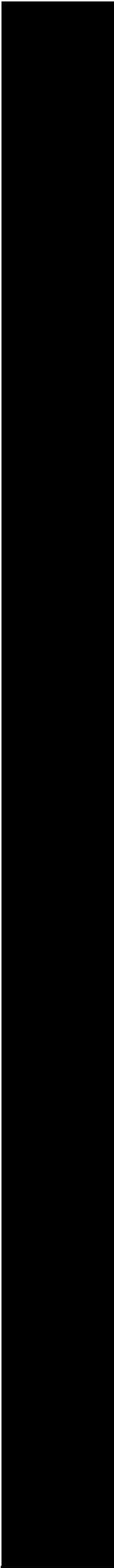# L180
Tape Library

Operator's Guide

STORAGETEK

L180
Tape Library

Operator's Guide

Information contained in this publication is subject to change without notice. Comments concerning the contents of this publication should be directed to:

> Information Development
> Storage Technology Corporation
> One StorageTek Drive
> Louisville, CO 80028-3256
> USA
>
> URL: http://sts.stortek.com/sts/nid

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Ninth Edition (February 2003)
This edition contains 140 pages. See "Summary of Changes" on page iii for the revision history and summary of changes made to this publication.

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> Global Learning Solutions
> Storage Technology Corporation
> One StorageTek Drive
> Louisville, CO 80028-3256
> USA

A Reader's Comment Form at the back of this publication lets you communicate suggestions or requests for change. StorageTek encourages and appreciates reader feedback.

Summary of Changes

EC	Date	Edition	Description
111222	November 1999	First	Initial release.
111426	March 2000	Second	Refer to this edition for a description of the changes.
111569	November 2000	Third	Refer to this edition for a description of the changes.
111640	April 2001	Fourth	Refer to this edition for a description of the changes.
111680	September 2001	Fifth	Refer to this edition for a description of the changes.
111721	March 2002	Sixth	Refer to this edition for a description of the changes.
111752	May 2002	Seventh	Refer to this edition for a description of the changes.
111810	December 2002	Eighth	Refer to this edition for a description of the changes.
111829	February 2003	Ninth	Chapter 1: Updated "Tape Drives."
			Chapter 2: Updated "Dynamic Worldwide Name."
			Appendix A: Updated "Ordering Cartridge Tapes and Labels."

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Preface

This guide describes how to operate the StorageTek L180 Tape Library (also referred to in this guide as the L180 library, tape library, or simply just library). Most of the information pertains to library hardware, refer to your appropriate tape drive or software documentation for specific information about the drives or client software commands and console messages.

This guide is intended primarily for data center operators who operate the tape library. System programmers, computer system administrators, and service representatives might also find the information in this guide useful.

■ Organization

The organization of this guide is:

Chapter 1　"General Information" describes the library hardware. This chapter also describes the library's two operating modes and its Auto Clean feature.

Chapter 2　"Controls and Indicators" shows the locations of the power switch and operator panel and describes the functions of the buttons, indicators, and display screens.

Chapter 3　"Library Operation" contains a list of procedures for operating the library.

Chapter 4　"StorageTek Service" describes how to contact Customer Support Services for assistance if the library has a hardware or software problem.

Appendix A　"Cartridge Information" describes how to prepare, inspect, store, clean, and repair cartridges. It also lists criteria that colored cartridges must meet to be used in the tape library.

Appendix B　"Library Statistics" lists counters and composite information.

Glossary　"Glossary" defines new or special library terms and abbreviations used in this guide.

Index　"Index" assists in locating information in this guide.

■ Alert Messages

Alert messages call the reader's attention to information that is especially important or that has a unique relationship to the main text or graphic.

Note: A note provides additional information that is of special interest. A note might point out exceptions to rules or procedures. A note usually, but not always, follows the information to which it pertains.

CAUTION:
A caution informs the reader of conditions that might result in damage to hardware, corruption of data, corruption of application software, or long-term health problems in people. A caution always precedes the information to which it pertains.

WARNING:
A warning alerts the reader to conditions that might result in injury or death. A warning always precedes the information to which it pertains.

■ Conventions

Typographical conventions highlight special words, phrases, and actions in this publication.

Item	Example	Description of Convention
Buttons	MENU	Sans serif font, capitalization follows the label on the product
Commands	Mode Select	Initial cap
Document titles	*System Assurance Guide*	Italic
Emphasis	*not* or *must*	Italic
File names	`fsc.txt`	Monospace font
Hypertext links	Figure 2-1 on page 2-5	Blue (prints black in hardcopy publications)
Indicators	*Open*	Font and capitalization follows label on product
Jumper names	TERMPWR	All uppercase
Keyboard keys	<Y> <Enter> or <Ctrl+Alt+Delete>	Enclosed within angle brackets
Menu names	Configuration Menu	Font and capitalization follows label on product
Parameters and variables	Device = *xx*	Italic

Item	Example	Description of Convention
Path names	`c:/mydirectory`	Monospace font
Port or connector names	SER1	Font and capitalization follows label on product
Positions for circuit breakers, jumpers, and switches	ON	Font and capitalization follows label on product; otherwise, all uppercase
Screen text (including screen captures, screen messages, and user input)	`downloading`	Monospace
Switch names	**Power**	Capitalization follows the label on the product
URLs	www.storagetek.com	Blue (prints black in hardcopy publications)

■ Related Publications

You can find additional information in the following publications:

APC Power Supply Publications	Part Number
L180 and L700 Tape Library Uninterruptible Power Supply Reference Manual	96047
Uninterruptible Power Supply online information	Go to www.apc.com

Tape Drive Documentation	Part Number
T9840 Tape Drive User's Reference Manual	95739
DLT 7000 Tape Drive Product Manual	Quantum 81-60000-0x
DLT 8000 Tape Drive Product Manual	Quantum 81-60118-0x
SDLT 220 Product Manual	Quantum 81-80000-0x
IBM 3585 Ultrium Tape Drive Setup, Operator, and Service Guide	IBM GA32.0415.xx
User's Guide for the C7369 High Performance Ultrium Tape Drive	Available from Hewlett-Packard
Seagate Viper 200 LTO Tape Drive Product Manual	Seagate 100006955-xxx

Note: Depending on the configuration, specific tape drive publications are shipped with the library.

■ Additional Information

StorageTek offers several methods for you to obtain additional information.

StorageTek's External Web Site

StorageTek's external Web site provides marketing, product, event, corporate, and service information. The external Web site is accessible to anyone with a Web browser and an Internet connection.

The URL for the StorageTek external Web site is http://www.storagetek.com

Customer Resource Center

StorageTek's CRC is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation. CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, addenda to product documentation books, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page.

The URL for the CRC is http://www.support.storagetek.com.

e-Partners Site

StorageTek's e-Partners site is a Web site that provides information about products, services, customer support, upcoming events, training programs, and sales tools to support StorageTek's e-Partners. Access to this site, beyond the e-Partners Login page, is restricted. On the e-Partners Login page, current partners who do not have access can request a login ID and password and prospective partners can apply to become StorageTek resellers.

The URL for the e-Partners site is http://members.storagetek.com.

Hardcopy Publications

Contact a StorageTek sales or marketing representative to order additional paper copies of this publication or to order other StorageTek customer publications in paper format.

Safety

Please read and observe the following safety topics for this product.

■ L180 Door Interlock

A safety interlock for the tape library is located behind the front door. When this door is opened, the interlock immediately disables all tape library motors.

■ Electrostatic Discharge Damage Prevention

Before you touch any internal components in the library, including drives, you must take precautions against electrostatic discharge (ESD).

CAUTION:
***Components are sensitive to static electricity:* Even a small electrostatic discharge can damage an electrical component that is inside the library. A damaged component might not fail immediately, but over time, it will become worse and might eventually cause an "intermittent" problem. Be sure that you touch an *unpainted* metal surface of the library before you reach inside the library or touch the drives or optional interface equipment.**

Before you touch any internal components:

1. With your finger, touch an *unpainted* metal surface of the library. In some libraries, you can touch the library's frame. In other libraries, you might have to touch a bolt on the wall or on the door frame.

2. Keep your body movement to a minimum as you touch the drives or the library components.

Antistatic wrist straps that have clip-on ends are commercially available.

■ Fiber-optic Safety

WARNING:
Eye hazard. **Never look directly into a fiber-optic cable, a fiber-optic connector, or a laser transceiver module. Hazardous conditions might exist from laser power levels that are capable of causing injury to the eye.**

Be especially careful when using optical instruments with this equipment. Such instruments might increase the likelihood of eye injury.

The laser transceivers in fiber-optic equipment can pose dangers to personal safety. Ensure that anyone who works with this StorageTek equipment understands these dangers and follows safety procedures. Ensure that the optical ports of every laser transceiver module are terminated with an optical connector, a dust plug, or a cover.

Each fiber-optic interface in this StorageTek Fibre Channel equipment contains a laser transceiver that is a Class 1 Laser Product. Each laser transceiver has an output of less than 70 µW and a wavelength of 850 nm. StorageTek's Class 1 Laser Products comply with EN60825-1(+A-11) and with sections 21 CFR 1040.10 and 1040.11 of the Food and Drug Administration (FDA) regulations.

The following translations are for users in Finland and Sweden who wish to identify laser safety and classification:

> CLASS 1 LASER
> LUOKAN 1 LASERLAITE
> KLASSE 1 LASER APPARAT

Laser Product Label

In accordance with safety regulations, a label on each StorageTek Fibre Channel product identifies the laser class of the product and the place and date of the manufacturer. The label appears on top of a Fibre Channel tape drive and near the Fibre Channel connectors on a Fibre Channel tape library. A copy of the label is shown here:

> CLASS 1 LASER PRODUCT
> LASER KLASSE 1
> APPAREIL A LASER DE CLASSE 1
> COMPLIES WITH 21 CFR 1040.10 AND 1040.11

Fiber-optic Cable Installation

Follow these guidelines when you install fiber-optic cables:

1. **Cable routing:**

   - **Raised floor:** You may install fiber-optic cables under a raised floor. Route them away from any obstruction, such as existing cables or other equipment.

   - **Cable tray or raceway:** Place the cables in position; do not pull them through the cable tray. Route the cables away from sharp corners, ceiling hangers, pipes, and construction activity.

   - **Vertical rise length:** Leave the cables on the shipping spool, and lower them from above; do not pull the cables up from below. Use proper cable ties to secure the cable.

   - **General:** Do not install fiber-optic cables on top of smoke detectors.

2. **Cable management:**

   - Leave at least 4.6 m (15 ft) of cable at each end for future growth.

   - Use strain reliefs to prevent the weight of the cable from damaging the connector.

   - Review all information in this manual and in any related manuals about safely handling fiber-optic cables.

3. **Connector protection:**

   - Insert connectors carefully to prevent damage to the connector or fiber.

   - Leave the connector's protective cover in place until you are ready to make connections.

   - Replace the connector's protective cover when the connector is disconnected.

   - Clean the connector before making a connection. Make sure that there are no obstructions and that keyways are aligned.

Fiber-optic Cable Handling

Observe these precautions when you handle fiber-optic cables:

- Do not coil the cable to less than 96 mm (3.75 in.) in diameter.

- Do not bend the cable to less than 12 mm (0.5 in.) in radius. StorageTek recommends that a cable's bend radius be no less than 20 times the diameter of the cable.

- Do not pull on the cables; carefully place them into position.

- Do not grasp the cables with pliers, grippers, or side cutters; do not attach pulling devices to the cables or connectors.

- Keep cables away from sharp edges or sharp protrusions that could cut or wear through the cable; make sure that cutouts in the equipment have protective edging.

- Protect the cable from extreme temperature conditions.

- Install the connector's protective cover whenever the connector is not connected.

■ Rack Safety and Precautions

WARNING:
Possible personal injury:

- **More than one person might be required to install equipment into the library's rack or to remove equipment from the library's rack.**

- **Personnel should take adequate precautions when they are moving a library that contains rack-mounted equipment. The weight of some rack equipment might alter the height of the library's center of gravity. This condition might cause the library to tip during a move.**

CAUTION:
Potential equipment damage: **Do not exceed the maximum allowable weight (77.1 kg [170 lb]) and U-height (6U) for equipment in the rack area of this library.**

Observe the following safety and handling precautions when you are installing equipment into the library's rack:

- Ensure that the equipment has UL listing (listing by Underwriters' Laboratories), CSA certification (certification by the Canadian Standards Association), and CE compliance (compliance with the European Council's directives and standards).

- Understand that the library does not supply power to the rack area. So ensure that the rack-mounted equipment has an adequate power source.

  Note: If you remove power from the library by using the library's power switch, the rack-mounted equipment will remain powered on.

- Follow the manufacturer's guidelines to position, to support, and to fasten the equipment in the rack.

- Locate the equipment so that it does not block or hinder any ventilation openings in the library's rack area. For example, do not block library or drive exhaust areas, the electronic module exhaust area, perforated metal, or other similar ventilation.

- Locate the equipment so that the library's doors adequately clear the equipment when you close them.

- Install the equipment from the bottom of the rack to the top of the rack; StorageTek recommends that you place the heaviest items near the bottom of the rack.

- Ensure that the equipment in the rack does not create an overcurrent condition, whether equipment is connected directly to the branch circuit or to a power distribution strip.

- Ensure that the equipment in the rack has reliable earth ground, whether equipment is connected directly to the branch circuit or to a power distribution strip.

- Ensure that any equipment that you place within the rack is adequately cooled. The library's internal ambient temperature should not exceed the recommended operating temperature.

   Base cooling considerations upon the power dissipation within the rack space as well as upon the ambient room conditions that are external to the library. You must provide cooling for moderate power dissipation within the rack space.

   Note: The following figures outline some temperature recommendations:

L180, Recommendations for Equipment Rated to 35° C

(89.6° F)

Room Ambient Temperature (°C)

May Exceed Operating Temperatures

Fan Recommended

No Fan Needed

(59° F)

Rack Equipment Power (Watts)

L180, Recommendations for Equipment Rated to 40° C

(89.6° F)

Room Ambient Temperature (°C)

May Exceed Operating Temperatures

Fan Recommended

No Fan Needed

(59° F)

Rack Equipment Power (Watts)
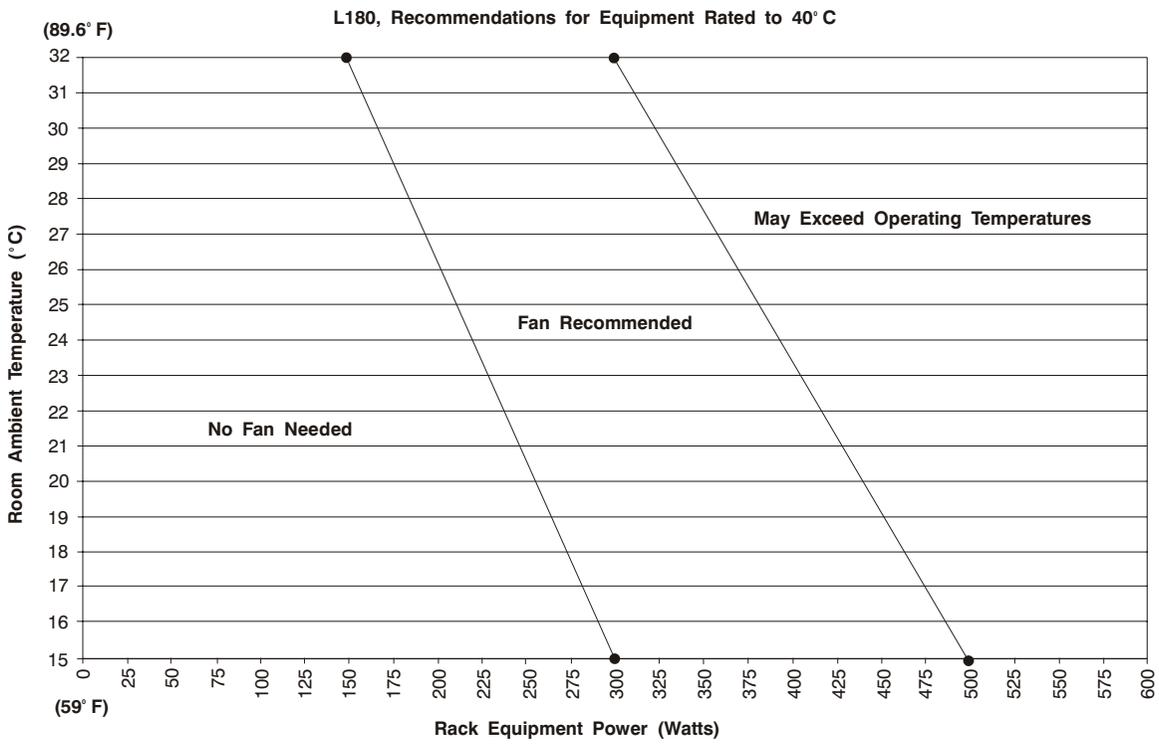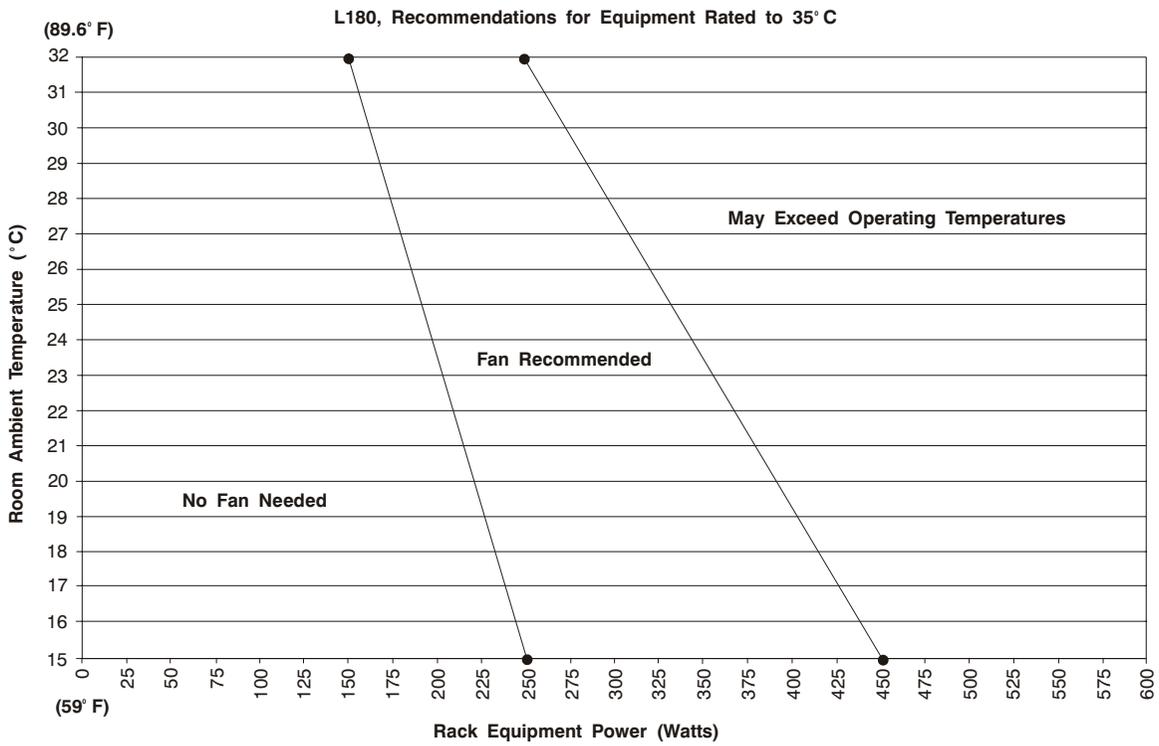
Notices

The following are compliance, warning, and internal code license statements for this product.

CAUTION:
Potential equipment damage: **Cables that connect peripherals must be shielded and grounded; refer to cable descriptions in the instruction manuals. Operation of this equipment with cables that are not shielded and not correctly grounded might result in interference to radio and TV reception.**

Changes or modifications to this equipment that are not expressly approved in advance by StorageTek will void the warranty. In addition, changes or modifications to this equipment might cause it to create harmful interference.

■ FCC Compliance Statement

The following compliance statement pertains to Federal Communications Commission Rules 47 CFR 15.105:

Note: This equipment has been tested and found to comply to the limits for Class A digital devices 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 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 or her own expense.

■ CISPR 22 and EN55022 Warning

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.

■ Japanese Compliance Statement

The following compliance statement in Japanese pertains to VCCI EMI regulations:

> この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

English translation: This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may occur, in which case, the user may be required to take corrective actions.

■ Taiwan Warning Label Statement

The following warning label statement pertains to BSMI regulations in Taiwan, R.O.C.:

> 警告使用者: 這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

English translation: 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.

■ Internal Code License Statement

The following is the Internal Code License Agreement from StorageTek:

NOTICE
INTERNAL CODE LICENSE
PLEASE READ THIS NOTICE CAREFULLY BEFORE INSTALLING AND OPERATING THIS EQUIPMENT. THIS NOTICE IS A LEGAL AGREEMENT BETWEEN YOU (EITHER AN INDIVIDUAL OR ENTITY), THE END USER, AND STORAGE TECHNOLOGY CORPORATION ("STORAGETEK"), THE MANUFACTURER OF THE EQUIPMENT. BY OPENING THE PACKAGE AND ACCEPTING AND USING ANY UNIT OF EQUIPMENT DESCRIBED IN THIS DOCUMENT, YOU AGREE TO BECOME BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE WITH THE TERMS OF THIS AGREEMENT, DO **NOT** OPEN THE PACKAGE AND USE THE EQUIPMENT. IF YOU DO NOT HAVE THE AUTHORITY TO BIND YOUR COMPANY, DO **NOT** OPEN THE PACKAGE AND USE THE EQUIPMENT. IF YOU HAVE ANY QUESTIONS, CONTACT THE AUTHORIZED STORAGETEK DISTRIBUTOR OR RESELLER FROM WHOM YOU ACQUIRED THIS EQUIPMENT. IF THE EQUIPMENT WAS OBTAINED BY YOU DIRECTLY FROM STORAGETEK, CONTACT YOUR STORAGETEK REPRESENTATIVE.

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    a. "Derivative works" are defined as works based upon one or more preexisting works, such as a translation or a musical arrangement, or any other form in which a work may be recast, transformed, or adapted. A work consisting of editorial revision, annotations, elaboration, or other modifications which, as a whole, represent an original work of authorship, is a Derivative work.

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    c. "Maintenance Code" is defined as Microcode and other software, including data files, which may reside or execute in or be used by or in connection with Equipment, and which detects, records, displays, and/or analyzes malfunctions in the Equipment.

    d. "Microcode" is defined as a set of instructions (software) that is either imbedded into or is to be loaded into the Equipment and executes below the external user interface of such Equipment. Microcode includes both Internal Code and Maintenance Code, and may be in magnetic or other storage media, integrated circuitry, or other media.

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    (ii) reverse assemble, decode, translate, decompile, or otherwise reverse engineer the Internal Code (except as decompilation may be expressly permitted under applicable European law solely for the purpose of gaining information that will allow

interoperability when such information is not otherwise readily available); or

(iii) sublicense, assign, or lease the Internal Code or permit another person to use such Internal Code, or any copy of it.

If you need a backup or archival copy of the Internal Code, StorageTek, or your authorized StorageTek distributor or reseller, will make one available to you, it being acknowledged and agreed that you have no right to make such a copy.

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6. You, the end user, agree to take all appropriate steps to ensure that all of your obligations set forth in this Notice, particularly in paragraphs 4 and 5, are extended to any third party having access to the Equipment.

7. You may transfer possession of the Internal Code to another party only with the transfer of the Equipment on which its use is authorized, and your license to use the Internal Code is discontinued when you are no longer an owner or a rightful possessor of the Equipment. You must give such transferee all copies of the Internal Code for the transferred Equipment that are in your possession, along with a copy of all provisions of this Notice. Any such transfer by you is automatically (without further action on the part of either party) expressly subject to all the terms and conditions of this Notice passing in full to the party to whom such Equipment is transferred, and such transferee accepts the provisions of this license by initial use of the Internal Code. You cannot pass to the transferee of the Equipment any greater rights than granted under this Notice, and shall hold StorageTek harmless from any claim to the contrary by your transferee or its successors or assigns. In addition, the terms and conditions of this Notice apply to any copies of Internal Code now in your possession or use or which you hereafter acquire from either StorageTek or another party.

