

StorageTek SL150 Modular Tape Library System

Installation Manual



Part Number: E28647-03
October 2012

Submit comments about this document to STP_FEEDBACK_US@ORACLE.COM.

Oracle welcomes your comments and suggestions for improving this book. Contact us at STP_FEEDBACK_US@ORACLE.COM. Please include the title, part number, issue date, and revision.

Copyright © 2012, Oracle and/or its affiliates. All rights reserved.

This software and related documentation are provided under a license agreement containing restrictions on use and disclosure and are protected by intellectual property laws. Except as expressly permitted in your license agreement or allowed by law, you may not use, copy, reproduce, translate, broadcast, modify, license, transmit, distribute, exhibit, perform, publish, or display any part, in any form, or by any means. Reverse engineering, disassembly, or decompilation of this software, unless required by law for interoperability, is prohibited.

The information contained herein is subject to change without notice and is not warranted to be error-free. If you find any errors, please report them to us in writing.

If this is software or related software documentation that is delivered to the U.S. Government or anyone licensing it on behalf of the U.S. Government, the following notice is applicable:

U.S. GOVERNMENT END USERS: Oracle programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, delivered to U.S. Government end users are "commercial computer software" pursuant to the applicable Federal Acquisition Regulation and agency-specific supplemental regulations. As such, use, duplication, disclosure, modification, and adaptation of the programs, including any operating system, integrated software, any programs installed on the hardware, and/or documentation, shall be subject to license terms and license restrictions applicable to the programs. No other rights are granted to the U.S. Government.

This software or hardware is developed for general use in a variety of information management applications. It is not developed or intended for use in any inherently dangerous applications, including applications that may create a risk of personal injury. If you use this software or hardware in dangerous applications, then you shall be responsible to take all appropriate fail-safe, backup, redundancy, and other measures to ensure the safe use. Oracle Corporation and its affiliates disclaim any liability for any damages caused by use of this software or hardware in dangerous applications.

Oracle and Java are registered trademarks of Oracle and/or its affiliates. Other names may be trademarks of their respective owners.

Intel and Intel Xeon are trademarks or registered trademarks of Intel Corporation. All SPARC trademarks are used under license and are trademarks or registered trademarks of SPARC International, Inc. AMD, Opteron, the AMD logo, and the AMD Opteron logo are trademarks or registered trademarks of Advanced Micro Devices. UNIX is a registered trademark of The Open Group.

This software or hardware and documentation may provide access to or information on content, products, and services from third parties. Oracle Corporation and its affiliates are not responsible for and expressly disclaim all warranties of any kind with respect to third-party content, products, and services. Oracle Corporation and its affiliates will not be responsible for any loss, costs, or damages incurred due to your access to or use of third-party content, products, or services.

Table of Contents

List of Figures	7
Preface	9
Access to Oracle Support	9
What's New	11
1 Product Overview	13
Library System Indicators	14
Human Interfaces	15
Installation Wizard Keyboard Screens	17
Specifications	18
Installation Overview	19
2 Planning and Preparation	21
Rack Preparation	21
Tape Device Driver	22
Environmental Information	22
To Stage the SL150 Library	22
To Unpack and Acclimate the SL150 Library	22
3 Hardware Installation	25
Overview	25
Base Module Installation	27
Gather the Rail Parts	27
Base Module Mounting Rail	28
Back Rail	28
Tool Requirement	28
To Install the Base Module Back Rails	29
Front Rail	30
Tool Requirement	30
To Install the Front Rail	31
Clip Nut Location	33
To Install the Clip Nut	34
Mount the Base Module	35
To Insert the Base Module	35

Expansion Module Installation Overview	37
Tool Requirement	38
To Unpack and Acclimate the Expansion Module	38
Expansion Module Attachment Kit	38
Gather the Attachment Hardware	39
To Power Down the Library	40
To Remove the Library Floor	41
To Install Clip Nuts for the Expansion Module	42
To Prepare the Expansion Module for Installation	43
To Install the Expansion Module	46
To Secure the Expansion Module	47
To Replace the Cartridge Magazines	48
To Label the Module	49
To Install the Hook and Loop Strap	50
Final Hardware Actions	50
To Release the Robot Lock	50
To Perform Basic Cabling	51
To Apply Power	52
4 Library Initialization	53
Initialization Overview	53
To Start Library Initialization	54
To Log in as the Default Administrator	54
Step 1 of 4 (Change the Default Administrator Password)	55
To Change the Default Password	55
Step 2 of 4 (Set the Library Date and Time)	56
To Set the Date and Time	57
Step 3 of 4 (Configure Network Port 1)	57
To Configure the Network with a Static IP Address	57
To Configure the Network Using DHCP	59
Step 4 of 4 (Review and Apply Initialization Settings)	60
To Apply Changes	60
To Verify Network Settings	61
Final Configuration	62
To Reset the Library with Manufacturing Default Values	63
5 Checkout	65
Self-Test Overview	65
To Set the Library Offline	65
To Run the Self-Test	66
6 Adding Power Supplies and Tape Drives	71
Power Supply	72
To Remove the Power Supply Filler	72
To Install an Additional Power Supply	72
Tape Drive Tray	73
To Remove the Tape Drive Filler	73
To Install an Additional Tape Drive Tray	74

7 Relocation	75
A Startup	77
B Drive Firmware	79
Determine the Current Drive Firmware Version	79
Download Firmware from MyOracleSupport	80
C Controlling Contaminants	83
Environmental Contaminants	83
Required Air Quality Levels	83
Contaminant Properties and Sources	84
Operator Activity	85
Hardware Movement	85
Outside Air	85
Stored Items	85
Outside Influences	85
Cleaning Activity	86
Contaminant Effects	86
Physical Interference	86
Corrosive Failure	86
Shorts	87
Thermal Failure	87
Room Conditions	87
Exposure Points	88
Filtration	89
Positive Pressurization and Ventilation	90
Cleaning Procedures and Equipment	90
Daily Tasks	91
Weekly Tasks	91
Quarterly Tasks	92
Bi-Annual Tasks	92
Activity and Processes	93
Glossary	95
Index	1

List of Figures

FIGURE 1-1	StorageTek SL150 Base Module and Expansion Module	13
FIGURE 1-2	Rear View Base Module and Expansion Module	14
FIGURE 1-3	Library System Indicators	15
FIGURE 1-4	Front Control Panel Home Screen	16
FIGURE 1-5	Remote Interface for SL150 Library (Library Menu)	16
FIGURE 1-6	Letters Screen	17
FIGURE 1-7	Numbers and Characters Screen	18
FIGURE 1-8	Special Characters Screen	18
FIGURE 2-1	Rear View of Sun Rack II (PDU on Right Side)	21
FIGURE 3-1	Installation Overview	25
FIGURE 3-2	Rear View of the Base Module (Module 1)	26
FIGURE 3-3	Base Module Accessory Package Mounting Hardware	28
FIGURE 3-4	Back Rails Installed	29
FIGURE 3-5	Back Rail Position	30
FIGURE 3-6	Front Rail Installation (Left Rail Shown)	31
FIGURE 3-7	Mounting Block for Front Rail (Right Rail Shown)	32
FIGURE 3-8	Rails Installed - Front View	33
FIGURE 3-9	Clip Nut Location for the Base Module	33
FIGURE 3-10	Tab and Rail Engagement	35
FIGURE 3-11	Magazine Latch Release	36
FIGURE 3-12	Expansion Module	37
FIGURE 3-13	Expansion Module Accessory Package Hardware	39
FIGURE 3-14	Power Down Options	40
FIGURE 3-15	Prepare Robot for Removal	41
FIGURE 3-16	Library Floor Removal from the Base Module	42
FIGURE 3-17	Expansion Module Installation	43
FIGURE 3-18	Magazine Latches	44
FIGURE 3-19	Library Floor	45
FIGURE 3-20	Floor Secured	45
FIGURE 3-21	Scratch Avoidance	46
FIGURE 3-22	Alignment Tab Seated	47
FIGURE 3-23	Expansion Module Back Rail and Clip Nut	47
FIGURE 3-24	Expansion Module ID Label	49
FIGURE 3-25	Hook and Loop Strap	50
FIGURE 3-26	Robot Lock (Unlock)	51
FIGURE 3-27	Initial Cabling	51
FIGURE 4-1	Library Initialization Overview	53
FIGURE 4-2	Default Administrator Login	54
FIGURE 4-3	Change the Default Password	55
FIGURE 4-4	Library Date and Time	56
FIGURE 4-5	Configure Network Port 1	58
FIGURE 4-6	Configure Network Port 1 (DHCP)	59
FIGURE 4-7	Review and Apply Changes	60

FIGURE 4-8	Home Screen	61
FIGURE 4-9	Settings Screen Network Tab	62
FIGURE 4-10	SL150 Remote Interface Log In Screen	63
FIGURE 5-1	Set Library Offline	66
FIGURE 5-2	Offline Confirmation	66
FIGURE 5-3	Self Test Commands	67
FIGURE 5-4	Self Test Confirmation	67
FIGURE 5-5	Self Test Progress	68
FIGURE 5-6	Self Test Complete	68
FIGURE 6-1	SL150 Rear View	71
FIGURE 6-2	Power Supply	72
FIGURE 6-3	Tape Drive Tray	73
FIGURE B-1	Drive Firmware Version	79
FIGURE B-2	MOS Patches & Updates	80

Preface

This guide is intended for anyone involved with planning and performing the installation of Oracle's StorageTek SL150 Modular Tape Library System.

Access to Oracle Support

Oracle customers have access to electronic support through My Oracle Support. For information, visit <http://www.oracle.com/support/contact.html> or visit <http://www.oracle.com/accessibility/support.html> if you are hearing impaired.

What's New

Revision 03 (October 2012):

- Changed the TIP for resetting to manufacturing default values to a section and expanded the explanation into steps.

Revision 02 (October 2012):

- Specifications updated in Chapter 2.
- Expansion module installation sequence modified to insert the floor in the bottom library module before inserting that module into the rack.
- Keyboard screen information moved to Chapter 1.
- Various format changes to facilitate a future migration to Oracle publishing tools.

Product Overview

Oracle's StorageTek SL150 Modular Tape Library System is a 3U (5.25 inches) to 21U (36.75 inches) rack-mounted, modular automated tape library (see [FIGURE 1-1](#)). It offers storage capacity of 30 to 300 Linear Tape Open (LTO) cartridges, from 1 to 20 half-height LTO5 Fibre Channel (FC) or Serial Attached SCSI (SAS) tape drives, and a bridged drive FC or SAS control path. The robot control is a SCSI Medium Changer device that appears as LUN 1 on a tape drive.

The minimum configuration consists of a 3U (5.25 inches) base module, designated Module 1, containing: the front control panel, one robotic hand, a mailslot with four slots, a power supply, and one tape drive (with options to add a second drive tray, a second power supply, or both). It stores up to 30 tapes in two, removable 15-slot magazines (one on the left side and the other on the right side). You can designate up to three reserved slots in the base module left magazine for storing cleaning or diagnostic tapes.

FIGURE 1-1 StorageTek SL150 Base Module and Expansion Module



Illustration Legend:

1. Base module (Module 1)
2. Expansion module
3. Left cartridge magazine
4. Right cartridge magazine

5. Front control panel

6. Mailslot

Up to nine 2U (3.5 inch) expansion modules (designated Module 2 through Module 10) can be added to provide additional tape slot capacity by two removable 15-slot magazines (see [FIGURE 1-1 on page 13](#)). The expansion module is connected to the base module by an expansion cable that has USB Type A connectors (see [FIGURE 1-2](#)). The expansion module controller receives power over the expansion cable.

Expansion modules ship without tape drive trays or power supplies. When the first tape drive tray is installed in an expansion module, a power supply must also be installed to provide power for the tape drive. A second power supply can be added for redundancy. One power supply provides adequate power for two tape drive trays.

FIGURE 1-2 Rear View Base Module and Expansion Module

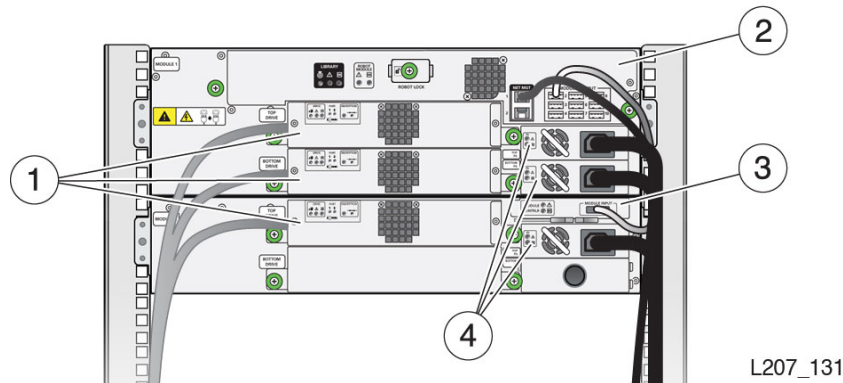


Illustration Legend:

1. Tape drives
2. Robot
3. Expansion controller
4. Power supplies

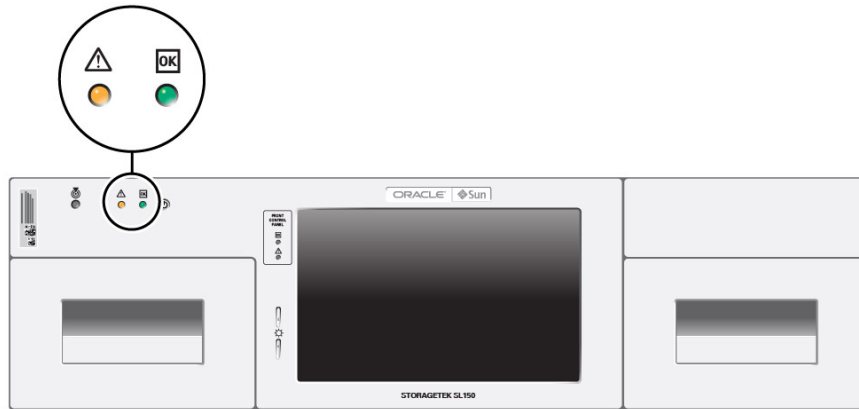
Library System Indicators

A set of library status indicators are located on the front control panel above the left magazine (see [FIGURE 1-3 on page 15](#)) and on the robot CRU at the back of the base module.

- Locate LED and push button switch: helps to identify the specific SL150 library in the data center. The LED is present in two places on the base module: on the front above the left magazine, and on the rear in black rectangle on the robot module. The LED is activated by pushing the locate button on the base module or by clicking the locate icon in the remote management interface.
- Fault: a fault anywhere in the library triggers the yellow fault LED.

- OK: indicates the library is functional (green), but the library might be in a degraded state (the Fault indicator is on concurrently with OK).

FIGURE 1-3 Library System Indicators



L207_135

Human Interfaces

Graphical user interfaces provide *limited* local access and full role-based remote access control of the library.

- The front control panel provides a 7 inch LCD touch panel with an 800 X 480 pixel resolution. The panel is used to initialize the library with three basic settings: default password, date/time, Port 1 network settings (see [Chapter 4, “Library Initialization”](#)). The values for the basic settings are entered from a keyboard screen (see [“Installation Wizard Keyboard Screens”](#) on page 17). When initialization is complete and the library restarts, the panel serves as an information point rather than a maintenance tool (see [FIGURE 1-4](#) on page 16). The masthead on the screen lists the library health state and a description of the current library state. The Home screen contains sections for the library, modules, magazines, mailslot, partitions, drives, tapes, and settings. The partitions section is not shown unless the library has been configured with partitions using the remote management interface (GUI).
- The primary management interface for the SL150 library is accessed by entering the library hostname or IP address into a web browser (IE8, Firefox, Chrome, or Safari). The interface provides information for the library, drives, tapes, settings, and service depending on the user role. The interface recognizes four user roles: viewer, operator, service, and administrator.

[FIGURE 1-5](#) on page 16 is an example of the screen seen by the administrator role. The Library information is presented as a graphical representation of the tape slots in the left magazine, tape slots in the right magazine, and tape drives between the magazines for each module. The mailslot is above the right magazine and the robot is above the left magazine of Module 1. Information for drives, tapes, settings, and service is generally shown in tabular format. Some screens have tabs to categorize the type of information available.

- Customer Replaceable Unit (CRU) indicators. Most CRUs have an OK indicator that shows it is operational (green). If any of those CRUs have a failure, a Fault indicator (yellow) is shown instead. The drive CRU has a blue indicator that is activated from the remote interface to indicate the CRU is safe to remove and aids in locating the specific drive needing replacement.

FIGURE 1-4 Front Control Panel Home Screen



FIGURE 1-5 Remote Interface for SL150 Library (Library Menu)

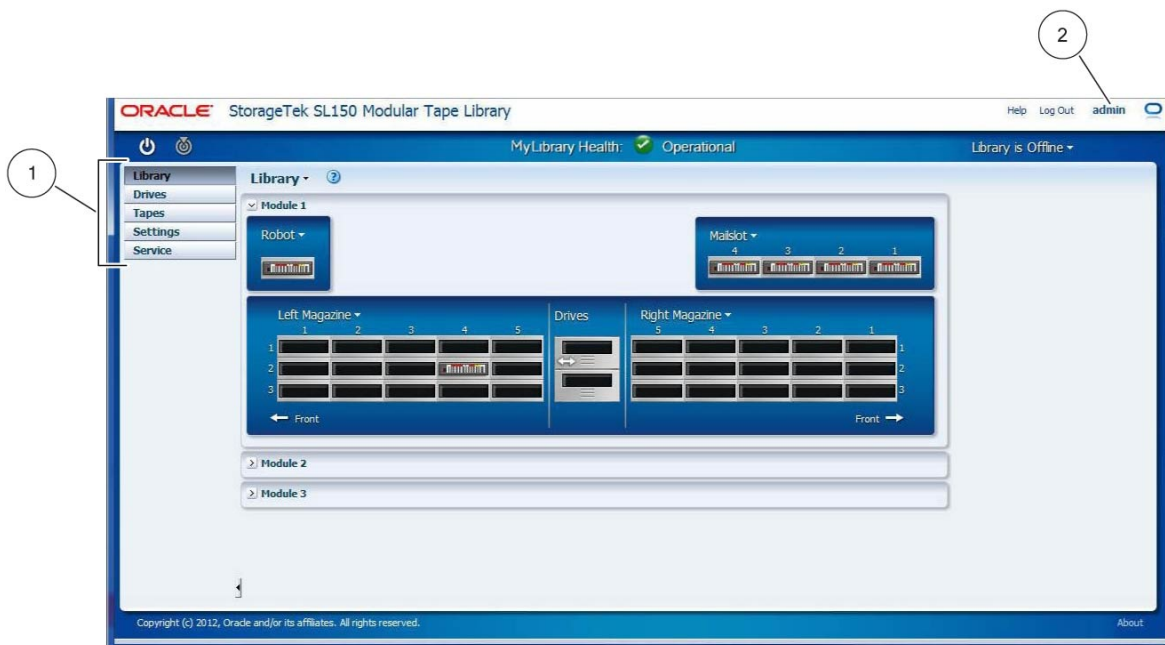


Illustration Legend:

1. Menus
2. User (*admin* in this Example)

Installation Wizard Keyboard Screens

In general, you enter installation wizard values from a keyboard screen and tap buttons to apply selections or navigate forward and backward through the various screens.

The keyboard opens in a window with white borders. The keyboard consists of two sections (see [FIGURE 1-6](#)):

- Upper section: a parameter field followed by buttons
- Key section: four rows of keys (three screens to list the full keyboard content)

[FIGURE 1-6](#) shows the letter keys

[FIGURE 1-7 on page 18](#) shows the number keys (accessed by tapping the ?123 key from either the letters screen or special characters screen)

[FIGURE 1-8 on page 18](#) shows the special characters keys (accessed by tapping the *+= key from the numbers screen)

The left key in the bottom (first) row is always a shortcut to another keyboard screen. On the numbers screen and special characters screen, the left key in the row immediately about the bottom row (second row) is a shortcut to a second keyboard screen.

Certain keys in the bottom row are standard in all keyboard screens (period, Space, @, and Enter keys).

FIGURE 1-6 Letters Screen



Illustration Legend:

1. Key to Access the Numeric Keyboard
2. Done Key
3. Enter Key

FIGURE 1-7 Numbers and Characters Screen



Illustration Legend:

1. Key to Access the Special Characters Keyboard
2. Key to Access the Letters Keyboard
3. Done Key
4. Enter Key

FIGURE 1-8 Special Characters Screen



Illustration Legend:

1. Key to Access the Numbers Keyboard
2. Key to Access the Letters Keyboard
3. Done Key
4. Enter Key

Specifications

Physical:

- Depth: 92.5 cm (36.4 inches including 2.25 inches of tape drive extension)
- Height:
 - Base module: 3U (13.3 cm, 5.25 inches)
 - Expansion module: 2U (8.89 cm, 3.5 inches)

- Width: 48.1 cm (18.9 inches) standard 19 inch rack system
- Weight:
 - Base module (Module 1): 27.2 kg (60 pounds) including left and right magazines, robot, two tape drives, and two power supplies
 - Expansion module (Module 2 through Module 10): 14.1 kg (31 pounds) including left and right magazines, two tape drives, and two power supplies

Power Supply:

- Input Voltage: 100-240 V
- Line frequency: 50-60 Hz
- Current: 2.1 A
- Output: 157.5 Watts (maximum)

Note – Each module can hold up to two power supplies. An SL150 library with ten modules can have up to 20 power supplies.

