

IBM TotalStorage 3581 Tape Autoloader
Models L28/L38/L3H and F28/F38/F3H



Setup, Operator, and Service Guide

IBM TotalStorage 3581 Tape Autoloader
Models L28/L38/L3H and F28/F38/F3H



Setup, Operator, and Service Guide

Note!

Before using this information and the product it supports, read the information in "Safety and Environmental Notices" on page xv and "Notices" on page 293.

To ensure that you have the latest publications, visit the web at <http://www.ibm.com/storage/support/lto>, select your product, and click "Documentation".

Second Edition (March 2005)

| This edition applies to the *IBM TotalStorage Ultrium Tape Autoloader 3581 Models L28/L38/L3H and F28/F38/F3H Setup, Operator, and Service Guide* and to all subsequent releases and modifications until otherwise indicated in new editions.

| The IBM« TotalStorage Ultrium Tape Autoloader 3581 Models L28/L38/L3H and F28/F38/F3H offer a 3-year parts-only warranty and are supported by the Customer Replaceable Unit (CRU) process. For details about the CRU process and customer responsibilities, see the warranty that is included in the back of this document.

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Read This First

Accessing Online Technical Support

For online Technical Support for your Autoloader, visit:

<http://www.ibm.com/storage/support/lto>

Summary of Changes

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

Second Edition (March 2005)

- Clarified the steps for determining the proper rack holes to use when installing the autoloader in a rack.
 - Modified the Operator Guide section by updating procedures, menus, and artwork, as necessary, to reflect changes in the microcode.
 - Changed the sequence of steps in the Configuration section in an effort to streamline the configuration procedure.
 - Expanded and restructured the Troubleshooting section.
 - Added new service procedures to the Appendices.
-

Registering for My Support

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Safety and Environmental Notices

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

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

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





Danger Notice





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

Caution Notice

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

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

If the symbol is...	It means....
	<p>A hazardous condition due to the weight of the unit. Weight symbols are accompanied by an approximation of the product's weight.</p>
	<p>Indicates access by IBM Authorized Service Personnel only.</p>

Laser Safety and Compliance

Before using the Autoloader, review the following laser safety information.

Class I Laser Product

The Autoloader 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 Autoloader 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 Autoloader and have obtained approvals to the latest standards as they apply.

Intended Use

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

Safeguards

To maintain safeguards, observe the following basic rules for installation, use, and servicing of the Autoloader.

- **Follow Warnings** - Adhere to all warnings on the product and in the operating instructions.
- **Read Instructions** - Read and follow all installation and operating instructions.
- **Ventilation** - Situate the Autoloader so that its location or position provides adequate front and rear ventilation (at least two inches).
- **Heat** - Situate the product away from heat sources such as radiators, heat registers, furnaces, or other heat-producing appliances.
- **Power Sources** - Connect the Autoloader to a power source only of the type directed in these operating instructions or as marked on the product label.
- **Power Cord Protection** - Route the AC line cord so that it is not likely to be walked on or pinched by items placed upon or against it, paying particular attention to the cord at the wall receptacle, and the point where the cords exits from the product.

- **Object and Liquid Entry** - Take care to ensure that objects do not fall and liquids are not spilled into the product's enclosure through openings.
- **Servicing** - Do not attempt to service the product beyond that described in the operating and installation instructions. All other servicing should be referred to qualified service personnel.

Precautions

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

- Do not use oil, solvents, gasoline, paint thinners, or insecticides on the unit or near the unit. Vapors from these types of chemicals can damage the tape media components.
- Do not expose the unit to moisture or store the unit in temperatures higher than 60°C (140°F), or to extreme low temperatures. See "Specifications" on page 15 for operating temperatures.
- Keep the unit away from direct strong magnetic fields, excessive dust, and electronic or electrical equipment that generates electrical noise.
- Hold the AC power plug by the head when removing it from the AC source outlet; pulling the cord can damage the internal wires.
- Use the unit on a firm, level surface free from vibration. Do not place any objects on top of the unit..

Safety Inspection Procedure

Before you service the Autoloader, perform the following safety inspection procedure:

1. Stop all activity on the SCSI bus.
2. Power off the Autoloader.
3. Unplug the Autoloader's power cord from the electrical outlet and then from the rear of the unit.
4. Disconnect all cables and terminators and inspect for damage.
5. Check the Autoloader's power cord for damage, such as a pinched, cut, or frayed cord.
6. Check the cover of the Autoloader for sharp edges, damage, or alterations that expose its internal parts.
7. Check the cover of the Autoloader for a proper fit. It should be in place and secure.
8. Check the product label on the bottom of the Autoloader to make sure it matches the voltage at your outlet.

3581 Library ac Grounding Inspection

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

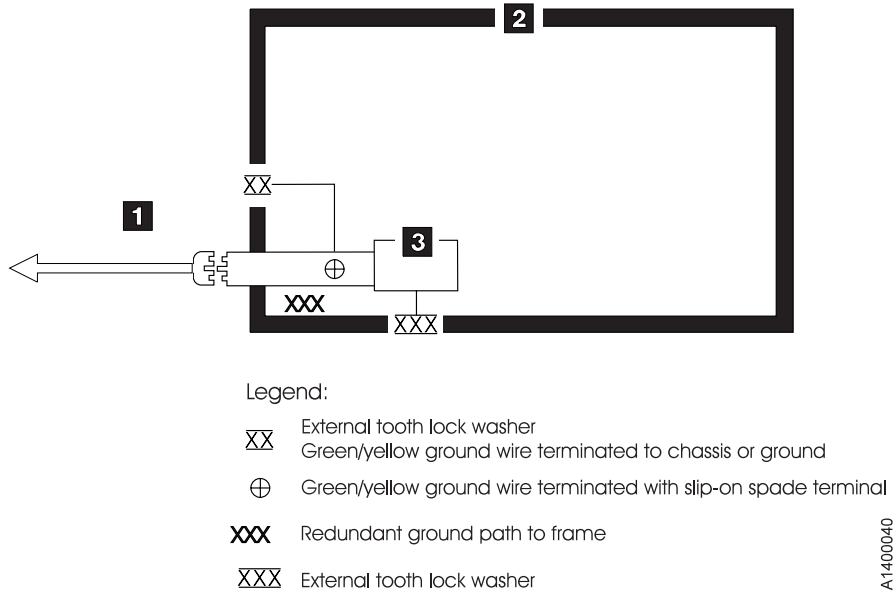


Figure 1. AC Grounding Diagram (50 Hz and 60 Hz)

End of Life (EOL) Plan

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

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

About This Guide

This Setup, Operator, and Service Guide is intended to provide information for operators, system administrators, installer, and service personnel. The publication is divided into the following parts:

- Part 1, "Setup Guide," on page 1 contains product description, installation, and configuration information.
- Part 2, "Operator Guide," on page 43 contains menu, operation, and media information.
- Part 3, "Service Guide," on page 161 contains troubleshooting, diagnostic/maintenance, serial port connection, removal/replacement, and parts information.
- Part 4, "The Appendix, " contains:
 - "Element Addresses" on page 225
 - "TapeAlert Flags" on page 227
 - "Messages" on page 233
 - "Sense Data" on page 241
 - "Autoloader Configuration Form" on page 251
 - "Rack Mount Template" on page 253
 - "Information for IBM Service Personnel" on page 255

Store this guide with your server's (host's) manuals. For additional reference information, refer to the section that follows.

Related Publications

Refer to the following publications for additional information about the Autoloader. To ensure that you have the latest versions of the publications, visit the web at <http://www.ibm.com/storage/support/lto>.

3581 Autoloader Publications

The following publications can be accessed at

<http://ehone.ibm.com/public/applications/publications/cgibin/pbi.cgi>.

- *IBM TotalStorage Ultrium Tape Autoloader 3581 Models L28/L38/L3H and F28/F38/F3H Quick Reference*, GX35-5071, provides quick start information for the Autoloader.

IBM TotalStorage Ultrium Tape Autoloader 3581 Models L28/L38/L3H and F28/F38/F3H SCSI Reference, GA32-0471, provides the supported SCSI commands and protocol that govern the behavior of the SCSI interface for the 3581 Tape Autoloader.

IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference, GA32-0450, provides information on the use and programming of all models of the LTO Ultrium Tape Drive.

Redbooks

- *The IBM LTO Ultrium Tape Libraries Guide* provides information on all LTO tape drive products.

- *Using IBM LTO Ultrium with Open Systems*, SG-6502, provides information on all LTO tape drive products.
- *Implementing IBM LTO in Linux and Windows*, SG-6268, provides information on all LTO tape drive products.

Device Driver Publications

- *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430, provides instructions for attaching IBM-supported hardware to open-systems operating systems. It indicates what devices and levels of operating systems are supported, gives the requirements for adapter cards, and tells how to configure servers to use the device driver with the Ultrium family of devices. To order by using File Transfer Protocol (FTP), visit <ftp://ftp.software.ibm.com/storage/devdrv>.
- *IBM TotalStorage Ultrium Device Drivers Programming Reference*, GC35-0483, supplies information to application owners who want to integrate their open-systems applications with IBM-supported Ultrium hardware. The reference contains information about the application programming interfaces (APIs) for each of the various supported operating-system environments. To order by using File Transfer Protocol (FTP), visit <ftp://ftp.software.ibm.com/storage/devdrv>.

Safety Publications

- *IBM Externally Attached Devices Safety Information*, SA26-2004, provides translations of safety notices.

SCSI Publications

- *SCSI-3 Stream Commands (SSC)*, published by the American National Standards Institute and available on the web at <http://www.t10.org>.
- *SCSI Primary Commands-2 (SPC-2)*, published by the American National Standards Institute and available on the web at <http://www.t10.org>.

Online Support

Autoloader Firmware

- <http://www.ibm.com/storage/support/lto/>
- <ftp://index.storsys.ibm.com/358x>

IBM Online Support

- <http://www.ibm.com/storage/support/lto/>
- <http://www.ibm.com/support/mySupport>

IBM Publications Center

- <http://ehone.ibm.com/public/applications/publications/cgibin/pbi.cgi>
- <http://www.ibm.com/storage/support/lto/>

IBM Redbooks

- <http://w3.itso.ibm.com/>

Device Drivers

- <ftp://ftp.software.ibm.com/storage/devdrv>
- <ftp://index.storsys.ibm.com/358x>

| **Media and Supplies**

| <http://www.ibm.com/storage/media/>

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Product Description

The IBM TotalStorage® Ultrium Tape Autoloader 3581 Models L28/L38/L3H and F28/F38/F3H offer high capacity, performance, and technology designed for the mid-range open systems environment. These models incorporate a single Linear Tape Open (LTO) IBM TotalStorage Ultrium 2 (Models L28/F28) or Ultrium 3 (Models L38/F38/L3H/F3H) Tape Drive. The IBM TotalStorage Ultrium 3 Tape Drive more than doubles tape drive performance over the previous generation Ultrium 2 Tape Drive, with up to 80 MB per second native data transfer rate. In addition, with the use of the new IBM TotalStorage Ultrium 400 GB Data Cartridge, the Ultrium 3 Tape Drive has the capability of writing twice as much data, up to 400 GB native capacity (800 GB with 2:1 compression).

The Model L28/L38/L3H comes with an LVD Ultra160 SCSI attachment, while the Model F28/F38/F3H comes with a Native Switched Fabric Fibre Channel attachment, for connection to a wide spectrum of open systems servers. Both models connect to a wide spectrum of open systems servers. Note that the Ultrium 3 Tape Drive does not support HVD technology.

The 3581 Tape Autoloader is a desktop or rack-mountable unit (requiring two rack units) that operates in automatic, sequential, or random mode and comes equipped with a robotic interface that moves tape cartridges to and from the drive and cartridge carousel. With an eight tape cartridge capacity, it provides a media capacity of up to 3.2 TB (6.4 TB with 2:1 compression) data storage per unit. Optional features include an HVD Converter, a Remote Management Unit (RMU), and a Bar Code Reader (BCR).



Figure 2. IBM TotalStorage Ultrium Tape Autoloader 3581 Models L28/L38/L3H and F28/F38/F3H

The Autoloader's Ultrium 2 and Ultrium 3 Tape Drive offer:

- **Digital speed matching**

The Ultrium 2 and Ultrium 3 Tape Drive will perform dynamic speed matching to adjust the drive's native data rate as closely as possible to the net host data rate (after data compressibility has been factored out). This offers the dual benefit of reducing the number of backhitch repositions and improving throughput performance.

- **Power management**

The power management function controls the drive's electronics to be either completely turned off or to be in a low-power mode. These power modes occur only when the circuit functions are not needed for drive operation.

- **Channel calibration**

The channel calibration feature allows for customization of 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.

- **Separate writing of multiple filemarks**

Separate writing of multiple filemarks causes any write command of two or more filemarks to cause a separate data set to be written containing all filemarks after the first. This feature has two advantages:

- First, it can improve performance if a subsequent append overwrites somewhere after the first filemark.
- Second, write of multiple filemarks typically indicates a point where an append operation might occur after the first of these filemarks.

This change prevents having to rewrite datasets containing customer data and the first filemark in cases when (where) such an append occurs.

- **Large internal buffer**

The Ultrium 2 Tape Drive and has a 64 MB internal data buffer. The Ultrium 3 Tape Drive has a 128 MB internal buffer .

- **Fast cartridge fill times** (for Ultrium 3, Ultrium 2 and Ultrium 1 data cartridges)

- **Fast data access, rewind, and load times**

Table 1. Data access, rewind, and load times

Action	Autoloader	Ultrium 2 Tape Drive	Ultrium 3 Tape Drive
Cartridge Load Time	32 seconds	15 seconds	10 seconds
Maximum Rewind Time	N/A	80 seconds	88 seconds
Average File Access Time	N/A	49 seconds	49 seconds

Product Features

This section describes the standard and optional features of the Autoloader.

Standard Features

The Autoloader includes the following standard features:

- **Operator Control Panel (OCP)**

The OCP provides an easy-to-read display and a four button keypad allowing the user to monitor and control the operations of the Autoloader. The OCP's display provides access to library status, commands, setup, and tools. See "Front Panel Components" on page 7 and "Operator Control Panel (OCP)" on page 46 for additional information.

- **Robotic system**

The Autoloader's robotic system includes an I/O Door, a cartridge carousel with cartridge slots, and a cartridge loader. The I/O Door allows importing or exporting a single cartridge to or from the Autoloader. The cartridge carousel encircles the Ultrium 2 and Ultrium 3 Tape Drive and positions the specified cartridge slot in front of the tape drive. A robotic cartridge loader moves the cartridges between the cartridge slots and the tape drive.

|

- **Eight-cartridge capacity**

Up to eight Ultrium 3, Ultrium 2 or Ultrium 1 tape cartridges can be stored in cartridge slots mounted on the carousel.

- **Cartridge inventory**

Each time the Autoloader is powered on, an inventory of all cartridge slots is performed.

- **Built-in diagnostics**

The Autoloader includes firmware that performs diagnostic tests and reports drive operating status. An error and event log is available through the OCP or optional RMU.

- **Ultrium 2 or Ultrium 3 Tape Drive**

The Autoloader is available with an LVD SCSI (Model L28/L38/L3H) or a Fibre Channel (Model F28/F38/F3H) Ultrium 2 or Ultrium 3 Tape Drive.

Optional Features

The Autoloader has the following optional features:

- **Bar Code Reader (BCR)**

The BCR reads bar code labels and sends the label IDs to the server (host) and to the Remote Management Unit (RMU), if installed.

- **Remote Management Unit (RMU)**

The RMU provides remote access to the Autoloader over a network via a web browser and makes functions accessible without the need for a dedicated server or separate software.

- **HVD Converter**

The HVD Converter is a SCSI HVD to LVD converter/expander. It converts the Autoloader's low voltage differential (LVD) to wide high voltage differential (HVD). This allows LVD-peripherals to be used on an HVD bus. The converter can also be used to reshape poor quality LVD signals, and allow additional cable length.

- **Rack Mount Kit**

The Rack Mount Kit supplies the necessary mounting hardware to install the Autoloader in a 19-inch rack.

Component Descriptions

This section contains descriptions of the following:

- “Front Panel Components”
- “Interior Components” on page 8
- “Rear Panel Components” on page 10

Front Panel Components

Figure 3 shows the Autoloader’s front panel components.

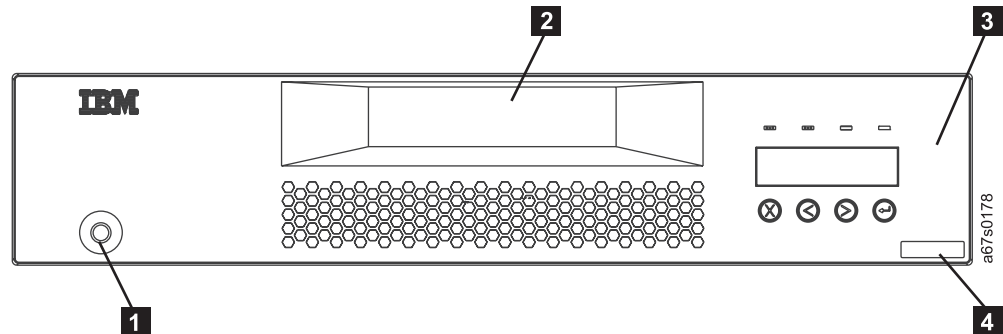


Figure 3. Front panel components

1 POWER™ button

For powering the Autoloader on and off.

2 I/O Door

Allows the user to insert or remove cartridges from the Autoloader.

3 Operator Control Panel (OCP)

Allows the operator to control the Autoloader without a Remote Management Unit (RMU) and contains the following:

- Status LEDs (4)
- Liquid crystal display (OCP display)
- Keypad with four buttons (Cancel, Previous, Next, Enter)

4 Serial Number

A label with machine type, model, and serial number.

Interior Components

Figure 4 shows the Autoloader's interior components and one cartridge slot.

á



Attention: Only IBM Authorized Service Personnel should remove the Autoloader's cover.

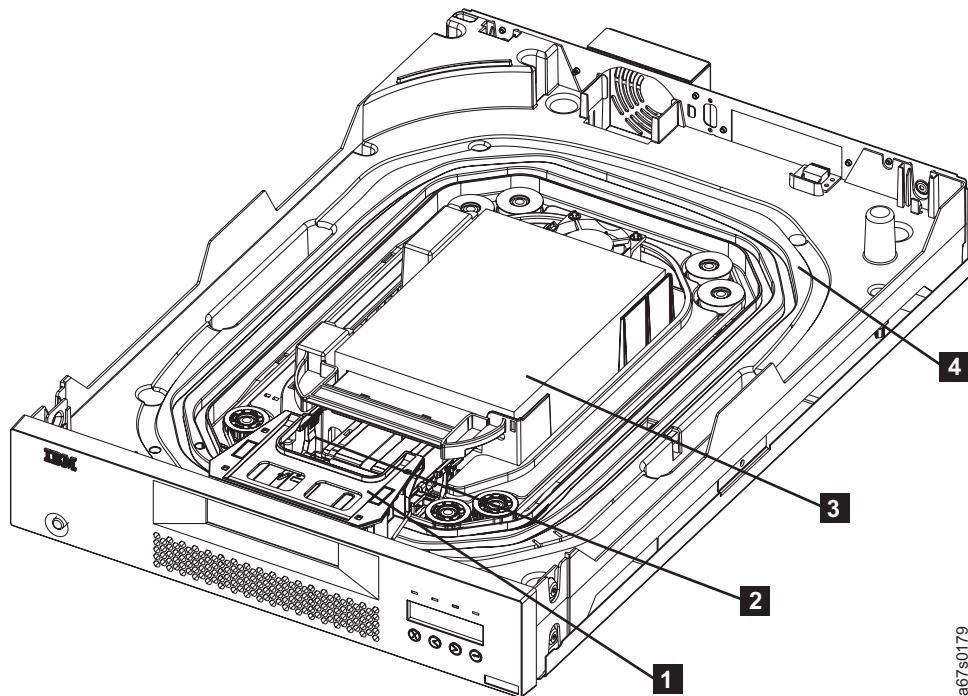


Figure 4. Interior components with one cartridge slot

1 Cartridge slot

Each cartridge is installed in a cartridge slot to ensure the cartridge is properly aligned for insertion into the tape drive.

2 Cartridge loader

The cartridge loader moves cartridges between the cartridge slots and the tape drive. When a cartridge slot is positioned in front of the drive, the loader grips the sides of the cartridge and slides it forward or backward between the slot and drive. The loader then releases the cartridge and pushes it firmly into the drive or slot.

3 Ultrium 2 or Ultrium 3 Tape Drive (LVD or Fibre Channel)

Generation 2 models of the Autoloader contain one LVD (Model L28) or Fibre Channel (Model F28) Ultrium 2 Tape Drive. The drive can sustain a maximum data transfer rate of 107 MB per second (compressed) and can store up to 400[®] GB of compressed information on a single data cartridge (assuming an average compression ratio of 2:1.)

Generation 3 models of the Autoloader contain one LVD (Model L38/L3H) or Fibre Channel (Model F38/F3H) Ultrium 3 Tape Drive. The drive can sustain a maximum data transfer rate of 160 MB per second and can store up to 800 GB of compressed information on a single data cartridge (assuming an average compression ratio of 2:1).

4 Carousel

The carousel stores up to eight Ultrium 3, Ultrium 2 or Ultrium 1 data cartridges. The carousel consists of a drive chain, guides, and gears that move the cartridges into position in front of the drive.

Rear Panel Components

All rear panels regardless of configuration contain the following standard elements:

- **1 Power cord receptacle**
Provides AC power and chassis grounding to the Autoloader.
- **2 Power Ratings / Warning Label**
A label showing power ratings and warning the customer not to remove the cover of the Autoloader.

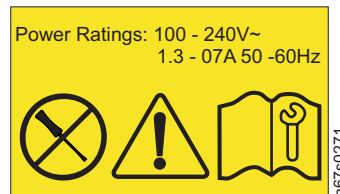


Figure 5. Rear panel label showing power ratings and warning customers not to remove the Autoloader cover

- **3 Fan**
Provides cooling for the Autoloader.
- **4 Serial Port**
Allows serial communication between the Autoloader and a server (host).

Figure 6 shows the rear panel components of the Autoloader with an LVD SCSI (Model L28/L38/L3H) drive.

- **5 SCSI Receptacles**
The Autoloader has two HD68 SCSI receptacles for connecting the Autoloader to a single LVD SCSI bus to accommodate one of the following:
 - A SCSI cable connecting the Autoloader to a server (host).
 - A wide external terminator or a cable to another SCSI device.

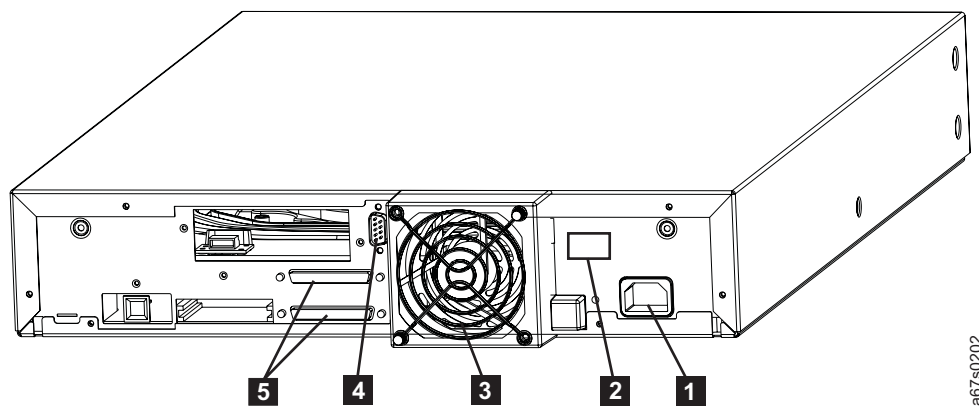


Figure 6. Rear panel with standard elements and SCSI connectors with an LVD SCSI (Model L28/L38/L3H) drive

Figure 7 on page 11 shows the rear panel components of the Autoloader with an LVD SCSI drive (Model L28/L38/L3H) and HVD Converter.

- **1 Optional HVD Converter**

Used to convert an Autoloader with an LVD SCSI drive to communicate with an HVD system.

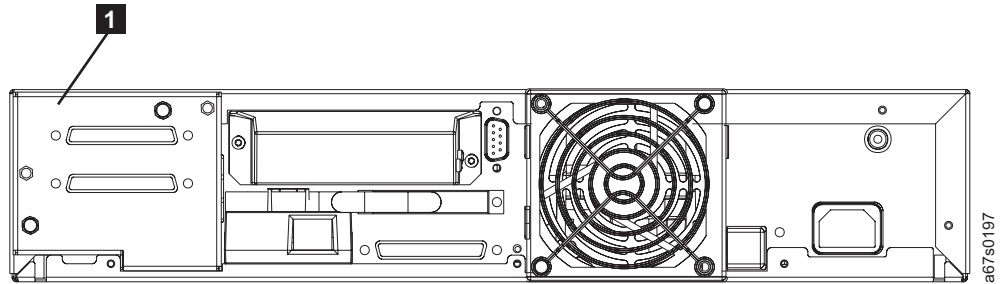


Figure 7. Rear panel components with an LVD SCSI drive (Model L28/L38/L3H) and HVD Converter

Figure 8 shows the rear panel components of the Autoloader with a Fibre Channel (Model F28/F38/F3H) drive.

- **1 Fibre Channel Receptacle**

The receptacle for the Fibre Channel interface cable that connects the Autoloader with the server (host).

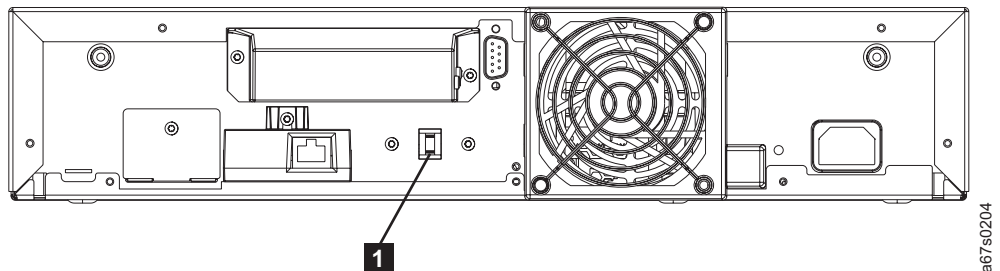


Figure 8. Rear panel with a Fibre Channel (Model F28/F38/F3H) drive connection

Media

The Autoloader uses the following cartridge types:

- IBM TotalStorage LTO Ultrium 400 GB Data Cartridge (Ultrium 3)
- IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (Ultrium 2)
- IBM LTO Ultrium Data Cartridge (Ultrium 1 with 100 GB capacity)
- IBM TotalStorage LTO Ultrium Cleaning Cartridge
- LTO Ultrium Cleaning Cartridge (universal cleaning cartridge compatible with Ultrium 3, Ultrium 2 and Ultrium 1 drives)

For additional information, refer to “Media” on page 143.

Tape Drive Performance

Table 2. Performance characteristics of the Ultrium 2 and Ultrium 3 Tape Drive

Performance Characteristic	Tape Drive	
	Ultrium 2 Tape Drive	Ultrium 3 Tape Drive
Native sustained data rate	N/A (with Ultrium 3 media)	80 MB/s (with Ultrium 3 media)
	35 MB/s (with Ultrium 2 media)	35 MB/s (with Ultrium 2 media)
	20 MB/s (with Ultrium 1 media)	20 MBs (with Ultrium 1 media - read only)
Compressed data rate (at 2:1 compression)	70 MB/s (with Ultrium 2 media)	135 MB/sec (SCSI)
	40 MB/s (with Ultrium 1 media)	150 MB/sec (FC)
Maximum sustained data rate (at maximum compression)	107 MB/s (LVD) 37 MB/s (HVD) 110 MB/s (Fibre Channel)	135 MB/s (LVD) 150 MB/s (Fibre Channel)
Burst data rate	160 MB/s (LVD) 40 MB/s (HVD) 200 MB/s (Fibre Channel)	160 MB/s (LVD) 200 MB/s (Fibre Channel-2Gbits)
Nominal load-to-ready time	15 seconds	15 seconds
Nominal unload time	15 seconds	15 seconds
Average search time to first byte of data	49 seconds	47 seconds
<p>Note: Although the Autoloader provides the capability for high tape performance, the actual throughput is a function of many components, such as system processor, disk data rate, data block size, data compressibility, I/O attachments, and the system or application software used. For example, the HVD Ultra SCSI converter interface has a maximum data transfer rate of 40 MB/second, so Ultrium Tape Drives on that SCSI interface will have a lower data transfer rate. The compression technology used in the tape drive can typically double the amount of data that can be stored on the media; however, the actual degree of compression achieved is highly sensitive to the characteristics of the data being compressed.</p>		

Interfaces

The Autoloader is available with a choice of interfaces, either SCSI HVD (with the optional HVD Converter or) LVD, or Fibre Channel.

SCSI Differential (HVD)

The SCSI differential HVD converter is only available on Ultrium 2 tape drives. HVD (often referred to as just "differential") uses differential signaling. The idea behind differential signals is that each bus signal is carried on a pair of wires. The first wire of the pair carries the same type of signal as single-ended SCSI. However, the second wire of the pair carries its logical inversion. The receiver of the signals takes the difference of the pair (hence the name), which makes it less susceptible to noise and capable of supporting greater cable lengths. HVD and single-ended SCSI are completely incompatible with each other.

In general, IBM HVD tape devices support an overall bus length of 25 meters, using point-to-point or multi-drop interconnection (daisy-chaining). For each daisy-chained device, the maximum cable length must be reduced by 0.5 meters.

SCSI Differential (LVD)

LVD uses less power than the HVD differential interface, and allows the higher speeds of Ultra-2 SCSI. LVD requires 3.3 V dc instead of 5 V dc for HVD.

IBM LVD tape devices support a bus length of 25 meters point-to-point, and 12 meters using multi-drop interconnection (daisy-chaining). For each daisy-chained device, the maximum cable length must be reduced by 0.5 meters.

The terms fast, wide, and ultra indicate characteristics that are separate from those implied by differential, single-ended, and high or low voltage. Table 3 shows the SCSI terms used to describe different host and device adapters and what they imply in terms of bus width and speed.

Table 3. SCSI terms and characteristics

SCSI Term	Bus Width (bits)	Speed (MB/s)	Max. Length	Max. Devices
SCSI	8	5	6 m	7
Fast SCSI	8	10	3 m	7
Fast Wide SCSI	16	20	3 m	15
Ultra (Wide) SCSI HVD	16	40	25 m	15
Ultra (Wide) SCSI 2 LVD	16	80	25 m / 12 m	15
Ultra 160 SCSI LVD	16	160	25 m / 12 m	15

Note: A faster bus does not imply that an attached device will support that data rate, but that multiple devices can operate on the bus at that maximum speed. For a detailed table of SCSI terms and related specifications, refer to the SCSI Trade Association Web site at <http://www.scsita.org/terms/scsiterms.html>. To ensure best performance, if possible, avoid daisy-chaining.

Fibre Channel Supported Topologies

Fibre Channel allows for an active intelligent interconnection scheme, called a Fabric, to connect devices. Everything between the ports on Fibre Channel is called the Fabric. The Fabric is most often a switch or series of switches that takes the responsibility for routing. Fibre channel supports three basic topologies:

- Arbitrated loop (supported by the Autoloader)
- Switched Fabric (supported by the Autoloader)
- Point-to-point (unsupported by the Autoloader)

The actual topology is transparent to each individual attached device. All point-to-point and arbitrated loop topologies require that all nodes use the same data rate at all times. In the switched topology, different speed devices can be supported.

The Switched Fabric topology is similar to the star network layout commonly implemented on networks that use twisted pair cabling. A central device, in this case a fibre channel switch, provides a central connectivity point for all of the devices in the fabric. This allows each node to access all other nodes that are connected to the fabric.

The Autoloader allows the selection of the following Fibre channel port behaviors:

- **LN Port:** (default setting) an automatic configuration that tries arbitrated loop first, then switched fabric.
- **NL Port:** an automatic configuration that tries switched fabric first, then arbitrated loop.
- **L Port:** arbitrated loop.
- **N Port:** point to point protocol in a switched fabric topology.

Server (Host) Attachment

The Autoloader supports LVD Ultra160, HVD Ultra SCSI (with the optional HVD Converter) or Fibre Channel interfaces. The Autoloader features two HD68 receptacles or one LC Fibre Channel receptacle. For instructions on attaching your Autoloader to a server (host), see “Step 4. Configure the Autoloader to the Server (Host)” on page 110.

Supported Servers (Hosts) and Operating Systems

The Autoloader is supported by a wide variety of servers (hosts) and operating systems, as well as adapters. The following operating systems are supported by the Autoloader:

- AS/400[®]
- HP-UX
- IBM @server i5 and iSeries[™]
- IBM @server p5 and pSeries[®]
- IBM @server xSeries[®]
- Linux
- Microsoft[®] Windows[®] 2000
- Microsoft Windows 2003
- Microsoft Windows NT[®] (Ultrium 2 only)
- Netfinity[®]
- RS/6000[®]
- RS/6000 SP[™]
- Sun
- zSeries[®] Linux (Model F28/F38/F3H only)

To determine the latest supported attachments and host software versions and releases, visit the web at <http://www.ibm.com/storage/support/lto>. Select “LTO Support”, then the “Interoperability Matrix and Software ISVs”, and view the “Supported Servers and Operating Systems”.

Note:

1. IBM does not provide backup application software with the Autoloader. 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 for each supported operating system listed above are available from IBM for downloading. For device driver downloading and installation instructions, see “Step 3. Install Device Drivers” on page 110.

TapeAlert Support

The Autoloader is compatible with TapeAlert technology, which provides error and diagnostic information to the server (host). For more information, see “TapeAlert Flags” on page 227.

Specifications

Specifications for the Autoloader are listed in the following tables below:

- Table 4 for Physical Specifications
- Table 5 for Power Specifications
- Table 6 for Acoustic Specifications
- Table 7 on page 16 for Environmental Specifications

Specifications for tape cartridges are given in “Environmental and Shipping Specifications for Tape Cartridges” on page 151.

Table 4. Physical Specifications for the Autoloader

Physical Specifications		
	Desktop Version	Rack Mount Version
Width	421 mm/16.6 in.	483 mm/19 in.
Depth	665 mm/26.2 in.	660 mm/26 in.
Height	86 mm/3.4 in.	89 mm/3.5 in.
Weight	Approx. 12.5 kg/27.56 lbs.(max.) without Rack Mount Kit	

Table 5. Power Specifications for the Autoloader

Power Specifications	
AC line voltage	100 to 240 Vac
Line frequency	50 to 60 Hz auto-ranging
Line current at 100 Vac	1.3 A
Line current at 240 Vac	0.7 A
Maximum heat output	100 watts (86 KCAL/hr.)

Table 6. Acoustic Specifications for the Autoloader

Acoustic Specifications		
Maximum noise level	Idling	Operating
	60 db (6.3 bels)	62 db (6.5 bels)

Table 7. Environmental Specifications for the Autoloader

Environmental Specifications				
Environmental Factor	Power On	Power Off ¹	Storage ²	Shipment ²
Temperature	+10°C to +35°C	+10°C to 43°C	1°C to 60°C	-40°C to +60°C
Temperature Variation	10°C/Hr max	10°C/Hr max	10°C/Hr max	10°C/Hr max
Relative humidity (noncondensing)	15% to 85%	10% to 90%	10% to 90%	10% to 90%
Wet bulb (max.)	26°C	27°C	29°C	29°C
Altitude (meters)	0 to 2500	0 to 2500	0 to 2500	0 to 12192

Note: The operating environment of the Autoloader must not conflict with the media storage requirements (see "Environmental and Shipping Specifications for Tape Cartridges" on page 151). While the Autoloader 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 Autoloader. If media is stored in the Autoloader for more than 10 hours, the storage temperature requirements for media should be met. It should be assumed that media stored in the Autoloader will be 2 degrees above ambient room temperature when the Autoloader is powered on.

1. Values indicated are valid for the unpacked unit with no data cartridge. If there is a cartridge with the unit either inside or out, then the "Power On" specification must apply to the "Power Off" situation.
2. Values indicated are valid for the packaged unit. The storage period should not exceed three (3) years. The limits are for the ambient temperature within 1 meter from the packaged unit.

Installation

Installation and configuration of the Autoloader can be accomplished by following the steps outlined in this chapter. If some options were not purchased with the Autoloader, skip the steps related to installing those options not purchased and proceed to the next step to continue the installation.

Attention

1. The Autoloader is a customer setup unit. It is the customer's responsibility to install this product.
2. The Autoloader Models L28/L38/L3H and F28/F38/F3H offer a 3-year warranty. These models are designed as Customer Replaceable Units (CRU). The warranty is a parts-only warranty. For details about the Customer Replaceable Unit process and customer responsibilities, see "Statement of Limited Warranty" on page 298.

To install the Autoloader, complete the following steps. For more information, refer to the instructions for each step in this chapter.

- • "Step 1. Unpack the Autoloader" on page 18
- • "Step 2. Verify the Shipment Inventory" on page 19
- • "Step 3. Inspect the Power Cord and Outlet" on page 21
- • "Step 4. Install the Optional Remote Management Unit (RMU)" on page 22
- • "Step 5. Install the Optional HVD Converter (L28 Models Only)" on page 23
- • "Step 6. Install the Optional Bar Code Reader (BCR)" on page 25
- • "Step 7. Install the Autoloader as a Desktop Unit" on page 26
- • "Step 8. Install the Autoloader in a Rack" on page 27
- • "Step 9. Connect Power" on page 36
- • "Step 10. Connect the Autoloader to Your Server (Host)" on page 38
- • "Step 11. Power on the Autoloader" on page 41

For detailed instructions on performing each step, refer to the sections that follow.

Step 1. Unpack the Autoloader

- ___ 1. If the operating environment differs from the storage environment by 15°C (30°F) or more, let the Autoloader acclimate to the surrounding environment for at least 12 hours before opening the shipping carton (see Table 7 on page 16).
- ___ 2. Unpack the Autoloader.
 - ___ a. Remove the accessories package, any options packages, and other contents from the outer box.
 - ___ b. Open the inner box and lift the Autoloader and padding out of the box.
 - ___ c. Place the Autoloader on a sturdy work surface with the top of the unit facing up.
 - ___ d. Carefully remove the shipping padding from the left and right sides of the Autoloader
 - ___ e. Remove the Autoloader from the plastic bag.
 - ___ f. Save the packing materials and boxes for storing or shipping the Autoloader in the future.
- ___ 3. Inspect the Autoloader for shipping damage. If there is damage, do not install the Autoloader. Report the damage immediately by contacting your place of purchase.
- ___ 4. Copy the “Autoloader Configuration Form” on page 251. This form is to be filled out with your Autoloader’s vital product data and stored in a secure location for future use. Should you need to contact IBM Technical Support, you will be asked for these numbers.

Note: Remember to update the Autoloader Configuration Form when changes are made to the configuration of the unit or firmware is upgraded.

- ___ 5. In the lower right corner of the front of the Autoloader, locate the label that gives the machine type (3581), model number (for example, L28) and serial number (S/N) of the Autoloader (see Figure 3 on page 7). Enter these numbers on your Configuration Form.
- ___ 6. On the underside of your Autoloader, locate the Agency Label. This label contains information regarding the various safety certifications associated with the Autoloader. Also on this label is a part number and revision number. Enter these numbers on your Configuration Form.

Step 2. Verify the Shipment Inventory

Table 8. Shipment inventory checklist

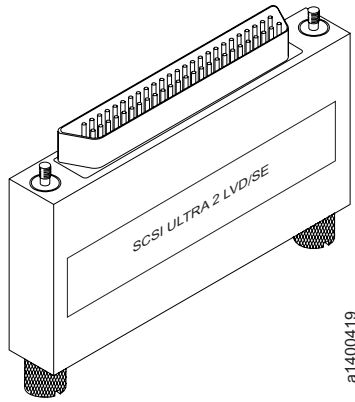
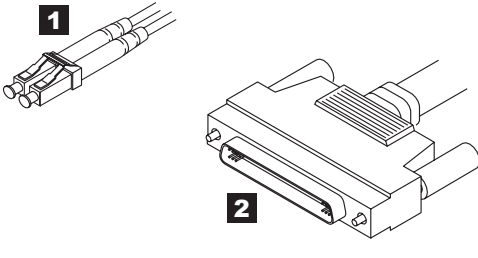
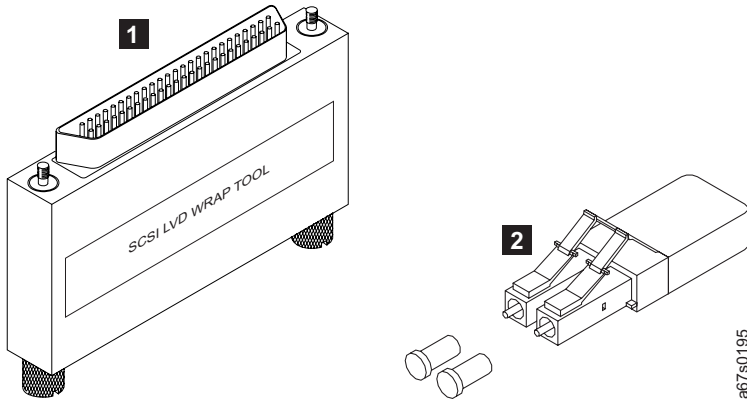
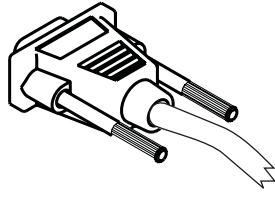
One Power cord (for the appropriate cord for your country or region, see “Power Cords” on page 218)
One IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (to be used for diagnostic purposes)
One IBM TotalStorage Ultrium Cleaning Cartridge (universal)
<p>One Device Driver Installation Kit that includes:</p> <ul style="list-style-type: none"> • CD that contains Open System device drivers, the <i>IBM Ultrium Device Drivers Installation and User’s Guide</i>, and the <i>IBM Ultrium Device Drivers Programming Reference</i> • Published copy of the <i>IBM Ultrium Device Drivers Installation and User’s Guide</i>
<p>One SCSI Ultra 2 LVD/SE terminator (with Model L28/L38/L3H)</p> 
<p>One fiber cable (1 with Model F28/F38/F3H) or one SCSI cable (2 with Model L28/L38/L3H)</p> 
<p>One SCSI LVD wrap tool (1 with Model L28/L38/L3H) or one Fiber wrap tool (2 with Model F28/F38/F3H)</p> 

Table 8. Shipment inventory checklist (continued)

One serial cable



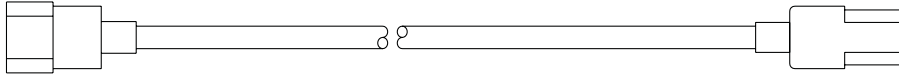
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Autoloader documentation CD-ROM containing:

- This document, the *IBM TotalStorage Ultrium Tape Autoloader 3581 Models L28/L38/L3H and F28/F38/F3H Setup, Operator, and Service Guide* which includes the Limited Statement of Warranty
- The *IBM TotalStorage Ultrium Tape Autoloader Models L28/L38/L3H and F28/F38/F3H Quick Reference*
- The *IBM Externally Attached Devices Safety Information* manual, SA26-2004

The Quality Hotline card

PCC cable for Autoloader installed in a rack (cable included in ship group when Rack Mount Kit is ordered)



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If your order has missing parts or was damaged in shipment, please contact your place of purchase or refer to the Quality Hotline card included with your shipment.

Step 3. Inspect the Power Cord and Outlet

- ___ 1. Inspect the power cord plug to ensure that it matches the power receptacle. If it does not match, refer to “Power Cords” on page 218 then contact your place of purchase.
- ___ 2. Ensure that the electrical outlets used are properly grounded and that the circuit breaker is turned on.

Step 4. Install the Optional Remote Management Unit (RMU)

The Remote Management Unit (RMU) provides remote access to the Autoloader over a network. The Autoloader can be attached to the network through a 10/100 Ethernet port located on the RMU. Any server (host) can access the Autoloader if it has a web browser installed and the IP Address of the Autoloader is known.

Tools Required

- T10 Torx wrench or small flat-blade screwdriver



CAUTION:

ESD Sensitive Component. Please touch the unit cover or rear panel before installing the RMU to avoid electrostatic discharge.

Installing the RMU

To install the RMU, complete the following steps:

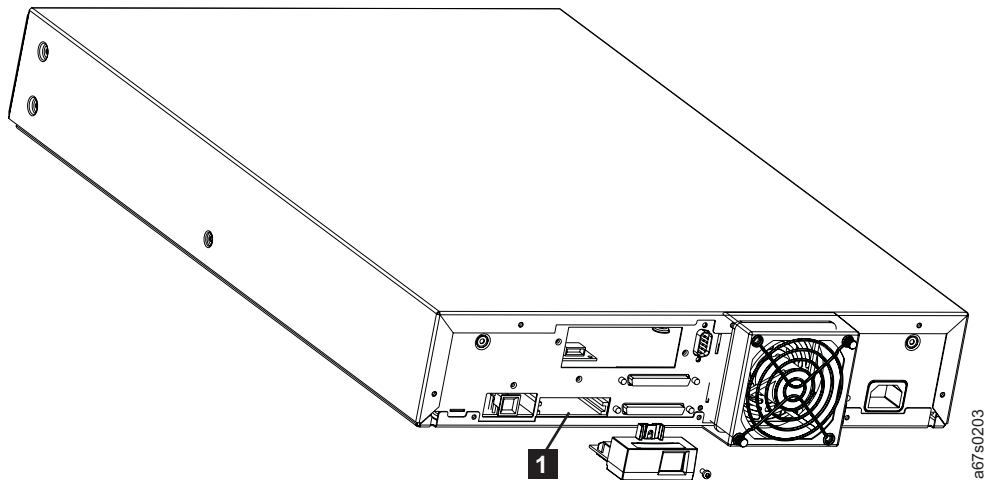


Figure 9. Installing the RMU

1. Remove the RMU cover plate (**1**) located below the BCR on the Autoloader's rear panel. **Save the screw.**



CAUTION:

Avoid contact with the card on the RMU.

2. Slide the RMU card into the guide slots at the bottom of the RMU opening on the rear panel of the Autoloader.
3. Insert and tighten the screw previously removed from the cover plate.
4. For instructions on connecting the RMU to a server (host), see "RMU Cabling" on page 38.

Step 5. Install the Optional HVD Converter (L28 Models Only)

Tools Required

- T10 Torx wrench or small flat-blade screwdriver



CAUTION:

ESD Sensitive Component. Please touch the unit cover or rear panel before installing the HVD Converter to avoid electrostatic discharge.

Installing the HVD Converter

Attention

Be sure to use HVD cables with the HVD converter.

To attach your Autoloader to a SCSI-HVD system, complete the following steps to install the HVD Converter:

1. Using the Torx wrench or small flat-blade screwdriver, remove the cover plate protecting the HVD Converter receptacle (**4**) on the rear of the Autoloader. **Save the cover plate and screws.**
2. Remove the converter from its packaging and check for damage. If the converter has missing parts or was damaged in shipment, please contact your place of purchase or refer to the Quality Hotline card included with your shipment.
3. Using the Torx wrench or small flat-blade screwdriver, remove the two screws (**1** or **2**) from the rear panel of the Autoloader.
4. Align the converter's power connector (**3**) with the receptacle (**4**) in the opening on the rear panel of the Autoloader and plug it in.

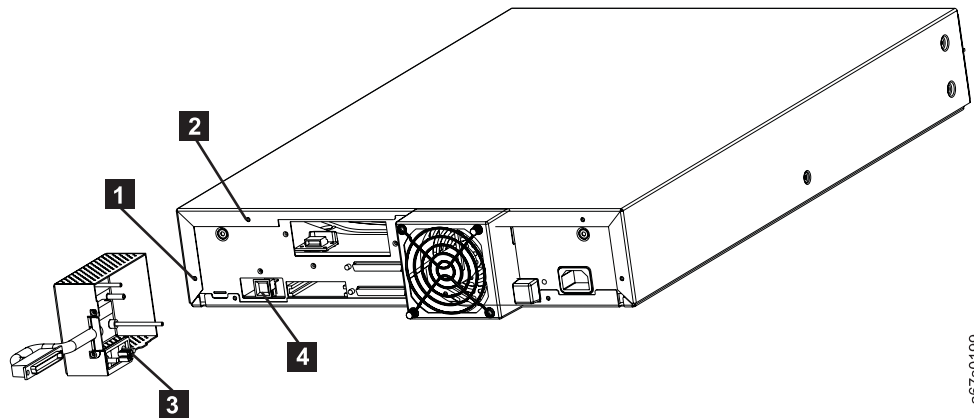


Figure 10. Aligning the HVD Converter to the Autoloader

5. Using the small flat-blade screwdriver, tighten the two thumbscrews (**5**) on the converter.

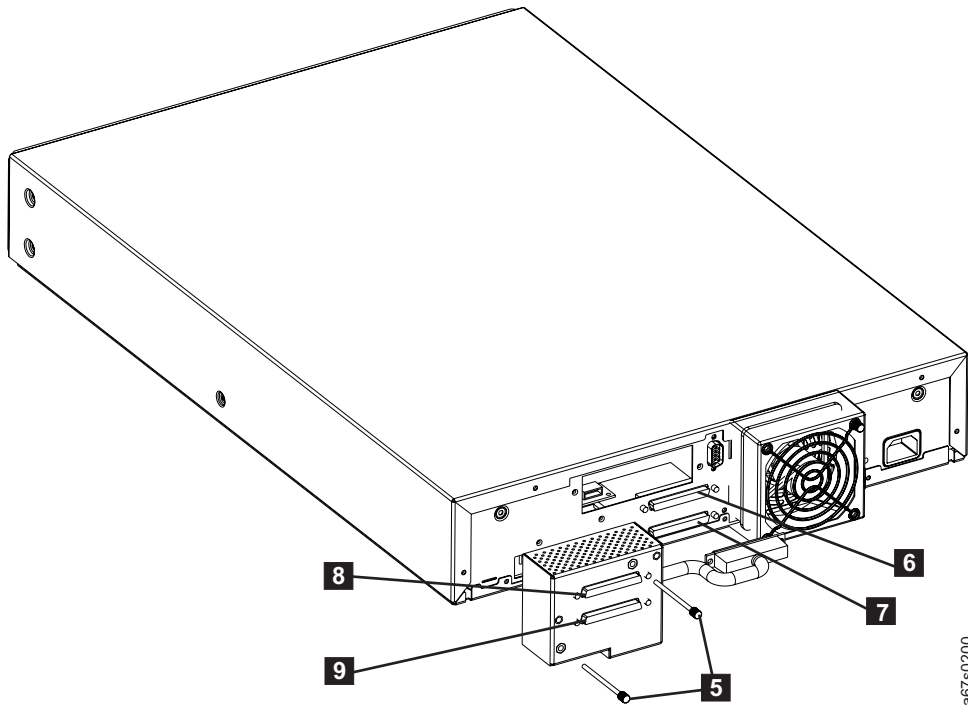


Figure 11. Installing the HVD Converter

- ___ 6. Plug in and secure the converter's SCSI cable into the top SCSI receptacle (**6**) on the rear panel of the Autoloader.
- ___ 7. Plug in and secure the LVD terminator into the bottom SCSI receptacle (**7**) on the rear panel of the Autoloader.

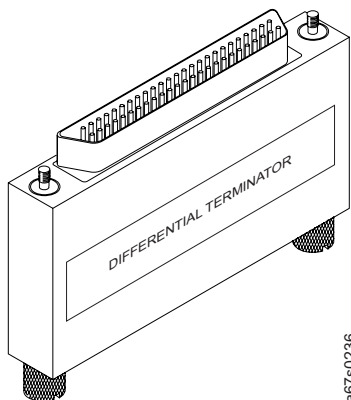


Figure 12. SCSI HVD Differential terminator

- ___ 8. For instructions on connecting the Autoloader to an HVD system via the receptacles (**8** and **9**) on the HVD Converter, see "Attaching to a SCSI-HVD System" on page 39.

Step 6. Install the Optional Bar Code Reader (BCR)

The BCR is an option for the Autoloader that reads bar code labels and sends the label IDs to the host and to the RMU, if installed. The BCR can operate only if bar code labels are present on the tape cartridges. Please make sure to use the appropriate bar code labels. See “Bar Code Label” on page 145 for more information.

Tools Required

- T10 Torx wrench or small flat-blade screwdriver

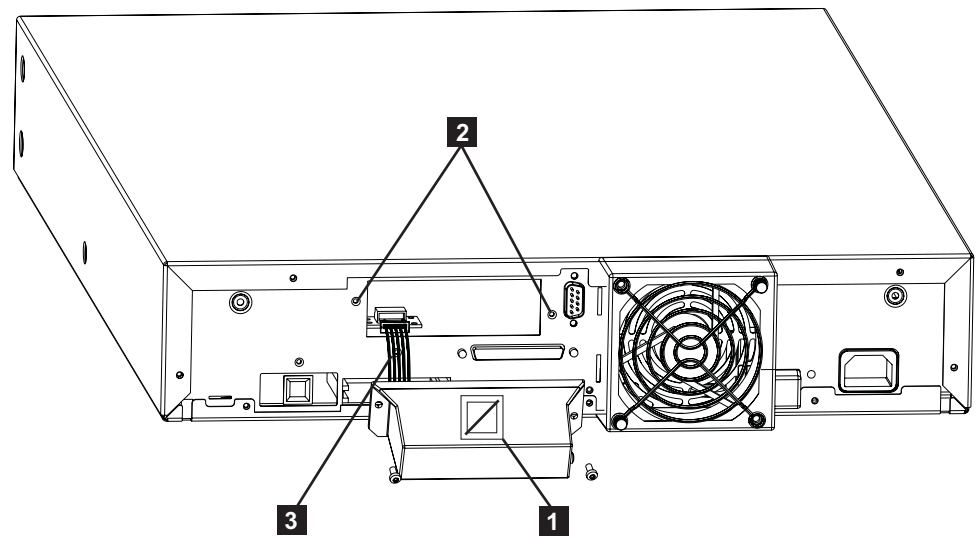


CAUTION:

ESD Sensitive Component. Please touch the unit cover or rear panel before installing the BCR to avoid electrostatic discharge.

Installing the BCR

Follow these steps to install the BCR on the rear panel of the Autoloader:



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Figure 13. Installing the Bar Code Reader

1. Remove the cover plate from the rear panel. **Save the screws.** Store the cover plate for reinstallation if the BCR is ever removed.
2. With the “No Handle” label (**1**) facing up, connect the cable (**3**) to the BCR’s controller outlet.
3. Align the screw holes (**2**) on the BCR with the holes left by the cover plate on the rear panel of the Autoloader to ensure correct placement. Feed the remainder of the cable back into the BCR so it will not block the BCR lens.
4. Using the Torx wrench or small flat-blade screwdriver, attach the BCR with the saved screws from the cover plate.

Step 7. Install the Autoloader as a Desktop Unit

Note: If your Autoloader is to be installed in a rack, skip this step and proceed to “Step 8. Install the Autoloader in a Rack” on page 27.

If your Autoloader will be installed as a desktop unit, position the Autoloader in a location that is away from dust, dirt, and debris, and is convenient to the server (host) to which it will be attached. The only restrictions are the length of the power cord and the length of the SCSI cable (with Model L28/L38/L3H) or the fiber cable (with Model F28/F38/F3H).

For a desktop installation, position the Autoloader in the following recommended locations:

- Away from high-traffic areas, especially if the floor is carpeted.
- Out of copy rooms to avoid toner and paper dust. Do not store paper supplies near any unit.
- Away from moving air, such as doorways, open windows, fans, and air conditioners.
- Off the floor.
- In a horizontal position on a flat surface.
- Where a tape cartridge can be easily inserted into the I/O Door.

á **Attention:** The Autoloader should not be stacked. Do not place anything on top of the Autoloader.



For instructions on connecting power to the Autoloader when installed as a desktop unit, see “Step 9. Connect Power” on page 36.

Step 8. Install the Autoloader in a Rack

These instructions describe how to install the Autoloader into a standard 19-inch rack.

Rack Safety

Rack Installation

DANGER

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

CAUTION:

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

(R001)

Rack Relocation (19" Rack)

CAUTION:

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

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

(R002)

Tools Required

- #2 Phillips screwdriver
- T10 Torx wrench (provided in kit)

Verify the Rack Mount Kit

Verify that the Rack Mount Kit contains the following items (refer to the figure below).

- Two support rails
- Two rack front-mount brackets

- Ten screws
- Ten washers
- Ten panel clip-nuts (for racks with round mounting holes)
- Ten cage clip-nuts (for racks with square mounting holes)
- Torx wrench

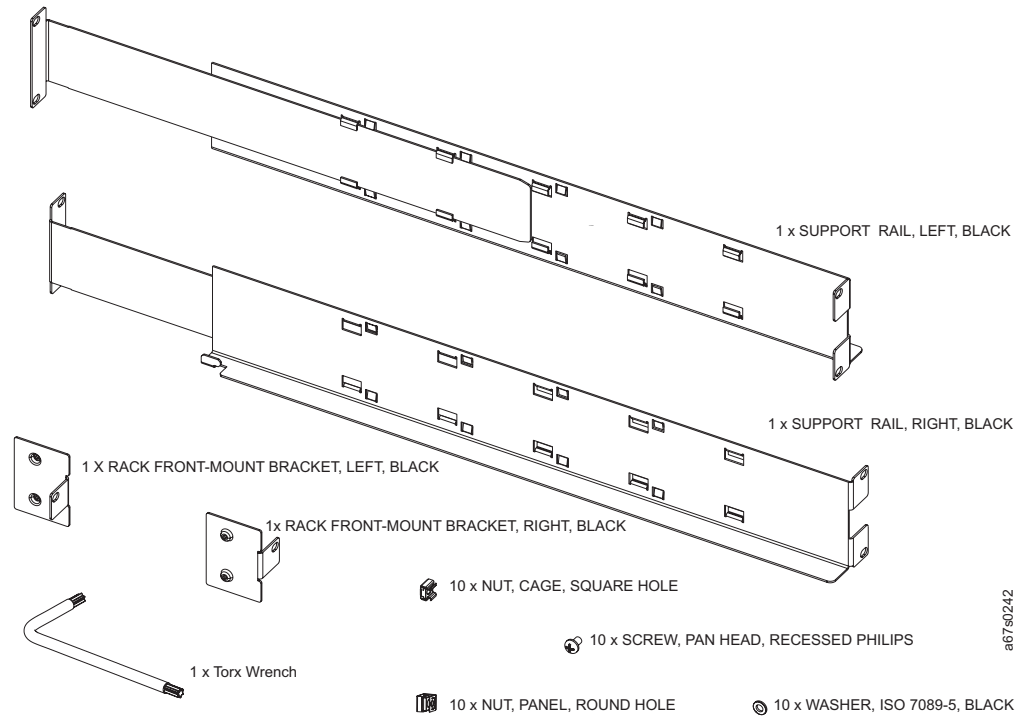


Figure 14. Illustration of parts contained in the Rack Mount Kit

Included in the ship group when a Rack Mount Kit is ordered is a PCC cable for Autoloaders installed in a rack. This cable connects the Autoloader to the rack's power strip.

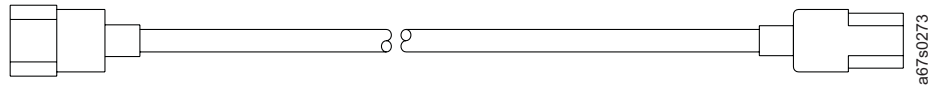


Figure 15. PCC cable

Check the Installation Environment

Before installing the Autoloader into a rack, consider the following:

- The maximum recommended ambient temperature for the Autoloader is 35°C (95°F). Install the Autoloader in an environment compatible with this temperature.
- The fan opening at the rear of the Autoloader and vent openings in the front should be free of cables and other obstructions.
- Make sure the supply circuit is suitable for all equipment loads in the rack.
- Secure all castor/wheels on the rack.
- Make sure the outlet or power strip that you intend to use is reliably grounded.
- Make sure that the installation environment is free of conditions that could cause electrostatic discharge (ESD). If possible, use an antistatic mat and grounded static protection wristband during installation. If a mat and wristband are not available, touch a known grounded surface, such as a computer's metal chassis.

Prepare the Autoloader for Installation

If the Autoloader is already in operation as a standalone unit, prepare it for installation in the rack as follows:



Attention: To avoid disrupting communication between the server (host) and other devices on the SCSI bus, make sure there is no SCSI activity on the bus before you power off the Autoloader.

- __ 1. Power off the Autoloader using the POWER button on the front panel.
- __ 2. Remove the power cord and any cables or terminator attached to the Autoloader. Note the configuration of the cables and terminator for reconnecting them after installing the Autoloader in the rack.

Install the Support Rails in the Rack

To install the two support rails in the rack:

- __ 1. Remove the two support rails from the kit and note how they will be positioned in the rack. When the rails are properly installed, the shelf flanges will face inward to support the Autoloader.

Note: The Autoloader requires 2 EIAs of rack space for installation.

- __ 2. Identify the 2 EIAs required by the Autoloader for rail placement.

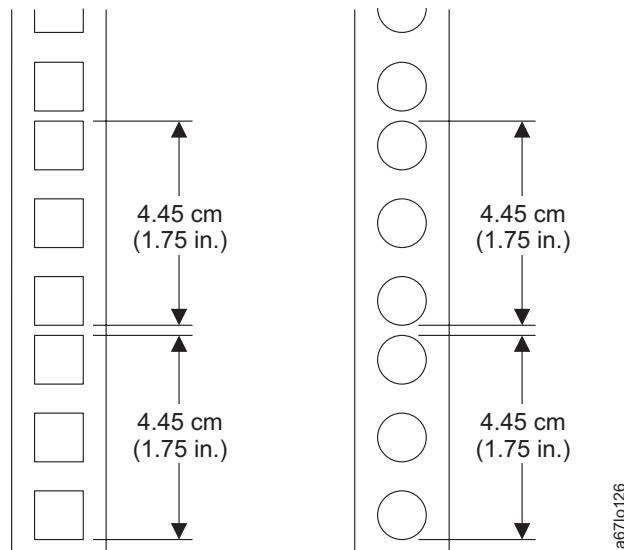


Figure 16. EIA identification

Note: One EIA is equal to 4.45 cm (1.75 in.).

- If your rack contains a rail with each EIA numbered:
 - a. Hold the rack template on the outside of the selected 2 EIAs (aligning all six circles on the template with the holes in the 2 EIAs) on each rail.
- If your rack does not contain a rail with each EIA numbered:
 - a. Locate the "Rack Mount Template" in the Quick Reference of the "Rack Mount Template" on page 253.

- b. To identify the 2 EIAs required by the Autoloader, hold the rack template on the outside of the rack rail and align all six circles on the template with the holes in the rack rail.

Note: All six circles on the template must align exactly with the holes of the 2 EIAs in the rack rail.

- ___ 3. Install clip-nuts in the rail holes indicated by the filled circles on the template.
- Top hole of the higher EIA
 - Top hole of the lower EIA
 - Bottom hole of the lower EIA

Note: Two types of clip-nuts are included with the Rack Mount Kit:

- Panel clip-nuts (for racks with round mounting holes) slip on from the side of the rail with the largest part of the clip-nut going on the back side of the rail.
- Cage clip-nuts (for racks with square mounting holes) are installed from the back side of each rail.

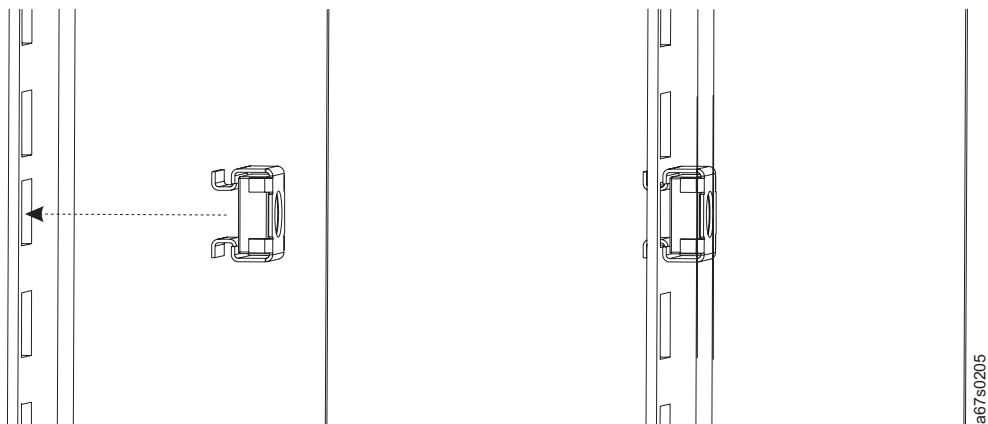
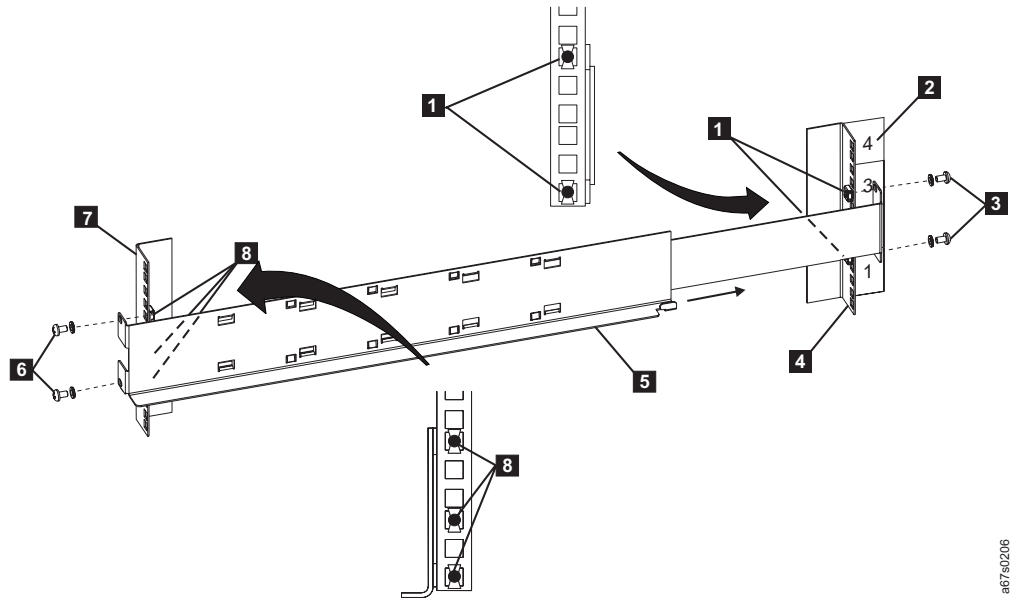


Figure 17. Attaching cage clip-nuts to a rack with square holes

- Note:** To ensure proper installation of the Autoloader in your rack, it is very important to install the clip-nuts in the correct positions on each rail.
- ___ 4. Count the holes on the other three rack rails, up or down, to determine the position of the top or bottom clip-nut. Use the Rack Mount Template to install the other two clip-nuts.
- ___ 5. From the front of the rack, position one of the rails on the appropriate side. Position the front flange so that it is on the outside of the strip of mounting holes in the rack (see Figure 18 on page 33).



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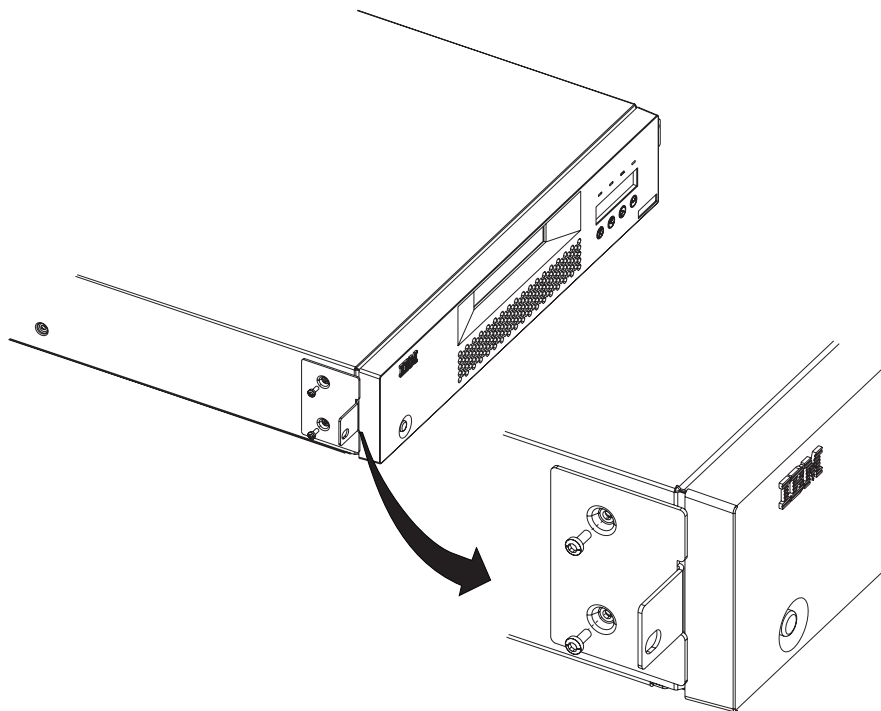
Figure 18. Attaching expanding rails to the rack

- ___ 6. Using a #2 Phillips screwdriver, attach the rail to the rack with screws and washers from the kit.
- ___ 7. Slide the rail pieces apart to match the depth of your rack.
- ___ 8. Using a #2 Phillips screwdriver, attach the rail to the outside of the rack with screws and washers supplied with the Rack Mount Kit.
- ___ 9. Repeat Steps 4 through 7 to install the second rail.

Install the Rack Front-Mount Brackets on the Autoloader

To install the rack mount brackets on the Autoloader:

- ___ 1. Determine on which side of the Autoloader the rack mount brackets will be attached (see Figure 19 on page 34). The oval hole for attaching the bracket to the rack will be on the lower portion of the arm of the bracket.



