# StorageTek SL3000

User's Guide

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# Preface

This guide is intended for administrators and operators of Oracle's StorageTek SL3000 modular library system. It assumes the reader is familiar with the SL3000 library modules and components. For introductory and planning information, see the *SL8500 Systems Assurance Guide* on OTN (refer to the Related Documentation section below)

Oracle's StorageTek SL3000 Modular Library System is an enterprise storage solution that provides fully automated tape-cartridge storage and retrieval. This document provides guidelines for library and device management using StorageTek Library Console (SLC).

## Related Documentation

For more information related to the SL3000 library, see the following documents on the Oracle Technical Network (OTN) at:

http://www.oracle.com/technetwork/documentation/tape-storage-curr-187744.html

- *SL3000 Systems Assurance Guide* - overview of the library and installation planning guide
- *SL3000 Host Connectivity Guide* - networking information on Dual TCP/IP, redundant electronics, and partitioning
- *Barcode Technical Brief* - barcode and label guidelines
- *SL3000 SNMP Reference Guide* - SNMP information
- Library management software documentation:
  - *ACSLS Administrator's Guide*
  - *ELS System Programmer's Guide*

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# 3

# StorageTek Library Console

Oracle's StorageTek Library Console (SLC) is a graphical user interface (GUI) application for configuring, monitoring, and managing the SL3000 tape library.

> **Note:** Customer data on tape cartridges is never available to SLC or the library. The external data interface of the tape drives is separate from the library infrastructure.



## SLC Versions

There are three versions of SLC. Throughout this document, you can perform the procedures using any SLC version, unless otherwise noted.

- Local Operator Panel — enables SLC to run remotely from any system that has a network connection to the library.
- Web-launched SLC — enables SLC to be installed on a server, allowing individual clients to use a browser to access SLC.
- Standalone SLC — enables SLC to run remotely from any system that has a network connection to the library.

## Downloading the SLC Media Pack

The media pack includes the web-launched SLC server, web-launched SLC client, and the standalone SLC. To download the media pack:

1. Go to the Oracle Software Delivery Cloud at: `http://edelivery.oracle.com/`
2. Click **Sign In/Register**.

3. On the Terms & Restrictions screen, read the License Agreement and Export Restrictions, and select the check boxes to indicate your acceptance. Click **Continue**.
4. On the Media Pack Search screen:
   a. In the Select a Product Pack list, select **Oracle StorageTek Products**.
   b. In the Platform list, select **Generic Platform**.
   c. Click **Go**.
5. Select the SLC version to download, click **Continue**.
6. To review the download instructions, click **Readme**. Optionally, use the **View Digest** button to verify the MD5 and SHA-1 digests of the download files.
7. Verify the SLC version is correct, click **Download**.
8. Save the file. Extract the media pack to the desired location.

# SLC GUI Overview

***Figure 1–1 SLC Screen Layout***

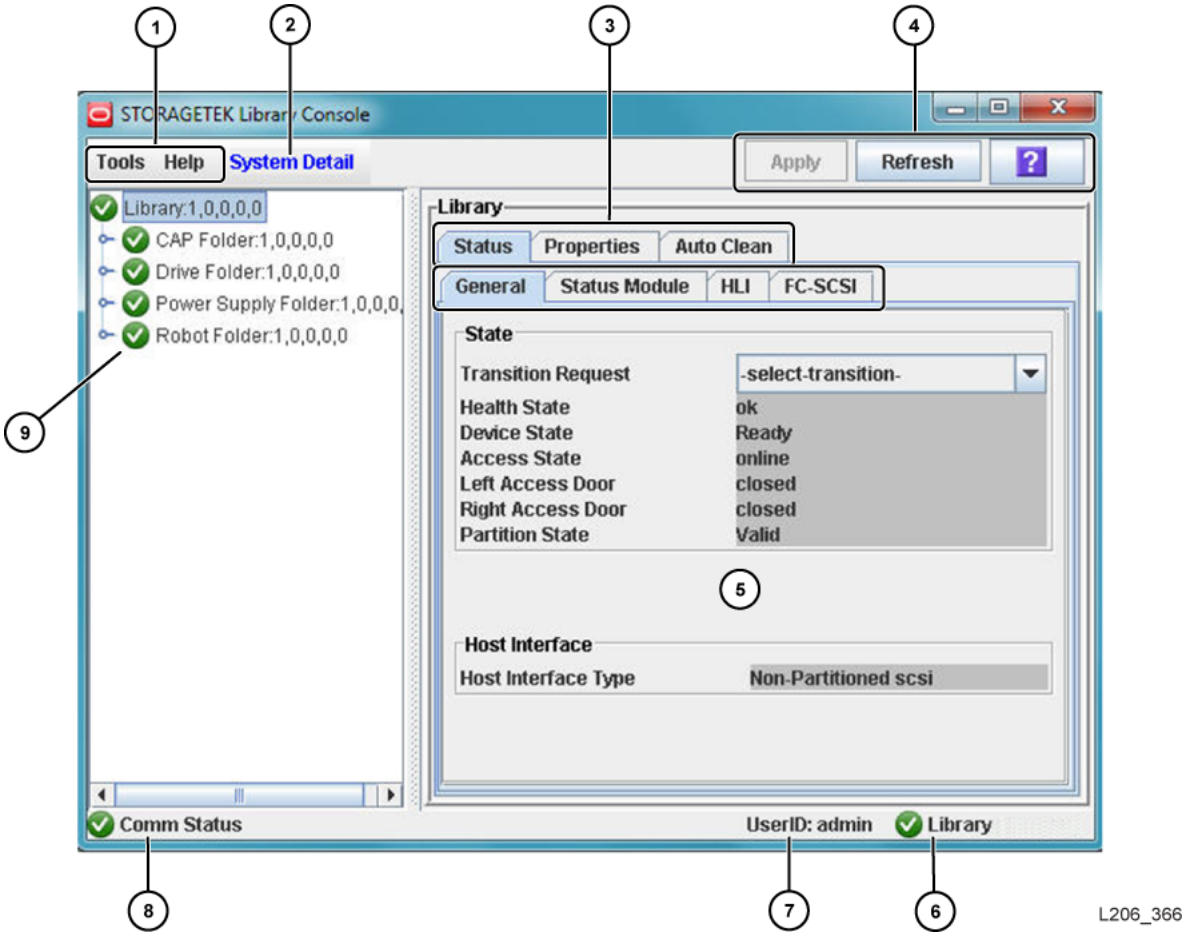


**Figure Legend:**

1. Menu Bar — includes the Tools menu and Help menu.

2. Utility Title — displays the title of the current screen.
3. Function Tabs — identifies the available functions for a utility. Some utilities contain second level tabs.
4. Options Bar — location of buttons related to the current utility screen (for example, **Apply**, **Refresh**, **Print**).
5. Utility content.
6. Library health indicator — identifies the library connected to SLC, and displays library health (see "Library and Device Status Overview" on page 7-1).
7. UserID indicator — displays the user ID currently logged in to SLC.
8. Server communication health indicator — displays a graphical heartbeat monitor indicating the state of server communication health (see "Library and Device Status Overview" on page 7-1).
9. Navigation tree — lists the devices contained in the library.

### Modifying a Tabular Display

Many SLC utilities use a tabular display. You can modify the table:

- To sort by a column, click the heading of a column. Initially the sort is in ascending order. Click the heading again to switch to descending order.
- To move a columns, click and drag a column heading horizontally to any position in the heading row.
- To re-size a column, click and drag the border of the column heading.

### Synchronizing the SL Console With the Controller Database

SLC receives library configuration data from the library controller. Configuration data may be unavailable if you log in to SLC before the library is fully initialized. Exit and log in again after initialization. Additionally, configuration data displayed during an audit may not be accurate until the audit completes.

SLC displays the most recently saved data from the library controller database. When the configuration changes (such as taking a drive offline, or removing or adding a cartridge), synchronize SLC by clicking the **Refresh** button.

Multiple users can access the library simultaneously. Coordinate with other library users when making major modifications to the configuration (such as adding modules, defining partitions, and so on) to prevent conflicts.

## Standalone SLC

The standalone version runs SLC remotely from any system with a network connection to the library.

You must uninstall the previous version of standalone SLC before installing a new version. Running multiple versions of SLC on the same system can cause inconsistent data.

## Security Considerations

SLC interfaces with the primary library interface (PLI) over a secure sockets layer (SSL). SSL provides a secure communication path between the library and the SLC session. This prevents an unauthorized network user from monitoring library activity.

## Installation Requirements

### Qualified Platforms

- Solaris 10 SPARC, Solaris 10 x86
- Windows Server 2008 SP2: 64bit, Windows 2012 Enterprise Server
- Windows 7 SP1: 64bit, Windows 8 64bit, Windows 8.1 64 bit
- Oracle Unbrakable Linux 5 (2.6.18) 32 bit
- SUSE Enterprise Linux 10.2 (2.6.16) 32 bit

### Other

- Network connection to the library

## Installing the Standalone SLC

Uninstall any previous versions of SLC before installing an update.

1. Download and extract the standalone SLC media pack (see "Downloading the SLC Media Pack" on page 3-1).
2. Select the SLC installer file for your operating system (refer to the media pack readme).
3. Review the information. Click **Next**.
4. Specify where to install SLC. Click **Next**.
5. Specify where to create the SLC shortcut icons. Click **Next**.

   **Note:** On Solaris, you cannot choose the default root directory. Oracle recommends `/u-sr/bin` or a similar location.

6. Verify the information is correct. Click **Install**.
7. Click **Done**.

## Logging in to the Standalone SLC

1. To start SLC on your system either:
   - Double-click the **SLC** icon on the desktop.
   - Select **Start > RunSLC** or **Launch > RunSLC**.
2. Enter your login information, and click **Log on**.

   For additional login and user management information, see "User Management" on page 3-7.

# Web-launched SLC

The web-launched version enables SLC to be installed on a web server. Then, individual clients can use a browser access SLC.

To install the web-launch version on a server, download the web-launch SLC server (**.war**) file from the Oracle Software Delivery Cloud (see "Downloading the SLC Media Pack" on page 3-1). Deploy the file on the server of your choice (refer to the media pack readme). The web-launched SLC is delivered to clients as a Java Web Start process, which executes outside the browser.

You only need to install updates on the web-launched SLC on the server. You can update the web-launched SLC server while it is running. After the updates are installed on the server, they are downloaded automatically to all clients whenever the application is started.

## Security Considerations

The web-launched SLC software is digitally signed, which guarantees that it has been issued by Oracle Corporation and has not been altered or corrupted since it was created. As a Java Web Start process, the web-launched SLC includes the security features provided by the Java 2 platform.

You are responsible for implementing all appropriate security systems, including firewalls, user access, and so on.

## Client Requirements

### Qualified Platforms

- Internet Explorer 8 (on Windows 7: 64 bit)
- Firefox 17.0.2 ESR (on Windows 7: 64bit)

### Other

- Java 1.5 Plug-in (the browser should install this automatically)
- Network connection to the web-launched SLC server

## Logging in to the Web-launched SLC

To log in using a browser, download Mozilla Firefox from `http://www.mozilla.com`. On Solaris platforms, you can also log in to the web-launched SLC using the command line.

1. Obtain the DNS alias or IP address of the SLC server. See your library administrator for assistance.
2. Choose a login method:
   - **Command line**: Available on Solaris only. In the terminal window, enter:

     **`javaws http://`***server_ID*`:`*port_ID*`/opel/slc.jnlp`**

   - **Web browser**: Available on Windows or Solaris. In a browser on the client system, go to the SLC Web Start application:

     **`http://`***server_ID*`:`*port_ID*`/opel`**

   where:

   - *server_ID:* Either the IP address or DNS alias of the SLC server

- *port_ID:* Port ID of the SLC application, typically **8080**
- **opel:** The name (context root) of the web-launched SLC application on the server.

3. Click **Launch Now**.
4. Specify the action to take with the **slc.jnlp** file. Select either:
   - **Open with Java(TM) Web Start Launcher** to start SLC directly.
   - **Save to Disk** to save the slc.jnlp file to your client and log in to the SLC later.
5. If this is your first time running the web-launched SLC, complete the digital signature warning dialog box: verify the publisher and click **Run**.
6. Enter your SLC login information, and click **Log on**.

   For additional login and user management information, see "User Management" on page 3-7.

# Local Operator Panel

The local operator panel is touch screen interface built in to the Customer Interface Module (CIM). It enables you to run most of the SLC utilities directly at the library.

## Logging in to the Local Operator Panel

Only one user at a time can log in to the local operator panel.

1. If the screen is blank, touch the screen anywhere to activate the Login screen.
2. Use the virtual keypad to enter your login information.
3. Click **Log on**.

   For additional login and user management information, see "User Management" on page 3-7.

## Calibrating the Touch Screen

Alignment of the touch screen is calibrated at the factory. If the touch screen becomes mis-aligned, you can re-calibrate or reset it. View the operator panel version and type using the **Tools > Diagnostics > Library Folder > Op Panel Tab**:

- If you have a Linux-based local operator panel (DL or OL), you can re-calibrate it yourself or reset it to factory setting with the procedures below.
- If you have a Windows-based local operator panel (W), contact your Oracle support representative.

### Re-calibrating the Local Operator Panel

For an accurate calibration, make sure there is no debris on the touch screen.

1. Log in to the local operator panel.
2. Select **Tools > Calibrate**.
3. Tap **Calibrate**.
4. A series of targets will display. Gently tap in the center of each target with your finger or a pointing stylus.
5. To save the new settings:

a. Tap the **Click Me** buttons within the indicated time period.

   If the buttons do not depress, the touch screen is not properly aligned. Discard the new settings, see Step 6.

b. Click **OK** to save the new settings.

6. To discard the new settings:

   a. Let the timer run out without tapping the **Click Me** button.

   b. Return to Step 4 and re-calibrate.

   The local operator panel reboots automatically after an unsuccessful second calibration and restores the previously saved alignment.

### Resetting the Local Operator Panel Calibration

To restore the alignment to the factory settings:

1. Log in to the local operator panel.
2. Select **Tools > Calibrate**.
3. Click **Reset Calibration**. The local operator panel reboots.

## Rebooting the Local Operator Panel

You may need to reboot the local operator panel if it hangs or the help content is not visible.

1. Select **Tools > Diagnostics > Library Folder > OpPanel Tab**
2. Click the **Reboot Operator Panel** button.
3. If rebooting from the local operator panel, the screen will go blank. The reboot is complete when the operator panel comes back online.

   If rebooting from a remote SLC session, a series of messages will display. "Reboot Complete" indicates the reboot of the local operator panel has finished.

# User Management

To access SLC, you must have a valid user ID and password. Only one user at a time can log in to the local operator panel, but any number of users can log in to the standalone or web-launched SLC.

## User IDs

Each user ID is assigned a set of permissions that determines access to utilities within SLC. There are a fixed set of user IDs at each site:

- **admin**: customer administrator
- **service:** Oracle support representative
- **oem:** third-party field service technician

## Passwords

After library installation, an Oracle support representative will provide a one-time use activation password. The library administrator must activate the **admin** user ID with

the first eight characters of a this password provided. After the initial log in, the administrator should change the **admin** user ID password to ensure system security.

### Changing a User Password

1. Log in to SLC using the account you want to modify.
2. Select **Tools > User Mgmt**.
3. On the navigation tree, expand the **Permanent** folder. Select the current user account.
4. Complete the following fields: **Current Password**, **New Password**, and **Retype Password**.
5. Click **Modify**.

# 4

# Hardware Activation Files

The hardware activation utility enables you to activate and monitor optional features on the SL3000 library. Some library features are activated by the customer, while others must be installed and enabled by an Oracle support representative. Features you can activate include capacity upgrades, dual TCP/IP, redundant electronics, and partitioning.

## Oracle Hardware Activation Files Overview

An Oracle hardware activation file is a digitally signed Java Archive (.jar) file containing a feature activation key. You must install one hardware activation file for each feature purchased. Once installed, the feature is added to the features already activated on the library.

### Legacy Hardware Activation Files

For SL3000 libraries with firmware version FRS_3.0 and below, hardware activation files are delivered by e-mail from Oracle Corporation. Do not use the procedures described in this chapter to download hardware activation files. In addition, all features purchased for a library are included in a single hardware activation file. When you install a new hardware activation file on the library, it overlays any previously installed activation files.

After upgrading to firmware version FRS_3.0 and above, use the process described in this chapter to activate new features.

### Hardware Activation File Installation Overview

1. Purchase the feature from Oracle.
2. Download the file from the Oracle Software Delivery Cloud and save it to a system accessible to your SLC session. See "Downloading a New Hardware Activation File" on page 4-2.
3. Install the file using SLC. See "Installing a New Hardware Activation File" on page 4-2.
4. Configure the new feature. See:
   a. Chapter 3, "Capacity Activation"
   b. Chapter 4, "Library Partitioning"
   c. Chapter 6, "Redundant Electronics"

## Downloading a New Hardware Activation File

1. Go to the Oracle Software Delivery Cloud at:

   http://edelivery.oracle.com/

2. Click **Sign In /Register**.
3. On the Terms & Restrictions screen:
   a. Read the License Agreement and Export Restrictions, and select the check boxes to indicate your acceptance.
   b. Click **Continue**.
4. On the Media Pack Search screen:
   a. In the Select a Product Pack list, select **Oracle StorageTek Products**.
   b. In the Platform list, select **Generic Platform**.
   c. Click **Go**.
5. Select the SL3000 hardware activation file media pack. Click **Continue**.
6. Verify that you have selected the correct media pack. Click **Download** beside each desired feature.
7. Save the file.
8. Extract the files to a location that you can reach from SLC.

## Installing a New Hardware Activation File

1. Complete the steps in "Downloading a New Hardware Activation File" on page 4-2.
2. Use SLC to log in to the target library.
3. Select **Tools > Hardware Activation**.
4. Click the **Install Hardware Activation Keys** tab.
5. Enter the full path of the hardware activation file to install, and press **Enter**. Optionally, click **Browse** and navigate to the file location.
6. Review the hardware activation file details. Click **Install**.
7. Click **Yes**, and then **OK**.
8. Verify that the activation file has been installed and activated successfully (see "Displaying Current Hardware Activation Files" on page 4-3).

   Depending on the features activated, you may need to perform additional tasks to use the new features (refer to the feature-specific chapter).

## Deleting a Hardware Activation File

Deleting a hardware activation file is rarely necessary and can impact library operations. Having extra hardware activation files installed on a library does not present any problems (for example, capacity activation files that exceed the physical capacity of the library). The extra activation files are simply not used.

1. Use SLC to log in to the target library.
2. Click **Tools > Hardware Activation**.

3. Click the **Delete Hardware Activation Files** tab.
4. Click the activation file to delete.
5. Verify the correct activation file is selected, and then click **Delete...**.
6. Click **Yes**.

   Depending on the feature of the hardware activation file, you may need to perform additional tasks after deleting the file (refer to the feature-specific chapter).

## Displaying Current Hardware Activation Files

To display the features currently activated on the library:

1. Select **Tools > Hardware Activation**.
2. Select the **Current Hardware Activation Keys** tab.

## Displaying the Feature Audit Log

The Feature Audit Log displays a list of all feature activation activity for the life of the library. Use this log to verify the features installed on the library.

By default, the report is sorted in chronological order. Optionally, you can change the sort order, and rearrange and resize the columns (see "Modifying a Tabular Display" on page 3-3).

1. Select **Tools > Reports**.
2. Expand the **Audit Logs** folder, and select the Feature Audit Log tab. The Feature Audit Log page appears.

# 5

# Capacity Activation

There are two types of capacity: physical and active. Physical capacity is the number of storage cells in the library. Active capacity is the number of storage cells activated with a hardware activation file. The active capacity does not have to equal the full number of physical storage cells. Capacity activation requires a hardware activation file.



## Active Capacity Configuration Overview

In a non-partitioned library, active capacity is automatically assigned after installing the hardware activation file. However, you can customize the configuration and select which cells will be activated (see "Defining Activate Capacity Regions Using SLC" on page 5-2). The automatic configuration activates storage cells in the order specified by the Default Capacity Policy (see "Setting the Default Capacity Policy" on page 5-4).

In a partitioned library, capacity is assigned automatically, but the total number of storage cells allocated to all library partitions cannot exceed the activated capacity (see "Library Partitioning" on page 6-1).

Coordinate with other library users before configuring the library to prevent conflicts.

### Effects of Capacity Changes on HLI Connections

With HLI libraries, you can increase active capacity without stopping host jobs or having host connections go offline. When you decrease capacity, the library goes offline only momentarily and then comes back online automatically. After a configuration change, ACSLS and ELS must perform an audit of the library to account for the new library configuration information. Hosts can continue processing jobs while the audit takes place.

#### Adding Active Capacity

Whenever you add active storage cells, the library stays online. The library controller sends an asynchronous message to all hosts notifying them that the library configuration has changed.

#### Removing Active Capacity

The library goes offline temporarily whenever you deactivate a storage cell or remove an empty drive slot. The library comes back online after the configuration change is updated in the library controller database. The library controller sends an

asynchronous message to all hosts notifying them that the library configuration has changed.

### Effects of Capacity Changes on FC-SCSI Connections

With FC-SCSI libraries, the library goes offline temporarily with a **Unit Attention** condition whenever you:

- Activate or deactivate a storage cell, drive, or CAP cell.
- Add, change, or remove a host LUN connection.

The library may generate multiple error messages. All hosts must issue the appropriate commands to update their library configuration information. See the appropriate tape management software documentation for detailed procedures and commands. When adding or removing drives, the device SCSI numbering is updated as well.

### Orphaned Cartridges Caused by Capacity Changes

In non-partitioned libraries, an orphaned cartridge is a cartridge located in an inactive storage cells. In partitioned libraries, an orphaned cartridge is a cartridge located in a non-allocated cell or drive. Orphaned cartridges are inaccessible to all hosts.

A cartridge can become orphaned when you reduce active storage capacity, change partitioning, or manually move a cartridge to an inaccessible cell.