Rack space requirements:

- Base module (Module 1): 3U (13.3 cm, 5.25 inches)
- Expansion module (Module 2 through Module 10): 2U (8.89 cm, 3.5 inches)
- Under the bottom module: 1U (49.5 mm, 1.75 inches) for service access

Installation Overview

The initial installation of the SL150 library involves the following:

- [Chapter 2, “Planning and Preparation”](#)
- [Chapter 3, “Hardware Installation”](#)
- [Chapter 4, “Library Initialization”](#)
- [Chapter 5, “Checkout”](#)

Post-installation, the library can be upgraded with more expansion modules, tape drives and power supplies. Refer to:

- [“Expansion Module Installation Overview” on page 37](#)
- [Chapter 6, “Adding Power Supplies and Tape Drives”](#)

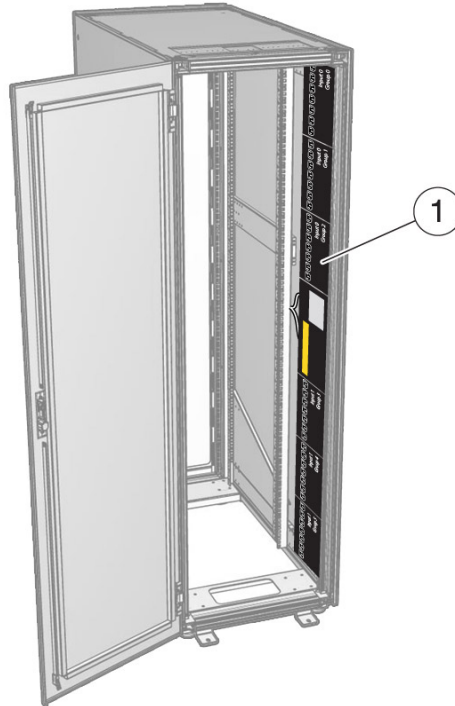
Planning and Preparation

Note – The installation instructions in this guide are based upon the Sun Rack II which is the standard Oracle 19-inch rack.

Rack Preparation

- It is suggested that you position the power distribution unit on the right side of the rack as viewed from the rear of the rack (see [FIGURE 2-1](#)). The SL150 power supply outlets are on the right side.

FIGURE 2-1 Rear View of Sun Rack II (PDU on Right Side)



L207_136

Illustration Legend:

1. Power Distribution Unit (PDU)

Note – Refer to the rack and power distribution unit documentation for instructions.

- The rack front and rear service clearance must be at least 96.5 cm (38 inches).
- Provide sufficient space to install the base module (3U) and any additional modules (2U each) at initial installation (a 300 tape library, ten modules, spans 21U). In addition:

Position the base module in the rack to enable easy access to the operator panel and mailslot

Allow for future expansion (2U modules)

Allow 1U service access below the bottom module

- It is suggested that you remove the front door from the rack to provide unimpeded access during installation of a library module.

Tape Device Driver

Make sure that the proper device driver is installed, if applicable. Download the driver from the HP web site, if needed.

For example, Oracle has qualified the HP LTO-5 drive with Windows driver 3.5.0.0.

Environmental Information

Temperature:

- Operating: +10° to +40°C (-50° to +104°F)
- Non-operating -40° to +60°C (-40° to +140°F)

Relative Humidity:

- Operating: 20% to 80% non-condensing
- Non-operating: 10% to 95% non-condensing

The operating environment must adhere to additional requirements (see [Appendix C, “Controlling Contaminants”](#)).

▼ To Stage the SL150 Library

Warning – An unpacked base module (Module 1) weighs approximately 27.2 kg (60 pounds). Use two persons to lift or transport.

1. Grasp the cutouts on each side of the shipping carton.
2. Lift the carton and transport it to the staging area.

▼ To Unpack and Acclimate the SL150 Library

Task 1: Unpack the Library Module

1. Open the carton.

2. Remove the front rails from the base module packing material and set them aside.

Note – The rails will be used in a later instruction (see “[Base Module Mounting Rail](#)” on page 28).

3. Remove the foam pieces which cover the top of the library module.
4. Remove the accessory package at the end of the module, and set it aside.
5. Lift the plastic covering the module.

Task 2: Acclimate the Library Module

Warning – Module is heavy. Use two persons to lift or transport.

1. Grasp the module by the sides, lift it out of the carton, and set it down.

Note – Do not lift the Base Module by the front control panel, the tape drive, or the tape drive filler.

2. Acclimate the module to the environment.

Note – If the module is colder than the location and sufficient humidity exists, condensation may occur.

3. Continue with Chapter 3.

Hardware Installation

The installation instructions in this manual address a two module SL150 and a rack with square holes.

Overview

The base module (Module 1) sits on rails which are secured to the rack with 8-32 screws and mounting blocks. The installation allows sufficient space to expand the library to include a maximum of ten modules. Each module is secured to a vertical rack rail (or stile) with screws and a back rail. The base module connects to each expansion module by a cable. [FIGURE 3-1](#) shows screws and a clip nut.

FIGURE 3-1 Installation Overview

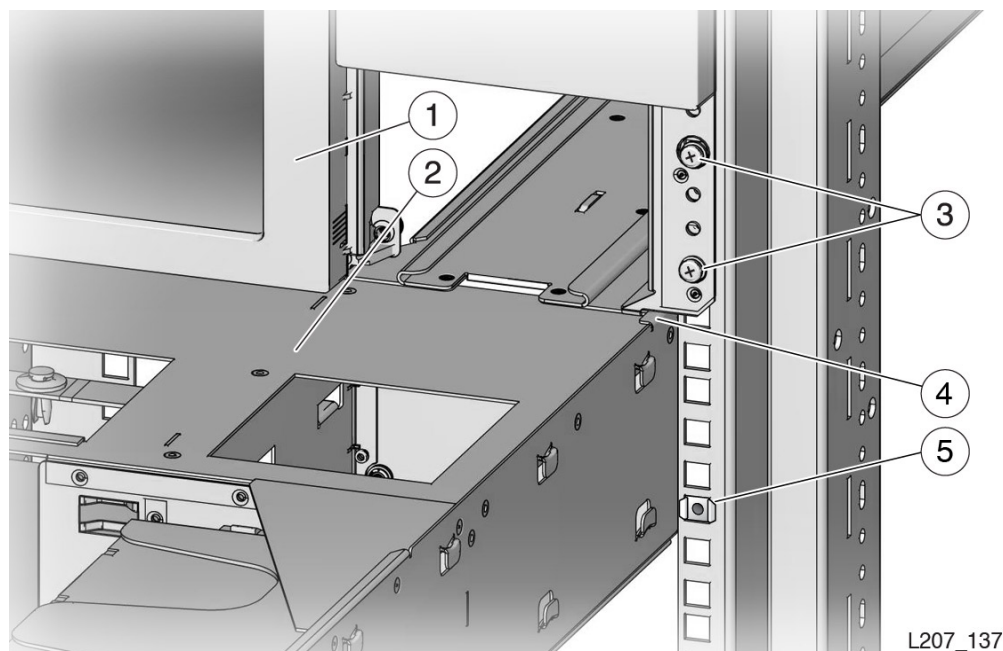


Illustration Legend:

1. Base Module (Module 1)
2. Expansion Module (Module 2)

3. Screws

4. Module Flange

5. Clip Nut

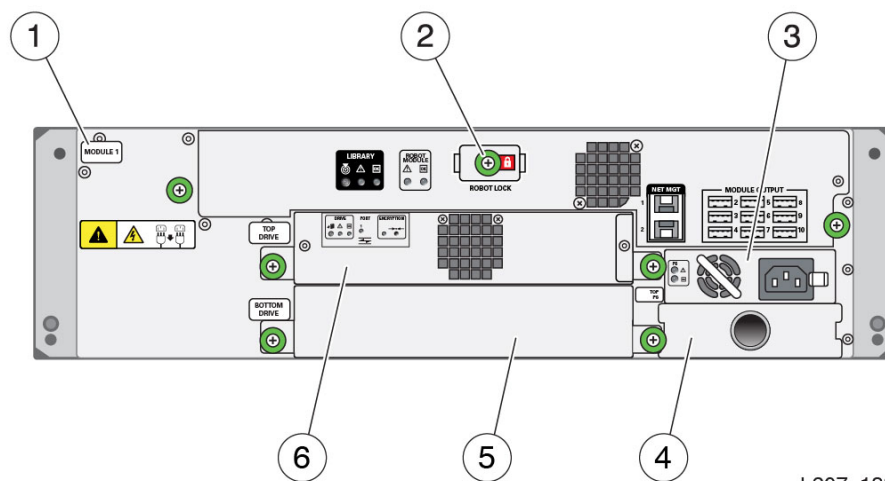
The module accessory package contains parts needed to complete the installation (such as the back rail pieces, screws, clip nuts, and mounting blocks).

After securing the base module in the rack, you can add one or more modules to expand cartridge capacity and increase the number of tape drives. The tape drive assemblies and power supplies are located at the back of a module (see [FIGURE 3-2](#)).

The robot CRU is located at the top of the base module. The robot is locked in the retracted position during shipment (see [FIGURE 3-2](#)). You must reset the robot lock during the initial installation process. To add modules after the initial library installation, you must park the robot and lock it in the shipping position prior to installation of an expansion module.

Each module is identified by a label in the rear, upper-left corner (Module 1 in [FIGURE 3-2](#)). The first expansion module is identified as Module 2 while the ninth expansion module is identified as Module 10. The identification label for an expansion module is attached during the installation process.

FIGURE 3-2 Rear View of the Base Module (Module 1)



L207_138

Illustration Legend:

1. Module Label
2. Robot Lock
3. Power Supply
4. Power Supply Filler
5. Tape Drive Filler
6. Tape Drive Assembly

Note – The installation instructions in this guide are based upon the Sun Rack II. If your rack is different (M5 or M6 holes), use the instructions as a basic guide but alter steps accordingly.

Base Module Installation

The following tasks are performed to install the base module:

1. Prepare the rack (see [“Rack Preparation” on page 21](#)).
2. Unpack and acclimate the base the module (see [Chapter 2, “Planning and Preparation”](#)).
3. Gather the mounting hardware from the *accessory package*.
4. Install the mounting rails (front and rear).
5. Install clip nuts in a rack with square holes.
6. Mount the base module in the rack.
7. Unlock the robot.
8. Attach cables to the library and tape drive.
9. Power on the library.
10. Initialize the library.

▼ Gather the Rail Parts

1. Open the accessory package and remove the items from the package.
2. Inventory parts to make sure you have everything for the module you are installing.
3. Select the appropriate attachment hardware for your rack, and set the other hardware aside.

Note – A rack with square mounting holes uses the clip nuts and 10-32 X 5/8 screws (the M5 and M6 screws are only used in threaded hole racks).

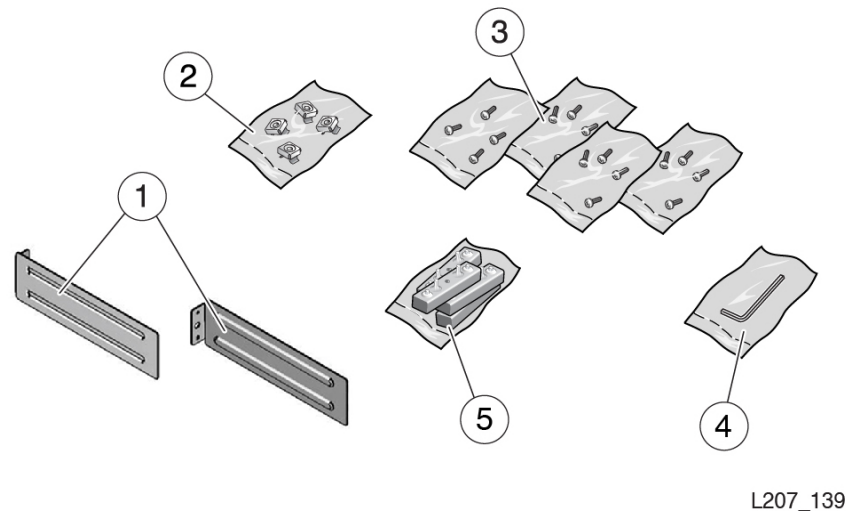
4. Retrieve the front rails that were set aside when unpacking the base module.

The base module *accessory package* contains the following attachment hardware (see [FIGURE 3-3 on page 28](#)):

- Back rails
- 10-32 clip nuts (used in racks with square holes)
- Assorted screws
 - 8-32 X 5/8 screws (used with the mounting block)
 - 10-32 X 5/8 screws (used with clip nuts and racks with 10-32 threaded holes)
 - M5 0.8 X 16 mm screws (used with M5 threaded hole racks)
 - M6 16 mm screws (used with M6 threaded hole racks)

- Hex key (used to manually open a magazine)
- Mounting block

FIGURE 3-3 Base Module Accessory Package Mounting Hardware



L207_139

Illustration Legend:

1. Back Rails
2. Clip Nuts
3. Screws (assorted types)
4. Hex Key
5. Mounting Block

Base Module Mounting Rail

The base module mounting rail consists of two parts (front rail and back rail). The front rail is installed after the back rail.

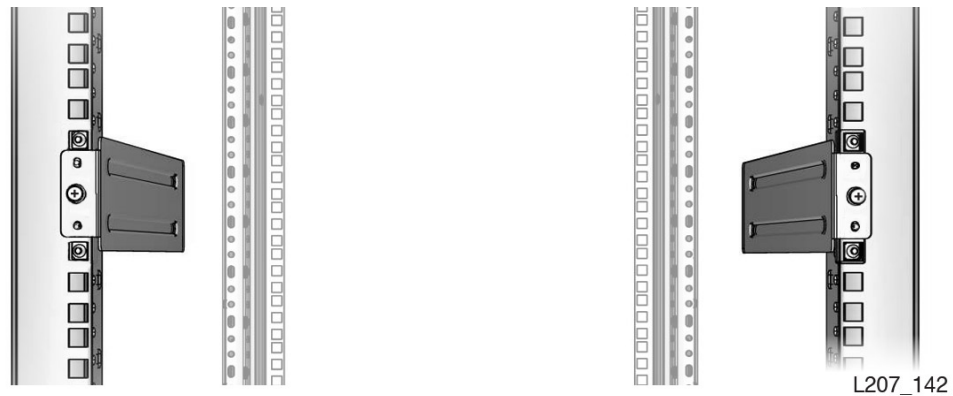
Back Rail

Installation of the back rails involves three part types: back rail, mounting block, and an 8–32 screw. A back rail installed on each side of the rack. [FIGURE 3-4 on page 29](#) shows the completed installation of the back rail.

Note – The mounting block has two pins and a threaded hole. These elements must reside within a single defined U boundary. Use the scribe marks, notches, or other designations to identify the U boundary. Do not mount the block with the pins straddling a U boundary.

Tool Requirement

#2 Phillips screwdriver (not provided).

FIGURE 3-4 Back Rails Installed

▼ To Install the Base Module Back Rails

Note – An operator in a seated position might need to access the library front control panel and mail slot. Mount the base module at a height that enables easy user access to the front control panel while providing sufficient space for library expansion below the base module (a 300 cartridge library spans 21 U but an additional 1U service clearance is recommended below the library).

The following instructions and supporting illustrations use rack units 32 through 34 for installation of the base module while providing access for seated users. The back rail is mounted in the middle rack unit (unit 33 for this example).

1. **Locate the rack unit designation where you will install the back rail (use the rail installation template as necessary), and allow rack space for library expansion.**
2. **Position the mounting block so the screw hole is in the second hole (center hole) of the rack unit.**

Note – The pins and screw hole must be within the boundaries of a single rack unit. Pay attention to the rack stile scribe lines or notches which identify the rack unit boundaries.

3. **Hold the block in place.**
4. **Position the back rail so the blade extends to the interior of the rack (see [FIGURE 3-5 on page 30](#)).**
5. **Use one hand to hold the back rail and the mounting block in position.**
6. **Insert the 8–32 screw into the mounting block hole, and turn the screw several full turns by hand.**
7. **Tighten the 8–32 screw with a #2 Phillips screwdriver.**

Note – If this is a square hole installation, make sure the face of the mounting block is flush with the rack rail. In round hole racks, make sure the pins are within a rack unit and extend an equal distance (see [FIGURE 3-5 on page 30](#)).

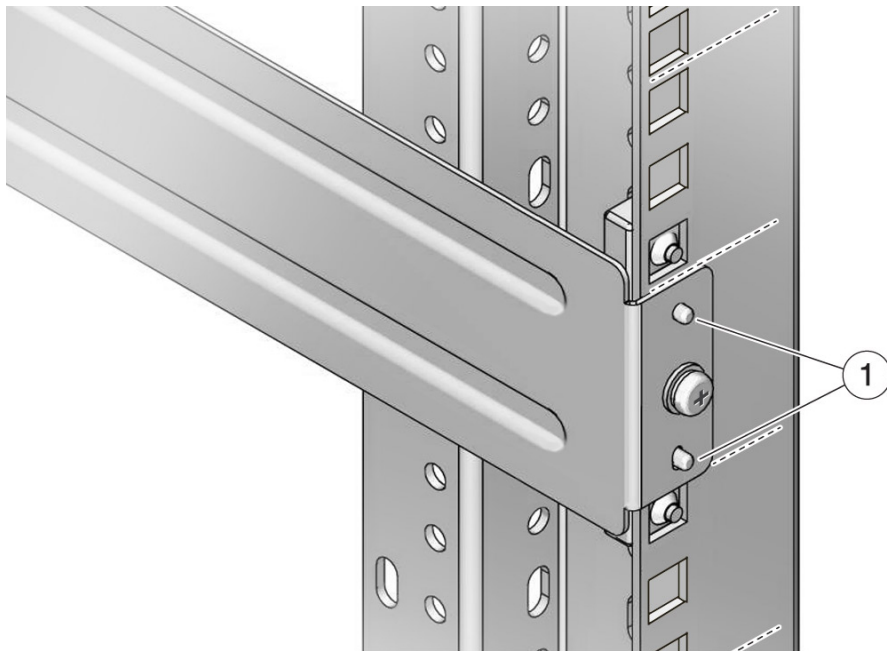
8. Make sure the wide surface of the back rail is plumb with the inside edge of the rack stile while maintaining an equal gap between the rack stile and the top and bottom edges of the back rail.

Note – The back rails should neither tilt in nor out.

9. Repeat the procedure for the back rail at the identical rack unit on the opposite side of the rack.

Note – It is critical that the top edges of the back rails are level with each other (see [FIGURE 3-4 on page 29](#)).

FIGURE 3-5 Back Rail Position



L207_141

Illustration Legend:

1. Pins

Front Rail

The front rail engages the back rail and is installed from the front of the rack (see [FIGURE 3-6 on page 31](#)). Installation hardware involves three parts: front rail, mounting block, and an 8–32 screw.

Tool Requirement

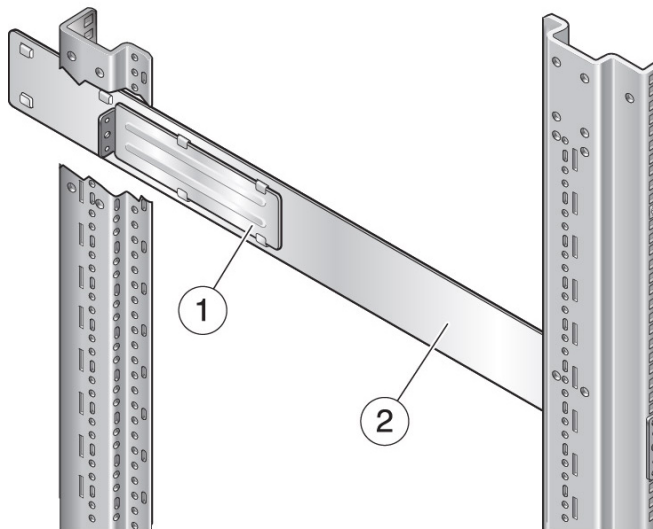
#2 Phillips screwdriver.

▼ To Install the Front Rail

Task 1: Connect the Front Rail to the Back Rail

1. Grasp the front rail and position it so the blade is facing into the rack with the rail tabs toward the outside of the rack.
2. Align the back edge of the front rail with the back rail (see [FIGURE 3-6](#)).
3. Slide the front rail toward the back rail to engage the front rail tabs.
4. Push the front rail into the rack until the front edge of the rail is approximately 6 cm (2.4 inches) from the rack stile.

FIGURE 3-6 Front Rail Installation (Left Rail Shown)



L207_143

Illustration Legend:

1. Back Rail
2. Front Rail

Task 2: Secure the Front Rail

1. Position the mounting block behind the rack stile in the second U of the three U span (see [FIGURE 3-7 on page 32](#)).

Note – The pins and screw hole must be within the boundaries of a single rack unit. Pay attention to the rack stile scribe lines or notches which identify the rack unit boundaries.

Tip: You might need to flex the front of the rail away from the rack stile while positioning the mounting block.

2. Hold the block in position with one hand.
3. Push the front rail against the rack stile.
4. Insert the 8–32 screw through the hole in the front rail and thread the screw by hand a few turns into the mounting block.

5. Tighten the 8–32 screw with a Phillips screwdriver while making sure that the rail is plumb with the inside edge of the rack stile.

Note – The front rail should not tilt in or tilt out.

6. Repeat Task 1 and Task 2 for the front rail at the identical rack unit on the opposite side of the rack.

FIGURE 3-7 Mounting Block for Front Rail (Right Rail Shown)

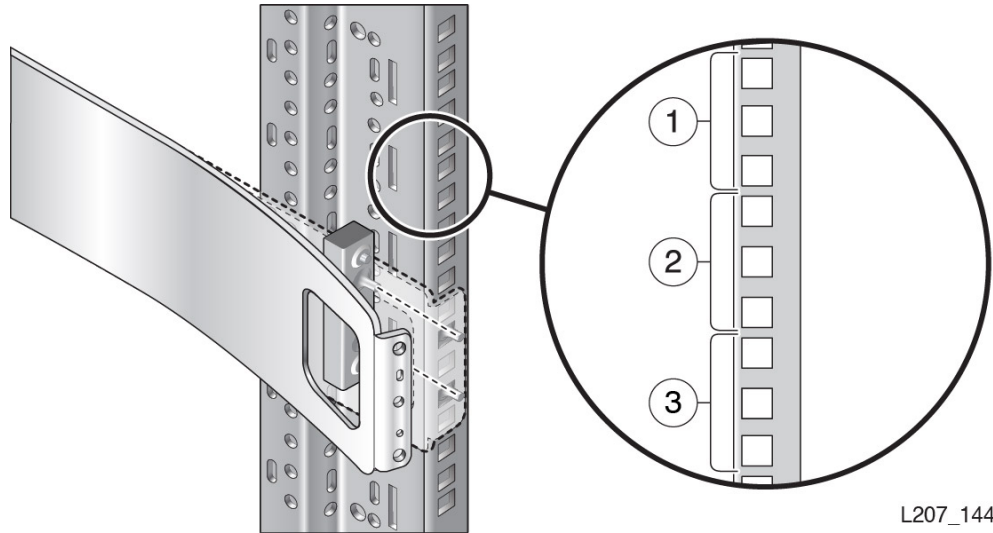


Illustration Legend:

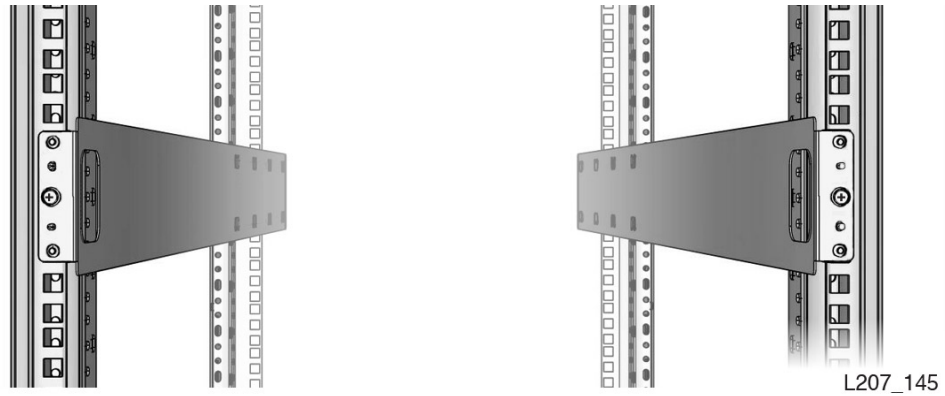
1. First U
2. Second U
3. Third U

Task 3: Verify Proper Front Rail Installation

1. Verify that the rack rails are parallel with each other (installed in the same rack unit positions).

Note – Do not proceed with the installation unless the rails are parallel. It is critical for the rack rails to be installed parallel with each other (see [FIGURE 3-8 on page 33](#)).

