StorageTek SL4000
Library Guide

E76470-14
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StorageTek SL4000 Library Guide,

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Preface

This guide provides a general overview of Oracle's StorageTek SL4000 modular tape library. This guide covers installation planning, configuration, and operation of the library. Most procedures involve using the SL4000 web application (referred to the as the SL4000 GUI).

Documentation Accessibility

For information about Oracle's commitment to accessibility, visit the Oracle Accessibility Program website at http://www.oracle.com/pls/topic/lookup?ctx=acc&id=docacc.

Access to Oracle Support

Oracle customers that have purchased support have access to electronic support through My Oracle Support. For information, visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=info or visit http://www.oracle.com/pls/topic/lookup?ctx=acc&id=trs if you are hearing impaired.

Related Documentation

For SL4000 documentation, visit: https://docs.oracle.com/en/storage/tape-storage/sl4000/.

- *SL4000 Library Guide*
- *SL4000 SCSI Reference Guide*
- *SL4000 SCI Reference Guide*
- *SL4000 Security Guide*
- *SL4000 Safety and Compliance Guide*
- *SL4000 Licensing Information User Guide*

Diversity and Inclusion

Oracle is fully committed to diversity and inclusion. Oracle respects and values having a diverse workforce that increases thought leadership and innovation. As part of our initiative to build a more inclusive culture that positively impacts our employees, customers and partners we are working to remove insensitive terms from our products and documentation. We are also mindful of the necessity to maintain compatibility with our customers' existing technologies and the need to ensure continuity of service as Oracle's offerings and industry standards evolve. Because of these technical constraints, our effort to remove insensitive terms is ongoing and will take time and external cooperation.

Release Notes for 1.1.1.110

Release information for Oracle's StorageTek SL4000 library software version 1.1.1.110

> **WARNING:**
>
> If the current library firmware version is 1.0.1.69 or less, you must first upgrade to version 1.0.2.75 or 1.0.2.76 before upgrading to version 1.1.1.

General Enhancements

- Enhanced support for IBM LTO9 Drives. See the section "Library Support of LTO9 Tape Calibration" below.
- Improved dual robot initialization:
  - If one robot fails any step of the initialization, the failed robot will be pushed out of the way and the library will complete the initialization.
  - Robots will be correctly identified in the GUI and logs, even if initialization fails, regardless of whether the database was cleared prior to initialization.
  - Improved handling of intermittent single robot failure in a two robot library with PEMs and AEMs.
  - Improved handling of robot initialization in a library with only a base after a clear database restart.
  - Improved addition, removal, and replacement of robots.
  - Since there is no library complex, the rail initialization job will no longer check the state of the library complex and will verify no other initialization jobs are running before initializing the rail.
- Added a library resource monitor to collect data on memory usage, load, queue sizes, etc. to aid in diagnosis of library health.
- Added support for multiple LOD2 FPGA versions: xc6slx4-2 and xc6slx4-3.
- Upgraded the following 3rd party components:
  - Apache Log4J to version 2.17.1.
  - Apache Mina’s apache-sshd to version 2.8.0.
  - org.slf4j to version 1.7.32.
  - com.oracle.database.jdbc components to ojdbc8 version 12.2.0.1.
  - SNMP4J to version 2.8.8.
- Reduced database retention time to 15 days to minimize the size of the tables.
- Implemented a system monitor.

- Added new security algorithms for SNMP users and trap recipients.

Bug Fixes

- Corrected a problem where some drives were not being audited after a Clean Db Restart or door open.
- The AEM CAP will now open without multiple button presses.
- The lock state of the AEM CAP is now preserved thru the use of the service key, opening then closing the AEM door.
- The AEM CAP wait LED will no longer blink if the CAP button is pressed when the AEM door is opened.
- If a robot fails during rail initialization, a fault report and associated support bundle will now always be generated.
- The sweeping robot will now back off the end stop or other robot to successfully read the frame labels.
- Corrected SNMP user recovery so the users are correctly added at boot time.
- Corrected several null pointer exceptions that caused communication issues between the library and ACSLS.

Library Support of LTO9 Tape Calibration

When LTO9 media is first loaded into the LTO9 drive, the drive automatically initiates tape calibration, which includes initialization and characterization of the cartridge.

IMPORTANT: IBM has stated that LTO9 calibration may require 20 minutes to 2 hours to complete.

With the 1.1.1.109 code release, the SL4000 library supports longer load times. However, LTO9 tape calibration can well exceed these load times and limited information is available from the library as to the status of this operation. Thus, with the 1.1.1.110 code release, library support has been modified to improve handling of tape calibration, as follows:

> **Note:**
>
> Contact service with any questions, especially with regard to the 1.1.1.109 code release.

- Load - When the library checks the status of the drive after a new cartridge is loaded, the library will report that the load is successful if the drive reports that a "calibration" is in process.
- Status: To determine if tape calibration is in process, access **Drive Properties** and select the **Details** tab. `Display Characters: c` indicates tape calibration is in process.
- Dismount Request: The drive ignores all requests to unload a cartridge while it is calibrating a tape. Thus, if a dismount request is received, the library will fail the request.
- Media Validation: Uninitialized cartridges are not currently compatible with Media Validation.

- Drive Power Cycle and Library Reboot: When a drive is power cycled while calibrating a tape, tape calibration resumes once drive initialization is complete. A library reboot does not power cycle the drive. Therefore, tape calibration continues during the library reboot.

Minimum Requirements for Related Software

ACSLS

- ACSLS 8.5.1+ is required to support SL4000 1.1.1.110 (the feature card must also be at version 1.0.2 or higher).

STA

- STA 2.4.0+ is required to interact with SL4000 1.1.1.110.

SDP

- SDP2 version 2.5.4 (Patch 33323391 or higher) is required for support of SL4000 1.1.1.110 (Linux 6 and Linux 7).

MIB Version

2.06

LTO Drive Firmware Versions

The following LTO drive firmware versions have been verified in the SL4000 library. For the drives to work correctly, ensure the drives are at the minimum versions specified in the table below. Lower drive firmware versions may function, but have not been fully tested with release 1.1.0 or later. For the IBM LTO drives to run in ADI mode, switch 5 must be on.

Drive Type	Drive Firmware Version	Encryption
HP Generation 5	I6PS	N/A
HP Generation 6	J5MS	N/A
IBM Generation 5	G360	Belisarius: 5.32.20
IBM Generation 6	JAX4	Belisarius: 5.32.20
IBM Generation 7	JAYE	LKM/D: 6.03.101
IBM Generation 8	JAYE	LKM/D: 6.03.101
IBM Generation 9	N7N0	LKM/D: 6.06.101

Firmware Component Versions

Component	Versions
Current Firmware Version	1.1.1.XX.YYYY
Library Platform Version	1.0.0.0.32000
WebLogic App Server Version	12.2.1.2.0 (22754279)
Oracle Clusterware Version	12.1.0.2.0
Oracle ADF Version	12.2.1.2.42.161008.1648
Database Server Version	Oracle Database 12c Release 12.1.0.1.0 - 64bit Production With the Real Application Clusters and Automatic Storage Management options
Database Driver Version	12.1.0.2.0
Library OS Information	Linux 4.1.12-37.4.1.e16uek.x86_64 amd64

Component	Versions
Java Runtime Version	Oracle Corporation 1.8.0_201 (64 bit)

Note:

If the Java version does not match the version above, contact L2 support in Colorado for assistance. This indicates that the library firmware was not updated in the correct order.

Release Notes for 1.1.1

Release information for Oracle's StorageTek SL4000 library software version 1.1.1.

> **WARNING:**
>
> If the current library firmware version is 1.0.1.69 or less, you must first upgrade to version 1.0.2.75 or 1.0.2.76 before upgrading to version 1.1.1.

Media Validation Enhancements

- Implemented full support of LTO Media Validation operations from the GUI by adding IBM LTO Standard and Complete Verify tests.
- Improved T10000 Media Validation.

STA Support

- Added support for STA 2.4.0+. Refer to the STA documentation for more information: https://docs.oracle.com/en/storage/storage-software/storagetek-tape-analytics/
- Improved the SCI/OSCI interface to support STA.

General Enhancements

- Added support for the IBM LTO9 drive.

  > **Note:**
  >
  > See Library Support of LTO9 Tape Calibration.

- Improved dual robot initialization:
  - If one robot fails any step of the initialization, the failed robot will be pushed out of the way and the library will complete the initialization.
  - Robots will be correctly identified in the GUI and logs, even if initialization fails, regardless of whether the database was cleared prior to initialization.
  - Improved handling of intermittent single robot failure in a two robot library with PEMs and AEMs.
  - Improved handling of robot initialization in a library with only a base after a clear database restart.
- Added a library resource monitor to collect data on memory usage, load, queue sizes, etc. to aid in diagnosis of library health.

- Updated the Rail Power Supply Diagnosis job to work with the Bel Power 1200W supplies during door open and close events.
- Updated the help to explain the definition of “Effective Auto Clean Enabled”.
- Added support for non-disruptive replacement of one robot in a two robot library.
- Added the ability to force a dump on IBM LTO6+ drives.
- Increased load and unload timeouts to 16 minutes to cover the extended timeouts for IBM drives per IBM specification.
- Upgraded the following components:
  - snmp4j: 2.8.7
  - snmp-agent: 2.7.4
  - log4j: 2.14.1

Bug Fixes

- Enhanced configuration import so that it will no longer timeout with the import of a large library configuration.
- Updated the state of the rail AC and DC power distribution devices to "Usable" upon announce of the LOER card.
- Corrected a problem that prevented the right AEM from enclosing a single robot library during a rail sweep of the left AEM.
- Corrected an issue that caused the GUI login to fail with “Your session has expired”.
- Corrected a problem with T10000 FICON drives failing to discover.
- Improved robot initialization to prevent collisions.
- The library now actively attempts to re-establish connection with unreachable outbound (OSCI) destinations. Failed destinations will still be disabled after 48 hours (regardless of the retention period).
- The library now raises the AEM Safety Door on initialization, if the AEM Service Key is off.
- The library now only sends the SNMP Test trap if the notification type of 'Library' was selected.
- Improved robot initialization to prevent collisions.
- Corrected an issue that was causing the import of a certificate to fail.

Minimum Requirements for Related Software

ACSLS

- ACSLS 8.5.1+ is required to support SL4000 1.1.1. (the feature card must also be at version 1.0.2 or higher).

STA

- STA 2.4.0+ is required to interact with SL4000 1.1.1.

SDP

- SDP2 version 2.5.1+ is required for support of SL4000 1.1.1.

MIB Version

2.06

LTO Drive Firmware Versions

The following LTO drive firmware versions have been verified in the SL4000 library. For the drives to work correctly, ensure the drives are at the minimum versions specified in the table below. Lower drive firmware versions may work, but have not been fully tested with 1.1.0. For the IBM LTO drives to run in ADI mode, switch 5 must be on.

Drive Type	Drive Firmware Version	Encryption
HP Generation 5	I6PS	N/A
HP Generation 6	J5MS	N/A
IBM Generation 5	G360	Belisarius: 5.32.20
IBM Generation 6	JAX4	Belisarius: 5.32.20
IBM Generation 7	JAYE	LKM/D: 6.03.101
IBM Generation 8	JAYE	LKM/D: 6.03.101
IBM Generation 9	N7N0	LKM/D: 6.06.101

Firmware Component Versions

Component	Versions
Current Firmware Version	1.1.1.XX.YYYY
Library Platform Version	1.0.0.0.32000
WebLogic App Server Version	12.2.1.2.0 (22754279)
Oracle Clusterware Version	12.1.0.2.0
Oracle ADF Version	12.2.1.2.42.161008.1648
Database Server Version	Oracle Database 12c Release 12.1.0.1.0 - 64bit Production With the Real Application Clusters and Automatic Storage Management options
Database Driver Version	12.1.0.2.0
Library OS Information	Linux 4.1.12-37.4.1.e16uek.x86_64 amd64
Java Runtime Version	Oracle Corporation 1.8.0_201 (64 bit)

Note:

If the Java version does not match the version above, contact L2 support in Colorado for assistance. This indicates that the library firmware was not updated in the correct order.

Release Notes for 1.1.0

Release information for Oracle's StorageTek SL4000 library software version 1.1.0

> **WARNING:**
>
> If the current library firmware version is 1.0.1, you must first upgrade to version 1.0.2 before upgrading to version 1.1.0.

DNS Configuration Has Been Removed

The option to configure an external DNS server has been removed. Please take appropriate action to ensure that any remote host has explicitly been defined only by IP Address, which include:

- Outbound StorageTek Control Interface (OSCI) notification recipients
- Simple Network Management Protocol (SNMP) trap recipients
- Optional Network Time Protocol (NTP) servers

Considerations for Migrating to Library-Managed Encryption

Library-managed encryption is supported for IBM LTO6+ only. If you are encrypting T10000 drives, HP LTO, or IBM LTO5 drives, you should continue to use the existing drive-enrolled encryption method using VOP.

Current OKM customers that want to migrate to LME must:

- Un-enroll the drives from OKM
- Enroll the library
- Enable specific drives for encryption.

For more information, see Library-Managed Encryption (LME) and Configure Library Encryption (LME).

General Enhancements

- Implemented Library-Managed Encryption (LME) for IBM LTO6 drives and higher.
- Upgraded the following third party components:
  - HttpClient to version 4.5.11
  - HttpCore to version 4.4.13
  - SNMP4J to version 2.8
  - SNMP4J-Agent to version 2.7.1
  - JSCH to version 0.1.55

- Added an option to export the configuration file when restarting the library with the clear database option.
- Partition IDs are now preserved when importing a configuration file.
- Implemented bond mode 1 active-backup dual networking support on public interfaces customer port 1 and customer port 2.
  - Previous code versions implemented bond mode 3 active-active support requiring compatible customer networks.

Bug Fixes

- The library will clear database audit files 14 days or older to better manage log file space.
- Enhanced monitoring of the local and shared data storage spaces. If the usage of any storage space is greater than 90%, the library generates a system report and issues a fault event to notification destinations registered for the "Fault" event type. This notification includes email and OSCI destinations.
- Corrected a problem with some faults not creating support bundles, causing the SDP API to hang.
- Corrected a problem where a concurrent rail initialization, code load and robot announce can cause rail initialization to wait forever for resources.
- When OSCI destinations go offline, delivery attempts to that destination will be paused.
- New OSCI notifications will be subject to a retention limit of 2 to 24 hours, based upon the destination.
- Implemented multiple improvements in support bundle contents and their creation.
- Corrected a problem where system cells could be filled up via the SCI interface or the GUI.
- Improved robot fault handling.
- Implemented a method to prevent rail power fault reports from generating when a door open event occurs.

Drive Specific Enhancements

- Implemented drive management:
  - Added the ability to retrieve drive dumps from all drive types.
  - Added the ability to force a drive dump on the T10000 series drives.
- Added virtual drive display information for both T10000 and IBM LTO drives to the Drive Properties page of the GUI.
- Added the fiber port speed and loop id to the Drive Properties page of the GUI.
- Added the drives table to support bundles.
- Added a drive communication 'activation-on-demand' service to improve drive discovery.
- Improved T10000 media validation.
- Implemented initial support for IBM LTO media validation.
- All LTO drives now set port configuration to auto-negotiate.

GUI Enhancements

- The library status now displays “Operative, Auditing, Online” while the top-level audit job is running.
- Implemented drive management:
  - Added the ability to retrieve drive dumps from all drive types.
  - Added the ability to force a drive dump on the T10000 series drives.
  - The Drive Properties page shows the availability of a drive dump.
  - The Drive Properties page shows port speed and loop id for attached drives.
- Media validation has been enhanced:
  - Added the option to initiate a media validation for LTO4+ cartridges.
  - Added the option to stop an in-progress media validation for both T10000 and LTO.
  - Improved the completion status on the Activities Events tab.
- Added LME configuration. See Configure Library Encryption (LME).

SNMP Enhancements

- Renamed the MIB to: ORACLE-TAPE-LIBRARY-MIB.txt.
  - Download the latest version: 2.06

Bug Fixes

- The library sends SNMP traps when the following occur:
  - Main door and AEM open/ close
  - Library online and offline changes
  - Audit completion
- Fixed the SNMP engineId generation.
- Improved SNMP device fault traps to include more information.
- Updated the MIB to have the trap varBind OID descriptions.

Minimum Requirements for Related Software

ACSLS

- ACSLS 8.5.1+ is required to support SL4000 1.1.0. (the feature card must also be at version 1.0.2.).

SDP

- SDP2 version 2.5.1+ is required to support of SL4000 1.1.0.

MIB Version

2.06

LTO Drive Firmware Versions

The following LTO drive firmware versions have been verified in the SL4000 library. For the drives to work correctly, ensure the drives are at the minimum versions specified in the table below. Lower drive firmware versions may work, but have not been fully tested with 1.1.0. For the IBM LTO drives to run in ADI mode, switch 5 must be on.

Drive Type	Drive Firmware Version	Encryption
HP Generation 5	I6PS	N/A
HP Generation 6	J5MS	N/A
IBM Generation 5	G360	Belisarius: 5.32.20
IBM Generation 6	JAX4	Belisarius: 5.32.20
IBM Generation 7	JAYE	LKM/D: 6.03.101
IBM Generation 8	JAYE	LKM/D: 6.03.101

Firmware Component Versions

Component	Versions
Current Firmware Version	1.1.0.89.34004
Library Platform Version	1.0.0.0.32000
WebLogic App Server Version	12.2.1.2.0 (22754279)
Oracle Clusterware Version	12.1.0.2.0
Oracle ADF Version	12.2.1.2.42.161008.1648
Database Server Version	Oracle Database 12c Release 12.1.0.1.0 - 64bit Production With the Real Application Clusters and Automatic Storage Management options
Database Driver Version	12.1.0.2.0
Library OS Information	Linux 4.1.12-37.4.1.e16uek.x86_64 amd64
Java Runtime Version	Oracle Corporation 1.8.0_201 (64 bit)

Note:

If the Java version does not match the version above, the library must install firmware version 1.0.2.76, then upgrade to 1.1.0.89.

Release Notes for 1.0.2

Release information for Oracle's StorageTek SL4000 library software version 1.0.2.

> **Note:**
>
> Once you upgrade the library to 1.0.2, Oracle recommends that you do not downgrade. If you must downgrade firmware, please contact service.

General Enhancements

- Enhanced support for future drive trays.
- Improved support for root switch (LOER card) replacement.
- Upgraded the Java Runtime Environment (JRE) to version 1.8 revision 201.
- Enhanced support for library controller (LOC) and storage (LOH) failure detection and replacement.

Bug Fixes

- Cleaning tapes are marked as “Unknown" once moved to the CAP and the CAP is opened then closed.
- Corrected a problem with replacing LOC managed cards (LOY, LOF, LON, LOH, LOV) that resulted in the device identity objects not getting updated with current manufacturing, marketing and FRU data.
- Corrected several problems with moves interrupted by a door open.
- Corrected a problem with a CAP staying online and available after a move error.
- Corrected a problem with importing a tape to a system cell without exporting a tape.
- The cleaning tape status is no longer set to "Unknown" until after the CAP is opened.

Drive Specific Enhancements

Bug Fixes

- Media mapping for CT cleaning tapes has been corrected and will no longer be loaded into T10000C or T10000D drives.

Feature Card Enhancements

> **Note:**
>
> To upgrade an existing feature card to 1.0.2, contact service.

- If the feature card is removed, the library will be set to “Degraded".
- Re-designed the LOH storage management and LOH replacement procedure.

Bug Fixes

- Corrected a problem that occurred when a second feature card was installed and both feature cards were seeing the same storage, causing conflicts with boot.
- Each feature card now uses the two LOH drives directly above it in the card cage.
- Corrected various issues with feature card removal and replacement.
- Improved reporting of read/write errors on the LOH card.

GUI Enhancements

- The library status now reads “Operative, Auditing, Online" while the top level audit job is running.

Bug Fixes

- The GUI now displays all system reports, even those with large record counts.
- The GUI no longer displays open CAPs as available for import/export.
- The GUI no longer displays deleted support bundles.
- The GUI drive page now displays the drive tray and encryption card types.
- The library name is now limited to 24 characters.

Minimum Requirements for Related Software

ACSLS

- ACSLS 8.5.1+ is required to support SL4000 1.0.2. (the feature card must also be at version 1.0.2.).

SDP

- SDP2 version 2.5.1+ is required to support of SL4000 1.0.2.

MIB Version

1.00

LTO Drive Firmware Versions

The following LTO drive firmware versions have been verified in the SL4000 library. For the drives to work correctly, ensure the drives are at the minimum versions specified in the table below. Lower drive firmware versions may work, but have not been fully test with 1.0.2. For the IBM LTO drives to run in ADI mode, switch 5 must be on.

Drive Type	Drive Firmware Version	Encryption
HP Generation 5	I6PS	N/A
HP Generation 6	J5MS	N/A
IBM Generation 5	G360	Belisarius: 5.32.20
IBM Generation 6	JAX4	Belisarius: 5.32.20
IBM Generation 7	JAYE	LKM/D: 6.03.101
IBM Generation 8	JAYE	LKM/D: 6.03.101

1

SL4000 Specifications and Features

Oracle's StorageTek SL4000 modular library system is an enterprise tape storage solution that offers flexibility, scalability, and high availability.

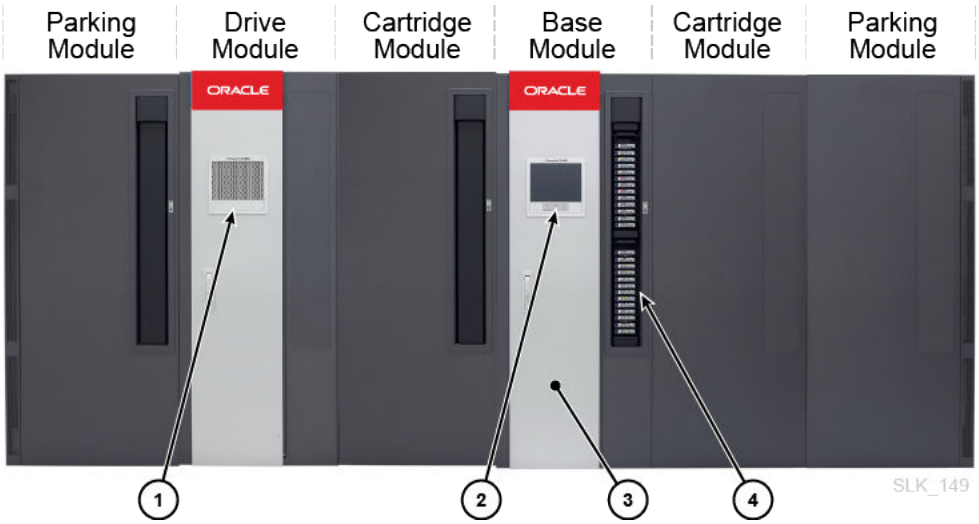
Library Modules

The library can have a maximum of 15 modules (one Base module and up to 14 expansion modules).

The module types are:

- Base Module
- Drive Module (DEM)
- Cartridge Module (CEM)
- Access Module (AEM)
- Parking Module (PEM)

Figure 1-1 SL4000 Library Configuration Example



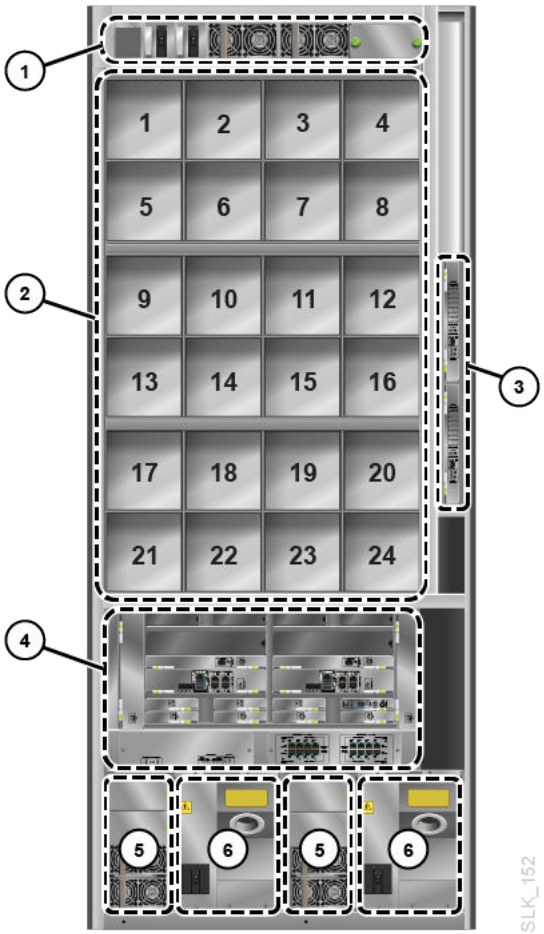
1. Perforated window
2. Operator panel
3. Base Module front door
4. Rotational CAP (rotary CAP)

Base Module

The Base Module controls the operation of the library. There must be one Base Module per library.

- A standalone Base Module is the smallest possible configuration.
- For best performance, place the Base Module at the center of the library.
- Comes standard with a rotational CAP, operator panel, one drive array (8 drive bays), two LTO drives, one PDU, two DC drive power supplies, and two DC rail power supplies.
- The Base Module contains the card cage. It ships standard with one library controller, a root switch, three library storage cards, a video card, two DC converters, two fan assemblies, safety controller, and network patch panel.
- Optional second and third drive array (for 24 drive bays max).
- Optional web camera.
- Optional feature card.
- 205 to 431 tape capacity depending on the number of drive arrays.

Figure 1-2 Base Module (Rear View)



1. Rail power module (contains up to three DC power supplies and two rail controllers)
2. Tape drive bays
3. Drive switch card cage (contains up to two drive network switches, slot 1 on the bottom and slot 2 on top)
4. Base card cage
5. Drive DC power supplies
6. Power distribution units

Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.

Base Module Measurements

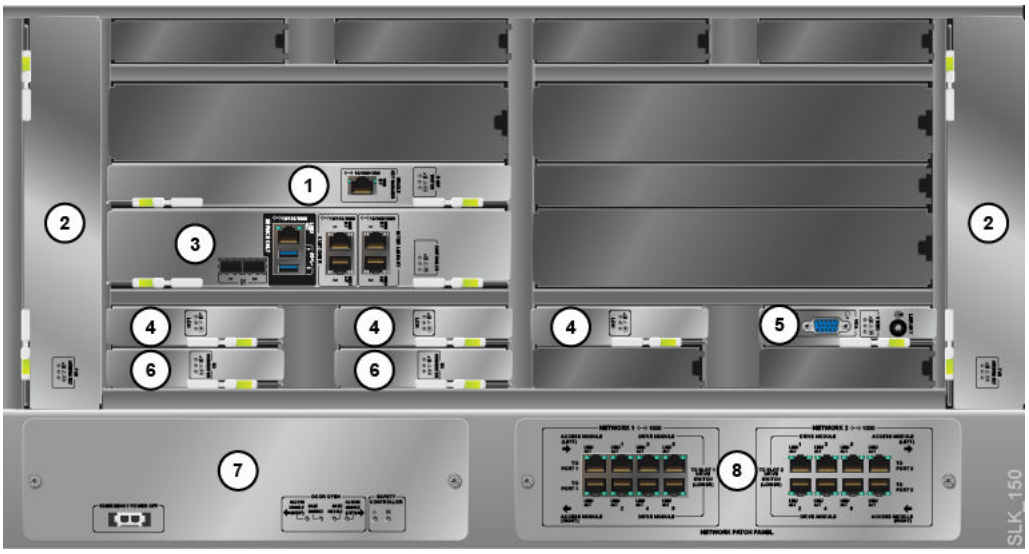
Dimension	Measurement
Height	196.7 cm (77.45 in.) on casters for transport 197.5 cm (77.75 in.) to 201.68 cm (79.4 in.) on weight pads for permanent install
Width	76.8 cm (30.22 in.) when placed between modules 81.3 cm (32 in.) transport width (no side covers) This is the minimum transportation clearance because alignment tabs on each side of the module add 4.5 cm to the 76.8 cm width. 91.5 cm (36 in.) standalone with side covers on both sides. One side cover adds 7.4 cm (2.9 in.) to the module width. Only the ends of the library require side covers.
Depth	121.9 cm (48 in.)
Service Area	Front: 45.7 cm (18.0 in.) Rear: 81.3 cm (32.0 in.) Side Cooling Area: 5 cm (2 in.) Side Install Area: 45.7 cm (18.0 in.)
Weight	Frame only: 357 kg (786 lb) 8 drives and tapes: 618 kg (1362 lb) 16 drives and tapes: 656 kg (1447 lb) 24 drives and tapes: 682 kg (1504 lb) Side Covers: 18.5 kg (41 lb) per side

Base Module Card Cage

The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.

The main controller card is the library controller. The configuration that ships standard is shown below.

Figure 1-3 Base Card Cage Standard Configuration



1. Root Switch (LOER)
2. Fan Assembly
3. Library Controller (LOC)
4. Library Controller Storage (LOH)
5. Video Card (LOV)
6. DC Power Converter (LOY)
7. Safety Controller (LON)
8. Network Patch Panel (LOEB)

Feature Card Upgrade Kit

The feature card upgrade allows you to host application software such as SDP 2.4+ or ACSLS 8.5+.

You can optionally add up to two feature card upgrade kits to the Base Card Cage. Each kit contains two Storage Controller cards, a DC Power Converter, and a Feature Card. The locations of the feature card upgrade components are shown below.

You can use the feature card kit to run application software such as SDP 2.4 or ACSLS 8.5+.

Figure 1-4 Base Card Cage Showing Feature Card Upgrade Locations

Feature Card Kit 1

1. Feature Storage Card (physically the same as Library Controller Storage (LOH))
2. Feature Card (physically the same as the Library Controller (LOC))
3. DC Power Converter (LOY)

Feature Card Kit 2

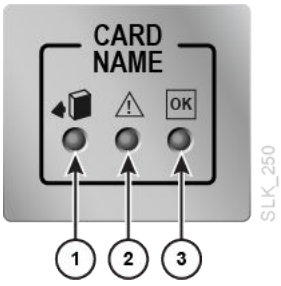
4. Feature Storage Card (physically the same as Library Controller Storage (LOH))
5. Feature Card (physically the same as the Library Controller (LOC))
6. DC Power Converter (LOY)

Related Topics

- Automated Cartridge System Library Software (ACSLS)
  Automated Cartridge System Library Software (ACSLS) is an application that can manage all library operations. It efficiently shares library resources, allowing centralized library control across multiple StorageTek libraries.

Controller Card Indicators

Most controller cards in the Base card cage have the same three indicator lights.

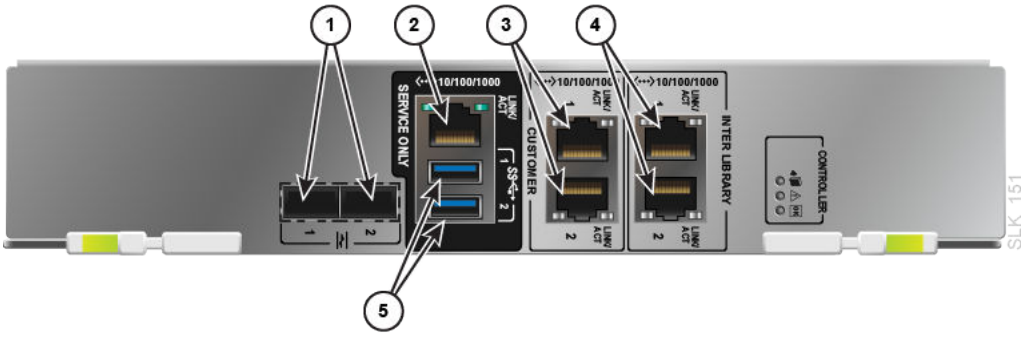


1. Ok to remove device (blue)
2. Service action required (yellow)
3. Power to device (solid green)

Library Controller (LOC)

The library controller is the main controller card in the library.

The library controller contains the ports used for the host connection and service maintenance. There are two FC ports and two Ethernet ports used for host connectivity.



1. FC ports (these do not have a LINK light). The library controller does not ship with SFP modules, you must purchase those separately.
2. Service network port
3. Customer network ports 1 and 2
4. Inter-library network ports (not used in the SL4000)
5. USB ports (for keyboard and mouse)

Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Controller Card Indicators
  Most controller cards in the Base card cage have the same three indicator lights.
- Connect to Both Customer Ports on the Library Controller for Redundancy
  Connect each customer port to a separate switch.
- Is the FC connection working? There is no LINK light.
  The Fibre Channel ports on the Library Controller card do not have lights to indicate there is a link. Use the GUI to see if they are connected to the host.

DC Power Converter (LOY)

The LOY converts 48V DC from the power supplies to 12V DC.

Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Controller Card Indicators
  Most controller cards in the Base card cage have the same three indicator lights.

Library Controller Storage (LOH)

The LOH is a hard drive that stores information for the library software.

The library comes standard with three storage cards and the data is mirrored on each.

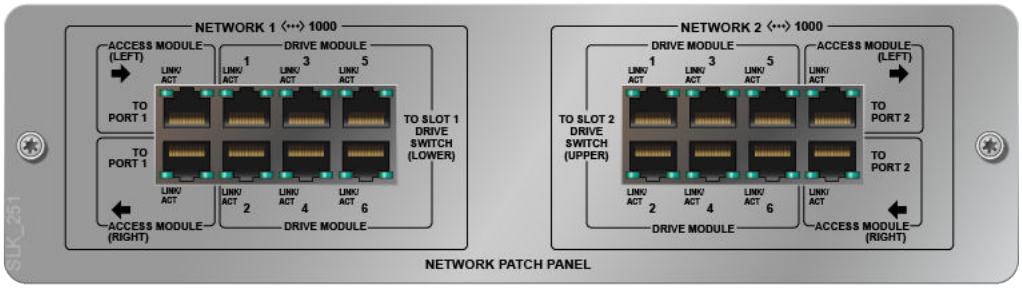
Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Controller Card Indicators
  Most controller cards in the Base card cage have the same three indicator lights.

Network Patch Panel (LOEB)

The LOEB is the Ethernet bulkhead that connects the Drive Module's drive switches and the Access Module's controllers to the Base Module.

There are two networks: Network 1 and Network 2. For each network there are six Drive Module Ethernet ports and two Access Module Ethernet ports.



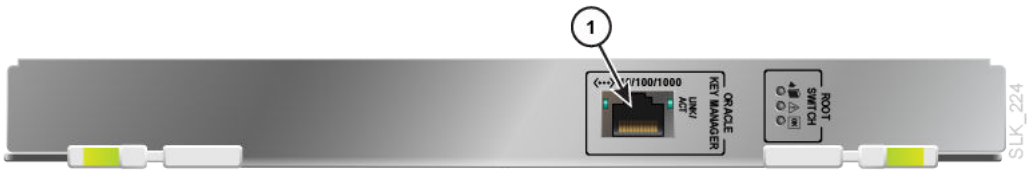
Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Drive Switch (LOES)
  The drive switch connects the drive trays to the rest of the library.

Root Switch (LOER)

The root switch provides connectivity to the drive switches, robot network, and controller cards.

The switch contains one Ethernet port to connect to the Oracle Key Manager network used for drive encryption (see the *Oracle Key Manager (OKM)* documentation for more information).



1. Oracle Key Manager (OKM) network port

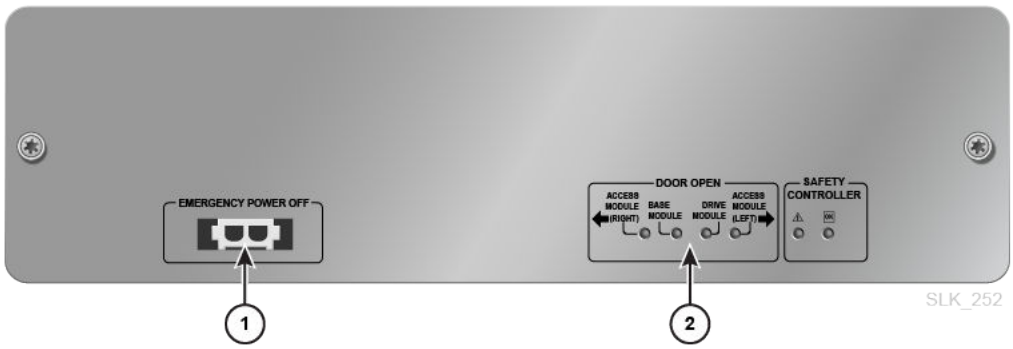
Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Controller Card Indicators
  Most controller cards in the Base card cage have the same three indicator lights.

Safety Controller (LON)

The Safety Controller monitors the status of all the library doors and cuts power to the rail when any door opens unexpectedly.

This card has a battery so that it can report "Door Has Been Opened" status if any door opens while the library has no power.



1. **Emergency shut off** — connects to the customer's emergency power off (EPO) system generally through an external switch (installed by the customer) which cuts power to the library in an emergency.

The connector is a two pin Universal Mate and Lock connector (TYCO 770024-1 with female contacts TYCO 770010-3). To connect to this port, you can use TYCO 770017-1 with male contacts TYCO 770009-1 (or equivalent part numbers).

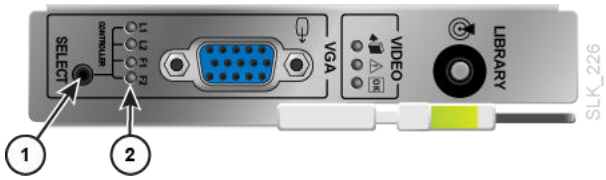
2. **Door open** — indicates if a module has an open front access door

Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Controller Card Indicators
  Most controller cards in the Base card cage have the same three indicator lights.

Video Card (LOV)

The LOV controls which controller is displayed on the front touch screen or on a separate monitor connected to the VGA port.



1. **SELECT (display toggle)** — switches the display signal routing between the controllers or feature cards. If the display is currently at the front touch screen, the initial press will toggle it to the VGA port and subsequent presses will cycle through the controllers.
2. **Controller card indicator** — L1 and L2 are the library controllers. F1 and F2 are feature cards. You can cycle through which controller is displayed by pressing the SELECT button.

Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Controller Card Indicators
  Most controller cards in the Base card cage have the same three indicator lights.

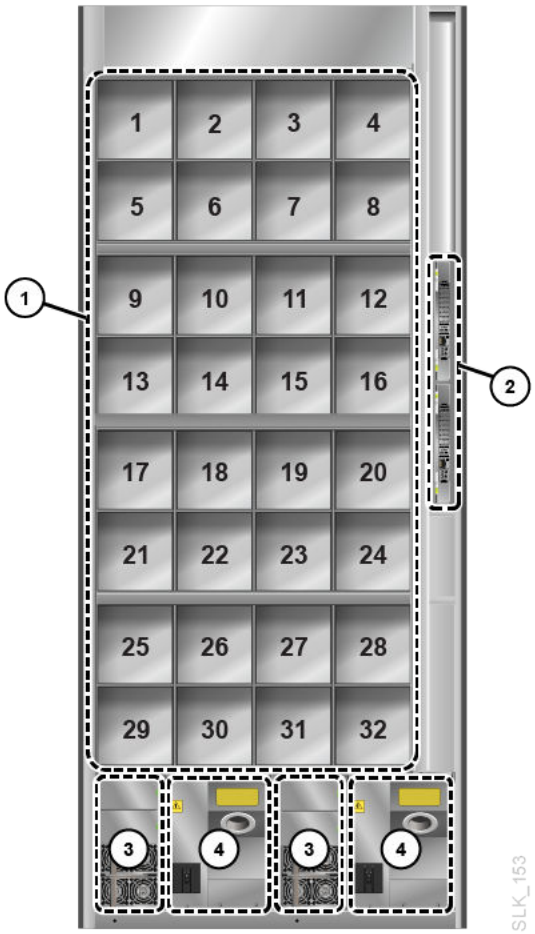
Drive Module (DEM)

The Drive Module increases the number of drive bays and provides additional tape storage.

- Maximum of three Drive Modules per library placed anywhere.
- Comes standard with one drive array (8 drive bays). The rear of the Drive Module contains drive bays, PDUs, DC power supplies, and a drive switch.
- Optional second, third, and fourth drive array (for 32 drive bays max).
- Optional rotational CAP.

- Optional web camera.
- 153 to 522 tape capacity depending on options selected.

Figure 1-5 Drive Module (Rear View)



1. Tape drive bays
2. Drive switch card cage (slot 1 on the bottom and slot 2 on top)
3. Drive DC power supplies
4. Power distribution units

Related Topics

- Drives
  Manage the drives within the library by setting the drive configuration properties, turning the drive on and off, online or offline, and configuring drive cleaning.

Drive Module Measurements

Dimension	Measurement
Height	196.7 cm (77.45 in.) on casters for transport: 197.5 cm (77.75 in.) to 201.68 cm (79.4 in.) on jack pads for permanent install
Width (module only)	76.8 cm (30.22 in.) when placed between modules 81.3 cm (32 in.) transport width (no side covers). This is the minimum transportation clearance because alignment tabs on each side of the module add 4.5 cm to the 76.8 cm width. 83.8 cm (33 in.) with one side cover
Depth (doors closed)	121.9 cm (48 in.)
Service Area	Front: 45.7 cm (18.0 in.) Rear: 81.3 cm (32.0 in.) Side Cooling Area: 5 cm (2 in.) Side Install Area: 45.7 cm (18.0 in.)
Weight	Frame only, no CAP: 265 kg (584 lb) 8 drives and tapes: 540 kg (1190 lb), 582 kg (1284 lb) with CAP 16 drives and tapes: 596 kg (1314 lb), 621 kg (1369 lb) with CAP 24 drives and tapes: 647 kg (1426 lb), 660 kg (1456 lb) with CAP 32 drives and tapes: 709 kg (1564 lb), 723 kg (1594 lb) with CAP

Cartridge Module (CEM)

The Cartridge Module provides additional storage cells.

- The maximum number of Cartridge Modules depends on the other modules present. The library is limited to 15 modules total. For example, if the library has a Base Module and two Drive Modules, the library can support up to 12 Cartridge Modules.
- Optional rotational CAP.
- 438 to 620 tape capacity each.

Cartridge Module Measurements

Dimension	Measurements
Height	196.7 cm (77.45 in.) on casters for transport 197.5 cm (77.75 in.) to 201.68 cm (79.4 in.) on jack pads for permanent install
Width (module only)	76.8 cm (30.22 in.) when placed between modules/side cover 81.3 cm (32 in.) transport width (no side covers). This is the minimum transportation clearance because alignment tabs on each side of the module add 4.5 cm to the 76.8 cm width. 83.8 cm (33 in.) with one side cover
Depth	77.5 cm (30.5 in.)

Dimension	Measurements
Weight (Cartridge Module)	Frame only: 175 kg (385 lb) Installed, with tapes: 340 kg (749 lb)
Weight (Parking Module)	Frame only: 175 kg (385 lb) Installed, with tapes: 257 kg (567 lb)

Parking Module (PEM)

A Parking Module provides space within the library to park an inoperative robot in a redundant robotics configuration.

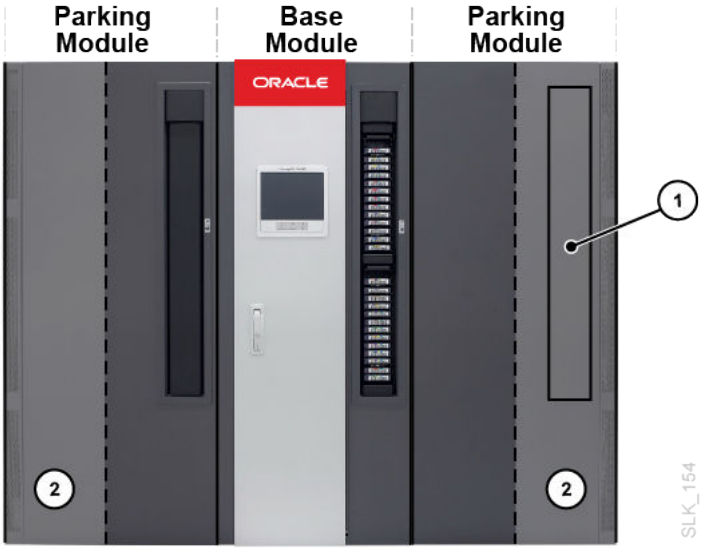
A Parking Module is a Cartridge Module with a modified module id block. The library only requires Parking Modules in a redundant robotics configuration when the library does not have Access Modules.

Six columns (three on the front wall and three on the back wall) are inaccessible and cannot contain tapes. The library "parks" a defective robot in this area without blocking access for the operational robot. You do not need to remove the inaccessible cartridge arrays. The module can be restored to a Cartridge Module at anytime by changing the module id block.

> **Note:**
>
> Performing maintenance on a disabled robot in a Parking Module disrupts library operations. For non-disruptive robot maintenance, use Access Modules instead.

- 230 to 312 tape capacity.
- Only the left Parking Module can have an optional CAP. The CAP area of the right Parking Module is inaccessible to the robot.
- Must be installed on each end of the library.
- Access Modules and Parking Modules cannot be installed in the same library. If you add Access Modules to a library that has Parking Modules, convert the Parking Modules back to Cartridge Modules.

Figure 1-6 Parking Module - Parking Area



1. Inaccessible CAP area, CAP vacancy plate
2. Robot parking area (inaccessible tape cells)

Related Topics

- Robot
  The robot moves tape cartridges within the library.
- Module Identification Block
  Each module has an identification block that lists the configuration for the robot to scan during startup.

Parking Module Measurements

Dimension	Measurements
Height	196.7 cm (77.45 in.) on casters for transport 197.5 cm (77.75 in.) to 201.68 cm (79.4 in.) on jack pads for permanent install
Width (module only)	76.8 cm (30.22 in.) when placed between modules/side cover 81.3 cm (32 in.) transport width (no side covers). This is the minimum transportation clearance because alignment tabs on each side of the module add 4.5 cm to the 76.8 cm width. 83.8 cm (33 in.) with one side cover
Depth	77.5 cm (30.5 in.)
Weight (Cartridge Module)	Frame only: 175 kg (385 lb) Installed, with tapes: 340 kg (749 lb)
Weight (Parking Module)	Frame only: 175 kg (385 lb) Installed, with tapes: 257 kg (567 lb)

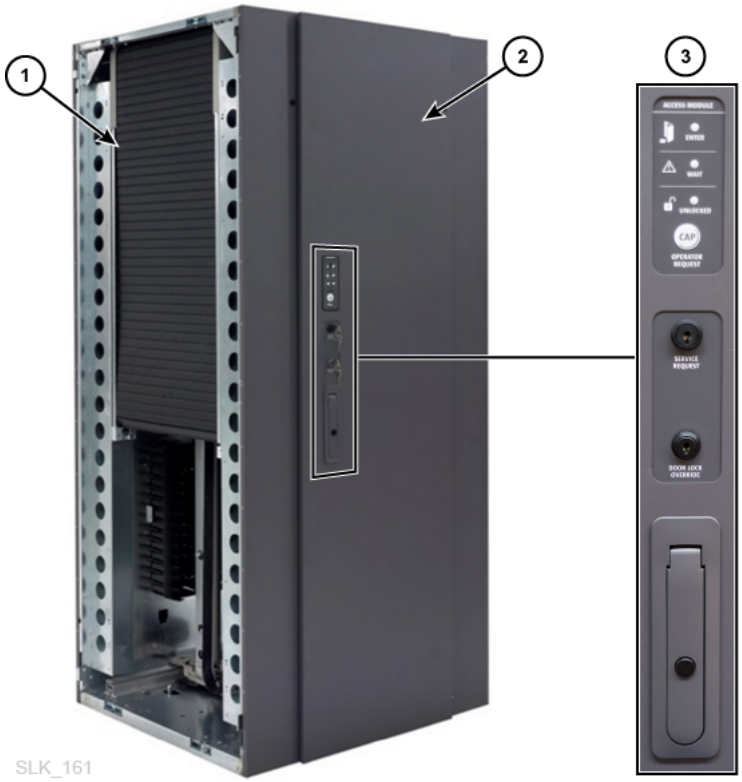
Access Module (AEM)

An Access Module has a cartridge access door used for bulk loading of up to 234 tapes. A library with two Access Module supports the redundant robotics feature.

A sliding safety door in the Access Module can separate a defective robot from the rest of the library, allowing a service representative to access the disabled robot while the library remains online.

- Access Modules must be placed on the ends of the library.
- A single Access Module supports bulk loading CAP capabilities only. You should install a single Access Module on the left for an additional 104 storage cells.
- Dual Access Modules support bulk loading and redundant robotics.
- Access Modules and Parking Modules cannot be installed in the same library.