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Figure 19. Installing rack-mount brackets

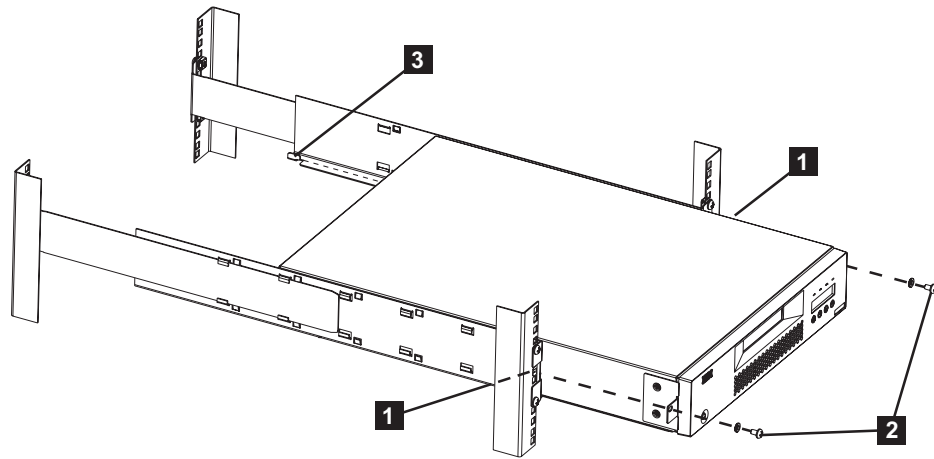
- ___ 2. Using the Torx wrench, remove the two screws on each side of the Autoloader cover.
- ___ 3. Position the correct bracket, as determined in Step 1, on each side of the Autoloader and secure by replacing the original screws (see Figure 19).

Secure the Autoloader to the Rack

To secure the Autoloader to the rack:

- ___ 1. From the front of the rack, position the Autoloader on the shelf flanges between the support rails. Slide it toward the rear of the rack until the brackets contact the rack's mounting holes.

Note: Make sure that the tabs on the back of each shelf flange are fully engaged in the slots at the rear of the Autoloader.



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Figure 20. Installing the Autoloader in a rack

- | 2. Place one screw and washer from the Rack Mount Kit into the hole in the front of each bracket. The screws should line up with the holes containing the remaining installed clip-nuts. Use a #2 Phillips screwdriver to tighten the screws.

| **Note:** For information on connecting a power cable to an Autoloader installed in a rack, see “Step 9. Connect Power” on page 36.

Step 9. Connect Power

Desktop Installation

To connect power to a desktop Autoloader:

1. Plug the power cord into the receptacle at the rear of the Autoloader, then plug the other end into a grounded electrical outlet.
2. Power on the Autoloader. The Autoloader will verify the drive configuration and status, build a valid cartridge inventory log, and calibrate the robotic cartridge loader. The OCP's green READY/ACTIVITY LED (light-emitting diode) will blink during this initialization process. When the Autoloader completes the Power-On Self Test (POST) for the drive and the library, the green READY/ACTIVITY LED will stop blinking. The Autoloader will be in automatic mode (the default mode) and **SEQ** will appear in the lower right corner of the OCP display.

For information about the Autoloader's modes of operation, see "CHANGE LDR MODE" on page 92.

If a failure occurred, the red ERROR LED will light up and an error message will be displayed on the OCP. Refer to "Troubleshooting" on page 163.

3. If the power on is successful, run the Drive Recalibration test and the Library Verify test.

Rack Installation

To connect power to an Autoloader installed in a rack:

1. Connect the PCC cable (included with your Rack Mount Kit) to the rear of the Autoloader.

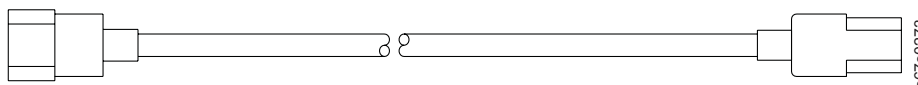


Figure 21. PCC cable

2. Connect the other end of the PCC cable to your rack's power strip.
3. Power on the power strip.
4. Power on the Autoloader. The Autoloader will verify the drive configuration and status, build a valid cartridge inventory log, and calibrate the robotic cartridge loader. The OCP's green READY/ACTIVITY LED (light-emitting diode) will blink during this initialization process. When the Autoloader completes the Power-On Self Test (POST) for the drive and the library, the green READY/ACTIVITY LED will stop blinking. The Autoloader will be in automatic mode (the default mode) and **SEQ** will appear in the lower right corner of the OCP display.

For information about the Autoloader's modes of operation, see "CHANGE LDR MODE" on page 92.

If a failure occurred, the red ERROR LED will light up and an error message will be displayed on the OCP. Refer to "Troubleshooting" on page 163.

5. If the power on is successful, run the Drive Recalibration test and the Library Verify test.

Running a Drive Recalibration Test

To run a drive recalibration test, complete the following steps:

- ___ Step 1. Navigate to the Diagnostic Menu.
- ___ Step 2. Press *Enter* and then *Next* to access the DRIVE DIAG menu.
- ___ Step 3. Press *Enter* then press *Next* until Recalibration is displayed.
- ___ Step 4. Press *Enter* to initiate the test.
- ___ Step 5. OCP prompts you to insert a cartridge into Slot 1 through the I/O door.
- ___ Step 6. When the calibration diagnostic is complete, remove the cartridge from the I/O door and press *Enter*.

LIBRARY VERIFY Test

Complete the following steps to run LIBRARY VERIFY.

- ___ 1. After pressing *Enter* on the OCP at the ONLINE screen:
 - a. Press *Next* four times to navigate to the **Diagnostic Menu**.
 - b. Press *Enter* to navigate to the LOADER DIAG menu item.
 - c. Press *Enter* to access LIBRARY VERIFY.
 - d. Press *Enter* to begin the verification.
 - e. On the OCP display, you will be asked to insert a cartridge.
 - f. When the I/O Door opens, insert a blank cartridge or a scratch cartridge. The I/O Door will close automatically.
 - g. While the test is running, the OCP will display library status.
 - If the test PASSED, proceed to the next step.
 - If the test FAILED, refer to "Troubleshooting" on page 163.
 - h. Press *Enter*.
 - i. When prompted by the OCP display, remove the cartridge.
 - j. Press *Enter* to end the test.
- ___ 2. Power off the Autoloader.

Step 10. Connect the Autoloader to Your Server (Host)

The Autoloader Model L28/L38/L3H can be attached to a SCSI/LVD system. The model L28 can also attach to a SCSI-LVD/HVD system using the optional HVD Converter. The Autoloader Model F28/F38/F3H contains a Fibre Channel drive that can be attached to a Fibre Channel system.

Cabling is required for the tape drive interface and the RMU, if installed, in order for your server (host) to communicate with the Autoloader. The sections that follow include information on options cabling and drive interface connections.

Ensure that Autoloader power is OFF.

RMU Cabling

To connect the RMU to a network switch or hub or directly to a server (host):

1. Plug an Ethernet cable into the RMU mounted on the rear of the Autoloader.
2. Plug the other end of the Ethernet cable into your network switch or hub.

Note: If you are plugging the RMU directly into a PC, use a special crossover Ethernet cable (not supplied).

SCSI Interface

A SCSI cable is required for each server connection to a SCSI bus. An LVD SCSI terminator is included in your ship group.

Attention: Be sure to install the appropriate SCSI host bus adapter and software on your server (host). For more information, refer to your server (host) documentation and application software.

Attaching to a SCSI-LVD System

Attention

Be sure to use LVD cables with the LVD converter.

To attach your Autoloader to a SCSI-LVD system, complete the following steps:

- Step 1. Plug the SCSI cable (included in your ship group) into the top SCSI receptacle (**1**) on the rear panel of your Autoloader.

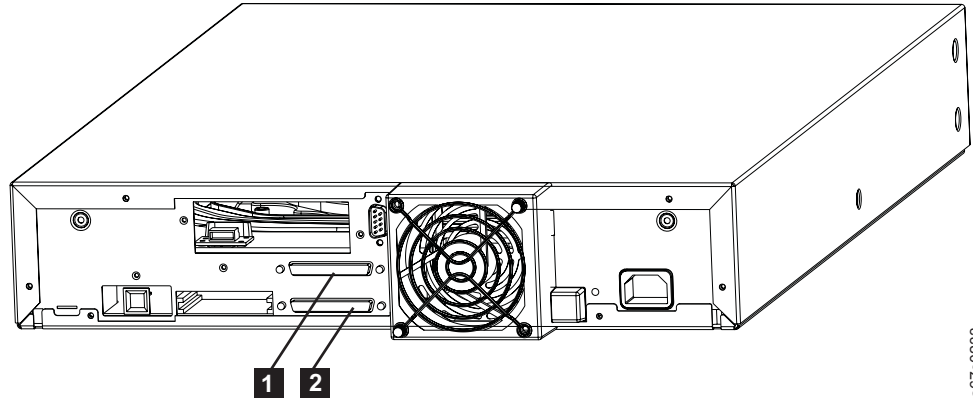


Figure 22. SCSI receptacles on rear of Autoloader

- ___ Step 2. Plug the LVD SCSI terminator (or another SCSI cable connecting to another SCSI device) into the bottom SCSI receptacle (**2**) on the rear panel of your Autoloader.
- ___ Step 3. Connect the SCSI cable to your server (host).

Attaching to a SCSI-HVD System

To attach your Autoloader to a SCSI-HVD system, complete the following steps:

1. Install the HVD Converter on the rear panel of your Autoloader (see “Step 5. Install the Optional HVD Converter (L28 Models Only)” on page 23).
2. Plug the HVD SCSI cable into the top SCSI receptacle (**1**) on the HVD converter.

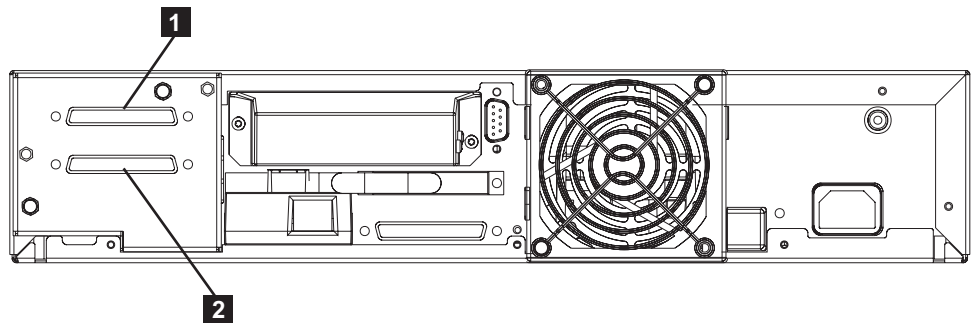


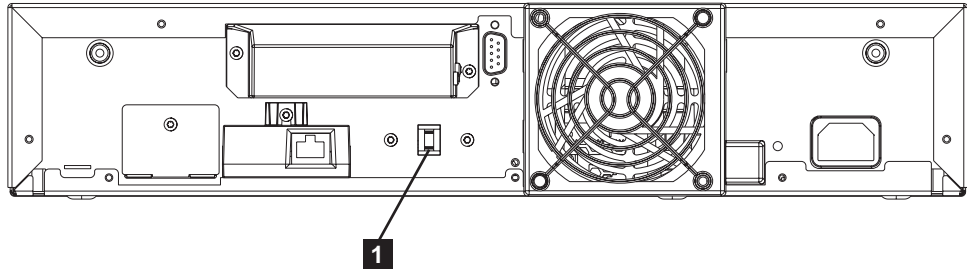
Figure 23. SCSI receptacles on HVD Converter

3. Plug the HVD Differential terminator into the bottom SCSI receptacle (**2**) on the HVD converter.
4. Connect the SCSI cable to the server (host).

Fibre Channel Interface

To attach your Autoloader to a Fibre Channel system, complete the following steps:

- ___ 1. Plug the fiber cable (included in your ship group) into the rear panel of your Autoloader.



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Figure 24. Fibre Channel receptacle

- ___ 2. Connect the fiber cable to your network switch or hub or directly into your server (host).

Step 11. Power on the Autoloader

To power on the Autoloader, press and release the POWER button located on the front panel.

If an RMU is installed, look on the rear panel of the Autoloader and verify that the RMU's green LED is on. If the green LED is not on, see "Removing/Replacing the RMU" on page 212 for instructions on reinstalling the RMU. If the green LED is still not on after reinstallation, contact IBM Technical Support (see "Contacting IBM Technical Support" on page 200).

Configuring Your Autoloader

Depending on the model, see one of the following to configure your Autoloader:

- "Configuring a Model L28/L38/L3H Autoloader" on page 91
- "Configuring a Model F28/F38/F3H Autoloader" on page 99

To complete configuration for either model:

- See "Completing Configuration of Autoloader" on page 107.

Note: It is recommended that you first read "Menus" on page 45 to familiarize yourself with the OCP interface, access protocol and menus.

Saving / Restoring VPD on the RMU

Note:

If an RMU is installed, after all items in the Vital Product Data (VPD) "save" list below are set to the desired values, you will be instructed at the end of the configuration instructions to access the **Reset** page in the **Configuration Menu** on the RMU to "save" these values on the actual RMU module installed on the rear panel of the Autoloader. These items are "saved" for possible use at a later date should the base Autoloader unit need to be replaced. This RMU feature allows for quick VPD restore rather than having to manually reinstall each desired value using the OCP. The above mentioned page (**Reset**) also contains a "restore" button selection. In addition, if any of these items are changed at any time after install, the "save" button on the above mentioned RMU page should be pressed to always save the latest values. Machine serial number and World Wide Node Name (WWNN) are "saved" from the original machine and "restored" to VPD of the replacement machine to enable various network hosts to see the "same" Autoloader without having to re-configure the network.

Model L28/L38/L3H VPD Items Saved on RMU:

- SCSI ID
- Operating Mode
- SCSI Drive Speed
- BCR Enablement
- Machine Serial Number

Model F28/F38/F3H VPE Items Saved on RMU:

- Loop ID
- Loop Port Type

- |
- |
- |
- |
- |
- Operating Mode
- Fibre Channel Drive Speed
- BCR Enablement
- Machine Serial Number
- WWNN

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Menus

The Menus chapter gives information on access protocol for the OCP, RMU, and serial communication, describes the components of the Operator Control Panel (OCP), and gives instructions on how to use the Autoloader's menus via the OCP.

- "Online Menu" on page 49
- "Model L28/L38/L3H (SCSI Drive) Offline Menu" on page 55
- "Model F28/F38/F3H (Fibre Channel Drive) Offline Menu" on page 75

Access Protocol

All three Autoloader user interfaces (OCP, RMU, and serial) can simultaneously be active on the lowest level (Information only).

- RMU: Standard user
- OCP: Online
- Serial: lgo (logout)

However, only one of the three interfaces can be active at any one time on the Administrator or Service levels (RMU and serial) or at the Offline level (OCP). The other two can remain active on the lowest level. If an attempt to login is made on either of the other two while the third has the highest level access, an "Already Reserved" message is displayed. The RMU will only allow access by a Standard user at the login panel.

For best results:

- If communicating via the OCP, return to the Home Screen before attempting to communicate via the RMU or serial port.
- If communicating via the RMU, log out before attempting to communicate via the OCP or serial port.
- If communicating via the serial port, log out before attempting to communicate via the OCP or RMU

Operator Control Panel (OCP)

The OCP contains four LEDs (light-emitting diodes), a display, and four push buttons.

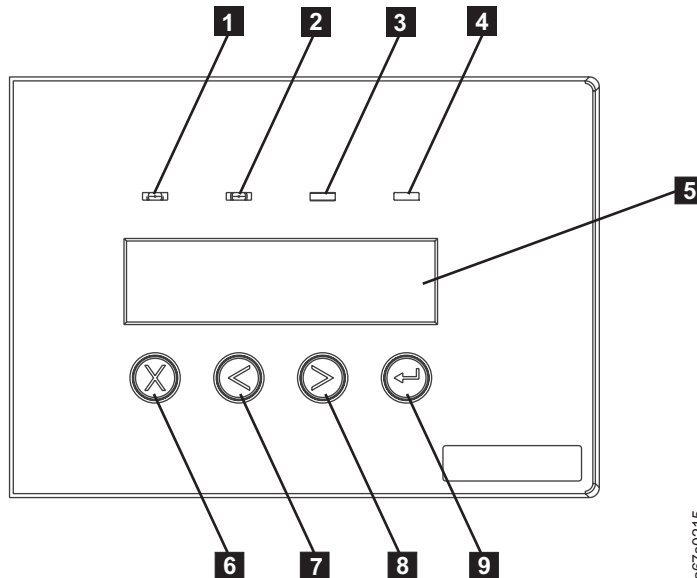


Figure 25. Operator Control Panel (OCP)

- **LEDs:**

- **1** READY/ACTIVITY (green)
Turns on any time the Autoloader is powered on and able to function. This LED should blink whenever there is Autoloader or tape drive activity.
- **2** CLEAN DRIVE (amber)
Turns on when the tape drive needs to be cleaned. This LED will turn off after the drive is cleaned.
- **3** MEDIA ATTENTION (amber)
Turns on when a media failure occurs. This LED will turn off when all defective, marginal, or invalid cartridges have been exported from the Autoloader.
- **4** ERROR (red)
Turns on when there is an unrecoverable tape drive or Autoloader failure. This LED will turn on at the same time the error message is displayed on the screen and will remain on until the error condition is corrected.

- **5 OCP's Display**

Consists of two lines with 16 characters per line. It displays actions and status information, menu items or error messages.

- **Buttons**

- **6 CANCEL**
 - Used to return to the Home Screen from any menu screen.
 - Used to return to the corresponding menu screen from any menu's commands screens.
- **7 PREVIOUS**
 - Used to move back from one menu screen to the previous menu screen.

- Used to move back from one command screen to the previous command screen within the same menu.
- **8 NEXT**
 - Used to move forward from one menu screen to the next menu screen.
 - Used to move forward from one command screen to the next command screen within the same menu.
- **9 ENTER**
 - Used to access the first corresponding command screen from any menu screen .
 - Used to initiate the corresponding operation from any menu's command screens .

Power On Display

When the Autoloader powers on, or resets, it goes through several Power On Self Tests (POST). POST are internally controlled processes that allow the Autoloader to initialize. While these processes are running, the OCP will display appropriate information to keep the user informed of the Autoloader's status.

Home Screen

The Home Screen displays the Autoloader's current status of the drive ("Drive empty" or "Drive ready") on the top line and the current cartridge inventory and operating mode on the bottom line.

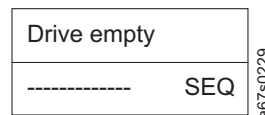


Figure 26. Operator Control Panel (OCP) Home Screen

The inventory status characters will be represented as follows on the second line of the display:

- Slot Empty - A dash character ("-") will be displayed as a placeholder. (Slot Full - The slot number "1" to "8" will be displayed.)
- A cartridge that is being loaded, unloaded, imported, exported, or is loaded in the drive, will be represented by the slot number blinking.
- A cartridge that has been identified as invalid or faulty (and the amber Media Attention LED is on) will be represented by an exclamation point (!).

The current operating mode will be displayed on the second line. The message varies, depending on the Autoloader's mode of operation:

- If the Autoloader is operating in sequential access mode or automatic mode (the default mode), **SEQ** displays. If a library command is sent by the host and received by the Autoloader, **SEQ** disappears from the display.
- If the Autoloader is operating in random access mode, nothing displays.

If the drive detects a write-protected media, the OCP displays "WP" on the bottom line of the display indicating a write-protected media is loaded in the drive. As soon as the write-protected media is ejected, "WP" is replaced by the current operating mode. For more information on write-protected media, see "Setting the Write-Protect Switch" on page 147.

To return to the Home Screen, perform one of the following:

- Suspend all activity on the OCP for one and a half minutes.
- Press the OCP's *Cancel* button from the top level of the current menu.

Online Menu

After powering on the Autoloader, the **Online Menu** is available. The **Online Menu** contains the **Information Menu** and **Go Offline**.

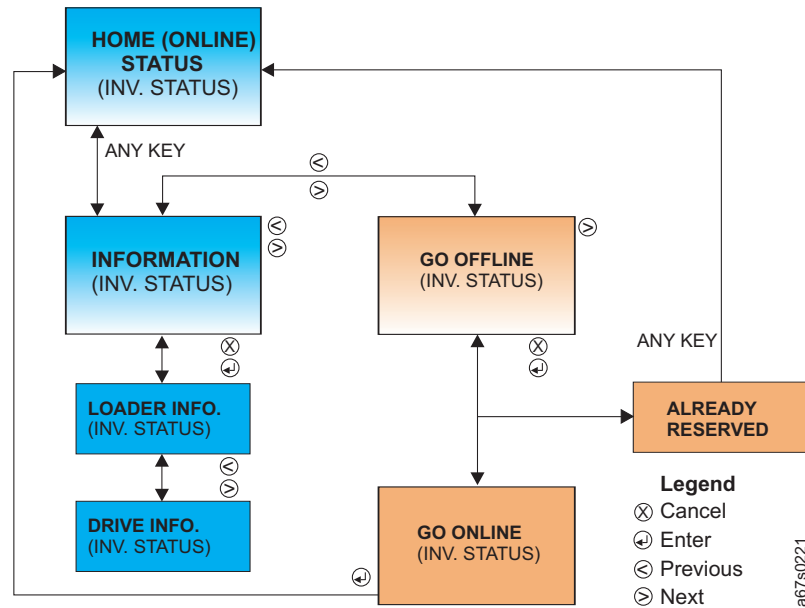


Figure 27. Online menu tree

Information Menu

The Information Menu contains commands that will display such things as Autoloader and drive serial numbers, model numbers, firmware levels, and error logs.

To navigate to the **Information Menu** from the Home Screen:

- Press any button (*Cancel, Previous, Next, or Enter*) on the OCP.

LOADER INFO

LOADER INFO contains the information that relates specifically to the Autoloader.

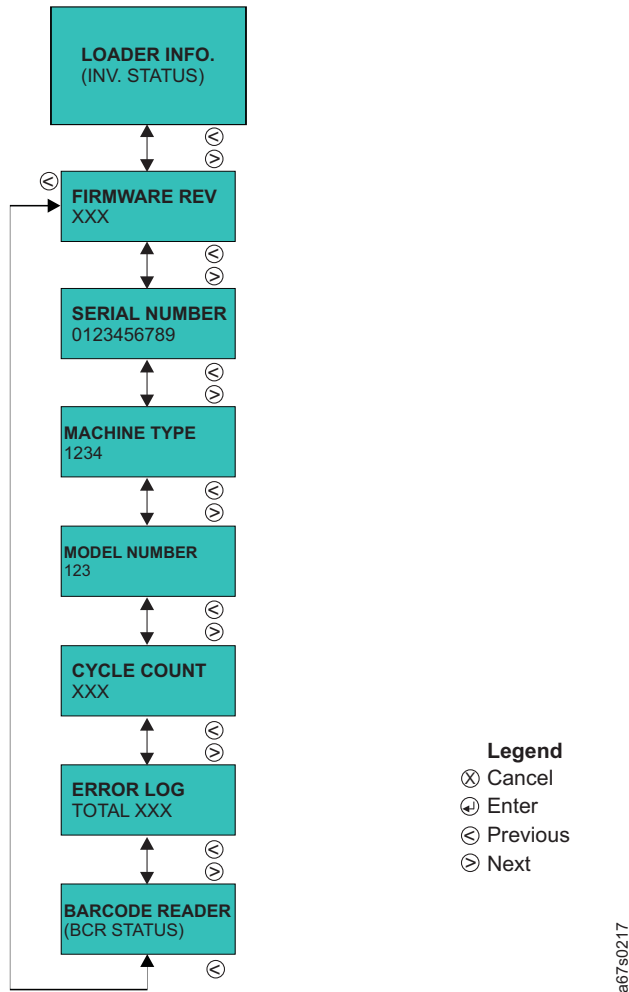


Figure 28. Information Menu LOADER INFO item

Note: Enter the information in this menu on the “Autoloader Configuration Form” on page 251.

To access the LOADER INFO menu using the OCP:

1. Navigate to the **Information Menu** (see “Information Menu” on page 49).
2. Press *Enter* to access the LOADER INFO screen.
3. Press *Enter* to access the first item in the LOADER INFO menu.
4. Press *Next* or *Previous* to navigate through the following menu items:
 - FIRMWARE REV - the current Autoloader firmware revision level
 - SERIAL NUMBER - this number should match the serial number on the label located in the lower right corner on the Autoloader’s front panel
 - MACHINE TYPE - “3581”
 - MODEL NUMBER - either L28/L38/L3H (LVD SCSI drive) or F28/F38/F3H (Fibre Channel drive)
 - CYCLE COUNT - the number of times the cartridge carousel has made a complete cycle.

- ERROR LOG - displays the error code (XX YY ZZ) and time the error occurred (ddd.hh.mm.ss.tt)

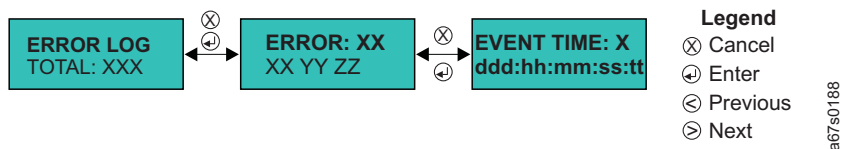


Figure 29. Information Menu Error Log for the Autoloader command

After navigating to ERROR LOG using the OCP:

- Press **Enter** to access the ERROR: XX screen and to display the error code (XX YY ZZ).
- Press **Previous** to scroll through each previous error entry in the log.
- Press **Enter** to display EVENT TIME: X of the error (ddd.hh.mm.ss.tt).
- Press **Previous** to scroll through other previous event times.
- Press **Cancel**:
 - One time to return to the corresponding error entry.
 - Two times to return to the ERROR LOG screen.
 - Three times to return to the LOADER INFO screen.
 - Four times to return to the **Information Menu** screen.
 - Five times to return to the Home Screen.

- **BARCODE READER**

- Press **Enter** to display the line LOADER BCR LAB X (X = library tape location). If the tape has a barcode, it will be displayed on the next nine. Otherwise, the second line will be blank.
- NO BCR FUNCTION will be displayed if the BCR:
 - Is not installed
 - OR -
 - Is installed but not initiated via the **Configuration Menu**
- BCR PRESENT will be displayed if the BCR is installed and initiated via the **Configuration Menu**
- Press **Cancel** as many times as necessary to exit and return to the Home Screen.

DRIVE INFO

DRIVE INFO contains the following information that relates specifically to the Autoloader's drive.

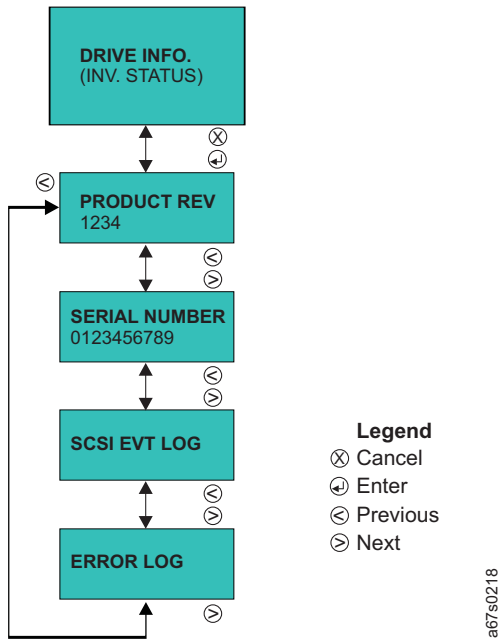


Figure 30. Information Menu DRIVE INFO item

Note: Enter the information in this menu on the “Autoloader Configuration Form” on page 251.

To access the DRIVE INFO menu using the OCP:

1. Navigate to the **Information Menu** (see “Information Menu” on page 49).
2. Press **Enter**.
3. Press **Next** to access the DRIVE INFO screen.
4. Press **Enter** to access the first menu item in the DRIVE INFO menu.
5. Press **Next** or **Previous** to navigate through the following menu items:
 - PRODUCT REV. - the current drive firmware revision level
 - SERIAL NUMBER - the drive serial number
 - SCSI EVT LOG - displays the error number (XX YY ZZ VV NN) and the time the error occurred (dddd:hh:mm:ss:tt)

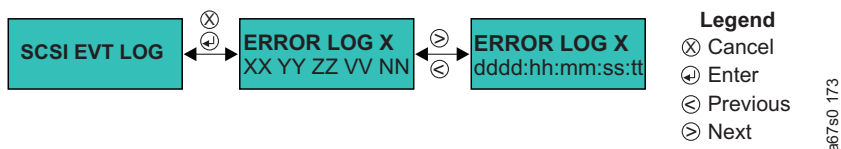


Figure 31. Information Menu SCSI Event Log for the drive command

After navigating to SCSI EVT LOG using the OCP:

- a. Press **Enter** to access the ERROR LOG X screen and to display the error number (XX YY ZZ VV NN).
- b. Press **Enter** to display the time the error occurred (dddd:hh:mm:ss:tt).

- c. Press *Cancel*:
 - One time to return to the corresponding error entry.
 - Two times to return to the SCSI EVT LOG screen. Press *Next* to access the next menu item.
 - Three times to return to the DRIVE INFO screen.
 - Four times to return to the **Information Menu** screen.
 - Five times to return to the Home Screen.
- ERROR LOG - displays the error number (XX YY ZZ VV NN) and the time the error occurred (dddd:hh:mm:ss:tt)

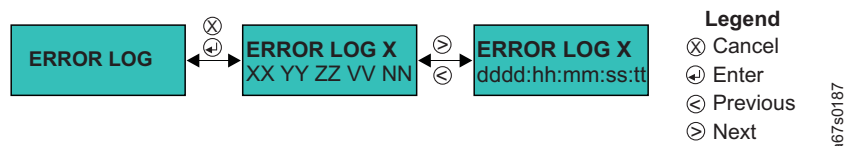


Figure 32. Information Menu Error Log for the drive command

After navigating to ERROR LOG using the OCP:

- a. Press *Enter* to access the ERROR LOG X screen and to display the error number (XX YY ZZ VV NN).
- b. Press *Enter* to display the time the error occurred (dddd:hh:mm:ss:tt).
- c. Press *Cancel*:
 - One time to return to the corresponding error entry.
 - Two times to return to the ERROR LOG screen. Press *Next* to access the next menu item.
 - Three times to return to the DRIVE INFO screen.
 - Four times to return to the **Information Menu** screen.
 - Five times to return to the Home Screen.

Go Offline

Password protection for going Offline to the Autoloader via the OCP can be turned OFF (default setting) or ON.

Going Offline with Password Protection OFF

To access all menus using the OCP with password protection OFF (the default setting):

1. Power on the Autoloader. When the Power On Self Test is complete, the Home Screen will appear on the OCP display.
2. Press any key on the OCP (*Cancel*, *Previous*, *Next*, or *Enter*) to access the **Information Menu**.
3. Press *Next* to access **Go Offline**.
4. Press *Enter* to **Go Offline** and make all menus accessible.
5. Press *Next*, as necessary, to verify that all Offline menus (**Information**, **Commands**, **Configuration**, **Diagnostic**, **Go Online**) are available.

Going Offline with Password Protection ON

To go offline with password protection activated:

1. Power on the Autoloader. When the Power On Self Test is complete, the Home Screen will appear on the OCP display.
2. Press any key on the OCP (*Cancel*, *Previous*, *Next*, or *Enter*) to access the **Information Menu**.
3. Press *Next* to access the **Go Offline** display.
4. Press *Enter*.
5. Using *Next* and *Previous*, enter the first numerical digit of the PIN (password) then press *Enter* to move to the next digit in the PIN (password). Repeat this step for each digit in the password.
6. If GO OFFLINE PASSED is displayed, press *Enter* to complete going offline. If GO OFFLINE FAILED displays, the PIN (password) was incorrect. Press *Cancel* and repeat this procedure.

Model L28/L38/L3H (SCSI Drive) Offline Menu

After logging in from an RMU, or going offline from the OCP, to an Autoloader with a SCSI drive (Model L28/L38/L3H), the user has access to the **Model L28/L38/L3H Offline Menu** shown in Figure 33.

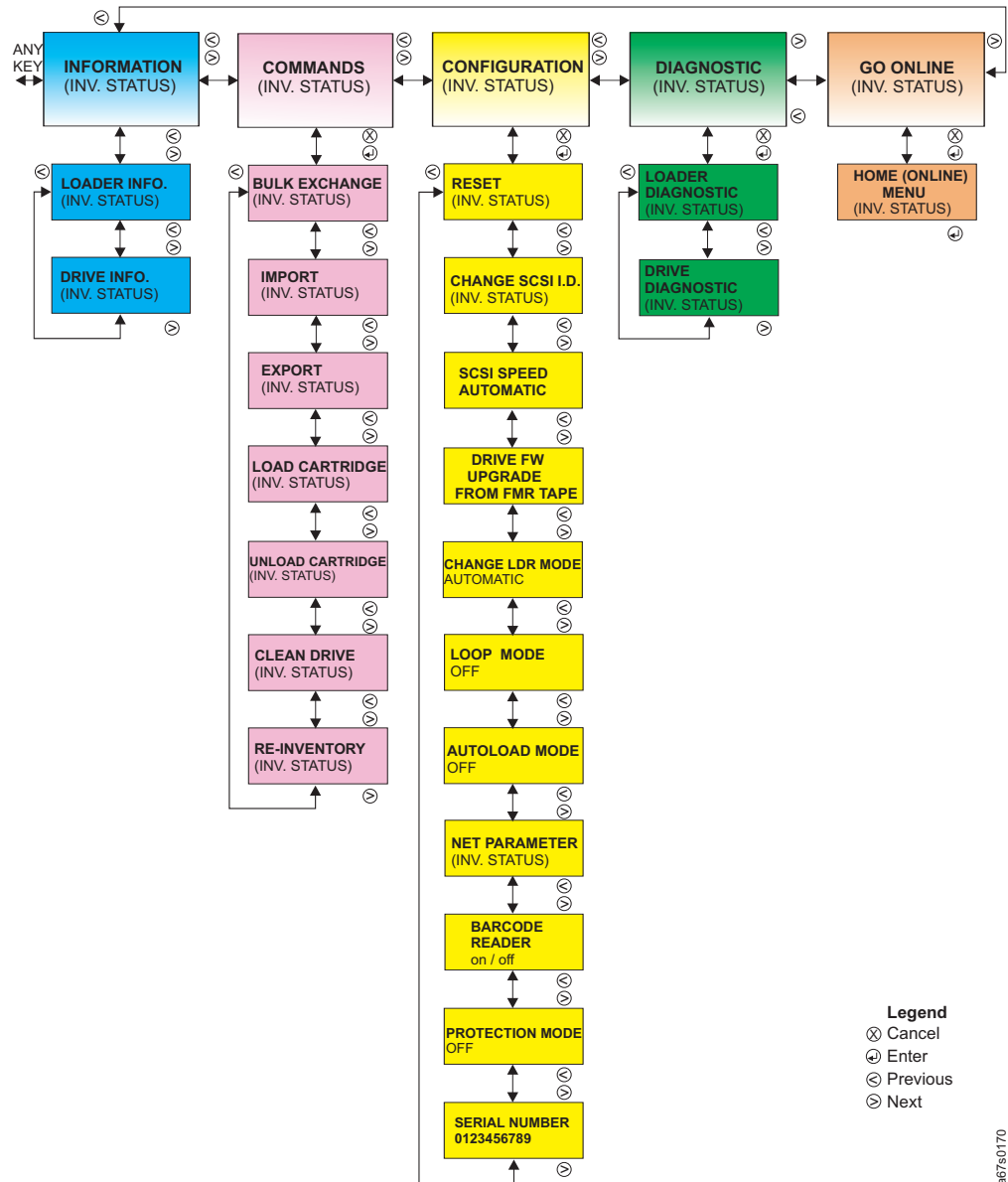


Figure 33. Autoloader Model L28/L38/L3H Offline Menu

Information Menu

See “Information Menu” on page 49.

Commands Menu

To navigate to the **Commands Menu** from the Home Screen using the OCP:

- Press any button (*Cancel*, *Previous*, *Next*, or *Enter*) on the OCP to display the **Information Menu** screen.
- Press *Next* to display the **Commands Menu** screen.

BULK EXCHANGE

BULK EXCHANGE enables the user to import or export all cartridges. Operation begins with Slot 1. If a cartridge is available, it will be exported. It is up to the user to import a new cartridge or to move to Slot 2. The same procedure repeats for the remainder of the eight slots.



Figure 34. Commands Menu BULK EXCHANGE command

To access BULK EXCHANGE using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press **Enter** to access BULK EXCHANGE.
3. Press **Enter** to initiate the importing and/or exporting of cartridges.
4. When the I/O Door opens, remove the ejected cartridge or proceed to the next step.
5. Do one of the following:
 - Insert another cartridge gently pushing the cartridge through the I/O Door until the cartridge can be pushed no farther.
 - Press **Enter** to export the next cartridge.
 - Press **Cancel** to terminate BULK EXCHANGE.
6. When all cartridges have been imported and/or exported, the Autoloader will return to the Home Screen.

IMPORT

The IMPORT command allows the user to insert and choose a destination slot for a cartridge in the Autoloader.

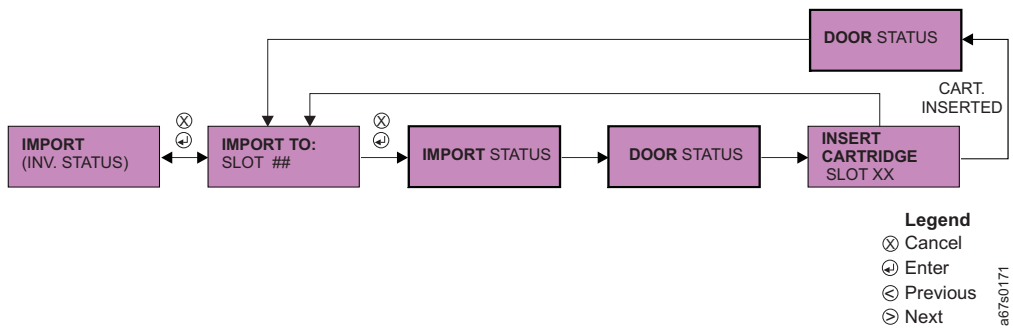


Figure 35. Commands Menu IMPORT command

To access IMPORT using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press **Enter** then **Next** to access IMPORT.
3. Press **Enter** to display the IMPORT TO: screen.
4. Use the **Next** and **Previous** to select the number of the slot to which the cartridge is to be imported. (Only those slots that are empty will be available for selection.)
5. Press **Enter** to initiate the procedure.

6. When the I/O Door opens, insert a cartridge. The Autoloader will import the cartridge, close the I/O Door, and insert the cartridge into the selected slot.
7. Repeat Steps 4 through 6 until all cartridges have been imported.
8. When the last cartridge has been inserted into its slot, press *Cancel* to return to the IMPORT screen.
9. Press *Cancel* to prompt the BCR (if installed) to re-inventory all cartridges and return to the Home Screen.

EXPORT

The EXPORT command allows the user to remove a cartridge from a selected slot in the Autoloader.

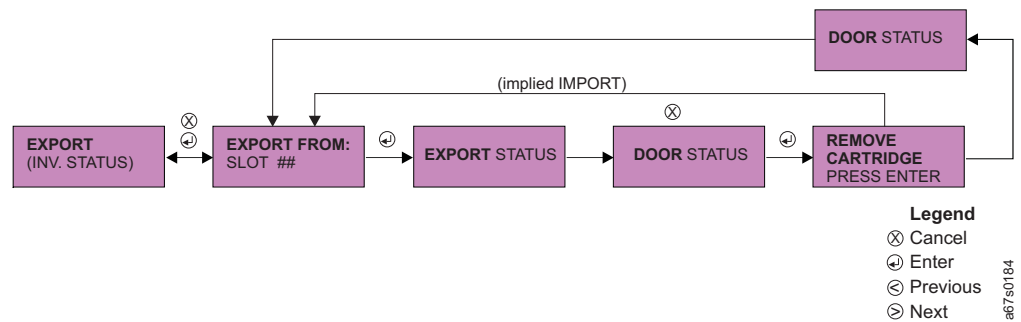


Figure 36. Commands Menu EXPORT command

To access EXPORT using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press *Enter* then *Next* or *Previous*, as necessary, until EXPORT is displayed.
3. Press *Enter* to display the EXPORT FROM: screen.
4. Use the *Next* and *Previous* to select the number of the slot from which the cartridge is to be exported. (Only those slots containing cartridges will be available for selection.)
5. Press *Enter* to initiate the procedure.
6. When the I/O Door opens, remove the cartridge.
7. Press *Enter*.
8. To export another cartridge, repeat Steps 4 through 7 until all cartridges have been exported. Otherwise, proceed to Step 9.
9. Press *Cancel*:
 - One time to return to the EXPORT SLOT *x* screen.
 - Two times to prompt the BCR (if installed) to re-inventory all cartridges and return to the Home Screen

LOAD CARTRIDGE

The LOAD CARTRIDGE command allows the user to insert a selected cartridge in the Autoloader into the drive.

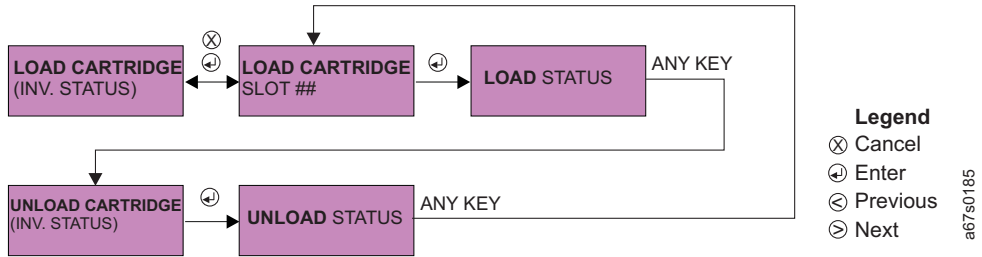


Figure 37. Commands Menu LOAD CARTRIDGE and UNLOAD CARTRIDGE commands

To access LOAD CARTRIDGE using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press *Enter* then *Next* or *Previous*, as necessary, until LOAD CARTRIDGE is displayed.
3. Press *Enter* to display the LOAD CARTRIDGE SLOT # screen.
4. Use *Next* and *Previous* to select the number of the slot of the cartridge to be loaded into the drive.
5. Press *Enter* to initiate the procedure.
6. When the cartridge has been loaded into the drive, the Autoloader will return to the Home Screen.

UNLOAD CARTRIDGE

The UNLOAD CARTRIDGE allows the user to remove a cartridge from the drive and return it to its home slot (see Figure 37).

To access UNLOAD CARTRIDGE using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press *Enter* then *Next* or *Previous*, as necessary, until UNLOAD CARTRIDGE is displayed.
3. Press *Enter* to unload the cartridge currently in the drive.
4. When the cartridge has been returned to its home slot, the Autoloader will return to the Home Screen.

CLEAN DRIVE

When the amber CLEAN DRIVE LED on the OCP turns on (the second LED from the left), the drive must be cleaned to ensure optimum drive performance and to safeguard your media.

The CLEAN DRIVE command allows the user to initiate a cleaning of the drive. The user will be prompted to insert a cartridge in the I/O Door if a cleaning cartridge does not currently reside in the Autoloader.

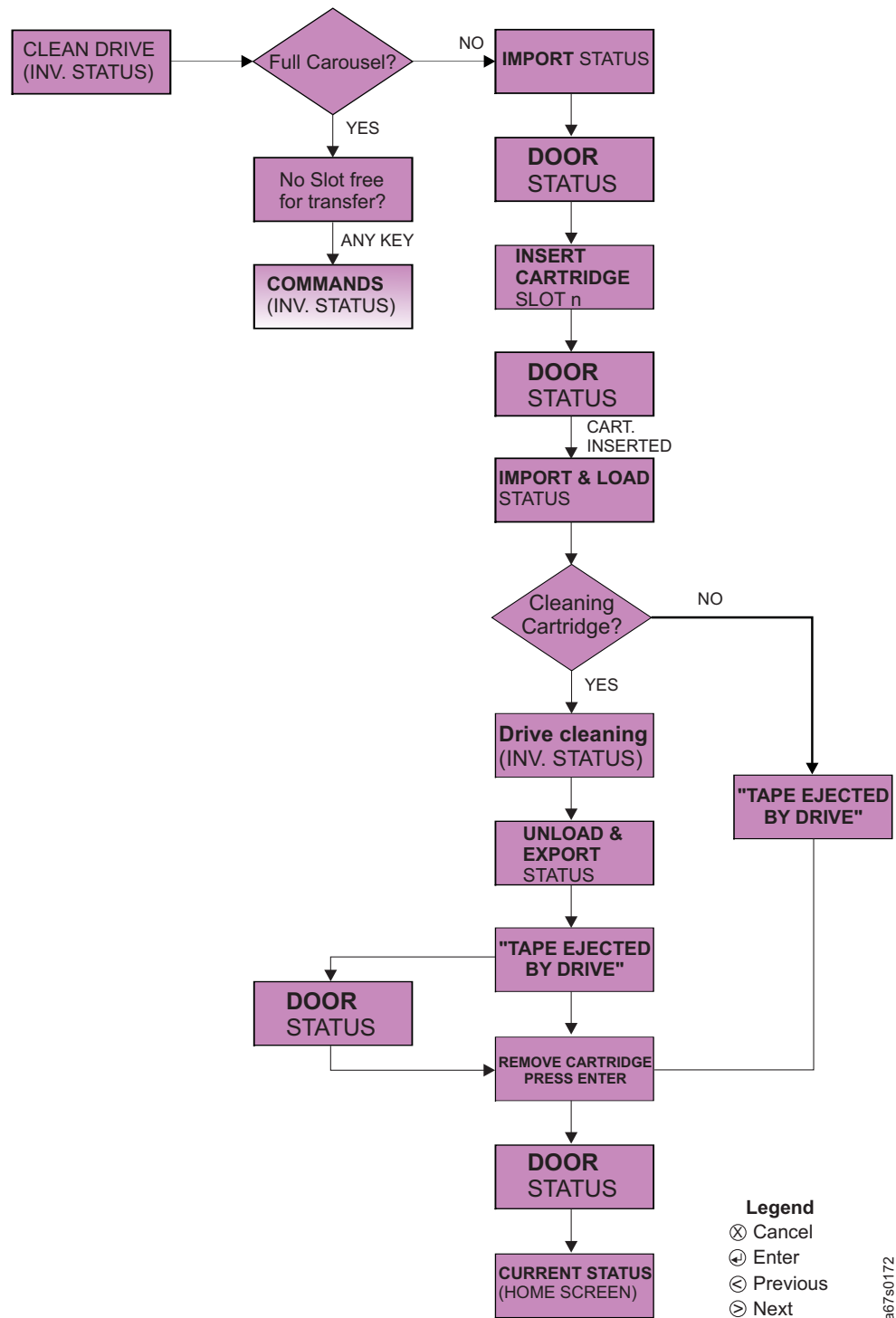


Figure 38. Commands Menu CLEAN DRIVE command

To access CLEAN DRIVE using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press **Enter** then **Next** or **Previous**, as necessary, until CLEAN DRIVE is displayed.
3. Press **Enter**.

4. If there are eight cartridges (all slots are full) in your Autoloader, press *Cancel* to return to the **Commands Menu** screen and EXPORT one data cartridge. If there are less than eight cartridges (all slots are not full) in your Autoloader, proceed to the next step.
5. When the I/O Door opens, insert a cleaning cartridge.
6. When the cleaning is complete, remove the ejected cleaning cartridge from the I/O Door.
7. Press *Enter* to return to the Home Screen.

RE-INVENTORY

The RE-INVENTORY command allows the BCR (if installed) to scan all cartridges in the Autoloader to update the cartridge inventory.

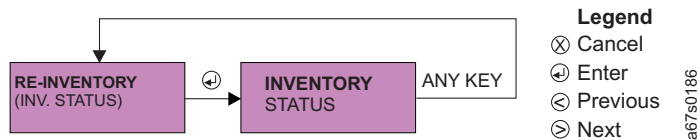


Figure 39. Commands Menu RE-INVENTORY command

To access RE-INVENTORY using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press *Enter* then *Next* or *Previous*, as necessary, until RE-INVENTORY is displayed.
3. Press *Enter* to initiate the inventory.
4. The Autoloader will return to the Home Screen and the updated inventory will be displayed on the second line.

Configuration Menu

The **Configuration Menu** allows the administrator to setup or change SCSI IDs, SCSI speed, operating mode, network parameters, as well as, initializing the BCR.

To navigate to the **Configuration Menu** from the Home Screen using the OCP:

- Press any button (*Cancel*, *Previous*, *Next*, or *Enter*) on the OCP to display the **Information Menu** screen.
- Press *Next* until the **Configuration Menu** screen displays.

RESET

RESET restarts the Autoloader and is used when initiating configuration changes.

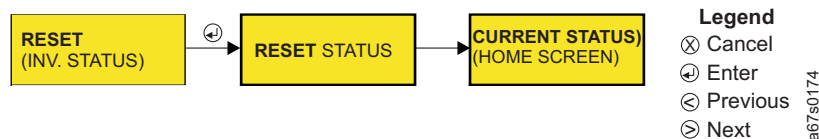


Figure 40. Configuration Menu's RESET command

To access RESET using the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu”).
2. Press *Enter* to access RESET.
3. Press *Enter* to initiate the reset.
4. When the reset is complete, the OCP will display the Home Screen.

CHANGE SCSI ID

CHANGE SCSI ID allows the user to set a new value for SCSI IDs. The SCSI default ID is "2".

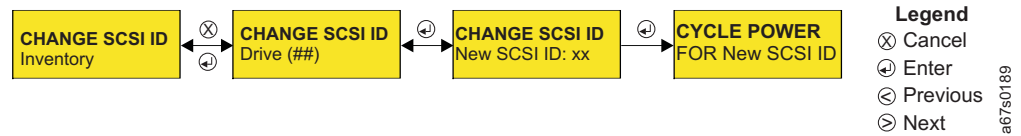


Figure 41. Configuration Menu's CHANGE SCSI ID command

To access CHANGE SCSI ID using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press **Enter** then **Next** or **Previous**, as necessary, until CHANGE SCSI ID is displayed.
3. Press **Enter** to display the CHANGE SCSI ID Drive (XX) screen.
4. Press **Enter** to display the CHANGE SCSI ID New SCSI ID: screen.
5. Use **Next** and **Previous** to select each digit in the new ID. After selecting each number, press **Enter** on the OCP to initiate the selected number and move to the next digit in the ID.
6. After all digits have been selected and initiated, cycle power by turning the Autoloader off then on again. After the power has cycled, the Home Screen will be displayed.

SCSI SPEED

Attention: SCSI SPEED is supported by certain host bus adapters. To determine if your adapter supports SCSI SPEED:

- Refer to the documentation for your server (host).
- Visit the web at <http://www.ibm.com/storage/support/ito>.

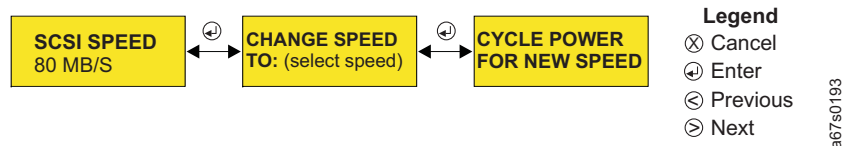


Figure 42. Configuration Menu's SCSI SPEED command

To access SCSI SPEED using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press **Enter** then **Next** or **Previous**, as necessary, until SCSI SPEED is displayed.
3. Press **Enter** to display the CHANGE SPEED TO: screen.
4. Use **Next** and **Previous** to select the new SCSI speed:
 - 80 MB/s
 - AUTO (variable speed; maximum speed allowed at the time)
5. Press **Enter** to initiate the new speed and cycle power by turning the Autoloader off then on again. After the power has cycled, the Home Screen will be displayed.

DRIVE FW UPGRADE FROM FMR TAPE

Attention: This option is for development and manufacturing use only, FMR tapes will not be shipped to the field to update drive firmware. Development and manufacturing personnel, see “Upgrading Code via FMR Tape” on page 264 for additional information.

CHANGE LDR MODE

CHANGE LDR MODE allows the user to change the Autoloader’s mode of operation. The Autoloader can operate in the following modes:

- Automatic (default setting): For more information, see “**Automatic Mode.**”
- Sequential (can be associated with Loop Mode and Autoload Mode): For more information, see “**Sequential Mode.**”
- Random: For more information, see “**Random Mode**” on page 63.

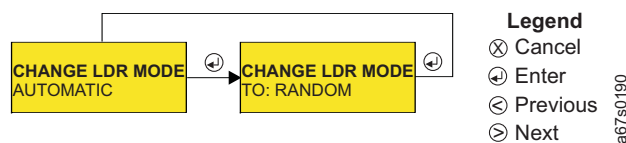


Figure 43. Configuration Menu’s CHANGE LDR MODE command

To access CHANGE LDR MODE using the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu” on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until CHANGE LDR MODE is displayed.
3. Press *Enter* to display the CHANGE LDR MODE TO: screen.
4. Use *Next* and *Previous* to select the new mode (Automatic, Sequential, or Random).
5. Press *Enter* to initiate the new mode.
6. Press *Cancel*:
 - One time to return to the **Configuration Menu** screen.
 - Two times to return to the Home Screen.

Automatic Mode: Automatic mode is the default setting and allows the Autoloader to switch between sequential and random modes depending on the SCSI command received. In automatic mode, sequential mode is activated when the Autoloader is powered on. When the Autoloader receives a MOVE MEDIUM, READ ELEMENT STATUS, or an INITIALIZE ELEMENT STATUS command, sequential mode is disabled and random mode becomes active. The Autoloader will switch back to sequential mode with every OCP initiated LOAD or UNLOAD command.

Sequential Mode: In sequential mode, the Autoloader’s firmware predefines the selection of the cartridges. After initialization, the firmware causes the Autoloader to select the first available cartridge found (counting from 1 through 8) for loading into the drive. If AUTOLOAD MODE (see “AUTOLOAD MODE” on page 63) is set to “ON”, the first cartridge will load automatically. Otherwise, the OCP’s LOAD CARTRIDGE command must be executed. After the server’s (host’s) application software fills this cartridge with data and issues an UNLOAD command, the Autoloader returns the cartridge to its storage slot and loads the next cartridge in order. Empty storage slots are ignored. The Autoloader continues this process until all cartridges have been filled with data.

Note: While in sequential mode, the Autoloader's robotics are not logically connected to the SCSI bus and do not respond to SCSI commands.

Associated with sequential mode are LOOP MODE and AUTOLOAD MODE. See "LOOP MODE" and "AUTOLOAD MODE" for more information.

Random Mode: In random mode, the Autoloader allows the server's (host's) application software to select any data cartridge in any order.

LOOP MODE

LOOP MODE can be used with sequential mode. Sequential mode with LOOP MODE "ON" loads the cartridge in slot 1 after the cartridge in slot 8 has been filled and sent back to its home slot. This allows endless backup operations without user interaction.

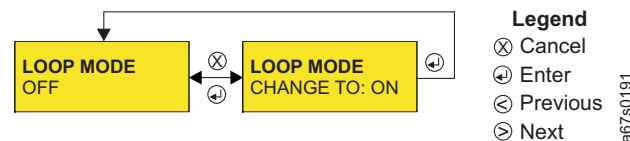


Figure 44. Configuration Menu's LOOP MODE command

To access LOOP MODE using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until LOOP MODE is displayed.
3. Press *Enter* to display the LOOP MODE CHANGE TO: screen.
4. Use *Next* and *Previous* to select "ON" or "OFF".
5. Press *Enter* to initiate the new mode.
6. Press *Cancel*:
 - One time to return to the **Configuration Menu** screen.
 - Two times to return to the Home Screen.

AUTOLOAD MODE

AUTOLOAD MODE can also be used with sequential mode. Sequential mode with AUTOLOAD MODE "ON" loads the first cartridge automatically if the Autoloader powers on with an empty drive.

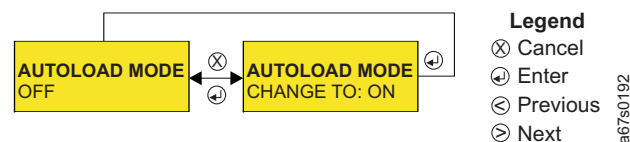


Figure 45. Configuration Menu's AUTOLOAD MODE command

To access AUTOLOAD MODE on the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until AUTOLOAD MODE is displayed.
3. Press *Enter* to display the AUTOLOAD MODE CHANGE TO: screen.
4. Use *Next* and *Previous* to select "ON" or "OFF".
5. Press *Enter* to initiate the new mode.

6. Press *Cancel*:
 - One time to return to the **Configuration Menu** screen.
 - Two times to return to the Home Screen.

NET PARAMETER

Turn NET PARAMETER "ON" when an RMU is installed on the Autoloader. This menu item also allows the user to:

- Turn DHCP (Dynamic Host Configuration Protocol) on or off
- Set or change the Autoloader's IP Address
- Set or change the Autoloader's Gateway Address
- Set or change the Autoloader's Network Mask Address

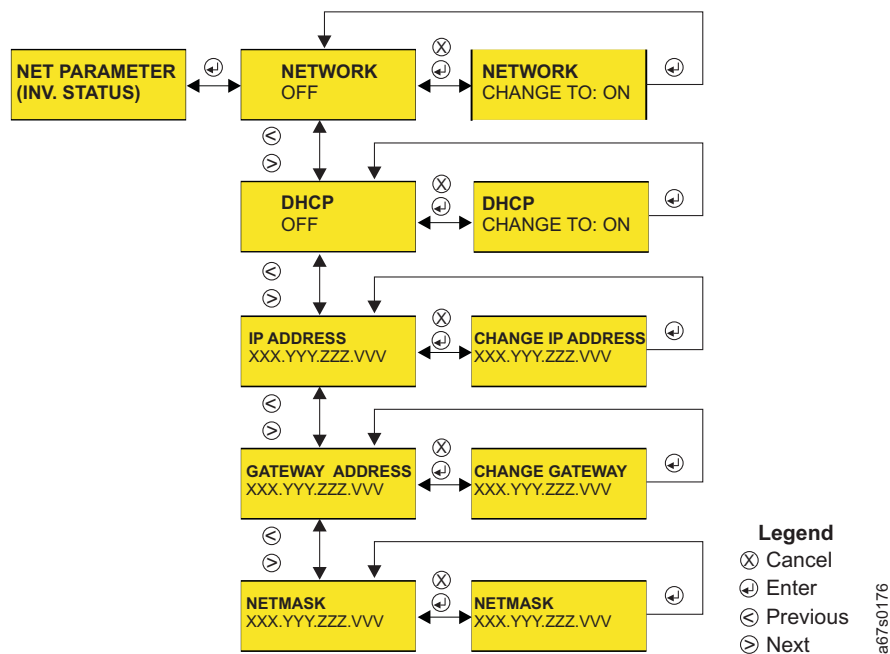


Figure 46. Configuration Menu's NET PARAMETER command

To access NET PARAMETER using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until NET PARAMETER is displayed.
 - a. Press *Enter* to display the NETWORK screen. Current status is displayed
 - b. Press *Enter* to display the NETWORK CHANGE TO: screen
 - c. Use *Next* and *Previous* to select "ON" or "OFF".
 - d. Press *Enter* to initiate the change and return to the NETWORK screen.
3. Press *Next* to display the DHCP screen. Current status is displayed.
 - a. Press *Enter* to display the DHCP CHANGE TO: screen.
 - b. Use *Next* and *Previous* to select "ON" or "OFF".
 - c. Press *Enter* to initiate the change and return to the DHCP screen.
4. Press *Next* to display the IP ADDRESS screen. The current IP Address is displayed.
 - a. Press *Enter* to display the CHANGE IP ADDRESS screen.

- b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the IP ADDRESS screen.
5. Press *Next* to display the GATEWAY ADDRESS screen. The current Gateway Address is displayed.
 - a. Press *Enter* to display the CHANGE GATEWAY screen.
 - b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the GATEWAY ADDRESS screen.
6. Press *Next* to display the NETMASK screen. The current Netmask Address is displayed.
 - a. Press *Enter* to display the CHANGE NETMASK screen.
 - b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the NETMASK screen.
7. Press *Cancel*:
 - One time, and the message CYCLE POWER FOR NEW NETPARAM is displayed.
 - Two times to return to the NET PARAMETER screen.
 - Three times to return to the **Configuration Menu** screen.
 - Four times to return to the Home Screen.

BARCODE READER

Turn BARCODE READER "ON" when a BCR is installed on the Autoloader.

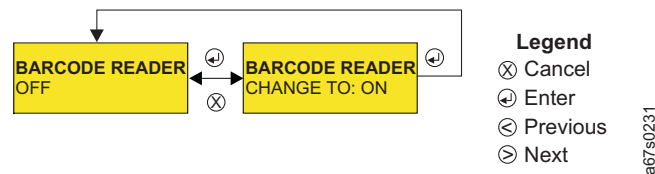


Figure 47. Configuration Menu's BARCODE READER command

To access BARCODE READER using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until BARCODE READER is displayed.
 - a. Press *Enter* to display the BARCODE READER CHANGE TO: screen
 - b. Use *Next* and *Previous* to select "ON" or "OFF".
 - c. Press *Enter* to initiate the change. If ON was selected, the barcode reader will inventory the cartridges in the autoloader.
3. Press *Cancel*:
 - One time to return to the Barcode Reader screen.
 - Two times to return to the Configuration Menu screen.
 - Three times to return to the Home screen.

PROTECTION MODE

Turn PROTECTION MODE "ON" to initiate a password protected login. Leave PROTECTION MODE "OFF" (default setting) to allow going offline without a password.

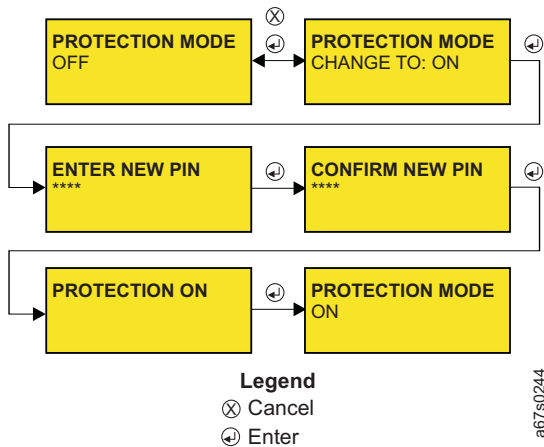


Figure 48. Configuration Menu's PROTECTION MODE command

Turning PROTECTION MODE ON: To activate password protection on the OCP:

1. Navigate to the Configuration Menu (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, to access PROTECTION MODE.
 - a. Press *Enter* to display the PROTECTION MODE CHANGE TO: screen.
 - b. Use *Next* or *Previous* to select ON.
 - c. Press *Enter* to initiate the change.
 - d. Enter a new PIN (password) using *Next* and *Previous*. After selecting each digit, press *Enter* to initiate the entry and move to the next digit.
 - e. Press *Enter* to confirm the new PIN (password). **PROTECTION ON** is displayed.
 - f. Press *Enter* to return to the PROTECTION MODE screen.
3. Press *Cancel*:
 - One time to return to the Configuration Menu.
 - Two times to return to the Home screen.

Turning PROTECTION MODE OFF: To deactivate password protection on the OCP:

1. Navigate to the Configuration Menu (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, to access PROTECTION MODE.
 - a. Press *Enter* to display the PROTECTION MODE CHANGE TO: screen.
 - b. Use *Next* or *Previous* to select OFF.
 - c. Press *Enter* to initiate the change. The message **Disable protect are you sure?** is displayed.
 - d. Press *Enter* for YES or *Cancel* for NO.
 - e. Press *Enter* to return to the PROTECTION MODE CHANGE TO: screen.
3. Press *Cancel*:
 - One time to return to the PROTECTION MODE screen.

- Two times to return to the Configuration Menu screen.
- Three times to return to the Home screen.

SERIAL NUMBER

This menu item allows the user to change the serial number displayed by the OCP. This item should be utilized when a replacement Autoloader is being installed. The serial number of the replacement Autoloader should be changed to the serial number of the original Autoloader for warranty purposes.

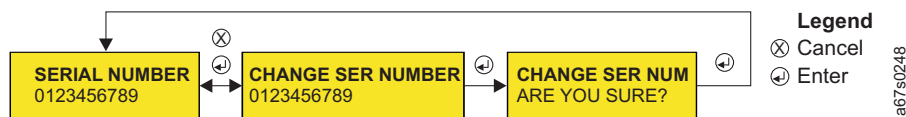


Figure 49. Configuration Menu's SERIAL NUMBER command

To access SERIAL NUMBER via the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until SERIAL NUMBER is displayed.
3. Press *Enter* to display the CHANGE SER NUM screen.
4. Use *Next* and *Previous* to select each digit in the new serial number. Press *Enter* to initiate each new digit and move to the next digit to be changed. The Autoloader's serial number is seven digits in length; therefore, the first three digits of the serial number should be entered as "000".
5. Press *Cancel* to return to the SERIAL NUMBER screen.

Diagnostic Menu

To navigate to the **Diagnostic Menu** from the Home Screen using the OCP:

- Press any button (*Cancel*, *Previous*, *Next*, or *Enter*) to display the **Information Menu** screen.
- Press *Next* until the **Diagnostic Menu** screen displays.

LOADER DIAG

The LOADER DIAG menu allows an Administrator to run a system test and a library verify test.

To access the LOADER DIAG menu:

1. Navigate to the **Diagnostic Menu** (see "Diagnostic Menu").
2. Press *Enter* to access the LOADER DIAG menu.

LIBRARY VERIFY:

Note: LIBRARY VERIFY requires a blank or scratch cartridge. This test will write and read data on the cartridge. **DO NOT USE** a cartridge containing valuable data.

When Library Verify is selected, the following actions take place:

1. The Autoloader ensures that all Autoloader hardware is functional.
2. The Autoloader ensures it can communicate with the drive over the RS422.
3. If the drive has a cartridge loaded, the Autoloader performs one of the following:

- Moves the cartridge to its home slot.
 - Moves the cartridge to the I/O Door and asks the user to remove it, if the home slot is unknown
4. If there is a cartridge in the I/O Door, the Autoloader prompts the user to remove it. Verify that the cartridge has been removed before proceeding.
 5. The Autoloader prompts the user to put a scratch cartridge known to be in good working condition into the I/O Door.
 6. When the scratch cartridge has been loaded, if the BCR is installed, it will read the bar code label on the scratch cartridge and save it for later comparison.
 7. The Autoloader moves the scratch cartridge to the drive.
 8. The Autoloader tells the drive to run a Fast Read/Write Test which includes a write/read/verify test on the tape.
 9. When the drive test is done, the Autoloader test tells the drive to eject the tape, then moves it back to the I/O Door.
 10. If a BCR is installed, when the scratch cartridge has been moved back to the I/O Door, it reads the bar code label again and compares it to what was recorded earlier.
 11. The Autoloader will prompt the user to remove the scratch cartridge from the I/O Door.

If any error is encountered during the Library Verify Test, see “Troubleshooting” on page 163 for help in diagnosing the problem.

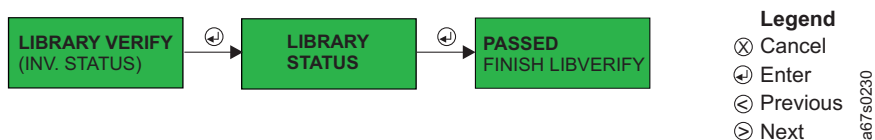


Figure 50. Diagnostic Menu's LOADER DIAG Library Verify command

To access LIBRARY VERIFY using the OCP:

1. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
2. Press **Enter** to access the LOADER DIAG menu.
3. Press **Enter** to access LIBRARY VERIFY.
4. Press **Enter** to begin the verification.
5. If a cartridge is in the drive:
 - The cartridge will be moved to its home slot.
 - The cartridge will be ejected through the I/O Door if the home slot is unknown and the user will be prompted to remove the cartridge.
6. When prompted, insert a scratch cartridge through the I/O Door.
7. When the test is complete and when prompted, remove the scratch cartridge when ejected through the I/O Door.
8. If an error occurred, the FAILED screen will display. Troubleshoot the problem (see “Troubleshooting” on page 163). If no error occurred, the PASSED screen will display. Proceed to the next step.
9. Press **Cancel**:
 - One time to return to the LOADER DIAG screen.
 - Two times to return to the **Diagnostic Menu** screen.
 - Three times to return to the Home Screen.

SYSTEM TEST:

Note: SYSTEM TEST requires at least one data cartridge. The cartridges are loaded and unloaded but no data is written on the cartridges.

SYSTEM TEST allows the user to select the number of cycles (270, 540, 1080, ENDLESS) the Autoloader will run while performing a system diagnostic.

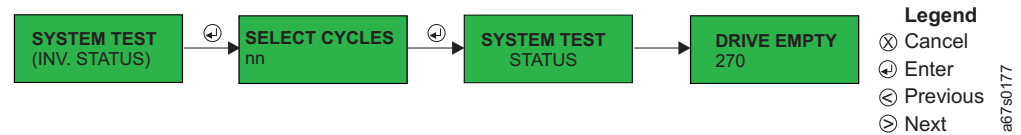


Figure 51. Diagnostic Menu's LOADER DIAG System Test command

To access SYSTEM TEST using the OCP:

1. Navigate to the **Diagnostic Menu** (see "Diagnostic Menu" on page 67).
2. Press **Enter** to access the LOADER DIAG menu.
3. Press **Enter** then **Next** to access SYSTEM TEST.
4. Press **Enter** to display the SELECT CYCLES screen.
5. Use **Next** and **Previous** to select the number of cycles to run the test (270, 540, 1080, or ENDLESS).
6. Press **Enter** to initiate the selection and begin the test. At the end of the test the DRIVE EMPTY screen will display.
7. Press **Cancel**:
 - One time to return to the LOADER DIAG screen.
 - Two times to return to the **Diagnostic Menu** screen.
 - Three times to return to the Home Screen.