2. If your rack has threaded holes, proceed to [“Mount the Base Module” on page 35](#).

FIGURE 3-8 Rails Installed - Front View

Clip Nut Location

Note – Clip nuts are only used in racks with square holes.

Two screws secure the module to the rack. Racks with square holes use a clip nut and a 10–32 X 5/8 screw. The base module spans 3Us, and the clip nut is installed in the center hole of the lowest (third) rack unit (see [FIGURE 3-9](#)).

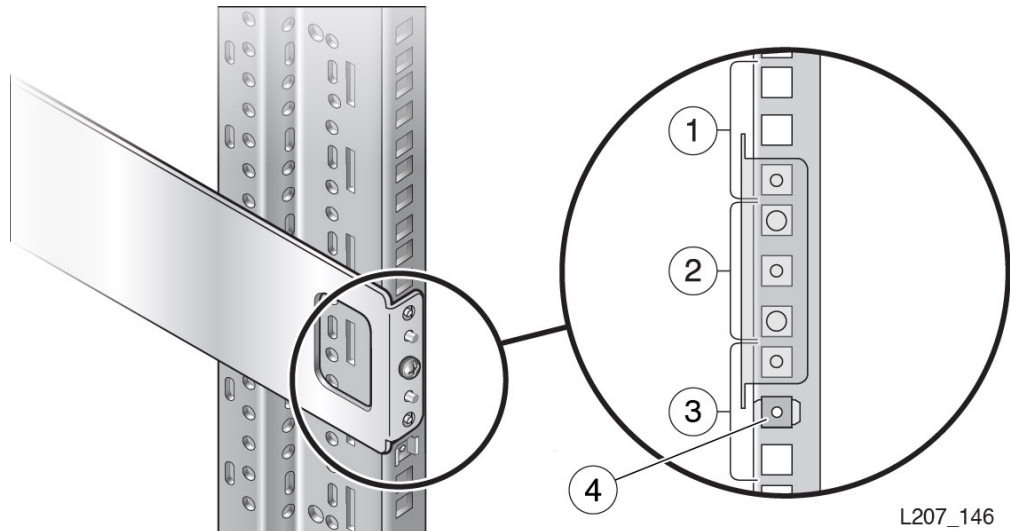
FIGURE 3-9 Clip Nut Location for the Base Module

Illustration Legend:

1. First U
2. Second U
3. Third U
4. Clip Nut is second hole of the third U

▼ To Install the Clip Nut

Note – Clip nuts are only used in racks with square holes.

1. Open the package containing clip nuts.
2. Locate the hole immediately below the front rail (second hole in the third U).
3. Seat one edge of the clip nut into the hole from the rear of the rack stile.

Note – The square nut is located on the inside of the rack stile.

4. Compress the other edge of the clip nut and seat it in the hole.

A tool, such as a small flat blade screwdriver, simplifies the compression.

5. Repeat for each front rail.

Mount the Base Module

Installation of the base module involves engaging the tabs on the side of the module with the rack rails (see [FIGURE 3-10](#)), removing the cartridge magazines, securing the module to the rack with screws, reinstalling the cartridge magazines, releasing the robot lock (see [FIGURE 3-2 on page 26](#)), and connecting cables.

FIGURE 3-10 Tab and Rail Engagement

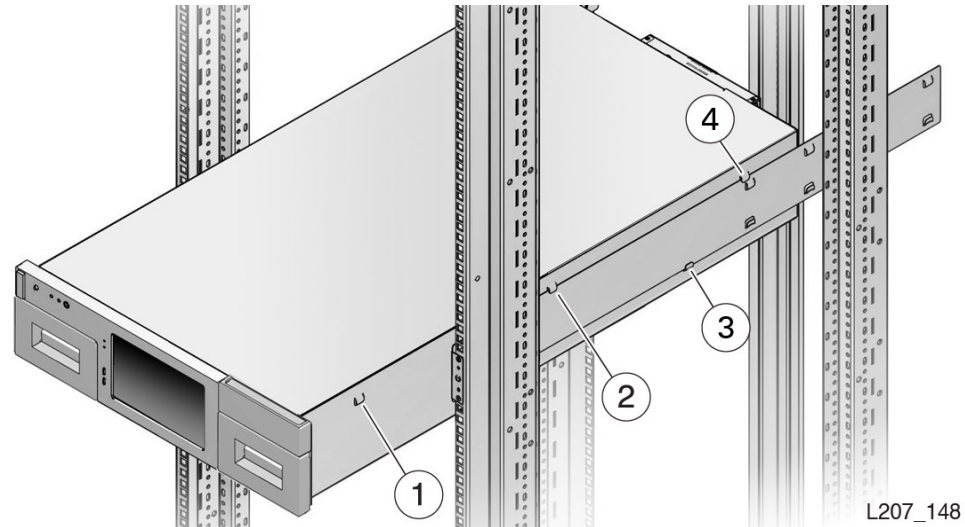


Illustration Legend:

1. Front Tab
2. Center Tab
3. Bottom Tab
4. Rear Tab

▼ To Insert the Base Module

Task 1: Engage the Base Module with the Rail

Warning – The base module (Module 1) is heavy. Use two people to lift and install it. Never lift it by the front control panel or the tape drive. Always lift the module from the side.

1. Grasp the module along the sides and lift the back above the rack rails.
2. Guide the module into the rack and set the rear side-tabs on the rack rails (see [FIGURE 3-10](#)).

Note – If the module does not fit properly, remove it from the rack. Adjust the rail spacing as necessary. *Never* bend the base module side tabs.

3. Push the module into the rack to engage the bottom and center side tabs.

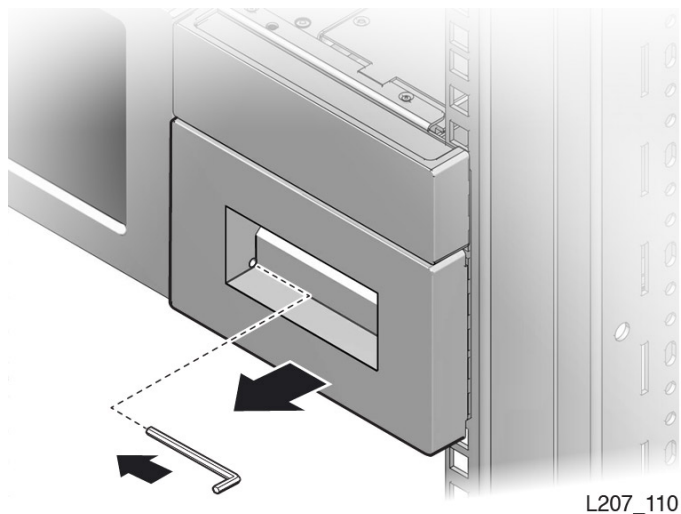
Note – If you can not engage the rails properly, remove the module and adjust the rails. *Never* bend the tabs to engage a rail.

4. Push the module into the rack until the front side-tabs approach the front of the rack rails.
5. Lift the module up slightly, push it into the rack, and set the front tabs down on the rack rail.

Task 2: Remove the Cartridge Magazines

1. Insert the hex key in the access hole at the lower inside corner of the cartridge magazine (see [FIGURE 3-11](#)).
2. Align the hex key shaft parallel with the magazine face.
3. Push the tool slowly into the hole to release the latch located behind the touch screen, and hold the hex key in place.
4. Grasp the cartridge magazine opening with your other hand, and pull the magazine a short distance out of the library.
5. Remove the hex key and store it for future use.
6. Support the bottom of the magazine with your other hand during removal.
7. Pull the magazine out of the module, and set it aside.
8. Remove the cartridge magazine from the other side of the base module.

FIGURE 3-11 Magazine Latch Release



Task 3: Secure the Base Module to the Rack

Note – Use the 10-32 screw when the rack has square mounting holes (screw mates with the clip nut).

1. Insert a screw through the bottom hole of the base module and thread it a few full turns.

Note – Use a 10-32, M5, or M6 screw depending on your rack hardware.

2. Insert a screw into the bottom hole on the other side of the module and thread it a few full turns (see [FIGURE 3-1](#) on page 25).
3. Fully tighten both retaining screws.

4. Replace the cartridge magazines if you are not installing expansion modules.

Note – Left and right magazines are unique. Orient the magazine so the cartridge openings face the Front Control Panel.

Note – Do not put cartridges in the magazine slots.

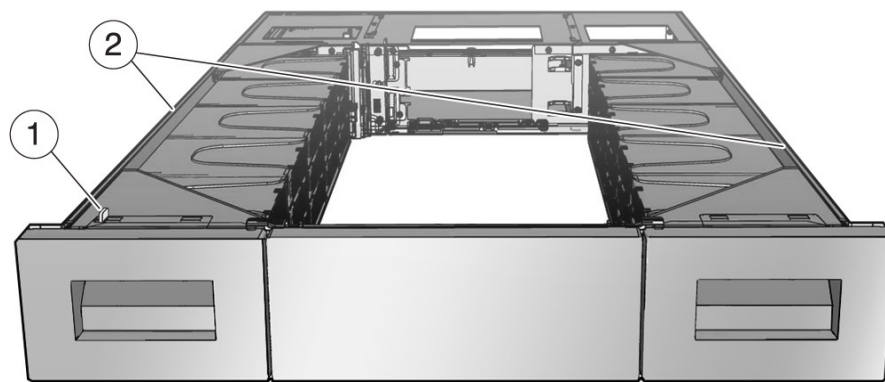
5. Continue with the applicable task:

- “Expansion Module Installation Overview”
- “Final Hardware Actions” on page 50

Expansion Module Installation Overview

You can add up to nine 2U modules to expand cartridge capacity and increase the number of available tape drive assemblies (see [FIGURE 3-12](#)). The expansion module is installed under the base module or the last 2U module (see [FIGURE 3-1 on page 25](#)).

FIGURE 3-12 Expansion Module



L207_150

Illustration Legend:

1. Alignment Tab
2. Flanges

The following tasks are performed to install the expansion module:

1. Unpack and acclimate the expansion module (see [Chapter 2, “Planning and Preparation”](#)).
2. When adding a module to an operating library, you must park and lock the robot then remove power from the library.
3. Remove the magazines and library floor from the previously installed module.
4. Insert clip nuts at the front and rear of a rack with square holes.
5. Remove tape cartridge magazines from the expansion module.

6. Replace the library floor in the last expansion module before you install the module.
7. Install the module to the existing library which includes mating the expansion module with the installed module, seating the alignment tab in the left magazine slot, installing the back rails, and securing the module to the rack with screws.
8. Reinstall the cartridge magazines.
9. Attach the module label.
10. Unlock the robot.
11. Connect cables.
12. Apply power to the library.

Tool Requirement

#2 Phillips screwdriver.

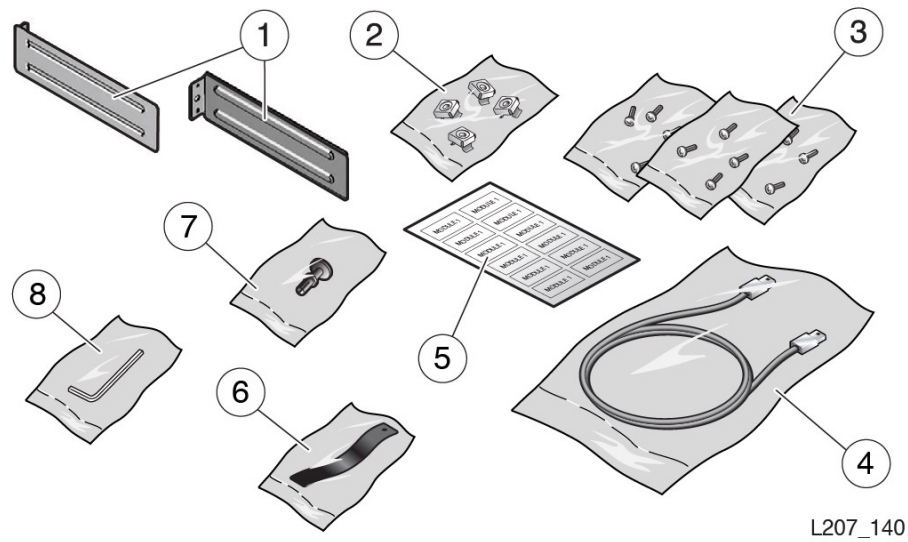
▼ To Unpack and Acclimate the Expansion Module

- Follow the instructions in [“To Unpack and Acclimate the SL150 Library” on page 22](#)).

Expansion Module Attachment Kit

The expansion module (Module 2 through Module 10) *accessory kit* contains the following attachment hardware (see [FIGURE 3-13 on page 39](#)):

- Back rails
- 10–32 clip nuts (used in racks with square holes)
- Assorted screws:
 - 10–32 X 5/8 screws (used with clip nuts and racks with 10-32 threaded holes)
 - M5 0.8X 16 mm screws (used with M5 threaded hole racks)
 - M6 16 mm screws (used with M6 threaded hole racks)
- Expansion interconnect cable with USB Type A connectors
- Label set (Module 2 through Module 10)
- Hook and loop strap
- Pop-in rivet
- Hex key

FIGURE 3-13 Expansion Module Accessory Package Hardware**Illustration Legend:**

1. Back Rails
2. Clip Nuts
3. Screws (assorted)
4. Expansion Cable with USB Type A Connectors
5. Module Labels
6. Hook and Loop Strap
7. Rivet
8. Hex Key

▼ Gather the Attachment Hardware

1. Remove the contents from the accessory package.
2. Inventory the items to make sure you have everything to install the module.
3. Select the items appropriate for installation in your rack, and set the others aside.

Note – Always use the back rails, module labels, and the expansion cable. Use the hook and loop strap and rivet as desired for cable management. Use the clip nuts and 10-32 screws for racks with square holes. Use the appropriate screws for racks with threaded holes. For example, a rack with M5 threaded holes uses only the M5 screws (the clip nuts, 10-32 X 5/8 screws, and M6 screws are not used).

▼ To Power Down the Library

Note – If you are installing the expansion module during the initial library installation, continue with [“To Remove the Library Floor” on page 41](#).

Task 1: Power Down the Library

1. Quiesce the host application to prevent disruption of active storage operations.
2. Log in to the SL150 remote interface (see [FIGURE 4-10 on page 63](#)).
3. Click the power icon in the upper left of the screen (see [FIGURE 3-14](#)), and select Power Down Library from the list control.
4. Check Prepare the Robot for removal before the library powers down (see [FIGURE 3-15 on page 41](#)), and click OK.

FIGURE 3-14 Power Down Options

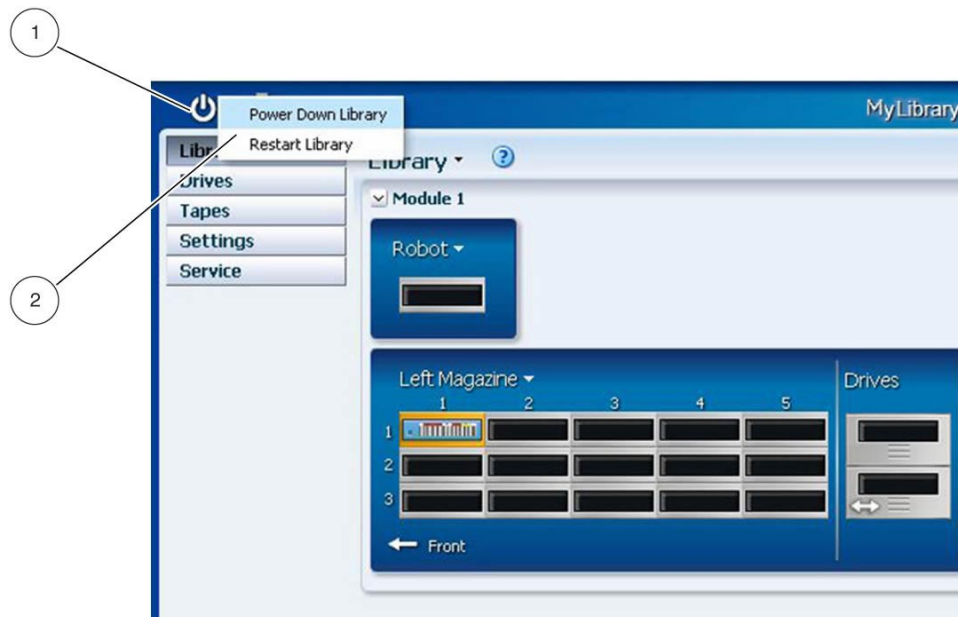
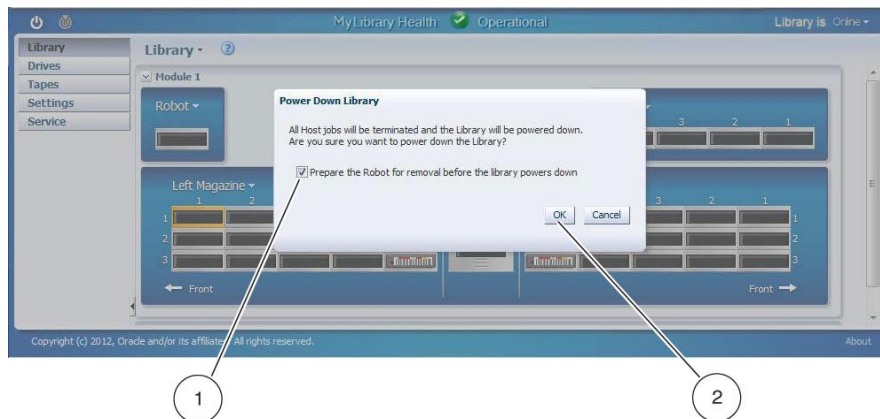


Illustration Legend:

1. Power Icon
2. Power Down Library Command

FIGURE 3-15 Prepare Robot for Removal**Illustration Legend:**

1. Prepare Robot for Removal Checkbox
2. OK Button

Task 2: Lock the Robot

1. Locate the robot lock on the base module (see [FIGURE 3-2 on page 26](#)).
2. Loosen the thumbscrew on the lock mechanism.
3. Remove the lock, rotate it 180 degrees, insert the lock mechanism into the base module slot, and tighten the robot lock thumbscrew.

Note – The *locked* padlock icon is visible.

▼ To Remove the Library Floor

1. Remove the cartridge magazines (see [“Task 2: Remove the Cartridge Magazines” on page 36](#)) from the bottom module of the library.
2. Grasp the finger holds on the front edge of the floor in the magazine bay (see [FIGURE 3-16 on page 42](#)).
3. Pull the floor out the front of the module, and set it aside.

FIGURE 3-16 Library Floor Removal from the Base Module

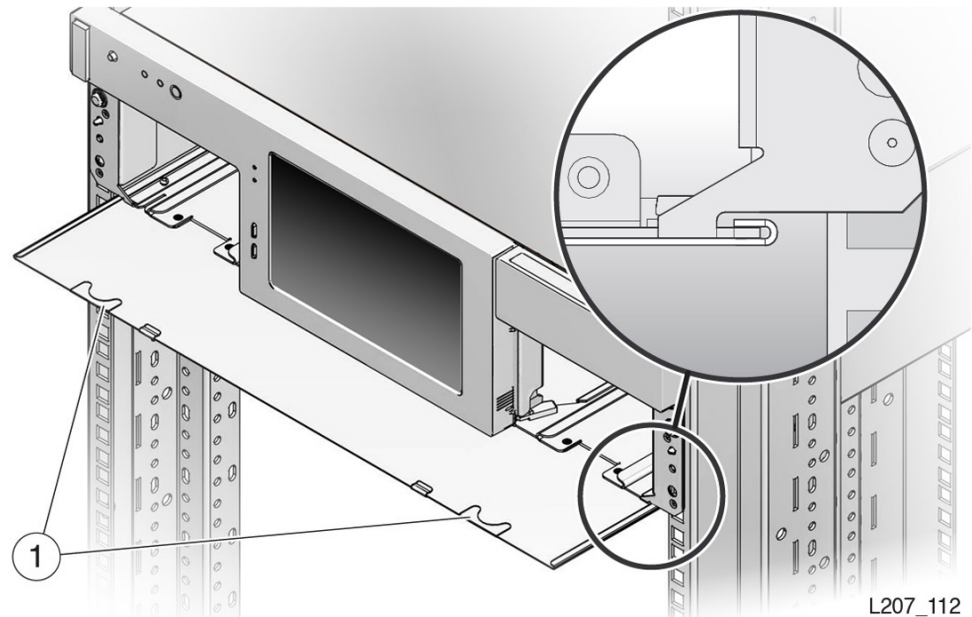


Illustration Legend:

1. Floor Finger Holds

▼ To Install Clip Nuts for the Expansion Module

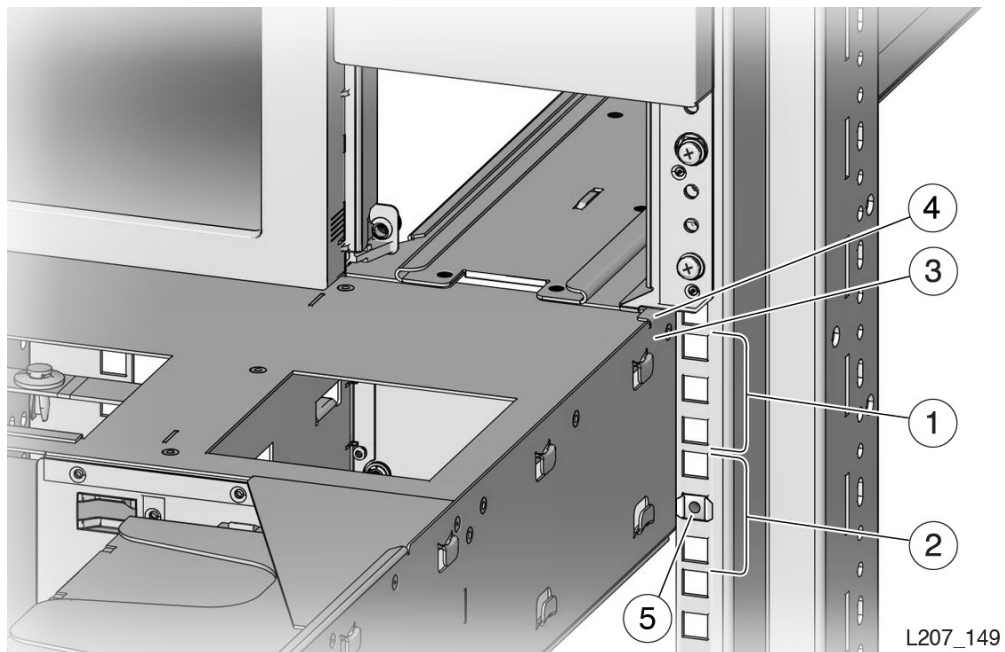
Note – The instructions in this section assume a rack with square holes. If your rack has threaded holes, go to [“To Prepare the Expansion Module for Installation”](#) on page 43.