Figure 1-7 Access Module



1. Side cover removed showing sliding door
2. Bulk load cartridge access door
3. Access module service panel and handle

Related Topics

- Cartridge Access Ports (CAPs)
  CAPs import and export cartridges from the library. There are two CAP types: rotational CAPs (rotary) and Access Module CAPs (bulk load). The term "CAP" refers to both types, unless otherwise noted.
- Robot
  The robot moves tape cartridges within the library.

Access Module Measurements

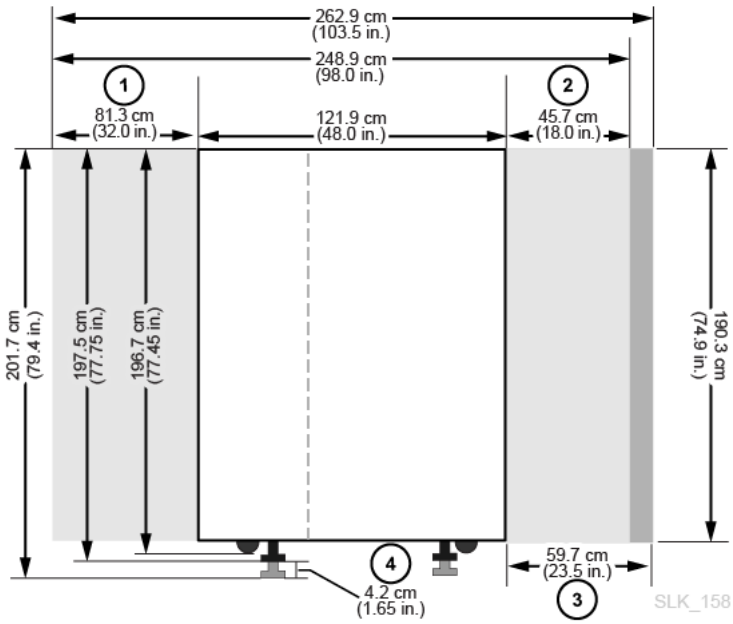
Dimension	Measurement
Height	196.7 cm (77.45 in.) on casters for transport 197.5 cm (77.75 in.) to 201.68 cm (79.4 in.) on jack pads for permanent install
Width	91.4 cm (36.0 in.) when placed between module and side cover 96 cm (37.8 in) transport width (no side covers). This is the minimum transportation clearance because alignment tabs on each side of the module add 4.5 cm to the 91.5 cm width. 99.1 cm (39 in.) with one side cover
Depth	77.5 cm (30.5 in.)
Service Area	Front: 59.7 cm (23.5 in.)
Weight	Frame only: 204.2 kg (450 lb)

Library Dimensions and Weights

Review the dimensions and weights of library modules and components to ensure the library has proper clearances at the installation site.

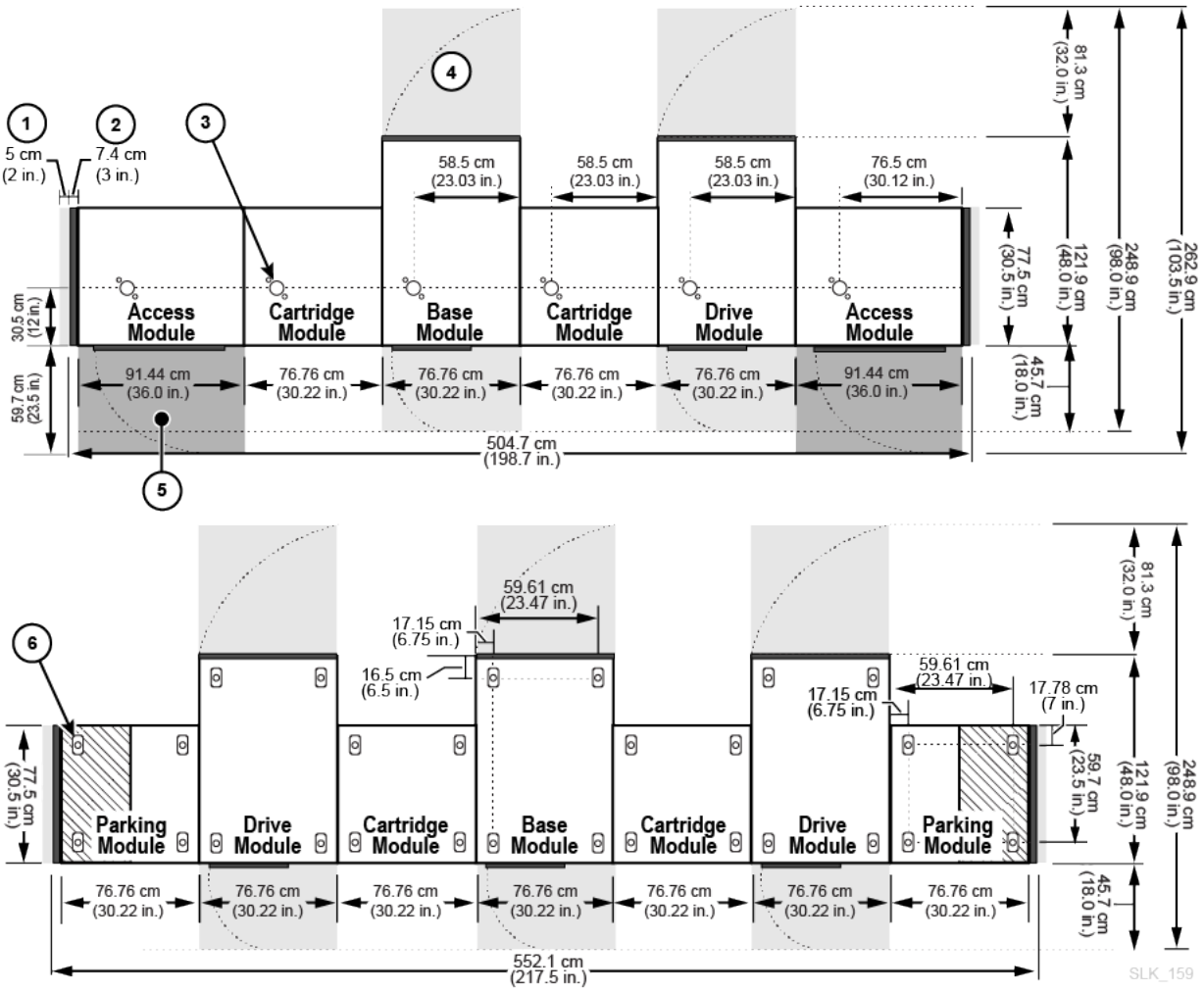
- Base Module Measurements
- Drive Module Measurements
- Cartridge Module Measurements
- Access Module Measurements
- Covers, Doors, and Service Clearances
- Shipping Weights and Dimensions

Figure 1-8 Clearances and Dimensions (Side View of SL4000)



1. Base and Drive Module rear service clearance
2. Base and Drive Module front service clearance
3. Access Module service clearance
4. Weight pad adjustment range

Figure 1-9 Clearances and Dimensions (Overhead View of Example SL4000 Layouts)



1. Side cooling area
2. Side cover
3. Nozzle cutout for fire suppression system
4. Base Module and Drive Module service clearance (light gray areas)
5. Access Module service clearance (dark gray areas)
6. Weight distribution pad

Covers, Doors, and Service Clearances

Dimension	Measurement
Height	190.3 cm (74.9 in.) frame only
Door thickness	Front: 1.9 cm (0.75 in.) Back: 4.5 cm (1.75 in.)

Dimension	Measurement
Door latches	2.53 cm (0.9 in.)
Service clearance	Front: 45.7 cm (18 in.) for Base and Drive Module only, 59.7 cm (23.5 in.) for Access Module Back: 81 cm (32 in.) for Base and Drive Module only Side: 5 cm (2 in.) for cooling, 45.7 cm (18.0 in.) for install
Side cover	7.4 cm (2.9 in.) width 18.5 kg (41 lb) each

Shipping Weights and Dimensions

The SL4000 library modules and other components are shipped on pallets. The table below lists each module and its shipping specifications.

If equipment on a pallet must be transported on elevators, the elevator cars must be capable of safely handling the weight.

Component	Height	Width	Depth	Weight
Base Module	213.3 cm (84 in.)	99 cm (39 in.)	159.3 cm (62.7 in.)	433 kg (954 lb)
Drive Module	213.3 cm (84 in.)	99 cm (39 in.)	159.3 cm (62.7 in.)	381 kg (839 lb)
Cartridge/Parking Module	215 cm (84.7 in.)	99 cm (39 in.)	100.7 cm (39.6 in.)	250 kg (552 lb)
Access Module	215 cm (84.7 in.)	113 cm (44.6 in.)	100.7 cm (39.6 in.)	290 kg (640 lb)
LTO drive tray	32 cm (12.6 in.)	31 cm (12.2 in.)	66 cm (26 in.)	9.5 kg (20.9 lbs)
T10000 drive tray	34 cm (13.4 in.)	31 cm (12.2 in.)	66 cm (26 in.)	10.5 kg (23.1 lbs)
Drive array	48.3 cm (19 in.)	65.5 cm (25.75 in.)	83.8 cm (33 in.)	24.5 kg (54 lbs)
CAP	32 cm (12.6 in.)	39.4 cm (15.5 in.)	135.4 cm (54.5 in.)	32.7 kg (72 lbs)
Redundant robot	63.2 cm (24.9 in.)	46.7 cm (18.4 in.)	196.9 cm (77.5 in.)	35 kg (77 lbs)
PDU	41.3 cm (16.25 in.)	32.7 cm (12.9 in.)	44.7 cm (17.6 in.)	7.7 kg (17 lbs)
Power Supply	14 cm (5.5 in.)	29 cm (11.4 in.)	40 cm (15.7 in.)	4 kg (8.8 lbs)
Power Cord	10.2 cm (4 in.)	31.8 cm (12.5 in.)	31.8 cm (12.5 in.)	1.6 kg (3.5 lbs)

Pallets have a pallet-ramp design to provide safe removal of the module at the customer site. The modules have wheels to allow for easy positioning. Once positioned, the installer must raise the modules from their wheel-base to rest upon weight-plates for stability and leveling.

Hardware Components

The library has several key hardware components.

- Drives
- Tape Cartridges (Media)
- Storage Cells
- Cartridge Access Ports (CAPs)

- Robot
- Operator Panel
- Base Module Card Cage
- DC Power Supplies
- Web Camera
- Cooling Fans

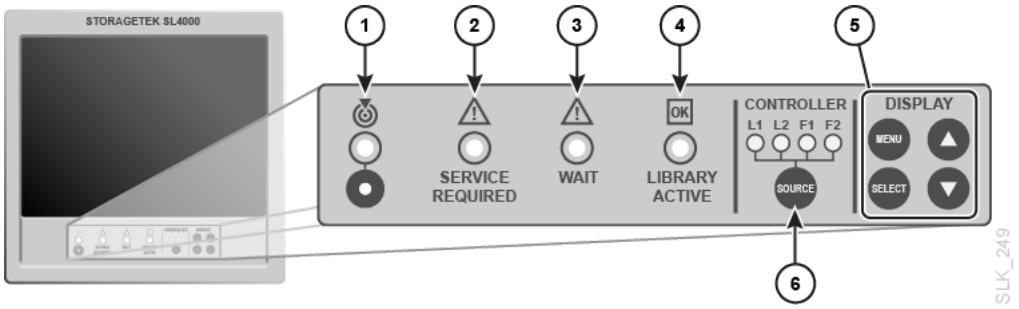
Controller Cards

- Root Switch (LOER)
- Library Controller (LOC)
- Library Controller Storage (LOH)
- Video Card (LOV)
- DC Power Converter (LOY)
- Safety Controller (LON)
- Network Patch Panel (LOEB)
- Drive Switch (LOES)

Operator Panel

The operator panel is the touch screen on the front of the Base Module used to access the GUI.

Figure 1-10 Operator Panel



1. **Locator light** — blinks when you activate the locate function from the GUI.
2. **Service action required indicator** — the library is inoperable and requires maintenance.
3. **Wait indicator** — the library is going to an offline state. Do not enter the library until this indicator is off.
4. **Library active indicator** — the library has power and is running.
5. **LCD display controls** — used to adjust the monitor settings, such as brightness and contrast.
6. **SOURCE (display toggle)** — switches the display signal routing between the controllers or feature cards. If the display is currently at the VGA port, the initial

press will toggle it to the front touch screen and subsequent presses will cycle through the controllers. L1 and L2 are the library controllers. F1 and F2 are feature cards.

Related Topics

- Log in Locally at the Front Touch Screen of the Library
  Access the library GUI directly from the front touch screen.

Robot

The robot moves tape cartridges within the library.

The robot retrieve and insert tapes into CAPs, storage cells, and drives. Robots move along two rails on the back wall of the library. Copper strips in the top rail provide power and a signal path between the robot and the library controller. Power is supplied from +48 VDC 1200 W load-sharing supplies in the rail power module.

Robots contain a barcode scanner that identifies volume serial numbers (volsers) of tapes during CAP entries and library audits. The scanner also reads the module identification blocks in each module during library initialization.

Each library can have either one (standard) or two robots (known as redundant robotics). The optional redundant robotics feature increases library efficiency and allows library operations to continue if one robot fails. Redundant robotics requires 2N power and either two Parking Modules or two Access Modules.

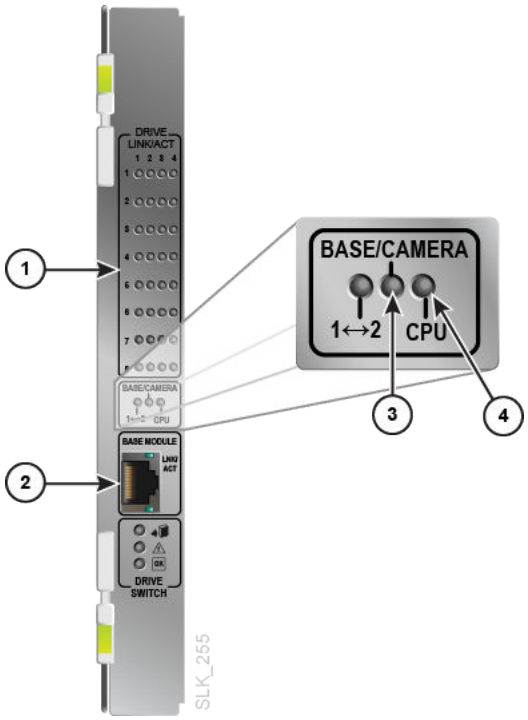
Related Topics

- Access Module (AEM)
  An Access Module has a cartridge access door used for bulk loading of up to 234 tapes. A library with two Access Module supports the redundant robotics feature.
- Parking Module (PEM)
  A Parking Module provides space within the library to park an inoperative robot in a redundant robotics configuration.
- Power Redundancy Options
  There are three power configurations that offer various levels of power redundancy: N+1, 2N, and 2N+1.

Drive Switch (LOES)

The drive switch connects the drive trays to the rest of the library.

The connection between the switch and the drive trays is internal, so you no longer need to connect Ethernet cables to individual drives. The Base Module and each Drive Module contains a drive switch card cage, which holds up to two drive switches. The Base and Drive Modules each come standard with one drive switch.



1. Drive tray connection indicators — each LED corresponds to a drive bay location. An active LED indicates the drive tray is installed and communicating with the library.
2. Ethernet port used to connect the Base Module's network patch panel to each Drive Module. Leave this port unconnected in the drive switches of the Base Module.
3. In the Base Module, this LED indicates there is an active connection between the network patch panel and the drive switch. In the Drive Module, this LED indicates there is an active connection between the drive switch and the web camera (if installed).
4. Indicates that the onboard processor for the drive switch is operational.

Web Camera

The optionally web camera in the Base Module or Drive Module allows you to remotely see inside the library.

The camera connects using Ethernet and mounts on the interior of the module access door.

Related Topics

- View the Inside of the Library Using the Web Camera
  The web camera is an optional feature installed on the inside of a Base or Drive Modules used to view library operations. This can be useful to view the tape drives without opening the library door.

Cooling Fans

The library contains cooling fans for key components to prevent overheating.

Fan Assembly

The library comes standard with two fan assemblies in the Base Module card cage that provide cooling for the electronics in the card cage. The library controller monitors these fans for proper operation. The fault indicator on the fan assembly indicates a failure. The assembly can be replaced without interfering with library operations.

Tape Drives

Each tape drive tray contains two fans for drive cooling. The tape drive's power converter card supplies power for the fans. Air is drawn from the front of the drive and flows through the fan to the back of the drive.

DC Power Supplies

Each 1200 Watt DC power supply contains two fans that pull air from the library, through the back of the supply, and out the back of the library.

Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.
- Drive Tray
  A drive tray houses a tape drive and slides into a drive bay within the drive array of a Base or Drive Module.
- DC Power Supplies
  The DC power supplies provide power for the tape drives and robot These supplies are located in the Base and Drive Modules.

Optional Library Features

Some optional library features can be enabled through the GUI, while others require you to purchase hardware and install a hardware activation file.

Features that Require an Hardware Activation File

- **Activated Cartridge Storage Capacity** — Capacity activation files determine the number of tapes allowed in the library. Tapes in system cells do not count toward licensed capacity. If the library contains more tapes than the activated capacity, it will continue to function normally, however, it is illegal to use non-activated capacity. Either eject tapes or purchase and install another capacity activation file.
- **Multiport Networking (Redundant Control Paths)** — Multiport networking activates the second FC port and second customer Ethernet port on the library controller. This feature requires you to purchase and upload Redundant Control Paths activation file. See Host Connectivity Options.

Features that Do Not Require an Activation File

- **Media Validation**— You can validate the integrity of tapes using media validation. You must dedicate drives to the "Media Validation" partition/pool to enable media validation. The partition does not contain tapes, and hosts cannot access the drives in the media validation partition. The library uses the drives in the partition to evaluate tape integrity. Use the GUI to configure the drive partition.
- **Library-Managed Encryption (LME)** — You can enable the library to manage the encryption enrollment and key delivery for designated encryption-capable drives. The library acts as the OKM agent instead of individual drives, meaning you only need to enroll the library with OKM rather than individual drives.
- **Partitioning** — Library partitioning reserves library resources (drives, storage cells, and CAPs) for the exclusive use of specific StorageTek Library Control Interface (SCI) and FC-SCSI hosts. The SL4000 supports up to 16 partitions. Partitioning is an optional feature that comes standard with the library, but is disabled by default. You can enable partitioning in the library settings.
- **Feature Card Upgrade Kit** — Run host applications such as SDP or ACSLS on additional controller cards with in the Base module card cage. You must order a feature card upgrade kit.
- **Web Camera** — A camera installed inside the library used to view internal operations.

Related Topics

- Add or Remove Optional Library Features
  After purchasing a feature (such as tape capacity or multi-port networking), you must download the hardware activation file and then upload it to the library before you can use the feature.

Cartridge Storage Capacity

The number of cartridges the library can hold depends the configuration. There are two types of capacity: physical and activated.

- **Physical Capacity** — The number of storage cells in the library, excluding reserved system cells. Physical storage capacity can range from 300 to 9,017 cells and 1 to 120 drives. Oracle recommends adding physical capacity in advance to meet future storage needs. Although modules can be added at any time, adding a module is disruptive to library operations.
- **Activated Capacity** — the number of tapes allowed in the library as defined by the cumulative amount of capacity hardware activation files installed on the library. Use the GUI to install the capacity activation files. Unlike the SL3000, the SL4000 does not designate active and inactive cells. The capacity activation files only limit the total number of tapes allowed in the library. The total tape count displayed in the GUI excludes tapes in the system cells.

> **Note:**
>
> If the library contains more tapes than installed capacity activation files, the library will continue to function. However, it is illegal to use unactivated capacity. Either eject tapes or purchase and install another capacity activation file.

Related Topics

- Calculate Physical Storage Capacity
  The physical capacity of the library depends on the configuration and location of modules within the library string.
- How to Fix a Tape Count Warning
  A warning displays on the Library page if the library contains more tapes than the activated capacity.

Calculate Physical Storage Capacity

The physical capacity of the library depends on the configuration and location of modules within the library string.

Use the table below to calculate the storage cell capacity of a library (excluding system cells). For each module in the library, start with the standard cell count. Then, either add or subtract based on the module's position and add-on options. Finally, add the cell counts of each module together to get the total capacity of the library.

When adding drive arrays, the first number is the change in capacity if there is no module to the left. The second number is if there is a module to the left (when facing the CAP-side of the library).

When adding a CAP to the Drive Module, the -39 is the change in capacity when there is no module to the right, and -78 is the change in capacity when there is a module to the right

Physical Configuration	Base Module	Drive Module	Cartridge Module	Parking Module	Access Module
Standard cell count	339	378	516	308	0
2nd Drive Array	-55 (if no module to left) -66 (if module to left)	-55 (if no module to left) -66 (if module to left)	--	--	--
3rd Drive Array	-60 (if no module to left) -72 (if module to left)	-60 (if no module to left) -72 (if module to left)	--	--	--
4th Drive Array	--	-65 (if no module to left) -78 (if module to left)	--	--	--
Module to Left	+88	+88	+104	+4	0
Module to Right	+13	+51	0	0	--

Physical Configuration	Base Module	Drive Module	Cartridge Module	Parking Module	Access Module
CAP	Std.	-39 (if no module to right) -77 (if module to right)	-78	-78 (for left PEM only)	--

Capacity Calculation Example 1

This example library has a Parking Module, Drive Module, Cartridge Module, Base Module, Cartridge Module, and Parking Module.

Left Parking Module
Contains a CAP. There is a module to the right.
308 (standard) - 78 (CAP) + 0 (module to right) = 230

Drive Module
Contains a CAP and four drive arrays. There is a module to the right and left.
378 (standard) – 78 (CAP with module to right) – 66 (2nd drive array) – 72 (3rd drive array) – 78 (4th drive array) + 52 (module to right) + 88 (module to left) = 224

Left Cartridge Module
There is a module to the right and left.
516 (standard) + 0 (module to right) + 104 (module to left) = 620

Base module
Contains three drive arrays. There are modules to the right and left.
339 (standard) – 66 (2nd drive array) – 72 (3rd drive array) + 13 (module to right) + 88 (module to left) = 302

Right Cartridge Module
Contains a CAP. There is a module to the right and left.
516 (standard) – 78 (CAP) + 0 (module to right) + 104 (module to left) = 542

Right Parking Module
308 (standard) + 4 (module to left) = 312

Library Total
230 (Parking Module) + 224 (Drive Module) + 620 (Cartridge Module) + 302 (Base Module) + 542 (Cartridge Module) + 312 (Parking Module) = 2,230

Capacity Calculation Example 2

This example library has a Base (in center) and seven Cartridge Modules on each side of the Base (15 modules total). This represents the maximum storage capacity for an SL4000.

Base module
Contains one drive array. There is a module to the right and left.
339 (standard) + 13 (module to right) + 88 (module to left) = 440

Cartridge Modules
Left-most Cartridge Module: 516 (standard) + 0 (module to right) = 516

Right-most Cartridge Module: 516 (standard) + 104 (module to left) = 620
All other Cartridge Modules: 516 (standard) + 104 (module to left) + 0 (module to right) = 620

Library Total
440 (Base) + 516 (left-most Cartridge Module) + 620 (right-most Cartridge Module) + 12 x 620 (other Cartridge Modules) = 9,016

Capacity Calculation Example 3

This example library has a Cartridge Module, Base Module, Drive Module, another Cartridge Module, and a single Access Module on the right for bulk loading.

Oracle does not recommend installing a single Access Module on the right. If the Access Module was installed on the left end of the library, 104 additional cells would be accessible in the far left Cartridge Module.

Left Cartridge Module
Module is on the left end of the library. There is a module to the right.
516 (standard) = 516

Base module
Contains two drive arrays. There are modules to the right and left.
339 (standard) + 13 (module to right) + 88 (module to left) – 66 (2nd drive array) = 374

Drive Module
Contains three drive arrays. There is a module to the right and left.
378 (standard) + 13 (module to right) + 88 (module to left) – 66 (2nd drive array) – 72 (3rd drive array) = 341

Right Cartridge Module
This is a module to the right and left.
516 (standard) + 0 (module to right) + 104 (module to left) = 620

Access Module
Module is on the right end of the library (not recommended for single Access Module).
0 (standard) = 0

Library Total
516 (left Cartridge Module) + 374 (Base) + 341 (Drive Module) + 620 (right Cartridge Module) + 0 (Access Module) = 1,851

Power Configurations

The library offers several power configurations depending on your redundancy and power requirements.

All power supplies and power distribution units (PDUs) reside in the Base Module and Drive Modules (each module ships standard with one PDU). When selecting a power configuration, consider any power redundancy requirements along with the features and number of drives in the library.

- Power Redundancy Options
- AC Power Source Options
- DC Power Supplies
- Calculate Power Supply Quantities

- Calculate Total Power Consumption

Power Redundancy Options

There are three power configurations that offer various levels of power redundancy: N+1, 2N, and 2N+1.

Config.	AC Power	DC Power	Feature Support
N+1	No redundancy One PDU per Base or Drive Module	Provides one extra drive DC supply and one extra robotics DC supply	Limited support for T10000 drives and no redundant robotics support
2N	Redundant Two PDUs per Base or Drive Module	Provides a set of DC power supplies for each PDU	Required for redundant robotics and redundant electronics support Full support for T10000 drives.
2N+1	Redundant Two PDUs per Base or Drive Module	Provides additional power supplies for each PDU, meaning N+1 DC power redundancy for each PDU (except the second PDU only has N DC power supply redundancy for the robot)	Supports redundant robotics and redundant electronics Full support for T10000 drives.

AC Power Source Options

Each PDU in the library requires a separate AC power source. The number of power cords required depends on the power configuration.

AC Power Source

- 240 VAC, 50/60 Hz, at 30 amps (range: 200–240 VAC, 47–63 Hz, 24 amps), single phase

AC Power Cables

- N+1 — order one power cord for the Base module and an additional power cord for each Drive Module
- 2N or 2N+1 — two power cords for the Base module and two additional power cords for each Drive Module

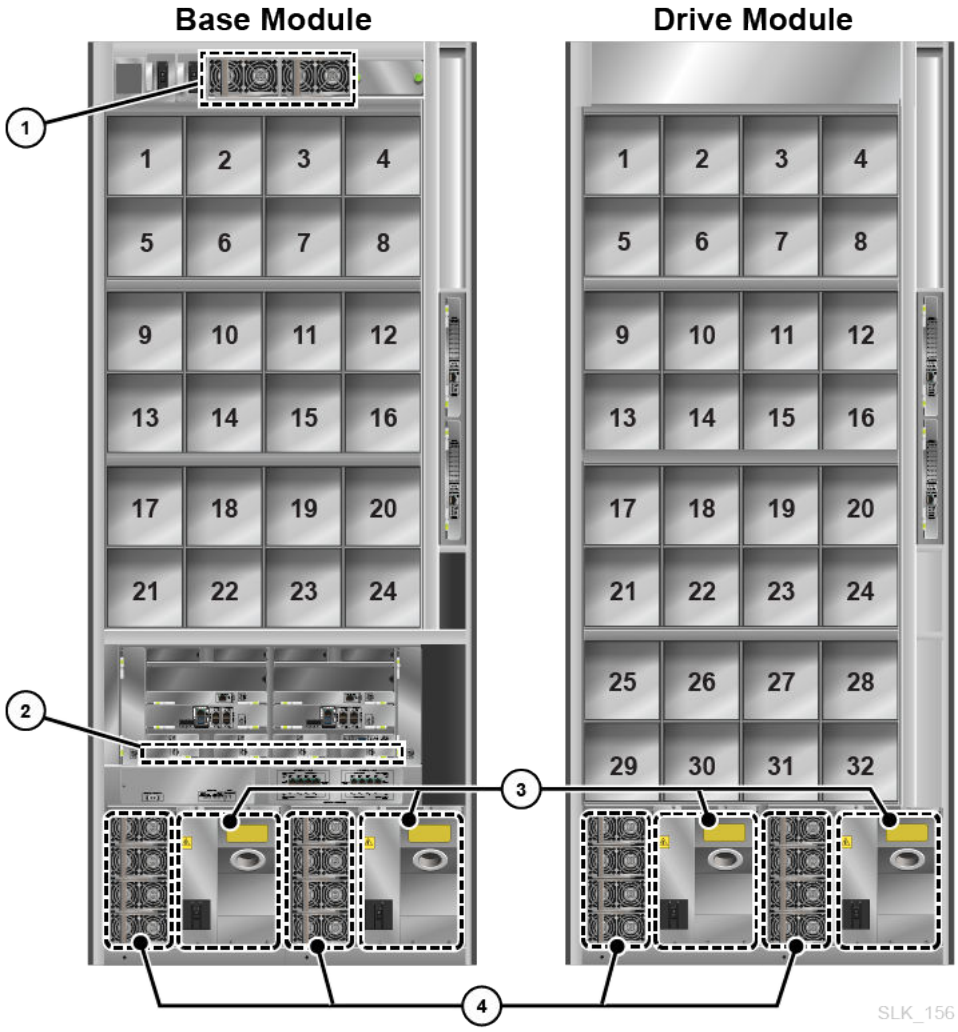
Power Cord - Length/Type	Power Source	Circuit Breaker	Wall Connector	Library Connector
US 3.7 m (12 ft) 12 AWG	240 VAC/30A	30A	L6-30P	L6-30R
International 4 m (13 ft) HAR	240 VAC/30A	30A	330P6W	L6-30R

DC Power Supplies

The DC power supplies provide power for the tape drives and robot These supplies are located in the Base and Drive Modules.

To determine the number of power supplies to order, see Calculate Power Supply Quantities.

Power Supply Locations



1. Rail DC power supplies (1200W DC)
2. DC power converters
3. PDUs (240 VAC)
4. Drive DC power supplies (1200W DC)

Base Card Cage DC Power Converters

The DC converters in the card cage convert 48VDC from the drive DC power supplies to 12VDC. The converters replace the functionality of the cPCI power supplies in the SL3000. Each Base Module ships standard with two DC converters.

A minimum card cage configuration (one controller, one root switch, three storage cards, one video card, and one fan assemblies) requires a minimum of two DC converters for N+1 and three for 2N or 2N+1 redundancy.

A maximum card cage configuration (four controllers, two root switches, seven storage cards, one video card, and two fan assemblies) requires a minimum of three DC converters for N+1 and four for 2N or 2N+1 redundancy.

Rail Power Supplies

The robots use load-sharing 1200 W DC power supplies located at the top of the Base Module (the Drive Module does not contain rail DC supplies).

The rail DC power supply are physically the same power supply used for the drives. Each Base Module ships standard with two rail DC power supplies used for N+1 and 2N configurations. You must order a third DC power supply for the 2N+1 configuration.

Tape Drive Power Supplies

The drives use load-sharing 1200 W DC power supplies. Up to four power supplies are located to the left of each PDU in both the Base and the Drive Module.

The library ships standard with two drive power supplies per Base and two per Drive Module. The number of additional power supplies required depends on the library configuration.

Calculate Power Supply Quantities

The number of power supplies you need to order depends on the power configuration (N+1, 2N, or 2N+1), card cage configuration, and number of drives.

1. Determine the maximum power consumption of the card cage.

Card Cage Configuration	Maximum Watts
Minimum (one controller, one root switches, three storage cards, one video card, and two fan assemblies)	352
Mid (two controllers, two root switches, three storage cards, one video card, and two fan assemblies)	511
Maximum (two controllers, two feature cards, two root switches, seven storage cards, one video card, and two fan assemblies)	793

2. Calculate the maximum power consumption of the drives:

Drive Type	Watts Used by Each Drive
T10000A/B/C	91
T10000D	117
LTO	48

   a. Determine the number of each drive type and multiply by the watts-per-drive for each drive type.

   b. Add together the watts used by each drive type to calculate the total watts consumed.

3. Add the card cage and drive power consumptions together. Use the following tables to determine the number of DC power supplies needed.

Base Module: Total Watts Used by All Drives	Power Supplies Required for N+1	Power Supplies Required for 2N	Power Supplies Required for 2N+1
1 - 1,063	2	2	4
1,064 - 2,263	3	4	6
2,264 - 3,463	4	6	8
3,464 - 3,805	5	8	8

Drive Module: Total Watts Used by All Drives	Power Supplies Required for N+1	Power Supplies Required for 2N	Power Supplies Required for 2N+1
1 - 1,200	2	2	4
1,201 - 2,400	3	4	6
2,401 - 3,600	4	6	8
3,601 - 4,443	5	8	8

Example: Calculating Required Number of DC Power Supplies

This example shows how to calculate power for a library with a Base and one Drive Module with both drive types (T10000 and LTO). The Base has the minimum configured card cage (352W).

Base Module Drive Type	Quantity of Drives	Multiply by Watts Per Drive	Total Watts Per Drive Type
T10000D	6	117	702
T10000C	6	91	546
LTO8	4	48	192

Total Drive Consumption for Base = 702 + 546 + 192 = 1,440 W

Drive Module Drive Type	Quantity of Drives	Multiply by Watts Per Drive	Total Watts Per Drive Type
T10000C	10	91	910
LTO7	4	48	192

Total for Drive Module = 910 + 192 = 1,102 W

The Base consumes 1,792W (352 W for card cage and 1,440 W for drives). The Drive Module consumes 1,102 W.

The tables below list the power supplies required for the example library. Two tape drive DC power supplies ship standard with the Base and two power supplies ship standard with the Drive Module. Therefore, subtract two from the DC supplies required when determining what to order.

Library Power Configuration	Base Module DC Supplies Required	DC Supplies to Order (= Required - 2)
N+1	3	1
2N	4	2
2N+ 1	6	4

Library Power Configuration	Drive Module DC Supplies Required	DC Supplies to Order (= Required - 2)
N+ 1	2	0
2N	2	0
2N+1	4	2

The number of DC supplies that you need to order depends on the power configuration. For instance, if the example library had a 2N+1 configuration, it would require an order of six additional DC power supplies (four supplies for the Base and two supplies for the Drive Module). The 2N+1 also requires an additional DC supply for the rail. Therefore, you would need to order a total of seven DC power supplies

Calculate Total Power Consumption

For environmental or economical reasons, you might want to determine the total power consumption (Watts), CO_2 emission values, and British Thermal Units (Btu/hr) for the library and drives.

The following table lists the idle and maximum watts consumed by various library components.

Components	Quantity	Idle Watts	Max Watts
Base Library (required) Includes: card cage, 1 robot, 1 CAP, operator panel	1	301	518
Redundant Robotics (optional)	1	48	154
Additional CAPs (optional)	Each	10	14
Drive Module/Cartridge Module	Each	3	5
Access Module	Each	9	29
T10000A/B/C	Each	61	93
T10000D	Each	64	127
LTO	Each	30	46

Calculate Total Watts, CO_2 Emissions, and Btu/hr

To calculate the total power consumption in Watts for the library, add up all the applicable wattage values for the library configuration.

To calculate kilograms of CO_2 emissions per day, multiply watts by the CO_2 emissions constant. Use the constant that is applicable for your country (0.02497 for US).

To convert electrical values to Btu/hr, multiply the number of watts by 3.412 (1 W = 3.412 Btu/hr).

Table 1-1 Power Consumption Example 1

Component	Quantity	Watts
SL4000 Base	1	518
LTO8 Tape Drives	16	736
Library Total	--	1,254

- Emissions: 1,254W x 0.02497 = 31.3 Kg of CO_2
- Power consumption: 1,254W x 3.412 = 4,279 Btu/hr

Table 1-2 Power Consumption Example 2

Component	Quantity	Watts
SL4000 Base	1	518
T10000D Tape Drives	8	1,016
Drive Module	1	5
T10000C Tape Drives	8	744
Cartridge Module	1	5
CAPs (3 at 10 Watts each)	3	30
Library Total	--	2,318

- Emissions: 2,318W x 0.02497 = 57.9 Kg of CO_2
- Power consumption: 2,318W x 3.412 = 7,909 Btu/hr

Applications that Support the SL4000

Certain library management, encryption, or analytics applications support the SL4000.

Not every application is tested on every platform or version. To verify the software is supported, contact an Oracle sales representative or application vendor.

The following are support the SL4000:

- Automated Cartridge System Library Software (ACSLS)
- Oracle Key Manager (OKM)
- Service Delivery Platform 2 (SDP2)
- StorageTek Tape Analytics (STA)

Software Vendors (ISVs)

- Oracle Hierarchical Storage Manager (HSM)
- Oracle Secure Backup
- Hewlett Packard Enterprise Data Protector
- Commvault Software
- Dell/EMC NetWorker

- IBM Spectrum Protect
- Veritas Netbackup
- DIVA

Automated Cartridge System Library Software (ACSLS)

Automated Cartridge System Library Software (ACSLS) is an application that can manage all library operations. It efficiently shares library resources, allowing centralized library control across multiple StorageTek libraries.

ACSLS 8.5+ is required for interfacing with the SL4000 library.

You can install ACSLS onto a feature card housed within the Base card cage. ACSLS 8.5+ is required to the feature card. ACSLS 8.5.1+ is required for the dual feature card configuration.

For more information, refer to the ACSLS documentation under the Storage Software section at: https://docs.oracle.com/en/storage/storage-software/acsls/.

Related Topics

- Feature Card Upgrade Kit
  The feature card upgrade allows you to host application software such as SDP 2.4+ or ACSLS 8.5+.

Oracle Key Manager (OKM)

OKM provides data security by creating, storing, and managing the encryption keys for stored data.

OKM uses a cluster of Key Management Appliances (KMAs) that connect to encryption agents (such as tape drives). The KMAs can be managed using a secure GUI or CLI. For HP LTO drives, OKM connects to individual tape drives. For drives IBM LTO-6 or higher, OKM connects to the library if using Library Managed Encryption (LME).

For more information on OKM, refer to the OKM documentation at https://docs.oracle.com/en/storage/storage-software/oracle-key-manager/

Service Delivery Platform 2 (SDP2)

The StorageTek Service Delivery Platform 2 (SDP-2) is a support solution that provides faster problem resolution, analysis and trending, and improved diagnostics.

SDP is a remote application that can be installed on a Linux server that connects to the library. SDP collects device events and alerts support analysts, providing remote diagnosis and automatic service requests (ASR).

For more information, contact an Oracle representative or visit: https://www.oracle.com/support/premier/auto-service-request.html

StorageTek Tape Analytics (STA)

StorageTek Tape Anlytics (STA) is an intelligent monitoring application for tape libraries.

STA simplifies tape storage management and allows you to make informed decisions about future tape storage investments based on the current health of the tape storage environment. STA tracks mounts, dismounts, and media usage within your tape library system. STA requires a dedicated server. Oracle recommends that you place the STA server on the same subnet as the library to improve communication reliability. To set up communications between the STA server and the libraries, you must perform some configuration procedures on the libraries and some on the STA server.

For more information, refer to the STA documentation at: https://docs.oracle.com/en/storage/storage-software/storagetek-tape-analytics/

STA version 2.4.0+ supports the SL4000 Library.

Ordering

Marketing part numbers are used to order components for the SL4000.

Contact Sales Assistance at +1.888.672.2534.

You must order tape cartridges separately. You can use existing tapes if they are compatible and still within their warranty period. Professional Services and Data Center Services offer media and drive migration:

- Call 1-877-STK-TAPE to order media from your local reseller or to obtain media pre-sales support.
- E-mail: tapemediaorders_ww@oracle.com

The table below provides the marketing part numbers for library components and upgrade options. ATO is for initial orders and PTO is for upgrade orders.

Part Type	Description	ATO	PTO
Module	Base module, 300 active cells, one drive array, CAP, two LTO drives, one PDU, two DC drive power supplies, two DC rail power supplies.	7112359 (LTO7 with OKM) 7119136 (LTO8 without OKM) 7119137 (LTO8 with OKM)	N/A
Module	Drive Module, 300 active cells, one drive array	7112361	7112379
Module	Cartridge Module, no active cells (438 to 620 storage cells)	7112362	7112380
Module	Left Access Module, 234 bulk loading CAP	7112363	7112381
Module	Right Access Module, 234 bulk loading CAP	7112364	7112382
Upgrade	Dual robot	7112369	7112388
Upgrade	CAP (with two 13 cell magazines)	7112370	7112389
Upgrade	Spare CAP Magazine (13 cells)	7112375	7112394
Upgrade	Tape drive array (eight drive bays)	7112371	7112390
Upgrade	Web Camera	7116404	7116405
Upgrade	Feature Card	7112373	7112392

Part Type	Description	ATO	PTO
Power	1200W DC power supply (for tape drives and robotics)	7112368	7112386
Power	200 - 240 VAC 30 Amp PDU	7112365	7112383
Power	US Power Cord 30A/220V, L6-30P plug, L6-30R connector, 3.6 meters long	7112366	7112384
Power	International Power Cord, 30A/220V, 330 P6W plug, L6-30R connector, 4 meters long	7112367	7112385
Activation File	25 Tape Cartridge Cells	N/A	7112417
Activation File	100 Tape Cartridge Cells	N/A	7112418
Activation File	200 Tape Cartridge Cells	N/A	7112419
Activation File	500 Tape Cartridge Cells	N/A	7112420
Activation File	1000 Tape Cartridge Cells	N/A	7112421
Activation File	Redundant Control Paths	N/A	7112416
Tape Drive	T10000D tape drive: 16 Gb FC	N/A	7105799
Tape Drive	T10000D tape drive: 16 Gb FICON	N/A	7105800
Tape Drive	IBM LTO9 FC with OKM compatibility	N/A	7602773
Tape Drive	IBM LTO8 FC without OKM compatibility	N/A	7118443
Tape Drive	IBM LTO7 FC with OKM compatibility	N/A	7113979
Tape Drive	IBM LTO7 FC without OKM compatibility	N/A	7113981
Tape Drive	OKM interface upgrade kit for IBM LTO (Bel card)	N/A	7113290
Encryption Permit	T10000 encryption activation permit for one drive	N/A	T10K-EKEY-A-N
Encryption Permit	LTO encryption activation permit for one drive	N/A	LTO-ENCRYPT-ACTIVE
SFP	Pair of 16 Gb FC SFPs	7101675	N/A

Support Options

Service and support representatives are available to assist with troubleshooting. During the initial order and installation planning, you can contact local and remote support with questions.

Service Delivery Platform

The StorageTek Service Delivery Platform (SDP) is a support enhancement solution that provides faster problem resolution, analysis and trending, and improved diagnostic capabilities. SDP is a remote application that can be installed on a Linux server that connects to the library and any StorageTek T-series tape drives. SDP collects device events and alerts support analysts, providing remote diagnosis and automatic service requests (ASR).

For more information, contact an Oracle representative or visit: https://www.oracle.com/support/premier/auto-service-request.html.

Oracle Premier Support for Systems

Oracle Premier Support is a fully integrated support solution that features:

- Complete system coverage and unlimited 24/7 access to Oracle system specialists
- Essential product updates, such as firmware
- Personalized, proactive IT support and rapid-response hardware service

For more information, visit: http://www.oracle.com/us/support/index.html

Contacting Support

Oracle Global Customer Support Contacts Directory: http://www.oracle.com/us/support/contact-068555.html

Submit, update, or review service requests at My Oracle Support: https://support.oracle.com/

Order an SL3000 to SL4000 Conversion Kit

Oracle representatives can use these procedures to order an SL3000 to SL4000 conversion kit.

The conversion kit for an SL4000 includes 300 active slots.

- Locate Tape Storage Products within Webquote
- Update the Configurator for the Library Kit
- Check the SL3000 SFPs
- Verify the Drives Trays Have LOD Cards
- Order Drive Tray Conversion Kits for HBD Trays

Locate Tape Storage Products within Webquote

Use Webquote to locate the tape storage products to begin ordering the conversion kit.

1. Sign in to Webquote.
2. Click **Create Hardware/Software Quote**.
3. Click **Add Hardware**.
4. Select **Configurable Systems**.
5. Under the System Types list, select **Tape Storage**.

Update the Configurator for the Library Kit

Update the configurator within the Webquote tool to add the conversion kit components that match the library configuration.

1. Follow Locate Tape Storage Products within Webquote, and then click the configure icon for: **7120109 SL3000 Conversion Model Family**.
2. Under Conversion Base System, select:

- **7120190 - base conversion kit** (includes a conversion for one drive array and 300 active slots)

3. If the library has a Drive Expansion Module (DEM), select:
   - Quantity 1 of **7120191 - drive expansion module conversion kit** (includes a conversion kit for one drive array)
4. If the library has Access Expansion Modules (AEMs), select:
   - Quantity 2 of **7120192 - access expansion module conversion kit**
5. If the library has two robots, select:
   - Quantity 1 of **7120193 - dual robot conversion kit**
6. Select the quantity of **7120194 - drive array conversion kits** based on the number of drives in the Base and DEM:

Drives in Base	Drives in DEM	Quantity 7120194 needed
1 to 8	No DEM or 1 to 8	0
9 to 16	No DEM or 1 to 8	1
17 to 24	No DEM or 1 to 8	2
17 to 24	9 to 16	3
17 to 24	17 to 24	4
17 to 24	25 to 32	5

7. Select **Installation Services**.
8. Click **Done**.

Check the SL3000 SFPs

The SL4000 can work with 16Gb, 8 Gb, and 4Gb SFPs. If the SL3000 doesn't have SFPs within this range, order **7101676 2 Sun Storage 16 Gb FC short wave optics, Qlogic**.

To order compatible SFPs:

1. In Webquote, click **Add Hardware**.
2. Select **Standalone Options/ Spare Part**.
3. Search for **7101676**. Click **Go**.
4. Enter the quantity. Click **Add to Quote**  .

Verify the Drives Trays Have LOD Cards

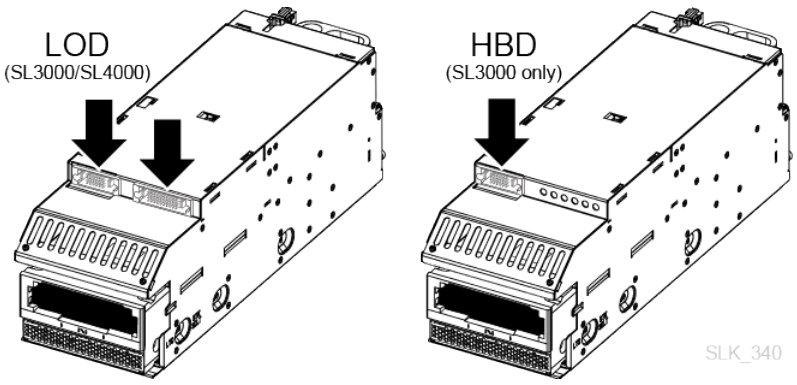
Drive trays must have the LOD card to work with the SL4000. There are two ways to check the tray type: physically or through SLC.

OPTION 1: Check the Tray Type in SLC

1. Log into SLC.
2. Highlight the **Drive Folder**.
3. In the **Tray Type** column, verify that all drives are "LOD" or "LOD 2"

OPTION 2: Check the Physical Connectors on the Tray

1. Remove the tray from the library.
2. Look for the connectors on the front of the drive tray. The LOD tray has two connectors.



Order Drive Tray Conversion Kits for HBD Trays

Order an LOD conversion kit for each HBD tray in the library.

Order the kit that matches the drive type. The LTO drive tray upgrade kit supports moving encryption cards from old trays to new trays. The SL3000 drive trays with LOD cards and SL4000 drive trays with LOD cards are the same and are interchangeable.

1. Follow Locate Tape Storage Products within Webquote, and then click the configure icon for the drive type:
   - *For T10K*: **T10K-SD-UPG-FAMILY StorageTek Serialized Upgrades T10000**
   - *For LTO*: **LTO-SLD-UPG-FAMILY StorageTek Serialized Upgrades LTO**
2. From the Library Type drop-down, select:
   - *For T10K*: StorageTek SL4000 Modular Library System
   - *For LTO*: StorageTek SL3000 Modular Library System
3. Select the kit for the drive type:
   - *For T10000 A/B/C*: **7110135**
   - *For T10000 D:* **7110136**
   - *For IBM LTO*: **7110132**
   - *For HP LTO*: **7110133**
4. Select **Installation Service**, and then click **Done**.
5. Order one kit for each drive of that type. Update the quantity as necessary and click **Save**.
6. Repeat for each other drive type in the library.

2

Plan for the Hardware Installation

Make sure the site meets requirements and is ready for the library hardware before beginning installation.

Module Configuration Restrictions

Make sure the site meets the following configuration requirements prior to beginning installation:

- The library must not exceed 15 modules.
- The maximum number of modules to the right of the Base is 7.
- The maximum number of modules to the left of the Base Module is 7.
- The Base Module must be centered in the middle of 15 module libraries. For more details, see Center Line of the Library and Module Numbers.
- The library must not exceed 3 Drive Expansion Modules (DEM).

Library Configuration Guidelines to Maximize Performance

Maximize library performance by following key configuration guidelines.