If SLC identifies an orphaned cartridge, it displays a warning message. To help resolve an orphaned cartridge issue, you can generate a report of orphaned cartridges, perform an audit of the library, or perform a recovery move on a cartridge. To resolving orphaned cartridges, see "Moving Cartridges (Recovery Moves)" on page 11-4.

## Defining Activate Capacity Regions Using SLC

Capacity is automatically applied in a partitioned library. You may only manually activate capacity in a non-partitioned library. Capacity changes cannot be performed at the local operator panel.

Use the **Tools > Select Active Cells** utility to define a custom storage region. No changes are committed to the library controller database unless you click **Apply User Design** at the top of the screen and confirm your choice. If you log off SLC, if the session times out, or if the connection to the library is lost before you save changes, any changes will be lost. At any time, you can discard changes and restore the last saved configuration by clicking **Refresh**.

You can remove all custom capacity activation, remove partitioning, remove media validation pools, and apply default capacity as defined by the default capacity policy by clicking **Reset Default** (see "Setting the Default Capacity Policy" on page 5-4). The Reset Default button also resets all SCSI element IDs in a SCSI library.

### Capacity Icons in SLC

***Table 3–1 Capacity Icons***

| Icon | Description |
|---|---|
|  | *Not Accessible* — cell not available for activation (reserved for diagnostic cartridges, physically blocked, and so on). |

*Table 3–1 (Cont.) Capacity Icons*

| Icon | Description |
|---|---|
|  | *Inactive* — cell not yet licensed for use |
|  | *Active* — cell licensed for use |
|  | *Selected* — cell designated for activation or deactivation |
|  | *No activation needed* — resource is active by default |

## Modifying Active Storage Regions

You can customize the active storage region by activating or deactivating storage cells or deselect storage cells so they will not be automatically activated when capacity is increased.

> **Note:** Capacity is automatically applied in a partitioned library. You may only manually activate capacity in a non-partitioned library.

1. Select **Tools > Select Active Cells**.
2. Click a module to modify.
3. Click the **Select Active Cells** tab.

   Click **Move Left** or **Move Right** to display an adjacent module.
4. If you are activating capacity for the first time in a non-partitioned library, follow the steps below. Otherwise, proceed to step 4. Before applying a custom design for the first time, you must deselect all storage cells:
   a. In the Select by menu, choose **Library**. Then, select the **Remove** option.
   b. Click any "Selected" cell on the module map. All cells should become "Inactive".
5. Choose a Select by method (**Cell**, **Column**, **Side**, **Module**, **Library**). Then, click the **Add** option to select cells for the storage region or the **Remove** option to deactivate cells.
6. Using the library map, click the storage cells you want to activate or deactivate.
7. To confirm and verify your changes, click **Apply User Design**.
8. If there are no warnings, click **OK**.
9. If there are warnings, click **Details**.

   If orphaned cartridges are reported, do not continue with this procedure until you have performed recovery moves on the listed cartridges (see "Moving Cartridges (Recovery Moves)" on page 11-4).
10. Reconfigure library host applications to recognize the changes (see the tape management software documentation).

## Displaying Active Cell Reports

The active cell reports only display data saved to the library controller database.

1. Click **Tools > Select Active Cells**, and then click the **View Reports** tab.

2. Select a report:
   - **Cartridge Cell and Media Summary**: Displays a detailed list of all library resources and their status (active or inactive).
   - **Orphaned Cartridge Report**: Displays a detailed list of all orphaned cartridges.
3. To save the report as a comma-sperated value (csv) file, click **Save to File**.

### Displaying Active Cell Details

Use the **Tools > Select Active Cells > Current Active Cells Tab** to display which storage cells are currently active, inactive, or selected for activation. You can also display detailed information about cartridge, drive, and storage cell locations.

1. Select **Tools > Select Active Cells**.
2. Select the module you want to display.
3. Select the **Current Active Cells** tab. You can mouse-over a cell or drive to display a tooltip for detailed information.

## Setting the Default Capacity Policy

Use the **Tools > Configuration > Default Capacity Policy Tab** to set the capacity assignment scheme within the library. The default setting is "Left to Right".

1. Select the type of capacity assignment for the library:
   - **Left to Right** - capacity assignment begins in upper left slot on the rear wall of the left-most module, moves right, then crosses over to the upper left slot on the front wall of the left-most module (see Figure B–4).
   - **Center Out** - capacity assignment begins nearest to the drives and is split evenly between the left/right and front/back.
2. Click **Apply**.

   This setting only defines the capacity assignment for new capacity additions in a non-partitioned library. To remove existing capacity assignments of the library and re-assign capacity to the new default, use the Select Active Cells utility:

   **Note:** Resetting the capacity to default removes all drives from the media validation pool and removes all partitioning settings in the library.

   a. Select **Tools > Select Active Cells > Select Active Cells**.
   b. Click **Reset to Default**.

# 6

# Library Partitioning

Library partitioning reserves library resources (drives, cells, and CAPs) for the exclusive use of specified hosts. Each partition appears to the host as a separate library. Partitioning is an optional feature enabled with a hardware activation file (see "Hardware Activation Files" on page 4-1).



## Partitioning Specifications

The SL3000 library partitioning specifications include:

- Up to eight partitions.
- Smallest increment is a single storage cell, single tape drive, or CAP.
- Support for non-contiguous resource assignments.
- The total number of storage cells allocated to all library partitions cannot exceed the activated capacity of the library (see "Active Capacity Configuration Overview" on page 5-1).
- Supports HLI and FC-SCSI (one type per partition). See HLI Host Partitions Overview or FC-SCSI Host Partitions Overview.

## Partitioning CAPs

> **Note:** AEM CAPs are subject to the same partitioning rules and restrictions as rotational CAPs. In this chapter, the term CAP refers to both types of CAPs, unless otherwise specified.

A partition can only use a CAP explicitly allocated to it. All cells in the CAP are allocated as a whole to the partition. It is not possible to allocate or remove individual

cells within a CAP (the library does not support common CAPs, split CAPs, or the allocation of individual CAP cells to a partition).

It may be necessary to share CAPs among partitions when a library has more partition than CAPs. Each partition can have dedicated CAPs or shared CAPs, but not both. Only partitions with the same host interface type (FC-SCSI or HLI) can share a CAP. Only one partition at a time can use a shared CAP (see "HLI CAP Reservations" on page 6-2 and "FC-SCSI CAP Associations" on page 6-3).

# HLI Host Partitions Overview

An HLI partition can have up to 16 assigned hosts. You define the HLI host-partition connection configuration through the library management software, ACSLS or ELS, (see the tape management software documentation).

A single ACSLS server can manage multiple partitions in the same library. Each partition is configured as a separate automated cartridge system (ACS).

ELS hosts using a common control data set (CDS) database (called a host group) can share one partition. A single ELS CDS database can manage more than one partition within the same SL3000 library. Individual HSC hosts and groups of up to 16 ELS hosts that share a common control data set can control a single partition.

## Configuration Changes in HLI Partitions

A partition remains online when allocating resources to the partition. You do not need to stop host jobs. However, a partition will go offline temporarily when resources are removed from the partition. Neighboring partitions are always left undisturbed. The affected partition automatically comes back online and the library notifies all hosts connected to the partition that a configuration change has occurred.

After allocating or removing resources, the hosts experience a brief interruption as library configuration information is updated. The host automatically continues to process jobs. After changing the configuration, the host should perform an audit to update the host software database.

## HLI CAP Reservations

HLI hosts use a reservation scheme to manage CAP usage. Each host reserves a CAP for exclusive use as needed, then releases the CAP when it is no longer required. A host can reserve a CAP if the CAP is empty, closed, locked, and not already reserved by another partition. After an enter or eject operation completes, the host terminates the enter/eject command. Then, the library controller releases the CAP after verifying that the CAP is closed and empty.

If for any reason a CAP reservation is not released and the enter or eject command cannot be terminated in ACSLS or HSC on the host, a library administrator must override the host partition reservation (see "Overriding a CAP Reservation" on page 9-5).

### CAP Auto Enter Mode

CAP auto enter mode enables a library operator to open a CAP and initiate an enter operation without issuing an explicit enter request and without an explicit reservation from a host application. Auto enter mode is available for HLI CAPs that have been dedicated to a partition. CAPs in auto enter mode are left unlocked. Host applications manage auto enter mode (see the tape management software documentation).

### CAP States

*Table 4–1 Default States of HLI CAPs in Partitioned Library*

| Type of CAP | Default State | Default CAP Light Condition | Comment |
|---|---|---|---|
| Dedicated or shared | Locked | Off | Host reservation unlocks the CAP and turns the light on. |
| Auto enter mode | Unlocked | On | Not applicable. |

# FC-SCSI Host Partitions Overview

An FC-SCSI partition can have one or more host-partition connections, but some host applications may not allow for CAP sharing (see "FC-SCSI CAP Associations" on page 6-3).

## Configuration Changes in FC-SCSI Partitions

The host-partition connection configuration is user-defined and consists of the world wide port name of the FC-SCSI host bus adapter and the logical unit number (LUN) of the host.

After adding or deleting a host-partition connection or changing the LUN, the affected partition goes offline with a "LUNS Data Has Changed Unit Attention" condition. If a host has unique ITL nexus connection mappings for each partition connection, then only the partition experiencing the connection change is affected.

After allocating or removing a storage cell, drive, or CAP in a partition, the affected partition goes offline with a condition of "Mode Parameters Have Changed Unit Attention".

Neighboring partitions and their connected hosts are not disturbed. The hosts connected to an affected partition must issue the appropriate commands to update their library configuration information (see the host software documentation).

## FC-SCSI CAP Associations

Most FC-SCSI host applications typically assume sole ownership of a CAP and therefore do not coordinate CAP sharing. To avoid contention among partitions for a shared CAP, you must manually associate a partition to a CAP for an enter or eject operation (see "Entering or Ejecting Cartridges for FC-SCSI Partition with Shared CAP" on page 9-5).

The following rules apply when making partition-CAP associations:

- You can associate only one partition at a time to a CAP.
- Selecting a partition causes all its allocated CAPs to become associated. You cannot select an individual CAP.
- Partition-CAP associations remain active until you explicitly remove them, the CAP becomes allocated to a different partition, the library reboots, the power cycles, the library door open/closes, or the CAP initializes.

If a partition-CAP association is removed while the CAP is open or has cartridges in it, the CAP ownership will be changed to the **default** requester (the library controller), and the CAP will be unavailable to all partitions. You must empty and close the CAP before it can be associated to any partitions.

### CAP States

*Table 4–2 Default States of FC-SCSI CAPs in Partitioned Library*

| Type of CAP | Default State | Default CAP Light Condition | Comment |
|---|---|---|---|
| Dedicated | Unlocked | On | Not applicable. |
| Shared | Locked | Off | Partition-CAP association unlocks the CAP and turns the light on. |

## Deleting the Partitioning Feature

To delete an individual partition, see "Delete a Partition" on page 6-6. It is not recommended, but to delete the partitioning feature, you must delete the partitioning hardware activation file from the library (see "Deleting a Hardware Activation File" on page 4-2). You must reboot the library after deleting the partitioning activation file for the deletion to take effect.

**Caution:** The partitioning feature cannot be deleted if it was activated by a legacy hardware activation file before SL3000 firmware version FRS_3.0.

Deleting the partitioning feature has the following effects on the library configuration:

- Changes the library state to non-partitioned.
- Makes all activated storage cells, drives, and CAPs accessible to hosts.
- All existing partition summary information and resource allocations are retained, but not usable. If the partitioning activation file is later re-installed, the partition allocations are restored.

## Changing Hardware in a Partitioned Library

Some library hardware changes may require modification of an existing partitioned module. Use the following process to make hardware changes without losing partitioning information for unchanged library sections.

1. All resources that will be affected by the hardware change must be removed from their respective partitions (see "Designing a Partition - Module Map & Design Tabs" on page 6-7).
2. Power down the library (see "Turning Off the Library" on page 15-2).
3. Install the hardware change.
4. Power up the library (see "Turning on the Library" on page 15-3).

   All partition allocations for the unchanged parts of the library remain in effect.
5. Allocate the library resources that have been added due to the hardware change (see "Designing a Partition - Module Map & Design Tabs" on page 6-7).

## Partitioning the Library Using SLC

- "Preparing for Partitioning - Instructions Tab" on page 6-5
- "Adding, Deleting, or Modifying a Partition - Summary Tab" on page 6-5

> **Note:** No actual changes to partitioning occur until the design is applied using the **Commit** tab. At any time, you can discard all uncommitted partition changes by clicking the **Refresh** button.

## Partitioning Icons in SLC

***Table 4–3 Partitioning Icons***

| Icon | Description |
|---|---|
| (rectangle with X) | *Not Accessible* — resources not available for host operations (reserved system cell, physically blocked, and so on). |
| (white rectangle) | *Unallocated* — resource available for assignment |
| (yellow rectangle) | *Partition #* — resources assigned to the current partition |
| (red rectangle) | *Other Partitions* — resources assigned to another partition |
| (gray rectangle) | *Shared CAP* — a CAP assigned to multiple partitions |

## Preparing for Partitioning - Instructions Tab

You should make the library unavailable to other users before committing partitioning changes. Configuration conflicts may arise if you change partition boundaries while other users are accessing the library.

1. Quiesce any host operations.
2. Select **Tools > Partitions**.
3. Review the Instructions tab. To create a partition, see "Adding, Deleting, or Modifying a Partition - Summary Tab" on page 6-5.

## Adding, Deleting, or Modifying a Partition - Summary Tab

You can create up to eight partitions. You must designate a partition ID and host interface type for each partition.

### Add a Partition

1. Select the **Summary (Step 2) tab** of the Partitions interface.
2. In the Partition Allocation Summary area, click **Add Partition**.
3. Select the Partition ID and enter the Name and Interface Type. Partition IDs do not need to be contiguous.
4. Click **OK**.
5. Repeat steps 2-4 until you have added all the required partitions.
6. For FC-SCSI partitions, you must add a host connection (HLI host-partition connections are configured through the host library management software):

a. In the Partition Allocation Summary area, click the partition.

b. Click **Add Connection**.

c. Enter the Initiator (WWPN) and LUN. Each initiator connected to the library must have one library partition assigned to LUN 0.

d. Click **OK**.

e. Repeat steps a - d until you have added all required FC-SCSI connections. Each partition can have up to nine host connections, and each host can connect to multiple partitions.

7. Design the partition (see "Designing a Partition - Module Map & Design Tabs" on page 6-7).

### Delete a Partition

You may want to delete a partition to re-assign resources to another partition or to change the partition ID. When you delete a partition:

- All resources allocated to the partition are marked available.
- All host connections for the partition are deleted.
- The partition ID is deleted.

To delete a partition:

1. Click the **Summary (Step 2)** tab of the Partitions interface.
2. In the Partition Allocation Summary area, click the partition to remove.
3. Click **Delete Partition**.
4. Click **OK** to confirm the deletion. If partitions still remain in the library, proceed to the next step.

   If no partitions remain, select the library interface type you want to assign for all host connections to the library, either HLI or FC-SCSI. Click **OK**.
5. Click **OK** to confirm the change.
6. Commit the changes (see "Confirming Partitioning Changes - Commit Tab" on page 6-7).

### Modify a Partition

You can modify the interface type (HLI or FC-SCSI) and for FC-SCSI partitions you can modify the host connection information. You cannot change the partition ID. To assign a different partition ID, you must delete the old partition and create a new one with the new ID (see "Delete a Partition" on page 6-6 and "Add a Partition" on page 6-5).

1. Select the **Summary (Step 2)** tab of the Partitions interface.
2. To modify the name or interface type:

   a. In the Partition Allocation Summary area, click the partition to modify.

   **Caution:** Changing the interface type can result in loss of active host connections or existing shared CAP assignments.

   b. Enter the changes you want to make. Click **OK**.
3. To modify a FC-SCSI host connection:

a. In the Connections section, select the host-partition connection to modify.

b. Click **Modify a Connection**.

c. Enter the changes you want to make. Click **OK**.

4. Commit the changes (see "Confirming Partitioning Changes - Commit Tab" on page 6-7).

## Designing a Partition - Module Map & Design Tabs

You can allocate library resources to only one partition at a time. Use the Module Map and Design tabs to add or remove resources. If you want to add currently-allocated resources to a different partition, you must first remove the resources from the assigned partition, and then add them to the new partition.

1. Click the **Module Map (Step 3a)** tab of the Partitions interface.
2. Click the module for which you want to design a partition.
3. Click the **Design (Step 3b)** tab.
4. Use the list control to select a partition ID.
5. Choose the **Select by** method, and then select either the **Add** or **Remove** option.
6. Use the library map to select the resources to add or remove. Click **Move Left** or **Move Right** to display an adjacent module.
7. After you have completed the partition configuration, click **Verify**. This checks for orphaned cartridges, oversubscribed capacity, and whether each host has a partition assigned to LUN 0.
8. If there are warnings, click **Details**.

   If orphaned cartridges were found, perform recovery moves on all listed volumes (see "Moving Cartridges (Recovery Moves)" on page 11-4). After you have resolved all orphaned cartridges, re-verify the partitioning configuration.
9. If there are no warnings, repeat steps 4-8 for each partition ID. After all partitions are configured, see "Confirming Partitioning Changes - Commit Tab" on page 6-7.

## Confirming Partitioning Changes - Commit Tab

Use the Commit tab to apply the partition configuration. No changes are made to the library until you complete these procedures.

1. Take the library offline to ACSLS and ELS tape management software (see the tape management software documentation).
2. Click the **Commit (Step 4)** tab of the Partitions interface.
3. Click **Apply**. If the library capacity is over-subscribed, the Apply button is grayed out. Remove storage cells from a partition or purchase more capacity.
4. If there are no warnings, click **OK**. If there are warnings, click **Details >>**.

   If orphaned cartridges were found, perform recovery moves on all listed volumes before committing partitioning changes. See "Moving Cartridges (Recovery Moves)" on page 11-4.
5. Configure all affected library host applications (see the host software documentation).

## Generating Partitioning Reports - Reports Tab

You can generate reports to assist in partitioning management and design. See also "Viewing Current Partition Definitions" on page 6-8.

1. Select the **Reports** tab of the Partitions interface.
2. Select a report from the menu:
   - **Cartridge Cell and Media Summary** - displays a list of all resource partition assignments.
   - **Host Connections Summary** - displays host-partition connection information.
   - **Orphaned Cartridge Report** - displays a list of all orphaned cartridges.
   - **Partition Details** - displays information for a selected partition.
   - **Partition Summary** - displays summary information for all partitions.
3. To print the report data, click **Print**. To save the report, click **Save to File**.

## Viewing Current Partition Definitions

Use the Current Partition Definitions tab to display current partition boundaries and allocations. You can also display detailed information about cartridge, drive, and storage cell locations. See also "Generating Partitioning Reports - Reports Tab" on page 6-8.

1. Click the **Module Map (Step 3a)** tab of the Partitions interface.
2. Click a module to display.
3. Click the **Current Partition Definitions** tab. You can hover over a cell to display a tooltip for detailed information.

# 7

# Library Management



## Library and Device Status Overview

SLC shows health status for devices, SLC communication, and the library. See also "SLC GUI Overview" on page 3-2.

***Table 5–1 Status Indicators***

| Icon | Meaning |
|---|---|
|  | Normal |
|  | Warning |
|  | Error |

### Health Status of a Device

This information is found in navigation tree of System Details and Diagnostics page.

- Normal — library device is functioning normally
- Warning — device is offline or operating in a degraded state
- Error — device has experienced a failure

### Communication Status

This information is found in lower left of all SLC screens. Indicates the communication status between SLC and the library controller.

- Normal — SLC is communicating normally with the library controller
- Warning — server is taking longer than 10 seconds to respond
- Error — server is taking longer than 30 seconds respond

After about 30–60 seconds of lost communication the heartbeat monitor turns gray, then red, and the following error message appears:

```
Heartbeat message not received from the library controller.
```

Log off SLC, and then log on again to restore communication.

#### Health Status of the Library

This information is found in lower right of all SLC screens.

- Normal — all library devices are functioning normally
- Warning — one or more library devices is offline or operating in a degraded state
- Error — one or more library devices has experienced a failure

  After a device error is fixed, the library health indicator changes to "Warning". The indicator will not change to "Normal" until the library is taken offline. If there are multiple problems with a device or status alert condition, the health indicator displays the most severe condition.

## Clearing Library Status Alerts

You can only clear alerts marked as "Clearable" and only if service is active on the library.

Clearing an alert only removes it from the Status Module display; it does not resolve the underlying cause. The library health indicator returns to "Normal" if there are no other device or status alerts. If the alert is subject to periodic updates, it will reappear at the next update cycle.

1. Select **Tools > System Detail**, and click the **Library** folder.
2. Click the **Status** tab, and then the **Status Module** tab.
3. On the Clear Alert Number list, select the alert number to clear, and then click **Apply**.

# Upgrading Library Firmware

To upgrade firmware, an Oracle service representative can use the SLC code load utility. You cannot perform a code download or activation at the local operator panel.

Library firmware does not contain drive code upgrades (see drive-specific documentation). Firmware upgrades for libraries with the redundant electronics feature are minimally disruptive (see Chapter 6, "Redundant Electronics").

## Downloading Code to the Library Controller

Only Oracle service representatives should download and install new library firmware. Contact Oracle Support for assistance.

1. Locate the firmware upgrade package (.jar file) at: `http://edelivery.oracle.com`
2. Download the code to your workstation.
3. Log in to SLC.

4. Select **Tools > Diagnostics**, and then click the **Library** folder.
5. Click the **Load Code** tab.
6. Enter the full path of the firmware package to download, and then press **Enter**.

   Optionally, click **Browse** and navigate to the file location.
7. Verify the contents and file name. Click **Load**.
8. Click **OK**. The download process could take up to 10 minutes.