Task 1: Install Clip Nuts at the Front of the Rack

1. Locate the 2U space immediately below the installed module.
2. Insert a clip nut into the middle hole of the second U (fifth hole down from the junction of the first U boundary) on both the left and right rail stiles (see [FIGURE 3-17 on page 43](#)). Use the Rail Installation Template, if desired.

TIP: The square nut is located on the inside of the rack stile.

3. Make sure the clip nuts are parallel (in the identical mounting hole).

FIGURE 3-17 Expansion Module Installation**Illustration Legend:**

1. First U
2. Second U
3. Module Flange
4. Module Engagement
5. Clip Nut Location (second hole of second U)

Task 2: Install Clip Nuts at the Back of the Rack

1. Locate the 2U space at the back of the rack immediately below the installed module.
2. Insert a clip nut in the third hole down from the junction of the first U boundary (see [FIGURE 3-17](#)) on both the left and right rail stiles.

TIP: The square nut is located on the inside of the rack stile.

3. Make sure the clip nuts are parallel (in the identical mounting hole).

▼ To Prepare the Expansion Module for Installation

Note – This step assumes that you have removed the expansion module from the shipping container (see [“To Unpack and Acclimate the SL150 Library”](#) on page 22).

Task 1: Remove the Cartridge Magazines

1. Reach behind the front panel and lift the latch to release the magazine (see [FIGURE 3-18 on page 44](#)).

The expansion module is open at the top, and the latches are located behind the front face of the module.

TIP: You can also release the magazine with the hex tool.

2. Remove the cartridge magazines from the module you are installing.

FIGURE 3-18 Magazine Latches

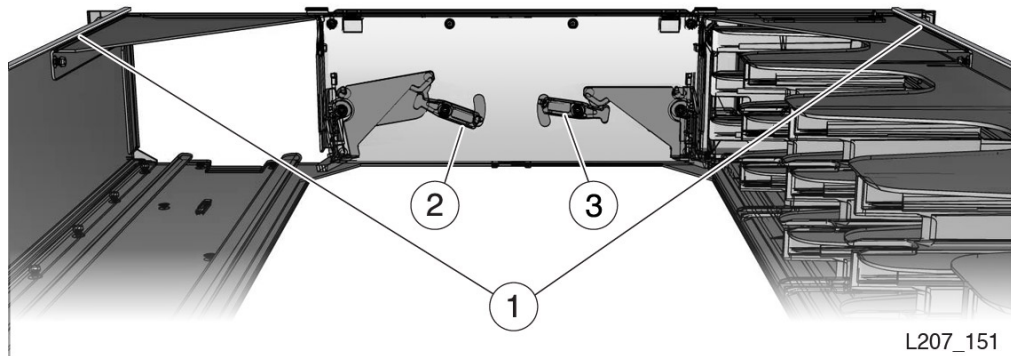
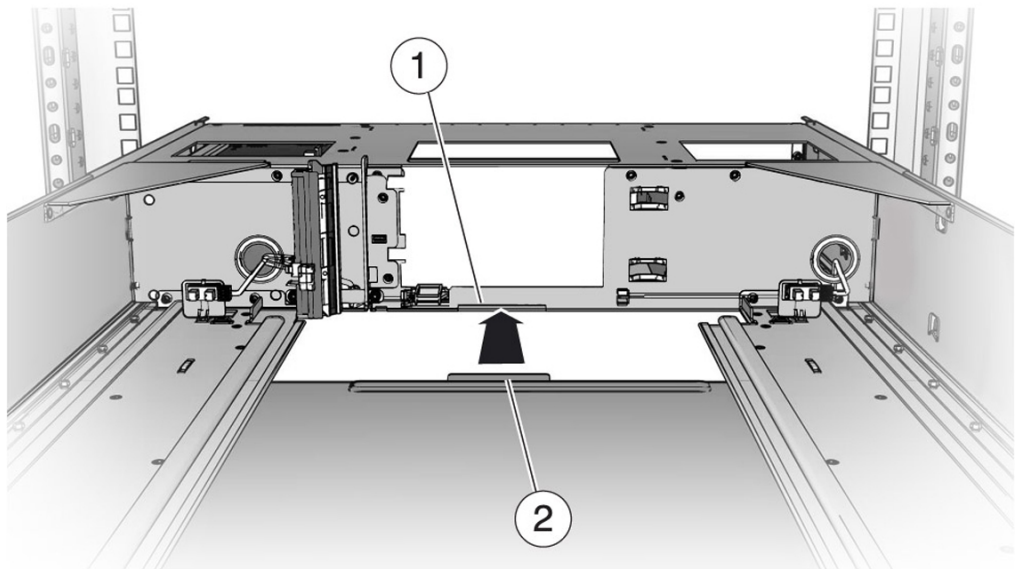


Illustration Legend:

1. Module Flanges
2. Unlatched Position
3. Latched Position

Task 2: Install the Floor in the Last Expansion Module

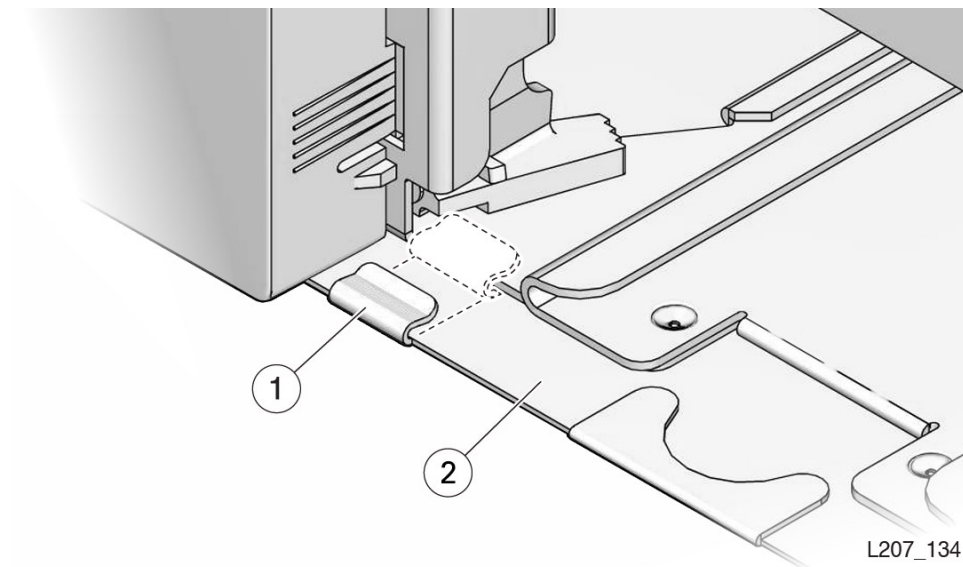
1. Turn the expansion module over.
2. Orient the floor so the finger holds are facing the inside of the cartridge magazine slot (see [FIGURE 3-16 on page 42](#)).
3. Insert the rear edge of the floor into the grooves at the bottom of the module.
4. Push the floor into the module and engage the rear floor tab with the module slot (see [FIGURE 3-19 on page 45](#)).
5. Push the floor fully into the module to seat the floor clip in each magazine bay (see [FIGURE 3-20 on page 45](#)).
6. Turn the module over and verify the floor clips properly engage the chassis.

FIGURE 3-19 Library Floor

L207_111

Illustration Legend:

- 1. Floor Slot
- 2. Floor Tab

FIGURE 3-20 Floor Secured

L207_134

Illustration Legend:

- 1. Floor Clip
- 2. Floor

▼ To Install the Expansion Module

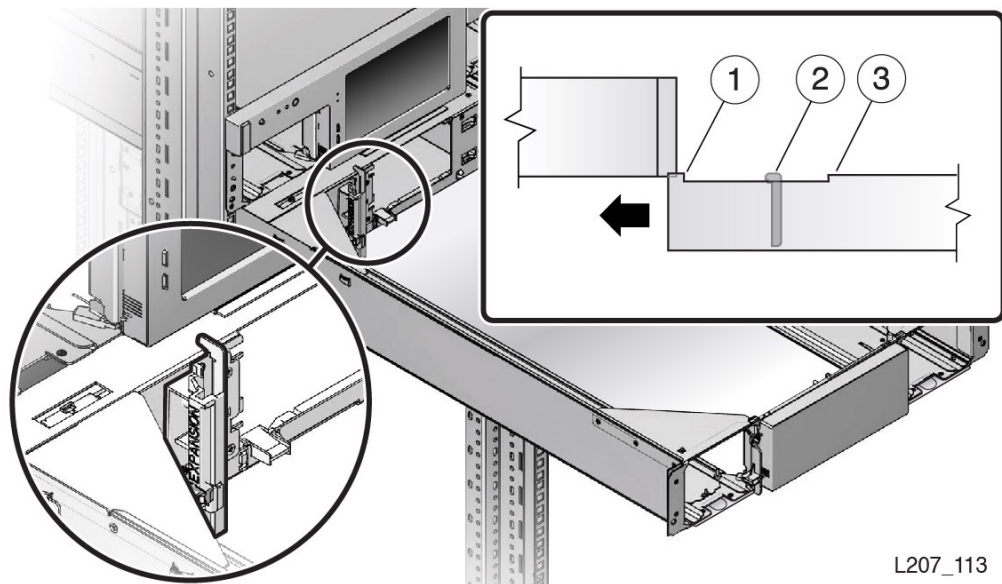
Warning – Use two people to lift and install the expansion module. Grasp the module by the sides. Do not lift the module by the tape drive filler.

1. Lift the module to the bottom of the installed module.
2. Insert the rear edge of the module flange into the grooves on the bottom edge of the installed module and push the 2U expansion module in a few centimeters.
3. Lower the front edge of the module approximately 10 mm (0.4 inch), guide any sharp metal edges away from the upper module front panel, and push the module in until the sharp edges are past the front panel (see [FIGURE 3-21](#)).

Caution – Do not scratch the front panel of the module above.

4. Raise the front of the 2U module, push the module in, and engage the module left and right side flanges with the grooves in the previous module.
5. Push the module in and seat the alignment tab in the slot of the left magazine bay (see [FIGURE 3-22 on page 47](#)).
6. Go to [“To Secure the Expansion Module” on page 47](#).

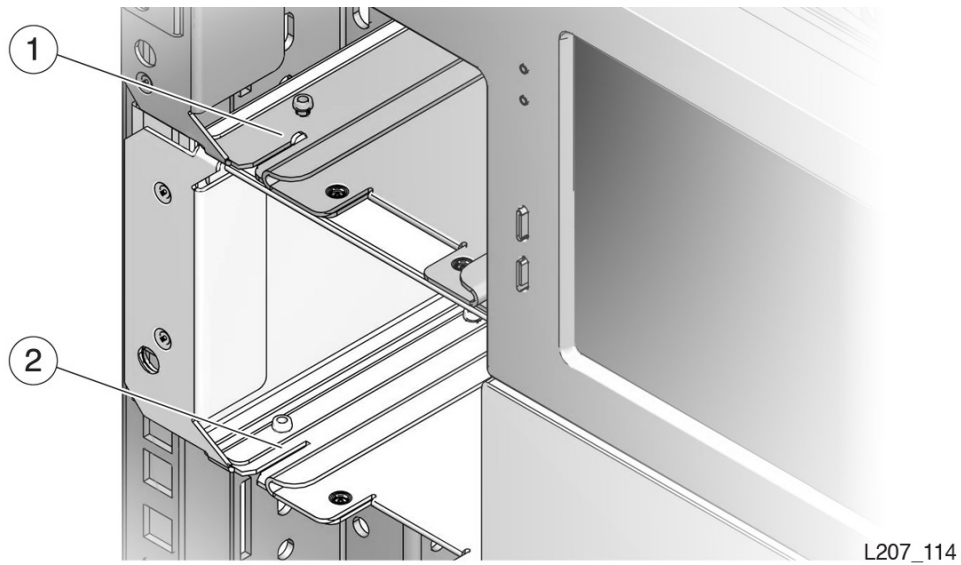
FIGURE 3-21 Scratch Avoidance



L207_113

Illustration Legend:

1. Flange (short section)
2. Tall Metal Part with Sharp Edges
3. Flange (long section)

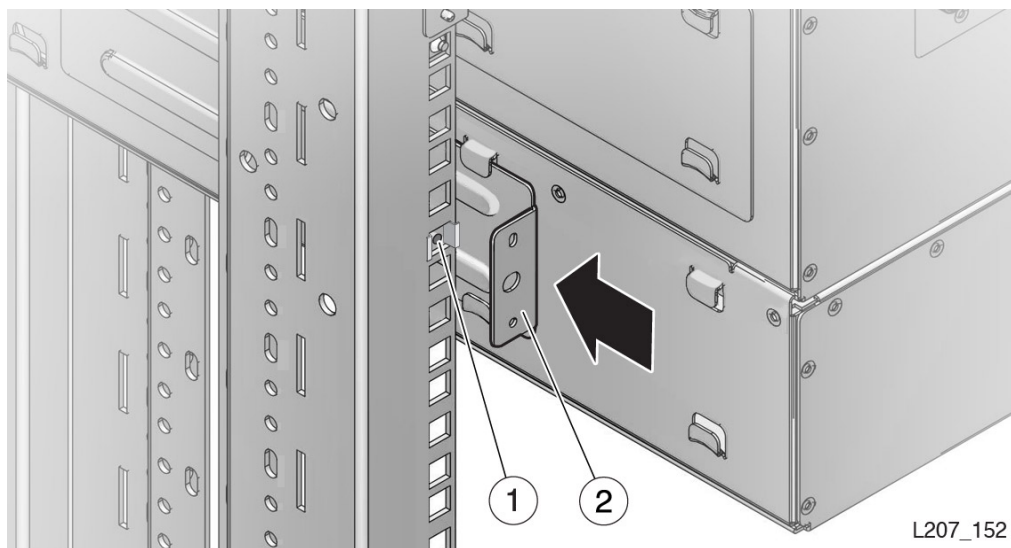
FIGURE 3-22 Alignment Tab Seated**Illustration Legend:**

1. Tab Seated in Slot
2. Slot in Magazine Bay

▼ To Secure the Expansion Module

Task 1: Install the Rear Rails

1. Slide the back rail blade under the expansion module tabs (see [FIGURE 3-23](#)).
2. Repeat this task for the rail on the other side of the module.

FIGURE 3-23 Expansion Module Back Rail and Clip Nut**Illustration Legend:**

1. Clip Nut
2. Rear Rail

Task 2: Secure the Rear Rails

1. Push the back rail against the rack vertical rail.
2. Secure the back rail to the rack vertical rail with a screw.

TIP: Use a 10-32 screw when a rack has square holes (screw mates with a clip nut).

3. Repeat this task for the rail on the other side of the module.

Task 2: Secure the Expansion Module to the Rack

TIP: Use a 10-32 screw when a rack has square holes (screw mates with a clip nut).

1. Insert a screw in the lower left side of the module and thread it a few turns.
2. Insert a screw in the lower right side of the module and thread it a few turns.
3. Fully tighten both screws.
4. Install another expansion module by returning to [“To Power Down the Library” on page 40.](#)

▼ To Replace the Cartridge Magazines

Note – Left and right magazines are unique.

1. Orient the magazine with the cartridge slots facing toward the center of the module.

Note – Do not put cartridges in the magazine slots.

2. Lift the magazine and point the back toward the module slot.
3. Engage the magazine with the track in the magazine slot.
4. Push the magazine fully into the slot.
5. Repeat as necessary until each expansion modules has two magazines.

▼ To Label the Module

1. Locate the scribe lines in the upper left corner of the expansion module (as viewed from the back of the rack).
2. Obtain the module label sheet from the accessory kit.
3. Peel the proper label from the label sheet.

Note – The sheet has labels for Module 2 through Module 10.

4. Orient the label properly, align the label with the scribe lines, and press the sticky side of the label to the chassis (see [FIGURE 3-24](#)).
5. Proceed with [“To Install the Hook and Loop Strap”](#).

FIGURE 3-24 Expansion Module ID Label

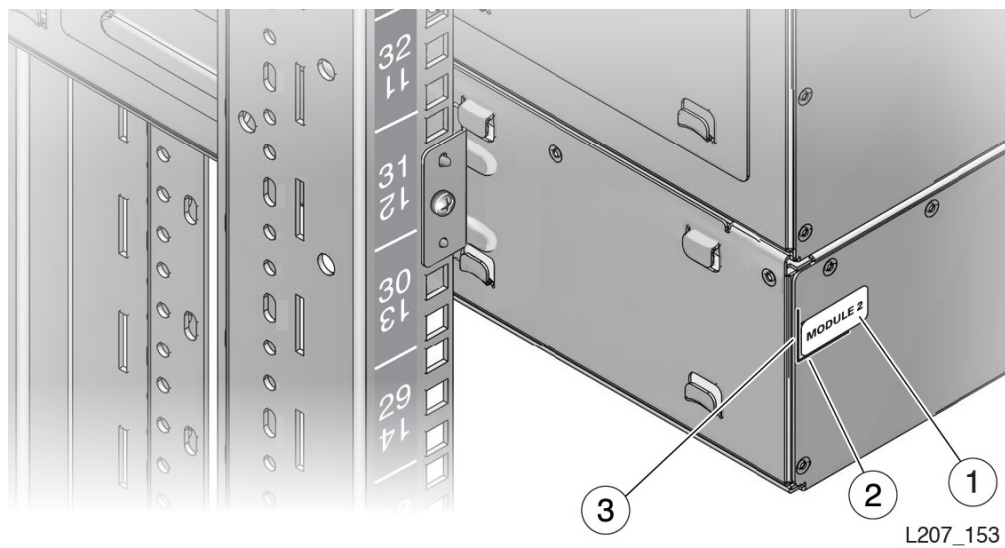


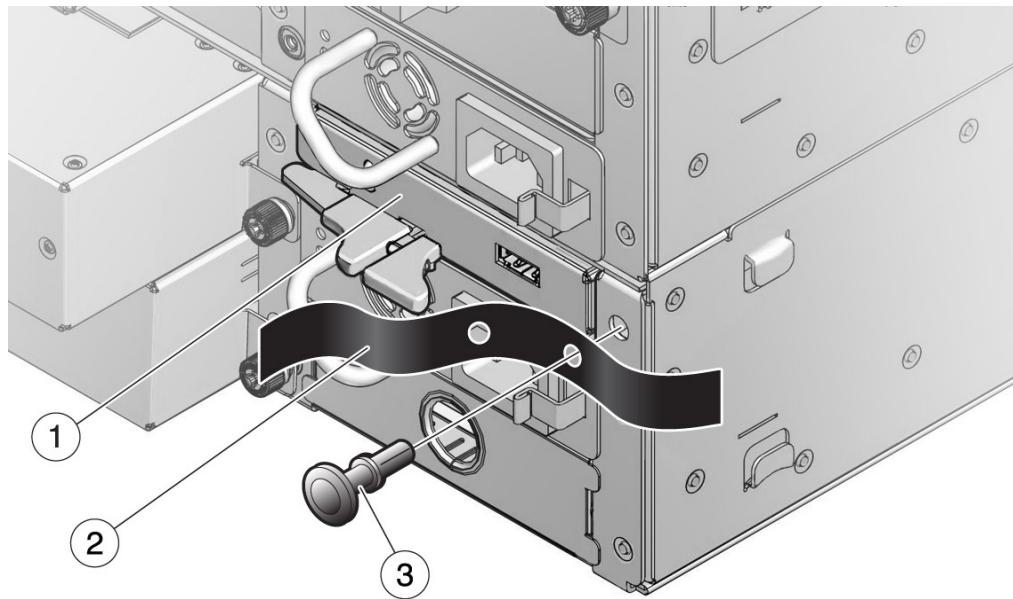
Illustration Legend:

1. Module Label
2. Vertical Scribe Line
3. Horizontal Scribe Line

▼ To Install the Hook and Loop Strap

1. Insert the rivet into a hole in the hook and loop strap (see [FIGURE 3-25](#)).
2. Pull the plunger back from the rivet face.
3. Align the rivet with the hole adjacent to the module controller.
4. Push the rivet into the hole.
5. Push the plunger in to secure the rivet.

FIGURE 3-25 Hook and Loop Strap



L207_154

Illustration Legend:

1. Module Controller
2. Hook and Loop Strap
3. Rivet

Final Hardware Actions

The SL150 hardware is now installed in the rack. To complete the installation you must reset the physical robot lock and connect cables.