- Place the Base Module in the center of the library string.
- Place a balance of Cartridge Modules to the left and the right of the Base Module.
- Spread the Drive Modules out within the library string to reduce robot contention.
- If only adding one Access Module for bulk loading, place the module on the left side of the library string.
- When installing additional CAPs, balance the CAPs between the left and right sides of the library string. If partitioning the library, install enough CAPs to provide at least one CAP for each partition. This allows each partition to contain a dedicated CAP.

- Install enough tape drives to adequately handle peak workload. Logically group tape drives and compatible tapes together.
- Pre-install physical capacity to grow into it non-disruptively.

Installation Site Requirements

Make sure that the site meets all requirements before installing the library.

Physical Space Requirements

The library requires adequate physical space and a service area for maintenance.

Ensure that the components can pass through doorways and fit in elevators. If you plan on adding modules in the future, ensure there is enough space. The suggested library adjustment height is 200 cm (77.6 in.). Ensure the top of the library does not interfere with ceiling fixtures at the installation site.

Related Topics

- Library Dimensions and Weights
  Review the dimensions and weights of library modules and components to ensure the library has proper clearances at the installation site.

Floor Requirements

Verify there is adequate airflow before installing the library on a raised, solid, or carpeted floor. The floor must be level and able to support the weight of the library.

- Raised floor — ensure there are no ventilation panels directly below the library.
- Solid floor — route the cables from the ceiling to avoid creating a tripping hazard.
- Carpeted floor — ensure the carpet is approved for computer-room equipment and provides protection from electrostatic discharge (ESD).

Weight

Verify the site floor can support the weight of the library. It must support 454 kg (1,000 lb) per weight distribution pad. There are four distribution pads per module. If using an elevator to transport the equipment, verify it can safely handle the weight.

Floor Slope

Robots must travel along a level plane throughout the library. Any excessive out-of-plane conditions could cause binding, premature wear, and damage to the robots. The library weight pads adjust to account for minor slope. However, you should ensure that the floor does not have excessive slope before installation.

Related Topics

- Shipping Weights and Dimensions
  The SL4000 library modules and other components are shipped on pallets. The table below lists each module and its shipping specifications.

Environmental Requirements

For optimal reliability, maintain the environment between the recommended ranges.

Description	Temperature	Relative Humidity (non-condensing)	Wet Bulb Maximum	Maximum Altitude
Operating	15 to 32°C (60 to 90°F) dry bulb	20% to 80% Oracle recommends 40% to 50%	29.2°C (84.5°F)	3.05 km (10,000 ft)
Storage	10 to 40°C (50 to 104°F)	10% to 95%	35.0°C (95.0°F)	3.05 km (10,000 ft)
Shipping	-40 to 60°C (-40 to 140°F)	10% to 95%	35.0°C (95.0°F)	15.24 km (50,000 ft)

Airborne Contaminants

Airborne particulates can damage tape libraries, drives, and tapes. The operating environment for the tape library must meet requirements.

- ISO 14644-1 Class 8 Environment
- 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

Particles ten microns or smaller are particularly harmful to most data processing hardware. 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.

Humidification with chlorinated water is a common source of airborne chlorine. Appropriately-designed carbon filters must be used to ensure safe levels of airborne chlorine when chlorinated water is used for humidification.

Table 2-1 Gas Limit Recommendations

Chemical	ASHRAE	OSHA (PEL)	ACGIH	NIOSH
Acetic Acid (CH_3COOH)	Not defined	10 ppm	Not defined	Not defined
Ammonia (NH)	3500 µg/m^3	350 ppm	25 ppm	Not defined
Chlorine (Cl)	2100 µg/m^3	31 ppm (c)	Not defined	0.5 ppm (c)
Hydrogen Chloride (HCl)	Not defined	5 ppm (c)	Not defined	Not defined

Table 2-1 (Cont.) Gas Limit Recommendations

Chemical	ASHRAE	OSHA (PEL)	ACGIH	NIOSH
Hydrogen Sulfide (H_2S)	50 µg/m^3	320 ppm (c)	10 ppm	10 ppm
Ozone (O_3)	235 µg/m^3	30.1 ppm	Not defined	Not defined
Petrol-hydrocarbons (C_nH_n)	Not defined	500 ppm	75 ppm	300 ppm
Sulfur Dioxide (SO_2)	80 µg/m^3	35 ppm	2 ppm	0.5 ppm (c)
Sulfuric Acid (H_2SO_4)	Not defined	1 ppm	Not defined	1 ppm (c)

Some basic precautions to follow:

- Do not allow food or drink into the data center.
- Do not store cardboard, wood, or packing materials 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. Dry wall and gypsum are especially damaging to equipment.

Seismic or Earthquake Ratings

For sites in areas of seismic activity, you might want to permanently fix the library position for added stability.

The requirements for seismic compatibility vary dramatically throughout the world. Therefore, Oracle does not offer a standard "seismic" feature for the SL4000 library. The library has mounting holes in the floor of each module where you can use half-inch carriage bolts (mounting studs) to permanently fix the library's position. If you have seismic concerns, Oracle recommends that you work with local experts who are familiar with the local code and requirements. Professional Services can also help coordinate this activity.

> **Caution:**
>
> Consult a qualified seismic engineer to verify seismic zone exposures and adequate site preparation.

Power Requirements

Before installing the library, make sure that the installation site can provide the minimum requirements for power.

The library requires a separate AC power source for each PDU in the library.

- 240 VAC, 50/60 Hz, at 30 amps (range: 200–240 VAC, 47–63 Hz, 24 amps), single phase

See Power Configurations.

Waste Disposal

Installing the library will result in many empty packages and packing material. Plan for the disposal of all material.

Determine if waste bins or recycling containers will be provided on site or whether an independent company will handle the disposal at additional cost.

Fire Suppression Planning

Customize the fire suppression system to meet the requirements of your organization.

The library does not ship with a fire suppression system, but each module has a 5 cm (2 inch) diameter circular nozzle opening. To custom fit the nozzles, you can drill openings in the cover plates (each plate is 7 cm (2.75 inch) square and 1.2 mm (0.048 inch) thick). Professional Services can assist with fire suppression planning.

> **Note:**
>
> Nozzles must remain clear of robotic operations and cannot protrude more than 1.9 cm (0.75 inches) into the library.

You can connect the library to your Emergency Power Off (EPO) system using the connector in the Base Module safety controller card.

Related Topics

- Safety Controller (LON)
  The Safety Controller monitors the status of all the library doors and cuts power to the rail when any door opens unexpectedly.

Networking

Plan how the library will fit within the network of your organization before installing the library.

- Network Requirements
- Host Connectivity Options
- Default Port Numbers
- Connect to Both Customer Ports on the Library Controller for Redundancy
- IP Addressing of Drives

Network Requirements

The library should be in a secure private network, switches set to auto negotiate, and each external library port on it's own subnet.

Oracle recommends a dedicated and secure private network for communication between the library and host software. A secure private network connection using an Ethernet hub or switch is required for maximum throughput and minimum resource contention. Switches must be set to auto negotiate. Each external library port must be on a separate subnet. If network ports are on the same subnet, you will only be able to reach one port.

See Default Port Numbers.

Reserved IP Address Range

The library reserves IP addresses 192.168.0.0/19. Avoid using addresses in the range 192.168.0.0/19 for any external interface.

Related Topics

- Default Port Numbers
  By default, the library uses certain port numbers. Configure your firewall it to allow traffic to use these ports.

Host Connectivity Options

The SL4000 library supports two types of host connections: FC-SCSI or Ethernet.

- Small computer system interface (SCSI) over a physical Fibre Channel interface
- Ethernet using 10/100/1000 Base-T and CAT 5e/1Gb cable

FC-SCSI Connection

The library can connect to SCSI over the Fibre Channel interface of the library controller.

The library comes standard with two FC ports (1 and 2) on the library controller card. However, by default only port 1 is fully active. Activating port 2 requires the Redundant Control Paths activation file. The library supports simultaneous access using both FC ports. However, the application using the SCSI interface must manage these connections. You must use a multi-path device driver or an application that is aware of the multiple paths.

See the *SL4000 SCSI Reference Guide* for more information on the SCSI command set, FC operations, topologies, and command implementations.

> **Note:**
>
> The library controller does not ship with SFP modules, you must purchase those separately.

TCP/IP Connection

The library controller provides two separate Ethernet connections (labeled as customer ports) on the library controller for communication with client applications.

- Port 1 provides the primary host connection (standard).
- Port 2 provides the dual connection (known as dual TCP/IP). Activation of this port requires the Redundant Control Paths activation file. Enabling dual Ethernet bonds

the two ports into a single interface, requiring only one IP address for the pair of ports on each library controller card. Dual TCP/IP prevents a loss of connection between the library and host by automatically avoiding a failed port.

Related Topics

- SCSI Host Connection
  Configure the library to support specific SCSI host applications.
- Connect to Both Customer Ports on the Library Controller for Redundancy
  Connect each customer port to a separate switch.

Default Port Numbers

By default, the library uses certain port numbers. Configure your firewall it to allow traffic to use these ports.

Enable the ports listed below on each of the network interfaces that are in use (except for the OKM interface — you only need to enable the OKM ports on the network interface used to connect to the OKM cluster).

Port	IP	Protocol	Description	Direction
22	TCP	SSH	SSH access to Linux running on library. Only enabled for 72 hours after an "Escalation" role service user is created.	To library
25	TCP	SMTP	Connection to external SMTP (Simple Mail Transfer Protocol) server. Required if you have configured any e-mail destinations.	From library
53	TCP & UDP	DNS	DNS (domain name server) lookup.	From library
80	TCP	HTTP	Default port for browser access.	To library
161	UDP	SNMP	Inbound GET requests using SNMP.	To library
162	UDP	SNMP	Outbound SNMP TRAPs.	From library
123	TCP	NTP	Connection from library to an external NTP server.	From library
443	TCP	HTTPS	Default port for browser and web services interfaces.	To library
7104	TCP	HTTP	Alternate port for browser access.	To library
7102	TCP	HTTPS	Alternate port for browser and web services interfaces.	To library
7104	TCP	HTTP	Browser GUI based access to WebLogic console running on the library. Only accessible by an "Escalation" user.	To library
7105	TCP	HTTPS	Browser GUI based access to WebLogic console running on the library. Only accessible by an "Escalation" user.	To library
Externally Defined	TCP	HTTP & HTTPS	Servers that are configured to receive outbound SCI calls will listen for SCI calls on ports of their choice. Open these port number in any firewalls and provided the port numbers configuring the destination on the library.	From library

Port	IP	Protocol	Description	Direction
Externally Defined	TCP	OKM	If the library is configured to retrieve tape drive encryption keys from a OKM cluster, open the ports used for OKM (see the OKM documentation).	From library

Browser and Web Services Interface Ports

The GUI and SCI protocols use default ports that can be modified using the configuration wizard.

The GUI can use both HTTP and HTTPS. The SCI protocol uses only HTTPS to secure for the credentials passed in each request. By default, these two protocols are on their standard port number of 80 for HTTP and 443 for HTTPS. You can modify these ports in the GUI (see Launch the Configuration Wizard).

Service Access Ports

The library enables or disables service ports depending on if a Service user has been created for the library.

Under normal library operations only customer-created users may log in to the library However, the administrator can enable service access when necessary (see Add a Service User). Creating a service user with an Escalation role enables access to the library that is not normally allowed. Specifically, an Escalation user can log in to Linux on the library using SSH on port 22 and can access the WebLogic console function using port 7104 for HTTP or 7105 for HTTPS. Service users expire 72 hours after creation. The library disables port 22 if there are no enabled service users. The library always enables ports 7104 and 7105, but unless an Escalation user exists, there are no valid users that can log in to the WebLogic console.

SNMP Ports

The library supports SNMP v3 protocol. The library uses ports 161 (inbound) and 162 (outbound) for SNMP GET commands and SNMP traps respectively.

E-mail Ports

The library uses port 25 for e-mail communication.

The library can send e-mail messages when certain events occur (see Configure Email Notifications). If you configure e-mail destinations, you must also configure an SMTP server and open port 25.

DNS Ports

DNS uses port 53.

DNS configuration is optional. You only need to configure DNS if destinations use host names (destination include SNMP, E-mail, Outbound SCI). You can add up to three DNS servers (see Launch the Configuration Wizard).

NTP Ports

The library uses port 123 for NTP.

The library can use an external NTP server to control the library clock (see Configure Time Settings). If using an external NTP server, you must open port 123.

Oracle Key Manager (OKM) Ports

See the OKM documentation for details on which port numbers to use.

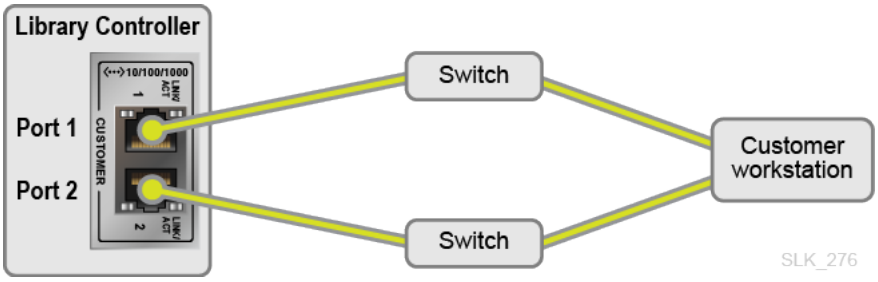
You can connect an OKM cluster to the library's OKM interface. You select the interface during network configuration of the library (see Launch the Configuration Wizard). Unlike legacy tape libraries, the SL4000 only requires a single connection to OKM, rather than individual connections to each encrypted tape drive. You must open the ports used by OKM appliance on the selected connection.

Connect to Both Customer Ports on the Library Controller for Redundancy

Connect each customer port to a separate switch.

If using dual TCP/IP, connect each customer port to a physically separate, non-stacked switch. Connecting both customer ports to a single physical switch or single logical switch may cause the customer network ports to stop functioning.

The following diagram shows an example configuration where the "customer workstation" could be a system running a browser to connect to the library GUI or a server running an application that directly uses the SCI interface to control the library.



Cable Routing

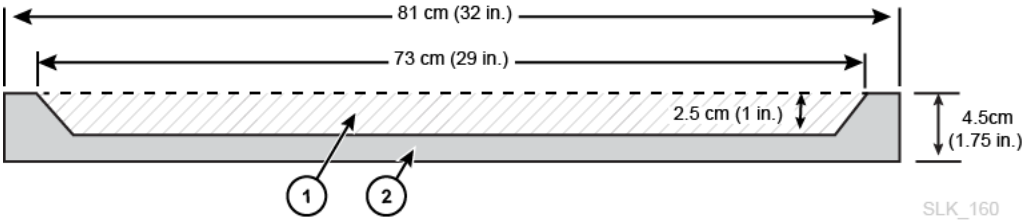
Plan for cable routing before installing the library.

The top and bottom of the Base and Drive Module rear door have openings to allow for cable routing. The openings are 2.5 cm (1 inch) by 73 cm (29 inches).

> **Note:**
>
> The rear door has two square holes near the bottom on the face of the door. These are for access to the PDU on/off switch, not for cable routing.

When routing cables, make sure to include locations for power, library control, and Ethernet cables. As a best practice, route power cables through one opening and signal cables through another opening.

Figure 2-1 Door Cable Routing Opening



1. Cable routing area
2. Overhead view of back door

Library Network Cables

Verify that you have the correct network cables before installing the library.

You can place the library in a 62.5-micron-cable Storage Area Network (SAN). However, the cable that connects the library to the network must be a 50-micron cable. Maximum supported cable distance depends on the link speed, the type of fiber (50 or 62.5 micron), and the device the library is attached to. The typical distances are:

- 8 Gbps = up to 21 m (69 ft) for 62.5-micron, 50 m (164 ft) for 50-micron
- 4 Gbps = up to 70 m (230 ft) for 62.5-micron, 150 m (492 ft) for 50-micron
- 2 Gbps = up to 150 m (492 ft) for 62.5-micron, 300 m (984 ft) for 50-micron
- 1 Gbps = up to 175 m (574 ft) for 62.5-micron, 500 m (1640 ft) for 50-micron

If your library attaches to a host bus adapter (HBA), refer to the HBA's documentation for the supported cable distances.

AC Power Cables

Plan for the locations of power cables and list the locations for their associated circuit breakers before installing the library.

Order appropriate cables for the power configuration.

Related Topics

- AC Power Source Options
  Each PDU in the library requires a separate AC power source. The number of power cords required depends on the power configuration.

Approximate Installation Time

The approximate time it takes to install a library depends on the configuration.

The times listed below do not include library initialization, testing, audits, and feature upgrades. Contact an Oracle sales representative for more information.

Module/Component	Time Estimate (hours)	Personnel Required	Total Person Hours
Base with 8 drives (standard)	3	2	6

Module/Component	Time Estimate (hours)	Personnel Required	Total Person Hours
Drive Module (each)	2	2	4
Cartridge Module (each)	2	2	4
Two Parking Modules	2	2	4
Access Module (each)	2	2	4
CAPs (each)	1	2	2
Tape drive (each drive)	0.5	1	0.5
Firmware	0.2	1	0.2
Integration (cables, hubs, switches, connections)	8	1	8
Tapes (each)	0.02	1	Varies
Software configuration	2 to 8	1	Varies

Gather Configuration Wizard Information

Before powering on the library for the first time, gather key library configuration information. You will use this information to complete the initial configuration wizard of the library GUI.

- IPv4 or IPv6 information for the public port, service port, and OKM port (if using OKM). Each port must be on a different subnet.
  - For IPv4, determine the IP address, netmask, and gateway
  - For IPv6, determine the IP address, prefix length, and gateway
- HTTP (default 80) and HTTPS (default 443) listening ports
- Library time zone:
  - Determine if using UTC or regional
  - Determine if using NTP server or setting the time manually
- Library name
- Determine desired system cell Volume Label Format
- OPTIONAL: DNS information for the library controller public port:
  - Domain name
  - Up to three DNS server addresses

> **Caution:**
>
> If using DNS, verify all DNS server information is correct and that the Customer Port has a valid link before configuration. Invalid DNS information can cause library startup to take 2 hours.

Related Topics

- Launch the Configuration Wizard
  The wizard configures network, time, and library settings.

3
Basic GUI Operations

Familiarize yourself with basic GUI operations that are frequently performed when working with the library.

- Log into the GUI
- Areas of the GUI
- Export a GUI Table to a Spreadsheet
- Search and Sort Tables
- Navigate the GUI with a Keyboard

Related Topics

- Users and Preferences
  Each user can configure settings for their login session. The administrator can manage users and change a user's password.

Log into the GUI

Access the GUI remotely with a browser, through the front touch screen, or through a keyboard and monitor connected to the Base module.

- Log in Remotely
- Log in Locally at the Front Touch Screen of the Library
- Log in Locally Using a Keyboard, Mouse, and Monitor

> **Note:**
>
> After five invalid attempts to log in, you will be locked out for 30 minutes. Contact the library administrator to unlock your account.

Related Topics

- Users and Preferences
  Each user can configure settings for their login session. The administrator can manage users and change a user's password.
- Unlock a User Account
  After five invalid login attempts, the system will lock the user out for 30 minutes. The administrator can unlock the user account.

Log in Remotely

Use a browser to access the library GUI remotely.

1. Obtain the library host name or IP address. If not using the standard port numbers, obtain the port number from the library administrator.
2. In a browser, navigate to:

   <Hostname or IP address of the library>:*<port>*

   You only need the port number if not using the standard port numbers of 80 (http) or 433 (https). For example, if using the port 7102:
   `MyLibrary.mycompany.com:7102`

   > **Note:**
   >
   > If you receive an "HTTPS connection untrusted" warning, configure the browser to trust the user interface server by following the browser's on-screen instructions.

3. On the log in screen, enter your user name and password. Click **Log In**.

Supported Browsers

The GUI has been tested on certain browsers.

- Microsoft Edge 25.x
- Microsoft Internet Explorer 11
- Google Chrome 53+
- Mozilla Firefox 45+
- Apple Safari 8 and 9

> **Note:**
>
> There may be slight differences and anomalies in browser operation. If you are having issues, try a different browser.

Log in Locally at the Front Touch Screen of the Library

Access the library GUI directly from the front touch screen.

1. Touch the op panel screen to activate it. If nothing displays, the display is either set to the rear VGA port or a different controller. Press the SOURCE button below the screen to set the controller source to the active library controller (L1).
2. On the log in screen, enter your user name and password. Click **Log In**.

Related Topics

- Operator Panel
  The operator panel is the touch screen on the front of the Base Module used to access the GUI.

Log in Locally Using a Keyboard, Mouse, and Monitor

Access the library GUI using a keyboard, monitor, and mouse connected to the Base Module card cage.

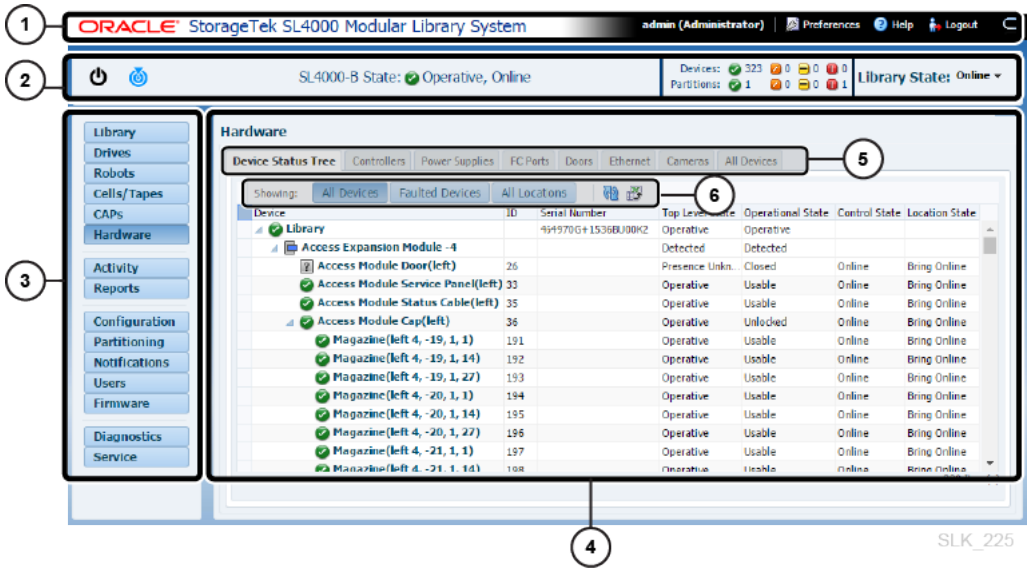
1. Connect a keyboard and mouse to the USB ports on the library controller in the Base card cage.
2. Connect a monitor to the VGA port on the video card in the Base card cage.
3. Press the SELECT button on the video card to set the display to the VGA port. Set the controller source to the active library controller (L1).
4. On the log in screen, enter your user name and password. Click **Log In**.

Related Topics

- Base Module Card Cage
  The rear of the Base Module houses the card cage, which contains controller cards, disk storage, cooling fans, switches, and power converters.

Areas of the GUI

The GUI screen has a standard layout.



1. **Masthead** — Displays the current user and contains user preferences, help, and logout.
2. **Status bar** — Displays the current library, device, and partition state. Provides a way to control the state of the library (online/offline, on/off, restart).
3. **Navigation** — Click to view different parts of the GUI. Depending upon the user's role, some of these buttons may not appear.
4. **Content area** — Changes depending on the navigation and tab selected.
5. **Tabs** — Displays different content for the current page.

6. **Action buttons** — Performs various GUI tasks (such as Add a Partition, Refresh, and so on). Hover over the icons to display tool tips.

Export a GUI Table to a Spreadsheet

Export an .xls file for any of the tables found in the GUI.

1. Navigate to the table.
2. Click **Export** .
3. Save the file to the desired location.
4. Open the file in a spreadsheet application (such as Microsoft Excel).

> **Note:**
>
> The extension of the file is .xls, but the format is html. When opening the file in a spreadsheet program, you may be required to verify that the file is not corrupt and from a trusted source.

5. You may need to change the format of any Date/Time columns. If using Excel, select the columns. Select Format Cell, Custom, and then enter the format, such as `mm/dd/yy hh:mm:ss.0;@`.

   If you select Format Cell, Date, and select a date type like `MM/DD/YY HH:MM`, then time will be rounded to the nearest minute.

Search and Sort Tables

Search and sort the tables in the GUI to clarify data.

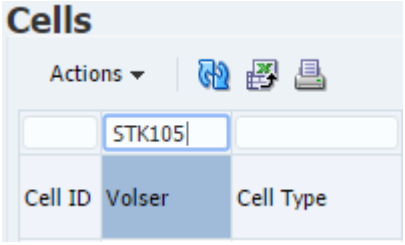
If you need additional sorting capabilities, you can export the table as a spreadsheet. See Export a GUI Table to a Spreadsheet.

Sort a Table

1. Hover over a column title.
2. Click the up or down arrows to sort the column.

Search in a Table Using Filters

1. Click in the white search bar above a column title.



2. Enter a search value. The value must match exactly (not case sensitive), or you can use a search operator:

- > (greater than) and < (less than) — valid for numeric fields or strings with values. For example Media Type: `<LtoGen6` or Date/Time: `>2017-06-16` (YYYY-MM-DD must be specified fully, therefore >2017-06 would not work).
- ! (not equal to) — such as `!Complete` or `!DefaultPartition`
- * (wildcard) — For example, `Z*` matches all rows starting with the letter Z.
  - Wildcard is valid for text fields only, not valid for numeric or date fields.
  - Only use one wildcard per filter. Do not use with any other search operator.
- For numeric fields, do not use a comma in your search (for example, use `5280` instead of `5,280`).
- Null values will never match any filter.

> **Note:**
>
> The search is not case sensitive and you can only use one search operator at a time, so `!Default*` (which uses two operators) will return no results.

3. Press **Enter** or click **Refresh**.
4. To remove the filter: Delete the text, and then press **Enter** or click **Refresh**.

Example 3-1 Multi-column Filtering Example

You can enter search items into multiple columns to further limit the results. For example, if you wanted to locate all cleaning and diagnostic LTO tapes in the Tapes table, you could search for `LTO*` for media type and `!Data` for medium type.

	LTO*	!Data						
Volser	Media Type	Medium Type	Cell ID	Cell Type	Module	Col	Side	Row
CLNU05	LtoUniv_Cleaning	Cleaning	101	System	Drive (Left 1)	-1	Back	50
CLNU00	LtoUniv_Cleaning	Cleaning	450	Storage	Cartridge (Left 2)	-11	Back	7
DG 503	LtoGen5_1500GB	Diagnostic	511	Storage	Cartridge (Left 2)	-12	Back	16

Navigate the GUI with a Keyboard

Use keyboard actions to navigate the GUI for accessibility or if you do not have a mouse.

- **Tab traversal** — All active elements of the page are accessible by tab traversal. Use the **Tab** key to move to the next control and **Shift+Tab** to move to the previous control. In most cases, when a control has focus, you can initiate the action by pressing **Enter**.
- **Arrow keys** — Some complex components use arrow keys to navigate after the component receives focus using the **Tab** key.

Related Topics

- Set Accessibility Options
  Configure the GUI for accessibility, such as enabling high-contrast, large fonts, or optimizing for a screen reader.

4

Users and Preferences

Each user can configure settings for their login session. The administrator can manage users and change a user's password.

Individual User Tasks:

- Change Your Password
- Add a Recovery Email Address to Your User Id
- Recover a Forgotten Password
- Set Accessibility Options
- Set the Session Timeout
- Set the Initial Page to Display After Login
- Display the Library's Current Date and Time
- Display Dates and Times in UTC
- Restore Hidden Warnings and Confirmation Prompts

Administrator Tasks:

- Add, Modify, or Delete a User
- Add a Service User
- Unlock a User Account
- Change the Password of Another User

Change Your Password

Change your password regularly to increase security for your username.

1. This procedure assumes that you can successfully login to the GUI. If you have forgotten your password, either contact the administrator or attempt to recover it.
2. Click **Preferences** in the upper right corner of the GUI, and then select **Reset Password**.
3. Enter a new password.

> **Note:**
>
> Your password must be at least 8 characters long and contain a mix of letters and numbers.

Related Topics

- Recover a Forgotten Password
  There are three options to recover a forgotten password: contact the administrator, generate a recovery email, or contact Oracle Support.

Change the Password of Another User

With the Administrator role you can change the password of other users.

See Add, Modify, or Delete a User.

Add a Recovery Email Address to Your User Id

Associate an email address with your user ID to use if you need to reset your password.

1. Resetting your password through email will only work if the SMTP server is configured on the library and email activity is enabled.
2. Click **Preferences** in the upper right corner of the GUI.
3. Select **User Preferences**.
4. Enter the email address to use to recover a forgotten password.

Related Topics

- Configure Email Notifications
  The library can send email notifications if you configure an SMTP server and set email recipients.
- Recover a Forgotten Password
  There are three options to recover a forgotten password: contact the administrator, generate a recovery email, or contact Oracle Support.

Recover a Forgotten Password

There are three options to recover a forgotten password: contact the administrator, generate a recovery email, or contact Oracle Support.

OPTION 1 — Contact the library's Administrator user to reset your password

Library administrators can refer to Add, Modify, or Delete a User for procedures.

OPTION 2 — Generate a recovery email

You can only use this option if the SMTP server is configured and a recovery email address is associated with your user ID. The password reset email expires after 2 hours.

1. Navigate to the GUI login screen, and then click **Forgot Password**.
2. Click **Generate Recovery Email**. If this button is not displayed, email notifications are disabled for the library. Use one of the other two options to recover your password.
3. Enter your email address. If the email is associated with a user ID, the library will send a recovery email.
4. Follow the instructions in the recovery email. Enter your new password, and click **Save**.

OPTION 3 — Download Service User Key and Contact Oracle Support

1. Navigate to the GUI login screen, and then click **Forgot Password**.
2. Click **Download service user key file**.
3. Send the key file to Oracle.

> **Note:**
>
> The key file is encrypted. Oracle then decrypts the file to get an Administrator user ID and password to login to the library. Oracle personnel can refer to the *SL4000 Installation and Service Guide* for procedures.

4. Oracle support will login to the library and reset your password.

Related Topics

- Configure Email Notifications
  The library can send email notifications if you configure an SMTP server and set email recipients.
- Add a Recovery Email Address to Your User Id
  Associate an email address with your user ID to use if you need to reset your password.

Set Accessibility Options

Configure the GUI for accessibility, such as enabling high-contrast, large fonts, or optimizing for a screen reader.

The first time you log in to the GUI, it will prompt you to set the accessibility options (this prompt remains each time you login until you select "Do not show these options"). However, you can change the settings at anytime.

1. Click **Preferences** in the upper right corner of the GUI.
2. Select **Accessibility Settings**
3. Select accessibility settings:
   - **Screen reader** - If you are using a screen reader to interface with the GUI, select this option. The GUI generates components that have rich user interface interaction and are accessible through the keyboard.
   - **High contrast** - The GUI generates high-contrast-friendly visual content. High-contrast mode is designed for use with operating systems or browsers that have high-contrast features enabled.
   - **Large-fonts** - The GUI generates browser zoom-friendly content.

Related Topics

- Navigate the GUI with a Keyboard
  Use keyboard actions to navigate the GUI for accessibility or if you do not have a mouse.

Set the Session Timeout

For security reasons, the GUI session times out after a period of inactivity. The default is 60 minutes.

1. Click **Preferences** in the upper right corner of the GUI.
2. Select **User Preferences**.
3. Enter the session timeout in minutes between 20 and 1440 (24 hours).

Set the Initial Page to Display After Login

Select the page that you most often access to display initially after you login.

1. Click **Preferences** in the upper right corner of the GUI.
2. Select **User Preferences**.
3. Select a start page from the drop-down list.

> **Note:**
>
> If there are multiple tabs on the page, you cannot select a specific tab to display. Only the first tab will display upon login.

Display the Library's Current Date and Time

Display the library's current date and time in the GUI status bar, beneath the library status indicator. This may be helpful when viewing requests, jobs, system reports, and so on.

The status bar displays the time in both local and UTC. However, if you have chosen to display times in UTC, then the status bar only displays UTC time.

1. Click **Preferences** in the upper right corner of the GUI.
2. Select **User Preferences**.
3. Select **Show Time in Status Area**.

Related Topics

- Configure Time Settings
  Set the library date and time using the configuration wizard.
- Display Dates and Times in UTC
  Display all dates and times throughout the GUI in Universal Coordinated Time (UTC).

Display Dates and Times in UTC

Display all dates and times throughout the GUI in Universal Coordinated Time (UTC).

This setting only affects the date and times displayed for the individual user. It does not change the library date and time configuration settings.

1. Click **Preferences** in the upper right corner of the GUI.
2. Select **User Preferences**.
3. Select **Display dates and times in UTC**.

Related Topics

- Configure Time Settings
  Set the library date and time using the configuration wizard.
- Display the Library's Current Date and Time
  Display the library's current date and time in the GUI status bar, beneath the library status indicator. This may be helpful when viewing requests, jobs, system reports, and so on.

Restore Hidden Warnings and Confirmation Prompts

As you encounter pop-up warnings, you can select to not show the warning again. You can restore the hidden warnings at any time.

1. Click **Preferences** in the upper right corner of the GUI.
2. Select **User Preferences**.
3. Select **Reset all warning prompts**.

Add, Modify, or Delete a User

The administrator can manage users to control who has access to the library.

1. Login with the Administrator role.
2. Click **Users** in the left navigation area of the GUI.
3. Click **Add User**, or select a user and then click **Change Role**, **Change Password**, or **Delete**.

> **Note:**
>
> You can only assign the Administrator, User, Operator, or Viewer roles. Service roles are only created when the library requires maintenance.

4. For each user, you can optionally add a recovery email address. If the SMTP server is configured on the library, this will allow the user to recover a forgotten password.

Related Topics

- User Roles
  A user's role determines their access to GUI and SCI functions.

- Add a Service User
  If Oracle service needs to access the library for maintenance, the Administrator can create a service user and provide Oracle with the key file. All service users expire 72 hours after creation.
- Recover a Forgotten Password
  There are three options to recover a forgotten password: contact the administrator, generate a recovery email, or contact Oracle Support.

Add a Service User

If Oracle service needs to access the library for maintenance, the Administrator can create a service user and provide Oracle with the key file. All service users expire 72 hours after creation.

1. Login with the Administrator role.
2. Click **Users** in the left navigation area of the GUI.
3. Click **Create Service User**  .
4. Select the role as directed by Oracle.
5. Select the service user in the list, and then click **Download Service User Key File**  .
6. Send the key file to Oracle.

> **Note:**
>
> The key file is encrypted. Oracle then decrypts the file to get the user ID and password to login to the library. Oracle service personnel can refer to the *SL4000 Installation and Service Guide* for procedures.

Unlock a User Account

After five invalid login attempts, the system will lock the user out for 30 minutes. The administrator can unlock the user account.

1. Login with the Administrator role.
2. Click **Users** in the left navigation area of the GUI.
3. Select the user, and then click **Unlock User(s)**  .

User Roles

A user's role determines their access to GUI and SCI functions.

- **Administrator** (C3) – a library administrator. This role has access to nearly every function and can manager other users.
- **User** (C2) – the role for day-to-day operators of the library. This role can perform most actions on the library, but some are off-limits, such as configuring partitions or creating users.

- **Operator** (C1) – a role with fewer privileges than a User. This role only has access to a small subset of actions such as viewing data and operating CAPs.
- **Viewer** (V) – a read-only role. Users with this role can view, but not alter, anything on the library.
- **Service** (S1) – a special role for service technicians. This role can pull service bundles, run diagnostics, change configuration settings, and so on.
- **Advanced Service** (S2) – an enhanced service role with additional access for diagnosing and repairing the library.
- **Escalation** (S3) – the highest level of service role with extensive access to repair the library.
- **Installer** (I) – a special role used during the initial installation and configuration of the library. This role is only available before library handoff to the customer.

Available Functions for Each User Role

A user's role determines which functions of the library they can access.

The following table lists which user roles have the authorization/permissions to perform a particular function (x = the role can perform the function).

Category	Function	V	C1	C2	C3	S1	S2	S3	I
Activity	View library activity (requests, jobs, resources, events)	x	x	x	x	x	x	x	x
Activity	Cancel a request	-	-	x	x	x	x	x	x
CAPs	Unlock/lock and open/close CAPs	-	x	x	x	x	x	x	x
CAPs	Set and clear the CAP owner	-	x	x	x	x	x	x	x
CAPs	Create, assign, and delete CAP pools	-	-	-	x	x	x	x	x
Cells/Tapes	Move or mount a tape within the same partition	-	-	x	x	x	x	x	x
Cells/Tapes	Move or mount a tape to any cell regardless of partition	-	-	-	x	x	x	x	x
Cells/Tapes	Import/export tapes in system cells	-	x	x	x	x	x	x	x
Cells/Tapes	Set the cleaning tape threshold	-	-	x	x	x	x	x	x
Cells/Tapes	Audit cells	-	-	x	x	x	x	x	x
Configuration	View library configuration settings	x	x	x	x	x	x	x	x
Configuration	Export the library configuration	-	x	x	x	x	x	x	x
Configuration	Import the library configuration	-	-	-	x	-	x	x	x
Configuration	Run the wizard to configure library, network, and time settings	-	-	-	x	-	x	x	x
Configuration	Add or remove hardware activation files	-	-	-	x	-	x	x	x
Devices	Activate/deactivate the locator LED	-	x	x	x	x	x	x	x
Devices	Obtain device telemetry	-	x	x	x	x	x	x	x
Devices	Reset a device (drives, controllers, and so on)	-	-	x	x	x	x	x	x
Devices	Change the online/offline state of a device	-	-	x	x	x	x	x	x

Category	Function	V	C1	C2	C3	S1	S2	S3	I
Devices	View device properties and status (using the Hardware page)	x	x	x	x	x	x	x	x
Diagnostics	Run and view diagnostic tests	-	-	x	x	x	x	x	x
Diagnostics	Run drive FDE diagnostics	-	-	-	-	x	x	x	x
Diagnostics	Run robot diagnostics	-	-	-	-	-	x	x	x
Drives	Initiate drive cleaning	-	x	x	x	x	x	x	x
Drives	Force a drive unload	-	-	x	x	x	x	x	x
Drives	Power a drive on/off	-	-	x	x	x	x	x	x
Firmware	View the library and device firmware level	x	x	x	x	x	x	x	x
Firmware	Alter the library or device firmware level	-	-	x	x	x	x	x	x
Firmware	Block, force, or allow firmware upgrades	-	-	-	-	-	-	x	-
Logging	Set the logging level	-	-	x	x	x	x	x	x
Logging	View and download logs, fault reports, and system reports	-	-	x	x	x	x	x	x
Logging	View, create, download, or delete support bundles	-	-	x	x	x	x	x	x
Logging	Clear robot logs	-	-	-	-	x	x	x	x
Logging	Clear library and drive logs	-	-	-	-	-	x	x	x
Library	View library contents and properties (tapes, cells, drives, CAPs)	x	x	x	x	x	x	x	x
Library	Power-down or restart the library	-	-	x	x	x	x	x	x
Library	Change the online/offline state of the library	-	-	x	x	x	x	x	x
Library	Reset the library to factory defaults	-	-	-	-	-	-	x	x
Media Val.	Modify the media validation pool	-	-	-	x	-	x	x	x
Media Val.	Start or cancel media validation operations	-	-	x	x	x	x	x	x
Media Val.	View in progress media validation operations	x	x	x	x	x	x	x	x
Notifications	View the notification configuration (SNMP, SCI, email)	x	x	x	x	x	x	x	x
Notifications	Test notifications (SNMP, SCI, email)	-	-	x	x	x	x	x	x
Notifications	Configure and submit ASRs	-	-	x	x	x	x	x	x
Notifications	Configure notification destinations and users (SNMP, SCI, email)	-	-	x	x	-	x	x	x
Partitioning	View the partitioning table and properties	x	x	x	x	x	x	x	x
Partitioning	Change the online/offline state of a partition	-	-	x	x	-	x	x	x
Partitioning	Edit partition information (name, connection type, and so on)	-	-	-	x	x	x	x	x
Partitioning	Create, delete, and assign cells to a partition	-	-	-	x	-	x	x	x

Category	Function	V	C1	C2	C3	S1	S2	S3	I
Reports	Access to system and fault reports	x	x	x	x	x	x	x	x
Reports	Access to support bundles	-	-	x	x	x	x	x	x
SCSI	View SCSI hosts and LUNs	x	x	x	x	x	x	x	x
SCSI	Configure SCSI hosts	-	-	-	x	-	x	x	x
Service	Add a service key	-	-	-	-	x	x	x	-
Service	Ping or trace route to a host	-	-	x	x	x	x	x	x
Service	View raw FRU-ID data	-	-	-	-	x	x	x	x
Service	Move the robot to the service area	-	-	-	-	-	x	x	x
Service	Alter the database or file system	-	-	-	-	-	-	x	-
User	Set user preferences (session time out, initial display, and so on)	x	x	x	x	x	x	x	x
User	Reset your own password	x	x	x	x	x	x	x	x
User	View users	-	x	x	x	x	x	x	x
User	Download service user key	-	x	x	x	x	x	x	x
User	Add service user	-	-	x	x	-	-	-	x
User	Add, delete, or modify a user	-	-	-	x	-	-	-	x
User	Reset another user's password	-	-	-	x	-	x	-	x

5

Configure the Library

Configuring key properties such as the network settings, library settings, partitioning, notifications, hardware activation files, and library firmware levels.

Library Configuration and the Wizard

- Library Configuration Guidelines to Maximize Performance
- Initial Configuration Steps After Physically Installing the Library
- Gather Configuration Wizard Information
- Launch the Configuration Wizard
- Configure Library Settings
- Configure Network Settings (Public, Service, and OKM Ports)
- Configure Time Settings
- Configure Library Encryption (LME)
- Probe for Physical Configuration Changes

Configuration Files and Properties

- Export the Library Configuration File
- Import a Library Configuration File
- View the Library Configuration Properties

Optional Features and Activation Files

- Add or Remove Optional Library Features
- View the History of Feature Activation Activity

Firmware

- View Firmware Levels
- Download Firmware from My Oracle Support
- Upload and Activate New Firmware
- Revert to the Previous Firmware Version
- Block, Allow, or Force Device Firmware Upgrades

Notifications

- Configure Email Notifications
- Configure SNMP Notifications
- Configure Outbound SCI Notifications
- Add an SDP2 Server to Receive ASR Notifications

Partitioning

- Enable Partitioning
- Configure Partitioning

CAP Pools

- Create a CAP Pool
- Assign CAPs to a Pool
- Delete a CAP Pool
- Assign a CAP Pool to a Partition

Drive Cleaning

- Set Drive Auto Cleaning for an Individual Drive
- Set Drive Auto Cleaning for a Partition
- Set the Cleaning Tape Usage Thresholds

SCSI Host Connection

- Add, Modify, or Delete a SCSI Host
- Assign Partitions to a SCSI Host and Alter LUN Assignment

Initial Configuration Steps After Physically Installing the Library

After physically installing the modules and tape drives, use these guidelines to initially configure the library and connect to SCSI host applications.

What to do before a library power up or restart

- Connect Ethernet cables to the library controller Customer port, and optionally connect to the Service and OKM ports.
- Install the tape drives (if not already installed). Connect Fibre Channel cables to all drives. DO NOT connect Ethernet cables to individual drives. The drive IP network is internal to the library.
- If using FC-SCSI host applications, connect Fibre Channel cables to the library controller ports. Initially, only port 1 is fully active.

What to do after the library powers up and completes initialization

- Verify the LINK light is active on the FC switches for the tape drives and the library controller connection. The library controller does not have FC link lights. To verify the connection, you must check the FC switch or use the GUI.
- Install hardware activation files: redundant control path and tape capacity as appropriate.
- OPTIONAL: Partition the library. Create CAP pools. Create partitions and assign cells to partitions.
- Load tapes using the CAP (if not done before power up).
  - For shared CAPs, you must assign ownership to a partition before importing tapes

  - Open the CAP, load tapes, and use the GUI to move the tapes out of the CAP.

How to remotely access the library's tape drives

- You will need to configure a separate admin server to remotely access the drives. You will use this admin server for OKM drive enrollment, VOP 2.3.3 operations, IBM drive encryption firmware upgrades, and drive firmware upgrades.
- The SL4000 drive network differs from that of the SL3000, and therefore requires different routing. Refer to the OKM documentation for the OKM SL4000 setup information.
- After configuring the admin server, try pinging an SL4000 drive using the drive's IP address as found in the GUI.

How to connect SCSI host applications to the library

- Verify that the library and drive FC ports are logged into the FC switches. Zone the FC switch so that the drives and library robots will be available to host applications. At this point, the hosts should be able to see the drives.
- Verify the hosts appear in the GUI. The World Wide Port Name (WWPN) is the WWPN of the host HBAs. Rename the host to make them easier to identify.
  - More "hosts" than expected may appear in the list. These are most likely FC switch ports. After identifying them, you may rename or ignore these "hosts".
- Assign partitions. Each host must have one and only one LUN 0 per host port.
- The host applications should now be able to see the robots.
- Configure the host applications. For example, install necessary patches to support the SL4000 library, setup the devices (paying attention to the drive order, which may be the SCSI addressing order), inventory the tapes, and so on.

Launch the Configuration Wizard

The wizard configures network, time, and library settings.

1. Click **Configuration** in the left navigation area of the GUI.
2. From the Settings tab, click **Configure**  .
3. Select the options you want to configure, click **Next**.
   - **Library Settings**
   - **Network Settings** (requires library restart)
   - **Time Settings** (requires library restart)
   - **Library Encryption** (must be configured separately from all other options)
4. Proceed to the corresponding sections:
   - Configure Library Settings
   - Configure Network Settings (Public, Service, and OKM Ports)
   - Configure Time Settings
   - Configure Library Encryption (LME)

Configure Library Settings

Library settings include the library name, partitioning activation, initialization settings, volume label format, and HTTP listening port settings.

1. This procedure assumes you have started the configuration wizard and selected **Configure Library Settings**.

   If not, see Launch the Configuration Wizard.

2. Enter the **Library Name** and **Domain Name**.

3. Select the library settings, as applicable:

   - **Library Partitioning Active** - Selecting this option enables partitioning in the library. You no longer need a hardware activation file to enable partitioning.
   - **Bypass audit if door opened with power off** – Normally, if a door opens while the library is off, the library will run a full audit when it resumes operation. However, if you plan to enter the library while it is off, but will not move any tape cartridges, then you can enable this option to bypass the full audit. This is also known as "suppress HBO" (suppress Has Been Opened). Only select this option if you are not going to add, remove, or move any tapes or drive trays.
   - **Probe for physical configuration changes upon next restart** - The robot will scan the module identification blocks during startup and perform a full audit. You must select this option when modifying the physical configuration. The probe only occurs on the initial restart after you select this option. Then, this option resets, so that subsequent restarts will not probe for configuration changes.
   - **System Cell Volume Label Format** – Controls the presentation of system cell volsers. To change the label format for normal storage cells, you must change the Volume Label Format of the partition containing the cells.
   - **IPv4 HTTP Listening Port** - Default is 80. Valid custom values are 10000-22000. IPv6 HTTP listens only on port 7102.
   - **IPv4HTTPS Listening Port** - Default is 443. Valid custom values are 10000-22000. Pv6 HTTPS listens only on port 7103.

Related Topics

- Probe for Physical Configuration Changes
  After physically changing the library (such as adding a CAP, module, drive array and so on), you must tell the library to probe for the configuration changes, which has the robot scan each module identification block after the library restarts.
- What Occurs to Partitions When the Physical Configuration Changes
  In a partitioned library, changing the physical configuration causes the library to adjust the partitioning configuration to handle the newly added or removed cartridge and drive slots.

Volume Label Format

The volume format controls how the library presents the volser to external applications and within the GUI tables.

You can select the system cell volume format when configuring the library settings and the storage cell volume format when defining a partition. For the examples listed below, the tape barcode is “STA015L4".

- **Prepend Last Two Characters** - Moves the last two characters of the barcode to the front. For example, "L4STA015".
- **Raw Label** - Presents the full eight-character label. For example, "STA015L4".
- **Trim Last Character** - Removes the last character of the barcode. For example, "STA015L".
- **Trim Last Two Characters** (default) - Removes the last two characters of the barcode. For example, "STA015".
- **Trim First Character** - Removes the first character of the barcode. For example, "TA015L4".
- **Trim First Two Characters** - Removes the first two characters of the barcode. For example, "A015L4".

Configure Network Settings (Public, Service, and OKM Ports)

Each network port has its own configuration step in the configuration wizard.

1. This procedure assumes you have started the configuration wizard and selected **Configure Network Settings**.

   If not, see Launch the Configuration Wizard.
2. Enter applicable IPv4 or IPv6 information for each port you want to configure.