   **Note:** Next to the Failed label, you should see "0". If there are any failures indicated, contact your Oracle support representative for assistance.
9. After the code unpacks, activate the code at any time (see "Activating Code on the Library Controller" on page 7-3).

### Activating Code on the Library Controller

Only Oracle service representatives should download and install new library firmware. Contact Oracle Support for assistance. A reboot of the library is required to activate new library firmware. Schedule the code activation accordingly.

The library controller can store up to two versions of firmware, but only one is active. The active version is identified as "running". You can restore the earlier firmware version if required.

1. If you have not done so, download and unpack the code (see "Downloading Code to the Library Controller" on page 7-2).
2. Select **Tools > Diagnostics**, and then click the **Library** folder.
3. Click the **Activate Code** tab.
4. In the Target list, select the code package to activate (in this case **SL3000 Code**).
5. In the Available Versions section, select the code version to activate.
6. Click **Activate**.
7. Click **OK** to start activation.

   **Caution:** POTENTIAL INTERNAL FILE CORRUPTION. Do not reboot any devices in the library or execute any operations on the library while activating code.
8. When the activation process finishes, click **OK** to reboot the library.
9. Click **OK** to terminate the SLC session.
10. After library initialization completes, log in to SLC.

## Special Library Configuration Options

The Library Configuration page provides the following configuration options. In partitioned libraries, you can configure these options separately for each partition.

- Barcode presentation (see"Configure Cartridge Barcode Presentation (FC-SCSI only)" on page 11-2)
- SCSI FastLoad controls the criteria by which cartridge mounts are considered complete (see "SCSI FastLoad Feature" on page 13-2).
- Library Auto Clean controls the management of cleaning cartridge and drive clean functions (see "Drive Cleaning" on page 10-1).

# Displaying Library Information



## Displaying Library Status

1. Select **Tools > System Detail**, and then click the **Library** folder in the navigation tree.
2. Click the **Status** tab.
3. Select a secondary tab:
   - **General** - displays the current operational state of the library. These values update whenever there is host activity, background operations, or operator activity.
   - **Status Module** - displays library status alerts and highlights significant messages. This feature is available only if service is active on the library. If service is not active on the library, this screen will be blank except for a message indicating that the "Service activation is not valid". If you see the "warning" status, a failure may occur. Contact a service representative.
   - **HLI** - displays the current status of all HLI interface ports on the library. Information includes the local TCP/IP socket, local IP, connection status, port status, and transmission sent and received from the time of connection.
   - **FC-SCSI** - displays the current status of all host FC–SCSI interface ports on the library. Detailed information is shown by port number. If the Multi Port Fibre feature has been activated on the library, detail is shown for all ports.

## Displaying Library Properties

1. Select **Tools > System Detail**, and then click the **Library** folder.
2. Click the **Properties** tab.
3. Select a secondary tab:
   - **General** - displays the physical, mechanical, logical, and network configuration of the library. Some of the information can be set up automatically during library initialization, while other information can be defined by the user.
   - **Library Controller** - displays details of the library controller, including the serial number and firmware versions.

- **Drive Controller** - displays details of the drive controller, including the serial number and current firmware versions.

## Viewing Library Reports

Use this procedure to display, search, or save library reports available from the **Tools > Reports** menu. Additional reports are available from the **Tools > Partitions** menu (see "Generating Partitioning Reports - Reports Tab" on page 6-8).

All report output is a static display of information at the time the report is generated. Click **Update** in the upper right corner to refresh the information.

> **Note:** Running multiple instances of SLC on the same workstation can cause inconsistent data on reports. It is recommended that only one user at a time produce SLC reports.

1. Select **Tools > Reports**.
2. In the navigation tree, expand a report category.
3. Select a report.

### Searching a Library Report

1. With the report displayed, click **Search**.
2. Enter a text string (case-sensitive and wildcards are invalid). Click **Search**.

### Saving Library Report Data to a File

1. With the report displayed, click **Save**.
2. Browse to the desired directory, enter a file name, select a format, and click **Save**.

### Displaying Library Statistics Reports

The Energy Monitor Reports help you monitor your power and energy usage, and identify periods of peak and low usage over time.

To change the sort order of the screen or rearrange and resize the columns, see "Modifying a Tabular Display" on page 3-3.

1. Select **Tools > Reports**.
2. Expand the **Statistics** folder, and then click a report: .
   - **General Events** - displays summary statistics for library operations. For each event, the report lists the event type, number of occurrences, and the date and time of the most recent occurrence of the event.
   - **Energy Monitor - Last 24 Hours** - displays minute-by-minute energy and average power usage for the entire library over the last 24 hours.
   - **Last Month Energy Monitor** - displays energy and average power usage for the entire library, measured in 15-minute intervals over the last 32 days.
   - **Last Month Energy Monitor** - displays energy and average power usage for the entire library, measured in one-day intervals over the last 365 days.

### Displaying Library Power Supply Information

For power configuration information, see the *SL3000 Systems Assurance Guide* "Power" chapter found on OTN.

The Power Supply Data screen displays summary information for all power supplies in the library. Use this screen to monitor the status of the power supplies for maintenance or replacement. By default, the display is sorted by internal address. To change the sort order, and rearrange and resize the columns, see "Modifying a Tabular Display" on page 3-3.

1. Select **Tools > System Detail**.
2. In the **Library** navigation tree, click the **Power Supply** folder to display summary information.
3. For detailed information, expand the **Power Supply** folder. Select a power supply.

## Generating Library Diagnostic Files

Generate the following files to help diagnose library problems.

- "Transferring the Library MIB File" on page 7-6
- "Generating and Transferring the Library Log Snapshot File" on page 7-6

### Transferring the Library MIB File

To help diagnose issues, you can transfer the public SNMP management information base (MIB) file to an Oracle support representative.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder in the navigation tree.
3. Click the **TransferFile** tab.
4. Select the Transfer Type of **SNMP MIB**. Click **Transfer File**.
5. Browse to the desired directory, and then enter the file name with a .txt suffix.
6. Click **Save**.
7. E-mail the file to your Oracle support representative.

### Generating and Transferring the Library Log Snapshot File

If a support representative requests a library Log Snapshot, use this procedure to generate and transfer the file. The system saves the file in an encrypted format, so you cannot view or edit it. You must save the log within 15 minutes of generation.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder in the navigation tree.
3. Click the **Transfer File** tab.
4. Select the **Log Snapshot** option.
5. In the Selected Devices list, select either **All Devices** or **Selected Device**. If you chose Selected Device, select the device.
6. Click **Generate Log Snapshot on Library**.
7. Click **Yes**, and then **OK**.

8. Click **Transfer Log Snapshot To Your Computer**.
9. Browse to the desired directory or enter the directory path. Click **Save**. The file is named automatically.
10. E-mail the file to your Oracle support representative.

## Performing a Library Self-Test

The self-test can help diagnose library operational problems. A self-test typically runs after the library is installed. You can run library self-test routines in either non-disruptive (cartridges are returned to home cells) or disruptive mode (cartridges may be moved to new cells).

When performing a self-test, the system:

- Checks the communication path between the library controller, drives, and robots.
- Performs get and put operations to check the health of the robots and CAPs. This includes get and put operations from a reserved system cell to a random empty storage cell or CAP cell.
- Performs a full library audit.
- Performs mounts and dismounts of diagnostic cartridges for all the drives installed in the library. The self-test does not begin unless a diagnostic cartridge is found in the system cells. If the system finds a compatible diagnostic cartridge, the self-test repeats for each drive type. If the system does not find a diagnostic cartridge for a drive type, the system skips the mount/dismount operation for the drive.

> **Note:** Before performing a disruptive test, the library must be taken offline. See "Placing the Library Online or Offline" on page 7-8.

1. Make sure the proper drive diagnostic cartridges are in the library (see "Displaying Cartridge Information" on page 11-2).
2. Select **Tools > Diagnostics**, and click the **Library** folder.
3. Click the **SelfTest** tab.
4. In the Mode list, select the type of self-test:
   - **Non-Disruptive** - all cartridges used in the test are returned to their original locations
   - **Disruptive** - the library must be taken offline to all hosts before running this test
5. Click **Run**. When the test completes, the results of the test display.
6. For disruptive tests, bring the library online to resume normal operations.

## Rebooting the Library

Use this procedure to reboot the library. This process involves reloading the firmware from flash memory and restarting the library controller.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder in the navigation tree.

3. Click **Reboot**.
4. All other users must log off. Click **OK**.
5. If the library is online, click **OK** to take the library offline.
6. Click **OK** to reboot the library.
7. Click **OK** to terminate this SLC session. Do not log back in to SLC until the library has fully initialized.

# Placing the Library Online or Offline

Use this procedure only if you are not using ACSLS or ELS tape management software, or if ACSLS/ELS servers cannot communicate with the library. For instructions on changing the state of the library and its components through ACSLS or ELS, see the appropriate tape management software documentation.

## Placing the Library Offline

You may need to place the library offline at the following times:

- Before powering down the library
- Before opening a library access door
- When the library is inoperative and requires maintenance

To place the library offline:

1. Take all library drives offline. See "Changing a Drive Online/Offline Status" on page 10-5.
2. Select **Tools > System Detail**.
3. Click the **Library** folder in the navigation tree.
4. Click the **Status** tab, and then the **General** tab.
5. In the Transition Request list, click **Take offline**.
6. Click **Apply**. Before the library goes offline, all outstanding library jobs complete.
7. Wait for the offline confirmation message. If the library does not come offline, check the status of the library.

## Bringing the Library Online

1. Select **Tools > System Detail**.
2. Click the **Library** folder in the navigation tree.
3. Click the **Status** tab, and then the **General** tab.
4. In the Transition Request list, click **Bring online**.
5. Click **Apply**.
6. If applicable, bring the library online to ACSLS and ELS hosts. See the ACSLS and ELS documentation.

## Bringing the Drives Online

LTO drives are automatically brought online when you bring the library online. To bring T-series drives online manually:

1. To verify that the T-series drives are ready and online, press the **MENU** switch. The display should now read **Online**.
2. If the drive displays **Offline**, press the **SELECT** switch once to bring it online.
   - If the drive message indicates **Online**, the transition to online completed.
   - If the **Onl Pend** message appears, the online state is pending due to completion of diagnostic tests.
   - If other messages appear, refer to the drive documentation.

## Changing the Library Interface Type (Non-Partitioned Libraries)

Use this procedure to change the interface type that all hosts use to connect to the library. This procedure applies to non-partitioned libraries only.

> **Note:** To change interface types in a partitioned library, see "Modify a Partition" on page 6-6.

1. Select **Tools > Select Active Cells**.
2. Click the **Select Active Cells** tab.
3. In the Interface Type list, select the interface type you want to assign. Click **Apply**.
4. Click **Yes** to update the library controller database.
5. Click **OK** to return to the Select Active Cells page.

   The new interface type is active immediately. The library does not need to be rebooted.

## Audits Overview

An audit is the process of cataloging or verifying cartridge locations within a library and updating the cartridge database. The database contains the volume ID (vol-id or volser), current location (in library internal address format), and verified status (true or false).

You can use SLC to perform an audit, see "Performing a Physical Audit" on page 7-10 and "Performing a Verified Audit" on page 7-11. There is also a virtual audit. A virtual audit displays a report listing the contents of the cartridge database (see "Displaying Cartridge Information" on page 11-2). Audit times vary according to the type of audit, size of the library, the number of robots, and the speed of the scan engine for the barcode scanner.

The library performs an audit when:

- One or both access doors have been opened and closed.
- An audit request is made through SLC.
- A host request to audit the library is entered. (System-level problems may occur if a host's record of the cartridge does not match what is in the cartridge database of the library controller.)
- The library initializes at start up.

### Audit Indicator

To indicate an audit is in progress, SLC displays a spinning indicator and the message "Audit in progress". When you see this indicator do not open the library access door. This will cause the audit to restart.

The audit indicator only displays when an audit is initiated automatically (library access door has been opened and closed, library power up or reboot). The indicator does not display for audits initiated from SLC or the host.

## Performing a Physical Audit

In a physical audit, the robot visits cartridge locations and records the vol-id of the cartridges. The library controller updates the cartridge database based on the physical audit. This audit changes the "verified" status of the cartridge locations to `true`.

You can manually initiate a physical audit for either the entire library or a specific range of cells.

**Note:** You cannot stop a physical audit after it begins.

### Auditing the Entire Library

The robot verifies all cells (storage, CAP, drive, reserved). Although an entire library audit is a background process and does not interrupt library operations, it does require sharing of robot resources. It is not recommended that you run this audit during peak activity periods. The audit takes approximately 1/2 second per cartridge slot.

After the audit completes, you can view the Cartridge Summary report for the latest cartridge locations and vol-ids. See "Viewing Library Reports" on page 7-5.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder on the navigation tree.
3. Click the **Audit** tab.
   a. In the Entire Library section, click **Yes**.
   b. Click **Audit**.
4. Click **OK** to begin the audit.

### Auditing a Range of Cells

During this audit, the library verifies only a specific range of storage cells (including the CAP and drives). The audit information is displayed on SLC while the audit is performed. After the audit completes, view the Cartridge Summary report for the latest cartridge locations and vol-ids. See "Viewing Library Reports" on page 7-5.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder on the navigation tree.
3. Click the **Audit** tab.
   a. In the Entire Library section, click **No**.

      In the Physical Audit section, select **Yes**.

      In the Verified Audit section, select **No**.
   b. In the Start Address and End Address sections, select the device types to audit and the internal address locations.

c. Click **Audit**.

4. Click **OK** to begin the audit. The Audit Console section displays the progress of the audit.

## Performing a Verified Audit

A verified audit validates the status of a specific cartridge location or range of locations (including CAPs and drives) in the cartridge database. If a cartridge address has a verified status of `false`, a physical audit of that location is performed and the cartridge database is updated.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder on the navigation tree.
3. Click the **Audit** tab.
   a. In the Entire Library section, select **No**.

      In the Physical Audit section, select **No**.

      In the Verified Audit section, select **Yes**.

   b. In the Start Address and End Address sections, select the device types to audit and the internal address locations.
4. Click **Audit**. The Audit Console section displays the progress of the audit.

# 8

# Redundant Electronics

The optional redundant electronics (RE) feature provides failover protection for the library controller. This allows an Oracle support representative to replace the faulty card while the library is online and provides minimal disruption during firmware upgrades.

> **Note:** Any reference to the HBC card also refers to the HBCR card.



## Requirements for Redundant Electronics

- Two library controller (HBC) cards
- Two drive controller (HBT) cards
- Minimum SL3000 firmware version FRS_3.0 and SLC version 5.00
- Hardware activation file (see "Hardware Activation Files" on page 4-1)
- HLI host with TCP/IP or FC-SCSI host using ACSLS (RE is not available to hosts using a native FC-SCSI interface)

## Redundant Electronics Overview

If the library controller or drive controller experiences errors, operations can switch to the standby controller with minimal disruption to the library and host operations. The library controller and drive controller installed on the same side of the card cage are always switched as a pair. Failover can be initiated automatically or manually. A failover cannot occur if:

- The standby library or drive controller is in a fault or eject state.
- The standby code is not running on the standby library or drive controller cards.
- A firmware download or card initialization is in progress.

In a failover, the active library controller attempts to complete all in-process jobs and copies the cartridge database to the standby controller card. If the database cannot be copied (usually only in a sudden failure), you must perform an audit after the failover completes (see "Audits Overview" on page 7-9). Any in transit cartridges are returned to their home slots. If a cartridge cannot be moved to its home slot, it is moved to a library system cell. The host must return the cartridge to its home cell (see library management software documentation).

After all in-process jobs have completed or timed out, the card roles switch. Active software is brought up on the standby controller. This controller becomes active and the previously active controller becomes the standby. If the standby software cannot be brought up on the previously active controller, the controller enters a fault state.

## Automatic Failover

An automatic failover can be initiated by either the active or standby library controller.

The active library controller initiates an automatic failover when:

- Its partner drive controller card is not installed or it is not communicating.
- It detects a catastrophic internal software error.

The standby library controller initiates an automatic failover if it detects the active controller is not functioning normally.

## Manual Failover

Before initiating a manual switch, you should verify that the standby library and drive controllers are running normally. You can initiate a manual switch using:

- **Host tape management** (ACSLS or ELS): Failover can be initiated from either the active or standby library controller. The standby library controller accepts only `set host path group` and `force switchover` HLI requests.
- **SLC**: Failover is initiated from the active library controller only (see "Performing a Manual Redundant Electronics Switch" on page 8-4).
- **CLI**: Failover can be initiated from either the active or standby library controller. This function is available to your Oracle support representative only.

You may want to perform a manual switch after initial installation of the standby cards, after a firmware upgrade, or periodically to check the failover function is working properly. It is not possible to manually switch the library controllers without the drive controllers — the controllers are always switched as a pair.

## Connections

Each library controller card requires a unique IP address. For libraries with Dual TCP/IP, each card requires two unique IP addresses: one for the primary port (2B) and one for the secondary (2A) port. A library equipped with both RE and Dual TCP/IP requires four unique IP addresses.

The failover process is minimally disruptive to host operations.

- Users of tape management software (Symantec or Virtual Storage Manager) do not see an interruption.
- HLI host applications (ACSLS and ELS) queue requests during the failover process for completion after the failover switch. For ACSLS, only mount and dismount requests are affected (see the ACSLS and ELS documentation).

- SLC and CLI connections are terminated. You must re-establish connections to the library using the IP address or DNS alias of the new active library controller (the former standby controller).

### Firmware Upgrades

Firmware upgrades for libraries with RE are minimally disruptive to library operations. New code is loaded and unpacked simultaneously on the active and standby controller cards and on all devices. The code is then activated, and the active and standby controllers and most devices are re-initialized. Under most circumstances, robot initialization is bypassed.

The loading, unpacking, and activation of code are not disruptive to library operations until the library is rebooted. During the reboot process (which takes approximately 10 minutes), the HLI host applications (ACSLS and ELS) queue all mount and dismount requests. After the reboot is complete, the queued requests are submitted to the library controller.

For firmware download and activation information, see "Upgrading Library Firmware" on page 7-2.

## Controller Card Status Information

Controller card status is indicated by LEDs on the card and displayed in SLC.

### Controller Card LEDs

The LEDs and meanings are the same on both card types (HBC and HBT).

***Table 6–1 LED Status Indicators***

| LED | Definition |
|---|---|
| ACTIVE - Green | Card is functioning as the active and is running active code. |
| STANDBY - Amber | Card is functioning as the standby and is running standby code. |
| FAULT - Red | Card has experienced a serious error. |
| EJECT OK - Blue | Support representative can safely initiate a card eject. |

### SLC Status of the Library Controller Card

Some SLC screens identify the individual library controller with an A or B suffix. The A suffix indicates the bottom card slot and the B suffix indicates the top card slot. To display the status of the controller cards in SLC, see "Displaying Redundant Electronics Information" on page 8-4.

***Table 6–2 SLC Controller Card Statuses***

| Status | Definition |
|---|---|
| Duplex: Software ready, switch possible | Card is functioning normally. A switch can be performed. |
| Not installed | Card is not installed in the library. |
| Ok | Active or standby drive controller card is functioning normally. |
| Pre-standby:<br>Software not ready | Standby library controller card is loading standby code and is not ready to be used in an automatic failover or manual switch. |

*Table 6–2 (Cont.) SLC Controller Card Statuses*

| Status | Definition |
|---|---|
| Standby:<br>Software ready | Standby library controller card is functioning normally and can be used for an automatic failover or manual switch. |

## Displaying Redundant Electronics Information

You can check the status of the controller cards using SLC.

1. Select **Tools > System Detail**.
2. Click the **Redundant Electronics** folder to display summary information.
3. For detailed information about each card, expand the Redundant Electronics folder in the navigation tree.
4. Select a card (for status meanings, see "SLC Status of the Library Controller Card" on page 8-3 ):
   a. **hbca**: Library controller, A (bottom) slot
   b. **hbcb**: Library controller, B (top) slot
   c. **hbta**: Drive controller, A (bottom) slot
   d. **hbtb**: Drive controller, B (top) slot

## Performing a Manual Redundant Electronics Switch

You may want to perform a manual switch after initial installation of the standby cards, after a firmware upgrade, or periodically to check the failover function is working properly. See also "Manual Failover" on page 8-2.

You cannot perform a manual switch at the local operator panel.

1. Verify that the device state of the card indicates "switch is possible" (see "Displaying Redundant Electronics Information" on page 8-4).
2. Select **Tools > Diagnostics**.
3. Select the **Redundant Electronics** folder
4. Click **Apply** to begin the switch process. If there is a problem with the standby library and drive controller cards, you cannot continue with the switch.
5. If there are no errors, click **Yes**.
6. Click **OK** to log off SLC.
7. Wait until the switch is complete before logging back into the library. You must specify the IP address or DNS alias of the new active controller to log in.

## Updating Host Management Software for RE

In order to support an RE configuration, the host management software may need to be updated.

## ACSLS

ACSLS 7.3 or higher is required for RE. Additionally, to update the ACSLS configuration to connect to an SL3000 with RE, you may want to add port connections to the libraries. There are two methods:

- Use `acsss_config`: Stop ACSLS. Run acsss_config, specifying the existing ACSs and port connections (with the ACSs in the same sequence) and add the new port connections. Start ACSLS.
- Run the `config ports` utility while ACSLS is running, specifying the existing ports in the same sequence and add new ports at the end. You cannot change or delete port connections with config ports.

## ELS

PTFs for 6.2 are L1H15S0(VM)/L1H15S1(MVS), and 7.0 is L1H15S2, are highly recommended for RE support. The following table defines the HSC PTF HLI compatibility level support prerequisites for SL3000 firmware FRS_4.00 and above.