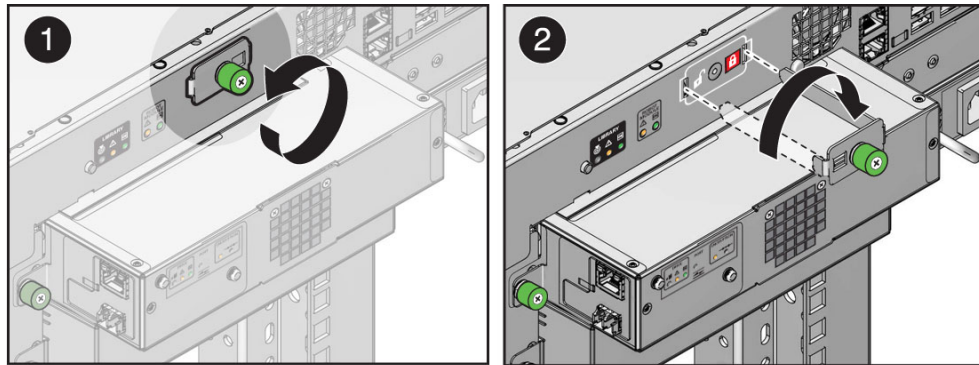
▼ To Release the Robot Lock

1. Locate the robot lock on the back of the base module (see [FIGURE 3-26 on page 51](#)).
2. Loosen the thumbscrew on the lock.
3. Remove the lock mechanism, rotate it 180 degrees, and insert the lock into the base module slot.

Note – The unlocked padlock icon is visible.

4. Tighten the thumbscrew.

FIGURE 3-26 Robot Lock (Unlock)



L207_133

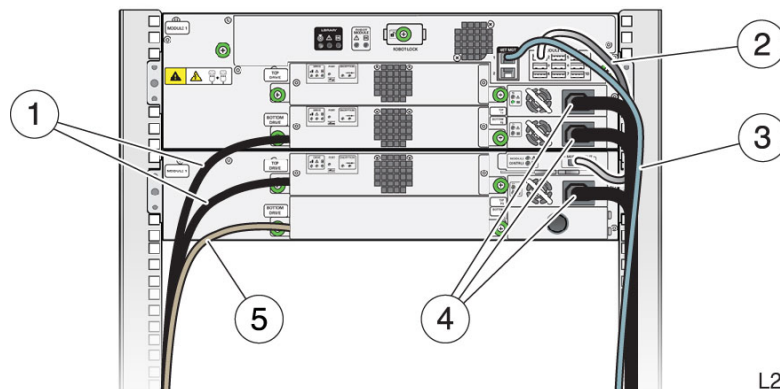
▼ To Perform Basic Cabling

Task 1: Connect the Expansion Module to the Base Module

1. Connect an expansion interconnect cable from any Module Output port in the base module to the module controller of each expansion module (see [FIGURE 3-27](#)).

Note – The Module Output connection area has nine ports labeled 2 through 10. Cable connection order is not critical (for example, there is not a requirement to connect Module Output port 2 to the Module 2 controller port).

FIGURE 3-27 Initial Cabling



L207_155

Illustration Legend:

1. Tape Drive Fibre Channel Cable
2. Expansion Cable
3. Ethernet Cable (Net Mgt Port 1)

4. Power Supply Power Cord
5. Tape Drive Serial Attached SCSI (SAS) Cable

Task 2: Connect Cables to the Tape Drive Assembly and Power Supply

1. For each installed power supply, connect the power cord to the AC receptacle on the power supply and connect the power cord to the power distribution unit in the rack.
2. For each installed tape drive, connect the interface cable(s) to the tape drive interface port(s). Attach a label indicating the tape drive position in the module and port to ensure proper connection after a service action.

Note – The interface port is located on the left side of the drive tray assembly (as viewed from the rear of the library).

Task 3: Connect the Network Port

1. Locate the NET MGT area of the base module (above the power supply and left of the Module Output ports).
2. Insert the Ethernet cable plug in the top port, designated with a 1 on the chassis.
3. Attach a label to the cable indicating the network port to ensure proper connection after a service action.

Task 4: Align and Dress the Cables and Cords

1. Gather cable slack to the outside edge of the expansion module, if necessary.
2. Wrap the hook and loop strap around the cables and cords.
3. Stow excess cord and cable length into the cavity between the rack stile and the side cover.

▼ To Apply Power

1. Make sure the robot is not locked.
2. Press the power push-button switch on the front panel of the base module.

The time duration of the power on varies based upon the number of modules and cartridges in the library (a 30 cartridge library takes about seven minutes). It is assumed that for an initial installation there are no cartridges in the library. The process is described in [Appendix A, "Startup"](#).

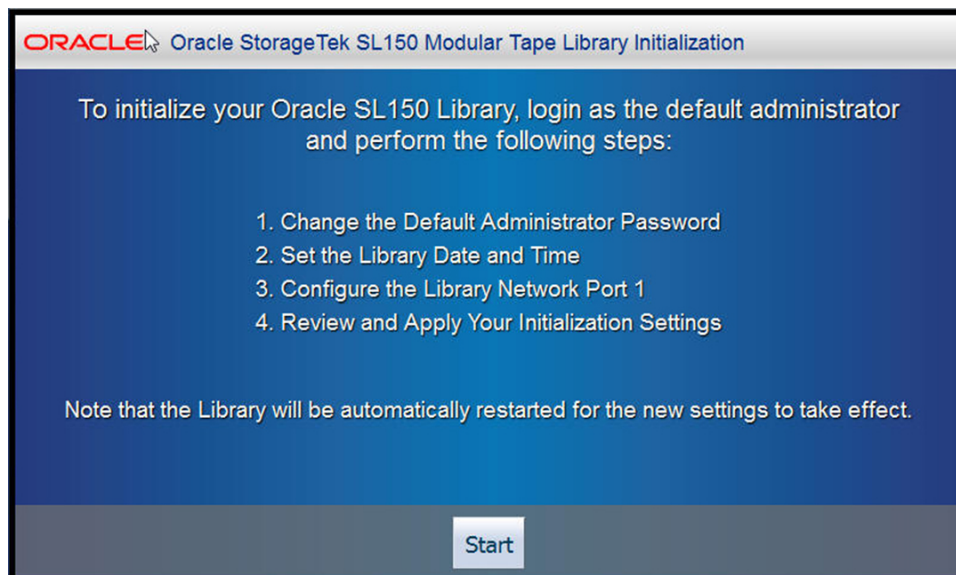
Note – Do not manually remove a cartridge magazine while the library is performing a restart after adding an expansion module. Only perform a manual cartridge magazine removal when the library is *operational* and *offline*.

3. Go to [Chapter 4, "Library Initialization"](#) if this is the initial library installation.
4. Go to [Chapter 5, "Checkout"](#) if you upgraded the library with an expansion module.

Library Initialization

Basic library initialization is performed from the touch screen of the front control panel (see [FIGURE 4-1](#)).

FIGURE 4-1 Library Initialization Overview



Initialization Overview

Library initialization is comprised of the following tasks:

1. Change the default administrator password (the default user ID is **admin**)
2. Set the library date and time
3. Configure the library network port
4. Review and apply the initialization settings

▼ To Start Library Initialization

- Tap the **Start** button on the initialization screen (see [FIGURE 4-1 on page 53](#)).

The Log in as the Default Administrator screen appears (see [FIGURE 4-2](#)).

FIGURE 4-2 Default Administrator Login

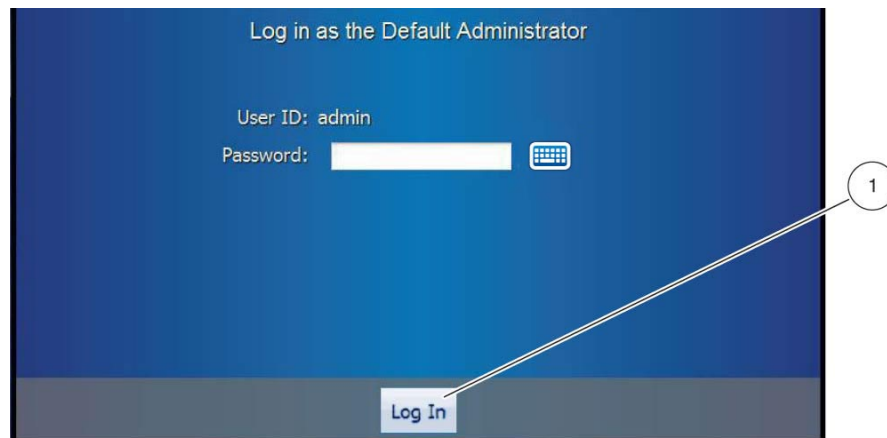


Illustration Legend:

1. Log In Button

▼ To Log in as the Default Administrator

Note that the User ID has the static value of **admin**.

1. Tap the **keyboard** button to access the screen for entering characters in the password field.
2. Enter the first letter of the default password (passw0rd) by tapping the P key on the keyboard screen (see [“Installation Wizard Keyboard Screens” on page 17](#)).
3. Verify that the proper character appears in the Password field.

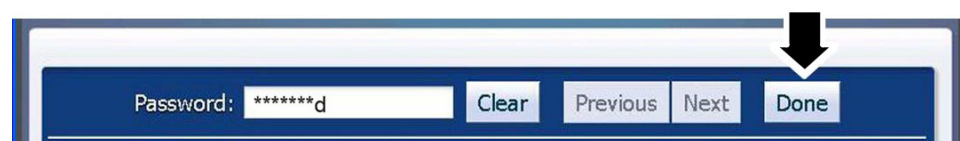
Note – Tap the Backspace key and re-enter the character if necessary.

4. Enter other characters of the default password.

Note – The last entered character is shown (an * is present for the other characters).

5. Tap either the **Done** button or the **Enter** key after entering the last character of the password.

The final character remains readable while asterisks represent all other characters in the Password field.



The *Log in as the Default Administrator* screen appears with several large dots in the Password field.

Note – The dots are the standard display and do not represent the actual number of characters you entered for the password.

6. Tap the Log In button.

The change password screen appears after a short delay (see [FIGURE 4-3](#)).

Step 1 of 4 (Change the Default Administrator Password)

The first step of library initialization is to change the default administrator password (see [FIGURE 4-3](#)). You must enter the new password and then enter it a second time for verification. Note that the Default Administrator User ID has the static value of **admin**.

Note – A value of `passw0rd` is considered an invalid password.

FIGURE 4-3 Change the Default Password

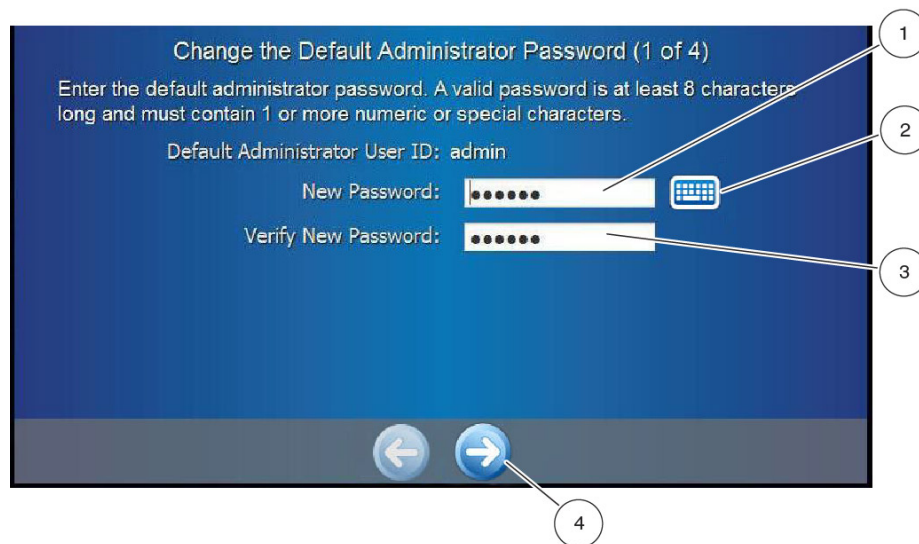


Illustration Legend:

1. New Password Field
2. Keyboard Button
3. Verify New Password Field
4. Next Screen Button

▼ To Change the Default Password

1. Tap the keyboard button.
2. Tap the screen keys to input a new default administrator password.

Note – The password must be at least eight characters long and contain one or more numeric or special characters. The value `passw0rd` is considered invalid.

3. Tap the **Next** button after entering the final character of the password.
4. Enter the new password again in the **Verify New Password** field.

Make sure to remember the default user ID (admin) and your password.

5. Tap the **Done** button or the **Enter** key.

The *Change the Default Administrator Password* screen appears with several large dots in both the New Password and Verify New Password fields (see [FIGURE 4-3 on page 55](#)).

Note – The dots are the standard display and do not represent the actual number of characters you entered for the password.

If an error message appears, click Edit to access the keyboard screen and clear the password field before you tap any key. Repeat previous steps as necessary to correct the password entries.

6. Tap the next screen (highlighted forward arrow) button.

The date and time screen appears.

Step 2 of 4 (Set the Library Date and Time)

The second step of library initialization is to change the library date and time. The date is in the format mm/dd/yyyy. The time is in the format hh:mm:ss followed by a space and *am* or *pm* (see [FIGURE 4-4](#)).

FIGURE 4-4 Library Date and Time



Illustration Legend:

1. Date Field

2. Keyboard Button
3. Time Field
4. Next Screen Button
5. Previous Screen Button

▼ To Set the Date and Time

Task 1: Enter the Date

1. Tap the **Edit** button to access the keyboard screen.
The Letters screen appears with the parameter field showing *Date*.
2. Tap the **Clear** button to remove any existing date value.
3. Tap the screen keys to enter the current date in the format MM/DD/YYYY.
4. Tap the **Next** button after entering the last digit for the year.

The keyboard screen appears, but the parameter field shows *Time*.

Task 2: Enter the Time

Note: Make sure to insert a space between the time and the AM or PM designation.

1. Tap the **Clear** button to remove any existing time value.
2. Tap the screen keys to enter the current time in the format HH:MM:SS AM/PM.
3. Tap the **Done** button.

The *Set the Library Date and Time* screen appears showing the values you entered.

Note – Change any incorrect value by tapping the Edit button.

4. Verify the values are correct and tap the next screen (forward arrow) button.

The configure network screen appears.

Step 3 of 4 (Configure Network Port 1)

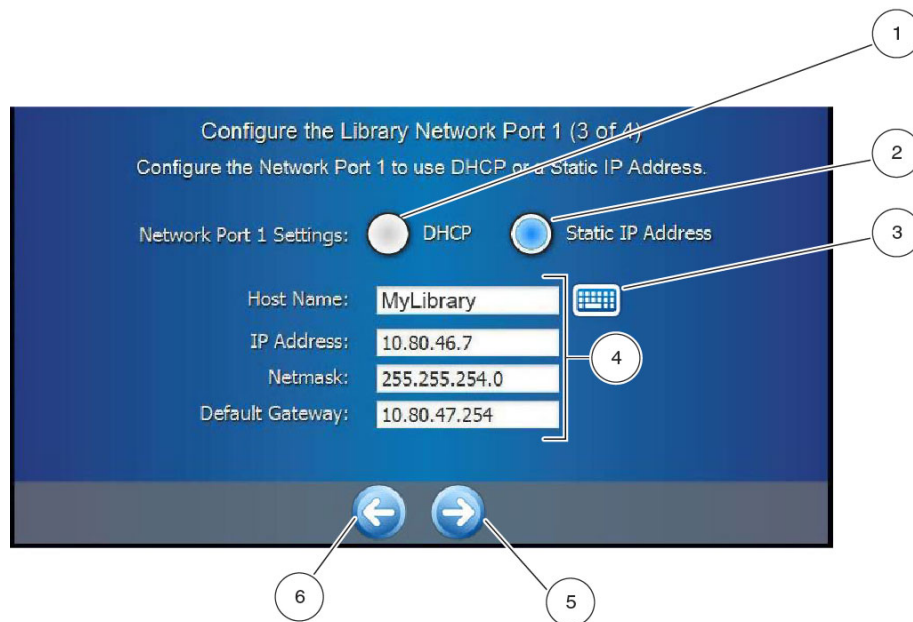
You can configure Network Port 1 to use DHCP or a static IP address. A procedure is provided for each selection.

▼ To Configure the Network with a Static IP Address

Task 1: Enter the Host Name

1. Tap the **Static IP Address** button (see [FIGURE 4-5 on page 58](#)).
2. Tap the keyboard button.
3. Tap the **Clear** button to remove any existing Host Name value.
4. Tap the screen keys to enter the host name.
5. Tap the **Next** button after entering the last character of the name.

The keyboard screen parameter field label is *IP Address*.

FIGURE 4-5 Configure Network Port 1**Illustration Legend:**

1. DHCP Choice
2. Static IP Address Choice
3. Keyboard Button
4. Host Name, IP Address, Netmask, and Default Gateway Fields
5. Next Screen Button
6. Previous Screen Button

Task 2: Enter the Static IP Address

1. Tap the **Clear** button to remove any existing IP Address value.
2. Tap the screen keys to enter the IP Address in the format XXX.XXX.XXX.XXX.
3. Tap the **Next** button after entering the last character of the address.

The keyboard screen parameter field label is *Netmask*.

Task 3: Enter the Net Mask

1. Tap the **Clear** button to remove any existing Netmask value.
2. Tap the screen keys to enter the Netmask in the format XXX.XXX.XXX.XXX.
3. Tap the **Next** button after entering the last character of the Netmask.

The keyboard screen parameter field label is *Default Gateway*.

Task 4: Enter the Default Gateway

1. Tap the **Clear** button to remove any existing Default Gateway value.

2. Tap the screen keys to enter the Default Gateway value in the format XXX.XXX.XXX.XXX.
3. Tap the **Done** button after you have entered the last character of the gateway.

The *Configure the Library Network Port 1* screen appears showing your entered values.

Note – Change any incorrect value by tapping the Edit button.

4. Verify the values are correct and tap the next screen (forward arrow) button.

The apply changes screen appears (see [FIGURE 4-7 on page 60](#)).

▼ To Configure the Network Using DHCP

1. Tap the **DHCP** button (see [FIGURE 4-6](#)).
2. Tap the keyboard button.
3. Tap the **Clear** button to remove any existing Host Name value.
4. Tap the screen keys to enter the host name.
5. Tap the **Done** button after you have entered the last character.

The *Configure the Library Network Port 1* screen appears showing your entered values.

There is a note on the screen informing you that DHCP must be running on your network for startup to be successful.

6. Verify the values are correct and tap the next screen (forward arrow) button.

The apply changes screen appears (see [FIGURE 4-7 on page 60](#)).

FIGURE 4-6 Configure Network Port 1 (DHCP)



Step 4 of 4 (Review and Apply Initialization Settings)

The fourth step of library initialization is to review and apply the initialization settings (see [FIGURE 4-7](#)).

FIGURE 4-7 Review and Apply Changes

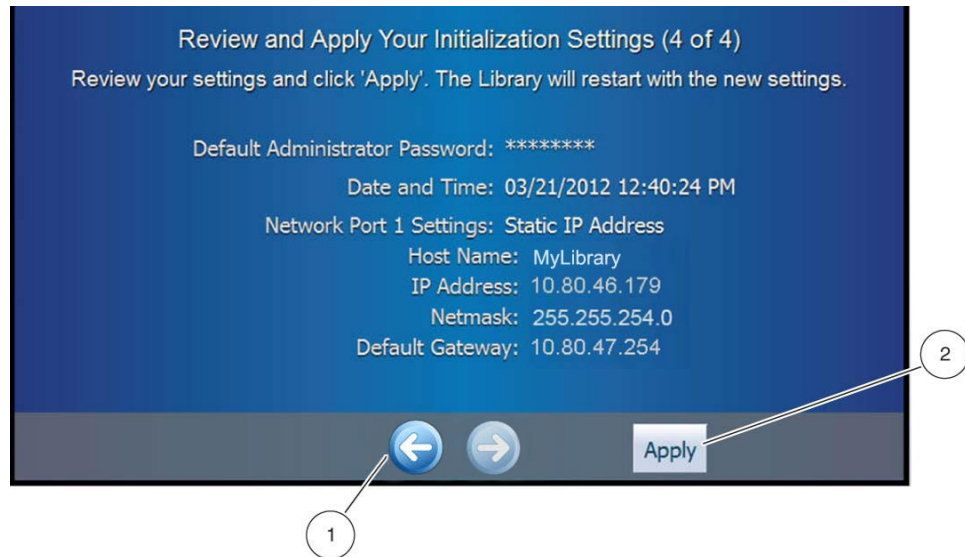


Illustration Legend:

1. Previous Screen Button
2. Apply Button

▼ To Apply Changes

Note – Make sure all values are correct. If incorrect values are applied, the library must be returned to factory default values and the entire process repeated.

1. **Verify the entered values for the date, time, and network interface.**

Note – Alter any incorrect value before applying changes by tapping the highlighted back arrow.

2. **Tap the Apply button.**

The library performs a restart (see [Appendix A, “Startup”](#)). The duration of the restart varies based upon the number of modules in the library (a 30 cartridge library takes about seven minutes).

Note – Do not manually remove a cartridge magazine while the library is performing the restart. Only perform a manual cartridge magazine removal when the library is *operational* and *offline*.

After completion of the restart, the Home screen appears on the touch screen (see [FIGURE 4-8 on page 61](#)).

Note – The top portion of the Home screen provides information on the library Health and the online/offline state. Make sure the library is online before using the SL150 remote interface.