8. You acknowledge that copies of both Internal Code and Maintenance Code may be installed on the Equipment before shipment or included with the Equipment and other material shipped to you, all for the convenience of StorageTek's service personnel or service providers licensed by StorageTek, and that during the warranty period, if any, associated with the Equipment, and during periods in which the Equipment is covered under a maintenance contract with StorageTek or service providers licensed by StorageTek, both Internal Code and Maintenance Code may reside and be executed in or used in connection with such Equipment, and you agree that no rights to Maintenance Code are conferred upon you by such facts. StorageTek or the licensed service provider may keep Maintenance Code and service tools and manuals on your premises but they are to be used only by StorageTek's customer service personnel or those of service providers licensed by StorageTek. You further agree that upon (i) any termination of such warranty period or maintenance contract period; or (ii) transfer of possession of the Equipment to another party, StorageTek and its authorized service providers shall have the right with respect to the affected Equipment to remove all service tools and manuals and to remove or disable all Maintenance Code and/or replace Microcode which includes both Internal Code and Maintenance Code with Microcode that consists only of Internal Code.

General Information

<div align="right">1</div>

This chapter describes the components of the L180 Tape Library.

The library is the hardware component in an automated cartridge system. More specifically, the library is a robotic system that stores, moves, mounts, and dismounts tape cartridges that are used for data read or write operations. Figure 1-1 on page 1-2 through Figure 1-5 on page 1-7 show the library's major components, and are described in the following pages.

Note: Refer to your tape drive and software documentation for specific information about the tape drives, interfaces, and client software.

■ Library Components

See Figure 1-1 on page 1-2 for the location of the major components in the library, which include:

- A robot that mounts and dismounts cartridges

- Storage cells (or arrays) for holding from 84 up to 174 data cartridges

- A cartridge access port (CAP) that holds two removable magazines with up to 10 cartridges

- Tape drives that perform read and write operations. See "Tape Drives" on page 1-9.

- Rack space that allows you to install additional equipment such as hubs and switches for network attachments

- Operator panel that provides controls and indicators for the library and a 10-character display for messages (see Chapter 2 for more information)

- Electronic module that controls the robot operations and interfaces to the host operating systems (not shown, located behind the rear door)

- Power systems that include both AC and DC power supplies (not shown, located behind the rear door)

Figure 1-1. L180 Tape Library Major Components (C67036)
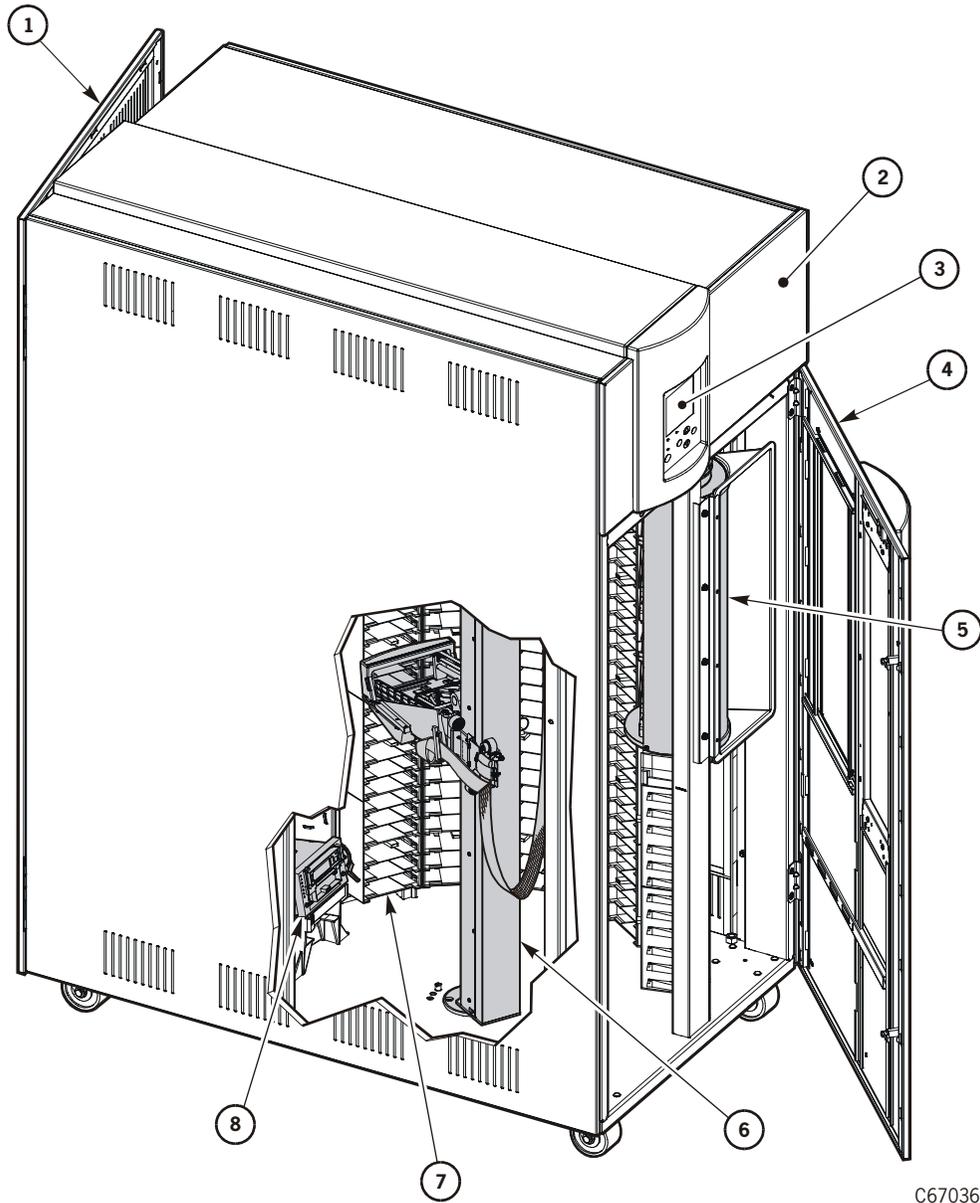
C67036

1. Rear door
2. Rack door
3. Operator panel
4. Front door
5. Cartridge access port (CAP)
6. Robotics
7. Arrays
8. Drives

Robot

Figure 1-2 shows the components of the robot:

- Theta motor (controls lateral movement)
- Z column motor (controls vertical movement)
- Hand-camera assembly on the Z carriage (controls cartridge movement to and from the cells, the drives, and the CAP)

The robot:

- Stores cartridges in cell arrays
- Mounts and dismounts cartridges within the library
- Moves cartridges by rotating the theta, moving the hand up and down the Z column, and reaching into a storage cell, drive, or CAP to grip a cartridge

Figure 1-2. Robot Components (C67002)

C67002
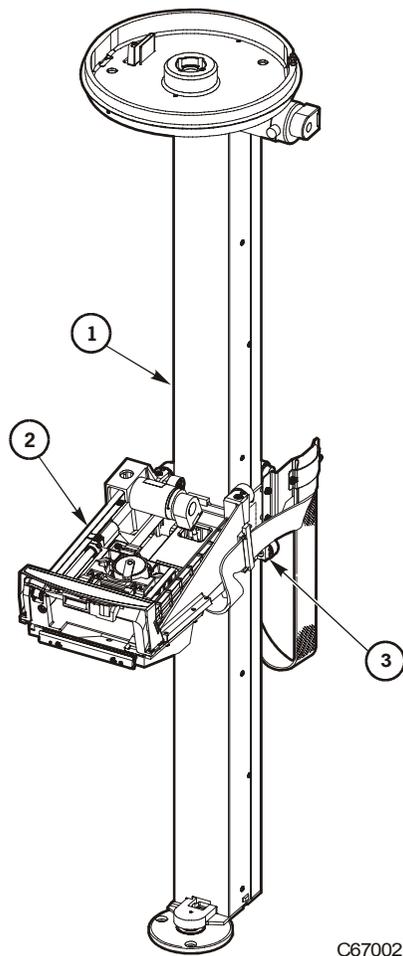
1. Z column (also called the Z tube)
2. Hand-camera assembly
3. Z carriage

Hand-Camera Assembly

Figure 1-3 shows the hand-camera assembly which consists of a gripper, a motor-driven drive belt for gripper extension, and a bar code scanner card and camera (enclosed in a case under the hand components).

The camera reads the volume serial numbers (VOLSERs) from the cartridge labels during an audit and as you enter cartridges through the CAP. During an audit, the library matches each VOLSER with a specific cell location. These locations are stored in memory on the MPC/MPCL card. Because the library always stores a cartridge in the same location, it does not use the camera during normal robotic operations.

During the library's initialization, the hand checks its extension in the space below the calibration label (at the bottom of the drive column).

Note: Cartridges left in drives will not be audited. However, volume information is retained for a cartridge that a library mounted to a drive.

Figure 1-3. Hand-Camera Assembly (C67038)
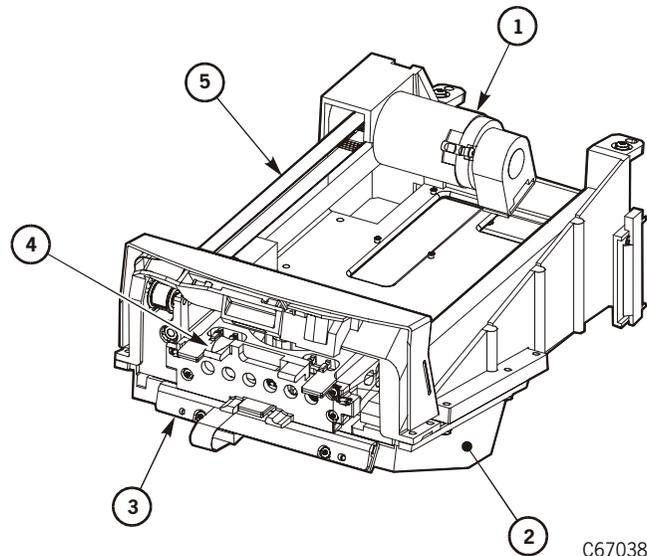
1. Motor
2. Camera housing
3. LED card
4. Gripper
5. Drive belt

Storage Cells

The storage cells (or arrays) are stacked in columns; the columns are arranged in a semicircle around the robot. Each column holds 28 cartridges.

Note: Each array holds six cartridges *but* the top two cells in each column are not available. These are *reserved* cells.

The library contains storage cells for 84, 140, and 174 data cartridges, excluding the CAP cells and reserved cells. The library capacity (total number of cells) was determined at the time the library was ordered or with an upgraded.

Client software locates cartridges by panel, column, row, and cell (shown in).

Cell Locations

Notes: The following statements apply to cell locations:

- The library uses targets on each cell for robotic calibration after you power on or re-initialize the library.

- Do not place data cartridges in the reserved cells. If you do not want to store diagnostic and/or cleaning tapes in these cells, you must leave them empty.

- The library does not use the drive and CAP locations to store cartridges.

- The robot uses the swap cell (the top-most cell in the reserved cells) to place a cartridge that is left in the hand when a power failure occurs or to perform a swap operation.

- The top-most arrays in each column hold only four data cartridges.

Reserved Cells

The following cautions pertain to placing cartridges into the reserved cells:

CAUTION:
Do not insert data tape cartridges into the reserved cells, the client software will not be able to find the cartridges.

Do not place cartridges into the swap cells. Swap cells are reserved tor in-transit cartridges.

Inserting cleaning cartridges into any of the reserved cells and resetting the library enables Auto Clean. Make sure your client software supports the Auto Clean feature.

Figure 1-4. Locating Cartridges—Panels, Cells, Rows (C67003)
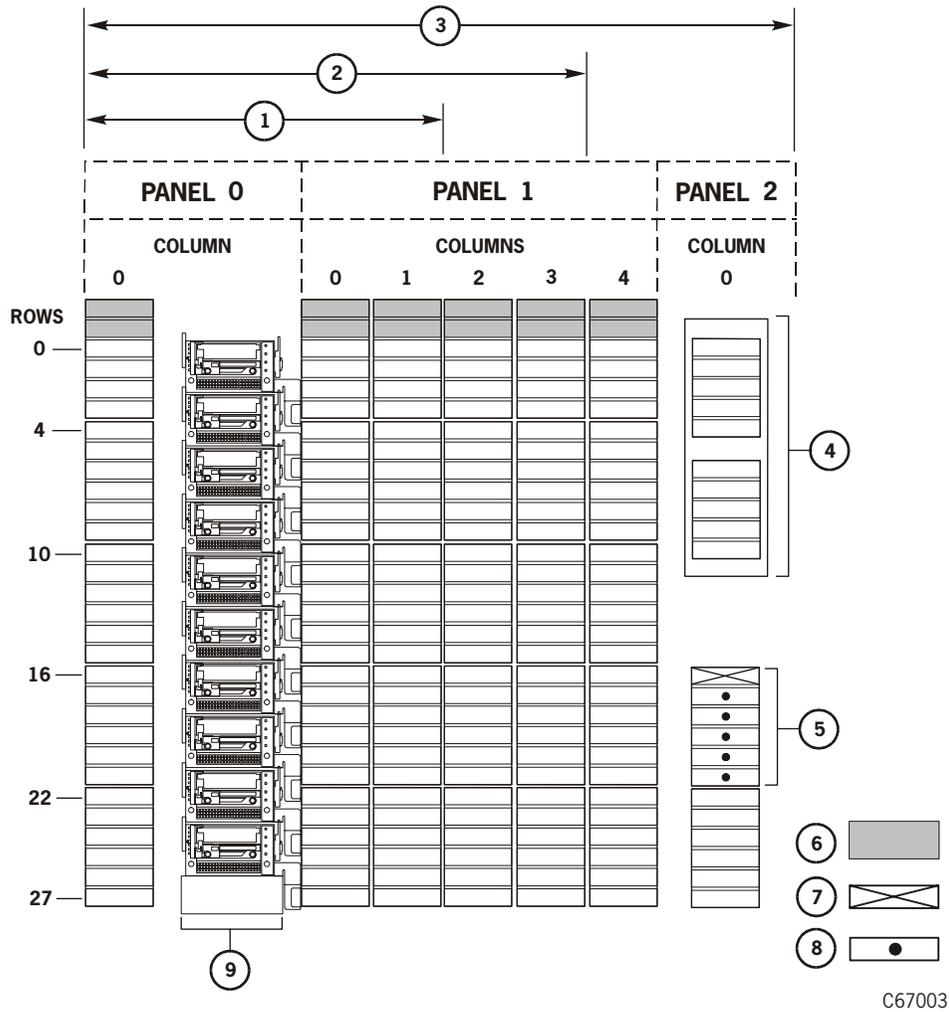
C67003

1. 84-cartridge-cell configuration
2. 140-cartridge-cell configuration
3. 174-cartridge-cell configuration
4. Cartridge access port (CAP)
5. Reserved cell array
6. Blocked storage cells (no cartridges permitted)
7. Swap cell
8. Cells reserved for cleaning or diagnostic cartridges
9. Drive column (shown with DLT drives installed)

Figure 1-5. Locating Cartridges—Hexadecimal (C67004)
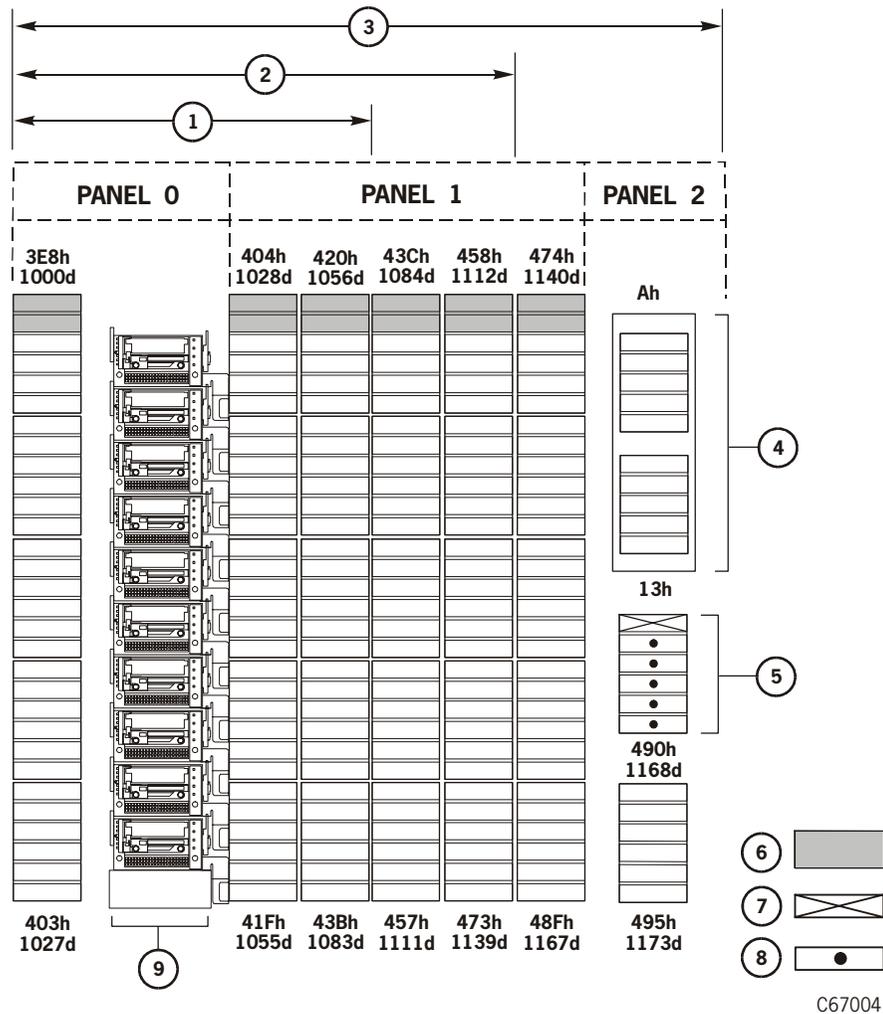
1. 84-cartridge-cell configuration
2. 140-cartridge-cell configuration
3. 174-cartridge-cell configuration
4. Cartridge access port (CAP)
5. Reserved cell array
6. Blocked storage cells (no cartridges permitted)
7. Swap cell
8. Cells reserved for cleaning or diagnostic cartridges
9. Drive column (addressed as Column 0, Panel 0 in some software)

Library Capacity

Table 1-1 lists library storage capacities:

Table 1-1. L180 Library Capacity

Model	Capacity	Description
L180-80	84	84 data cartridge slots, 6 reserved cartridge slots, one DC power supply, one AC PDU
L180-140	140	140 data cartridge slots, 6 reserved cartridge slots, one DC power supply, one AC PDU
L180-180	174	174 data cartridge slots, 6 reserved cartridge slots, one DC power supply, one AC power distribution unit (PDU)

Cartridge Access Port

The cartridge access port (CAP) shown closed in Figure 1-1 on page 1-2 lets you add cartridges to or remove cartridges from the library without interrupting normal library operations.

The CAP, accessible from the front of the library, holds two cartridge magazines.

A cartridge magazine is designed for easy handling. You can add cartridges to the magazine while leaving it in the CAP by simply lifting up and pulling down on the magazine handle and then adding cartridges. Or you can add cartridges to the magazine by lifting it out, inserting the cells, and placing the magazine back into the CAP.

The magazine's snap-on cartridge retention cover lets you keep cartridges in place when carrying the magazine (see "Magazine Retention Cover" on page 3-7 for information and an example).

For detailed procedures, see

- "Inserting Cartridges Through the CAP" on page 3-5
- "Importing Cleaning Cartridges Through the CAP" on page 3-8
- "Exporting Cleaning Cartridges Through the CAP" on page 3-10

Tape Drives

As an operator, you might need to:

- Check drive status information; see "Monitoring Status Information" on page 2-16.

- Manually clean a drive, see "Cleaning a Drive" on page 3-13.

- Manually mount a cartridge into a drive or dismount a cartridge from a drive; see "Mounting and Dismounting Cartridges Manually" on page 3-22.

The library supports the following types of tape drives:

- T9x40 – HVD SCSI or Fibre Channel (9940 requires feature 99DR, the extended door)
- T9840B – HVD SCSI, Fibre Channel, or ESCON[1]
- DLT 7000 or DLT 8000 – HVD SCSI only
- The SDLT 320 model—Backward Read Compatibility (BRC – ability to read previously written tapes on DLTIV media)
- IBM Gen1 Ultrium – Native LVD, Fibre Channel or, with a converter card, HVD
- IBM Gen2 Fibre Channel drives[2]
- Hewlett Packard Ultrium drives:
  - Gen1—Native LVD or, with a converter card, HVD
  - Gen2[3]—Native LVD only
- Seagate Ultrium – LVD or HVD (determined by model number)

CAUTION:
Possible equipment damage: **The IBM LTO Fibre Channel drive requires FB 101593 to be installed. The field bill includes a new coupler retainer clip, part number 313769501. Without the field bill, the coupler on the back of the drive tray is too close to the bay door, causing the attached external fiber cable to bend sharply when the bay door is closed.**

Possible data loss: **StorageTek does not advise mixing DLT 7000 and DLT 8000 drives in the same library. If a DLT 7000 cartridge is inserted into a DLT 8000 drive, the tape can be read and written in 7000 mode.**

If a DLT 8000 cartridge is inserted into a DLT 7000 drive, the drive will indicate an error if a read command is issued and will write over any data present on the tape if a write command is issued at load point.

---

1. The StorageTek T9840B drive is available for ESCON operation; library firmware must be version 3.01 or later.
2. The Gen2 IBM Fibre Channel drive requires Firmware Version 3.04.
3. The Gen2 HP Ultrium drive support is available with Firmware Version 3.03.

Table 1-2 lists the number of each type of drive when mixing drives.

Table 1-2. Mixed Drive Combinations

T9840	DLT or LTO
0	10
1	8
2	7
3	5
4	4
5	2
6	1

ESCON

ESCON operation is now available for the T9840B drive *only*; it requires certain considerations that must be taken into account for correct operation.

- Library firmware must be version 3.01 or later

- Client Server Component (CSC) software, version 4.1 or later, must be resident within the host's operating system

- ACSLS (Unix-based server) software, version 6.0.1 or later must be resident within the server's operating system.

Cables and configuration are explained in the *T9x40 Tape Drive Installation Manual*, part 95879.

Hewlett Packard Gen2 SCSI Drives

Support for Hewlett Packard Gen2 Ultrium (LTO) SCSI drives is provided with library firmware version 3.03 and later.

Gen2 drive/tape specifics include:

- Use of standard Ultrium cartridges
- Ability to read/write to Gen1 tape media
- For SCSI operation, Gen2 drives are only available with an LVD interface
- New codes for Gen2 drives— model LTO2ML and feature HPLV.
- Cartridge memory remains the same (4 KB) for Gen2 tapes
- Cartridge Media ID for Gen2 drives is "L2" (200 GB)

The major improvements seen with the Gen2 drives are:

- Increased native capacity of 200 GB or up to 400 GB compressed
- Data transfer rate of 40–80 MB/sec

Rack Area

The library has a six unit (U) rack area above the front door where additional equipment can be placed, including:

- Servers
- Fibre Channel components for a storage area network (SAN)
- Uninterruptible power supply (an optional feature)

CAUTION:
***Potential damage to library electronics and drives*: The two perforated sections in the rear of the rack area provide ventilation for the library processor, power supply, and drives. Do not block these sections.**

***Potential equipment damage*: The total maximum weight of equipment installed in this location must not exceed 77.1 kg (170 lb), and the total height must not exceed 6U.**

***Potential equipment damage*: Ensure that any equipment that you place within the rack is adequately cooled. The library's internal ambient temperature should not exceed the recommended operating temperature. Base cooling considerations upon the power dissipation within the rack space as well as upon the ambient room conditions that are external to the library. You must provide cooling for moderate power dissipation within the rack space.**

The rack area is not recommended for high power dissipation components such as multiprocessor servers or disk arrays.

You may use the internal 6U rack area, behind the top front door, for additional equipment. Requirements for this area are:

- An understanding of all the information in "Rack Safety and Precautions" on page xx.

- Placement of equipment well away from the perforated ventilation areas in the rack.

- Routing of power cables through the cutouts in the bottom of the library frame.

■ Power System

The library power system consisting of:

- One or two AC power distribution units (PDUs)
- One or two DC power supplies that provide voltage to the library
- An *optional* uninterruptible power supply

AC Power Distribution Units

Each power distribution unit (PDU):

- Operates within 100 to 127 VAC or 200 to 240 VAC at 50/60 Hz
- Distributes AC voltage to a library DC power supply
- Protects the library from overcurrent by circuit breakers

Uninterruptible Power Supply

The uninterruptible power supply (UPS) is an *optional* feature designed to maintain continuous operation in the event of a power disruption. The UPS also eases the effects of blackouts, brownouts, sags and surges in AC power.