***Table 6–3 HSC/ELS PTF HLI Compatibility Level Support***

| HSC/ELS Level | Level 20 or Below | Level 21 | Level 22 | Level 23 Minimum RE Support[1] | Level 23 Enhanced RE Support[2] | Level 23 Multi-RE Support[3] |
|---|---|---|---|---|---|---|
| 6.1 | Level 21 PTF | L1H14UU (VM)<br>L1H14UV (MVS) | Unsupported | Unsupported | Unsupported | Unsupported |
| 6.2 | Level 21 PTF | L1HA4UW (VM)<br>L1H14UX (MVS) | L1H15DH (VM)<br>L1H15DI (MVS) | L1H15H9 (VM)<br>L1H15HA (MVS) | L1H15MF (VM)<br>L1H15ME (MVS) | L1H168F (VM)<br>L1H168G (MVS) |
| 7.0 (MVS) | Level 21 PTF | L1H14UY | L1H15DJ | L1H15HB | L1H15MH | L1H168H |
| 7.1 (MVS) | Included | Included | Included | Included | Included | L1H168I |

1 Can connect to one SL3000 RE library in an ACS string. Only the library connected can be switched through HSC switch command.

2 Can connect to one SL3000 RE library in an ACS string. All RE library can be switched through HSC switch command. Supports 32 TCP/IP connections. Includes dual TCP/IP support, display of acs-id, auto CAP recovery, and support for 64 read in-transit cartridges during cartridge recovery.

3 Can connect to multiple SL3000 RE library in an ACS string. Includes same functionality as the enhanced RE support.

# 9

# CAP Management

Cartridge access ports (CAPs) are used to enter or eject cartridges to or from the library. A CAP can be a shared library resource in a partitioned library (see "Partitioning CAPs" on page 6-1). This chapter describes general CAP activities:

> **Note:** The term CAP refers to both AEMs and rotational CAPs, unless otherwise noted.



## CAP Modes and States

### Auto Enter Mode

Only HLI libraries support CAP auto enter mode.

Auto enter mode enables you to open a CAP and begin an enter operation without issuing an explicit enter request or having an explicit CAP reservation from a host application. However, to eject cartridges through the CAP, you still have to issue an explicit eject command. When in auto mode, a CAP is unlocked and its LED is on. The system locks the CAP only during cartridge enter, eject, or audit operations. To initiate an enter operation using an automatic CAP, press **CAP Open** on the key pad.

Host applications manage the auto enter mode. To place a CAP in auto enter mode, enter the appropriate tape management command to unlock the CAP (see the tape management software documentation).

### Manual Mode

Manual mode is the most secure method of CAP operations. When in manual mode, the system locks a CAP by default, and its LED is off. To initiate an enter or eject operation using a manual CAP, enter an explicit enter or eject request before pressing the **CAP Open** button on the keypad.

### Assignment Mode

Only non-partitioned FC-SCSI host connections support assignment mode. The CAP assignment mode controls whether library CAPs can be used for normal host operations or for manual operations (see "Changing the CAP Assignment Mode for an FC-SCSI Library" on page 9-4).

## CAP States

*Table 7–1 CAP States in Non-partitioned Library*

| Type of CAP | Default State | Default CAP Button Light Condition |
|---|---|---|
| HLI: Manual mode | Locked | Off |
| HLI: Auto enter mode | Unlocked | On |
| FC-SCSI | Unlocked | On |

# CAP Priorities for FC-SCSI Hosts

In a non-partitioned library, the SCSI interface treats all CAPs as one large CAP. When you initiate an eject operation from an FC-SCSI host, the robot loads cartridges into the left-most rotational CAP, then moves right, and then moves to AEMs. For partitioned libraries, the CAP priority depends on how CAPs are allocated to partitions.

For example, assume an FC-SCSI library with a base module, two CEMs (one on each side of the base), and two AEMs (one on each end of the library). For an eject operation of 350 cartridges, the robots fills CAP cells as shown Table 7–2.

*Table 7–2 Fill Order of CAP Cells in Eject Operation*

| Order | Module | Number of Cartridges | Total Cartridges |
|---|---|---|---|
| 1 | Left CEM | 26 | 26 |
| 2 | Base Module | 26 | 52 |
| 3 | Right CEM | 26 | 78 |
| 4 | Left AEM | 234 | 312 |
| 5 | Right AEM | 38 | 350 |

# AEM Operations

The front panel of the access door includes the following components:

- **Deadbolt Override Lock** — enables fast access to the inside of the AEM (has the same effects on library operations as opening the main library access door).
- **Service Access Lock** — releases the access door deadbolt (only for Oracle support)
- **Operator Request CAP button** — releases the access door deadbolt for normal access to the inside of the AEM, to load or unload cartridges.
- **Latch** — opens and closes the access door after the deadbolt is released.

# Displaying CAP and AEM Safety Door Information

Use this procedure to display information for rotational and AEM CAPs in the library. This information is also available through **Reports > CAP Summary** (see "Viewing Library Reports" on page 7-5).

## Displaying CAP Status and Properties

To display the current operational state or properties of a rotational or AEM CAP:

1. Select **Tools > System Detail**.
2. Select the **CAP** folder in the navigation tree. The system lists all the library's CAPs and their locations. For more information, expand the **CAP** folder, and select the CAP to display. AEM CAPs are column –31 for the left and column 31 for the right.
3. Select a tab:
   - **Status** - displays the current status of the selected CAP
   - **Properties** - displays the CAP properties, including code version

## Displaying AEM Safety Door Status and Properties

To display the current status or properties of an AEM safety door:

1. Select **Tools > System Detail**.
2. Expand the **Safety Door** folder, and select the safety door you want to display.
3. Select a tab:
   - **Status** - displays the current state of the door. Beside the Door Position label, "open" indicates the safety door is up and the TallBot is free to move in and out of the AEM. "Closed" indicates the safety door is completely closed and it is safe for you to open the AEM access door.
   - **Properties** - displays detailed information for an AEM safety door, including the serial number and current firmware versions.

# Locking or Unlocking a CAP or AEM

Normally, the host unlocks a CAP or AEM access door. If the CAP is reserved by a host, the host must release the CAP reservation before you can use this procedure. An unlocked CAP is reserved by the library and unavailable to all hosts until it is locked. Use this procedure to manually lock or unlock a CAP with SLC.

1. Select **Tools >Diagnostics**.
2. Expand the **CAP** folder, and select the CAP to modify. AEM CAPs are column –31 for the left and column 31 the right.
3. Click the **Access** tab.
4. In the Locked list select:
   - **True** to unlock
   - **False** to lock
5. Click **Apply**. When locking a CAP, a confirmation message appears. Click **OK** to unlock the CAP.

# Changing the CAP Assignment Mode for an FC-SCSI Library

Use this procedure to change the CAP assignment mode for all CAPs in an un-partitioned FC-SCSI library. The CAP assignment mode controls whether library CAPs can be used for normal host operations or for diagnostic moves.

1. Verify that all library CAPs are unreserved, empty, closed, and locked.
2. If you are changing the CAPs to diagnostics mode, quiesce the library to all hosts (see the tape management software documentation).
3. Select **Tools > CAP Assignment**.
4. Using the Mode list, select a mode:
   - **Diagnostics —** causes all CAPs to be available for diagnostic operations. Select this to perform manual cartridge moves, such as moving cleaning or diagnostic cartridges from the CAPs to system cells.
   - **Host Operations** — causes all CAPs to be available for normal host operations. Select this to return the library to normal tape mount or dismount operations.
5. Click **Apply** and then **OK**.

# Performing CAP Self-Test

You can use a CAP self-test to help diagnose issues. See also "Performing a Library Self-Test" on page 7-7.

1. Select **Tools > Diagnostics**.
2. Expand the **CAP** folder, and click the CAP to test. AEM CAPs are identified as column –31 for the left and column 31 the right.
3. Click the **SelfTest** tab.
4. In the Mode list, select **Non-Disruptive**.
5. Click **Run**. A message appears when the test finishes.

# Changing CAP Online/Offline Status

Use this procedure only if you are not using ACSLS or ELS tape management software, or if their servers are unable to communicate with the library. For instructions on changing the state of the library and its components through ACSLS or ELS, see the appropriate tape management software documentation.

> **Note:** Library devices that are offline and in an error state cannot go online. The error condition must be cleared first.

1. Select **Tools > System Detail**.
2. Expand the **CAP** folder. Click the CAP to modify. AEM CAPs are identified as column –31 for the left and column 31 the right.
3. Click the **Status** tab.
4. In the Transition Request list, select either:
   - **Take Offline** - all outstanding jobs for the CAP will complete first.

- **Bring online**

5. Click **Apply**.

## Entering or Ejecting Cartridges for FC-SCSI Partition with Shared CAP

Use this procedure to give the partition exclusive ownership of a shared CAP for an enter or eject operation for an FC-SCSI partition. The association remains until you explicitly remove the association.

This procedure is not necessary for dedicated FC-SCSI CAPs or HLI partitions. For HLI hosts or FC-SCSI dedicated CAPs, see "Entering Cartridges" on page 11-5 and "Ejecting Cartridges" on page 11-6.

1. Select **Tools > Shared CAP Assignment**.
2. Select the partition into which you want to enter cartridges.
3. Click **Apply**, and then **OK**.
4. Perform the enter or eject operation (see "Entering Cartridges" on page 11-5 and "Ejecting Cartridges" on page 11-6).
5. Once the operation is complete, remove the CAP association. Select **Tools > Shared CAP Assignment**.
6. Deselect the partition with the CAP associations.
7. Click **Apply**, and then **OK**.

## Overriding a CAP Reservation

If for any reason a CAP reservation by a partition is not released and the enter or eject command cannot be terminated on the ACSLS or HSC host, use this procedure to override the CAP reservation.

> **Note:** You must follow all steps in this procedure, or the CAP could be left unavailable to all partitions.

1. Select **Tools > Shared CAP Assignment**.
2. Expand the CAP folder, and then click the CAP to override. AEM CAPs are identified as column –31 for the left and column 31 the right.
3. Click the **Unreserve** tab.
4. Click **Apply** to override the reservation.
5. Click **OK** to continue with the override operation.
6. If the CAP is locked, unlock using SLC (see "Locking or Unlocking a CAP or AEM" on page 9-3).
7. Open the CAP. Remove any cartridges and label them with the partition ID.
8. Close the CAP. The CAP status changes to "unreserved".
9. Determine if the cartridges from the CAP should be re-entered into the library and then enter the cartridges into the correct partition.

# 10

# Drive Management



## Drive Cleaning

Library tape drives require periodic cleaning to prevent read/write errors. A drive cleaning occurs when the system mounts a compatible cleaning cartridge in response to a cleaning request from the drive. You can manage drive cleaning using either:

- **Host-Managed Cleaning** — Host applications (such as ACSLS or ELS) or direct-attach applications (such as Symantec and NetBackup) manage all cleaning cartridge and drive clean functions. This method is available for HLI libraries and partitions.
- **Library Auto Clean** — The library controller manages all cleaning cartridge and drive clean functions. This is required for libraries using the Media Validation feature. Check your tape management software documentation to determine whether this method is recommended for your library.

For a non-partitioned library, select one method for the entire library. In a partitioned library, select one method per partition.

### Host-Managed Cleaning

When a drive requires cleaning, it notifies the host and the host mounts a cleaning cartridge to the drive. To enter/export cleaning cartridges in the library, use the applicable ACSLS or ELS commands. Do not use the SLC import/export feature. All cleaning cartridges are stored in data cells.

You must disable library auto clean before enabling host-managed cleaning (see "Configuring Library Auto Clean" on page 10-3). To enable host-managed cleaning, see the *ACSLS Administrator's Guide* or *ELS System Programmer's Guide*.

### Library Auto Clean

When a drive requires cleaning, the library controller automatically mounts a cleaning cartridge on the drive. While a drive is being cleaned, the system marks it as busy to

all hosts. If an FC-SCSI host requests the drive while the drive is being cleaned, the request is rejected.

Ensure that the library contains enough cleaning cartridges that are compatible with each drive type in your library. You must use SLC to enter/export cleaning cartridges (see "Importing/Exporting Cleaning Cartridges (Library Auto Clean Only)" on page 10-3). Imported cleaning cartridges are stored in reserved system cells.

The library tracks cleaning cartridge usage and sends notification when cleaning cartridges have expired or have reached a user-defined warning threshold (see "Defining Warning Thresholds (Library Auto Clean Only)" on page 10-3). Cleaning cartridges are expired based on information from the drives. If a drive cannot use a cleaning cartridge, the drive sends a "cleaning cartridge expired" notification to the library controller. Expired cleaning cartridges can be exported from the library in bulk, by expiration date, or by selected cartridge volume ID (vol-id or volser). Replace expired cartridges as soon as possible.

## Manually Cleaning a Drive

Normally, either the library auto clean feature or the host tape management software manages drive cleaning. However, there may be occasions when you need to perform a manual clean. Refer to the drive manufacturer's documentation for information on whether manual cleaning is allowed.

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

1. Verify that the drive needs cleaning (see "Displaying Drive Information" on page 10-4).
2. Display a list of cleaning cartridges (see "Displaying Cleaning Cartridges" on page 10-2). Verify there is a compatible cleaning cartridge for the drive.
3. Move a compatible cleaning cartridge from a system cell to the drive that needs cleaning (see "Moving Cartridges (Recovery Moves)" on page 11-4).
4. When the cleaning operation is complete, move the cleaning cartridge from the drive back to a system cell.

## Displaying Cleaning Cartridges

You can monitor the status and usage count for all cleaning cartridges in reserved system cells. A cleaning cartridge may not appear on this page if it is in use, in transit, or was entered into the library with host tape management software.

1. Select **Tools > System Details**.
2. Select the **Library** folder on the navigation tree
3. Click the **Auto Clean** tab, and then the **Cleaning Cartridges** tab. Possible cleaning cartridge statuses are:
   - *OK* — cartridge is usable for cleaning.
   - *warning* — usage count has reached or exceeded the warning threshold defined for this cartridge type.
   - *expired* — cartridge has expired, based on information from the drives.

## Configuring Library Auto Clean

If the library is partitioned, you can enable or disable library auto clean for individual partitions.

1. Select **Tools > Configuration**.
2. Set the Enable Auto Clean option:
   - Uncheck the box to turn library auto clean off (default). Host management software must manage drive cleaning.
   - Check the box to turn library auto clean on.
3. Click **Apply**.

## Defining Warning Thresholds (Library Auto Clean Only)

The cleaning cartridge warning threshold notifies you when a cleaning cartridge is nearing time for replacement. Set the threshold lower than the cartridge's recommended maximum usage to allow time to replace the cartridge. Refer to the drive manufacturers' documentation for maximum recommended usage for each type of cleaning cartridge.

When you import a cleaning cartridge into the library, the library controller sets the usage count to zero. The count will not be accurate when importing a used cleaning cartridge. To display the current usage count, see "Displaying Drive Information" on page 10-4.

To assign usage warning thresholds to selected cleaning cartridge types:

1. Select **Tools > System Detail**. Click the Library folder on the navigation tree.
2. Select **Auto Clean**, and then the **Warning Threshold** tab.
3. In the "Threshold warning index to change" list, select the index number of the cleaning cartridge type to configure.
4. In the "New warning threshold count" field, enter the warning threshold for the cartridge type.

   All cleaning cartridges of this type are assigned the threshold. An entry of 0 (default) deactivates the warning threshold feature for the cartridge type.
5. Click **Apply**.

## Importing/Exporting Cleaning Cartridges (Library Auto Clean Only)

Only one cleaning or diagnostic cartridge import or export operation can be performed at a time. The library controller reserves the CAP for the entire operation.

### Importing Cleaning Cartridges

Ensure there are enough empty reserved system cells (one system cell on each side of the library must be left open for robot recovery or library initialization). The library distributes imported cleaning cartridges evenly in reserved system cells, and sets their usage counts to 0. The library auto clean feature requires that cleaning cartridge volume IDs (vol-ids or volsers) be eight characters in length, with CLN as the first three characters (refer to the *Barcode Label Technical Brief* on OTN for more information).

1. Verify that the CAP is empty, unreserved, closed, and locked.
2. Select **Tools > Diagnostics**.

3. Expand the **CAP** folder and then select a CAP to use. Click the **Import/Export** tab.
4. Select **Import Cleaning/Diagnostic** cartridges.
5. Click **Start**, and then **OK** to begin the import operation.
6. Load the cleaning cartridges into the CAP (see steps 2 to 4 of "Entering Cartridges" on page 11-5).

### Exporting Cleaning Cartridges

1. Verify the CAP is empty, unreserved, closed, and locked.
2. Select **Tools > Diagnostics**.
3. Expand the **CAP** folder and then select a CAP to use. Click the **Import/Export** tab.
4. Select a type of export operation:
   a. **Export expired cleaning cartridges** — exports all cleaning cartridges with an "expired" status.
   b. **Export specific cleaning cartridges** — select the cartridges to export in the "Select Cartridges(s) to export" list.
   c. **Export all cleaning cartridges** — exports all cleaning cartridges in the library.
5. Click **Start**.
6. Click **OK** to begin the export operation.
7. Remove the cartridges from the CAP (see steps 2 to 5 of "Ejecting Cartridges" on page 11-6).

## Displaying Drive Information

Use this procedure to display drive information for all drives in the library. This information is also available through **Reports > Drive Details** (see "Viewing Library Reports" on page 7-5).

1. Select **Tools > System Detail**.
2. Click the **Drive Folder** in the navigation tree to display a table of drive information, including the drive FPGA version and the drive tray card type — LOD or HBD.
3. For more detailed information, expand the **Drive** folder in the navigation tree. Select a drive.
4. Select a tab:
   - **Status tab** — displays the current operational state of the selected drive
   - **Properties tab** — displays configuration information, including the drive type, serial number, and port configuration
   - **Display tab** — displays network data, the Virtual Operator Panel (VOP) for T10000 and T9840D drives, and drive LED status
   - **Drive Tray tab** — displays the current status of a drive tray

## Displaying the Drive and Drive Media Reports

The Drive and Drive Media Events Reports summarize drive and media events and errors that have occurred on library drives. Use these reports to help identify and diagnose faulty drives and cartridges.

By default, the reports are sorted in drive serial number order. Optionally, you can change the sort order and rearrange and re-size the columns (see "Modifying a Tabular Display" on page 3-3).

1. Select **Tools > Reports**.
2. Expand the **Statistics** folder.
3. In the navigation tree, click a report type:
   - **Drive Events** — summarizes drive events and errors. For each drive that has experienced an event, the report lists the type of drive, type of error, the number of occurrences, and the date and time of the last such event. The report can display up to 70 entries.
   - **Drive Media Events** — summarizes media events. For each drive that has experienced media events, the report lists the vol-id of the cartridge, the type of event, the number of occurrences, and the date and time of the last such event. The report can display up to 500 entries.

## Configuring the Drive Tray Serial Numbers

Use this procedure to add or edit the drive tray serial number.

1. Select **Tools > Configuration**.
2. Click the **Drive Tray S/N** tab.
3. Click **Refresh** to display the current data.
4. To edit an individual drive tray serial number:
   a. Double-click the Drive Tray S/N field.
   b. Enter the drive tray serial number. Proceed to step 6.
5. To edit multiple drive tray serial numbers at once, you can edit a comma-separated value (csv) file:
   a. Click **Export**, and then save the file to a desired location.
   b. Open the file and edit only the drive tray serial numbers. Do not alter any other values. Save the changes.
   c. In SLC, click **Import**. Locate the updated .csv file, and then click **Open**.
6. Click **Apply**, then **Yes**.

## Changing a Drive Online/Offline Status

A drive can be online (available for read/write operations) or offline (unavailable for read/write operations).

Use this procedure only if you are not using ACSLS or ELS tape management software, or if their servers cannot communicate with the library. For instructions on changing the state of the library and its components through ACSLS or ELS, see the tape management software documentation.

**Note:** Library devices that are offline and in an error state cannot go online. Clear the error condition first.

1. Select **Tools > System Detail**.
2. Expand the **Drive** folder, and then click the drive to modify.
3. Click the **Status** tab.
4. In the Transition Request list, select either:
   - **Take Offline** — the system completes all outstanding jobs for the drive first.
   - **Bring Online**
5. Click **Apply**.

## Performing a Drive Self-Test

You can use a drive self-test to help diagnose issues. See also "Performing a Library Self-Test" on page 7-7.

1. Select **Tools > Diagnostics**.
2. Expand the **Drive** folder, and then click the drive to test.
3. Click the **SelfTest** tab.
4. In the Mode list, select **Non-Disruptive**.
5. Click **Run**.

# 11

# Cartridge Management



## Cartridge Types

- Data cartridges
- Diagnostic cartridges — used by service representatives to run read/write tests on drives (see "Importing or Exporting Diagnostic Cartridges" on page 11-7)
- Cleaning cartridges — used to clean the tape path and read/write heads of the tape drives (see "Drive Cleaning" on page 10-1)

> **Caution:** Do not re-enter a cleaning cartridge ejected by the library. The library will consider it to be new, and set the usage counter to zero.

Library cartridges must meet specifications defined in *American National Standard Magnetic Tape and Cartridge for Information Interchange*. For more information on cartridges, refer to the drive vendor's publication and website.

## Cartridge Labels

All library cartridges must have a readable external label. The robot reports an error when it encounters an unreadable label.

Non-labeled cartridges are not supported. The library exports any non-labeled cartridges it finds through the CAP. A non-labeled or unknown type cartridge will not mount to a drive.

Cartridge labels include a media domain and media ID. The media domain indicates the cartridge type — data, cleaning (CLN), or diagnostic (DG).The media ID indicates the compatible drive type. Some FC-SCSI host applications, may require you to configure the barcode presentation to use the full eight-character barcode. For information about barcode label standards for each cartridge type, refer to the *Barcode Label Technical Brief* on OTN.

### Configure Cartridge Barcode Presentation (FC-SCSI only)

Use this procedure to configure the cartridge barcode presentation format for an FC-SCSI library or FC-SCSI partition. This specifies which part of a cartridge barcode the library passes to host applications that use the FC-SCSI interface.