DRIVE DIAG

The DRIVE DIAG menu allows the user to run diagnostic tests on the drive.

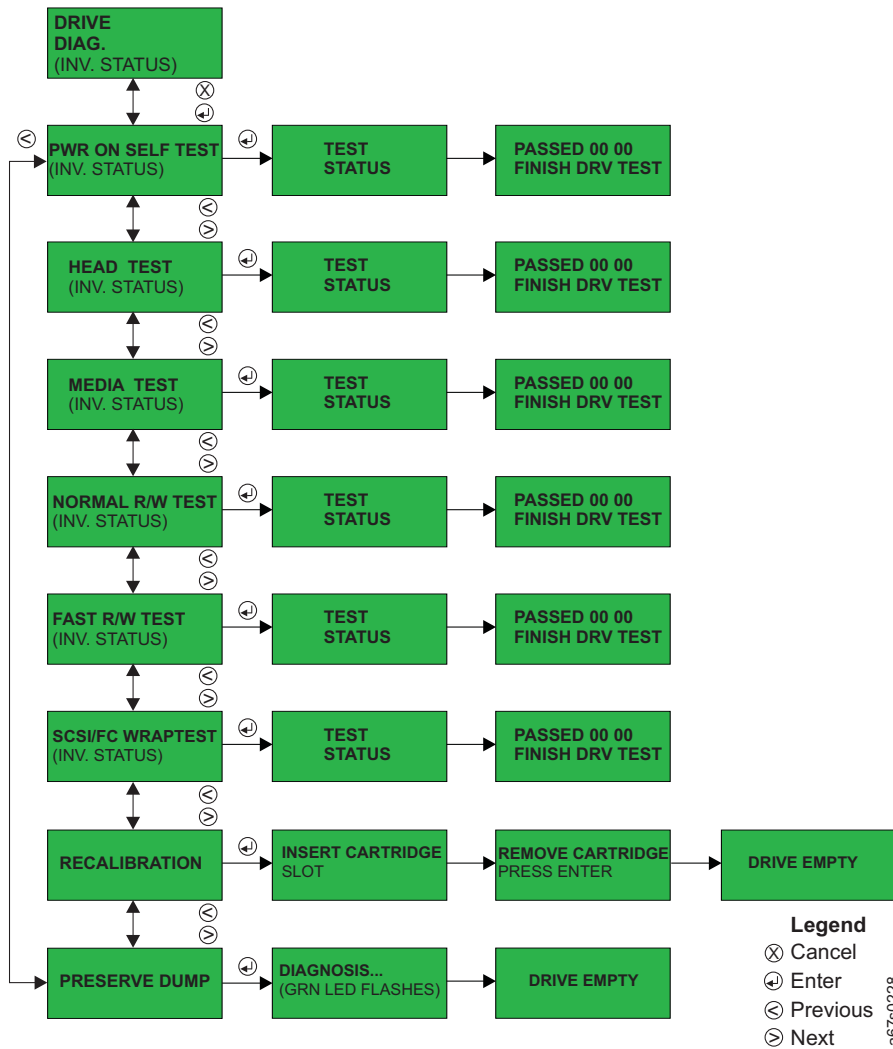


Figure 52. Diagnostic Menu's DRIVE DIAG menu

Note: The format of a drive error code reported on the OCP is 0x00. The leading and trailing zeros are ignored.

To access the DRIVE DIAG menu using the OCP:

1. Navigate to the **Diagnostic Menu** (see "Diagnostic Menu" on page 67).
2. Press **Enter** then **Next** to access the DRIVE DIAG menu.

PWR ON SELF TEST: The Power On Self Test (POST) tests the drive's initialization process. The OCP's green LED will blink during this initialization process. When the drive completes the Power On Self Tests (POST), the green LED will stop blinking.

The POST runs each time the Autoloader is powered on as well as whenever it is activated via this menu item.

To access PWR ON SELF TEST using the OCP:

1. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
2. Press *Enter* then *Next* to access the DRIVE DIAG menu.
3. Press *Enter* to access PWR ON SELF TEST.
4. Press *Enter* to initiate the test.
5. If the test FAILED, troubleshoot the problem (see “Troubleshooting” on page 163). If the test PASSED, press *Enter* to return to the PWR ON SELF TEST screen.
6. Press *Cancel* to return to the Home Screen.

HEAD TEST: The Head Test performs diagnostics on difficult head patterns and determines if the head is functioning properly.

To access HEAD TEST using the OCP:

1. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
2. Press *Enter* then *Next* to access the DRIVE DIAG menu.
3. Press *Enter* then *Next* to access HEAD TEST.
4. Press *Enter* to initiate the test.
5. When prompted and the I/O Door opens, insert a scratch cartridge. When test is complete, remove scratch cartridge from the I/O Door when prompted.
6. If the test FAILED, troubleshoot the problem (see “Troubleshooting” on page 163). If the test PASSED, press *Enter* to return to the PWR ON SELF TEST screen.
7. Press *Cancel* to return to the Home Screen.

MEDIA TEST: The Media Test verifies whether a suspect tape cartridge and its magnetic media are acceptable.

Attention: Data on the suspect tape will be overwritten during this test.

To access MEDIA TEST using the OCP:

1. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
2. Press *Enter* then *Next* to access the DRIVE DIAG menu.
3. Press *Enter* then *Next* or *Previous*, as necessary, until MEDIA TEST is displayed.
4. Press *Enter* to initiate the test.
5. When prompted and the I/O Door opens, insert the suspect cartridge. When test is complete, remove the cartridge from the I/O Door when prompted.
6. If the test FAILED, troubleshoot the problem (see “Troubleshooting” on page 163). If the test PASSED, press *Enter* to return to the PWR ON SELF TEST screen.
7. Press *Cancel* to return to the Home Screen.

NORMAL R/W TEST: The Normal Read/Write Test performs a load operation, a write/read test, and an unload operation. The Normal Read/Write Test is more comprehensive and longer in duration than the Fast Read/Write Test.

To access NORMAL R/W TEST using the OCP:

1. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
2. Press *Enter* then *Next* to access the DRIVE DIAG menu.
3. Press *Enter* then *Next* or *Previous*, as necessary, until NORMAL R/W TEST is displayed.

4. Press *Enter* to initiate the test.
5. When prompted and the I/O Door opens, insert a scratch cartridge. When test is complete, press *Enter* and remove the scratch cartridge from the I/O Door when ejected.
6. If the test FAILED, troubleshoot the problem (see “Troubleshooting” on page 163). If the test PASSED, press *Enter* to return to the Home Screen.

FAST R/W TEST: The Fast Read/Write Test performs a load operation, a write/read test, and an unload operation.

To access FAST R/W TEST using the OCP:

1. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
2. Press *Enter* then *Next* to access the DRIVE DIAG menu.
3. Press *Enter* then *Next* or *Previous*, as necessary, until FAST R/W TEST is displayed.
4. Press *Enter* to initiate the test.
5. When prompted and the I/O Door opens, insert a scratch cartridge. When test is complete, press *Enter* and remove the scratch cartridge from the I/O Door when ejected.
6. If the test FAILED, troubleshoot the problem (see “Troubleshooting” on page 163). If the test PASSED, press *Enter* to return to the Home Screen.

SCSI / FIBRE WRAP TEST: The wrap test causes the Autoloader’s drive to perform one of the following:

- A check of the SCSI circuitry from and to the SCSI connector (Model L28/L38/L3H)
- A check of the Fibre Channel circuitry from and to the Fibre Channel connector or fiber cable (Model F28/F38/F3H)

To run the wrap test, determine whether your Autoloader uses a SCSI (Model L28/L38/L3H) or Fibre Channel (Model F28/F38/F3H) interface, then choose one of the following procedures.

Running an LVD SCSI Wrap Test: To run a wrap test on an LVD SCSI system, complete the following steps:

1. Disconnect the SCSI cable on the rear of the Autoloader from the receptacle closest to the server in the SCSI bus. Ensure that the terminator or SCSI cabling to the terminator at the end of the bus remains on the other connector.
2. Attach the LVD SCSI wrap tool (see “Step 2. Verify the Shipment Inventory” on page 19) to the connector where the SCSI cable was just removed.
3. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
4. Press *Enter* then *Next* to access the DRIVE DIAG menu.
5. Press *Enter* then *Next* or *Previous*, as necessary, until SCSI WRAP TEST is displayed.
6. Press *Enter* to initiate the test.
7. At the end of the test, the OCP will indicate TEST PASSED or TEST FAILED.
 - If TEST PASSED is displayed, the Autoloader is functioning properly. If the original problem persists, there is a failure outside the Autoloader or its attachments. Check the SCSI cables, the server’s hardware or software (device drivers, etc.).

- If TEST FAILED is displayed, repeat the test with a different SCSI terminator. If TEST FAILED persists, replace the Autoloader (see “Removing/Replacing the Autoloader” on page 204).
8. Remove the LVD SCSI wrap tool and restore the original SCSI cable connections.

Running an HVD SCSI Wrap Test: There is no HVD SCSI wrap tool available. However, it is important to exercise the LVD SCSI wrap test on the drive to help eliminate it as the failing unit. On Autoloaders with an HVD Converter, complete the following steps:

1. Remove the SCSI cable from the HVD Converter that is attached to the LVD SCSI receptacle on the base unit. Leave the LVD terminator attached to the other LVD SCSI receptacle.
2. Attach the LVD SCSI wrap tool to the connector where the HVD Converter SCSI cable was just removed.
3. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
4. Press *Enter* then *Next* to access the DRIVE DIAG menu.
5. Press *Enter* then *Next* or *Previous*, as necessary, until SCSI WRAP TEST is displayed.
6. Press *Enter* or *Previous* as necessary to initiate the test.
7. If the LVD SCSI wrap indicates TEST FAILED, then replace the Autoloader. See “Removing/Replacing the Autoloader” on page 204.
8. If the LVD SCSI wrap indicates TEST PASSED, then the problem may be with the HVD Converter, SCSI cable(s), terminator or other hardware/firmware (device driver, etc.) outside the Autoloader or its attachments.
9. Check all SCSI cable connections and terminator for damage or bent pins. Remove the LVD SCSI wrap tool and reattach the HVD Converter SCSI cable to the LVD SCSI receptacle on the Autoloader. If damage or a bent pin was found on the HVD Converter SCSI cable connector, and, if it could not be corrected, replace the HVD Converter. See “Removing/Replacing the HVD Converter” on page 214.
10. Even if SCSI cable damage or bent pins were not found, try another SCSI cable and terminator and repeat the failing test from the host.
11. If the test still fails, replace the HVD Converter. See “Removing/Replacing the HVD Converter” on page 214.

Running a Fibre Channel Wrap Test: To run a wrap test on a Fibre system, complete the following steps:

1. Disconnect the fiber cable from the connector on the rear panel of the Autoloader.
2. Attach the Fibre wrap tool (see “Step 2. Verify the Shipment Inventory” on page 19) to the connector where the fiber cable was just removed.
3. Navigate to the **Diagnostic Menu** (see “Diagnostic Menu” on page 67).
4. Press *Enter* then *Next* to access the DRIVE DIAG menu.
5. Press *Enter* then *Next* or *Previous*, as necessary, until SCSI WRAP TEST is displayed.
6. Press *Enter* to initiate the test.
7. The OCP will indicate TEST PASSED or TEST FAILED.
 - If TEST PASSED is displayed, the Autoloader is functioning properly. If the original problem persists, there may be a failure outside the Autoloader or its attachments. Use switch, hub, or other fibre product service guides, as

appropriate, and verify the switch hub configuration, host adapter, host software levels, and other device drivers.

- IF TEST FAILED is displayed, replace the Autoloader (see “Removing/Replacing the Autoloader” on page 204).

8. Remove the fibre wrap tool and restore the original fibre channel connections.

RECALIBRATION:

Running a Drive Recalibration Test: To run a drive recalibration test, complete the following steps:

1. Navigate to the Diagnostic Menu.
2. Press *Enter* and then *Next* to access the DRIVE DIAG menu.
3. Press *Enter* then press *Next* until Recalibration is displayed.
4. Press *Enter* to initiate the test.
5. OCP prompts you to insert a cartridge into Slot 1 through the I/O door.
6. When the calibration diagnostic is complete, remove the cartridge from the I/O door and press *Enter*.

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

Running a Preserve Dump: To run a Preserve Dump, complete the following steps:

1. Navigate to the Diagnostic Menu
2. Press *Enter* and then *Next* to access the DRIVE DIAG menu.
3. Press *Enter* then press *Next* until PRESERVE DUMP is displayed.
4. Press *Enter* to initiate the test.

Note: The OCP display will show “Diagnosis..” and OCP’s green LED will blink during this process. When the preserve dump is complete, the green LED will stop blinking.

5. Wait until the Home Screen displays “Drive empty” before removing the drive.
6. When the preserve dump is complete, press *Enter* to return to the Home Screen.

Go Online

Going online or logging out of the Autoloader will allow only the **Information Menu** to be displayed. This protects your Autoloader from being reconfigured or the advanced menus being accessed. To go online or logout of the Autoloader using the OCP:

1. Navigate to **Go Online**.
 - a. From the Home Screen, press any key (*Cancel*, *Previous*, *Next*, or *Enter*) to access the **Information Menu**.
 - b. Continue to press *Next*, as necessary, until **Go Online** is displayed.
2. Press *Enter* to complete going online.

Model F28/F38/F3H (Fibre Channel Drive) Offline Menu

After logging in from an RMU, or going offline from the OCP, to an Autoloader with a Fibre drive (Model F28/F38/F3H), the user has access to the Offline Menu shown in Figure 53.

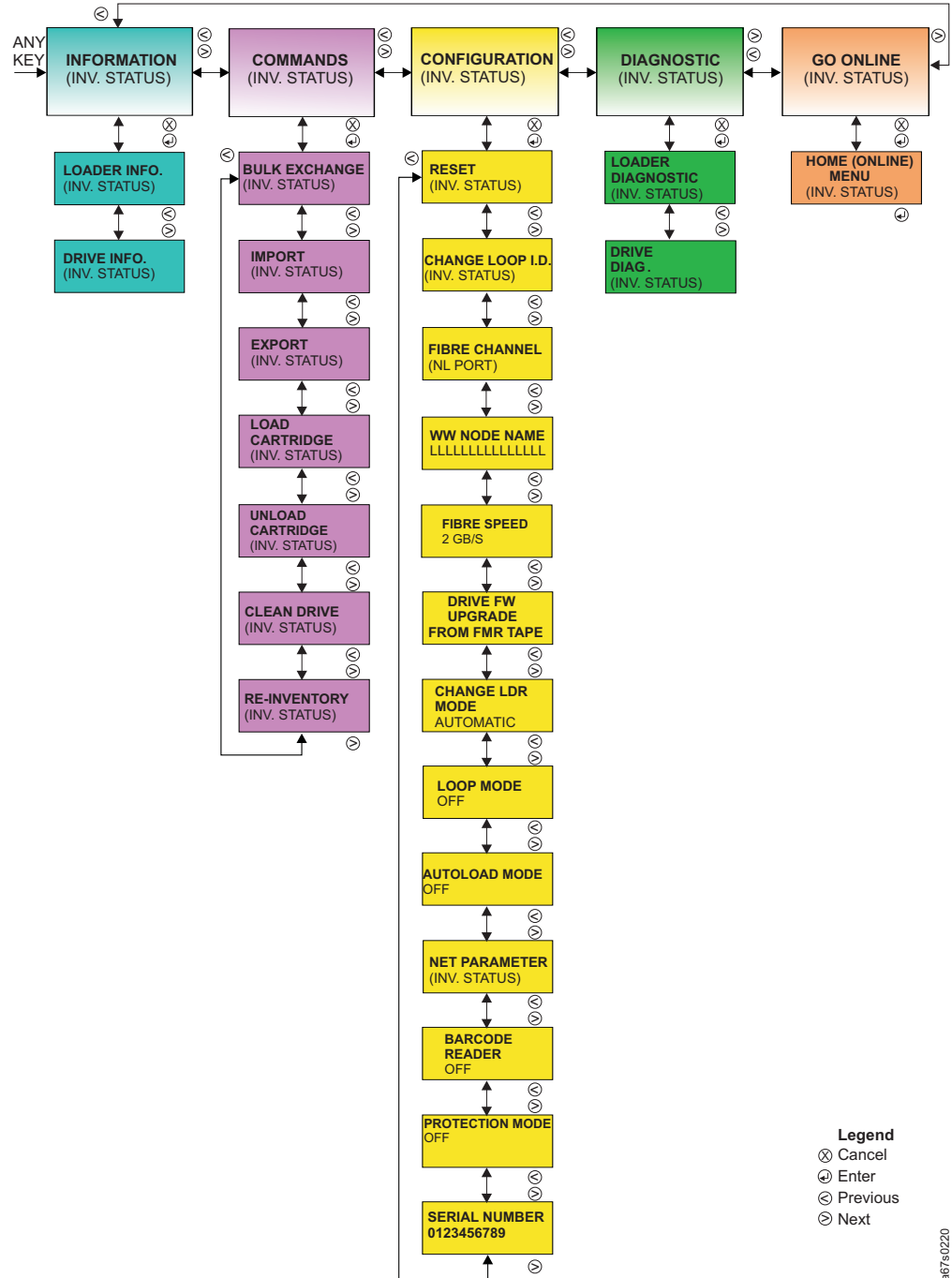


Figure 53. Autoloader Model F28/F38/F3H Offline Menu

Information Menu

See “Information Menu” on page 49.

Commands Menu

See “Commands Menu” on page 55.

Configuration Menu

The **Configuration Menu** allows the administrator to setup or change SCSI IDs, SCSI speed, operating mode, network parameters, as well as, initializing the BCR.

For navigation information and descriptions of menu items, refer to the sections that follow.

To navigate to the **Configuration Menu** from the Home Screen using the OCP:

- Press any button (*Cancel*, *Previous*, *Next*, or *Enter*) on the OCP to display the **Information Menu** screen.
- Press *Next* until the **Configuration Menu** screen displays.

RESET

RESET restarts the Autoloader and is used when initiating configuration changes.

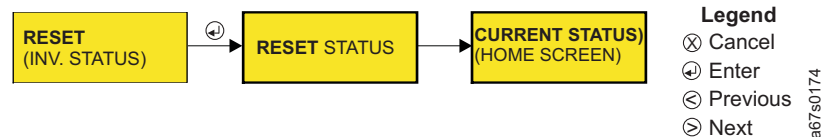


Figure 54. Configuration Menu's RESET command

To access RESET using the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu”).
2. Press *Enter* to access RESET.
3. Press *Enter* to initiate the reset.
4. When the reset is complete, the OCP will display the Home Screen.

CHANGE LOOP ID

CHANGE LOOP ID allows the user to set a new value for Fibre Loop IDs. The Fibre Loop default ID is "005".

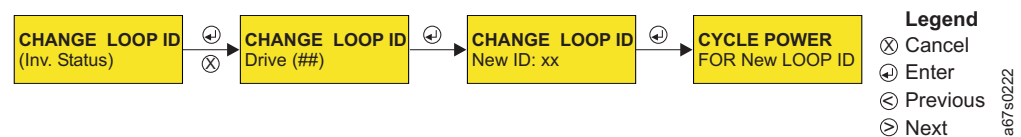


Figure 55. Configuration Menu's CHANGE LOOP ID command

To access CHANGE LOOP ID using the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu”).
2. Press *Enter* then *Next* or *Previous*, as necessary, until CHANGE LOOP ID is displayed.
3. Press *Enter* to display the CHANGE LOOP ID Drive (XX) screen.
4. Press *Enter* to display the CHANGE LOOP ID New ID: screen.

5. Use *Next* and *Previous* to select each digit in the new ID. After selecting each number, press *Enter* to initiate the selected number and move to the next digit in the ID.
6. After all digits have been selected and initiated, press *Enter*.
7. Cycle power on the Autoloader. After the power has cycled, the Home Screen will be displayed.

FIBRE CHANNEL

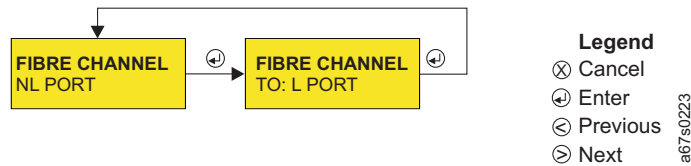


Figure 56. Configuration Menu's FIBRE CHANNEL command

To access FIBRE CHANNEL using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press *Enter* then *Next* or *Previous*, as necessary, until FIBRE CHANNEL is displayed.
3. Press *Enter* to display the FIBRE CHANNEL TO: screen.
4. Use *Next* and *Previous* to select the new port (NL PORT, LN PORT, L PORT, or N PORT).

Note: See "Fibre Channel Supported Topologies" on page 13 for detailed port information.

5. Press *Enter* to initiate the change and return to the FIBRE CHANNEL screen.
6. Press *Next* to go to the next menu item. Press *Cancel*:
 - One time to return to the **Configuration Menu**.
 - Two times to return to the Home Screen.

WW NODE NAME

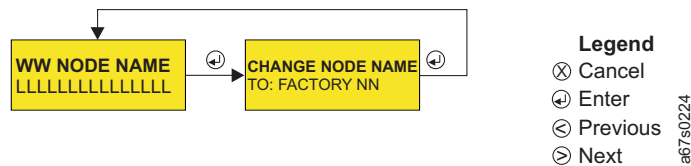


Figure 57. Configuration Menu's WW NODE NAME command

To access WW NODE NAME using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press *Enter* then *Next* or *Previous*, as necessary, until WW NODE NAME is displayed.
3. Press *Enter* to display the CHANGE NODE NAME TO: OVERWRITE NN screen.
4. Press *Enter* to access the current Node Name.
5. Use *Next* and *Previous* to select each digit in the new name. Press *Enter* after each digit is selected to initialize the digit and move to the next digit to be changed.

6. Cycle power on the Autoloader. After the power has cycled, the Home Screen will display.
7. Verify that the WWNN was changed. If not, cycle power again.

FIBRE SPEED

Attention: FC SPEED is supported by certain host bus adapters. To determine if your adapter supports FC SPEED:

- Refer to the documentation for your server (host).
- Visit the web at <http://www.ibm.com/storage/support/ito>.

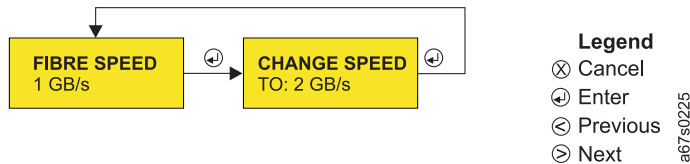


Figure 58. Configuration Menu's FC SPEED command

To access FC SPEED using the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu” on page 76).
2. Press *Enter* then *Next* or *Previous*, as necessary, until FC SPEED is displayed.
3. Press *Enter* to display the CHANGE SPEED TO: screen.
4. Use *Next* and *Previous* to select the new speed:
 - 1 Gb/s
 - 2 Gb/s
 - AUTO (variable speed; maximum speed allowed at the time)
5. Press *Enter* to initiate the change and return to the HI SPEED FC screen.
6. Cycle Autoloader power. When power has cycled, the Home Screen displays.

DRIVE FW UPGRADE FROM FMR TAPE

Attention: This option is for development and manufacturing use only, FMR tapes will not be shipped to the field to update drive firmware. Development and manufacturing personnel, see “Upgrading Code via FMR Tape” on page 264 for additional information.

CHANGE LDR MODE

CHANGE LDR MODE allows the user to change the Autoloader’s mode of operation. The Autoloader can operate in the following modes:

- Automatic (default setting): For more information, see “**Automatic Mode**” on page 79.
- Sequential (can be associated with Loop Mode and Autoload Mode): For more information, see “**Sequential Mode**” on page 79.
- Random: For more information, see “**Random Mode**” on page 79.

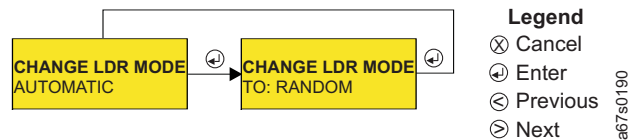


Figure 59. Configuration Menu's CHANGE LDR MODE command

To access CHANGE LDR MODE:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press **Enter** then **Next** or **Previous**, as necessary, until CHANGE LDR MODE is displayed.
3. Press **Enter** on the OCP to display the CHANGE LDR MODE TO: screen.
4. Use **Next** and **Previous** on the OCP to select the new mode (Automatic, Sequential, or Random).
5. Press **Enter** on the OCP to initiate the new mode.
6. Press **Cancel** on the OCP:
 - One time to return to the **Configuration Menu** screen.
 - Two times to return to the Home Screen.

Automatic Mode: Automatic mode is the default setting and allows the Autoloader to switch between sequential and random modes depending on the SCSI command received. In automatic mode, sequential mode is activated when the Autoloader is powered on. When the Autoloader receives a MOVE MEDIUM, READ ELEMENT STATUS, or an INITIALIZE ELEMENT STATUS command, sequential mode is disabled and random mode becomes active. The Autoloader will switch back to sequential mode with every OCP initiated LOAD or UNLOAD command.

Sequential Mode: In sequential mode, the Autoloader's firmware predefines the selection of the cartridges. After initialization, the firmware causes the Autoloader to select the first available cartridge found (counting from 1 through 8) for loading into the drive. If AUTOLOAD MODE (see "**Automatic Mode**") is set to "ON", the first cartridge will load automatically. Otherwise, the OCP's LOAD CARTRIDGE command must be executed. After the server's (host's) application software fills this cartridge with data and issues an UNLOAD command, the Autoloader returns the cartridge to its storage slot and loads the next cartridge in order. Empty storage slots are ignored. The Autoloader continues this process until all cartridges have been filled with data.

Note: While in sequential mode, the Autoloader's robotics are not logically connected to the SCSI bus and do not respond to SCSI commands.

Associated with sequential mode are LOOP MODE and AUTOLOAD MODE. See "LOOP MODE" and "AUTOLOAD MODE" on page 80 for more information.

Random Mode: In random mode, the Autoloader allows the server's (host's) application software to select any data cartridge in any order.

LOOP MODE

LOOP MODE can be used with sequential mode. Sequential mode with LOOP MODE "ON" loads the cartridge in slot 1 after the cartridge in slot 8 has been filled and sent back to its home slot to allow endless backup operations without user interaction.

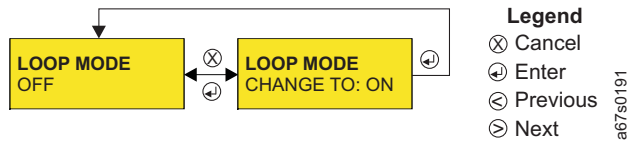


Figure 60. Configuration Menu's LOOP MODE command

To access LOOP MODE:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press **Enter** then **Next** or **Previous**, as necessary, until LOOP MODE is displayed.
3. Press **Enter** on the OCP to display the LOOP MODE CHANGE TO: screen.
4. Use **Next** and **Previous** on the OCP to select "ON" or "OFF".
5. Press **Enter** on the OCP to initiate the new mode.
6. Press **Cancel** on the OCP:
 - One time to return to the **Configuration Menu** screen.
 - Two times to return to the Home Screen.

AUTOLOAD MODE

AUTOLOAD MODE can be used with sequential mode. Sequential Mode with AUTOLOAD MODE "ON" loads the first cartridge automatically if the Autoloader powers on with an empty drive.

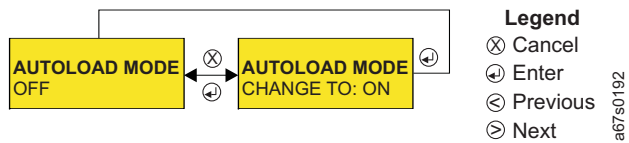


Figure 61. Configuration Menu's AUTOLOAD MODE command

To access AUTOLOAD MODE:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press **Enter** then **Next** or **Previous**, as necessary, until AUTOLOAD MODE is displayed.
3. Press **Enter** on the OCP to display the AUTOLOAD MODE CHANGE TO: screen.
4. Use **Next** and **Previous** on the OCP to select "ON" or "OFF".
5. Press **Enter** on the OCP to initiate the new mode.
6. Press **Cancel** on the OCP:
 - One time to return to the **Configuration Menu** screen.
 - Two times to return to the Home Screen.

NET PARAMETER

Turn NET PARAMETER "ON" when an RMU is installed on the Autoloader. This menu item also allows the user to:

- Turn DHCP (Dynamic Host Configuration Protocol) on or off
- Set or change the Autoloader's IP Address
- Set or change the Autoloader's Gateway Address
- Set or change the Autoloader's Network Mask Address

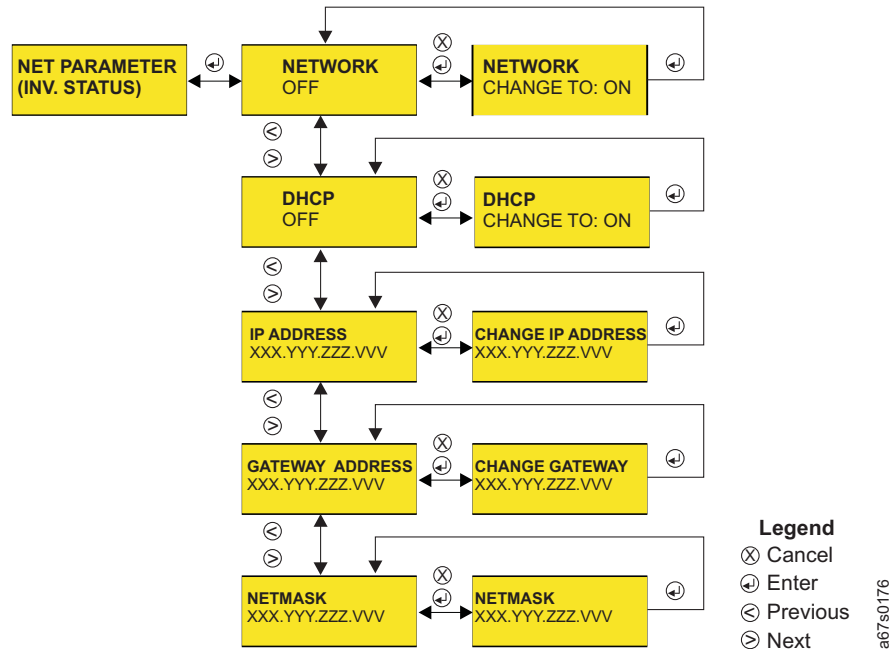


Figure 62. Configuration Menu's NET PARAMETER command

To access NET PARAMETER using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press **Enter** then **Next** or **Previous**, as necessary, until NET PARAMETER is displayed.
 - a. Press **Enter** to display the NETWORK screen. Current status is displayed.
 - b. Press **Enter** to display the NETWORK CHANGE TO: screen
 - c. Use **Next** and **Previous** to select "ON" or "OFF".
 - d. Press **Enter** to initiate the change and return to the NETWORK screen.
3. Press **Next** to display the DHCP screen. Current status is displayed.
 - a. Press **Enter** to display the DHCP CHANGE TO: screen.
 - b. Use **Next** and **Previous** to select "ON" or "OFF".
 - c. Press **Enter** to initiate the change and return to the DHCP screen.
4. Press **Next** to display the IP ADDRESS screen. The current IP Address is displayed.
 - a. Press **Enter** to display the CHANGE IP ADDRESS screen.
 - b. Use **Next** and **Previous** to select each digit in the new address. Press **Enter** to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press **Cancel** to return to the IP ADDRESS screen.
5. Press **Next** to display the GATEWAY ADDRESS screen. The current Gateway Address is displayed.
 - a. Press **Enter** to display the CHANGE GATEWAY screen.
 - b. Use **Next** and **Previous** to select each digit in the new address. Press **Enter** to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press **Cancel** to return to the GATEWAY ADDRESS screen.

6. Press *Next* to display the NETMASK screen. The current Netmask address is displayed.
 - a. Press *Enter* to display the CHANGE NETMASK screen.
 - b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Cancel* to return to the NETMASK screen.
7. Press *Cancel*:
 - One time to return to the NET PARAMETER screen.
 - Two times to return to the **Configuration Menu** screen.
 - Three times to return to the Home Screen.

BARCODE READER

Turn BARCODE READER "ON" when a BCR is installed on the Autoloader.

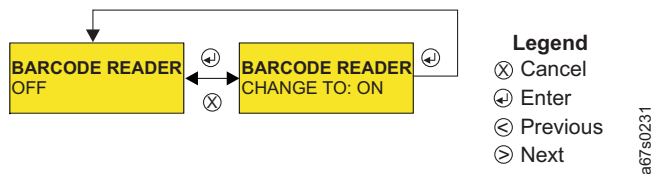


Figure 63. Configuration Menu's BARCODE READER command

To access BARCODE READER using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press *Enter* then *Next* or *Previous*, as necessary, until BARCODE READER is displayed.
 - a. Press *Enter* to display the BARCODE READER CHANGE TO: screen
 - b. Use *Next* and *Previous* to select "ON" or "OFF".
 - c. Press *Enter* to initiate the change and return to the Home Screen.

PROTECTION MODE

Turn PROTECTION MODE "ON" to initiate a password protected login. Leave PROTECTION MODE "OFF" (default setting) to allow going offline without a password.

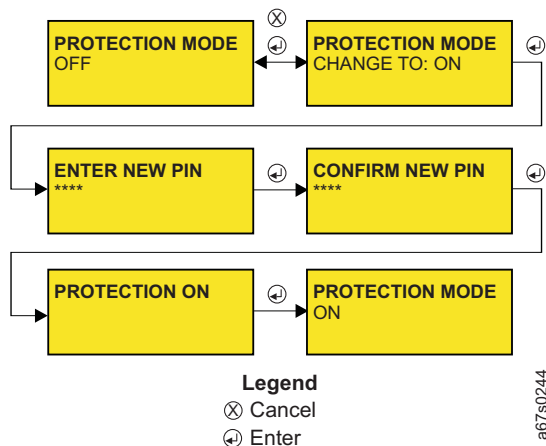


Figure 64. Configuration Menu's PROTECTION MODE command

Turning PROTECTION MODE ON: To activate password protection on the OCP:

1. Navigate to the Configuration Menu (see “Configuration Menu” on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, to access PROTECTION MODE.
 - a. Press *Enter* to display the PROTECTION MODE CHANGE TO: screen.
 - b. Use *Next* or *Previous* to select ON.
 - c. Press *Enter* to initiate the change.
 - d. Enter a new PIN (password) using *Next* and *Previous*. After selecting each digit, press *Enter* to initiate the entry and move to the next digit.
 - e. Press *Enter* to confirm the new PIN (password). **PROTECTION ON** is displayed.
 - f. Press *Enter* to return to the PROTECTION MODE screen.
3. Press Cancel:
 - One time to return to the Configuration Menu.
 - Two times to return to the Home screen.

Turning PROTECTION MODE OFF: To deactivate password protection on the OCP:

1. Navigate to the Configuration Menu (see “Configuration Menu” on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, to access PROTECTION MODE.
 - a. Press *Enter* to display the PROTECTION MODE CHANGE TO: screen.
 - b. Use *Next* or *Previous* to select OFF.
 - c. Press *Enter* to initiate the change. The message **Disable protect are you sure?** is displayed.
 - d. Press *Enter* for YES or *Cancel* for NO.
 - e. Press *Enter* to return to the PROTECTION MODE CHANGE TO: screen.
3. Press Cancel:
 - One time to return to the PROTECTION MODE screen.
 - Two times to return to the Configuration Menu screen.
 - Three times to return to the Home screen.

SERIAL NUMBER

This menu item allows the user to change the serial number displayed by the OCP. This item should be utilized when a replacement Autoloader is being installed. The serial number of the replacement Autoloader should be changed to the serial number of the original Autoloader for warranty purposes.

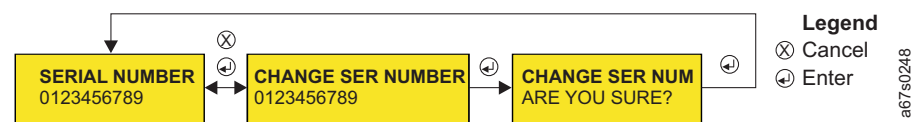


Figure 65. Configuration Menu’s SERIAL NUMBER command

To access SERIAL NUMBER via the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu” on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until SERIAL NUMBER is displayed.
3. Press *Enter* to display the CHANGE SER NUM screen.

4. Use *Next* and *Previous* to select each alphanumeric digit in the new serial number. Press Enter to initiate each new digit and move to the next digit to be changed. The Autoloader's serial number is seven digits in length; therefore, the first three digits of the serial number should be entered as "000".
5. Press *Cancel* to return to the SERIAL NUMBER screen.

Diagnostic Menu

See "Diagnostic Menu" on page 67.

Go Online

See "Go Online" on page 74.

Configuration

Configuring the Autoloader consists of the following steps:

1. Setting passwords (see “Passwords”)
2. Setting model-specific configuration options
 - See “Configuring a Model L28/L38/L3H Autoloader” on page 91
 - OR -
 - “Configuring a Model F28/F38/F3H Autoloader” on page 99
3. Setting configuration options common to all models (see “Completing Configuration of Autoloader” on page 107)

Passwords

Password-protected logins are available with the OCP, the RMU, and serial communication. Password protected logins are:

- Optional with the OCP.
- Mandatory with all RMU user levels.
- Mandatory with serial communication Administrator and Service user levels; not mandatory for the Standard user level.

OCP Password

Password protection can be turned on or off for the OCP.

Going Offline with Password Protection OFF

To access all menus using the OCP with password protection off (the default setting):

1. Power on the Autoloader. When the Power On Self Test is complete, the Home Screen will appear on the OCP display.
2. Press any key on the OCP (*Cancel*, *Previous*, *Next*, or *Enter*) to access the **Information Menu**.
3. Press *Next* to access **Go Offline**.
4. Press *Enter* to **Go Offline** and make all menus accessible.
5. Press *Next*, as necessary, to verify that all offline menus (**Information**, **Commands**, **Configuration**, **Diagnostic**, **Offline**) are available.

Going Offline with Password Protection ON

To go offline with password protection activated:

1. Power on the Autoloader. When the Power On Self Test is complete, the Home Screen will appear on the OCP display.
2. Press any key on the OCP (*Cancel*, *Previous*, *Next*, or *Enter*) to access the **Information Menu**.
3. Press *Next* to access the **Go Offline** display.
4. Press *Enter*.
5. Using *Next* and *Previous*, enter the first numerical digit of the PIN (password) then press *Enter* to move to the next digit in the PIN (password). Repeat this step for each digit in the password.

6. If GO OFFLINE PASSED is displayed, press *Enter* to complete going offline. If GO OFFLINE FAILED displays, the PIN (password) was incorrect. Press *Cancel* and repeat this procedure.
7. Press *Enter* to complete the login.

RMU Passwords

Password protection is a standard feature of the RMU. The Administrator must log in using the factory password setting the first time the RMU is used. This password can be changed after the initial login, if desired.

Logging in the First Time

An initial login is required before user accounts can be configured for your Autoloader. To login to the RMU before user accounts have been configured, complete the following:

1. Select "Administrator".
2. Type in the password, "secure" (for Administrator).
3. Click **LOGIN**.

For information on changing RMU passwords, see "Step 2. Configure RMU User Accounts" on page 108.

Serial Communication Password

Advanced communication with the Autoloader via the serial port (using an application such as HyperTerminal) requires the Administrator to enter the default user ID ("admin") and password ("secure"), or the same Administrator or Service user ID and password created for the RMU, to access the full serial menu. A short menu is available to Standard users prior to logging in without entering a user ID or password.

Using HyperTerminal

1. Start the terminal emulation software (such as, HyperTerminal).
On your Windows desktop, click **Select**—>**Programs**—>**Accessories**—>**Communications** —>**HyperTerminal**.

Note: Other applications similar to HyperTerminal exist. If you are using an application other than HyperTerminal, please refer to that application's documentation for instructions.

2. On the Connection Description window:
 - Type in "3581".
 - Click **OK**.

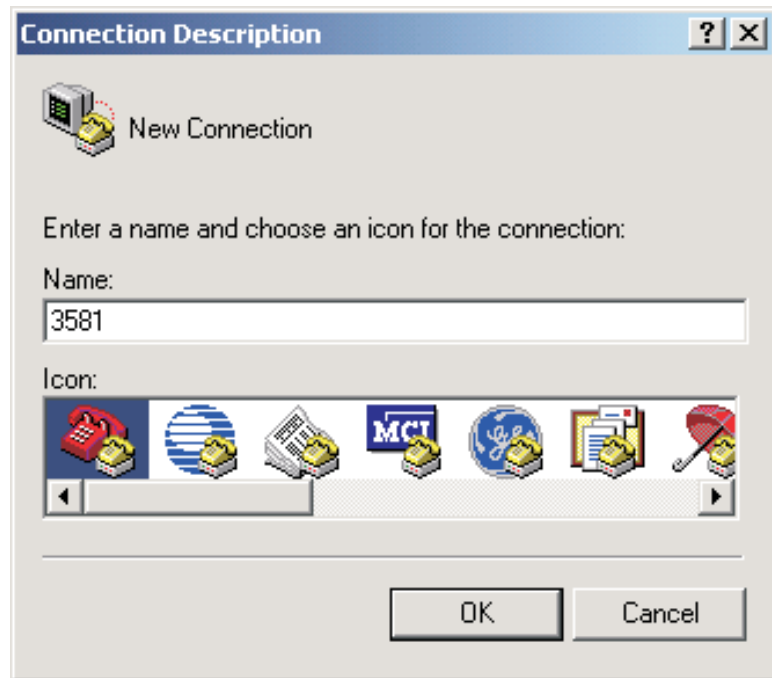


Figure 66. HyperTerminal Connection Description window

3. On the Connect To window:
 - Select the COM port that the serial cable was plugged into on the rear of your server (host).
 - Click **OK**.



Figure 67. HyperTerminal Connect To window

4. On the Comx Properties window:
 - Select the following port settings:
 - Bits per second = 38 400
 - Data bits = 8
 - Parity = None
 - Stop Bit = 1
 - Flow control = None
 - Click **OK**.

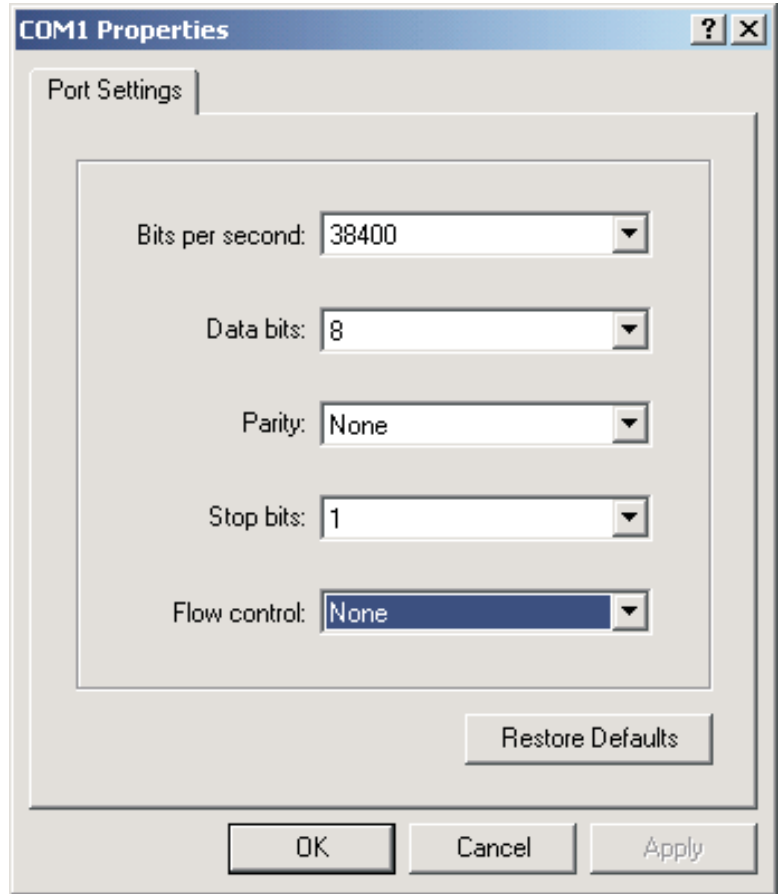


Figure 68. HyperTerminal COMx Properties window

5. Press **Enter**.

If you see the following screen, all went well and you are able to use the Serial Monitor. If you see nothing like this or only scrambled characters, check your connection parameters.

```
TSMON>
```

6. To access the standard user serial menu, type "help".

```
TSMON>help
```

7. Press **Enter**.
8. To access the administrator serial menu:
 - a. Type "lgi" and press **Enter**.

```
TSMON>lgi
```

Note: Both the OCP and RMU must be online (logged out) before the serial port will allow login.

- 1) For the User ID, type "admin" (Administrator) or the new Administrator User ID set for the RMU.

```
TSMON>lgi
User ID:admin
```

- 2) For the password, type "secure" (Administrator) or the new Administrator password set for the RMU.

```
TSMON>lgi
User ID:admin
Password:secure
```

- 3) Press **Enter** to display the full serial menu.
9. After completing all serial communication, logout by completing the following:
 - a. At the TSMON> prompt, type "lgo".

```
TSMON>lgo
```

- b. Press **Enter**.

Configuring a Model L28/L38/L3H Autoloader

To configure a Model L28/L38/L3H Autoloader, complete the following steps using the Configuration Menu via the OCP on the front panel of the Autoloader:

- “Step 1. Go Offline Using the OCP”
- “Step 2. Change SCSI ID”
- “Step 3. Change SCSI Speed” on page 92
- “Step 4. Change the Operating Mode” on page 92
- “Step 5. Configure the RMU” on page 95
- “Step 6. Configure the BCR” on page 96
- “Step 7. Cycle Autoloader Power” on page 96
- “Step 8. Set Protection Mode ON or OFF” on page 97
- “Step 9. Save Vital Product Data (Autoloader with RMU Only)” on page 97
- “Step 10. Update Autoloader Configuration Form” on page 98

Step 1. Go Offline Using the OCP

Follow the procedure in “Going Offline with Password Protection OFF” on page 85 or “Going Offline with Password Protection ON” on page 85 to enable the Offline Menu.

Step 2. Change SCSI ID

The Autoloader’s drive must be assigned a unique SCSI ID in order to be recognized by, and to be able to communicate with, the server (host). Table 9 lists the default SCSI IDs for the Autoloader’s drive.

Table 9. Default SCSI IDs for the Autoloader’s drive

Device	Default ID
SCSI Drive (Model L28/L38/L3H) SCSI ID	2

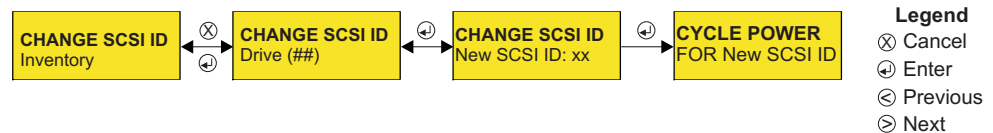


Figure 69. Configuration Menu’s CHANGE SCSI ID command

To access CHANGE SCSI ID using the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu” on page 60).
2. Press **Enter** then **Next** until CHANGE SCSI ID is displayed.
3. Press **Enter** to display the CHANGE SCSI ID Drive [XX] screen.
4. Press **Enter** to display the CHANGE SCSI ID New SCSI ID: screen.
5. Use **Next** and **Previous** to select each digit in the new ID. After selecting each number, press **Enter** on the OCP to initiate the selected number and move to the next digit in the ID.
6. At the CYCLE POWER FOR NEW SCSI ID screen, press **Cancel** two times to return to the CHANGE SCSI ID screen.

Step 3. Change SCSI Speed

Attention: SCSI SPEED is supported by certain host bus adapters. To determine if your adapter supports SCSI SPEED:

- Refer to the documentation for your server (host).
- Visit the web at <http://www.ibm.com/storage/support/lto>.

To change the SCSI speed, see “SCSI SPEED” on page 61.

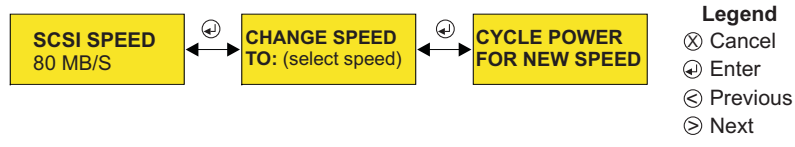


Figure 70. Configuration Menu's SCSI SPEED command

To access SCSI SPEED using the OCP:

1. Press *Next* or *Previous*, as necessary, to display SCSI SPEED.
2. Press *Enter* to display the CHANGE SPEED TO: screen.
3. Use *Next* and *Previous* to select the new SCSI speed:
 - 80 Mb/s
 - AUTO (variable maximum speed)
4. Press *Enter* to initiate the new speed.
5. At the CYCLE POWER FOR NEW xxx screen, press *Cancel* one time to return to the SCSI SPEED screen.

Step 4. Change the Operating Mode

Use the **Configuration Menu** to change the Autoloader's mode of operation via the OCP (see “CHANGE LDR MODE” on page 62).

CHANGE LDR MODE

CHANGE LDR MODE allows the user to change the Autoloader's mode of operation. The Autoloader can operate in the following modes:

- Automatic (default setting): For more information, see “Automatic Mode” on page 93.
- Sequential (can be associated with Loop Mode and Autoload Mode): For more information, see “Sequential Mode” on page 93.
- Random: For more information, see “Random Mode” on page 93.

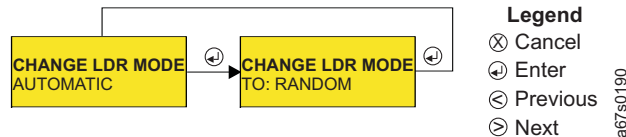


Figure 71. Configuration Menu's CHANGE LDR MODE command

To access CHANGE LDR MODE using the OCP:

1. Press *Next* or *Previous*, as necessary, until CHANGE LDR MODE is displayed.
2. Press *Enter* to display the CHANGE LDR MODE TO: screen.
3. Use *Next* and *Previous* to select the new mode (Automatic, Sequential, or Random).
4. Press *Enter* to initiate the new mode.

Automatic Mode: Automatic mode is the default setting and allows the Autoloader to switch between sequential and random modes depending on the SCSI command received. In automatic mode, sequential mode is activated when the Autoloader is powered on. When the Autoloader receives a MOVE MEDIUM, READ ELEMENT STATUS, or an INITIALIZE ELEMENT STATUS command, sequential mode is disabled and random mode becomes active. The Autoloader will switch back to sequential mode with every OCP initiated LOAD or UNLOAD command.

Sequential Mode: In sequential mode, the Autoloader's firmware predefines the selection of the cartridges. After initialization, the firmware causes the Autoloader to select the first available cartridge found (counting from 1 through 8) for loading into the drive. If AUTOLOAD MODE (see "AUTOLOAD MODE" on page 63) is set to "ON", the first cartridge will load automatically. Otherwise, the OCP's LOAD CARTRIDGE command must be executed. After the server's (host's) application software fills this cartridge with data and issues an UNLOAD command, the Autoloader returns the cartridge to its storage slot and loads the next cartridge in order. Empty storage slots are ignored. The Autoloader continues this process until all cartridges have been filled with data.

Note: While in sequential mode, the Autoloader's robotics are not logically connected to the SCSI bus and do not respond to SCSI commands.

Associated with sequential mode are LOOP MODE and AUTOLOAD MODE. See "LOOP MODE" and "AUTOLOAD MODE" on page 94 for more information.

Random Mode: In random mode, the Autoloader allows the server's (host's) application software to select any data cartridge in any order.

LOOP MODE

LOOP MODE can be used with sequential mode. Sequential mode with LOOP MODE "ON" loads the cartridge in slot 1 after the cartridge in slot 8 has been filled and sent back to its home slot. This allows endless backup operations without user interaction.

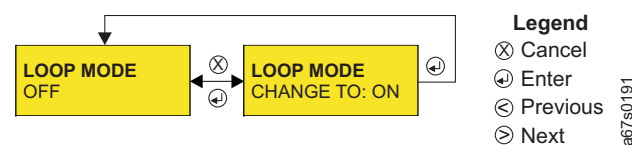


Figure 72. Configuration Menu's LOOP MODE command

To access LOOP MODE using the OCP:

1. Press *Next* or *Previous*, as necessary, until LOOP MODE is displayed.
2. Press *Enter* to display the LOOP MODE CHANGE TO: screen.
3. Use *Next* and *Previous* to select "ON" or "OFF".
4. Press *Enter* to initiate the new mode.

AUTOLOAD MODE

AUTOLOAD MODE can also be used with sequential mode. Sequential mode with AUTOLOAD MODE "ON" loads the first cartridge automatically if the Autoloader powers on with an empty drive.

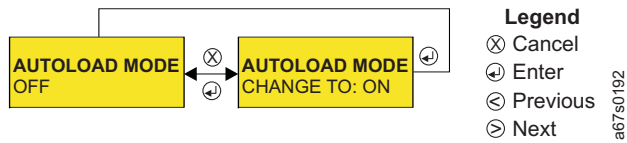


Figure 73. Configuration Menu's AUTOLOAD MODE command

To access AUTOLOAD MODE on the OCP:

1. Press *Next* or *Previous*, as necessary, to display AUTOLOAD MODE.
2. Press *Enter* to display the AUTOLOAD MODE CHANGE TO: screen.
3. Use *Next* and *Previous* to select "ON" or "OFF".
4. Press *Enter* to initiate the new mode.
5. Press *Cancel* two times to return to the Home Screen.

Step 5. Configure the RMU

The RMU requires a network address that consists of an Internet Protocol (IP) address, subnet mask, and a gateway IP address.

Configuring Network Parameters

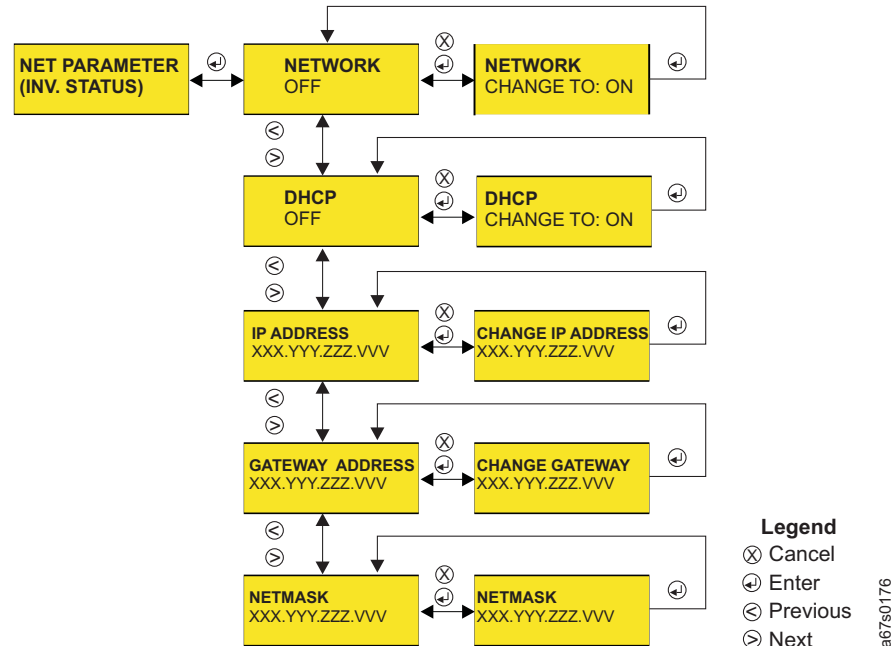


Figure 74. Configuration Menu's NET PARAMETER command

To access NET PARAMETER using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press **Enter** then **Next** or **Previous**, as necessary, until NET PARAMETER is displayed.
 - a. Press **Enter** to display the NETWORK screen. Current status is displayed.
 - b. Press **Enter** to display the NETWORK CHANGE TO: screen
 - c. Use **Next** and **Previous** to select "ON" or "OFF".
 - d. Press **Enter** to initiate the change and return to the NETWORK screen.
3. Press **Next** to display the DHCP screen. Current status is displayed.
 - a. Press **Enter** to display the DHCP CHANGE TO: screen.
 - b. Use **Next** and **Previous** to select "ON" or "OFF".
 - c. Press **Enter** to initiate the change and return to the DHCP screen.
4. Press **Next** to display the IP ADDRESS screen. The current IP Address is displayed.
 - a. Press **Enter** to display the CHANGE IP ADDRESS screen.
 - b. Use **Next** and **Previous** to select each digit in the new address. Press **Enter** to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press **Enter** to return to the IP ADDRESS screen.
5. Press **Next** to display the GATEWAY ADDRESS screen. The current Gateway Address is displayed.

- a. Press *Enter* to display the CHANGE GATEWAY screen.
 - b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the GATEWAY ADDRESS screen.
6. Press *Next* to display the NETMASK screen. The current Netmask address is displayed.
 - a. Press *Enter* to display the CHANGE NETMASK screen.
 - b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the NETMASK screen.
 7. Press *Cancel*:
 - One time, and the message CYCLE POWER FOR NEW NETPARAM is displayed.
 - Two times to return to the NET PARAMETER screen.
 - Three times to return to the **Configuration Menu** screen.
 - Four times to return to the Home Screen.

Step 6. Configure the BCR

The BCR can only sense cartridges if bar code labels are present on the tape cartridges. Please make sure that the appropriate bar code labels are used (see Table 16 on page 160 for ordering information).

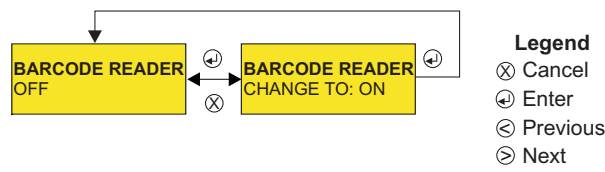


Figure 75. Configuration Menu's BARCODE READER command

To access BARCODE READER using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60).
2. Press *Enter* then *Next* or *Previous*, as necessary, until BARCODE READER is displayed.
 - a. Press *Enter* to display the BARCODE READER CHANGE TO: screen
 - b. Use *Next* and *Previous* to select "ON" or "OFF".
 - c. Press *Enter* to initiate the change. If ON was selected, the barcode reader will inventory all cartridges in the autoloader.
3. Press *Cancel*:
 - One time to return to the **Barcode Reader** screen.
 - Two times to return to the **Configuration Menu** .
 - Three times to return to the **Home** screen.

Step 7. Cycle Autoloader Power

To save all configuration changes made in Steps 1, 2, and 3, cycle power by turning the Autoloader off then on again using the POWER button.

Step 8. Set Protection Mode ON or OFF

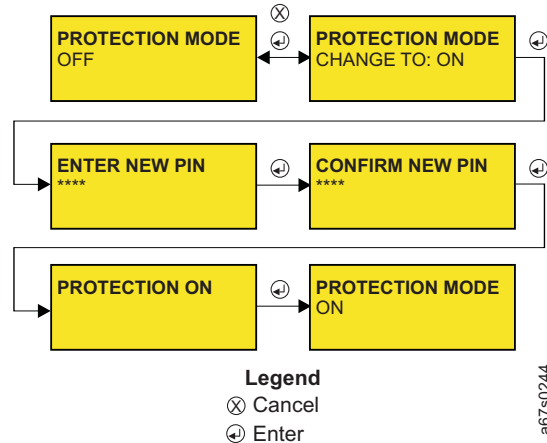


Figure 76. Configuration Menu's PROTECTION MODE command

Turn Protection Mode ON to initiate a password-protected login. Leave Protection Mode OFF (default setting) to allow going offline without a password.

See "PROTECTION MODE" on page 82 for instructions on how to set Protection Mode ON or OFF.

Step 9. Save Vital Product Data (Autoloader with RMU Only)

Selected Vital Product Data (VPD) items are saved on the RMU installed on the rear panel of the Autoloader for possible use in the case where the Autoloader base unit needs to be replaced. Saving VPD in this manner facilitates quick VPD transfer from the original machine to the replacement machine and eliminates having to use the OCP to re-configure the replacement machine.

Model L28/L38/L3H VPD Items Saved on the RMU:

- SCSI ID
- Operating Mode
- SCSI Drive Speed
- BCR Enablement
- Machine Serial Number

To save VPD to the RMU:

1. Login to the RMU at the Administrator level.
2. Select **Reset** in the **Configuration Menu**.
3. Press the **Save Vital Product Data** button.

The selected VPD items are now saved in the save area on the RMU unit installed on the rear panel of the Autoloader.

Notes:

1. Any time one of the selected VPD items are changed, the above procedure should be used to ensure that the "saved" data is always the latest.
2. The "Autoloader Configuration Form" on page 251 should also be updated anytime one of the VPD items is changed.

Step 10. Update Autoloader Configuration Form

If the autoloader should ever need to be replaced, the Vital Product Data (VPD) will need to be transferred from the old autoloader to the new autoloader. If the old autoloader has the optional RMU feature installed, this VPD information can be transferred from the RMU. (See “Restore VPD Configuration from the RMU” on page 206.)

For autoloaders without the optional RMU feature, or if the RMU has failed, the VPD information can be retrieved from the “Autoloader Configuration Form” on page 251.

1. Update the “Autoloader Configuration Form” on page 251 with the following configuration items:
 - SCSI ID
 - Operating Mode
 - SCSI Drive Speed
 - Machine Serial Number
 - RMU configuration items (if installed)
 - IP Address
 - Network Mask Address
 - Gateway Address
 - Administrator Passwords
2. To complete configuration, continue at “Completing Configuration of Autoloader” on page 107.

Configuring a Model F28/F38/F3H Autoloader

To configure a Model F28/F38/F3H Autoloader, complete the following steps using the Configuration Menu via the OCP on the front panel of the Autoloader:

- “Step 1. Go Offline Using the OCP”
- “Step 2. Change Loop ID”
- “Step 3. Select Fibre Channel Port” on page 100
- “Step 4. Enter WW Node Name” on page 100
- “Step 5. Change Fibre Channel Speed” on page 100
- “Step 6. Change the Operating Mode” on page 101
- “Step 7. Configure the RMU” on page 103
- “Step 8. Configure the BCR” on page 104
- “Step 9. Cycle Autoloader Power” on page 104
- “Step 10. Set Protection Mode ON or OFF” on page 105
- “Step 11. Save Vital Product Data (Autoloader with RMU Only)” on page 105
- “Step 12. Update Autoloader Configuration Form” on page 106

Cycle power to initiate configuration changes.

Step 1. Go Offline Using the OCP

Follow the procedure in “Going Offline with Password Protection OFF” on page 85 or “Going Offline with Password Protection ON” on page 85 to enable the Offline Menu.

Step 2. Change Loop ID

The Autoloader’s drive must be assigned a unique Loop ID in order to be recognized by, and to be able to communicate with, the server (host). Table 10 lists the default Loop IDs for the Autoloader’s drive.

Table 10. Default Loop IDs for the Autoloader’s drive

Device	Default ID
Fibre Drive (Model F28/F38/F3H) Loop ID	005

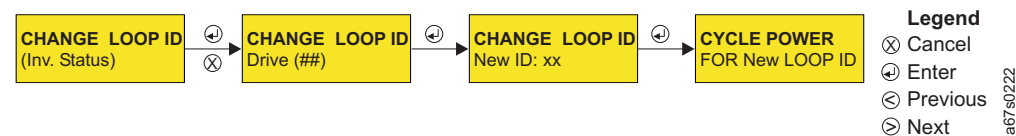


Figure 77. Configuration Menu’s CHANGE LOOP ID command

To access CHANGE LOOP ID using the OCP:

1. Navigate to the **Configuration Menu** (see “Configuration Menu” on page 76).
2. Press **Enter** then **Next** to access CHANGE LOOP ID.
3. Press **Enter** to display the CHANGE LOOP ID Drive (XXX) screen.
4. Press **Enter** to display the CHANGE LOOP ID New ID: screen.
5. Use **Next** and **Previous** to select each digit in the new ID. After selecting each number, press **Enter** to initiate the selected number and move to the next digit in the ID.

- After all digits have been selected and initiated, press *Cancel* two times to return to CHANGE LOOP ID.

Step 3. Select Fibre Channel Port

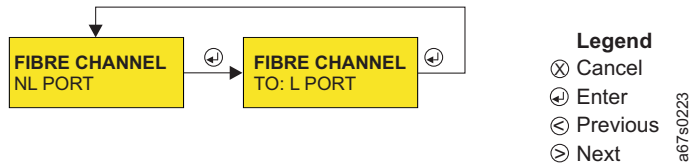


Figure 78. Configuration Menu's FIBRE CHANNEL command

To access FIBRE CHANNEL using the OCP:

- Press *Next* or *Previous*, as necessary, to access FIBRE CHANNEL.
- Press *Enter* to display the FIBRE CHANNEL TO: screen.
- Use *Next* and *Previous* to select the new port (LN PORT [default], NL PORT, L PORT, N PORT). For more information on the port selections, see "Fibre Channel Supported Topologies" on page 13.
- Press *Enter* to initiate the change and return to the FIBRE CHANNEL screen.

Step 4. Enter WW Node Name

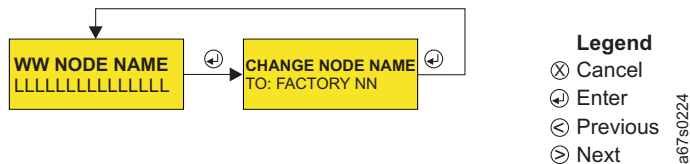


Figure 79. Configuration Menu's WW NODE NAME command

To access WW NODE NAME using the OCP:

- Press *Next* or *Previous*, as necessary, to access WW NODE NAME.
- Press *Enter* to display the CHANGE NODE NAME TO: screen.
- Press *Enter* to display the current Node Name.
- Use *Next* and *Previous* to select each digit in the new name. Press *Enter* after each digit is selected to initialize the digit and move to the next digit to be changed.
- When prompted to cycle power, press *Cancel* to return to the WW NODE NAME screen.

Step 5. Change Fibre Channel Speed

Attention: FIBRE SPEED is supported by certain host bus adapters. To determine if your adapter supports FIBRE SPEED:

- Refer to the documentation for your server (host).
- Visit the web at <http://www.ibm.com/storage/support/ito>.

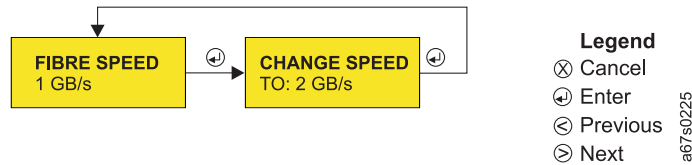


Figure 80. Configuration Menu's FIBRE SPEED command

To access FC SPEED using the OCP:

1. Press *Next* or *Previous*, as necessary, to access FC SPEED.
2. Press *Enter* to display the CHANGE SPEED TO: screen.
3. Use *Next* and *Previous* to select the new speed:
 - 1 Gb/s
 - 2 Gb/s
 - AUTO (variable speed; maximum speed allowed at the time)
4. Press *Enter* to initiate the change.
5. When prompted to cycle power, press *Cancel* to return to the FC Speed screen.

Step 6. Change the Operating Mode

CHANGE LDR MODE

CHANGE LDR MODE allows the user to change the Autoloader's mode of operation. The Autoloader can operate in the following modes:

- Automatic (default setting): For more information, see "Automatic Mode."
- Sequential (can be associated with Loop Mode and Autoload Mode): For more information, see "Sequential Mode" on page 102.
- Random: For more information, see "Random Mode" on page 102.

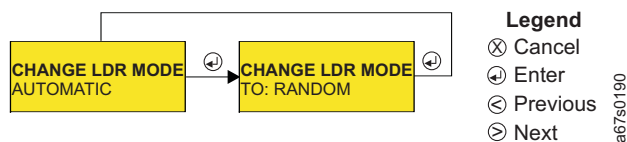


Figure 81. Configuration Menu's CHANGE LDR MODE command

To access CHANGE LDR MODE:

1. Press *Next* or *Previous*, as necessary, until CHANGE LDR MODE is displayed.
2. Press *Enter* to display the CHANGE LDR MODE TO: screen.
3. Use *Next* and *Previous* to select the new mode (Automatic, Sequential, or Random).
4. Press *Enter* to initiate the new mode.

Automatic Mode: Automatic mode is the default setting and allows the Autoloader to switch between sequential and random modes depending on the SCSI command received. In automatic mode, sequential mode is activated when the Autoloader is powered on. When the Autoloader receives a MOVE MEDIUM, READ ELEMENT STATUS, or an INITIALIZE ELEMENT STATUS command, sequential mode is disabled and random mode becomes active. The Autoloader will switch back to sequential mode with every OCP initiated LOAD or UNLOAD command.

Sequential Mode: In sequential mode, the Autoloader's firmware predefines the selection of the cartridges. After initialization, the firmware causes the Autoloader to select the first available cartridge found (counting from 1 through 8) for loading into the drive. If AUTOLOAD MODE (see "Automatic Mode" on page 79) is set to "ON", the first cartridge will load automatically. Otherwise, the OCP's LOAD CARTRIDGE command must be executed. After the server's (host's) application software fills this cartridge with data and issues an UNLOAD command, the Autoloader returns the cartridge to its storage slot and loads the next cartridge in order. Empty storage slots are ignored. The Autoloader continues this process until all cartridges have been filled with data.

Note: While in sequential mode, the Autoloader's robotics are not logically connected to the SCSI bus and do not respond to SCSI commands.

Associated with sequential mode are LOOP MODE and AUTOLOAD MODE. See "LOOP MODE" and "AUTOLOAD MODE" for more information.

Random Mode: In random mode, the Autoloader allows the server's (host's) application software to select any data cartridge in any order.

LOOP MODE

LOOP MODE can be used with sequential mode. Sequential mode with LOOP MODE "ON" loads the cartridge in slot 1 after the cartridge in slot 8 has been filled and sent back to its home slot. This allows endless backup operations without user interaction.

