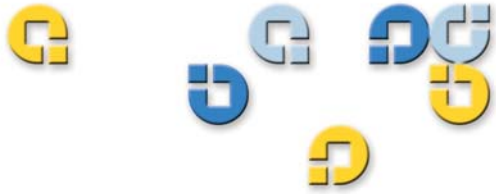
Quantum



User's Guide User's Guide User's Guide **User's Guide** User's Guide User's Guide

LTO Ultrium 8-Slot Autoloader

LTO Ultrium

50002762 B01

Quantum LTO Ultrium 8-Slot Autoloader User's Guide, P/N50002762, B01, July 2005
Made in USA.

COPYRIGHT STATEMENT

TRADEMARK STATEMENT

Warnings

All safety and operating instructions should be read before this product is operated, and should be retained for future reference. This unit has been engineered and manufactured to assure your personal safety. Improper use can result in potential electrical shock or fire hazards. In order not to defeat the safeguards, observe the following basic rules for installation, use and servicing.

A **Warning** box alerts the user to the presence of "dangerous voltage" inside the product that might cause harm or electric shock. For example:

Warning: Risk of electric shock! Do not open!

To reduce the risk of electric shock, do not remove the cover (or back). No user-serviceable parts are inside. Refer servicing to qualified service personnel.

- Heed warnings — All warnings on the product and in the operating instructions should be adhered to.
- Follow instructions — All operating and use instructions should be followed.
- Ventilation — The product should be situated so that its location or position does not interfere with proper ventilation.
- Heat — The product should be situated away from heat sources such as radiators, heat registers, furnaces, or other heat producing appliances.
- Power sources — The product should be connected to a power source only of the type directed in this document or as marked on the product.
- Power cord protection — The power cord should be routed so that it is not likely to be walked on or pinched by items placed upon or against it, paying particular attention to the cord at the wall receptacle, and the point where the cord exits from the product.
- To complete the disconnection of the electricity, please remove the power (electric) cord and the SCSI cable from their connections in the back of the autoloader. The plugs should be placed near the autoloader for easy access.
- Object and liquid entry — Care should be taken to insure that objects do not fall and liquids are not spilled into the product's enclosure through openings.
- Servicing — The user should not attempt to service the product beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

Precautions

- Do not use oil, solvents, gasoline, paint thinners, or insecticides on the unit.
- Do not expose the unit to moisture or to temperatures higher than 140 °F (60 °C) or lower than -40 °F (-40°C).
- Keep the unit away from direct sunlight, strong magnetic fields, excessive dust, humidity, and electronic/electrical equipment, which generate electrical noise.
- Hold the power cord by the head when removing it from the AC outlet; pulling the cord can damage the internal wires.
- Use the unit on a firm level surface free from vibration, and do not place anything on top of the unit.

FCC Notice

This equipment generates and uses radio frequency energy and, if not installed and used properly that is, in strict accordance with the manufacturer's instructions — may cause interference to radio communications or radio and television reception. It has been tested and found to comply with the limits for a Class B computing device in accordance with the specifications in Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference in a residential installation. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment on and off, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer into a different outlet so that the computer and receiver are on different branch circuits.

Warning: Changes or modifications made to this equipment, which have not been expressly approved by Certance, may cause radio and television interference problems that could void the user's authority to operate the equipment.

Further, this equipment complies with the limits for a Class B digital apparatus in accordance with Canadian Radio Interference Regulations ICES-003.

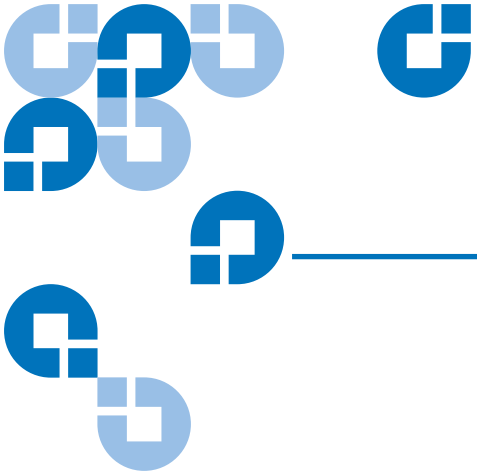
Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

The external device drive described in this manual requires shielded interface cables to comply with FCC emission limits.

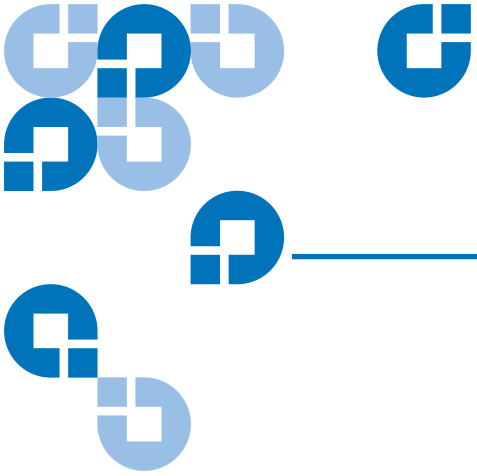
Warning: To prevent fire or electrical shock hazard, do not expose the unit to rain or moisture.

To avoid electrical shock, do not open the cabinet.

Refer servicing to qualified personnel.



Contents



Figures

Tables

Preface

The Quantum LTO Ultrium 8-Slot Autoloader User's Guide aprovides automated data storage, archival, backup, and retrieval for a range of systems, from desktop workstations to small office local area networksAudience

Audience

This document was written for users of the LTO Ultrium 8-Slot Autoloader.

Purpose

This document provides information about the LTO Ultrium 8-Slot Autoloader including:

- Installing
- Basic operations
- Operator commands
- Troubleshooting
- Specifications

Document Organization

This User's Guide describes how to install, configure, and care for the LTO Ultrium 8-Slot Autoloader autoloader. Please read the appropriate

chapters and appendixes carefully, and keep this Guide handy for future reference.

- Chapter 1, Quick Start provides quick-start instructions for getting the autoloader up and running in the shortest possible time.
- Chapter 2, Introduction describes the features and accesories of the autoloader.
- Chapter 3, Setting Up the Autoloader describes how to set up the autoloader.
- Chapter 4, Operating the Autoloader describes how to use and maintain the autoloader.
- Chapter 5, Troubleshooting and Diagnostics describes the troublshooting and diagnostics operations and error codes..
- Appendix A, Specifications describes technical and environmental specifications. The WEEE Compliance Statement is in this appendix.

Notational Conventions

This manual uses the following conventions:

Note: Notes emphasize important information related to the main topic.

Caution: Cautions indicate potential hazards to equipment and are included to prevent damage to equipment.

Warning: Warnings indicate potential hazards to personal safety and are included to prevent injury.

Related Documents

Documents related to the LTO Ultrium 8-Slot Autoloader User's Guide are shown below:

SCSI-2 Specification

The SCSI-2 communications specification is the proposed American National Standard for information systems, dated March 9, 1990. Copies may be obtained from:

Global Engineering Documents
15 Inverness Way, East
Englewood, CO 80112
(800) 854-7179 or (303) 397-2740

Contacts

Quantum company contacts are listed below.

Quantum Corporate Headquarters

To order documentation on the LTO Ultrium 8-Slot Autoloader User's Guide or other products contact:

Quantum Corporation
P.O. Box 57100
Irvine, CA 92619-7100
(949) 856-7800
(800) 284-5101

Technical Publications

To comment on existing documentation send e-mail to:

doc-comments@quantum.com

Quantum Home Page

Visit the Quantum home page at:

http://www.quantum.com

Customer Support

The Quantum Customer Support Department provides a 24-hour help desk that can be reached at:

North/South America:	(949) 725-2100 or (800) 284-5101
Asia/Pacific Rim:	(International Code) + 61 7 3839 0988
Europe/Middle East/Africa:	(International Code) + 44 (0) 1256 848748

Send faxes for the Customer Support Department to:

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Europe/Middle East/Africa:	(International Code) + 44 (0) 1256 848777

Send e-mail for the Customer Support Department to:

Asia/Pacific Rim:	apachelp@quantum.com
Europe/Middle East/Africa:	eurohelp@quantum.com

Visit our web site:

www.quantum.com/support

Chapter 1

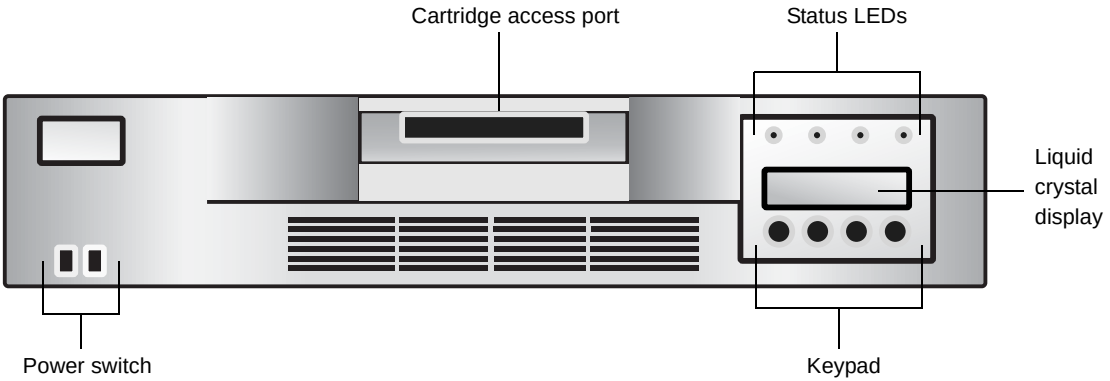
Quick Start

This chapter provides quick start information for the LTO Ultrium 8-Slot Autoloader, including:

Autoloader Components

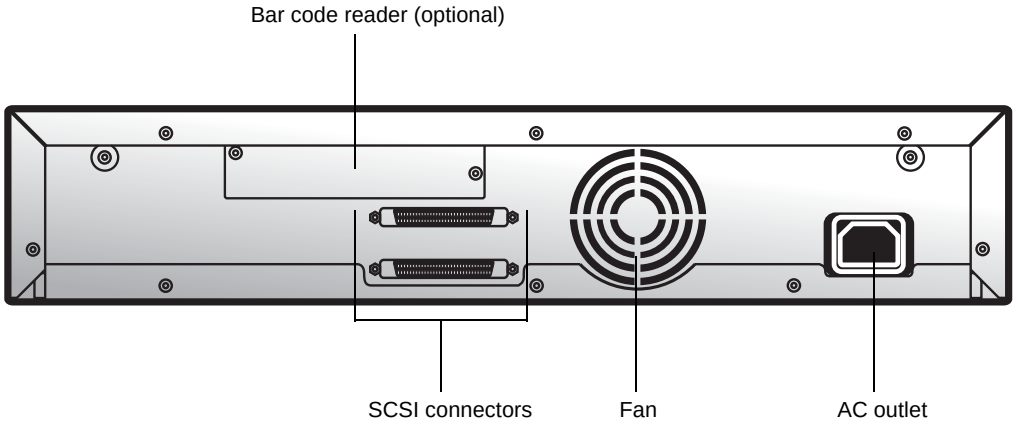
The following describes the major components of the autoloader.