1. Select **Tools > Configuration**.
2. In the Barcode Presentation list, select the presentation format to use for each partition. The Partition Name scsi0 indicates a non-partitioned library. Format options are:
   - **all** — passes all eight barcode characters to the host.
   - **left6** — passes only the six VOLID characters to host applications. It does not pass the domain and type characters, which are the two characters on the right of the barcode. This is the default setting.
3. Click **Apply**.
4. Click **OK** to dismiss the message.

## Resolving Orphaned Cartridges

An orphaned cartridge is a cartridge which is inaccessible to a host. Orphaned cartridges can occur when you change the capacity, delete a partition, or move a cartridge to a cell or drive that is not allocated to a partition.

In a partitioned library, orphaned cartridges can cause data loss. A host that finds an orphaned cartridge in its partition may treat the cartridge as a scratch volume and overwrite the data.

SLC will warn you when it identifies orphaned cartridges. Resolve the orphaned cartridges by performing recovery moves on listed cartridges. Recovery moves transfer the orphaned cartridges to accessible locations within their parent partitions. See "Moving Cartridges (Recovery Moves)" on page 11-4.

## Displaying Cartridge Information

The reports feature can display information about all library cartridges, including cartridge vol-id, location, and media type. You can display the information in a tabular format or a list. For drive-related media events, see "Displaying the Drive and Drive Media Reports" on page 10-5.

1. Select **Tools > Reports**.
2. Expand the **Status Summary** folder in the navigation tree.
3. Click the report to view:
   - **Cartridge Table** - displays cartridge information in a tabular form. You can modify the layout and display of this screen (see "Modifying a Tabular Display" on page 3-3).

- **Cartridge Summary** - displays cartridge information in a list.

4. To search the report data or save it to a file, see "Viewing Library Reports" on page 7-5.

# Locating Cartridges

You can display the library internal address of any cartridge by using SLC. You can locate a cartridge based on vol-id, internal library address, or HLI address.

This utility is especially useful when you must perform a manual mount of a cartridge. The library management software (ELS or ACSLS) provides the vol-id, HLI-PRC address of the cartridge, and drive bay address of an available drive. Before you enter the library, write down the vol-id, cartridge location, and the drive slot location (see "Library Addressing" on page B-1).

## Locating a Cartridge by vol-id

Use this procedure to display the current location of a cartridge with a specified volume ID. You can display cartridge location in the library internal address or HLI-PRC address format.

1. Select **Tools > Diagnostics**, and then click the **Library** folder.
2. Click the **Search** tab.
3. In the Search Type list, select **VOLID**.
4. Enter the volume ID (wildcards are valid).
5. The Requester field controls the address format of the search results. Select:
   - **default** to display in library internal address format.
   - **hli0** or **hli1** to display in HLI-PRC address format.
6. Select the Cartridge Type.
7. Click the **Search** tab. The Search Results section updates.

## Locating a Cartridge by Address

Use this procedure to display detailed information for cartridges with a specified location. You can specify the location using library internal address, HLI-PRC address, or FC-SCSI address.

1. Select **Tools > Diagnostics**, and then click the **Library** folder.
2. Click the **Search** tab.
3. In the Search Type list, select **Location**.
4. In the Location list, select the search criteria.
5. In the **Location** field, enter the address (wildcards are invalid)
6. In the Requester list, select the type of address format - **FC-SCSI**, **HLI**, or **default** (internal address). Make sure the type matches what was entered in the Location field.
7. Click the **Search** tab.
8. To see details about a cartridge or to view a location mapping, click the "**. . .**" button in the Details column.

# Moving Cartridges (Recovery Moves)

Using the recovery move diagnostic function, you can move a cartridge from one location to another. For example, you can:

- Return a cartridge to its original location from a CAP cell, drive, or another storage cell location.
- Transfer orphaned cartridges to accessible locations
- Group cartridges by data type or move them closer to assigned drives.
- Eject a cleaning or diagnostic cartridge that has expired.
- Enter a new cleaning or diagnostic cartridge and move it to a reserved storage cell.

A cartridge in a storage cell can be moved only to a CAP, a system cell, or another storage cell, and not to a drive. A cartridge currently in a drive, CAP, or system cell can be moved to any other unoccupied location in the library.

Before moving any cartridge, it is helpful to display or print a report showing where cartridges are currently located and which storage cells are unoccupied (see "Displaying Cartridge Information" on page 11-2).

## Moving a Cartridge by Vol-id or Specified Location

You can move a cartridge in the library to a new specified location. These procedures update the cartridge's location in the library controller database, but not in the host database. You must perform an audit from the host software to update the host database. Failure to do so will cause future mount requests from the host software to fail.

---

**Caution:** *Potential data loss.* Use caution when moving cartridges in partitioned libraries. Accidentally moving a cartridge from one partition to another allows the new partition to overwrite data.

---

1. Select **Tools > Diagnostics.** Click the **Library** folder.
2. Click the **RcvrMove** tab.
3. In the Source Location Mode section, select either:
   - **VOLID** to use vol-id. In the VOLID field, enter the vol-id of the cartridge to move.
   - **Location** to use a specific location. Select the cartridge's current location type. Options are: **CAP**, **Slot**, **Drive**, **Reserved Slots**.
4. In the Destination Location Type list, select the type of location to which to move the cartridge. Options are: **CAP**, **Storage Slots**, **Drive**, and **Reserved Slots**.

   Selection restrictions include:

   - The destination can be a drive only if the source is a CAP or reserved slot.
   - To move a cartridge to a drive, the cartridge media type must be compatible with the drive type.
   - You cannot move a cartridge to a location that is already occupied.
   - Only diagnostic or cleaning cartridges should be moved to reserved slots.

5. In the Destination Location table, specify the cartridge destination with the library internal address lists: Library, Rail, Column, Side, Row.

   Options include:

   - **Min**: First element of that location type (library, rail, column, side, row) in the library
   - **Max**: Last element of that location type (library, rail, column, side, row) in the library

6. Click **Start** to begin the move.
7. Click **OK**.
8. To verify the new location, you can display a Cartridge Summary report (see "Displaying Cartridge Information" on page 11-2).
9. To update the new cartridge location in the host database, initiate a library audit from the host software (see the tape management software documentation).

# Entering Cartridges

Before you enter a cartridge, verify that it is labeled properly. Do not enter unlabeled cartridges or place cartridges upside-down.

A rotational CAP holds 26 cartridges and an AEM hold 234 cartridges. Place cartridges in any magazine slot and in any order with the hub gear facing down and cartridge label facing you.

After a cartridge is entered through the CAP, the library moves the cartridge from the CAP to a library storage slot, records the cartridge's location, and sends the location to the host.

---

**Caution:** *Possible equipment damage*: DO NOT force the CAP to open or close.

---

### Entering Cartridges Using Rotational CAPs

1. If the CAP is in auto enter mode (see "CAP Modes and States" on page 9-1), proceed to the next step. If it is in manual mode, initiate the enter operation at the host (see tape management software documentation).
2. Press the **CAP** button.

   The CAP door opens, and the CAP button light turns ON.

3. Place the cartridges in the CAP with the hub gear face down and barcode toward you.
4. Press the **CAP** button.

   The CAP closes and locks automatically, and the CAP button light turns OFF. When the CAP is empty, the library returns the CAP to its default state

### Entering Cartridges Using AEMs

1. If the CAP is in auto enter mode (see "CAP Modes and States" on page 9-1), proceed to the next step. If it is in manual mode, initiate the enter operation at the host (see tape management software documentation). The "Unlocked" indicator lights.

2. Push the **AEM CAP** button. The "Wait" indicator blinks until the safety door is completely down. Then the "Enter" light displays solid. Depending on the level of activity in the library, this may take several minutes.
3. Lift the latch, and open the door. Place the cartridges in the CAP with the hub gear face down and barcode toward you. Close and latch the AEM access door.
4. Push the **AEM CAP** button. The "Enter" light goes off, and the "Wait" light starts blinking. The safety door goes up.

# Ejecting Cartridges

A rotational CAP holds 26 cartridges and an AEM holds 234 cartridges. To export a cartridge, specify the vol-id of the cartridge to remove from the library. For HLI hosts you can select a CAP for the eject operation. For FC-SCSI hosts, the library uses CAPs in a pre-defined order (see "CAP Priorities for FC-SCSI Hosts" on page 9-2). The system retrieves the vol-id location from the library's memory. The robot locates the cartridge and places it into the CAP slot.

After the CAP opens, the system erases the location of the cartridge from the library controller database and the host database. The robot does not read cartridge labels during export operations.

**Caution:** *Possible equipment damage*: DO NOT force the CAP to open or close.

### Ejecting Cartridges Using Rotational CAPs

1. Initiate the eject operation at the host. Specify the vol-ids of the cartridges to remove from the library (see the tape management software documentation).
2. Press the appropriate **CAP** button.

   The CAP door opens, and the CAP button light turns ON.
3. Remove the cartridges from the CAP.

**CAUTION:** *Potential data loss.* If you do not remove the cleaning cartridge from the CAP and the CAP closes, the library treats the cartridge as new and the expired cleaning cartridge is used again.

4. Push the **CAP** button to close the CAP.

   The CAP closes and locks, and the CAP button light turns OFF.
5. If more cartridges must be exported, the robot continues filling the CAP. Wait until the CAP door is unlocked and repeat step 2 through step 4.

   Once the system ejects all cartridges, the robot audits the CAP to verify it is empty. The CAP returns to its default state.

### Ejecting Cartridges Using AEMs

1. Initiate the eject operation at the host. Specify the vol-ids of the cartridges to remove from the library (see the tape management software documentation).
2. Push the **AEM CAP** button.

The "Wait" indicator blinks until the safety door is in place. The the "Enter" light displays solid. Depending on the level of activity in the library, this process may take several minutes.

3. Lift the latch, and open the door. Remove the cartridges from the AEM CAP. Close and latch the AEM access door.
4. Push the **AEM CAP** button. The "Enter" light goes off, and the "Wait" light begins blinking. The safety door moves up. If more cartridges need to be exported, the TallBot continues filling the necessary AEMs.
5. If more cartridges must be exported, wait until the AEM "Unlocked" light is comes on and repeat step 2 through step 4.

# Importing or Exporting Diagnostic Cartridges

Library self-tests and some other diagnostic activities require the use of diagnostic cartridges. Make sure the library contains a enough diagnostic cartridges for these activities. Diagnostic cartridges are stored in the reserved system cells, and cannot be imported or exported with host management software.

To import or export a diagnostic cartridge through a CAP, use the SLC Import/Export function. The library controller reserves the CAP for the entire operation. The system can perform only one diagnostic or cleaning cartridge import or export operation at a time.

Diagnostic cartridge volume IDs (vol-ids or volsers) must be eight characters in length, with DG as the first two characters. The library Import/Export function works only for diagnostic cartridges with labels in this format. You can use any of the following SLC reports and searches to display information about diagnostic cartridges. Search for cartridges that begin with DG.

- "Displaying Cartridge Information" on page 11-2
- "Locating Cartridges" on page 11-3

## Importing Diagnostic Cartridges

Make sure that the library has enough empty reserved system cells for the diagnostic cartridges. There must be at least one empty system cell on each side of the library for robot recovery or library initialization. The diagnostic cartridges are distributed as evenly as possible in reserved system cells.

1. Verify that the CAP is empty, available for use (not reserved by a host), and closed and locked.
2. Select **Tools > Diagnostics**.
3. Expand the **CAP** folder and click a CAP to use. Click the **Import/Export** tab.
4. In the Operation section, select **Import Cleaning/Diagnostic cartridges**.
5. Click **Start**.
6. Click **OK** to begin the import operation.
7. Follow steps 2 to 4 of "Entering Cartridges" on page 11-5 to complete the import operation.

### Exporting Diagnostic Cartridges

1. Verify that the CAP is empty, available for use (not reserved by a host), and closed and locked.
2. Select **Tools > Diagnostics**.
3. Expand the **CAP** folder, click a CAP to use. Click the **Import/Export** tab.
4. In the Operation list, select the type of export operation:
   - **Export specific diagnostic cartridges**, then select the cartridges to export in the "Select Cartridge(s) to export" list
   - **Export all diagnostic cartridges**, then select a rail in the "Select rail to export cartridges from" list.
5. Click **Start**.
6. Click **OK** to begin the export operation. The Import/Export page displays a message when the CAP is ready to be unloaded.
7. Follow steps 2 to 5 of "Ejecting Cartridges" on page 11-6 to complete the export operation.

## Cartridge Handling

**Caution:** When cartridges are improperly handled, loss of data or damage to a library component can occur.

- Keep cartridges clean and inspect for damage before each use.
- Never open a cartridge.
- Do not handle tape that is outside the cartridge; the tape edge might be damaged.
- Do not expose the tape or cartridge to direct sunlight, moisture, or magnetic fields.

### Inspecting a Cartridge

Always inspect a cartridge before you insert it into a tape drive or a library. A defective or dirty cartridge can damage a tape drive. Never use a damaged cartridge. Look for:

- Dirt or debris
- Cracked or broken housing
- Damaged write-protect switch
- Liquid in the cartridge
- Labels not firmly attached, or that extend over the cartridge edge

### Cleaning the Cartridge Exterior

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

**Caution:** *Potential 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.

## Storing Cartridges

Store cartridges in a clean environment. Do not take a 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 cartridge, ensure that it has been in its operating environment for at least 24 hours.

## Applying a Label to a Cartridge

If you did not order cartridges with pre-applied labels, you must apply them yourself. Use labels that do not leave a residue when they are removed.

1. Make sure the cartridge has been at room temperature for at least 24 hours.
2. Use OracleStorageTek Tape Cleaner Wipes to clean the surface where the label will be placed (see "Cleaning the Cartridge Exterior" on page 11-8)
3. Locate the type of label you need (see "Cartridge Labels" on page 11-1). Make sure the label contains a vol-id.
4. Peel the backing from the cartridge label.
5. Orient the cartridge:
   - LTO — hold the cartridge so that the write-protect switch is toward you.
   - T-series — hold the cartridge so that the two recessed areas are toward you.
6. Place the label within the indented area of the cartridge so that the edges of the label are parallel to the edges of the cartridge. The label must not overlap the edge of the indented area. Press into place.

   Make sure the edges of the labels do not curl, as the label may be misread or become jammed in a drive.
7. For T-series cartridges, repeat step 2 through step 6 for the media ID label. Make sure both labels are aligned with each other.

# 12

# Media Validation

Media validation allows customers to verify T10000 tape cartridge types using SLC. SLC indicates the progress of the validation at the initial start, one minute after the start, and then every 10 minutes. The validation provides a "success" or "failure" result for each tape cartridge tested.

The media validation feature requires minimum SL3000 firmware FRS_4.30, SLC FRS_6.50, and a high memory HBT card. You can only validate one cartridge at a time per each SLC session. Refer to the StorageTek Tape Analytics (STA) documentation to use STA to automate media validation.



## Media Validation Drive Pool Overview

Media validation requires a designated pool of T10000C or T10000D type tape drives at TTI level 5.40+. Up to 10 drives can be placed in the media validation pool using SLC (see "Adding Drives to the Media Validation Pool" on page 12-2). The drives in the pool are not available to any host applications, such as ACSLS, ELS, or a SCSI-attached host. The pool is not considered a partition and does not contain cartridges.

Drives in the media validation pool are automatically cleaned by the library. This occurs regardless of the auto clean status for the entire library or for partitions in the library (see "Drive Cleaning" on page 10-1).

---

**Note:** The CSE should ensure there are cleaning cartridges in the reserved system slots for auto-cleaning of the drives in the media validation pool.

---

## Validation Types

The table below shows the five types of validation available through SLC.

*Table 10–1 Media Validation Types*

| Type of Validation | Description | Starts at | Approximate Duration per Cartridge |
|---|---|---|---|
| **Basic Verify** | Simple mount/dismount of the cartridge to determine if MIR is unreadable or out of sync | Not applicable: Simple mount and dismount | 2 minutes |
| **Standard Verify** | Reads:<br>- 1000 records from the beginning of the tape<br>- The wrap that contains EOD, then into the EOD<br>- Outermost wraps on top and bottom bands to verify edges | Beginning of tape (BOT) | Maximum of 30 minutes |
| **Complete Verify** (default) | Reads data at tape speed | - Beginning of tape (BOT)<br>- Resumes where it left off | T10000C: 6 hours<br>T10000D: 9 hours max |
| **Complete Verify** Plus StorageTek Data Integrity Validation[1] | Checks DIV CRC to determine if it exists | - Beginning of tape (BOT)<br>- Resumes where it left off | T10000C: 6 hours for compression ratios less than 2.5:1.<br>T10000D: 9 hours for compression ratios less than 3:1 |
| **Rebuild MIR** | Reads data at tape speed | At invalid position in the MIR | T10000C: 5 hours<br>T10000D: 9 hours |

[1] Decompression and encryption key management system are required.

# Media Validation in a SCSI Library

Adding or removing a drive to the media validation pool can renumber the SCSI element IDs. If renumbering occurs, you may need to reconfigure the host. When you place a drive in the media validation pool, the library automatically re-assigns element IDs to the drives. The drive bay that the media validation drive occupies is treated as "empty". Therefore, the media validation drive is skipped and not assigned a SCSI element ID. Refer to "Default SCSI Storage Element Numbering Scheme" on page B-8 for the order of default element numbering.

When you remove a drive from the media validation pool, the library logically assigns the drive the last element ID regardless of the drive's physical location.

To avoid renumbering, for the media validation pool use the drive that is both physically and logically the last element ID (ensure the drive is a T10000C/D — see "Media Validation Drive Pool Overview" on page 12-1 for more information).

# Adding Drives to the Media Validation Pool

Use the **Media Validation > Slot Selection Tab** to create or modify the media validation drive pool. Hosts cannot access drives or drive slots in the media validation pool. Before defining a media validation pool in a SCSI library, refer to "Media Validation in a SCSI Library" on page 12-2.

1. Ensure host applications are not using the drives you want to add to the media validation pool. Finish any read or write operations and dismount any cartridges from the selected drives.

   If ACSLS manages the drives, vary the drives offline to ACSLS to prevent drive activity.

2. In SLC, select **Tools > Media Validation**. Click the **Slot Selection** tab
3. Click **Refresh** to update the screen.
4. Highlight the drive slots to place in the media validation pool (a maximum of 10)

***Table 10–2 Status Indicators for Drive Slots***

| Status Indicator | Meaning |
|---|---|
|  | Empty drive slot |
|  | Slot contains either an invalid drive type or a correct drive type in an invalid state |
|  | Correct drive type (T10000C or T10000D) in a valid state |
|   | Partition number of drive slot/bay |
|   | Drive slot is in media validation pool |

5. Click **Add**.

   An error message appears if you add more than 10 drives to the pool. Click **OK**. De-highlight slots until only 10 are highlighted. Click **Add.**

6. Click **Apply**.

   Only a non-partitioned library, or the partitions containing drive slots moved into the pool, will go offline. For hosts connected to affected partitions:

   - ACSLS and ELS hosts receive "Configuration Changed", "LSM Ready", and then "Not Ready" messages from the library. ELS automatically removes any media validation drives from its configuration. ACSLS automatically updates any media validation drives to an offline state, but ACSLS requires you to initiate re-configuration (see step 7).
   - For SCSI hosts, the library renumbers element IDs. SCSI hosts receive two Unit Attentions: "Not Ready to Ready Transition" and "Mode Parameters Changed". You should initiate a re-configuration of the host.

7. *ACSLS only* — To remove a media validation drive from the ACSLS configuration, use the `config drives <panel_id>` utility. You can run `config drives` while the library is online and mounts/dismounts to other drives are occurring.

## Removing Drives from the MV Pool

> **Note:** If you try to remove a drive from the pool that is in the process of validating a cartridge, an error will be reported.

1. Select **Tools > Media Validation**. Click the **Slot Selection** tab
2. Click **Refresh** to update the screen.
3. Highlight the drive slots to remove from the pool. Click **Remove**.
4. Click **Apply**.
5. To reassign a drive slot removed from the pool:

- For a non-partitioned library managed by ACSLS or ELS, the drive slot will be available to hosts immediately. ELS hosts begin re-configuration. ACSLS hosts require you to initiate re-configuration with the `config drives <panel_id>` utility.
- For a non-partitioned SCSI library, the library goes offline. The library logically assigns the drive the last element ID regardless of the drive's physical location. When the library comes back online, SCSI hosts receive two Unit Attentions: "Not Ready to Ready Transition" and "Mode Parameters Changed". You should initiate a re-configuration.
- For a partitioned library, a drive slot removed from the validation pool is not allocated to a partition. To assign the drive slot to a partition, see "Library Partitioning" on page 6-1.

## Validating a Cartridge

Use the **Media Validation > Media Validation Tab** to validate a cartridge. You can only validate one cartridge at a time per each SLC session.

---

**Note:** If media validation for a cartridge is interrupted, follow the procedures below to resume the validation. For Complete Verify validation types, select **Resume** to resume the validation where it left off.

---

1. Select **Tools > Media Validation**. Click the **Media Validation** tab.
2. In the Drive column, select the drive to use. A drive may not be selectable if:
   - The drive is in an invalid state.
   - The drive type is invalid.
   - You are not logged into the library containing the drive.
3. In the center column, choose the cartridge to validate from a list, or type the cartridge VOLSER.
4. In the right-hand column, select the validation type. See Table 10–1 for details.
5. Click **Start**. Validation begins if the cartridge loads successfully.

   After validation completes, the cartridge is returned to its source location. If the source location is lost, the library moves the cartridge to a system slot for host recovery.

## Stopping a Validation in Progress

Media validation can be stopped by either a host requesting the cartridge being validated or the technician who initiated the validation through SLC.

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**Note:** You must log in as the user who initiated the validation.

---

To stop a validation in progress through SLC:

1. Select **Tools > Media Validation.** Select the **Media Validation** tab.
2. Click **Stop**.

Once validation stops, the cartridge is returned to its source location. If the source location is lost, the library moves the cartridge to a system slot for host recovery.