The UPS (Figure 1-6) is installed in the rack area of the library and comes with a power strip that allows you to connect up to eight additional components to the UPS. If power fails, the UPS will supply power to the equipment connected to the power strip until the batteries are exhausted.

Figure 1-6. Uninterruptible Power Supply (C67327)

C67327
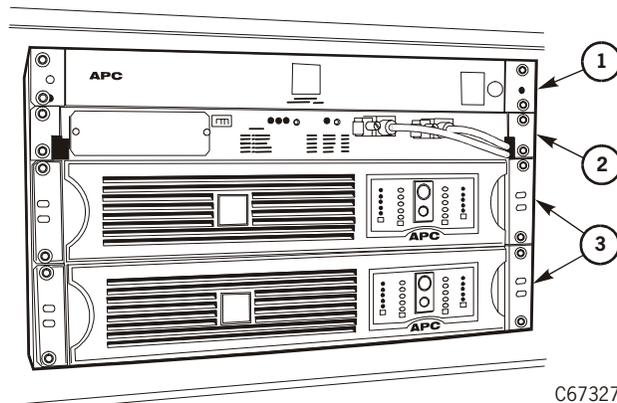
1. Power strip	2. Switch	3. Batteries

Note: Refer to the *L180 and L700 Tape Library Uninterruptible Power Supply Reference Manual* for more information.

■ Library Safety Features

Safety features are incorporated into the library include:

- An electronic interlock to remove power from the robot if the front door to the library is opened.

- Protective covers in the electronics compartment that cover the logic card, the AC power supply, and the DC power supply to prevent you from coming into contact with hazardous voltages and sensitive electronics.

■ Library Operating Modes

An operating mode is the manner in which a library and the controlling software interact. A library can operate in either automated mode or manual mode, as described in the following paragraphs.

Automated Mode

Automated mode is the normal operating mode of the library. The controlling software instructs the robot to move cartridges among the storage cells, drives, and CAP without operator intervention. Operator tasks include:

- Monitoring the library operator panel for messages
- Entering a cartridge into the CAP
- Ejecting a cartridge from the CAP
- Replacing a cleaning cartridge
- Cleaning a drive
- Reviewing the FSC log
- Running diagnostic tests
- Powering off the library

Manual Mode

Manual mode occurs when the library is taken offline or experiences a robot malfunction. Operator tasks include:

- Opening the library front door
- Moving the robot
- Locating a cartridge
- Removing a cartridge from the hand
- Mounting a cartridge into a drive
- Dismounting a cartridge from a drive
- Returning the library to online status

■ Controlling Software

The controlling software (also referred to as client, server, or host software) requests tape read/write operations and robotic move operations. When the library is in automated mode these operations occur without operator intervention. The software determines where the cartridge is located by accessing audit data (sometimes referred to as the catalog) uploaded from the library; the software then allocates which drive receives the cartridge. See "Library Operating Modes" for additional information.

Note: Refer to your software publications for command descriptions.

■ L-Series Library Admin

StorageTek's L-Series Library Admin is an optional web-based interface to the library. If your library has this feature installed, you can perform these tasks through a workstation or PC that is running a Netscape or Microsoft browser.

- View the interior of the library electronically
- Monitor status information
- Perform automated operations
- Run diagnostic tests

Note: The workstation or PC must be connected to the library's Enet or Ethernet port.

For information about monitoring, operating, or testing the library through your browser, access the online help files or other documentation set with the software.

See Appendix B, "Library Statistics."

Controls and Indicators

<div style="text-align: right;">2</div>

This chapter identifies and describes the functions of the L180 Tape Library operator panel and lists tasks the operator can perform through the panel. shows an example of the operator panel.

■ Operator Panel

The operator panel is recessed into the library's rack door and contains buttons, indicators, and a graphic display.

The operator panel allows you to:

- Monitor current information about the library's readiness
- Help resolve library problems if an error occurs
- Set library, network, and drive configurations
- Rotate the CAP
- Replace drive cleaning cartridges and set cleaning cartridge warning count
- Run library and drive tests
- Reset (starts an initial program load [IPL] on the library).

Indicators

Three indicators on the operator panel provide basic status information:

- Library Active
- Service Required (note: contact your service provider)
- Open

Buttons

Five buttons appear on the operator panel:

- CAP
- MENU
- SELECT
- Up arrow
- Down arrow

The up arrow, down arrow, **MENU**, and **SELECT** buttons control only the values that are under operator control. As you scroll down or up a list of selections, the cursor underscores values you can change.

Figure 2-1. Operator Panel Display, Controls, and Indicators (C67005)
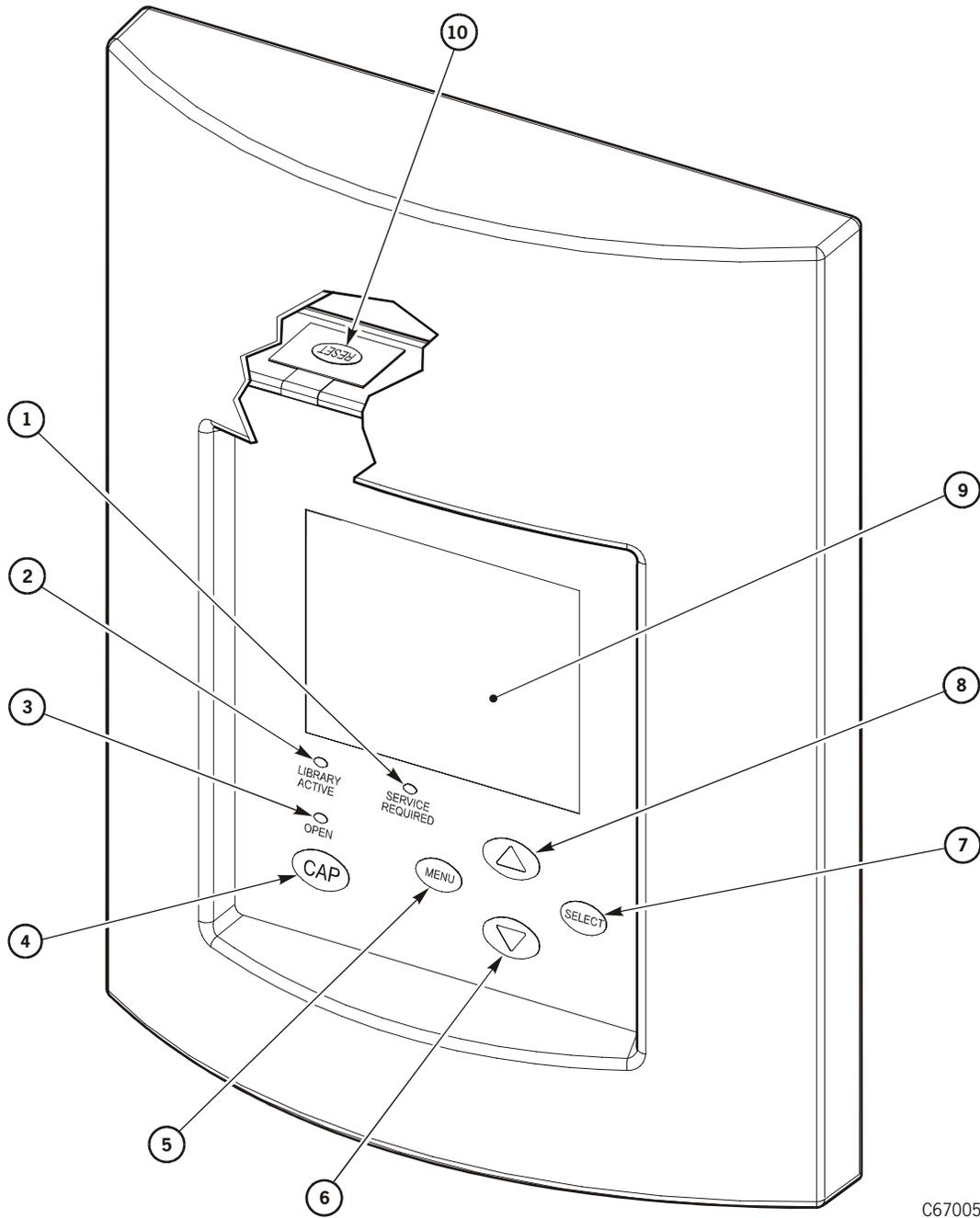
C67005

1. *Service Required* indicator is steadily red when human intervention is required and flashes if a fan is defective.

2. *Library Active* indicator flashes green when the library is operational.

3. *Open* indicator is steadily amber when the CAP is open for you to enter or remove cartridges.

4. CAP button opens and closes the CAP.

5. MENU button initially places you into the main menu or returns you to a previously selected screen.

Figure 2-1. Operator Panel Display, Controls, and Indicators (Continued) (C67005)

6. Arrow down button moves the cursor down the display screen and decrements a value.

7. SELECT button selects an item on a menu, saves the currently underscored value, and moves the cursor to the next field.

8. Arrow up button moves the cursor up the display screen and increments a value.

9. Graphic display screen shows current information and FSCs and allows input from menus.

10. RESET button resets the library (starts an IPL). To access the RESET button, you must open the rack door.

■ Display Screens

Screens on the operator panel show current information and/or allow input. The following information are examples of these screens.

Initial Status

The Initial Status screen is the first screen that appears on the operator panel after an IPL. Information includes:

STK L180 Code Version	Version of microcode installed
CAP Closed	Status of the cartridge access port (CAP)
Library Online	Status of the library
Web Enabled	The Web interface is enabled (or remote user's)
Column 0	The status and location of each drive installed in the drive column

Figure 2-2. Initial Status Screen
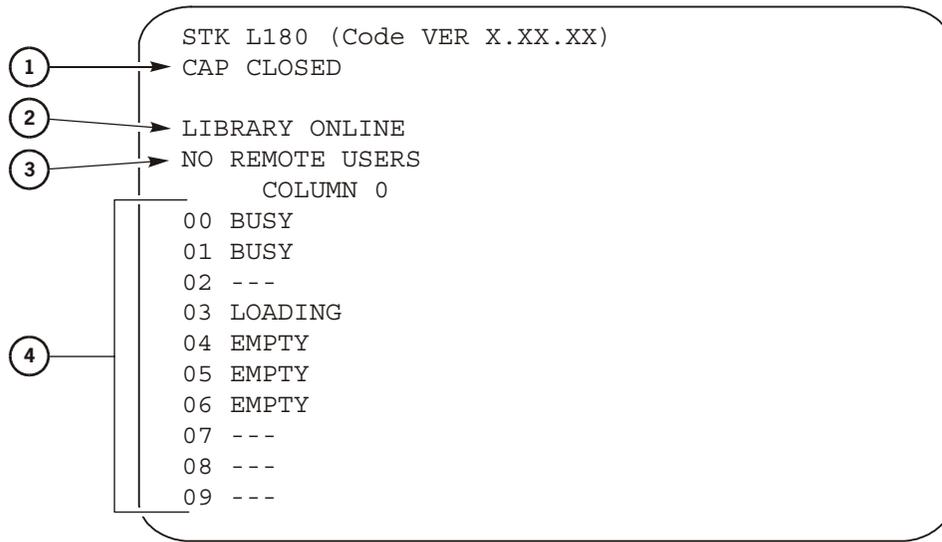
```
        STK L180 (Code VER X.XX.XX)
   ①──▶ CAP CLOSED
   ②──▶ LIBRARY ONLINE
   ③──▶ NO REMOTE USERS
             COLUMN 0
        00 BUSY
        01 BUSY
        02 ---
        03 LOADING
        04 EMPTY
   ④    05 EMPTY
        06 EMPTY
        07 ---
        08 ---
        09 ---
```
C67314

1. CAP status message
2. Library status message
3. Web Enabled indicates a Personality Module is present and Library Admin is enabled
4. Drive status messages

Main Menu

When you push the MENU button from the Initial Status screen, you can see the Main Menu:

Figure 2-3. Main Menu

```
MAIN MENU:

FSC LOG
CAP CONTENTS
DRIVE INFO
CLEANING INFO
DIAGNOSTICS
VERSION INFO
CONFIGURATION
```

FSC Log

The fault symptom code (FSC) Log displays the last 20 events and includes an FSC, the number of occurrences, and the date and time of the last occurrence.

See for more information.

The following statements apply to the FSC Log screen:

- Events listed in the log might not be failures or an error indication.
- FSCs are generated for the both library and tape drives.

Figure 2-4. Example of the FSC Log

```
3329    03    NONE
03/01/2004      14:46:14
3304    09    NONE
03/01/2004      14:46:14
30BB    02    NONE
03/01/2004      14:44:01
30BA    02    NONE
03/01/2004      14:44:01
```

CAP Contents

The CAP Contents screen is an information-only screen. This screen displays either the VOLSER of a cartridge or a status message for each slot in a CAP magazine.

See "CAP Magazine Status" on page 2-17 for more information.

Figure 2-5. CAP Status

```
CAP CONTENTS

MAGAZINE 1 CONTENTS
100024
44AF57R
EMPTY
EMPTY
EMPTY
MAGAZINE 2 CONTENTS
EMPTY
EMPTY
EMPTY
EMPTY
EMPTY
```

Version Information

The Version Info Menu is an information-only screen. This displays the version level of the library's microcode, the date the code was completed, and the serial number of the logic card (also referred to as the MPC or MPCL card).

Figure 2-6. Version Information

```
VERSION INFO MENU:

STK L180

CODE VERSION:
   x.xx.xx

CODE BUILT ON:
   May 22 2002  12:38:47

HARDWARE / VERSION
   MPC 00000098
```

Drive Information

The Drive Information Menu is an information-only screen that lists information about the selected drive, such as:

Vendor	The manufacturer of the drive
Type	The drive model
Status	The drive's logical number and status (see "Drive Status" on page 2-19 for a list of status messages)
Serial Number	The serial number assigned by the drive's manufacturer
Interface Type	The type of client-to-drive interface (this example shows a SCSI interface, but a drive with Fibre Channel capability would display FIBRE I/F)
Code Version	The firmware version of the drive

Figure 2-7. Drive Information

```
DRIVE INFORMATION MENU:

VENDOR: QUANT
TYPE: DLT8000
STATUS: 00 EMPTY

SERIAL NUMBER:
 XXXXXXXXXX

INTERFACE TYPE:
 SCSI I/F

CODE VERSION
 50
```
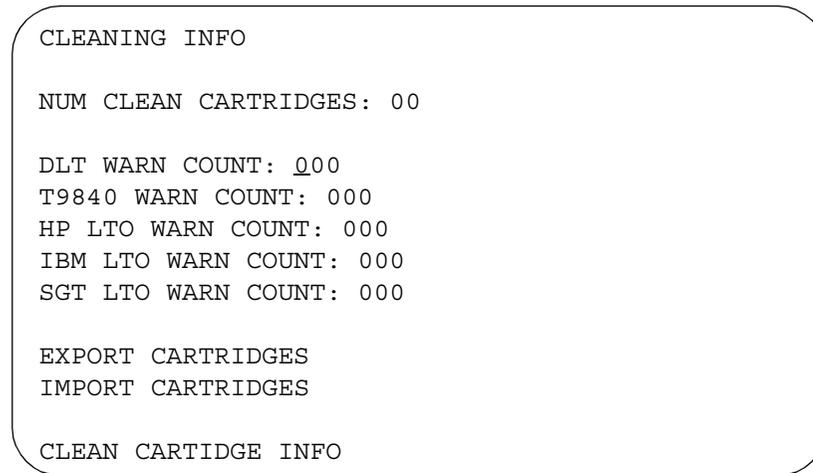
Cleaning Information

The Cleaning Info screen provides information about and control of the library's cleaning cartridges.

Figure 2-8. Cleaning Information

```
CLEANING INFO

NUM CLEAN CARTRIDGES: 00

DLT WARN COUNT: 000
T9840 WARN COUNT: 000
HP LTO WARN COUNT: 000
IBM LTO WARN COUNT: 000
SGT LTO WARN COUNT: 000

EXPORT CARTRIDGES
IMPORT CARTRIDGES

CLEAN CARTIDGE INFO
```

The following information describes the fields in the Cleaning Information screen.

Num Clean Cartridges	The total number of cleaning cartridges located in the reserved cells within the library.
DLT Warn Count	The number times you want the DLT cleaning cartridge to be used before a warning appears.
T9840 Warn Count	The number times you want the T9840 cleaning cartridge to be used before a warning appears.
HP LTO Warn Count IBM LTO Warn Count SGT LTO Warn Count Universal LTO Warn Count	The number of times you want the specified Ultrium cleaning cartridge to be used before a warning appears.
Export Clean Cartridges	A procedure for moving cleaning cartridges from from the reserved cells to the CAP.
Import Cleaning Cartridges	A procedure for moving cleaning cartridges from the CAP to the reserved cells.
Clean Cartridge Info	A path to an information screen that lists all cleaning cartridges in the library.

The menu lets you change the warning count for each type of cleaning cartridge as well as import cleaning cartridges to the library and export them from the library. This menu also lets you check the number of times a cleaning cartridge has been used.

The warning count should be set lower than the cartridge's recommended usage (or "maximum warning count" displayed on the operator panel); this will allow time for you to obtain a replacement cleaning cartridge. For example, if the maximum warning count equals 20 uses, you may want to set the warning count to 17 (or other, lower number).

Always replace a used cleaning cartridge with a new, unused cleaning cartridge.

If the usage count for a cleaning cartridge has reached its life limit, the `CLEAN CARTRIDGE INFO` screen will display `EXPIRED`. You *must* remove this cartridge from the library. See "Cleaning Cartridge Expiration" on page 3-15 for more details.

See "Setting the Cleaning Cartridge Warning Count" on page 3-12 for the procedure to set or change the warning count.

Diagnostics

The Main Diagnostics Menu lets you perform these functions:

- **Drive-related functions:**

    - **Clean Drive:** Enables you to clean tape drives manually
    - **Mount:** Inserts a test cartridge into a drive
    - **Dismount:** Removes a test cartridge from a drive
    - **Run Drive Check:** Determines that the drive is functioning
    - **Mount-Dismount Loop:** Inserts a test cartridge into and removes it from a drive.

- **Get-Put Loop:** Gets a test cartridge and puts it in another location. (You may designate the number of times the library goes through the loop.)

- **Demo Mode:** Simulates library operation

Note: All diagnostic functions except for Clean Drive require the library and associated tape drive to be offline.

Figure 2-9. Main Diagnostics Menu

```
MAIN DIAGNOSTICS MENU:


DRIVE DIAGNOSTICS
GET/PUT LOOP
DEMO MODE
```

■ Main Configuration Menu

The Main Configuration Menu routes you to the configuration menus (library, drive, network) and to the panel display controls. This menu also routes you to screens that let you view the library personality and input a password for a web interface product.

Figure 2-10. Main Configuration Menu

```
MAIN CONFIGURATION MENU

LIBRARY CONFIG
DRIVE CONFIG
NETWORK CONFIG
PERSONALITY MODULE
WEB PASSWORD
DISPLAY INFO
```

Library Configuration

The Lib Config Menu displays library information and allows you to modify the configuration.

Lib SCSI I/F ID or **Lib Fibre I/F ID**	The library's interface identifier
Fast Load	The Fast Load feature status (on or off)
Date	Current date
Time	Current time
Auto Clean	Whether Auto Clean is enabled
User Cells	How many data storage cells the library contains

Figure 2-11. Library Configuration Menu

```
LIB CONFIG MENU:

LIB SCSI I/F ID: 00
FAST LOAD: OFF
DATE: 03/12/2004
TIME: 08:20

AUTO CLEAN: OFF
USER CELLS: 84
```

Library SCSI Interface Configuration

The Lib SCSI I/F Config Menu lets you view the library's SCSI type (differential or single-ended) and access an edit menu for the library's SCSI ID.

Figure 2-12. Library SCSI Interface Configuration Menu

```
LIB SCSI I/F CONFIG MENU:

LIB SCSI I/F ID: 00

SCSI TYPE: LVD (or HVD)
```

Library Fibre Channel Interface Configuration

The Lib Fibre I/F Config Menu lets you view the library's worldwide ID and Port 0 worldwide ID. This menu also lets you access an edit menu for the library's Port 0 address.

Figure 2-13. Library Fibre Channel Interface Configuration Menu

```
LIB FIBRE I/F CONFIG MENU:

LIBRARY WORLDWIDE ID:
00.00.00.00.00.00.00.00

PORT 0 WORLDWIDE ID:
00.00.00.00.00.00.00.00

PORT 0 CONFIGURATION
```

Drive Configuration

The Drive Configuration Menu lets you modify portions of each SCSI drive's configuration.

For each drive, the menu displays the drive position, drive type, and, if the drive path is SCSI, the drive's SCSI ID and the drive's SCSI bus relationship with the library. If the drive path is Fibre Channel, the menu displays FIBRE I/F after the drive type.

Sub-menus let you change the SCSI ID and indicate whether the drive is on the same SCSI bus as the library.

These statements apply to this menu:

• The cursor position is saved on all screens that list the library's drives.

• The panel displays 16 lines of data per menu. If you library contains more than seven drives, you must use the down arrow button to scroll to drives 08 and 09.

Figure 2-14. Drive Configuration Menu

```
00 DLT8000_ID:01
        ON BUS: OFF
01 DLT8000_ID:02
        ON BUS: OFF
02 IBM_LTO_ID:04
        ON BUS: OFF
03 SGT_LTO_ID:05
        ON BUS: OFF
04 HP_LTO_ID:06
        ON BUS: OFF
05 9840_FIBRE I/F

06 9840_FIBRE I/F

07 9840_ESCON
```

Network Configuration

The Network Config Menu lets you modify the library's network configuration and view the library's Ethernet address.

Figure 2-15. Network Configuration Menu

```
NETWORK CONFIG MENU:
LIBRARY NAME:

_

IP ADDRESS:
 000.000.000.000
NETWORK GATEWAY:
 NOT SET
SUBNET MASK:
 000.000.000.000

DNS CONFIGURATION
DWN
SVR PRIMARY
SVR SECONDARY
DHCP: DISABLED

ETHERNET ADDRESS:
00:10:4F:00:05:76
```

Domain Name Service

You must enter the Domain Name Service (DNS) configuration *only* if your Simplified Network Management Protocol (SNMP) agent is set to trap *named* recipients; if SNMP is set for *numbered* recipients, no entries are required.

Dynamic Worldwide Name

The dynamic Worldwide Name (dWWN) feature is generally enabled at installation. You must consult with your service representative and system administrator to enable it.

To correct re-configuration problems within a Fibre Channel network, the 3.02 firmware includes the dWWN enhancement. Previously, Fibre Channel devices contained fixed worldwide names within the network. If a device (for example, a defective tape drive) required replacement, the new device was detected by the network as "unknown" and re-configuration of the network was required.

When enabled, dWWN assigns names to library drive *slots* rather than devices. When a drive is replaced, the new drive receives the same name as the one replaced, thereby eliminating the need for system re-configuration. There are three Worldwide Names reserved for each drive: Node, Port A, and Port B.

Note: This feature also requires corresponding drive code that supports the dynamic Worldwide Name feature. Currently, IBM LTO drive code 27Q1 is the only available supporting microcode.

Microcode for other drives is in process and will be released with the next drive firmware versions.

With firmware version 3.04, you *cannot* mix dWWN-supported and non-dWWN supported drives when the dWWN feature is enabled on the library. In such a case, non-supported drives remain in the "configuring" state on the library operator panel.

Display Information

The Display Info Menu leads to menus that let you adjust the contrast and backlight on the graphic display screen.

Figure 2-16. Display Information Menu

```
DISPLAY INFO MENU:

CONTRAST: 09
   DEFAULT = 16

BACKLIGHT: 128
    DEFAULT = 128

RESTORE DEFAULTS

MENU TO EXIT
```

Personality Module

The Personality Module Info Menu lets you *view* the library's personality settings. This feature must be installed by the service representative. The screen below illustrates how you may check the personality module for the library.

Figure 2-17. Personality Module Information (1 of 2)

```
PERSONALITY MODULE INFO:


STATUS:
   PRESENT
TYPE:
   NORMAL
VERSION:
   0
LIBRARY VENDOR ID:
   0
LIBRARY VENDOR NAME:
   STK
LIBRARY PRODUCT NAME:
   L180


        (DOWN FOR MORE INFORMATION)
```

When you use the down arrow, additional information will appear:

Figure 2-18. Personality Module Information (2 of 2)

```
PERSONALITY MODULE INFO:


LIBRARY ADMIN:
   ENABLED
SCSI VENDOR NAME
   STK
SCSI PRODUCT NAME
   L180
```

■ Monitoring Status Information

The Initial Status screen lets you monitor CAP, library, remote user, and drive status.