Figure 1 Front Panel Components



- **Cartridge access port** —Used to insert or remove cartridges from the autoloader.
- **Status LEDs** — Consists of several lights that provide information about various system functions. See Status LEDs on page 26 for more information.
- **Liquid crystal display (LCD)** — Displays two lines of text with 16 characters per line. The screen displays actions and status information, menu items, and error messages, based on the operation mode. See LCD on page 27 for more information.
- **Keypad** — Performs various tasks in *interaction* mode. See Keypad on page 27 for more information.
- **Power switch** — Lets you turn the autoloader and the enclosed tape drive off and on. The switch is recessed into the front panel to prevent the autoloader from being accidentally turned off during operation.

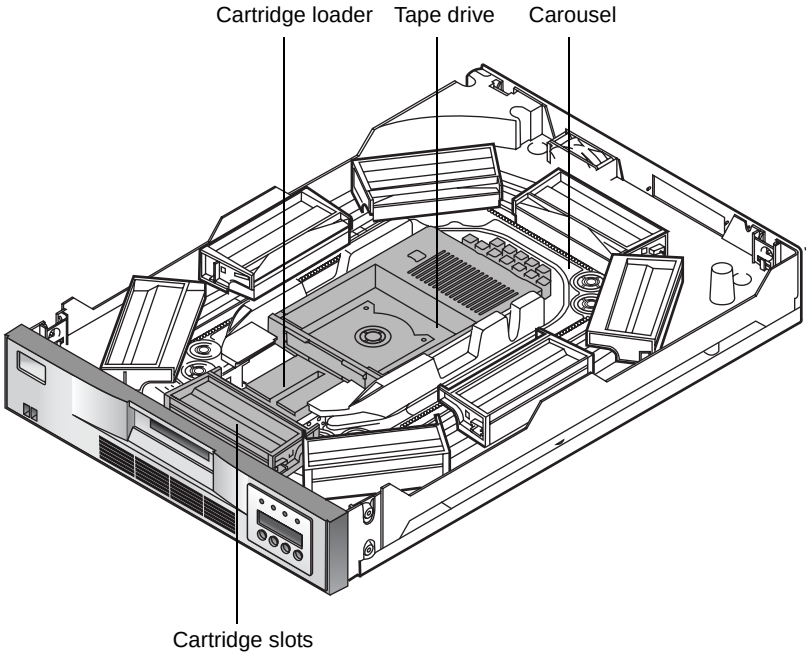
Figure 2 Back Panel Components



- **Bar code reader** — The bar code reader is an optional accessory that automatically scans each cartridge in the carousel. The information from each bar code label is stored in memory and available through SCSI to the computer's operating system or backup application. For more information on the bar code reader, see Optional Accessories on page 12.
- **SCSI connectors** — The autoloader has two wide SCSI connectors for connecting the autoloader and tape drive to a single SCSI bus. The connectors can accommodate either of the following:
  - A shielded male, high-density wide (68-pin) SCSI cable (see SCSI Interface on page 46.)
  - An LVD or multi-node terminator

  The wide SCSI configuration allows up to 16 devices (including one or more initiators) to be attached to a single SCSI bus.
- **Fan** — The system fan provides cooling for the autoloader and the tape drive.
- **AC outlet** — The AC outlet provides AC power and chassis grounding to the autoloader and the tape drive.

Figure 3 Internal Components



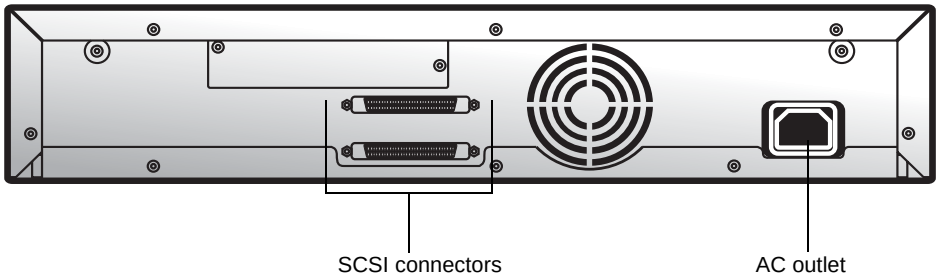
- **Cartridge loader** — The cartridge loader moves cartridges between the cartridge slots and the tape drive. When a cartridge slot is positioned in front of the tape drive, the loader grips the sides of the cartridge and slides it forward or backward, between the slot and tape drive. The loader then releases the cartridge and pushes it firmly into the drive or slot.
- **Tape drive** — The autoloader contains one tape drive. Please see the associated User's Guide for the particular LTO version for details of tape drive performance and operation.
- **Cartridge slots and carousel** — The carousel stores up to eight data cartridges. The carousel consists of a drive chain, guides, and gears that move the cartridges into position in front of the tape drive. Each cartridge is installed in a cartridge slot that ensures that the cartridge is properly aligned to be inserted into the tape drive. If desired, you can use one cartridge slot to hold a cleaning cartridge.

Starting the Autoloader

To start the autoloader:

1. Attach the power cord to the autoloader, and then to the AC outlet. For more information on power cords, see Power Specifications on page 50.

Figure 4 Attaching the Power Cord and a SCSI Terminator



2. Connect the SCSI cables and the terminator. For more information about the SCSI interface, see Performance Specifications on page 49.
   - Connect one end of the SCSI cable to one of the SCSI connectors on the back of the autoloader.
   - Connect the other end of the SCSI cable to the SCSI connector on the SCSI host bus adapter or on the previous device of the SCSI bus.
   - If this is the last device in the SCSI chain, connect the SCSI terminator to the remaining SCSI connector on the back of the autoloader.

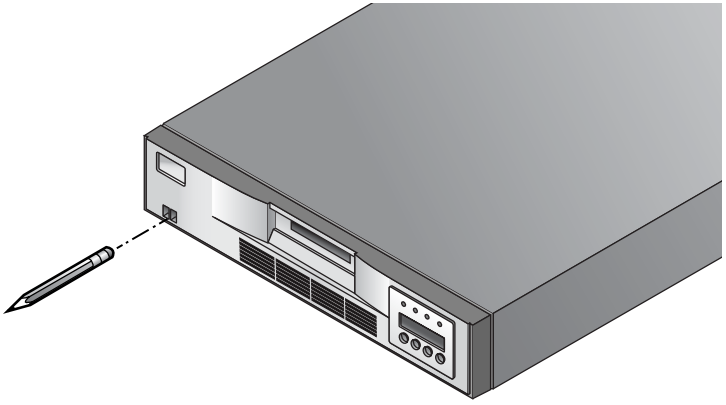
Table 1 SCSI ID Default Settings

Autoloader	5
Tape drive	6

To change the SCSI ID settings, see Changing the SCSI ID Settings on page 47.

3 Use the eraser end of a pencil, or something similar, to press the left side of the power switch. The autoloader powers up. Never use a metal object, such as a screwdriver.

Figure 5 Pressing the Power Switch



Note: The power switch lets you turn the power on and off for the autoloader and the enclosed tape drive. The power switch is recessed into the front panel to prevent the autoloader from being accidentally turned off during operation.

When the autoloader powers up, or resets, it goes through several internally controlled processes that allow it to get initialized and running. While those processes are happening, the Operator's Panel displays appropriate information to keep you informed about the events taking place. After initialization, the autoloader displays the mount status for the current drive. It also indicates that the sequential mode is ON by displaying the characters SEQ.

In addition, the appropriate inventory status characters display. For more information about inventory status characters, see Inventory Status Characters on page 29.

4 Start the host computer system.

Operator's Panel

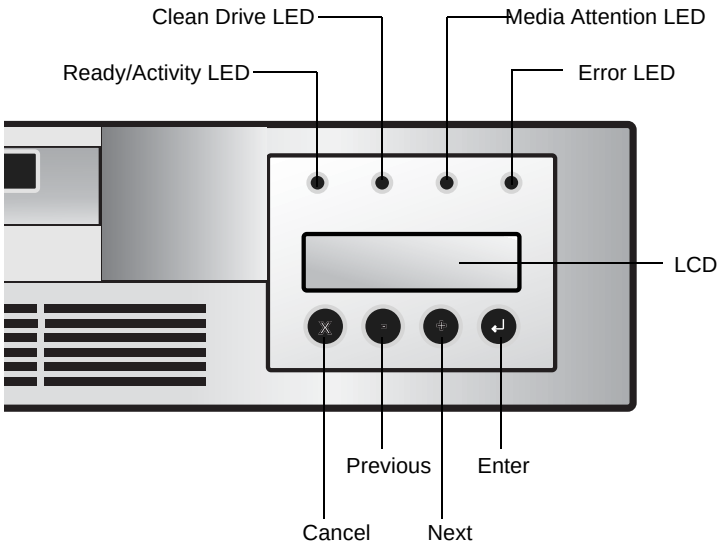
The Operator's Panel consists of various status LEDs, an LCD, and keypad buttons that enable you to perform various tasks.