# 13

# Robot and Safety Door Management



## AEM Safety Door Overview

The safety door is a sliding barrier that closes off an AEM from the operational portion of the library. The door slides into place when performing robot maintenance or a bulk load/unload operations. With the safety door in place, a service representative can perform maintenance on a robot while the library remains online. See "Displaying AEM Safety Door Status and Properties" on page 9-3.

## TallBot Overview

A TallBot is a robot that moves cartridges between storage slots, tape drives, and CAPs. With the dual robotics option, two robots operate in parallel to increase the overall performance of the library and provide redundancy. If one robot fails, the other robot can move the defective robot into an AEM service area or PEM parking area.

## Rebooting an AEM Safety Door

Use the **Tools > Diagnostics** utility to reboot an AEM safety door. You may need to reboot the door to clear errors when the AEM safety door is in an abnormal condition.

1. Select **Tools > Diagnostics**.
2. Expand the **Safety Door** folder, and then select the AEM safety door.
3. Click **Reboot**.
4. If the safety door is online, click **OK** to take the safety door offline.
5. Click **OK** to confirm the reboot. The library controller reboots the safety door. The safety door re-initializes, and the TallBot audits the AEM.

6. Click **OK** to dismiss the success message.

# SCSI FastLoad Feature

SCSI FastLoad is an optional feature that enables faster mount and dismount operations for an FC-SCSI library or partition. After a robot successfully inserts a cartridge into a drive, the robot is immediately available for the next request and does not wait until the drive reports that the cartridge has been loaded. The library controller waits to return the mount request response until it detects that the tape drive has successfully loaded the cartridge. If a cartridge fails to load after the robot has been released, the FC-SCSI host must move the cartridge from the drive back to the source location.

The SCSI FastLoad feature requires minimum SL3000 firmware FRS_2.33 and SLC 4.47.

## Configuring the SCSI FastLoad Feature

You can enable or disable SCSI FastLoad separately for each FC-SCSI partition.

1. Select **Tools > Configuration**.
2. For each partition, set the Enable FastLoad Feature option:
   - **Select** to turn SCSI FastLoad on.
   - **Unselect** to turn SCSI FastLoad off (default).
3. Click **Apply**, and then click **OK**.

# Displaying Robot Information

**Note:** This information is also available through **Reports > Robot Summary**. See "Viewing Library Reports" on page 7-5.

1. Select **Tools > System Detail**.
2. Select the **Robot** folder to display summary information.
3. For detailed information, expand the **Robot** folder and then select a robot.
4. Select a tab:
   - **Status** — displays the current operational state of the selected robot. Use the transition request list to place the robot online or offline (see "Changing the Robot Online/Offline Status" on page 13-2).
   - **Properties** — displays robot configuration information, including the serial number and current firmware levels

# Changing the Robot Online/Offline Status

Do not use this procedure if you are using ACSLS or ELS tape management software, unless their servers cannot communicate with the library. For instructions on changing the online or offline state using ACSLS or ELS, see the tape management software documentation.

Use this procedure to take a robot offline or bring a robot online through SLC.

**Note:** Library devices that are offline and in an error state cannot go online. The error condition must be cleared first.

1. Select **Tools > System Detail**.
2. Expand the **Robot** folder, and then select the robot to modify.
3. Select the **Status** tab.
4. In the Transition Request list, select either:
   - **Take Offline** — the system completes all outstanding jobs for the robot.
   - **Bring Online** — the robot moves to the end of the rail, and the library cannot use it. If the library has redundant robotics, the second robot will take all requests.
5. Click **Apply**.

## Performing a Robot Self-Test

**Note:** To perform a robot self-test, diagnostic cartridges must be available in the library.

1. Select **Tools > Diagnostics**.
2. Expand the **Robot** folder, and then select the robot to test.
3. Click the **SelfTest** tab.
4. In the **Mode** list, select **Non-Disruptive**.
5. Click **Run**.

## Robot Diagnostic Moves

Diagnostic moves can help monitor or diagnose robotic problems with a series of "get" and "put" operations. The system chooses a robot for the diagnostic move based on the minimum and maximum ranges set for the target and pool addresses. Multiple robots may be selected if the address range requires it.

Successful diagnostic moves do not rearrange the cartridges in the library — the system returns cartridges to their original locations. However, some diagnostic move failures can cause cartridges to be left in new locations.

A diagnostic move is defined by:

- **Target Address Range** — defines the area used to perform the "get" operation in a diagnostic move. Valid target address types are storage cells, CAP, drive and storage cells, system cells, or all.

**Note:** All resources within the target address range are reserved. However, only the location currently being accessed by the robot for a get/put operation is unavailable to the host.

- **Pool Address Range** — defines the area used to supply cartridges or empty cells if a target address does not contain a cartridge or no empty cells are available. The pool and target address can overlap.
- **Access Order** — determines how the robot performs get operations within the target address range. There are two options:
  - *Sequential* — robot performs a get operation starting with the first location in the target address ranges. The robot continues visiting the locations sequentially through the range until it completes the requested number of moves.
  - *Random* — robot randomly selects a location in the target address range to get a cartridge. The robot can also visit the same location in the target address range multiple times to get a cartridge, however if you specify enough move request the robot is guaranteed to visit all cells. The random access routine ends after performing the requested number of moves.

## Defining a Diagnostic Move

You can set up and run multiple diagnostic move routines simultaneously if the target and pool ranges for each diagnostic move do not overlap.

---

**Note:** This procedure requires sharing of robot resources. You should not run it during peak activity periods.

---

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder in the navigation tree.
3. Click the **DiagMove** tab, and then the **Manage** tab.
4. In the Defined Sequence section, click **Add**.
5. Complete the Sequence screen to define the target address:
   a. In the Selection Mode section, select the type of cells to diagnose.
   b. In the Minimum Address and Maximum Address sections, select the library internal address of the starting and ending locations of the cells to diagnose.
6. Click **Next**.
7. Complete the SOURCE screen to define the pool address:
   a. In the Selection Mode sections, select the appropriate cartridge pool address type.
   b. In the Minimum Address and Maximum Address sections, select the library internal addresses of the starting and ending locations of the cartridge pool to use.
8. Click **Next**.
9. Complete the Sequence screen:
   a. Name of the diagnostic move.
   b. Move Count: Specify a number between 1 and 5000.
   c. Access order: Sequential or Random.
   d. Move Type: Robot and Cartridge or Robot Only.

e. If you are certain the cartridges and drives in the diagnostic move are compatible, select "Disable pre-move cartridge compatibility check".

10. Click **Finish**. The Defined Sequences section lists all diagnostic sequences.

## Managing Diagnostic Move Definitions

Use the Manage tab to add, modify, start, or remove a diagnostic move definition. Each open diagnostic move displays in its own monitor screen.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder on the navigation tree.
3. Click the **DiagMove** tab, and then the **Manage** tab.
4. In the Defined Sequences section, select an option:

***Table 11–1 Diagnostic Moves Options***

| Option | Definition | Notes |
|---|---|---|
| Add | Define a diagnostic move | None |
| Open | Start a diagnostic move | Multiple diagnostic moves may be open at a time, so long as the target and pool address ranges setup for the moves do not overlap. |
| Modify | Modify options for a diagnostic move | This diagnostic move routine must not be open or if open must be in a "Stopped" state. |
| Remove | Remove a diagnostic move | This diagnostic move routine must not be open. |
| Copy | Copy an existing diagnostic move | Copy a diagnostic move definition, make changes if necessary, and assign a different name. |

5. See "Monitoring and Controlling Open Diagnostic Moves" on page 13-6 to manage the diagnostic moves currently open.

## Saving a Diagnostic Move

You can save a defined diagnostic move to a file. The file is saved as a JavaBean component represented as an XML 1.0 document (**.xml**). You can use the file to restore a deleted move definition or copy the move definition to a different library (see "Restoring a Diagnostic Move" on page 13-5).

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder on the navigation tree.
3. Click the **DiagMove** tab, and then the **Manage** tab.
4. Select a diagnostic move. Click **Save**.
5. Browse to the desired directory, enter a file name, and click **Save**.

## Restoring a Diagnostic Move

You can load a saved diagnostic move definition file (see "Saving a Diagnostic Move" on page 13-5).

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder on the navigation tree.
3. Click the **DiagMove** tab, and then the **Manage** tab.

4. Click **Restore**.
5. Browse to the saved diagnostic move file, and then click **Open**.

## Starting a Diagnostic Move

A monitor window displays for each move you start. You can run multiple moves at the same time, if the target and pool address ranges for the moves do not overlap.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder on the navigation tree.
3. Click the **DiagMove** tab, and then the **Manage** tab.
4. In the Defined Sequences section, select a diagnostic move. Click **Open**.
5. From each monitor window, select **File > Start Sequence** to start the move.

## Monitoring and Controlling Open Diagnostic Moves

A monitor window displays for each open move. Use the Monitor tab control and monitor the status of any open diagnostic moves.

1. See "Starting a Diagnostic Move" on page 13-6 to open a diagnostic move.
2. Select **Tools > Diagnostics**. Select the **Library** folder.
3. Click the **DiagMove** tab, and then the **Monitor** tab. Each monitor window indicates the status of the move.

***Table 11–2 Status Indicators for Moves***

| Status Indicators | Valid Values |
|---|---|
| **Spooling Status** — whether the move output is being spooled to a file | True, False |
| **State** — execution state of the move | Running, pausing, paused, stopping, stopped |
| **Health** — health state of the move | OK, warning, error |
| **Completed moves** — Number of moves completed in the requested move count | Not applicable |

4. Use the **File** menu in each Monitor window to start/stop/pause the sequence, clear the output window, or start/stop spooling.

# 14

# SLC Diagnostic Utilities

SLC provides many diagnostic utilities, including library self-tests, event monitoring, and device diagnostics:

- Library and Device Self-Tests
- Diagnostic Support Information
- Troubleshooting
- Using the Monitors Utility to Open an Event Monitor

For information on using SLC diagnostic tools not described in this chapter, see:

- Importing or Exporting Diagnostic Cartridges
- Robot Diagnostic Moves

## Library and Device Self-Tests

Self-tests can help diagnose issues with the library or devices. Refer to:

- Performing a Library Self-Test
- Performing CAP Self-Test
- Performing a Drive Self-Test
- Performing a Robot Self-Test

## Diagnostic Support Information

The following diagnostic tools aid in troubleshooting. Your Oracle support representative may request that you capture and transfer these files.

- *Management Information Base (MIB) file* - an SNMP database used to manage your library devices. This file can be saved as a text file. See "Transferring the Library MIB File" on page 7-6.
- *Log Snapshot file* - an encrypted snapshot of the library event log. You cannot view or edit this file. This file is available for only 15 minutes from the time it is generated. See "Generating and Transferring the Library Log Snapshot File" on page 7-6.
- *Device Reserve Table* - a table displaying device information and status. See "Viewing Library Reports" on page 7-5.
- *Event monitors* - spool of events that captures error data. See "Using the Monitors Utility to Open an Event Monitor" on page 14-3.

# Troubleshooting

Before you run diagnostic tests, check the following areas of the library:

### Service Required (amber) LED is constantly on

Use SLC to check the health of the library and the attached devices (drives, CAPs, and robots). See Chapter 5, "Library Management".

To perform a health check:

1. Log in to SLC.
2. Access the System Detail module, **Tools > System Detail**.
3. Check the navigation tree for the following indicators: Device Healthy or Device Error

Additional checks:

1. Check the Status (for example, online/offline) and Statistics (for example, uptime, downtime, errors and warnings) tabs for more information on the health of the library and devices.
2. Make sure the cartridges are fully seated and properly oriented in their storage cells.
3. Inspect for any foreign objects or debris and remove them if found.

### Library does not turn on and SLC does not display any messages

1. Check that the library power switch is in the ON position.
2. Check all power cord connections.
3. Make sure that there is power to the outlet.
4. Replace the power cord.

### CAP Open LED is on and blinking

Open the CAP and make sure the cartridges in the CAP cells are properly seated. Close the CAP.

### SLC does not display modified data or information remains static

Check the SLC Heartbeat icon.

### Robot Fault or Library Fault Amber LED is constantly on

1. Check SLC for any displayed error messages.
2. Open the front door. Observe the state of the cartridges, robot hand, and tape drives.
3. Make sure cartridges are fully seated and properly oriented in their storage cells.
4. Make sure packing materials have been removed.
5. Remove any objects or debris from the library floor.
6. Check the status of the tape drives.
7. Close the front door.
8. Make sure the tape drives are fully seated and locked forward by pushing and pulling on the rear of the drive tray. Any motion of the tray indicates that it requires re-seating and locking down.

**Client computer cannot communicate with the library or tape drives**
Make sure cables are securely attached to their connectors on the rear of the library, the tape drives, and the client computer.

**Library cannot communicate with the drives and drive status on SLC displays "Not communicating"**
Make sure cables are securely attached to their connectors on the rear of the library, the drives, and the client computer.

**Repeated or excessive drive cleaning or cleaning messages**
1. Replace the cleaning cartridge with a new one.
2. Run the Library Self-Test and note if errors are reported for the drive.
3. Run any client computer-based drive diagnostic tests.

# Using the Monitors Utility to Open an Event Monitor

The library controller continually monitors library operations and logs all events. Using the Monitors utility of SLC, you can open an event monitor to display event data or spool it to a file. Event monitors are useful tools for root cause analysis.



## Event Monitor Overview

There are four types of event monitors: All, Error Warn Info, Error and Warnings, and Errors. Each monitor type logs events based on the severity of the event. For example, the Errors monitor only logs error events (see "Severity" on page 14-4 for a description of the event types).

Each event logged in the event monitor contains the following information:

**Time**
Identifies when the event occurred.

**Device ID**
Identifies the library address of the device corresponding to the event.

**User**
Identifies the user that originated the event. This is "root" for HLI or SCSI host activities.

**I / F**
Identifies the interface type of the requester. The interface can be hli, scsi, or default (for SLC or CLI requests).

**Activity**
Identifies the command that was issued, such as "load drive".

**Request Identifier**
Identifies all host interface requests. Helps track the sequence of log activity resulting from each host request.

**Severity**
Identifies the significance of the event. Some event data is non-volatile, meaning it persists across system power cycles.

*Error* — non-volatile data indicating a fault that prevented a request (host or diagnostic) from completing successfully.

*Warning* — non-volatile data indicating a fault that has not stopped the library's ability to complete requests (host or diagnostic). A warning can identify a loss of performance or a condition that may indicate future irrecoverable errors.

*Information* — volatile data indicating general device or library information (such as the device state, device added, listener registered, tray serial number updated, and so on). This information may be important to establish a history of activity for the warning or error event.

*Trace* — volatile data indicating diagnostic activity tracing.

**Result Code**
Identifies the library event type (result codes are the same as library EventIds). To search for the meaning of the Result Code using SLC, see "Displaying Result Code Definitions" on page 14-5 or refer to the SL3000_FRS*xxx*_JavaErrorCodes.html file included in the library firmware code package.

**Result Text**
Provides information about the results of the request or event.

## Opening an Event Monitor

1. Select **Tools > Monitors**.
2. Expand the **Permanent Monitors** folder in the navigation tree.
3. Click an event monitor type. Click **Open**.
4. Use the **Monitor** menu to pause, resume, permanently stop, or clear the event monitor.
5. To close a monitor, click the **X** in the upper right corner of the window.

### Arranging Multiple Monitors

Arrange multiple event monitors using the **Window** menu in the upper right corner.

| Menu Option | Description |
|---|---|
| **Window > Arrange** | Custom arrange the open monitors on screen |
| **Window > Tile Horizontal** | Arrange the event monitor windows horizontally |
| **Window > Tile Vertical** | Arrange the event monitor windows vertically |
| **Window > Cascade** | Stack the event monitors |

## Spooling Event Monitor Data to a File

You can send an event monitor file to Oracle Support to assist in diagnosing problems.

1. Open an event monitor (see "Opening an Event Monitor" on page 14-4).

2. In the event monitor window, select **Spool File > Start Spooling**.
3. Browse to the desired directory, enter the file name, and click **Save**.
4. To stop spooling, select **Monitor > Stop Spooling**.

## Displaying Result Code Definitions

Use the following procedure to search for the definition of a result code from the event monitor.

1. Select **Tools > Diagnostics**.
2. Click the **Library** folder in the navigation tree.
3. Click the **Search** tab.
4. In the Search Type list, select **Result Code**.
5. Complete the remaining fields:
   a. To search for a specific result code, enter the complete code. Wildcards or partial codes are not accepted.
   b. To list all result codes, select **List All**.
6. Click **Search**.

# 15

# Manual Operations



## Modes of Operation

### Manual Mode

Manual operation may be required if the library has experienced an unrecoverable error or a library component requires service or installation. To perform manual operations, the library is placed in manual mode.

A library in manual mode cannot accept host requests (host requests may continue to generate and cartridge mounts and dismounts require human intervention). The library is in manual mode when a library main access door is open, a robot does not automatically mount and dismount cartridges, or the SLC navigation tree indicates that there is a problem with the library.

### Maintenance Mode

Maintenance mode is active when a service representative enters the access door to perform maintenance or to replace a component. The library continues to operate and process host request.

## Safety Precautions when Entering the Library

**WARNING: When entering the library, lock the access door open and retain the key to prevent accidental closure.**

When entering a library, strictly observe the following safety precautions:

- Know the location of the emergency door unlocking mechanisms (see "Door Interlocks" on page 15-2).
- Ensure the library is offline (see "Placing the Library Online or Offline" on page 7-8). Do not enter the library or move any of the robot mechanisms if you have any reason to suspect the robots are online.

- Leave the access door open whenever working inside the library. This disconnects DC power and signal lines to the library's motors (see "Servo Power Interrupt" on page 15-2).
- Know the location of the mechanical door releases (see "Mechanical Door Releases" on page 15-2).
- Know the physical restrictions of the library. Be careful not to bump your body against the arrays or to snag clothing on the arrays (only 0.4 m [18 in.] of aisle clearance).
- If you must move a robot, avoid damaging the robot's mechanical or electronic components.
- If you are manually loading or unloading a cartridge, your hands must remain clear of the drive's mechanical and electronic load components.

### Door Interlocks

Door safety interlocks are located behind the front access doors of the base module and DEM. To open either access door, an access key is required.

Door safety interlocks are constantly monitored by the library controller. If an access door is opened during normal operation, an Emergency Robotics Stop condition is initiated and all library motors are immediately disabled. This prevents motors from operating while a library door is open. If the library is varied offline, opening the access door disconnects DC voltages to the rails and the power bus.

The door switches are also monitored when the library is powered off. A battery supplies power for the circuitry to detect a door opening/closing event while the library is powered off.

When a base module and DEM are connected together, opening an access door to either module automatically suspends operations within the entire library (the two door switches are connected in series).

### Servo Power Interrupt

An additional safety feature is the servo power interrupt (SPI). If the library controller detects that a library motor is out-of-range, it will generate an SPI to turn off drive voltage to the faulty motor. This prevents a servo runaway condition until the cause of the problem can be determined.

### Mechanical Door Releases

Each lock handle on the access doors of the base module and DEM includes a mechanical release which is painted yellow. This release serves as a safeguard in case a person is inside the library and the access door is accidentally closed and locked. When you push the release, it unlocks and opens the door.

## Turning the Library On or Off

Use the following procedures to power the library on or off.

### Turning Off the Library

Use this procedure to turn off the library.

1. Ensure all jobs have completed and quieces the library.

2. Take all library drives offline (see "Changing a Drive Online/Offline Status" on page 10-5).
3. Take the library offline (see "Placing the Library Online or Offline" on page 7-8).
4. Open the rear doors of the Base Module and DEM (if present).
5. Turn off the power enable switches.
6. If necessary, turn off the circuit breakers on the PDUs.

### Turning on the Library

Use this procedure to turn on the library.

1. Open the rear doors of the Base Module and DEM (if present).
2. If necessary, turn on the circuit breakers on the PDUs.
3. Turn on the power enable switches.
4. The library goes through the initialization sequence. If the access doors have been opened and closed, a full audit of the library will be performed.

## Accessing the Main Door and AEM Door

Use these procedures to open and close the main library access door. Additionally, you can open the AEM door in emergency situations.

### Opening the Main Door

1. Observe all safety precautions (see "Safety Precautions when Entering the Library" on page 15-1).
2. Take all library drives offline (see "Changing a Drive Online/Offline Status" on page 10-5).
3. Take the library offline (see "Placing the Library Online or Offline" on page 7-8).
4. Insert the key into the door lock, and turn the key to unlock the door.
5. Pull up on the door latch to release it, and open the door.
6. Turn the key in the lock, to lock the door open, and then remove the key from the lock and keep it with you. This will prevent the door from being closed while you are in the library.
7. Enter the library.

### Closing and Locking the Main Door

Use this procedure to close and lock the main doors of the library. When you close the access door, the library will perform a full audit.

1. Verify that there are no loose items in the library.
2. If the access doors were locked open, insert the key into the door lock, and turn the key, to unlock the door.
3. Push the door closed and make sure it latches securely.
4. Turn the key in the lock, to lock the door closed.
5. Remove the key from the lock and keep it in a safe place.

6. If the library has been powered off, power it on (see "Turning on the Library" on page 15-3).

## Opening AEM Door for Emergency Access

Use this procedure to gain emergency access to the AEM.

**Caution:** This procedure has the same effects on library operations as opening the main library access door. It causes an abrupt interruption of library activity. This procedure does not lower the internal AEM safety door.

1. Insert the library access door key in the Deadbolt Override lock, and unlock the door by turning the key clockwise. The key cannot be removed from the lock while it is in the unlocked position.
2. Lift the AEM access door latch, and open the door. DO NOT force the AEM access door to open or close.

   All power to the TallBots is stopped immediately. All in-process jobs are stopped abruptly, and the TallBots and AEM CAPs are brought offline.

## Closing AEM Access Door

Use this procedure to close the AEM access door and re-initialize the library after performing an AEM emergency access. This procedure initiates a full audit of the library.