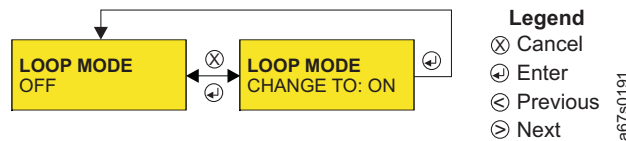


Figure 82. Configuration Menu's LOOP MODE command

To access LOOP MODE:

1. Press *Next* or *Previous*, as necessary, to access LOOP MODE.
2. Press *Enter* to display the LOOP MODE CHANGE TO: screen.
3. Use *Next* and *Previous* to select "ON" or "OFF".
4. Press *Enter* to initiate the new mode.

AUTOLOAD MODE

AUTOLOAD MODE can be used with sequential mode. Sequential Mode with AUTOLOAD MODE "ON" loads the first cartridge automatically if the Autoloader powers on with an empty drive.

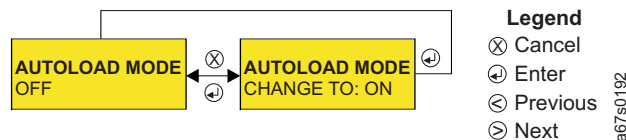


Figure 83. Configuration Menu's AUTOLOAD MODE command

To access AUTOLOAD MODE:

1. Press *Next* or *Previous*, as necessary, to access AUTOLOAD MODE.
2. Press *Enter* to display the AUTOLOAD MODE CHANGE TO: screen.
3. Use *Next* and *Previous* to select "ON" or "OFF".
4. Press *Enter* to initiate the new mode.

Step 7. Configure the RMU

The RMU requires a network address that consists of an Internet Protocol (IP) address, subnet mask, and a gateway IP address.

Configuring Network Parameters using the OCP

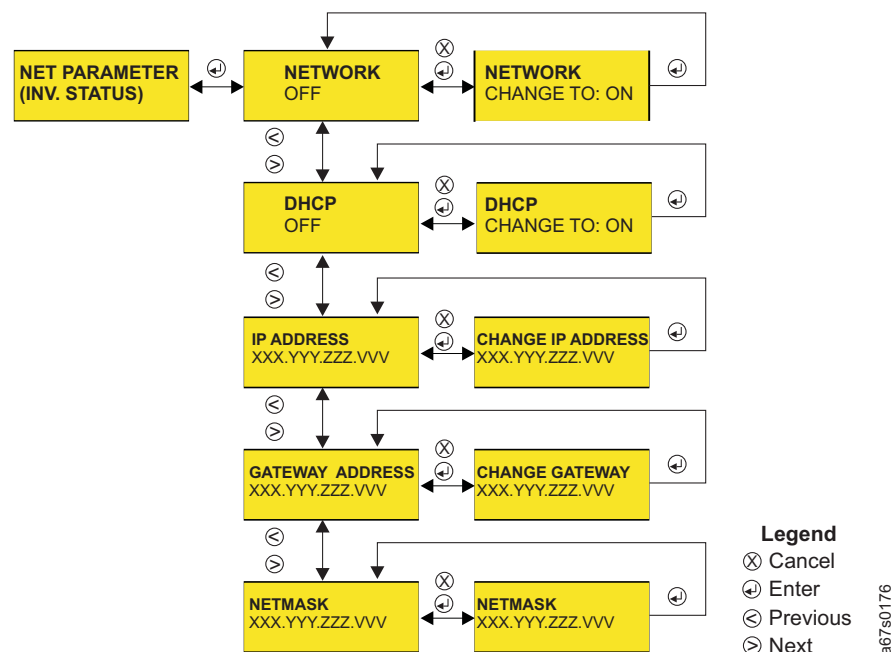


Figure 84. Configuration Menu's NET PARAMETER command

To access NET PARAMETER using the OCP:

1. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 76).
2. Press *Enter* then *Next* or *Previous*, as necessary, until NET PARAMETER is displayed.
 - a. Press *Enter* to display the NETWORK screen. Current status is displayed.
 - b. Press *Enter* to display the NETWORK CHANGE TO: screen
 - c. Use *Next* and *Previous* to select "ON" or "OFF".
 - d. Press *Enter* to initiate the change and return to the NETWORK screen.
3. Press *Next* to display the DHCP screen. Current status is displayed.
 - a. Press *Enter* to display the DHCP CHANGE TO: screen.
 - b. Use *Next* and *Previous* to select "ON" or "OFF".
 - c. Press *Enter* to initiate the change and return to the DHCP screen.
4. Press *Next* to display the IP ADDRESS screen. The current IP Address is displayed.
 - a. Press *Enter* to display the CHANGE IP ADDRESS screen.

- b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the IP ADDRESS screen.
5. Press *Next* to display the GATEWAY ADDRESS screen. The current Gateway Address is displayed.
 - a. Press *Enter* to display the CHANGE GATEWAY screen.
 - b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the GATEWAY ADDRESS screen.
6. Press *Next* to display the NETMASK screen. The current Netmask address is displayed.
 - a. Press *Enter* to display the CHANGE NETMASK screen.
 - b. Use *Next* and *Previous* to select each digit in the new address. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - c. After all digits have been changed and initiated, press *Enter* to return to the NETMASK screen.
7. Press *Cancel* to return to the NET PARAMETER screen.

Step 8. Configure the BCR

The BCR can sense cartridges only if bar code labels are present on the tape cartridges. Please make sure that the appropriate bar code labels are used (see Table 16 on page 160 for ordering information).

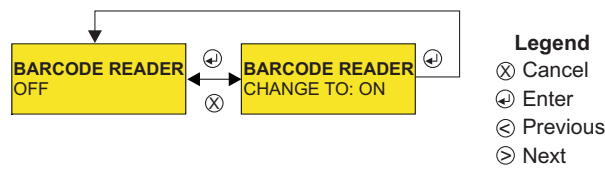


Figure 85. Configuration Menu's BARCODE READER command

To access BARCODE READER using the OCP:

1. Press *Next* to access BARCODE READER.
 - a. Press *Enter* to display the BARCODE READER CHANGE TO: screen
 - b. Use *Next* and *Previous* to select "ON" or "OFF".
 - c. Press *Enter* to initiate the change. If ON was selected, the Barcode Reader will inventory all the cartridges in the autoloader.
2. Press *Cancel*:
 - One time to return to the BARCODE READER screen.
 - Two times to return to the Configuration Menu.
 - Three times to return to the Home screen.

Step 9. Cycle Autoloader Power

To save all configuration changes made in Steps 1 through 5, cycle power by turning the Autoloader off then on again using the POWER button.

Note: Verify that all values are correct using the OCP. If all values are not correct, cycle power again.

Step 10. Set Protection Mode ON or OFF

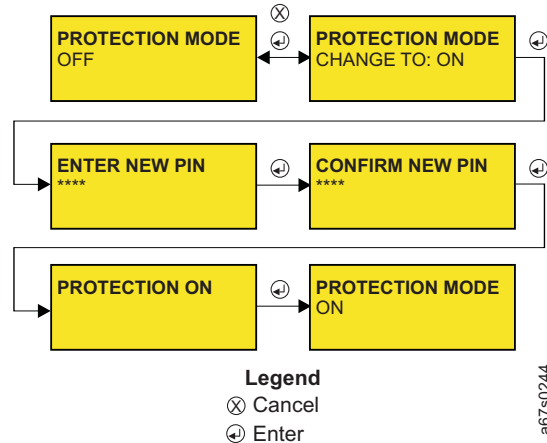


Figure 86. Configuration Menu's PROTECTION MODE command

Turn Protection Mode ON to initiate a password-protected login. Leave Protection Mode OFF (default setting) to allow going offline without a password.

See "PROTECTION MODE" on page 82 for instructions on how to set Protection Mode ON or OFF.

Step 11. Save Vital Product Data (Autoloader with RMU Only)

Selected Vital Product Data (VPD) items are saved on the RMU installed on the rear panel of the Autoloader for possible use in the case where the Autoloader base unit needs to be replaced. Saving VPD in this manner facilitates quick VPD transfer from the original machine to the replacement machine and eliminates having to use the OCP to re-configure the replacement machine.

Model F28/F38/F3H VPD Items Saved on the RMU:

- Loop ID
- Fibre Channel (Loop) Port Type
- WW Node Name
- Fibre Channel Drive Speed
- Operating Mode
- BCR Enablement
- Machine Serial Number

To save VPD to the RMU:

1. Login to the RMU at the Administrator level.
2. Select **Reset** in the **Configuration Menu**.
3. Press the **Save Vital Product Data** button.

The selected VPD items are now saved in the save area on the RMU unit installed on the rear panel of the Autoloader.

Notes:

1. Any time one of the selected VPD items are changed, the above procedure should be used to ensure that the "saved" data is always the latest.

2. The "Autoloader Configuration Form" on page 251 should also be updated any time one of the VPD items is changed.

Step 12. Update Autoloader Configuration Form

If the autoloader should ever need to be replaced, the Vital Product Data (VPD) will have to be transferred from the old autoloader to the new autoloader. If the old autoloader has the optional RMU feature installed, the VPD information can be transferred from the RMU. (See "Restore VPD Configuration from the RMU" on page 206.)

For autoloaders without the optional RMU feature, or if the RMU has failed, the VPD information can be retrieved from the "Autoloader Configuration Form" on page 251.

1. Update the "Autoloader Configuration Form" on page 251 with the following configuration items:
 - Drive Loop ID
 - Fibre Channel (Loop) Port Type
 - World Wide Node Name
 - Fibre Channel Drive Speed
 - Operating Mode
 - Machine Serial Number
 - RMU configuration items (if necessary)
 - IP Address
 - Network Mask Address
 - Gateway Address
 - Administrator Passwords
2. To complete configuration, continue at "Completing Configuration of Autoloader" on page 107.

Completing Configuration of Autoloader

Use the following steps to complete the configuration of the autoloader:

- “Step 1. Import Cartridges”
- “Step 2. Configure RMU User Accounts” on page 108
- “Step 3. Install Device Drivers” on page 110
- “Step 4. Configure the Autoloader to the Server (Host)” on page 110
- “Step 5. Update Firmware” on page 111
- “Step 6. Register for My Support” on page 121

Step 1. Import Cartridges

You can import cartridges with the Bulk Exchange command or the Import command.

If you have installed a BCR in your Autoloader, ensure that appropriate bar code labels have been applied to all cartridges (see “Bar Code Label” on page 145). To import cartridges into the Autoloader using the OCP:

BULK EXCHANGE

BULK EXCHANGE enables the user to import or export all cartridges. Operation begins with Slot 1. If a cartridge is available, it will be exported. It is up to the user to import a new cartridge or to move to Slot 2. The same procedure repeats for the remainder of the eight slots.



Figure 87. Commands Menu BULK EXCHANGE command

To access BULK EXCHANGE using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press **Enter** to access BULK EXCHANGE.
3. Press **Enter** to initiate the importing and/or exporting of cartridges.
4. When the I/O Door opens, remove the ejected cartridge or proceed to the next step.
5. Do one of the following:
 - Insert another cartridge gently pushing the cartridge through the I/O Door until the cartridge can be pushed no farther.
 - Press **Enter** to export the next cartridge.
 - OR -
 - Press **Cancel** to terminate BULK EXCHANGE.
6. When all cartridges have been imported and/or exported, the Autoloader will return to the Home Screen.

IMPORT

The IMPORT command allows the user to insert and choose a destination slot for a cartridge in the Autoloader.

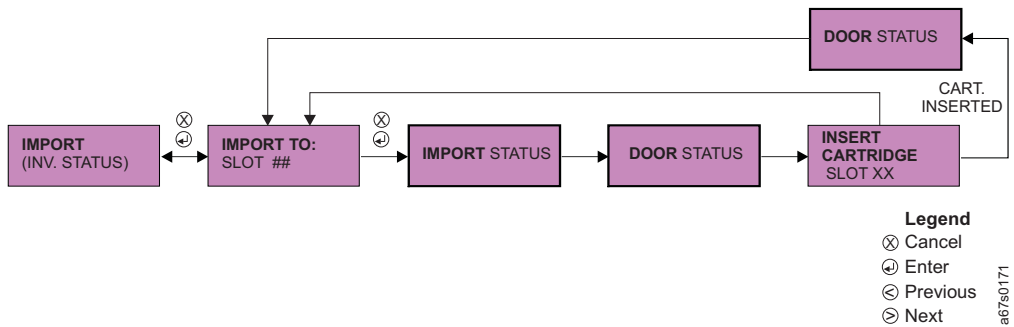


Figure 88. Commands Menu IMPORT command

To access IMPORT using the OCP:

1. Navigate to the **Commands Menu** (see “Commands Menu” on page 55).
2. Press *Enter* then *Next* or *Previous*, as necessary, to access IMPORT.
3. Press *Enter* to display the IMPORT TO: screen.
4. Use the *Next* and *Previous* to select the number of the slot to which the cartridge is to be imported. (Only those slots that are empty will be available for selection.)
5. Press *Enter* to initiate the procedure.
6. When the I/O Door opens, insert a cartridge. The Autoloader will import the cartridge, close the I/O Door, and insert the cartridge into the selected slot.
7. Repeat Steps 4 through 6 until all cartridges have been imported.
8. When the last cartridge has been inserted into its slot, press *Cancel* to return to the IMPORT screen.
9. Press *Cancel* to prompt the BCR (if installed) to re-inventory all cartridges and return to the Home Screen.

Step 2. Configure RMU User Accounts

Starting the RMU

Attention: Before using the RMU, make certain it has been configured with the correct network address.

To start the RMU:

1. Open a Web browser.
2. Enter the RMU IP address in your browser (for example, 182.073.056.205).

Logging in the First Time

An initial login is required before user accounts can be configured for your Autoloader. To login to the RMU before user accounts have been configured, complete the following:

1. Select “Administrator”.
2. Type in the password, “secure”.
3. Click **LOGIN**.

Configuring User Accounts

To personalize access levels and associated passwords for user access, click on **User** under the **Configuration Menu** and complete the following steps:

The screenshot shows the IBM TotalStorage Ultrium Tape 2U Autoloader 3581 web interface. The main content area is titled "User Configuration" and contains the following fields:

- Access Level:** A dropdown menu with "2" selected.
- Access Level Name:** A text input field containing "Admin".
- Password:** A text input field with a masked password.
- Repeat Password:** A text input field with a masked password.
- OCP Access Pin Enabled:** A checkbox that is currently unchecked.
- OCP Access Pin Code:** A text input field with a masked 4-digit pin code.
- Repeat OCP Access Pin Code:** A text input field with a masked 4-digit pin code.
- Support Name:** A text input field.
- Support Phone:** A text input field.
- Support Email:** A text input field.

At the bottom of the form is a "Submit" button. To the right of the form is a "Quick Status" panel with the following information:

Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:23:02
Drive Error Code	0

On the far right edge of the screenshot, the text "a67s0255" is visible vertically.

Figure 89. RMU displaying the Configuration Menu's User screen

1. **Access Level:** Select the access level to be changed:
 - 1 - Standard
 - 2 - Administrator
 - 3 - Service
2. **Access Level Name:** Enter the name to be associated with the access level.
3. **Password:** Enter the password (a maximum of 15 characters) to be associated with the access level.
4. **Repeat Password:** Repeat the password entered in the previous item.
5. **OCP Access Pin Enabled:** Check this box to enable password-protected OCP login.
6. **OCP Access Pin Code:** Enter a 4 digit pin code for OCP access (not available with all models). If a password has already been keyed into the OCP, it will show up here.
7. **Repeat OCP Access Pin Code:** Repeat the pin code entered in the previous item (not available with all models).
8. **Support Name:** Enter the name of the person to provide support for the access level. This information will appear on the Support page.
9. **Support Phone:** Enter the phone number of the support person for the access level. This information will appear on the Support page.
10. **Support Email:** Enter the email address of the support person for the access level. This information will appear on the Support page.

After all entries have been made, click **SUBMIT** to initiate the configuration changes. Repeat the steps to set up or change other access levels.

Step 3. Install Device Drivers

A device driver kit included in your ship group contains a CD with device drivers and documentation for installing these drivers. You can use this CD to install the device drivers for the Autoloader or download the drivers from the Web.

IBM maintains the latest levels of device drivers and driver documentation for the Autoloader on the Internet. You can access this material from your browser or the IBM FTP site.

Using a browser, type one of the following:

<http://www.ibm.com/storage/support/lto>

<ftp://ftp.software.ibm.com/storage/devdvr>

<ftp://index.storsys.ibm.com/358x>

Note: If you do not have Internet access and you need information about device drivers, contact your place of purchase.

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

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

Device drivers for each supported server (host) are found in /storage/devdvr/ in the following directories:

- AIX/
- HPUX/
- Linux/
- Solaris/
- Windows/Win2000/
- Windows/Win2003/

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

Step 4. Configure the Autoloader to the Server (Host)

Depending on the type of drive in your Autoloader, install a SCSI or Fibre Channel host bus adapter, and software on your server (host). To determine the latest supported attachments and host software versions and releases, visit the web at **<http://www.ibm.com/storage/support/lto>**. For additional information, refer to the documentation for your server (host) and application software.

Step 5. Update Firmware

Attention: Download the latest levels of Autoloader and drive firmware by visiting:

- <http://www.ibm.com/storage/support/lto>
- <ftp://index.storsys.ibm.com/358x>

After downloading the latest firmware from the web, Autoloader and tape drive firmware can be updated using the following methods:

- +“Via Serial Port”
- “Via SCSI / Fibre” on page 118
- “Via RMU” on page 118

Table 11. Firmware upload times via different methods

Method	Type of Firmware	Update Time	
		Autoloader	Tape Drive
Serial Port	Autoloader and Drive	6 min.	13 min.
RMU	Autoloader and Drive	45 sec. (preferred method)	6 min.
SCSI (using NTUTIL or TAPEUTIL)	Autoloader and Drive	20 min.	1 min.
SCSI (using LTO-TDX)	Drive Only	N/A	1 min.

Note: Updating firmware via FMR tape is for development and manufacturing use only. FMR tapes will not be shipped to the field to update drive firmware.

My Support

Note: 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, see “Step 6. Register for My Support” on page 121.

Via Serial Port

Attention: Download the latest levels of Autoloader and drive firmware by visiting:

- <http://www.ibm.com/storage/support/lto>
- <ftp://index.storsys.ibm.com/358x>

For information on serial port communications, see “Using Serial Port Communications” on page 259.

Attention: A user can communicate with the Autoloader via the OCP, the RMU, or the serial port. The Autoloader will accept commands from only one communication method at a time. If communicating via the OCP, return to the Home Screen before attempting to communicate via another method (RMU or serial port). If communicating via the RMU, log out before attempting to communicate via another method (OCP or serial port). If communicating via the serial port, exit the connection before attempting to communicate via another method (OCP or RMU).

| To upgrade Autoloader and drive firmware via serial port, follow these
| instructions:

Installing the Serial Cable: To install the serial cable, follow these instructions:

1. Power off the Autoloader.
2. Connect the serial cable to the Autoloader serial port (at rear connector plate).
3. Power on the Autoloader.

Using HyperTerminal:

1. Start the terminal emulation software (such as, HyperTerminal).

On your Windows desktop, click **Select**—>**Programs**—>**Accessories**
—>**Communications** —>**HyperTerminal**.

Note: Other applications similar to HyperTerminal exist. If you are using an application other than HyperTerminal, please refer to that application's documentation for instructions.

2. On the Connection Description window:
 - Type in "3581".
 - Click OK.

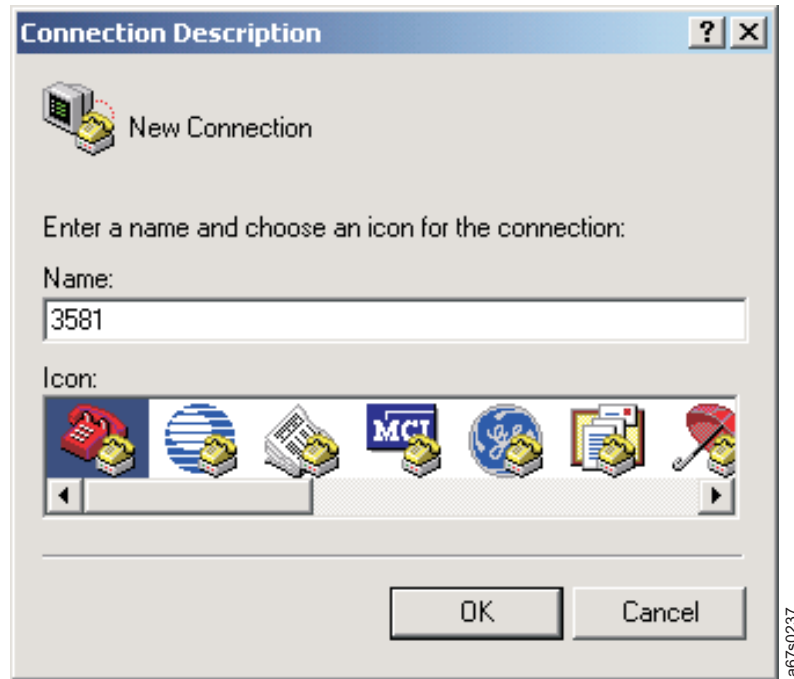


Figure 90. HyperTerminal Connection Description window

3. On the Connect To window:
 - Select the COM port that the serial cable was plugged into on the rear of your server (host).
 - Click **OK**.



Figure 91. HyperTerminal Connect To window

4. On the Comx Properties window:
 - Select the following port settings:
 - Bits per second = 38 400
 - Data bits = 8
 - Parity = None
 - Stop Bit = 1
 - Flow control = None
 - Click **OK**.

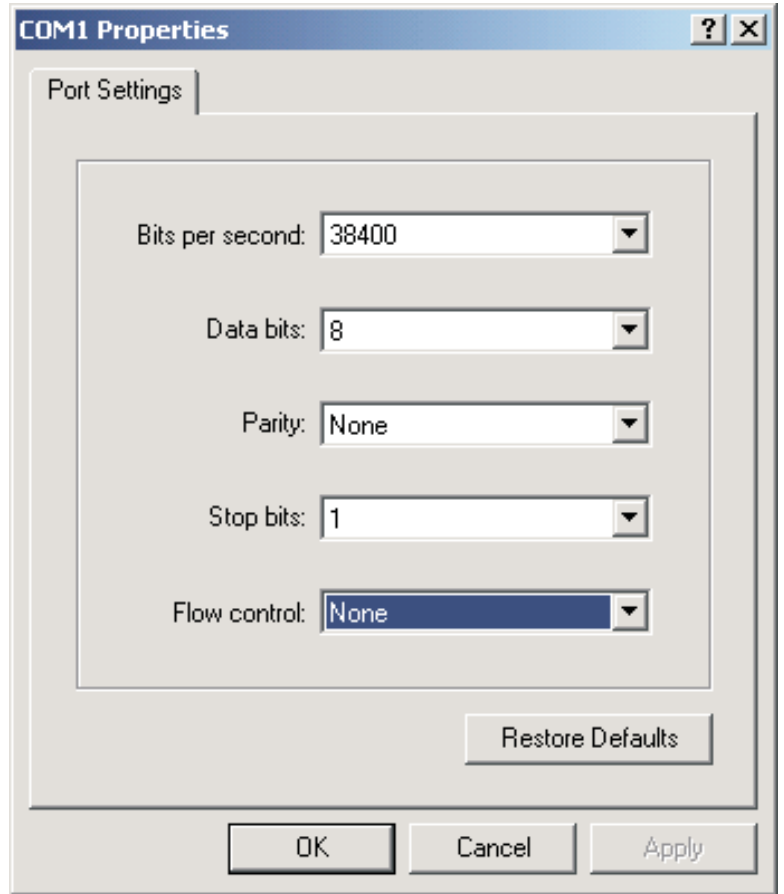


Figure 92. HyperTerminal COMx Properties window

5. Press **Enter**.

If you see the following screen, all went well and you are able to use the Serial Monitor. If you see nothing like this or only scrambled characters, check your connection parameters.

```
TSMON>
```

6. To access the standard user serial menu, type "help".

```
TSMON>help
```

7. To access the administrator serial menu:

- a. Type "lgi" and press **Enter**.

```
TSMON>lgi
```

Note: Both the OCP and RMU must be online (logged out) before the serial port will allow login.

- 1) For the User ID, type "admin" (Administrator) or the new Administrator User ID set for the RMU.

```
TSMON>lgi  
User ID:admin
```

- 2) For the password, type "secure" (Administrator) or the new Administrator password set for the RMU.

```
TSMON>lgi  
User ID:admin  
Password:secure
```

- 3) Press **Enter**.

8. To identify which firmware (Autoloader or drive) you wish to upgrade, enter one of the following after the TSMON> prompt:

- "lfw" to upgrade library firmware.
- "dfw" to upgrade drive firmware.

```
TSMON>lfw
```

9. Press **Enter**. You should see the following screen.

```
TSMON>lfw  
Please start data upload  
using XMODEM protocol!
```

Note: If the Autoloader has timed out, press **Enter** for a fresh screen and start this procedure over.

10. In the 3581-HyperTerminal window's toolbar, select **Transfer** then **Send File...**

11. On the Send File window:

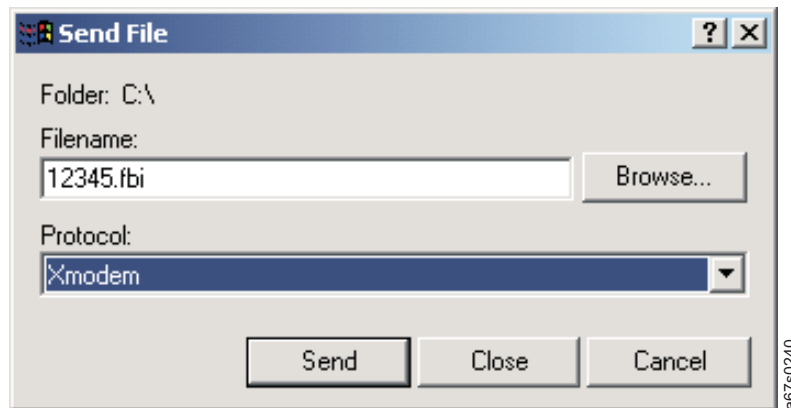


Figure 93. Send File window

- Browse to downloaded Autoloader or drive firmware file on server (host).
 - Autoloader firmware has a **.fbi** file extension.
 - Drive firmware has a **.ro** file extension.
 - Select XMODEM.
 - Click **Send**. If successful:
 - The **Xmodem file send for 3581** screen will show activity.
 - The OCP will display FW UPGRADE.
 - The OCP's green Activity LED will be flashing.
12. At the end of the firmware upgrade, the Autoloader will reboot.
13. When the following screen displays, verify the firmware revision uploaded is the correct version.

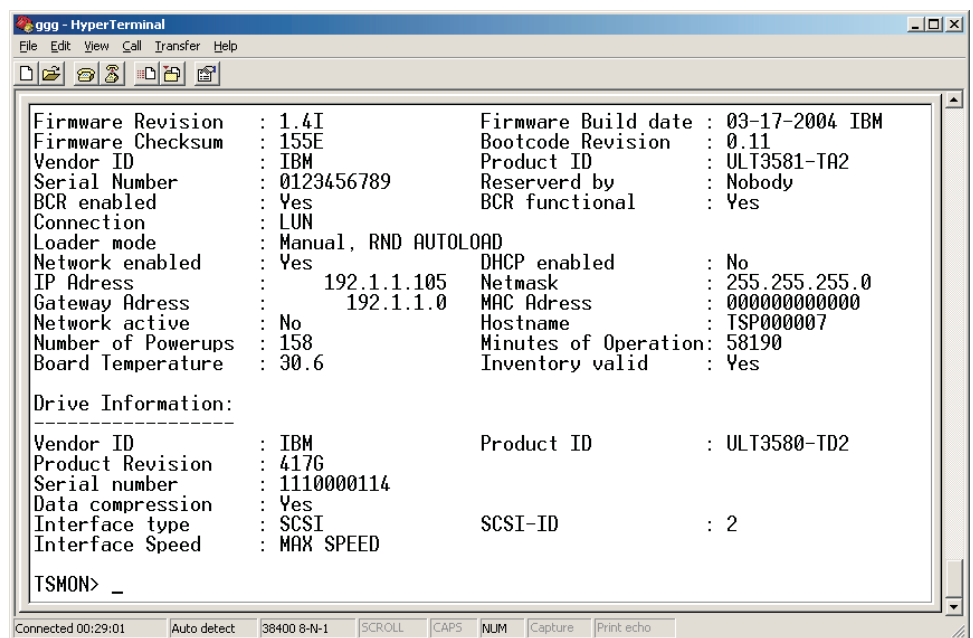


Figure 94. Verification screen

Via RMU

Attention

Download the latest levels of Autoloader and drive firmware by visiting:

- <http://www.ibm.com/storage/support/lto>
- <ftp://index.storsys.ibm.com/358x>

For information on RMU installation and configuration, see “Step 4. Install the Optional Remote Management Unit (RMU)” on page 22. For information on using the RMU, see “Remote Management Unit (RMU)” on page 123.

Attention

A user can communicate with the Autoloader via the OCP, the RMU, or the serial port. The Autoloader will accept commands from only one communication method at a time. If communicating via the OCP, return to the Home Screen before attempting to communicate via another method (RMU or serial port). If communicating via the RMU, log out before attempting to communicate via another method (OCP or serial port). If communicating via the serial port, exit the connection before attempting to communicate via another method (OCP or RMU).

To upgrade Autoloader and drive firmware via the RMU, follow these instructions:

1. Click on **Support** in the left frame of the RMU.
2. Click on the link to download the latest Autoloader and drive firmware onto your server (host).
3. Refer to “Firmware (Models L28/L38/L3H and F28/F38/F3H)” on page 139 for instructions.

Via SCSI / Fibre

ITDT SCSI Firmware Update, Dump Retrieval, and Library/Drive Test Tool:

Attention

At the time of publication, the ITDT tool was not available. Register with MySupport (<http://www.ibm.com/support/mySupport>) to be notified by email when the tool becomes available, or periodically check the IBM support site (<http://www.ibm.com/storage/lto>).

The ITDT tool offers multiple functional capabilities that simplify the task of updating tape and library firmware. It is available for most major platforms (Windows, AIX, Sun, Linux, Netware, and so on), and requires no special device drivers. This tool is similar to the LTO-TDX *drive-only* firmware update and dump retrieval tool described later in this chapter.

Note: The ITDT tool is available on the IBM website

<http://www.ibm.com/storage/support/lto>. In addition to the executable file (.exe), a README file will be posted on the web page. The README file

describes the features and capabilities of the ITDT tool, provides downloading instructions, and gives detailed information on how to use the tool.

You use the ITDT tool to perform the following tasks:

- Update firmware using SCSI to all IBM LTO Tape Drive and Tape Library products (non-IBM devices may not be selected).
- Upload drive and library dump files
- Perform drive and library diagnostics, including drive read/write diagnostics

The ITDT tool is a command line utility. To invoke it, enter the executable *itdt* from the directory where the tool is located. The Help feature gives a brief explanation of each function and shows the required syntax.

LTO-TDX: LTO SCSI and Fibre Drive Firmware Download & LTO Drive Dump Upload Tool: The tool, LTO-TDX, is an alternative method for downloading LTO drive firmware across the SCSI bus or fibre channel. In addition, this tool can be used to upload LTO drive error dumps. The following information describes how to obtain the tool and lists its capabilities.

1. The tool supports all IBM LTO 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 firmware logs from the drive to a computer system
3. The tool is distributed from the IBM web site. Download the tool by visiting <http://www.ibm.com/storage/support/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, a license agreement will be presented. This license agreement must be accepted 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 starting 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. The user 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 must 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 shall 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 Log Dump Function:

1. When the dump function is executed on a drive, the tool shall 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.

NTUTIL or TAPEUTIL for Updating Autoloader and Drive Firmware:

Autoloader and drive firmware can be updated over your server's (host's) SCSI bus by using the device drivers and utilities that are supplied by IBM. Before updating library or drive firmware, you must:

1. Download the latest version of Autoloader and drive firmware. To obtain the new firmware, download it from the web to the server by visiting:
 - <http://www.ibm.com/storage/support/lto>
 - <ftp://index.storsys.ibm.com/358x>
2. Install the latest version IBM device drivers.
3. Install the proper IBM utility (NTUTIL or TAPEUTIL)

For instructions about installing and using the appropriate IBM device drivers and utilities (such as NTUTIL or TAPEUTIL), refer to the *The IBM LTO Ultrium Tape Libraries Guide* by visiting <http://w3.itso.ibm.com/>. To obtain instructions about using NTUTIL or TAPEUTIL, visit <http://www.ibm.com/storage/support/lto/>.

Step 6. 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 **Personalized support**, click on **My support**.
3. Under **We use IBM Registration**, click on **Register**.
4. Fill in the information required for registration. Items with an asterisk (*) are required fields.
5. Login. Enter your **User ID** and **Password** and click **Go** to access My Support.
6. 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 Autoloaders**.
 - 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.

Remote Management Unit (RMU)

The Remote Management Unit (RMU) provides remote access to the Autoloader over a network via a web browser. All available functions are accessible without the need of a dedicated server or separate software.

Access Protocol

All three Autoloader communication methods (OCP, RMU, and serial) can simultaneously be active on the lowest level (Information only).

- RMU: Standard user
- OCP: Online (logout)
- Serial: lgo (logout)

However, only one of the three methods can be active at any one time on the Administrator or Service levels (RMU and serial) or at the Offline level (OCP). The other two can remain active on the lowest level. If an attempt to login is made on either of the other two while the third has the highest level access, an "Already Reserved" message is displayed. The RMU will only allow access by a Standard user at the login panel.

For best results:

- If communicating via the OCP, return to the Home Screen (Go Online) before attempting to communicate via the RMU or serial port.
- If communicating via the RMU, log out before attempting to communicate via the OCP or serial port.
- If communicating via the serial port, log out before attempting to communicate via the OCP or RMU

Attention: If at any time the RMU interface is not responding properly, click on your Browser's **Back** button or close out the browser session and try reconnecting using the RMU IP address. If still unsuccessful, cycle Autoloader power and login to the RMU again.

Login

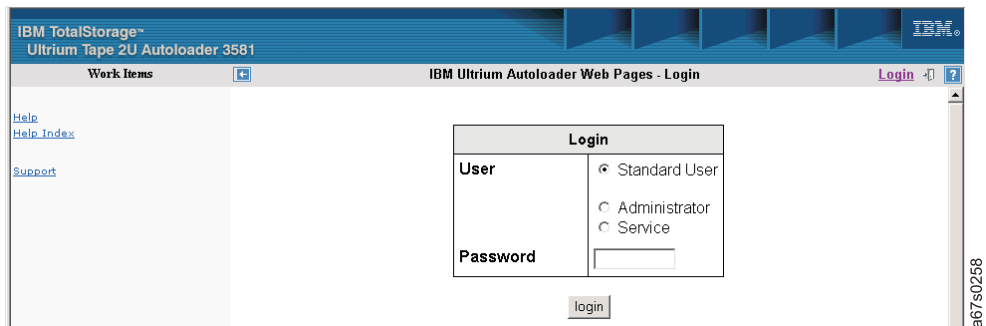


Figure 95. RMU login page

Anyone trying to access the RMU is asked to log in. There are three access levels for logging in:

- Standard User (Level 1)
- Administrator (Level 2)
- Service (Level 3)

These names can be changed by clicking **User** under **Configuration** in the **Work Items** list. See “User (Models L28/L38/L3H and F28/F38/F3H)” on page 133 for more information.

After a successful login the user will be able to view screens available to that user’s level of access. The Standard User can access the:

- Information Menu
- Status Menu

An Administrator can access the:

- Information Menu
- Status Menu
- Configuration Menu
- Maintenance Menu (exception: Advanced Diagnostics)
- Log Menu

Service can access the:

- Information Menu
- Status Menu
- Configuration Menu
- Maintenance Menu
- Log Menu

To login to the RMU:

1. Select the **User** type.
2. Enter your password.
3. Click **login**. The **Autoloader Information** table in the **Information** menu will be displayed.

Help

Clicking on the "?" in the upper right corner above the **Quick Status** table displays helpful information on the active RMU window.

Quick Status

The **Quick Status** table is located on the right side of each RMU screen after login. It displays the current status of the Autoloader. The following entries appear in the table:

- **Name:** Displays the name of the Autoloader.
- **Status:** Indicates by icon (see "Status Icons") the overall status of the Autoloader.
- **Lock:** Displays a lock when the Administrator is in the process of making configuration changes.
- **Cartridge in drive:** Displays the slot number of the tape currently mounted in the tape drive.
- **Drive Status:** Indicates by icon the overall status of the tape drive.
- **Drive Activity:** Indicates the current activity of the tape drive.
- **Robotic Action:** Indicates the current activity of the Autoloader's robotics.
- **Time:** Indicates the total amount of time the Autoloader has been in operation.
- **Drive Error Code:** Displays the code of the last error that occurred. Clicking on this code will take the user to a description of the code.

Status Icons

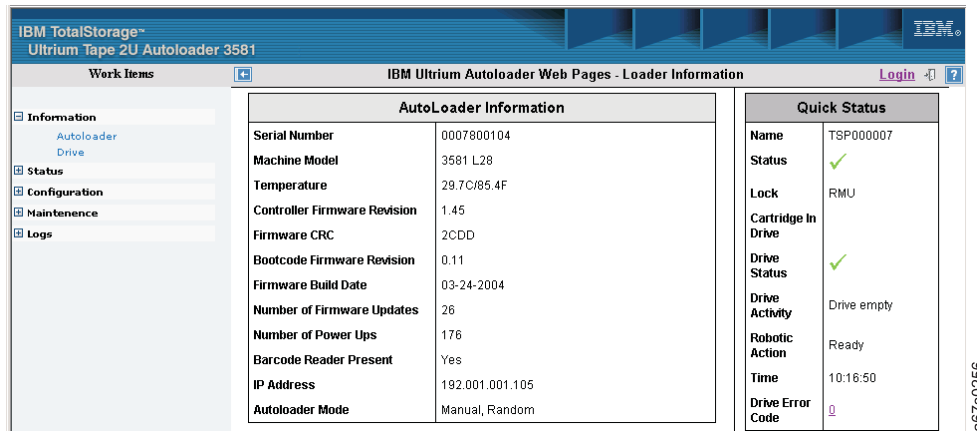
Status icons that appear in the RMU interface are as follows:

- The green icon means "OK" and indicates that the Autoloader is fully operational and no user intervention is required.
- The yellow icon means "Warning" and indicates that user intervention is necessary but that the Autoloader is still capable of performing operations.
- The red icon means "Error" and indicates that user intervention is required and that the Autoloader is not capable of performing operations.

Information Menu

The **Information Menu** displays information on the Autoloader and the tape drive. This menu is accessible by all user levels. No changes can be made to these menu items. To expand the menu, click on the "+".

Autoloader (Models L28/L38/L3H and F28/F38/F3H)



The screenshot shows the IBM TotalStorage Ultrium Tape 2U Autoloader 3581 web interface. The main content area is titled "Autoloader Information" and contains a table with the following data:

Autoloader Information	
Serial Number	0007800104
Machine Model	3581 L28
Temperature	29.7C/85.4F
Controller Firmware Revision	1.45
Firmware CRC	2CDD
Bootcode Firmware Revision	0.11
Firmware Build Date	03-24-2004
Number of Firmware Updates	26
Number of Power Ups	176
Barcode Reader Present	Yes
IP Address	192.001.001.105
Autoloader Mode	Manual, Random

To the right of the main table is a "Quick Status" section with the following data:

Quick Status	
Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:16:50
Drive Error Code	0

The interface also includes a left-hand navigation menu with options like Information, Status, Configuration, Maintenance, and Logs. The top of the page shows the browser title "IBM Ultrium Autoloader Web Pages - Loader Information" and a "Login" button.

Figure 96. RMU Information Menu's Autoloader page

This menu item displays the **Autoloader Information** table which includes the following entries:

- **Serial Number:** Displays the Autoloader's serial number.
- **Machine Model:** Displays the type of machine (3581) and mode (L28/L38/L3H or F28/F38/F3H).
- **Temperature:** Displays the Autoloader's current temperature.
- **Controller Firmware Revision:** Displays the revision level of the current firmware.
- **Firmware CRC:** Displays the firmware's CRC.
- **Bootcode Firmware Revision:** Displays the revision level of the current Bootcode Firmware.
- **Firmware Build Date:** Displays the build date of the current firmware.
- **Number of Firmware Updates:** Displays the number of times the firmware has been updated.
- **Number of Power Ups:** Displays the number of times the Autoloader has been powered on.
- **Barcode Reader present:** Displays "Yes" if the BCR has been enabled; "No" if it has not been enabled.
- **IP Address:** Displays the Autoloader's IP Address.
- **Autoloader Mode:** Displays the current operating mode.

Drive (Models L28/L38/L3H and F28/F38/F3H)

The screenshot shows the IBM TotalStorage Ultrium Tape 2U Autoloader 3581 web interface. The main content area is titled "IBM Ultrium Autoloader Web pages - Device Information". On the left, there is a "Work Items" menu with options: Information (Autoloader, Drive), Status, Configuration, Maintenance, and Logs. The "Drive Information" table is displayed with the following data:

Drive Information	
Vendor ID	IBM
Product ID	ULT3580-TD2
Serial Number	1110000114
Product Revision	417G
Firmware Revision	
SCSI ID	2
Temperature	0.0C
Cooling	0

To the right of the table is a "Quick Status" panel with the following information:

Quick Status	
Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:18:57
Drive Error Code	0

The IBM logo is visible in the top right corner of the interface. A vertical text "a67s0257" is located on the right side of the screenshot.

Figure 97. RMU Information Menu's Drive page

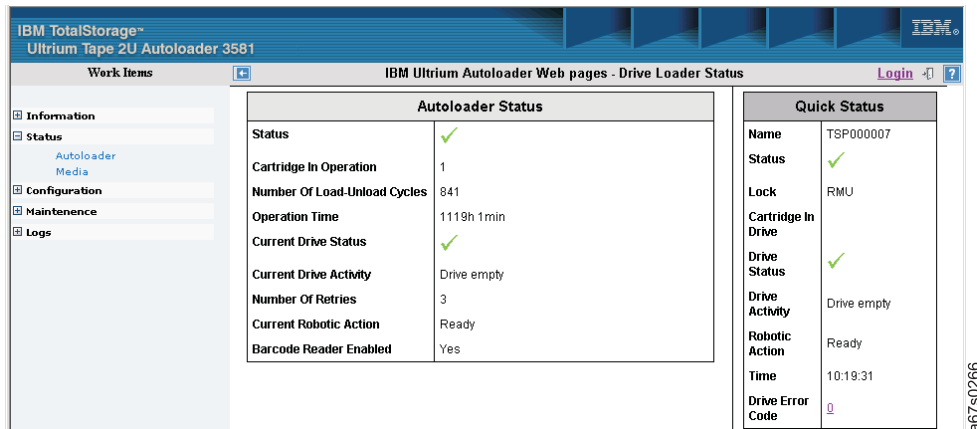
This menu item displays the **Drive Information** table with the following entries:

- **Vendor ID:** Displays the tape drive's vendor.
- **Product ID:** Displays the tape drive's product ID.
- **Serial Number:** Displays the tape drive's serial number.
- **Product Revision:** Displays the drive's product revision number.
- **Firmware Revision:** Displays the revision level of the current firmware.
- **SCSI ID:** Displays the drive's SCSI ID.
- **Temperature:** Displays the drive's temperature.
- **Cooling:** Displays the RPMs of the drive's cooling fan.

Status Menu

The **Status Menu** displays current status information on the Autoloader and its Media (tape cartridges). To expand the menu, click on the "+".

Autoloader (Models L28/L38/L3H and F28/F38/F3H)



The screenshot shows the IBM TotalStorage Ultrium Tape 2U Autoloader 3581 web interface. The main content area is titled "IBM Ultrium Autoloader Web pages - Drive Loader Status". It features a navigation menu on the left with options like Information, Status, Configuration, Maintenance, and Logs. The main content is divided into two tables: "Autoloader Status" and "Quick Status".

Autoloader Status	
Status	✓
Cartridge In Operation	1
Number Of Load-Unload Cycles	841
Operation Time	1119h 1min
Current Drive Status	✓
Current Drive Activity	Drive empty
Number Of Retries	3
Current Robotic Action	Ready
Barcode Reader Enabled	Yes

Quick Status	
Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:19:31
Drive Error Code	0

Figure 98. RMU Status Menu's Autoloader page

This menu item displays the **Autoloader Status** table which lists the following entries:

- **Status:** Indicates by icon (see "Status Icons" on page 125) the current status of the Autoloader.
- **Cartridge in Operation:** Displays the number of the cartridge currently in operation.
- **Number of Load-Unload Cycles:** Displays the number of times the tape drive has loaded and unloaded a cartridge.
- **Operation Time:** Displays the time accrued since the first start-up.
- **Current Drive Status:** Displays the current status of the tape drive.
- **Current Drive Activity:** Displays the current activity of the tape drive.
- **Number of Retries:** Displays in a percentage format the number of retries.
- **Current Robotic Action:** Displays the current action of the Autoloader's robotics.
- **Barcode Reader Enabled:** Displays "Yes" if the BCR is enabled; "No" if the BCR is not enabled.

Media (Models L28/L38/L3H and F28/F38/F3H)

Slot Nr	Status	In Drive	Barcode	Write Protected
1			E1S155L1	
2			ANC109L1	
3				
4			U14502L1	
5			L00006L1	
6			E1S144L1	
7			LB0060L2	
8			E2S197L2	

Cartridge:
 = Normal = Cleaning = Bad = In Access

Quick Status	
Name	TSP000007
Status	
Lock	RMU
Cartridge In Drive	
Drive Status	
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:20:32
Drive Error Code	0

Figure 99. RMU Status Menu's Media page

This menu item displays the **Media Status** table which lists the following:

- **Slot Nr:** Identifies by number all eight cartridge slots.
- **Status:** Indicates which slots contain cartridges and what kind of cartridge (Normal Tape, Cleaning Tape, Bad Tape, or Moving Tape).
- **In Drive:** Indicates if a cartridge is currently in the tape drive.
- **Barcode:** Displays the number on the cartridge's bar code label (if a BCR is installed).
- **Write Protected:** Indicates if a cartridge is write protected.

The cartridge status icons are as follows:

- Black cartridge = Normal
- Blue cartridge = Cleaning
- Red cartridge = Bad
- Green cartridge = In Access (in drive)

Configuration Menu

The **Configuration Menu** allows an Administrator to enter or change configuration values for the Autoloader (Device), Network, User, RTC (Real Time Clock), Event Notification, and Reset. To expand the menu, click on the "+".

Device (Model L28/L38/L3H)

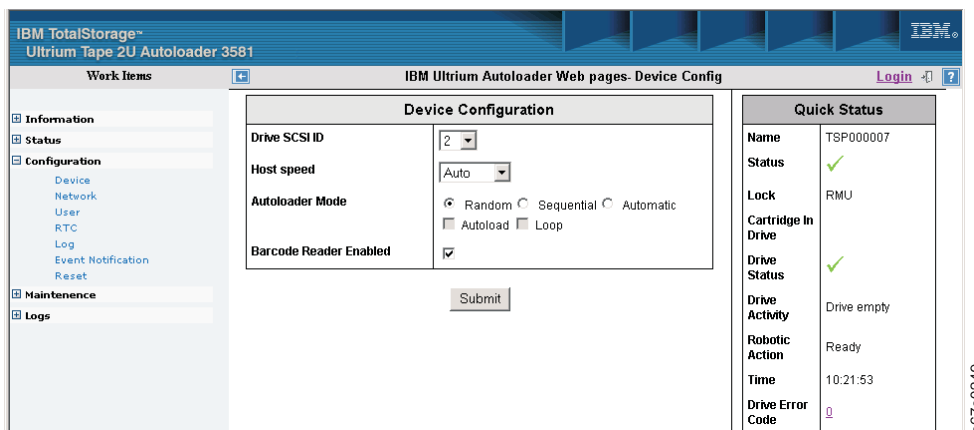


Figure 100. RMU Configuration Menu's Device page for Model L28/L38/L3H

This menu item displays the **Device Configuration** table for a Model L28/L38/L3H (SCSI) Autoloader which contains the following:

- **Drive SCSI ID:** To change the drive SCSI ID select a number from "0" to "15" from the drop-down menu.
- **Host speed:** To change the host speed, select one of the following:
 - 80 MB/s
 - AUTO (variable maximum speed)
- **Autoloader Mode:** To change the Autoloader's operation mode, select from the following:
 - Random
 - Sequential
 - Autoload
 - Loop
 - Automatic

Note: For information on operating modes, see "CHANGE LDR MODE" on page 62.

- **Barcode Reader Enabled:** Selected if BCR is enabled.

After making your selections, click **SUBMIT** to initiate the changes.

Device (Model F28/F38/F3H)

The screenshot shows the 'Device Configuration' page for an IBM Ultrium Autoloader. The page is titled 'IBM TotalStorage Ultrium Tape 2U Autoloader 3581' and 'IBM Ultrium Autoloader Web pages- Device Config'. The navigation menu on the left includes Information, Status, Configuration (with sub-items: Device, Network, User, RTC, Log, Event Notification, Reset), Maintenance, and Logs. The main configuration area contains the following fields:

Device Configuration	
Factory Default WWNN	<input type="checkbox"/> On
WorldWide Node Name	5005076300210164
Loop ID	5
Port Type	LN Port
Port Speed	Auto
Autoloader Mode	<input type="radio"/> Random <input type="radio"/> Sequential <input checked="" type="radio"/> Automatic <input type="checkbox"/> Autoload <input type="checkbox"/> Loop
Barcode Reader Enabled	<input checked="" type="checkbox"/>

At the bottom of the configuration area is a 'Submit' button. To the right is a 'Quick Status' table:

Quick Status	
Name	TSP000015
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	19:21:24
Drive Error Code	0

A vertical text 'a67s0270' is visible on the right side of the screenshot.

Figure 101. RMU Configuration Menu's Device page for Model F28/F38/F3H

This menu item displays the **Device Configuration** table for a Model F28/F38/F3H (Fibre Channel) Autoloader which contains the following:

- **Factory Default WWNN:** To restore the World Wide Node Name set at the factory, turn this option "On" by clicking the box. The default value is off.
- **World Wide Node Name:** To change the WWNN, enter the new number here.
- **Loop ID:** To change the Loop ID, select a number between "0" and "127" in the drop-down menu. Loop ID's between 0 and 125 are hard addresses. Loop ID's of 126 or 127 allow the Autoloader to dynamically arbitrate the AL_PA (soft addressing).
- **Port Type:** To change the Port Type, select one of the following:
 - LN Port (default setting)
 - L Port
 - N Port
 - NL Port
- **Port Speed:** To change the Port Speed, select one of the following:
 - 1 Gb/s
 - 2 Gb/s
 - AUTO (variable maximum speed; default setting)
- **Autoloader Mode:** To change the operating mode, select from the following:
 - Random
 - Sequential
 - Autoload
 - Loop
 - Automatic (default setting)

Note: For more information on operating modes, see "CHANGE LDR MODE" on page 78.

- **Barcode Reader Enabled:** Selected if the BCR is enabled.

After making your selections, click **SUBMIT** to initiate the changes.

Network (Models L28/L38/L3H and F28/F38/F3H)

Network Configuration	
DHCP Address	<input type="checkbox"/> On
Hostname	<input type="text" value="TSP000007"/>
IP Address	<input type="text" value="192.001.001.105"/>
Network Mask	<input type="text" value="255.255.255.0"/>
Gateway Address	<input type="text" value="192.1.1.0"/>

Quick Status	
Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:22:24
Drive Error Code	0

Figure 102. RMU Configuration Menu's Network page

This menu item displays the **Network Configuration** table which contains the following:

- **DHCP Address:** Select "On" if the Autoloader should get its IP Address from a DHCP server.
- **Hostname:** Enter a hostname.
- **IP Address:** Enter an IP Address.
- **Network Mask:** Enter a Network Mask.
- **Gateway Address:** Enter a Gateway Address.

After all entries have been made, click **SUBMIT** to initiate the configuration changes. A pop-up box will appear asking, "Are you sure?" Click **OK** to initiate the changes or **CANCEL** to return to the **Device Configuration** table.

User (Models L28/L38/L3H and F28/F38/F3H)

To personalize access levels and associated passwords for user access, click on **User** under the **Configuration Menu** and complete the following steps:

The screenshot displays the 'User Configuration' web page. On the left is a navigation menu with categories: Information, Status, Configuration (Device, Network, User, RTC, Log, Event Notification, Reset), Maintenance, and Logs. The main area contains the 'User Configuration' form with the following fields: 'Access Level' (dropdown menu showing '2'), 'Access Level Name' (text box with 'Admin'), 'Password' (masked text box), 'Repeat Password' (masked text box), 'OCP Access Pin Enabled' (checkbox), 'OCP Access Pin Code' (masked text box), 'Repeat OCP Access Pin Code' (masked text box), 'Support Name' (text box), 'Support Phone' (text box), and 'Support Email' (text box). A 'Submit' button is located below the form. To the right is a 'Quick Status' panel with the following data: Name: TSP000007, Status: ✓, Lock: RMU, Cartridge In Drive: ✓, Drive Status: ✓, Drive Activity: Drive empty, Robotic Action: Ready, Time: 10:23:02, Drive Error Code: 0. A vertical text 'a67s0255' is visible on the far right edge of the screenshot.

Figure 103. RMU displaying the Configuration Menu's User screen

1. **Access Level:** Select the access level to be changed.
 - 1 - Standard
 - 2 - Administrator
 - 3 - Service
2. **Access Level Name:** Enter the name to be associated with the access level.
3. **Password:** Enter the password (a maximum of 15 characters) to be associated with the access level.
4. **Repeat Password:** Repeat the password entered in the previous item.
5. **OCP Access Pin Enabled:** Check this box to enable password-protected OCP login.
6. **OCP Access Pin Code:** Enter a 4 digit pin code for OCP access. If a password has already been keyed into the OCP, it will show up here.
7. **Repeat OCP Access Pin Code:** Repeat the pin code entered in the previous item.
8. **Support Name:** Enter the name of the person to provide support for the access level. This information will appear on the Support page.
9. **Support Phone:** Enter the phone number of the support person for the access level. This information will appear on the Support page.
10. **Support Email:** Enter the email address of the support person for the access level. This information will appear on the Support page.

After all entries have been made, click **SUBMIT** to initiate the configuration changes. Repeat the steps to set up or change other access levels.

RTC (Models L28/L38/L3H and F28/F38/F3H)

The screenshot shows the 'IBM Ultrium Autoloader Web Pages - RTC Config' page. The 'Clock Configuration' section has the following fields:

Time	10 : 23 : 32	am/pm 24h
Date (DD-MM-YYYY)	25 - 03 - 2004	

A 'Submit' button is located below the form. The 'Quick Status' panel on the right displays the following information:

Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:23:32
Drive Error Code	0

Figure 104. RMU Configuration Menu's RTC page

This menu item (Real Time Clock) displays the **Clock Configuration** table which contains the following:

- **Time:** Enter the current time and select between a 12 hour or 24 hour display.
- **Date:** Enter the date (DD-MM-YYYY).

After all entries have been made, click **SUBMIT** to initiate the configuration changes.

Log (Models L28/L38/L3H and F28/F38/F3H)

The screenshot shows the 'IBM Ultrium Autoloader Web Pages - Log Config' page. The 'Log Configuration' section has the following options:

Error Log Mode: Off Continuous Stop trace at first error

Log recovered errors

Trace Level:

<input checked="" type="checkbox"/> Cmd	<input checked="" type="checkbox"/> Response	<input checked="" type="checkbox"/> Event
<input checked="" type="checkbox"/> Trace Data	<input checked="" type="checkbox"/> Low Level Trace	<input checked="" type="checkbox"/> Recovered Error
<input checked="" type="checkbox"/> Hard Error		

Trace Filter:

<input checked="" type="checkbox"/> Main	<input checked="" type="checkbox"/> Drive	<input checked="" type="checkbox"/> CDB Interpreter
<input checked="" type="checkbox"/> Robotic	<input checked="" type="checkbox"/> Trace	<input checked="" type="checkbox"/> OCP Input
<input checked="" type="checkbox"/> OCP Output	<input checked="" type="checkbox"/> SCSI Module	<input checked="" type="checkbox"/> SDCI Module

A 'Submit' button is located below the form. The 'Quick Status' panel on the right displays the following information:

Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:24:01
Drive Error Code	0

Figure 105. RMU Configuration Menu's Log page

This menu item displays the **Log Configuration** table which contains the following:

- **Error Log Mode:** Select the desired event mode and select if recovered errors should be logged.
- **Trace Level:** Select all desired event levels you want logged.
- **Trace Filter:** Select all items you want to appear when entries are logged.

Attention: These filters apply during logging of the entries in the database. **THEY ARE NOT RETRIEVE FILTERS.** When filtering out events, no events will be stored in the log database and, therefore, will not be retrievable.

After all entries have been made, click **SUBMIT** to initiate the configuration changes.

Event Notification (Models L28/L38/L3H and F28/F38/F3H)

Event Notification Configuration	
Notify Errors	<input type="checkbox"/> On
Notify Warnings	<input type="checkbox"/> On
To Email Address	<input type="text"/>
Email Domain	<input type="text"/>
Smtip Server Address	<input type="text"/>
<input type="button" value="Submit"/>	

Quick Status	
Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:24:30
Drive Error Code	?

Figure 106. RMU Configuration Menu's Event Notification page

This menu item displays the **Event Notification Configuration** table which contains the following:

- **Notify Errors:** Select whether the notification of errors should be emailed or not.
- **Notify Warnings:** Select whether the notification of warnings should be emailed or not.
- **To Email Address:** Enter the email address of the person to be notified in the event of an error or warning.
- **Email Domain:** Enter the email domain to appear as the sender on the notification.
- **SMTP Server Address:** Enter the IP Address of the SMTP server used to send the email.

Note: The complete email address of the sender is built from the Loader Name and Email Domain, for example: TS000007@ibm.com.

After all entries have been made, click **SUBMIT** to initiate the configuration changes.

Reset (Models L28/L38/L3H and F28/F38/F3H)

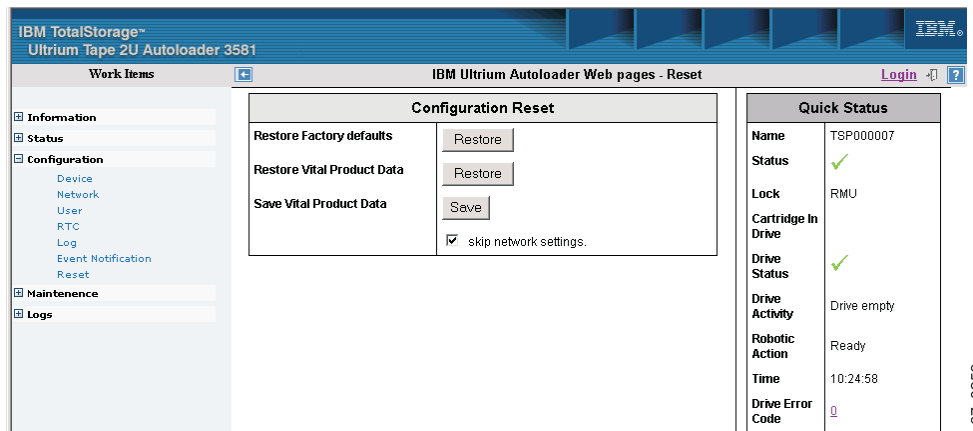


Figure 107. RMU Configuration Menu's Reset page

This menu item displays the **Configuration Reset** table which contains the following:

- **Restore Factory defaults:** Click **RESTORE** to restore all factory default setting. A pop-up box will appear asking, "Are you sure?" Click **OK** to restore all factory default settings or **CANCEL** to return to the **Configuration Reset** table.
- **Restore Vital Product Data:** Click **RESTORE** to load saved vital product data (SCSI or Loop ID, etc.). A pop-up box will appear asking, "Are you sure?" Click **OK** to restore vital product data or **CANCEL** to return to the **Configuration Reset** table.
- **Save Vital Product Data:** Click **SAVE** to save the current Autoloader configuration. The "skip network settings" box is selected and notifies the Autoloader to skip the network settings (IP, Gateway, and Netmask addresses) when resetting or downloading the configuration. To change and save new network settings (if an RMU is installed), deselect this box, change the settings, and save the configuration to the server (host). A pop-up box will appear asking, "Are you sure?" Click **OK** to save the changes or **CANCEL** to return to the **Configuration Reset** table.

After restoring or saving settings, do one of the following:

- Cycle power via the **POWER** button on the Autoloader.
- Click **RESET** under the **Maintenance** in the RMU interface.

Attention: It is recommended to always leave the "skip network settings" box checked (On) if the IP, Mask and Gateway addresses are to remain constant for the same Autoloader. Anytime an Autoloader needs to be replaced, the original network settings must first be installed manually using the OCP in order for the RMU to connect to a browser. At that point, after connection is made, the remaining "saved" VPD values can be restored via the RMU.

Verify via the OCP that all configuration values are correct. If not, cycle power again.

Maintenance Menu

The **Maintenance Menu** allows the Administrator to access Operations, General Diagnostic, Firmware, and Reset functions. The Advanced Diagnostic functions can be accessed by Authorized IBM Service Personnel only. To expand the menu, click on the "+".

Operations (Models L28/L38/L3H and F28/F38/F3H)

The screenshot displays the IBM TotalStorage Ultrium Tape 2U Autoloader 3581 Operations page. The page is divided into several sections:

- Navigation Menu:** Information, Status, Configuration, Maintenance (Operations, General Diagnostic, Advanced Diagnostic, Firmware, Reset), and Logs.
- Operations Section:** A dropdown menu set to 'Reinitialize library controller' and radio buttons for Slot 1 through Slot 8. An 'Execute' button is located below the radio buttons.
- Media Status Table:**

Slot Nr	Status	In Drive	Barcode	Write Protected
1			E18155L1	
2			ANC109L1	
3				
4			U14502L1	
5			L00006L1	
6			E18144L1	
7			LB0060L2	
8			E28197L2	
- Quick Status Panel:** Name: TSP000007, Status: , Lock: RMU, Cartridge In Drive: , Drive Status: , Drive Activity: Drive empty, Robotic Action: Ready, Time: 10:26:31, Drive Error Code:

Cartridge: = Normal = Cleaning = Bad = In Access

Figure 108. RMU Maintenance Menu's Operations page

This menu item displays the **Operations** table and the **Media Status** table.

The **Operations** table contains the following:

- In the left column, select one of the following maintenance operation:
 - Reinitialize library controller
 - Perform inventory scan
 - Load cartridge into drive
 - Unload cartridge from drive
 - Import to slot
 - Export from slot
 - Perform clean process
 - Perform drive upgrade
 - Bulk Exchange
- In the right column, select the slot to use for the operation. Only the slots that are valid for the chosen operation can be selected.
- Click **EXECUTE** to begin the diagnostic.

For more information on the **Media Status** table, see "Media (Models L28/L38/L3H and F28/F38/F3H)" on page 129.

General Diagnostic (Models L28/L38/L3H and F28/F38/F3H)

IBM TotalStorage™
Ultrium Tape 2U Autoloader 3581

Work Items IBM Ultrium Autoloader Web pages - General Diagnostic Login ?

General Diagnostic

Library Verify Test

Nr Cycles:

Execute Stop

Media Status

Slot Nr	Status	In Drive	Barcode	Write Protected
1			E1S155L1	
2			ANC109L1	
3				
4			U14502L1	
5			L00006L1	
6			E1S144L1	
7			LB0060L2	
8			E2S197L2	

Cartridge:
 = Normal = Cleaning = Bad = In Access

Quick Status

Name: TSP000007
 Status:
 Lock: RMU
 Cartridge In Drive:
 Drive Status:
 Drive Activity: Drive empty
 Robotic Action: Ready
 Time: 10:31:30
 Drive Error Code: [a](#)

a6750263

Figure 109. RMU Maintenance Menu's General Diagnostic page

This menu item displays the **General Diagnostic** table and the **Media Status** table.

The **General Diagnostic** table contains the following:

- Select one of the following diagnostic operations from the drop-down box:
 - Library Verify Test
 - System Test
- Enter the number of cycles to run the operation.

Click **EXECUTE** to begin the diagnostic. Click **STOP** to terminate the diagnostic.

For more information on the **Media Status** table, see “Media (Models L28/L38/L3H and F28/F38/F3H)” on page 129.

Advanced Diagnostic (Models L28/L38/L3H and F28/F38/F3H)

This menu item is available only to Authorized IBM Service Personnel.

Firmware (Models L28/L38/L3H and F28/F38/F3H)

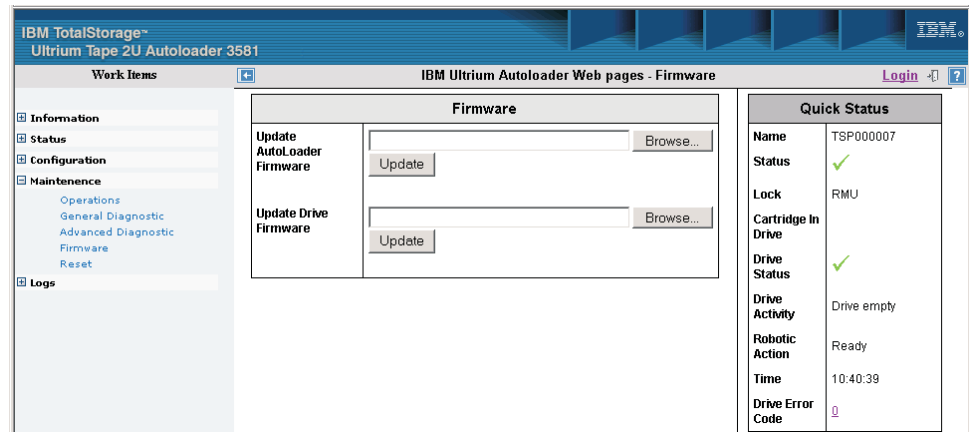


Figure 110. RMU Maintenance Menu's Firmware page

This menu item displays the **Firmware** table which contains the following:

- **Update Autoloader Firmware:** Enter the filename or browse to the file on your server (host) and click **UPDATE** to load the new firmware onto the Autoloader.
- **Update Drive Firmware:** Enter the filename or browse to the file on your server (host) and click **UPDATE** to load the new firmware onto the Autoloader's drive.

A pop-up box will appear asking "Are you sure?" Click **OK** to initiate the firmware update. Click **CANCEL** to return to the **Firmware** table.

Reset (Models L28/L38/L3H and F28/F38/F3H)

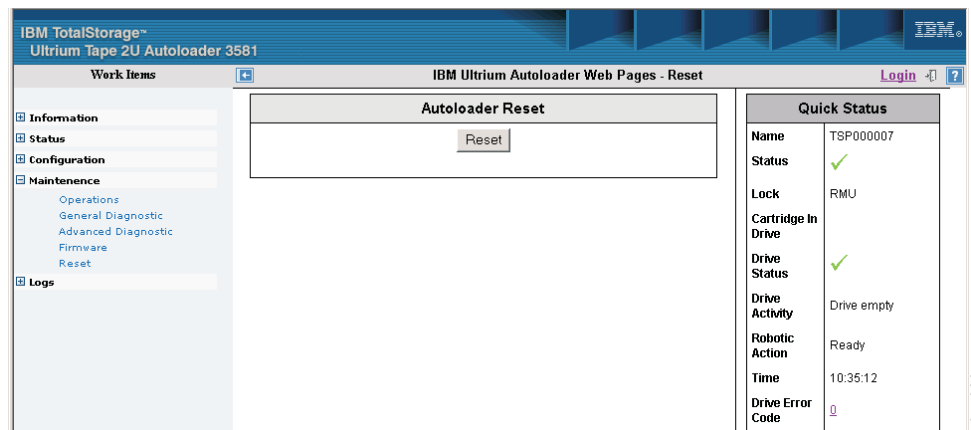


Figure 111. RMU Maintenance Menu's Reset page

This menu item displays the **Autoloader Reset** table which contains a **RESET** button. Clicking this button restarts the Autoloader and the RMU connection can be lost. Reload the RMU interface and navigate back to the **Autoloader Reset** table by clicking on **Reset** in the **Maintenance Menu** in the left frame.

A pop-up box will appear asking "Are you sure?" Click **OK** to initiate the reset. Click **CANCEL** to return to the **Autoloader Reset** table.

Logs Menu

The **Logs Menu** allows the Administrator to access and configure Autoloader and Drive log information. To expand the menu, click on the "+".

Loader (Models L28/L38/L3H and F28/F38/F3H)

The screenshot shows the IBM TotalStorage Ultrium Tape 2U Autoloader 3581 web interface. The main content area is titled "BIBM Ultrium Autoloader Web Pages - Loader Logs". It features a "Logs" section with the following fields and controls:

- Log Type:** Radio buttons for "Error" (selected) and "Trace".
- Total number of entries:** 56
- Start entry:** Input field with value "1".
- Number of entries per page:** Input field with value "5".
- Update:** "Submit" button.
- Clear log:** "Ok" button.
- Dump log:** "Ok" button.

Below these fields is a log entry list:

```
000:00:07:24.60 LIB/ERR< 0x80 0xA3 0x39 0x35
-- Ripper pick error
001:01:01:11.96 LIB/ERR< 0x80 0xBA 0x91 0x30
-- Drive load timeout
001:00:59:24.08 LIB/ERR< 0x80 0xBA 0x91 0x30
-- Drive load timeout
000:03:35:09.91 LIB/ERR< 0x80 0xBA 0x91 0x40
-- Drive load timeout
000:00:44:07.55 LIB/ERR< 0x80 0x84 0x00 0x21
-- Source status unsuitable
```

At the bottom of the log list are "< Prev" and "Next >" buttons.

On the right side, there is a "Quick Status" panel with the following information:

Name	TSP000007
Status	✓
Lock	RMU
Cartridge In Drive	
Drive Status	✓
Drive Activity	Drive empty
Robotic Action	Ready
Time	10:36:00
Drive Error Code	0

The left navigation menu includes: Information, Status, Configuration, Maintenance, and Logs (expanded to show Loader and Drive).