The following keypad buttons are used to navigate the menu options:

- **CANCEL** button [**X**] — Cancel a user action and return to the last menu item.
- **PREVIOUS** button [**-**] — Navigate through menu items.
- **NEXT** button [**+**] — Navigate through menu items.
- **ENTER** button [**ø**] — Go to a sub-menu or to force a robotic action.

For more information about the Operator's Panel, see Operator's Panel on page 25. For more information on the menu options, see Menu Options on page 28.

Figure 6 Operator's Panel



Installing the Data Cartridges

Before using the autoloader, the data cartridges must be installed properly. For more information on data cartridges, see Data Cartridges on page 22.

Caution: The tape drive only operates with LTO-3 Ultrium (LTO-3 autoloader only), LTO-2 Ultrium (LTO-3 and LTO-2 autoloaders only), or LTO-1 Ultrium tape data cartridges. Attempting to use other types of cartridges may damage the unit. For best performance, Certance-brand cartridges are recommended.

To install the data cartridges:

1. Press any button on the Operator's Panel to change to **Interaction** mode.
2. Choose the **Commands** menu, and then press **Enter**.
3. Choose **Import** and press **Enter**.
4. Enter the number of the cartridge slot and press **Enter**.
5. Insert the cartridge in the cartridge access port. The cartridge is now placed in the selected slot.
6. Repeat steps 4 and 5 until all cartridges have been imported.

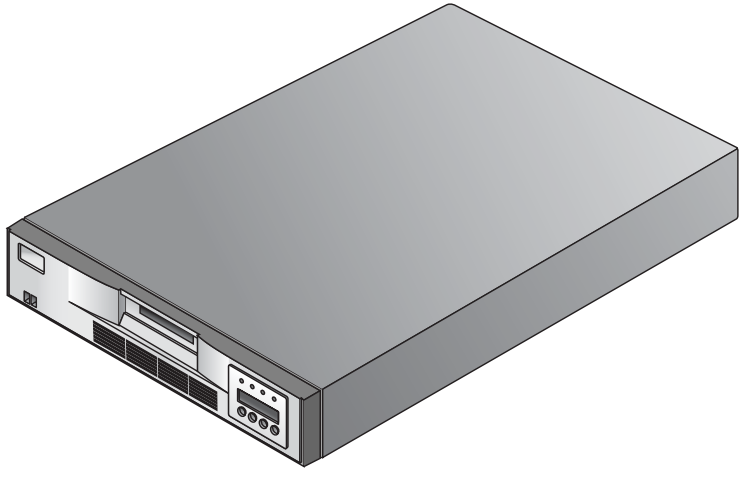
Chapter 2
Introduction

The autoloader provides automated data storage, archival, backup, and retrieval for a range of systems, from desktop workstations to small office local area networks.

This chapter contains general information about the autoloader, including:

- Features.
- Accessories

Figure 7 Autoloader



Features

The LTO Ultrium 8-Slot Autoloader includes the following features:

- A carousel that encircles the 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.
- Storage for up to eight cartridges. Cartridges are stored in cartridge slots mounted on the carousel. One of these cartridge slots can contain a cleaning cartridge.
- A cartridge access port for importing or exporting a single cartridge from the autoloader.
- A liquid crystal display that lets you monitor autoloader operations, select configuration options, and control the cartridge loader and carousel from the front panel.
- The autoloader and the tape drive each include independent Small Computer System Interface (SCSI) controllers. Each supports independent sets of SCSI messages and commands. The autoloader and the enclosed tape drive use a wide, low-voltage differential (LVD) SCSI interface.

> **Note:** The LVD SCSI interface is compatible with single-ended SCSI.

Table 2 Physical Characteristics and Features

Drive technology	LTO Ultrium 3	LTO Ultrium 2	LTO Ultrium 1
Total drives	1	1	1
Total storage elements	8	8	8
Cartridge access port	1	1	1
LCD display size and type	Two-line x 32 character, ASCII	Two-line x 32 character, ASCII	Two-line x 32 character, ASCII

LCD user interface	Four-button keypad	Four-button keypad	Four-button keypad
Maximum capacity	6.4TB/ 3/2TB (Compressed/ Native)	3.2TB/1600GB (Compressed/ Native)	1.6TB/800GB (Compressed/ Native)
Maximum sustained data transfer rate MB/Sec	132/68 (Compressed/ Native)	68/32 (Compressed/ Native)	32/16 (Compressed/ Native)

Table 3 Parallel SCSI Communication Interface

Low-voltage differential (LVD) + SE	YES
Maximum SCSI bus connections	1

Accessories

The autoloader is shipped with the following accessories:

- Power cord and adapter
- One wide SCSI-3 cable
- One LVD wide SCSI terminator (included in some configurations)
- Resource CD (product documentation). Basic diagnostic software for the tape drive and autoloader is available at www.quantum.com/support. Please see the online documentation on the CD for details about installation and operation.

Optional Accessories

- **Rack-mount kit —** If you want to mount the autoloader in a rack, you can purchase a rack-mount kit. The kit includes all the necessary hardware to mount the autoloader in a standard 19-inch EIA rack. The autoloader occupies two rack units.
- **Bar code reader —** Your autoloader may have come equipped with an optional bar code reader. The bar code reader automatically scans each cartridge in the carousel upon power up, after a reset, or when the **Re-Inventory** command is used. Beyond that, there is no user interface with the bar code reader via the front panel operator controls or liquid crystal display.

  If utilizing the bar code reader, you must apply bar code labels to the recessed area on the front of each cartridge. The information from each label is stored in memory and available through SCSI to the computer's operating system or backup application, upon request. The labels must conform to ANSI/AIM BC1 -1995, Uniform Symbology Specification Code 39.

  The bar code reader is enclosed in a plastic housing that protrudes out the rear panel of the autoloader, just above the SCSI connectors.

Chapter 3

Setting Up the Autoloader

This chapter describes how to set up the autoloader, and install the autoloader into a rack, if desired. Setting up the autoloader involves the following steps:

1. Choosing a Location.
2. Unpacking the Autoloader.
3. Installation Options
4. Connecting the Cables on page 21.
5. Data Cartridges on page 22

Choosing a Location

Choose a location that meets the following criteria (see Specifications on page 45 for more information on autoloader specifications):

- Select a location that is flat, sturdy, level, and close to a host server. Do not place the autoloader on the floor or other carpeted surfaces.

> **Caution:** Do not place the autoloader on its side or upside down, or stack items that weigh more than 33 lbs. (15 kg) on top of the autoloader.

- Rack requirements — Standard 19-inch rack with 2U of clearance
- Room temperature —
  - LTO Ultrium 2 and LTO Ultrium 1: 50-95° F (10-35° C)
  - LTO Ultrium 3: 50-104° F (10-40° C)
- Power source —
  - AC power voltage: 100-127 VAC
  - 200-240 VAC line frequency: 50-60 Hz

> **Note:** Locate the AC outlet at the back of the autoloader. The power cord is the autoloader's main AC disconnect device and must be easily accessible at all times.

- Weight — 19.5 lbs. (8.8 kg)
- Air quality — Minimal sources of particulate contamination. Avoid areas near frequently used doors and walkways, stacks of supplies that collect dust, printers, and smoke-filled rooms.

> **Caution:** Excessive dust and debris can damage tapes and tape drives.

- Humidity — 20-80% RH non-condensing
- Clearance —
  - Back (minimum of six inches [15.4 cm])
  - Front (minimum of 12 inches [30.8 cm])
  - Sides (minimum of two inches [5.08cm])

Checking the Installation Environment

After choosing a location for the autoloader, consider the following:

- The maximum recommended ambient temperature for the autoloader is +50°F to +104 °F (+10 °C to +40 °C). Install the autoloader in an environment compatible with this temperature.
- The fan opening at the rear of the autoloader and the 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.
- 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.

Unpacking the Autoloader

No special tools are required for unpacking the autoloader. Save all the original packing materials, including the accessory box, in case you need to ship or move the autoloader at a later time.

Installation Options

You have the option of installing the autoloader into a rack, or using it as a standalone unit.

- If you are installing the autoloader into a rack, go to Installing the Autoloader into a Rack.
- If you are using the autoloader as a standalone unit, go to Connecting the Cables on page 21.

Installing the Autoloader into a Rack

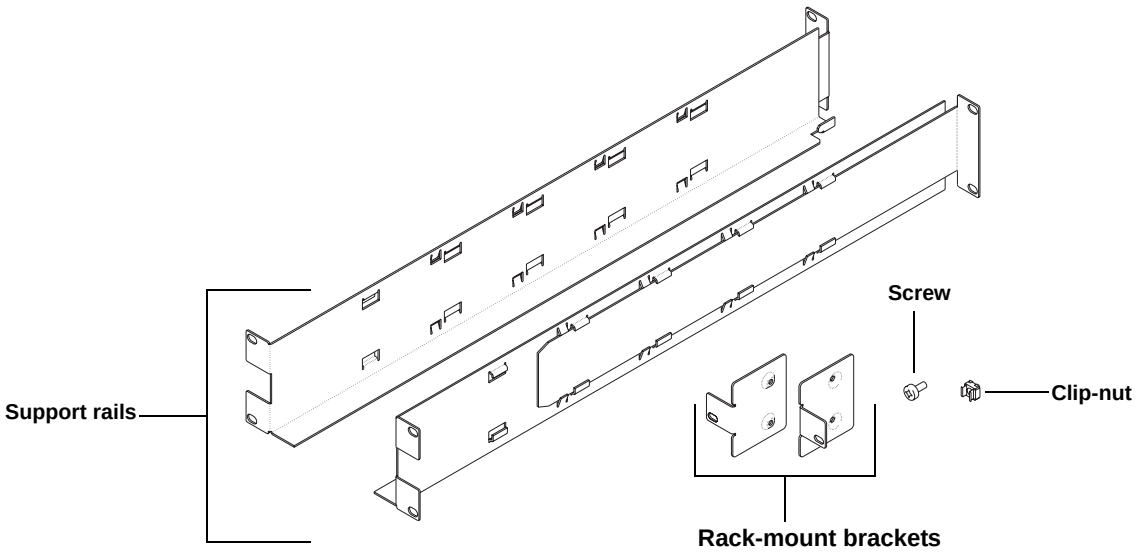
The autoloader can be installed into a standard 19-inch rack.