   > **Note:**
   >
   > Each port must be on a separate subnet. If network ports are on the same subnet, you will only be able to reach one port.

   You must proceed through each port one screen at a time. For example, to configure only the OKM port, click **Next** to bypass the public and service port pages. There is no way to start at the OKM port page.

   - **Public Network Port (Customer Port)** — IP information is required. DNS information is optional, but all DNS information must be valid before applying the configuration. Incorrect DNS information or unreachable DNS servers, will cause the library startup to take up to 2 hours.

> **Caution:**
>
> If using DNS, verify all DNS server information is correct and that the Customer Port has a valid link before applying the configuration. Invalid DNS information can cause library startup to take 2 hours.

- **Service Network Port** — IP address and netmask information is required. Gateway information is optional. You can accept the default information.
- **Oracle Key Manager Port** — IP information is optional. You can select **Port Disabled**, which will unconfigure and take down the port.

Related Topics

- Networking
  Plan how the library will fit within the network of your organization before installing the library.
- Default Port Numbers
  By default, the library uses certain port numbers. Configure your firewall it to allow traffic to use these ports.
- IP Addressing of Drives
  The drive IP address depends on the drive bay and module frame ID.

Configure Time Settings

Set the library date and time using the configuration wizard.

1. This procedure assumes you have started the configuration wizard and selected **Configure Time Settings**.

   If not, see Launch the Configuration Wizard.
2. You must restart the library after making changes to the time settings. Do not proceed unless you can restart the library now.
3. Select the **Op Panel Time Zone**. You should use the time zone where the library is physically located.

   Internally the library always runs on UTC (coordinated universal time), but the library uses the "Op Panel Time Zone" parameter to adjust the times displayed at the local operator panel. For browser connections, the GUI automatically adjusts the time to the local time of the browser.
4. Select an option for **Configure Date and Time**:
   - *Using Network Time Protocol* — Enter the address of up to five Network Time Protocol (NTP) servers.
   - *Manually* — Enter the time using the same time zone as the library time zone. The library will adjust its internal clock to UTC based on the library time zone parameter selected above.
5. Accept the changes and allow the library to restart.

Related Topics

- Display Dates and Times in UTC
  Display all dates and times throughout the GUI in Universal Coordinated Time (UTC).

- Display the Library's Current Date and Time
  Display the library's current date and time in the GUI status bar, beneath the library status indicator. This may be helpful when viewing requests, jobs, system reports, and so on.

Configure Library Encryption (LME)

Enable the library to manage the enrollment and key delivery for designated encryption-capable drives. The library acts as the OKM agent, meaning you only need to enroll the library with OKM rather than individual drives.

Pre-requisites

- Minimum library firmware 1.1.0
- Library contains IBM LTO 6+ drives
- No drives in the library are currently enrolled with OKM
- Configuration of library settings and network settings is complete

Obtain Information from OKM

Have the OKM administrator use the OKM GUI to create an SL4000 library agent. Then, record the following information:

- OKM Cluster IP address
- Agent Name
- Passphrase

Configure the SL4000 to Manage Encryption

1. Library encryption must be configured separately and after all other library configuration options. Ensure you have completed the network configuration and rebooted the library before configuring encryption.
2. If you previously enrolled individual drives with OKM, unenroll all drives before enabling LME.
3. Launch the Configuration Wizard. Then, select **Configure Library Encryption**.
4. From the "Library Encryption Status:" drop-down, select **Encrypting**.
5. Enter the following:
   - OKM Cluster IP address
   - Agent Name
   - Passphrase
6. Leave the OKM tuning parameters at their default setting unless instructed to change them by your OKM administrator.
7. Click **Next**. Review and apply the changes.

Verify the SL4000 Agent is Enrolled

After confirming the changes within the Configuration Wizard, have the OKM administrator go to the OKM GUI and verify that the SL4000 agent now shows "Enrolled: True".

See the OKM documentation for more information.

Enable Specific Drives for Encryption

The configuration wizard enables LME on the library, but initially no drives will be enabled for encryption. You must select IBM LTO 6+ drives and enable encryption on them by modifying the Drive Settings.

See Enable a Drive for Library-Managed Encryption (LME).

Probe for Physical Configuration Changes

After physically changing the library (such as adding a CAP, module, drive array and so on), you must tell the library to probe for the configuration changes, which has the robot scan each module identification block after the library restarts.

1. Select **Configure Library Settings**, and then click **Next**.
2. On the Configure Library Settings screen, select the **Probe for configuration changes upon next restart** option. Click **Next**.
3. Accept the changes, and then click **Apply**.
4. Restart the library.

Physical configuration changes include:

- Adding or removing modules, rotational CAPs, drive arrays, and so on.
- Converting a Cartridge Module into a Parking Module or vice versa.

Physical configuration changes do not include:

- Adding, removing, or moving tape cartridges or drive trays.
- Adding or removing robots or controller cards.

Related Topics

- What Occurs to Partitions When the Physical Configuration Changes
  In a partitioned library, changing the physical configuration causes the library to adjust the partitioning configuration to handle the newly added or removed cartridge and drive slots.

Module Identification Block

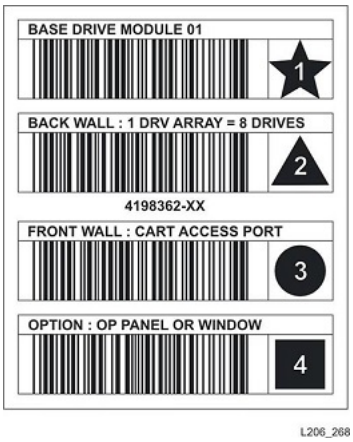
Each module has an identification block that lists the configuration for the robot to scan during startup.

The robot scans the id block during the first library startup or during a startup where you have selected Probe for Configuration Changes. The id block lists the module type and module options, such as a CAP or the number of drives.

For the location of the module identification block, see the Cell Maps.

For information on the Probe for Configuration Changes setting, see Configure Library Settings.

Figure 5-1 Example Module Identification Block - Base Module



View the Library Configuration Properties

Display library properties such as library name, model, serial number, state, cell counts, and disk usage.

1. Click **Library** in the left navigation area of the GUI.
2. View the configuration under the **Library Properties** section.
3. You can also view the library properties by clicking **Hardware** in the left navigation area. Then select **All Devices** on the Device Status tab. Right click **Library**, and select **Properties**.

Related Topics

- How to Fix a Tape Count Warning
  A warning displays on the Library page if the library contains more tapes than the activated capacity.

Add or Remove Optional Library Features

After purchasing a feature (such as tape capacity or multi-port networking), you must download the hardware activation file and then upload it to the library before you can use the feature.

- Download a Hardware Activation File
- Upload or Delete Hardware Activation Files on the Library
- How to Fix a Tape Count Warning

Related Topics

- Optional Library Features
  Some optional library features can be enabled through the GUI, while others require you to purchase hardware and install a hardware activation file.

Download a Hardware Activation File

Download the hardware activation files from the Oracle Software Delivery Cloud.

1. Go to the Oracle Software Delivery Cloud at:

   http://edelivery.oracle.com/
2. Click **Sign In /Register**.
3. Search for **SL4000**, and then select the hardware activation file.
4. Click **+Add to Cart** for the hardware activation file.
5. Click **Checkout**.
6. Verify the correct hardware activation file is listed, and then click **Continue**.
7. Read the terms and restrictions. Indicate your acceptance. Click **Continue**.
8. Download the zip file, and then extract it to a location accessible to the GUI browser.

Related Topics

- Upload or Delete Hardware Activation Files on the Library
  Upload a hardware activation file to enable the feature on the library. Remove the file to disable the feature.

Upload or Delete Hardware Activation Files on the Library

Upload a hardware activation file to enable the feature on the library. Remove the file to disable the feature.

1. Connect to the library GUI through a web browser (you cannot upload hardware activation files through the local operator panel).
2. Click **Configuration** in the left navigation area of the GUI.
3. Click the **Features** tab.
4. To add a feature: click **Upload**  , and browse to the activation file (.jar).
   To remove a feature: select the feature in the table, and then click **Delete**  .

What Occurs When You Delete a Capacity Activation File

After deleting a capacity activation file, the activated tape capacity decreases by the capacity of the activation file. If there are more tapes in the library than remaining activated capacity, a Storage Cells alert  will appear on the Library page. To correct this, either eject tapes or re-install a capacity activation file.

What Occurs When You Delete the Multiport FC or Dual TCP/IP Activation File

After deleting the Multiport FC activation file, the library powers off the unavailable FC ports, which are port 2 and port 4 (for a library with a second library controller card).

Related Topics

- Download a Hardware Activation File
  Download the hardware activation files from the Oracle Software Delivery Cloud.

- View the State of the Library, Devices, and Partitions in the Status Bar
  The status bar displays the overall library state which automatically updates based on the status of devices within the library.
- How to Fix a Tape Count Warning
  A warning displays on the Library page if the library contains more tapes than the activated capacity.
- View the History of Feature Activation Activity
  View a list of activation file activity. The list includes when and who performed the action.

View the History of Feature Activation Activity

View a list of activation file activity. The list includes when and who performed the action.

1. Click **Configuration** in the left navigation area of the GUI.
2. Click the **Features** tab.
3. Click **Feature History**  .

Related Topics

- Add or Remove Optional Library Features
  After purchasing a feature (such as tape capacity or multi-port networking), you must download the hardware activation file and then upload it to the library before you can use the feature.

Export the Library Configuration File

Export the configuration file to save the configuration to restore or clone it later. You should export the configuration after any major configuration changes and save the file in a safe location.

1. Click **Configuration** in the left navigation area of the GUI.
2. From the Settings tab, click **Import/Export Configuration**  .
3. Select **Export Configuration to File**. If changes are made in another window or by another user after you click export, the changes will not be contained in the export file.
4. Download the file.

What is Exported in the Configuration File

- Library settings
- Hardware activation files
- Network settings
- NTP settings
- GUI usernames and preferences
- Partition configuration and mapping
- CAP pool configuration and mapping
- SCSI host configuration and partition mapping
- Notification destinations

- Notification users and passwords (SNMP and SCI)
- ASR settings
- Logging levels

What is NOT Exported in the Configuration File

- GUI user passwords

Related Topics

- Import a Library Configuration File
  Import the configuration file to clone or to restore the configuration of an existing library.

Import a Library Configuration File

Import the configuration file to clone or to restore the configuration of an existing library.

1. Verify the library you are importing has the same module configuration as the library in the configuration file.
2. Stop all library activity.
3. If importing partitioning information, complete the checklist in What to Check Before Importing a Configuration with Partition Information below.

> **Caution:**
>
> Importing a configuration file is disruptive and replaces the current settings with the values in the configuration file. The library must restart.

4. Click **Configuration** in the left navigation area of the GUI.
5. From the Settings tab, click **Import/Export Configuration**  .
6. Select **Import Configuration from File**.
7. Browse to the libraryConfigSettings.xml file.
8. Review the configuration (the library will require a restart to apply the configuration). Click **Apply**.
9. After a clone, perform the following actions:
   - **Network Settings**: On a clone, the duplicated network configuration will conflict with the network configuration of the original library. To avoid network conflict, after the configuration import, you should unplug the library controller customer port Ethernet cable. You will then need to manually change the network settings of the cloned library locally at the op panel or through an attached monitor, keyboard, and mouse.
   - **Library Settings**: Create a unique library name and verify the time settings. Launch the Configuration Wizard to update the settings.
   - **SCSI Host Configuration**: Review and update the SCSI host and SCSI host mapping.

- **Partitioning and CAP Pool Configuration**: Review and update partitioning and CAP pools.

10. After either a clone or restore, perform the following actions:
    - **User Passwords**: The configuration file does not transfer GUI user passwords. The administrator that performed the configuration import must create a temporary password and notify each user to reset their passwords.
    - **Notification Settings**: Verify the notification settings (email, SNMP, SCI, ASR) are still valid and test each of the notification types to confirm connectivity.

What to Check Before Importing a Configuration with Partition Information

Importing partition mapping can result in tapes being "owned" by an unintended partition, unless you verify key components.

- Verify all drives, CAPs, and robots are fully initialized.
  1. If the library state is "Operative" the library hardware is in a good state to continue.
  2. If the library state is not "Operative", scan the **Hardware Device Status** tree to for failed components. Verify the issue will not impact the Import Configuration Partition Mapping.
- Close all CAPs.
  1. Click **CAPs**. Verify the "Physical State" of all CAPs is "Closed".
  2. Close any open CAPs.
- Move all tapes out of CAP or Drive cells:
  1. Click **Cells/Tapes**. From the **Tapes** tab, filter for **!Storage** in the Cell Type column.
  2. Verify that the list shows only System cells. Move any tapes out of CAP or Drive cells.

Manage the Library Firmware

Manage the library firmware level by uploading, activating new firmware, or reverting to an older version.

> **Caution:**
>
> Changing the library firmware is disruptive and can take up to 20 minutes. You will be logged out of the GUI, and will not be able to log in or use the library until the activation completes. Activating new firmware resets the library time to UTC time. You may need to reconfigure the library time.

- Download Firmware from My Oracle Support
- Upload and Activate New Firmware
- Revert to the Previous Firmware Version
- View Firmware Levels

Related Topics

- Block, Allow, or Force Device Firmware Upgrades
  Updating the library firmware automatically pushes new firmware to the devices. In rare cases, Oracle service representatives may need to block automatic firmware updates for particular devices.

Download Firmware from My Oracle Support

Download the firmware from My Oracle Support.

1. Go to My Oracle Support (MOS): `https://support.oracle.com/`
2. Sign in to your MOS account.
3. Click the **Patches & Updates** tab near the top of the screen.
4. In the Patch Search section under the Search tab, click **Product or Family (Advanced)**.
5. In the Product field, enter **SL4000** and then select **StorageTek SL4000 Modular Library System** from the drop-down list.
6. In the Release field, select the firmware version.
7. Click **Search**.
8. Click the link under Patch Name column.
9. Click **Download** and save the file to a location on your system. Unzip the downloaded file. The unzipped folder should contain files similar to the ones listed below:
   - summit-1.0.0.65.27052.tar
   - ReleaseNotes1.0.0.65.27052.pdf
   - LicenseAgreement.txt
10. Verify the integrity of the firmware file using the md5 checksum file (summit-1.0.0.65.27052.tar.md5).
    - *For Linux*: Use the command **`md5sum -c summit-1.0.0.65.27052.tar.md5`** in the directory containing the unzipped files.
    - *For Windows*: Use a third party tool such as WinMD5 or another file checksum integrity verifier.

Related Topics

- Upload and Activate New Firmware
  Upload and activate the firmware package to update the firmware on the library.

Upload and Activate New Firmware

Upload and activate the firmware package to update the firmware on the library.

1. Before uploading, download the firmware to a location accessible to your browser.
2. Connect to the library GUI using a web browser. You cannot upload firmware from the front touch screen or if connected using a monitor and keyboard attached to the back of the library.

3. Export the library configuration before activating new code. If you need to revert to a previous version of code, the library configuration does not transfer.
4. Click **Firmware** in the left navigation area of the GUI.
5. Click the **Library Firmware** tab.
6. Click **Upload**.
7. Click **Choose File** and then browse to the firmware .tar file that you downloaded previously (such as summit-1.0.0.65.27052.tar). Click **Open**, and then click **Upload**.
8. Once the upload completes, click **OK**.
9. Click **Activate**. Activating code will reset the library time to UTC. Confirm the activation.
10. Activation can take up to 20 minutes and you will be logged out of the library during the update.

Related Topics

- Download Firmware from My Oracle Support
  Download the firmware from My Oracle Support.
- Export the Library Configuration File
  Export the configuration file to save the configuration to restore or clone it later. You should export the configuration after any major configuration changes and save the file in a safe location.

Revert to the Previous Firmware Version

Reverting to a previous firmware version can help troubleshoot library issues.

1. Reverting to a previous version of firmware will erase the library configuration. Export the Library Configuration File.
2. Click **Firmware** in the left navigation area of the GUI.
3. Click the **Library Firmware** tab.
4. Click **Revert**. Confirm the activation.
5. Activation can take up to 20 minutes and you will be logged out of the library during the update.
6. Import a Library Configuration File.

View Firmware Levels

View the build date and version of the library or device firmware.

1. Click **Firmware** in the left navigation area of the GUI.
2. Click one of the following tabs:
   - **Available Device Firmware** - shows the device firmware that was delivered as part of the library firmware image.
   - **Reported Device Firmware** - shows the firmware that the devices themselves report. This firmware may or may not be the same version as what is shown on the Available table since some devices may be blocked from receiving upgrades.
   - **Library Firmware** - shows the current library firmware.

Manage the Library's SSL/TLS Certificate for HTTPS

A certificate encrypts SSL/TLS traffic to and from the library. At initial installation, the library includes a default certificate that must be replaced with either a self-signed or third-party verified certificate.

At a minimum, replace the default certificate with a new self-signed certificate. Then, optionally, you can install a certificate signed by a certifying authority (CA). See the *SL4000 Security Guide* for more information.

- Generate a Self-Signed Certificate
- Install a Third-Party Signed Certificate

Generate a Self-Signed Certificate

Replace the default certificate with a self-signed certificate to increase security.

A self-signed certificate is secure, but will require you to manually tell the browser to trust the certificate before you can view the login screen. To eliminate the browser security exception, you can replace the self-signed certificate with one signed by a certifying authority (CA).

1. Click **Configuration** in the left navigation area of the GUI.
2. Click the **Certificate** tab, and then click **New Certificate**  .
3. Enter in the certificate information.

Related Topics

- Install a Third-Party Signed Certificate
  Installing a third-party certificate is a multistep process of submitting a certificate signing request (CSR) to the CA, obtaining the certificate from the CA, combining the certificates into a single file, and then importing the certificate file to the library.

Install a Third-Party Signed Certificate

Installing a third-party certificate is a multistep process of submitting a certificate signing request (CSR) to the CA, obtaining the certificate from the CA, combining the certificates into a single file, and then importing the certificate file to the library.

Task 1 Install a Self-Signed Certificate

The library must have a self-signed certificate before you can install a third-party signed certificate. You cannot go directly from the default certificate to a third-party certificate.

See Generate a Self-Signed Certificate.

Task 2 Export CSR File

1. Click **Configuration** in the left navigation area of the GUI.
2. Click the **Certificate** tab, and then click **Export CSR**  .
3. Submit the CSR to the third-party certifying authority (CA).

Task 3 Combine the Certificates into a Single File

Once obtain a certificate from the CA, use any text editor to assemble the following certificates into a single file for upload:

- Primary certificate of the trust anchor CA (such as VeriSign's public primary root CA)
- Intermediate certificate of the issuing SSL CA. In cases where there is no intermediate issuer, you can omit the intermediate certificate portion of the combined file. This is highly site-specific, so check with your company's security experts for requirements.
- Your newly issued SSL certificate

The combined certificate file should look like:

```
-----BEGIN CERTIFICATE-----
(Encoded Primary certificate)
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
(Encoded Intermediate certificate)
-----END CERTIFICATE-----
-----BEGIN CERTIFICATE-----
(Your encoded SSL certificate)
-----END CERTIFICATE-----
```

Task 4 Import the Certificate File and Restart the Library

1. Click **Configuration** in the left navigation area of the GUI.
2. Click the **Certificate** tab, and then click **Import Certificate**  .
3. Browse to the combined certificate file, and then click **Ok**.
4. Restart the library. The GUI may show the new certificate immediately, but the certificate will not take affect until after the library restarts.

6
Drives

Manage the drives within the library by setting the drive configuration properties, turning the drive on and off, online or offline, and configuring drive cleaning.

About Drives

- Supported Drive Types
- Drive Tray

Operate and Manage Drives

- View the Drives Table
- Physically Locate a Drive Using the Locator LED
- Set a Drive Online or Offline
- Turn a Drive On or Off
- Reset a Drive (Power Cycle the Drive)
- Force a Drive to Unload a Tape Cartridge
- Move or Mount a Tape Cartridge

Drive Encryption

- Drive-Enrolled Encryption
- Library-Managed Encryption (LME)
- Enable a Drive for Library-Managed Encryption (LME)
- Configure Library Encryption (LME)
- Encryption Activation Permits

Drive Dumps

- Generate a Drive Dump
- Retrieve and Download Drive Dumps
- Delete Retrieved Drive Dumps

Drive Cleaning

- Configure Drive Auto-Cleaning
- View a List of Cleaning Cartridges
- Set the Cleaning Tape Usage Thresholds
- Manually Clean a Drive

Drive Configuration

- Configure the Drive Fast Load Setting
- Add a Drive Alias

- Drive Serial Number Spoofing
- Configure MDVOP

Partitioning and Media Validation

- Move Storage Cells and Drive Bays to a Partition
- Add or Remove Drives from the Media Validation Partition (Pool)

Supported Drive Types

The SL4000 library supports T10000 and LTO tape drive types.

The library supports:

- StorageTek T10000 (all models)
- HP LTO Generations 5 and 6
- IBM LTO Generations 5, 6, 7, 8 and 9

> **Note:**
>
> LTO-8 and above can read and write one generation back. LTO-7 and below can read two generations back and write one generation back. For best capacity and performance, always use cartridges of the same generation as your drives.

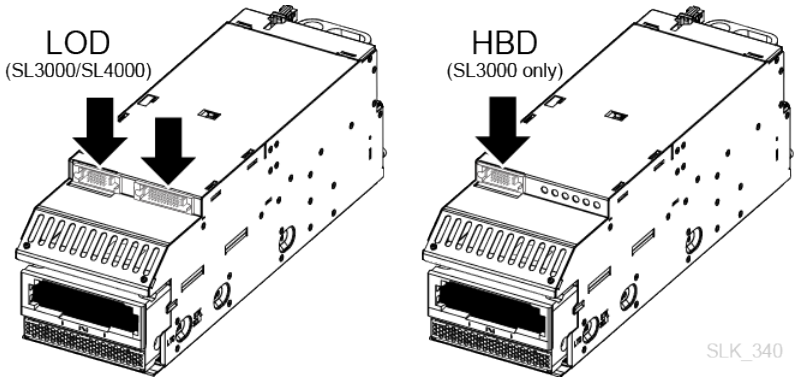
Drive Tray

A drive tray houses a tape drive and slides into a drive bay within the drive array of a Base or Drive Module.

The tray contains the drive controller card which allows the drive to interface with the library. Often "tape drive" and "drive tray" are synonymous. The SL4000 only supports drive trays with the LOD controller.

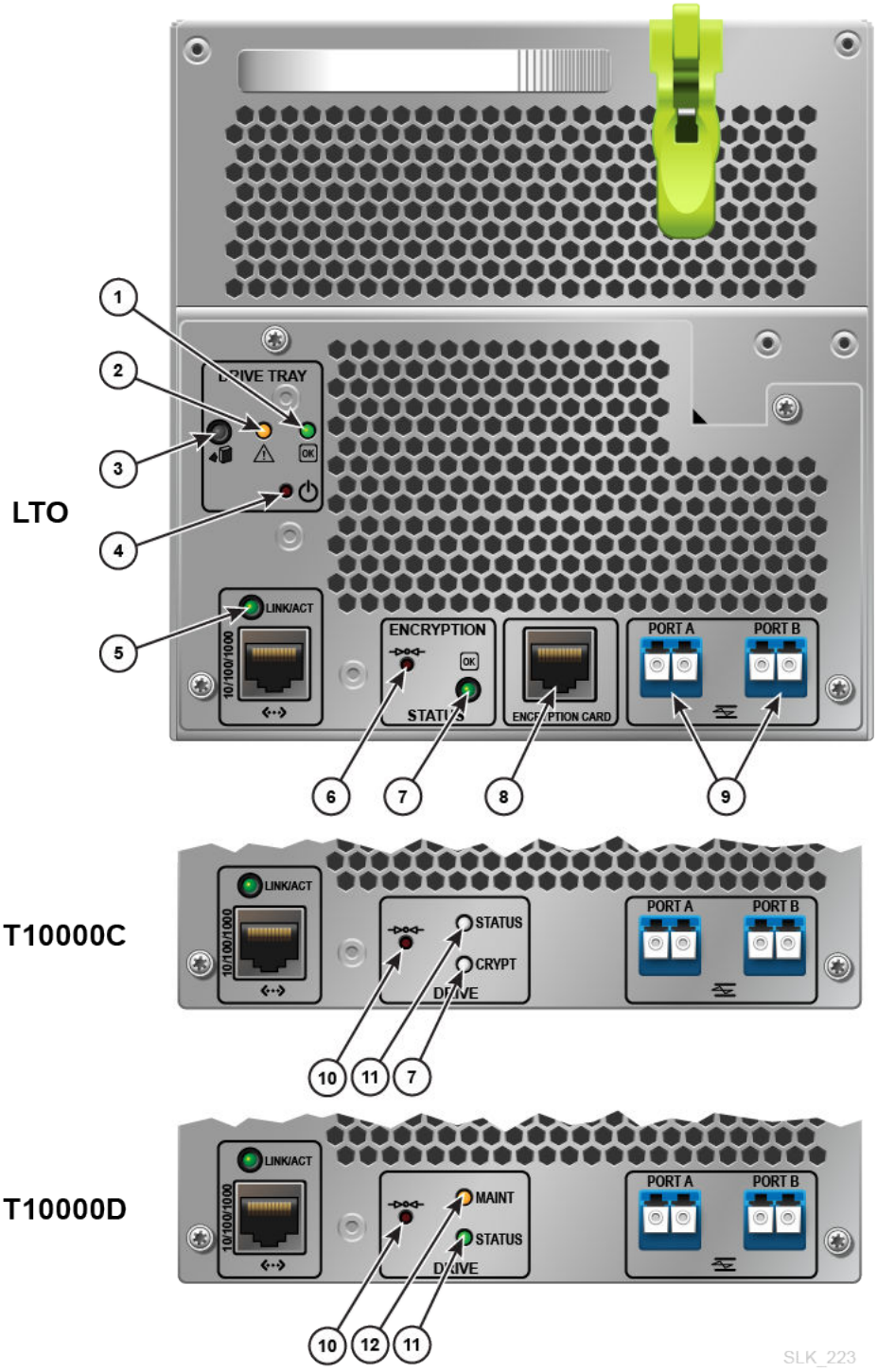
Can I reuse an SL3000 drive tray in the SL4000?

You can use an SL3000 drive tray in an SL4000 if the tray contains the SL4000 controller LOD card. The SL3000 drive controller HBD card is not supported. You can easily identify the tray type by noting the number of ports on top of the tray. The SL3000 HBD card has one port and the LOD has two ports.



Rear of the Drive Tray

> **Note:**
>
> The rear drive tray Ethernet ports are disabled in the SL4000.



1. Power to drive (solid green). Power to tray only or installing code (blinking green).
2. Service action required (yellow)
3. Okay to remove drive tray from library (blue). Flashes when you use the locate feature.

4. Power to tray on/off (push button) — Disabled on the SL4000. Instead use the GUI to turn the tray on or off.
5. Ethernet link (green). The port is disabled on the SL4000 and only used by Oracle service representatives for maintenance.
6. Encryption reset to default IP address (push button)
7. Encryption indicator
8. Encryption card port. The port is disabled on the SL4000.
9. Fiber channel ports
10. Maintenance push button (DO NOT USE in the SL4000. It will take the drive offline.)
11. Drive status indicator
12. Drive maintenance indicator

Drive Encryption

Drive encryption with Oracle Key Manager (OKM) is supported on the SL4000 using either library-managed encryption or drive-enrolled encryption.

Library-Managed Encryption (LME)

Library-Managed Encryption (LME) allows you to enroll the library as an agent with OKM instead of enrolling individual drives. The library then manages the keys for any encryption-enabled IBM LTO 6+ drives within the library.

Supported Drive Types

IBM LTO 6 and higher drives.

Currently, the library does not support library-managed encryption for IBM LTO 5, HP LTO, or T10000 drives. You should continue to use drive-enrolled encryption if you want to use encryption with these drive types. You cannot mix library-managed encryption with drive-enrolled encryption.

Benefits of LME

- You only need to enroll the library as an agent with OKM, not individual drives.
- The drives do to not require an encryption card (BEL or LKMD). Since the library handles the interface with OKM, the encryption card and permit is no longer needed to handle key requests.
- The drives do not require encryption permits.

Configuration

LME requires minimum library firmware 1.1.0. Before enabling LME, all drives must be un-enrolled with OKM. Then, you must enable encryption on the library, enroll the SL4000 as an agent with OKM, and then enable encryption on specific drives within the library.

Can I use library-managed encryption and have drives individually enrolled with OKM?

No, you cannot have a mix of drives enrolled individually with OKM and drives enabled with library-managed encryption. You can only use either library-managed encryption or only drive-enrolled encryption, not both.

Before enabling library-managed encryption, you must un-enroll all drives with OKM. Likewise, before using drive-enrolled encryption, you must disable library-managed encryption. The library will automatically disable encryption on all drives when you disable encryption using the Configuration Wizard. However, you should verify that all drives have encryption disabled before enrolling individual drives with OKM.

To use encryption on a mixture of LTO and T10000 drives, you should continue to only use drive-enrolled encryption. You cannot use library-managed encryption at this time for IBM LTO 5, HP LTO, or T10000 drives.

Related Topics

- Configure Library Encryption (LME)
  Enable the library to manage the enrollment and key delivery for designated encryption-capable drives. The library acts as the OKM agent, meaning you only need to enroll the library with OKM rather than individual drives.
- Enable a Drive for Library-Managed Encryption (LME)
  After enabling library-managed encryption within the Configuration Wizard, you must enable encryption on specific IBM LTO 6+ drives within the library.
- Drive-Enrolled Encryption
  Drive-enrolled encryption uses VOP to individually enroll drives as agents with OKM. Some drive types require an encryption card and an encryption activation permit to use drive-enrolled encryption.

Enable a Drive for Library-Managed Encryption (LME)

After enabling library-managed encryption within the Configuration Wizard, you must enable encryption on specific IBM LTO 6+ drives within the library.

1. Click **Drives** in the left navigation menu.
2. Within the table, identify the IBM LTO6+ drives. Look at the *Drive Type* column of the Drives table.
3. Right-click an IBM LTO6+ drive, and then select **Drive Settings**.
4. From the **Encryption Active** drop-down, select **Yes**.

> **Note:**
>
> If you do not see the "Encryption Active" drop-down within the Drive Settings dialog, you must first enable library encryption within the Configuration Wizard.

5. Click **Ok**.

   The Drive table will now show Encryption Status Enabled.

Name	Encr card Type	Encr card IP Addr	Auto Clean Enabled	Cleaning Needed	Encryption Active	Encryption Status
Drive(base, 15)	LKMD	192.168.1.79	Yes	No	Yes	Enabled

Related Topics

- Configure Library Encryption (LME)
  Enable the library to manage the enrollment and key delivery for designated encryption-capable drives. The library acts as the OKM agent, meaning you only need to enroll the library with OKM rather than individual drives.

Drive-Enrolled Encryption

Drive-enrolled encryption uses VOP to individually enroll drives as agents with OKM. Some drive types require an encryption card and an encryption activation permit to use drive-enrolled encryption.

Supported Drive Types

All T10000 drives and HP LTO drives are encryption ready. IBM LTO 5, 6, 7, and 8 drives require an encryption card in the drive tray to interface directly with OKM.

Each LTO and T10000A/B encrypting drive must have an encryption permit. T10000 C/D drives no longer require permits.

Configuration

Use VOP to individually enroll drives with OKM. Before enrolling the drives, make sure that library-managed encryption is disabled and all drives within the library have encryption disabled. You cannot use both drive-enrolled encryption and library-managed encryption.

How do I know if a drive tray has an encryption card?

The *Encr card Type* column of the Drives table shows if the tray contains a BEL, LKM, or LKMD card. If the field is blank, this means the drive tray does not contain an encryption card.

Name	Drive Type	Drive Firmware	Col	Row	Drive IP Address	Tray Version	Encr card Type
Drive(base, 15)	IbmUltrium7	K4K0	2	4	192.168.1.15	2	LKMD
Drive(base, 3)	IbmUltrium7	KAH0	2	1	192.168.1.3	2	
Drive(base, 6)	IbmUltrium5	G360	3	2	192.168.1.6	1	BEL
Drive(base, 7)	IbmUltrium6	KAJ0	2	2	192.168.1.7	1	BEL

Related Topics

- Encryption Activation Permits
  To use drive-enrolled encryption, each LTO and T10000A/B encrypting drive must have an encryption permit. T10000 C/D drives no longer require permits. You do not need permits to use library-managed encryption.
- Library-Managed Encryption (LME)
  Library-Managed Encryption (LME) allows you to enroll the library as an agent with OKM instead of enrolling individual drives. The library then manages the keys for any encryption-enabled IBM LTO 6+ drives within the library.

Encryption Activation Permits

To use drive-enrolled encryption, each LTO and T10000A/B encrypting drive must have an encryption permit. T10000 C/D drives no longer require permits. You do not need permits to use library-managed encryption.

You can order an encryption activation permit at any time (during initial purchase or afterward).

T10000 Drive Encryption Permits

Enabling drive-enrolled encryption on T10000 A or B drives requires a T10K-EKEY-A-N encryption activation permit. T10000C and D drives no longer require an encryption permit.

LTO Drive Encryption Permits

Drive-enrolled encryption requires an LTO-ENCRYPT-ACTIVE encryption activation permit for each encrypting LTO drive.

Reusing Activation Permits

If you previously purchased an activation permit for an older drive, you can re-use the activation permit when upgrading to a newer generation drive in the same family, as long as the total number of encryption enabled drives does not exceed your total number of activation permits for that family. For example, if you have six LTO-ENCRYPT-ACTIVE activation permits, you can only have a total of six encryption-enabled LTO drives (regardless of generation).

Related Topics

- Drive-Enrolled Encryption
  Drive-enrolled encryption uses VOP to individually enroll drives as agents with OKM. Some drive types require an encryption card and an encryption activation permit to use drive-enrolled encryption.

View the Drives Table

The drives table displays drive information such as state, SCSI element ID, IP address, serial number, and WWN.

1. Click **Drives** in the left navigation area of the GUI.

2. For more options, select a drive (or use shift-click and ctrl-click to select multiple drives). Then, right-click or use the **Actions** drop-down.
   - Physically Locate a Drive Using the Locator LED
   - Set a Drive Online or Offline
   - Reset a Drive (Power Cycle the Drive)
   - Manually Clean a Drive
   - Force a Drive to Unload a Tape Cartridge
   - Turn a Drive On or Off

IP Addressing of Drives

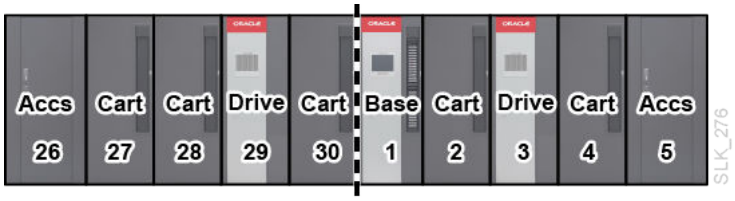
The drive IP address depends on the drive bay and module frame ID.

SL4000 Network Address	Third Octet	Fourth Octet
192.168.0.0/19 One subnet for all drive network hosts	1-30 determined by the frame ID	1-32 determined by drive bay

The Drives table has an IP address column that shows the address for each drive. To view the table, click **Drives** in the left navigation of the GUI.

Frame ID Values

Drive IP addressing uses the frame ID of the module. The library controller and root switch compute the frame ID when the library initializes. Valid values range from 1 to 30. The Base Module is always 1 and the module to the left of the Base is always 30. The value increments when moving to the right and decrements when moving to the left. Note that the frame ID values are different than the module numbers.



Related Topics

- Center Line of the Library and Module Numbers
  Addressing uses the left edge of the Base Module (as viewed from the front of the library) as a reference point, called the center line.

Drive Dumps

Drive dumps provide important diagnostic information for troubleshooting drive issues. Use the Drives Table to create, collect, and download drive dumps.

- Generate a Drive Dump

- Retrieve and Download Drive Dumps
- Delete Retrieved Drive Dumps

Generate a Drive Dump

Force a T10000 or IBM drive to create a new drive dump.

1. From the **Drives** table or **Library** cell map, select a T10000 or IBM drive .
2. From the **Actions** drop-down (or right-click menu), select **Drive dumps...**
3. Click **Force new dump** .

The drive may take several minutes to generate the dump, and then you can retrieve and download it. For T10000, the drive will go inoperative while it creates the drive dump and will be unavailable for use by any client systems until it completes the dump.

Related Topics

- Retrieve and Download Drive Dumps
  Retrieve dumps from the drive to transfer them to the library. Once retrieved, you can download the dump files to your workstation.

Retrieve and Download Drive Dumps

Retrieve dumps from the drive to transfer them to the library. Once retrieved, you can download the dump files to your workstation.

The Drive Dump dialog only displays dumps that have been previously transferred to the library. To collect the most recent dumps from the drive, you must retrieve the current drive dumps. You can only retrieve and transfer drive dumps for T10000 and IBM LTO drives. HP LTO drives dump transfer is not supported.

1. From the **Drives** table or **Library** cell map, select a T10000 or IBM LTO drive.
2. From the **Actions** drop-down (or right-click menu), select **Drive dumps...**
3. Click **Retrieve drive dump** .
4. Select files in the table, and then click **Download** .

Related Topics

- Generate a Drive Dump
  Force a T10000 or IBM drive to create a new drive dump.
- Delete Retrieved Drive Dumps
  The SL4000 stores all retrieved drive dumps until you delete them. You should delete drive dump files that are no longer needed.

Delete Retrieved Drive Dumps

The SL4000 stores all retrieved drive dumps until you delete them. You should delete drive dump files that are no longer needed.

1. From the **Drives** table or **Library** cell map, select a T10000 or IBM LTO drive.
2. From the **Actions** drop-down (or right-click menu), select **Drive dumps...**

3. Select dump files from the list, and then click **Delete**  .

Related Topics

- Retrieve and Download Drive Dumps
  Retrieve dumps from the drive to transfer them to the library. Once retrieved, you can download the dump files to your workstation.

Drive Operation

Change the drive state, power cycle the drive, force an unload, manually clean the drive, and physically locate the drive.

- Set a Drive Online or Offline
- Turn a Drive On or Off
- Reset a Drive (Power Cycle the Drive)
- Force a Drive to Unload a Tape Cartridge
- Manually Clean a Drive
- Physically Locate a Drive Using the Locator LED

Set a Drive Online or Offline

Take a drive offline when servicing the drive or updating the drive firmware.

The library will not mount a tape to an offline drive. If you take a mounted drive offline, the drive's state switches to "going offline" and then to "offline" once the tape dismounts.

1. Select a drive from the Drives table or Cell Map (shift-click and ctrl-click to select multiple drives).
2. From the **Actions** drop-down (or right-click menu), select **Go Online** or **Go Offline**.

Related Topics

- View the Drives Table
  The drives table displays drive information such as state, SCSI element ID, IP address, serial number, and WWN.
- View the Cell Map
  Use the cell map to view the current location of tapes and drives in the library.

Turn a Drive On or Off

Use the GUI to power the drive on or off (the power button on the rear of the drive tray is non-functional).

1. Click **Drives** in the left navigation area of the GUI.
2. Select a drive in the table (or use shift-click and ctrl-click to select multiple drives).
3. From the **Actions** drop-down (or right-click menu), select **Power On Drive** or **Power Off Drive**.

Reset a Drive (Power Cycle the Drive)

Reset a drive to power it off and then back on, which re-initializes the drive. This action may resolve a drive problem.

1. Select a drive from the Drives table or Cell Map (shift-click and ctrl-click to select multiple drives).
2. From the **Actions** drop-down (or right-click menu), select **Power Cycle Drive**.

Related Topics

- View the Drives Table
  The drives table displays drive information such as state, SCSI element ID, IP address, serial number, and WWN.
- View the Cell Map
  Use the cell map to view the current location of tapes and drives in the library.

Force a Drive to Unload a Tape Cartridge

Force a drive to unload to stop any read/write operations in process.

Typically, applications send a unload command to the drive on the data path before issuing a command to the library to dismount the drive. However, you may need to initiate a forced unload through the GUI if there is a problem with the drive.

1. Click **Drives** in the left navigation area of the GUI.
2. Select a drive in the table.
3. From the **Actions** drop-down (or right-click menu), select **Force Unload Drive**.

Physically Locate a Drive Using the Locator LED

Turn on and flash the drive's "Ok to Remove" blue LED to help locate the drive.

1. In the **Drives** table or Cell Map, select a drive (shift-click and ctrl-click to select multiple drives).
2. From the **Actions** drop-down (or right-click menu), select **Locate** and then **Activate Locator LED**.
3. Open the rear door of the Base or Drive Module and locate the drive tray with the blinking blue LED.
4. To turn the LED off, repeat the steps above, except select **Deactivate Locator LED**.

Related Topics

- View the Drives Table
  The drives table displays drive information such as state, SCSI element ID, IP address, serial number, and WWN.
- View the Cell Map
  Use the cell map to view the current location of tapes and drives in the library.

- Drive Tray
  A drive tray houses a tape drive and slides into a drive bay within the drive array of a Base or Drive Module.

Manually Clean a Drive

Normally, either the library or the host manages drive cleaning. However, there may be occasions when you need to perform a manual cleaning.

> **Caution:**
>
> Cleaning a drive before it is due is not recommended. Excessive drive cleaning can prematurely wear out a drive head.

1. Refer to the drive manufacturer's documentation for information on whether manual cleaning is allowed.
2. Verify the system cells contain a valid cleaning tape for the drive you need to clean.
3. Click **Drives** in the left navigation. Verify the drive needs cleaning by looking at the status of the "Cleaning Needed" column.
4. Select the drive, and then from the **Actions** drop-down (or right-click menu), select **Clean Drive**.

Related Topics

- View a List of Cleaning Cartridges
  View the cleaner status, current cleaning count, cleaning thresholds, type, and location of all cleaning tapes in the library.
- Import/Export Tapes in System Cells
  Use system cells to store cleaning and diagnostic tapes. System cells are not accessible by host applications.
- Configure Drive Auto-Cleaning
  Enable drive auto-cleaning to have the library manage and respond to any cleaning requests made by drives.

Drive Configuration

Configure the fast load setting, auto cleaning, drive alias, spoofing, and drive integration with MDVOP.

- Configure the Drive Fast Load Setting
- Configure Drive Auto-Cleaning
- Add a Drive Alias
- Configure MDVOP
- Drive Serial Number Spoofing

Configure the Drive Fast Load Setting

The fast-load setting defines how the drive handles replying to mount requests. If either the partition setting or individual drive setting is fast, then the library fast loads the drive.

1. Click **Drives** in the left navigation area of the GUI.
2. Select a drive in the table (or use shift-click and ctrl-click to select multiple drives).
3. From the **Actions** drop-down (or right-click menu), select **Drive Setting** and then select **Normal** or **Fast** for Fast-Load Type.
   - **Normal** (default) – The library will reply to a mount request only after the selected tape is loaded and threaded in the drive.
   - **Fast** – The library will reply to a mount request after the selected tape is inserted into the drive, but before loading and threading completes.

Configure Drive Auto-Cleaning

Enable drive auto-cleaning to have the library manage and respond to any cleaning requests made by drives.

When auto-cleaning is enabled the library will automatically mount a cleaning tape from a system cell to a drive that has indicated it needs cleaning following a dismount. This cleaning operation occurs before the library returns the status for the dismount operation. If disabled, the host software must manage drive cleaning. The library only uses cleaning tapes from system cells for auto cleaning. Cleaning tapes for host managed drive cleaning reside in storage cells.

- Set Drive Auto Cleaning for an Individual Drive
- Set Drive Auto Cleaning for a Partition
- Set the Cleaning Tape Usage Thresholds
- View a List of Cleaning Cartridges
- Import/Export Tapes in System Cells
- What Does "Effective Auto Clean Enabled" Mean?

Related Topics

- Manually Clean a Drive
  Normally, either the library or the host manages drive cleaning. However, there may be occasions when you need to perform a manual cleaning.

Set Drive Auto Cleaning for an Individual Drive

Set the auto-cleaning configuration for an individual drive.

1. Click **Drives** in the left navigation area of the GUI.
2. Select a drive in the table (or use shift-click and ctrl-click to select multiple drives).
3. From the **Actions** drop-down (or right-click menu), select **Drive Setting** and then select **Yes** or **No** for Auto Clean Enabled.

Set Drive Auto Cleaning for a Partition

Set the auto-cleaning configuration for all drives within a partition.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Select the partition, and then click **Edit Partition**  .
3. Select **Drive Auto Clean** (when checked, the library automatically handles drive cleaning).

What Does "Effective Auto Clean Enabled" Mean?

The "Effective Auto Clean Enabled" status is a field within Drive Properties that identifies if the library will auto-clean the drive. It reflects a combination of the auto-clean setting for the individual drive and the setting for the partition.

The library will auto-clean a drive if auto-cleaning is enabled for either the drive or the partition containing the drive. The "Effective Auto Clean Enabled" field will reflect this combined status as noted in the table below.

Individual Drive Auto Clean	Partition Auto Clean	Effective Auto Clean Enabled Status
Enabled	Enabled	Yes
Enabled	Disabled	Yes
Disabled	Enabled	Yes
Disabled	Disabled	No

For example, if you disable auto-cleaning for a partition, but enable auto-cleaning for a single drive within that partition, the "Effective Auto Clean Enabled" field will be Yes and the library will auto-clean that drive. Likewise, if you enable auto-cleaning for the partition, but disable it for a single drive within that partition, the library will still auto-clean that drive and the "Effective Auto Clean Enabled" field will be Yes. The "Effective Auto Clean Enabled" field will only be No if auto-cleaning is disabled for both the individual drive and the partition.

Add a Drive Alias

Configure a drive alias to display in the library GUI. This can assist with drive identification.

1. Click **Drives** in the left navigation area of the GUI.
2. Select a drive in the table (or use shift-click and ctrl-click to select multiple drives).
3. From the **Actions** drop-down (or right-click menu), select **Drive Setting** and then select enter a drive alias.

Configure MDVOP

Setup the network on a VOP admin station to manage multiple SL4000s.

1. On the admin station, change the gateway setting for the static route of the IP port used to manage the SL4000 library. You can automate this with either a shell script on Unix or a .bat file on Windows.

2. Once the route's gateway points to the SL4000 library you want to manage, set up individual MDVOP configuration files (.vop files) to manage that library.
3. Launch the specific MDVOP configuration for that library.

Drive Serial Number Spoofing

The library "spoofs" the true serial number of LTO drives, meaning the library uses the right-most 10 characters of the drive tray serial number rather than the drive manufacturing serial number.

The library only spoofs drive serial numbers for LTO drives (T10000 drive spoofing is not supported). The library returns the spoofed value for the SCSI medium changer "read element status" command and the "inquiry" command. Spoofing helps when replacing a failed drive because the "spoofed" serial number of the drive is the same after the replacement, eliminating the need to reconfigure applications. When requesting drive service, you can provide the spoofed value to look up the service contract for the drive.

7

Tape Cartridges (Media)

Tape cartridges, also known as media, store data. The library can have data cartridges, cleaning cartridges, and diagnostic cartridges. The library supports LTO and T10000 media.

About Tape Cartridges

- Supported Media Types
- Media Labels
- Tips for Handling Tape Cartridges
- How to Fix a Tape Count Warning

Move, Mount, Import and Export Tape Cartridges

- View a List of Tape Cartridges
- Move or Mount a Tape Cartridge
- Enter Tapes Through a CAP
- Eject Tapes Through a CAP
- Import/Export Tapes in System Cells

Cleaning Cartridges

- View a List of Cleaning Cartridges
- Set the Cleaning Tape Usage Thresholds
- Configure Drive Auto-Cleaning

Media Validation

- Add or Remove Drives from the Media Validation Partition (Pool)
- Validate a Tape (Perform a Media Validation)
- Monitor Validation Progress
- Stop a Validation in Progress
- Media Validation Types

Supported Media Types

The SL4000 supports LTO5+ and all T10000 tape types. To read and write data, each tape must be compatible with at least one drive in the library.

Tape Cartridge Types

- **Data tapes** — used to store customer data. The label is six-character volume ID followed by a two character media ID. Such as ABC123L8, where ABC123 is the volume ID and L8 is the media ID for an LTO-8 cartridge.

- **Cleaning tapes** — used to clean tape drives. The label is a six-character volume ID with `CLNUnn` for plus the cleaning-specific media ID, where `CLNU` is the cleaning tape identifier and `nn` is a sequence of numbers (for example, `CLNU01CU` would be a universal LTO cleaning tape).
- **Diagnostic tapes** — used for diagnosing tape drive issues. The label is a six-character volume ID with `DG`*[space]*`nnn` plus the media ID, where `DG`*[space]* is the diagnostic tape identifier, and `nnn` is a sequence of numbers (for example, `DG 001L7` would be an LTO7 diagnostic tape label).