Figure 112. RMU Logs Menu's Loader page

This menu item displays the Autoloader **Logs** table which contains the following:

- **Log Type:** Select the type of Autoloader log to be displayed.
- **Total number of entries:** Displays the current number of Autoloader log entries.
- **Start entry:** Enter a number for the first Autoloader log entry.
- **Number of entries per page:** Enter the number of Autoloader log entries that should appear on a page.
- **Update:** Click **SUBMIT** to update the Autoloader log with the new settings.
- **Clear log:** Click **OK** to clear the Autoloader log.
- **Dump log:** Click **OK** to copy the Autoloader log to a file on your server (host).

Drive (Models L28/L38/L3H and F28/F38/F3H)

The screenshot displays the IBM TotalStorage Ultrium Tape 2U Autoloader 3581 web interface. The main content area is titled "IBM Ultrium Autoloader Web pages - Drive Logs". On the left, a navigation menu includes "Information", "Status", "Configuration", "Maintenance", and "Logs". The "Logs" menu is expanded, showing "Loader" and "Drive" options. The central "Logs" section has a "Log Type" dropdown set to "Error" (with "SCSI" as an alternative), a "Total number of entries" field showing "8", a "Start entry" field showing "1", and a "Number of entries per page" field showing "5". There are "Update" and "Dump log" buttons. Below these fields is a list of log entries, each with a timestamp and hexadecimal error codes. The "Quick Status" panel on the right shows the drive name "TSP000007", a green checkmark for "Status", "Lock" set to "RMU", "Cartridge In Drive" status, "Drive Status" with a green checkmark, "Drive Activity" as "Drive empty", "Robotic Action" as "Ready", "Time" as "10:36:54", and "Drive Error Code" as "0".

Figure 113. RMU Logs Menu's Drive page

This menu item displays the tape drive **Logs** table which contains the following:

- **Log Type:** Select the type of drive log to be displayed.
- **Total number of entries:** Displays the current number of drive log entries.
- **Start entry:** Enter a number for the first drive log entry.
- **Number of entries per page:** Enter the number of drive log entries that should appear on a page.
- **Update:** Click **SUBMIT** to update the drive log with the new settings.
- **Dump log:** Click **OK** to copy the drive log to a file on your server (host).

Logout

To logout of the RMU, click on the small icon to the right of "Login" in the upper right corner of the screen above the **Quick Status** table.

Media

Attention

LTO Ultrium Tape Cartridges are delicate components and require care in handling. Before using the media, be sure to read "Handling Cartridges" on page 147.

The Ultrium 3 and Ultrium 2 Tape Drive is compatible with the cartridges of its predecessor, the Ultrium 1 Tape Drive. When labeled according to proper IBM bar code label specifications (see "Bar Code Label" on page 145), the last character of the cartridge's volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge. Table 12 shows Ultrium data and cleaning cartridge compatibility with Ultrium Tape drives:

Table 12. Ultrium data and cleaning cartridge compatibility with Ultrium tape drives

IBM Ultrium Tape Drive	IBM TotalStorage LTO Ultrium Data Cartridges		
	400 GB (Ultrium 3)	200 GB (Ultrium 2)	100 GB (Ultrium 1)
Ultrium 3	Read/Write	Read/Write	Read only
Ultrium 2		Read/Write	Read/Write
Ultrium 1			Read/Write

Figure 114 on page 144 shows the TotalStorage LTO Ultrium 200 GB Data Cartridge and its components.

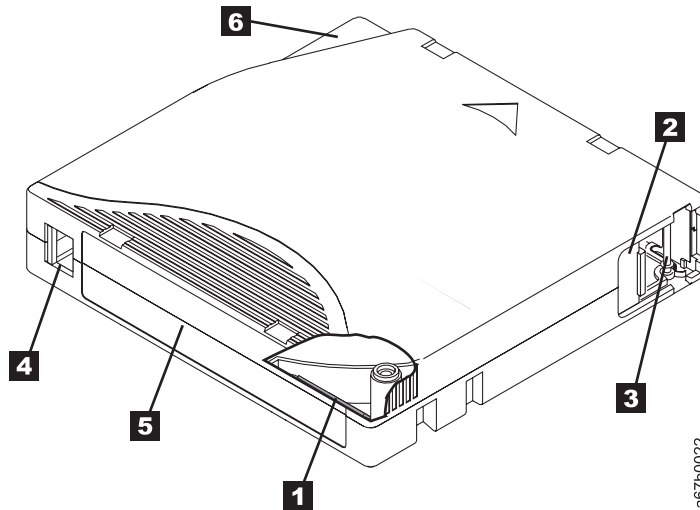


Figure 114. The IBM TotalStorage LTO Ultrium 200 GB Data Cartridge

- | | | | |
|----------|----------------------|----------|----------------------|
| 1 | LTO cartridge memory | 4 | Write-protect switch |
| 2 | Cartridge door | 5 | Label area |
| 3 | Leader pin | 6 | Insertion guide |

In addition to using LTO Ultrium 3 Tape Cartridges with up to 400 GB capacity and Ultrium 2 Tape Cartridges with up to 200 GB capacity, the Ultrium 3 tape drive reads to certified LTO Ultrium Tape Cartridges that have capacities of 100 GB. If you want to control the capacity of the cartridge (for example, if you want to limit the capacity to obtain a faster seek time) you can do so by issuing the SCSI command SET CAPACITY. For information about this command, refer to the *IBM TotalStorage Ultrium Tape Drive SCSI Reference* at <http://www.ibm.com/storage/support/lto/>.

To ensure that your tape library conforms to IBM's specifications for reliability, use only IBM LTO Ultrium Tape Cartridges. You may use other LTO-certified data cartridges, but they may not meet the standards of reliability established by IBM. The IBM TotalStorage LTO Ultrium 200 GB Data Cartridge cannot be interchanged with the media used in other IBM non-LTO Ultrium tape products.

Data Cartridge

The IBM Ultrium 3 Data Cartridge is slate blue, the IBM Ultrium 2 Data Cartridge is purple, and the Ultrium 1 Data Cartridge is black. All generations contain 1/2-inch, dual-coat, metal-particle tape. The Ultrium 1 cartridge has a native data capacity of 100 GB (200 GB at 2:1 compression); the Ultrium 2 cartridge has a native data capacity of 200 GB (400 GB at 2:1 compression); and, the Ultrium 3 cartridge has a native data capacity of 400 GB (800 GB at 2:1 compression).

When processing tape in the cartridges, the Ultrium Tape Drives use a linear, serpentine recording format. The Ultrium 1 drive reads and writes data on 384 tracks, 8 tracks at a time; the Ultrium 2 drive reads and writes data on 512 tracks, 8 tracks at a time; and the Ultrium 3 drive reads and writes data on 704 tracks, 16 tracks at a time for generation 3 media and 8 tracks at a time for generation 1 or 2 media. The first set of eight tracks is written from near the beginning of the tape to

near the end of the tape. The head then repositions to the next set of eight tracks for the return pass. This process continues until all tracks are written and the tape is full, or until all data is written.

All generations of the IBM LTO Ultrium Data Cartridge includes a Linear Tape-Open Cartridge Memory (LTO-CM) chip (**1** in Figure 114 on page 144), which contains information about the cartridge and the tape (such as the name of the manufacturer that created the tape), as well as statistical information about the cartridge's use. Whenever you unload a tape cartridge, the Autoloader writes any pertinent information to the cartridge memory.

The cartridge door (**2** in Figure 114 on page 144) protects the tape from contamination when the cartridge is out of the drive. Behind the door, the tape is attached to a leader pin **3**. When you insert the cartridge into the drive, a threading mechanism pulls the pin (and tape) out of the cartridge, across the drive head, and onto a non-removable takeup reel. The head can then read or write data from or to the tape.

The write-protect switch **4** prevents data from being written to the tape cartridge. The label area **5** provides a location for you to place a label. Affix only a bar code label or a human-writable label. When affixing a label, place it only in the recessed label area. A label that extends outside of the recessed area can cause loading problems in the internal drive or in the Autoloader. The VOLSER on a cleaning cartridge's bar code label must begin with **CLN** or the library treats the cleaning cartridge as a data cartridge during an inventory. The insertion guide **6** is a large, notched area that prevents you from inserting the cartridge incorrectly.

You can order tape cartridges with the bar code labels included, or you can order custom labels. To obtain tape cartridges and bar code labels, see "Ordering Media Supplies" on page 159. The bar code and bar code label must meet predefined specifications. To determine the specifications, visit the web at <http://ssddom02.storage.ibm.com/tape/lto/documentation/labelspec.pdf> or contact your IBM Marketing Representative.

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

Cleaning Cartridge

The drive determines when it needs to be cleaned and alerts the library and the server's (host's) application software. The user is required to select **CLEAN DRIVE** in the **Commands Menu** to initiate cleaning. See "CLEAN DRIVE" on page 58.

All generations of the LTO Ultrium Cleaning Cartridge are valid for 50 uses. A cartridge's LTO-CM chip tracks the number of times the cartridge has been used.

Bar Code Label

Each data and cleaning cartridge that is processed by the Autoloader must bear a bar code label. The label contains:

- A volume serial number (VOLSER) that you can read
- A bar code that the library can read

When read by the library's bar code scanner, the bar code identifies the cartridge's VOLSER to the library. The bar code tells the library whether the cartridge is a data, cleaning, or diagnostic cartridge. If a cartridge in a storage or I/O Door slot

does not contain a label, the bar code scanner will treat that slot as empty. In addition, the bar code includes the two-character media-type identifier Lx, where x equals 1 or 2. L identifies the cartridge as an LTO cartridge. 1 indicates that the cartridge is the first generation of its type; 2 indicates that the cartridge is the second generation of its type. Figure 115 shows a sample bar code label for the LTO Ultrium Tape Cartridge.

You can order tape cartridges with the labels included, or you can order custom labels. To order tape cartridges and bar code labels, see “Ordering Media Supplies” on page 159. The bar code must meet predefined specifications. To determine the specifications of the bar code and the bar code label, visit the web at <http://ssddom02.storage.ibm.com/tape/lto/documentation/labelspec.pdf> or contact your IBM Marketing Representative.

When attaching a bar code label to a tape cartridge, place the label only in the recessed label area (see **5** in Figure 114 on page 144). A label that extends outside of the recessed area can cause loading problems in the drive or the library.

Attention: Do not place any type of mark on the white space at either end of the bar code. A mark in this area may prevent the Autoloader from reading the label.

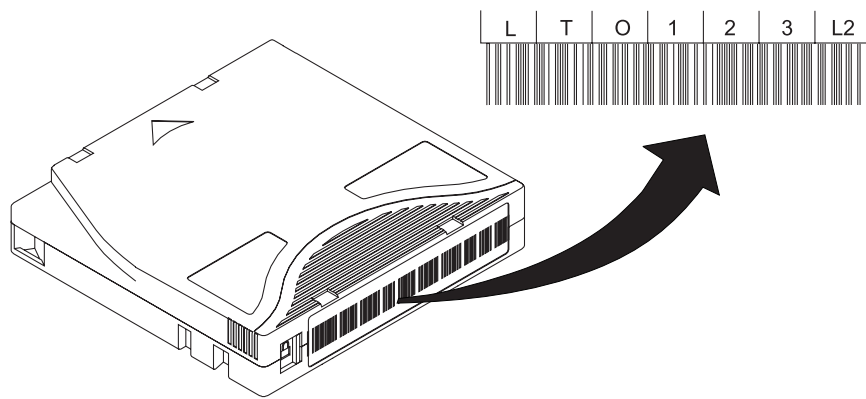


Figure 115. Sample bar code label on the LTO Ultrium Tape Cartridge. The volume serial number (LTO123L2) and bar code are printed on the label.

Guidelines for Using Bar Code Labels


Apply the following guidelines whenever you use bar code labels:

- Use only IBM-approved bar code labels.
- Do not reuse a label or reapply a used label over an existing label.
- Before you apply a new label, remove the old label by slowly pulling it at a right angle to the cartridge case.
- Use peel-clean labels that do not leave a residue after they are removed. If there is glue residue on the cartridge, remove it by gently rubbing it with your finger. Do not use a sharp object, water, or other chemical to clean the label area.
- Examine the label before you apply it to the cartridge. Do not use the label if it has voids or smears in the printed characters or bar code (an application software’s inventory operation will take much longer if the bar code label is not readable).
- Remove the label from the label sheet carefully. Do not stretch the label or cause the edges to curl.
- Position the label within the recessed label area (see **5** in Figure 114 on page 144).

- With light finger pressure, smooth the label so that no wrinkles or bubbles exist on its surface.
- Verify that the label is smooth and parallel, and has no roll-up or roll-over. The label must be flat to within 0.5 mm (0.02 in.) over the length of the label and have no folds, missing pieces, or smudges.
- Do not place other machine-readable labels on other surfaces of the cartridge. They may interfere with the ability of the bar code scanner to read the bar code.

Setting the Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1** in Figure 116) determines whether you can write to the tape:

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

If possible, use your server's (host's) application software to write-protect your cartridges (rather than manually setting the write-protect switch). This allows the server's (host's) software to identify a cartridge that no longer contains current data and is eligible to become a scratch (blank) cartridge. Do not write-protect scratch cartridges; the tape drive will not be able to write new data to them.

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

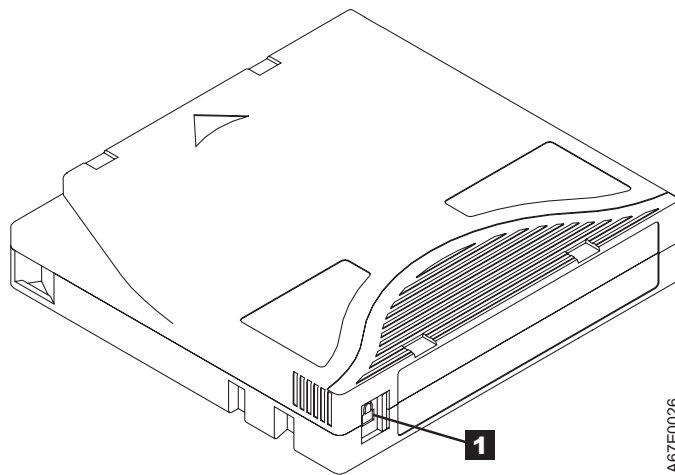


Figure 116. Setting the write-protect switch

Handling Cartridges

Attention

Do not insert a damaged tape cartridge into your Autoloader. A damaged cartridge can interfere with the reliability of a drive and may void the warranties of the drive and the cartridge. Before inserting a tape cartridge, inspect the cartridge case, cartridge door, and write-protect switch for breaks.

Incorrect handling or an incorrect environment can damage the IBM LTO Ultrium Tape Cartridges or their magnetic tape. To avoid damage to your tape cartridges and to ensure the continued high reliability of your IBM LTO Ultrium Tape Drive, use the following guidelines:

Provide Training

- Post procedures that describe proper media handling in places where people gather.
- Ensure that anyone who handles tape has been properly trained in handling and shipping procedures. This includes operators, users, programmers, archival services, and shipping personnel.
- Ensure that any service or contract personnel who perform archiving are properly trained in media-handling procedures.
- Include media-handling procedures as part of any services contract.
- Define and make personnel aware of data recovery procedures.

Ensure Proper Packaging

- When you ship a cartridge, ship it in its original or better packaging.
- Always ship or store a cartridge in a jewel case.
- Use only a recommended shipping container that securely holds the cartridge in its jewel case during transportation.

Note: Ultrium Turtlecases (by Perm-A-Store) have been tested and found to be satisfactory (see Figure 117). They are available at www.turtlecase.com/.



Figure 117. Tape cartridges in a Turtlecase

- Never ship a cartridge in a commercial shipping envelope. Always place it in a box or package.
- If you ship the cartridge in a cardboard box or a box of a sturdy material, ensure the following:

- Place the cartridge in polyethylene plastic wrap or bags to protect it from dust, moisture, and other contaminants.
- Pack the cartridge snugly; do not allow it to move around.
- Double-box the cartridge (place it inside a box, then place that box inside the shipping box) and add padding between the two boxes (see Figure 118).



Figure 118. Double-boxing tape cartridges for shipping

Provide Proper Acclimation and Environmental Conditions

- Before you use a cartridge, let it acclimate to the normal operating environment for 1 hour. If you see condensation on the cartridge, wait an additional hour.
- Ensure that all surfaces of a cartridge are dry before inserting it.
- Do not expose the cartridge to moisture or direct sunlight.
- Do not expose recorded or blank cartridges to stray magnetic fields of greater than 100 oersteds (for example, terminals, motors, video equipment, X-ray equipment, or fields that exist near high-current cables or power supplies). Such exposure can cause the loss of recorded data or make the blank cartridge unusable.
- Maintain the conditions that are described in “Environmental and Shipping Specifications for Tape Cartridges” on page 151.

Perform a Thorough Inspection

After purchasing a cartridge and before using it, perform the following steps:

Attention

When inspecting a cartridge, open only the cartridge door. Do not open any other part of the cartridge case. The upper and lower parts of the case are held together with screws; separating them destroys the usefulness of the cartridge.

- ___ Step 1. Inspect the cartridge’s packaging to determine potential rough handling.
- ___ Step 2. Inspect the cartridge for damage before using or storing it.

- ___ Step 3. Inspect the rear of the cartridge (the part that you load first into the tape load compartment) and ensure that there are no gaps in the seam of the cartridge case (see **1** in Figure 119). If there are gaps in the seam, the leader pin may be dislodged. Go to “Repositioning or Reattaching a Leader Pin” on page 152.

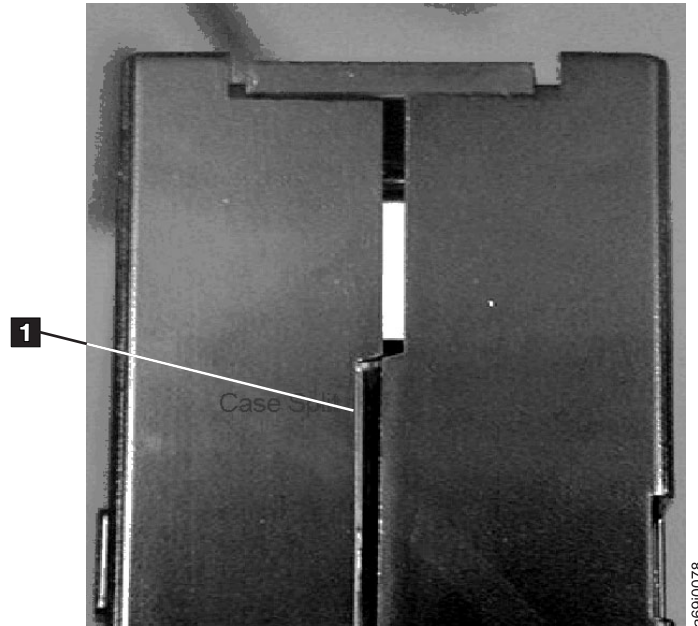


Figure 119. Checking for gaps in the seams of a cartridge

- ___ Step 4. Check that the leader pin is properly seated.
- ___ Step 5. If you suspect that the cartridge has been mishandled but it appears useable, copy any data onto a good cartridge immediately for possible data recovery. Discard the mishandled cartridge.

Handle the Cartridge Carefully

- Do not drop the cartridge. If the cartridge drops, slide the cartridge door back and ensure that the leader pin is properly seated in the pin-retaining spring clips (see **2** in Figure 114 on page 144). If the leader pin has become dislodged, go to “Repositioning or Reattaching a Leader Pin” on page 152.
- Do not handle tape that is outside the cartridge. Handling the tape can damage the tape’s surface or edges, which may interfere with read or write reliability. Pulling on tape that is outside the cartridge can damage the tape and the brake mechanism in the cartridge.
- Do not stack more than six cartridges.
- Do not degauss a cartridge that you intend to reuse. Degaussing makes the tape unusable.

Examples of Cartridge Problems

Example: Improper Placement of Leader Pin

The leader pin is misaligned. Perform the following steps:

- ___ Step 1. Look for cartridge damage.

- ___ Step 2. Use the IBM Leader Pin Reattachment Kit (part number 08L9129) to correctly seat the pin (see “Ordering Media Supplies” on page 159). Then, immediately use data recovery procedures to minimize chances of data loss.

Example: Split Cartridge Case

The cartridge’s case is damaged. There is a high possibility of media damage and potential loss. Perform the following steps:

- ___ Step 1. Look for cartridge mishandling.
- ___ Step 2. Use the IBM Leader Pin Reattachment Kit (part number 08L9129) to correctly seat the pin (see “Reattaching a Leader Pin” on page 154). Then, immediately use data recovery procedures to minimize chances of data loss.
- ___ Step 3. Review media-handling procedures (see “Handling Cartridges” on page 147).

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

Table 13. 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 degrees C (50 to 113 degrees F)	16 to 32 degrees C (61 to 90 degrees F)	16 to 25 degrees C (61 to 77 degrees F)	23 to 49 degrees C (9 to 120 degrees F)
Relative humidity (noncondensing)	10 to 80%	20 to 80%	20 to 50%	5 to 80%
Wet bulb temperature	26 degrees C (79 degrees F)	26 degrees C (79 degrees F)	26 degrees C (79 degrees F)	26 degrees C (79 degrees F)
Notes:				
1. Operational storage equals less than 1 year.				
2. Archival storage equals 1 to 10 years.				

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 120 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)

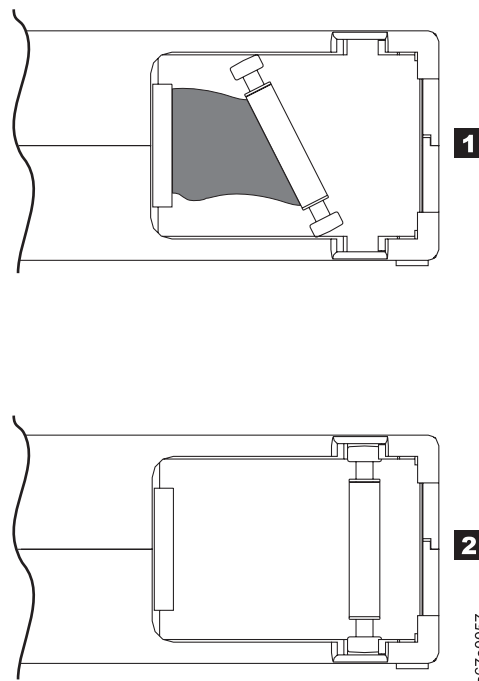


Figure 120. Leader pin in the incorrect and correct positions. The cartridge door is open and the leader pin is visible inside the cartridge.

To reposition the leader pin, perform the following steps.

1. Slide open the cartridge door (**1** in Figure 121 on page 153) 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.

4. Close the cartridge door.

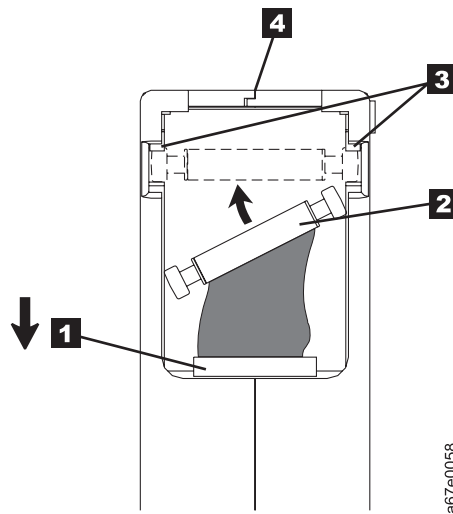


Figure 121. Placing the dislodged leader pin into the correct position. The cartridge door is open to show the leader pin.

5. To rewind the tape, insert the cartridge manual rewind tool (**1** in Figure 122) into the cartridge's hub (**2**) and turn it clockwise until the tape becomes taut.

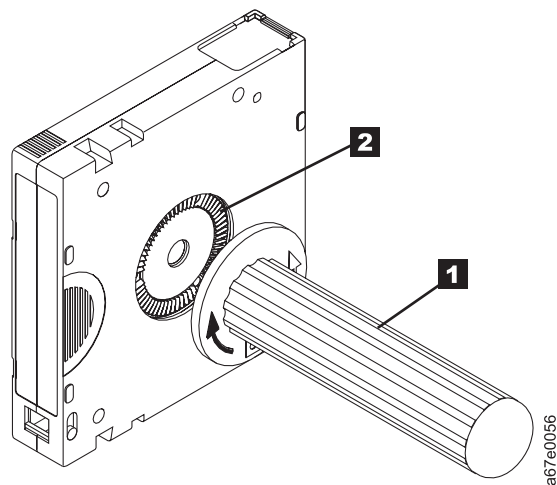


Figure 122. Rewinding the tape into the cartridge

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 123). A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** (see **2** in Figure 123). 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 123). 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.

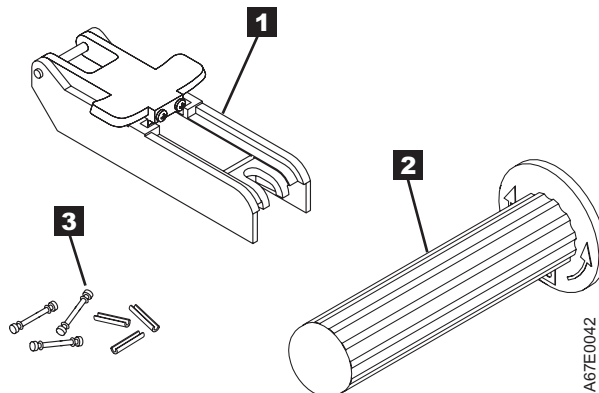


Figure 123. Leader Pin Reattachment Kit

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 124 on page 155) to the cartridge **2** so that the tool's hook **3** latches into the cartridge's door **4**. Pull the tool back to hold the door open, then slide the tool onto the cartridge. Open the tool's pivot arm **5**.

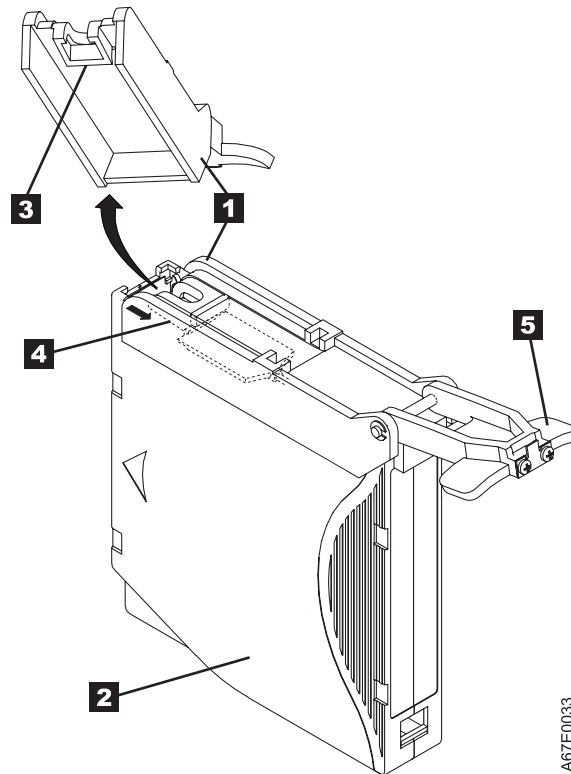


Figure 124. Attaching the leader pin attach tool to the cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool (**1** in Figure 125 on page 156) to the cartridge's hub **2** by fitting the tool's teeth between the teeth of the hub. Turn the tool clockwise until you see the end of the tape inside the cartridge. Then, slowly turn the rewind tool counterclockwise to bring the tape edge toward the cartridge door **3**.
3. Continue to turn the rewind tool counterclockwise until approximately 13 cm (5 in.) of tape hangs from the cartridge door. If necessary, grasp the tape and pull gently to unwind it from the cartridge.
4. Remove the rewind tool by pulling it away from the cartridge. Set the tool and the cartridge aside.

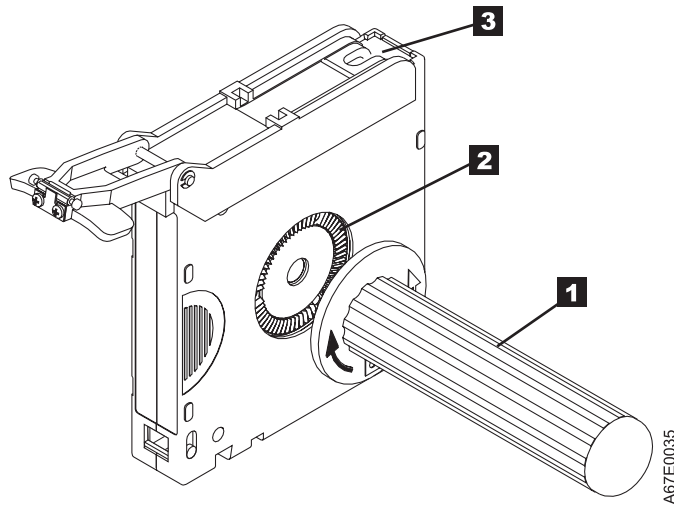


Figure 125. Winding the tape out of the cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the cartridge door.

5. On the leader pin (**1** in Figure 126), 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.

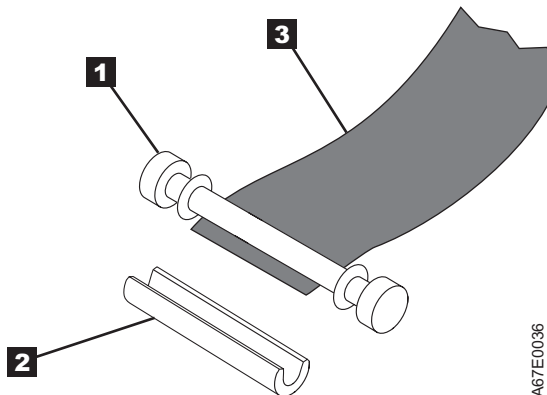


Figure 126. Removing the C-clip from the leader pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see **1** in Figure 127 on page 157).
8. Place a new C-clip into the retention groove **2** on the leader pin attachment tool and make sure that the clip's open side faces up.
9. Place the leader pin (from step 6) into the cavity **3** of the leader pin attach tool.

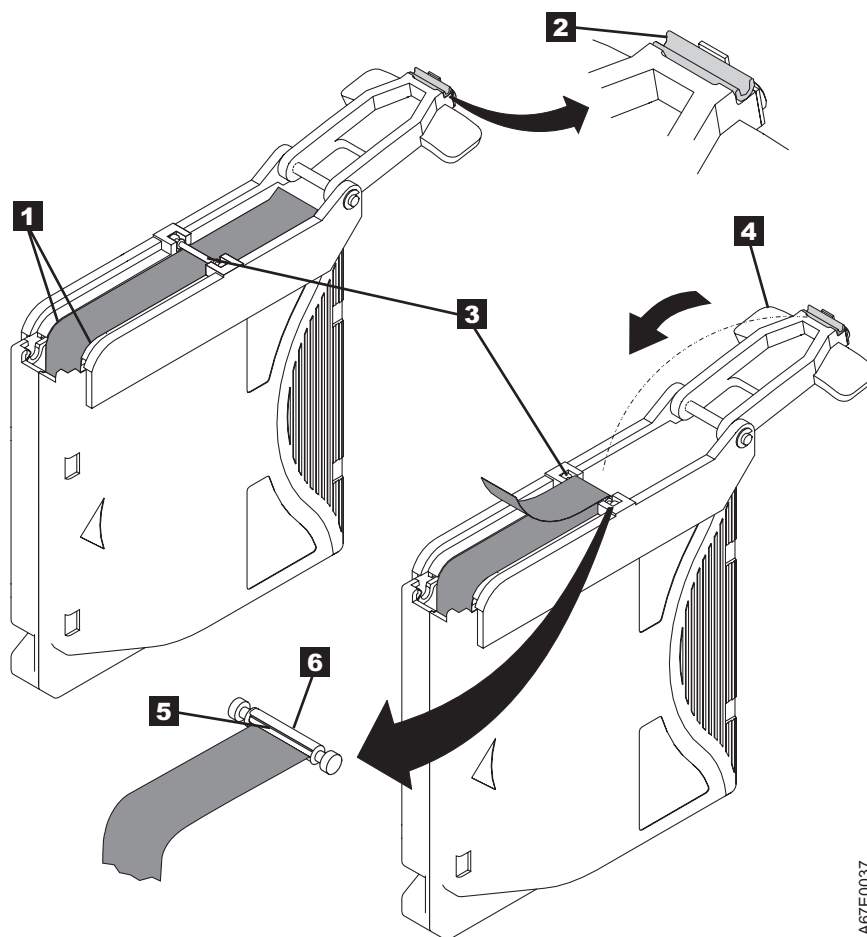
Attention

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 127 on page 157).

Attention

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.



A67E0037

Figure 127. Attaching the leader pin to the tape

11. Close the pivot arm **4** of the leader pin attach tool by swinging it over the leader pin so that the C-clip snaps onto the pin and the tape.
12. Swing the pivot arm open and trim the excess tape **5** so that it is flush with the reattached leader pin **6**.
13. Use your fingers to remove the leader pin from the cavity **3** in the leader pin attach tool.
14. Use the cartridge manual rewind tool to wind the tape back into the cartridge (wind the tape clockwise). Ensure that the leader pin is latched by the pin-retaining spring clips on each end of the leader pin.
15. Remove the rewind tool.
16. Remove the leader pin attach tool by lifting its end up and away from the cartridge.

Attention

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

Disposing of Tape Cartridges

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

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

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

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

Ordering Media Supplies

Table 14 lists the data cartridges and media supplies that you can order for the Autoloader.

Table 14. Ordering media supplies for the Autoloader

Supply Item	Methods of Ordering
IBM TotalStorage LTO Ultrium 400 GB Data Cartridge Bar code labels are pre-applied to cartridges.	<ul style="list-style-type: none"> Order the cartridge from your IBM Sales Representative or any authorized IBM Business Partner by specifying Machine Type 3589 Model 009. Specify the VOLSER characters that you want. Order as part number 96P1470 (color label) or 96P1471 (black and white label) through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media). Or, call 1-888-IBM-MEDIA. Specify the VOLSER characters that you want.
IBM TotalStorage LTO Ultrium 400 GB Data Cartridge Order VOLSER labels separately.	<ul style="list-style-type: none"> Order the cartridge from your IBM Sales Representative or any authorized IBM Business Partner by specifying Machine Type 3589 Model 009. Order as part number 24R1922 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media). Or, call 1-888-IBM-MEDIA. Specify the VOLSER characters that you want.
IBM TotalStorage LTO Ultrium 200 GB Data Cartridge Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 160). For Models L28/L38/L3H and F28/F38/F3H only.	<ul style="list-style-type: none"> Order as part number 08L9870 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media), or if you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative, or call 1-888-IBM-MEDIA.
IBM LTO Ultrium 100 GB Data Cartridge Order VOLSER labels separately (see "Ordering Bar Code Labels" on page 160).	<ul style="list-style-type: none"> Order as part number 08L9120 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media), or if you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative, or call 1-888-IBM-MEDIA.
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal cleaning cartridge for use with Ultrium 1, Ultrium 2, and Ultrium 3 drives) VOLSER labels are included.	<ul style="list-style-type: none"> Order as part number 35L2086 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media), or if you do not have Internet access, order the cartridge from any authorized IBM Business Partner or your IBM Sales Representative, or call 1-888-IBM-MEDIA.
Leader Pin Reattachment Kit	Order as part number 08L9129 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media).
Manual Rewind Tool	Order as part number 08L9130 through an IBM-authorized distributor (for the closest distributor, visit the web at http://www.ibm.com/storage/media).

Note: Be sure to order bar code labels for all cleaning and data cartridges. The Autoloader will not recognize cartridges without a bar code label.

Ordering Bar Code Labels

Bar code labels with VOLSERS are required for cartridges that are read by the Autoloader. You can order these labels separately from the IBM Data Cartridges and Cleaning Cartridges.

You can order bar code labels directly from the authorized label suppliers in Table 15.

Table 15. Authorized suppliers of custom bar code labels

In the Americas	In Europe and Asia
EDP/Colorflex 697 South Pierce Street Louisville, CO 80027 U. S. A. Telephone: 800-522-3528 http://www.edp-usa.com/	EDP Europe, Ltd. 43 Redhills Road South Woodham Ferrers Chelmsford, Essex CM3 5UL U. K. Telephone: 44 (0) 1245-322380 http://www.edpeurope.com/
Dataware 7570 Renwick Houston, TX 77081 U. S. A. Telephone: 800-426-4844 http://www.datawarelabels.com/	Dataware Labels Europe Heubergstrasse 9 D-83052 Bruckmuhl-Gotting Germany Telephone: 49 806-29455 http://www.datawarelabels.com/
NetC P. O. Box 320784 Fairfield, CT 06432 U. S. A. Telephone: 203-372-6382 http://www.netc11c.com/	NetC Europe Ltd Town Farm Bungalow North Curry Taunton Somerset U. K. TA3 6LX Telephone: 44 (0) 1823 491439 http://www.netclabels.co.uk
	NetC Asia Pacific Pty Ltd Locked Bag 14 Kenthurst NSW Australia 2156 Telephone: 61 (0) 2 9654 8272 http://www.netclabels.com.au/

Table 16. Ordering media supplies for the Autoloader

IBM Part Number	Product Description
19P1053	LTO Ultrium Data Cartridge Bar Code Labels, sheet of 20, black and white
08L9267	LTO Ultrium Cleaning Cartridge Bar Code Labels, sheet of 20, black and white

Part 3. Service Guide

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Illegal Request Errors 50h - 6Fh	170	Replacing the External Fan	208
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Troubleshooting

This chapter provides information and instructions on Autoloader and tape drive problem determination should one ever occur.

Maintenance/Service Starting Point

Many problems can be resolved by a firmware upgrade. Ensure that both the autoloader and drive firmware are at the latest levels available. Compare the firmware levels on the Operator Control Panel (OCP) Information Menu panel with the latest levels on the web site <http://www.ibm.com/storage/lto/> or <ftp://index.storsys.ibm.com/358x>. See “Step 5. Update Firmware” on page 111.

Most autoloader or drive errors will result in an error code or error message on the OCP. An error code history is maintained in the autoloader or drive error log.

Table Table 17 lists possible reasons for service and the associated service action. Find the *reason you are here* in the left column and *perform the action* listed in the right column. If the action leads to removal and replacement of the autoloader or other Customer Replaceable Unit (CRU), or if you are unable to resolve the problem, see “Pre-call Checklist” on page 200 and “Contacting IBM Technical Support” on page 200.

Table 17. Start Here

If You Are Here for This Reason...	Perform This Action...
An Autoloader error code or error message is displayed on the OCP display, in the error log, on the Host, or on the RMU display.	See “Resolving Error Messages/Codes” on page 166.
A Drive error code or error message is displayed on the OCP display, in the error log, on the Host, or on the RMU display.	See “Resolving Error Messages/Codes” on page 166.
The Error (red) LED on the OCP is ON.	See “Resolving Error Messages/Codes” on page 166.
A TapeAlert Message from the host.	See “TapeAlert Flags” on page 227.
The Media Attention (amber) LED on the OCP is ON.	See “OCP Media Attention LED / Tape Drive Error Codes” on page 166 - OR - “Tape Unload/Export Problems Procedure” on page 199.
The Clean Drive (amber) LED on the OCP is ON.	Perform the Clean Drive procedure. See “CLEAN DRIVE” on page 58.
The Autoloader does not power ON or the Power (green) LED on the OCP is OFF.	See “Power/External Fan Analysis Procedure” on page 197.
No air flow from the cooling fan in the Autoloader.	See “Power/External Fan Analysis Procedure” on page 197.
The OCP display is blank, hung, or frozen.	Gather all failure information available, ensure that power is being applied to the Autoloader, cycle the power OFF then ON, load the latest level of firmware, if possible. If the OCP display is still failing, replace the Autoloader.

Table 17. Start Here (continued)

If You Are Here for This Reason...	Perform This Action...
A tape is stuck in the drive, or a cartridge is stuck in the autoloader.	See "Tape Unload/Export Problems Procedure" on page 199 -OR-(IBM Service Personnel Only) See "Removing a Cartridge Manually" on page 266 or "Manually Removing a Tape Cartridge from an Ultrium 1 or 2 Drive" on page 270.
Reposition/reattach a leader pin.	See "Repositioning or Reattaching a Leader Pin" on page 152.
Suspected media problem.	See "Drive Error Codes" on page 179. Use Error Code 6, <i>Tape Drive or Media Error</i> , or Error Code 7, <i>High Probability of Media Error</i> . If the tape is stuck, see "Tape Unload/Export Problems Procedure" on page 199.
Fibre Channel service or error messages from the host.	See " Running a Fibre Channel Wrap Test " on page 73.
SCSI errors from the host.	See "Fixing Drive SCSI Bus Errors" on page 239.
Excessive temporary errors reported to the host.	1. Clean the drive. See "CLEAN DRIVE" on page 58. 2. Run "NORMAL R/W TEST" on page 71.
Suspected firmware (microcode) problem.	Update the firmware. See "Step 5. Update Firmware" on page 111. For drive firmware problems, see "Drive Error Codes" on page 179. Use Error Code 3 or 4. If new firmware does not resolve the problem, contact IBM Technical Support.
Update firmware (microcode) on the Autoloader or drive.	See "Step 5. Update Firmware" on page 111.
Copy the Autoloader Error log or Trace log to the host.	See "Copying Autoloader Error Log and Trace Log Files to the Server (Host)" on page 193.
Copy the drive firmware dump to the host.	See "Copying a Drive Dump Log to Server (Host)" on page 185.
Preserve the drive firmware dump before replacing the Autoloader.	See "PRESERVE DUMP (LTO-3 only)" on page 74.
Obtain drive or Autoloader error information at the server (host).	See "Messages" on page 233.
Remove/replace Customer Replaceable Units (CRUs).	See "Removing/Replacing the Autoloader" on page 204. -OR-See "Removing/Replacing the External Fan" on page 208. -OR-See "Removing/Replacing the Bar Code Reader (BCR)" on page 210. -OR-See "Removing/Replacing the RMU" on page 212. -OR-See "Removing/Replacing the HVD Converter" on page 214.
Run Autoloader diagnostic tests.	See "LOADER DIAG" on page 67.

Table 17. Start Here (continued)

If You Are Here for This Reason...	Perform This Action...
Run drive diagnostic tests.	See "DRIVE DIAG" on page 70.
Analyze suspected RMU problems.	See "RMU Analysis Procedure" on page 198.
Analyze suspected BCR problems.	See "BCR Analysis Procedure" on page 198.
Analyze suspected HVD Converter problems.	See "HVD Converter Analysis Procedure" on page 199.
Contact IBM Technical Support.	See "Pre-call Checklist" on page 200 and "Contacting IBM Technical Support" on page 200.
Perform safety inspection of the Autoloader.	See "Safety Inspection" on page 203.

Resolving Error Messages/Codes

An error message or error code may appear in the OCP's display, in the error log, on the host, or on the RMU display.

Note: As part of the error recovery procedure, you may need to review the following:

- "Operator Control Panel (OCP)" on page 46 to review the OCP functions that can aid error recovery.
- "Diagnostic Menu" on page 67 to review aids that are available for isolating and verifying Autoloader and drive errors.
- "Contacting IBM Technical Support" on page 200 if a cartridge must be manually removed from the drive or library.

Resolving Autoloader and Drive Error Codes or Messages

To resolve an Autoloader or drive error code or message, perform the following steps:

1. Record the error message. You will need it later if contacting IBM Technical Support is required.
2. If a cartridge will not unload from the drive, use the "Tape Unload/Export Problems Procedure" on page 199.
3. Make sure that you have recorded the error code or message, then cycle power to the Autoloader (the power cord may have to be disconnected from its electrical outlet if the Autoloader's POWER button is non-operational). Retry the operation that produced the error.
4. Perform "LIBRARY VERIFY" on page 67.
5. Use the error code or message and go to one of the following:
 - a. "OCP Media Attention LED / Tape Drive Error Codes"
 - b. "Autoloader Error Codes" on page 168
 - c. "Drive Error Codes" on page 179

OCP Media Attention LED / Tape Drive Error Codes

If the Media Attention LED turns on (amber), this is an indication that a drive error occurred pointing to the media as the possible problem. For instance, if during the Library Verify diagnostic, the drive read/write test fails with a media error, the Media Attention LED becomes active thus ending the test. To determine the drive error code after the cartridge is unloaded and returned to the I/O Door for removal, perform the following procedure to determine the latest drive error code:

Viewing Drive Error Codes via the OCP:

Attention: This is the recommended method for viewing drive error codes.

1. From the OCP, press *Enter* to access the **Information Menu**.
2. Press *Next* to access DRIVE INFO.
3. Press *Next* or *Previous*, as necessary, until ERROR LOG appears.
4. Press *Enter* to display the most recent error code.
5. Line one will indicate ERROR CODE 0; line two will show a single hex digit drive error code (refer to "Drive Error Codes" on page 179 for error code definition).
6. Press *Previous* to view previous error codes (up to ten error codes are stored).

|

| **Viewing Drive Error Codes via Serial Communication:**

- |
- | 1. From the TSMON> prompt, login (lgi) as "admin" (Administrator needs appropriate password).
 - | 2. From the TSMON> prompt, type **drv1** (display drive error log).
 - | 3. The entire drive error log table will display (up to ten errors if ten are available).
 - | 4. The first byte in the string of five bytes will contain the drive error code. The drive error code is displayed in ASCII. For example, if the single hex drive error code is a "7" (media error), the representation displayed in the drive error log table will show a "37". The remaining four bytes on each line are development information and can be ignored. The most recent drive error code is on line one.

|

| **Viewing Drive Error Codes via the RMU:**

- |
- | 1. Login as Administrator.
 - | 2. Click on **Logs** and then **Drive**.
 - | 3. The drive error log table described for serial communication is displayed.

Autoloader Error Codes

The tables in this section list error codes and associated sub codes of the Autoloader. These codes can be used for analyzing failure situations and error logs stored in the Autoloader. The errors are divided into two parts:

- Errors which occur on the SCSI interface side
- Errors which occur on the user interface side (such as the OCP, serial monitor, and RMU)

Depending on the type of error, the error is only reported on the specified side but is always stored in the error log.

An error entry from the Autoloader has four information values which describe the error in detail, a time stamp, and a source identifier. This information is shown on the bottom line of the OCP display. The display can be switched between status and time stamp. A negative number in the top line shows the current position in the error log. The error entry format is as follows:

AA	BB	CC
Indicator for hard error or recovered error 80 - hard error 40 - recovered error	Main error code	Main error specific subcode
Attention: The <AA> indicator for the type of error code is only available in the error log. Recovered errors will not be displayed on the OCP.		

The following is an example for an error/event log display:

```
EVENT —6  
80 93 0B 20
```

Sequence number —6 indicates the position in the sequence list, 0 being the most recent. In this example, the log shows a load error:

- Type 80 = Unrecovered error
- Code 93 = Load error
- Internal error 0B = Door Stop
- Cmd 20 = Load

After pressing **Enter**, the associated time stamp will be displayed in the following format:

```
ddd:hh:mm:ss:HH  
- ddd: days  
- hh: hours  
- mm: minutes  
- ss: seconds  
- HH: 1/100 second
```

The time stamp is set at zero at system start up.

The complete Error Log can be printed out also through the Serial Monitor or the optional RMU. For more information on the Serial Monitor, see "Using Serial Port Communications" on page 259. For more information on the RMU, see "Remote Management Unit (RMU)" on page 123.

Different sub code classes are joined to the main errors. In the following tables, the specific sub code class is defined in the error description. To get the correct sub code, look in the associated sub code class table.

Not Ready Errors 01h - 0Fh

Table 18. Not Ready Errors 01h - 0Fh

Error Code	Description
01h	Unit becoming ready by scanning magazines etc.
02h	Manual intervention required
03h	Cause not reportable
04h	Firmware upgrade in process
05h	Front door is open
06h	Working on other SCSI command
07h	Cleaning cartridge installed
08h	Loader is in sequential mode
09h	Loader is offline
0Ah	Fibre Channel link problem
0Bh-0Fh	Reserved

Unit Attention 10h - 1Fh

Table 19. Unit Attention 10h - 1Fh

Error Code	Description
10h	Power-on or reset occurred
11h	Media may have changed
12h	Media removal prevented
13h	Invalid cartridge
14h	Not ready to transition
15h	Mode parameters changed
16h	Microcode has changed
17h	Door was open and was closed again
18h	SCSI Bus type changed to SE
19h	SCSI Bus type changed to LVD
1Ah	Invalid cleaning cartridge
1Bh	Invalid upgrade tape
1Ch	Cleaning requested
1Dh-1Fh	Reserved

Recovered Errors 20h - 2Fh

Table 20. Recovered Errors 20h - 2Fh

Error Code	Description
20h	Error log overflow

Table 20. Recovered Errors 20h - 2Fh (continued)

Error Code	Description
21h	SCSI parity error
22h-2Fh	Reserved

Hardware Errors 30h - 4Fh

Table 21. Hardware Errors 30h - 4Fh

Error Code	Description
30h	Media not present
31h	POST soft failure
32h	Loader communications timeout
33h	Loader communications UART error or buffer overflow
34h	Bad status returned from loader
35h	Unexpected status from test
36h	Cartridge has no home
37h	Tape drive handle problem
38h	No cartridge in drive during unload
39h	Loader mechanism problem after retries
3Ah	Timeout moving cartridge
3Bh	Reserved
3Ch	Couldn't unlock door after retries
3Dh	Error during scanning
3Eh	Couldn't lock door after retries
3Fh	Unexpected door open
40h	Didn't find all expected slots during elevator movement
41h	Cartridge already in drive during cartridge loading
42h	Slot empty during cartridge loading
43h	Cleaning tape expired
44h	Cleaning failed
45h-4Fh	Reserved

Illegal Request Errors 50h - 6Fh

Table 22. Illegal Request Errors 50h - 6Fh

Error Code	Description
50h	No slot free for transfer
51h	All slots empty
52h	Parameter length error
53h	SCSI invalid opcode
54h	Invalid element address
55h	Invalid field in CDB
56h	Invalid mode on write buffer

Table 22. Illegal Request Errors 50h - 6Fh (continued)

Error Code	Description
57h	Invalid drive specified
58h	Invalid test number at diagnostic
59h	Invalid offset on write buffer
5Ah	Invalid size on write buffer
5Bh	Bad controller image checksum
5Ch	Invalid LUN
5Dh	Parameter list error: Invalid field
5Eh	Parameter list error: Parameter not supported
5Fh	Parameter value invalid
60h	Saving parameters not supported
61h	Cleaning slot empty
62h	Cleaning slot doesn't have a cleaning tape
63h	SCSI invalid ID message
64h	Media Load/Eject failure
65h	Destination element full
66h	Source slot or drive empty
67h	Unrecognized loader command
68h	Wrong header length
69h	Bad sequence number
6Ah	Wrong checksum
6Bh	Command unspecified
6Ch	Configuration Problem: No Bar Code Reader installed
6Dh	Flash image does not fit boot code
6Eh	Medium removal prevented by drive
6Fh	Firmware image contains wrong personality

Aborted Command Errors 70h - 73h

Table 23. Aborted Command Errors 70h - 73h

Error Code	Description
70h	SCSI message error
71h	SCSI parity error
72h	SCSI invalid message
73h	SCSI overlapped command attempt
74h-79h	Reserved

Additional Errors 7Ah - 7Fh

Table 24. Additional Errors 7Ah - 7Fh

Error Code	Description
7Ah-7Dh	Reserved

Table 24. Additional Errors 7Ah - 7Fh (continued)

Error Code	Description
7Eh	Reservation conflict status
7Fh	Reserved

Error 80h

Table 25. Error 80h

Error Code	Description	Action
80h	No error.	No action required.

Robotic Control Errors 81h - 8Fh

Table 26. Robotic Control Errors 81h - 8Fh

Error Code	Description	Action
81h	Invalid command error. This error indicates that the Autoloader received an undefined command or an invalid parameter to a command.	Retry operation. After several occurrences, contact IBM Technical Support.
82h	Device Status not suitable to execute this command. If the Autoloader is busy, some commands cannot be executed at the same time. This error will indicate a probable conflict. This is not an error condition, but does result in reporting a busy condition to the server (host) for the requested SCSI command.	Retry operation. After several occurrences, contact IBM Technical Support.
83h	Inventory not valid. The cartridge inventory is not valid, because of manual changes or previous fatal errors. In such case, the inventory must be updated by the appropriate 'Set Slot Status' commands.	Perform an inventory rescan (Menu item COMMANDS / RE-INVENTORY).
84h	Source element not ready. Transport source element does not have the expected state.	Perform an inventory rescan (Menu item COMMANDS / RE-INVENTORY).
85h	Destination element not ready. Destination element does not have the expected state.	Perform an inventory rescan (Menu item COMMANDS / RE-INVENTORY).
86h	Assigned to a rejected user attempt to access door while media removal is prevented.	Finish IMPORT/EXPORT, afterwards retry operation.
87h	Is used for several robotic command timeout conditions.	Reset the unit (Menu item CONFIGURATION / RESET).
89h	Timeout detected by Autoloader on system testing	Reset the unit (Menu item CONFIGURATION / RESET), restart System Test.

Table 26. Robotic Control Errors 81h - 8Fh (continued)

Error Code	Description	Action
8Fh	No error after Autoloader recovery.	Only informational message, no action required.

Function Errors 90h - 9Fh

Table 27. Function Errors 90h - 9Fh

Error Code	Description	Action
90h	Mechanical initialization failure. The robotic was not able to get into its safe mechanical init position. Manual intervention will be necessary.	Reset the unit (Menu item CONFIGURATION / RESET), after further occurrences, contact IBM Technical Support.
91h	Scan failure. Fatal error during cartridge scan, building up inventory.	Perform an inventory rescan (Menu item COMMANDS / RE-INVENTORY).
92h	Preposition failed. Belt positioning error	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
93h	Cartridge mount error. Movement of cartridge into drive failed.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
94h	Cartridge dismount error. Failure during cartridge removal and transport back to the slot.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
95h	Import error. Device wasn't able to finish import of new cartridge without error.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
96h	Export error. Fatal error during cartridge export.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
97h-9Fh	Reserved	

|

Low Level Axis Errors A0h - AFh

Table 28. Low Level Axis Errors A0h - AFh

Error Code	Description	Action
A0h	Belt axis error. Error during cartridge carrier movement (position not found).	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
A1h	Slider axis error. Transport slider unable to reach estimated position.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
A2h	Gripper position error. Gripper unable to reach position.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
A3h	Cartridge pick error. Missing cartridge during pick operation of gripper.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
A4h	Door function error. Slider door in front bezel not in requested position during device operation.	Run Library Verify Test (menu item DIAGNOSTICS / LOADER DIAG. / LIBRARY VERIFY), after further occurrences, contact IBM Technical Support.
A5h	Fan error. Autoloader has detected a fan error. <i>Sub code:</i> <ul style="list-style-type: none"> • F1: Fan at backplane was the originator • F2: Fan at drive was the originator • F3: Both fans are defective 	Subcode F1: Replace fan at rear connector plate. Subcode F2: Contact IBM Technical Support. Subcode F3: Contact IBM Technical Support.
A6h-AFh	Reserved	

Electronic Hardware Errors B0h - B9h

Table 29. Electronic Hardware Errors B0h - B9h

Error Code	Description	Action
B0h	ROM error. A defective ROM was detected.	Retry operation. After several occurrences, contact IBM Technical Support.
B1h	RAM error. A defective RAM was detected.	Contact IBM Technical Support.
B2h	NVRAM error. A defective NVRAM was detected.	Retry operation. After several occurrences, contact IBM Technical Support.

Table 29. Electronic Hardware Errors B0h - B9h (continued)

Error Code	Description	Action
B5h	Display error. A defective Display was detected.	Contact IBM Technical Support.
B6h	Memory error. A defective Memory was detected.	Contact IBM Technical Support.
B7h	Fatal system error	Contact IBM Technical Support.
B8h	Bar code error	Perform an inventory rescan (Menu item COMMANDS / RE-INVENTORY). After several occurrences, replace Bar Code Reader.
B9h	Database Error	Contact Technical Support

Drive Errors BAh - BFh

Table 30. Drive Errors BAh - BFh

Error Code	Description	Action
BAh	Tape load timeout.	Retry operation. If not successful, contact IBM Technical Support.
BBh	Tape unload timeout.	Cycle power. Retry operation. If not successful, contact IBM Technical Support.
BCh	Over temperature problem. <i>Sub code:</i> The original drive error code is reported (refer to Table 35 on page 179).	Check ambient temperature (should not exceed 35°C). After further occurrences, contact IBM Technical Support.
BDh	No connection to drive.	Contact IBM Technical Support.
BFh	Drive Failure <i>Sub code:</i> The original drive error code is reported (refer to Table 35 on page 179).	Use drive error code (and sub code) and refer to Table 35 on page 179.

Drive Errors C0h - CFh

Table 31. Drive Errors C0h - CFh

Error Code	Description	Action
C0h	Library verify test: loader has detected different reading results according to one barcode label	Check barcode labels; perform a rescan inventory
C1h-CFh	Reserved	

Drive Errors D0h - D5h

Table 32. Drive Errors D0h - D5h

Error Code	Description	Action
D0h	Error at Network Initialization	Check cable connection, check Network configuration, retry operation; if not successful, contact IBM Technical Support
D1h	Telnet Server Error	Check cable connection, power-cycle unit; after several occurrences, contact IBM Technical Support
D2h	Webserver Error	Check cable connection, power-cycle unit; after several occurrences, contact IBM Technical Support
D3h	RMU EEPROM Access Error	Check RMU connectivity, power-cycle unit; after several occurrences, contact IBM Technical Support
D4h	No RMU found	Check RMU connectivity, power-cycle unit; after several occurrences, contact IBM Technical Support
D5h	Error in write data to RMU EEPROM	Check RMU connectivity, power-cycle unit; after several occurrences, contact IBM Technical Support

Network Error F0h - F3h

Table 33. Network Error F0h - F3h

Error Code	Description	Action
F0h	Error at Network initialization	Check cable connection. Check Network configuration. Retry operation. If not successful, contact IBM Technical Support.
F1h	Telnet server error	Check cable connection. Cycle power. After several occurrences, contact IBM Technical Support.
F2h	Web server error	Check cable connection. Cycle power. After several occurrences, contact IBM Technical Support.

Subcode Descriptions

Table 34. Subcode Descriptions

Error Code	Description
00h	No subcode error
01h	Communication timeout
02h	Length expired before expected character received

Table 34. Subcode Descriptions (continued)

Error Code	Description
03h	Any other kind of driver error
10h	Start pattern missing
11h	Sequence enumeration error
12h	Packet length error
13h	Checksum mismatch
14h	End pattern missing
15h	Drive busy - command rejected
16h	General drive error
17h	Byte stuffing error
18h	Command negative acknowledged
21h	Carrier state error.
22h	Repetitions error. Number of repetitions reached.
23h	Move to slot position repetitions error. Number of repetitions at move to slot reached.
24h	Move to eject position repetitions error. Number of repetitions at move to eject position reached.
25h	Belt start error. Start of belt motor unsuccessful.
26h	Belt backward start error. Start of belt motor unsuccessful.
27h	Belt home error. Home carrier at move to home position not found.
28h	Unexpected belt home error. Unexpected home carrier detected at belt movement.
29h	Belt door stop error. Belt stopped by door opening.
2Ah	Belt position error at move to carrier 1 (home slot)
2Bh	Belt position error at move to carrier 2
2Ch	Belt position error at move to carrier 3
2Dh	Belt position error at move to carrier 4
2Eh	Belt position error at move to carrier 5
2Fh	Belt position error at move to carrier 6
30h	Belt position error at move to carrier 7
31h	Belt position error at move to carrier 8
32h	Belt position error at move to carrier 9 (optional)
33h	Belt position error at move to carrier 10 (optional)
35h	Gripper start error. Start of gripper motor unsuccessful
36h	Gripper open error. Gripper open position not reached.
37h	Gripper close error. Gripper close position not reached.
38h	Gripper hold error. Gripper hold/closed position not reached.
39h	Gripper unexpected closed error. Gripper closed although a cartridge should be there.
40h	Slider start error. Start of slider motor unsuccessful.
41h	Slider home error. Slider home position not reached.

Table 34. Subcode Descriptions (continued)

Error Code	Description
42h	Slider forward positioning error. Slider position in forward direction not reached.
43h	Slider complex forward positioning error. Slider position in a complex forward movement not reached.
44h	Slider backward positioning error. Slider position in backward direction not reached.
45h	Slider complex backward positioning error. Slider position in a complex backward movement not reached.
46h	Slider lost steps at forward movement.
47h	Slider lost steps at complex forward movement.
48h	Slider lost steps at backward movement.
49h	Slider lost steps at complex backward movement.
4Ah	Wrong slider start position at forward movement.
4Bh	Wrong slider start position at complex forward movement.
4Ch	Wrong slider start position at backward movement.
4Dh	Wrong slider start position at complex backward movement.
50h	Door open error. Door open position not reached.
51h	Door close error. Door close position not reached.
52h	Door repetitions error. Door close repetitions not reached.
60h	Axis initialization error. Initialization of all axis not successful.
70h	Unknown cartridge error.
71h	Door close error at import/export.
72h	Wrong source carrier state.
73h	Wrong destination carrier state.
74h	Multiple carrier state.
75h	Expected cartridge in transit not found.
76h	Unexpected cartridge in transit found.
81h	Drive wake up failed.
88h	Error accessing the slot status in System Database.
90h	The Robotic load operation could not reach the cartridge present position.
91h	No drive activity after the load operation.
92h	Timeout while loading cartridge.
93h	No drive activity after the unload operation.
94h	Timeout while unloading cartridge.
95h	Drive unload operation terminated unsuccessfully
96h	Robotic could not detect an ejected cartridge at unload operation
97h	No slot was free at Robotic unload operation.

Drive Error Codes

The Autoloader presents each drive error as a single character in the OCP's display. Table 35 describes the codes. To resolve error codes 1 through 9, refer to Table 35.

Attention

If the tape drive detects a permanent error and displays an error code other than 0, it automatically performs a drive firmware dump. If you force a drive dump, the existing dump will be overwritten and error information will be lost. Do not switch OFF power to the Autoloader or the dump data will be lost.

(For Ultrium 3 drives only) If the error code action procedure leads to replacement of the Autoloader, it is *very important* to preserve the active dump information in non-volatile storage *before* switching the library power OFF. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Perform "PRESERVE DUMP (LTO-3 only)" on page 74 *before* powering OFF the drive.

Table 35. Drive error codes. A drive error code appears in the OCP's display of the Autoloader. It clears when you power-off the unit.

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 Autoloader. • When diagnostics have finished running and no error occurred.
1	<p>Cooling problem. The tape drive detected that the recommended operating temperature was exceeded. Perform one or more of the following actions:</p> <ul style="list-style-type: none"> • Ensure that the cooling fan is rotating and is quiet. If not, replace the external fan. • Remove any blockage that could prevent air from flowing freely through the Autoloader. • Ensure that the operating temperature and airflow is within the specified range (see Table 7 on page 16). • If the operating temperature is within the specified range and the problem persists, replace the Autoloader. <p>The error code clears when you power-off the Autoloader or access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</p>
2	<p>Power problem. The tape drive detected that the externally supplied power is either approaching the specified voltage limits (the Autoloader is still operating) or is outside the specified voltage limits (the Autoloader 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 AC voltages are being applied within the tolerances allowed (see Table 5 on page 15). 3. If the proper voltages are being applied but the problem persists, replace the Autoloader. <p>The error code clears when you power-off the Autoloader or access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</p>

Table 35. Drive error codes (continued). A drive error code appears in the OCP's display of the Autoloader. It clears when you power-off the unit.

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: <ul style="list-style-type: none"> Note: Do not force a new dump; the Autoloader has already created one. <ul style="list-style-type: none"> • Server's SCSI interface by using a device driver utility or system tool (for instructions about reading a drive dump from tape, visit the web at http://www.ibm.com/storage/lto) • Ultrium Tape Drive (to copy a drive dump, see "Copying a Drive Dump Log to Server (Host)" on page 185) 2. Power the Autoloader 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, contact your IBM Technical Support Center and send the drive dump (that you collected in Step 1) to them. <p>The error code clears when you power-off the Autoloader or access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</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: <ul style="list-style-type: none"> Note: Do not force a new dump; the Autoloader has already created one. <ul style="list-style-type: none"> • Server's SCSI interface by using a device driver utility or system tool (for instructions about reading a drive dump from tape, visit the web at http://www.ibm.com/storage/lto) • Ultrium Tape Drive (to copy a drive dump, see "Copying a Drive Dump Log to Server (Host)" on page 185). 2. Power the Autoloader off and on, then retry the operation that produced the error. The error code clears when you power-off the autoloader or access the Diagnostic Menu (see "Diagnostic Menu" on page 67). 3. If the problem persists, run the Normal (Long) R/W Test. (See "NORMAL R/W TEST" on page 71.) <ul style="list-style-type: none"> • If the test FAILED, contact IBM Technical Support and replace the Autoloader. • If the test PASSED, ensure that you have installed the latest level of firmware, then contact IBM Technical Support and send the drive dump (that you collected in Step 1) to them.
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 Autoloader will not allow you to insert a cartridge if the current cartridge was successfully ejected. If the problem persists, replace the Autoloader. The error code clears when you power-off the Autoloader or access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</p>

Table 35. Drive error codes (continued). A drive error code appears in the OCP's display of the Autoloader. It clears when you power-off the unit.

Code	Cause and Action
6	<p>Tape drive or media error. The tape 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 Autoloader 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 Autoloader is available, insert the cartridge into the other unit 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 unit and run the Normal (Long) R/W Test (see “NORMAL R/W TEST” on page 71). <ul style="list-style-type: none"> - If the diagnostics fail, replace the Autoloader. - If the diagnostics succeed, the error was temporary. • If the operation fails and another Autoloader is not available, insert a scratch cartridge into the unit and run the Normal (Long) R/W Test (see “NORMAL R/W TEST” on page 71). <ul style="list-style-type: none"> – If the diagnostics fail, replace the Autoloader. – 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 (Long) R/W Test (see “NORMAL R/W TEST” on page 71).</p> <ul style="list-style-type: none"> • If the diagnostics fail, replace the Autoloader. • If the diagnostics succeed, run the Head Test diagnostic (see “DRIVE DIAG” on page 70). <ul style="list-style-type: none"> – If the Head Test diagnostic fails, replace the Autoloader. – If the Head Test diagnostic succeeds, replace the cartridges that caused the problem. <p><u>For Problems with Reading Data:</u></p> <p>If the problem occurred while the Autoloader 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 Autoloader is available, insert the cartridge into the other unit 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 unit and run the Normal (Long) R/W Test (see “NORMAL R/W TEST” on page 71). <ul style="list-style-type: none"> - If the diagnostics fail, replace the Autoloader. - If the diagnostics succeed, the error was temporary. • If another autoloader is not available, insert a scratch cartridge into the unit and run the Normal (Long) R/W Test (see “NORMAL R/W TEST” on page 71). <ul style="list-style-type: none"> – If the diagnostics fail, replace the Autoloader. – If the diagnostics succeed, discard the cartridge. <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 (Long) R/W Test (see “NORMAL R/W TEST” on page 71).</p> <ul style="list-style-type: none"> • If the diagnostics fail, replace the Autoloader. • If the diagnostics succeed, run the Head Test diagnostic (see “DRIVE DIAG” on page 70). <ul style="list-style-type: none"> – If the Head Test diagnostic fails, replace the Autoloader. – If the Head Test diagnostic succeeds, replace the cartridges that caused the problem. <p>The error code clears when you remove the tape cartridge or access the Diagnostic Menu (see “Diagnostic Menu” on page 67).</p>

Table 35. Drive error codes (continued). A drive error code appears in the OCP's display of the Autoloader. It clears when you power-off the unit.

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. Try another tape cartridge. If the problem only occurs with one cartridge, replace the failing cartridge. If the problem occurs with multiple tape cartridges, use the following procedure:</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Attention When you run the Media Test diagnostic, data on the suspect tape will be overwritten. Use only a scratch data cartridge to run the test.</p> </div> <ol style="list-style-type: none"> 1. If possible, run the tape cartridges in a different Autoloader. If the operation in the other unit fails and 6 or 7 displays, replace the media. If the operation succeeds, run the Media Test diagnostic (see "DRIVE DIAG" on page 70) on all the failing cartridges. 2. If the Media Test diagnostic fails, replace the media. If it runs successfully, clean the drive (see "CLEAN DRIVE" on page 58) and run the Normal (Long) R/W Test (see "NORMAL R/W TEST" on page 71). 3. If the Normal (Long) R/W Test fails, replace the Autoloader. If the Normal (Long) R/W Test runs successfully, repeat the operation that produced the original media error. <p>The error code clears when you remove the tape cartridge or access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</p>
8	<p>Tape Drive or SCSI bus/Fibre Loop Failure. The tape drive determined that a failure occurred in the tape drive's hardware or in the SCSI bus/Fibre loop. Ensure that all cables on the back of the Autoloader are seated securely and ensure that the SCSI/Loop IDs are correct. See "Verifying SCSI/Loop IDs" on page 197.</p> <p>If the problem persists, run the wrap test diagnostics. See "SCSI / FIBRE WRAP TEST" on page 72.</p>
9	<p>Tape drive or RS-422 error. The tape drive determined that a failure occurred in the tape drive's hardware or in the RS-422 connection. Replace the Autoloader. The error code clears 10 seconds after the drive detected the error or when you access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</p>
o, c, b, h, E, or F	<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 your Autoloader's firmware or this book. Refer to the latest version of the firmware or this book.</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 Autoloader. The drive is usable. The error code clears when you power-off the Autoloader or access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</p>
B	<p>No error or message is assigned. See error code 8 in this table.</p>
C	<p>The tape drive needs to be cleaned. Clean the tape drive. See "CLEAN DRIVE" on page 58.</p> <p>The error code clears when you clean the tape drive or access the Diagnostic Menu (see "Diagnostic Menu" on page 67).</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.</p>
D	<p>No error or message assigned. See error code 0 in this table.</p>

Table 35. Drive error codes (continued). A drive error code appears in the OCP's display of the Autoloader. It clears when you power-off the unit.