Requirements

To install the autoloader into a rack, you will need the following:

- #2 PHILLIPS® screwdriver
- TORX T-10 screwdriver
- Rack mount kit — Make sure the rack-mount kit contains the following items:
  - Two support rails
  - Two rack-mount brackets
  - Ten screws
  - Ten clip-nuts

Figure 8 Rack Mount Kit



Preparing the Autoloader

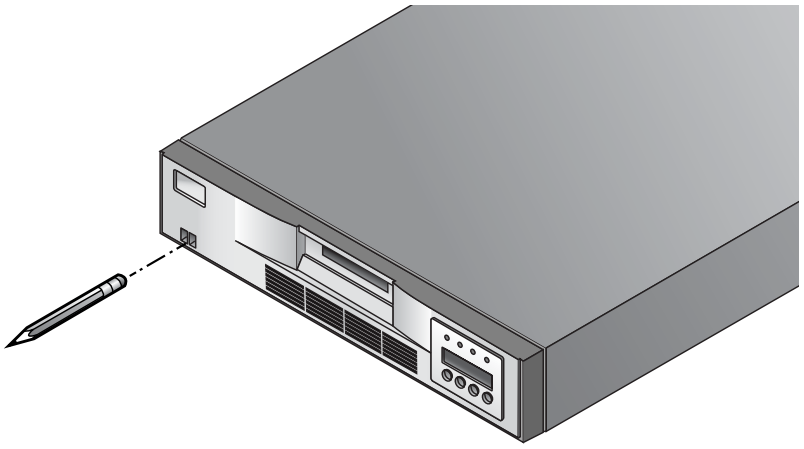
If the autoloader is currently in operation as a standalone unit, prepare it for installation in the rack as follows:

Warning: Before performing any installation or maintenance procedures, be sure that the power switch is off and that the power cord is disconnected from the autoloader and the AC outlet.

1 Power off the autoloader by pressing the right side of the recessed power switch located on the autoloader's front panel. Use the eraser end of a pencil or a similar object to press the power switch.

Note: To avoid disrupting communication between the host computer and other devices on the SCSI bus, make sure that there is no SCSI activity on the bus before you power off the autoloader.

Figure 9 Power Switch



2 Remove the power cord and any SCSI cables or terminators attached to the autoloader. Note the configuration of the cables and terminator. You will need to reinstall them after installing the autoloader in the rack.

Installing the Support Rails

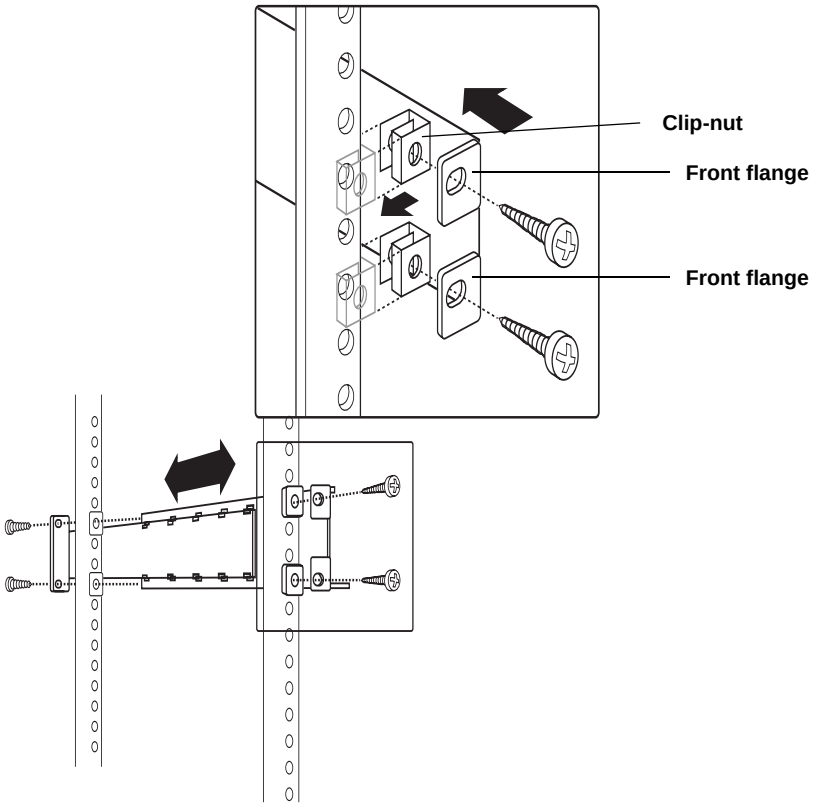
To install the support rails in the rack:

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

2 From the front of the rack, position one of the rails on the appropriate side. Slide the rail pieces apart to match the depth of your rack. Position the front flange so that it is on the outside of the strip of mounting holes in the rack.

3 Using a #2 Phillips screwdriver, attach the rail to the rack with four of the screws from the kit. If your rack has square mounting holes, or the holes are larger than the screws provided in the kit, use the clip-nuts to secure the screws, as shown in the following figure.

Figure 10 Attaching the Rails to the Rack



4 Repeat steps 2 and 3 for the second rail.

Installing the Rack-Mount Brackets

To install the rack-mount brackets on the autoloader:

1 Remove the rack-mount brackets from the rack-mount kit and determine on which side of the autoloader you will attach them, as follows:

- From the front of the rack, slide the autoloader partially onto the shelf flanges between the support rails you just installed.
- Holding one of the rack-mount brackets against one side of the autoloader, line up the two holes in the bracket with the two screw holes on the side of the autoloader. The flange on the bracket should be toward the front of the autoloader, facing outward.

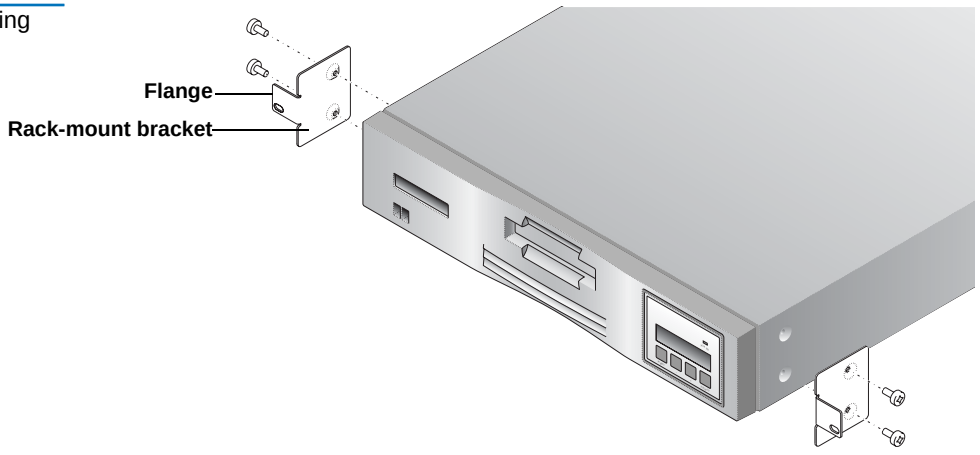
- Slide the autoloader into the rack until the bracket you are holding contacts the rack's mounting holes.
- Determine whether the screw hole on the bracket flange lines up with a mounting hole in the rack. If it does, you will mount the bracket on that side of the autoloader. If not, you will mount it on the other side of the autoloader.

2 Remove the autoloader from the shelf and place it on the work surface.

3 Using a TORX T-10 screwdriver, remove the two screws on each side of the autoloader.

4 Position the correct bracket, as determined in step 1, on each side of the autoloader. Secure each bracket by replacing the original screws.

Figure 11 Securing the Brackets



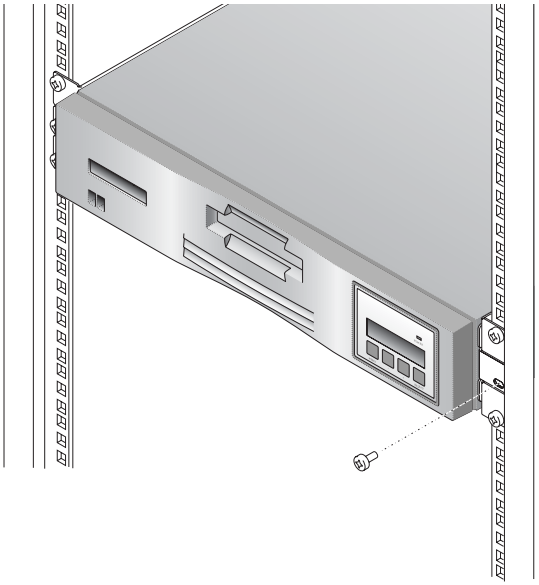
Securing the Autoloader

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

2 Place one screw from the rack-mount kit into the hole in the front of each bracket. If your rack has square mounting holes or the holes are larger than the screws provided in the kit, use the clip-nuts to secure the screws. Use a #2 PHILLIPS screwdriver to tighten the screws.