This screen displays after initialization or a reset has completed, and it also displays this information when you press the MENU button while you are viewing the Main Menu.

Figure 2-19. Example of the Initial Status Screen (C67314)


```
STK L180 (CODE VER 3.02.00)*
CAP CLOSED

LIBRARY READY
WEB ENABLED
     COLUMN 0
00 BUSY
01 LOADING
02 CLEAN NEEDED
03 CARTRIDGE IN
04 EMTPY
05 CLEANING
06 REWINDING
07 NOT COMMUNICATE
08 ---
09 ---
```
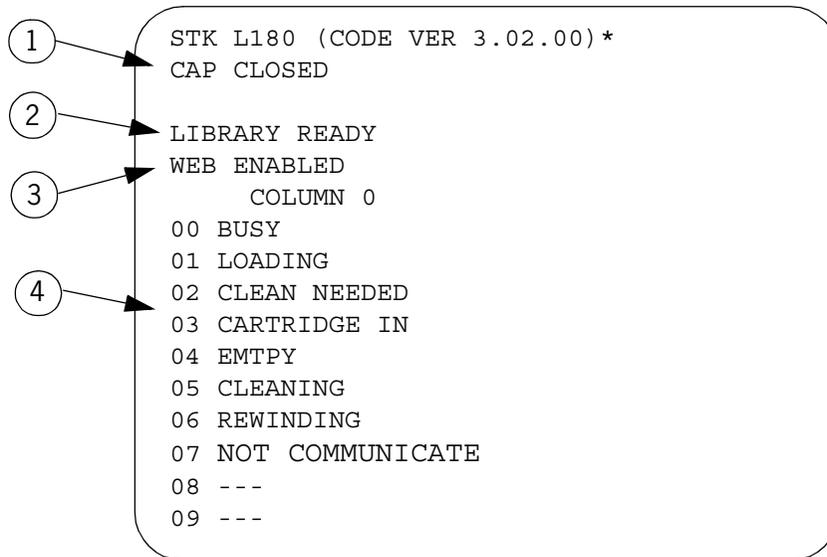
1. CAP status message (See Table 2-1 on page 2-17 for additional information)
2. Library status message (See Table 2-3 on page 2-18 for additional information)
3. Web status message (Personality Module installed and Library Admin is enabled)
4. Drives status messages (See Table 2-4 on page 2-19 for additional information)

Note: An asterisk (*) after the code version indicates an expired cleaning cartridge is in the library.

CAP Status

The first line of status information on the initial status screen indicates the condition of the CAP.

Table 2-1. CAP Status Messages

Status Message	Explanation
OPEN	The CAP door is currently open. You may insert or remove cartridges or the magazines.
CLOSED	The CAP door is currently closed.
CLOSED(LOCKED)	The CAP door is currently closed and locked. Before you can open the CAP door, you must issue a command from the system console.
TRANSITION	The CAP door stalled while attempting to open.
UNKNOWN	The library does not recognize the current state of the CAP door.

CAP Magazine Status

To check the status of a CAP magazine and its contents:

1. Press the **MENU** button to display the Main Menu.

2. Press an arrow button until the cursor lines up with CAP CONTENTS.

3. Press the **SELECT** button. The CAP Contents menu will appear (see). This menu lists the VOLSER of each cartridge in a magazine, or the screen lists a status message.

Note: The upper magazine is always MAGAZINE 1; the lower magazine is always MAGAZINE 2.

Table 2-2. CAP Magazine Slot Status Messages

Status Message	Explanation
EMPTY	This magazine slot does not contain a cartridge.
UNKNOWN	The library has not yet performed an audit to determine the contents of this magazine slot.
UNREADABLE	This magazine slot contains a cartridge, but the camera could not read the cartridge's VOLSER label.

Library Status

The following library status messages might appear:

Table 2-3. Library Status Messages

Status Message	Explanation
LIB MAIN DOOR OPEN	The library's front door is open. When you close it, the library will reinitialize.
LIB INIT REQUIRED	The library requires initialization. This message might appear momentarily after you close the library's front door.
	If the message remains on the screen, open and close the front door. The library then begins its initialization cycle.
LIBRARY NOT READY	The library is not available to perform operator-requested actions. Some status information might be available through the network interfaces.
LIBRARY READY	The library has completed initialization and is ready to perform requested actions.
LIB MAINTENANCE MODE	The library is offline because it is performing diagnostic tests.
INTERVENTION REQUIRED	The library is experiencing a problem.
	Note the fault symptom code (FSC) if the library has displayed one and call your service provider.
LIB UNKNOWN STATE	The library does not recognize its current state.
	Note the FSC if the library has displayed one and call your service provider.

Remote Users Status

Following the library status line is a status line that indicates the number of users who are currently accessing the library remotely (for example, through the Horizon L Series Library Monitor).

At the time of publication, no additional status messages were available for this line. The line will always read NO REMOTE USERS.

Drive Status

The following drive status messages might appear:

Table 2-4. Drive Status Messages

Status Message	Explanation
INIT REQUIRED	You must initialize this drive.
NOT CONNECTED	This drive is not connected to the library.
UNKNOWN DRIVE	The library does not recognize this type of drive.
NOT COMMUNICATE	This drive is not communicating with the library. (This drive might be powered off.)
NOT FUNCTIONAL	This drive is not operating properly.
EMPTY	No cartridge is loaded in this drive.
CARTRIDGE IN	This drive contains a cartridge, but it is not loaded into the drive.
CLEAN NEEDED	This drive requires cleaning.
CLEAN FAILED	The attempt to clean this drive failed.
LOADING	The drive is loading a cartridge.
REWOUND	The cartridge in this drive has been rewound.
UNLOADING	The drive is unloading a cartridge.
LOADED	A cartridge is loaded in this drive.
REWINDING	The cartridge in this drive is being rewound.
BUSY	This drive is performing a read or write operation.
CLEANING	The drive is being cleaned.

Drive Information

To view details about an installed drive, including the serial number and firmware version:

1. Press the **MENU** button to display the Main Menu.

2. Press an arrow button until the cursor lines up with DRIVE INFO.

3. Press the **SELECT** button. A list of all installed drives will appear.

4. Use the arrow buttons until the cursor underscores the desired drive.

5. Press the **SELECT** button. The Drive Information Menu will appear (see).

Library Personality Information

Viewing library personality information lets you determine who the library's manufacturer is, whether a personality module is present and enabled, and how the library's name and vendor name appear on a SCSI interface.

To view the library's personality information:

1. Press the **MENU** button to return to the Main Menu.

2. Press the arrow buttons until the cursor underscores CONFIGURATION.

3. Press the **SELECT** button. The panel displays the Main Configuration Menu.

4. Press the arrow buttons until the cursor underscores PERSONALITY MODULE.

5. Press the **SELECT** button. The panel displays the Personality Module screen.

6. Press the down arrow to view a second screen of information.

7. To exit the Personality Module Info screen, press the **MENU** button.

Table 2-5. Status Messages about the Personality Module

Status Message	Explanation
STATUS:	
PRESENT	A recognizable personality module is attached.
NOT PRESENT	No personality module is attached.
UNKNOWN	No valid vendor information has been loaded into this library.
TYPE:	
NORMAL	One of two conditions is true if you see TYPE: NORMAL.
	• If the STATUS is PRESENT, a personality module containing vendor information is attached to the logic card. • If the STATUS is NOT PRESENT, the factory-installed vendor information is in effect.
UPGRADE	You can use the personality module attached to the logic card to install a feature. This type of personality module is an "upgrade module."
USED UPGRADE	The feature on the attached upgrade module has already been installed on a library.
WRITE IN PROGRESS	The installation of the information from the personality module has been interrupted. The personality module is no longer valid.

Status Message	Explanation
VERSION:	This is the version number for the personality module. If a personality module is not present, this is the version of the vendor information.
LIBRARY VENDOR ID:	This is the identity number for the library vendor.
LIBRARY VENDOR NAME:	This is the name of the library vendor.
LIBRARY PRODUCT NAME:	• If TYPE is NORMAL, this is the product name assigned by the vendor. • If TYPE is UPGRADE, this is the name of the product for which the upgrade is valid.
SCSI VENDOR NAME:	This is the vendor name reported on the interface.
SCSI PRODUCT NAME:	This is the product name reported on the interface.

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Library Operation

This chapter contains procedures for the L180 Tape Library, including:

■ Powering-on the Library

Figure 3-1 on page 3-3 shows the location of the library power switch.

The power switch is one or two circuit breakers behind the rear door of the library (left of the drive column). The power switch has two configurations:

• A single circuit breaker on the main power distribution unit (PDU) that controls power to the library and all ten drive positions.

• An optional second circuit breaker (on the optional PDU) that controls power to the top five drive positions and power to the library in case the main electrical circuit loses power. (In this configuration, the main PDU powers the bottom five drive positions as well as the library.)

Note: For redundancy, if your library has two circuit breakers, then the optional PDU should be connected to a separate electrical circuit. This way, if one PDU loses power, the other PDU remains on to provide power to the library.

To apply power to the library and drive column:

1. Open the rear door by pulling on the finger slot.

2. Lift up on the power switch (one or two circuit breakers).

3. Close the rear door.

■ Powering-off the Library

Figure 3-1 on page 3-3 shows the location of the library power switch.

To power off the library:

1. Make sure all jobs are complete.

2. Enter the operating system command to take the library and drives offline.

3. Open the rear door by pulling on the finger slot.

4. Push down on the library power switch (one or two circuit breakers).

5. Close the rear door.

Figure 3-1. Library Power Switch Location (C67009)
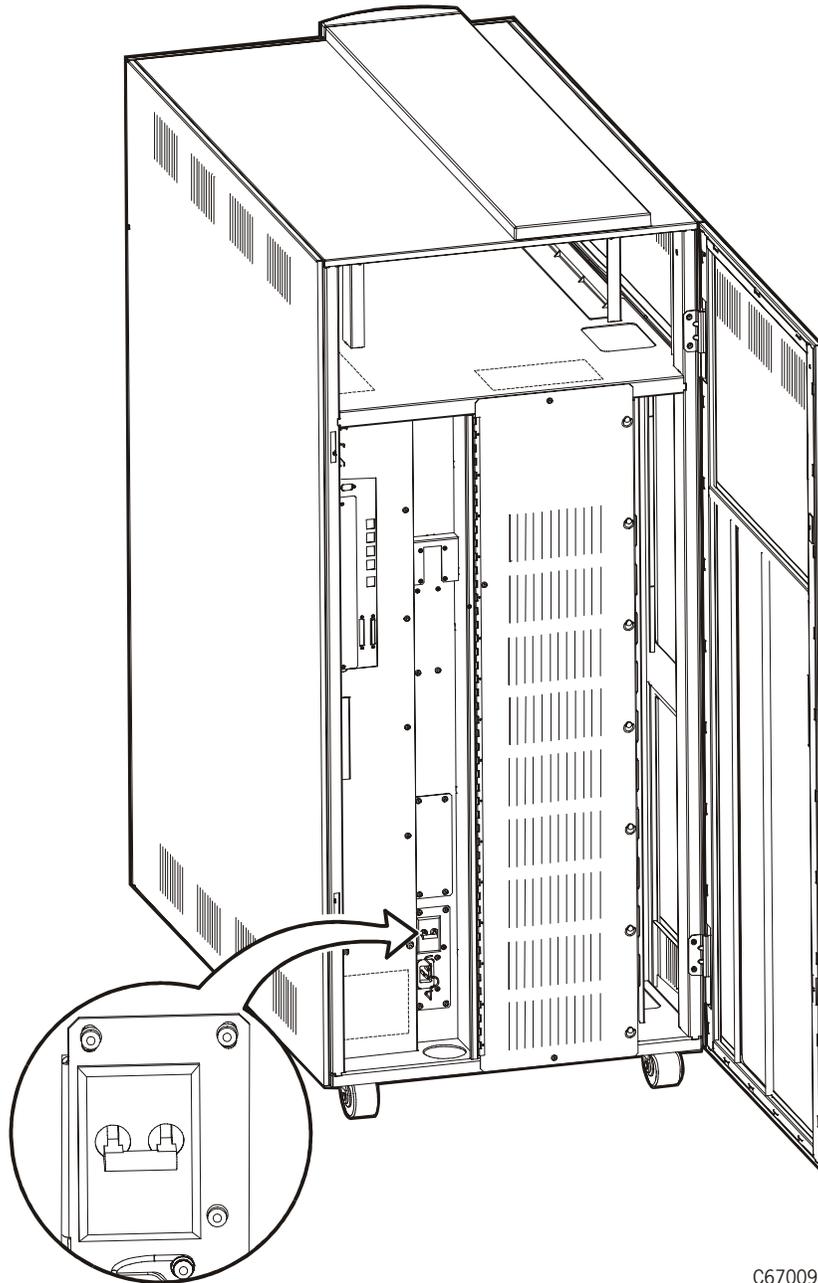
C67009

■ Initializing and IPLing the Library

Powering-on the library causes it to initialize components and perform an IPL (initial program load).

During initialization, the library prepares the robotics for use and audits any cartridges in the storage and reserved cells.

During an IPL, the library loads the operating code and automatically verifies some configuration values, such as drive locations and drive types.

Re-initializing the Library

As an operator, you might need to re-initialize the library when you:

- Manually add cartridges in the library
- Run the library in demo mode
- If a robotic component malfunctions

To re-initialize the library, make sure that all drives are powered-on and perform one of these actions:

- Power-on the library (or power-off and then power-on the library)
- Open and close the library's front door

When you re-initialize the library it:

- Initializes and calibrates robotic mechanisms and the hand-camera assembly
- Audits the tapes within the library (requires approximately **five** minutes)
- Checks drive targeting
- Audits the reserve cells
- Cycles the DLT load handle (for DLT drives)

Re-IPLing the Library

As an operator, you might need to re-IPL (reset) the library when:

- You are directed to do so by your system administrator or a service representative

- You have to change the library configuration (for example, when you have to change the library's network configuration)

To re-IPL the library after it is already powered-on, make sure that all the drives are powered-on and press the RESET button on the operator panel.

■ Inserting Cartridges Through the CAP

To unlock the CAP, open it, and place cartridges into it:

1. Enter the console command to unlock the CAP.

2. Press the **CAP** button on the operator panel to open the CAP. The *Open* indicator will light.

CAUTION:
***Possible halt to operation or damage to components*: You must enter the cartridges properly, or you might damage the robot, the drive, or cause the library to stop operating.**

3. Insert cartridges into the magazine. You can do this one of two ways: Pull out and down on the magazine handle, or remove the magazine by lifting it out (see Figure 3-2).

Figure 3-2. Removing the CAP Magazine (C67082)
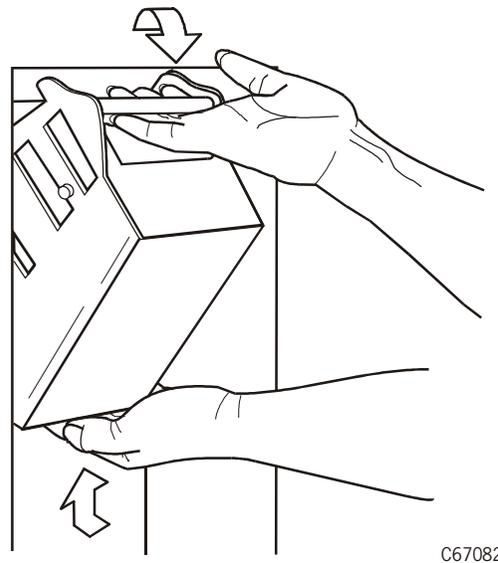
C67082

4. Enter the cartridges into the magazine so that they lie flat, with the VOLSER label facing toward you, the customer label facing down, and the reel facing away from you. (See Figure 3-3 and Figure 3-4 on page 3-6.)

CAUTION:
***Possible damage to the hand assembly.* Remove the magazine's retention cover before inserting the magazine into the CAP.**

5. Return the magazine to its closed position. (If you have used a retention cover on the magazine, remove the cover before replacing the magazine.)

6. Press the **CAP** button on the operator panel to close the CAP.

Figure 3-3. Entering DLT and T9840 Cartridges into the CAP Magazine (C67011)

C67011
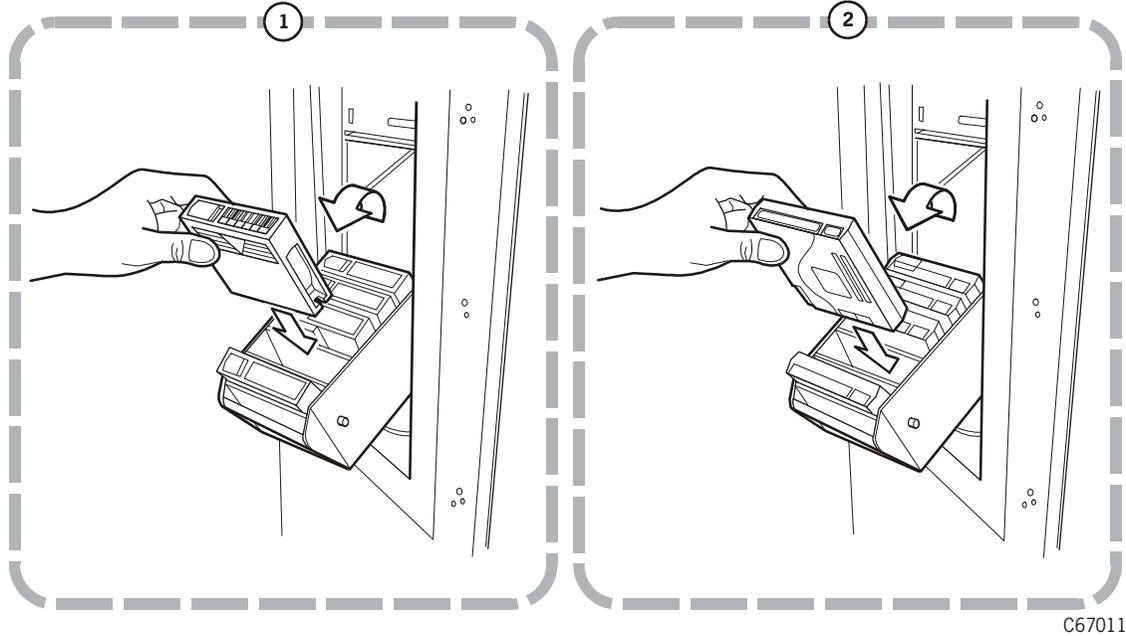
1. DLT cartridge

2. T9840 cartridge

Figure 3-4. Entering Ultrium Cartridges into the CAP Magazine (C67286)

C67286
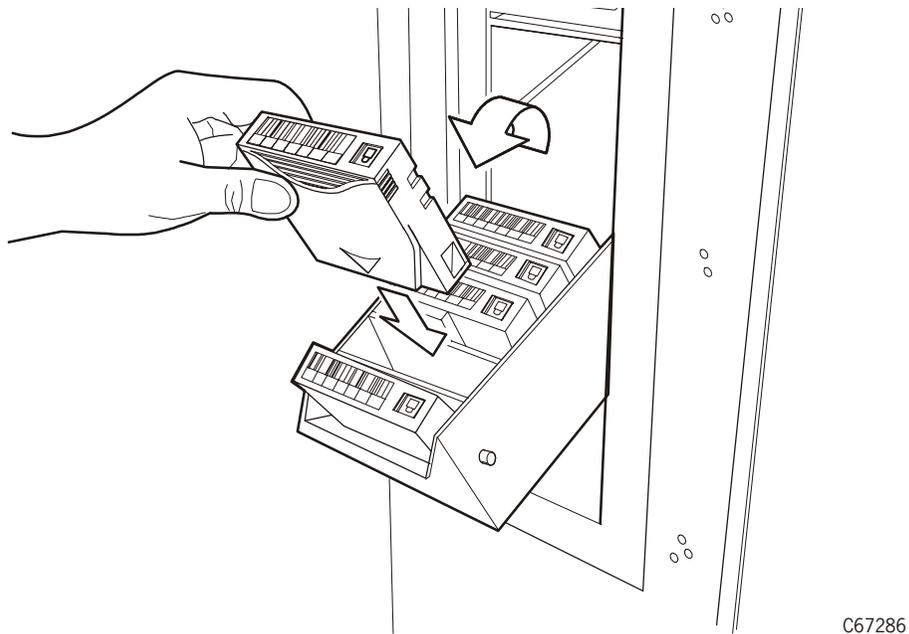
Entering Unlabeled Cartridges

Note: StorageTek strongly advises that you *do not* enter unlabeled cartridges.

The client software determines what happens when you enter a cartridge with a missing or unreadable label. Under ordinary conditions, the camera on the hand audits the CAP and recognizes that a cartridge is present, but the hand does not move it. You must remove the cartridge from the CAP. In this situation, the client software might direct the library to stop operating.

Other software might prompt you to type in a label number when no VOLSER is read. Typing in a label number might cause a problem later during an audit because the camera still will not be able to read the VOLSER on the cartridge.

Magazine Retention Cover

You can use a snap-on retention cartridge cover to keep cartridges in place when carrying the magazine (shown in Figure 3-5).

- To remove the clear cover from the back of the magazine by lifting the side edge. Note: Make sure you remove the cover before placing the magazine into the CAP.

- To protect the cartridges, place the slots on one edge of the cover into the grooves on the side of the magazine's top panel and snap the other edge into place.

Figure 3-5. Attaching/Detaching CAP Magazine Cover (C67227)
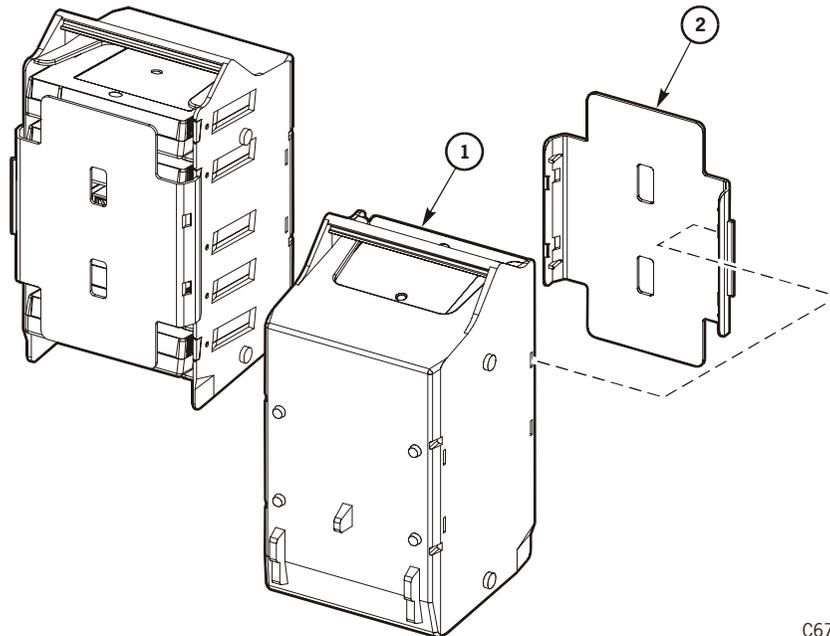
C67227

1. CAP magazine (in upright position)   2. CAP magazine cover

■ Removing Cartridges From the CAP

To unlock the CAP, open the CAP, and remove cartridges from it:

1. At the system console, enter the VOLSERs of the cartridges you require. The robot will retrieve the cartridges and insert them into the CAP.

2. Enter the console command to open the CAP. This will unlock the CAP.

3. Press the **CAP** button on the operator panel to open the CAP.

4. Remove or pull down the magazine and remove the cartridges and store them *outside* the library (refer to "Storing Cartridges" in Appendix A, "Cartridge Information").

5. Repeat these steps until you have removed all the required cartridges.

■ Importing Cleaning Cartridges Through the CAP

Follow this procedure to import the cleaning cartridges into the reserved cells in the library using the cartridge access port.

Note: Manually placing a cartridge in one of the reserved cells and initializing the library will automatically enable the Auto Clean feature.