1. Close and latch the AEM access door. DO NOT force the AEM access door to open or close.
2. Lock the door by turning the key counter-clockwise in the Deadbolt Override lock.
   a. The library re-initializes.
   b. The TallBots go through their initialization sequence.
   c. A full audit of the library is conducted.
   d. The AEM CAP is brought online and returned to its default state.

# A

# Command Line Interface Reference

This appendix describes the Command Line Interface (CLI) commands available for an Admin user for SL3000 version 4.30 firmware and above. Since the CLI is firmware-based, not all commands are available for libraries running earlier versions.

Admin accessible CLI commands include:



## audit

This command performs a physical audit on all or part of the library.

**audit**
Displays help for the audit command, the same as "help audit".

**audit ***

Initiates a physical audit of the entire library. This command returns immediately and displays no results.

**Example:**

```
SL3000> audit *
   requestId
   requestId 9
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

**audit <device address> <address>**

Performs a physical audit of a single address and displays the results.

- <*device address*> - specifies the robot to use in library, rail, column, side, row format.
- <*address*> - specifies the cell location to audit in library, rail, column, side, row format.

**Example:**

```
SL3000> audit 1,1,0,1,0 1,1,-10,1,1
   requestId
   requestId 9
   Attributes Media Label #EMPTY..
   Object     Location    1,1,-10,1,1
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

**audit <device address> <start address> <end address>**

Performs a physical audits of a range of addresses and displays the results.

- <*device address*> - specifies the robot to use in library, rail, column, side, row format.
- <*start address*> <*end address*> - specifies the starting and ending cell location to audit in library, rail, column, side, row format. Only the row is variable between the start and end addresses.

**Example:**

```
SL3000> audit 1,1,0,1,0 1,1,-10,1,1 1,1,-10,1,5
   requestId
   requestId 10
   Attributes Media Label #EMPTY..
   Object     Location    1,1,-10,1,1

   Attributes Media Label EN34410R
   Object     Location    1,1,-10,1,5
   ...
   Done
   Failure Count 0
   Success Count 5
COMPLETED
```

**audit multiRowScan {enable | disable | print} <device address>**

Enables or disables multiple row scan audit capability to speed up audit time.

- **print** - prints the multi-row scan audit state.
- <*device address*> - specifies the robot to use in library, rail, column, side, row format.

**Example:**

```
SL3000> audit multiRowScan print 1,1,0,1,0
   requestId
   requestId 8401
   Attributes Multi Row Scan enabled
   Object     Robot          1,1,0,1,0
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

# capCommand

This command is for managing CAPs.

### capCommand

Displays help for the capCommand command, the same as "help capCommand".

### capCommand forceUnreserve <device address>

Forces the release of a CAP. If cartridges are in the CAP, the reservation changes to "default". If there are no cartridges in the CAP, the reservation changes to "none".

- <*device address*> - specifies the CAP to release in library, rail, column, side, row format.

### capCommand {lock | unlock} <device address>

Locks or unlocks a CAP specified by the device address.

- <*device address*> - specifies the CAP to lock/unlock in library, rail, column, side, row format.

### capCommand resetCap {left | right | both}

This command forces the reset of a cap string or strings based on the provided side argument.

**Example:**

```
SL3000> capCommand resetCap right
   requestId
   requestId 17002
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

# cleaning

This family of commands displays and controls cleaning and diagnostic cartridge-related functions within the library. Only customers with the media validation feature should use these commands.

### cleaning

Displays help for the cleaning command, the same as "help cleaning".

**cleaning list {cleaning | diagnostic}**
Lists all cleaning or diagnostic cartridges in the system cells.

**Example:**

```
SL3000> cleaning list cleaning
   requestId
   requestId 9001
   Attributes Expired  false
      Label            CLN0080U
      Location         1,1,-12,1,13
      Max Usage Count  100
      Media Type       9840_Cleaning
      Status           ok
      Usage Count      0
Object Cartridge       cleaning
```

**cleaning import <cap device address>**
Imports cleaning and diagnostic cartridges to system cells. Only one import/export operation is allowed at a time. There must be a minimum 2 empty system cells for SL3000 libraries to allow imports.

- <*cap device address*> - specifies the CAP to use for the import operation, in library, rail, column, side, row format.

**Example:**

```
SL3000> cleaning import 1,1,5,2,0
   requestId
   requestId 10101
   Message CAP open(ing). Place cartridges to import in CAP, then close CAP.Use
CONTINUE cmd to proceed...
   Done
   Failure Count 0
   Success Count 0
COMPLETED
```

**cleaning export <cap device address> cleaning [select expired]**
Exports cleaning cartridges. Only one import/export operation is allowed at a time.

- <*cap device address*> - specifies the CAP to use for the export operation, in library, rail, column, side, row format.

**Example:**

```
SL3000> cleaning export 1,1,5,2,0 cleaning
   requestId
   requestId 9601
   Address      1.1.-12.1.12
   Success      Cartridge Exported
   Volume Label CLN002CU
   Message CAP open(ing). Remove cartridges, then close CAP.Use CONTINUE cmd to
proceed...
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

**cleaning export <cap device address> <cartridge address>**
Exports a specific cleaning or diagnostic cartridge to the specified cap. Only one import/export operation is allowed at a time.

- <*cap device address*> - specifies the CAP to use for the export operation, in library, rail, column, side, row format.
- <*cartridge address*> - specifies the location of the cartridge to export in library, rail, column, side, row format. The specified cartridge must be in a system cell and must be either a cleaning or diagnostic cartridge.

**Example:**

```
SL3000> cleaning export 1,1,5,2,0 1,4,-12,1,12
   requestId
   requestId 9601
   Address      1.4.-12.1.12
   Success      Cartridge Exported
   Volume Label CLN002CU
   Message CAP open(ing). Remove cartridges, then close CAP.Use CONTINUE cmd to
proceed...
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

### cleaning threshold list

Displays a list of cleaning cartridge types and their warning thresholds. Each cleaning cartridge type has 4 attributes:

- `Index` - cleaning cartridge type used by the "cleaning threshold set" command
- `Media type` - the type of cleaning cartridge used
- `Maximum usage count` - recommended max usage by tape manufacturer
- `Warning threshold value` - user-defined threshold that determines when a warning status is set for a cleaning cartridge once its usage count reaches that threshold.

**Example:**

```
SL3000> cleaning threshold list
   requestId
   requestId 15001
   Attributes
   Object     Index               1
              Media Type          SgtUltrium1_Cleaning
              Recommend Max Usage 100
              Warning Threshold   0
   Attributes
   Object     Index               3
              Media Type          T10000_Cleaning
              Recommend Max Usage 50
              Warning Threshold   0
```

### cleaning threshold set <warning threshold value> <list index number>

Sets a warning threshold value for a particular cleaning cartridge type.

- <*warning threshold value*> - can be any positive integer up to 1000. A value of 0 indicates no warning threshold.
- <*list index number*> - cleaning cartridge type as specified by the index number from the table listing of the “cleaning threshold list” command.

**Example:**

```
SL3000> cleaning threshold set 55 11
```

```
   requestId
   requestId 15101
   Attributes
   Object      Success true
   Done
COMPLETED
```

**cleaning driveWarning set { on | off }**
Sets the drive cleaning warning flag to either on or off.

- **on** - the drive health status will be set to warn if it needs cleaning
- **off** - the drive health status is not affected if the drive needs cleaning

# config

This command will either display the current physical library configuration or set library configuration parameters.

**config**
Displays help for the config command, the same as "help config".

**config print**
Displays the current physical library configuration.

**config ilc print**
Display the ilc status.

**config ilc {enable | disable}**
Enables or disables the Inter-Library Communications (ILC) LAN. If a disable is requested, the library must first be taken offline using the "accessState offline <device address>" command.

**config print**
Displays the current physical library configuration.

**config serviceInfo print**
Displays the library service information.

**config serviceInfo set**
Sets service information: contact ‘contactName’ phone ‘phoneNumber’ streetAddr ‘streetAddress’ city ‘city’ state ‘state’ country ‘country’ zip ‘zipCode’ description ‘description data’.

Currently the maximum string length is 31 characters. Each string must be delimited by ‘ ’ (single quotes) to provide the ability to use spaces and other characters.

**Example**:

```
SL3000> config serviceInfo set city 'Denver' contact 'Andy' country 'USA'
description 'Manager' phone '303 222-4444' state 'C0' streetAddr '1 tape drive'
zip '80027'

requestId
requestId 1512402
Device serviceInfo
Success true
Done
Failure Count 0
Success Count 1
```

```
COMPLETED
```

# date

This command sets the library date in Greenwich Mean Time (GMT).

**date**
Displays help for the date command, the same as "help date".

**date print**
Displays the current system date.

**date <MM> / <DD> / <YYYY>**
Sets the system date. In a library complex, the library with libraryId = 1 is the master. Change the date on the master library.

- *<MM>* - two digit month
- *<DD>* - two digit day
- *<YYYY>* - four digit year

# drive

This command displays information about the drives or executes the drive utilities such as adiEnable, fastLoad, power, and rewindUnload.

**drive**
Displays help for the drive command, the same as "help drive".

**drive adiEnable {on | off | print}**
Turns on or off or prints status of drive discovery with ADI. Once enabled, any subsequently added drives will attempt ADI drive discovery. To enable ADI for all ADI capable drives in the library, the library must be rebooted.

**drive fastLoad {on | off | print}**
Turns on or off or prints the status of the fastLoad feature. FastLoad changes the behavior of drive mounts (move commands). With fastLoad on, the robot will not wait for a complete load of a PUT to a drive, but will go immediately to the next operation. Also changes the behavior of the rewindUnload command to return immediately, not waiting for the drive to unload. The state of the fastLoad applies to all drives.

> **Note:** This command only affects commands issued in the same CLI session where this command was issued.

**drive print { <drive address> | * }**
Displays summary drive information: location, state, status, type, firmware version, interface type, in use, serial number, state (online/offline), status (ok, warning, or error), and drive vendor.

- *<drive address>* - specifies the drive in library, rail, column, side, row format.
- * - displays drive information for all drives in the library

**drive search {on | off} <drive address>**
Causes the green LED on the drive tray to blink. Blinking continues until the search off command issued.Used to locate a drive within the library.

- <*drive address*> - specifies the drive in library, rail, column, side, row format.

# hwActivation

This command activating certain library features after purchasing a hardware activation permit.

> **Note:** The library must be rebooted when disabling openVolser, dualRobot, partitioning, or redundant electronics.

**hwActivation**
Displays help for the hwActivation command, same as "help hwActivation".

**hwActivation addLicenseFile**
Adds a license file. The license file must be named *SL3000_license_config*.dsf. The full path name being /usr/local/*SL3000_license_config*.dsf.

**hwActivation deleteFile <index>**
Deletes the specified installed feature file.

- <*index*> - specifies file number to delete as specified in the library controller hwActivation module database. See "hwActivation listFiles".

**hwActivation listFiles**
Lists the installed feature files in the library controller hwActivation module database.

**hwActivation print**
Lists all of the enabled features in the library controller hwActivation module database.

# FibreConfig

This command obtains and sets multi-port fibre channel configurations for the library controller. The Fibre Channels controls and displays by this command are not to be confused with the fibre channel configurations to tape drives. This command is only available on the SL3000.

**fibreConfig print**
Displays the status of the library fibre channel connections.

**fibreConfig ports print**
Displays the number of multi fibre port channels enabled.

**fibreConfig config <hard|soft> <loopId> <portNum>**
Sets either hard or soft addressing, and sets the fibre loop ID if hard addressing is enabled to the provided value. The loop ID is set to 126 if hard addressing is disabled. This configuration is on a per port basis.

**fibreConfig ports set <number to enable>**
Sets the number of multi fibre port channels to enable. The MultiFibrePort license limitation and the physical hardware determine the maximum number of ports to enable.

# mediaValidation

This command manages the media validation feature.

**mediaValidation**
Displays help for the mediaValidation command, same as "help mediaValidation"

**mediaValidation print { all | poolOnly } { * | @ }**
Displays drive locations of the media validation pool.

- **all** - lists all drive slots
- **poolOnly** - lists only drive slots in the media validation pool
- * - displays only information for the target library
- @ - displays information for the entire complex

**mediaValidation reservation clear <drive address>**
Clears media validation reservation for specified drive.

- *<drive address>* - specifies the drive in library, rail, column, side, row format.

**mediaValidation stopValidation <drive address>**
Stops a validation currently in progress. Cartridge is returned to source storage cell.

- *<drive address>* - specifies the drive in library, rail, column, side, row format.

# network

This command configures and displays network configuration for the controller card. For additional information, see the *SL3000 Host Connectivity Guide* on OTN.

**network clone [Port 2B IP address] [Port 2A IP address]**
Used for redundant electronics configuration. Copies all port, routing, and IP policy configurations to side B HBC. IP addresses are replaced with the ones specified in the command for side B. If no port IP address is specified, then they are not set on side B.

**network config print**
Displays the target library side (A or B) that is set for network commands.

**network config side {a | b}**
Sets the target library side for network commands.

**network config clear**
Clears the network configuration. This command stops network connectivity. Reconfiguration requires access to the serial port on the HBC card.

**network export**
Exports library network configuration file (.lnc) and generates a network configuration script (.scr). It can only be used in cases where no prior network configurations have been set.

**network gateway <IP address>**
Sets the external network default gateway.

**network gateway clear**
Clears the external network default gateway.

**network import**
Imports a library network configuration file (.lnc).

**network ip <IP address>**
Sets the IP address of port 2B.

**network ip address add <IP address> dev {2A | 2B}**
Sets the IP address of a particular port.

**network ip address del <IP address> dev {2A | 2B}**
Removes the IP address of a port.

**network ip address show [dev {2A | 2B}]**
Displays the current address information for a particular port or both ports if dev is not specified.

**network ip link set dev {2A | 2B} {up | down}**
Sets the operation status of a port, which controls whether a port can send and receive Ethernet traffic.

- **up** - sets port online
- **down** - sets port offline

**network ip policy {enable | disable} dev {2A | 2B}**
Enables or disables policy routing for device 2A or 2B.

**network ip policy status**
Displays policy routing status for devices 2A and 2B.

**network ip policy route {add | del} <IP address> dev {2A | 2B}**
Adds or deletes a static route to policy for device 2A or 2B.

**network ip policy route {add | del} <IP address> via <Gateway IP address> dev {2A | 2B}**
Adds or deletes a static route to policy for device 2A or 2B via gateway.

**network ip policy route show [ dev {2A | 2B} ]**
Displays policy route information for device 2A or 2B.

**network ip route add default via <IP address>**
Sets the default gateway routing IP address.

**network ip route delete default**
Deletes the default gateway routing IP address.

**network ip route {add | del} <IP address [/netmask] > dev {1A | 1B | 2A | 2B}**
Adds or deletes a static IP (Internet Protocol) routing address for a specified host. This command also enables a user to set the netmask for a particular port.

**Example:**

```
SL3000>network ip route add 129.80.81.59/24 dev 1B
COMPLETED
```

**network ip route {add | del} <IP address [/netmask] > via <Gateway IP address>**
Adds or deletes a static route to a destination network IP gateway address.

**network ip route show [dev {2A | 2B}]**
Displays the current routing table information or routing table information for a particular port.

**network name <host name string>**
Sets the host name.

**network netmask <netmask>**
Sets the external network netmask in xxx.xxx.xxx.xxx form.

**network print**
Displays the current network configuration for the external Ethernet ports (2A and 2B).

# partition

This command displays the current status or disables the partition feature.

**partition**
Displays help for the partition command, same as "help partition".

**partition autoClean set { * | <Partition Id> }**
Set auto clean in a specified partition (0, for a non-partitioned library).

**partition attribute status { * | <Partition Id> }**
Displays the status attributes of a single specified partition or all partitions.

**partition fastLoad set '<partitionId-mode, partitionId-mode, ...>'**
Sets the fastLoad mode for a one or more specified partitions. Currently the only valid modes are true or false. This command is only available on the SL3000.

**Example:**

```
SL3000> partition fastload set '1-true,3-false'
   requestId
   requestId 40901
   Attributes Success true
   Object
   Done
   Failure Count 0
   Success Count 2
COMPLETED
```

**partition getCapacity**
Displays the capacity values for library or any defined partitions.

**partition get state <Partition Id>**
Displays the current state of the specified partition(s). This command is available on SL3000 libraries only

**partition predefined file <partition file number>**
Uses a predefined partition text file to set the library partition configuration. Each file name consists of the word “partition” and a numeric value ie “2” and a “.txt” extension. The predefined files are below.

partition1.txt – Non-partitioned Base with a HLI interface.
partition2.txt – Non-partitioned Base with a SCSI interface.
partition3.txt – One partitioned Base with a HLI interface.
partition4.txt – One partitioned Base with a SCSI interface.

partition5.txt – Two partitioned Base with a HLI interface.
partition6.txt – Two partitioned Base with a SCSI interface.
partition7.txt – Two partition Base w/DEM HLI and SCSI partitions.
partition8.txt – Two partition Base w/DEM SCSI interface.
partition9.txt – Multiple partitions (stripes) HLI interface.
partition10.txt – Multiple partitions (stripes) SCSI interface.
partition11.txt – Multiple partitions (random) HLI interface.
partition12.txt – Multiple partitions (random) SCSI interface.

**Example:**

```
SL3000> partition predefined file 5
   requestId
   requestId 7601
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

**partition setCapacity { <Partition Id> , <Capacity> }**
Sets the capacity for the designated partition. Existing partitions not listed in the command will have their capacity set to zero.

**Example:**

```
SL8500> partition setCapacity 1,200 2,50 3,600
   requestId 7601
   Done
   Failure Count 0
   Success Count 1
COMPLETED
```

**partition setNonPartitionedHLI**
Sets the partition to hli0. If there are any drives in the media validation pool, they must be removed beforehand. If in complex, it sets all the libraries to hli0.

**partition set state {online | offline} <Partition Id>**
Sets the current state (offline/online) of a specified partition.

**partition set {hli | scsi}**
Sets the interface type for the entire library. Available on SL3000 only.

**partition status**
Displays the current partitioning status.

# reControl

This command controls/switches the redundant electronics and retrieves the library controller redundant electronics statuses.

**reControl**
Displays help for the reControl command, same as "help reControl".

**reControl status [ <library address> | * ]**
Retrieves the redundant electronics status.

- *<library address>* - specifies the library in library, rail, column, side, row format. For example: 2, 0, 0, 0, 0.
- * - retrieves status from all libraries in a complex

## snmp

This command configures the Simple Network Management Protocol (SNMP). For detailed information, see the *SNMP Reference Guide* on OTN.

## ssh

This command controls configuration for the ssh daemon/server which resides on the HBC. This is the protocol utility which SLC and other various applications use to connect to the library controller.

**ssh print**
Prints the current ssh daemon protocol settings.

**ssh set version1and2**
Sets the ssh daemon protocol restriction to v1 and v2. (this is the default). The ssh server is restarted.

**ssh set version2**
Sets the ssh daemon protocol restriction to v2 only.

## time

This command sets the library time in military time notation.

**time**
Displays help for the time command, same as "help time".

**time print**
Displays the current system time.

**time <HH> : <MM>**
Sets the system time. Resolution is within one minute. In a library complex, the library with libraryId = 1 is the master. Change the time on the master library.

- *<HH>* - two digit hour
- *<MM>* - two digit minute

**time <HH> : <MM> : <SS>**
Sets the system time. Resolution is within one second. In a library complex, the library with libraryId = 1 is the master. Change the time on the master library.

- *<HH>* - two digit hour
- *<MM>* - two digit minute
- *<SS>* - two digit second

## traceRoute

This command traces the network route to a specified IP address.

**traceRoute <IP Address>**
Executes a traceRoute to the IP address specified.

# version

This command displays the customer version and the versions of the software for the device(s) requested.

**version print [ <device address> | *]**
Displays the software version of code for a device or all devices.

- *<device address>* - specifies the device in library, rail, column, side, row format.

# whereAmi

This command displays the system and logic card information relative to the library and card related to redundant electronics command is being executed.

**whereAmi**
Displays the information relating to where the command is being issued.

**Example:**