Figure 12 Securing the Autoloader to the Rack



Connecting the Cables

To connect the cables to the autoloader:

1 Make sure that the power switch on the front of the autoloader is off (the right side of the power switch is pressed).

2 Connect the female end of the power cord to the AC outlet on the back of the autoloader.

> **Note:** The power cord shipped with the autoloader is a 120 VAC three-conductor power cord for use in the United States and Canada. An adapter for use outside of the United States and Canada is also included.

3 Connect the male end of the power cord to the power outlet.

4 Connect the SCSI cables and the terminator. For more information about the SCSI interface, see SCSI Interface on page 46.

- Connect one end of the SCSI cable to one of the SCSI connectors on the back of the autoloader.
- Connect the other end of the SCSI cable to the SCSI connector on the SCSI host bus adapter or on the previous device of the SCSI bus.
- If this is the last device in the SCSI chain, connect the SCSI terminator to the remaining SCSI connector on the back of the autoloader.

5 Push the power switch on the front of the autoloader to the ON position (press the left side of the switch).

6 Power on the host computer system.

Data Cartridges

Installing the Data Cartridges

Caution: The tape drive only operates with LTO-3 Ultrium (LTO-3 autoloader only), LTO-2 Ultrium (LTO-3 and LTO-2 autoloaders only), or LTO-1 Ultrium tape data cartridges. Attempting to use other types of cartridges may damage the unit. For best performance, Certance-brand cartridges are recommended.

Note: Do not open the front door of the autoloader unless you must perform interaction mode commands or change media. Use only the recommended types of media cartridges. Clean the drive whenever necessary.

Caution: Never insert or remove cartridges from the cartridge slot unless READY/ACTIVITY is lit.

To install the data cartridges:

1. Press any button on the Operator's Panel to change to *interaction* mode.
2. Choose the **Commands** menu, and then press **Enter**.
3. Choose **Import** and press **Enter**.
4. Enter the number of the cartridge slot and press **Enter**.
5. Insert the cartridge in the cartridge access port. The cartridge is now placed in the selected slot.
6. Repeat steps 4 and 5 until all cartridges have been imported.

The **Import** command in the **Library Commands** menu places a cartridge into a specific cartridge slot through the cartridge access port. When you use the **Import** command, the cartridge carousel moves the specified cartridge slot into position in front of the cartridge access port and slides the door open. You can then push the cartridge into the slot through the door. The cartridge loader then grasps the cartridge, pulls it into the autoloader, and closes the door.

The **Export** command lets you remove a cartridge from a specific cartridge slot through the cartridge access port. When you use the **Export** command, the cartridge carousel moves the specified cartridge slot into position in front of the cartridge access port and slides the door open. The cartridge loader then pushes the cartridge far enough out through the door to allow you to remove it.

Loading and Unloading a Cartridge

The **Load Cartridge** command in the **Commands** menu lets you load the cartridge in the specified slot into the tape drive. When you use the **Load Cartridge** command, the cartridge carousel moves the specified cartridge slot into position in front of the tape drive. The cartridge loader then extracts the cartridge from the cartridge slot and inserts it into the tape drive.

The **Unload Cartridge** command causes the tape drive to unload the tape from the tape path and eject the cartridge. After the cartridge is ejected, the cartridge carousel moves the slot from which the cartridge originated into position in front of the tape drive. The cartridge loader then extracts the cartridge from the tape drive and returns it to the cartridge slot.

Updating the Cartridge Inventory

After you import or export a data cartridge, you can update the cartridge inventory using the **Re-inventory Option** command in the **Commands** menu. The autoloader checks for the presence of a cartridge in each cartridge slot.

Chapter 4

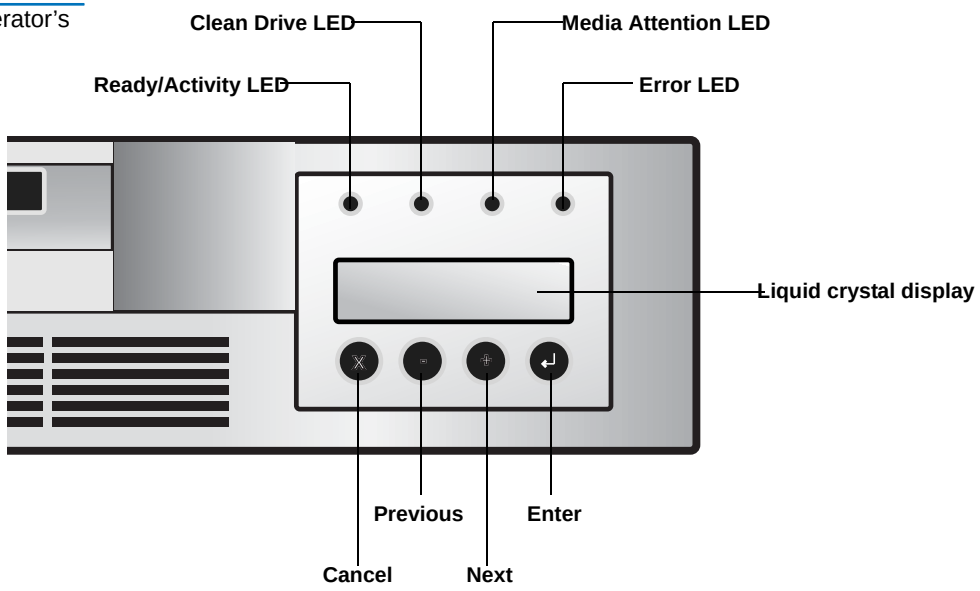
Operating the Autoloader

This chapter information about using the autoloader, including:

Operator's Panel

The operator's panel consists of the following:

Figure 13 Operator's Panel



Status LEDs

The LEDs are updated during power up and reset sequences. Upon power up or software reset, the autoloader will illuminate all LEDs as soon as the power-on self-test (POST) allows. This assists you in verifying that all LEDs are functional.

When mechanical initialization starts, all LEDs will be extinguished and the **READY/ACTIVITY** LED will flash at a reasonable rate of approximately one second per cycle.

When the mechanical initialization is complete, the **READY/ACTIVITY** LED will stop flashing and be constantly illuminated.

If a loader failure occurs, the **READY/ACTIVITY** LED will be turned off and the **ERROR** LED will be illuminated. The Operation's Panel will also display an appropriate error code to help identify the failure.

> **Note:** The circuitry to illuminate four external LED's is incorporated into the autoloader.

- **READY/ACTIVITY** (Green LED) — Lit any time the unit is powered on and able to function. It should blink whenever there is autoloader or drive activity.

- **CLEAN DRIVE** (Amber LED) — Lit when the drive is to be cleaned. The LED will be turned off after the drive is cleaned successfully.
- **MEDIA ATTENTION** (Amber LED) — Lit when there has been a failure that indicates that there is a piece of media that is bad, marginal, or invalid. It will be cleared when all invalid cartridges have been exported from the autoloader.
- **ERROR** (Red LED) — Lit when there is an unrecoverable autoloader or drive failure. A message displays at the same time on the screen. It will be cleared when the error state is resolved.

LCD

The LCD consists of two lines, with 16 characters per line. The screen displays actions, status information, menu items, and error messages equivalent to the operation mode.

Keypad

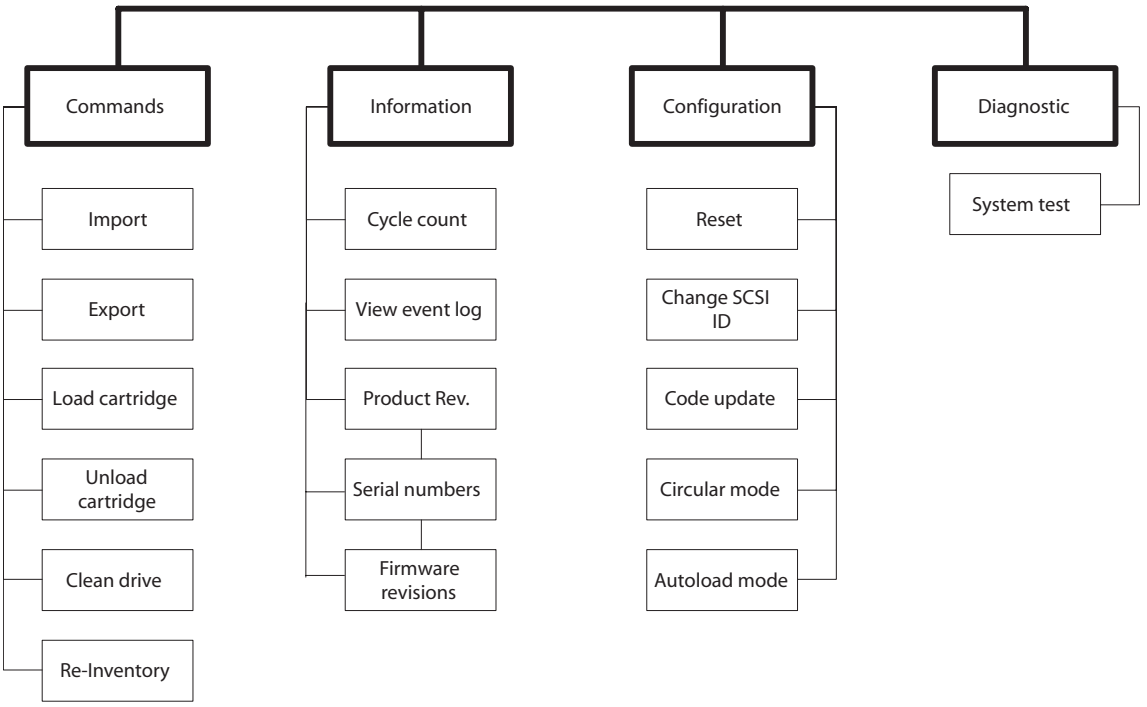
The keypad buttons are used for navigating the various menu options that are available. For more information on the menu options, see Menu Options on 28.