C67272

1. Press the **MENU** button to return the display to the Main Menu.
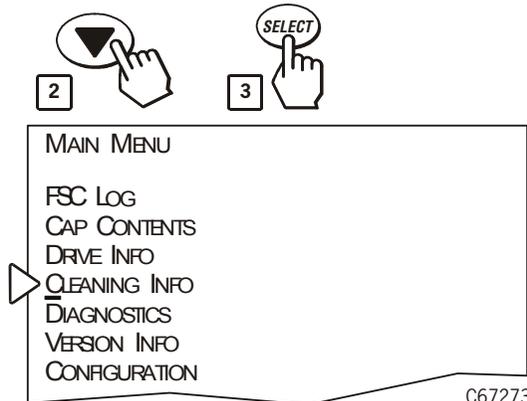
2

3

MAIN MENU

FSC LOG
CAP CONTENTS
DRIVE INFO
▷ CLEANING INFO
DIAGNOSTICS
VERSION INFO
CONFIGURATION

C67273

2. Press the arrow buttons until the cursor underscores CLEANING INFO.

3. Press the **SELECT** button. The panel displays the Cleaning Info Menu.

---

4 **5**

CLEANING INFO MENU

NUM CLEAN CARTRIDGES: 03

DLT WARN COUNT: 020

9840 WARN COUNT: 050

EXPORT CARTRIDGES

▷ IMPORT CARTRIDGES

CLEAN CARTRIDGE INFO

C67278
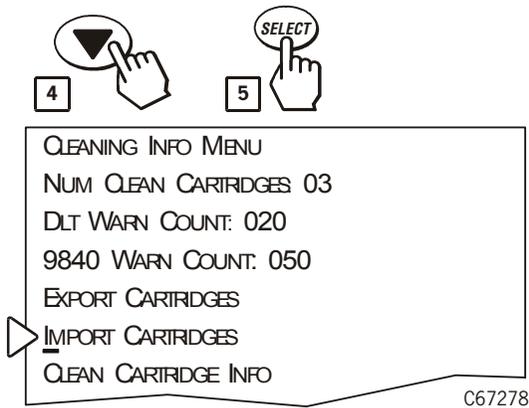
4. Press the arrow buttons until the cursor underscores IMPORT CARTRIDGES.

5. Press the **SELECT** button.

   The Import Clean Cartridges screen appears, which lists all reserved cell cleaning cartridges by domain (or drive type) and VOLSER.

6A **6B** **7**

IMPORT CLEAN CARTRIDGES:

DOMAIN   VOLSER

DLT   CLN021

▷ DLT   CLN014

DLT   CLN007

C67279
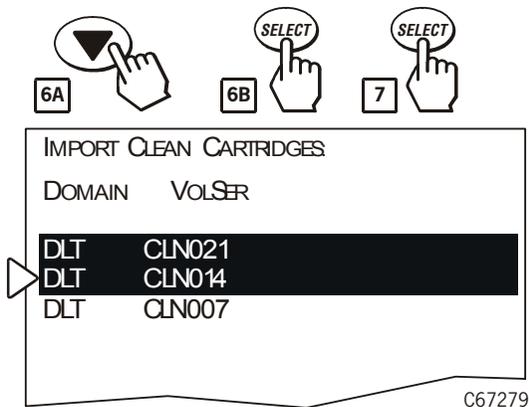
6. Select the cleaning cartridges you want to import by:

   a. Moving the cursor to the desired cartridge entry on the list

   b. Pressing the **SELECT** button. A selected cleaning cartridge is then highlighted (in reverse video)

   Repeat Steps a and b until you have selected all the cartridges you want to import

Note: There is no undo available on this menu. If you select a cartridge by mistake, you must exit the menu by pressing the **MENU** button. Then you must start again at Step 4.

7. Press the **SELECT** button again to initiate the import.

   The panel will display a message to indicate when the import is complete.

---

8. Press the **MENU** button to exit the menu.

MENU

C67272

■ Exporting Cleaning Cartridges Through the CAP

When one or more cleaning cartridges have expired, you can export them from the reserved cells to the CAP with this procedure:

C67272

1. Press the **MENU** button to return the display to the Main Menu.

MAIN MENU

FSC LOG
CAP CONTENTS
DRIVE INFO
▷CLEANING INFO
DIAGNOSTICS
VERSION INFO
CONFIGURATION

C67273

2. Press the arrow buttons until the cursor underscores CLEANING INFO.

3. Press the **SELECT** button. The panel displays the Cleaning Info Menu.

CLEANING INFO MENU

NUM CLEAN CARTRIDGES: 03
DLT WARN COUNT: 020
9840 WARN COUNT: 050
▷EXPORT CARTRIDGES
IMPORT CARTRIDGES
CLEAN CARTRIDGE INFO

C67274
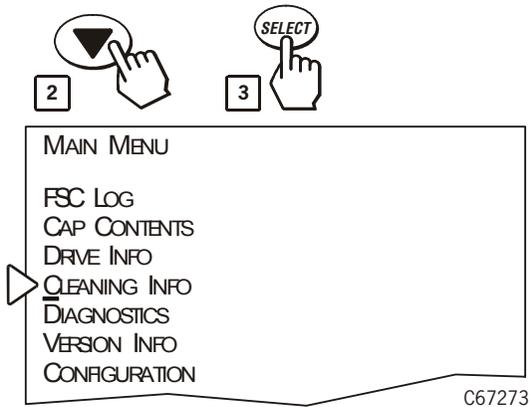
4. Press the arrow buttons until the cursor underscores EXPORT CARTRIDGES.

5. Press the **SELECT** button.
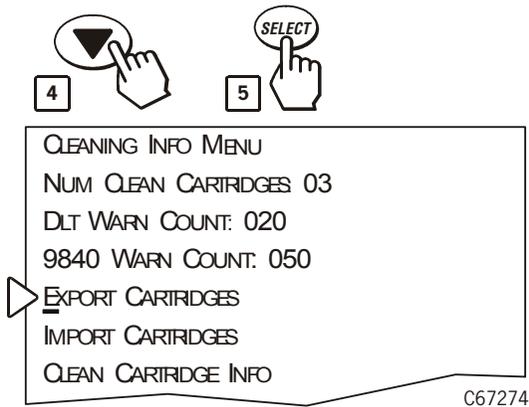
   The Export Clean Cartridges screen appears, which lists all reserved cell cleaning cartridges by domain (or drive type), VOLSER, and usage count.

EXPORT CLEAN CARTRIDGES:

DOMAIN	VOLSER	USAGE
DLT	CLN021	0
DLT	CLN014	0
DLT	CLN007	0

C67275

C67272
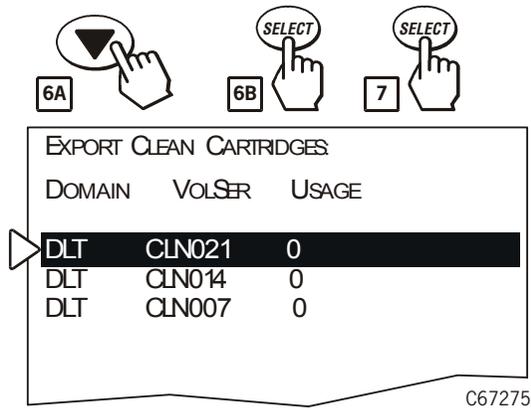
6. Select the cleaning cartridges you want to export by:

   a. Moving the cursor to the desired cartridge entry on the list

   b. Pressing the **SELECT** button. A selected cleaning cartridge is then highlighted (in reverse video)

   Repeat Steps a and b until you have selected all the cartridges you want to export.

Note: There is no undo available on this menu. If you select a cartridge by mistake, you must exit the menu by pressing the **MENU** button. Then you must start again at Step 4.

7. Press the **SELECT** button again to initiate the export.

   The panel will display a message to indicate when the export is complete.

8. Press the **MENU** button to exit the menu.

■ Setting the Cleaning Cartridge Warning Count

Cleaning cartridges have a limited life span. After multiple uses, a cleaning cartridge must be replaced and disposed of at your site. Keeping the tape drives clean is important for proper operation. You will need to clean the drives occasionally to prevent read/write errors.

Enabling the Auto Clean feature allows the library to initiate drive cleaning without operator intervention. If you have enabled the Auto Clean feature, you can use the operator panel to set the maximum number of times a cleaning cartridge can be used (the warning count). Check your tape drive's product manual for the recommended use and life of the drive's cleaning cartridge.

The warning count should be set lower than the cartridge's recommended usage (or "maximum warning count" displayed on the operator panel); this will allow time to obtain a replacement cleaning cartridge. For example, if the maximum warning count equals 20 uses, you may want to set the warning count to 17 (or other, lower number).

If the Auto Clean feature is enabled, use the main menu screen on the operator panel to set the warning threshold.

To enable Auto Clean, insert valid cleaning cartridges into any of the five cells that are reserved for cleaning and diagnostic cartridges.

Note: The Auto Clean feature is automatically enabled if there is at least one cleaning cartridge in the reserved cells and the library is re-initialized by a power-on or by opening and closing the front door.

To set the cleaning cartridge warning count from the Cleaning Info menu, see and use this procedure:

1. From the status screen, press the **MENU** button. The Main Menu will appear.

2. Press the arrow button until the cursor underscores CLEANING INFO.

3. Press the **SELECT** button. The Cleaning Info menu will appear. This menu displays the number of cleaning cartridges in the reserved area.

4. Using an arrow button, line up the cursor with the appropriate drive's warning count.

5. Press the **SELECT** button for your choice. An editing screen will appear.

   The editing screen displays the current setting for the cartridge warning count. It displays the maximum recommended warning count below the current setting.

6. Use the up and down arrow buttons to change the count value.

7. When the value is correct, press the **SELECT** button to save the changes. Press the **MENU** button to abort.

8. When you are finished, press the **MENU** button twice to return to the library status screen.

■ Cleaning a Drive

If you do not have the Auto Clean feature enabled, then when the library status screen displays `CLEAN NEEDED` you will need to manually clean the drive.

To clean the drive:

1. Import the required cleaning cartridge by using the procedure described in "Importing Cleaning Cartridges Through the CAP" on page 3-8.

2. Press the **MENU** button to display the Main Menu.

3. Press the arrow buttons until the cursor underscores `DIAGNOSTICS`.

4. Press the **SELECT** button. The panel will display the Main Diagnostics Menu (see Figure 2-9 on page 2-9).

5. Press the arrow buttons until the cursor underscores `DRIVE DIAGNOSTICS`.

6. Press the **SELECT** button. The screen will display a list of all installed drives.

7. Use the arrow buttons to highlight the desired drive.

8. Press the **SELECT** button. The diagnostics for drive menu appears.

9. Press the arrow buttons until the cursor underscores `CLEAN DRIVE`.

10. Press the **SELECT** button. A message will appear to tell you that the drive will be cleaned at the next opportunity.

11. When cleaning is complete, the robot will return the cleaning cartridge to a reserved cell.

12. If you want to clean another drive (of the same type), press the **MENU** button to return to the list of drives, and repeat these steps.

13. When drive cleaning is complete, export the cleaning cartridge using the procedure described in "Exporting Cleaning Cartridges Through the CAP" on page 3-10.

Update the cleaning cartridge label to indicate the number of uses.

Enabling Auto Clean

There are two ways to enable the Auto Clean feature:

1. Manually load valid cleaning cartridges into any of the cells that are reserved for cleaning and diagnostic cartridges.

2. Import valid cleaning cartridges through the CAP.

The Auto Clean feature is automatically enabled if you load even one cleaning cartridge into the reserved cell area and then reset the library.

Cleaning Cartridge Requirements

Valid cleaning cartridges are those that match the drive types installed in the library. Other requirements are:

- All cleaning cartridges must have a "CLN" in their VOLSER label.
- T9840 cleaning cartridges must also have a "U" on their media ID labels.
- Ultrium cleaning cartridges must either have labels specific to the drive manufacturer or they must be a universal cleaning cartridges for all Ultrium drives.
  For more label information, see Appendix A, "Cartridge Information."

Cleaning Cartridge Usage

Cleaning cartridges will be used when the drive requires a cleaning. The drive request is sent from the drive to the host—the library does not request a cleaning action.

If there are multiple cleaning cartridges per drive types:

- One cartridge will be used until it reaches its warning count before proceeding to the next cartridge.

- Once all cartridges have reached their warning counts, the library will rotate through the cartridges until each cartridge reaches its expired status.

- Once all cartridges are expired, if a drive requires cleaning, mounts will still occur, but the library operator panel will display an asterisk on the top line and the drive status screen will display "clean needed." The "clean needed" status will remain until a new cleaning cartridge is entered into the library to satisfy the cleaning requirement.

Cleaning Cartridge Expiration

A cleaning cartridge is determined as expired when the following sequence occurs:

- A drive has requested to be cleaned.
- A cleaning cartridge is mounted on the drive.
- After the cartridge is dismounted, the drive still requests a cleaning operation.

You can determine if a cleaning cartridge is expired by:

1. Viewing its usage from the Cleaning Information menu

2. Viewing its usage through the StorageTek L-Series Library Admin screen

3. Observing that an asterisk (*) appears on the operator panel display; for example, STK L180 (Code 3.00.13)*

■ Opening the Front Door

CAUTION:
*Confined space***: While reaching inside the library, take care to avoid bumping your head or catching your clothing on protruding edges.**

You must open the front door to perform manual operations.

1. Make sure all jobs have ended and that the library is offline.

2. Open the front door by using a latch key to unlock both latches. (**Note:** Turn the key counterclockwise to unlock them.)

3. Pull open the door.

Figure 3-6. Opening Front Door (C67013)
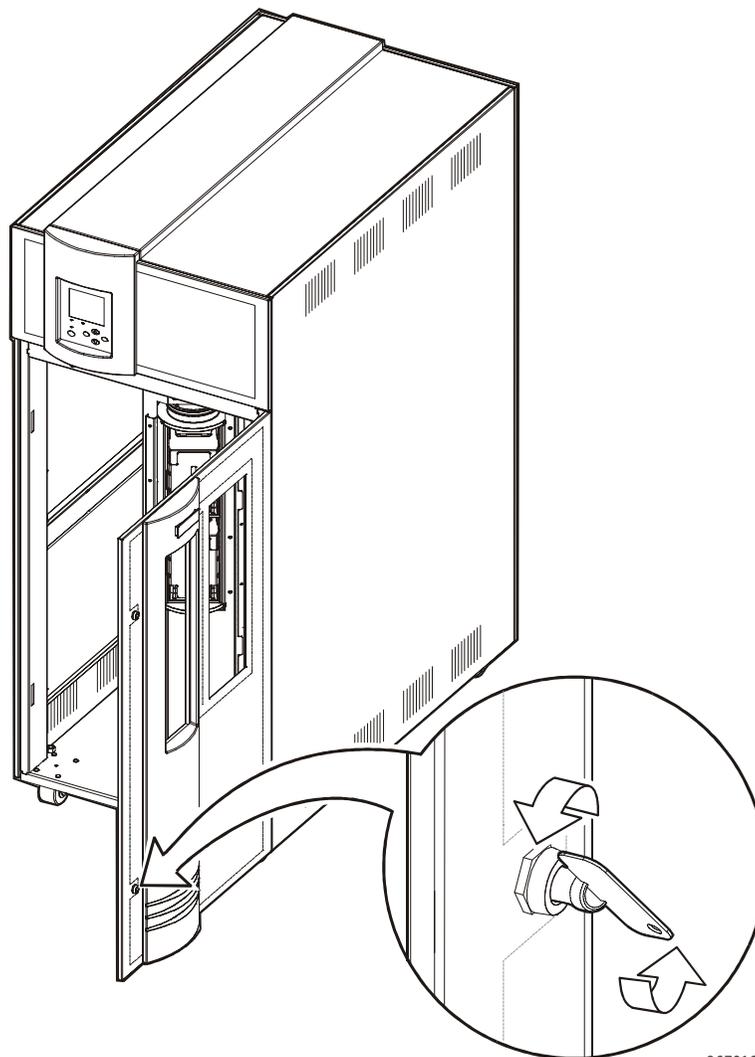
C67013

■ Moving the Robot

After you open the library door, you might need to move the robot so that you can more easily access cartridges or the drives. Read and observe the following caution before you attempt to move any portion of the robot.

CAUTION:
***Potential equipment damage*: Make sure the gripper mechanism on the hand is fully retracted to prevent damaging the hand-camera assembly or Z-carriage before moving any part of the robot.**

If necessary, push the gripper mechanism into the retracted position. If the library goes offline, the reach mechanism might be extended into a storage cell or drive. If you rotate the robot when this condition exists, the hand could be damaged.

Raising and Lowering the Hand Assembly

If you need to raise or lower the hand, *slowly and carefully* move it by placing your fingers on the bottom of the hand assembly as shown in Figure 3-7.

Figure 3-7. Raising and Lowering the Z Carriage (C67014)
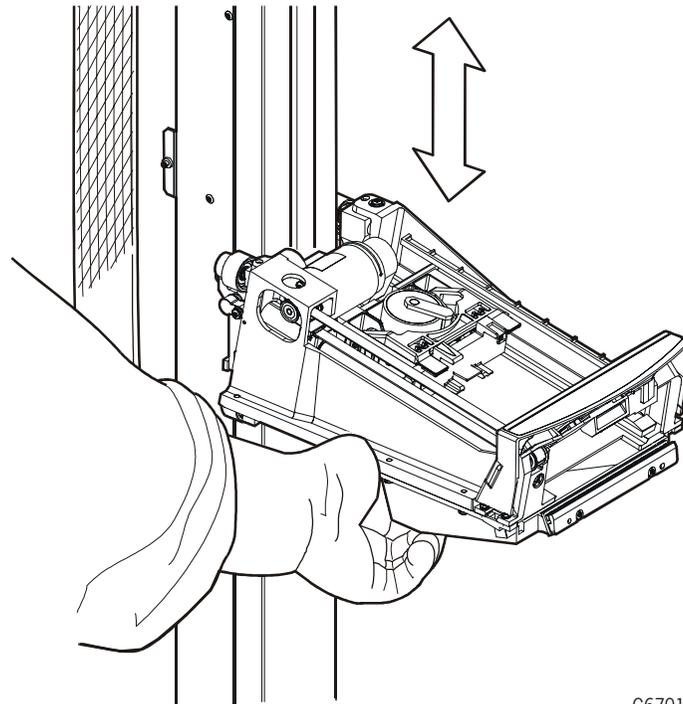
C67014

Rotating the Z Column

If you need to rotate the Z column, grasp it and *carefully* rotate it.

CAUTION:
***Potential equipment damage*: Move the Z column and Z carriage only as shown in Figure 3-8, do not force the movement of the Z column.**

The Z column does not rotate a full 360 degrees. If the column meets resistance and physically stops before reaching the desired position, it has reached a stopping mechanism. Rotate the column in the opposite direction.

Figure 3-8. Rotating the Z Column (C67015)
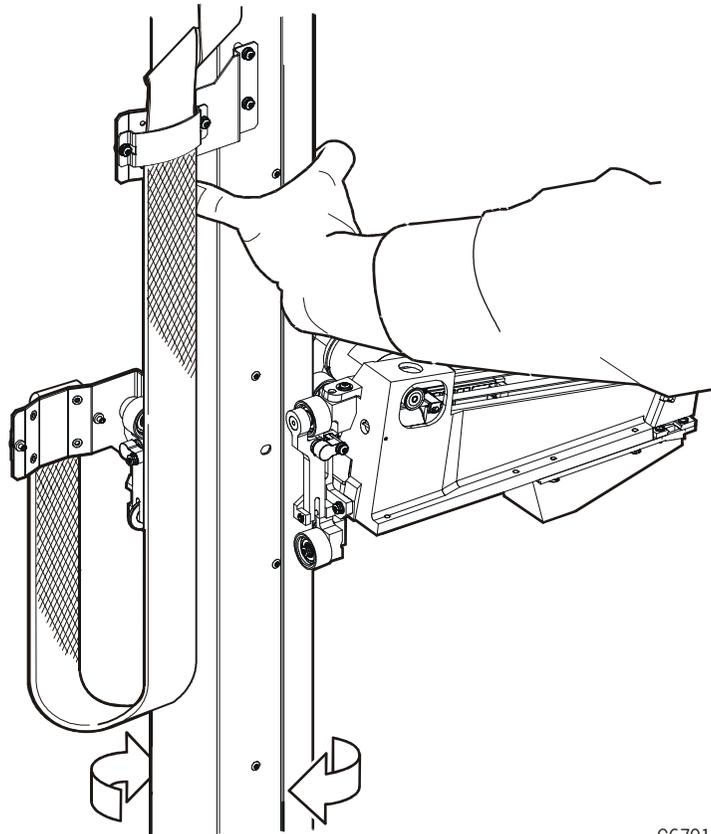
C67015

■ Removing a Cartridge from the Hand

If the library (control path) goes offline or experiences mechanical difficulties, a cartridge might remain in the hand. You can remove it from the hand and manually mount it into a drive for a read/write operation.

CAUTION:
Potential equipment damage: **Follow the procedures described in "Moving the Robot" on page 3-17. Failing to do so could damage the hand.**

Make sure you do not touch any electronic components on the hand assembly. The components could easily be damaged.

To remove a cartridge from the hand:

1. Rotate the Z column, move the hand until it is facing the front door.

2. Push on the back of the reach mechanism (as shown in Figure 3-9) until the gripper is extended to its full position, as shown in Figure 3-10 on page 3-20.

CAUTION:
Heated components: **If the robot has been active, the solenoid and switch might be hot. Wait for the solenoid to cool before touching it.**

Figure 3-9. Extending the Gripper (C67017)
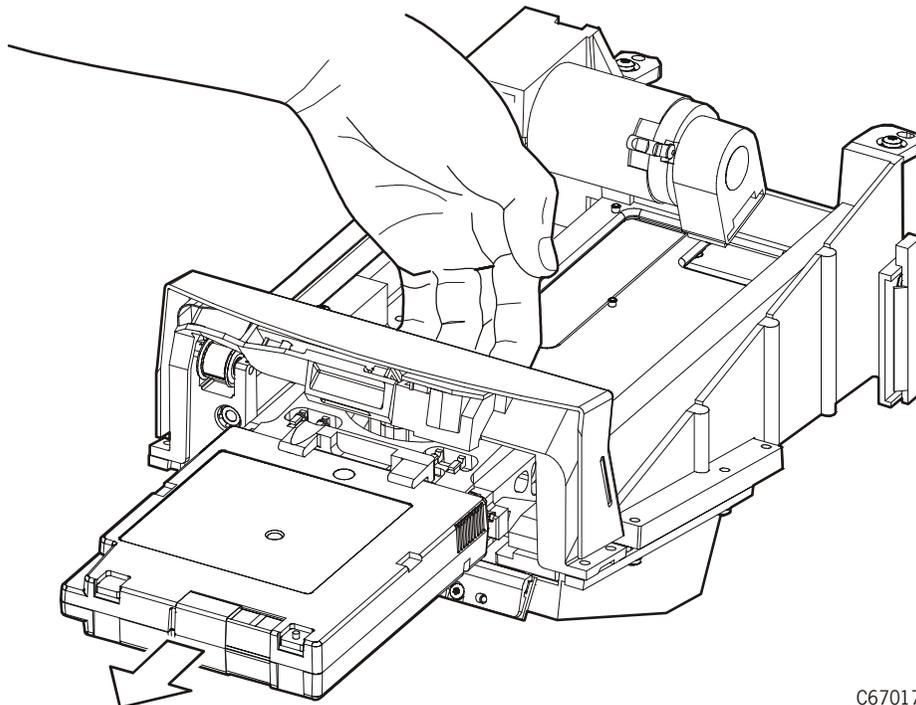
C67017

Figure 3-10. Removing a Cartridge from the Hand (C67018)

C67018
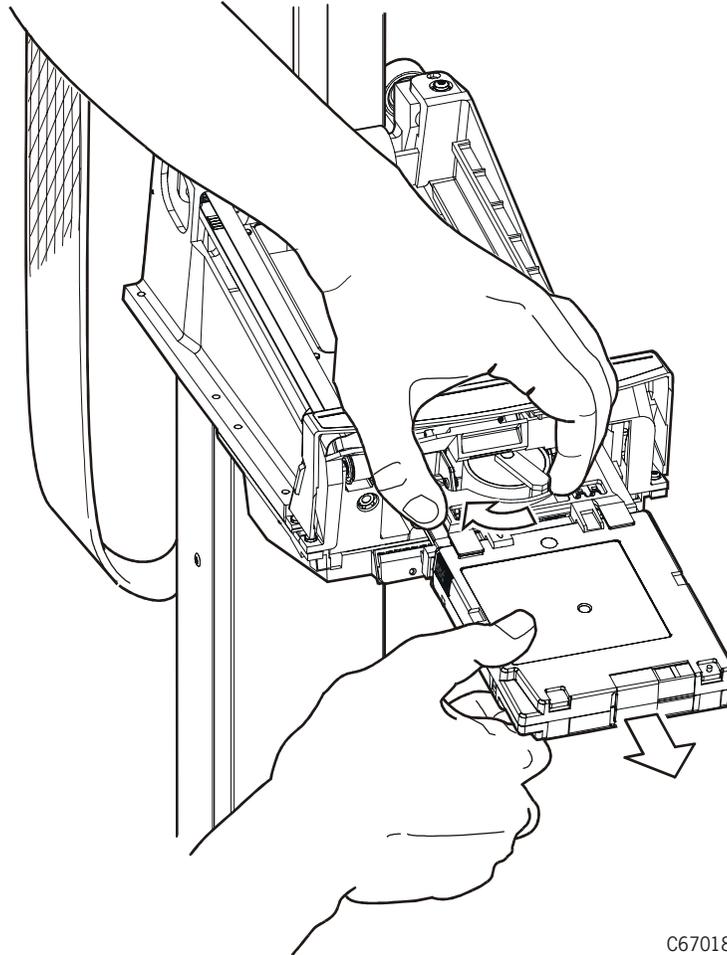
3. Hold the solenoid on top of the reach mechanism with one hand and grasp the cartridge with the other.