FIGURE 4-8 Home Screen

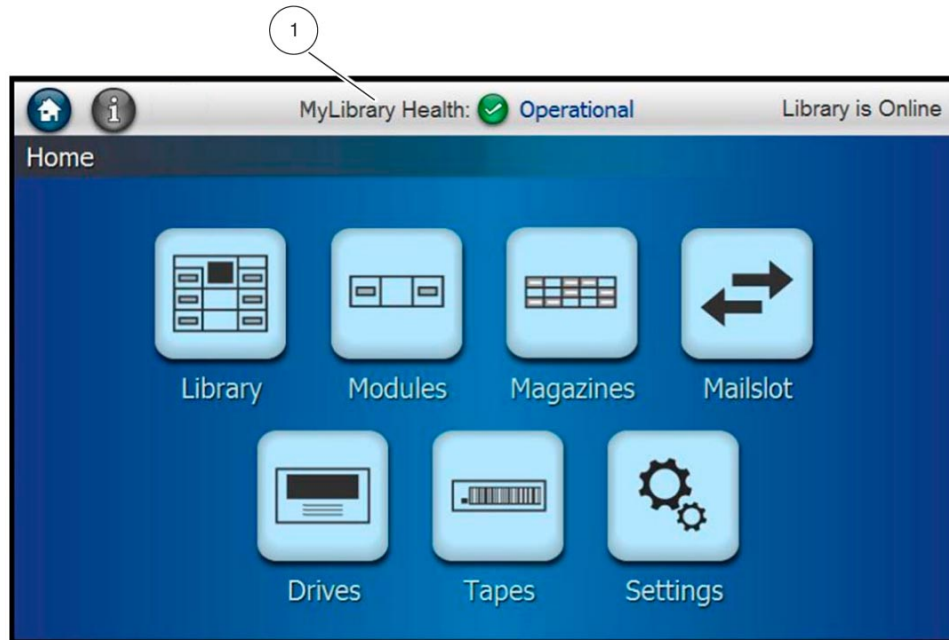


Illustration Legend:

1. Library Health

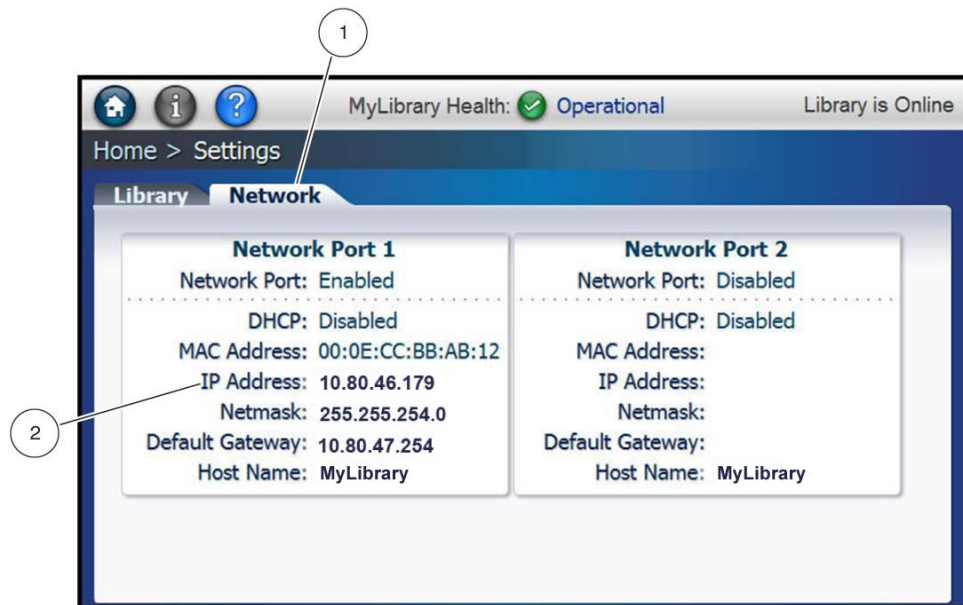
▼ To Verify Network Settings

1. Tap the Settings button on the Home screen.

The settings screen appears (see [FIGURE 4-9 on page 62](#)) with the library tab open.

2. Tap the Network tab.
3. Verify the settings are correct.

The screen shows the network port, DHCP setting, MAC address, IP address, subnet mask, default gateway, and host name.

FIGURE 4-9 Settings Screen Network Tab**Illustration Legend:**

1. Network Settings Tab
2. IP Address

Final Configuration

Additional configuration tasks are performed through the SL150 remote interface. The Log In screen is shown in [FIGURE 4-10 on page 63](#). Notice the Help link in the upper right corner of the remote interface.

1. **Log in to the remote interface using the admin password defined during library initialization (see [“To Change the Default Password” on page 55](#)).**

Note – If you are not able to log in to the remote interface because the network setting is wrong or you have forgotten the password, you can reset the initialization values to the manufacturing default. See [“To Reset the Library with Manufacturing Default Values” on page 63](#).

2. **Refer to the user’s guide or online Help for further information regarding the Settings screen in order to:**
 - Define other user roles.
 - Define a reserved cell and insert a diagnostic cartridge, if desired.
 - Partition the library, if desired.
 - Specify the volume label format.
 - Alter tape drive settings, if desired.
3. **Go to [Chapter 5, “Checkout”](#) when the applicable items above are complete.**

Note – Refer to the Oracle Key Manager documentation if you intend to enable tape drive encryption.

FIGURE 4-10 SL150 Remote Interface Log In Screen

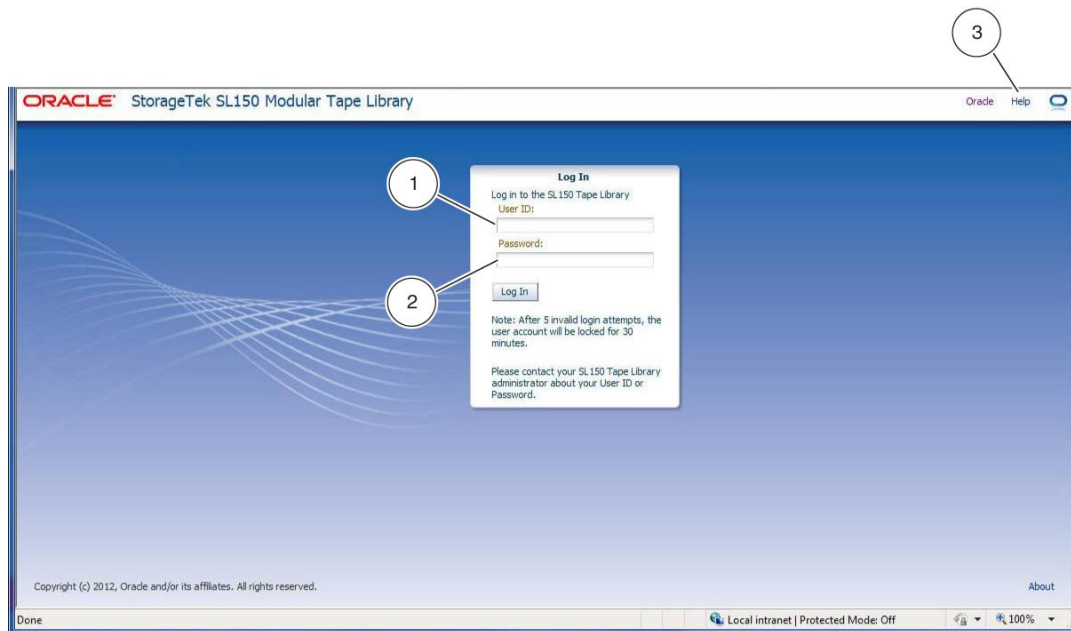


Illustration Legend:

1. User ID
2. Password
3. Help Link

▼ To Reset the Library with Manufacturing Default Values

1. Push and release one of the Locate buttons on the library to enable the Locate indicators.

The Locate button is in the upper left corner of the front control panel (see [“Library System Indicators”](#) on page 14) or at the rear of the library on the robot CRU in the black Library section.

2. Simultaneously press and hold both the front and rear Locate buttons for approximately 10 seconds.

Holding both buttons is more easily accomplished by using two people.

Note – After approximately 4 seconds, the indicator flashes at a slow rate.

3. Wait for the Locate indicator to flash at a fast rate before releasing the Locate buttons.

The library is reset to manufacturing default values.

Note – If either Locate button is released before the fast flash rate, the reset process terminates.

4. Press the library power switch if the library does not restart.
5. Repeat the library initialization steps and apply the changes.

Checkout

The self-tests in the SL150 remote interface are used to checkout the library.

Self-Test Overview

The self-test moves a diagnostic cartridge from an origination point to a destination point in an offline library. The point can be a reserved slot, a storage slot, a tape drive, or a mailslot.

There are two types of self-tests. The Basic Self Test performs six moves. The Full Self Test preforms the moves of the basic test plus moves to all available storage slots and installed tape drives.

The self-tests use a diagnostic tape (data tape with a special label). The diagnostic tape can be stored in a reserved slot or placed in a mailslot.

▼ To Set the Library Offline

1. Log in to the SL150 remote interface.

Note – The Viewer role does not allow running of the self-tests.

2. Click Library in the left navigation area.

The graphical library map appears containing a section for each installed module.

3. View the current library state at the top right of the screen.

4. Click Online.

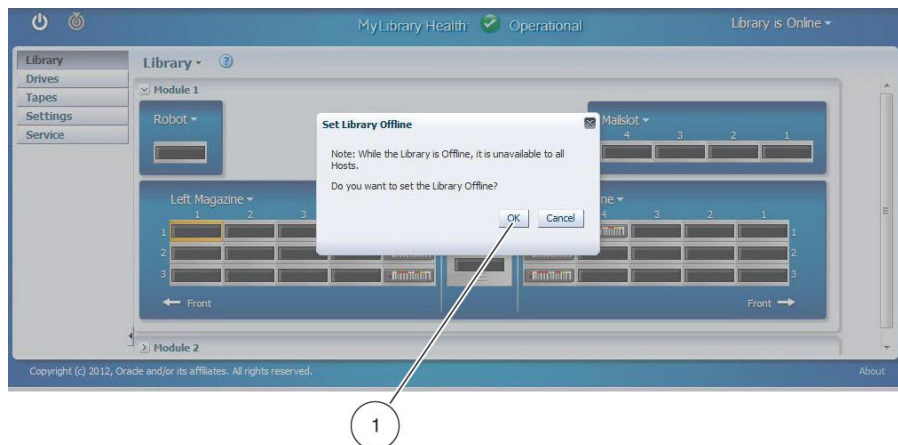
5. Select Set Library Offline (see [FIGURE 5-1 on page 66](#)).

The Set Library Offline dialog appears (see [FIGURE 5-2 on page 66](#)).

6. Click OK to continue or Cancel to exit.

FIGURE 5-1 Set Library Offline**Illustration Legend:**

1. Set Library Offline

FIGURE 5-2 Offline Confirmation**Illustration Legend:**

1. Offline Dialog Box (OK button)

▼ To Run the Self-Test

Task 1: Invoke the Self Test

1. Insert a diagnostic tape in the mailslot if the library does not have a reserved slot containing a diagnostic tape.

Note – You can open the mailslot from either the remote interface or the touch screen on the base module. You might need to enable the Locate LED to help you identify the library.

2. Click the Library control located to the left of the Help (question mark) icon (see [FIGURE 5-3 on page 67](#)).
3. Click Basic Self Test or Full Self Test.

The Confirm Diagnostics dialog appears (see [FIGURE 5-4 on page 67](#)).

- Click **OK** to begin the test or **Cancel** to exit.

FIGURE 5-3 Self Test Commands

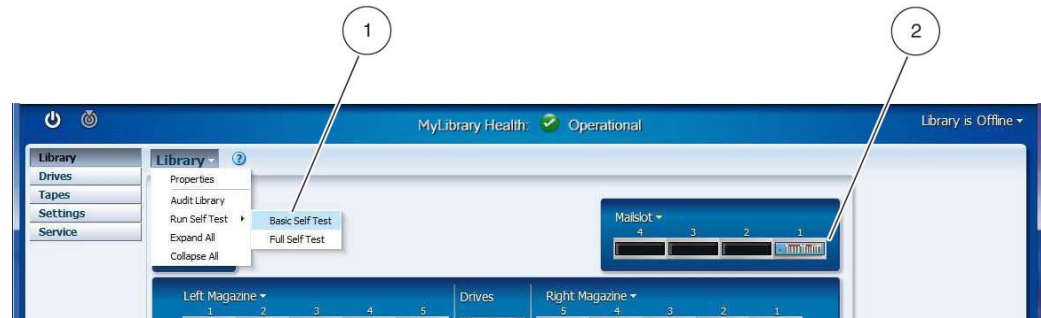


Illustration Legend:

- Basic Self Test Command
- Diagnostic Cartridge (in Mailslot)

FIGURE 5-4 Self Test Confirmation

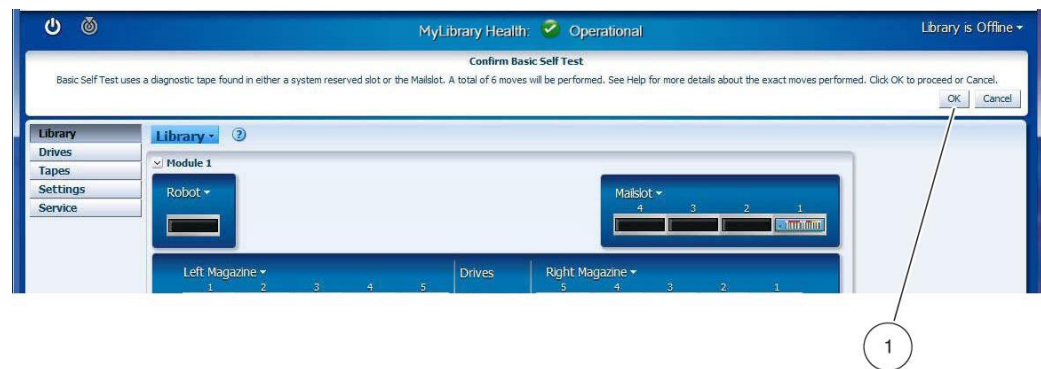


Illustration Legend:

- Confirm Basic Self Test Dialog

Task 2: Monitor Test Progress

- Monitor the self-test progress in the Running Diagnostics window section (see [FIGURE 5-5 on page 68](#)).

Note – The library map has visual indications of cartridge movement from a slot to the robot and to a destination (tape drive, mailslot, or a cartridge slot).

- Verify successful test completion.

Note – If the test does not complete successfully or you stop the test, see [“Incomplete Test” on page 69](#).

- Click **Close** in the Running Self Test - Completed window section (see [FIGURE 5-6 on page 68](#)).

FIGURE 5-5 Self Test Progress

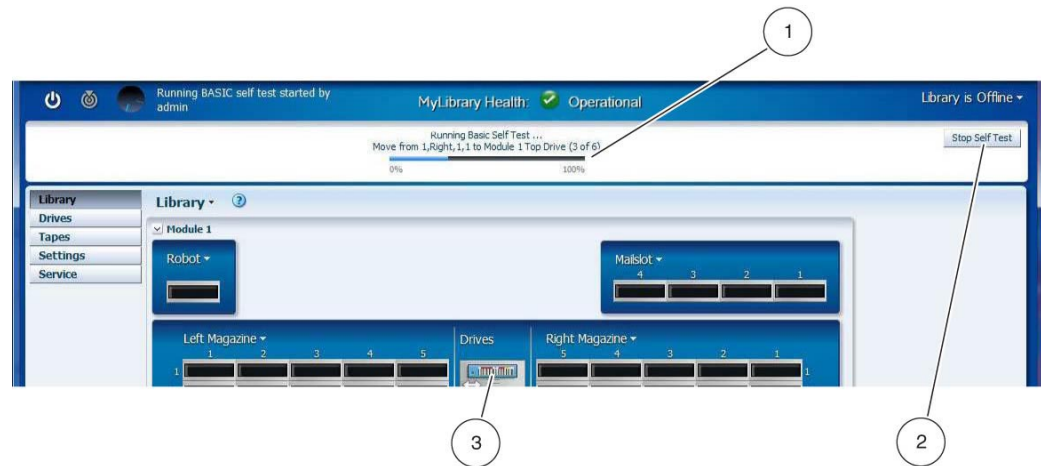


Illustration Legend:

1. Basic Self Test Progress Bar
2. Stop Self Test Button
3. Diagnostic Cartridge in Module 1 Top Drive

FIGURE 5-6 Self Test Complete



Illustration Legend:

1. Progress Bar 100%
2. Close Button
3. Diagnostic Cartridge Return to Mailslot

Task 3: Finish Up

1. Set the library to the Online state.
2. Remove the diagnostic tape from the mailslot, if applicable.
 - a. Select Open from the Mailslot control.

- b. Extend the Mailslot mechanism from the base module to access the diagnostic tape.
 - c. Grasp the diagnostic tape and pull it out of the slot.
 - d. Push the Mailslot fully into the base module.
3. Log out if you will not be performing other operations.

Incomplete Test

The test may not complete because of an error condition or the deliberate action to stop the test.

If the test encountered an error, the *library health* might change from operational to degraded.

Note – Clicking Degraded launches a window identifying a failed or degraded component. Refer to the Help system Troubleshooting category for further information.

Observe the location of the diagnostic tape. It might not have been returned to the reserved slot or mailslot. Refer to the remote interface Help system or the user's guide for information about manually moving the diagnostic cartridge from the present location to the reserved slot.

Adding Power Supplies and Tape Drives

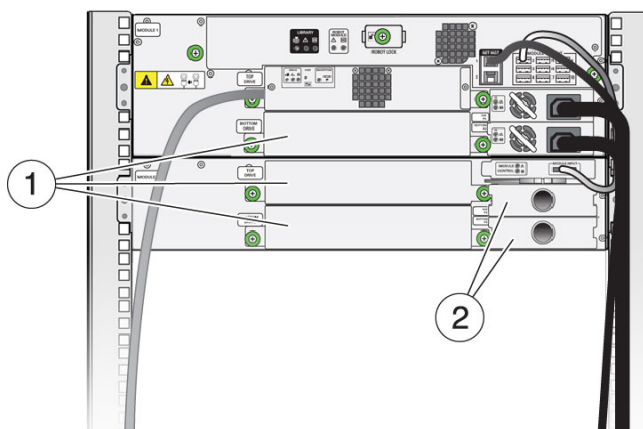
The tape drives and power supplies are located at the back of the library (see [FIGURE 6-1](#)). Each module in the library has space for two tape drives and two power supplies. You can add tape drives and power supplies as your needs grow.

The power supply and tape drive can be added while the library is powered-on. However, you must *restart* the library for it to recognize and account for the tape drive.

The instructions in this chapter have you momentarily remove the power supply or drive filler and then immediately insert the new power supply or tape drive in the open slot.

Warning – Do not operate the library with open tape drive or power supply slots.

FIGURE 6-1 SL150 Rear View



L207_156

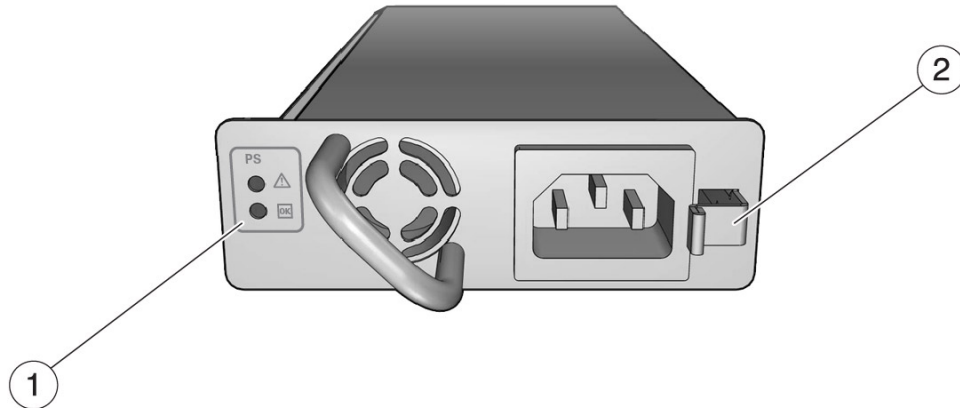
Illustration Legend:

- 1. Tape Drive Filler
- 2. Power Supply Filler

Power Supply

Two actions are involved to add a power supply (see [FIGURE 6-2](#)) to a library module: 1) removal of the power supply filler and 2) installation of the power supply. No tools are required to perform these tasks.

FIGURE 6-2 Power Supply



L207_115

Illustration Legend:

1. Power Supply Indicators
2. Power Supply Latch

▼ To Remove the Power Supply Filler

1. Hook your finger in the hole of the power supply filler (see [FIGURE 6-1 on page 71](#)).
2. Pull the filler out of the power supply slot and set it aside.

▼ To Install an Additional Power Supply

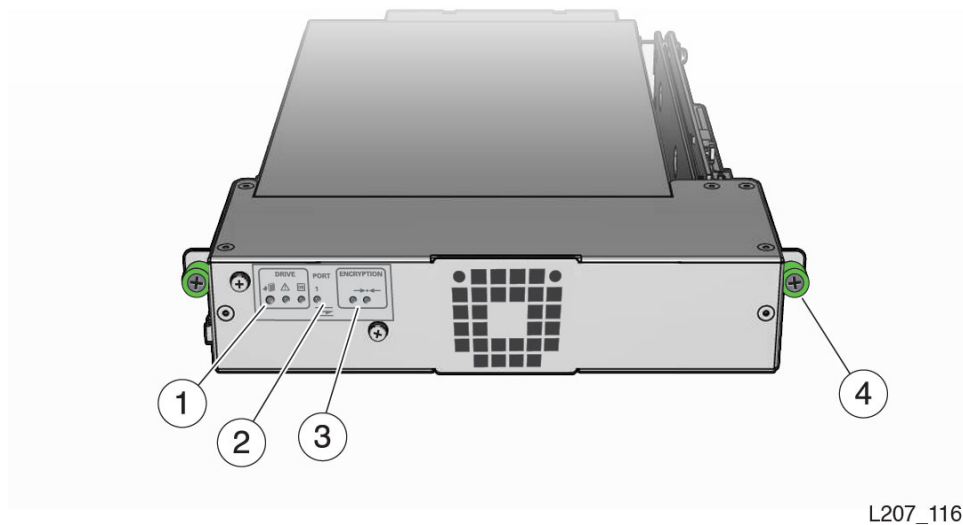
1. Remove the power supply from the shipping carton.
2. Grasp the power supply by the handle with one hand and support the bottom of the supply with your other hand.
3. Guide the power supply into the power supply slot.
4. Make sure the power supply is latched in place.
5. Connect a power cord to the power supply receptacle and a receptacle on the rack power strip.
6. Gather cord slack to the outside of the library then secure with the hook and loop strap(s).

Tape Drive Tray

Two actions are involved to add a tape drive tray (see [FIGURE 6-3](#)) to a library module: 1) removal of the tape drive filler and 2) installation of the tape drive tray. No tools are required to perform these tasks.

Note – The library must be restarted to recognize and account for the installation of a tape drive tray. You might need to coordinate the restart around backup windows and other activities.