> **Note:** The keypad buttons are only available for use in interaction mode. For more information on operating modes, see Operating Modes on 30.

- **CANCEL** button [**X**] — Push the **Cancel** button to cancel a user action and return to the last menu item.
- **PREVIOUS** button [**-**] — Navigate through menu items.
- **NEXT** button [**+**] — Navigate through menu items.
- **ENTER** button [**ø**] — Push the **Enter** button to go to a sub-menu or to force a robotic action.

Menu Options

Figure 14 Autoloader Menu Options



The menu options are accessed from the Operator's Panel by pressing the **Enter** button. Use the **Previous** and **Next** buttons to navigate through the menu items. Use the **Cancel** button to cancel the last action and return to the previous menu item.

For most installations, the default configuration for the autoloader does not need to be changed. However, if necessary, you can use the Operator's Panel to change the SCSI IDs for the autoloader and the tape drive using the **Configuration** menu.

Note: The autoloader and the tape drive must each have unique SCSI IDs. It is your responsibility to make sure you do not assign duplicate IDs within a bus. For more information on changing SCSI IDs, see SCSI ID Settings on page 47.

Inventory Status Characters

The inventory status characters represent the status of each slot within the tape drive. They display in the second line of text in the liquid crystal display as an eight-character string, with four blank spaces on each side.

Table 4 Inventory Status Characters

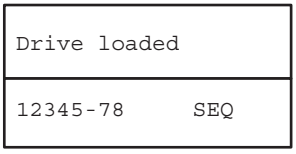
Character	Meaning
1 … 8	**Slot Full**: Indicates that slot contains a cartridge
-	**Slot Empty**: Indicates the slot does not contain a cartridge.
1/■	A cartridge that is being loaded, unloaded, imported, exported, or is loaded in the drive is represented by the slot number alternating with the block (■) character.
!	(Exclamation point and the **Media Attention** LED is on) The cartridge in that slot is faulty. An invalid cartridge is identified the same way.

To clear the faulty status (exclamation point) and the **Media Attention** LED, export the faulty cartridge.

If a drive does not contain any cartridges, the following displays in the liquid crystal display. In this example, there is no cartridge in slot 6.

```
Drive empty
12345-78     SEQ
```

If the autoloader detects that a cartridge is loaded when it first powers on, the following displays in the liquid crystal display. In this example, there is no cartridge in slot 6. If the cartridge in the drive came from slot 8, the 8 would be alternating with the block character.



Operating Modes

The **System Driven** mode is the normal mode of operation. In this mode, the Operator's Panel displays the status associated with the actions that were caused from commands issued via the drive's SCSI interface. Some of these actions including loading, rewinding, and moving tape display.

When an operator's panel button is pressed and released, the operator's panel changes to **Interaction** mode. In **Interaction** mode, you can operate the unit.

Interaction mode continues for three minutes after you stop pushing buttons or the requested robotic action stops. After this time, the operator's panel returns to **System Driven** mode automatically.

The autoloader has two operating modes — **Random** and **Sequential**. The operating mode used depends on whether automation software is controlling cartridges in the autoloader. Initially, the autoloader assumes you are not using automation software to control cartridge or drive activity. This is called **Sequential** mode. If the autoloader detects that automation software is controlling tape drive activity, it switches to **Random** mode automatically.

> **Note:** **SEQ** appears in the operator's panel LCD when the autoloader is in **Sequential** Mode. No message appears during **Random** Mode.

The following sections provide more information about **Sequential** and **Random** modes.

Random Mode

Random mode is the normal operating mode when a backup software application is being used. In **Random** mode, the autoloader loads tape into the drive when it receives the appropriate commands from software. To use this mode, your backup software must support autoloaders. This support often requires an autoloader/library software module to be installed.

Sequential Mode

Sequential mode is used when autoloader software is not available. In **Sequential** mode, the autoloader loads and unloads tapes automatically. The operator specifies which tape is to be loaded first by using the autoloader operator's panel controls. (For more information on loading cartridges, see Loading and Unloading a Cartridge on page 23.)

When the first tape is full or unloaded, the autoloader removes the tape from the drive automatically, returns it to its original slot, and loads another tape in the next higher numbered slot that is available. For additional control over loading tapes in **Sequential** mode, you can set **Circular** and **Autoload** options from the autoloader's front panel.

Circular Mode

This option is accessed from the **Configuration** menu. When **Circular** mode is enabled, the autoloader reloads the original first cartridge in the sequence after it cycles through all available cartridges. If **Circular** mode is disabled, the autoloader stops loading cartridges after the last cartridge has been unloaded and waits until you load another cartridge manually.

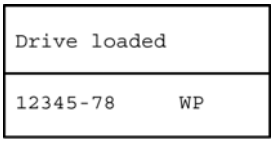
Caution: Use caution with circular mode, as it can overwrite data on previously written cartridges.

Autoload Mode

This option is accessed from the **Configuration** menu. When **autoload** mode is enabled, the autoloader automatically loads the cartridge from the lowest numbered full slot into the tape drive when powered on. It then follows standard sequential operation as described above.

Write-Protected Media

If the drive detects a write-protected media, an internal bit is set and the autoloader posts the 'WP' string on the display indicating a write protected media is loaded in the drive. The display shows the following status:



As soon as the write-protected media is ejected, the drive resets the internal bit and the 'WP' string on the display is cancelled.

Autoloader Operations

After you install and configure the autoloader and install your application software on the host computer, the autoloader performs most operations automatically. Operator intervention includes the following activities:

- Monitoring autoloader operation and status
- Performing autoloader and tape drive operations

Monitoring the Autoloader Operation and Status

During normal operation, the **Status** screen is displayed on the liquid crystal display. You can use this screen to monitor autoloader activities. By default, the **Status** screen displays the current operating status of the autoloader and tape drive.

To set the Operator's Panel to **Interaction** mode, press any key. This mode lets you use the keypad to display options for issuing commands to the autoloader, viewing information screens, and configuring the autoloader.

Performing Autoloader and Tape Drive Operations

The **Commands** menu provides options for importing and exporting cartridges, loading and unloading a cartridge from the tape drive, cleaning the tape drive, and updating the cartridge inventory. For more information on data cartridges, see Data Cartridges on page 22.

Resetting the Autoloader

A reset causes the autoloader to perform its power-on self-test (POST) and check for the presence of the data cartridges. The autoloader can be reset in any of the following ways:

- Power-on reset — Powering the autoloader off (or unplugging it), and then back on again, resets the autoloader and the tape drive.
- Operator's Panel — Choose the **Configuration** menu, press Enter, choose **Reset**, and then press **Enter**. For more information about using the Operator's Panel, see Operator's Panel on page 7.
- Bus device reset message — Issuing a bus device reset message from the SCSI application program can reset either the autoloader or the tape drive.

Resetting the Tape Drive

Resetting the tape drive does not cause a cartridge loaded in the drive to be ejected. If a cartridge is in the tape drive during a reset, make sure that it is safe to overwrite the loaded cartridge before performing a backup. If you perform a backup without checking the loaded cartridge, you may lose important data from a previous backup.

Maintenance

The autoloader requires no routine maintenance. Parts can be serviced only by the manufacturer, an approved maintenance organization, or by self-maintenance contract customers.

Caution: Do not clean or lubricate any of the autoloader's mechanical assemblies. Lubricating may adversely affect the function of those parts. All other parts can be serviced only by the manufacturer, an approved maintenance organization, or by self-maintenance contract customers.

Note: The autoloader warranty does not apply to failures of the autoloader when it is repaired by untrained or unauthorized service personnel.

Cleaning the Tape Drive

The tape drive requires regular cleaning with an LTO tape cleaning cartridge to maintain optimal performance. Following a regular cleaning schedule for your tape drive will maximize the reliability of your drive and the life of your LTO tape data cartridges.

Caution: Do not use cleaning cartridges other than a Quantum-approved LTO cleaning cartridge. Carefully follow all instructions and recommendations provided with the cleaning cartridge.

Note: The tape drive can also report its cleaning requirements to the application software. Your application may notify you when the tape drive needs cleaning. Refer to your application documentation for more information.

To clean the tape drive, make sure there is an empty slot available to hold the cleaning cartridge. Select the **Clean drive** option from the **Commands** menu on the Operator's Panel. When you use this option, the autoloader imports a cleaning cartridge through the cartridge access port and inserts it into the tape drive. When the cleaning is complete, the tape drive ejects

the cleaning cartridge and the autoloader returns it to the cartridge access port for removal.

Alternatively, you can store a cleaning cartridge in one of the cartridge slots. You use the **Load** command from the **Commands** menu to move the slot containing the cleaning cartridge into position and load the cartridge into the tape drive. When the cleaning is complete, the tape drive ejects the cleaning cartridge and the autoloader returns it to the slot from which it originated. Although this alternative lets you always have the cleaning cartridge in the autoloader, it has following disadvantages:

- You have to remember which slot your cleaning cartridge is in.
- The autoloader's data storage capacity is reduced by one cartridge.

Some software applications may support reserving a slot for a cleaning cartridge and thereby automate the cleaning process. Refer to your software documentation if your software has this capability.

Shipping the Autoloader

If you need to ship the autoloader, use the original shipping carton and packing materials (or replacement packaging obtained from the vendor) to prevent damage. The shipping carton and packing materials are not intended to be used for shipping items other than or in addition to the autoloader.

Chapter 5

Troubleshooting and Diagnostics

The autoloader includes features to support troubleshooting and diagnostic operations. If an autoloader error occurs, an error message and error code are displayed on the Operator's Panel.