4. Rotate the solenoid switch clockwise until the cartridge is released from the gripper, as shown in Figure 3-10.

CAUTION:
***Potential equipment damage*: Make sure the gripper mechanism is fully retracted. If it is left extended and you turn the robot, the gripper mechanism will strike a storage cell. If the gripper mechanism is left extended and the hand is facing the library door when it is closed, the door will strike the gripper mechanism.**

5. Push the gripper mechanism back into the hand until the mechanism is fully retracted.

■ Locating a Cartridge in the Storage Cells

Figure 3-11 show the locations of the panels, rows, and columns for the storage cells. A decal at the top of each column also provides this information. To remove a cartridge from a storage cell:

1. Slide the cartridge out.

2. If a drive has a mount request, manually insert the cartridge into the drive (see "Mounting and Dismounting Cartridges Manually" on page 3-22).

Figure 3-11. Locating Cartridges (C67003)

C67003

1. 84-cartridge-cell configuration
2. 140-cartridge-cell configuration
3. 174-cartridge-cell configuration
4. Cartridge access port (CAP)
5. Reserved cell array

6. Blocked storage cells (no cartridges permitted)
7. Swap cell
8. Reserved cells
9. Drive column (shown with DLT drives installed)

■ Mounting and Dismounting Cartridges Manually

When the library is offline, you can mount a cartridge to a drive or dismount a cartridge from a drive. The following pages provide manual mount and dismount procedures for the tape drives.

Note: If you manually mount any cartridges, you must manually dismount them and store them in the proper cell or remove them from the library.

Figure 3-12. Reviewing DLT Operate Handle and Hub Positions   (C67129)

C67129
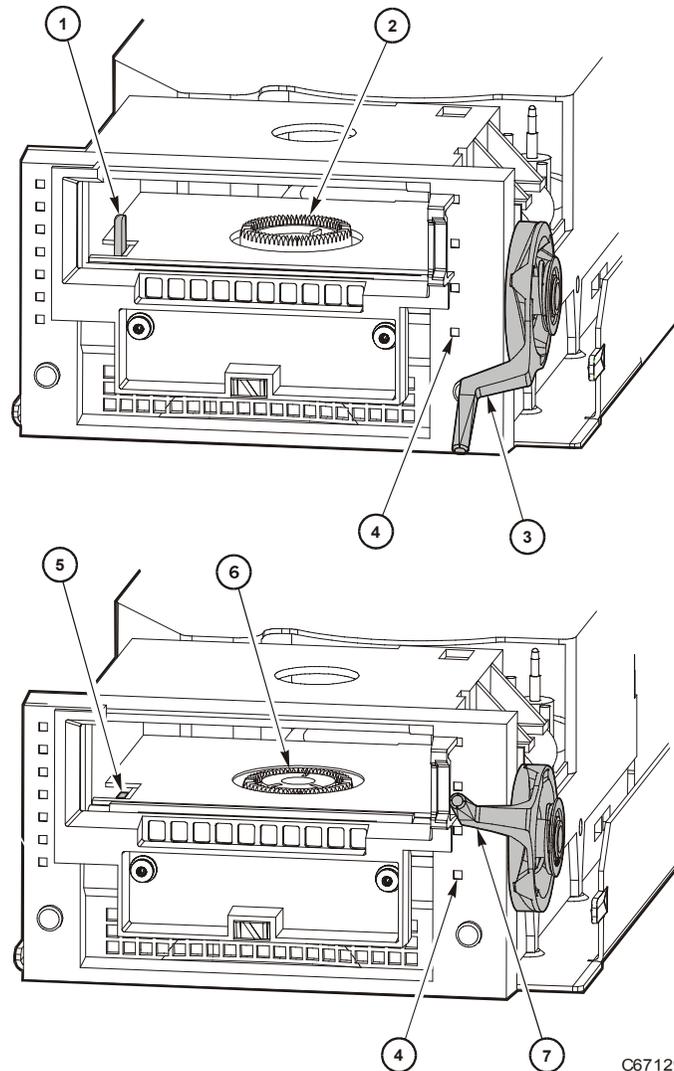
1. Cartridge hook (up)	2. Hub (up)
3. Handle (down)	4. Operator handle indicator
5. Cartridge hook (down)	6. Hub (down)
7. Handle (up)	

Mounting a Cartridge to a DLT Drive

CAUTION:
***Potential equipment damage*: Before you mount a cartridge into the drive, you must make sure power is on, and the *Operate Handle* indicator is steadily lit (not flashing).**

To mount a cartridge to a DLT drive:

1. Obtain the VOLSER, location, and drive number from the server console.

2. Place the drive offline.

3. Open the front door by using the key to unlock both latches.

4. Locate the cartridge (see "Locating a Cartridge in the Storage Cells" on page 3-21).

Figure 3-13. Mounting a Cartridge into the DLT Drive (C67019)
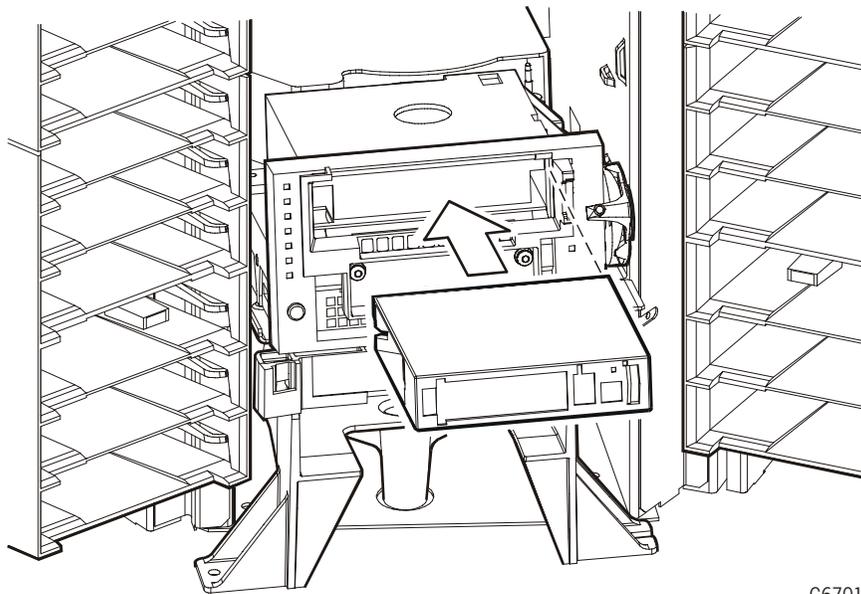
C67019

5. Make sure the DLT handle is up and the *Operate Handle* indicator is on.

   Note: If the handle is in the down position, wait for the *Operate Handle* indicator to remain on before moving it to the up position (see Figure 3-12 on page 3-22).

   If the *Operate Handle* indicator is flashing while the handle is up, move the handle to the down position and wait for the *Operate Handle* indicator to stay on. Then move the handle to the up position.

CAUTION:
***Potential equipment damage*: You must insert the cartridge properly or you will damage the drive. Use only DLT cartridges for DLT drives.**

6. Hold the cartridge so that the VOLSER label area is facing you and the write protect switch is on the right side of the cartridge, as shown in Figure 3-13.

7. Insert the cartridge into the drive and push the cartridge into the back of the drive until it is firmly seated. If the drive is a DLT7000, you must hold the cartridge in place for three seconds.

8. Lower the drive handle.

9. Place the drive online.

Dismounting a Cartridge from a DLT Drive

To dismount a cartridge from a DLT drive:

1. Obtain the drive number from the server console and place the drive offline.

2. Open the front door by using a latch key to unlock both locks.

3. Locate the desired drive.

4. Press the Unload button on the drive.

5. Wait (about 12 seconds) for the *Operate Handle* indicator to remain on.

6. Raise the handle. The cartridge will eject about 12.7 mm (0.5 in.).

CAUTION:
***Potential equipment damage*: Wait at least three seconds before pulling the cartridge out of the drive. Immediately removing the cartridge may damage the cartridge or drive leaders.**

7. Gently pull the cartridge from the drive.

   Note: If the cartridge does not come out of the drive, remount the cartridge and return to Step 5.

8. Store the cartridge in an empty cell or outside the library.

   If you store the cartridge in empty cell, you will have to re-initialize the library (see "Initializing and IPLing the Library" on page 3-4.)

9. Place the drive online.

Mounting a Cartridge to a T9840 Drive

CAUTION:
***Potential equipment damage*: You must insert the cartridge properly or you will damage the drive. Use only T9840 cartridges for the T9840A and T9840B Tape Drives.**

To mount a cartridge to a T9840 drive:

1. Obtain the VOLSER, location, and drive number from the server console.

2. Place the drive offline.

3. Open the front door by using a latch key to unlock both latches.

4. Locate the cartridge (see "Locating a Cartridge in the Storage Cells" on page 3-21).

5. Insert the cartridge into the drive as shown in Figure 3-14.

Figure 3-14. Mounting a Cartridge into the T9840 Drive (C67020)
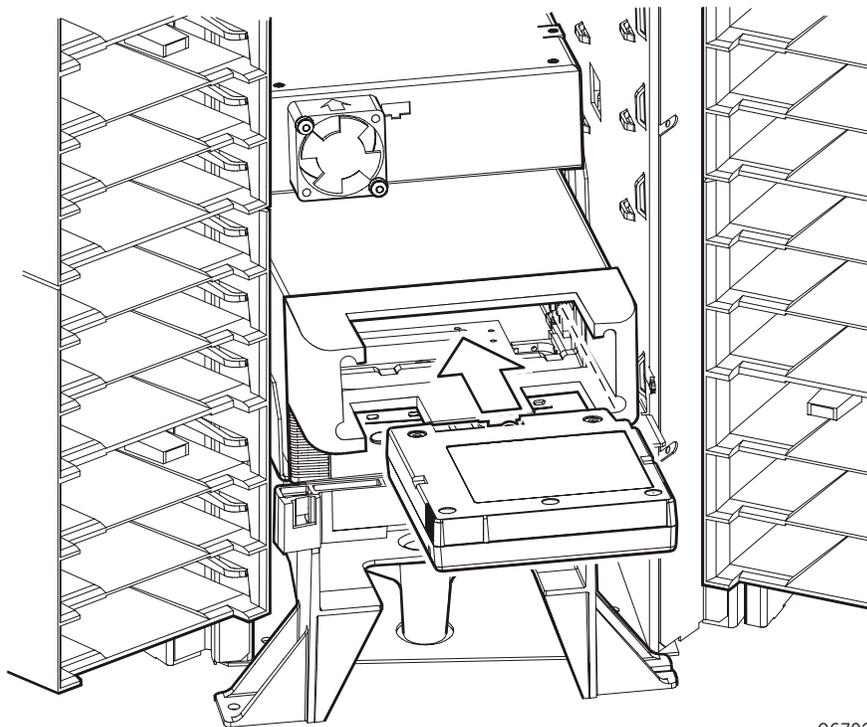
C67020

6. Wait for one of the following messages to display on the drive's front panel:

- The `Ready F`, a write-protected cartridge loads successfully.

- The `Ready U`, a cartridge that is not write-protected loads successfully.

- The `Ready A`, a write-enabled VolSafe cartridge loads successfully.

- The `NTReady` message displays when the tape in the cartridge has lost tension. Follow the instructions outlined in the *Tape Drive User's Reference Manual* to correct this condition.

- The `LOADxxxx` message displays when the cartridge unsuccessfully loads, where the `xxxx` is a fault symptom code. Follow the instructions outlined in the *Tape Drive User's Reference Manual* to correct this condition.

Dismounting a Cartridge from a T9840 Tape Drive

To dismount a cartridge from a T9840 Tape Drive:

1. Make sure that the drive is not selected or in use.

2. Open the front door by using a latch key to unlock both latches.

3. Press the **Unload** switch on the front panel of the drive. One of the following conditions may occur:

- After the tape rewinds, the cartridge ejects from the drive. Remove the cartridge from the drive.

- The cartridge fails to eject after the tape rewinds. Refer to the *Tape Drive User's Reference Manual* to correct this condition.

- If the **Unload** switch is pressed during a write operation, the drive tries to write the remaining data before the cartridge unloads. If the `UnWrxxxx` (Unwritten Data) message displays, where `xxxx` is the fault symptom code, the attempt failed and some data remains unwritten to the tape. For more information about recovering from an Unwritten Data condition, refer to the *Tape Drive User's Reference Manual*.

4. Gently pull the cartridge from the drive.

5. Store the cartridge in an empty cell or outside the library.

   If you store the cartridge in empty cell, you will have to re-initialize the library (see "Initializing and IPLing the Library" on page 3-4.)

6. Place the drive online.

Mounting a Cartridge to an Ultrium Drive

Figure 3-15. Mounting a Cartridge into an Ultrium Drive (C67293)
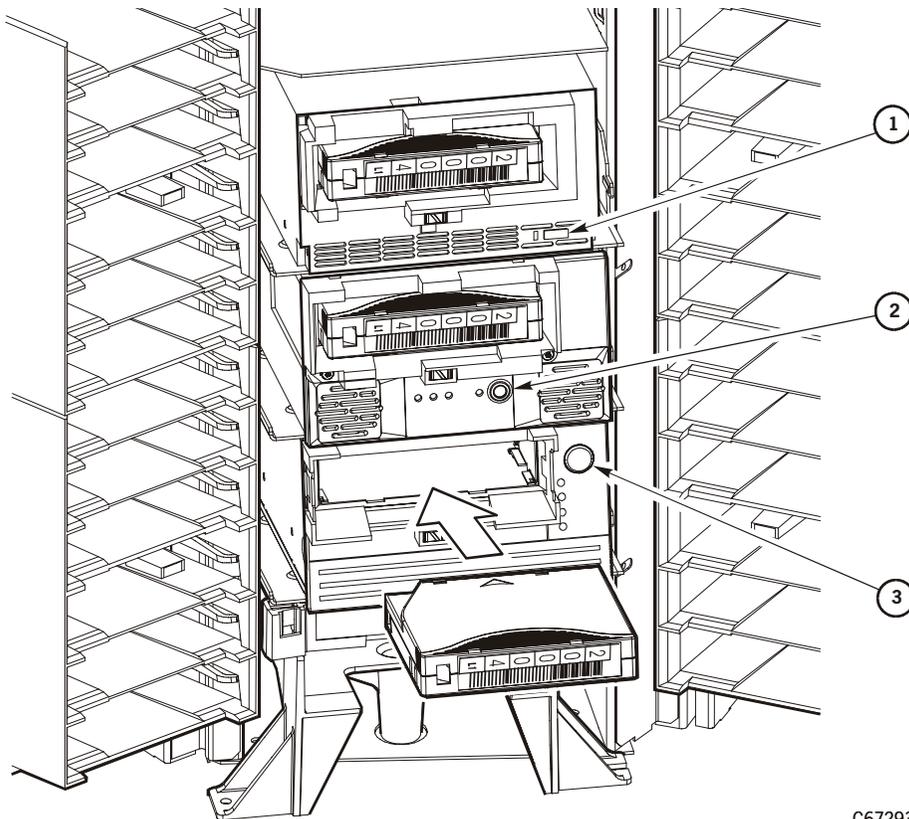
C67293

1. Cartridge dismount button on the IBM Ultrium drive
2. Cartridge dismount button on the Seagate Ultrium drive
3. Cartridge dismount button on the HP Ultrium drive

CAUTION:
Potential equipment damage: **You must insert the cartridge properly or you will damage the drive. Use only Ultrium cartridges for Ultrium drives.**

To mount a cartridge to an Ultrium drive:

1. Obtain the cartridge VOLSER, location, and drive number from the server console and place the drive offline.

2. Open the front door by using a latch key to unlock both latches.

Note: You *must* open the front door before attempting to manually mount a cartridge to an Ultrium drive. A unique communication between the library and the drive prepares the drive for manual operation.

3. Locate the cartridge (see "Locating a Cartridge in the Storage Cells" on page 3-21).

4. Insert the cartridge into the Ultrium drive using the direction shown in Figure 3-15 on page 3-27.

5. Wait for the indicator on the front panel of the drive to stop blinking.

6. Place the drive back online

Dismounting a Cartridge from an Ultrium Drive

To dismount a cartridge from an Ultrium drive:

1. Make sure that the Ultrium drive is not selected by the client.

2. Obtain the drive number from the server console and place the drive offline.

3. Open the library front door by using a latch key to unlock both latches. See Figure 3-6 on page 3-16. (Turn the key counterclockwise to unlock the latches; then pull open the door.)

Note: You *must* open the front door before attempting to manually dismount a cartridge from an Ultrium drive. A unique communication between the library and the drive prepares the drive for manual operation.

4. Press the button on the front panel of the drive.

Note: Do not hold down the button.

One of the following conditions can occur:

*   After the tape rewinds, the cartridge ejects from the Ultrium drive. Remove the cartridge from the Ultrium drive.

*   The cartridge fails to eject after the tape rewinds. Refer to the specific drive manufacturer's documentation to correct this condition.

5. Gently pull the cartridge from the drive.

6. Store the cartridge in an empty cell or outside the library.

If you store the cartridge in empty cell, you will have to re-initialize the library (see "Initializing and IPLing the Library" on page 3-4).

7. Place the drive online.

■ Placing the Library Online

To return or place the library online for automated operations:

1. Refer to your specific drive publications for instructions on making the drives ready. For a DLT drive, make sure the *Operate Handle* light is on and the handle is up.

Note: If you manually mounted any cartridges, you must manually dismount them and store them in a storage cell or remove them from the library.

2. Make sure that the library is powered on. (If you have powered off the library, power it on by lifting up on the power switch inside the rear door of the library.)

3. Close and lock the library front door. The robot will perform an audit of the cells.

4. Place the library and drives online by entering the appropriate commands at the server operator console.

5. Give the client command to upload the audit data to the client.

6. Refer to your specific software publications for instructions on replacing the cartridges you removed and on inserting the cartridges into the storage cells.

■ Adjusting the Display Screen

You also can change the operator panel's screen characteristics from the main configuration menu. The screen characteristics are saved in non-volatile memory.

To change the contrast and backlight (or brightness) of the operator panel screens:

1. At the Main Configuration Menu, press an arrow button until the cursor underscores DISPLAY INFO.

2. Press the **SELECT** button. The Display Info Menu will appear.

3. Use the arrow buttons to line up with the desired screen characteristic: CONTRAST or BACKLIGHT. An editing screen will appear.

4. On the editing screen, use the up and down arrow buttons to change the count value.

   Note: To reset the screen characteristics to the default values, line up the cursor with RESTORE DEFAULTS and press the **SELECT** button.

5. When the value is correct, press the **SELECT** button to save the changes. You may press the **MENU** button to abort.

6. If you have already changed the library's SCSI ID or Port 0 address and are planning to exit the Main Configuration Menu at this time, you must press the **RESET** button. (In this case, if you try to exit the main configuration menu, a message will appear requesting that you reset the library.) If you have not changed the library's SCSI ID or Port 0 address, you may exit the configuration menu to do other tasks.

■ Reviewing the FSC Log

A StorageTek service representative or other service representative might ask you to review the library's FSC log so that they can better analyze library-related problems. The FSC log records significant messages and errors that the library has generated during operation.

To review the FSC log:

1. Press the **MENU** button until the Main Menu displays.

2. If necessary, press the arrow buttons until the cursor underscores `FSC LOG`.

3. Press the **SELECT** button. The panel displays the FSC log screen (see).

4. Use the arrow buttons to scroll through the log.

Here is a sample entry on the event logs screen, followed by an explanation of the entry's elements:

```
3329    03    NONE
03/01/2004      14:46:14
```

3329	This four-character code is the FSC.
03	This value indicates the number of times this FSC has occurred.
NONE	This message indicates which, if any, mechanical device was involved.
03/01/2004	These digits indicate the date the FSC occurred. The fields from left to right are month, day, and year.
14:46:14	These digits indicate the time the FSC occurred. The fields from left to right are hour, minutes, and seconds.

Note: The electronic FSC dictionary, which lists additional information about FSCs and responses to them, is available through your service representative or other StorageTek representative. Contact your service provider for more information.

■ Running Diagnostics

Diagnostic tests included in the library's firmware let you test the functionality of important library components. You also may place the library in demonstration mode through the diagnostics menus.

CAUTION:
Diagnostic tests should be performed *only* by trained personnel.

Before performing the diagnostic tests, ensure that the library and tape drives are offline.

Running Drive Diagnostics

To run a diagnostic test on a drive:

1. Place the library and drives offline.

2. Press the MENU button until the Main Menu displays.

3. Press the arrow buttons until the cursor underscores DIAGNOSTICS.

4. Press the SELECT button. The panel displays the Main Diagnostics Menu (see Figure 2-9 on page 2-9).

5. Press the arrow buttons until the cursor underscores DRIVE DIAGNOSTICS.

6. Press the SELECT button. The screen will display a list of installed drives.

7. Use the arrow buttons to highlight the desired drive.

8. Press the SELECT button. The Diags for Drive menu appears.

9. Press the arrow buttons until the cursor underscores the desired test. For a description of the available tests, see Table 3-1 on page 3-33.

10. Press the SELECT button. If you selected MOUNT/DISMOUNT LOOP, an editing screen will appear:

    a. Use the arrow buttons to enter the desired value. (The up arrow button increases the value; the down arrow button decreases the value.)

    b. Press the SELECT button.

11. You will be prompted to confirm that you want the library in Maintenance Mode (offline) before beginning the test (ARE YOU SURE?). Confirm this by pressing the SELECT button. You may press the MENU button to abort.

12. Wait until the test is complete; the screen will display a message that indicates that the test has completed or has been successful. If a problem occurred, the screen will display an error message and, in some cases, an FSC code.

Table 3-1. L180 Library Drive Diagnostic Tests

Test	Description
Clean Drive	This function is not a test. It moves a specified cleaning cartridge from a reserved cell to a drive and initiates drive cleaning. When cleaning is complete, it returns the cleaning cartridge to a reserved cell. See "Cleaning a Drive" on page 3-13.
Mount	This test mounts a diagnostic tape to the selected drive.
Dismount	This test dismounts a diagnostic tape from the selected drive.
Run Drive Check	This test will determine whether the specified drive is functioning. At the time of publication, the only drives that support this test are the DLT 8000 and the T9840. (The T9840 must be running code version 1.28 or later.)
Mount-Dismount	This test mounts and dismounts a diagnostic tape from the selected drive.

Running a Get-Put Loop

During a Get-Put loop, the hand mounts and dismounts a cartridge from a storage cell. This tests the functionality of the hand-camera assembly. To run a Get-Put loop:

1. Place the library offline.

2. Press the **MENU** button until the Main Menu displays.

3. Press the arrow buttons until the cursor underscores DIAGNOSTICS.

4. Press the **SELECT** button. The panel displays the Main Diagnostics Menu (see Figure 2-9 on page 2-9).

5. Press the arrow buttons until the cursor underscores GET PUT LOOP.

6. Press the SELECT button. The Get-Put Mode screen will appear.

7. Use the arrow buttons to enter the desired number of loops. The up arrow button increases the value; the down arrow button decreases the value. The maximum number of loops allowed is 20.

8. Press the **SELECT** button.

9. You will be prompted to confirm that you want the library in Maintenance Mode (offline) before beginning the test (ARE YOU SURE?). Confirm this by pressing the **SELECT** button. You may press the **MENU** button to abort.