Supported Media Types and Media ID

The SL4000 supports the following media types and corresponding two-character media ID:

- L5 = LTO Generation 5
- L6 = LTO Generation 6
- L7 = LTO Generation 7
- L8 = LTO Generation 8
- L9 = LTO Generation 9

> **Note:**
>
> See Library Support of LTO9 Tape Calibration.

- M8 = LTO Generation 7 cartridge initialized to 9TB capacity (only compatible with LTO8 drives)
- LV = LTO Generation 5 WORM
- LW = LTO Generation 6 WORM
- LX = LTO Generation 7 WORM
- LY = LTO Generation 8 WORM
- LZ = LTO Generation 9 WORM
- CU = Universal LTO cleaning
- T1 = T10000 A/B data
- T2 = T10000 C/D data
- TS = T10000 A/B sport
- TT = T10000 C/D sport
- CT = T00000 cleaning (A and B only)
- CL = Universal T10000 cleaning

What happens when you mount an M8 cartridge in an LTO9 drive?

LTO9 does not support M8 media. If you mount an M8 cartridge into an LTO9, the drive will reject the cartridge and the library will report a Media Error.

Library Support of LTO9 Tape Calibration

When LTO9 media is first loaded into the LTO9 drive, the drive automatically initiates tape calibration, which includes initialization and characterization of the cartridge.

IMPORTANT: IBM has stated that LTO9 calibration may require 20 minutes to 2 hours to complete.

With the 1.1.1.109 code release, the SL4000 library supports longer load times. However, LTO9 tape calibration can well exceed these load times and limited information is available from the library as to the status of this operation. Thus, with the 1.1.1.110 code release, library support has been modified to improve handling of tape calibration, as follows:

> **Note:**
>
> Contact service with any questions, especially with regard to the 1.1.1.109 code release.

Load

When the library checks the status of the drive after a new cartridge is loaded, the library will report that the load is successful if the drive reports that a "calibration" is in process.

Status

To determine if tape calibration is in process, access **Drive Properties** and select the **Details** tab.

The following indicates that tape calibration is in process:

```
Display Characters: c
```

Dismount Request

The drive ignores all requests to unload a cartridge while it is calibrating a tape. Thus, if a dismount request is received, the library will fail the request.

Media Validation

Uninitialized cartridges are not currently compatible with Media Validation.

Drive Power Cycle and Library Reboot

When a drive is power cycled while calibrating a tape, tape calibration resumes once drive initialization is complete.

A library reboot does not power cycle the drive. Therefore, tape calibration continues during the library reboot.

Media Labels

All tapes must have a readable external label that consists of a volume serial ID (volser) and a one- or two-character media ID.

Labels Must Be Unique

All tapes entered into the library must have a unique label. Do not enter tapes with duplicate media labels. This applies to all tape types: data, cleaning, and diagnostic. Two tapes may have the same volume serial ID as long as they have different media IDs (such as ABC123L7 and ABC123L8). The full label must be unique within the library.

If you are using STA, media labels should be unique across all libraries monitored by STA. Duplicate labels will result in mixed data tracking for the media.

Label Design and Standards

The barcode label placed on the tape cartridges must meet certain requirements to be compatible with the library. StorageTek libraries use labels based on the Code 39 barcode standard (refer to ANSI/AIM BC1/1995, Uniform Symbology Specification - Code 39).

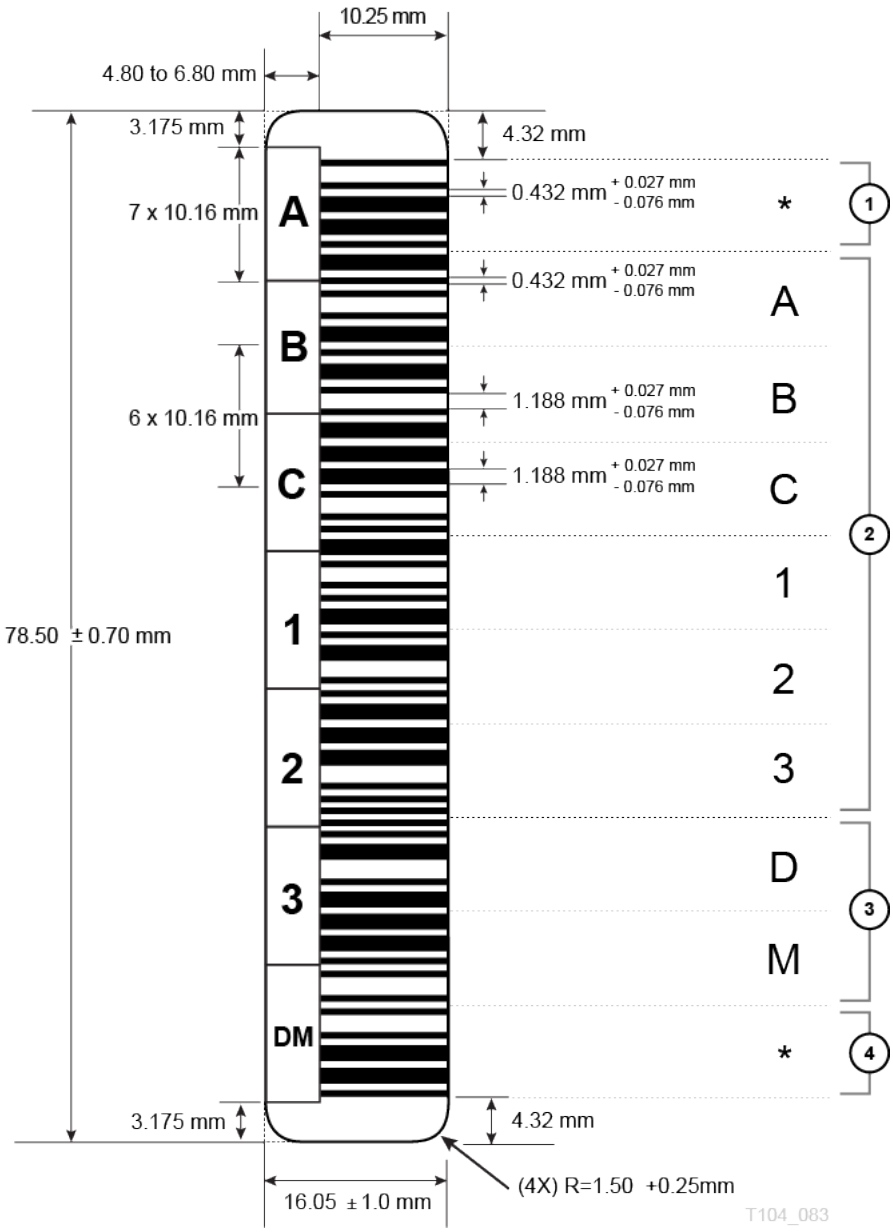
The media ID identifies the tape type. The labels can only use the uppercase letters A through Z, the numbers 0 through 9, and an asterisk (*) for the start and stop character (for example, `*ABC123L6*`, where ABC123 is the vol-id and L6 is the media ID).

The StorageTek T-series tape labels made by Tri-optic use a dollar sign ($) as the start and stop character. Never use the asterisk or dollar sign as part of the customer-defined characters of a barcode. Barcode algorithms only decode the characters between the end stops, ignoring any characters outside. Refer to the table below for examples.

Table 7-1 Start and Stop Character Placement

Actual Barcode Label	After Decoding	Result
ABC123L6	ABC123L6	Correct label
*ABC*23L6*	ABC	Misplaced stop character
*ABC1234L6	Unreadable	No stop character

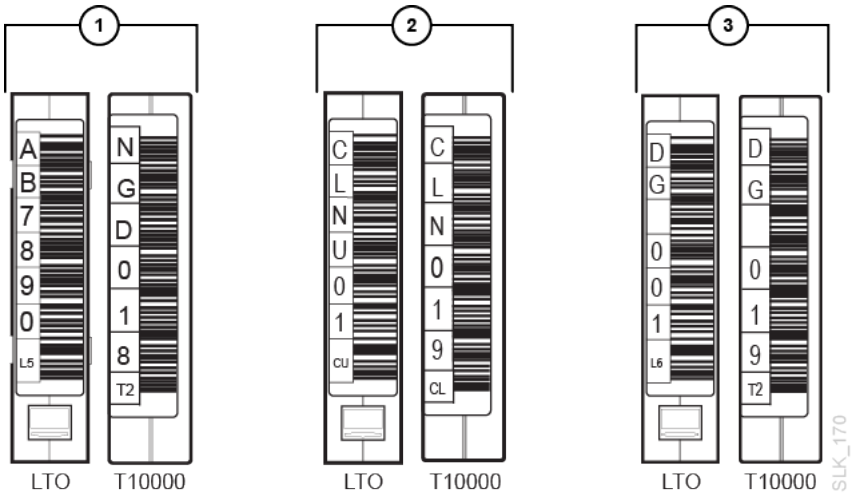
Figure 7-1 Barcode Placement Standards (T10000 and LTO)



1. Start character
2. Volume ID
3. Media ID
4. Stop character

Example Tape Labels

These example help depict acceptable cartridge labels.



1. Data tapes
2. Cleaning tapes
3. Diagnostic tapes

Proper Label Care

Proper label care is required to prevent barcode read errors or damage to the equipment.

- Keep the barcode intact. Do not mark or damage the barcode label or place any kind of tape across the label.
- Remove old labels completely before applying a new label. Do not apply a new label on top of an old one.
- Do not use sharp instruments to seat or remove a label.

Related Topics

- Volume Label Format
  The volume format controls how the library presents the volser to external applications and within the GUI tables.

Media Validation

Validate the integrity of tape cartridges using the media validation (MV) feature.

Media validation requires that you dedicate drives to a media validation pool. You can only assign T10000C/D or IBM LTO6 or higher drives to the media validation pool (HP LTO drives are not supported). There is no limit on the number of drives you can add to the pool, but media validation drives are invisible to host applications and can only be used for media validation. While a tape is being validated, the library spoofs the tape's original location to the host. If a host requests a tape currently being validated, the library will cancel the validation and return the tape to its original slot to allow the tape to then be mounted by the host command.

- Add or Remove Drives from the Media Validation Partition (Pool)
- Validate a Tape (Perform a Media Validation)

- Monitor Validation Progress
- Stop a Validation in Progress
- Media Validation Types

Add or Remove Drives from the Media Validation Partition (Pool)

Dedicate drives to a special Media Validation partition containing T10000C/D or IBM LTO6+ drives. These drives are reserved for media validation requests only.

The partition can only contain drives (not storage cells). Hosts cannot access the drives within the MV partition. The library automatically cleans MV drives regardless of the auto clean status for other partitions or individual drives in the MV pool.

> **Note:**
>
> When adding or removing drives from the MV partition, affected partitions will temporarily go OFFLINE.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click **Assign Cells** .
3. ***To add a drive*** — From the first **Move Cells** drop-down list, select the source partition to move the drive from (if you have not partitioned the library, select the **DefaultPartition**). From the second drop-down list, select **Media Validation**.

   To remove a drive — From the first drop-down list, select **Media Validation**. From the second drop-down list, select the destination partition to move the drives to.
4. Click a module that contains drives (the green arrow below a module indicates the currently selected module).
5. Choose a **Select Cells By** method. This determines how many resources are selected when you click.
   - **Cell-by-cell** – Assign cells one at a time by clicking individual cells.
   - **Cell Block** – Assign like-cells in a rectangular block (two clicks required). Click the top-left corner of the block, and then click the bottom-right corner of the block (do not click-and-drag).
   - **Column** – Assign all like-cells in a column by clicking any cell in the column.
   - **Side** – Assign all cells on a side (front or back) by clicking any cell on the side.
   - **Row** – Assign all like-cells in a row by clicking any cell in the row.
   - **Module** – Assign all cells currently assigned to the source partition in a module by clicking any cell in the module.
6. Click a T10000C/D drive, IBM LTO6+ drive, or an empty drive bay to add/remove. You can add non-supported drives, however these will not be used for media validation.

> **Note:**
>
> Hovering over a drive will show the drive type.

On the cell map, media validation drive bays are indicated by MV  .

7. Click **Next**, and then apply the changes.

Related Topics

- Why is there a Media Validation Partition?
  By default there is always a Media Validation partition (even in a library with partitioning disabled). You cannot delete or rename the Media Validation partition.
- Validate a Tape (Perform a Media Validation)
  Use media validation to evaluate the integrity of a T10000 or LTO5+ tape.

Partitioning Cell Map Legend

Various symbols are used to depict the type of cell on the partitioning screen.

Cell Map Icon	Meaning
	Tape - indicates that the cell is occupied or the drive is mounted.
 (no color overlay)	Unallocated - cell assigned to the source partition (in this case partition with ID 1).
 (yellow overlay)	Allocated - cell assigned to the destination partition (in this case partition with ID 21)
 (red overlay)	Unselectable - cell assigned to a partition that is not one of the partitions currently selected in the drop-down lists. Or, the cell is a system cell. System cells cannot be assigned to any partition.
	CAP cell - you cannot assign these cells to a partition. The CAP cells assigned to the partition depend on the CAP pool.
	Inaccessible - a system cell. You cannot add these cells to a partition and hosts cannot access these cells.

Validate a Tape (Perform a Media Validation)

Use media validation to evaluate the integrity of a T10000 or LTO5+ tape.

1. Use the **Drives** table to verify there are compatible media validation drives within the Media Validation partition. If not, add drives to the media validation partition.
2. Click **Cells/Tapes** in the left navigation area of the GUI, and then click the **Tapes** tab.
3. Right-click a tape, and then select **Media Validation Start**.

> **Note:**
>
> You can only validate tapes in storage cells, not system cells. If you want to run media validation on a tape in a system cell, you must first move that tape into a storage cell.

4. Select the type of validation.

5. Select a drive. The drop-down shows the valid drives currently available in the Media Validation partition.
6. Click **Ok**.
7. To view the progress of the validation, go to **Activity** in the left navigation. Click the **Events** tab.

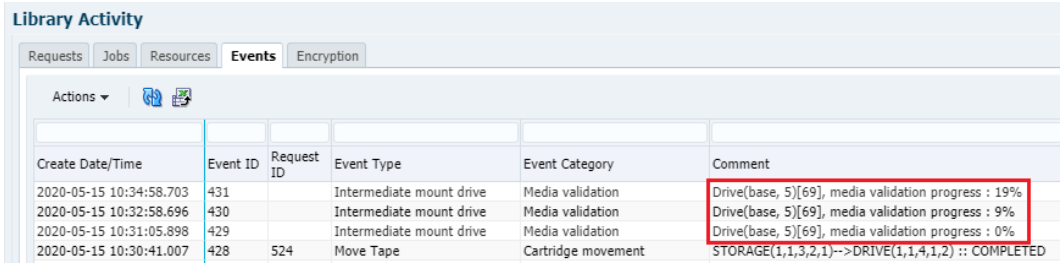
Related Topics

- Add or Remove Drives from the Media Validation Partition (Pool)
  Dedicate drives to a special Media Validation partition containing T10000C/D or IBM LTO6+ drives. These drives are reserved for media validation requests only.
- Media Validation Types
  The type of validation which determines the length of the test and level of validation.
- Monitor Validation Progress
  View the progress of a media validation request on the Events tab within the Library Activity page.

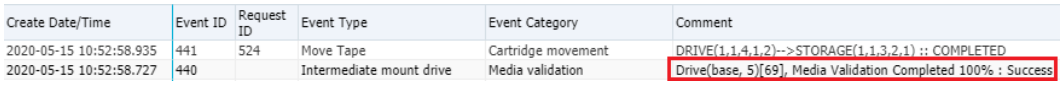
Monitor Validation Progress

View the progress of a media validation request on the Events tab within the Library Activity page.

1. After initiating a media validation, click **Activity** in the left navigation.
2. Click the **Events** tab.
3. The current progress displays as a line item within the table. The library updates the progress every few minutes. Click **Refresh** to update the table.



4. Once completed, the progress will show 100%. Then, the library will move the tape back to its storage cell.



Related Topics

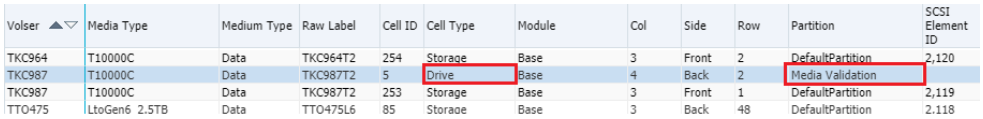
- Stop a Validation in Progress
  Stop an in-progress validation to return the tape to its original slot.

Stop a Validation in Progress

Stop an in-progress validation to return the tape to its original slot.

The library will automatically stop a validation if a host requests the tape currently being validated. Use this procedure if you need to manually stop a validation. Alternatively, you can cancel the request.

1. Click Cells/Tapes in the left navigation. Select the **Tapes** table,
2. Identify tapes currently being validated by looking for Cell Type "Drive" and Partition "Media Validation".



Volser	Media Type	Medium Type	Raw Label	Cell ID	Cell Type	Module	Col	Side	Row	Partition	SCSI Element ID
TKC964	T10000C	Data	TKC964T2	254	Storage	Base	3	Front	2	DefaultPartition	2,120
TKC987	T10000C	Data	TKC987T2	5	Drive	Base	4	Back	2	Media Validation	
TKC987	T10000C	Data	TKC987T2	253	Storage	Base	3	Front	1	DefaultPartition	2,119
TTO475	LtoGen6 2.5TB	Data	TTO475L6	85	Storage	Base	3	Back	48	DefaultPartition	2,118

3. Right-click a tape currently being validated, select **Media Validation Stop**.

   If the option is grayed-out, the validation is not running or is in a state that cannot be canceled (such as unloading).

Related Topics

- Cancel a Library Request or Job
  Cancel requests that are in the "Active" or "Submitted" state.

Media Validation Types

The type of validation which determines the length of the test and level of validation.

Type	T10000 Description	LTO Description	Duration per Tape
Basic Verify	• Simple mount and dismount of the cartridge to determine if MIR is unreadable or out of sync. • This is the only test that is valid for blank tapes.	• Simple mount and dismount of the cartridge. Reads the CM on the mount. • This is the only test that is valid for blank tapes.	2 minutes
Standard Verify	• Starts at the beginning of tape. • Reads 1000 records from the beginning of tape (the highest-priority area of media). • Reads the wrap that contains the end of data (EOD). • Reads the outermost wraps on top and bottom bands to verify edges. • Records are not decompressed nor decrypted.	• Starts at the beginning of the tape. • Reads 2 wraps, then stops the validation. • Records are not decompressed nor decrypted.	Maximum of 30 minutes regardless of the data and the compression ratio used

Type	T10000 Description	LTO Description	Duration per Tape
Complete Verify OR **Resume Complete Verify**	• Starts at the beginning of the tape or resumes where it left off. • Verifies all data records on the tape are readable. • Reads data at tape speed. • Records are not decompressed nor decrypted.	• Starts at the beginning of the tape. Resume is not available. • Verifies all data records on the tape are readable. • Reads data at tape speed. • Records are not decompressed nor decrypted.	T10000C — 6 hours max T10000D — 9 hours max LTO — 5 to 24 hours
Complete Verify Plus OR **Resume Complete Verify Plus**	• Starts at beginning of the tape or resumes where it left off. • Verifies all records on the tape are readable. • Checks Data Integrity Validation (DIV). • Data is decompressed and decrypted if records contain cyclic redundancy check (CRC) codes added by host. The drive must be encryption capable and connected to Oracle Key Manager. Not valid for FICON drives.	• Not available	T10000C— 6 hours for compression ratios less than 2.5:1. T10000D — 9 hours for compression ratios less than 3:1
Rebuild MIR	• Starts at last-known valid position in the MIR, or the beginning of tape to rebuild MIR. • Verifies the MIR and rebuilds it if necessary. Records are not decompressed nor decrypted. The drive reads the data a tape speed.	• Not available	T10000C — 5 hours max T10000D — 9 hours max

Related Topics

- Validate a Tape (Perform a Media Validation)
  Use media validation to evaluate the integrity of a T10000 or LTO5+ tape.

View a List of Tape Cartridges

View a list of all tape cartridges within the library.

1. Click **Cells/Tapes** in the left navigation area of the GUI.
2. Click the **Tapes** tab.

Related Topics

- View a List of Cleaning Cartridges
  View the cleaner status, current cleaning count, cleaning thresholds, type, and location of all cleaning tapes in the library.
- View a List of All Cells in the Library
  Display a list of all cells in the library to view their current contents and properties.
- View the Cell Map
  Use the cell map to view the current location of tapes and drives in the library.

View a List of Cleaning Cartridges

View the cleaner status, current cleaning count, cleaning thresholds, type, and location of all cleaning tapes in the library.

1. Click **Cells/Tapes** in the left navigation area of the GUI.
2. Click the **Cleaning Tapes** tab.
   - Cleaning tapes in system cells are for library-managed auto cleaning.
   - Cleaning tapes in storage cells are for host-managed cleaning.

Related Topics

- Configure Drive Auto-Cleaning
  Enable drive auto-cleaning to have the library manage and respond to any cleaning requests made by drives.
- Set the Cleaning Tape Usage Thresholds
  The usage threshold gives a warning once the number of remaining uses for a cleaning tape falls below the threshold. You should replace cleaning tapes after a certain number of uses (generally 50 max).
- Import/Export Tapes in System Cells
  Use system cells to store cleaning and diagnostic tapes. System cells are not accessible by host applications.

Move or Mount a Tape Cartridge

Move a tape from a cell or drive to an empty cell, drive, or CAP cell.

1. The User and Operator role can only move a tape to a cell within the same partition. The Administrator and service roles can move tapes between two offline partitions and into system cells or drives or CAPs. Take note of what your role can do before proceeding.
2. If moving a tape between two partitions, take both affected partitions offline. Moving cartridges in online partitions using the GUI is disruptive to host applications and is not allowed.

> **Caution:**
>
> Moving a cartridge between partitions may confuse some applications requiring you to re-sync the application with the library.

3. Select the tape from the GUI tapes table or cell map.
4. From the **Actions** drop-down (or right-click menu), select **Move Tape**.
   - If moving the tape to a drive, the destination drop-down only displays empty, compatible drives.
   - If moving the tape to a CAP, the destination drop-down only displays locked CAPs. You cannot move a tape into a CAP owned by another partition.
   - If moving a tape from a drive, the first option in the destination drop-down is the home cell.

5. Select the destination. If moving to or from a drive, select the options below.
   - **Force unload** — When selected, the drive stops any in-process read or write operations and unloads the tape. Generally, only perform a force unload if there is a problem with the drive. This operation is disruptive.
   - **Read-only mount** — When selected, the drive only reads the tape and rejects any write commands. LTO drives do not support this feature.

Related Topics

- Place a Partition Online or Offline
  An offline partition rejects all client requests. Partitions automatically go offline during partitioning and SCSI host configuration changes. However, you can manually change the partition state when necessary.
- View a List of Tape Cartridges
  View a list of all tape cartridges within the library.
- View the Cell Map
  Use the cell map to view the current location of tapes and drives in the library.
- Unload the CAP
  Host applications should moves tapes out of the CAP and into storage cells. However, you can manually unload the CAP using the GUI when necessary.

How the Library Avoids Conflicting Move Requests Between SCSI, SCI, and the GUI

The ability for SCSI, SCI, and the GUI to request a cartridge move depends on the partition online/offline state and if the partition is SCSI enabled.

Interface Type Requesting the Move	Partition Online, SCSI Enabled	Partition Online, SCSI Disabled	Partition Offline, SCSI Enabled	Partition Offline, SCSI Disabled
SCSI	Allowed	Not possible	Not allowed	Not possible
SCI	Not allowed	Allowed	Not allowed	Not allowed
GUI	Not allowed	Not allowed	Allowed	Allowed

Import/Export Tapes in System Cells

Use system cells to store cleaning and diagnostic tapes. System cells are not accessible by host applications.

Cleaning tapes in system cells are for library-managed (automatic) drive cleaning. If you are using host-managed drive cleaning, import and export cleaning cartridges as you would with normal data tapes.

1. Click **Cells/Tapes** in the left navigation area of the GUI.
2. Click the **Cleaning Tapes** tab.
3. Click **Import/Export System Cells**  .
4. Select the CAP to use. During the import and export, the selected CAP will be unavailable to host applications. You must coordinate this activity with the hosts.

5. Select tapes to export (optional). You are not required to export existing tapes in order to import new tapes. The number of tapes you can export is limited to the size of the selected CAP. Click **Ok**.
6. Remove any ejected tapes from the CAP.
7. Optionally, you can now import cleaning and diagnostic tapes into system cells. Verify there are enough empty system cells for the number of tapes you want to import. Insert the tapes into the CAP. Press the **CAP** button to close the CAP.

> **Note:**
>
> The library will not import data tapes into the system cells. If you place any data tapes in the CAP while importing to system cells, the library reopens the CAP. Remove the data tapes from the CAP.

Related Topics

- Configure Drive Auto-Cleaning
  Enable drive auto-cleaning to have the library manage and respond to any cleaning requests made by drives.

Tips for Handling Tape Cartridges

Properly handle tapes to prevent damage. Improperly handling tapes can cause loss of data or damage to a library component.

- Keep tapes clean and inspect for damage before each use.
- Never open a tape cartridge.
- Do not handle tape that is outside the cartridge; the tape edge might be damaged.
- Do not expose the tape or cartridge to direct sunlight, moisture, excessive temperatures, or magnetic fields.
- Transport cartridges in shock resistant cases.

Inspect the Tape Cartridge

Always inspect a tape before you insert it into a drive or a library. A defective or dirty tape can damage a drive. Never use a damaged tape.

Look for:

- Dirt, debris, or liquid
- Cracked or broken housing
- Damaged write-protect switch
- Labels not firmly attached, or that extend over the tape cartridge edge

Clean the Tape Cartridge Exterior

Keep the cartridge exterior clean by wiping all dust, dirt, and moisture from the cartridge with a lint-free cloth or tape cleaner wipes.

The tape cleaner wipes are saturated with isopropyl alcohol. Do not let any solution touch the tape or get inside the cartridge.

> **Caution:**
>
> To avoid damage to cartridges, do not use acetone, trichloroethane, toluene, xylene, benzene, ketone, methylethyl ketone, methylene chloride, ethyldichloride, esters, ethyl acetate, or similar chemicals to remove labels or clean cartridges.

Store Tape Cartridges

Store tapes in a clean and temperature controlled environment to prevent damage.

Do not take a tape cartridge out of its protective wrapping until you are ready to use it. Use the tear string (not a sharp instrument) to remove the wrapping. Before using a tape cartridge, ensure that it has been in its operating environment for at least 24 hours so that it can adjust to changes in temperature and humidity.

Set the Cleaning Tape Usage Thresholds

The usage threshold gives a warning once the number of remaining uses for a cleaning tape falls below the threshold. You should replace cleaning tapes after a certain number of uses (generally 50 max).

> **Note:**
>
> When you import a cleaning tape, the library sets the usage count for that tape to zero, regardless if the tape has been used before.

1. Click **Cells/Tapes** in the left navigation area of the GUI.
2. Click the **Cleaning Tapes** tab.
3. Click **Set Cleaning Thresholds**  .
4. Set the threshold for each type of cleaning tape. The threshold will apply to all cleaning tapes of that type. Set the threshold high enough to allow adequate time to replace the tape. The default threshold is 5 remaining uses.

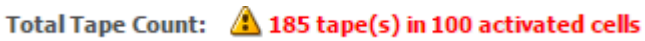
Related Topics

- Configure Drive Auto-Cleaning
  Enable drive auto-cleaning to have the library manage and respond to any cleaning requests made by drives.

- Manually Clean a Drive
  Normally, either the library or the host manages drive cleaning. However, there may be occasions when you need to perform a manual cleaning.

How to Fix a Tape Count Warning

A warning displays on the Library page if the library contains more tapes than the activated capacity.



With this warning, the library will continue to function normally, however, it is illegal to use unactivated capacity. Either eject tapes or purchase and install another capacity activation file.

Capacity activation files determine the number of tapes allowed in the library. For example, if you install a 100 capacity activation file and a 200 capacity activation file, the library has a activated capacity of 300 and can legally store a maximum of 300 tapes. Tapes in system cells do not count toward licensed capacity.

Related Topics

- Add or Remove Optional Library Features
  After purchasing a feature (such as tape capacity or multi-port networking), you must download the hardware activation file and then upload it to the library before you can use the feature.

8
Storage Cells

The library stores tape cartridges within storage cells (slots) along the walls of the library. Use the GUI to view library cells. Have the library perform an audit to scan all storage cells in the library for tapes.

View a List of All Cells in the Library

Display a list of all cells in the library to view their current contents and properties.

1. Click **Cells/Tapes** in the left navigation area of the GUI.
2. Click the **All Cells** tab.

Related Topics

- View the Cell Map
  Use the cell map to view the current location of tapes and drives in the library.
- View a List of Tape Cartridges
  View a list of all tape cartridges within the library.
- View a List of Cleaning Cartridges
  View the cleaner status, current cleaning count, cleaning thresholds, type, and location of all cleaning tapes in the library.

View the Cell Map

Use the cell map to view the current location of tapes and drives in the library.

1. Click **Library** in the left navigation area of the GUI.
2. Click a module. A green arrow indicates the currently selected module.
3. Hover over a cell to view the cell address, partition assignment, tape type, and so on. Click a cell to view more options:
   - Move or Mount a Tape Cartridge
   - Physically Locate a Drive Using the Locator LED
   - Set a Drive Online or Offline
   - Reset a Drive (Power Cycle the Drive)

Related Topics

- View a List of All Cells in the Library
  Display a list of all cells in the library to view their current contents and properties.

Cell Map Legend

Various symbols depict the type of cell within the cell map.

Cell Map Icon	Meaning
	Tape. Indicates cell is occupied or drive is mounted.
	Tape cell.
	CAP cell.
	Reserved system cell, generally used to store cleaning and diagnostic tapes. Hosts cannot access these cells.
	Drive.
	Empty drive bay.

Audit All or Part of the Library

An audit verifies cell contents and updates the library database, which contains the volume ID (volser), current location, and verified status for each tape.

The library automatically performs a full library audit after a front access door closes (excluding the Access Module door when used as a CAP) or after the library initializes (unless you select bypass audit in the library settings).

1. Click **Cells/Tapes** in the left navigation area of the GUI.
2. From the **Actions** drop-down (or right-click menu), select **Audit**.
3. Select the starting and ending address. Select the cell types to audit.

   To run a full library audit, select the following values:

   - Starting Address
     - Column: smallest value available (most likely the most negative value)
     - Side: Back
     - Row: 1
   - Ending Address
     - Column: highest positive value available
     - Side: Front
     - Row: 52
   - Cell Types: All

Cell Maps

Each module in the library has a particular layout for the drive bays and storage slots.

Legend

Cell	Description
	Normal data storage cell
	CAP cell
	Unavailable with no module to left
	Unavailable with no module to right
	Unavailable in a Parking Module
	Module identification block (see Module Identification Block)
	System cell for cleaning and diagnostic tapes