Additional diagnostic tests are included on the diagnostic software on the Resource CD.

Performing a System Test

The System Test option cycles the autoloader through the process of loading, calibrating, and unloading all cartridges in the carousel. Running a system test verifies the basic operational soundness of the autoloader and tape drive. The system test continues indefinitely until you press the Cancel button. All regular backup or restore operations are suspended while a system test is in progress.

To run a system test:

1. From the main menu, press the Next [+] or Previous [-] button until **Diagnostics** appears on the top line of the LCD screen.
2. Press the Enter button. **System Test** is displayed.

3 Press **Enter** to begin the test. The **Test Count** displays the number of load-calibrate-unload cycles that have been completed during the test.

4 Press the **Cancel** button to end the test.

Error Codes

Table 5 Oviewview of Error Codes

Error Code Hex Notation	Error Belonging to
80 - 8F	Robotic control errors
90 - 96	Function errors
A0 - A5	Low level axis errors
B0 - B7	Electronic hardware errors
BA - BF	Drive errors

Table 6 Robotic Control Errors

Error Code Hex Notation	Description
80	No error.
81	Invalid command error. This error indicates that the Loader received an undefined command or an invalid parameter to a command.
82	Device status not suitable to execute this command. If the robotics are busy, some commands can't be executed at the same time. This error will indicate a probable violation. This is not an error condition, but does result in busy being reported to the host for the requested SCSI command.

Error Code Hex Notation	Description
83	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 appropriate **Set Slot Status** commands.
84	Source element not ready. The transport source element is empty.
85	Destination element not ready. The destination element is already full.
86	Access door not possible. An attempt to access the door is rejected, while a media removal is prevented.
87	Timeout. A timeout condition occurred.
88	Communications error during loop-back.
89	Timeout detected by loader on BHC testing.
8F	No error after autoloader recovery.

Table 7 Function Errors

Error Code Hex Notation	Description
90	Mechanical initialization failure. The robotic wasn't able to get into its safe mechanical init position. Manual intervention will be necessary.
91	Scan failure. Fatal error during cartridge scan, building up inventory.
92	Preposition failed. Belt positioning error during the **Preposition** command.

Error Code Hex Notation	Description
93	Cartridge mount error. Movement of cartridge into drive failed.
94	Cartridge dismount error. Failure during cartridge removal and transport back to the slot.
95	Import error. Device wasn't able to finish import of new cartridge without error.
96	Export error. Fatal error during cartridge export.

Table 8 Low Level Axis Errors

Error Code Hex Notation	Description
A0	Belt axis error. Error during cartridge carrier movement (position not found).
A1	Slider axis error. Transport slider unable to reach estimated position.
A2	Gripper position error. Gripper unable to reach position.
A3	Cartridge pick error. Missing cartridge during pick operation of gripper.
A4	Door function error. Slider door in front bezel not in requested position during device operation.
A5	Fan error. Loader processor has detected a fan error.

Table 9 Electronic Harware Errors

Error Code Hex Notation	Description
B0	ROM error.
B1	RAM error.
B2	NVRAM error.
B3	CTC error.
B4	UART error.
B5	Display error.
B6	Memory error.
B7	Timeout on loader command.

Table 10 Drive Errors

Error-Code Hex Notation	Description
BA	Drive load timeout.
BB	Drive unload timeout.
BC	Over temperature problem.
BD	No connection to drive.
BE	Generic drive response error.
BF	Drive broken, needs repair.

Error and Event Log

Every autoloader provides an internal error and event log with 64 entries. This log data is helpful for development and service purposes. The error and event log is accessible through the Operator's Panel and can be read out entry by entry.

Log Entry

A negative number in the top line shows the current position in the error log.

Every log entry consists of a type identifier and two data bytes. This information is shown on the bottom line of the screen.

Entry: AA BB CC AA type identifier

BB data type 1

CC data byte 2

Table 11 Example of Error/Evemt Log Display

EVENT -6		
03	A0	00

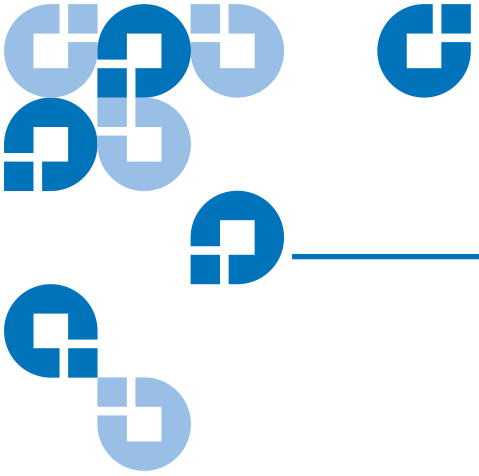
- Sequence number -6 indicates the position in sequence list, 0 being the most recent.
- Log shows a belt axis error (type identifier: 03 = error, data byte 1: A0 = belt axis error, data byte 2: 00 is not used).

The following entry modes can be assigned by the type identifier:

Table 12 Entry Modes

Type	Description
01	Internal robotic command message which is received by RobCtrl Module. Data byte 1 will show the command, data byte 2 means its first parameter (usually cartridge number).
02	Internal robotic command message which is received by RobTest Module. Data byte 1 will show the command, data byte 2 means its first parameter (usually cartridge number).
03	Indicates an error message. Errors are represented by the same codes as described before in this interface specification. Data byte 2 is not used in this mode.

Type	Description
04	Represents a motion script information. Data byte 1 points to the current script number, data byte 2 points to the last line executed in the script. The provided information is rather extensive and needs to be verified by the developer of the particular script.
05	Indicates a debug output. This type can be used by a software developer to fix special problems. Data byte 1 and data byte 2 are free for any usage and may depend on the investigated problem. This type will only be used during the development phase.



Appendix A
Specifications

This chapter provides technical specifications for the LTO Ultrium 8-Slot Autoloader.

The topics covered in this chapter are:

Size and Weight

Length	**24.0 inches (60.9 cm)**
Width	16.9 inches (42.9 cm)
Height	3.3 inches (8.4 cm)
Weight	19.5 pounds (8.8 kg) without cartridges installed

SCSI Interface

The autoloader has a standard LVD SCSI interface. One SCSI cable and one SCSI terminator are included with the autoloader. Additional cables and terminators can be ordered from the manufacturer.

The LVD SCSI interface is compatible with a single-ended SCSI bus.

- Do not attach the autoloader to a non-LVD SCSI controller, as this will degrade the performance of the tape drive and the performance of your backups.
- Do not attach non-LVD SCSI devices to the same bus cable as your autoloader, as this will degrade the performance of the tape drive and the performance of your backups.
- Do not connect the tape drive to a disk RAID controller, as this is not supported.
- If you are installing an adapter, it is recommended that you purchase a SCSI LVD controller kit that includes a SCSI cable and SCSI terminator (unless provided with your autoloader).
- It is strongly recommended that the autoloader not be attached to the same SCSI bus as your SCSI hard drive(s).

SCSI ID Settings

The autoloader contains two SCSI ID settings — one for the autoloader's SCSI controller and one for the tape drive. If there is another device already assigned to these IDs, you will need to change the IDs. For information on how to do this, see Changing the SCSI ID Settings.

Table 13 SCSI ID Default Settlings

Autoloader	5
Tape drive	6

Changing the SCSI ID Settings

To change the SCSI ID settings:

1. From the main menu, press the **Previous** or **Next** button until **Configuration** displays in the liquid crystal display.
2. Press **Enter** to select the **Configuration** menu.
3. Press the **Previous** or **Next** button until **Change SCSI ID** displays in the LCD
4. Press **Enter** to select the **Change SCSI ID** option.
5. Press the **Previous** or **Next** button until **Loader** displays in the LCD. To change the SCSI ID of the tape drive, press the **Previous** or **Next** button until **Drive** displays in the liquid crystal display.
6. Press **Enter** to select the **Loader** option.
7. Press the **Previous** or Next button until the desired SCSI ID displays.
8. Press the **Enter** button. **Cycle Power for New SCSI ID** displays on the LCD screen.
9. Turn off the autoloader. Wait a few seconds, and then turn the autoloader on again. The selected SCSI ID is now set.

Note: If you change the SCSI ID, you may also need to cycle power on the host server and reconfigure your backup software before you can use the autoloader. The autoloader and the tape drive must each have unique SCSI IDs. It is your responsibility to make sure you do not assign duplicate IDs within a bus.

SCSI Cable Requirements

The manufacturer recommends using 68-pin SCSI cables that conform to SCSI-3 specifications.

Caution: All wide SCSI configurations (single-ended, LVD, and HVD) use the same 68-pin connector. Attaching the autoloader directly to an HVD SCSI will make the entire bus non-functional and may permanently damage the drive or other SCSI devices on the bus.

Note: To comply with the safety and regulatory agency standards for the autoloader, all SCSI cables you use with the autoloader must be properly shielded.

SCSI Cable Length

The maximum allowable cable length for a low-voltage differential SCSI bus, including all internal and external cables, is specified as follows:

- If you have more than two devices on the LVD bus, the maximum allowable length is 39 feet (12 meters).
- If you are making a point-to-point connection (target and initiator only), the maximum length is 82 feet (25 meters).

Note: The autoloader and the tape drive are independent SCSI devices on the same SCSI bus. As a result, when they are connected to the initiator, there are a minimum of three devices attached to the SCSI bus. Therefore, the maximum allowable cable length is 39 feet (12 meters).

- To determine the cable length of the bus, measure the lengths of all external SCSI cables. Add those lengths together. To that sum, add 26.8 inches (68 centimeters) for the internal SCSI cable length.

SCSI Terminator Requirements

If the autoloader or the tape drive is the last device on the SCSI bus, you must install an external, wide LVD terminator on the unused SCSI connector. Do not use internal terminators to terminate the autoloader or the tape drive. The manufacturer recommends using a SCSI-3 type SE/LVD multi-mode terminator.