FIGURE 6-3 Tape Drive Tray



L207_116

Illustration Legend:

1. Drive Indicators
2. Port Indicator (SAS Drive has two Indicators)
3. Encryption Indicators
4. Thumbscrew (One on Each Side of the Tray)

▼ To Remove the Tape Drive Filler

1. Loosen the thumbscrews on both sides of the tape drive filler (see [FIGURE 6-1 on page 71](#)).
2. Grasp the thumbscrews and pull the filler toward you.
3. Remove the filler from the drive slot and set it aside.

▼ To Install an Additional Tape Drive Tray

Task 1: Install the Tape Drive Tray

Caution – Equipment damage. Do not touch the circuit card or static sensitive components. The circuit card is located on the right side of the drive tray (see [FIGURE 6-3 on page 73](#)).

1. Follow accepted practices to prevent ESD.
2. Remove the drive tray from the shipping carton.

Note – Handle the drive tray by the rear corners (close to the thumbscrews) and the bottom of the tray. Avoid contact with the top cover of the actual tape drive.
3. Grasp the rear corners of the drive tray and guide the front of the drive tray into the library drive slot.
4. Push the drive tray completely into the drive slot.

The LEDs activate at the rear of the drive tray if the library is powered on.
5. Tighten the thumbscrews firmly on each side of the drive tray to make sure there is no tray movement in any direction.
6. Connect the interface cable to the port on the left side of the drive.

Task 2: Restart the Library

1. Quiesce the host application(s) to prevent disruption of active storage operations.
2. Restart the Library by one of the following methods to enable the library to recognize and account for the new tape drive.
 - a. Push the library power button and tap **Restart Library** on the touch screen.
 - b. Click the power button in the SL150 remote interface and click **Restart Library** in the dialog box.

The tape drive appears in the library listing of available drives after completion of the restart.

3. Confirm that the library recognizes and accounts for the drive (Drives area of the SL150 remote interface).

It can take some time for the drive to be recognized by the library and for the LEDs to indicate the drive is operational.
4. Make sure the drive port is enabled (view the Drive Properties and change drive settings if appropriate).
5. Verify the firmware level of the added drive is consistent with that of other installed tape drives (see [Appendix B, “Drive Firmware”](#)).

Note – You might need to run application commands to ensure that the library and drive application are synchronized after installing a tape drive. Refer to your host tape application documentation for guidance.

Relocation

The following information is provided to aid for relocating a library in the data center.

1. **Quiesce the host application to prevent disruption of active storage operations.**
2. **Perform a controlled power-down of the library while invoking the option to prepare the robot for removal.**
3. **Follow prompts on the touch screen or the SL150 remote interface to lock the robot.**
4. **Set the rack PDU circuit breakers to OFF.**
5. **Disconnect the PDU power cord(s) from the main circuit.**
6. **Release any rack anti-tip device(s), and remove any wheel chocks.**
7. **Remove the tape cartridge magazines from the library manually, if the floor surface is uneven.**

Note – Uneven surfaces might result in cartridges shifting position in or falling out of a magazine slot.

8. **Roll the rack to its assigned location.**

Startup

The SL150 library is typically started up when power is applied (the power cord is plugged in or the external power is switched on). If the library was manually powered down (from the front panel power switch or the shutdown function of the remote management interface), pressing the front panel power switch starts the library.

If the library is in the factory default state, Library Initialization starts. Prompts appear on the operator panel for the administrator to enter the minimal information needed to bring the library to a running state (see [Chapter 4, “Library Initialization”](#)). When the administrator completes the process, the library performs a reboot.

During library startup, the following steps are preformed:

1. The robot is unparked.
2. The hand fully retracts.
3. The robot moves from the top to the bottom of the entire library. By starting at the top and moving down one module at a time, the robot determines the order of the modules.
4. The wrist sweeps through its full range of motion.
5. The hand moves through the full track range.
6. The reach mechanism extends and retracts.
7. Magazines are latched.
8. A full library audit is performed.

You can observe the progress of a library audit from the Library view in a web browser. Tape slots that have not been audited are greyed-out and audited tape slots are active (slot contains a barcode icon).

When the audit completes and all drives are *ready*, the library is operational.

Drive Firmware

New versions of drive firmware are periodically posted to MOS (MyOracleSupport). You should check MOS for firmware updates and load the update to your tape drives.

Determine the Current Drive Firmware Version

1. Login to the SL150 remote interface.
2. Click Drives in the navigation area on the left side of the screen.
3. Locate the specific tape drive and click the table row.
4. Click the Actions control and select Properties.
5. Locate the firmware version in the Drive Properties dialog (see [FIGURE B-1](#)).
6. Click Close.

FIGURE B-1 Drive Firmware Version

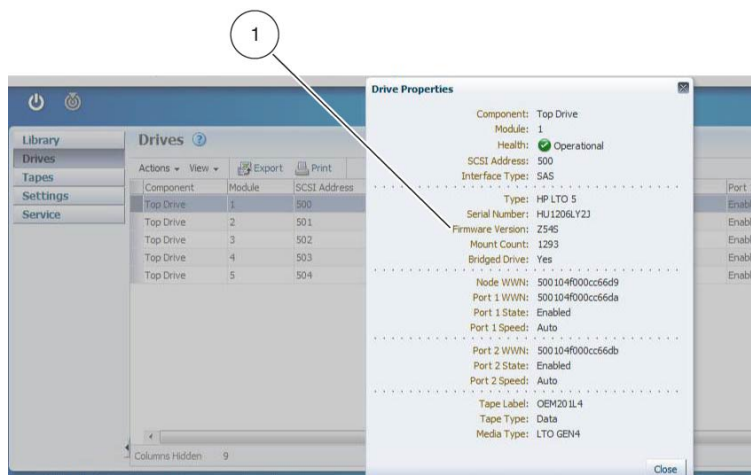


Illustration Legend:

1. Firmware Version (Drive Properties)

Download Firmware from MyOracleSupport

Note – The drive firmware levels at initial release of the SL150 were: Y5BS (FC) and Z55S (SAS).

Task 1: Access MOS

1. Use a web browser and connect to <https://support.oracle.com>.
2. Click Register to create an account, if applicable.
3. Sign in.

Task 2: List the Available Firmware Versions

1. Click the Patches & Updates tab (see [FIGURE B-2](#)).
2. Click the Product or Family (Advanced) link in the Search tab.
3. Choose or enter Sun StorageTek LTO5 HH SAS Tape Drive or Sun StorageTek LTO5 HH FC Tape Drive in the Product and Release fields.
4. Click Search.
5. Click the applicable Patch Name link.
6. Open the Read Me file to make sure the firmware version applies to your library drive.

FIGURE B-2 MOS Patches & Updates

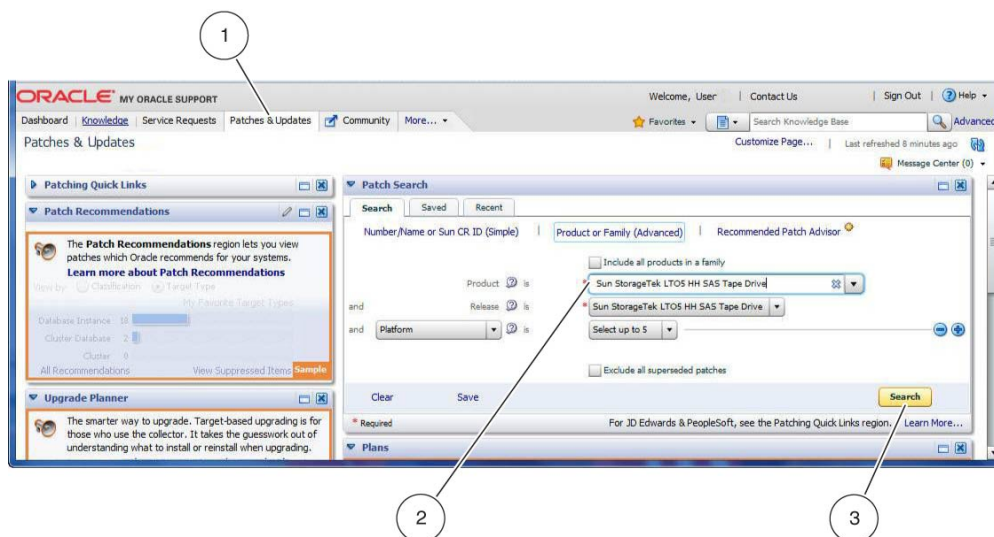


Illustration Legend:

1. Patches & Updates Tab
2. Product Control (LTO 5 HH)
3. Search Button

Task 3: Download the Firmware File

Note – Do not download the firmware file intended for half-height stand-alone drives used in the 1U media tray.

1. Click the Download button.
2. Sign out of MOS.
3. Follow the instructions in the Read Me file to install the firmware on your tape drive.

Note – Load firmware through the drive interface port using the HP Library and Tape Tools (LTT) utility or the SCSI write buffer download. Use of a firmware update (FUP) tape is not supported.

Download Firmware from MyOracleSupport

Controlling Contaminants

Control over contaminant levels in a computer room is extremely important because tape libraries, tape drives, and tape media are subject to damage from airborne particulates.

Environmental Contaminants

Most particles smaller than ten microns are not visible to the naked eye under most conditions, but these particles can be the most damaging. As a result, the operating environment must adhere to the following requirements:

- ISO 14644-1 Class 8 Environment.
- The total mass of airborne particulates must be less than or equal to 200 micrograms per cubic meter.
- Severity level G1 per ANSI/ISA 71.04-1985.

Oracle currently requires the ISO 14644-1 standard approved in 1999, but will require any updated standards for ISO 14644-1 as they are approved by the ISO governing body. The ISO 14644-1 standard primarily focuses on the quantity and size of particulates as well as the proper measurement methodology, but does not address the overall mass of the particulates. As a result, the requirement for total mass limitations is also necessary as a computer room or data center could meet the ISO 14644-1 specification, but still damage equipment because of the specific type of particulates in the room. In addition, the ANSI/ISA 71.04-1985 specification addresses gaseous contaminations as some airborne chemicals are more hazardous. All three requirements are consistent with the requirements set by other major tape storage vendors.

Required Air Quality Levels

Particles, gasses and other contaminants may impact the sustained operations of computer hardware. Effects can range from intermittent interference to actual component failures. The computer room must be designed to achieve a high level of cleanliness. Airborne dusts, gasses and vapors must be maintained within defined limits to help minimize their potential impact on the hardware.

Airborne particulate levels must be maintained within the limits of *ISO 14644-1 Class 8 Environment*. This standard defines air quality classes for clean zones based on airborne particulate concentrations. This standard has an order of magnitude less

particles than standard air in an office environment. Particles ten microns or smaller are harmful to most data processing hardware because they tend to exist in large numbers, and can easily circumvent many sensitive components' internal air filtration systems. When computer hardware is exposed to these submicron particles in great numbers they endanger system reliability by posing a threat to moving parts, sensitive contacts and component corrosion.

Excessive concentrations of certain gasses can also accelerate corrosion and cause failure in electronic components. Gaseous contaminants are a particular concern in a computer room both because of the sensitivity of the hardware, and because a proper computer room environment is almost entirely recirculating. Any contaminant threat in the room is compounded by the cyclical nature of the airflow patterns. Levels of exposure that might not be concerning in a well ventilated site repeatedly attack the hardware in a room with recirculating air. The isolation that prevents exposure of the computer room environment to outside influences can also multiply any detrimental influences left unaddressed in the room.

Gasses that are particularly dangerous to electronic components include chlorine compounds, ammonia and its derivatives, oxides of sulfur and petrol hydrocarbons. In the absence of appropriate hardware exposure limits, health exposure limits must be used.

While the following sections will describe some best practices for maintaining an ISO 14644-1 Class 8 Environment in detail, there are some basic precautions that must be adhered to:

- Do not allow food or drink into the area.
- Cardboard, wood, or packing materials must not be stored in the data center clean area.
- Identify a separate area for unpacking new equipment from crates and boxes.
- Do not allow construction or drilling in the data center without first isolating sensitive equipment and any air targeted specifically for the equipment. Construction generates a high level of particulates that exceed ISO 14644-1 Class 8 criteria in a localized area. Dry wall and gypsum are especially damaging to storage equipment.

Contaminant Properties and Sources

Contaminants in the room can take many forms, and can come from numerous sources. Any mechanical process in the room can produce dangerous contaminants or agitate settled contaminants. A particle must meet two basic criteria to be considered a contaminant:

- It must have the physical properties that could potentially cause damage to the hardware.
- It must be able to migrate to areas where it can cause the physical damage.

The only differences between a potential contaminant and an actual contaminant are time and location. Particulate matter is most likely to migrate to areas where it can do damage if it is airborne. For this reason, airborne particulate concentration is a useful measurement in determining the quality of the computer room environment.

Depending on local conditions, particles as big as 1,000 microns can become airborne, but their active life is very short, and they are arrested by most filtration devices.

Submicron particulates are much more dangerous to sensitive computer hardware, because they remain airborne for a much longer period of time, and they are more apt to bypass filters.

Operator Activity

Human movement within the computer space is probably the single greatest source of contamination in an otherwise clean computer room. Normal movement can dislodge tissue fragments, such as dander or hair, or fabric fibers from clothing. The opening and closing of drawers or hardware panels or any metal-on-metal activity can produce metal filings. Simply walking across the floor can agitate settled contamination making it airborne and potentially dangerous.

Hardware Movement

Hardware installation or reconfiguration involves a great deal of subfloor activity, and settled contaminants can very easily be disturbed, forcing them to become airborne in the supply air stream to the room's hardware. This is particularly dangerous if the subfloor deck is unsealed. Unsealed concrete sheds fine dust particles into the airstream, and is susceptible to efflorescence — mineral salts brought to the surface of the deck through evaporation or hydrostatic pressure.

Outside Air

Inadequately filtered air from outside the controlled environment can introduce innumerable contaminants. Post-filtration contamination in duct work can be dislodged by air flow, and introduced into the hardware environment. This is particularly important in a downward-flow air conditioning system in which the sub-floor void is used as a supply air duct. If the structural deck is contaminated, or if the concrete slab is not sealed, fine particulate matter (such as concrete dust or efflorescence) can be carried directly to the room's hardware.

Stored Items

Storage and handling of unused hardware or supplies can also be a source of contamination. Corrugated cardboard boxes or wooden skids shed fibers when moved or handled. Stored items are not only contamination sources; their handling in the computer room controlled areas can agitate settled contamination already in the room.

Outside Influences

A negatively pressurized environment can allow contaminants from adjoining office areas or the exterior of the building to infiltrate the computer room environment through gaps in the doors or penetrations in the walls. Ammonia and phosphates are often associated with agricultural processes, and numerous chemical agents can be produced in manufacturing areas. If such industries are present in the vicinity of the data center facility, chemical filtration may be necessary. Potential impact from automobile emissions, dusts from local quarries or masonry fabrication facilities or sea mists should also be assessed if relevant.

Cleaning Activity

Inappropriate cleaning practices can also degrade the environment. Many chemicals used in normal or “office” cleaning applications can damage sensitive computer equipment. Potentially hazardous chemicals outlined in the [“Cleaning Procedures and Equipment”](#) section should be avoided. Out-gassing from these products or direct contact with hardware components can cause failure. Certain biocide treatments used in building air handlers are also inappropriate for use in computer rooms either because they contain chemicals, that can degrade components, or because they are not designed to be used in the airstream of a re-circulating air system. The use of push mops or inadequately filtered vacuums can also stimulate contamination.

It is essential that steps be taken to prevent air contaminants, such as metal particles, atmospheric dust, solvent vapors, corrosive gasses, soot, airborne fibers or salts from entering or being generated within the computer room environment. In the absence of hardware exposure limits, applicable human exposure limits from OSHA, NIOSH or the ACGIH should be used.

Contaminant Effects

Destructive interactions between airborne particulate and electronic instrumentation can occur in numerous ways. The means of interference depends on the time and location of the critical incident, the physical properties of the contaminant and the environment in which the component is placed.

Physical Interference

Hard particles with a tensile strength at least 10% greater than that of the component material can remove material from the surface of the component by grinding action or embedding. Soft particles will not damage the surface of the component, but can collect in patches that can interfere with proper functioning. If these particles are tacky they can collect other particulate matter. Even very small particles can have an impact if they collect on a tacky surface, or agglomerate as the result of electrostatic charge build-up.

Corrosive Failure

Corrosive failure or contact intermittence due to the intrinsic composition of the particles or due to absorption of water vapor and gaseous contaminants by the particles can also cause failures. The chemical composition of the contaminant can be very important. Salts, for instance, can grow in size by absorbing water vapor from the air (nucleating). If a mineral salts deposit exists in a sensitive location, and the environment is sufficiently moist, it can grow to a size where it can physically interfere with a mechanism, or can cause damage by forming salt solutions.

Shorts

Conductive pathways can arise through the accumulation of particles on circuit boards or other components. Many types of particulate are not inherently conductive, but can absorb significant quantities of water in high-moisture environments. Problems caused by electrically conductive particles can range from intermittent malfunctioning to actual damage to components and operational failures.

Thermal Failure

Premature clogging of filtered devices will cause a restriction in air flow that could induce internal overheating and head crashes. Heavy layers of accumulated dust on hardware components can also form an insulative layer that can lead to heat-related failures.

Room Conditions

All surfaces within the controlled zone of the data center should be maintained at a high level of cleanliness. All surfaces should be periodically cleaned by trained professionals on a regular basis, as outlined in the [“Cleaning Procedures and Equipment”](#) section. Particular attention should be paid to the areas beneath the hardware, and the access floor grid. Contaminants near the air intakes of the hardware can more easily be transferred to areas where they can do damage. Particulate accumulations on the access floor grid can be forced airborne when floor tiles are lifted to gain access to the sub-floor.

The subfloor void in a downward-flow air conditioning system acts as the supply air plenum. This area is pressurized by the air conditioners, and the conditioned air is then introduced into the hardware spaces through perforated floor panels. Thus, all air traveling from the air conditioners to the hardware must first pass through the subfloor void. Inappropriate conditions in the supply air plenum can have a dramatic effect on conditions in the hardware areas.

The subfloor void in a data center is often viewed solely as a convenient place to run cables and pipes. It is important to remember that this is also a duct, and that conditions below the false floor must be maintained at a high level of cleanliness. Contaminant sources can include degrading building materials, operator activity or infiltration from outside the controlled zone. Often particulate deposits are formed where cables or other subfloor items form air dams that allow particulate to settle and accumulate. When these items are moved, the particulate is re-introduced into the supply airstream, where it can be carried directly to hardware.

Damaged or inappropriately protected building materials are often sources of subfloor contamination. Unprotected concrete, masonry block, plaster or gypsum wall-board will deteriorate over time, shedding fine particulate into the air. Corrosion on post-filtration air conditioner surfaces or subfloor items can also be a concern. The subfloor void must be thoroughly and appropriately decontaminated on a regular basis to address these contaminants. Only vacuums equipped with High Efficiency Particulate Air (HEPA) filtration should be used in any decontamination procedure. Inadequately filtered vacuums will not arrest fine particles, passing them through the unit at high speeds, and forcing them airborne.

Unsealed concrete, masonry or other similar materials are subject to continued degradation. The sealants and hardeners normally used during construction are often designed to protect the deck against heavy traffic, or to prepare the deck for the application of flooring materials, and are not meant for the interior surfaces of a supply air plenum. While regular decontaminations will help address loose particulate, the surfaces will still be subject to deterioration over time, or as subfloor activity causes wear. Ideally all of the subfloor surfaces will be appropriately sealed at the time of construction. If this is not the case, special precautions will be necessary to address the surfaces in an on-line room.

It is extremely important that only appropriate materials and methodology are used in the encapsulation process. Inappropriate sealants or procedures can actually degrade the conditions they are meant to improve, impacting hardware operations and reliability. The following precautions should be taken when encapsulating the supply air plenum in an on-line room:

- Manually apply the encapsulant. Spray applications are totally inappropriate in an on-line data center. The spraying process forces the sealant airborne in the supply airstream, and is more likely to encapsulate cables to the deck.
- Use a pigmented encapsulant. The pigmentation makes the encapsulant visible in application, ensuring thorough coverage, and helps in identifying areas that are damaged or exposed over time.
- It must have a high flexibility and low porosity to effectively cover the irregular textures of the subject area, and to minimize moisture migration and water damage.
- The encapsulant must not out-gas any harmful contaminants. Many encapsulants commonly used in industry are highly ammoniated or contain other chemicals that can be harmful to hardware. It is very unlikely that this out-gassing could cause immediate, catastrophic failure, but these chemicals will often contribute to corrosion of contacts, heads or other components.

Effectively encapsulating a subfloor deck in an on-line computer room is a very sensitive and difficult task, but it can be conducted safely if appropriate procedures and materials are used. Avoid using the ceiling void as an open supply or return for the building air system. This area is typically very dirty and difficult to clean. Often the structural surfaces are coated with fibrous fire-proofing, and the ceiling tiles and insulation are also subject to shedding. Even before filtration, this is an unnecessary exposure that can adversely affect environmental conditions in the room. It is also important that the ceiling void does not become pressurized, as this will force dirty air into the computer room. Columns or cable chases with penetrations in both the subfloor and ceiling void can lead to ceiling void pressurization.

Exposure Points

All potential exposure points in the data center should be addressed to minimize potential influences from outside the controlled zone. Positive pressurization of the computer rooms will help limit contaminant infiltration, but it is also important to minimize any breaches in the room perimeter. To ensure the environment is maintained correctly, the following should be considered:

- All doors should fit snugly in their frames.
- Gaskets and sweeps can be used to address any gaps.

- Automatic doors should be avoided in areas where they can be accidentally triggered. An alternate means of control would be to remotely locate a door trigger so that personnel pushing carts can open the doors easily. In highly sensitive areas, or where the data center is exposed to undesirable conditions, it may be advisable to design and install personnel traps. Double sets of doors with a buffer between can help limit direct exposure to outside conditions.
- Seal all penetrations between the data center and adjacent areas.
- Avoid sharing a computer room ceiling or subfloor plenum with loosely controlled adjacent areas.