Figure 8-1 Base Module - Front Wall and Back Wall with 8 Drives

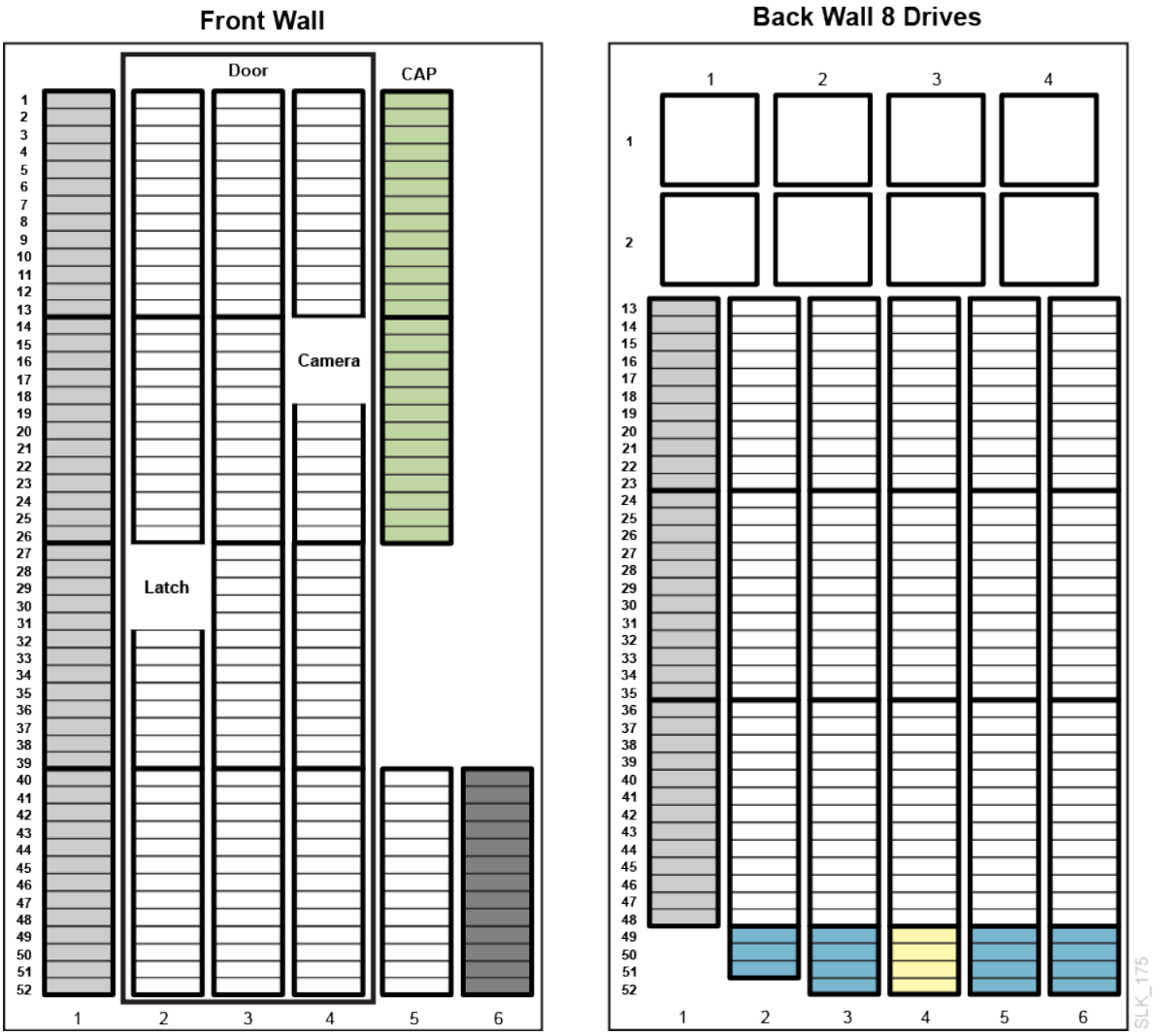


Figure 8-2 Base Module- Back Wall 16 Drives and 24 Drives

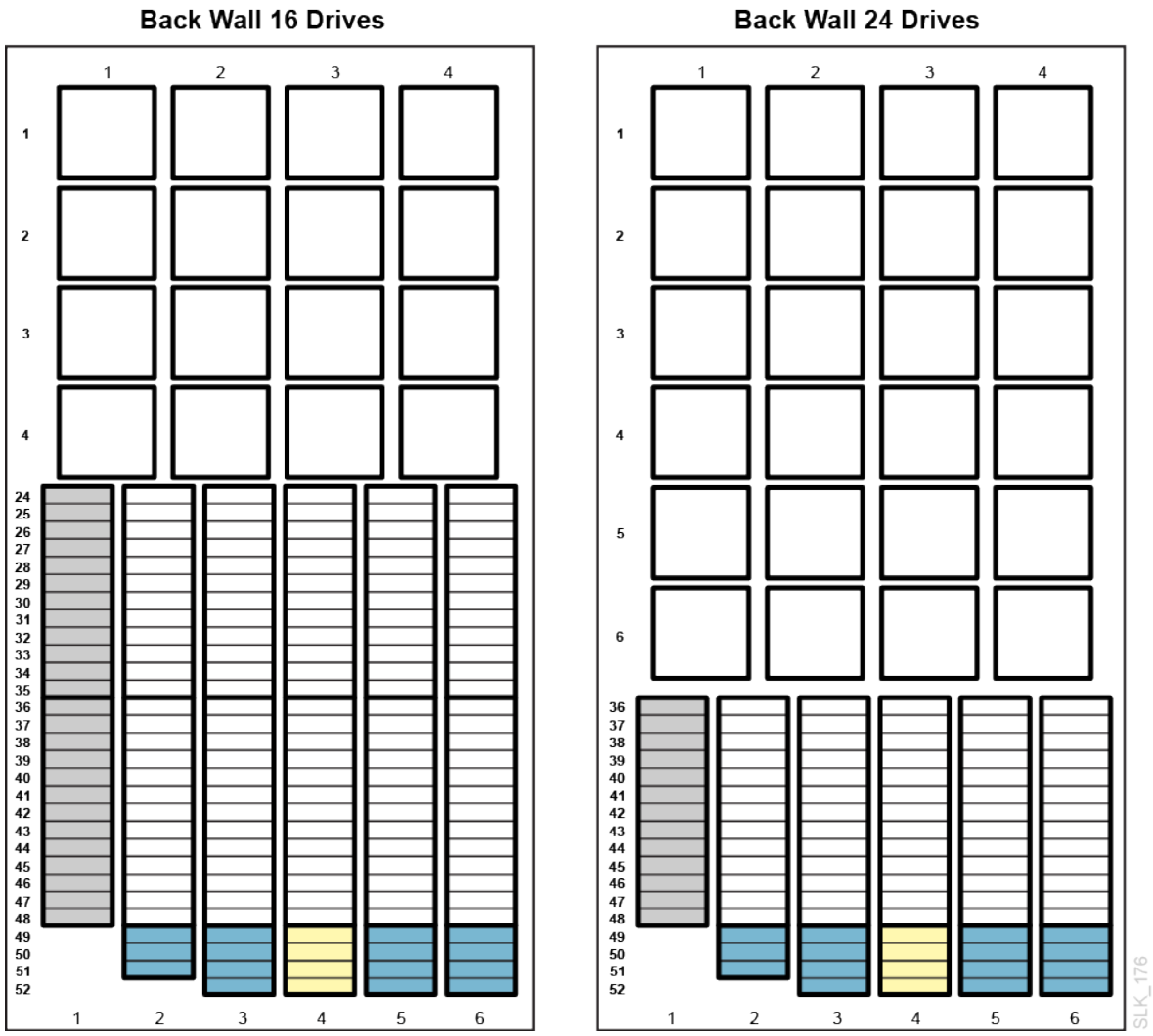


Figure 8-3 Drive Module - Front Wall

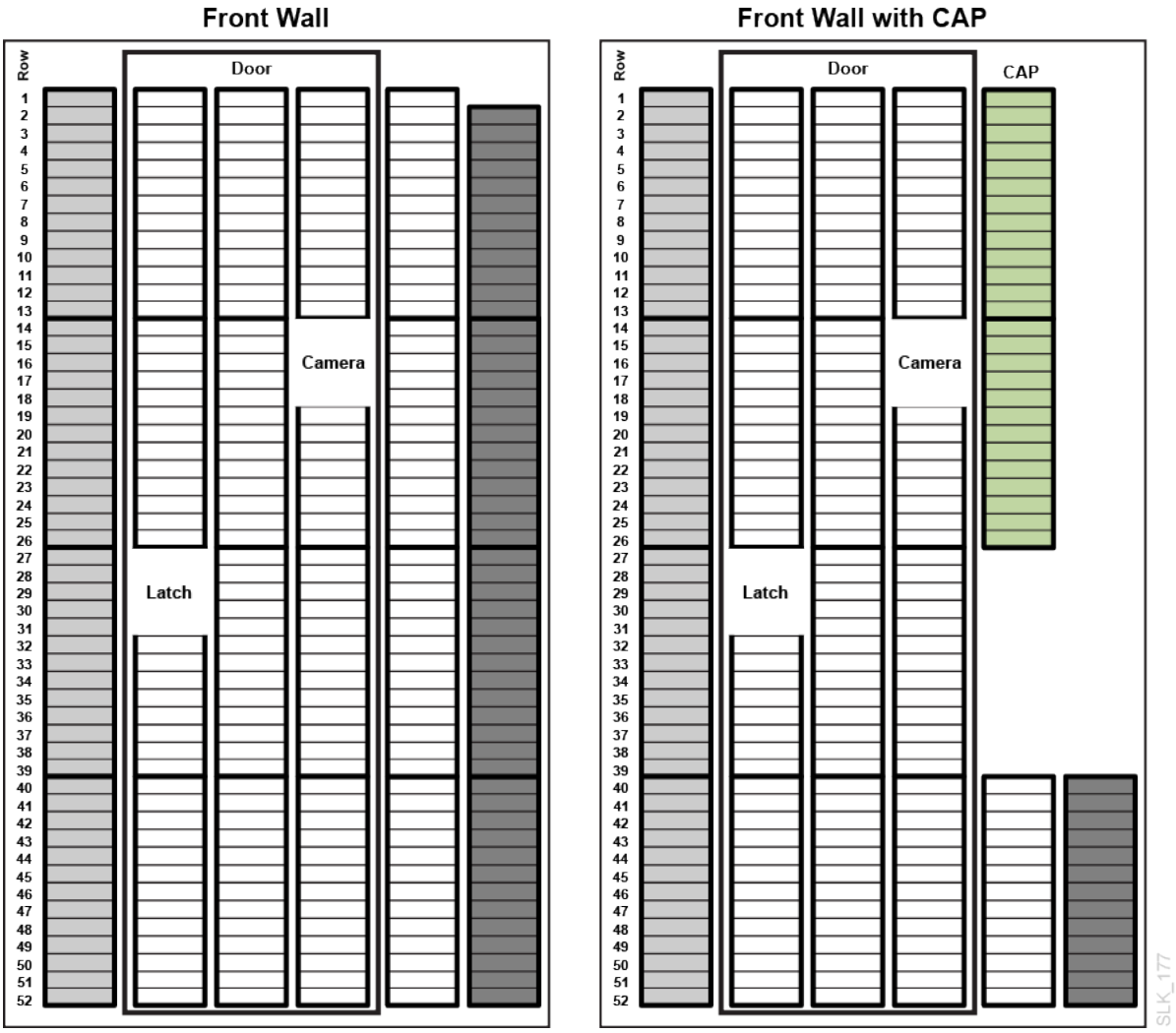


Figure 8-4 Drive Module - Back Wall 8 Drives and 16 Drives

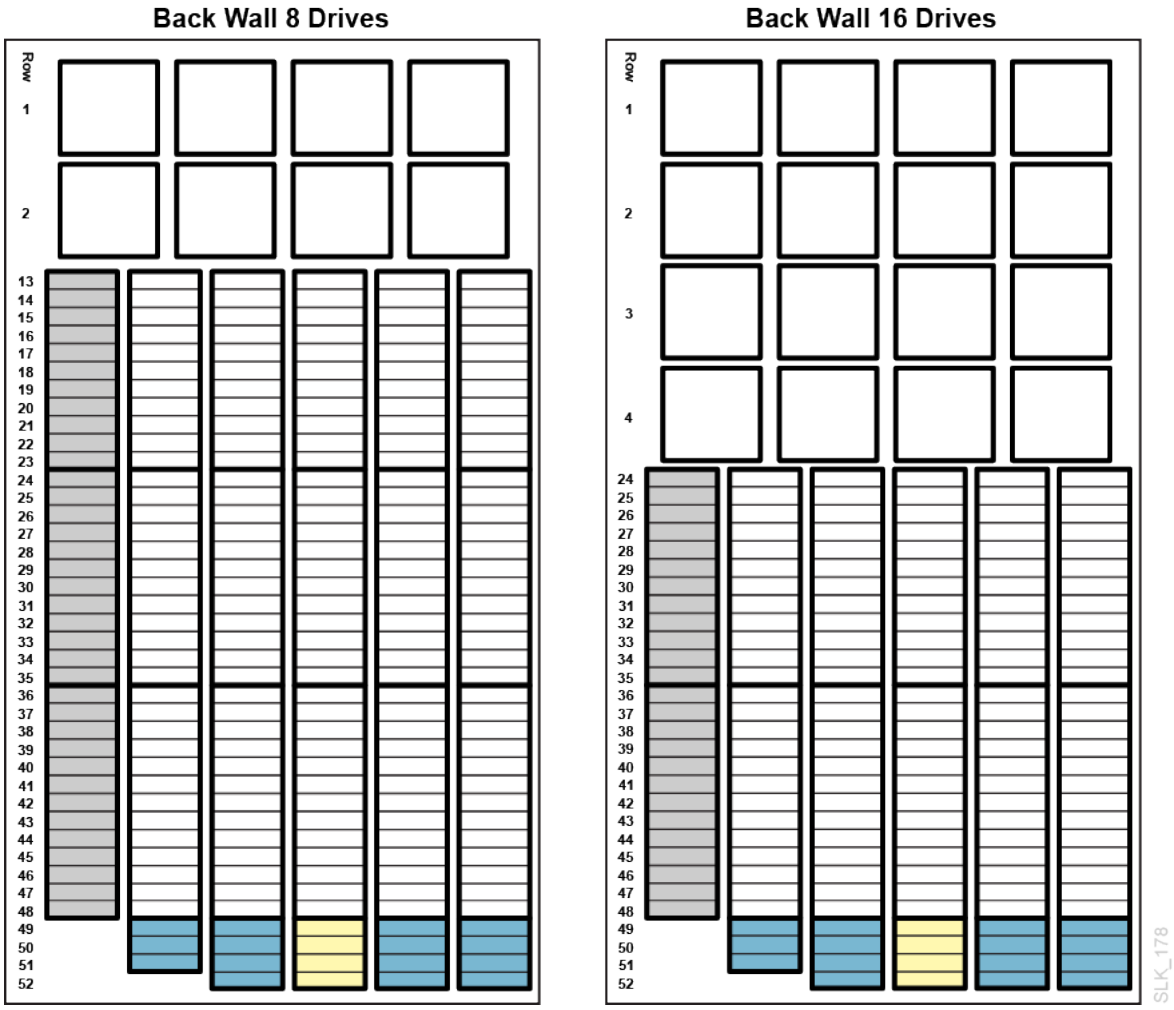


Figure 8-5 Drive Module - Back Wall 24 Drives and 32 Drives

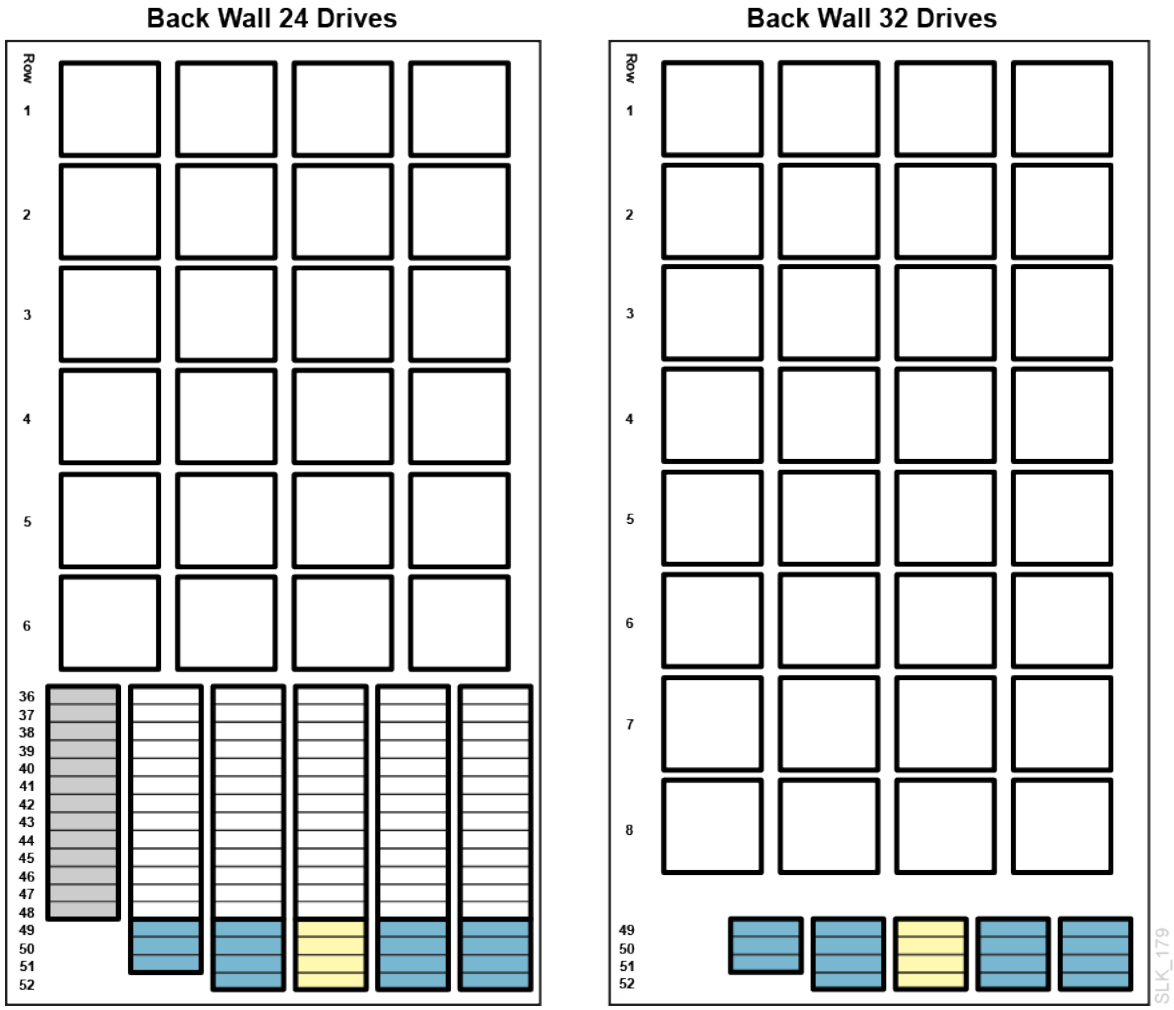


Figure 8-6 Cartridge Module - Front Wall

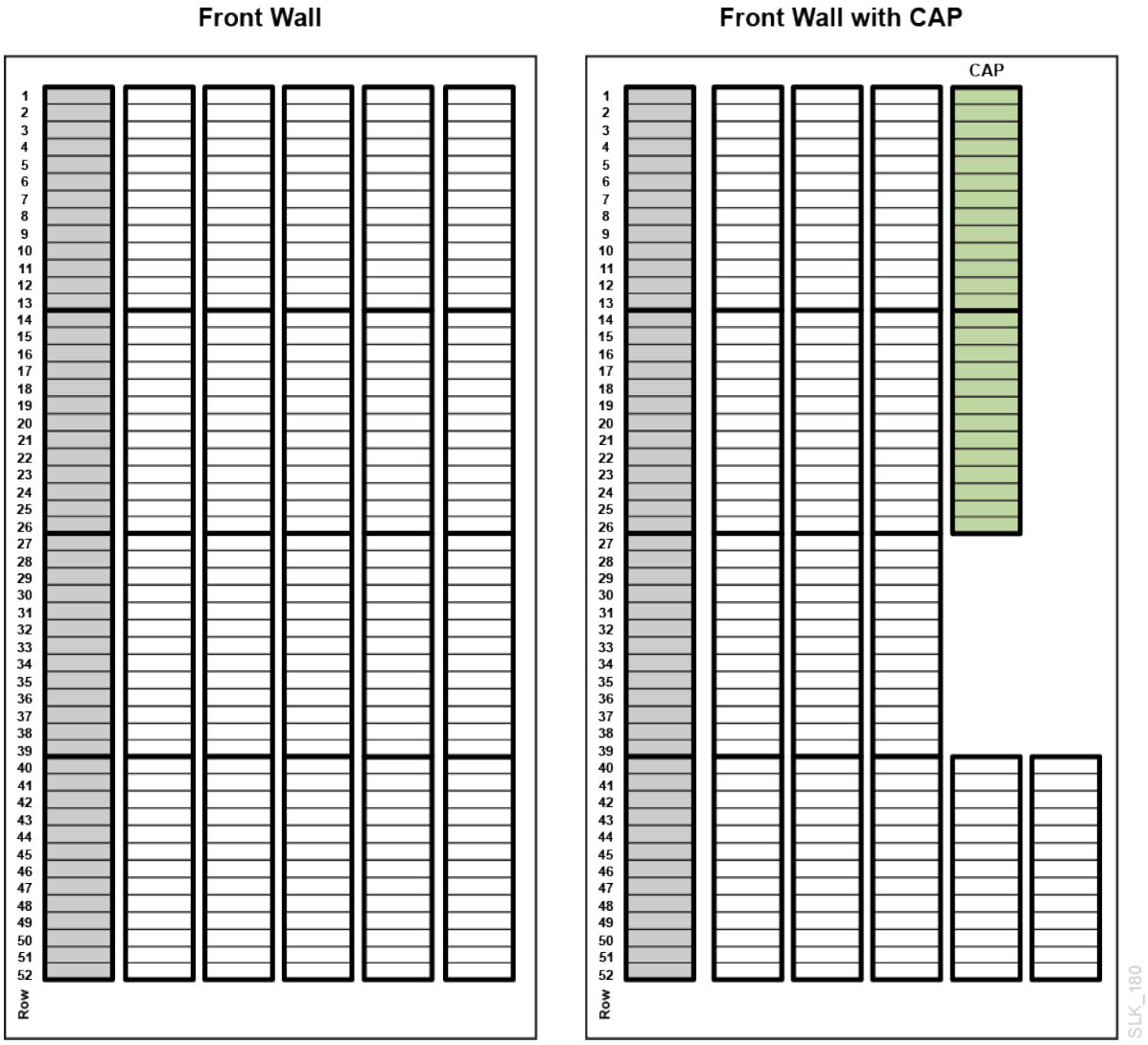


Figure 8-7 Cartridge Module - Back Wall

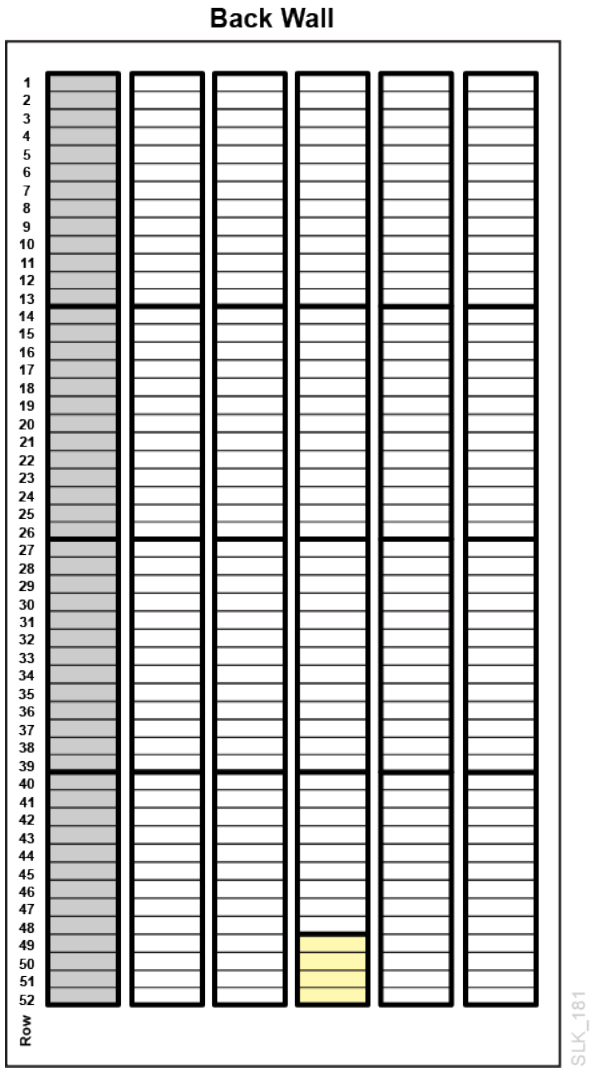


Figure 8-8 Parking Module, Left

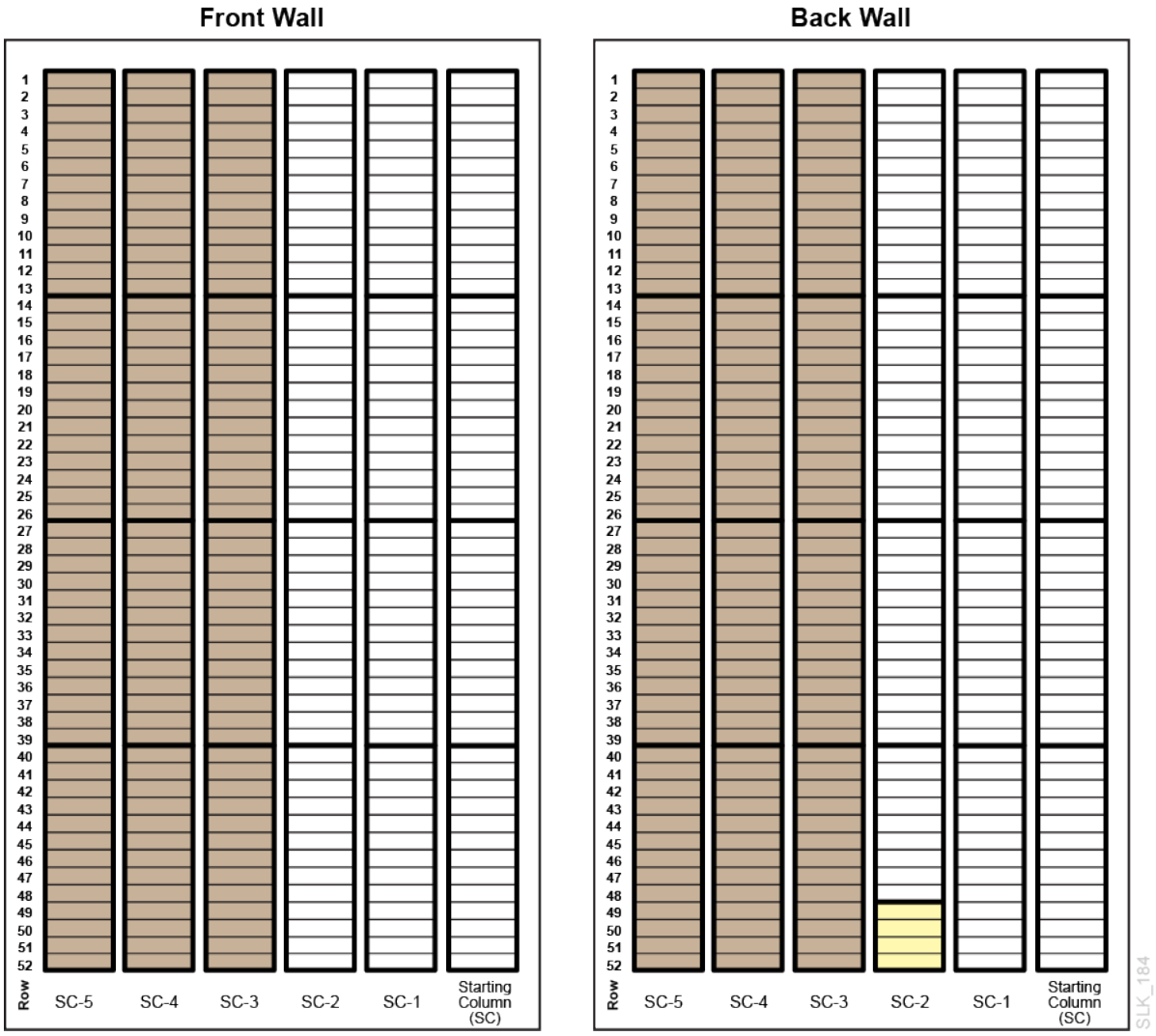


Figure 8-9 Parking Module, Right

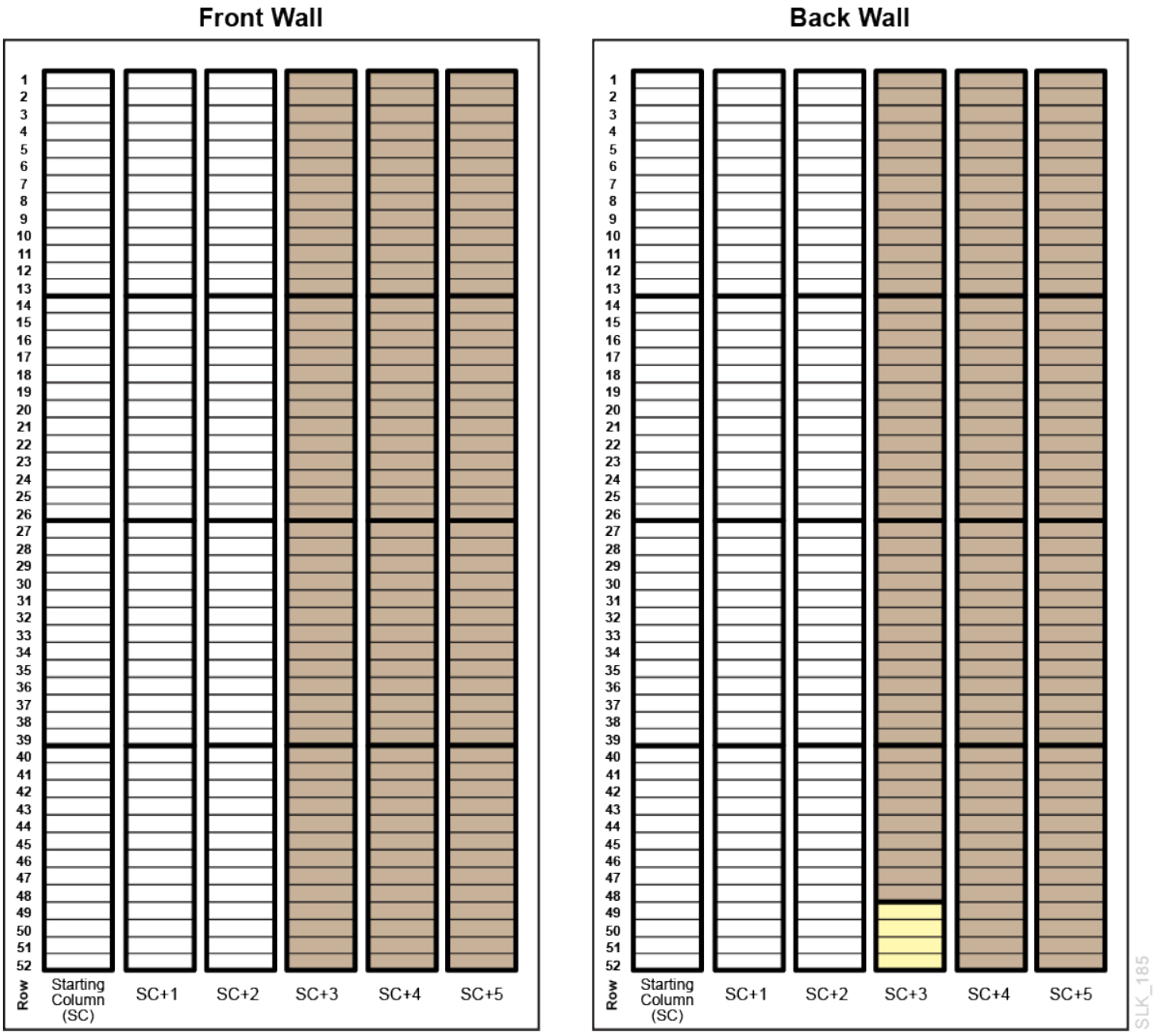


Figure 8-10 Access Module, Left

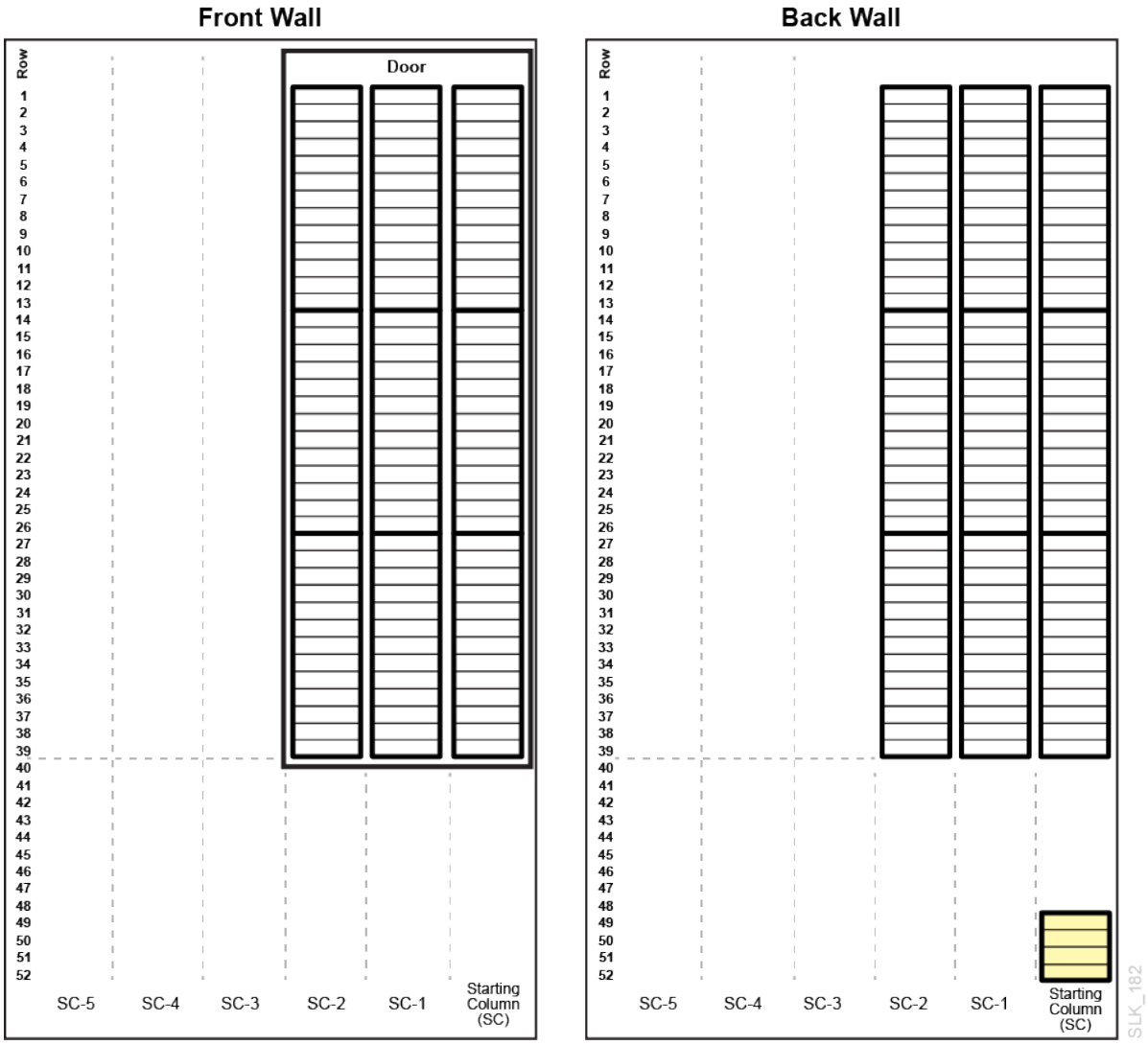
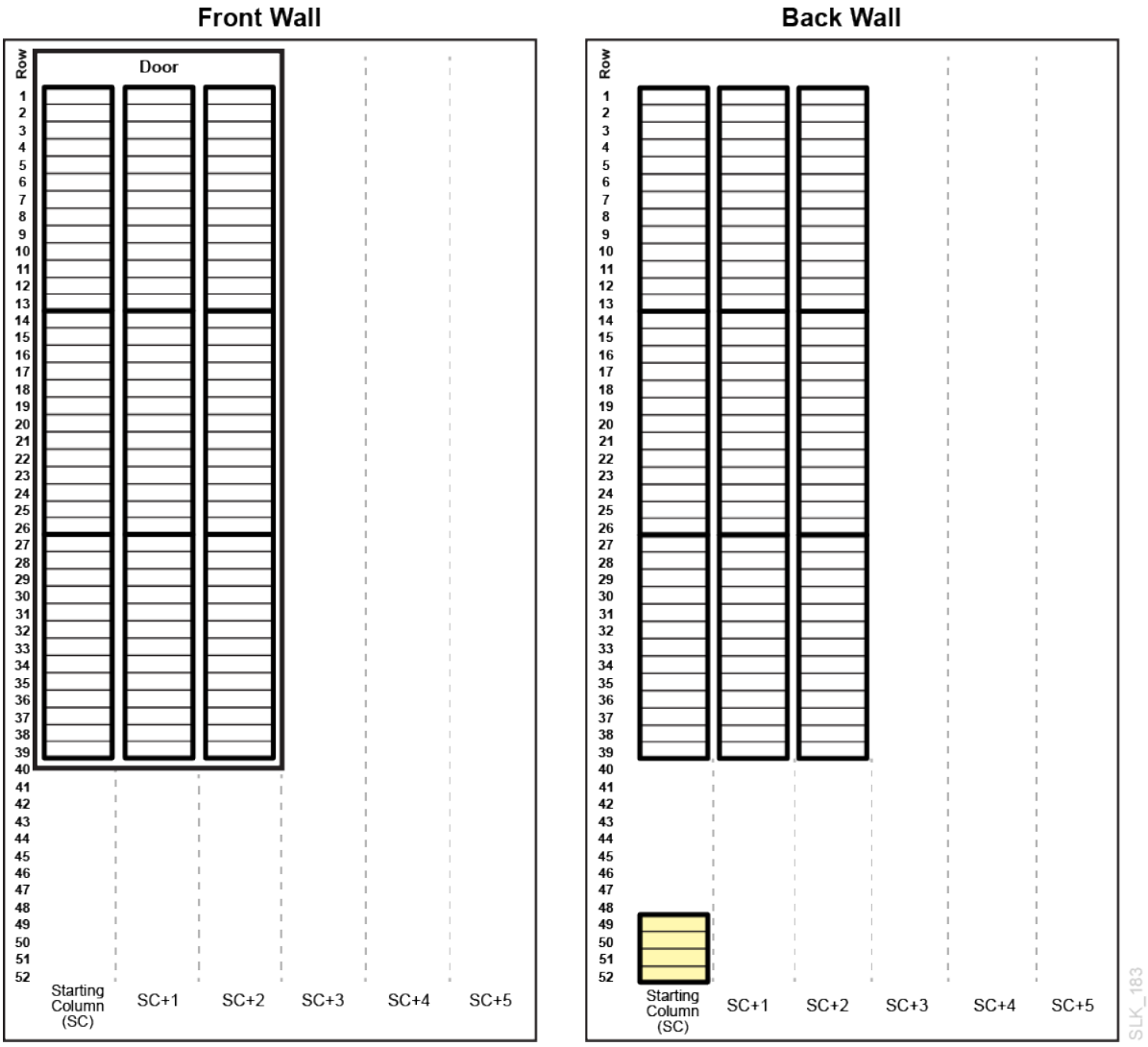


Figure 8-11 Access Module, Right



9

Cartridge Access Ports (CAPs)

CAPs import and export cartridges from the library. There are two CAP types: rotational CAPs (rotary) and Access Module CAPs (bulk load). The term "CAP" refers to both types, unless otherwise noted.

About CAPs

- CAP Types
- Default CAP States

Operate CAPs

- Guidelines for Using CAPs
- Lock or Unlock a CAP
- Open or Close a CAP Using the GUI
- Enter Tapes Through a CAP
- Eject Tapes Through a CAP

CAP Pools

- Create a CAP Pool
- Assign CAPs to a Pool
- Delete a CAP Pool
- Assign a CAP Pool to a Partition
- Dedicated vs. Shared CAP pools

Partitioning

- Assign a CAP Pool to a Partition
- Assign Ownership of a Shared CAP to a Partition

Guidelines for Using CAPs

Follow best practices when using CAPs to maximize library performance.

- Insert cartridges with the correct orientation (hub gear facing down and label facing you). You can skip slots in the CAP magazine when loading cartridges.
- Verify all cartridges are properly labeled before placing them into a CAP. Do not enter unlabeled cartridges
- To enter cartridges more efficiently, load the CAP magazines before issuing the enter command.
- If only one CAP is required to do the job, do not use multiple CAPs. Opening multiple CAPs will increase the audit time.

Lock or Unlock a CAP

The lock/unlocked state of CAP determines if it can be opened by pushing the CAP button.

1. Click **CAPs** in the left navigation area of the GUI.
2. Click the **CAPs** tab.
3. Select a CAP from the list. From the **Actions** drop-down (or right-click menu), select **Lock** or **Unlock**.
   - **Locked State** — While in the locked state, the CAP's "Unlock" LED indicator will be off. The library disables all means of opening the CAP, allowing the robot to access the CAP. To lock a CAP using the GUI, it must be closed, online, and owned by a partition.
   - **Unlocked State** — While in the unlocked state, the CAP's "Unlock" LED will be on. A CAP in the unlocked state can be opened by an operator by pushing the CAP button. When unlocked, the robot cannot access the CAP cells. To unlock a CAP using the GUI, it must be closed, online, owned by a partition (or controlled by the GUI), and not currently in use by the robot.

Related Topics

- Default CAP States
  The default state of a CAP (meaning the CAP state immediately after library initialization) depends on the CAP pool status and whether the partition that owns the CAP is SCSI enabled.
- Open or Close a CAP Using the GUI
  Opening or closing the CAP with the GUI is equivalent to pushing the CAP button on the exterior of the library.

Open or Close a CAP Using the GUI

Opening or closing the CAP with the GUI is equivalent to pushing the CAP button on the exterior of the library.

1. Click **CAPs** in the left navigation area of the GUI.
2. Click the **CAPs** tab.
3. Select a CAP from the list. From the **Actions** drop-down (or right-click menu), select **Open** or **Close**.
   - **Open** — Selecting Open is equivalent to pressing the CAP button on a closed and unlocked CAP.
   - **Close** — Selecting Close is equivalent to pressing the CAP button on an open CAP. Once closed, the library locks and audits the CAP cells.

Related Topics

- Lock or Unlock a CAP
  The lock/unlocked state of CAP determines if it can be opened by pushing the CAP button.
- Enter Tapes Through a CAP
  Enter tape cartridges through the CAP to move them to storage cells.

- Eject Tapes Through a CAP
  Eject tape cartridges through the CAP to remove them from the library.
- Import/Export Tapes in System Cells
  Use system cells to store cleaning and diagnostic tapes. System cells are not accessible by host applications.

Enter Tapes Through a CAP

Enter tape cartridges through the CAP to move them to storage cells.

CAP magazines are removable. You can place tapes in any magazine cell and in any order (making sure the hub-side is down). After entering tapes through the CAP, the library audits the CAP. Based on commands from the host software or GUI, the library moves the tapes to storage cells, records the location, and sends the location to the host. When the CAP is empty, the library returns the CAP to its default state.

> **Caution:**
>
> To avoid equipment damage, do not force the CAP to open or close. Do not enter unlabeled tapes or place tapes upside-down.

Enter Tapes Using a Rotational CAP

1. If entering tapes through a shared CAP, assign ownership of the CAP.
2. If the CAP is in auto enter mode, proceed to the next step. If it is in manual mode, initiate the enter operation at the host (see the host documentation).
3. Press the **CAP** button. The button light turns ON and the door opens.
4. Place the tapes in the CAP. Verify the hub gear is face down and barcode is toward you.
5. Press the **CAP** button. The CAP closes and temporarily locks, and the CAP button light turns OFF.

Enter Tapes Using an Access Module

1. If using a shared CAP, assign ownership of the CAP.
2. If the CAP is in auto enter mode, proceed to the next step. If it is in manual mode, initiate the enter operation at the host (see the host documentation).
3. Once the "Unlocked" indicator lights, push the Access Module **CAP** button.
   The "Wait" indicator blinks until the safety door is completely down. Depending on the level of activity in the library, this may take several minutes.
4. When the "Enter" indicator light is solid, lift the latch and open the door. Place the tapes in the CAP with the hub gear face down and barcode toward you.
5. Close and latch the Access Module access door.
6. Push the Access Module **CAP** button.
7. The "Enter" light turns off and the "Wait" light starts blinking. The safety door moves up.

Related Topics

- Guidelines for Using CAPs
  Follow best practices when using CAPs to maximize library performance.

- Tips for Handling Tape Cartridges
  Properly handle tapes to prevent damage. Improperly handling tapes can cause loss of data or damage to a library component.
- Assign Ownership of a Shared CAP to a Partition
  Set the ownership of a CAP within a shared CAP pool to allow the partition to use the CAP.

Unload the CAP

Host applications should moves tapes out of the CAP and into storage cells. However, you can manually unload the CAP using the GUI when necessary.

1. If possible, use the host application to unload the CAP instead of the GUI.
2. Click **CAPs** in the left navigation area of the GUI.
3. Verify the CAP is closed and locked.
4. Select a CAP from the list, and then from the **Actions** drop-down (or right-click menu) select **Unload CAP**.

   The library will move the tapes to empty cells within the partition that currently owns the CAP.
5. You may need to update your host application with the location of the new tapes.

Related Topics

- Move or Mount a Tape Cartridge
  Move a tape from a cell or drive to an empty cell, drive, or CAP cell.

Eject Tapes Through a CAP

Eject tape cartridges through the CAP to remove them from the library.

Once the library places all tapes to be ejected in the CAP. An operator must then open the CAP, remove the cartridges from the magazine, and close the CAP. Once the robot verifies the CAP is empty, the library erases the location of the tapes from the library database. The CAP returns to its default state.

> **Caution:**
>
> To prevent equipment damage, do not force the CAP to open or close.

Eject Tapes Using a Rotational CAPs

1. If ejecting tapes through a shared CAP, assign ownership of the CAP.
2. Initiate the eject operation. Specify the tapes to eject. The CAP button light turns ON.
3. Press the **CAP** button to open the CAP.
4. Remove all tapes from the CAP.
5. Push the **CAP** button to close the CAP.
   The CAP closes and locks, and the CAP button light turns OFF.

6. The robot continues filling the CAP until all selected tapes are ejected. Wait until the CAP door is unlocked, and then repeat step 2 through step 4.

Eject Tapes Using an Access Module

1. If ejecting tapes through a shared CAP, assign ownership of the CAP.
2. Initiate the eject operation. Specify the tapes to eject.
3. Push the **Access Module CAP** button .
   The "Wait" indicator blinks until the safety door is in place, and then the "Enter" light is solid. Depending on the level of activity in the library, this process may take several minutes.
4. Lift the latch and open the door. Remove the tapes from the Access Module CAP. Close and latch the Access Module access door.
5. Push the **Access Module CAP** button. The "Enter" light turns off and the "Wait" light begins blinking. The safety door moves up. If more tapes need to be exported, the robot continues filling the necessary Access Modules.
6. The robot continues filling the Access Module until all selected tapes are ejected. Wait until the door is unlocked, and then repeat step 2 through step 4.

Related Topics

- Guidelines for Using CAPs
  Follow best practices when using CAPs to maximize library performance.
- Tips for Handling Tape Cartridges
  Properly handle tapes to prevent damage. Improperly handling tapes can cause loss of data or damage to a library component.
- Assign Ownership of a Shared CAP to a Partition
  Set the ownership of a CAP within a shared CAP pool to allow the partition to use the CAP.

CAP Pools

A CAP pool is a set of CAPs grouped together. CAP pools are assigned to a partition to import and export tapes. A non-partitioned library always contains a single pool assigned to the default partition.

- Create a CAP Pool
- Assign CAPs to a Pool
- Delete a CAP Pool
- Assign a CAP Pool to a Partition
- Dedicated vs. Shared CAP pools
- Assign Ownership of a Shared CAP to a Partition

Create a CAP Pool

A CAP pool provides a way to group CAPs together and assign them to partitions.

1. Click **CAPs** in the left navigation area of the GUI.
2. Click the **CAP Pools** tab.

3. Click **Add**  .

> **Note:**
>
> If **Add**  is grayed-out, you need to enable partitioning using the configuration wizard.

4. Enter a CAP pool name.
5. A new CAP pool has no CAPs assigned to it. Assign CAPs to the pool.

Related Topics

- Configure Library Settings
  Library settings include the library name, partitioning activation, initialization settings, volume label format, and HTTP listening port settings.
- Assign CAPs to a Pool
  Assign CAPs to a pool to group them together. You can only assign each CAP to a single pool.

Assign CAPs to a Pool

Assign CAPs to a pool to group them together. You can only assign each CAP to a single pool.

> **Note:**
>
> Any partitions assigned to the modified pool will temporarily go OFFLINE when you modify the CAPs in the pool.

1. Click **CAPs** in the left navigation area of the GUI.
2. Click the **CAPs** tab.
3. Verify that the CAP you want to assign is empty and idle.
4. Click **Assign CAPs to Pools**  .
5. Select a CAP pool from the drop-down list.

Related Topics

- Assign a CAP Pool to a Partition
  Assigning a CAP pool to a partition to gives the partition the ability to use the CAPs to import and export tape cartridges.

Delete a CAP Pool

Deleting a CAP pool to removes it from the GUI CAPs pool list. You can only delete a pool if it is not assigned to a partition and contains no CAPs.

1. Assign all CAPs in the pool to another pool.
2. Remove the CAP pool partitioning assignment by editing the partition attributes.

3. Click **CAPs** in the left navigation area of the GUI.
4. Click the **CAP Pools** tab.
5. Select the CAP pool in the list, and then click **Delete**  .

Related Topics

- Assign CAPs to a Pool
  Assign CAPs to a pool to group them together. You can only assign each CAP to a single pool.
- Edit a Partition
  Edit the partition attributes to make changes to the partition name and settings. This does not change the resources assigned to the partition.

Assign a CAP Pool to a Partition

Assigning a CAP pool to a partition to gives the partition the ability to use the CAPs to import and export tape cartridges.

> **Note:**
>
> A non-partitioned library only contains a single default pool always assigned to the default partition and you do not need to follow the procedure below.

You can assign the CAP pool to a partition when setting the partitioning attributes for the partition. Each partition can have only one CAP pool assigned to it. However, you can assign a CAP pool to multiple partitions.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Select the partition in the table, and then click **Edit Partition**  .
3. Select a CAP pool from the **CAP Pool Name** drop-down.

   If the CAP pool is already assigned to a partition it will become a shared CAP pool. There are special considerations you must take when using a shared CAP pool.

Related Topics

- Dedicated vs. Shared CAP pools
  A CAP pool can either be dedicated or shared depending on the number of partitions it is assigned to. Shared CAP pools require extra steps to use for import/export operations.
- Partitioning
  Library partitioning is an optional feature that divides library resources (drive bays, storage cells, and CAPs) into smaller subsections to allow different hosts to independently use a portion of the library.
- Assign Ownership of a Shared CAP to a Partition
  Set the ownership of a CAP within a shared CAP pool to allow the partition to use the CAP.

Dedicated vs. Shared CAP pools

A CAP pool can either be dedicated or shared depending on the number of partitions it is assigned to. Shared CAP pools require extra steps to use for import/export operations.

- **Dedicated CAP** — If the CAP pool is assigned to only one partition, the CAPs within the pool are "dedicated" and the partition automatically assumes ownership of all CAPs within the pool.
- **Shared CAP** — If a CAP pool is assigned to multiple partitions, the CAPs within the pool are "shared". In order for a partition to use a shared CAP for import/export operations, the partition must "own" the CAP. Once the import/export operation completes, the partition must then release ownership of the CAP so that other partitions can use it.

> **Note:**
>
> Avoid assigning a shared CAP pool to a SCSI partition. For more information, refer to the *SL4000 SCSI Reference Guide*.

Related Topics

- Assign a CAP Pool to a Partition
  Assigning a CAP pool to a partition to gives the partition the ability to use the CAPs to import and export tape cartridges.
- Assign Ownership of a Shared CAP to a Partition
  Set the ownership of a CAP within a shared CAP pool to allow the partition to use the CAP.

Assign Ownership of a Shared CAP to a Partition

Set the ownership of a CAP within a shared CAP pool to allow the partition to use the CAP.

If you assign a CAP pool to more than one partition, a partition must "own" a CAP within the pool before the partition can import or export tapes. If you assign the CAP pool to only one partition, that partition automatically owns all CAPs within the pool and you do not need to follow the procedures below.

1. Click **CAPs** in the left navigation area of the GUI.
2. Click the **CAPs** tab.
3. Select a CAP from the list. From the **Actions** drop-down (or right-click menu), select **Set CAP Owner**.
4. Select a partition from the drop-down list.

Related Topics

- Assign a CAP Pool to a Partition
  Assigning a CAP pool to a partition to gives the partition the ability to use the CAPs to import and export tape cartridges.
- Create a CAP Pool
  A CAP pool provides a way to group CAPs together and assign them to partitions.
- Assign CAPs to a Pool
  Assign CAPs to a pool to group them together. You can only assign each CAP to a single pool.

- Default CAP States
  The default state of a CAP (meaning the CAP state immediately after library initialization) depends on the CAP pool status and whether the partition that owns the CAP is SCSI enabled.

CAP Types

CAPs are used to import and export cartridges. There are two types: rotational and bulk load.

Rotational CAP

A rotational CAP (referred to as rotary CAP in the GUI) is a vertically-mounted, rotating cylinder with two removable 13-cell magazines used to import and export cartridges.

- The Base Module comes standard with a rotational CAP.
- Each Drive Module or Cartridge Module can have one optional rotational CAP per module. Only the left parking module can contain a rotational CAP. The rotational CAP on a right parking module is inaccessible.
- Each rotational CAP has a keypad with an unlock indicator and a button to open the CAP.

Figure 9-1 Rotational CAPs

1. CAP (closed)
2. No CAP installed
3. CAP (open)
4. Keypad

Bulk Load CAP (Access Module)

The Access Module can enter and eject up to 234 tapes at a time. Only one Access Module is required to support the bulk loading feature.

Related Topics

- Access Module (AEM)
  An Access Module has a cartridge access door used for bulk loading of up to 234 tapes. A library with two Access Module supports the redundant robotics feature.

Default CAP States

The default state of a CAP (meaning the CAP state immediately after library initialization) depends on the CAP pool status and whether the partition that owns the CAP is SCSI enabled.

Table 9-1 Default CAP State Based on CAP Pool and Partition Status

CAP Pool Status	CAP Status	Partition is SCSI enabled	Partition is not SCSI enabled
Library only has single default pool (no partitioning activation file installed and library has single default partition)	All CAPs are "Dedicated" (the default partition automatically owns all CAPs in the library)	All CAPs are unlocked	All CAPs are locked
CAP pool not assigned to a partition	CAPs in pool are "Free" and locked	N/A	N/A
CAP pool assigned to a single partition	CAPs in pool are "Dedicated" (the partition owns all CAPs in the pool)	CAPs in pool are unlocked	CAPs in pool are locked
CAP pool assigned to more than one partition	CAPs in pool are "Shared" and remain locked until a partition explicitly takes ownership of a CAP in the pool	If owned by a partition, the CAP will be unlocked	If owned by a partition CAP will be locked.

Related Topics

- Lock or Unlock a CAP
  The lock/unlocked state of CAP determines if it can be opened by pushing the CAP button.
- Assign a CAP Pool to a Partition
  Assigning a CAP pool to a partition to gives the partition the ability to use the CAPs to import and export tape cartridges.
- Assign Ownership of a Shared CAP to a Partition
  Set the ownership of a CAP within a shared CAP pool to allow the partition to use the CAP.

10 Partitioning

Library partitioning is an optional feature that divides library resources (drive bays, storage cells, and CAPs) into smaller subsections to allow different hosts to independently use a portion of the library.

The library supports up to 16 partitions. Each partition appears as a standalone library to the host, which allows more than one application to use the library simultaneously.

Configure Partitioning

- Enable Partitioning
- Add a Partition
- Edit a Partition
- Move Storage Cells and Drive Bays to a Partition
- Delete a Partition
- Add or Remove Drives from the Media Validation Partition (Pool)
- Place a Partition Online or Offline

SCSI Host Configuration

- Assign Partitions to a SCSI Host and Alter LUN Assignment
- View the Host Connections of a Partition

CAP Ownership and Pools

- Assign a CAP Pool to a Partition
- Assign Ownership of a Shared CAP to a Partition

FAQs

- Partitioning Guidelines to Maximize Library Performance
- Why is there a Default Partition in a "Non-Partitioned" Library?
- Why is there a Media Validation Partition?
- What Occurs When You Disable Partitioning
- What Occurs to Partitions When the Physical Configuration Changes

Partitioning Guidelines to Maximize Library Performance

Follow best practices when partitioning to maximize library performance.

- Partition storage slots in the largest blocks possible. Cluster cartridges and drives together based on workload. Ensure that each partition has an adequate number of data cartridges, scratch cartridges, and tape drives to support peak workload.

- Avoid partitioning individual drives and storage cells. Individually add and remove resources only when you need to fine-tune a partition that has already been broadly defined in larger blocks.
- Install enough CAPs to provide at least one CAP for each partition. This allows each partition to contain a dedicated CAP.
- For quicker enter and ejects, partition storage cells close to the CAPs. For quicker access to stored data, partition storage cells close to the drives.

Enable Partitioning

Partitioning is disabled by default. Enable it within the library settings.

Partitioning now comes standard (it no longer requires a hardware activation file). However, it is disabled by default. Use the Configuration Wizard to enable it within the Library Settings.

See Configure Library Settings to enable partitioning.

Related Topics

- What Occurs When You Disable Partitioning
  Disabling partitioning causes the library to move resources and set SCSI LUNs.

Add a Partition

Create a partition and name it before adding resources to the partition. The library supports 16 partitions.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click **Create New Partition**  .

   If the Create New Partition icon is grayed-out  , you need to enable partitioning.
3. Enter the Partition Attributes, and then click **Ok** to create the partition.
   - **Partition Name** – Limit of 20 characters.
   - **Drive Auto Clean** – If selected, this enables library-managed drive cleaning for drives within the partition. If not selected, the host software must manage drive cleaning.
   - **Volume Label Format** – Controls presentation of the storage cell volsers.
   - **Initial Control State** – The initial state of the partition. An “Online" partition can respond to client requests. An "Offline" partition will reject all client requests until you set it "Online".
   - **SCSI Access Enabled** – "Yes" means only SCSI clients can access the partition. "No" means only StorageTek Library Control Interface (SCI) clients can access the partition. See also .
   - **Fast-Load Type** – Defines how the partition handles replying to mount requests.
     – **Normal** (default) – The library will reply to a mount request only after the selected tape is loaded and threaded in the drive.

  - **Fast** – The library will reply to a mount request after the selected tape is inserted into the drive, but before loading and threading completes.
- **CAP Pool Name** – Select the CAP pool from the list. In order to import/export tapes, you must assign a CAP pool to the partition.

4. A newly created partition does not have any resources assigned to it. You must move cells and drives into the partition.

Related Topics

- Enable Partitioning
  Partitioning is disabled by default. Enable it within the library settings.
- Move Storage Cells and Drive Bays to a Partition
  Move resources to a partition after defining the partition name and selecting partition attributes.
- Assign Partitions to a SCSI Host and Alter LUN Assignment
  Assign a partition to a SCSI host to give the host the ability to use resources within the partition.

Edit a Partition

Edit the partition attributes to make changes to the partition name and settings. This does not change the resources assigned to the partition.

> **Caution:**
>
> Modifying the partitioning configuration can be disruptive to client systems. Any altered partitions currently online will temporarily go OFFLINE and then come back online. Partitions that were already offline will remain offline.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Select the partition in the table, and then click **Edit Partition** .
3. Update the Partition Attributes, and then click **Ok**.
   - **Partition Name** – Limit of 20 characters.
   - **Drive Auto Clean** – If selected, this enables library-managed drive cleaning for drives within the partition. If not selected, the host software must manage drive cleaning.
   - **Volume Label Format** – Controls presentation of the storage cell volsers.
   - **Initial Control State** – The initial state of the partition. An “Online" partition can respond to client requests. An "Offline" partition will reject all client requests until you set it "Online".
   - **SCSI Access Enabled** – "Yes" means only SCSI clients can access the partition. "No" means only StorageTek Library Control Interface (SCI) clients can access the partition. See also .
   - **Fast-Load Type** – Defines how the partition handles replying to mount requests.
     - **Normal** (default) – The library will reply to a mount request only after the selected tape is loaded and threaded in the drive.

  - **Fast** – The library will reply to a mount request after the selected tape is inserted into the drive, but before loading and threading completes.
- **CAP Pool Name** – Select the CAP pool from the list. In order to import/export tapes, you must assign a CAP pool to the partition.

Related Topics

- Move Storage Cells and Drive Bays to a Partition
  Move resources to a partition after defining the partition name and selecting partition attributes.
- Assign Partitions to a SCSI Host and Alter LUN Assignment
  Assign a partition to a SCSI host to give the host the ability to use resources within the partition.

Move Storage Cells and Drive Bays to a Partition

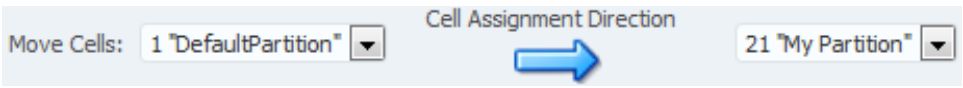
Move resources to a partition after defining the partition name and selecting partition attributes.

Initially, all resources are assigned to a predefined default partition. After you add at least one additional partition, you can move storage cells and drive bays between partitions. All storage cells and drive bays in the library must always belong to a partition.

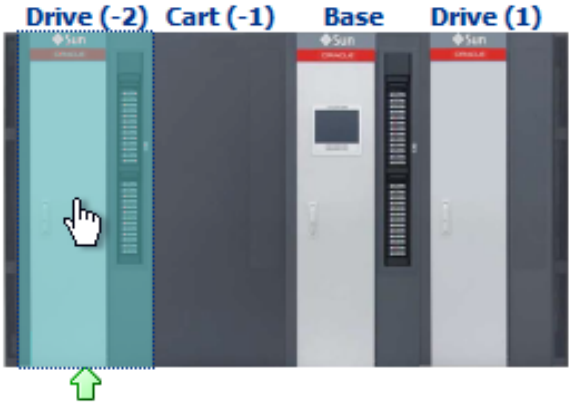
> **Note:**
>
> No actual configuration changes are made to the library until you click **Apply** on the summary page. After applying changes, any altered partitions currently online will temporarily go OFFLINE. Partitions that were already offline will remain offline.

1. Make sure you have already added at least one partition.
2. Click **Partitioning** in the left navigation area of the GUI.
3. Click **Assign Cells** .
4. From the drop-down lists, select the source and destination partition. The arrow indicates the direction the resources will move. Initially, the default partition must be the source partition.

> **Note:**
>
> Click the arrow to reverse the direction.



5. Click a module to modify (the green arrow below a module indicates the currently selected module).



6. Choose a **Select Cells By** method. This determines how many resources are selected when you click.
   - **Cell-by-cell** – Assign cells one at a time by clicking individual cells.
   - **Cell Block** – Assign like-cells in a rectangular block (two clicks required). Click the top-left corner of the block, and then click the bottom-right corner of the block (do not click-and-drag).
   - **Column** – Assign all like-cells in a column by clicking any cell in the column.
   - **Side** – Assign all cells on a side (front or back) by clicking any cell on the side.
   - **Row** – Assign all like-cells in a row by clicking any cell in the row.
   - **Module** – Assign all cells currently assigned to the source partition in a module by clicking any cell in the module.
7. Click cells on the cell map. The number over a cell or drive bay indicates the partition ID.

   Oops...I made a mistake, how do I move cells back?
   Click the cell assignment direction arrow to flip the direction ⟸. Choose a **Select Cells By** method, and then click cells on the cell map. The cells reassign to the source partition.
8. Click another module and repeat.
9. Once you have completed the partitioning design, click **Next**.

> **Note:**
>
> Applying changes will take any modified partitions temporarily OFFLINE. Unaffected partitions will remain ONLINE. You should stop any host operations involving the modified partitions before applying the partitioning changes.

10. Review the Cell Assignment Count Summary and Cell Assignment Details, and then click **Apply**.

Partitioning Cell Map Legend

Various symbols are used to depict the type of cell on the partitioning screen.

Cell Map Icon	Meaning
	Tape - indicates that the cell is occupied or the drive is mounted.
 (no color overlay)	Unallocated - cell assigned to the source partition (in this case partition with ID 1).
 (yellow overlay)	Allocated - cell assigned to the destination partition (in this case partition with ID 21)
 (red overlay)	Unselectable - cell assigned to a partition that is not one of the partitions currently selected in the drop-down lists. Or, the cell is a system cell. System cells cannot be assigned to any partition.
	CAP cell - you cannot assign these cells to a partition. The CAP cells assigned to the partition depend on the CAP pool.
	Inaccessible - a system cell. You cannot add these cells to a partition and hosts cannot access these cells.

Delete a Partition

Delete a partition to remove the definition from the GUI partitioning list. You can only delete a partition if it contains no storage cells or drive bays.