Code	Cause and Action
E	<p>Informational message. The Fibre Channel port on the tape drive 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.</p> <p>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. After a reset, the drive comes online.</p>
F	<p>No light over Fibre Channel. The error code clears when the drive detects light or when you place the drive in maintenance mode.</p>

Access Protocol

All three Autoloader communication methods (OCP, RMU, and serial) can simultaneously be active on the lowest level (Information only).

- RMU: Standard user
- OCP: Online
- Serial: lgo (logout)

However, only one of the three methods can be active at any one time on the Administrator or Service levels (RMU and serial) or at the Offline level (OCP). The other two can remain active on the lowest level. If an attempt to login is made on either of the other two while the third has the highest level access, an "Already Reserved" message is displayed. The RMU will only allow access by a Standard user at the login panel.

For best results:

- If communicating via the OCP, return to the Home Screen before attempting to communicate via the RMU or serial port.
- If communicating via the RMU, log out before attempting to communicate via the OCP or serial port.
- If communicating via the serial port, log out before attempting to communicate via the OCP or RMU

Copying a Drive Dump Log to Server (Host)

A drive dump log is a collection of drive information. It can be copied to your server (host) via serial communication or 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 support site (<http://www.ibm.com/storage/lto>).

The ITDT tool offers multiple functional capabilities that simplify the task of updating tape and library firmware. It is available for most major platforms (Windows, AIX, Sun, Linux, Netware, and so on), and requires no special device drivers. This tool is similar to the LTO-TDX *drive-only* firmware update and dump retrieval tool described later in this chapter.

Note: The ITDT tool is available on the IBM website <http://www.ibm.com/storage/support/lto>. In addition to the executable file (.exe), a README file will be posted on the web page. The README file describes the features and capabilities of the ITDT tool, provides downloading instructions, and gives detailed information on how to use the tool.

You use the ITDT tool to perform the following tasks:

- Update firmware using SCSI to all IBM LTO Tape Drive and Tape Library products (non-IBM devices may not be selected).
- Upload drive and library dump files
- Perform drive and library diagnostics, including drive read/write diagnostics

The ITDT tool is a command line utility. To invoke it, enter the executable *itdt* from the directory where the tool is located. The Help feature gives a brief explanation of each function and shows the required syntax.

LTO-TDX: LTO SCSI and Fibre Drive Firmware Download & LTO Drive Dump Upload Tool

The tool, LTO-TDX, is an alternative method for downloading LTO drive firmware across the SCSI bus or fibre channel. In addition, this tool can be used to upload LTO drive error dumps. The following information describes how to obtain the tool and lists its capabilities.

1. The tool supports all IBM LTO 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 firmware logs from the drive to a computer system
3. The tool is distributed from the IBM web site. Download the tool by visiting <http://www.ibm.com/storage/support/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, a license agreement will be presented. This license agreement must be accepted 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 starting 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. The user 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 must 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 shall 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 Log Dump Function

1. When the dump function is executed on a drive, the tool shall 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.

Via Serial Communication

To copy a drive dump log to your server (host) via serial communication, follow these instructions:

1. On your Windows desktop, click **Start—>Programs—>Accessories—>Communications—>HyperTerminal**.

Note: Other applications similar to HyperTerminal exist. If you are using an application other than HyperTerminal, please refer to that application's documentation for instructions.

2. On the Connection Description window:
 - Type in "3581".
 - Click OK.



Figure 128. HyperTerminal Connection Description window

3. On the Connect To window:
 - Select the COM port that the serial cable was plugged into on the rear of your server (host).
 - Click **OK**.



Figure 129. HyperTerminal Connect To window

4. On the COMx Properties window:
 - Select the following port settings:
 - Bits per second = 38400
 - Data bits = 8
 - Parity = None
 - Stop Bit = 1
 - Flow control = None
 - Click **OK**.

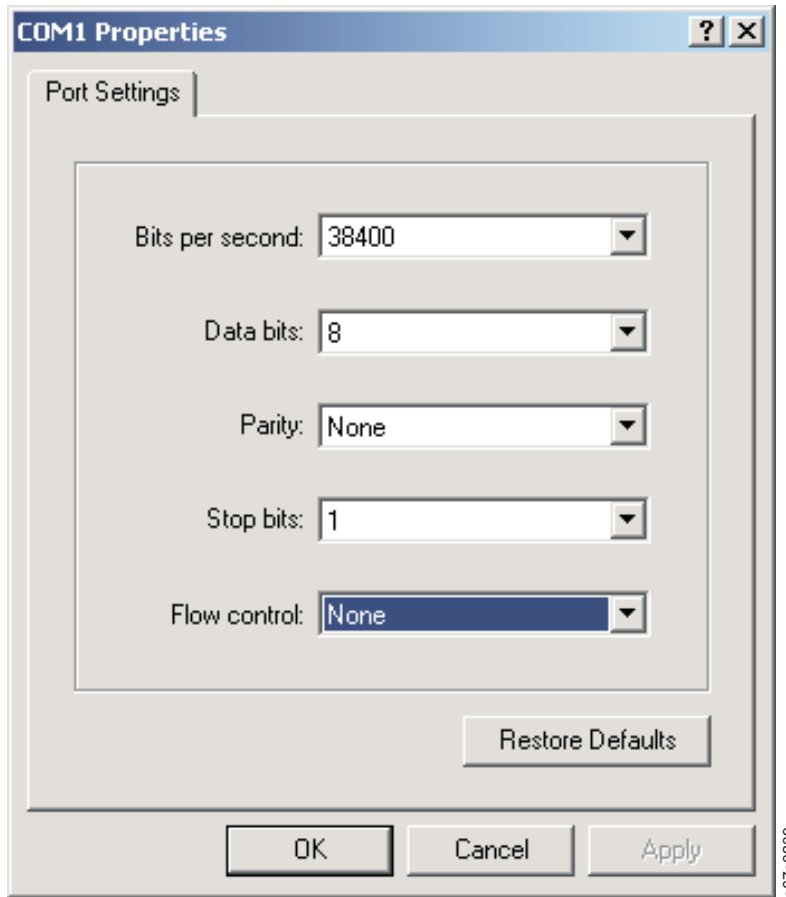


Figure 130. HyperTerminal COMx Properties window

5. Press **Enter**.

If you see the following window, all went well and you are able to use the Serial Monitor. If you see nothing like this or only scrambled characters, check your connection parameters.

```
TSMON>
```

6. At the TSMON> prompt, type "help".

```
TSMON>help
```

7. Press **Enter**.

8. To access the administrator serial menu:

- a. Type "lgi" and press **Enter**.

```
TSMON>lgi
```

Note: Both the OCP and RMU must be online (logged out) before the serial port will allow login.

- 1) For the User ID, type "admin" (Administrator) or the new Administrator User ID set for the RMU.

```
TSMON>lgi  
User ID:admin
```

- 2) For the password, type "secure" (Administrator) or the new Administrator password set for the RMU.

```
TSMON>lgi  
User ID:admin  
Password:secure
```

- 3) Press **Enter**.

9. Press **Enter**.

10. At the next TSMON> prompt, type "ddmp".

```
TSMON>ddmp
```

11. Press **Enter**. You should see the following screen.

```
TSMON>ddmp  
Please start data download  
using XMODEM protocol!
```

Note: If the Autoloader has timed out, press **Enter** for a fresh screen and start this procedure over.

12. In the screen's toolbar, select **Transfer** then **Receive File...**

13. On the Receive File window:

- Browse to the directory on your server (host) where the file will be saved.
- Select XMODEM for Use receiving protocol.
- Click **Receive**.

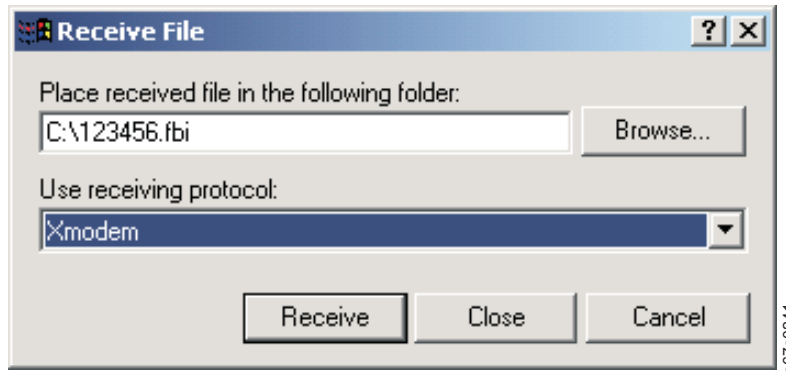


Figure 131. Receive File window

14. On the Receive Filename window:
 - a. Enter the desired file name under which to save the file if not already present.
 - b. Click **OK**.
15. Type "lgo" at the TSMON> prompt to logout.

TSMON>lgo

Via RMU

To copy a drive dump log to your server (host) via the RMU, follow these instructions:

1. Navigate to the **Logs Menu** in the RMU.
2. Select **Drive** in the **Logs Menu**.
3. Select **Error** for **Log Type**.
4. Click on **SUBMIT** to update the log.
5. Click **OK** to **Dump Log** to a file on your server (host).

Copying Autoloader Error Log and Trace Log Files to the Server (Host)

Autoloader error and trace logs are collections of Autoloader information. These logs can be copied to your server (host) via serial communication or the RMU.

Via Serial Communication

To copy an error log or trace log to your server (host) via serial communication, follow these instructions:

1. On your Windows desktop, click **Start**—>**Programs**—>**Accessories**—>**Communications**—>**HyperTerminal**.

Note: Other applications similar to HyperTerminal exist. If you are using an application other than HyperTerminal, please refer to that application's documentation for instructions.

2. On the Connection Description window:
 - Type in "3581".
 - Click **OK**.

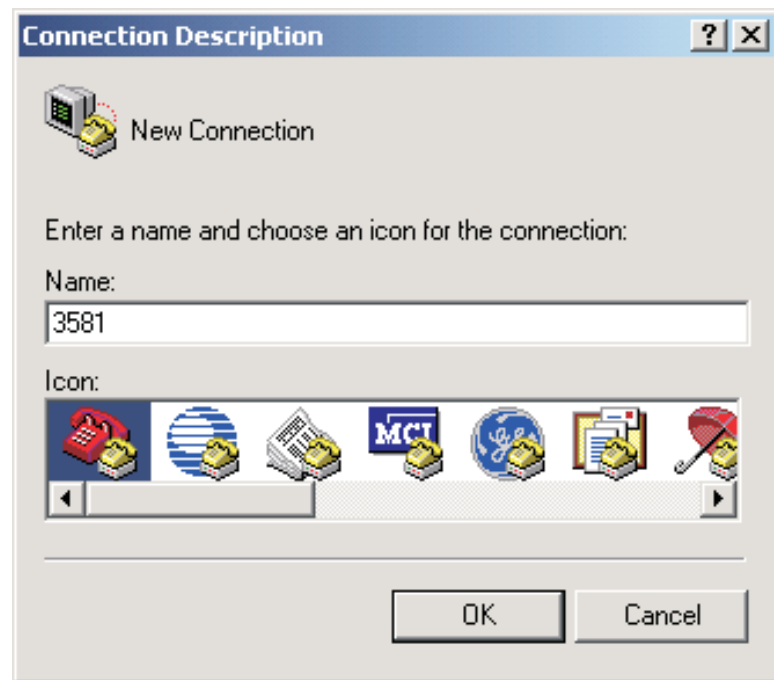


Figure 132. HyperTerminal Connection Description window

3. On the Connect To window:
 - Select the COM port that the serial cable was plugged into on the rear of your server (host).
 - Click **OK**.



Figure 133. HyperTerminal Connect To window

4. On the COMx Properties window:
 - Select the following port settings:
 - Bits per second = 38400
 - Data bits = 8
 - Parity = None
 - Stop Bit = 1
 - Flow control = None
 - Click **OK**.

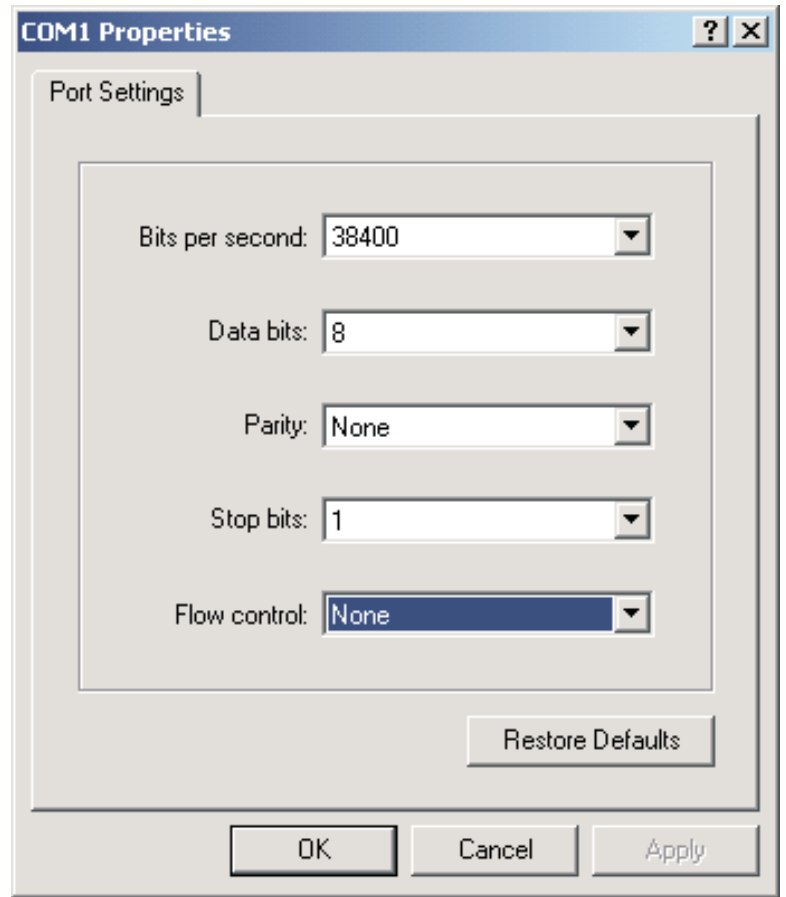


Figure 134. HyperTerminal COMx Properties window

5. Press **Enter**.

If you see the following window, all went well and you are able to use the Serial Monitor. If you see nothing like this or only scrambled characters, check your connection parameters.

```
TSMON>
```

6. At the TSMON> prompt, type "help".

```
TSMON>help
```

7. Press **Enter**.

8. To access the administrator serial menu:

- a. Type "lgi" and press **Enter**.

```
TSMON>lgi
```

- 1) For the User ID, type "admin" (Administrator) or the new Administrator User ID set for the RMU.

```
TSMON>lgi  
User ID:admin
```

Note: Both the OCP and RMU must be online (logged out) before the serial port will allow login.

- 2) For the password, type "secure" (Administrator) or the new Administrator password set for the RMU.

```
TSMON>lgi  
User ID:admin  
Password:secure
```

- 3) Press **Enter**.

Note: If the Autoloader has timed out, press **Enter** for a fresh screen and start this procedure over.

9. In the screen's toolbar, select **Transfer** then **Capture Text...**

- a. Select the path or folder and the file name desired. It is suggested to use the date in the file name and give it a .txt extension. (Example: c:\temp\mar23err-log.txt).
- b. Click Start.

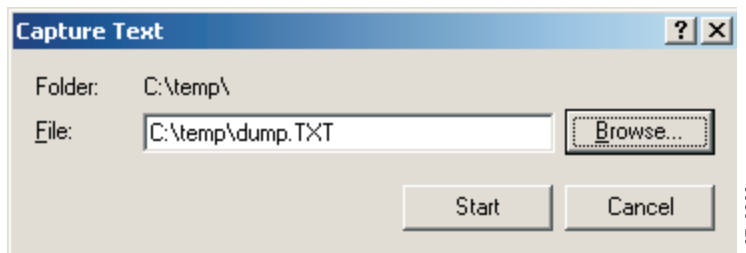


Figure 135. HyperTerminal Capture Text window

10. At the next TSMON> prompt, type "edp" for an error log or "tdp" for a trace log.

```
TSMON>edp
```

11. Press **Enter**.
12. When the file completes scrolling across the monitor, click on the **Transfer** selection again, choose **Capture Text...** and then click **Stop**.
13. Attach the just created file to a memo and email to the desired destination.
14. Type "lgo" at the TSMON> prompt to logout.

```
TSMON>lgo
```


Via RMU

To copy error or trace logs to your server (host) via the RMU, follow these steps:

1. Navigate to the **Logs Menu** in the RMU.
2. Select **Loader** in the **Logs Menu**.
3. Select **Error** or **Trace** as the **Log Type**.
4. Click on **UPDATE** to update the log.
5. Click on **OK** to **Dump Log**.

Obtaining Autoloader and Drive Error Information from Different Servers (Hosts)

For information on obtaining Autoloader and drive error information from different IBM and non-IBM servers (hosts), see “Messages” on page 233.

TapeAlert Flags

For a listing of TapeAlert Flags supported by the Autoloader and the tape drive, see “TapeAlert Flags” on page 227.

Sense Data

For information on Autoloader and drive sense data and information on using host sense data, see “Sense Data” on page 241.

Verifying SCSI/Loop IDs

SCSI ID (Model L28/L38/L3H) and Loop ID (Model F28/F38/F3H) can be verified via the OCP or the RMU.

To verify the SCSI ID via the OCP, see “CHANGE SCSI ID” on page 61. To verify the SCSI ID via the RMU, see “Drive (Models L28/L38/L3H and F28/F38/F3H)” on page 127.

To verify the Loop ID via the OCP, see “CHANGE LOOP ID” on page 76. To verify the Loop ID via the RMU, see “Drive (Models L28/L38/L3H and F28/F38/F3H)” on page 127.

Power/External Fan Analysis Procedure

If the Autoloader does not power on:

1. Ensure power cord is plugged in at the Autoloader and at the electrical outlet.
2. Try another electrical outlet or plug another device into outlet to test.
3. Try another power cord.
4. If none of the above are successful in restoring power to the unit, replace the Autoloader (see “Removing/Replacing the Autoloader” on page 204).

If air does not flow from the external fan on the rear panel of the Autoloader:

1. Ensure power is switched off and the power cord removed.
2. Ensure the external fan is making a firm connection by removing and replacing the fan (see “Removing/Replacing the External Fan” on page 208).
3. Plug the power cord into the Autoloader and switch on the **POWER** button.

4. If the Autoloader power comes on, but the fan remains off, replace the rear fan (see "Removing/Replacing the External Fan" on page 208).

RMU Analysis Procedure

Note: Both the OCP and the serial port must be online (logged out) before the RMU can complete its Administrator or Service login.

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

- Ensure that the RMU attachment is securely plugged and fastened to the RMU connector in the rear of the Autoloader.
- Ensure that the correct IP, Gateway, and Netmask addresses are keyed into the network parameters. From the OCP, navigate to NET PARAMETER in the **Configuration Menu**.
- Ensure that the correct IP address is being used on the web browser.
- If the ethernet connection is a direct connection between the PC and the Autoloader, ensure that a special "crossover" ethernet cable is being used. Otherwise, if the Autoloader connection is made to a network hub or switch, ensure that a normal "straight-through" ethernet cable is being used.
- Check the ethernet cable carefully (or try another cable) and, if the RMU is connected to a network hub or switch, try a different port.
- Ensure that the Network Setting is switched ON via the Operator Control Panel or the serial communication.

If the RMU is still malfunctioning, replace the RMU parts in the following order:

1. RMU (see "Removing/Replacing the RMU" on page 212 then "Parts Lists" on page 217)
2. Autoloader (see "Removing/Replacing the Autoloader" on page 204)

BCR Analysis Procedure

If the server (host) has reported inventory problems relating to inability to read bar code labels, or, if some or all of the cartridge labels are not being displayed on the RMU (Status: Media), use the following procedure to determine if the BCR needs to be replaced.

- Ensure that a supported bar code label (or labels) are being used. Also, check for damaged labels. See "Bar Code Label" on page 145.
- Ensure that the bar code function configuration has been enabled properly:
 - From the OCP, navigate to BARCODE READER in the **Configuration Menu**.
 - BCR *must* be configured to ON. If it is OFF, change to ON.
- Power off the Autoloader and remove the BCR (see "Removing/Replacing the Bar Code Reader (BCR)" on page 210).
- Clean the lens with a lint-free cloth.
- Check pins and connector for damage.
- Reinstall the BCR (see "Removing/Replacing the Bar Code Reader (BCR)" on page 210).
- Power on the Autoloader.

- Perform a re-inventory via the OCP (see “RE-INVENTORY” on page 60) or view the inventory via the RMU (see “Media (Models L28/L38/L3H and F28/F38/F3H)” on page 129) to determine if the labels are now being read.

If the BCR is still not functioning properly, replace the BCR (see “Removing/Replacing the Bar Code Reader (BCR)” on page 210).

HVD Converter Analysis Procedure

The HVD Converter Analysis Procedure involves running a wrap test. For information on running a SCSI or Fibre Channel wrap test, see “SCSI / FIBRE WRAP TEST” on page 72.

Tape Unload/Export Problems Procedure

Unload Problems

If a cartridge will not respond to the UNLOAD CARTRIDGE command in the **Commands Menu**, this means that a cartridge will not unload from the Autoloader’s drive.

Attention

(For Ultrium 3 drives only) Before attempting to remove a tape from the Autoloader or drive, it is *very important* to preserve the active dump information in non-volatile storage in case the Autoloader has to be replaced. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Perform “PRESERVE DUMP (LTO-3 only)” on page 74 *before* powering OFF the drive.

1. Navigate to UNLOAD CARTRIDGE in the **Commands Menu** and press **Enter** on the OCP.
2. If the cartridge will not unload from the drive, cycle the Autoloader power OFF then ON. This will force a slow rewind of the tape in the drive. It may take as long as 20 minutes for the tape to rewind and the cartridge to unload.
3. If the cartridge still will not eject from the drive, navigate to BULK EXCHANGE in the **Commands Menu** and remove all other cartridges from the Autoloader.
4. Replace the Autoloader. (See “Pre-call Checklist” on page 200 and “Contacting IBM Technical Support” on page 200.)

Export Problems

If a cartridge in the Autoloader will not respond to EXPORT or BULK EXCHANGE in the “Commands Menu” on page 55, this means that a cartridge is stuck in the Autoloader.

1. Navigate to EXPORT in the “Commands Menu” on page 55 and attempt to export the cartridge.
2. If the cartridge will not export, try the BULK EXCHANGE command.
3. If the cartridge still will not export from the Autoloader, replace the Autoloader. See “Pre-call Checklist” on page 200 and “Contacting IBM Technical Support” on page 200.

Pre-call Checklist

If you have questions or problems concerning the Autoloader, perform the following steps before placing a call to IBM Technical Support.

Note: Where instructions refer you to the web, visit <http://www.ibm.com/storage/support/lto/>.

- ___ Step 1. Verify that the drive's firmware is at the most recent level (see "Information Menu" on page 49). To determine the latest release of firmware, visit the web.
- ___ Step 2. Verify that your device drivers are at the most recent level (see your server (host) manual for instructions).
 - For the latest release of IBM device drivers, visit the web.
 - For the latest release of device drivers by independent software vendors (ISVs), visit the appropriate third-party web site.
- ___ Step 3. Verify whether your hardware and software configuration is supported. To determine the latest supported attachments, visit the web.
- ___ Step 4. Perform a general checkup of the hardware and connections:
 - Ensure that you are using the correct SCSI terminator and that you are not mistakenly using a SCSI wrap plug (used for the diagnostic SCSI wrap test).
 - Ensure that the SCSI cable connector does not contain bent or recessed pins.
 - Ensure that all retention screws for the SCSI cable and terminator are securely tightened.
- ___ Step 5. If you still have a problem after completing the above steps, see "Contacting IBM Technical Support."

Contacting IBM Technical Support

Perform the steps in "Pre-call Checklist" before placing a call to IBM Technical Support.

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

The IBM Support Center will assist with problem determination and initiate shipment of a replacement part, if needed, to the customer's location. Transportation costs, both ways, are paid by IBM. The replacement part becomes the property of the customer in exchange for the failed part, which becomes the property of IBM. The customer must transfer the machine type, model, and serial number of the failing unit to the replacement unit. The customer is responsible for packing the failed part into the shipping carton that contained the replacement part. The customer is responsible for contacting IBM to arrange for its collection in most major cities outside of People's Republic of China (PRC). Failure to return the failed part to IBM within 30 days will result in the customer being billed for the new list price. The customer is responsible for installing and setting up the replacement part. For PRC, the customers are required to bring the failed part to the nearest IBM authorized service center to obtain the replacement part.

Failure to use the carton in which the replacement part was received, or failure to otherwise properly pack the returned part, could result in charges being incurred

by the customer for damage to the failed part during shipment. Failure to fill out and affix the repair identification (RID) tag to the replacement unit with the machine type, model, and serial number of the failing unit could result in losing the warranty for the replacement unit.

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

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

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

Removal and Replacement Procedures

Safety Inspection

Before servicing the 3581 Tape Autoloader, perform the following safety inspection procedure:

- ___ Step 1. Stop all activity on the SCSI bus.
- ___ Step 2. Power off the Autoloader.
- ___ Step 3. Unplug the Autoloader's power cord from the electrical outlet and then from the rear of the unit.
- ___ Step 4. Disconnect all cables and terminators and inspect for damage.
- ___ Step 5. Check the Autoloader's power cord for damage, such as a pinched, cut, or frayed cord.
- ___ Step 6. Check the cover of the Autoloader for sharp edges, damage, or alterations that expose its internal parts.
- ___ Step 7. Check the cover of the Autoloader for a proper fit. It should be in place and secure.
- ___ Step 8. Check the product label on the bottom of the Autoloader to make sure it matches the voltage at your outlet.

Removing/Replacing the Autoloader

To remove and replace the Autoloader, follow the instructions in the sections below:

Tools Required

- T10 Torx wrench or small flat-blade screwdriver

Before Powering OFF the Autoloader

1. Ensure that all the data cartridges have been removed from the tape drive and Autoloader.
 - a. If necessary, perform UNLOAD CARTRIDGE in the “Commands Menu” on page 55 to unload any cartridge in the drive.
 - b. If necessary, perform BULK EXCHANGE in the “Commands Menu” on page 55 to export all cartridges from the Autoloader.
2. If the Autoloader is to be replaced, perform the Preserve Dump procedure (see “PRESERVE DUMP (LTO-3 only)” on page 74) before powering off.

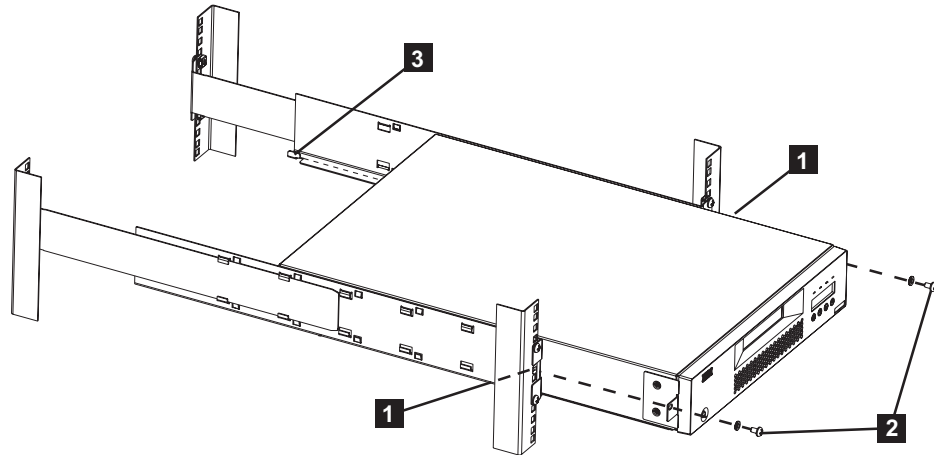
Note: To aid in failure analysis for LTO-3 tape drives, prior to *removing* the failing drive and while the power is still enabled to the drive, it is very important to preserve any available drive dump that may be in the active dump area in the drive memory.

3. (*For Ultrium 3 drives only*) Before removing the Autoloader, it is very important to preserve the active dump information in non-volatile storage *before* switching the library power OFF. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Perform “PRESERVE DUMP (LTO-3 only)” on page 74 *before* powering OFF the drive.
4. Before removing or powering off the failing autoloader, ensure that the configuration VPD information from the failing autoloader is available for transfer to the replacement autoloader.
 - If a properly functioning RMU is installed on the failing autoloader, and can be moved to the replacement autoloader, the VPD information can be transferred from the RMU.
 - If the failing autoloader does not have the RMU feature installed, or the RMU is not functioning properly, the VPD information will have to be restored using the OCP. Refer to the “Autoloader Configuration Form” on page 251 for the data to be entered.
 - If the VPD information has to be restored using the OCP, and the “Autoloader Configuration Form” on page 251 was not filled out when the autoloader was installed, it will be necessary to retrieve the VPD information from the failing autoloader before it is removed. See “Configuring a Model L28/L38/L3H Autoloader” on page 91 or “Configuring a Model F28/F38/F3H Autoloader” on page 99 to retrieve the VPD information.

Removing the Autoloader

- ___ Step 1. Power off the Autoloader.
- ___ Step 2. Unplug the power cord from the electrical outlet and then from the rear of the Autoloader.
- ___ Step 3. Unplug all cables.
- ___ Step 4. If necessary, remove the Autoloader from its rack.

- ___ Step a. Remove the screws from the rack mount brackets on the Autoloader.



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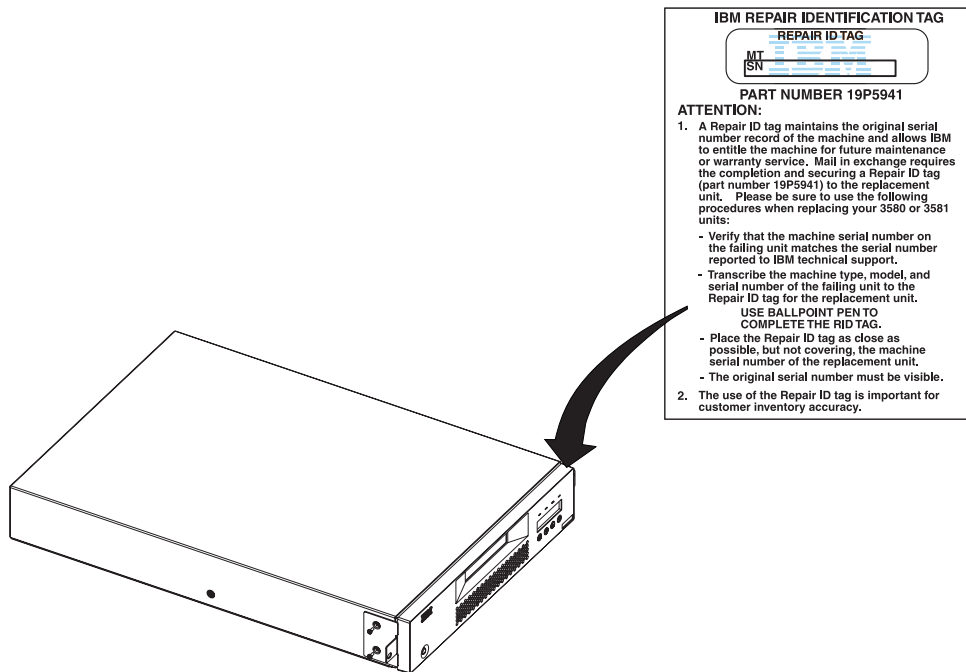
Figure 136. Removing Autoloader from a rack

- ___ Step b. Slide the Autoloader out of the rack.
- ___ Step c. Remove the rack mount brackets from the Autoloader.
- ___ Step d. Store the brackets and screws.
- ___ Step 5. Remove all options installed (BCR, RMU, HVD Converter).
- ___ Step 6. Put the Autoloader in its original packaging or similar materials.
- ___ Step 7. Contact your sales representative or IBM Service Personnel for shipping instructions.

Replacing the Autoloader

Attaching the RID Tag

The Repair Identification (RID) Tag will be included with an Autoloader replacement unit. Copy the machine type (3581), model type (L28/L38/L3H or F28/F38/F3H), and serial number of your original Autoloader onto the RID Tag. Adhere the tag to the top, front, right corner of your replacement autoloader unit. This information links your replacement unit to your existing warranty.



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Figure 137. Repair Identification Tag

Installing the Replacement Autoloader

For instructions on installing the replacement Autoloader, see “Installation” on page 17.

Configuration Changes

After installing the replacement Autoloader, complete the following configuration changes.

If an RMU was installed on the original Autoloader and has been moved to the replacement Autoloader, proceed to “Restore VPD Configuration from the RMU.” If an RMU is not installed, proceed to “Restore VPD Configuration from the OCP” on page 207.

Note:

- The replacement Autoloader Administrator password will be the default password (“secure”).
- Network settings (IP, Mask, and Gateway addresses) must be entered via the OCP before RMU communications can occur.

Restore VPD Configuration from the RMU:

1. Power on the Autoloader and wait for initialization to complete.
2. Login to the RMU as Administrator.
3. Select **Reset** in the **Configuration Menu**.
4. Press the **Restore Vital Product Data** button.

If a *VPD Not Valid* error message is received on the browser monitor, proceed to “Restore VPD Configuration from the OCP” on page 207. An error message will be received if a **Save Vital Product Data** was not performed as instructed in the installation instructions.

5. From the OCP or from the RMU, verify that the VPD items are correct. If any of the VPD items (see "Configuring Your Autoloader" on page 41) are not correct because the "saved" item list on the RMU was not at the latest level, proceed to "Restore VPD Configuration from the OCP" for the item or items that need to be corrected.
6. Resume normal operations.

Restore VPD Configuration from the OCP:

- ___ Step 1. Change the Serial Number on the replacement Autoloader with the Serial Number of your original Autoloader. This is for warranty purposes. To change the Serial Number:
 - a. Navigate to the **Configuration Menu** (see "Configuration Menu" on page 60 [for Model L28/L38/L3H] and "Configuration Menu" on page 76 [for Model F28/F38/F3H]).
 - b. Press *Enter*, then *Next* or *Previous*, as necessary, to access SERIAL NUMBER.
 - c. Press *Enter* to display the CHANGE SER NUM screen.
 - d. Use *Next* and *Previous* to select each digit in the new serial number. Press *Enter* to initiate each new digit and move to the next digit to be changed.
 - e. Press *Cancel*:
 - One time to return to the SERIAL NUMBER screen.
 - Two times to return to the **Configuration Menu** screen.
- ___ Step 2. For Model F28/F38/F3H, to change the World Wide Node Name:
 - a. Refer to the "Autoloader Configuration Form" on page 251 that was filled out when you installed your original Autoloader for the original World Wide Node Name.
 - b. Press *Enter*, then *Next* or *Previous*, as necessary, to access WW NODE NAME.
 - c. Press *Enter* to display the CHANGE NODE NAME TO: OVERWRITE NN screen.
 - d. Press *Enter* to access the current Node Name.
 - e. Use *Next* and *Previous* to select each digit in the new name. Press *Enter* after each digit is selected to initialize the digit and move to the next digit to be changed.
 - f. Cycle power on the Autoloader. After the power has cycled, the Home Screen will display.
- ___ Step 3. For Model F28/F38/F3H, restore Loop ID, FC Port type, operating mode, FC Speed, and BCR enablement to the original values (see the "Autoloader Configuration Form" on page 251 filled out at installation time for values). Refer to "Configuring a Model F28/F38/F3H Autoloader" on page 99 for instructions.
- ___ Step 4. For Model L28/L38/L3H, restore SCSI ID, operating mode, SCSI Speed, and BCR enablement to the original values (see the "Autoloader Configuration Form" on page 251 filled out at installation time for values). Refer to "Configuring a Model L28/L38/L3H Autoloader" on page 91 for instructions.

Removing/Replacing the External Fan

Tools Required

- T10 Torx wrench or a small, flat-blade screwdriver

Removing the External Fan

To remove the external fan located on the rear panel of the Autoloader, complete the following steps:

- Step 1. Power off the Autoloader.
- Step 2. Unplug the Autoloader's power cord from the electrical outlet and from the rear of the Autoloader.
- Step 3. Remove any SCSI cable or SCSI terminator from the LVD SCSI connectors **1** and remove any connector from the serial port **2**. (Connections on the SCSI connectors or serial port will interfere with the fan housing as it swings out to remove the captured tabs).
- Step 4. Loosen the two captured thumbscrews that fasten the fan housing to the Autoloader chassis.
- Step 5. Pull gently on the right side (side containing the thumbscrews) of the fan housing until the power connector pulls free of the receptacle (**4**) and the fan housing is rotated until it is perpendicular with the Autoloader rear panel.
- Step 6. Pull the fan housing straight back, removing the tabs from the openings (**3**) on the Autoloader's rear panel.
- Step 7. Proceed to "Replacing the External Fan," if you are replacing the fan immediately.

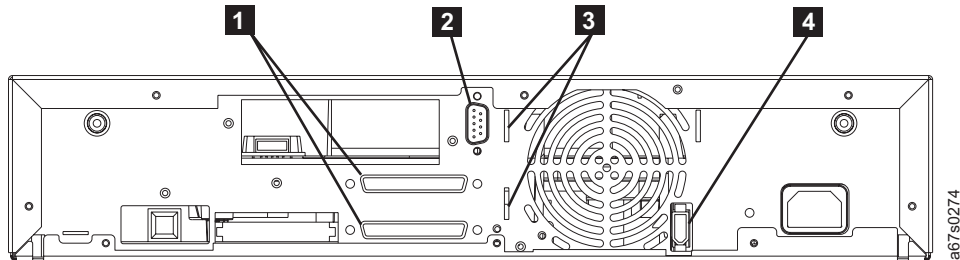


Figure 138. Autoloader rear panel with the External Fan removed

Replacing the External Fan

- Step 1. Power off the Autoloader.
- Step 2. Unplug the Autoloader's power cord from the electrical outlet and from the rear of the Autoloader.
- Step 3. Remove any SCSI cable or SCSI terminator from the LVD SCSI connectors **1** and remove any connector from the serial port **2**. (Connections on the SCSI connectors or serial port will interfere with installing the fan housing).
- Step 4. Insert the tabs on the fan housing into the openings (**3**) on the rear panel of the Autoloader.
- Step 5. Ensure that the fan's power connector docks into the power receptacle (**4**) in the fan opening on the rear panel of the Autoloader.

- Step 6. Align thumbscrews on the fan housing with the holes on the rear panel of the Autoloader.
- Step 7. Tighten the thumbscrews.
- Step 8. Reconnect any SCSI cable or SCSI terminator to the LVD SCSI connectors **1** on the rear panel of the Autoloader.
- Step 9. Reconnect any serial cable connector to the serial port connector **2**.
- Step 10. Plug the Autoloader's power cord into the electrical outlet and the rear of the Autoloader.
- Step 11. Power on the Autoloader

Removing/Replacing the Bar Code Reader (BCR)

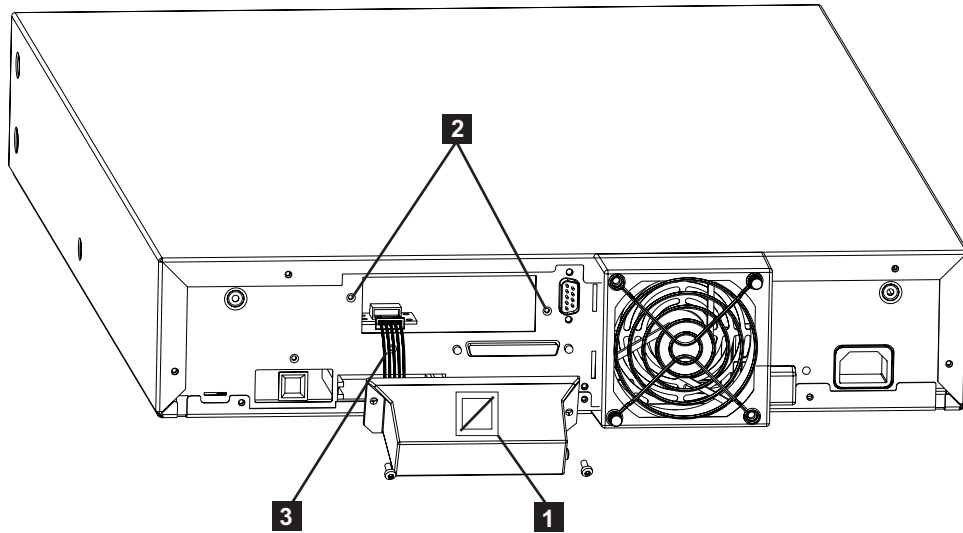


Figure 139. Removing/replacing the BCR

Tools Required

- T10 Torx wrench or small flat-blade screwdriver

Removing the BCR

Follow these procedures to remove the bar code reader from the Autoloader.

1. Power off the Autoloader.
2. Disconnect the power cord from the power outlet.
3. Disconnect the power cord from the rear panel of the Autoloader.
4. Remove all cables from the rear panel of the Autoloader.
5. Remove the screws (**2**) that attach the BCR to the rear panel of the Autoloader.
6. Unplug the BCR cable (**3**) from the controller outlet.
7. Replace the cover panel using the same screws removed from the BCR if a new BCR is not being installed immediately.
8. Pack the BCR in its original packaging for storage or shipping.
9. If a replacement BCR is not being installed immediately:
 - After powering on the unit, disable the BCR through the OCP. Select **BARCODE READER** in the **Configuration Menu**.
 - Select **OFF** in the **BARCODE READER CHANGE TO:** screen.

Replacing the BCR

The following tool is required for this installation:

- T10 Torx wrench or a small, flat-blade screwdriver

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CAUTION:

ESD Sensitive Component. Please touch the unit cover or rear panel before installing the BCR to avoid electrostatic discharge.

Follow these steps to install the BCR on the rear panel of the Autoloader:

Note: See Figure 139 on page 210.

- ___ 1. Power off the Autoloader.
- ___ 2. Disconnect the power cord from the outlet.
- ___ 3. Remove all cables and power cord from the rear panel of the Autoloader.
- ___ 4. Remove the BCR cover plate (**2**) from the rear panel. **Save the screws.** Store the cover plate for future use. The cover plate will be needed if the BCR is ever removed.
- ___ 5. Connect the cable (**3**) to the BCR's controller outlet. Feed the remainder of the cable back into the BCR so it will not block the BCR lens.
- ___ 6. With the label (**1**) facing up, align the screw holes (**2**) on the BCR with the holes left by the cover plate on the rear panel of the Autoloader.
- ___ 7. Attach the BCR with the saved screws from the cover plate.
- ___ 8. Reconnect all cables and power cord to the Autoloader.
- ___ 9. Power on the Autoloader.
- ___ 10. Enable the BCR through the OCP (see "BARCODE READER" on page 65). Select BARCODE READER in the **Configuration Menu**.
- ___ 11. Select **ON** in the BARCODE READER CHANGE TO: screen.

Removing/Replacing the RMU

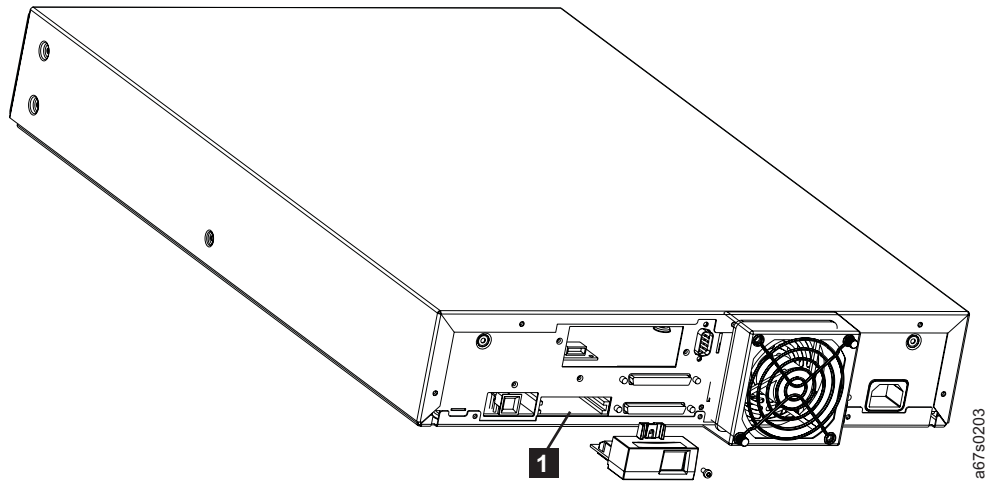


Figure 140. Removing/replacing the RMU

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CAUTION:
Avoid contact with the card on the RMU.

Tools Required

- T10 Torx wrench or small flat-blade screwdriver

Removing the RMU

- ___ Step 1. Power off the Autoloader.
- ___ Step 2. Unplug the power cord from the electrical outlet and then from the rear of the Autoloader.
- ___ Step 3. Remove the screw from the RMU on the rear panel of the Autoloader. Save this screw.
- ___ Step 4. Unplug the RMU from the Autoloader.
- ___ Step 5. If not immediately replacing the RMU, replace the cover plate (**1**) previously removed before installing the RMU, using the same screws removed in Step 3.
- ___ Step 6. Put the RMU in its original packaging or similar materials for storage or shipping.
- ___ Step 7. To resume operations, plug the power cord into the rear panel of the Autoloader, then into the electrical outlet, and power on the unit.

Replacing the RMU

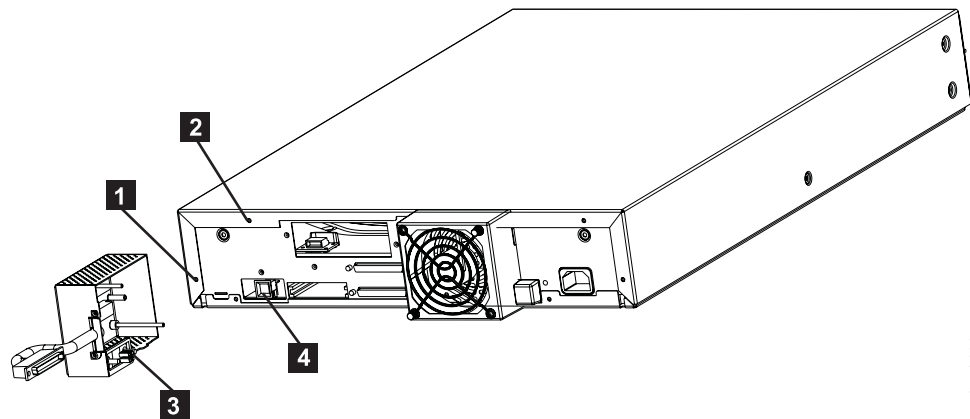
To replace the RMU, complete the following steps:

1. Slide the RMU card into the guide slots at the bottom of the RMU opening on the rear panel of the Autoloader.
2. Insert and tighten the screw to secure the RMU to the Autoloader.
3. Power on the Autoloader and wait for initialization to complete.
4. Login to the RMU as Administrator.
5. Select **Reset** in the **Configuration Menu**.
6. Press the **Save Vital Product Data** button.
7. Resume normal operation.

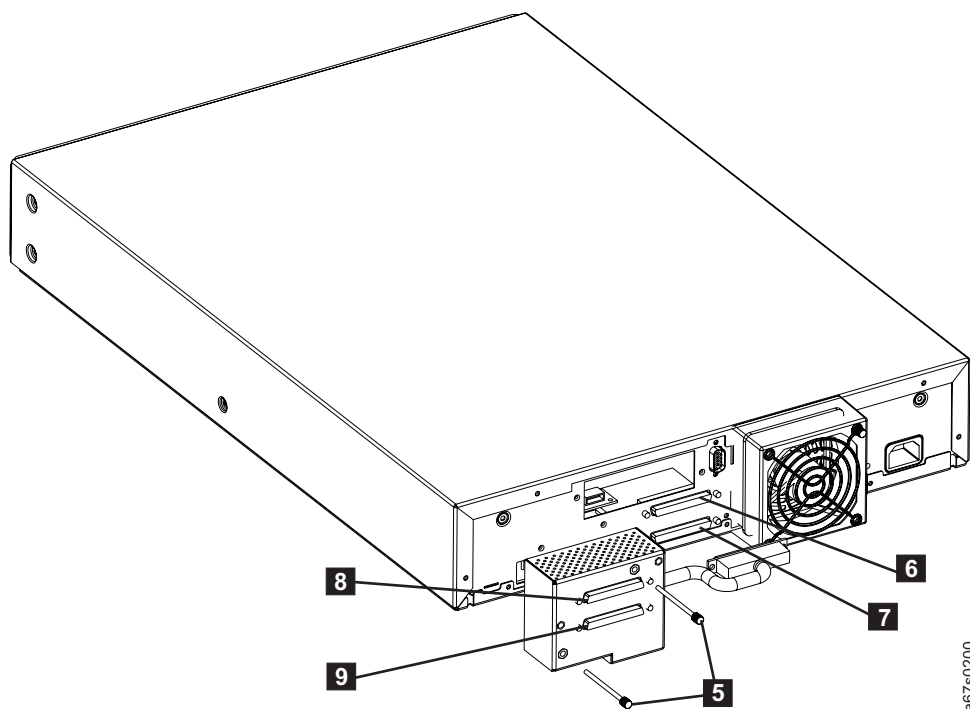
Removing/Replacing the HVD Converter

Tools Required

- Small flat-blade screwdriver



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ac67s0200

Figure 141. Removing/replacing the HVD Converter

Removing the HVD Converter

- Step 1. Power off the Autoloader.
- Step 2. Unplug the Autoloader's power cord from the electrical outlet and then from the rear of the Autoloader.
- Step 3. Remove the SCSI cable and HVD terminator from the HVD Converter's SCSI receptacles (**8** and **9**).
- Step 4. Remove the converter's cable from the LVD SCSI receptacle (**6**) on the Autoloader's rear panel.

- ___ Step 5. Remove the two thumbscrews (**5**) from the converter.
- ___ Step 6. Gently pull straight back on the converter until its power connector **3** pulls free from the power receptacle **4**.
- ___ Step 7. Put the converter in its original packaging or similar materials for storage or shipping.
- ___ Step 8. If you are replacing the HVD Converter immediately, proceed to "Replacing the HVD Converter." Otherwise, replace the cover plate over the HVD Converter opening on the Autoloader's rear panel.
- ___ Step 9. Plug the power cord and LVD cable (**6**) into the rear of the Autoloader.
- ___ Step 10. Plug the power cord into an electrical outlet.
- ___ Step 11. Power on the Autoloader to resume operations.

Replacing the HVD Converter

See Figure 141 on page 214.

- ___ Step 1. Power off the Autoloader.
- ___ Step 2. Unplug the Autoloader's power cord from the electrical outlet and then from the rear of the Autoloader.
- ___ Step 3. Using a T10 Torx wrench, remove the cover plate from the HVD Converter opening (**4**) on the Autoloader's rear panel.
- ___ Step 4. Remove the "replacement" HVD Converter from its packaging (save the packaging).
- ___ Step 5. Remove the two screws (**1** and **2**) from the rear panel of the Autoloader.
- ___ Step 6. Plug in the converter's power connector **3** into the power receptacle **4** in the HVD Converter opening on the Autoloader's rear panel.
- ___ Step 7. Tighten the two thumbscrews (**5**) on the converter into the Autoloader's rear panel.
- ___ Step 8. Plug the converter's SCSI cable into the top LVD SCSI receptacle (**6**) on the Autoloader's rear panel and the LVD terminator into the bottom LVD SCSI receptacle (**7**).
- ___ Step 9. Plug the SCSI cable into the top receptacle (**8**) of the HVD converter.
- ___ Step 10. Plug the HVD terminator into the bottom receptacle (**9**) of the HVD Converter.
- ___ Step 11. Plug the Autoloader's power cord into the electrical outlet and then into the rear of the Autoloader.
- ___ Step 12. Power on the Autoloader

Parts Lists

Table 36 lists orderable models and features, as well as replacement parts for the 3581 Tape Autoloader. To order a part by feature code, contact your local IBM Marketing Representative or Business Partner. If the part has a customer replaceable unit (CRU) number, it is available through the IBM Technical Support Center.

Note: Power cords are listed separately in “Power Cords” on page 218; media supplies are listed in “Ordering Media Supplies” on page 159.

Parts for Autoloader

Table 36 lists the parts for the 3581 Tape Autoloader.

Table 36. Parts list for the 3581 Tape Autoloader

Feature Code (FC)	Description	Model	CRU Part Number
—	IBM 3581 Ultrium Tape Autoloader with LVD SCSI interface	L28/L38/L3H	24R1031
—	IBM 3581 Ultrium Tape Autoloader with Fibre Channel interface	F28/F38/F3H	24R1032
FC 7004	Bar Code Reader	L28/L38/L3H, F28/F38/F3H	24R0969
FC 3104	HVD Converter Kit	L28/L38/L3H	24R0971
FC 1660	RMU	L28/L38/L3H, F28/F38/F3H	24R0970
FC 7003	Rack Mount Kit	L28/L38/L3H, F28/F38/F3H	24R0968
—	Rear Fan	L28/L38/L3H, F28/F38/F3H	24R1030
FC 5302	2.5 m HD68/HD68 SCSI cable	L28/L38/L3H	—
FC 9702	2.5 m HD68/HD68 SCSI cable	L28/L38/L3H	—
FC 5305	5 m HD68/HD68 SCSI cable	L28/L38/L3H	—
FC 5310	10 m HD68/HD68 SCSI cable	L28/L38/L3H	—
FC 5325	25 m HD68/HD68 SCSI cable	L28/L38/L3H	—
FC 5602	2.5 m VHDCI/HD68 SCSI cable	L28/L38/L3H	—
FC 9703	2.5 m VHDCI/HD68 SCSI cable	L28/L38/L3H	—
FC 5604	4.5 m VHDCI/HD68 SCSI cable	L28/L38/L3H	—
FC 5610	10 m VHDCI/HD68 SCSI cable	F28/F38/F3H	—
FC 5625	25 m VHDCI/HD68 SCSI cable	F28/F38/F3H	—
FC 5907	7 m LC/SC Fibre Channel cable	F28/F38/F3H	—
FC 5922	22 m LC/SC Fibre Channel cable	F28/F38/F3H	—
FC 5961	61 m LC/SC Fibre Channel cable	F28/F38/F3H	—
FC 6005	5 m LC/LC Fibre Channel cable	F28/F38/F3H	—
FC 6025	25 m LC/LC Fibre Channel cable	F28/F38/F3H	—
FC 6061	61 m LC/LC Fibre Channel cable	F28/F38/F3H	—
—	RS-232 serial cable	L28/L38/L3H, F28/F38/F3H	19P1061

Table 36. Parts list for the 3581 Tape Autoloader (continued)

Feature Code (FC)	Description	Model	CRU Part Number
—	SCSI LVD/SE terminator	LL28/L38/L3H	19P0874
—	SCSI HVD Differential terminator	L28/L38/L3H with HVD Converter Kit	19P0378
—	SCSI LVD wrap tool	L28/L38/L3H	19P0481
—	Fiber wrap tool	F28/F38/F3H	11P3847
FC 5096	SC/LC Fiber Cable Interposer	F28/F38/F3H	—
FC 5099	VHDCI/HD68 SCSI interposer cable	L28/L38/L3H	—
FC 8002	Cleaning Cartridge	L28/L38/L3H, F28/F38/F3H	—
FC 8101	5-Pack Ultrium 2 Data Cartridge	L28/L38/L3H, F28/F38/F3H	—

Power Cords



To avoid electrical shock, a power cord with a grounded attachment plug has been provided. Use only properly grounded outlets.

Table 37 lists the power cord part number, feature code, the country or region where the power cord can be used, and the plug's standard reference. The last column in the table contains an index number that you can match to a specific receptacle type in Figure 142 on page 221.

All power cords use an appliance coupler that complies with the International Electrotechnical Commission (IEC) Standard 320, Sheet C13.

If the power cord that you receive does not match your receptacle, contact your place of purchase.

Power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL), are certified by the Canadian Standards Association (CSA), and comply with the plug standards of the National Electrical Manufacturers Association (NEMA). For other worldwide geographies, plug standards are listed in Table 37.

Power Cord Information

Table 37. Power cord information

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 142 on page 221
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

Table 37. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 142 on page 221
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
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

Table 37. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 142 on page 221
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 142 on page 221 shows the plugs that are used by the power cords in Table 37 on page 218. Match the index number that is beside each plug to the index number in the table.

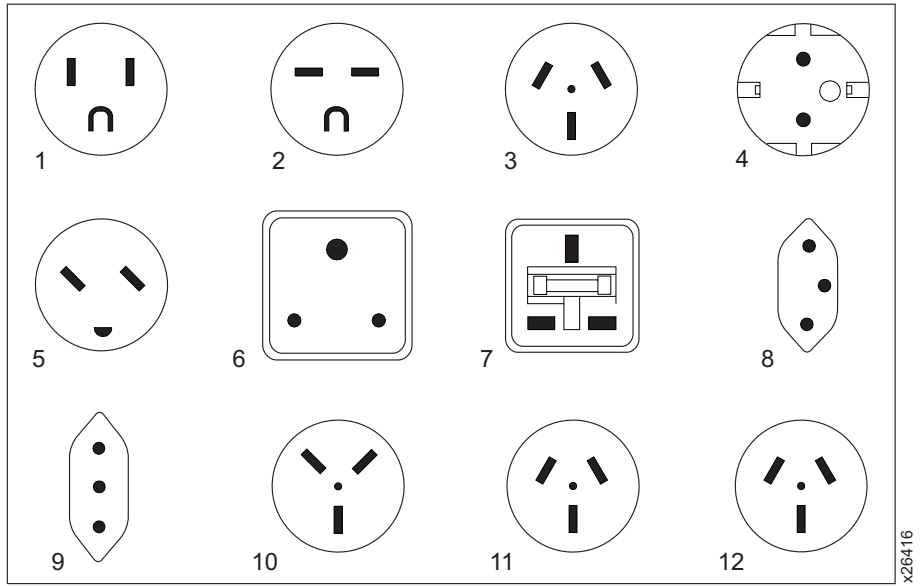


Figure 142. Types of receptacles

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Part 4. Appendixes

Element Addresses

Elements are the locations in the Autoloader that can accept a cartridge. The Autoloader includes three types of elements:

- **Medium transport element:** The cartridge loader and carousel make up the medium transport element. The carousel positions the specified cartridge in front of the tape drive and the cartridge loader moves the cartridge between the tape drive and the storage slot.
- **Storage elements:** The eight cartridge slots in the Autoloader are storage elements.
- **Data transfer element.** The tape drive is a data transfer element that reads and writes data as requested by the host.

The Autoloader maintains current information about each element in its cartridge inventory, which is stored in memory.

Each of the elements in the Autoloader requires an address so it can be identified by SCSI commands. Figure 143 on page 226 shows the default address assigned to each element in the Autoloader.

In addition to element addresses, each of the cartridge slots is assigned an element index. The element indexes are identical to the default element addresses. Unlike the element addresses, the element indexes are permanently coded in the Autoloader's firmware and cannot be changed.

The OCP's LCD displays the element indexes, not the element addresses for the cartridge slots. The slot numbers are displayed in hexadecimal format (1h through 8h).

Use the MODE SELECT command to change the address of each element in the Autoloader.

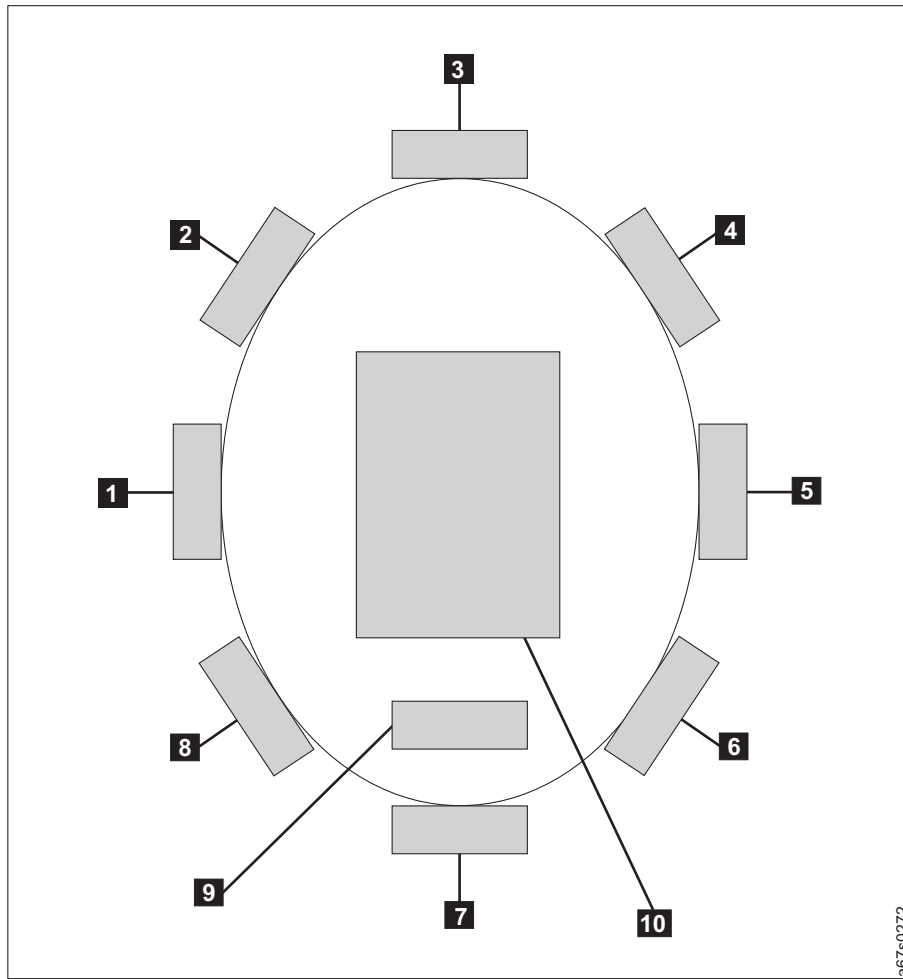


Figure 143. Default Element Addresses and Element Indexes

	Element Description	Element Address (hex)	Element Indexes
1	Cartridge Slot 1	1 (1h)	1
2	Cartridge Slot 2	2 (2h)	2
3	Cartridge Slot 3	3 (3h)	3
4	Cartridge Slot 4	4 (4h)	4
5	Cartridge Slot 5	5 (5h)	5
6	Cartridge Slot 6	6 (6h)	6
7	Cartridge Slot 7	7 (7h)	7
8	Cartridge Slot 8	8 (8h)	8
9	Cartridge Loader/Carousel	82 (52h)	-
10	Tape Drive	86 (56h)	-

TapeAlert Flags

The Autoloader's internal TapeAlert firmware constantly monitors the Autoloader's operation for problems. TapeAlert is an industry-standardized method for reporting errors and potential difficulties to the software application.

Supported by the Autoloader

The Autoloader media changer will support the following Tape Alert Flags:

Table 38. TapeAlert Flags supported by the Autoloader

Parameter Code	Flag Name	Type ^a	Description
01	Autoloader Hardware A	C	The library mechanism is having difficulty communicating with the drive: <ul style="list-style-type: none"> • Turn the library OFF than ON • Restart the operation If the problem persists, contact Technical Support
02	Autoloader Hardware B	W	There is a problem with the media changer mechanism. If the problem persists, contact Technical Support.
03	Autoloader Hardware C	C	The media changer has a hardware fault: <ul style="list-style-type: none"> • Make sure the media changer and drives are not being used by any host, then reset the media changer from the front panel. • If the problem persists, contact Technical Support.
04	Autoloader Hardware D	C	<ul style="list-style-type: none"> • Make sure the media changer and drives are not being used by any host, then reset the media changer from the front panel. • If the problem persists, contact Technical Support.
13	Autoloader Pick Retry	W	There is a potential problem with the cartridge loader picking a cartridge from a drive or slot. <ul style="list-style-type: none"> • No action needs to be taken at this time. • If the problem persists, contact Technical Support. This flag is cleared when the next move command is received.
14	Autoloader Place Retry	W	There is a potential problem with the cartridge loader placing a cartridge into a slot. <ul style="list-style-type: none"> • No action needs to be taken at this time. • If the problem persists, contact Technical Support. This flag is cleared when the next move command is received.

Table 38. TapeAlert Flags supported by the Autoloader (continued)

Parameter Code	Flag Name	Type ^a	Description
15	Drive Load Retry	W	There is a potential problem with the cartridge loader or drive when placing a cartridge into a drive. <ul style="list-style-type: none"> • No action needs to be taken at this time. • If the problem persists, contact Technical Support. This flag is cleared when the next move command is received.
16	Autoloader Door	W	The operation has failed because the Autoloader door is open. <ul style="list-style-type: none"> • Clear any obstructions from the media changer door. • Close the Autoloader door. • If the problem persists, contact Technical Support. This flag is cleared when the door is closed.
19	Autoloader Security	W	Autoloader security has been compromised. The door was opened then closed during operation.
24	Library Inventory	C	The library has detected an inconsistency in its inventory. <ul style="list-style-type: none"> • Redo the library inventory to correct inconsistency • Restart the operation Check the applications users manual or the hardware users manual for specific instructions on redoing the library inventory.
27	Cooling Fan Failure	W	One or more fans inside the Autoloader have failed. This flag is cleared when all fans are working again.
32	Unreadable Bar Code Labels	I	The Autoloader was unable to read the bar code on a cartridge

- I = Informational suggestion to user.
- W = Warning. Remedial action is advised. Performance of data may be at risk.
- C = Critical. Immediate remedial action is required.

Supported by the Drive

Table 39 describes the TapeAlert flags that are supported by the drive and lists the actions that you must take to correct problems.

Table 39. TapeAlert flags supported by the drive

TapeAlert Flags Supported			
Flag Number	Flag	Description	Action Required
3	Hard error	Set for any unrecoverable read, write, or positioning error. (This flag is set in conjunction with flags 4, 5, or 6.)	See the Action Required column for Flag Number 4, 5, or 6 in this table.
4	Media	Set for any unrecoverable read, write, or positioning error that is due to a faulty tape cartridge.	Replace the tape cartridge.
5	Read failure	Set for any unrecoverable read error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag 4 is not set, see "Troubleshooting" on page 163.
6	Write failure	Set for any unrecoverable write or positioning error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape (see "Setting the Write-Protect Switch" on page 147). If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag 4 is not set, see "Troubleshooting" on page 163.
8	Not data grade	Set when severe servo errors occur while loading a tape cartridge.	Replace the tape cartridge. If this error occurs with multiple cartridges, see error code 6 in Table 35 on page 179.
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 147).
10	No removal	Set when the tape drive receives an UNLOAD command after the server prevented the tape cartridge from being removed.	Refer to the documentation for your server's operating system.
11	Cleaning media	Set when you load a cleaning cartridge into the drive.	No action required.
12	Unsupported format	Set when you load an unsupported cartridge type into the drive or when the cartridge format has been corrupted.	Use a supported tape cartridge.
14	Unrecoverable snapped tape	Set when the tape split apart.	Manually remove the tape cartridge (see "Contacting IBM Technical Support" on page 200).
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	Replace the cartridge. If this error occurs on multiple tapes, see error code 6 in Table 35 on page 179.

Table 39. TapeAlert flags supported by the drive (continued)

TapeAlert Flags Supported			
Flag Number	Flag	Description	Action Required
16	Forced eject	Set when you manually unload the tape cartridge while the drive was reading or writing.	No action required.
18	Tape directory corrupted in the cartridge memory	Set when the drive detects that the tape directory in the cartridge memory has been corrupted.	Re-read data from the tape to rebuild the tape directory.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive.
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive as soon as possible. The drive can continue to operate, but you should clean the drive soon.
22	Expired clean	Set when the tape drive detects a cleaning cartridge that has expired.	Replace the cleaning cartridge.
23	Invalid cleaning tape	Set when the tape drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
30	Hardware A	Set when a hardware failure occurs which requires that you reset the tape drive to recover.	If resetting the drive does not recover the error, note the error code on the single-character display and see Table 35 on page 179 for the appropriate instructions.
31	Hardware B	Set when the tape drive fails its internal Power-On Self Test (POST).	Note the error code on the single-character display and see Table 35 on page 179 for the appropriate instructions.
32	Interface	Set when the tape drive detects a problem with the SCSI or RS-422 interface.	See error code 8 or 9 in Table 35 on page 179.
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive and discard it.	Unload and reload the tape cartridge.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive over the SCSI interface.	Download the FMR image again (ensure that it is the correct image).
36	Drive temperature	Set when the drive's temperature sensor indicates that the drive's temperature is exceeding the recommended temperature of the enclosure (see Table 7 on page 16).	See error code 1 in Table 35 on page 179.
37	Drive voltage	Set when the drive detects that the externally supplied voltages are approaching the specified voltage limits or are outside the voltage limits (see Table 5 on page 15).	See error code 2 in Table 35 on page 179.
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics to isolate the problem.	See error code 6 in Table 35 on page 179.

Table 39. TapeAlert flags supported by the drive (continued)

TapeAlert Flags Supported			
Flag Number	Flag	Description	Action Required
51	Tape directory invalid at unload	For the tape that was unloaded, set when the tape directory on the cartridge memory is corrupted.	If the problem continues after successive loads, replace the cartridge. If the problem persists, replace the drive.
52	Tape system area write failure	Set when the tape that was unloaded could not write its system area (FID) successfully.	<ol style="list-style-type: none"> 1. Copy the data to another tape cartridge. 2. Discard the old cartridge.
53	Tape system area read failure	Set when the tape system area could not be read successfully at loadtime.	<ol style="list-style-type: none"> 1. Copy the data to another tape cartridge. 2. Discard the old cartridge.