10. Wait until the test is complete; the screen will display TEST COMPLETE or, if a problem occurred, an FSC code.

Operating in Demo Mode

CAUTION:
Potential for error: **Running the library in Demo Mode causes the data cartridges to be rearranged. After Demo Mode is complete, you must re-initialize the library and give the client command to upload library audit data to client memory.**

With the library in Demo Mode (demonstration mode), the hand retrieves a cartridge from a storage cell, rotates around on the Z and theta axes, and places the cartridge back to a different storage cell. This tests the functionality of the robot. To operate in Demo Mode:

1. Place the library and drives offline.

2. Press the **MENU** button until the Main Menu displays.

3. Press the arrow buttons until the cursor underscores DIAGNOSTICS.

4. Press the **SELECT** button. The panel displays the Main Diagnostics Menu (see Figure 2-9 on page 2-9).

5. Press the arrow buttons until the cursor underscores DEMO MODE.

6. Press the **SELECT** button. The Demo Mode menu appears.

7. Use the arrow buttons to enter the desired number of loops. The up arrow button increases the value by 100; the down arrow button decreases the value by 100. The maximum number of loops allowed is 2,000.

Note: StorageTek recommends selecting only 100 loops to avoid premature wear on the hardware.

8. Press the **SELECT** button.

9. You will be prompted to confirm that you want the library in Maintenance Mode (offline) before beginning the test (ARE YOU SURE?). Confirm this by pressing the **SELECT** button. You may press the **MENU** button to abort.

10. Wait until the test is complete; the screen will display TEST COMPLETE or, if a problem occurred, an FSC code.

11. Press the **RESET** button to reset the library.

StorageTek Service

4

This chapter describes what to do if problems occur with the L180 Tape Library. In some cases, you might be able to correct the problem. In other cases, you must contact your service provider to correct the problem.

Notes:

- Refer to Appendix A, "Cartridge Information" when the problem is caused by a cartridge.

- Refer to your drive publications for additional information when the problem is caused by a tape drive.

Most of the time, a fault symptom code (FSC) appears on the library operator panel display. Write down the FSC information and give the information to your service representative or to the staff at Customer Support Services (CSS).

■ Drive Replacement

If your contract provides for the StorageTek Interactive Maintenance Agreement, you might be able to replace tape drives.

CAUTION:
***Potential equipment damage*: Only trained and certified personnel may replace drives.**

After you are certified, you may order replacement drives. For instructions on how to replace drives, consult the documentation that accompanies the drive.

Contact your StorageTek representative for training information.

■ Customer Support Services

Customer Support Services (CSS) and the Customer Resource Center (CRC) is available 24 hours a day, seven days a week, to customers with StorageTek maintenance contracts and to StorageTek employees. You can find additional information about the CSS on StorageTek's external web site at:

http://storagetek.com/servsupport

■ Customer Initiated Maintenance

Customer Initiated Maintenance begins with a telephone call from you to the StorageTek CSS. You receive immediate attention from qualified StorageTek personnel, who record problem information and respond with the appropriate level of support.

To contact the CSS about a problem:

1. Use the telephone to call the StorageTek Customer Support Services at:

    1-800-525-0369 (from within the United States) or

    303-673-4056 (from outside the United States) or

    See "StorageTek's Worldwide Offices" on page 4-3 for information about International customer support centers.

2. Describe the problem to the call taker. The call taker will ask several questions and will either route your call to a trained support technician or dispatch a service representative.

If you have the following information when placing a service call, the process will be much easier:

Account name	
Site location number	
Contact name	
Telephone number	
Equipment model number	
Device address	
Device serial number (if known)	
Urgency of problem	
Fault Symptom Code (FSC)	
Problem description	

■ StorageTek's Worldwide Offices

StorageTek is committed to providing world-class, worldwide service and support including technical experts, innovative tools, and cross-functional solution-based teams.

Contact any of StorageTek's worldwide offices to discuss complete storage, service, and support solutions for your organization. You can find address and telephone number information on StorageTek's external web site at:

http://www.storagetek.com/global

International customers should call their local, regional, or country customer support for information about how to place a service call or how to contact their remote centers.

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Cartridge Information

A

This appendix describes how to:

- Order cartridge tapes and labels
- Handle, inspect, store, and clean cartridges
- Apply labels
- Set the write-protect switch

This appendix also includes a list of cartridge specifications.

■ Ordering Cartridge Tapes and Labels

To order cartridge tapes and labels or to obtain information:

Contact your authorized Storagetek Selling Agent for labeled cartridges.

For labels, contact EDP/Colorflex at 1-888-438-8362 or http://www.colorflex.com.

For technical questions, contact the StorageTek Sales Support at 1-800-ask4stk or e-mail sales_support@storagetek.com.

■ Handling a Cartridge

Improper handling of cartridges can result in a loss of data or damage to a library component. To handle a cartridge correctly:

- Make sure the leader block is latched every time you pick up a cartridge.

- Keep cartridges *clean*.

- Inspect a cartridge before each use, and *never* put a damaged cartridge into a tape drive or library.

- Never release a leader block and pull tape from a cartridge.

- Never open a cartridge.

- Do not handle tape that is outside the cartridge; the tape edge might be damaged.

- Do not expose the tape or cartridge to direct sunlight or moisture.

- Do not expose a recorded cartridge to magnetic fields; this might destroy data on the tape.

■ Inspecting a Cartridge

A defective or dirty cartridge can damage a tape drive. Always inspect a cartridge before inserting it into a tape drive or a library.

Look for:

- Cracked or broken cartridge
- Broken leader block
- Broken leader block latch
- Damaged write-protect selector or write-protect switch
- Liquid in the cartridge
- Labels not firmly attached or extending over the cartridge edge
- Any other obvious damage

■ Storing Cartridges

CAUTION:
Potential damage to cartridges: **Tape temperatures above 49°C (120°F) might damage the tapes. If during storage or transportation a cartridge has been exposed to conditions exceeding the above values, before using the cartridge, keep the cartridge within those operating environment specifications for at least as long as the time that the cartridge exceeded the specifications, up to two hours.**

When you store a cartridge:

- Leave it in its protective wrapping until you are ready to use it.

- Choose a clean environment that duplicates the conditions of the room in which it is used.

- Make sure it has been in its operating environment for at least 24 hours.

■ Cleaning the Cartridge Exterior

CAUTION:
Potential damage to cartridges: **Do not use certain solvents to remove labels or to clean cartridges because they can damage the cartridges. Do not use acetone, trichloroethane, toluene, xylene, benzene, ketone, methylethyl ketone, methylene chloride, ethyldichloride, esters, ethyl acetate, or similar chemicals.**

Wipe all dust, dirt, and moisture from the cartridge with a lint-free cloth. Use StorageTek Tape Cleaner Wipes, PN 4046289-01, to clean the cartridges. These wipes are saturated with isopropyl alcohol. Do not let any solution touch the tape or get inside the cartridge.

■ Repairing Leader Blocks

When a tape is damaged, use a backup tape. If a leader block is detached, there is no obvious damage to the cartridge or tape, and you have no backup tape, you may repair the leader block using a repair kit provided by your supplier. You can use the tape once to copy the data onto another tape.

■ Colored Cartridge Specifications

Colored cartridges are approved only if the measured reflection density is greater than 0.10 for DLT and LTO cartridges and greater than 1.50 for T9840 cartridges, as measured by an X-Rite 404G color reflection densitometer. The measurements are:

Bandwidth	ANSI Status T Wide band (380 to 780 nanometers)
Measuring range	Density (0.00 to 2.50) D
Accuracy	± 0.02 D
Repeatability	± 0.01 D
Aperture diameter	3.4 mm

For more information about colored cartridges, contact your StorageTek marketing representative.

■ Labels

Besides the volume serial number, cartridges require a media identifier. Table A-1 and Table A-2 show *examples* of cartridge labels.

Note: Using the correct label is important. They identify the form, factor, and function of the cartridge for the library, operator, and tape drive.

Table A-1. Data Cartridge Label Example

DLT	LTO Ultrium	T9840

C67370

Media ID Labels		
The DLTtape Media ID label is incorporated into the tape label, and includes: **C** = DLTtape III **D** = DLTtape IV **E** = DLTtape III-XT **S** = Super DLTtape I	The LTO Media ID label is incorporated at the end of the tape label, and includes: **L1** = Data cartridge	The Media ID label for the T9840 is at the end of the tape label, and includes: **R** = Data

Table A-2. Cleaning and Diagnostic Cartridge Label Examples

DLT Diagnostic	LTO Cleaning	T9840 Diagnostic	T9840 Cleaning

C67369
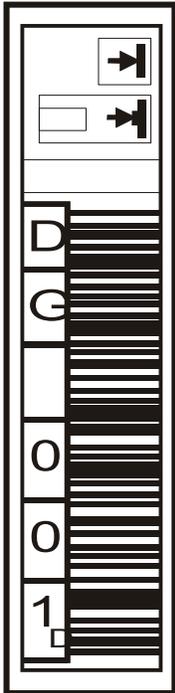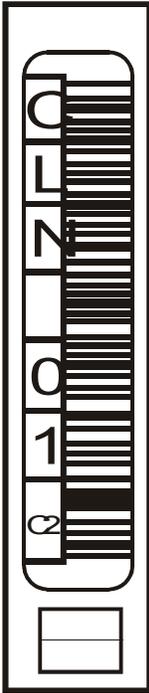
Diagnostic and Cleaning Cartridge Label Identifiers			
DG = Diagnostic Plus the Media ID label to identify the type of cartridge. **CLN** = Cleaning	The cleaning Media ID labels include: **C1** = HP **C2** = IBM **C3** = Seagate **CU** = Universal DG plus **L1** = Diagnostic	**DG** = Diagnostic Plus the Media ID label: **R** = Data	**CLN** = Cleaning plus **U** = Cleaning

■ DLTtape Cartridges

DLT cartridge tapes use a high-grade metal particle surface for the DLTtape cartridges and advanced metal powder formulation for the Super DLTtape I. These cartridges use a one-reel design with a simple tape path and stationary linear tape recording heads.

Media	Recorded Format	Capacity (native)
DLTtape IV	DLT 7000	35 GB
DLTtape IV	DLT 8000	40 GB
Super DLTtape I	SDLT	110 GB

Figure A-1. DLT Cartridge Components (C67026)
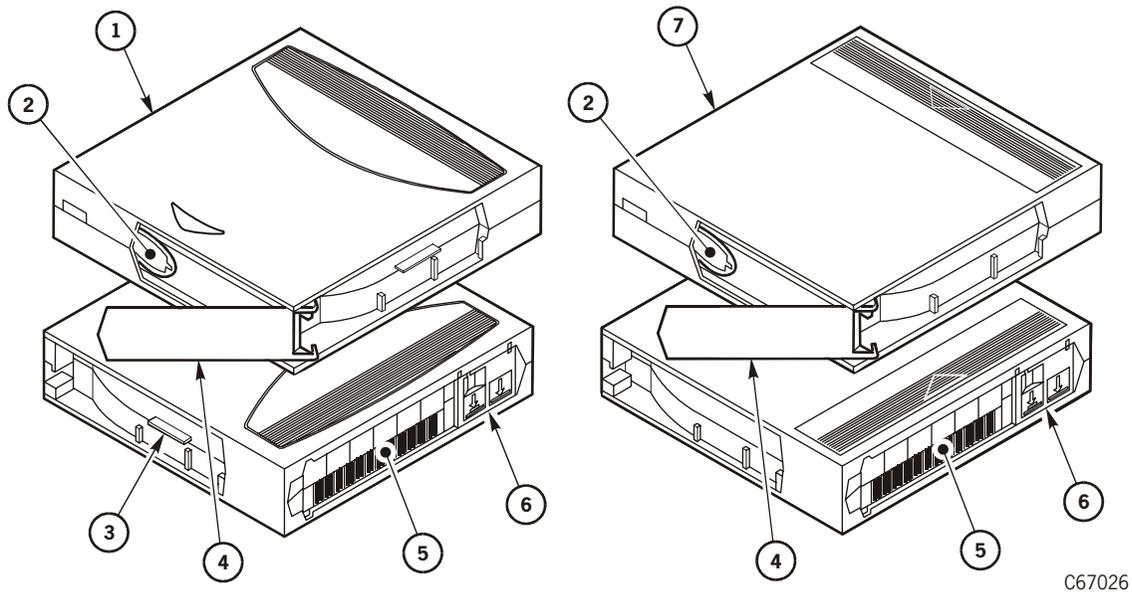
C67026

1. SDLT cartridge
2. Tape leader
3. SDLT cartridge identifier tab
4. Access door
5. Volume serial number (VOLSER) label
6. Read/Write-protect switch
7. DLT cartridge

Applying Labels

Cartridge labels reflect the cartridge media and usage. The letter located next to the last number in the VOLSER reflects the media-type and use:

- Cleaning cartridges have CLN in the VOLSER
- Diagnostic cartridges have DG in the VOLSER.

See Figure A-2 and perform these steps before inserting the label into the recessed area on the cartridge:

Figure A-2. DLT Cartridge Labels (C67028)
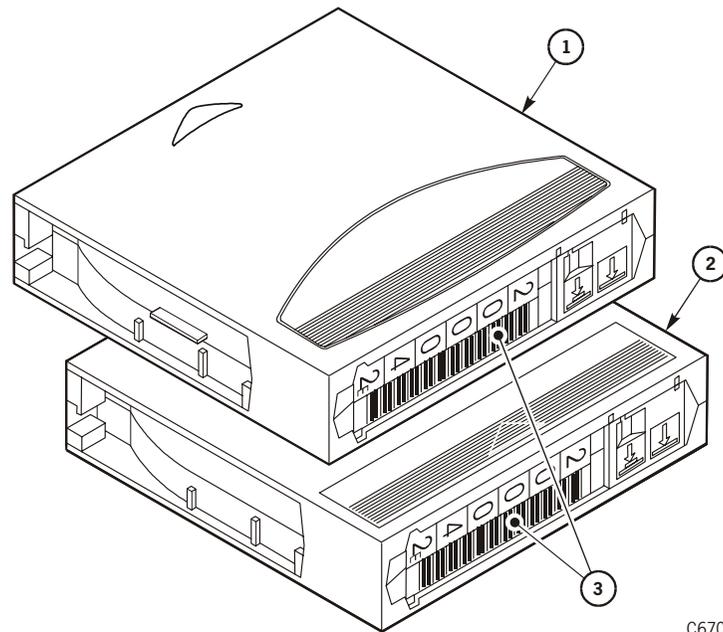
C67028

1. SDLT cartridge	2. DLT cartridge	3. Volume labels

1. Make sure the cartridge has been at room temperature for at least 24 hours.

2. Clean the surface where the labels will be placed using a cleaning solution made for this purpose. See "Cleaning the Cartridge Exterior" on page A-2.

3. Locate the label that you require:

   - CompacTape III has a "C" next to the far left number, bar code down.
   - CompacTape IIIXT has an "E" next to the far left number.
   - CompacTape IV has a "D" next to the far left number, bar code down.
   - Diagnostic cartridge has "DG" at the beginning of the VOLSER label.
   - Cleaning cartridge has "CLN" somewhere on the VOLSER label.

4. Hold the cartridge so that the write-protect switch is toward you.

5. See Figure A-2 on page A-7 and slide the label under the slots in the recessed area. If you prefer, peel the backing from the label and then slide it under the slots, pressing it into place.

Setting the Write-protect Switch

You can set the write-protect switch so the cartridge is *write-enabled*. Slide the switch to the right so the orange indicator is not visible (see Figure A-3). In this position, the tape drive can write as well as read data. This setting is recommended when inserting cartridges into the library.

You can set the write-protect switch so that the cartridge is *read-only* (nothing can be written on the tape). Slide the switch to the left so that the orange indicator is visible (see Figure A-3). In this position, the tape drive can only read data from the tape, but cannot write data on it.

Figure A-3. Setting the DLT Write-protect Switch (C67030)
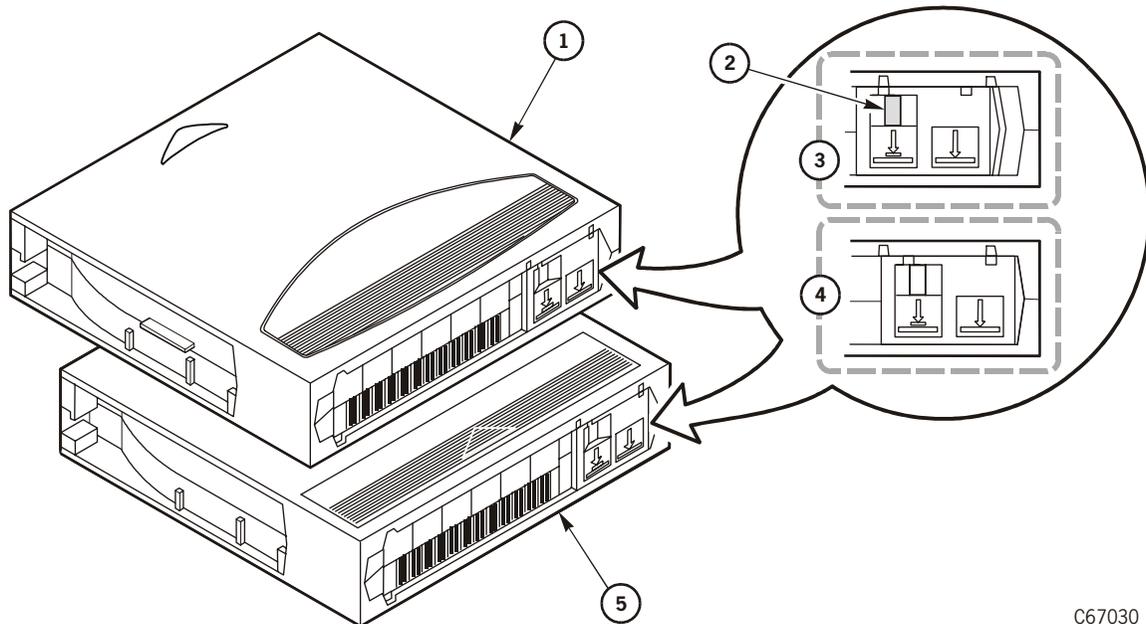
C67030

1. SDLT cartridge
2. Orange indicator
3. Write-protect position
4. Write-enabled position
5. DLT cartridge

DLT Cartridge Environmental Specifications

The following specifications refer to the operating and storage environments for DLT cartridges.

Table A-3. DLT Cartridge Environmental Specifications

Operating environment	
Temperature	10º to 40ºC (50º to 104ºF)
Relative humidity	20% to 80% noncondensing
Wet-bulb temperature	25º C (77ºF) maximum
Storage environment	
Temperature	16º to 32ºC (61º to 90ºF)
Relative humidity	20% to 80% noncondensing
Wet-bulb temperature	26º C (79º F) maximum
Storage environment for cartridges intended for archiving data one year or more	
Temperature	18º to 26ºC (64º to 79ºF)
Relative humidity	40% to 60%

CAUTION:
Potential damage to cartridges: **When storing DLT cartridges, the stray magnetic field at any point on the tape shall not exceed 4000A/m.**

Super DLT Cartridge Environmental Specifications

Operating environment	
Temperature	10º to 40ºC (50º to 104ºF)
Relative humidity	20% to 80%
Wet-bulb temperature	26ºC (79ºF) maximum
Storage environment (archive)	
Temperature	18º to 28ºC (64º to 82ºF)
Relative humidity	40% to 60%
Wet-bulb temperature	26ºC (78.8ºF) maximum
Storage environment (non-archive)	
Temperature	16º to 32ºC (60º to 90ºF)
Relative humidity	20% to 80%
Wet-bulb temperature	26ºC (79ºF) maximum

For more information about DLT cartridges, visit:

http://www.quantum.com

■ LTO Ultrium Cartridges

The Ultrium tape format is an implementation of the LTO (Linear Tape-Open) technology that is optimized for high capacity and performance. Ultrium tapes use a single reel cartridge to maximize capacity that makes them ideal for backup, restore, and archive applications.

CAUTION:
Equipment damage: **The advantage of the LTO specification is that any LTO Ultrium data cartridge can work in any LTO Ultrium tape drive. However, use only the tape drive manufacturer's cleaning cartridge or a universal Ultrium cleaning cartridge to clean an Ultrium tape drive.**

Figure A-4. Ultrium Cartridge Components (C67287)

C67287
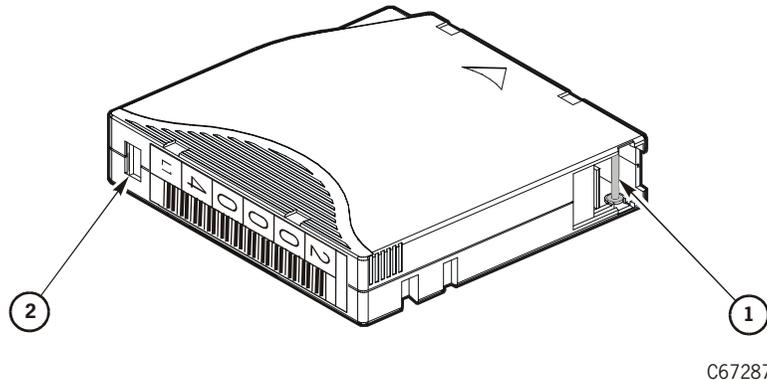
1. Access door
2. Write-protect switch (data cartridge = red; cleaning cartridge = gray)

Applying Labels

shows the location of the VOLSER label. Refer to the specific tape drive manufacturer's documentation for cartridge labeling instructions. Cartridge labels reflect the cartridge media and usage. The letter located next to the last number in the VOLSER reflects the media. Cleaning cartridges have CLN in the VOLSER; diagnostic cartridges have DG in the VOLSER.

Note: The two generations of LTO tape drives are referred to as Gen1 and Gen2. The Gen2 tape drive is backward-read compatible to LTO Gen1 media. The LTO Gen1 cleaning cartridge can be used in Gen1 and Gen2 tape drives.

Label	Type of Cartridge
L1	Data cartridge for Gen1
L2	Data cartridge for Gen2
C1 plus CLN	Cleaning cartridge for Hewlett Packard
C2 plus CLN	Cleaning cartridge for IBM
C3 plus CLN	Cleaning cartridge for Seagate
CU plus CLN	Universal cleaning cartridge (for all three tape drive manufacturers)
L plus DG	Diagnostic cartridge

Setting the Write-protect Switch

As shown in Figure A-5, you can set the write-protect switch so that the cartridge is *write-enabled*.

- Slide the switch to reveal the "open lock" symbol to write-enable the tapes. In this position, the tape drive can write as well as read data. This setting is recommended when inserting cartridges into the tape library.

You can set the write-protect switch so that the cartridge is *read-only* (nothing can be written on the tape).

- Slide the switch to reveal the "closed lock" symbol. In this position, the tape drive can only read data from the tape; the tape drive cannot write data to it.

Figure A-5. Setting the Ultrium Write-protect Switch (C67289)
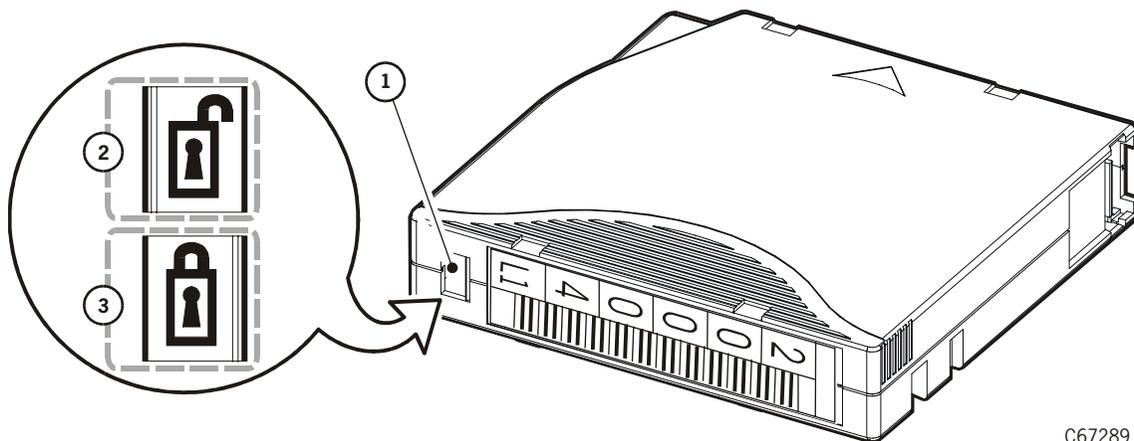
C67289

1. Write-protect switch (Data cartridge = red; cleaning cartridge = gray)
2. Write-enabled position
3. Write-protected position

Ultrium Cartridge Environmental Specifications

The following specifications refer to the operating and storage environments for LTO Ultrium cartridges.