1. Move all storage cells and drive bays to another partition.

> **Note:**
>
> To quickly reassign all the cells in a module that belong to the source partition, choose the **By Module** selection method, and then click anywhere on the cell map.

2. On the assign cells summary screen, verify that the partition you want to delete contains zero resources, and then click **Apply**.

Cell Assignment Counts Summary

Partition Name	ID	Changes	Drive Bays Count	Drive Count	Storage Cells Count	Tape Count
PartitionToDelete	01	*Yes*	0	0	0	0

3. To delete the empty partition, click **Partitioning** in the left navigation area of the GUI.
4. Select the partition in the table, and then click **Delete**  . If Delete is grayed-out, you must first move all storage cells and drive bays to another partition.

> **Note:**
>
> Any SCSI hosts assigned to this partition will have their LUNs deleted. Additionally, the library may renumber some LUNs if the host has higher-numbered LUNs than the deleted partition. You will have to reconfigure the host.

Related Topics

- Move Storage Cells and Drive Bays to a Partition
  Move resources to a partition after defining the partition name and selecting partition attributes.

Assign Partitions to a SCSI Host and Alter LUN Assignment

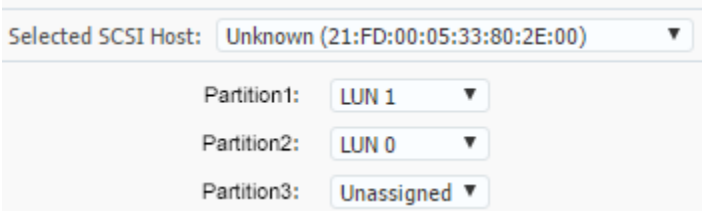
Assign a partition to a SCSI host to give the host the ability to use resources within the partition.

The partition will temporarily go OFFLINE after you assign a SCSI host. You will need to reconfigure the host after you alter the LUN numbering.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click the **SCSI Host Configuration** tab.
3. Click **Configure SCSI Connections** .
4. Select a SCSI host from the drop-down list.

> **Note:**
>
> If a partition does not appear, SCSI access is not enabled. To enable SCSI access, see Edit a Partition.

5. For each partition, select a LUN assignment. There must be a LUN 0 and you cannot have duplicate LUNs for a host. You can leave partitions unassigned.



6. If there are additional SCSI hosts to assign, select the host from the list and repeat.
7. Click **Ok** to initiate the reconfiguration, which will take the affected partitions offline and re-assign LUNs. Reconfigure the hosts as necessary.

Related Topics

- SCSI Host Connection
  Configure the library to support specific SCSI host applications.
- Add, Modify, or Delete a SCSI Host
  Normally, the library automatically detects SCSI hosts connected to the SAN. However, you can manually add, modify, rename, or delete SCSI hosts as needed.
- View the SCSI LUN Mapping
  View the LUN mapping of SCSI hosts in a partitioned library.
- View Actively Logged-In SCSI Hosts
  View actively logged in hosts, see which ports the hosts are connected to, and view the LUN assignment of the hosts.

- View the Host Connections of a Partition
  View which hosts are connected to a particular partition.

View the Host Connections of a Partition

View which hosts are connected to a particular partition.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click the **Partitions** tab.
3. Select a partition in the list. From the **Actions** drop-down (or right-click menu), select **Properties**.

Related Topics

- SCSI Host Connection
  Configure the library to support specific SCSI host applications.
- Assign Partitions to a SCSI Host and Alter LUN Assignment
  Assign a partition to a SCSI host to give the host the ability to use resources within the partition.

Place a Partition Online or Offline

An offline partition rejects all client requests. Partitions automatically go offline during partitioning and SCSI host configuration changes. However, you can manually change the partition state when necessary.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click the **Partitions** tab.
3. Select the partition.
4. From the **Actions** drop-down (or right-click menu), select **Go Online** or **Go Offline**.

Why is there a Default Partition in a "Non-Partitioned" Library?

All resources (drive bays, storage cells, and CAPs) within the SL4000 library must always be contained within at least one partition. Therefore, at a minimum there is always a default partition.

In a non-partitioned library (meaning a library with partitioning disabled), there is a single default partition that contains the entire library. Initially, this partition is named "DefaultPartition", but you can rename or edit its partitioning attributes at anytime.

Related Topics

- Edit a Partition
  Edit the partition attributes to make changes to the partition name and settings. This does not change the resources assigned to the partition.

Why is there a Media Validation Partition?

By default there is always a Media Validation partition (even in a library with partitioning disabled). You cannot delete or rename the Media Validation partition.

The Media Validation partition dedicates drives for validating the integrity of tapes. Initially the partition is empty and contains no resources. You must add supported media validation drives to the partition to enable media validation.

Related Topics

- Media Validation
  Validate the integrity of tape cartridges using the media validation (MV) feature.
- Media Validation
  Validate the integrity of tape cartridges using the media validation (MV) feature.
- Add or Remove Drives from the Media Validation Partition (Pool)
  Dedicate drives to a special Media Validation partition containing T10000C/D or IBM LTO6+ drives. These drives are reserved for media validation requests only.

What Occurs When You Disable Partitioning

Disabling partitioning causes the library to move resources and set SCSI LUNs.

After deactivating partitioning in the library settings, the library:

- Moves everything into a single default partition and deletes all other partitions.
- Moves all CAPs into a single DefaultPool owned by the DefaultPartition and deletes all other CAP pools.
- Deletes all SCSI LUNs greater than zero from all SCSI hosts and assigns SCSI LUN zero on each host to the default partition.

What Occurs to Partitions When the Physical Configuration Changes

In a partitioned library, changing the physical configuration causes the library to adjust the partitioning configuration to handle the newly added or removed cartridge and drive slots.

When the physical configuration changes, the library will:

- Remove storage cells and drive bays that no longer exist from the partition they were in.
- Remove CAPs that no longer exist from the CAP pool they were in.
- Place new storage cells and drive bays into a newly created partition (the library does not assign a CAP pool or SCSI hosts to this new partition).
- Place new CAPs into a newly created CAP pool (the library does not assign this CAP pool to a partition).

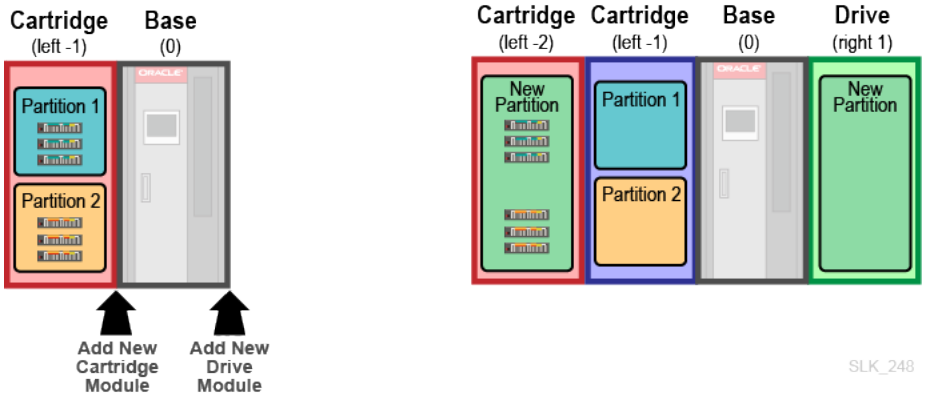
The library will assume that all configuration changes occur at the ends of the library, even if you add a module to the middle. For example:

- **Initial configuration** — Cartridge (left -1), Base (0)

- **New configuration** — Cartridge (left -2), *new Cartridge (left -1)*, Base (0), *new Drive (right 1)*

Even though you install the new Cartridge Module between the old Cartridge Module and Base Module, the library assumes that the old Cartridge Module (now left -2) is the new module, since it is closer to the end. The library places cells in Cartridge (left -2) into a new partition. The library partitions the newly added Cartridge (left -2) the same as before. The library assumes that the Drive Module is new, so it places all storage cells and drive bays into the new partition.

Figure 10-1 Example Configuration Change with Partitioning



11

SCSI Host Connection

Configure the library to support specific SCSI host applications.

Configuration and Mapping

- Add, Modify, or Delete a SCSI Host
- View the SCSI LUN Mapping
- View Actively Logged-In SCSI Hosts
- View the SCSI Element IDs
- SCSI Element Addressing

Partitioning

- Assign Partitions to a SCSI Host and Alter LUN Assignment
- View the Host Connections of a Partition

Fibre Channel Ports

- Behavior of an Unavailable Fibre Channel Port
- Is the FC connection working? There is no LINK light.

Add, Modify, or Delete a SCSI Host

Normally, the library automatically detects SCSI hosts connected to the SAN. However, you can manually add, modify, rename, or delete SCSI hosts as needed.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click the **SCSI Host Configuration** tab.
3. Click **Add**, or select a SCSI host and then click **Modify** or **Delete**. You can only delete a host if it is currently logged out.
   - **Host Alias** - limited to 64 characters
   - **World Wide Name** - 16 characters (8 byte) hexadecimal fields not prefixed with "0x" (for example B97F877BF079F405)

Related Topics

- Assign Partitions to a SCSI Host and Alter LUN Assignment
  Assign a partition to a SCSI host to give the host the ability to use resources within the partition.
- View the Host Connections of a Partition
  View which hosts are connected to a particular partition.
- View the SCSI LUN Mapping
  View the LUN mapping of SCSI hosts in a partitioned library.

- View Actively Logged-In SCSI Hosts
  View actively logged in hosts, see which ports the hosts are connected to, and view the LUN assignment of the hosts.

View the SCSI Element IDs

Each cell within the library has a unique element ID used for SCSI.

1. Hover over a cell on the **Library** cell map. The SCSI ID shows in the tooltip.
2. Or, view the **Drives** table or **Cells/Tapes** table "SCSI element ID" column.

Related Topics

- View the Cell Map
  Use the cell map to view the current location of tapes and drives in the library.
- View the Drives Table
  The drives table displays drive information such as state, SCSI element ID, IP address, serial number, and WWN.
- View a List of All Cells in the Library
  Display a list of all cells in the library to view their current contents and properties.

View the SCSI LUN Mapping

View the LUN mapping of SCSI hosts in a partitioned library.

In a non-partitioned library, all hosts are automatically connected to the default partition on LUN 0. After configuring partitioning, you can alter the LUN assignment and assign multiple partitions to each host.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click the **SCSI Host Configuration** tab.

> **Note:**
>
> Users with service roles will see additional columns in this table to help diagnose SCSI connectivity issues.

Related Topics

- Assign Partitions to a SCSI Host and Alter LUN Assignment
  Assign a partition to a SCSI host to give the host the ability to use resources within the partition.

View Actively Logged-In SCSI Hosts

View actively logged in hosts, see which ports the hosts are connected to, and view the LUN assignment of the hosts.

1. Click **Partitioning** in the left navigation area of the GUI.
2. Click the **Active SCSI Hosts** tab. The table only shows host that are actively logged into the library.

3. To view the LUN assignment, select a host and then click **Show LUNs** .

Related Topics

- View the SCSI LUN Mapping
  View the LUN mapping of SCSI hosts in a partitioned library.
- Assign Partitions to a SCSI Host and Alter LUN Assignment
  Assign a partition to a SCSI host to give the host the ability to use resources within the partition.
- View the Host Connections of a Partition
  View which hosts are connected to a particular partition.

Behavior of an Unavailable Fibre Channel Port

The FC Port 2 of the library controller is initially unavailable and only supported a limited set of commands until you activate it with a hardware activation file.

The library controller comes standard with two FC ports (1 and 2). By default only port 1 is fully active (available). Port 2 is unavailable until you install the Redundant Control Paths (multi-port) hardware activation file.

The library can receive commands on an unavailable port. However, the unavailable port only fully supports `Inquiry`, `Report LUNs`, `Report Target Port Groups`, and `Request Sense`. For all other commands, the library terminates the command with `Check Condition` status and sets the sense key to `Not Ready, Logical Unit Not Accessible, Target Port in Unavailable State`.

For more information see the *SL4000 SCSI Reference Guide*.

Related Topics

- Add or Remove Optional Library Features
  After purchasing a feature (such as tape capacity or multi-port networking), you must download the hardware activation file and then upload it to the library before you can use the feature.
- Library Controller (LOC)
  The library controller is the main controller card in the library.

Is the FC connection working? There is no LINK light.

The Fibre Channel ports on the Library Controller card do not have lights to indicate there is a link. Use the GUI to see if they are connected to the host.

1. Click **Hardware** in the left navigation area of the GUI.
2. Click the **FC Ports** tab.
3. If a host is currently connected, the port **Link State** will be **Up**.

> **Note:**
>
> By default only FC port 1 is fully active (available) and can receive all supported SCSI commands. You must install the Redundant Control Paths (multi-port) activation file to fully activate port 2.

Related Topics

- Behavior of an Unavailable Fibre Channel Port
  The FC Port 2 of the library controller is initially unavailable and only supported a limited set of commands until you activate it with a hardware activation file.

12

Operate the Library

Host applications generally manage most library operations. However, you can use the GUI to manage and operate the library as needed.

Turn the Library On/Off

- Set the Library Online or Offline
- Turn Off the Library
- Turn On the Library
- Restart the Library or Reboot Library Operating System

Manage Tape Cartridges

- Move or Mount a Tape Cartridge
- Enter Tapes Through a CAP
- Eject Tapes Through a CAP
- Import/Export Tapes in System Cells
- Lock or Unlock a CAP

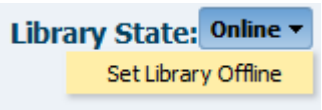
Manage Drives

- Force a Drive to Unload a Tape Cartridge
- Set a Drive Online or Offline
- Turn a Drive On or Off
- Reset a Drive (Power Cycle the Drive)
- Manually Clean a Drive

Set the Library Online or Offline

An offline library will not receive an operation requests from hosts.

1. Stop any host activity before taking the library offline. An offline library is unavailable to hosts, therefore taking the library offline is disruptive to host operations.
2. Click **Online** or **Offline** in the upper right corner of the GUI.
3. Change the library state.



> **Note:**
>
> If there are jobs in-process when you take the library offline, the library will remain in a "going offline" state until it completes the jobs, and then transition to "offline".

Turn Off the Library

Turn off the library to completely power down the system.

1. Stop any host activity. Ensure all library requests have completed.
2. Click the power button in the upper left of the GUI.

> **Note:**
>
> Powering down the library will interrupt all host jobs. If you shut off power to the library without performing the following procedure, you risk possible equipment damage, tape damage, and loss of data.

3. Select **Power Down Library**.
4. Optionally, select settings "Bypass audit" or "Probe for configuration" when the library turns on.

> **Note:**
>
> You must select "Probe for configuration changes" if you plan to add or remove modules, drive arrays, or CAPs.

   - **Bypass audit if door opened with power off** – Normally, if a door opens while the library is off, the library will run a full audit when it resumes operation. However, if you plan to enter the library while it is off, but will not move any tape cartridges, then you can enable this option to bypass the full audit. This is also known as "suppress HBO" (suppress Has Been Opened). Only select this option if you are not going to add, remove, or move any tapes or drive trays.
   - **Probe for physical configuration changes upon next restart** - The robot will scan the module identification blocks during startup and perform a full audit. You must select this option when modifying the physical configuration. The probe only occurs on the initial restart after you select this option. Then, this option resets, so that subsequent restarts will not probe for configuration changes.

5. Click **Power Down**. The library operator panel will go black once the power down sequence completes.
6. Turn off the breaker on all PDUs at the bottom-rear of the Base and Drive Modules.

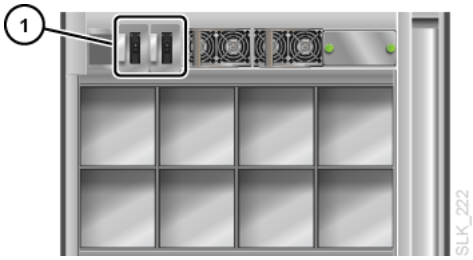
Related Topics

- View Library Requests, Jobs, and Resources
  Use the Requests page to monitor all requests to the library and to view the resulting jobs created by the library to handle the requests.
- What Occurs to Partitions When the Physical Configuration Changes
  In a partitioned library, changing the physical configuration causes the library to adjust the partitioning configuration to handle the newly added or removed cartridge and drive slots.

Turn On the Library

Turn on the library to start initialization.

1. Open the rear doors of the Base Module (and any Drive Modules if present).
2. If necessary, turn on the rail controller modules at the top of the Base module.



3. Turn on the breaker for all PDUs.

> **Note:**
>
> You can turn on the PDU and rail controller breakers in any order. However, you must turn on all breakers within two minutes of turning on the first breaker.

4. The initialization sequence will begin. If someone opened an access door while the library was off, the library performs a full audit (unless you selected bypass audit in the settings before turning off the library).

Related Topics

- Configure Library Settings
  Library settings include the library name, partitioning activation, initialization settings, volume label format, and HTTP listening port settings.

Restart the Library or Reboot Library Operating System

Restarting the library can sometimes help troubleshoot library issues. Note that this does not power cycle the library.

1. Click the power button in the upper left of the GUI.
2. Select an option. Neither option power cycles the library.
   - **Restart the Library** — completely stops and restarts the library controller.
   - **Reboot Library OS** — only restarts the operating system, it does not completely restart all library systems. This option generally takes a shorter amount of time.

> **Note:**
>
> If you bypass the audit, the contents of the library must not change. The library will not perform an audit when it initializes.

3. Click **Restart**.
4. You will be logged out of the GUI, wait until the library initializes to log back in.

To power cycle the library, see:

- Turn Off the Library
- Turn On the Library

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Monitor the Library

Use the GUI to monitor the status the library, devices, jobs, and requests. Configure notifications to have external applications monitor the library.

Library and Device Status

- View the State of the Library, Devices, and Partitions in the Status Bar
- View Hardware Device Status
- View a Graph of Device Telemetry Data
- View the Inside of the Library Using the Web Camera
- Set the Control State of a Device Online or Offline

Jobs, Requests, and Events

- View Library Requests, Jobs, and Resources
- Cancel a Library Request or Job
- View a List of Library Events
- Monitor Validation Progress

Notifications

- Configure Email Notifications
- Configure SNMP Notifications
- Configure Outbound SCI Notifications
- Add an SDP2 Server to Receive ASR Notifications

Logging

- View a System Report
- View a Fault Report
- View or Download a Library Log
- Create, Download, or Delete Support Bundles

View a List of Library Events

View the time and description for the events that have occurred on the library.

1. Click **Activity** in the left navigation area of the GUI.
2. Click the **Events** tab.

Related Topics

- Alerting Event Types
  Library events are grouped into categories. When an event occurs, the library sends a message to all destinations configured to receive that event category.

View the State of the Library, Devices, and Partitions in the Status Bar

The status bar displays the overall library state which automatically updates based on the status of devices within the library.

1. Look at the status bar near the top of the GUI.
2. The indicator shows the current library state and the number of devices and partitions in each state.
3. Click the library state in the status bar to display the current Library Condition Indicators and note any offline or inoperative devices.

Library States

The library status indicates the current library state. The state is a summary of all devices within the library.

- **Starting Up** — the library will be in this state immediately after powering on or restarted. The library is waiting for devices to "announce" their presence. If the library remains in "Starting Up" state for more than a few minutes, click the library state to see what the library is waiting for.
- **Initializing** — the library is initializing the robots.
- **Operative** — the library is fully operational.
- **Operative, Partially Online** — the library is operational, but some devices are in an offline state. Click the "Operative, Partially Online" status for a list of offline devices.
- **Degraded** — a device in the library has failed or is offline, but the library can continue to function.
- **Inoperative** — a device has failed and the library cannot function (such as a failed robot in a single robot configuration).

Partition and Device States

Each partition and device within the library has a state displaying its current status.

Device Status — In the status bar, clicking the device count adjacent to the indicator takes you to the hardware device tree. The device counts in the status bar include all devices but not modules, while the device counts in the device tree include modules. Therefore, the device counts in the status bar and device tree will differ slightly.

Partition Status — In the status bar, clicking any of the partition counts takes you to the partition page where you can filter or sort by control or operational state.

Status Indicators:

- **Operative** — the device/partition is operating properly. A device is operative if the library can fully use the device, its control state is online, and its operational state is operative.

- **Offline** — the device/partition is in the offline control state.
- **Degraded** — a device/partition has failed, but the library can continue to function.
- **Inoperative** — a device/partition has failed causing the library to not function.

Related Topics

- View Hardware Device Status
  Display status information for all devices in the library. Use this to verify that devices are running correctly.
- Partitioning
  Library partitioning is an optional feature that divides library resources (drive bays, storage cells, and CAPs) into smaller subsections to allow different hosts to independently use a portion of the library.

View Hardware Device Status

Display status information for all devices in the library. Use this to verify that devices are running correctly.

1. Click **Hardware** in the left navigation area of the GUI.
2. Select a tab:
   - **Device Status Tree** tab - shows a hierarchal device tree for all devices in the library. The library cannot populate the device tree while in "Starting Up" state. Select a viewing option for the device tree:
     - **All Devices button** - shows all installed devices (default view)
     - **Faulted Devices button** - shows only the devices in a troubled state
     - **All Locations button** - shows all installed devices, plus empty location where a device could be installed (for example an unoccupied drive bay)

     > **Note:**
     >
     > Right-click in the device tree, and then use "Collapse", "Collapse All Below", "Expand", or "Expand All Below" to view specific portions of the device hierarchy.

   - **All other tabs** - show devices of that type in table format. These tabs may be incomplete if the library is in "Starting Up" state.

Related Topics

- Partition and Device States
  Each partition and device within the library has a state displaying its current status.

View Library Requests, Jobs, and Resources

Use the Requests page to monitor all requests to the library and to view the resulting jobs created by the library to handle the requests.

Every external command to the library (SCSI, SCI, GUI, SNMP, GET) and many internal actions will result in a request. As the library executes requests, it generates "request output messages" which describe the actions taken by the library or any errors encountered. You can view theses messages in the GUI.

Some library requests generate jobs. For example, moving a tape from one cell to another would generate a parent "Move" job and two sub-jobs: "Fetch" and "Put". Jobs allocate cells, devices (robots, drives, and so on), and rail segments. Only one job at a time can use each resource. Use the Jobs and Resources page to monitor library activity.

1. Click **Activity** in the left navigation area of the GUI.
2. Click the **Requests** tab, **Jobs** tab, or the **Resources** tab.
3. To view more information: Select a row in the table, and then from the **Actions** drop-down (or right-click menu), select **Details**.

   For Requests, the Details screen shows several tabs:

   - **Details** - summary of detailed information about the request.
   - **Output Messages** - the list of request messages generated as the library processed the request
   - **Log Messages** - (selected roles only) log message that references the request.

   For Jobs, you can select **Request Details** to view information about the parent request that spawned the job. If a **Download** button is present, then you can save the entire Details or open it in an application.
4. To only view active requests or jobs, filter for 'Active' in the Status column.

Related Topics

- Cancel a Library Request or Job
  Cancel requests that are in the "Active" or "Submitted" state.
- Search and Sort Tables
  Search and sort the tables in the GUI to clarify data.

View a Graph of Device Telemetry Data

Some devices in the library periodically collect time-stamped measurements. View a graph of the telemetry data to analyze device performance.

1. Click **Hardware** in the left-navigation area of the GUI.
2. Select a device from the device tree. You can view telemetry for the following:
   - Library Controller
   - Robot
   - Drive

- Root Switch
- Drive Switch
- Fan assembly
- DC power controller

3. Use the **Actions** drop-down (or right-click menu) to select **Device Telemetry**, and then select a type of measurement.
4. By default, the graph shows the past three days of telemetry data. Adjust this time span by clicking the buttons above the graph.
5. For further analysis of telemetry data, you can download the graph's source data in CSV format, and then import the data into a graphing application of your choice.

Related Topics

- Telemetry Measurements
  The library collects various device telemetry data that you can use to monitor library performance.

Telemetry Measurements

The library collects various device telemetry data that you can use to monitor library performance.

Telemetry data can be a running total (such as robot and CAP operational data) or show an instantaneous value for a point in time (such as temperature or fan speed). Running totals reset after each library startup.

Robot Measurements

The robot tracks gets and puts of tape cartridges.

- **Gets** - running total of gets performed by robot
- **Get Retries** - running total of retries performed during gets
- **Failures** - running total of failures during gets
- **Puts** - running total of puts performed by robot
- **Put Retries** - running total of retries performed during puts
- **Put Failures** - running total of failures during puts

CAP Measurements

The library collects CAP measurements for both rotational and Access Module CAPs.

- **Operations** - running total of open and close operations performed by CAP
- **Retries** - running total of retries
- **Unrecoverable Errors** - running total of unrecoverable errors for the CAP (typically zero or one because an unrecoverable error requires replacement)
- **Reboots** - running total of CAP restarts (typically just one at library startup, but this can be higher if you replace the CAP controller card while the library is running)

Library Energy Measurements

Each PDU in the library has a single sensor that collects the energy draw and energy consumption for the PDU. Total power consumption is the sum of all PDU energy usage in the library.

- **Kilowatts** - average power draw over measurement period, in KW
- **Kilowatt hours** - energy consumption over measurement period, in KW-hours
- **Duration** - measurement period

Device Power Measurements

Some devices contain "hot swap controller chips" that collect the energy draw and energy consumption for the device and any downstream components.

- **Input Voltage** - input DC voltage to the device in volts.
- **Watts** - power draw in watts at the time of measurement
- **Input Amps** - input current to the device in amps.

Devices monitored in the Base card cage:

- Library controllers
- Feature cards
- Root switches, which each have a 12V input sensor and a 48V power sensor for the web camera
- Fan assemblies
- Storage hard drives
- Video card

Robot-related devices monitored:

- Rail controller, which has an input sensor to the rail controller and an input sensor to the rail
- Robot controller, which captures input to the robot controller and robot, including all mechanical mechanisms

Drive-related devices monitored:

- Drive switches
- Drive controller which captures input to the drive tray (including power for the drive controller, fans in the drive tray, tape drive and encryption card, if present)

Access Module devices monitored:

- Access module controllers which capture the input to the Access Module (including power for access module controller and the mechanical mechanisms in the module)

Other devices monitored:

- Rotational CAPs (rotary)

Network Statistics Measurements

Ethernet switches and some device controllers in the library collect a running total of network performance data.

The root and drive switches collect data infrequently due to the high number of ports, about every 10 to 20 minutes. The rail, robot, drive, and Access Module controllers collect data every few minutes. Each device has multiple sensors that represent the network ports on that device that link to another device. The sensor names reflect the destination of the link.

- **Port Speed** - speed at which the port is running.
- **Transmit Bytes** – bytes transmitted by the port.
- **TX Dropped Packets** – transmit packets dropped by the port due to lack of resources or internal MAC sublayer transmit error.
- **TX Collisions** – collisions experienced by a port during packet transmissions.
- **TX Pause Events** – PAUSE packets transmitted on the port.
- **Receive Bytes** – bytes of data received by the port.
- **RX Dropped Packets** – packets received by a port that were dropped due to lack of resources. This increments only if the receive error was not counted by the RX Alignment Errors or the RX FCS Errors counters.
- **RX Pause Frames** – PAUSE packets received by a port.
- **RX Alignment Errors** – packets received by a port that have a bad FCS with a nonintegral number of bytes.
- **RX FCS Errors** – packets received by a port that have a bad FCS with an integral number of bytes.
- **RX Symbol Errors** – Number of times a valid length packet was received at a port and at least one invalid data symbol was detected.

Devices that record network statistics:

- Access Module controller
- Drive controller
- Drive switch
- Rail controller
- Robot controller
- Root switch

Fan Measurements

The library monitors fan speed and performance.

- **Performance** - an overall assessment of the fan's health based on comparing the measured fan speed to the expected speed. The actual speed may be higher or lower than the expected speed.
  - **GOOD** — measured speed is within 15% of the expected speed.
  - **MARGINAL** — measured speed is between 15% and 20% of the expected speed.
  - **POOR** — measured speed is more than 20% away from the expected speed.

  - **UNSTABLE** — the fan speed cannot be measured accurately
  - **NO_READING** — the fan performance cannot be determined at the time of the measurement.
- **Speed** - actual fan speed in RPM at the time of the measurement

Devices that record fan measurements:

- Drive controller (up to three fans, depending on drive type)
- Fan assembly (four fans)

Temperature Measurements

The library measures the temperature of most controllers in the card cage.

- **Temperature** - in degrees Celsius at time of measurement

Devices that record temperature:

- Library controllers (two sensors)
- Robot controllers (two sensors)
- Drive controllers
- Root switches (two sensors)
- Drive switches
- Access Module controllers
- DC convertors (two sensors).

View the Inside of the Library Using the Web Camera

The web camera is an optional feature installed on the inside of a Base or Drive Modules used to view library operations. This can be useful to view the tape drives without opening the library door.

1. Click **Hardware** in the left-navigation area of the GUI.
2. Click the **Cameras** tabs.

> **Note:**
>
> If library contains cameras but they are not showing up in the list, from the **Actions** drop-down select **Detect Cameras**.

3. Select the camera from the list, and then use the **Actions** drop-down (or right-click menu) to select **View**  .
4. Use the arrow buttons  to move the camera's field of view or click **Reset** to center the camera straight forward.

Cancel a Library Request or Job

Cancel requests that are in the "Active" or "Submitted" state.

1. Click **Activity** in the left navigation area of the GUI.
2. Click the **Requests** tab or the **Jobs** tab.
3. Select a request or job. To select multiple, ctrl-click or shift-click.
4. From the **Actions** drop-down (or right-click menu), select **Request Cancel** (for requests) or **Cancel Parent Request** (for jobs).

Cancellation is not immediate

After you cancel a request, the library completes all in-progress robot operations and attempts to leave itself in a consistent state.

For in-progress moves, the library returns the tape to the source cell, if possible. For canceled diagnostic tests, the library attempts to return the tape to the cell it started in before the diagnostic began.

Related Topics

- View Library Requests, Jobs, and Resources
  Use the Requests page to monitor all requests to the library and to view the resulting jobs created by the library to handle the requests.
- Search and Sort Tables
  Search and sort the tables in the GUI to clarify data.

Set the Control State of a Device Online or Offline

An offline device is unavailable to hosts. Take a device offline before removing it from the library.

1. Click **Hardware** in the left navigation area of the GUI. Locate the device in the device tree.
2. Select the device and then from the Actions drop-down (or right-click menu) select **Control State**, and then click **Go Online** or **Go Offline**.

> **Note:**
>
> Some devices (such as drives and robots) will complete in-process jobs before going offline. When this occurs, the GUI indicates "offline pending" for the device.

What's the Difference Between Control State and Location State?

The control state indicates the current online or offline state of the device. The location state (either Bring Online or Keep Offline) determines whether the library should bring the device in that slot online when you insert a new device or when the library powers on.

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Notifications - Email, SNMP, SCI, or ASR

The library can send notifications to external destinations when certain library events occur.

The library supports four destination types: Outbound StorageTek Library Control Interface (SCI), Simple Network Management Protocol (SNMP), Email, and Automatic Service Requests (ASR). Each destination type uses a specific protocol and requires destination-type specific information, such as IP addresses, email addresses, and credentials.

Alerting Event Types

Library events are grouped into categories. When an event occurs, the library sends a message to all destinations configured to receive that event category.

In the table below, x denotes that the destination type supports the event category.

Event Category	Events Included	Email	SNMP	SCI	ASR
Fault	Fault detected.	x	x	x	x
Cartridge_movement	Tape moved between storage cells, tape mounted, tape dismounted.	x	-	x	-
Media_validation	Media validation partition modified, validation data notification (sent one minute after media validation starts and then every 10 minutes)	x	-	x	-
Device	Device state changed, device removed, device failed, and device fault detected.	x	x	x	x
Door	Door opened, door closed, and audit completed.	x	x	x	-
Cap	CAP ownership overridden, CAP ready to open, CAP opened, CAP closed, and audit complete.	x	-	x	-
Partition	Partition change. Generally, any partitioning changes involve at least two partitions, because the commands that change partitions move cells and drives from one partition to another.	x	-	x	-

Event Category	Events Included	Email	SNMP	SCI	ASR
Cleaning_required	Drive needs cleaning by an application. The library does not send this call if library auto-cleaning is enabled.	x	-	x	-
Library	Library or rail state changed, capacity changed, library audit completed, and lost cartridge found.	x	x	x	x
Heartbeat	Heartbeat stopped.	-	-	x	x
Test	Test notification sent by library.	x	x	x	x

Configure Email Notifications

The library can send email notifications if you configure an SMTP server and set email recipients.

- Configure the SMTP Server
- Configure Email Recipients
- Test an Email Notification
- Add a Recovery Email Address to Your User Id

Configure the SMTP Server

Provide the library with SMTP server information so that it can use the server to send emails.

1. Click **Notifications** in the left navigation area of the GUI.
2. Click **Configure**  under the Email tab.
3. Enter the SMTP information:
   - **Enabled** - Globally enables or disables all email activity for the library (including password recovery emails).
   - **SMTP Host Address** - Enter the email server host address.
   - **From Name** and **From Email Address** - The information that will appear in the "from" fields of the email client. Set short but meaningful values. For example:
     - Name: STK_Alert_YourLibraryName
     - Email Address: STK_Alert@YourLibraryName

     > **Note:**
     >
     > If the recipient is using a spam filter, they should whitelist the library email address to prevent the filter from blocking the emails.

   - **SMTP Protocol** - TCP is open and unauthenticated. SSL and TLS are secure and require a username and password.

4. After making any changes to the SMTP settings, you should add a recipient and send a test email.

Related Topics

- Configure Email Recipients
  The library will send emails to recipients added to the notifications page.
- Test an Email Notification
  Run a test to validate that the email notifications are properly defined. The test sends a message using the configured SMTP server.

Configure Email Recipients

The library will send emails to recipients added to the notifications page.

1. Click **Notification** in the left navigation area of the GUI.
2. Click the **Email** tab.
3. Click **Add**, or select a recipient and then click **Modify** or **Delete**.
   - **Locale** - sets the language of the notification.
   - **Alerting Event Types** - the notification categories that the library should send. You should include the "Test" event for the administrator's email. Then, when you trigger a "Test Notification" through the Notifications Test tab, the administrator will receive an email.

Related Topics

- Alerting Event Types
  Library events are grouped into categories. When an event occurs, the library sends a message to all destinations configured to receive that event category.
- Create a Test Event Alert
  Create a test event to verify all configured notification destinations. Creating a test event only notifies destinations (email, SNMP, SCI, or ASR) that are configured to receive the "test" event type.

Test an Email Notification

Run a test to validate that the email notifications are properly defined. The test sends a message using the configured SMTP server.

1. Click **Notification** in the left navigation area of the GUI.
2. Click the **Email** tab, select a recipient from the list.
3. Click **Test**, and then confirm the test.
4. If SMTP Server has been setup correctly, you will see "Message accepted for delivery".

   If the attempt times out or results in an error, there are other issues with the SMTP configuration, then resolve the issue and retry the test. Try pinging the email server to verify that the library can reach it.

Related Topics

- Create a Test Event Alert
  Create a test event to verify all configured notification destinations. Creating a test event only notifies destinations (email, SNMP, SCI, or ASR) that are configured to receive the "test" event type.

Configure SNMP Notifications

Use Simple Network Management Protocol (SNMP) to monitor the library.

SNMP is an application layer protocol that performs network management operations over Ethernet using the User Datagram Protocol/Internet Protocol (UDP/IP). With SNMP, clients can query the library for information (configuration, operation, statistical) and the library can inform clients of potential problems.

- Configure SNMP Users
- Configure SNMP Trap Recipients
- Test an SNMP Recipient
- Download the MIB File

Configure SNMP Users

Define an SNMP user if your SNMP manager will perform GET requests against the library.

1. Click **Notification** in the left navigation area of the GUI.
2. Click the **SNMP Users** tab.
3. Click **Add**  , or select a user and then click **Modify**  or **Delete**  .
   - **Authentication Protocol** - Choose SHA for best security or MD5 for compatibility with systems that use MD5. Enter an authentication password.
   - **Privacy Protocol** - Choose NONE, AES, or DES. Select AES (Advanced Encryption Standard) for best security or DES (Data Encryption Standard) for compatibility with systems that use DES. Enter a privacy password for AES or DES.

Requirements:

User Name

- Must be 1 to 32 characters in length.
- Cannot use the following special characters: [space] # % & * ( ) _ = ` [ ] \ " : / { } < > ? | +

Authentication and Privacy passwords

- Must be 8 to 40 characters in length.
- Can use special characters.

Limit for the number of SNMP Users and Trap Recipients defined

- Maximum of 20 for each

Configure SNMP Trap Recipients

Configure the SNMP trap recipient to receive trap notifications sent by the SNMP agent on the library.

1. Click **Notification** in the left navigation area of the GUI.
2. Click the **SNMP Trap Recipients** tab.
3. Click **Add**  , or select a recipient and then click **Modify**  or **Delete**  .
   - **Host address** - the IP address of the management host that will receive the trap.
   - **Alerting Event Types** - the notification categories that the library should send. You should include the "Test" event for each recipient so that you can test the configuration.
   - **Authentication Protocol** - Choose SHA for best security or MD5 for compatibility with systems that use MD5. Enter an authentication password.
   - **Privacy Protocol** - Choose NONE, AES, or DES. Select AES (Advanced Encryption Standard) for best security or DES (Data Encryption Standard) for compatibility with systems that use DES. Enter a privacy password for AES or DES.
   - **Engine ID** - In most cases, accept the default value. If you must override this value, enter a hexadecimal value that starts with 0x and does not contain either all zeroes (0) or all sixteens (F).

Requirements:

User Name

- Must be 1 to 32 characters in length.
- Cannot use the following special characters: [space] # % & * ( ) _ = ` [ ] \ " : / { } < > ? | +

Authentication and Privacy passwords

- Must be 8 to 40 characters in length.
- Can use special characters.

Limit for the number of SNMP Users and Trap Recipients defined

- Maximum of 20 for each

Related Topics

- Alerting Event Types
  Library events are grouped into categories. When an event occurs, the library sends a message to all destinations configured to receive that event category.
- Test an SNMP Recipient
  Run a test to validate that the SNMP recipients are properly defined. The test sends a test trap (level 13) to the recipient.

Test an SNMP Recipient

Run a test to validate that the SNMP recipients are properly defined. The test sends a test trap (level 13) to the recipient.

1. Click **Notification** in the left navigation area of the GUI.

2. Click the **SNMP Trap Recipients** tab.
3. Select a destination.
4. Click **Test**, and then confirm the test.

Related Topics

- Create a Test Event Alert
  Create a test event to verify all configured notification destinations. Creating a test event only notifies destinations (email, SNMP, SCI, or ASR) that are configured to receive the "test" event type.

Download the MIB File

The management information base (MIB) is an ASCII text file containing the object identifiers (OIDs) that define the characteristics of a managed device (the library).

When a manager requests information, or a managed device generates a trap, the MIB translates the numeric strings into readable text that identifies each data object within the message.

1. Click **Notification** in the left navigation area of the GUI.
2. Click the **SNMP Users** tab.
3. Click **Download MIB File**.

Configure Outbound SCI Notifications

Use the Outbound StorageTek Library Control Interface (SCI) to monitor the library.

SCI messages will be sent to clients registered as listeners. Sending an outbound SCI message is similar to sending an SNMP trap.

- Configure the Library to Send Outbound SCI
- Configure the Destination to Receive SCI Notifications and Implement the WSDL
- Test a SCI Destination
- Manually Configure the SL4000 to Send Outbound SCI to STA

See Also:

- *SL4000 SCI Reference Guide*

Configure the Library to Send Outbound SCI

Configure the client information and set the types of SCI messages the library should send.

1. Click **Notifications** in the left navigation area of the GUI.
2. Click the **SCI** tab.
3. Click **Add**, or select a destination and then click **Modify** or **Delete**.
   - **Username and password** - optional depending on the security policy of the client
   - **IP address, port number, and URL** - enter the client information

- **Retention Time Limit** - the amount of time (in hours) the library will store outbound messages when a destination is unavailable. The library will periodically attempt to send pending messages to the destination. The library deletes any pending messages it cannot send within the retention time limit.
- **Alerting Event Types** - the notification categories that the library should send. You should include the "Test" event so that you can test the SCI destination configuration.

Related Topics

- Alerting Event Types
  Library events are grouped into categories. When an event occurs, the library sends a message to all destinations configured to receive that event category.
- Test a SCI Destination

Configure the Destination to Receive SCI Notifications and Implement the WSDL

At a minimum, you must configure the destination to use SSL/TSL for the library connection.

If you added a username and password when configuring the destination on the library, it sends the credentials as a username/password token in the SOAP headers of the messages.

The library sends outbound SCI messages using a WSDL interface. An application developer must implement this interface at the destination so that the library can make successful outbound SCI calls.

You can find the WSDL at:

`http://<hostname>:<port>/OutboundWebService/`

- *<hostname>* is the hostname of the library in your DNS.
- *<port>* is the port you have configured for the library. The default port number is 80.

The developer must implement the outbound SCI interface methods so that these calls return quickly by capturing the data sent on the call and then returning the call immediately. The application should wait to process data until after returning the call.

Test a SCI Destination

Run a test to validate SCI destinations are properly defined. The test sends a "test" event message to the destination.

1. Click **Notifications** in the left navigation area of the GUI.
2. Click the **SCI** tab.
3. Select a destination.
4. Click **Test** ✔, and then confirm the test.

Related Topics

- Create a Test Event Alert
  Create a test event to verify all configured notification destinations. Creating a test event only notifies destinations (email, SNMP, SCI, or ASR) that are configured to receive the "test" event type.

Manually Configure the SL4000 to Send Outbound SCI to STA

STA automatically configures the outbound SCI connection. However, if there are SCI connections issues you may need to manually configure the connection.

1. STA automatically configures OSCI when you add the SL4000 to the Monitored Libraries table within the STA interface. Only perform this procedure if you are troubleshooting a connection issue.
2. Sign in to the SL4000 GUI.
3. Click **Notifications** in the left navigation area.
4. Click the **SCI** tab.
5. Click **Add**  .
   - **Protocol** - Select https.
   - **Username and password** - Credential information for an STA user account to be used by the SL4000 to communicate to STA using outbound SCI.
   - **IP address** - Enter the IP address for the STA server.
   - **Destination Port** - Set to 7026.
   - **Destination URL** - Set to /Oyapi/OutboundWebServicePort
   - **Retention Time Limit** - Set to 24 hours.
   - **Alerting Event Types** - Select "All"

Add an SDP2 Server to Receive ASR Notifications

If you are using a local Service Delivery Platform 2 (SDP2) server, the library can send Automatic Service Requests (ASRs) to Oracle.

For more information, refer to the SDP documentation.

Add the ASR Destination

Add the ASR destination and add the SDP2 server information.

1. Click **Notifications** in the left navigation area of the GUI.
2. Click the **ASR** tab.
3. Click **Configure**  .
4. Select **Enabled**. Enter the SDP2 server information. Select the network interface to use to communicate with SDP2, and then click **Ok**.

Register an ASR Destination

The library can send a test to the ASR destination to help complete the registration.

1. Click **Register and Test ASR Destination**  to begin the client registration. The library automatically fills in the client identifier.
2. See the SDP2 documentation to complete the ASR registration.

View the History of ASR Notification Activity

View a list of when and what ASR notifications have been sent out by the library.

1. Click **Notifications** in the left navigation area of the GUI.
2. Click the **Notification History** tab.

Create a Test Event Alert

Create a test event to verify all configured notification destinations. Creating a test event only notifies destinations (email, SNMP, SCI, or ASR) that are configured to receive the "test" event type.

1. Click **Notifications** in the left navigation area of the GUI.
2. Click the **Test** tab.
3. Click **Test Notifications**.

Related Topics

- Alerting Event Types
  Library events are grouped into categories. When an event occurs, the library sends a message to all destinations configured to receive that event category.
- Test an Email Notification
  Run a test to validate that the email notifications are properly defined. The test sends a message using the configured SMTP server.
- Test an SNMP Recipient
  Run a test to validate that the SNMP recipients are properly defined. The test sends a test trap (level 13) to the recipient.
- Test a SCI Destination

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Logging

The library uses system reports, fault reports, and support bundles to track library activity and issues.

About Logging

Library logging is composed of system reports, fault reports, and support bundles.

What is a System Report?

Jobs and intelligent devices (those with onboard processors) generate system reports when a potential fault has occurred. The library evaluates the information in the system report and attempts to recover from the issue. If the library cannot resolve the issue, it creates a fault report, support bundle, and notification (email, SNMP, outbound SCI, or ASR).

After a job or device generates a system report, the library attempts to recover. The library will either initiate a recovery job or initiate handling of the fault. A typical recovery job will:

- Perform one or more diagnosis tests
- Generate a suspect FRU list and create a final system report indicating the failed device (if a failed FRU is identified)
- Log the status of the diagnosis

What is a Fault Report?

If the library cannot recover from an issue indicated in a system report, it generates a fault report. The report lists the faulted device and log information. Faults also generate a support bundle and notifications (email, SNMP, outbound SCI, ASR).

What is a Support Bundle?

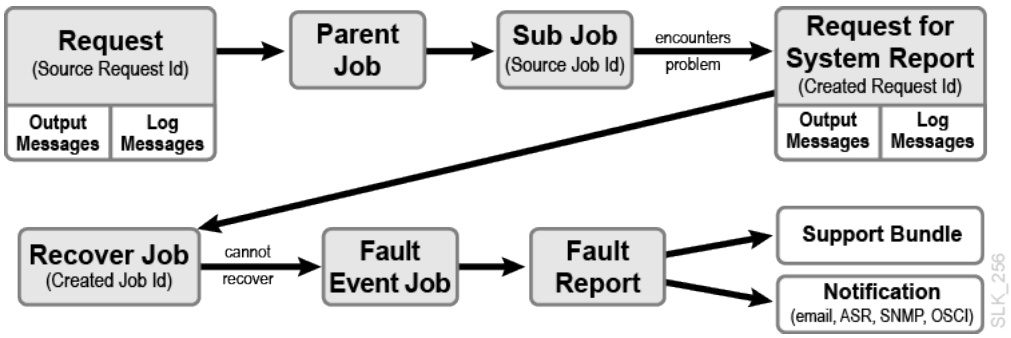
Support bundles contain encrypted log files and database information used for fault diagnosis by Oracle service personnel. The library automatically generates a support bundle when it detects a fault.

Related Topics

- Alerting Event Types
  Library events are grouped into categories. When an event occurs, the library sends a message to all destinations configured to receive that event category.
- View a Fault Report
  View fault report to see corresponding system reports, mark it as reviewed, or downloaded the corresponding support bundle.
- View a System Report
  View the details of a system report to help troubleshoot library issues.
- View Library Requests, Jobs, and Resources
  Use the Requests page to monitor all requests to the library and to view the resulting jobs created by the library to handle the requests.
- Create, Download, or Delete Support Bundles
  Support bundles capture important library data used for troubleshooting. You can manually create, download, or delete the bundles as needed.
- Notifications - Email, SNMP, SCI, or ASR
  The library can send notifications to external destinations when certain library events occur.

Fault Example

A fault creates a system request, fault report, and support bundle. Understanding the fault process can help explain library logging.



In this example, an external client (such as the GUI) creates a request. That request creates a parent job, which creates a sub job. The sub job encounters an issue and submits a request for a system report. The system report generates a recovery job. When the recovery job is unsuccessful, it creates a fault event job which creates a fault report. The fault then generates a support bundle and sends out notifications to any destination registered to receive the fault event category.

The initial request is the "source request", and the sub job that encountered the issue is the "source job". The request submitted by the sub job to create the system report is the "created request". The recovery job is the "created job". Depending on the actions taken by the library to complete the requests, the details about the request may contain output messages and log messages.

View a System Report

View the details of a system report to help troubleshoot library issues.

1. Click **Reports** in the left navigation area of the GUI.
2. Click the **System Reports** tab.
3. Select a report in the table. Use the **Actions** drop-down (or right-click menu) to view additional information.
   - **Source Request Details** — information about the request that spawned the problematic job. If the issue was not a direct result of a request (such as a sudden device failure), there will be no source request or source job information.
   - **Source Job Details**— information about the job that encountered the issue.
   - **Created Request Details** — information about the request made by the problematic job or intelligent device to generate the system report. Every system report will have a created request ID.
   - **Created Job Details** — in some cases, the generation of a system report may create a job to recover from the issue. The created Job Details contains information about the job that was spawned by the system report.

   Some Request Details pages will contain additional tabs that you can use to view more information about the issue.
   - **Output Messages** - the list of request messages generated as the library processed the request
   - **Log Messages** - (selected roles only) log messages that references the request.

View a Fault Report

View fault report to see corresponding system reports, mark it as reviewed, or downloaded the corresponding support bundle.