Messages

The Messages appendix gives information on obtaining Autoloader and drive error information from different IBM and non-IBM servers (hosts).

Obtaining Tape Drive or Library Error Information at the Host

IBM device drivers for the pSeries, RS/6000, iSeries, and AS/400 systems log error information when an error occurs on a tape drive or library.

The error information includes the following:

1. Device VPD
2. SCSI command parameters
3. SCSI sense data (if available)

Obtaining Error Information from an RS/6000 or pSeries

The AIX Tape and Media Changer Device Driver for the pSeries or RS/6000 provides logging to the system error log for a variety of errors. You can view the error log by following this procedure.

1. At the AIX command line, type **errpt |pg** to display a summary report, or type **errpt -a |pg** to display a detailed report. Press **[Enter]**.

Note: In most cases you will use the summary report to find the date and time of any errors related to library devices, then use the detail report to obtain the sense data needed to identify the cause of the error.

2. Press **[Enter]** to scroll through the error log.
3. Type **q** and press **[Enter]**, to quit the error log at any time.

To correct a problem you noticed in the **errpt** report, determine the type of error by using the examples that follow:

- For library errors [Resource Name = **smcn** (for example, **smc0**) and Resource Type = 3581]), refer to Figure 144 on page 234 and locate the SCSI sense data.
- For drive errors [Resource Name = **rmtn** (for example, **rmt0**) and Resource Type = LTO], refer to Figure 145 on page 235 and locate the SCSI sense data.
- For SCSI adapter errors (not SCSI bus errors), use the maintenance package for the host.

Note: See "Sense Data" on page 241 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: 3581
Location:     40-60-00-1,1
VPD:
    Manufacturer.....IBM
    Machine Type and Model.....ULT3581-TA2
    Serial Number.....1323858
    Device Specific . (FW) .....2.20 (Firmware Level)

Description
TAPE DRIVE FAILURE

Probable Causes
TAPE DRIVE

Failure Causes
TAPE
TAPE DRIVE
    Recommended Actions
    PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0C01 0000 A520 0000 0100 0010 0000 0000 0000 0000 7000 0900 0000 010A 0000 0000
FF2A 8000 0000 0000 0000 0000 0000 0000 0001 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
    
```

Figure 144. AIX ERRPT Library Error Log Example

Table 40. AIX ERRPT Library Sense Data

Hex	Description
A5	SCSI Command
0000, 0100, 0010	Command Parameters
70	Byte 0 of Library Sense Data
09	Sense Key
FF2A	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier)

Drive Error Log Example

```

LABEL:          TAPE_ERR1
IDENTIFIER:     4865FA9B

Date/Time:      Wed Oct 10 11:39:43
Sequence Number: 25264
Machine ID:     000D090D4C00
Node ID:        tsm
Class:          H
Type:           PERM
Resource Name:  rmt2
Resource Class: tape
Resource Type:  LTO
Location:       40-60-00-1,0
VPD:
    Manufacturer.....IBM
    Machine Type and Model.....ULT3581-TD2
    Serial Number.....1300015078
    Device Specific.(FW).....35N0 (Firmware Level)

Description
TAPE OPERATION ERROR

Probable Causes
TAPE

User Causes
MEDIA DEFECTIVE
DIRTY READ/WRITE HEAD

Recommended Actions
FOR REMOVABLE MEDIA, CHANGE MEDIA AND RETRY
PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0602 0000 0100 0000 0200 0000 0000 0000 0000 0000 7000 0300 0000 001C 0000 0000
5200 0700 20B0 0000 0000 0000 0000 0000 0000 0000 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 145. AIX ERRPT Drive Error Log Example

Table 41. 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

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 146. 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.

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Obtaining Service Information Message from an iSeries or AS/400

To gain access to the iSeries or AS/400 problem logs and error logs, sign on at any available workstation using the QSRV logon and its security password (QSRV). After sign on, the proper access authorizations will be granted and the iSeries or AS/400 MAIN MENU displays.

iSeries or AS/400 System with RISC Processor

1. Type STRSST (Start System Service Tools) command on the command entry line on the iSeries or AS/400 Main Menu, and press **[Enter]**.

Note: If your operating system is higher than 5.1, you will be asked to enter your password.

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 3581 (autoloader) or 3580 (drive), and press **[Enter]**.
8. On the Display Detail Report for Resource screen, press:
 - F4=Additional Information.
Pressing F4 will display the machine type and serial number of the device. It also will display SCSI sense data, if available.
 - F6=Hexadecimal report.
Pressing F6 will display the device hexadecimal data (for support use).
 - F9=Address Information.
Pressing F9 will display the SCSI address information.

Obtaining Error Information from a Sun System

System log files are generally used to provide a time sequenced order of system events. In addition, various daemons write the file with adapter information and other information. There is always a current file and backup file. Depending on local set up, there may be other files. If a system has been running a long time, the file may not contain the information recorded at boot time. It is highly recommended that the customer save the file that has boot time information, but at this time it is probably too late. On UNIX[®] based systems, the logs are typically written to a central location. On Solaris the file is found in **/var/adm/messages**. Note that there are also **messages.#** files, where # is a number. When a messages file reaches a system defined limit, the file is renamed and older files are subsequently renumbered upwards. The date on the messages file is the last time the file was modified with data. The file that is required is the one that was recording information at the time of the problem.

In addition, you may use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination.

The two following service aid programs are provided with the IBM SCSI Tape Device Driver for SunOS:

- Tape service program

A tape service program called **tapesrv.c** is provided and contains the following service aids:

- Query device serial number
- Format tape 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

System log files are generally used to provide a time sequenced order of system events. In addition, various daemons write the file with adapter information and other information. There is always a current file and backup file. Depending on local set up, there may be other files. If a system has been running a long time, the file may not contain the information recorded at boot time. It is highly recommended that the customer save the file that has boot time information, but at this time it is probably too late. On UNIX based systems, the logs are typically written to a central location. On HP the file is found in **/var/adm/syslog/syslog.log**.

There is an older version of the syslog.log file called OLDsyslog.log. The file that is required is the one that was recording information at the time of the problem.

In addition, you may use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination.

Obtaining Error Information from a Linux System

On Linux based systems, logs are typically written to a central location. On Linux the file is found in `/var/log/messages`. Note that there are also `messages.#` files, where # is a number. When a messages file reaches a system defined limit, the file is renamed and older files are subsequently renumbered upwards. The date on the messages file is the last time the file was modified with data. The command for listing a file along with the date is `ls -l`. The file that is required is the one that was recording information at the time of the problem. The IBMtape daemon also writes to two files, `/var/log/IBMtape.errorlog` and `/var/log/IBMtape.trace`. These files are archived when they reach a certain size with a timestamp date as part of the file name. Extract the required file for analysis. Consult the *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430, for setup and operation.

In addition, you may use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination.

Fixing Drive SCSI Bus Errors

Fixing a Consistent Error with a Single Drive on a SCSI Bus

1. Ensure that the Autoloader is powered on.
2. Ensure that the tape drive's SCSI address is the same as the SCSI address assigned by the server.
3. See "Diagnostic Menu" on page 67 and select the Wrap test.
 - If the test runs successfully, replace the SCSI cable and the interposer (if installed). Repeat the operation that caused the error. If you replaced the 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, rerun the SCSI wrap test with a new SCSI terminator.
 - If the test fails again, replace the Autoloader (see "Removing/Replacing the Autoloader" on page 204).
4. See "SCSI / FIBRE WRAP TEST" on page 72 and run the wrap test.
 - If the test fails, re-run the wrap test with a new SCSI terminator.
 - If the test fails again, replace the Autoloader (see "Removing/Replacing the Autoloader" on page 204).
 - If the test runs successfully, use the ITDT tool to run the test device diagnostic.
 - If the test device diagnostic fails, there is a problem between the Autoloader and the host. Check the SCSI connectors for bent pins. If the cables are okay, the problem may be with the server's hardware or software. Refer to the server's service documentation.
 - If the test device diagnostic runs successfully, and the original problem persists, the failure is outside the Autoloader and its attachments. Use the

server or host service documentation, as appropriate. Also, ensure that the device drivers are at the latest level. (See “Step 3. Install Device Drivers” on page 110.)

Attention

At the time of publication, the ITDT tool was not available. Register with MySupport (<http://www.ibm.com/support/mySupport>) to be notified by email when the tool becomes available, or periodically check the IBM support site (<http://www.ibm.com/storage/lto>).

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 3 or Ultrium 2 Tape Drive.
4. Replace the Autoloader (see “Removing/Replacing the Autoloader” on page 204). If the problem persists, the problem is with your server. Consult your server’s documentation.

Sense Data

The Sense Data appendix contains Autoloader and drive sense data and information on using host sense data.

Autoloader Sense Data

Table 42. Autoloader Sense Data

Sense Key	Hex Value	Description
No Sense	0h	Indicates that there is no specific sense key information to be reported.
Recovered error	1h	Indicates that the last command completed successfully but required the Autoloader to perform some recovery action.
Not ready	2h	Indicates that the Autoloader cannot accept any motion commands.
Hardware error	4h	Indicates that the Autoloader detected a hardware failure.
Illegal request	5h	Indicates that there was an illegal parameter in the command descriptor block (CDB) or in the additional parameters supplied as data for some command.
Unit attention	6h	Indicates that the state of the Autoloader may have changed.
Aborted command	Bh	Indicates that the Autoloader aborted the last command.

Possible Additional Sense Codes (ASC) and Additional Sense Code Qualifiers (ASCQ).

Table 43. Autoloader possible Additional Sense Codes (ASC) and Additional Sense Code Qualifiers (ASCQ)

Sense Key	ASC	ASCQ	Message
No Sense (00)			No Sense
Recovered Error (01)	0Ah	00h	Error log overflow
	47h	00h	SCSI parity error
Not Ready (02)	04h	00h	Cause not reportable
	04h	01h	Becoming ready, scanning magazines, etc.
	04h	03h	Not ready, manual intervention required
	04h	07h	Not ready, other command in progress
	04h	83h	Not ready, door open
	04h	85h	Not ready, firmware upgrade in progress
	04h	8Dh	Not ready, the media charger is offline
	04h	8Eh	Not ready, the media charger is in sequential mode
	85h	01h	Unit not ready, Inventory not valid

Table 43. Autoloader possible Additional Sense Codes (ASC) and Additional Sense Code Qualifiers (ASCQ) (continued)

Sense Key	ASC	ASCQ	Message
Hardware Error (04)	3Ah	80h	Media not present
	40h	84h	POST soft failure
	44h	80h	Loader communications timeout
	44h	81h	Loader communication UART error or buffer overflow
	44h	86h	Bad status returned from the Autoloader
	44h	FFh	Unexpected status from test
	80h	70h	Cartridge has no home
	80h	73h	No cartridge in drive during unload
	80h	74h	Loader mechanism problem, after retries
	80h	75h	Time out moving cartridge
	80h	76h	Reserved
	80h	77h	Couldn't unlock door after retries
	80h	78h	Error during SCAN MAGAZINE
	80h	79h	Couldn't unlock door after retries
	80h	7Ah	Unexpected door open
	80h	7Bh	Didn't find all expected slots during elevator movement
	80h	7Ch	Cartridge already in drive during LOAD CARTRIDGE
	80h	7Dh	Slot empty during LOAD CARTRIDGE
	80h	7Eh	Cleaning tape expired
	80h	7Fh	Cleaning failed
	80h	87h	Hardware Error Global Timeout
	80h	88h	Hardware Error Communication error
	80h	89h	Hardware Error Timeout during BHC testing
	80h	90h	Mechanical Positioning Error
80h	91h	Scan Failure	
80h	92h	Preposition Failed	

Table 43. Autoloader possible Additional Sense Codes (ASC) and Additional Sense Code Qualifiers (ASCQ) (continued)

Sense Key	ASC	ASCQ	Message
Hardware Error (04) [continued]	80h	93h	Cartridge load error
	80h	94h	Cartridge failed to unload
	80h	95h	Import Error
	80h	96h	Export Error
	80h	A0h	Belt Axis Error
	80h	A1h	Slider Axis Error
	80h	A2h	Gripper Position Error
	80h	A3h	Cartridge Pick Error
	80h	A4h	Door Function Error
	80h	A5h	Hardware Error Fan Error
	80h	B0h	ROM Error
	80h	B1h	RAM Error
	80h	B2h	Hardware Error NVRAM Error
	80h	B3h	Hardware Error CTC Error
	80h	B4h	Hardware Error UART Error
	80h	B5h	Hardware Error DISPLAY Error
	80h	B6h	Hardware Error Memory Error
	80h	B7h	Hardware Error Timeout Loader Command
	80h	BAh	Hardware Error Drive load timeout
	80h	BBh	Hardware Error Drive unload timeout
	80h	BCh	Hardware Error Over temperature problem
	80h	BDh	Hardware Error No Connection to Drive
	80h	BEh	Hardware Error Genetic Drive Response error
80h	BFh	Hardware Error Drive broken: Needs repair	

Table 43. Autoloader possible Additional Sense Codes (ASC) and Additional Sense Code Qualifiers (ASCQ) (continued)

Sense Key	ASC	ASCQ	Message
Illegal Request (05h)	1Ah	00h	Parameter length error
	20h	00h	SCSI invalid opcode
	21h	01h	Invalid element address
	24h	00h	Invalid field CDB
	24h	81h	Invalid mode on WRITE BUFFER
	24h	82h	Invalid drive specified
	24h	83h	SEND DIAG Invalid test number
	24h	86h	Invalid offset on WRITE BUFFER
	24h	87h	Invalid size on WRITE BUFFER
	24h	88h	Wrong sequence number of code image
	24h	89h	Wrong checksum of code image
	24h	8Ah	Wrong header length of code image
	24h	8Fh	Bad controller image checksum
	24h	90h	Wrong flash file (image does not fit to boot code)
	24h	91h	Wrong firmware image, personality mismatch
	25h	00h	Invalid LUN
	26h	00h	Invalid field in parameter list
	26h	01h	Parameter list error: parameter not supported
	26h	02h	Parameter value invalid
	39h	00h	Saving parameters not supported
	3Bh	0Dh	Destination element full
	3Bh	0Eh	Source slot or drive empty
	3Dh	00h	SCSI invalid ID message
	53h	00h	Media Load/Eject failure
	53h	01h	Cartridge failed to unload
	F1h	00h	Command unspecified
	F1h	02h	Unrecognized Autoloader command
Unit Attention (06h)	28h	00h	Not ready to ready transition/Door was open and closed again.
	29h	00h	Power on reset occurred
	29h	05h	Bus type changed to Single Ended (SE)
	29h	06h	Bus type changed to Low Voltage Differential (LVD)
	2Ah	01h	Mode parameters changed
	3Fh	01h	Microcode has changed
Command Aborted (0Bh)	43h	00h	SCSI message error
	47h	00h	SCSI parity error
	49h	00h	SCSI invalid message

Drive Sense Data

Table 44. 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 44. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12-13	Additional Sense Code (ASC) Additional Sense Code Qualifier (ASCQ)							
	Byte 12		Byte 13					
	ASC		ASCQ					
00	00 - No additional sense — The flags in the sense data indicate the reason for the command failure							
00	01 - Filemark detected — A Read or Space command terminated early due to an FM. The FM flag is set.							
00	02 - EOM — A Write or Write File Marks command failed because the physical end of tape was encountered, or a Read or Space command encountered EOM. The EOM flag is set							
00	04 - BOM — A space command ended at Beginning of Tape. The EOM bit is also set							
00	05 - EOD — Read or Space command terminated early because End of Data was encountered							
04	00 - Cause not reportable — A cartridge is present in the drive, but it is in the process of being unloaded							
04	01 - Becoming Ready — A media access command was received during a front panel initiated load or an immediate reported load command							
04	02 - Initializing Command Required — A cartridge is present in the drive, but is not logically loaded. A Load command is required							
04	03 - Manual Intervention Required — A cartridge is present in the drive but could not be loaded or unloaded without manual intervention							
0C	00 - Write Error — A Write operation has failed. This is probably due to bad media, but may be hardware related							
11	00 - Unrecovered Read Error — A Read operation failed. This is probably due to bad media, but may be hardware related							
14	00 - Recorded Entity Not Found — A space or Locate command failed because a format violation prevented the target from being found.							
14	03 - End Of Data not found — A Read type operation failed because a format violation related to a missing EOD data set							
1A	00 - Parameter list length error — The amount of parameter data sent is incorrect							
20	00 - Invalid Command Operation Code — The Operation Code in the command was not a valid Operation Code							
24	00 - Invalid field in CDB — An invalid field has been detected in a Command Descriptor Block							
25	00 - LUN not supported — The command was addressed to a non-existent logical unit number							
26	00 - Invalid Field in Parameter List — An invalid field has been detected in the data sent during the data phase							
27	00 - Write Protect — A Write type operation has been requested on a cartridge which has been write protected							
28	00 - Not Ready to Ready Transition — A cartridge has been loaded successfully into the drive and is now ready to be accessed							
29	00 - Reset — The drive has powered on, received a reset signal or a bus device reset signal since the initiator last accessed it							
2A	01 - Mode Parameters Changed — The Mode parameters for the drive have been changed by an initiator other than the one issuing the command							
30	00 - Incompatible Media Installed — A write type operation could not be executed because it is not supported on the cartridge type that is loaded.							
30	01 - Unknown Format — An operation could not be carried out because the cartridge in the drive is of a format not supported by the drive							
	(Continued on next page)							

Table 44. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12-13	Additional Sense Code (ASC) — Additional Sense Code Qualifier (ASCQ) (Continued)							
	Byte 12	Byte 13						
	ASC	ASCQ						
30	02	- Incompatible Format — An operation could not be completed because the Logical Format is not correct						
30	03	- Cleaning Cartridge Installed — An operation could not be carried out because the cartridge in the drive is a cleaning cartridge						
30	07	- Cleaning Failure — A cleaning operation was attempted, but could not be completed for some reason						
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						
3D	00	- Invalid bits in identify Message — An illegal Identify Message has been received at the drive at the start of a command						
3E	00	- Logical Unit has not Self-Configured — The drive has just powered on and has not completed its self test sequence and can not process commands						
3F	01	- Code Download — The firmware in the drive has just been changed by a Write Buffer command						
40	xx	- Diagnostic failure — A diagnostic test has failed. The xx (ASCQ) is a vendor specific code indicating the failing component.						
43	00	- Message Error — A message could not be sent or received due to excessive transmission errors						
44	00	- Internal target failure — A hardware failure has been detected in the drive that has caused the command to fail						
45	00	- Select/Reset Failure — An attempt to reselect an initiator in order to complete the command has failed						
4B	00	- Data Phase Error — A command could not be completed because too many parity errors occurred during the Data phase						
4E	00	- Overlapped Commands — An initiator selected the drive even though it already had a command outstanding in the drive						
50	00	- Write Append Error — A write type command failed because the point at which to append data was unreadable						
51	00	- Erase failure — An Erase command failed to erase the required area on the media						
52	00	- Cartridge fault — A command could not be completed due to a fault in the 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						
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						

Table 44. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
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.

Using Host Sense Data

Table 45 lists the hosts to which the tape drive attaches. It gives the operating system for each host and describes how the host records errors from the tape drive.

To determine the meaning of host sense data, refer to the *IBM Ultrium Device Drivers Installation and User's Guide* visit the Web at <ftp://ftp.software.ibm.com/storage/devdrv>.

Table 45. 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	<p>Uses the IBM Atape device driver (provided with the 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, errpt, or itdt.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Attention</p> <p>At the time of publication, the ITDT tool was not available. Register with MySupport (http://www.ibm.com/support/mySupport) to be notified by email when the tool becomes available, or periodically check the IBM support site (http://www.ibm.com/storage/lto).</p> </div>
HP	HP-UX	Uses the IBM device driver for HP. Error and trace logging are proprietary to Hewlett-Packard.
Sun Microsystems	Solaris	Uses the IBM device driver for Solaris to post sense information to the Solaris host-wide messages file <i>/var/adm/messages</i> .
Intel-based PCs	Windows NT	Uses the NTUTIL device driver to log some sense data in the Event Viewer host log.
	Red Hat Linux	Uses the IBM device driver for Linux to post sense information to the Linux files <i>/var/log/IBMtape.errorlog</i> and <i>/var/log/IBMtape.trace</i> .

Autoloader Configuration Form

Please copy this form and fill out with your Autoloader's vital product data and store in a secure location for future reference. Default settings are in bold type.

Machine Type	IBM TotalStorage Ultrium Tape Autoloader 3581				
Model No. (circle one)	L28/L38/L3H	F28/F38/F3H			
Autoloader Serial No.					
Drive Serial No.					
Autoloader Firmware Level					
Drive Firmware Level					
Device Driver Level					
Drive SCSI ID (Model L28/L38/L3H only)	2				
Drive Loop ID (Model F28 only)	005				
Operating Mode	Automatic	Random	Sequential	Loop	Autoload
SCSI Drive Speed (Model L28/L38/L3H only)	AUTO		80 Mb/s		
Fibre Channel Drive Speed (Model F28/F38/F3H only)	AUTO	1Gb/s		2Gb/s	
Loop Port Type (Model F28/F38/F3H only)	LN	NL	L	N	
World Wide Node Name (Model F28/F38/F3H only)					
SCSI Inquiry String	IBM ULT3581-TL				
IP Address (for RMU)					
Network Mask (for RMU)					
Gateway Address (for RMU)					

|
|

Administrator Passwords	OCP:	RMU:	Serial:
------------------------------------	------	------	---------

Rack Mount Template

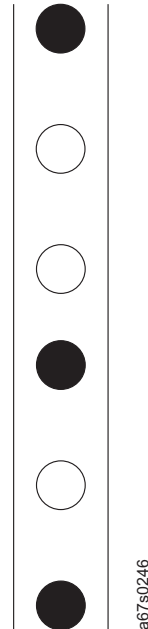


Figure 147. Rack mount template

The Autoloader requires 2 EIAs (units) of rack space. The Rack Mount Template helps in identifying proper placement of the clip-nuts.

Two types of clip-nuts are included with the Rack Mount Kit:

- **Panel** clip-nuts (for racks with round mounting holes) are installed by sliding them on from the side of each rack rail with the largest part of the clip-nut going on the back side of the rack rail.
- **Cage** clip-nuts (for racks with square mounting holes) are installed from the back side of each rack rail.

To install the clip-nuts:

1. Identify the 2 EIAs needed on the rack rail. If your rack does not contain a rail with each EIA numbered, identify the two EIAs required by holding the template on the outside of the rack rail and aligning all six circles on the template with the holes in the rail.

Note: All six circles on the template **must align exactly** with the holes of the 2 EIAs in the rack rail.

2. Install clip-nuts in the rail holes indicated by the filled circles on the template.
 - Top hole of the higher EIA
 - Top hole of the lower EIA
 - Bottom hole of the lower EIA
3. Count the holes in the other rack rails, up or down, to determine EIA location and install clip-nuts using the Rack Template.

Information for IBM Service Personnel

Attention: All information and procedures in this chapter are intended for use by Authorized IBM Service Personnel only. Customers should not attempt these procedures. Doing so may void your warranty.

Gripper Calibration

After every power on and after the first cartridge is loaded into the drive, the gripper calibrates its movement to the drive.

Service Menus

Three Service Menus exist for the Autoloader:

- LIBRARY SERVICE in the Diagnostics Menu accessed via the OCP.
- ADVANCED DIAGNOSTICS in the Maintenance Menu accessed via the RMU, if installed.
- Diagnostic and maintenance tests accessed via serial communication.

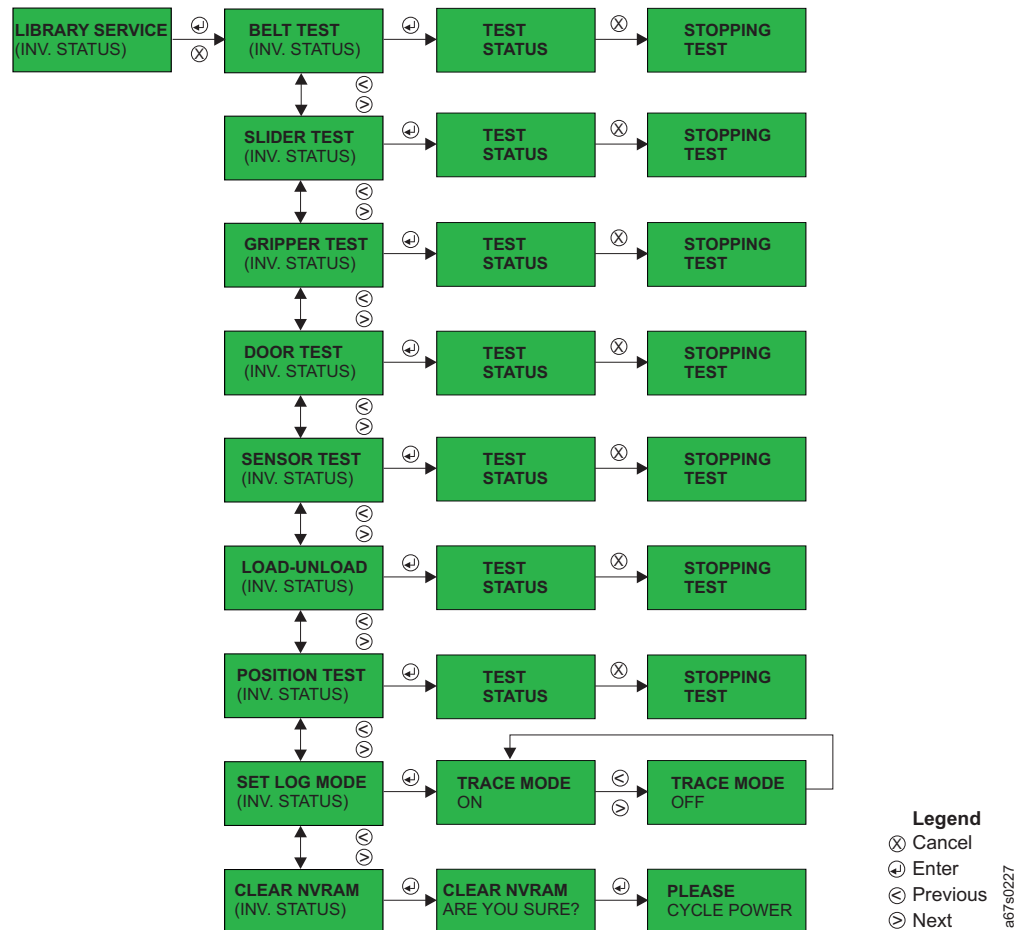


Figure 148. Service menu.

LIBRARY SERVICE via the OCP

The **Library Service Menu** contains tests that are performed by Authorized IBM Service Personnel only. To access the **Library Service Menu**, navigate to:

Diagnostic Menu;LOADER DIAG;LIBRARY SERVICE

Login

To login to LIBRARY SERVICE via the OCP:

1. Press *Enter* to access LOADER DIAGNOSTIC.
2. Press *Enter* then press *Next* until LIBRARY SERVICE displays.
3. Press *Enter* to access the SERVICE PIN screen.
4. Use *Next* and *Previous* to enter each digit then press *Enter* to proceed to the next digit.
5. After entering the last digit and pressing *Enter*, SERVICE PIN PASSED or SERVICE PIN FAILED will display.
 - If FAILED, press *Cancel* and enter the password again.
 - If PASSED, press *Enter* to proceed to BELT TEST.

BELT TEST

The BELT TEST rotates the carousel belt to verify that it is functioning properly. To run the BELT TEST:

1. Navigate to the BELT TEST and press *Enter* to begin the test. Cycles will increment in the display.
2. Press *Cancel* to stop the test.

SLIDER TEST

The SLIDER TEST performs the slider operation to verify that it is functioning properly. To run the SLIDER TEST:

1. Navigate to the SLIDER TEST and press *Enter* to begin the test.
2. Press *Cancel* to stop the test and return to the Home Screen.

GRIPPER TEST

The GRIPPER TEST performs the gripper operation to verify that it is functioning properly. To run the GRIPPER TEST:

1. Navigate to the GRIPPER TEST and press *Enter* to begin the test.
2. Press *Cancel* to stop the test and return to the Home Screen.

DOOR TEST

The DOOR TEST opens and closes the door to verify that it is functioning properly. To run the DOOR TEST:

1. Navigate to the DOOR TEST and press *Enter* to begin the test.
2. Press *Cancel* to stop the test and return to the Home Screen.

SENSOR TEST

The SENSOR TEST verifies that all internal sensors are functioning properly. To run the SENSOR TEST:

1. Navigate to the SENSOR TEST and press *Enter* to begin the test.
2. Press *Enter* to begin the test. Characters on the second line of the display are as follows:
 - B:
 - "0" means "no cartridge present in slot positioned in front of the drive"
 - "1" means "cartridge present in slot positioned in front of the drive"

- S:
 - "0" means "slider in home position (middle of path)"
 - "1" means "slider in path"
- G:
 - "0" means "gripper in home position or open"
 - "1" means "gripper in closed position"
- D:
 - "0" means "I/O Door closed"
 - "1" means "I/O Door open"

LOAD-UNLOAD

LOAD-UNLOAD tests the cartridge loader mechanism. To run the LOAD-UNLOAD TEST:

1. Navigate to the LOAD-UNLOAD TEST and press *Enter* to begin the test.
2. Press *Cancel* to stop the test and return to the Home Screen.

POSITIONS TEST

The POSITIONS TEST verifies that the carousel is properly aligned. To run the POSITIONS TEST:

1. Navigate to the POSITIONS TEST and press *Enter* to begin the test.
2. Press *Cancel* to stop the test and return to the Home Screen.

SET TRACE MODE

SET TRACE MODE sets the trace log to ON, OFF, or STOP AT AN ERROR. To SET TRACE MODE:

1. Navigate to SET TRACE MODE and press *Enter*.
2. Press NEXT to select between the following options:
 - ON
 - OFF
 - STOP AT AN ERROR
3. Press Enter to set the new trace mode.

CLEAR NVRAM

CLEAR NVRAM clears temporary information (such as error log data). To CLEAR NVRAM:

1. Navigate to CLEAR NVRAM and press Enter to access the "ARE YOU SURE?" screen.
2. Press Enter for "YES".
3. Cycle Autoloader power when prompted.

Advanced Diagnostics via the RMU

The screenshot displays the 'Advanced Diagnostic' page of the IBM Ultrium Autoloader Web pages. The page is titled 'IBM TotalStorage™ Ultrium Tape 2U Autoloader 3581' and 'IBM Ultrium Autoloader Web pages - Advanced Diagnostic'. The main content area includes a dropdown menu for selecting a diagnostic operation (currently 'Long Read/Write Test'), a text input for 'Nr Cycles', and 'Execute' and 'Stop' buttons. Below this is the 'Media Status' table:

Slot Nr	Status	In Drive	Barcode	Write Protected
1	Normal		E1S155L1	
2	Normal		ANC109L1	
3	Normal			
4	Normal		U14502L1	
5	Normal		L00006L1	
6	Normal		E1S144L1	
7	Normal		LB0060L2	
8	Normal		E2S197L2	

Cartridge: = Normal = Cleaning = Bad = In Access

The 'Quick Status' panel on the right shows: Name: TSP000007, Status: , Lock: RMU, Cartridge In Drive: , Drive Status: , Drive Activity: Drive empty, Robotic Action: Ready, Time: 10:45:25, Drive Error Code: .

Figure 149. RMU Maintenance Menu's Advanced Diagnostic page

This menu item displays the **Advanced Diagnostic** table and the **Media Status** table. This menu item is available only to Authorized IBM Service Personnel.

The **Advanced Diagnostic** table contains the following:

- Select one of the following diagnostic operations:
 - **Long Read/Write Test:** Performs a load operation, a write/read test, and an unload operation.
 - **Head Test:** Performs diagnostics on difficult head patterns and determines if the head is functioning properly.
 - **Media Test:** Verifies whether a suspect tape cartridge and its magnetic media are acceptable.
 - **Short Read/Write Test:** Performs a load operation, a write/read test, and an unload operation.
 - **Self Test:** Performs a system diagnostic.
 - **SCSI Wrap Test:** Checks the SCSI (Model L28/L38/L3H) or Fibre Channel (Model F28/F38/F3H) circuitry.
 - **Load-Unload Test:** Tests the cartridge loader mechanism.
 - **Belt Test:** Rotates the carousel belt to verify that it is functioning properly.
 - **Slider Test:** Performs the slider operation to verify that it is functioning properly.
 - **Gripper Test:** Performs the gripper operation to verify that it is functioning properly.
 - **Door Test:** Opens and closes the I/O Door to verify that it is functioning properly.
 - **Sensor Test:** Verifies that all internal sensors are functioning properly.
 - **Preposition Test:** Verifies that the carousel is properly aligned.
- Enter the number of cycles to run the operation.

Click **EXECUTE** to begin the diagnostic. Click **STOP** to terminate the diagnostic.

Using Serial Port Communications

The Serial Monitor is a text-based console which gives service personnel the ability to do several diagnostic and service tasks on the Autoloader without using the OCP. It can easily be accessed through a serial cable which is connected to any standard terminal program, independent from the server's (host's) operating system.

Depending on the user level, there are special low level commands to test the different components of the Autoloader. Also, there is a trace interface which can be used to retrieve a history from the last commands, events, and errors which have occurred. If an RMU is installed on the Autoloader, there exists a Telnet interface with the same functionality.

Hardware Requirements:

- Autoloader
- Free serial port (38 400 Baud)
- RS-232 DB9F-to-DB9F straight through cable (supplied with ship group)

Software Requirement:

Terminal emulation software (for example, HyperTerminal)

Attention: A user can communicate with the Autoloader via the OCP, the RMU, or the serial port. The Autoloader will accept commands from only one communication method at a time. If communicating via the OCP, return to the Home Screen before attempting to communicate via another method (RMU or serial port). If communicating via the RMU, log out before attempting to communicate via another method (OCP or serial port). If communicating via the serial port, exit the connection before attempting to communicate via another method (OCP or RMU).

Serial Port Connections

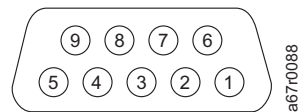


Figure 150. Serial port pin-out

Pin Number	Signal Name	Abbreviation	Direction Relative to the Autoloader
1	Carrier detect	CD	In
2	Receive data	RD	In
3	Transmit data	TD	Out
4	Data terminal ready	DTR	Out
5	Signal ground	SG	-
6	Data set ready	DSR	In
7	Request to send	RTS	Out
8	Clear to send	CTS	In
9	Ring indicator	RI	In

Installing the Serial Cable

For information on installing the serial cable, see “Installing the Serial Cable” on page 112.

Using HyperTerminal

HyperTerminal is a serial communications software provided with all PCs with a Windows operating system.

Note: Other applications similar to HyperTerminal exist. If you are using an application other than HyperTerminal, please refer to that application’s documentation for instructions.

To use HyperTerminal, follow these instructions:

1. On your Windows desktop, click **Start** —> **Programs** —> **Accessories** —> **Communications** —> **HyperTerminal**
2. On the Connection Description window:
 - Type in “3581”.
 - Click **OK**.

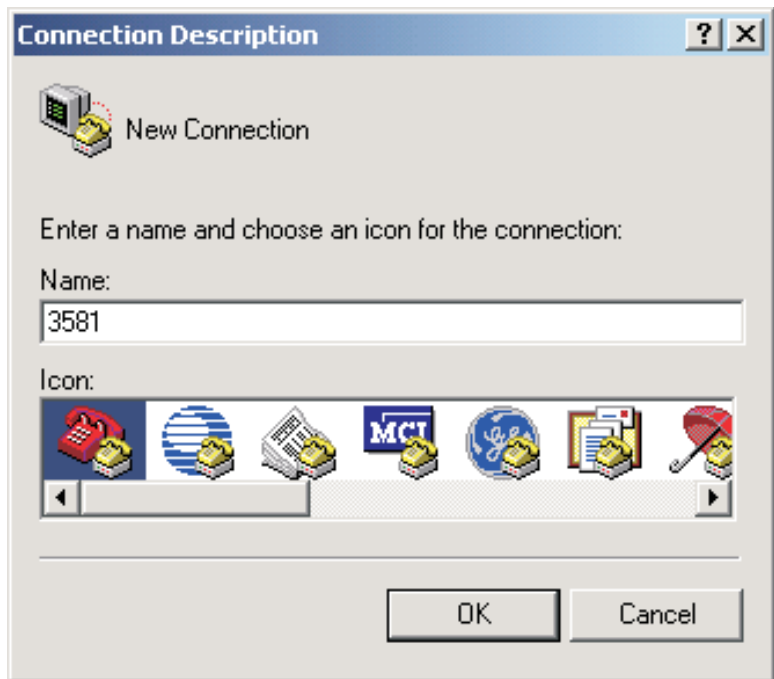


Figure 151. HyperTerminal Connection Description window

3. On the Connect To window:
 - Select the COM port that the serial cable was plugged into on the rear of your server (host).
 - Click **OK**.



Figure 152. HyperTerminal Connect To window

4. On the COMx Properties window:
 - Select the following port settings:
 - Bits per second = 38400
 - Data bits = 8
 - Parity = None
 - Stop Bit = 1
 - Flow control = None
 - Click **OK**.

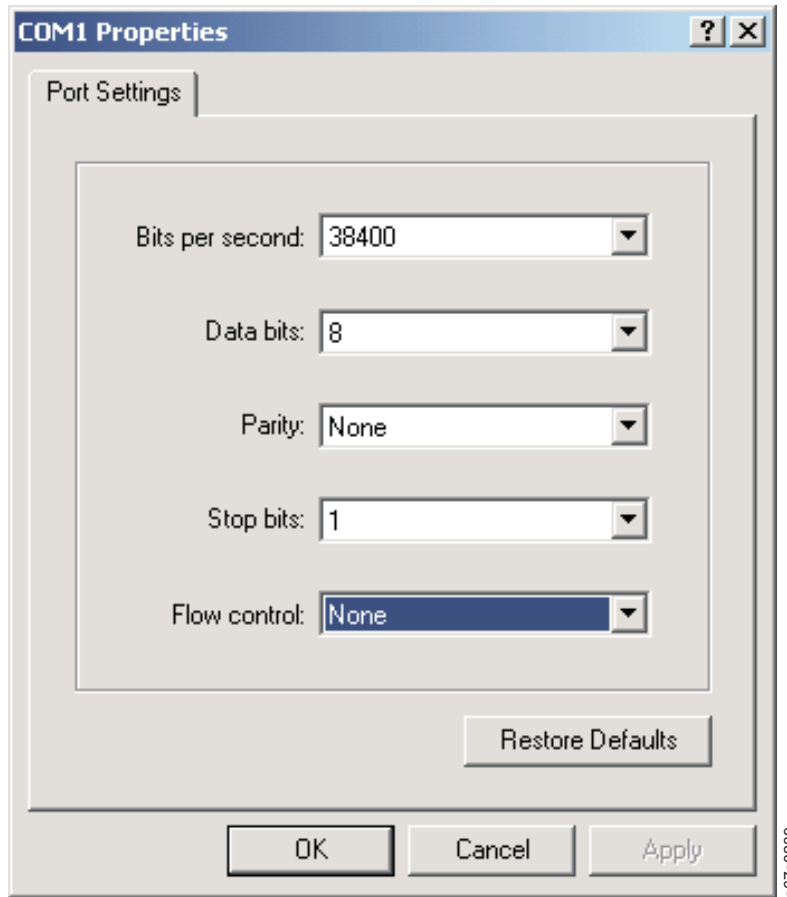


Figure 153. HyperTerminal COMx Properties window

5. Press **Enter**.

If you see the following screen, all went well and you are able to use the Serial Monitor. If you see nothing like this or only scrambled characters, check your connection parameters.

6. At the TSMON> prompt, type "help" for the list of serial commands.

```
TSMON>help
```

Below is a list of the more commonly used serial commands:

- Login (**lgi**): User login.
 - Logout (**lgo**): User logout.
 - LibraryFirmware (**lfw**): Library firmware upgrade by XMODEM download (**Transfer->Send file**).
 - DriveFirmware (**dfw**): Drive firmware upgrade by XMODEM download (**Transfer->Send file**).
 - DriveDump (**ddmp**): Get drive dump by XMODEM upload (**Transfer->Receive file**).
 - DumpAll (**dpa**): Dump all status and traces. To store in a file, use **Transfer->Capture text** using XMODEM.
 - ErrorDump (**edp**): Dump the Autoloader error log. To store in a file, use **Transfer->Capture text** using XMODEM.
 - TraceDump (**tdp**): Dump the Autoloader trace log. To store in a file, use **Transfer->Capture text** using XMODEM.
 - IPAddress (**ipa**): ipa "IP","Mask","Gateway".
7. To access the administrator serial menu:
- a. Type "lgi" and press **Enter**.

```
TSMON>lgi
```

Note: Both the OCP and RMU must be online (logged out) before the serial port will allow login.

- 1) For the User ID, type "admin" (Administrator) or the new Administrator User ID set for the RMU.

```
TSMON>lgi
User ID:admin
```

- 2) For the password, type "secure" (Administrator) or the new Administrator password set for the RMU.

```
TSMON>lgi
User ID:admin
Password:secure
```

- 3) Press **Enter**.

8. Enter any command at the TSMON> prompt and press **Enter** to initiate.

9. When the operation is complete, type "lgo" at the TSMON> prompt to logout.

```
TSMON>lgo
```

Upgrading Code via FMR Tape

Attention: This option is for development and manufacturing use only, FMR tapes will not be shipped to the field to update drive firmware.

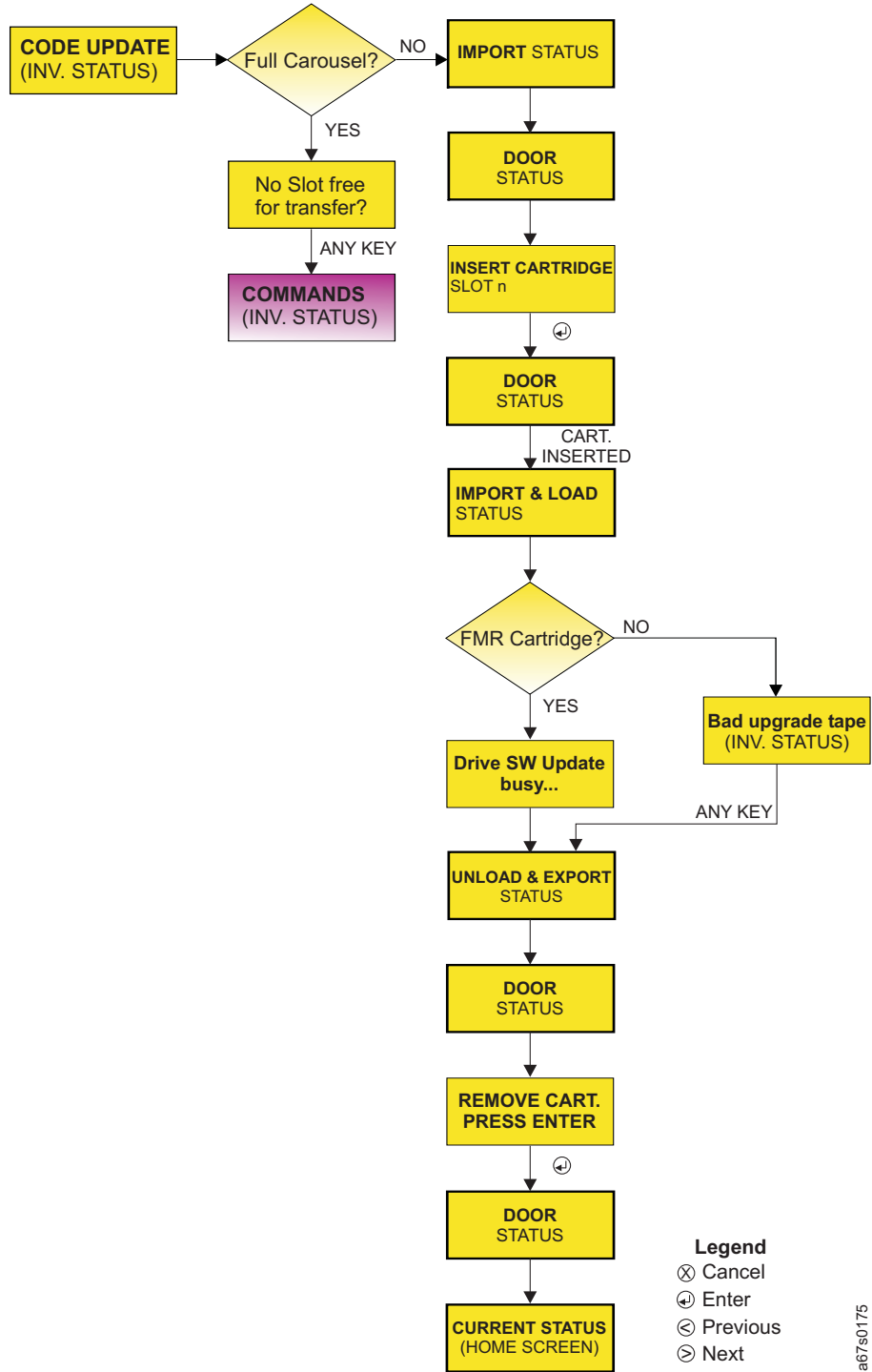


Figure 154. Configuration Menu's DRIVE FW UPGRADE FROM FMR TAPE command

To access CODE UPDATE:

1. Navigate to the **Configuration Menu** (see “Configuration Menu” on page 60).
2. Press *Enter* then press *Next* three times on the OCP to access DRIVE FW UPGRADE FROM FMR TAPE.
3. If there are eight cartridges (all slots are full) in your Autoloader, press *Cancel* on the OCP to return to the **Configuration Menu** screen. If there are less than eight cartridges (all slots are not full) in your Autoloader, proceed to the next step.
4. When the I/O Door opens, insert the FMR tape.
5. When the code update is complete, remove the ejected FMR tape from the I/O Door.
6. Press *Enter* on the OCP to return to the Home Screen.

Removing a Cartridge Manually

Note: IBM Service Personnel should charge their time to perform this procedure against ECA 013.

Removing a cartridge manually becomes necessary when the Autoloader's power supply fails or some other problem occurs that requires the unit to be returned to IBM for replacement. Before shipping the unit back to IBM, you will want to remove all cartridges from the unit, if possible. Should it be impossible for a cartridge to be removed, ship the unit back with the cartridge inside and IBM will replace your cartridge with a new cartridge. The information on the cartridge you send back to IBM will not be returned; therefore, the information will be lost.

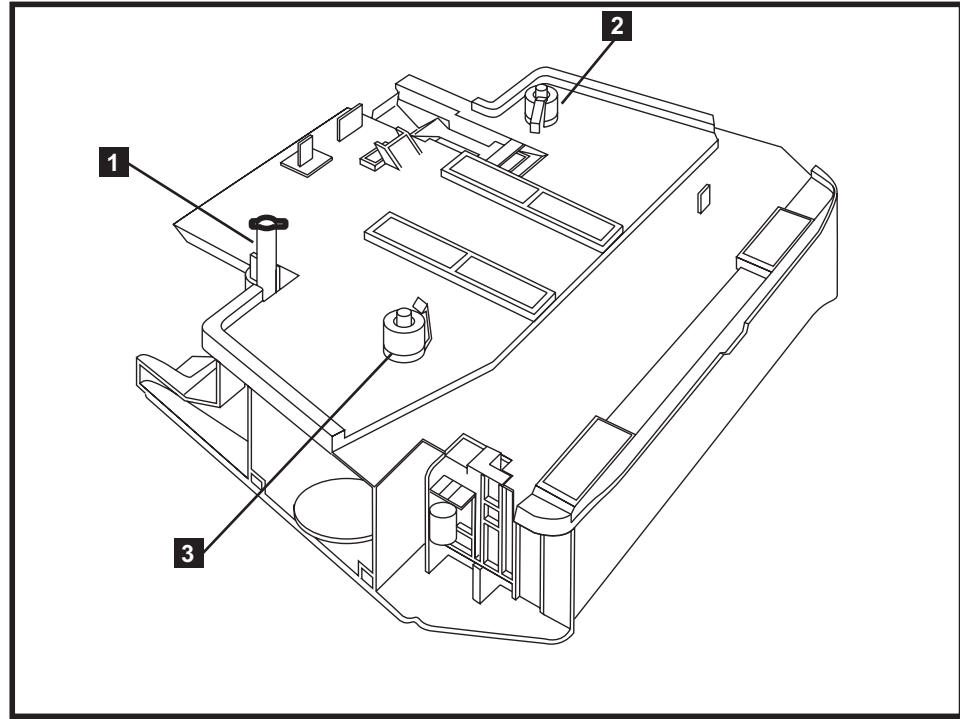
Attention

(For Ultrium 3 drives only) Before attempting to remove a tape from the Autoloader or drive, it is *very important* to preserve the active dump information in non-volatile storage in case the Autoloader has to be replaced. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Perform "PRESERVE DUMP (LTO-3 only)" on page 74 *before* powering OFF the drive.

The sections that follow give instructions on removing a cartridge slot and cartridge and replacing the cartridge slot.

Removing a Cartridge Slot and Cartridge

In order to be successful in this procedure, you must have an understanding of the cartridge slot. The cartridge slot pin **1** inserts into a loop on the carousel belt. The left **2** and right **3** track pins are seated in the carousel tracks.



a6750211

Figure 155. Bottom view of cartridge slot

- __ Step 1. Power off the Autoloader.
- __ Step 2. Unplug the power cord from the electrical outlet and from the rear panel of the Autoloader.
- __ Step 3. Remove all cables and the external fan from the Autoloader's rear panel.
- __ Step 4. Using a T10 Torx wrench, remove screws from the sides and rear of the Autoloader and remove the top cover.
- __ Step 5. To make slot removal easier, rotate the slot to be removed to the nearest corner position in the Autoloader.
 - a. Facing the front of the Autoloader, place your left hand on the left middle slot in the Autoloader.
 - b. Place your right hand on the right middle slot.
 - c. Gently rotate the carousel counterclockwise until the desired slot is in a corner position.



CAUTION:
DO NOT ROTATE CAROUSEL CLOCKWISE AS THIS WILL
DAMAGE THE AUTOLOADER.

- __ Step 6. Grasp the sides of a cartridge slot.
- __ Step 7. Gently lift the left side of the cartridge slot until the right track pin is removed from the track nearest the belt.

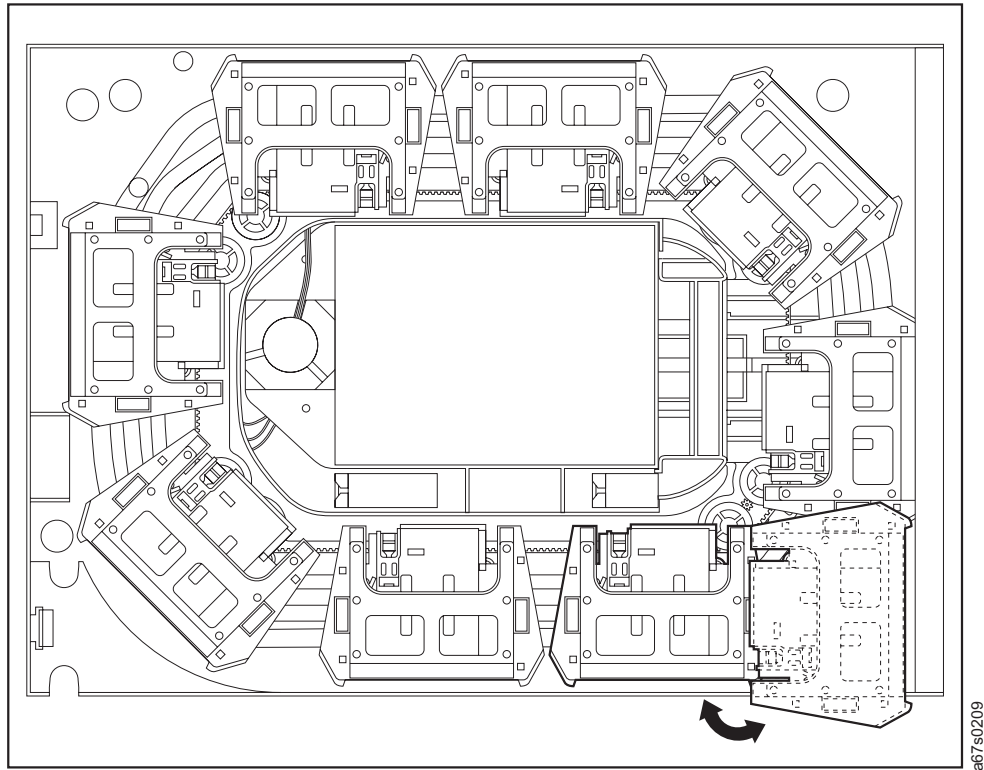
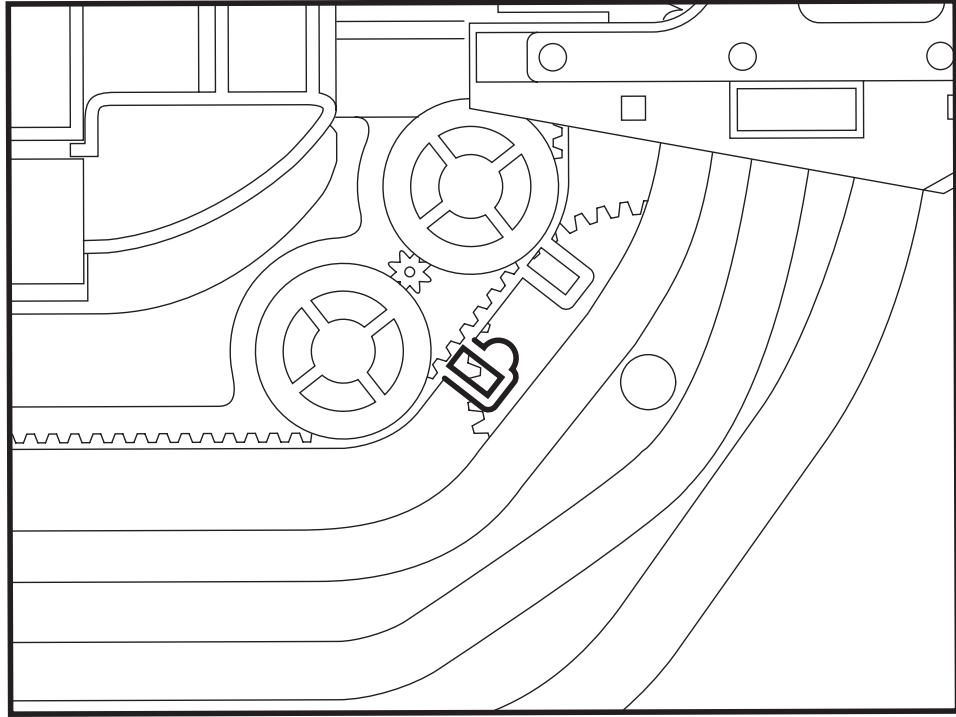


Figure 156. Top view of Autoloader with top cover removed showing cartridge slot being removed

- ___ Step 8. With the left side of the slot higher than the right side, turn the cartridge slot to the left while gently pulling up until the belt pin is free of the belt loop.
- ___ Step 9. If necessary, push down on the belt near the belt pin with your free hand.
- ___ Step 10. When the cartridge slot is removed from the Autoloader, lift the cartridge release lever on the right side of the cartridge slot and remove the cartridge.
- ___ Step 11. Repeat Steps 5 through 10 for all remaining cartridge slots containing cartridges.

Replacing a Cartridge Slot

- ___ Step 1. Insert the cartridge's belt pin into the proper belt loop.



a67s0210

Figure 157. Belt loop for cartridge slot pin

- ___ Step 2. Rotate the cartridge slot right until the left track pin is seated in the track nearest the belt.
- ___ Step 3. Replace the top cover and secure with screws.
- ___ Step 4. Replace the external fan.

Manually Removing a Tape Cartridge from an Ultrium 1 or 2 Drive

Note: IBM Service Personnel should charge their time to perform this procedure against ECA 013.

Attention

(For Ultrium 3 drives only) Before attempting to remove a tape from the Autoloader or drive, it is *very important* to preserve the active dump information in non-volatile storage in case the Autoloader has to be replaced. This dump information will be used by the Repair Center when they perform failure analysis on the returned drive. Perform “PRESERVE DUMP (LTO-3 only)” on page 74 *before* powering OFF the drive.

Attention

Perform this procedure only after you have attempted to remove the tape cartridge by power cycling the Autoloader. Note that (depending on its location on the reel) the tape may take as much as 20 minutes to completely rewind and eject.

If a tape cartridge fails to eject from the Autoloader, you can manually remove the cartridge. The procedure to do so, however, requires care. Success depends on your ability to maintain constant and appropriate tension on the tape while rewinding it into the cartridge and disengaging it from the drive’s leader block. Apply too much tension and the tape may break; apply too little tension and the leader pin may fall from the leader block. IBM recommends that you read the complete instructions before starting the task, then perform the steps slowly and carefully to avoid complications.

Required Tools

The following tools are required to manually remove a tape cartridge:

- T10 Torx or small, flat-blade screwdriver
- #1 Phillips screwdriver
- 2.5-mm allen wrench
- Small-blade screwdriver or potentiometer screwdriver
- Needle-nose pliers
- Flashlight (optional)

Removing a SCSI Drive from the Autoloader

Attention

(LTO-3 only) Before removing the drive from the Autoloader, perform the Preserve Dump procedure (see “PRESERVE DUMP (LTO-3 only)” on page 74). 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.

1. Power off the Autoloader.
2. Remove cables from the rear panel of the Autoloader.

- a. Unplug the Autoloader's power cord from the electrical outlet and from the rear of the Autoloader.
- b. Remove any SCSI cable or SCSI terminator from the LVD SCSI connectors (connections on the SCSI connectors will interfere with the fan housing as it swings out to remove the captured tabs).
- c. Remove the RMU cable, if installed.
3. Remove the fan from the rear panel of the Autoloader.
 - a. Loosen the two captured thumbscrews that fasten the fan housing to the Autoloader chassis.
 - b. Pull gently on the right side (side containing the thumbscrews) of the fan housing until the power connector pulls free of the receptacle and the fan housing is rotated until it is perpendicular with the Autoloader rear panel.
 - c. Pull the fan housing straight back, removing the tabs from the openings on the Autoloader's rear panel.
4. Remove the bottom cover of the Autoloader.
 - a. Turn the Autoloader over so that the bottom is facing up and the unit is resting on the top cover.
 - b. Remove the three screws from the rear panel (**1** in Figure 158).

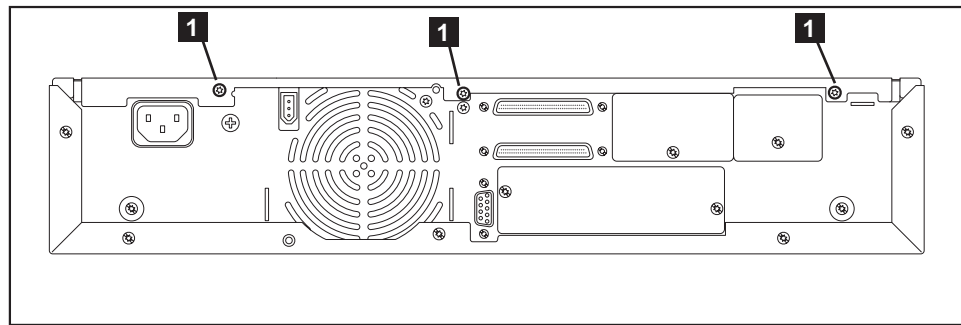


Figure 158. Location of screws on rear panel for drive removal

- c. Remove the 12 screws from the bottom cover (**1** in Figure 159).
- d. Remove the 2 screws attaching the bottom cover to the sides of the Autoloader (**2** in Figure 158 on page 271).

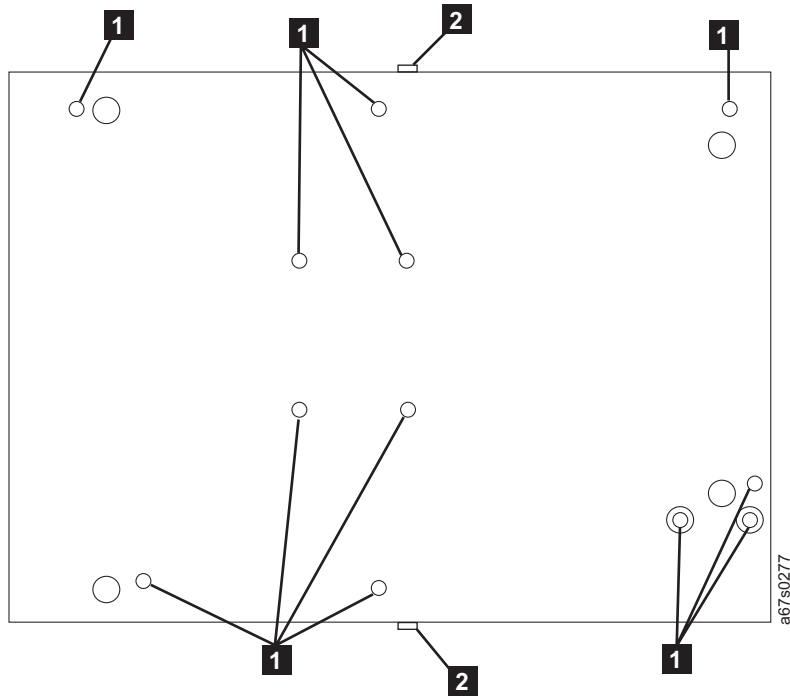


Figure 159. Location of screws on bottom cover for drive removal

- e. Lift the bottom cover off of the unit.

5. Remove the drive from the Autoloader.
 - a. Remove the four screws securing the drive (**4** in Figure 160).

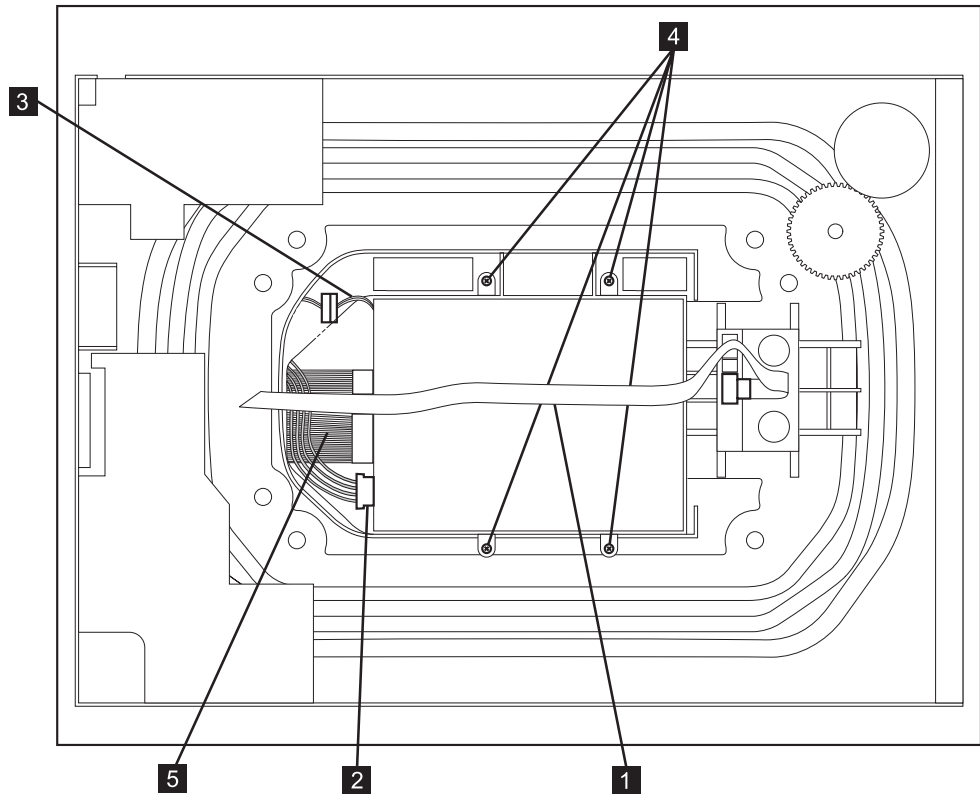


Figure 160. Internal view of drive in Autoloader

- b. Unplug the SCSI cable (**5** in Figure 160).
- c. Unplug the power cable (**2** in Figure 160).
- d. Unplug the RS-422 cable (**3** in Figure 160). Use a flat blade screw driver to separate the two parts of the connector.
- e. The ribbon cable (**1** in Figure 161 on page 275) is secured to the top of the drive by adhesive. Loosen the ribbon cable from the top of the drive, then carefully slide the drive from underneath the ribbon cable and out of the chassis.

Removing a Fibre Channel Drive from the Autoloader

Attention

(LTO-3 only) Before removing the drive from the Autoloader, perform the Preserve Dump procedure (see “PRESERVE DUMP (LTO-3 only)” on page 74). 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.

1. Power off the Autoloader.
2. Remove cables from the rear panel of the Autoloader.
 - a. Unplug the Autoloader’s power cord from the electrical outlet and from the rear of the Autoloader.

- b. Remove the fiber cable from the connectors.
 - c. Remove the RMU cable, if installed.
3. Remove the fan from the rear panel of the Autoloader.
- a. Loosen the two captured thumbscrews that fasten the fan housing to the Autoloader chassis.
 - b. Pull gently on the right side (side containing the thumbscrews) of the fan housing until the power connector pulls free of the receptacle and the fan housing is rotated until it is perpendicular with the Autoloader rear panel.
 - c. Pull the fan housing straight back, removing the tabs from the openings on the Autoloader's rear panel.
4. Remove the bottom cover of the Autoloader.
- a. Turn the Autoloader over so that the bottom is facing up and the unit is resting on the top cover.
 - b. Remove the three screws from the rear panel (refer to **1** in Figure 161 on page 275).
 - c. Remove the 12 screws from the bottom cover (refer to **1** in Figure 159 on page 272).
 - d. Remove the 2 screws attaching the bottom cover to the sides of the Autoloader (refer to **2** in Figure 161 on page 275).
 - e. Lift the bottom cover off of the unit.

5. Remove the drive from the Autoloader.
 - a. Lift the clear tab, squeeze the top and bottom of the cable plug to disengage the plug prongs (located on the underside of the plug) while pulling the fiber cable (**5** in Figure 161) out of the connector on the back of the drive.

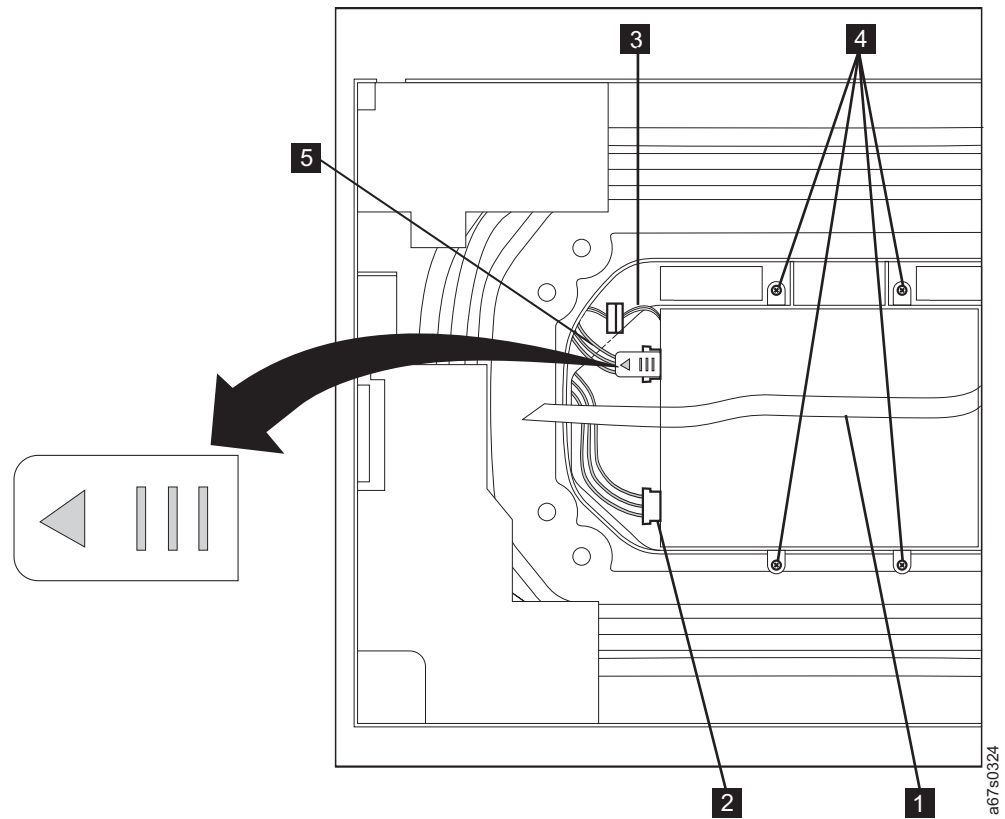
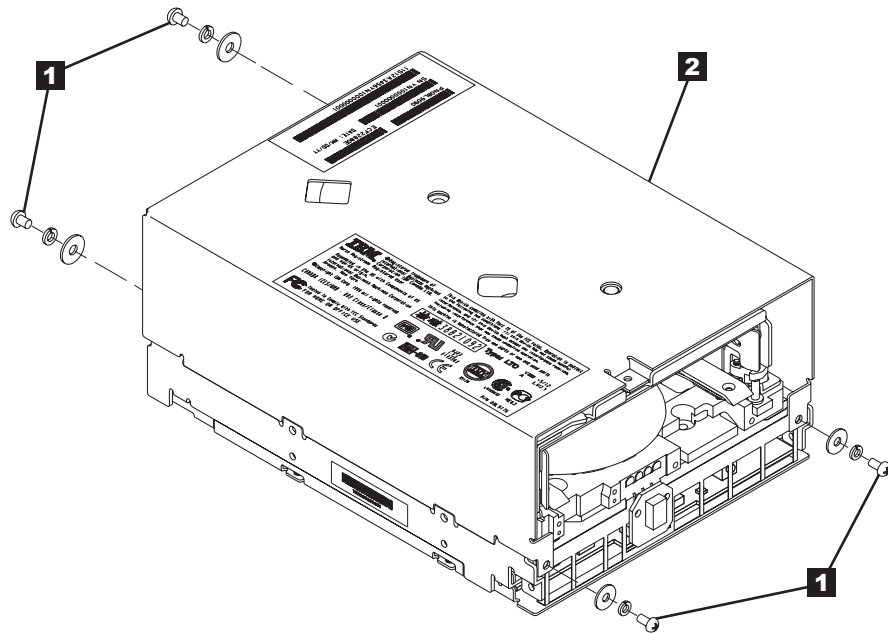


Figure 161. Internal view of drive in Autoloader

- b. Unplug the power cable (**2** in Figure 161).
- c. Unplug the RS-422 cable (**3** in Figure 161). Use a flat blade screw driver to separate the two parts of the connector.
- d. Remove the four screws securing the drive (**4** in Figure 161).
- e. The ribbon cable (**1** in Figure 161) is secured to the top of the drive by adhesive. Loosen the ribbon cable from the top of the drive, then carefully slide the drive from underneath the ribbon cable and out of the chassis.