Table A-4. LTO Ultrium Cartridge Environmental Specifications

Operating environment[1]	
Temperature	10° to 45°C (50° to 113°F)
Relative humidity	20% to 80%
Wet-bulb temperature	26°C (79°F) maximum
Storage environment (archive)[2]	
Temperature	16° to 25°C (61° to 77°F)
Relative humidity	20% to 50%
Wet-bulb temperature	26°C (79°F) maximum
Storage environment (non-archive)	
Temperature	16° to 32°C (61° to 90°F)
Relative humidity	20% to 80%
Wet-bulb temperature	26°C (79°F) maximum
Shipping environment (unrecorded)[3]	
Temperature	-23° to 49°C (-10° to 120°F)
Relative humidity	20% to 80%
Wet-bulb temperature	26°C (79°F) maximum

Notes:

1. The conditioning time before use is 24 hours.
2. Archival storage is one to 10 years.
3. The shipping environment must not exceed the limit of the storage environment, archive or non-archive, for longer than 10 days.

■ StorageTek T9840 Cartridges

The T9840 cartridge tape achieves fast access by having both the supply and take-up reels in the cartridge and by facilitating midpoint loading. The data cartridge tape has a capacity of 20 GB, uncompressed.

The media identification labels for T9840 cartridge tapes have unique letters:

- R = Standard and VolSafe data cartridge tape
- U = Cleaning cartridge

Figure A-6 shows an example of the T9840 cartridge labels, and write-protect switch.

Figure A-6. T9840 Cartridge Components (C67027)

C67027
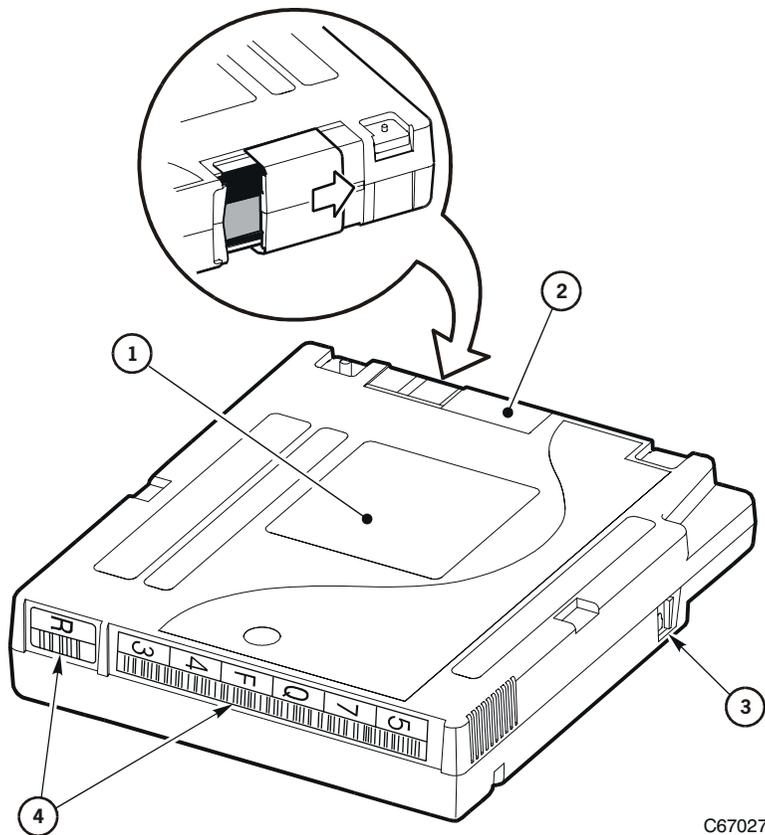
1. Customer label
2. Access door
3. Write protect switch
4. Labels

Applying Labels

Figure A-6 on page A-14 shows the location of the VOLSER label. Refer to the T9840 Tape Drive documentation before applying labels to the cartridges.

Setting the Write-protect Switch

Refer to the T9840 Tape Drive documentation for instructions about how to set the cartridge's write-protect switch. Figure A-7 shows the write-protect switch settings.

Figure A-7. Setting the T9840 Write-protect Switch (C67031)
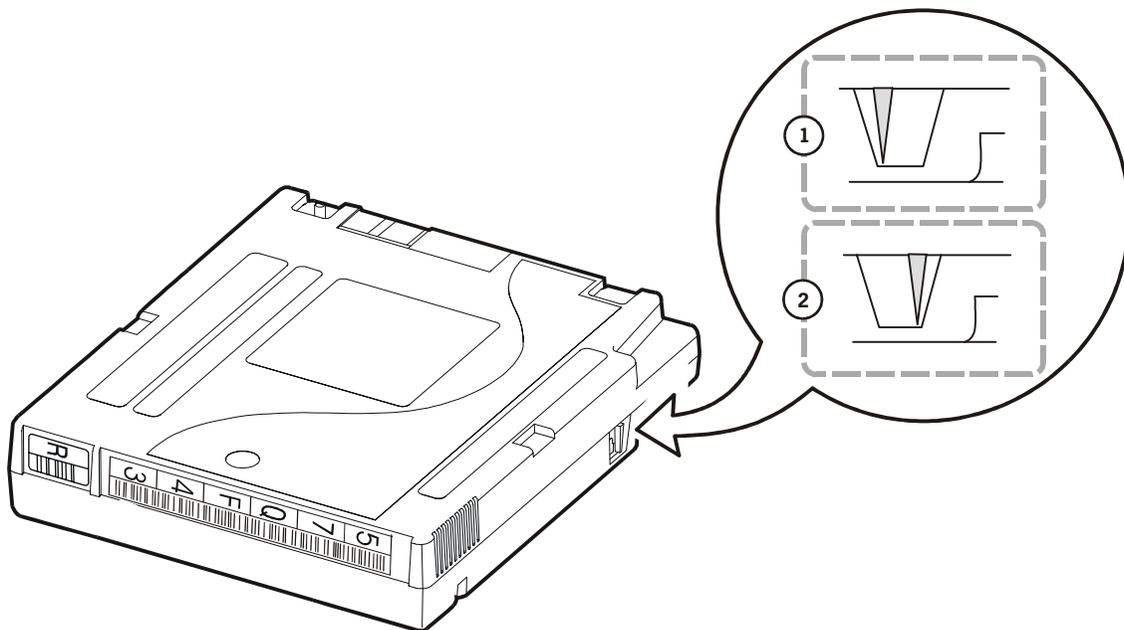
C67031

1. Write-enabled position
2. Write-protect position

T9840 Cartridge Environmental Specifications

The following specifications refer to the operating and storage environments for T9840 cartridges.

Table A-5. T9840 Cartridge Environmental Specifications

Operating environment[1]	
Temperature	15.6º to 32.2ºC (60º to 90ºF)
Relative humidity	20% to 80%
Wet-bulb temperature	26ºC (79ºF) maximum
Storage environment (archive)	
Temperature	5º to 25.5ºC (41º to 78ºF)
Relative humidity	40% to 60%
Wet-bulb temperature	26ºC (79ºF) maximum
Storage environment (non-archive)	
Temperature	5º to 32.2ºC (41º to 90ºF)
Relative humidity	5% to 80%
Wet-bulb temperature	26ºC (79ºF) maximum
Shipping environment (unrecorded)[2]	
Temperature	-23º to 49ºC (-10º to 120ºF)
Relative humidity	5% to 80%
Wet-bulb temperature	26ºC (79ºF) maximum
Shipping environment (recorded)[2]	
Temperature	4º to 40ºC (40º to 104ºF)
Relative humidity	5% to 80%
Wet-bulb temperature	26ºC (79ºF) maximum

Notes:

1. The conditioning time before use is 24 hours.
2. The shipping environment must not exceed the limit of the storage environment, archive or non-archive, for longer than 10 days.

For more information about cartridges, visit StorageTek's Web site at:

http://www.storagetek.com/products/tape/services/

Library Statistics

<div style="float:right">**B**</div>

Library statistics are divided into two major categories: counters and composite information. Both categories are explained in the following sections.

■ Counters

Counters are composed of 8-bit, 16-bit, and 32-bit elements. Each type is explained below.

8-bit Counters

8-bit counters have values from 0 to 2^8 minus 1 (or 255).

Drive Statistics

Drive statistics are composed of the following information, based upon the absolute element location of the drive:

1. PUT Retries—The number of times a PUT operation was retried for the specified location. Generally, two retries will be logged for one failed motion.

2. GET Retries—The number of times a GET operation was retried for the specified location. Generally, two retries will be logged for one failed motion.

3. Mount Count—The number of mount operations to a specified location

Cell Statistics

Cell statistics are composed of the following information, based upon the absolute element location of the cell:

1. PUT Retries—The number of times a PUT operation was retried for the specified location. Generally, two retries will be logged for one failed motion.

2. GET Retries—The number of times a GET operation was retried for the specified location. Generally, two retries will be logged for one failed motion.

16-Bit Counters

16-bit counters have values from 0 to 2^{16} minus 1 (or 65,535).

Table B-1. 16-Bit Counters

Bin	Description
IPL	Number of times the machine was booted. No distinction is made between powering-on or pressing the RESET button.
Door Open	Number of times the access door has been opened
GET Retries	Number of times a GET operation required a retry operation. A single move will have two retries before failing
GET Failures	Number of times a GET operation failed. For every failed GET operation, there will be two GET retries logged.
PUT Retries	Same as GET retries, but for PUT operations
PUT Failures	Same as GET failures, but for PUT operations
Label Retries	Same as GET retries, but for label reading operations
Label Failures	Same as GET failures, but for label reading operations
Target Retries	Same as GET retries, but for targeting operations
Target Failures	Same as GET retries, but for targeting operations

32-Bit Counters

32-bit counters have values from 0 to 2^{32} minus 1 (or 4,294,967,295).

Table B-2. 32-Bit Counters

Bin	Description
Move Count	Number of successful sets of GET/PUT operations (a single move consists of one GET and one PUT operation)
Mount Count	Same as move count, except that the move here involves mounting/dismounting a tape to/from a drive
Uptime Second Count	Number of time (in seconds) that the machine has been running
Empty Read	Number of times an empty cell was detected
Target Read	Number of successful targeting operations
Label Read	Number of time a cartridge label was read
Label Read 1*	Number of times algorithm 1 read a label
Label Read 2*	Number of times algorithm 2 read a label
Label Read 3*	Number of times algorithm 3 read a label
Label Unread 1*	Number of times algorithm 1 could not read a label
Label Unread 2*	Number of times algorithm 2 could not read a label
Label Unread 3*	Number of times algorithm 3 could not read a label

* Added for the purpose of tracking new vision algorithms supplied with firmware Versions 2.21.00 and later.

■ Composite Information

Composite information contains statistics that keep track of *groups of data*, using units of time or some other discrete measurement. Composite information is supplied for cartridge access port (CAP) usage, library-wide drive performance, and individual drive performance.

Cartridge Access Port (CAP) Usage

CAP usage counters are 16-bit. The definitions are supplied below.

PUT Count

The CAP PUT count is the number of times a PUT was executed to a CAP, with bins incrementing when a CAP is opened. This provides an indication of how a CAP is being used. For example, if five PUTs were executed to a CAP, the "5" bin (see bin list below) would increment by one. Counts in the 21+ bin would indicate that the CAP is being used for normal operations, not just export operations.

Table B-3. CAP PUT Count

Bin	PUTs executed between CAP opens
Idle	0
1	1
2	2
3	3
4	4
5	5
6–10	6–10
11–15	11–15
16–20	16–20
21+	21 or more

GET Count

The CAP GET count is the number of times a GET was executed from a CAP, with bins incrementing when a CAP is opened. This provides an indication of how a CAP is being used. For example, if 10 GETs were executed from a CAP, the "6–10" bin (see bin list below) would increment by one. Counts in the 21+ bin would indicate that the CAP is being used for normal operations, not just import operations.

Table B-4. CAP GET Count

Bin	GETs executed between CAP opens
Idle	0
1	1
2	2
3	3
4	4
5	5
6–10	6–10
11–15	11–15
16–20	16–20
21+	21 or more

Library-Wide Drive Performance

Job rate intervals are set to five and 15 minutes to best understand peak machine usage. These intervals were chosen because such data can generally be applied to thermal behavior of electromechanical components.

As examples, one customer may only require peak machine performance for a time less than five minutes. If so, some electromechanical components may not heat sufficiently to cause short- or long-term reliability issues. On the other hand, another customer may require peak performance for a full 15 minutes or longer. In this case, peak performance indicates that components will reach higher operating temperatures and, therefore, require more costly components.

Note: Drive mount times are included in these statistics; these times vary widely, depending on the drive type. As a result, these statistics cannot be used to determine if a library is meeting its published Exchanges Per Hour (EPH) specification.

Library-wide drive performance counters are 32-bit.

Five Minute Job Rate

This pool of statistics defines the hourly drive job rate the library was given during continuous five minute intervals. For example, if 13 mounts were executed during one five minute interval, the "151–175" usage bin (see below) would increment by one (13 mounts/5 minutes x 60 minutes/hour = 156 mounts per hour). If no mount activity takes place during a five minute interval, the "idle" bin will increment by one.

Table B-5. Library-Wide Performance—Five Minute Job Rate

Bin	Number of mounts within a five minute interval
Idle	0
1–25	1–2
26–50	3–4
51–75	5–6
76–100	7–8
101–125	9–10
126–150	11–12
151–175	13–14
176–200	15–16
201–225	17–18
226–250	19–20
251–300	21–25
301–350	26–29
351–400	30–33
401–450	34–37
451–500	38–41
501–550	42–45
551–600	46–50
611–650	51–54
651–700	55–58
701+	58+

Fifteen Minute Job Rate

This pool of statistics defines the hourly drive job rate the library was given during continuous fifteen minute intervals. For example, if 31 mounts were executed during one fifteen minute interval, the "101–125" usage bin (see below) would increment by one (31 mounts/15 minutes x 60 minutes/hour = 124 mounts per hour). If no mount activity takes place during a five minute interval, the "idle" bin will increment by one.

Table B-6. Library-Wide Performance—Fifteen Minute Job Rate

Bin	Number of mounts within a fifteen minute interval
Idle	0
1–25	1
26–50	2–3
51–75	4–5
76–100	6
101–125	7–8
126–150	9–10
151–175	11
176–200	12–13
201–225	14–15
226–250	16
251–300	17–20
301–350	21–23
351–400	24–26
401–450	27–30
451–500	31–33
501–550	34–36
551– 600	37–40
601–650	41–43
651–700	44–46
701+	47+

Individual Drive Performance

Performance statistics for individual drives is the third component of composite information. The counters for these statistics are mixed.

Table B-7. Individual Drive Performance

General—No Data Transfer*		
Bin	**Counter**	**Explanation**
Serial Number		Tracking is done by serial number rather than location. This allows for drive positional changes with no loss or inaccurate information. In addition, two extra information slots are allocated above the maximum drive count to allow for temporary swapping of drives.
PUT Retries	8-bit	Number of times a PUT was retried on this drive
GET Retries	8-bit	Number of times a GET was retried on this drive
Mount Count	16-bit	Number of times a mount was executed on this drive
Idle Time		How long (in seconds) the drive has not been able to transfer data across the host interface (for example, no cartridge loaded, loading, unloading)
Specific—Data Transfer Possible*		
Minimum	16-bit	Cartridge spent less than 30 seconds in a drive (probably a 9840-style drive)
30 sec to 5 minutes	16-bit	Cartridge spent from 30 seconds to 5 minutes in a drive
5 minutes to 10 minutes	16-bit	Cartridge spent from 5 minutes to 10 minutes in a drive
10 minutes to 30 minutes	16-bit	Cartridge spent from 10 minutes to 30 minutes in a drive
30 minutes to 60 minutes	16-bit	Cartridge spent from 30 minutes to 60 minutes in a drive
More than 60 minutes	16-bit	Cartridge spent more than 60 minutes in a drive

Note: "General" refers to statistics that relate to non-data transfer drive activities; "Specific" excludes loading/unloading activities and counts only the time that data may be transferred to/from the drive.

Glossary

This glossary defines abbreviations and new or special terms found in this or other L180 Tape Library manuals.

A

address A character or group of characters that identifies a register, a particular part of storage, or some other data source or destination.

Advanced Interactive Executive (AIX) The operating software for an IBM RISC System/6000.

audit (1) Tape library audit—the part of the library initialization sequence that catalogs all tape cartridge locations. This data is retained in the logic (MPC/MPCL) card memory. (2) client audit—A client request to catalog the tape cartridges of a library by SCSI element or library number, panel, row, column.

Automated Cartridge System Library Software (ACSLS) The software within a UNIX-based server that interfaces the server and clients; it also maintains a list of all cartridges within a library.

automated mode A relationship between a library and all attached clients. The library is powered on and ready to receive operator requests. In automated mode, the robot moves cartridges among storage cells, the CAP, and drives. This is the normal operating mode of a library.

B

bus A facility that transfers data between two devices with only one device having control at a time. An interface.

C

camera A system that reads VOLSER labels on cartridges, instead of scanning the labels with a laser. A camera performs faster and more accurately than a laser scanner.

CAP *See* "cartridge access port."

cartridge The plastic housing around a cartridge tape. A plastic leader block is attached to the tape for automatic threading when loaded in a transport. The spine of the cartridge contains a VOLSER label listing the volume identification number.

cartridge access port (CAP) An assembly allowing an operator to enter or eject cartridges during automated operations.

cartridge tape Magnetic tape enclosed in a plastic housing.

catalog The inventory of all cartridge storage locations in an L180 library. This inventory is by SCSI element or library number, panel, row, column.

cell In the library, a receptacle that stores a single cartridge.

configuration The physical description of a library, listing the panel types, cartridge capacity, type of client connection, and number of tape drives.

Customer Resource Center (CRC) StorageTek's Web-based service that provides technical information to customers with StorageTek maintenance contracts. A log-in and password are required.

Customer Support Services (CSS) StorageTek's customer services organization. Customers with StorageTek maintenance contracts may contact CSS 24 hours a day, seven days a week.

D

diagnostics Tests, accessible through the library operator panel or the Horizon Library Monitor, that allow a user to evaluate the functionality of certain library components while the library is offline.

differential operation A SCSI bus alternative in which the signal from the SCSI chip passes through a set of differential drivers/receivers. This alternative provides better signal quality with less cross-talk and noise but requires more power to drive the signal. The maximum cable length is 25 m (82 ft.). *See* "single-ended operation."

DNS *See* Domain Name Service.

Domain Name Service A service that translates domain names into IP addresses.

drive A device that reads from or writes to a magnetic tape.

drive column Inside the library, a set of hardware shelves with power connections into which drives are installed.

Dynamic Worldwide Name (dWWN) A feature that applies dynamic names to network devices rather than fixed names. When a dWWN-named devices is replaced, it is assigned the same WWN as the one it replaced, preventing re-configuration of the network.

E

Ethernet address A six-byte address that makes a library accessible to a network. (*See* "IP address," "library name," "network gateway," and "subnet mask.")

event log *See* "FSC log."

F

fault symptom code (FSC) Error or information code generated by functional or diagnostic software that may directly or indirectly be used to indicate the field replaceable unit (FRU) that is probably causing the error.

Fibre Channel The National Committee for Information Technology Standards standard that defines an ultra high-speed, content-independent, multilevel data transmission interface that supports multiple protocols simultaneously. Fibre

Channel supports connectivity to millions of devices over copper and/or fiber-optic physical media and provides the best characteristics of both networks and channels over diverse topologies.

FSC log A file, accessible through the operator panel, that contains events that occurred during the functional operation of the library.

H

hand-camera assembly The robotic element that includes a motor, a gripper for grasping cartridges, and a camera for reading VOLSER labels and targets.

hard address A device address that is directly input into the firmware by the operator or manufacturer.

Horizon L Series Library Monitor An optional software interface that provides internet browser operation for the library. This feature is enabled by the personality module.

HVD High Voltage Differential SCSI.

I

initial program load (IPL) A process that activates a machine reset and loads system programs to prepare a computer system for operation. Processors having diagnostic programs activate these programs at IPL execution.

initialization A startup-diagnostic routine performed automatically by the library when it is powered on or when the main door is opened and closed. In the L180 library, this routine includes an audit of the cells.

Internet Protocol (IP) address A four-byte value that identifies a library and makes it accessible through a network. (*See* "Ethernet address," "subnet mask," and "library name.")

in-transit cartridges Cartridges that have been moved from their home cell by the robot. The client software must recover these cartridges to a known location to clear out the software in-transit record.

IP address *See* "Internet Protocol (IP) address."

IPL *See* "initial program load (IPL)."

L

leader block The mechanism that loads the cartridge tape through the tape path in a drive.

library name An assigned name that maps to the IP address for a library. (*See* "IP address," "Ethernet address," and "network gateway," and "subnet mask.")

load a cartridge The process by which a drive prepares a cartridge tape for read and write operations.

LTO Linear Tape-Open, an open specification for tape storage devices.

LVD Low-Voltage Differential SCSI.

M

manual mode A relationship between an library and all attached clients. Tape libraries operating in manual mode have been placed offline to all client CPUs and require human assistance to perform cartridge operations.

media format Format of data written on the cartridge tape (36-track, compressed, etc.)

mount a cartridge The process by which the library robot retrieves a cartridge from a cell and places it into a drive.

MPC card The main logic card in the library.

MPCL card Replaces the MPC card in new machines manufactured after 9/02. The MPCL card function is identical to the MPC except that it can be jumpered to operate on a native LVD/SE interface; there is no need to install the MPV and MPW cards for LVD operation.

N

network gateway A four-byte notation that makes the library accessible to a large network, which consists of two or more subnets, through a gateway connection.

non-volatile random-access memory (NVRAM) A section of memory that will retain its information even when power is removed from the equipment.

O

offline Not available for functional use.

online State of being controlled directly by or in direct communication with a computer. Available for functional use.

P

Port 0 address The address by which the library's first (and currently *only*) port will be identified on a Fibre Channel loop.

Q

quiesce Allowing all activity to complete before any new activity is allowed to start.

R

Remote Center The remote diagnostic center at StorageTek headquarters.

RESET button This button will start a initial program load to the library.

RISC System/6000 An IBM processor that may be used to connect several IBM AS/400 processors, acting as their server through a network.

robot Electro-mechanical device for locating and moving cartridges.

S

servo Device that uses closed-loop feedback to govern physical positioning.

Simplified Network Management Protocol A set of protocols for managing complex networks.

single-ended operation A SCSI bus alternative in which the signal passes directly between SCSI chips on either end of the cable. *See* "differential operation."

small computer systems interface (SCSI) A type of data or control interface between the library/ tape drives and client.

SNMP *See* Simplified Network Management Protocol.

subnet mask A four-byte notation that resolves routing within a network. (*See* "IP address," "Ethernet address," "library name," and "network gateway.")

T

tape drive A device that reads from or writes to a magnetic tape.

theta motor The motor responsible for the lateral movement of the hand mechanism in the library.

Tri-Optic label An external label attached to the spine of a cartridge that is both human- and machine-readable. *See also* "volume serial (VOLSER) label."

TTI Tape Transport Interface. A library communication cable with the tape drives.

U

Ultrium The single hub implementation of the LTO specification for tape storage devices.

V

VOLSER The volume serial identification of a cartridge tape. *See* "volume serial label."

volume A certain portion of data, together with its data carrier, that can be handled conveniently as a unit.

volume serial (VOLSER) label An alphanumeric label used by client software to identify a volume (sometimes used to indicate the contents of a tape).

Y

Y-cable A SCSI communications cable that has two connectors at one end and one connector at the other.

Z

Z carriage The portion of the robot on which the hand assembly rests.

Z column The column (or tube) which allows the hand mechanism in the library to move vertically.

Z motor The motor responsible for the vertical movement of the hand assembly in the library.

Index

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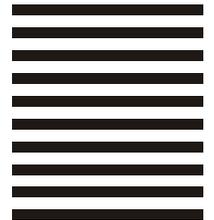TO COMPLY WITH POSTAL REGULATIONS, FOLD EXACTLY ON DOTTED LINES AND TAPE (DO NOT STAPLE)
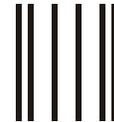
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