1. Click **Reports** in the left navigation area of the GUI.
2. Click the **Fault Reports** tab.
3. Select a report in the table. Use the **Actions** drop-down (or right-click menu) to view properties, view the corresponding system report properties, mark as reviewed, or download the corresponding support bundle.

View or Download a Library Log

Library logs can be used to help troubleshoot library issues.

1. Click **Service** in the left navigation area of the GUI.
2. Click the **Library Logs** tab.
3. Select the starting and ending time for the log. You should select a start and end time around a specific event. Enter text to search for (optional). Click **View Log**.

> **Note:**
>
> Viewing hours or days of logs may result in a truncated view and may take multiple minutes to populate. If the GUI viewer truncates the log, download the log to see the entire time period.

4. Optionally, click **Download Log** to save or view the log in an external application. Click **Download All Logs** to create an encrypted ZIP of all log files that you can send to Oracle support.

Analyze the Log

The log may contain diagnostic information that you can use for troubleshooting. The easiest way to analyze the log is to download and open it in a searchable text viewer.

Use the GUI's system reports, fault reports, or jobs page to identify the date/time and deviceId, jobId, or requestId relating to the issue. Then, search the log for that ID. For example, if the GUI indicates the library rail is inoperative and the rail has a deviceId of 38, you might search for "`deviceId: 38`" and review any log entry relating to that device for clues on the issue.

Create, Download, or Delete Support Bundles

Support bundles capture important library data used for troubleshooting. You can manually create, download, or delete the bundles as needed.

The library automatically generates a support bundle when it detects a fault. However, you can create a support bundle at any time. The bundle only captures recent data, therefore you should create the bundle as soon as possible after the event you want to investigate occurs.

1. Click **Reports** in the left navigation area of the GUI.
2. Click the **Support Bundles** tab.
3. Click **Create**  , or select a bundle and then click **Download**  or **Delete**  .

> **Note:**
>
> A new bundle may take time to generate. Click **Refresh**  , and wait until the bundle state is 'Completed' before downloading. You can only create one support bundle at a time.

4. After downloading a support bundle, send it to Oracle.
5. Oracle service personnel can refer to the *SL4000 Installation and Service Guide* for procedures on decrypting these files.

Modify the Logging Levels

Only change the logging level when directed to by Oracle support. Otherwise, leave the logging levels at their defaults.

1. Do not proceed unless directed to by Oracle support.
2. Click **Service** in the left navigation area of the GUI.
3. Click the **Logging Levels** tab.
4. Clicking **Apply Defaults** immediately sets and saves all logging levels to their default values. There is no undo.
5. Select a logging level for each of the library's loggers.
6. Click **Save**.

Logging Level Options

The logging level controls the amount of data collected.

- **SEVERE** — Used only for situations where the library has encountered an unrecoverable error requiring human intervention. Severe level messages usually generate an ASR.
- **WARNING** — Used in abnormal situations where the library has encountered a problem, but does not require immediate human intervention. The library can recover and continue operations.
- **INFO** — Provides a summary of library actions about the specific logger.
- **CONFIG** — Used for logging any change to the library configuration. This can be from a SCI or GUI command (such as changing partitions or reconfiguring the LDAP server) or from a hardware change (such as adding or removing a FRU).
- **FINE** — Used to capture detailed debugging information. 'FINE' is not the default setting for any logger. However, Oracle support can enable 'FINE' to troubleshoot a problem. 'FINE' messages should be infrequent enough to be captured for hours or perhaps days while troubleshooting.
- **INHERITED** — Uses the setting of the parent logger. For example, if deviceInterface.Controller is set to INHERITED, it will have the same logging level as deviceInterface (the parent of deviceInterface.Controller).

Where did the log message or support bundle go?

To prevent running out of storage space on the disk drive, the library rotates (overwrites) older logs, storing a maximum of 500MB of diagnostic log data.

Due to log rotation, some request and job details may no longer have a log messages tab. Similarly, the library keeps the latest ten supports bundles and then removes the oldest once a new one is created. You should copy or download any log information or support bundles as soon after an event as possible.

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Servicing the Library

If there are issues with the library, an Oracle representative may need to service the library.

Access the Library

- Access the Library GUI as a Service User
- Add a Service User
- Open and Go Inside the Library
- Open an Access Module Door by Overriding the Lock

Diagnose an Issue

- Create, Download, or Delete Support Bundles
- View or Download a Library Log
- Ping a Host
- Run a Host Trace Route

Modify the Firmware, Database, File System, or Logging Level

- Block, Allow, or Force Device Firmware Upgrades
- Manage the Library Firmware
- Clear the Database
- Modify the Database
- View and Modify the Library File System
- Modify the Logging Levels

Fix the Op Panel

- Calibrate the Local Op Panel Touch Screen
- Restart the Local Op Panel Touch Screen

Restore Factory Defaults

- Reset the Library to Factory Defaults

Access the Library GUI as a Service User

Oracle service representatives must use the service user role to access the library GUI for troubleshooting.

Service users are created in one of two ways: the library automatically generates a service user after it detects a fault or the administrator manually creates a service user.

When the library detects a fault, it automatically creates a user with the "Service" role and generates an encrypted support bundle which contains the service role key file. The service user automatically expires 72 hours after creation.

If the fault requires more than 72 hours to resolve or requires a higher-level role than "Service", the administrator of the library must create a service user and then provide the key file to Oracle. Oracle service personnel then decrypt the key file, which provides the service user ID and password (see the *SL4000 Installation and Service Guide* for procedures).

Related Topics

- Add a Service User
  If Oracle service needs to access the library for maintenance, the Administrator can create a service user and provide Oracle with the key file. All service users expire 72 hours after creation.
- User Roles
  A user's role determines their access to GUI and SCI functions.

Locate a Failed Device

Use the GUI to locate the device causing the library to be in a "Partially Online", "Degraded", or "Inoperative" state.

1. Click the library state in the status bar to view offline or failed devices.
2. Or, click **Hardware**, followed by the **Device Status** tab, and then click the **Faulted Devices** tab to identify which device is causing the state.

Related Topics

- View the State of the Library, Devices, and Partitions in the Status Bar
  The status bar displays the overall library state which automatically updates based on the status of devices within the library.

Run a Diagnostic Test

Diagnostic tests can help identify issues with the library or components, and verify the installation. Diagnostic tests are typically run by Oracle service personnel.

> **Note:**
>
> You should run diagnostic tests that move tapes one at a time, otherwise a conflict could terminate one or both of the tests.

1. Click **Diagnostics** in the left navigation area of the GUI.
2. Check to see if the diagnostic test you plan to run is disruptive. Before running a disruptive test, stop any host operations and take the library offline.
3. Select a diagnostic test from the list, and then click **Run**  .

> **Note:**
>
> If Run is grayed-out  , you must take the library offline before running the test.

4. Enter the values for the test, and then click **Ok**.
5. To view the progress of the test, click the **Diagnostics Results** tab.

   For detailed test information, select the diagnostic in the list, and then from the **Actions** drop-down (or right-click menu), select **Request Details**. Click the **Output Messages** tab.

Related Topics

- Set the Library Online or Offline
  An offline library will not receive an operation requests from hosts.
- Diagnostic Test Descriptions
  Each diagnostic runs through a different set of tests. Only perform disruptive tests if the library is offline.
- How to Locate Diagnostic Test Values
  Obtain parameters from the GUI to provide required values to run a diagnostic test.

Diagnostic Test Descriptions

Each diagnostic runs through a different set of tests. Only perform disruptive tests if the library is offline.

allCaps (DISRUPTIVE TEST)
Opens and closes all eligible CAPs. A CAP must be empty and closed to be eligible. This test skips any CAPs that are open, opening or closing or that contain cartridges. This test terminates when it reaches iterationCount or the timeLimit, whichever comes first. This test does not physically open the Access Module door. This test overwrites any existing CAP ownership for the duration of the diagnostic. When this diagnostic completes, the library returns ownership to the previous owner.

- **stopOnError** (check box) - If selected, this diagnostic test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. One iteration opens, and then closes each eligible CAP.
- **timeLimit** - Total time limit for the test. Allow approximately 100 seconds per rotational CAP per iteration.

allDrives (DISRUPTIVE TEST)
Mounts and then dismounts a diagnostic tape to each eligible drive in the library. Drives must be empty to be eligible. This test skips any drives containing tapes or any drives that are empty but for which the library has no compatible diagnostic cartridges. This test terminates when it reaches iterationCount or timeLimit, whichever comes first.

- **stopOnError** (check box) - If selected, this diagnostic test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. Each iteration mounts and dismounts a diagnostic tape in each drive.
- **timeLimit** - Total time limit for the test. Allow approximately 25 seconds per drive per iteration.

allLeds
Sets all supported LEDs on all devices to the desiredLedState for the holdTime. Some LEDs do not change state instantaneously, therefore choose a holdTime that is long enough to allow all device LEDs to change state (for example 300 seconds).

- **desiredLedState** - The desired LED test state — LIT, UNLIT, SLOWBLINK, FASTBLINK
- **holdTime** - Duration in seconds that the LEDs remain in the desiredLedState before reverting to their original state.

cellCalibration
Calibrates the robot to a cartridge array or drive. For a cartridge array, specify a cell ID for any cell in the array.

- **deviceId** - ID of robot to calibrate — see Determine a Robot ID.
- **cellId** - A cell ID from the cartridge array to use for the calibration, or the cell ID of the drive — see Determine a Cell ID.
- **isHandFull** (check box) - If selected, the robot picks up a tape before performing the calibration (this may interfere with normal operations if a client application needs the tape while this diagnostic runs). When the diagnostic completes, the robot returns the tape to its original cell. If not selected, the robot hand remains empty for the test.
- **fetchOrPutCellId** - If isHandFull was selected, this parameter is the cell ID that contains the tape to use. If isHandFull was not selected, the library ignores this parameter — see Determine a Cell ID.

customerAcceptance (DISRUPTIVE TEST)

> **Note:**
>
> The library must contain at least 8 tapes in storage cells to perform a complete customer acceptance test.

Runs a series of diagnostic tests to qualify the system after installation, but before customer hand-off. The customer acceptance test does the following in order:

1. Obtains all system versions
2. Obtains all device states
3. Obtains all feature information
4. Sets all supported LEDs on all devices to the desiredLedState for the holdTime. Then returns the LEDs to their original state.
5. Opens and closes all closed and empty CAPs
6. Moves a tape into or out of each corner of the library (8 total).
7. Mounts and dismounts a diagnostic tape on all drives if the library contains a compatible diagnostic tape for that drive type
8. Moves a tape from a system cell into each of the first and last cell of every CAP magazine

9. Moves a tape based on the cellMoveType parameter

Input parameters:

- **stopOnError** (check box) - If selected, this diagnostic test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. Each iteration repeats tests 6, 7, 8, and 9 above.
- **timeLimit** - Total time limit for the test in minutes.
- **holdTime** - Duration in that the LEDs blink before reverting to their original state. Allow approximately 4 minutes.
- **cellMoveType** - The library does a move based on the move type parameter:

  MAGAZINES — moves a tape into or out of the highest and lowest cell of each storage array within the library

  ALL — moves a tape into or out of every cell in the library

  NONE — does not perform a move

devices
Provides information about all installed devices and the locations where a device could be installed.
To see the information, go to **Diagnostic Results** tab. Select the "devices" test, and then from the **Actions** drop-down (or right-click menu), select **Request Details**. Click the **Output Messages** tab.

diagnosticMove
Performs repeated cell to cell moves between a pair of cells. This test terminates when it reaches the number of iterations or the time limit, whichever comes first.

- **stopOnError** (check box) - If selected, the test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. One iteration is a move from sourceCellId to destinationCellId and then back to sourceCellId.
- **timeLimit** - Total time limit for the diagnostic test. Allow approximately 20 to 60 seconds per iteration.
- **suppressNotification** (check box) - If selected, the library will ignore any errors detected during the diagnostic. The errors will not generate faults.
- **partitionId** - The ID of the partition to use for the moves — see Determine a Partition ID.
- **sourceCellId** - Enter '`random`' to have the library select a cell. Or, enter a cell ID that contains a tape within the specified partition — see Determine a Cell ID.
- **destinationCellId** - Enter or '`random`' to have the library select a cell. Or, enter the cell ID of an empty cell within the specified partition — see Determine a Cell ID.

features
Lists all possible features that could be enabled using activation files. Lists the all features that are currently active.
To see the information, go to **Diagnostic Results** tab. Select the "features" test, and then from the **Actions** drop-down (or right-click menu), select **Request Details**. Click the **Output Messages** tab.

libraryCalibration
Performs robot calibration for the entire library.

- **deviceId** - ID of robot to be calibrated — see Determine a Robot ID.
- **isHandFull** (check box) - If selected, the robot picks up a tape before performing the calibration (note that this may interfere with normal operations if that tape is needed while this diagnostic is running). If not selected, the robot hand remains empty for the calibration.
- **fetchOrPutCellId** - If isHandFull is selected, enter the ID of a cell containing a tape (the robot will return the tape to its original cell when the diagnostic completes). If isHandFull is not selected, the library ignores this parameter — see Determine a Cell ID.

mountDismountDrives (DISRUPTIVE TEST)
Mounts all drives or dismounts all drives. This test is intended for use when all drives need to have a tape for some other testing.

> **Note:**
>
> Disable library auto cleaning before using this test. This test does not properly handle cleaning tapes that are mounted when the test starts.

- **isOperationMount** (check box) - If selected, the test mounts a tape in every drive. For empty drives, the library mounts a tape of the highest media generation supported by the drive. If there are insufficient tapes of the highest media generation for the drives, the library may leave some drives empty. For already occupied drives (those in Mounted or Tape Present state), the library dismounts the tape, and then remounts it back into the drive.

  If not selected, the test dismounts all drives. The library force unloads any occupied drives (those in Mounted or Tape Present state). The library moves the tapes to cells in the same module as the drive, if possible.

moveInRange (DISRUPTIVE TEST)
Moves a tape into and out of each cell in the specified range. The test starts at startCellId, then increments the row. At the bottom of the column of cells, the test increments the side and begins at the first row in the new column of cells. Once the test completes a column (back-side first, then front-side), the test moves to the next column. The test ends when it reaches the endCellId.
If Testing Storage and System Cells — For empty test cells, the library chooses a tape from another cell, moves the tape into the empty test cell, then back to its starting cell. For occupied test cells, the library removes the tape, places it in an empty cell then back to the test cell.
If Testing Drive Cells — To be eligible for this test, the drive must empty and the library must contain a compatible diagnostic tape. The library mounts a diagnostic tape from a system cell, then dismounts and returns it to the system cell.

- **startCellId** - ID of the first cell in the range — see Determine a Cell ID
- **endCellId** - ID of the last cell in the range (must be greater than the starting cell, based on ordering by column then side then row) — see Determine a Cell ID

- **stopOnError** (check box) - If selected, the test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **timeLimit** - Total time limit for the test.

moveToAllCells (DISRUPTIVE TEST)
Moves a tape into and out of all system, storage, and drive cells in the library. This creates a child moveInRange diagnostic test (see moveInRange (DISRUPTIVE TEST) for details).

- **stopOnError** (check box) - If selected, this diagnostic test will stop if any error is encountered. If not selected, the test will continue until the timeLimit is reached or all cells in the range have been tested.
- **timeLimit** - Total time limit for the diagnostic test.

moveToCapMagazines (DISRUPTIVE TEST)
Moves a tape between the top and bottom cell of each CAP magazine. If the CAP cell is empty, the library chooses a tape from another cell, moves the tape into the CAP cell, then back to its starting cell. If the CAP cell is occupied, the library moves the tape to an empty cell, and then back to the CAP cell. The library always returns tapes to their original cells, if possible, even if the test reaches the time limit or an error occurs.

- **inputCapId** - ID of CAP to test — see Determine a CAP ID
- **stopOnError** (check box) - If selected, the test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. One iteration tests the top and bottom cell in each of the CAP's magazines.
- **timeLimit** - Total time limit for the test.

moveToCorners (DISRUPTIVE TEST)
Moves a tape into and out of each corner cell in the library. Corner cells are the top and bottom storage cells in the first and last columns on each wall of the library (8 cells total). If a corner cell is empty, the library chooses a tape from a nearby cell, moves the tape into the corner cell, then back to its starting cell. If a corner cell is occupied, the library moves the tape out of and then back into the cell. The library always returns tapes to their original cells, if possible, even if the test reaches the time limit or an error occurs.

- **stopOnError** (check box) - If selected, the test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. One iteration is a move into and out of each corner cell.
- **timeLimit** - Total time limit for the test.

robotToStorageMagazines (DISRUPTIVE TEST)
Moves a tape between the top and bottom cell in each cartridge array in the library. If a cell is empty, the library chooses a tape from a nearby cell, moves the tape into the cell, then back to its starting cell. If a cell is occupied, the library moves the tape out of and then back into the cell. The library always returns tapes to their original cells, if possible, even if the test reaches the time limit or an error occurs.

- **stopOnError** (check box) - If selected, the test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. One iteration tests all cartridge arrays in the library.
- **timeLimit** - Total time limit for the diagnostic test.

robotCellToCellMove (DISRUPTIVE TEST)
Moves a robot between two cells (does not move any tapes). While this test is running, the specified robot moves between the two cells. If the library has a second robot, it moves out of the way, unable to perform other actions while this diagnostic runs.

- **robotId** - ID of robot to move — see Determine a Robot ID.
- **sourceCellId** and **destinationCellId** - The cell IDs of the two cells that robot will move between (does not affect tapes in those cells) — see Determine a Cell ID.
- **numberOfMoves** - Number of cycles to perform. Each cycle is a round trip from the source cell to the destination cell and back.

robotMove
Moves a robot to a specified cell (does not move any tapes). If the library has a second robot, it moves out of the way, but will resume operation as soon as this diagnostic completes.

- **deviceId** - ID of robot to move — see Determine a Robot ID
- **cellId** - Destination cell ID — see Determine a Cell ID

robotMoveToLocation (DISRUPTIVE TEST)
Moves a robot mechanism using "mils" to specify the desired position. This test is primarily intended manufacturing.

> **Caution:**
>
> Incorrectly running this test can cause the robot to collide with another robot or the interior of the library. Before running this test, you must move the other robot and other mechanisms to allow for free movement.

- **deviceId** - ID of robot to move — see Determine a Robot ID
- **mechName** - Name of the mechanism to move: TRACK, ZMECH, WRIST, REACH, GRIP — see Robot Mechanisms
- **expectedFinalMilsPosition** - The final mils position of the selected mechanism. Only use values between the operational limits — see Determine the Robot Range.

robotMoveToTachCount (DISRUPTIVE TEST)
Moves a robot mechanism using "tach counts" to specify the desired position. This test is primarily intended manufacturing.

> **Caution:**
>
> Incorrectly running this test can cause the robot to collide with another robot or the interior of the library. Before running this test, you must move the other robot and other mechanisms to allow for free movement.

- **deviceId** - ID of robot to move — see Determine a Robot ID
- **mechName** - Name of the mechanism to move: TRACK, ZMECH, WRIST, REACH, GRIP— see Robot Mechanisms
- **expectedFinalTachPosition** - The final tach position of the selected mechanism. Only use values between the operational limits — see Determine the Robot Range and Mils to Tach Conversion Factors

robotSweep (DISRUPTIVE TEST)
Moves a robot mechanism through its full range of motion.

> **Caution:**
>
> X

- **deviceId** - ID of robot to move — see Determine a Robot ID
- **mechName** - Name of the mechanism to move: TRACK, ZMECH, WRIST, REACH, GRIP— see Robot Mechanisms

singleCap (DISRUPTIVE for the specified CAP)
Opens and closes a specified CAP. The CAP must be closed and empty at the start of the test. When you use this test on an Access Module, the door does not physically open.

- **inputCapId** - ID of CAP to test — see Determine a CAP ID
- **iterationCount** - Number of iterations to perform. One iteration opens and then closes the CAP.
- **timeLimit** - Total time limit for the diagnostic test. Allow approximately 100 seconds per iteration.

singleDrive (DISRUPTIVE for the specified drive)
Mounts and then dismounts a diagnostic tape for a specified drive. The library uses a compatible diagnostic tape from a system cell, mounts the drive, dismounts it, and returns the tape to its original cell.

- **inputDriveId** - ID of the drive to test — see Determine a Drive ID.
- **stopOnError** (check box) - If selected, the test stops if it encounters an error. If not selected, and the test encounters an error, the test continues until it reaches the iterationCount or timeLimit.
- **iterationCount** - Number of iterations to perform. One iteration is a mount and dismount of a diagnostic tape.
- **timeLimit** - Total time limit for the diagnostic test. Allow approximately 25 seconds per iteration.

singleLed
Sets all LEDs on a device to a specified state for a specified time. After the specified time period passes, the LEDs return to their previous state.

- **deviceId** - ID of device — see Determine a Device ID.

  The valid devices are: Access Module Controller, Access Module Service Panel, Base Module Service Panel, CAP, Library Controller, DC Converter, Drive Controller, Drive Switch, Fan Assembly, Power Supply, Rail Controller, Robot Controller, Root Switch, Safety Controller, Safety Door, Storage Card, and Video Card.

  > **Note:**
  >
  > To select a drive, use the deviceId of the Drive Controller.

- **desiredLedState** - The desired LED test state — LIT, UNLIT, SLOWBLINK, FASTBLINK
- **holdTime** - Duration in seconds the LED remains in the desiredLedState before reverting to the original state.

versions
Collects software and firmware version information for the library controller, web logic, ADF, database, operating system, java, and all devices except tape drives.
To see the information, go to **Diagnostic Results** tab. Select the "versions" test, and then from the **Actions** drop-down (or right-click menu), select **Request Details**. Click the **Output Messages** tab.

How to Locate Diagnostic Test Values

Obtain parameters from the GUI to provide required values to run a diagnostic test.

Determine a Cell ID

1. Click **Cells/Tapes** in the left navigation area of the GUI.
2. Select the **Tapes** to locate a tape cartridge or **All Cells** tab to locate an empty cell. The cell ID is an integer value found in the Cell ID column (such as 666), it is not the cell address (such as 1,F,1).

Determine a Device ID

1. Click **Hardware** in the left navigation area of the GUI.
2. Select the tab that corresponds to the device.
3. The ID column indicates the device ID.

Determine a CAP ID

1. Click **CAPs** in the left navigation area of the GUI.
2. Select the **CAPs** tab. The ID column indicates the CAP ID.

Determine a Drive ID

1. Click **Drives** in the left navigation area of the GUI.
2. The Drive ID column indicates the drive ID.

Determine a Robot ID

1. Click **Robots** in the left navigation area of the GUI.
2. The ID column indicates the robot ID.

Determine a Partition ID

1. Click **Partitioning** in the left navigation area of the GUI.
2. Select the **Partitions** tab. The ID column indicates the partition ID.

Determine the Robot Range

1. Click **Robots** in the left navigation area of the GUI.
2. From the **Actions** drop-down (or right-click menu), select **Robot Diagnostics** and then select **Get Robot Ranges**.

> **Note:**
>
> Only use values between the operational limits. Values outside the operational limits, but inside the physical limits, may cause high currents and robot damage.

Robot Mechanisms

- TRACK — Horizontal robot motion along the rails.
- WRIST — Rotary motion of the hand allowing it to move from back wall to front wall.
- REACH — Mechanism that moves the gripper out of hand to get or put a tape into a cell or drive
- GRIP — Mechanism that grips a tape cartridge and holds it while moving into or out of the hand.

Mils to Tach Conversion Factors

- TRACK - 0.552024828 tachs/mil
- WRIST - 0.3669 tachs/mil
- ZMECH - 1.3503 tachs/mil
- REACH - 0.8128 tachs/mil
- GRIP - 20.48 tachs/mil

Block, Allow, or Force Device Firmware Upgrades

Updating the library firmware automatically pushes new firmware to the devices. In rare cases, Oracle service representatives may need to block automatic firmware updates for particular devices.

> **Note:**
>
> Only Escalation users can block firmware upgrades from being pushed to a device.

1. Click **Firmware** in the left navigation area of the GUI.
2. Click the **Device Locations** tab. The Code Load Enabled column indicates if automatic firmware upgrades are allowed.
3. Select a device, and then click **Block Upgrade**, **Allow Upgrade**, or **Force Upgrade** (which forces an immediate upgrade and allows future upgrades).

Related Topics

- Manage the Library Firmware
  Manage the library firmware level by uploading, activating new firmware, or reverting to an older version.
- View Firmware Levels
  View the build date and version of the library or device firmware.

Clear the Database

It may be necessary to clear the library database when troubleshooting issues.

1. Do not proceed unless directed to by Oracle services.
2. You must be logged in as an administrator or service user.
3. Click the power button in the upper left corner of the GUI.
4. Select **Restart Library**.
5. Select **Clear Database**.
6. Click **Restart**. The library will scan the module id blocks and perform a full audit.

Modify the Database

It may be necessary to modify the library database when troubleshooting issues.

> **Caution:**
>
> Only use this function for diagnosis and repair under the direction of Oracle engineering. Improperly modifying the database can render the library inoperable.

1. Do not proceed unless directed to by Oracle engineering.
2. You must be logged in as an Escalation user.
3. Click **Service** in the left navigation area of the GUI.
4. Click the **Database** tab.
5. Enter the SQL command, and then click **Execute**.

   INSERT, UPDATE, DELETE, CREATE, ALTER, DROP, and SELECT are the only supported commands.

View and Modify the Library File System

It may be necessary to view or modify the library file system when troubleshooting issues.

> **Caution:**
>
> Only use this function for diagnosis and repair under the direction of Oracle engineering. Improperly modifying the files can render the library inoperable.

1. Do not proceed unless directed to by Oracle engineering.
2. You must be logged in as an Escalation user.
3. Click **Service** in the left navigation area of the GUI.
4. Click the **File System** tab.
5. Select a file, and then click **Download** (to save the file locally) or **Modify** (to open the file in a text editor).

Open and Go Inside the Library

Some library issue require you to stop library operations and physically go inside the library.

> **Note:**
>
> Opening a Base or Drive Module door will trigger a full audit when the library comes back online, unless you have select bypass audit for the library settings.

Related Topics

- Configure Library Settings
  Library settings include the library name, partitioning activation, initialization settings, volume label format, and HTTP listening port settings.

Safety Precautions When Entering the Library

The library contains moving parts and entering the library can be dangerous. Always review and follow all safety precautions before entering the library.

> **WARNING:**
>
> You should lock the access door open and retain the key to prevent injury while inside the library.

- Verify the library is offline. Do not enter the library or move any of the robot mechanisms if you suspect the robots are on.
- Always leave the access door open while inside the library.
- Locate the mechanical door releases (yellow handles on the inside of the access doors). If the doors close while inside the library, push the mechanical release to unlock and open the door.
- Know the physical restrictions. Be careful not to bump your body or snag clothing on the arrays (there is only 0.4 m [18 in.] of aisle clearance).
- Avoid damaging the robot's mechanical or electronic components when manually moving a robot.

Enter the Library

Open the front door to cut power to the robots and physically enter the library.

1. Observe all safety precautions.
2. Take all drives offline.
3. Take the library offline.
4. Unlock the door.
5. Pull up on the door latch and open the door.

Related Topics

- Safety Precautions When Entering the Library
  The library contains moving parts and entering the library can be dangerous. Always review and follow all safety precautions before entering the library.
- Set a Drive Online or Offline
  Take a drive offline when servicing the drive or updating the drive firmware.
- Set the Library Online or Offline
  An offline library will not receive an operation requests from hosts.

Exit the Library

Ensure the library is ready to operate before physically exiting the library.

1. Before you exit the library, verify that there are no loose items in the library.
2. Close the door and latch it.
3. Lock the door and place the key in a safe location.
4. Bring the library online.

Related Topics

- Set the Library Online or Offline
  An offline library will not receive an operation requests from hosts.

Open an Access Module Door by Overriding the Lock

Overriding Access Module lock does not lower the internal safety door. You may need to do this to troubleshoot certain library issues.

> **Caution:**
>
> Opening an Access Module door by overriding the lock has the same effects on the library as opening a Base or Drive Module front door. It causes an abrupt interruption of library activity. The library will run an full library audit once you shut the door, unless you selected bypass audit for the library settings.

1. Turn the maintenance key on the Access Module to "Door Lock Override". The key cannot be removed from the lock while it is in the unlocked position.
2. Lift the Access Module door latch and open the door. DO NOT force the door to open.

   The robots lose power, all in-process jobs stop, and the library takes the robots and Access Module offline.
3. To close the Access Module door, close and latch it. DO NOT force the door to close.
4. Lock the door and retain the key.

   Once the door shuts, the library re-initializes, the robots initialize, the library does a full audit, and the library brings the Access Modules online.

Related Topics

- Configure Library Settings
  Library settings include the library name, partitioning activation, initialization settings, volume label format, and HTTP listening port settings.

Ping a Host

If you are having host connectivity issues, you can ping the host. Pinging can determine whether the host IP address is reachable from the library and tests the connection speed between the library and the host.

1. Click **Service** in the left navigation area of the GUI.
2. Click the **Network Tools** tab.
3. Click **Ping**.
4. Enter the host IP address and the maximum number of attempts (the default is four). Click **Ok**.

Run a Host Trace Route

If you are having host connectivity issues, you can trace the route to the host.

1. Click **Service** in the left navigation area of the GUI.
2. Click the **Network Tools** tab.
3. Click **Trace Route**.
4. Enter the host IP address and the maximum number of hops (the default is 20). Click **Ok**.

Calibrate the Local Op Panel Touch Screen

Alignment of the touch screen is calibrated at the factory. If the touch screen becomes mis-aligned, you can re-calibrate it.

1. Login to the SL4000 GUI locally at the operator panel.
2. Click **Configuration** in the left navigation area of the GUI.
3. Click the **Touch Panel** tab.
4. Click **Run Calibration**.
5. Tap the series of targets on the touch panel. Once the calibration completes, the panel returns to displaying the library interface.

Restart the Local Op Panel Touch Screen

If the library op panel touch screen becomes non-responsive, you may need to restart the touch panel.

1. If the screen is blank, the display source might be set to the rear VGA port. Press the **SOURCE** button below the op panel and wait a couple of seconds.

   The SOURCE button switches the display between the rear VGA output and the controllers or feature cards. If the display is currently at the VGA port, the initial press toggles it to the front touch screen and subsequent presses cycle through the controllers. L1 and L2 are the library controllers. F1 and F2 are feature cards.
2. If the op panel is still non-responsive, login to the SL4000 GUI remotely or through a direct Ethernet connection.
3. Click **Configuration** in the left navigation area of the GUI.
4. Click the **Touch Panel** tab.
5. Click **Restart Touch Panel**.

Reset the Library to Factory Defaults

Reset the library to factory defaults to erase all stored information and configuration data.

Resetting the library to factory defaults will erase all stored information about drives, tapes, partitions, notification destinations, logs, date and time settings, network settings, and all other library settings. The library will restart, requiring the Installer role to run the Initial Installation Wizard to reconfigure the library.

> **Caution:**
>
> Resetting the library to defaults cannot be canceled or undone. After resetting, only Oracle services can log back in with the Installer credentials.

1. Click **Service** in the left navigation area of the GUI.
2. Click the **Reset** tab.
3. Click **Reset to Factory Default Settings**.
4. Wait until the library completes the reset. Once the screen remains blank for a few minutes, manually turn the PDU breakers off and then back on.

A

Library Addressing Reference

The library uses addressing schemes to identify each component of the library.

> **Note:**
>
> "Left" and "right" are in reference to viewing the library from the CAP-side (front) unless otherwise specified.

Comparison of Cell Addressing Schemes

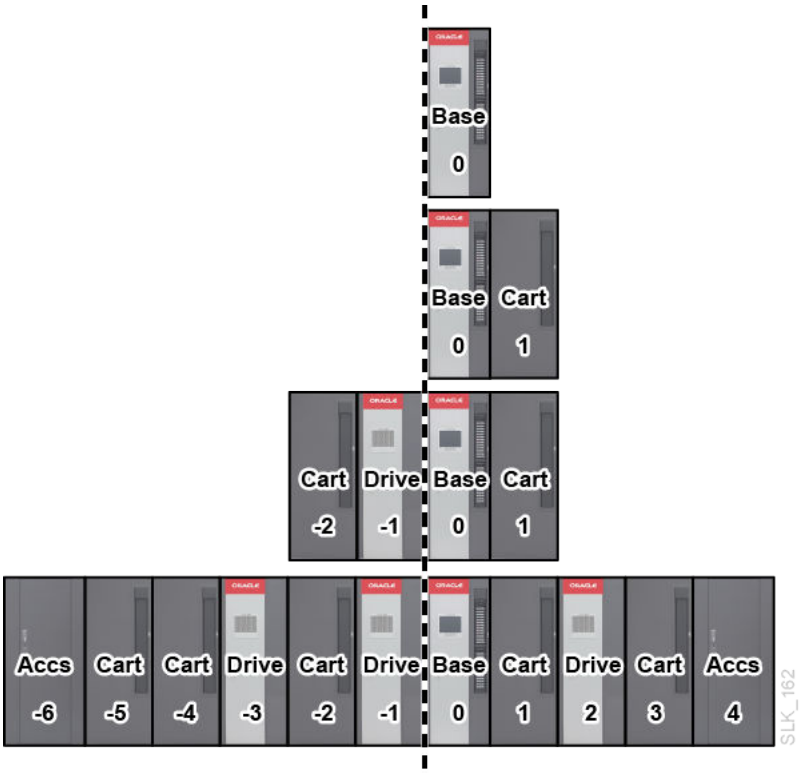
The library has two main addressing schemes to identify each component in the library.

- Library Cell Addressing Scheme (Library, Rail, Column, Side, Row) — used by the firmware and internal communications to represent all devices and locations within the library.
  - Begins at 1 and uses negative numbers.
  - Side indicates the front or back wall of the library (B or 1 for back wall, F or 2 for front wall).
- SCSI Element Addressing — used by hosts with FC-SCSI connections to the library.
  - Uses single positive number for the element ID.
  - Storage cells begin at 2000, drive bays begin at 1000, CAPs begin at 10.
  - Unlike the SL3000, the SL4000 assigns empty drive bays an element number.
  - Default element numbering is reassigned with any library configuration change.

Center Line of the Library and Module Numbers

Addressing uses the left edge of the Base Module (as viewed from the front of the library) as a reference point, called the center line.

The figure below shows the location of the center line for various library configurations. Module numbers starts with the Base as module zero (0) and increments positively to the right and negatively to the left.



Library Cell Addressing Scheme

Cell addressing designates physical location using Library, Rail, Column, Side, Row (L, R,C,S,W). The GUI onlu uses (C, S, W) to address each location.

Library
Always 1.

Rail
Always 1.

Column
Indicates the horizontal location of a storage cell or drive bay referenced from the center line:

- Positive (+) value indicates right of center line
- Negative (-) value indicates left of center line
- Zero (0) is never used for a column number. The first column to the right of the center line (viewed from the front of the library) is column 1. The first column to the left of the center line is column -1.

Base Module — Contains columns 1 to 6 for storage cells and 1 to 4 for drive cells.
Drive Module — Contains six columns for storage cells and four for drive bays. Column numbering for storage cells continues consecutively from the adjacent module. Column numbering for drive bays uses the storage cell columns that are closest to zero. For example, a Drive Module immediately to the right of the Base Module will contain storage cell columns 7 through 12 and drive columns 7 through

10. A Drive Module immediately to the left of the Base Module will contain storage cell columns -6 through -1 and drive columns -4 through -1.
Cartridge Module — Contains six columns for storage cells. Column numbering continues consecutively from the adjacent module.
Parking Module — Contains three columns for storage cells. The outer most three columns are inactive. Column numbering continues consecutively from the adjacent module.
Access Module — Contains three columns for storage cells. Column numbering continues from the adjacent module.

Side

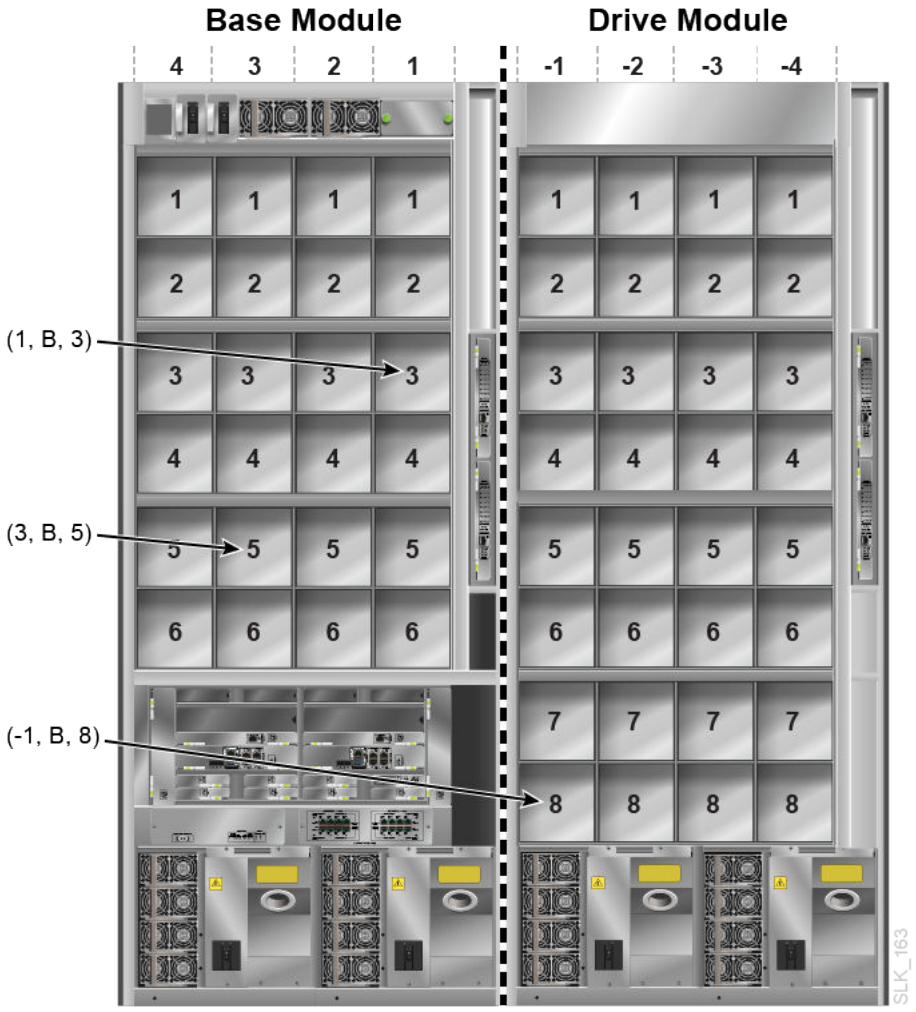
- Back wall (drive side) = 1 (B in GUI)
- Front wall (CAP side) = 2 (F in GUI)

Row
The vertical location of a storage cell, consecutively numbered top down (1 to 52).

Cell Addressing of Tape Drive Bays

The library addressing distinguishes a drive bay by column and row. The side value is always 1 (shown as B in the GUI).

Figure A-1 Example Library Addressing of Tape Drives (viewed from back of library)



Cell Addressing of Rotational CAP Cell

The CAP cells have a unique addressing scheme.

Column
The CAP column depends on the location of the module containing the CAP. The CAP column value corresponds to the fifth column from the left-side of the module. For example, module number 2 (second module to the right of the Base) will have storage columns 13 through 18 and the rotational CAP column will be 17. Module number -3 (third module to the left of the Base) will have storage cell columns -18 through -13 and the rotational CAP column will be -14.

Side
Always 2 (shown as F in the GUI), since the CAPs are only located on the front of the module.

Row
When addressing a specific cell: the row value is the cell in the CAP magazine (values 1 to 26).

Example CAP Cell Address
For this example, the library has Cartridge Module, Drive Module, Base Module, and all modules have a CAP. The top cell of the Cartridge Module CAP would be (-8, F, 1).

SCSI Element Addressing

Element addressing is used by SCSI hosts to identify library components.

> **Note:**
>
> Changing the library configuration or partition configuration can cause the library to re-assign element IDs.

The SCSI element address depends on the element type. Each library or partition uses a fixed starting address for each element type. Then, within each element type, the element addresses are sequential.

- **Storage Elements** (storage cells)
  - Begins at 2000 in left-most module.
  - Numbered top to bottom, back to front, and left to right.
- **Import/Export Elements** (CAPs)
  - Begins at 10 for the left-most rotational CAP in the library.
  - All rotational CAPs are numbered first (top to bottom and left to right), followed by the left Access Module CAP and then the right Access Module CAP (numbered top to bottom, back to front, and left to right).
- **Data Transfer Elements** (drives and empty drive bays)
  - Begins at 1000 in the left-most Drive Module or Base and increments by one for every drive or empty drive bay.
  - Numbered top to bottom, left to right.

Related Topics

- View the SCSI Element IDs
  Each cell within the library has a unique element ID used for SCSI.
- SCSI Host Connection
  Configure the library to support specific SCSI host applications.

Glossary

access door

A door on the Base and Drive Module for service personnel to enter the library. See the section Open and Go Inside the Library.

Access Module

An optional module installed on the ends of a library that allows for bulk tape loading and redundant robotics support. One module supports bulk loading only. Two modules support bulk loading and redundant robotics. Abbreviated as "Accs" in the GUI and previously referred to in the SL3000 as an Access Expansion Module (AEM). See the section "Access Module (AEM)".

audit

The process of scanning the tape barcodes and updating the library database. The library automatically runs a full audit after initialization of one of the front access door has be opened. See the section "Audit All or Part of the Library".

Base card cage

The assembly in the Base module that houses controller cards which process commands from a host system, coordinate the activities of robots, CAPs, and tape drives, and monitors status inputs from sensors and switches. See the section "Base Module Card Cage".

Base Module

The main module in an SL4000 library that contains the card cage, power distribution units (PDUs), power supplies, and tape drives. This module is required for all libraries. Abbreviated as "Base" in the GUI. See the section "Base Module".

bulk load

Loading numerous tapes into the library using an Access Module. See also glossary term Access Module.

CAP pool

A group of CAPs that you can assign to a partition. The partition must have ownership of a CAP within the pool to use it for import/export. If a CAP pool is only assigned to one partition

the partition automatically owns all CAPs in the pool. You can assign a CAP pool to multiple partitions, but each partition can only be assigned one CAP pool.

cartridge access port (CAP)

A device in the library that allows an operator to import or eject tapes. The SL4000 can contain rotational CAPs (26 slots) and AEM CAPs (234 slots). CAP is synonymous with import/export mail cell in SCSI and open system libraries. See the section "Cartridge Access Ports (CAPs) ".

cartridge array

A plastic array of slots that holds multiple tapes. The number of slots per array depends on the location in the library. Arrays range from 8 to 14 slots.

Cartridge Module

Optional module in the library that adds storage capacity. Abbreviated as "Cart" in the GUI and previously referred to in the SL3000 as a Cartridge Expansion Module (CEM). See the section "Cartridge Module (CEM)".

cell

The location in the library in which a tape can be stored. See the section "View a List of All Cells in the Library".

cleaning tape

A tape that contains special material to clean the tape path in a tape drive. Has a "CLN" prefixed label. Contrast with glossary terms data tape and diagnostic tape. See the section "View a List of Cleaning Cartridges".

data tape

A tape that stores customer data. Contrast with glossary terms cleaning tape and diagnostic tape.

device

A mechanical component of the library, excluding tapes, but including all other physical components in the library (such as controllers, robots, CAPs and so on). Devices may be nested within each other. See the section "View Hardware Device Status".

diagnostic tape

A tape with a "DG" label that is used for diagnostic routines. Contrast with glossary terms cleaning tape and data tape. See the section "Run a Diagnostic Test".

drive array

A group of eight drive bays installed in the Base or Drive Module. Each bay can hold one drive tray. The Base Module holds up to three drive arrays. The Drive Module holds up to four drive arrays. See the section "Library Modules".

drive bay

A slot in a drive array that holds one drive tray. Synonymous with drive slot.

Drive Module

An optional library module that provides additional drive tray capacity and tape storage. Abbreviated as "Drive" in the GUI and previously referred to in the SL3000 as a Drive Expansion Module (DEM). See the section "Drive Module (DEM)".

dynamic World Wide Name (dWWN)

A feature that applies dynamic names to network devices rather than fixed names. When a dWWN-named device is replaced, it is assigned the same WWN as the one replaced, preventing reconfiguration of the network.

enter

The process of placing a tape into the cartridge access port (CAP) so that the library can insert it into a storage cell. Synonymous with import. See the section "Enter Tapes Through a CAP".

eject

The action in which the library places a tape into the cartridge access port (CAP) so that an operator can remove the tape from the library. Synonymous with export. See the section "Eject Tapes Through a CAP".

FC-SCSI

A library connection type which uses the small computer system interface over a physical Fibre Channel interface. See the section "SCSI Host Connection".

hardware activation file (feature activation file)

A .jar file that you purchase and upload to active optional feature on the library. See the section "Add or Remove Optional Library Features".

job

Some requests generate jobs which direct the library to perform some action necessary to complete the request. Some jobs can generate sub-jobs necessary to complete the parent job. See also glossary term request. See the section "View Library Requests, Jobs, and Resources".

label

An identifier associated with a tape. Labels are humanly readable, machine readable, or both. Synonymous with volume serial number (volser or vol-id). See the section "Volume Label Format".

library controller

Controls operations and communicates with the operator console and other modules. It resides in the Base card cage. See the section "Library Controller (LOC)".

magazine

A removable array that holds tapes for entering or ejecting tapes through the cartridge access port (CAP).

media

Same as tape cartridge.

operator panel

A flat-panel display with a touch screen interface. This feature is attached to the front door of the Base Module. See the section "Operator Panel".

Parking Module

A converted Cartridge Module installed on the ends of a library configuration. Parking expansion modules can house a defective robot in a redundant robotics library. Robot maintenance is disruptive to the library. Abbreviated as "Park" in the GUI and previously referred to in the SL3000 as a Parking Expansion Module (PEM). Contrast with glossary term Access Module. See the section "Parking Module (PEM)".

partition

A portion of the library that presents itself to a host client as an independent library. Cells and drives in one partition cannot be seen by another partition. See the section "Partitioning".

physical capacity

The number of storage cells in the library (excludes system cells for cleaning tapes, diagnostic tapes, and the module identification block).

power distribution unit (PDU)

A device for the distribution of AC line power from one inlet to multiple outlets. Multiple PDUs provide higher availability because the power continues if one PDU (or its AC source if the PDUs use separate AC sources) loses power.

rail

That portion of the upper robot track that provides power and communication to the robot.

raw label

The full barcode label including volser and media ID. See the section "Media Labels".

request

Every external command to the library (SCSI, SCI, GUI, SNMP, GET) and many internal actions will result in a request. A request may spawn a job to direct the library to perform the actions necessary to complete the request. See also job. See the section "View Library Requests, Jobs, and Resources".

robot

An electromechanical device that moves tapes among CAPs, storage cells, and drives. One or two robots are used in an SL4000 library. See the section "Robot".

safety door

The rolling "garage door" that separates the Access Module from the rest of the library. During service operations, the safety door lows to prevent the robot from striking someone working inside the Access Module. See the section "Access Module (AEM)".

SCSI elements

A four-digit number that represents the addressing scheme used by hosts operating on a Fibre Channel interface. See also FC-SCSI. See the section "View the SCSI Element IDs".

service area

The space surrounding the library for service representatives to perform maintenance. See the section "Covers, Doors, and Service Clearances".

slot

A location in the library than can hold a device. Drive bays and slots in the Base card cage are examples of slots. A slot is different from a cell. Cells hold tape cartridges.

spoofed serial numbers

A feature that overrides the manufacturer's serial number of an LTO tape drive with the right most 10 characters of the drive tray serial number. See Drive Serial Number Spoofing.

StorageTek Library Control Interface (SCI)

The web services (WSDL) interface used to control the library.

system cell

Cell reserved by the library as a drop-off cell or used to store a cleaning or diagnostic tape.

tape cartridge

A container holding magnetic tape that can be processed without separating the tape from the container. The library uses data, diagnostic, and cleaning tapes. Sometimes a tape cartridge is referred to as "tape", "cartridge", or "media". See the section "Tape Cartridges (Media)".

tape drive

An electromechanical device that moves magnetic tape and includes mechanisms for writing and reading data to and from the tape. Sometimes referred to as "drive". See the section "Drives".

TCP/IP

A library connection type using Ethernet (10/100/1000 Base-T and CAT-5e cable).

volume serial number (volser or vol-id)

An alphanumeric label that the host software uses to identify a tape cartridge. It attaches to the spine of a tape and is both human and machine readable. Generally, a eight-character alphanumeric label. See the section ."Volume Label Format"

World Wide Name (WWN)

A 64-bit integer that identifies a Fibre Channel port. See also dynamic World Wide Name (dWWN).