Filtration

Filtration is an effective means of addressing airborne particulate in a controlled environment. It is important that all air handlers serving the data center are adequately filtered to ensure appropriate conditions are maintained within the room. In-room process cooling is the recommended method of controlling the room environment. The in-room process coolers re-circulate room air. Air from the hardware areas is passed through the units where it is filtered and cooled, and then introduced into the subfloor plenum. The plenum is pressurized, and the conditioned air is forced into the room, through perforated tiles, which then travels back to the air conditioner for reconditioning. The airflow patterns and design associated with a typical computer room air handler have a much higher rate of air change than typical comfort cooling air conditioners so air is filtered much more often than in an office environment. Proper filtration can capture a great deal of particulates. The filters installed in the in-room, re-circulating air conditioners should have a minimum efficiency of 40% (Atmospheric Dust-Spot Efficiency, ASHRAE Standard 52.1). Low-grade pre-filters should be installed to help prolong the life of the more expensive primary filters.

Any air being introduced into the computer room controlled zone, for ventilation or positive pressurization, should first pass through high efficiency filtration. Ideally, air from sources outside the building should be filtered using High Efficiency Particulate Air (HEPA) filtration rated at 99.97% efficiency (DOP Efficiency MILSTD-282) or greater. The expensive high efficiency filters should be protected by multiple layers of pre-filters that are changed on a more frequent basis. Low-grade pre-filters, 20% ASHRAE atmospheric dust-spot efficiency, should be the primary line of defense. The next filter bank should consist of pleated or bag type filters with efficiencies between 60% and 80% ASHRAE atmospheric dust-spot efficiency.

ASHRAE 52-76		Fractional Efficiencies %		
Dust spot efficiency %	3.0 micron	1.0 micron	0.3 micron	
25-30	80	20	<5	
60-65	93	50	20	
80-85	99	90	50	
90	>99	92	60	
DOP 95	--	>99	95	

Low efficiency filters are almost totally ineffective at removing sub-micron particulates from the air. It is also important that the filters used are properly sized for the air handlers. Gaps around the filter panels can allow air to bypass the filter as it passes through the air conditioner. Any gaps or openings should be filled using appropriate materials, such as stainless steel panels or custom filter assemblies.

Positive Pressurization and Ventilation

A designed introduction of air from outside the computer room system will be necessary to accommodate positive pressurization and ventilation requirements. The data center should be designed to achieve positive pressurization in relation to more loosely controlled surrounding areas. Positive pressurization of the more sensitive areas is an effective means of controlling contaminant infiltration through any minor breaches in the room perimeter. Positive pressure systems are designed to apply outward air forces to doorways and other access points within the data processing center to minimize contaminant infiltration of the computer room. Only a minimal amount of air should be introduced into the controlled environment. In data centers with multiple rooms, the most sensitive areas should be the most highly pressurized. It is, however, extremely important that the air being used to positively pressurize the room does not adversely affect the environmental conditions in the room. It is essential that any air introduction from outside the computer room is adequately filtered and conditioned to ensure that it is within acceptable parameters. These parameters can be looser than the goal conditions for the room since the air introduction should be minimal. A precise determination of acceptable limits should be based on the amount of air being introduced and the potential impact on the environment of the data center.

Because a closed-loop, re-circulating air conditioning system is used in most data centers, it will be necessary to introduce a minimal amount of air to meet the ventilation requirements of the room occupants. Data center areas normally have a very low human population density; thus the air required for ventilation will be minimal. In most cases, the air needed to achieve positive pressurization will likely exceed that needed to accommodate the room occupants. Normally, outside air quantities of less than 5% make-up air should be sufficient (ASHRAE Handbook: Applications, Chapter 17). A volume of 15 CFM outside air per occupant or workstation should sufficiently accommodate the ventilation needs of the room.

Cleaning Procedures and Equipment

Even a perfectly designed data center requires continued maintenance. Data centers containing design flaws or compromises may require extensive efforts to maintain conditions within desired limits. Hardware performance is an important factor contributing to the need for a high level of cleanliness in the data center.

Operator awareness is another consideration. Maintaining a fairly high level of cleanliness will raise the level of occupant awareness with respect to special requirements and restrictions while in the data center. Occupants or visitors to the data center will hold the controlled environment in high regard and are more likely to act appropriately. Any environment that is maintained to a fairly high level of cleanliness and is kept in a neat and well organized fashion will also command respect from the room's inhabitants and visitors. When potential clients visit the room they will interpret the overall appearance of the room as a reflection of an

overall commitment to excellence and quality. An effective cleaning schedule must consist of specially designed short-term and long-term actions. These can be summarized as follows:

Frequency	Task
Daily Actions	Rubbish removal
Weekly Actions	Access floor maintenance (vacuum and damp mop)
Quarterly Actions	Hardware decontamination
	Room surface decontamination
Bi-Annual Actions	Subfloor void decontamination
	Air conditioner decontamination (as necessary)

Daily Tasks

This statement of work focuses on the removal of each day's discarded trash and rubbish from the room. In addition, daily floor vacuuming may be required in Print Rooms or rooms with a considerable amount of operator activity.

Weekly Tasks

This statement of work focuses on the maintenance of the access floor system. During the week, the access floor becomes soiled with dust accumulations and blemishes. The entire access floor should be vacuumed and damp mopped. All vacuums used in the data center, for any purpose, should be equipped with High Efficiency Particulate Air (HEPA) filtration. Inadequately filtered equipment cannot arrest smaller particles, but rather simply agitates them, degrading the environment they were meant to improve. It is also important that mop-heads and dust wipes are of appropriate non-shedding designs.

Cleaning solutions used within the data center must not pose a threat to the hardware. Solutions that could potentially damage hardware include products that are:

- Ammoniated
- Chlorine-based
- Phosphate-based
- Bleach enriched
- Petro-chemical based
- Floor strippers or re-conditioners

It is also important that the recommended concentrations are used, as even an appropriate agent in an inappropriate concentration can be potentially damaging. The solution should be maintained in good condition throughout the project, and excessive applications should be avoided.

Quarterly Tasks

The quarterly statement of work involves a much more detailed and comprehensive decontamination schedule and should only be conducted by experienced computer room contamination-control professionals. These actions should be performed three to four times per year, based on the levels of activity and contamination present. All room surfaces should be thoroughly decontaminated including cupboards, ledges, racks, shelves and support equipment. High ledges and light fixtures and generally accessible areas should be treated or vacuumed as appropriate. Vertical surfaces including windows, glass partitions, doors, etc. should be thoroughly treated. Special dust cloths that are impregnated with a particle absorbent material are to be used in the surface decontamination process. Do not use generic dust rags or fabric cloths to perform these activities. Do not use any chemicals, waxes or solvents during these activities.

Settled contamination should be removed from all exterior hardware surfaces including horizontal and vertical surfaces. The unit's air inlet and outlet grilles should be treated as well. Do not wipe the unit's control surfaces as these areas can be decontaminated by the use of lightly compressed air. Special care should also be taken when cleaning keyboards and life-safety controls. Specially treated dust wipes should be used to treat all hardware surfaces. Monitors should be treated with optical cleansers and static-free cloths. No Electro-Static Discharge (ESD) dissipative chemicals should be used on the computer hardware, since these agents are caustic and harmful to most sensitive hardware. The computer hardware is sufficiently designed to permit electrostatic dissipation thus no further treatments are required. After all of the hardware and room surfaces have been thoroughly decontaminated, the access floor should be HEPA vacuumed and damp mopped as detailed in the Weekly Actions.

Bi-Annual Tasks

The subfloor void should be decontaminated every 18 months to 24 months based on the conditions of the plenum surfaces and the degree of contaminant accumulation. Over the course of the year, the subfloor void undergoes a considerable amount of activity that creates new contamination accumulations. Although the weekly above floor cleaning activities will greatly reduce the subfloor dust accumulations, a certain amount of surface dirt will migrate into the subfloor void. It is important to maintain the subfloor to a high degree of cleanliness since this area acts as the hardware's supply air plenum. It is best to perform the subfloor decontamination treatment in a short time frame to reduce cross contamination. The personnel performing this operation should be fully trained to assess cable connectivity and priority. Each exposed area of the subfloor void should be individually inspected and assessed for possible cable handling and movement. All twist-in and plug-in connections should be checked and fully engaged before cable movement. All subfloor activities must be conducted with proper consideration for air distribution and floor loading. In an effort to maintain access floor integrity and proper psychrometric conditions, the number of floor tiles removed from the floor system should be carefully managed. In most cases, each work crew should have no more than 24 square feet (six tiles) of open access flooring at any one time. The access floor's supporting grid system should also be thoroughly decontaminated, first by vacuuming the loose debris and then by damp-sponging the accumulated residue. Rubber gaskets, if present, as the metal framework that makes up the grid system should be removed from the grid

work and cleaned with a damp sponge as well. Any unusual conditions, such as damaged floor suspension, floor tiles, cables and surfaces, within the floor void should be noted and reported.

Activity and Processes

Isolation of the data center is an integral factor in maintaining appropriate conditions. All unnecessary activity should be avoided in the data center, and access should be limited to necessary personnel only. Periodic activity, such as tours, should be limited, and traffic should be restricted to away from the hardware so as to avoid accidental contact. All personnel working in the room, including temporary employees and janitorial personnel, should be trained in the most basic sensitivities of the hardware so as to avoid unnecessary exposure. The controlled areas of the data center should be thoroughly isolated from contaminant producing activities. Ideally, print rooms, check sorting rooms, command centers or other areas with high levels of mechanical or human activity should have no direct exposure to the data center. Paths to and from these areas should not necessitate traffic through the main data center areas.

Glossary

This glossary defines terms and abbreviations in this publication.

Some of the definitions are taken from other glossaries. The letters in the parentheses that follow some definitions indicate the source of the definition:

(A) *The American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI).

(E) The ANSI/Electronic Industries Association (EIA) Standard-440-A, *Fiber Optic Terminology*.

(I) *The Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and International Electro-technical Commission (ISO/IEC/JTC1/SC1).

(IBM) *The IBM Dictionary of Computing*, copyright 1994 by IBM.

(T) Draft international standards committee drafts, and working papers being developed by the ISO/IEC/JTC1/SC1.

A

arm

The robotic assembly that is lowered between the columns of tapes. The arm hangs on four wires from the Z mechanism. The arm includes the hand, the rails the hand rides on, the track motor that moves the hand along the rails, and the KLT card.

alphanumeric

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

audit

The process of recording the location of all tapes in a library.

B

base chassis

The sheet metal and plastic chassis that makes up the framework of Module 1.

base module

The smallest, fully functional library consisting of the base chassis with the midplane, robot, front control panel, mailslot, one or two power supplies, up to two half-height LTO Ultrium tape drives, left magazine, and right magazine.

C

cartridge

A storage device that consists of magnetic tape on a supply reel in a protective housing. The spine of the cartridge usually contains a label listing the volume identification number. Also called tape, tape cartridge, tape volume, or cassette.

cell

See [slot](#).

cleaning cartridge

A tape cartridge that contains special material to clean the tape path in a transport or drive. LTO Ultrium cleaning cartridge labels have a CLN prefix and a CU media identifier.

configuration

The manner in which the hardware and software of an information processing system is organized and interconnected. (T)

D

data cartridge

A term used to distinguish a cartridge onto which a tape drive may write data.

diagnostics

Pertaining to the detection and isolation of errors in programs and faults in equipment.

dismount

To remove a tape from a drive.

drive

A drive controls the movement of the tape and records or reads the data on the tape as desired by the customer (see [tape drive](#)).

drive cleaning

The device feature that uses a cleaning cartridge to clean a tape drive.

drive slot

The space in the library where the tape drive resides.

drive tray

See [tape drive](#).

dynamic host configuration protocol (DHCP)

A network protocol that enables a server to automatically assign an IP address to devices on a network. DHCP assigns a number dynamically from a defined range of numbers for a given network.

E

encryption

The process of changing data into a form that cannot be read until it is deciphered, protecting the data from unauthorized access and use.

Ethernet

A local-area, packet-switched network technology. Originally designed for coaxial cable, it now also runs over shielded, twisted-pair cable. Ethernet is a 10 or 100 Megabytes-per-second LAN.

expansion cable

A cable used to connect modules 2–10 to Module 1. Each end of the cable has a USB A style connector.

expansion chassis

The sheet metal and plastic chassis that makes up the framework for Module 2–10.

expansion module

A module that can be added to the bottom of an existing library to increase its capacity for drives and tape cartridges (tapes). The module consists of the expansion chassis, a module controller, up to two power supplies, up to two half-height LTO Ultrium tape drives, a left magazine, and a right magazine. The expansion module connects to the base module by an expansion cable.

export

The action in which the device places a cartridge into the mailslot so that the operator can remove the cartridge. Also called eject.

F

FC

See *Fibre Channel*.

fiber optics

The branch of optical technology concerned with the transmission of radiant power through fibers made of transparent materials such as glass, fused silica, and plastic. (E)

fiber-optic cable

A cable made of ultra-thin glass or silica fibers which can transmit data using pulses of laser light. Fiber-optic cables have several advantages over copper cables: they have much less signal loss; they allow information to be transmitted at higher speeds and over longer distances; they are not affected by external electrical noise; and they are better for transmissions which require security.

Fibre Channel

The National Committee for Information Technology Standards standard that defines an ultrahigh-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.

front control panel

An assembly mounted on the front of the base chassis. It includes the touch screen operator panel, various LEDs and switches, and associated electronics.

G

get

An activity in which a robot obtains a cartridge from a slot or drive.

gripper

The portion of the hand assembly that grasps and holds a cartridge.

GUI

Graphical user interface. Software that allows the user to control the device through visual screens.

H

hand

The robotic mechanism that grabs tape cartridges and moves them between slots and the drive. It is a component of the arm. The hand has a reach mechanism that gets tape cartridges from slots or drives and puts them into slots or drives. The hand also has a wrist mechanism that rotates the hand to allow it to reach cartridges on either side or the drives at the back of the library.

hardware

All or part of the physical components of an information processing system, such as computers or peripheral devices. (T) (A)

HBA

See *host bus adapter (HBA)*.

host computer

In a computer network, a computer that usually performs network control functions and provides end users with services such as computation and database access. (T)

host bus adapter (HBA)

A circuit installed in a multi-platform host or device that interfaces between the device and the bus.

host interface

An interface between a network and host computer. (T)

I

import

The process of bringing a cartridge into the library from the mailslot. Also called enter.

indicator

A device that provides a visual or other indication of the existence of a defined state. (T)

initialization

The operations required for setting a device to a starting state, before the use of a data medium, or before implementation of a process. (T)

interface

Hardware, software, or both, that links systems, programs, or devices. (IBM)

internet protocol (IP)

A protocol used to route data from its source to its destination in an Internet environment. (IBM)

inventory

The process of reading and storing in memory the bar code identification and location of all tape cartridges in a library.

IP

See *internet protocol (IP)*.

L

LC connector

A standard fiber-optic cable connector for Fibre Channel data transfer.

LED

Light emitting diode. An electronic device that lights up when electricity is passed through it.

left magazine

A plastic assembly containing 15 tape slots that can be inserted into the left side (as viewed from the front) of Modules 1–10. Left magazines and right magazines are not interchangeable.

library

A robotic system that stores, moves, mounts, and dismounts tape cartridges that are used in data read or write operations.

LTO

An acronym for Linear Tape-Open technology. An “open format” technology, which means that users will have multiple sources of products and media.

LUN

Logical Unit Number. An address for a component of a SCSI device. In this device, the host computer sends the SCSI commands to for the *library* to LUN 1 of the master *tape drive* and sends SCSI commands for the tape drive itself to LUN 0.

M

magnetic tape

A tape with a magnetizable layer on which data can be stored. (T)

magnetic tape drive

A mechanism for controlling the movement of magnetic tape, commonly used to move magnetic tape past a read head or write head, or to allow automatic rewinding. (I) (A)

mailslot

A plastic and metal assembly located in the upper right corner of the base chassis used to enter tapes into the library and to remove tapes from the library. Previous StorageTek libraries called this a CAP (Cartridge Access Port).

midplane

A card mounted in the base chassis or expansion chassis that is behind the tape slots and in front of the tape drives. Other cards connect to it either by direct connection or by a cable.

Module 1

See *base module*.

module controller

A card inserted into the back of Modules 2–10 that controls the operation of the module. It is connected to the robot by an expansion cable.

Module X (2 through 10)

See *expansion module*.

mount

To place a tape in a drive and make it accessible to the host system.

multimode fiber

An optical fiber designed to carry multiple signals, distinguished by frequency or phase, at the same time.

N

net mask

A 32-bit, or 4-byte number, in dotted decimal format (typically written as four numbers separated by periods, such as 255.255.0.0 or 255.255.255.0) that is applied to an IP address to identify the network and node address of a host or router interface. (*Synonymous* with subnet mask.)

network

An arrangement of nodes and branches that connects data processing devices to one another through software and hardware links to facilitate information interchange.

O

offline

Neither controlled by, nor communicating with, a computer. (IBM)

online

Pertaining to the operation of a functional unit when under the direct control of the computer. (T)

operator panel

A component of the front control panel consisting of a seven inch WVGA color touch screen.

P

port

A specific communications end point within a host. A port is identified by a port number. (IBM) (2) In Fibre Channel, an access point in a device where a link attaches.

put

An activity in which a robot places a cartridge into a slot or drive.

power supply

An AC to DC power supply that mounts into the rear of a module Module (1–10). Referred to as top power supply or bottom power supply when referring to a power supply installed in a specific module.

power supply filler

A metal frame that slides into a power supply slot when a power supply will not be used in that slot.

R

release

A distribution of a new product or new function and fixes for an existing product. (IBM)

right magazine

A plastic assembly containing 15 tape slots that can be inserted into the right side (as viewed from the front) of Modules 1–10. Right magazines and left magazines are not interchangeable.

robot

An assembly that incorporates the bulk of the Module 1 electronics and the robotic components. This assembly is a combination of mechanical components, electronics, and a sheet metal housing. It is located at the top of the base chassis and incorporates the arm, Z mechanism, a CPU board, plus the KLC and KLZ cards.

S

SAS

Serial Attached SCSI. A computer bus technology and serial communication protocol for direct attached storage devices, including disk drives and high-performance tape drives.

SCSI

Small Computer System Interface. A standard interface and command set for transferring data between mass storage and other devices. The host computer uses SCSI commands to operate the device. Depending on the model, physical connection between the host computer and the tape drive will use a parallel SCSI, SAS, or Fibre Channel interface.

slot

An empty location into which something else may be placed. Most commonly used when referring to the locations in the magazine or mailslot where tape cartridges are placed. Power supplies and drives are also placed in slots.

switch

In Fibre Channel technology, a device that connects Fibre Channel devices together in a fabric.

T

tape

Also known as cartridge, tape cartridge, tape volume, volume, or cassette.

tape cartridge

A container holding magnetic tape that can be processed without separating the tape from the container. The device uses data and cleaning cartridges. These cartridges are not interchangeable. *See [cartridge](#).*

tape drive

An electro-mechanical device that moves magnetic tape and includes mechanisms for writing and reading data to and from the tape. The drive is mounted into a proprietary tray (sometimes called a sled).

tape drive filler

A metal frame that slides into a tape drive slot when a tape drive will not be used in that slot.

Terabyte

A unit of storage, abbreviated T or TB, equal to 1,024 Gigabytes.

U

U

A measure of chassis height. 1U in rack measurement is 44.45 millimeters (1.75 inches).

USB

Universal Serial Bus. A serial bus standard used to interface devices.

W

World Wide Name

A unique identifier in a Fibre Channel or SAS storage network. The first three bytes are derived from an IEEE Organizationally Unique Identifier (OUI), which defines the manufacturer or vendor. The remaining five bytes are assigned by the vendor.

WORM

An acronym for Write Once Read Many times, a class of recording systems that allow recording and adding data, but not altering recorded data.

wrist

A component of the hand assembly that rotates the hand horizontally.

Z

Z mechanism

The robotic assembly mounted at the back of the robot that raises and lowers the arm. The Z mechanism includes a motor, gears, the bullwheel, and the wires and pulleys that hold the arm. As the motor turns, the bullwheel rotates and extends or retracts the wires to lower or raise the arm.

Index

A

- accessory package
 - base module 27
 - expansion module 38
- addresses, network verification 61
- air quality 83
- apply initial configuration settings 60

B

- back rail
 - installation
 - base module 29
 - expansion module 47
 - overview 28
- base module
 - accessory package 27
 - back rail installation 29
 - cabling 51
 - clip nut installation 34
 - floor removal 41
 - front rail installation 31
 - installation 35
 - robot lock release 50

C

- cable, connection of 51
- cartridge magazine
 - description 13
 - removal tool 36
- cleaning procedures, data center 90
- clip nut
 - installation
 - base module 34
 - expansion module 42
 - location overview 33
- configuration settings, initial 60
- contaminants, controlling 83

D

- data center cleaning procedures 90

E

- environmental
 - contaminants 83
 - information, SL150 22
- expansion module
 - clip nut installation 42
 - installation of 46
 - magazine removal 43
 - rail installation 47

F

- filtration 89
- floor removal 41
- front rail
 - installation 31
 - overview 30

H

- hook and loop strap 50

I

- initial configuration settings 60
- instructions
 - base module
 - back rail 29
 - clip nut installation 34
 - installation 35
 - cable connection 51
 - expansion module
 - clip nut installation 42
 - installation 46
 - magazine removal 43
 - rear rail installation 47
 - front rail installation 31
 - gather rail parts
 - base module 27
 - expansion module 39
 - hook and loop strap 50
 - label a module 49
 - library floor removal 41

- robot lock release 50
- unpacking 22

K

- keyboard screens 17

L

- label installation, module 49
- library
 - control interface 13
 - floor removal 41
 - initialization
 - apply changes 60
 - change default password 55
 - network configuration 57
 - set date and time 57
 - start and log in 54
 - power down 40
 - self test 65
- lock, robot 50

M

- magazine
 - cartridge 13
 - removal
 - expansion module 43
 - using tool 36
- module, base
 - installation 35
 - tab locations 35
- module, expansion
 - hook and loop strap 50
 - installation 46
- module, label installation 49
- mounting rail, base module 28

N

- network settings verification 61

P

- power down the library 40
- product staging 22

R

- rack preparation 21
- rail
 - back, overview 28
 - front, overview 30
 - installation
 - back rail 29

- expansion module 47
- front rail 31
- mounting description 28
- parts
 - base module 27
 - expansion module 39
- robot lock, release of 50

S

- self test 65
- service clearance 22
- settings, network 61
- shipping robot lock 50
- staging, product 22

T

- test, self 65

U

- unpacking instructions 22

W

- Windows device driver 22