> **Note:** The manufacturer recommends using active termination. The manufacturer's testing has shown that older passive termination does not provide rising edge transitions that are fast or clean enough at fast SCSI speeds.

Performance Specifications

Capacity

The autoloader can accommodate up to eight LTO tape cartridges. The storage capacity of the autoloader depends on the type of cartridge and the type of data being stored.

Tape Drive Performance

When installed in the autoloader, the tape drive performs within its specifications. A minimum of an Ultra2 LVD-capable controller that can transfer data at least 160 MB/second is required. For more information about tape drive performance specifications, refer to the documentation for the tape drive.

Autoloader Self-Test Times

Each time the autoloader is powered on, it performs a power-on self-test (POST). POST includes a self-test of the control electronics, initialization of the mechanical components, and a cartridge inventory. The POST time is measured from the time the autoloader is powered on until the autoloader indicates Ready status. The maximum time required for POST is 65 seconds.

The autoloader also performs a self-test when you select **Library Test** from the Operator's Panel or in response to a **SEND DIAGNOSTICS SCSI** command. The maximum time required for this self-test is nine seconds.

If the cartridges are properly installed, the autoloader is ready for operation after performing either a POST or a self-test. If the autoloader encounters a problem during a POST or the self-test, it reports an error on the LCD.

Initial Element Status Time

When an initiator sends an **INITIALIZE ELEMENT STATUS (IES)** command, the autoloader checks each cartridge slot for the presence of cartridge. The autoloader requires 21 seconds to perform an **IES** command.

Move Complete Time

Move complete time is measured from the time the autoloader receives a **Move** command to the time it returns status to the initiator indicating that the move is complete. The average time required for the autoloader to move the cartridge slot into position in front of the tape drive and either insert or remove the cartridge from the tape drive is less than 45 seconds.

Reliability

The mean cycles between failures (MCBF) for the autoloader's robot is 250,000 cycles. This value does not include failures attributable to the tape drive or cartridges.

During one full cycle, the cartridge loader completes the following actions:

1. Picks the cartridge from a cartridge slot.
2. Places the cartridge in the tape drive.
3. Removes the cartridge from the tape drive.
4. Replaces the cartridge in the cartridge slot.

Power Specifications

AC Power

The autoloader has automatic AC input voltage selection and accepts the input voltages shown in the following table. It is capable of continuous operation when the AC power experiences intermittent operation, voltage surges, and voltage spikes.

Table 14 AC Power

Input voltage	100 to 240 V AC ±10%,47 to 63 Hz
Power consumption: Average while idle Average while operating Maximum while operating Average heat output while operating (based on the AC true power consumption)	 20 watts 35 watts 70 watts 119.4 BTU/hour

AC Power Cord

The autoloader is shipped with a 7-foot (2.1-meter), three-conductor, 18 AWG power cord for 120 volt use in the United States and Canada, along with an international adapter. The power cord has a molded NEMA 5-15P male connector on one end and a molded IEC 320/EN 60320 female connector on the other end. The power cord is UL Listed and CSA Certified.

If you need an additional power cord, it must meet the following specifications.

United States and Canada — 120 VAC Power Cord

- The power cord must have a molded NEMA 6-15P attachment plug on one end.
- The power cord must have a molded EC 320/EN 60320 female connector on the other end.
- The cordage must be an SJT or SVT type, 3-conductor, 18 AWG minimum.
- The power cord must comply with local electrical code.

International — 230 VAC Power Cord

- The power cord must have a grounded attachment plug of the proper type, rating, and safety approval for the intended country.
- The power cord must have an IEC 320/EN60320 female connector on one end.

- The cordage must be harmonized to CENELEC publication HD-21. The electrical characteristics and rating must be minimum H05VVF3G0.75 (6 A).

Environmental Specifications

Specification	Operating (1)	Storage (2) or Non-operating (3)	Transportation (4)
Ambient temperature range	+50° F to +104° F (+10° C to +40° C)	-40° F to +140° F (-40° C to +60° C)	-4° F to +140° F (-20° C to +60° C)
Temperature variation (5) (thermal gradient)	2° F per minute; max 18° F per hour (1° C per minute; max 10° C per hour)	1° F per minute; max 36° F per hour (1° C per minute; max 20° C per hour)	2° F per minute; max 36° F per hour (1° C per minute; max 20°C per hour)
Relative humidity (humidity gradient)	20% to 80%; Non-condensing 10% per hour	10% to 80%; Non-condensing 10% per hour	10% to 80%; Non-condensing 10% per hour
Wet bulb	79° F (26° C) max	84° F (29° C) max	84° F (29° C) max
Altitude	-1000 ft. to +30,000 ft. (-304.8 m to +9,144 m)	-1000 ft. to +30,000 ft. (-304.8 m to +9,144 m)	-1000 ft. to +30,000 ft. (-304.8 m to +9,144 m)

(1) All operating specifications include a data cartridge. These measurements assume that the autoloader is installed in accordance with the installation instructions.
(2) The autoloader is in its original packaging.
(3) The autoloader has been unpacked but is still in its protective antistatic bag. The packaging is designed to protect the autoloader from the condensation caused by extreme temperature variations (15° C or more). When the autoloader is moved from a cold storage environment to a warm operating environment, it must acclimate in its packaging for at least 12 hours before opening to prevent serious condensation damage from occurring.
(4) The autoloader has not been unpacked. The transportation period does not exceed 72 hours.
(5) The data cartridges, temperature and humidity must be allowed to stabilize in the specified ambient environment for 24 hours.

Acoustic Noise Limits

The overall, averaged A-weighted sound pressure level (in decibels) for the autoloader does not exceed the upper limits specified in the following table.

Operating mode	LpA (1)
The autoloader is powered on and idle.	55 dBA
The autoloader is operational (the carousel or cartridge loader is moving); the tape drive is in streaming mode.	55 dBA (2)

(1) LpA is the average A-weighted sound pressure level over the following frequency range: 5 Hz to 12.5 KHz.
(1) Represents a maximum sustained operational level.

Shock and Vibration

The autoloader meets the shock and vibration criteria described in the following sections.

Shock Specifications

The autoloader will operate normally after experiencing shock loads as specified in the following table. The operating shock levels indicate how much shock the autoloader can withstand while the enclosed tape drive is reading and writing data. The non-operating and storage shock levels indicate how much shock the autoloader can withstand when it is not operating. After experiencing this amount of shock, the autoloader will operate normally.

Operating (1)	Storage (2) or Non-operating (3)	Transportation (2)
3 g for 5 msec[4]	45 g at 152 in/sec[5]	ISTA Procedure 2A

(1) The autoloader is unpacked and is picking and placing cartridges from the cartridge slots and tape drive.
(2) The autoloader has not been unpacked.
(3) The autoloader has been unpacked, but no power has been applied.
(4) A minimum of 20 shock pulses were applied to the bottom/top axis. The shock pulses were half-sine waves and were applied at a rate not exceeding one shock per second.
(5) A minimum of three 45 g shock pulses were applied to each of the autoloader's six sides.

Vibration Specifications

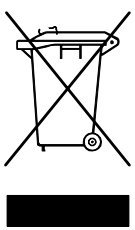
The following table displays the vibration specifications for the autoloader during operation, non-operation, storage, and transportation. The operating specifications indicate the amount of vibration the autoloader can withstand while the enclosed tape drive is reading and writing data.

Random vibration (1) applied during operation	
1 Hz	PSD = 0.0000040 g2/Hz
5 Hz	PSD = 0.0000270 g2/Hz
10-150 Hz	PSD = 0.0004048 g2/Hz
200-400 Hz	PSD = 0.0001079 g2/Hz
Random vibration(2) applied during non-operation(3) and storage(4)	
1 Hz	PSD = 0.0003 g2/Hz
3 Hz	PSD = 0.00055 g2/Hz
12-100 Hz	PSD = 0.01 g2/Hz
400 Hz	PSD = 0.000003 g2/Hz

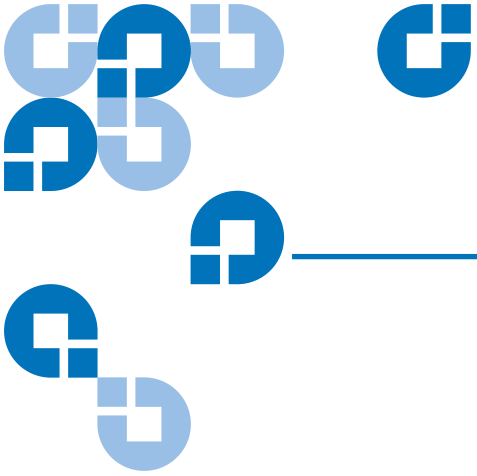
Random vibration (1) applied during operation	
Transportation (4)	
ISTA Procedure 2A	
Swept sine applied during non-operation (5) and operating (6)	
5 to 500 to 5 Hz	

(1) A 0.3 g rms random vibration spectrum is applied to the bottom/top axis for a minimum of 20 minutes per axis.
(2) A 1.06 g rms random vibration spectrum is applied to each of three orthogonal axes for a minimum of 20 minutes per axis.
(3) The autoloader has been unpacked, but is not operating.
(4) The autoloader is packaged in its original shipping container.
(5) Three sweeps at one octave per minute are applied to each axis at 0.75 g (0 . peak) input.
(6) Three sweeps at one octave per minute are applied to the top/bottom axis at 0.3 g (0 . peak) input.

Disposal of Electrical and Electronic Equipment



This symbol on the product or on its packaging indicates that this product should not be disposed of with your other waste. Instead, it should be handed over to a designated collection point for the recycling of electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please visit our website at: http://qcare.quantum.com or contact your local government authority, your household waste disposal service or the business from which you purchased the product.



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