Removing the Cover of the Internal Drive

1. Remove the cover of the drive by doing the following:
 - a. Remove the four cover-mounting screws and washers (see **1** in Figure 162 on page 276).
 - b. Remove the cover **2** by lifting it up. Set the cover aside.



a67s0059

Figure 162. Removing the cover of the tape drive

Fixing the Problem

1. Place the tape drive so that the front faces you, then tilt it on its left side (see Figure 163 on page 277).
2. Examine the tape to determine the source of the problem:
 - If the leader pin is jammed in the cartridge, go to the Note contained in step 4.
 - If the leader pin has become detached from the leader block and is lying in the tape path, go to step 3.
 - If the tape has broken between the supply reel and the takeup reel, contact IBM Technical Support.
3. If necessary, use needle-nose pliers to grasp the end of the leader pin and pull it out of the cartridge so that you can grip it with your fingers (see **1** in Figure 163 on page 277).

Reminder: The following step requires care. Success depends on your ability to maintain constant and appropriate tension on the tape while rewinding it into the cartridge. Apply too much tension and the tape may break; apply too little tension and the leader pin may fall from the leader block. Perform the steps slowly and carefully to avoid complications.

4. While keeping the tape taut with your fingers, rotate the allen wrench clockwise **2** to wind the excess tape into the cartridge. Guide the leader pin toward the cartridge and drop it deep inside the cartridge door; do not attempt to seat the leader pin. Remove the allen wrench.

Note: Ensure that the leader pin drops into the opened cartridge door, falls deeply into the cartridge, and does not jam near the cartridge door. Do not seat the pin into the cartridge's clips; this will interfere with the motion of the leader pin block (you can seat the pin after you have removed the cartridge from the drive). If the tape did not load because

the leader pin was wedged in the clip area, grasp the leader pin with needle-nose pliers to free it and drop it into the cartridge.

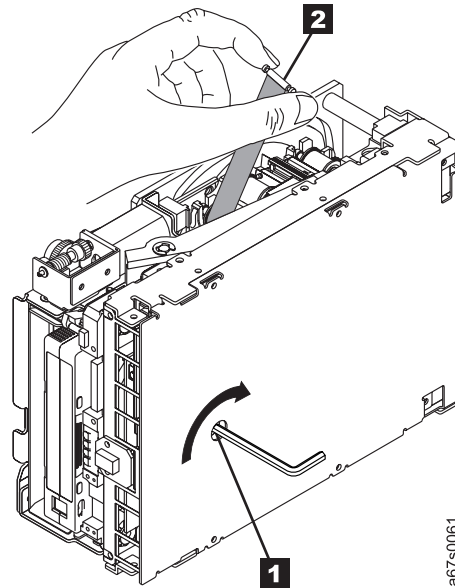


Figure 163. Rewinding the leader pin into the tape cartridge

Removing the Cartridge from the Drive

1. Manually rotate the loader motor gear (see **1** in Figure 164 on page 278) in the unload direction until the leader pin block **2** reaches the last roller **3**.

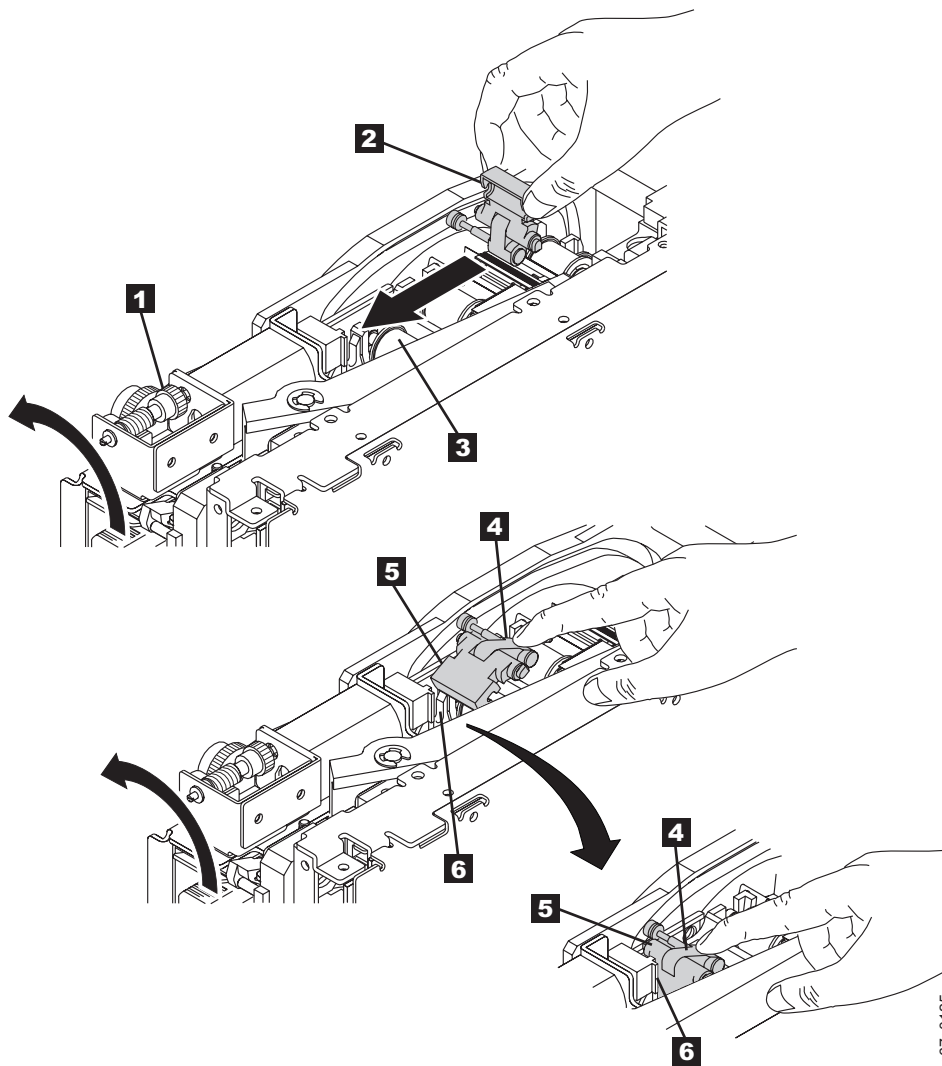


Figure 164. Guiding the leader pin into the tape cartridge

2. To prevent the leader pin block from jamming, press down on the linkage of the leader pin block **4** to force the hinged section of the block upward.
3. While manually rotating the loader motor gear in the unload direction, guide the end of the leader pin block **5** into the white block guide **6**.
4. Continue to rotate the loader motor gear counterclockwise until you feel resistance and the cartridge ejects.
5. Remove the tape cartridge.
6. To reuse the Autoloader, you must raise the drive's loader so that it is able to accept a cartridge. To raise the loader, continue to wind the loader motor gear counterclockwise with the screwdriver until you feel resistance.
7. Remove the small-blade screwdriver.
8. If you choose to replace the Autoloader, return it in its original packaging or in the packaging from its replacement.
9. To reassemble the Autoloader, reverse the preceding steps.

After you remove the stuck tape cartridge, copy the data on the tape to another tape. Then, discard the stuck tape cartridge.

Manually Removing a Tape Cartridge from an Ultrium 3 Tape Drive

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 165) 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.

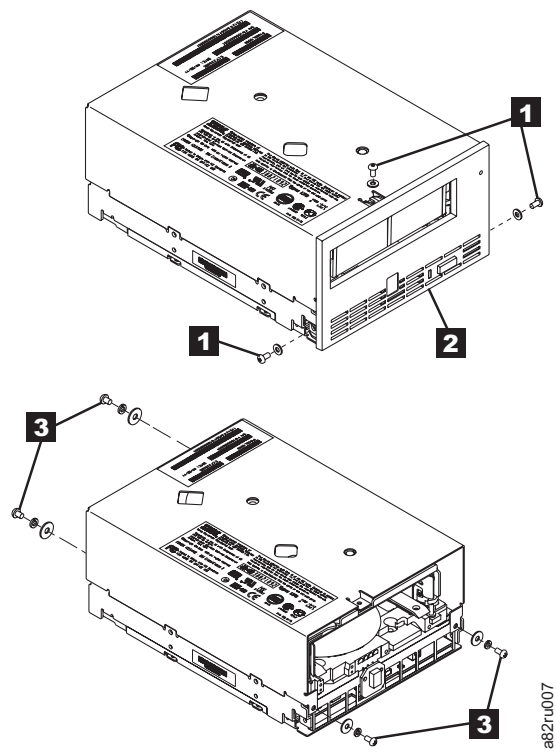


Figure 165. Removing the cover from the internal drive

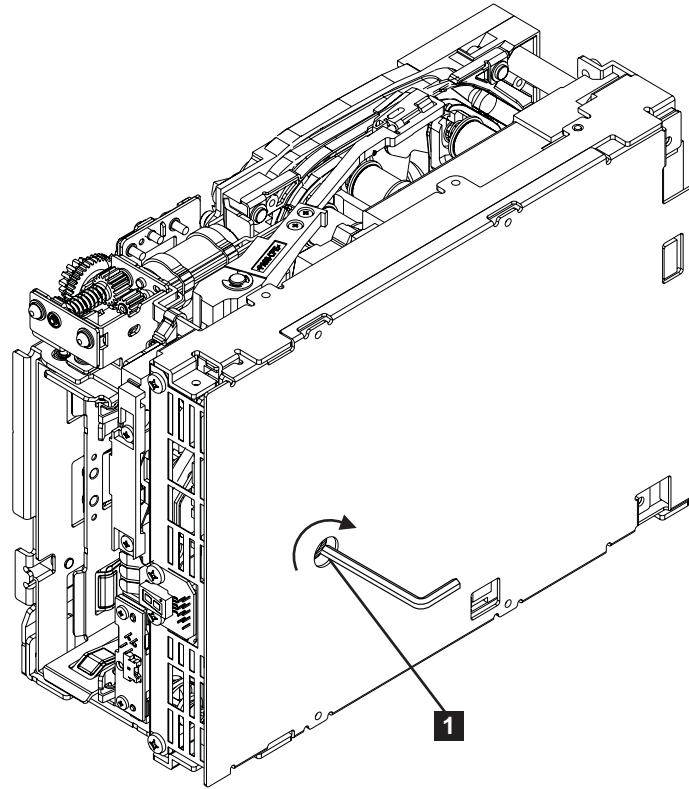
- ___ 5. Inspect the drive to decide which of the following conditions most closely matches the symptom on the drive:
 - **Tape spooled off the supply reel** - All the tape appears to be on the take up reel and no tape is on the supply reel (inside the cartridge). Test the drive after the procedure is 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.

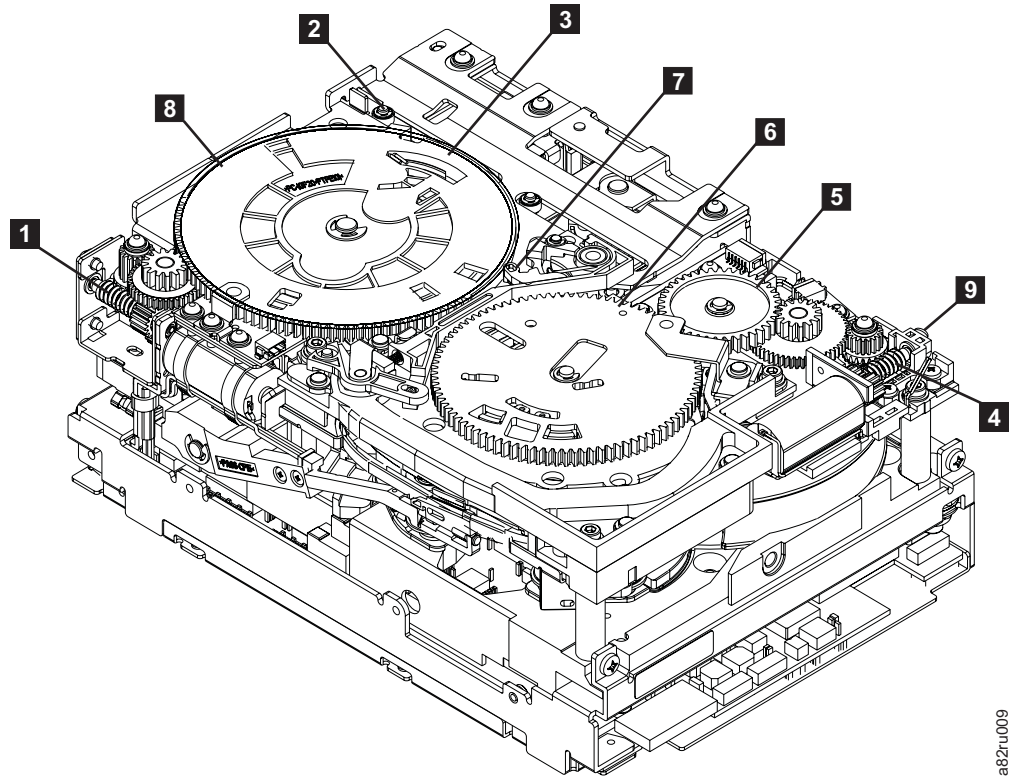


a82ru008

Figure 166. 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 280.
- | — 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 to determine if it should be replaced.

Tape Pulled from or Broken near Leader Pin



a82ru009

Figure 167. 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 285.

- ___ 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 167) 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 167) clockwise; or
 - b. Use a #1 flathead screwdriver to turn the threader worm gear (**9** in Figure 167) clockwise.

This rotates the threader motor worm gear (**4** in Figure 167) 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 167 on page 283) 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.
- 5. Notice the following:
 - a. Loader mechanism gear (**8** in Figure 167 on page 283) nearest the front of the drive that actuates the cartridge loader mechanism
 - b. Position of the rotator stub (**3** in Figure 167 on page 283).
 - c. Front loader motor worm gear (**1** in Figure 167 on page 283). Rotating this gear allows the loader mechanism gear (**8** in Figure 167 on page 283) to turn.
 - 6. Rotate the loader motor worm gear (**1** in Figure 167 on page 283) to turn the loader mechanism gear (**8** in Figure 167 on page 283) counterclockwise. Continue turning until the rotator stub (**3** in Figure 167 on page 283) loses contact with the lever (**7** in Figure 167 on page 283). This releases the LBA leader pin.
 - 7. Rotate the threader motor worm gear (**4** in Figure 167 on page 283) to turn the threader mechanism gear (**6** in Figure 167 on page 283) 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 168).

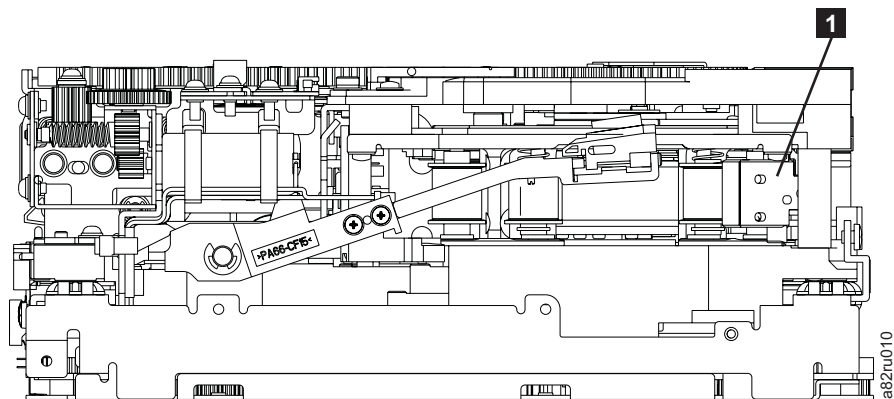


Figure 168. Leader Block Assembly (LBA)

- 8. Continue rotating the loader motor worm gear (**1** in Figure 167 on page 283) until the rotator stub (**3** in Figure 167 on page 283) is positioned as shown. Notice that the rotator stub (**3** in Figure 167 on page 283) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure 167 on page 283).
- 9. Remove the cartridge from the cartridge loader tray.
- 10. Reassemble the drive by reversing the procedure in Step 4 on page 280 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 283.

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 169) 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.

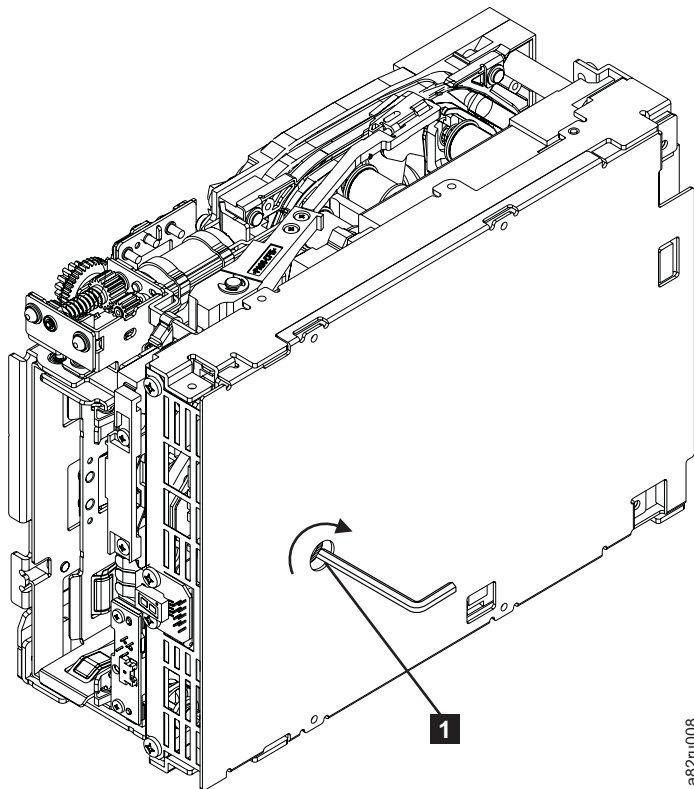


Figure 169. Using hex wrench to rewind tape into cartridge

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 280 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 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 281
- “Tape Pulled from or Broken near Leader Pin” on page 283

--OR--

“Tape Broken in Mid-tape” on page 285

- ___ 2. Set the drive on its left side with the head and tape path facing up.

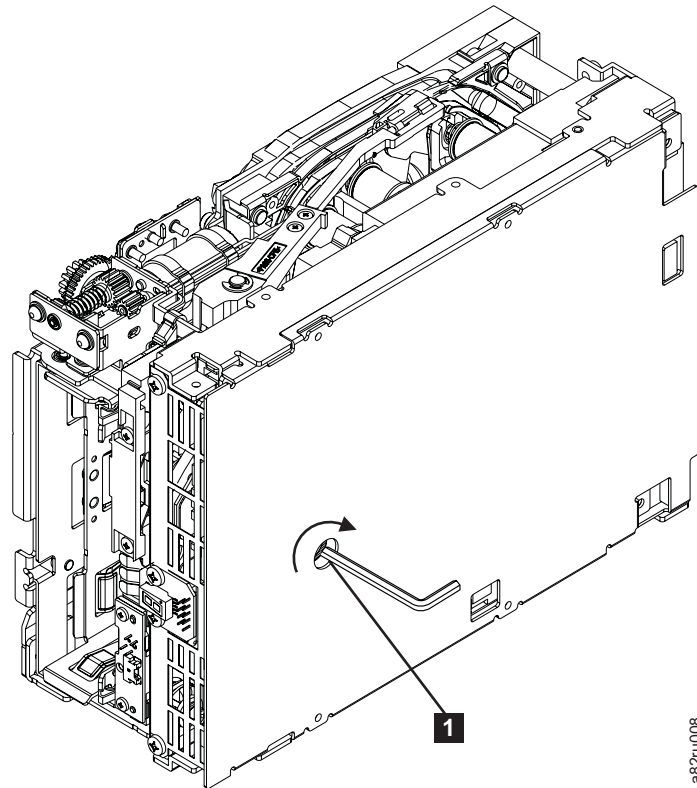
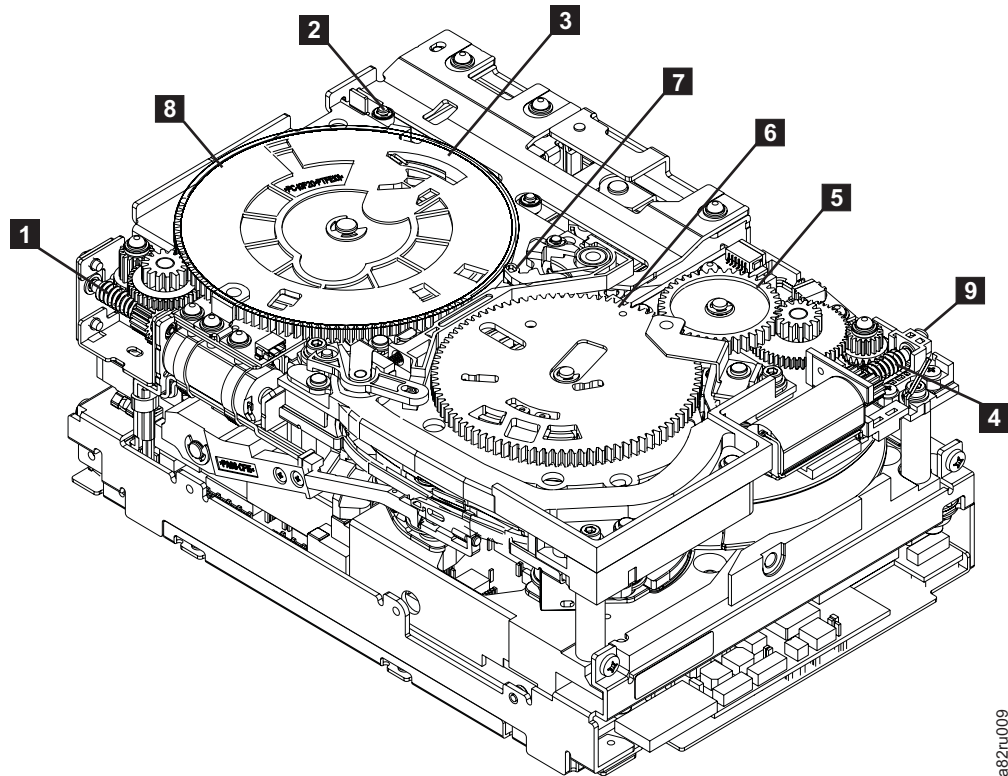


Figure 170. Using hex wrench to rewind tape into cartridge

- ___ 3. From the bottom of the drive, locate the access hole (**1** in Figure 170).
- ___ 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 171 on page 287) on the rear of the drive. You can either:

- a. Use your finger to rotate the treader motor worm gear and slowly rotate the threader mechanism gear (**6** in Figure 171) clockwise; OR
- b. Use a #1 flathead screwdriver to turn the worm gear (**9** in Figure 171) clockwise.

This rotates the threader motor worm gear (**4** in Figure 171) clockwise, drawing the LBA into the cartridge.



a82r0009

Figure 171. 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 171) 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 170 on page 286.

- ___ 8. Notice the:
 - a. Loader mechanism gear (**8** in Figure 171) nearest the front of the drive that actuates the cartridge loader mechanism.

- b. Position of the rotate stub (**3** in Figure 171 on page 287).
 - c. Front loader motor worm gear (**1** in Figure 171 on page 287). Rotating this gear allows the loader mechanism gear (**8** in Figure 171 on page 287) to turn.
9. Rotate the loader motor worm gear (**1** in Figure 171 on page 287) to turn the threader mechanism gear (**6** in Figure 171 on page 287) counterclockwise. Continue turning until the rotator stub (**3** in Figure 171 on page 287) loses contact with the lever (**7** in Figure 171 on page 287). This releases the LBA leader pin.
 10. Rotate the threader motor worm gear (**4** in Figure 171 on page 287) to turn the threader mechanism gear (**6** in Figure 171 on page 287) 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 172.

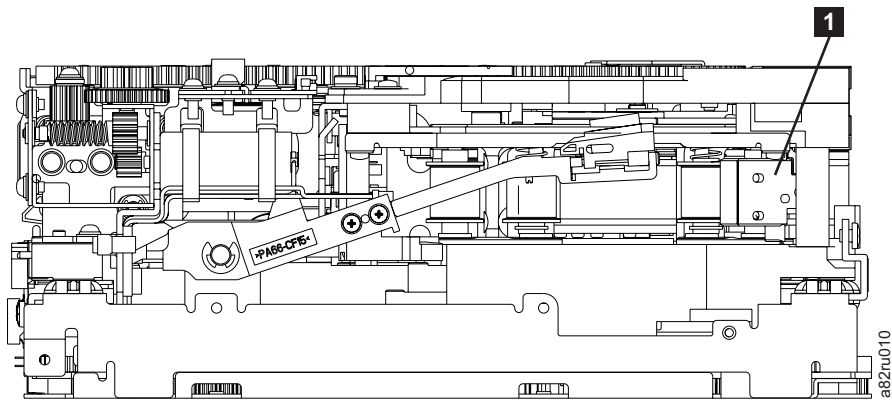


Figure 172. Leader Block Assembly (LBA)

11. Continue rotating the loader motor worm gear (**1** in Figure 171 on page 287) until the rotator stub (**3** in Figure 171 on page 287) is positioned as shown. Notice that the rotator stub (**3** in Figure 171 on page 287) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure 171 on page 287).
12. Remove the cartridge from the cartridge loader tray.
13. Reassemble the drive by reversing the procedure in Step 4 on page 280 in Beginning Procedure.
14. Refer to the appropriate procedure to install the new drive and return the failed drive.

No Apparent Failure or Damage to Tape

1. Set the drive on its left side with the head and tape path facing up.

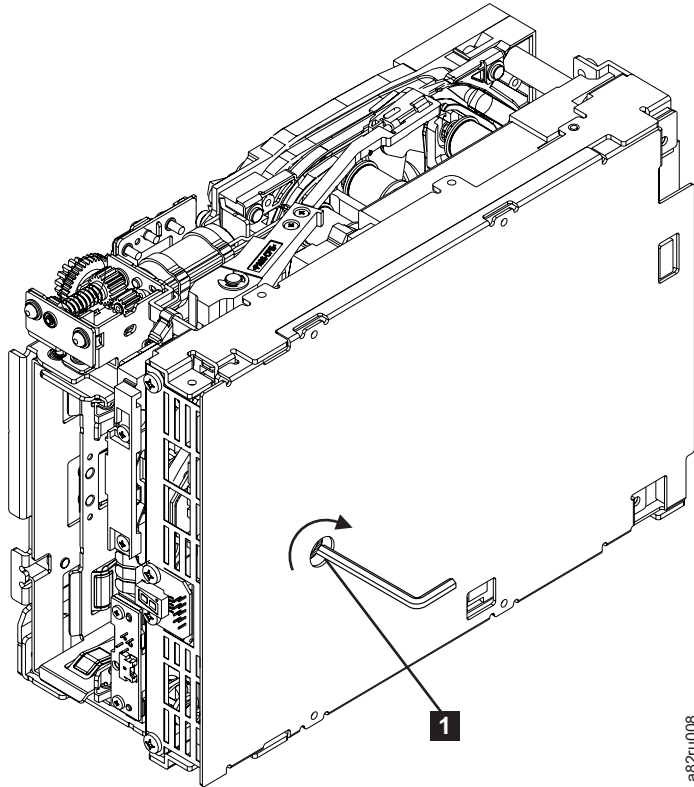


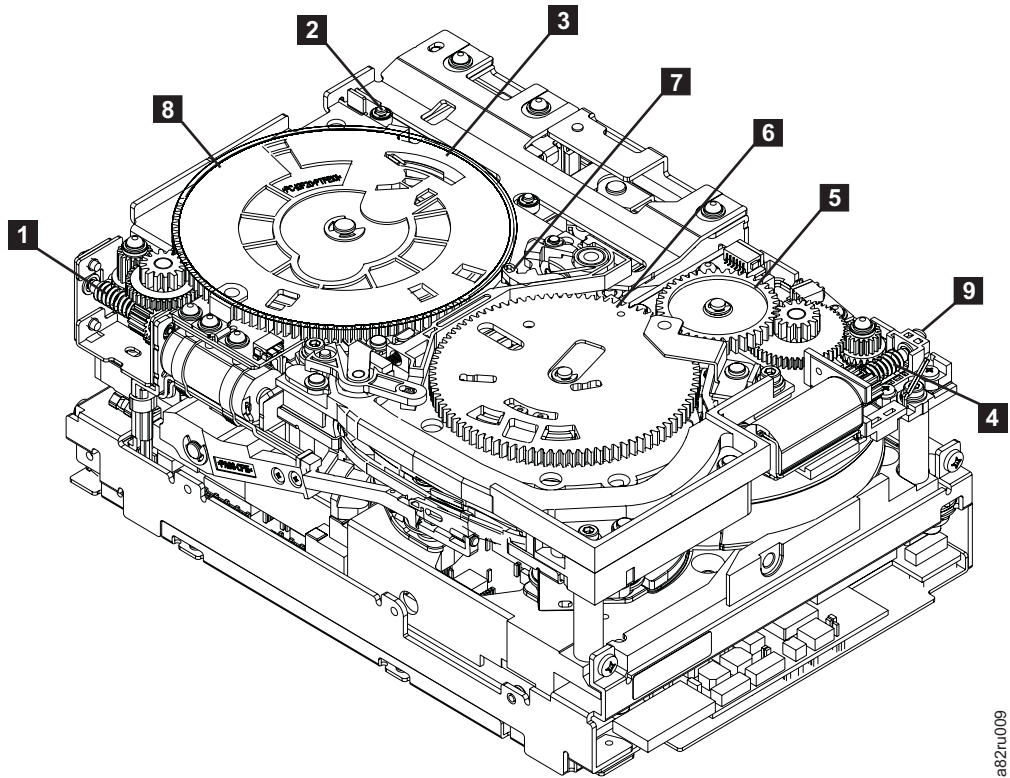
Figure 173. Using hex wrench to rewind tape into cartridge

2. From the bottom of the drive, locate the access hole (**1** in Figure 173).
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 174 on page 290) 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 174 on page 290) clockwise;

--OR--

 - b. Use a #1 flathead screwdriver to turn the threader worm gear (**9** in Figure 174 on page 290) clockwise.

This rotates the threader motor worm gear (**4** in Figure 174 on page 290) clockwise, drawing the LBA into the cartridge.



a82u009

Figure 174. 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 171 on page 287) 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 170 on page 286.

- 7. Notice the:
 - a. Loader mechanism gear (**8** in Figure 174) nearest the front of the drive that actuates the cartridge loader mechanism.
 - b. Position of the rotate stub (**3** in Figure 174).
 - c. Front loader motor worm gear (**1** in Figure 174). Rotating this gear allows the loader mechanism gear (**8** in Figure 174) to turn.
- 8. Rotate the loader motor worm gear (**1** in Figure 174) to turn the threader mechanism gear (**6** in Figure 174) counterclockwise. Continue turning until the rotator stub (**3** in Figure 174) loses contact with the lever (**7** in Figure 174). This releases the LBA leader pin.

- ___ 9. Rotate the threader motor worm gear (**4** in Figure 174 on page 290) to turn the threader mechanism gear (**6** in Figure 174 on page 290) counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the rear of the drive shown as **1** Figure 175.

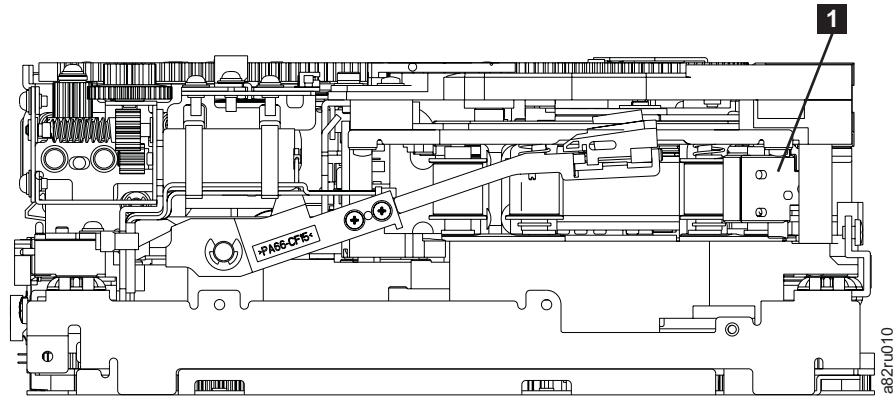


Figure 175. Leader Block Assembly (LBA)

- ___ 10. Continue rotating the loader motor worm gear (**1** in Figure 174 on page 290) until the rotator stub (**3** in Figure 174 on page 290) is positioned as shown. Notice that the rotator stub (**3** in Figure 174 on page 290) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure 174 on page 290).
- ___ 11. Remove the cartridge from the cartridge loader tray.
- ___ 12. Reassemble the drive by reversing the procedure in Step 4 on page 280 in Beginning Procedure.
- ___ 13. Refer to the appropriate procedure to install the new drive and return the failed drive.

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Getting Help

If you need assistance while installing or operating your Autoloader, refer to Table 46 and contact the IBM Customer Assistance Center nearest you. When calling for assistance, please have your autoloader's serial number available (located on the label at the inside bottom of the unit).

Table 46. Telephone numbers and e-mail addresses for IBM Customer Assistance Centers

World Wide Web Site: http://www.ibm.com/storage/support/1to/		
Geographic Location	IBM Customer Assistance Center	
	Telephone	e-mail
<i>Americas</i>		
North America	888 IBM 9585	tape@us.ibm.com
South America	888 IBM 9585	tape@us.ibm.com
Hawaii	888 IBM 9585	tape@us.ibm.com
Guam	888 IBM 9585	tape@us.ibm.com
<i>Europe, Middle East, Africa</i>		
United Kingdom	01475 898 125	tape@uk.ibm.com
France	02 3855 7490	tape@uk.ibm.com

Table 46. Telephone numbers and e-mail addresses for IBM Customer Assistance Centers (continued)

Italy	02 5962 2122	tape@uk.ibm.com
Republic of Ireland	01 815 9408	tape@uk.ibm.com
Netherlands	020 513 2440	tape@uk.ibm.com
Germany	07032 153050	tape@de.ibm.com
Sweden	08 793 1081	tape@se.ibm.com
Norway	066 998432	tape@se.ibm.com
Denmark	045 233178	tape@se.ibm.com
Finland	09 459 5698	tape@se.ibm.com
<i>Asia Pacific</i>		
Japan	+65 840 9494	tape@sg.ibm.com
Australia	+65 840 9494	tape@sg.ibm.com
New Zealand	+65 840 9494	tape@sg.ibm.com
Other Asia Pacific locations	+65 840 9494	tape@sg.ibm.com

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- IBMLink
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- SP
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- Linear Tape-Open
- LTO
- Ultrium Tape Drive

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UNIX is a registered trademark of The Open Group in the United States and other countries.

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

Electronic Emission Notices

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

IBM 3581 Ultrium Tape Autoloader

Federal Communications Commission (FCC) Class A Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die: IBM Deutschland Informationssysteme GmbH 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 4 Abs. (1) 4:

Das Gerät erfüllt die Schutzerfordernungen nach EN 55024 und EN 55022 Klasse A.

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

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

Japan VCCI Class A ITE Electronic Emission Statement

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taitemi

Statement of Limited Warranty

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. **Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.**

What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

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What this Warranty Does not Cover

This warranty does not cover the following:

- any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
- failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
- failure caused by a product for which IBM is not responsible; and
- any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

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

Any technical or other support provided for a Machine under warranty, such as assistance via telephone with "how-to" questions and those regarding Machine set-up and installation, is provided **WITHOUT WARRANTIES OF ANY KIND**.

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

When you call for service, you must follow the problem determination and resolution procedures that IBM specifies. A technician will attempt to make an initial diagnosis of your problem and help you resolve it over the telephone.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called "BIOS"), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit ("CRU") (e.g., keyboard, mouse, speaker, memory, hard disk drive and other easily replaceable parts), IBM will ship these parts to you for replacement by you.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Exchange of a Machine or Part

When the warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item.

Your Additional Responsibilities

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

You also agree to:

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

3. where applicable, before service is provided:
 - a. follow the service request procedures that IBM or your reseller provides;
 - b. backup or secure all programs, data, and funds contained in the Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
 - d. inform IBM or your reseller of changes in the Machine's location.
4. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

Limitation of Liability

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

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

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2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

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

UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

Governing Law

Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Statement of Limited Warranty, without regard to conflict of law principles.

THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

Jurisdiction

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

Part 2 - Country-unique Terms

AMERICAS

ARGENTINA

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

BRAZIL

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

PERU

Limitation of Liability: *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

NORTH AMERICA

How to Obtain Warranty Service: *The following is added to this Section:*

To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Limitation of Liability: *The following replaces item 1 of this section:*

1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

What this Warranty Covers: *The following paragraph is added to this section:*

The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this section:*

Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State or Territory

CAMBODIA, LAOS, and VIETNAM

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America.

CAMBODIA, INDONESIA, LAOS, and VIETNAM

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the SIAC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

HONG KONG S.A.R. OF CHINA and MACAU S.A.R. of CHINA

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of China (Hong Kong S.A.R.).

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence; and
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

Arbitration: *The following is added under this heading*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

JAPAN

Governing Law: *The following sentence is added to this section:*

Any doubts concerning this Statement of Limited Warranty will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

MALAYSIA

Limitation of Liability: *The word "SPECIAL" in item 3 of the fifth paragraph is deleted.*

NEW ZEALAND

What this Warranty Covers: *The following paragraph is added to this section:*

The warranties specified in this section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this section:*

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC of CHINA (PRC)

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

PHILIPPINES

Limitation of Liability: *Item 3 in the fifth paragraph is replaced by the following:*

SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR

Arbitration: *The following is added:* under this heading

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc.. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

SINGAPORE

Limitation of Liability: *The words "SPECIAL" and "ECONOMIC" in item 3 in the fifth paragraph are deleted.*

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:

The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

How to Obtain Warranty Service:

If you purchase a Machine in Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom or Vatican State, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service. If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia

(FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase a Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

Add the following paragraph in **Western Europe** (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom, Vatican State):

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

Governing Law:

The phrase "the laws of the country in which you acquired the Machine" is replaced by:

1) "the laws of Austria" in **Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia;** 2) "the laws of France" in **Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna;** 3) "the laws of Finland" in **Estonia, Latvia, and Lithuania;** 4) "the laws of England" in **Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe;** and 5) "the laws of South Africa" in **South Africa, Namibia, Lesotho and Swaziland.**

Jurisdiction: The following exceptions are added to this section:

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) in **Belgium** and

Luxembourg, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in Russia**, all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) **in South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) **in Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 9) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

Arbitration: The following is added under this heading:

In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

In Estonia, Latvia and Lithuania all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

How to Obtain Warranty Service:*The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information. You may contact IBM at the following address: IBM Warranty & Service Quality Dept.

PO Box 30

Spango Valley

Greenock

Scotland PA16 0AH

AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, NORWAY, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS. THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:**

FRANCE and BELGIUM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications. *The following paragraphs are added to this section:*

The warranty period for Machines is 12 months from the date of delivery. The limitation period for consumers in action for breach of warranty is the statutory period as a minimum. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this section:*

as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this section:*

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: (items 1 and 2 unchanged).

GERMANY

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this section:

The minimum warranty period for Machines is twelve months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

HUNGARY

Limitation of Liability: *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

IRELAND

What this Warranty Covers: *The following is added to this section:*

Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability:*The following replaces the terms of section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.
3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM, its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

SLOVAKIA

Limitation of Liability: *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this section:*

IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for:
 - (a) death or personal injury caused by the negligence of IBM; and
 - (b) any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.

2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

These limits also apply to IBM's suppliers and resellers. They state the maximum for which IBM and such suppliers and resellers are collectively responsible.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM or any of its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

Warranty Period

The warranty period may vary by country or region and is specified in the tables below.

MACHINE TYPE: 3580 IBM TotalStorage Ultrium Tape Drive

Model	Warranty Period / Type	Exceptions
L11	1 Year / On-site Exchange	n/a
H11	1 Year / On-site Exchange	n/a
L13	3 Years / Customer Replaceable Unit	1 Year / On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays
		1 Year/On-site Exchange in Japan
H13	3 Years / Customer Replaceable Unit	1 Year / On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays
		1 Year/On-site Exchange in Japan
L23	3 Years / Customer Replaceable Unit	1 Year / On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays
		1 Year/On-site Exchange in Japan
H23	3 Years / Customer Replaceable Unit	1 Year / On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays
		1 Year/On-site Exchange in Japan

L13	3 Years/Customer Replaceable Unit	Customer Carry-In Exchange for People's Republic of China, Taiwan and China (Hong Kong S.A.R.)
H13	3 Years/Customer Replaceable Unit	Customer Carry-In Exchange for People's Republic of China, Taiwan and China (Hong Kong S.A.R.)
L17	1 Year/On-site Exchange	1 Year/On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays.
		1 Year/On-site Exchange in Japan
H17	1 Year/On-site Exchange	1 Year/On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays.
		1 Year/On-site Exchange in Japan
L23	3 Years/Customer Replaceable Unit	1 Year/On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays.
		1 Year/On-site Exchange in Japan
H23	3 Years/Customer Replaceable Unit	1 Year/On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays.
		1 Year/On-site Exchange in Japan
L28/L38/L3H	3 Years/Customer Replaceable Unit	1 Year/On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays.
		1 Year/On-site Exchange in Asia Pacific
F28/F38/F3H	3 Years/Customer Replaceable Unit	1 Year/On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays.
		1 Year/On-site Exchange in Asia Pacific

MACHINE TYPE: 3582 IBM TotalStorage Ultrium Tape Library

Model	Warranty Period/Type	Exceptions
L23	3 Years/Customer Replaceable Unit	1 Year/On-site Exchange in Japan
		1 Year/On-site Exchange in India and Vietnam with nine (9) hours per business day or next business day excluding holidays.
		Customer Carry-In Exchange for Peoples' Republic of China, Taiwan and China (Hong Kong S.A.R.)

OPTIONS

The following options have a Customer Replaceable Unit Warranty for a period of one (1) year.

IBM TotalStorage Ultrium Machine Type	Option
3580 Tape Drive	3580 Rack Mount Kit with Power Cord

IBM TotalStorage Ultrium Machine Type	Option
3581 Tape Autoloader (models L/H13, L/H 17, L/H23)	3581 Rack Mount Kit with Power Cord
3581 Tape Autoloader (models L/H13, L/H 17, L/H23)	3581 Bar Code Reader
3581 Tape Autoloader (models L28/L38/L3H, F28/F38/F3H)	3581 Rack Mount Kit
3581 Tape Autoloader (models L28/L38/L3H, F28/F38/F3H)	3581 Bar Code Reader
3581 Tape Autoloader (models L28/L38/L3H, F28/F38/F3H)	3581 HVD Converter
3581 Tape Autoloader (models L28/L38/L3H, F28/F38/F3H)	3581 Remote Management Unit
3582 Tape Library	3582 Additional LVD Drive
3582 Tape Library	3582 Additional HVD Drive
3582 Tape Library	3582 Additional Fibre Drive
3582 Tape Library	3582 Stand Alone Decorative Cover
3582 Tape Library	3582 Magazine Cover
3582 Tape Library	3582 Remote Management Unit

Machine Type	Model	Warranty Period/Type
3583 IBM TotalStorage Ultrium Scalable Tape Library	All	1 Year / On-site Repair Service
3584 IBM TotalStorage Ultrium Ultrascalable Tape Library	All	1 Year / On-Site Repair Service

Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above tables and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM's normal service area, contact your local IBM representative or your reseller for country and location specific information.

1. Customer Replaceable Unit ("CRU") Service: The CRU warranty service is for a period of three years and is available nine (9) hours per day, five (5) business days per week excluding holidays. Proof of purchase may be required to validate warranty service.

The IBM Technical Support Center will assist the customer with problem determination and will initiate shipment of a replacement unit, if needed, to the customer's location by express delivery. In most cases, for calls received by 5:00 p.m. (in the customer's time zone) the replacement unit will arrive within two business days excluding holidays. These terms cover most continental U.S. locations (cities defined by FedEx as H1/H2-designated locations) and most other countries and/or regions, except exclusions noted in table. Call 800-GO-FEDEX

(800-463-3339) for specific delivery schedule information. In EMEA and LA countries and/or regions, CRU Service may be via Courier Exchange. (See Courier or Depot Service below.)

2. On-site Repair Service (IOR): On-site repair warranty service is available nine (9) hours per day, five (5) business days per week, next business day response excluding holidays or twenty four (24) hours per day, seven (7) days per week, same day response. IBM or your reseller will repair the failing Machine at your location and verify its operation. You must provide a suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. **For some Machines, certain repairs may require sending the Machine to an IBM service center.**

3. On-site Exchange Service (IOE): On-site exchange warranty service is available nine (9) hours per day, five (5) business days per week, the next business day excluding holidays or twenty four (24) hours per day, seven (7) days per week, same day response. IBM or your reseller will exchange the failing Machine at your location and verify its operation.

4. Courier or Depot Service*: You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

5. Customer Carry-In (CCR or CCE) or Mail-In Service: You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM's expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

With Customer Carry-In Exchange service (CCIE), the IBM support center will assist with problem determination. When it is determined that a replacement is needed, the IBM support center representative will instruct the customer to bring the failed unit to the nearest IBM authorized service center to exchange for a replacement unit. For calls received by 5:00 p.m. (in the customer's time zone) the exchange date can occur within three business days in most cases.

While replacing the unit, the customer must transfer the machine type, model number, and serial number of the failing unit to the replacement unit, which is important for future warranty service calls to be handled properly. The customer performs the transfer by writing the information on a repair identification tag that is shipped with the replacement unit and affixing the tag to the replacement unit.

The customer should pack the failed unit in the shipping carton that contained the replacement unit, relabel the carton with the shipping label included with the replacement unit, and make arrangements for return of the unit to IBM. Failure to use the carton in which the replacement unit was received or failure to properly pack the returned unit could result in charges incurred by the customer for damage to the failed unit during shipment. Failure to return the failed unit to IBM within 30 days will result in the customer being billed for the replacement unit at IBM's current list price. Transportation charges, both ways, are paid by IBM. The replacement unit becomes the property of IBM.

* This type of service is called ThinkPad EasyServ or EasyServ in some countries.

The customer is responsible for following IBM's published diagnostic procedures in the machine's setup and operator guide. Prior to calling the IBM Technical Support Center, the customer should reference service-related information and bulletins on the following IBM LTOTM web site:

<http://ssddom02.storage.ibm.com/techsup/webnav.nsf/support/lto>

Customers in Japan should reference the following IBM web site:

<http://www-6.ibm.com/jp/storage/products/tape/lto/update.html>

The IBM Machine Warranty worldwide web site at

http://www.ibm.com/servers/support/machine_warranties/ provides a worldwide overview of IBM's Limited Warranty for Machines, the Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.** To obtain warranty service, contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

EU Country Telephone List: Phone numbers are subject to change without notice.

Austria -- 43-1-24592-5901	Italy --39-02-482-9202
Belgium -- 02-718-4339	Luxembourg -- 352-360385-1
Denmark -- 4520-8200	Netherlands --020-514-5770
Finland -- 358-9-4591	Portugal -- 351-21-7915-147
France -- 0238-557-450	Spain --34-91-662-4916
Germany -- 07032-15-4920	Sweden -- 46-8-477-4420
Greece -- 30-210-688-1220	United Kingdom -- 01475-555-055
Ireland --353-1-815-4000	

Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication.

Numbers

2:1 compression. The relationship between the quantity of data that can be stored with compression as compared to the quantity of data that can be stored without compression.

3581 Ultrium Tape Autoloader. A device that can be attached to a supported server and used to write data to and from magnetic tape.

A

A. Ampere.

AC. Alternating current.

AC line voltage. The input voltage (in volts) that is required by the Autoloader for normal operation.

activity bars. A graduated series of horizontal bars that appear and disappear at varying rates to signify robotic or drive activity.

ACTIVITY light. One of three status lights located on the operator panel of the Autoloader.

adapter card. A circuit board that adds function to a computer.

ALARM light. One of three status lights located on the operator panel of the Autoloader. The red ALARM light comes on whenever an error occurs.

alphanumeric. Pertaining to a character set that contains letters, numerals, and usually other characters, such as punctuation marks.

alternating current (ac). An electric current that reverses its direction at regularly recurring intervals.

ambient temperature. The temperature of air or other media in a designated area, particularly the area surrounding equipment.

amp. Ampere.

ampere (A, amp). A unit of measure for electric current that is equivalent to a flow of one coulomb per second, or to the current produced by one volt applied across a resistance of one ohm.

American Standard Code for Information Interchange (ASCII). The predominant character-set code of present-day computers. The modern version uses 7 bits for each character (8 bits, if including parity check). The code is used for information interchange among data processing systems, data communications systems, and associated equipment.

Arbitrated Loop Topology . A Fibre Channel topology that provides a (FC-AL) solution to attach multiple communicating ports in a loop.

Arbitration. The process of selecting one respondent from a collection of several candidates that request service concurrently.

archive. To collect and store files in a designated place.

ASCII. American Standard Code for Information Interchange.

AUTOCLEAN function. A choice on the Autoloader's menu that lets you specify the Autoloader to automatically clean the head of the tape drive with a cleaning cartridge.

B

BCR . Bar Code Reader.

bar code. A code representing characters by sets of parallel bars of varying thickness and separation which are read optically by transverse scanning.

bar code label. A specially coded label that can be affixed to a tape cartridge and which enables a device to identify the cartridge and its volume serial number.

bar code reader. In the Autoloader, a laser device specialized for scanning and reading bar codes and converting them into either the ASCII or EBCDIC digital character code.

bit. Either of the digits 0 or 1 when used in the binary numbering system.

browser. A client program that initiates requests to a web server and displays the information that the server returns.

burst data transfer rate. In data communications, the average number of bits, characters, or blocks per unit time passing between corresponding equipment in a data transmission system.

bus. See *SCSI bus*.

byte. A string consisting of a certain number of bits (usually 8) that are treated as a unit and represent a character. A fundamental data unit.

C

calibrate. To adjust, tune.

capacity. The amount of data that can be contained on storage media and expressed in bytes of data.

cartridge. See *tape cartridge*.

cartridge door. On a tape cartridge, a hinged barrier that can be opened to access, or closed to protect, the magnetic tape within the cartridge.

cartridge memory. See *LTO cartridge memory*.

cartridge manual rewind tool. A device that can be fitted into the reel of a cartridge and used to rewind tape into or out of the cartridge.

cartridge storage slot. One of seven containers that are mounted inside the Autoloader and are used to house tape cartridges.

CD. Compact disc.

compact disc (CD). A disc, usually 4.75 inches in diameter, from which data is read optically by means of a laser.

centimeter (cm). One one-hundredth of a meter (0.01 m). Approximately 0.39 inch.

circuit board. A thin plate on which chips and other electronic components are placed. Computers consist of one or more boards, often called cards or adapters.

circuit breaker. A switch that automatically interrupts an electric circuit under an infrequent abnormal condition.

cleaning cartridge. A tape cartridge that is used to clean the heads of a tape drive. Contrast with *data cartridge*.

cm. Centimeter.

compression. The process of eliminating gaps, empty fields, redundancies, and unnecessary data to shorten the length of records or blocks.

configure. To describe to a system the devices, optional features, and programs installed on the system.

control buttons. Located on the control panel of the Autoloader, four push buttons that, when pressed, let you interact with the menus on the message display. The control buttons are CANCEL, PREVIOUS, NEXT, and ENTER.

CRU. See *customer replaceable unit*.

CT. On the left side of the Autoloader's message display, one of three indicators that, when displayed, indicates that drive head needs to be cleaned.

current. The quantity of charge per unit time, measured in amperes (Amps, A).

customer replaceable unit (CRU). A part that a customer (rather than a service representative) replaces.

D

data. Any representations such as characters or analog quantities to which meaning is, or might be, assigned.

data cartridge. A tape cartridge dedicated to storing data. Contrast with *cleaning cartridge*.

data compression. See *compression*.

data transfer rate. See *native sustained data transfer rate*.

DC. On the left side of the Autoloader's message display, one of three indicators that, when displayed, indicates that data compression is selected on the drive.

default setting. The value that is assumed when none is explicitly specified.

degauss. To make a magnetic tape nonmagnetic by means of electrical coils carrying currents that neutralize the magnetism of the tape.

degausser. A device that makes magnetic tape nonmagnetic.

device. Any hardware component or peripheral, such as a tape drive or tape library, that can receive and send data.

device driver. A file that contains the code needed to use an attached device.

DHCP. Dynamic Host Configuration Protocol. An agreed-upon format for assigning IP addresses to devices on a network at the moment they are needed rather than in advance.

diagnostic. A software program that is designed to recognize, locate, and explain faults in equipment or errors in programs.

Diagnostic Menu. A collection of diagnostic and maintenance functions that the Autoloader can perform.

differential. See *High Voltage Differential (HVD/DIFF)*.

disable. To make nonfunctional.

download. To transfer programs or data from a computer to a connected device, typically a personal computer.

drive. See IBM Ultrium Tape Drive.

drive dump. The recording, at a particular instant, of the contents of all or part of one storage device into another storage device.

drive head. The component that records an electrical signal onto magnetic tape, or reads a signal from tape into an electrical signal.

E

eject. To remove or force out from within.

electronic mail. Correspondence in the form of messages transmitted between user terminals over a computer network.

e-mail. See *electronic mail*.

enable. To make functional.

erase. To remove recorded matter from a magnetic tape.

ESD. Electrostatic Discharge.

F

fabric. A group of interconnections between fibre channel ports that include a fabric element.

Fibre Channel. Up to 2 Gigabit per second data transfer interface technology that maps several common transport protocols including IP and SCSI, allowing it to merge high-speed I/O and network functionality in a single connectivity technology.

field microcode replacement (FMR) tape. A tape cartridge that contains new or revised firmware (microcode) for the IBM Ultrium Tape Drive.

file. A named set of records stored or processed as a unit.

filemark. The size in bytes of the end-of-file (EOF) marks that a tape device writes.

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 servers.

firmware. Proprietary code that is usually delivered as microcode as part of an operating system.

FMR tape. See *field microcode replacement tape*.

FTP site. Any electronic repository of information that uses the File Transfer Protocol (FTP) for transferring files to and from servers.

FMR tape. Firmware upgrade tape.

G

GB. Gigabyte.

gigabyte (GB). 1 000 000 000 bytes.

grounded. Having or making an electrical connection with the earth.

H

head. See *drive head*.

hertz (Hz). A unit of frequency equal to one cycle per second.

High Voltage Differential (HVD/DIFF). A logic signaling system that enables data communication between a supported server and another device, such as the Autoloader. HVD/DIFF signaling uses a paired plus and minus signal level to reduce the effects of noise on the SCSI bus. Any noise injected into the signal is present in both a plus and minus state, and is thereby canceled. Synonymous with *differential*.

host . The controlling or highest-level system in a data communication configuration. Synonymous with *server*.

HVD/DIFF. High voltage differential.

Hz. Hertz.

I

IBM Ultrium Tape Drive. Located within the Autoloader, a data-storage device that controls the movement of the magnetic tape in an IBM LTO Ultrium Tape Cartridge.

ID. Identifier.

initialize. To format a magnetic tape, write a label (VOLSER) on the tape, and leave the tape empty except for the system files containing the structure information. All former contents of the tape are lost.

insert. Pertaining to the Autoloader, to place a tape cartridge into the cartridge storage slot in the autoloader.

install. To set up for use or service. The act of adding a product, feature, or function to a system or device either by a singular change or by the addition of multiple components or devices.

Internet. The worldwide collection of interconnected networks that use the Internet suite of protocols and permit public access.

interposer. An adapter-like device that allows a connector of one size and style to connect to a mating connector of a different type and style.

K

kg. Kilogram.

kilogram (kg). One thousand grams (approximately 2.2 pounds).

L

label. See *bar code label*.

label area. On the LTO Ultrium Tape Cartridge, a recessed area next to the write-protect switch where a label must be affixed.

LCD. See *liquid crystal display*.

leader pin. With the LTO Ultrium Tape Cartridge, a small metal column attached to the end of the magnetic tape.

LED. Light-emitting diode.

light-emitting diode (LED). A semiconductor chip that gives off visible or infrared light when activated.

Linear Tape-Open (LTO). A type of tape storage technology developed by the IBM Corporation, Hewlett-Packard, and Certance.

line frequency. The frequency (in hertz) of the ac line voltage that the Autoloader requires for normal operation.

liquid crystal display (LCD). A low-power display technology used in computers and other I/O devices.

load. Pertaining to the Autoloader and following the insertion of a tape cartridge into a cartridge storage slot, the act (performed by the picker) of transferring the cartridge from the storage slot to the drive and of positioning the tape (performed by the tape drive) for reading or writing by the drive head.

load and unload cycle. The act of inserting a cartridge into a tape drive, loading the tape to load point, rewinding the tape into the cartridge, and ejecting the cartridge from the drive.

Low Voltage Differential/Single Ended (LVD/SE). A low-noise, low-power, and low-amplitude electrical signaling system that enables data communication between a supported server and another device, such as the Autoloader. LVD/SE signaling uses two wires to

drive one signal over copper wire. The use of wire pairs reduces electrical noise and crosstalk. This method of data transmission requires a cable that is no longer than 25 meters (82 ft).

LTO. Linear Tape-Open.

LTO-CM. LTO cartridge memory.

LTO cartridge memory (LTO-CM). Within each IBM Ultrium Data Cartridge, an embedded electronics and interface module that can store and retrieve a cartridge's historical usage and other information.

LVD/SE. Low voltage differential/single ended.

M

m. Meter.

magnetic tape. A tape with a magnetizable surface layer on which data can be stored by magnetic recording.

MB. Megabyte.

media. The plural of *medium*.

media capacity. See *capacity*.

media-type identifier. Pertaining to the bar code on the bar code label of the LTO Ultrium Tape Cartridge, a two-character code, *Ln*, that represents information about the cartridge. *L* identifies the cartridge as one that can be read by devices which incorporate LTO technology; *n* indicates the generation level of its type.

medium. A physical material in or on which data may be represented, such as magnetic tape.

megabyte (MB). 1 000 000 bytes.

message display. Located on the operator panel of the Autoloader, an LCD display that provides information about the status of the autoloader and error conditions.

metal particle tape. In the LTO Ultrium Tape Cartridge, tape that uses very small, pure metal particles (rather than oxide coatings) in the magnetic layer.

meter. In the Metric System, the basic unit of length; equal to approximately 39.37 inches.

MODE button. Located on the operator panel of the Autoloader, one of four control buttons that, when pressed, lets you scroll through the commands that you can use to operate the autoloader.

Model H13. One of two versions of the Autoloader. The Model H13 uses the Ultra SCSI, High Voltage Differential (HVD/DIFF) SCSI interface. Contrast with *Model L13*.

Model H23. One of two versions of the Autoloader. The Model 23 uses the Ultra SCSI, High Voltage Differential (HVD/DIFF) SCSI interface. Contrast with *Model L23*.

Model L13. One of two versions of the Autoloader. The Model L13 uses the Ultra2, Low Voltage Differential/Single Ended (LVD/SE) interface. Contrast with *Model H13*.

Model L23. One of two versions of the Autoloader. The Model L23 uses the Ultra160 SCSI, Low Voltage Differential/Single Ended (LVD/SE) interface. Contrast with *Model H23*.

N

native data capacity. The amount of data that can be stored without compression on a tape cartridge.

native storage capacity. See *native data capacity*.

native sustained data transfer rate. Over a long period of time, the average number of bits, characters, or blocks per unit time passing between corresponding equipment in a data transmission system.

NEXT button. Located on the operator panel of the Autoloader, one of four control buttons that, when pressed, highlights the next item or value in the currently displayed menu.

node. A fibre channel device that has at least one N_Port or NL_Port

noncondensing. A controlled environment that does not permit moisture to condense on the Autoloader or other devices.

O

OCP. Operator Control Panel.

oersted. The unit of magnetic field strength in the unrationalized centimeter-gram-second (cgs) electromagnetic system.

operating environment. The temperature, relative humidity rate, and wet bulb temperature of the room in which the Autoloader routinely conducts processing.

operating system. The master computer control program that translates the user's commands and allows application programs to interact with the computer's hardware.

Operator Control Panel. Located on the front of the Autoloader, the functional unit that contains buttons to control the autoloader and a display that provides information about the operation of the autoloader.

P

PDF. Portable Document Format.

pick. Pertaining to the Autoloader, to remove, by means of a robotic device, a tape cartridge from a storage slot or drive.

picker. A robotic mechanism located inside the Autoloader that moves cartridges between the cartridge storage slots and the drive.

point-to-point. A topology where two points communicate.

port. An access point in a device where a link attaches.

Portable Document Format (PDF). A standard specified by Adobe Systems, Incorporated, for the electronic distribution of documents.

POST. Power-On Self Test.

PostScript. A standard specified by Adobe Systems, Incorporated, that defines how text and graphics are presented on printers and display devices.

| **potentiometer-setting tool.** Normally used on a
| potentiometer to adjust resistance, a tool that is used
| during the manual removal of a tape cartridge from the
| Autoloader.

POWER button. Located on the operator panel of the Autoloader, a momentary push button switch that lets you turn the power to the autoloader on or off.

power cord. A cable that connects a device to a source of electrical power.

POWER light. One of three status lights located on the operator panel of the Autoloader. The green POWER light comes on when power is applied to the autoloader.

power-off, powered-off. (1) To remove electrical power from a device. (2) The state of a device when power has been removed from it.

power-on, powered-on. (1) To apply electrical power to a device. (2) The state of a device when power has been applied to it.

Power-On Self Test (POST). A series of diagnostic tests that are run automatically by a device when the power to that device is turned on.

power cord plug. On a power cord, the male fitting for making an electrical connection to a circuit by insertion into a receptacle.

power receptacle. The mounted female electrical fitting that contains the live parts of the circuit.

PREVIOUS button. Located on the operator panel of the Autoloader, one of four control buttons that, when pressed, highlights the preceding item or value in the currently displayed menu.

put. Pertaining to the Autoloader, to place, by means of a robotic device, a tape cartridge into a storage slot or drive.

R

RID. Repair Identification.

RMU. Remote Management Unit.

rack. A unit that houses the components of a storage subsystem, such as the Autoloader.

rackmount kit. A packaged collection of articles used to install the rack-mounted version of the Autoloader.

rackmount tray. A flat-bottomed container with a low rim that holds the Autoloader when it is mounted in a rack.

random access. An access technique in which data is obtained from or placed in a storage device in a nonsequential manner.

read. To acquire or interpret data from a storage device, from a data medium, or from another source.

reinitialize. To reformat a magnetic tape, write a label (VOLSER) on the tape, and leave the tape empty except for the system files containing the structure information. All former contents of the tape are lost.

relative humidity. The ratio of the amount of water vapor actually present in the air to the greatest amount possible at the same temperature.

remove. Pertaining to the Autoloader, to take a tape cartridge from a cartridge storage slot.

retention screws. Pertaining to the connector on a cable, two screws on either side of the connector that secure it to its mating connector.

robotics. The picker and any associated mechanisms that move a tape cartridge within the Autoloader.

robotics interface. See *picker*.

RPM. Revolutions per minute.

S

scratch cartridge. A data cartridge that contains no useful data, but can be written to with new data. Synonymous with *blank cartridge*.

SCSI. Small computer systems interface.

SCSI-2. Small computer systems interface-2.

SCSI bus. (1) A collection of wires through which data is transmitted from one part of a computer to another. (2) In networking, a central cable that connects all devices on a local-area network (LAN). (3) A generic term that refers to the complete set of signals that define the activity of the Small Computer Systems Interface (SCSI). Synonymous with *SCSI bus cable* and *SCSI cable*.

SCSI bus cable. See *SCSI bus*.

SCSI cable. See *SCSI bus*.

SCSI command. An operation performed by a target (tape drive) for an initiator (server). The command is initiated by the operator from the host console.

SCSI connector. One of the set of all female and male connectors on the SCSI bus.

SCSI device. Anything that can connect into the SCSI bus and actively participate in bus activity.

SCSI host adapter card. The logic card that connects a host (server) to the SCSI bus cable. Synonymous with *SCSI controller*.

SCSI ID. The hexadecimal representation of the unique address (0-F) which a user assigns to the Autoloader and which is used in SCSI protocols to identify or select the drive. The user normally assigns and sets the SCSI ID when installing the drive.

SCSI wrap tool. A device that attaches to the SCSI connector on the Autoloader and enables internal tests on the SCSI interface.

seat, seated. (1) To fit to. (2) To ensure that one object is fitted to another object.

SELECT button. Located on the operator panel of the Autoloader, one of four control buttons that, when pressed, activates the currently displayed operation.

sensor field. Located on the operator panel of the Autoloader, one of seven numeric fields at the bottom of the display that represent each storage slot and indicate whether a cartridge is present in that slot. A numeric sensor field displays only when a cartridge is present.

sequential access. An access technique for retrieving or storing data during which the data is read from, written to, or removed from a file based on the logical order (sequence) of the data in the file.

server. A functional unit that provides services to one or more clients over a network.

ship group. The group of supplies, cords, or documentation that is shipped with the Autoloader.

shipping environment. The temperature, relative humidity rate, and wet bulb temperature of the environment to which the Autoloader is exposed when being transferred from one location to another.

sled. Pertaining to a Autoloader that has been mounted in a rack, the container that houses the autoloader in the rackmount tray.

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).

Small Computer Systems Interface-2 (SCSI-2). See *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).

| **speed matching.** The Ultrium 3 and Ultrium 2 Tape Drive dynamically adjusts its native (uncompressed) data rate to the slower data rate of a connected server.

| **status lights.** Located on the front of the Autoloader, four light-emitting diodes (LEDs) indicate READY/ACTIVITY (green), CLEAN DRIVE (amber), MEDIA ATTENTION (amber), and ERROR (red).

storage environment. The temperature, relative humidity rate, and wet bulb temperature of the environment in which the Autoloader is nonoperational and being kept for future use.

storage slot. See *cartridge storage slot*.

T

TapeAlert. A patented technology from Hewlett-Packard that monitors the status of a tape device and media, and detects problems as they occur.

TapeAlert flags. Status and error messages that are generated by the TapeAlert utility and display on the host console.

tape cartridge. A removable storage device that consists of a tape wound on a supply reel.

tape drive. See IBM Ultrium Tape Drive.

TB. Terabyte.

terabyte. 1 000 000 000 000 bytes.

terminate, termination. To prevent unwanted electrical signal reflections by applying a device (a terminator) that absorbs the energy from the transmission line.

terminator. (1) A part used to end a SCSI bus. (2) A single-port, 75- Ω device that is used to absorb energy from a transmission line.

toggle. To alternate between two states.

track. A linear or angled pattern of data written on a tape surface.

transfer rate. See *data transfer rate*.

U

U. Pertaining to the rack that houses Autoloader, the amount of space between two holes in a mounting rail. One U is equal to 4.45 cm (1.75 in.).

Ultra SCSI. See *Small Computer Systems Interface (SCSI)*.

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

Ultrium Tape Drive. See *IBM Ultrium Tape Drive*.

unattended backup. The act of copying files without operator assistance.

uniform resource locator (URL). The address of an item on the World Wide Web. It includes the protocol followed by the fully qualified domain name (sometimes called the host name) and the request.

unload. Pertaining to the Autoloader, a term used to describe the act of the drive unthreading the tape from the internal tape path and returning the leader block to the tape cartridge.

URL. Uniform resource locator.

V

Vac. Volts of alternating current.

Vdc. Volts of direct current.

VOLSER. Volume serial number.

volume serial number (VOLSER). A number that a computer assigns to a tape cartridge when it prepares (initializes) the cartridge for use.

void. In character recognition, the inadvertent absence of ink within a character outline.

volt. The SI (international) unit of potential difference and electromotive force, formally defined to be the difference of electric potential between two points of a conductor carrying a constant current of one ampere, when the power dissipated between these points is equal to one watt.

voltage. The electric potential or potential difference expressed in volts.

VPD. Vital Product Data. Settings chosen during configuration of the unit.

W

W. Watts.

watt. A metric unit of measure of power; the power required to keep a current of one ampere flowing under a potential drop of one volt; about 1/736 of one horsepower.

web. See *World Wide Web*.

wet bulb temperature. The temperature at which pure water must be evaporated at constant pressure into a given sample of air in order to saturate the air under steady-state conditions. Read from a wet-bulb thermometer.

World Wide Web. A network of servers that contain programs and files. Many of the files contain hypertext links to other documents available through the network.

WP. On the left side of the Autoloader's message display, one of three indicators that, when displayed, indicates that a write-protected cartridge is loaded in the drive. The drive cannot write data to the cartridge.

write. To make a permanent or transient recording of data in a storage device or on a data medium.

write protected. A tape cartridge is write protected if some logical or physical mechanism causes the device that is processing the tape to prevent the program from writing on the tape.

write-protect switch. Located on the LTO Ultrium Tape Cartridge, a switch that prevents accidental erasure of data.

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