```
SL8500> whereAmI
   Host Name: gulibtst02b
   Port 2B IP Address: 172.20.151.24
   Library Type: SL8500
   HBC side: B
   Active side: B
COMPLETED
```

# B

# Library Addressing

This appendix explains the addressing schemes used in the SL3000 library. There are four main types of addressing schemes:

- **Internal Firmware** (Library, Rail, Column, Side, Row) — used by the firmware and internal communications to represent all devices and locations within the library.
- **HLI-PRC** (LSM, Panel, Row, and Column) — used by HLI clients, such as ACSLS and ELS, to represent library locations and components.
- **FC-SCSI Element Numbering** — used by hosts with FC-SCSI connections to the library.
- **External hardware numbering** — used for drive bay locations (see "Tape Drive Numbering" on page B-12).

> **Note:** In this appendix, "left" and "right" are in reference to viewing the library from the CAP-side (front) unless otherwise specified.

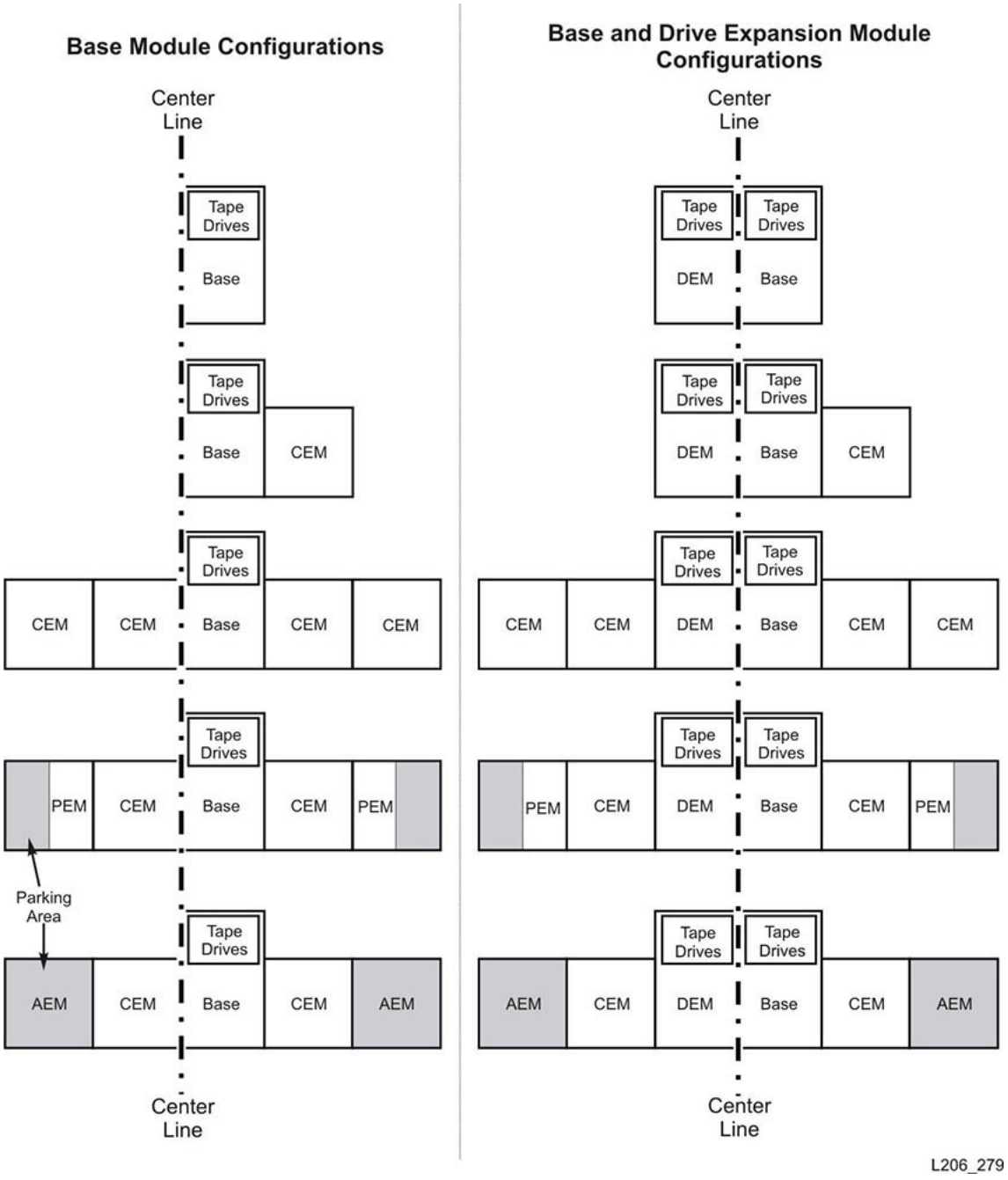
## CenterLine

Internal firmware and HLI addressing use the centerline as a reference point. When additional modules are added to either end of the library, the existing components do not change address number.

The basis of centerline technology involves balancing additional modules on the left and right side of the Base Module. This reduces the overall travel of the robot to help balance the work load and improve library performance.

Figure B–1 shows the location of the centerline for various library configurations.

***Figure B–1 CenterLine Location in Sample Libraries***




# Internal Firmware

Internal firmware addressing designates physical location using five parameters: Library, Rail, Column, Side, Row (L,R,C,S,W).

**Library**
Always equal to 1.

**Rail**
Always equal to 1.

**Column**
Indicates the horizontal location of a tape cartridge referenced from the centerline of the library. Numbering is static, allowing modules to be added without renumbering existing columns.

- Positive (+) value indicates right of centerline
- Negative (-) value indicates left of centerline

*Base Module*

- Contains columns 1 to 6 for data cartridges and 1 to 4 for tape drives.

*DEM*

- Contains columns -1 to -6 for data cartridges and -1 to -4 for tape drives.

*CEM*

- Contains six columns for data cartridges.
- Column numbering continues consecutively from the adjacent module. However, if there is no DEM, a CEM placed directly to the left of a Base contains columns -7 to -12 (columns -1 to -6 are skipped).

*PEM*

- Contains only three columns for data cartridges. The outer most three columns are inactive.

*AEM*

- AEM columns are numbered as if a DEM and four CEMS are installed to the left of the Base Module and four CEMs are installed to the right.
- Left AEM columns are always numbered -33 to -31.
- Right AEM columns are always 31 to 33.

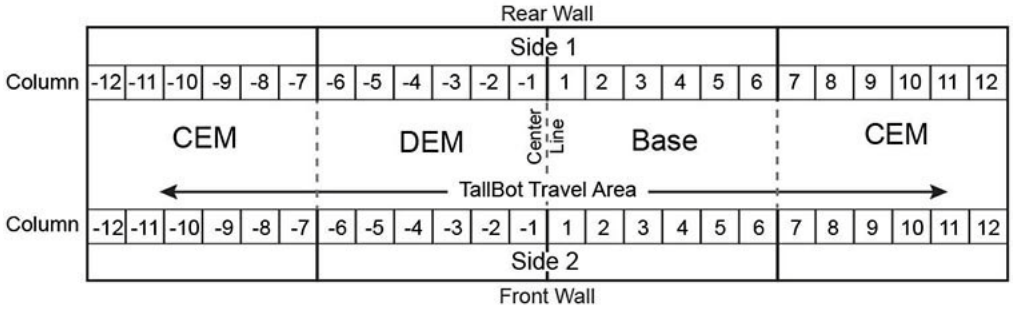
**Side**
Indicates the front or rear walls of the library.

- Rear wall = 1
- Front wall = 2

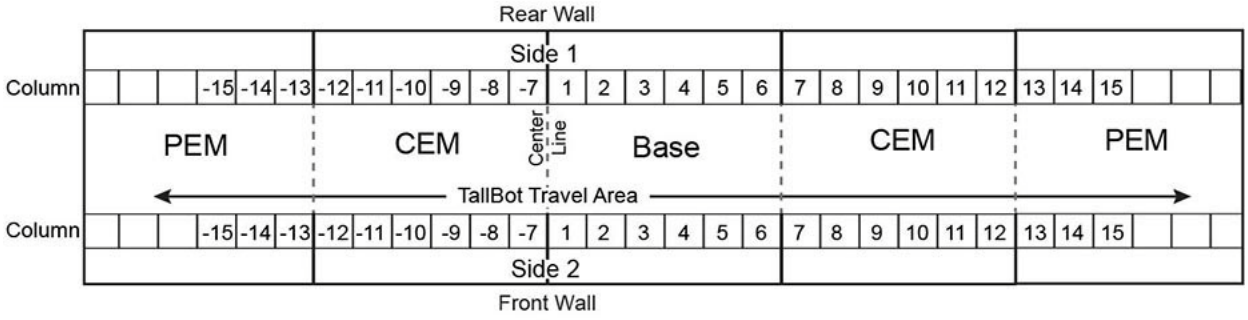
**Row**
The vertical location of a tape cartridge, consecutively numbered from the top (1) down (52).

***Figure B–2 Internal Firmware Addressing Examples (viewed from top of library)***

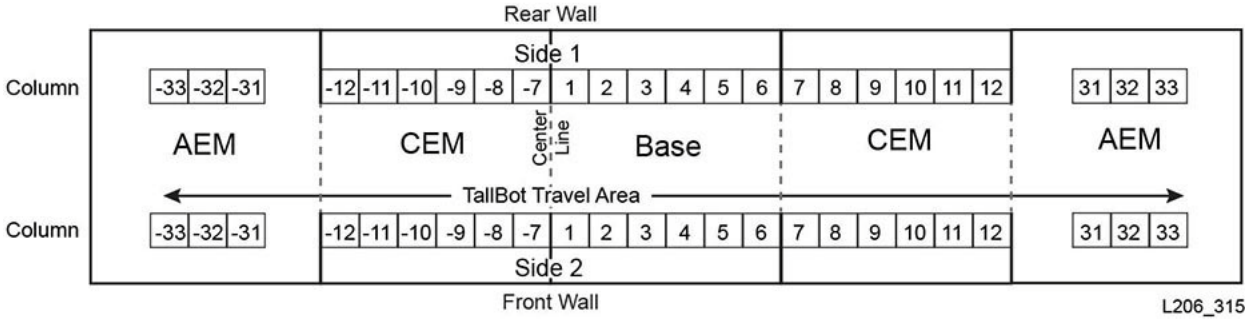
**Example 1**




**Example 2**




**Example 3**




# HLI-PRC

HLI-PRC addressing designates physical location using four parameters: LSM, Panel, Row, and Column.

**LSM**
Always equal to 0.

**Panel**
Indicates the front or rear wall of a module. The panel number can range from 0 to 23 depending on the configuration of the library.

- Rear wall = even numbers
- Front wall = odd numbers

The panel location is defined relative to the Base Module (panels 12 and 13). Panel values less than 12 indicate the module is to the left of the Base Module, while values greater than 13 indicate the module is to the right of the Base Module.

*Base Module*

- Panels 12 and 13

*DEM*

- Panels 10 and 11

*CEM*

- Panels are numbered consecutively from the adjacent module. However, if there is no DEM, a CEM placed directly to the left of a Base Module contains panels -8 and -9 (panels -10 and -11 are skipped).

*AEM*

- AEMs are considered CAPs by HLI addressing. Therefore, AEMs have a CAP ID instead of a panel number (see "Cartridge Access Ports - HLI" on page B-16)
- Left AEM CAP ID is always numbered 0
- Right AEM CAP ID is always numbered 11

#### Row

The vertical location of a slot, consecutively numbered from the top down (0 to 51). However, drive bays have row numbering from 0 to 23 for the Base Module, and 0 to 31 in the DEM.

#### Column

The horizontal location of a slot from left to right (0 to 5). However, drive bays always have a column value of 0 (see "Tape Drive Numbering" on page B-12").

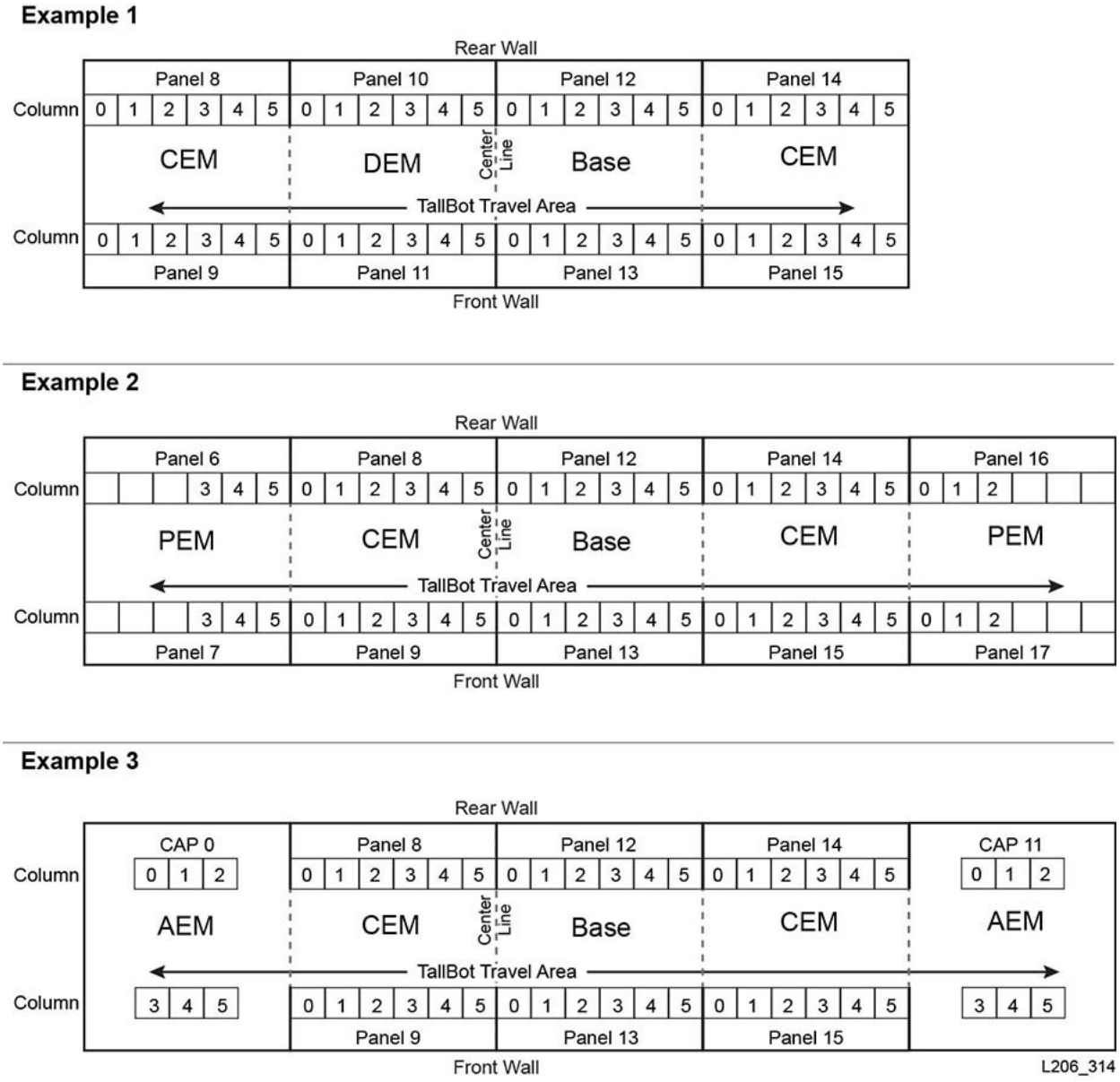
AEM column numbering starts at the rear wall and runs left to right (columns 0–2), then proceeds to the front wall and runs left to right (columns 3–5).

## Tape Drives and CAPs

HLI addressing defines tape drives with a drive ID instead of a row value. The addressing is LSM, panel, drive ID, column (see "Tape Drive Numbering" on page B-12).

HLI addressing defines CAP locations with a CAP ID instead of a panel value. The addressing is LSM, CAP ID, row, column (see "Cartridge Access Ports - HLI" on page B-16").

***Figure B–3 HLI-PRC Addressing Examples (viewed from top of library)***




# FC-SCSI Element Numbering

For FC-SCSI element numbering, each active component in the library is defined by a unique element ID number. SCSI element numbering consists of three element types:

- **Storage Elements** (active cartridge slots)
  - Begins at 2000 and increments by one for every active slot.
  - Numbered top to bottom, left to right, and rear to front (see Figure B–4).
- **Import/Export Elements** (rotational CAPs)
  - Begins at 10 for the left most CAP in the library. Storage and Import/Export elements are numbered sequentially by slot. No slots are skipped.
  - Numbered top to bottom, left to right (see Figure B–7).

- **Data Transfer Elements** (tape drives)
  - Begins at 1000 and increments by one for every installed tape drive.
  - Numbered left to right, top to bottom, starting at the centerline in the Base module and continuing in the DEM if installed. This numbering scheme allows the user to add a bank of drives and not disturb the ordering of the banks above (see Figure B–5).

**Note:** When the library powers on, a vacant drive slot will not be included in the element number sequence. Open Systems backup applications do not tolerate Data Transfer Elements that cannot or do not respond when you power-on the library.

The behavior of the FC-SCSI element numbering depends on the whether the library is partitioned and if the active capacity was assigned by default or was user-selected.

## Default Capacity Assignment

Active capacity assignment is based on the Default Capacity Policy setting (see "Setting the Default Capacity Policy" on page 5-4). The default setting is "Left to Right". For this setting, the library always begins the active capacity from the upper left slot on the rear wall of the left-most module. The activated capacity and SCSI numbering scheme follows the pattern defined in Figure B–4. The default SCSI element numbering for tape drives follows the numbering scheme defined in Figure B–5.

With default numbering, any configuration change to the library causes the element numbers to be reassigned. Therefore, the element numbers will be reassigned and the library will reboot when:

- A storage module is added/removed from the library
- Activated capacity changes
- Tape drives are added/removed

## User Defined—Non-Partitioned Capacity Assignment

When the active capacity location is selected by the user in a non-partitioned library, the numbering begins with the left most slot on the rear wall within the selected active area. The numbering scheme follows the pattern defined in "Default SCSI Storage Element Numbering Scheme" on page B-8 for all active slot cells, but skips over any inactive cells.

If additional capacity is activated, the SCSI numbering of previously activated cells does not change — the library simply appends the SCSI numbering for newly activated cells (see Figure B–8 and Figure B–9 on page B-11).

However, if tape drives are added to a user-defined, non-partitioned library, the library reassigns SCSI Data Transfer element numbering following the "Default SCSI Data Transfer Element Numbering Scheme" on page B-8. Then, the library reboots

## User Defined—Partitioned Capacity Assignment

When the active capacity location is selected by the user in a partitioned library, the numbering begins with the left most slot on the rear wall within the partition. The numbering scheme follows the pattern defined in Figure B–4 for all active slot cells, but skips over any inactive cells and cells not within the partition. Therefore, element

numbering is continuous within each partition, even if cell locations for the partition are not adjacent.

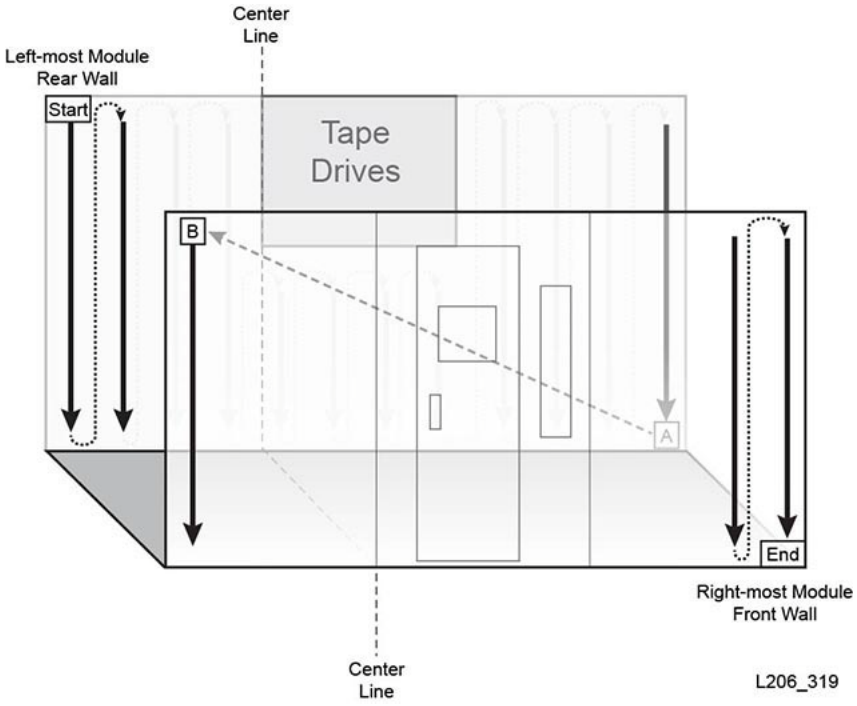
If additional capacity is activated or tape drives are added to a partition, the SCSI numbering of previously numbered elements in the partition does not change. The library simply appends the SCSI numbering for newly activated cells or newly inserted tape drives within the partition.

## Default SCSI Storage Element Numbering Scheme

Figure B–4 shows the default numbering scheme for SCSI Storage Elements. The numbering scheme follows these rules:

1. The numbering starts in the upper left slot on the rear wall of the left-most module.
2. The numbering increases from top to bottom and left to right.
3. When the numbering reaches the last slot on the rear wall, it crosses to the front wall of the left-most module (A to B in Figure B–4).
4. The numbering continues top to bottom, left to right, and ends at the lower right slot of the right-most module.

***Figure B–4 SCSI Storage Element Numbering***



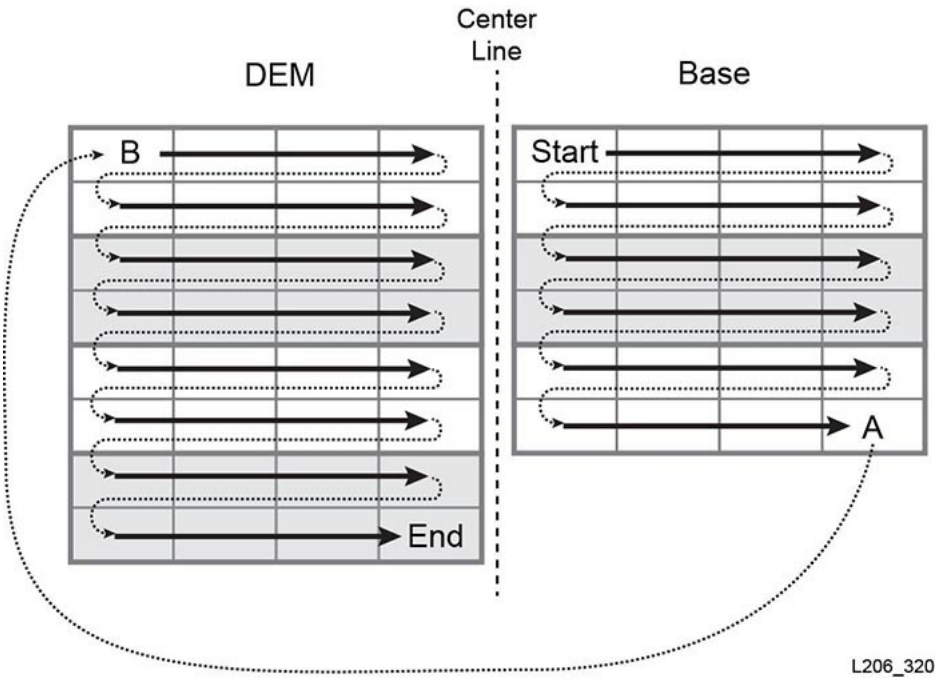

## Default SCSI Data Transfer Element Numbering Scheme

Figure B–5 shows the default numbering scheme for SCSI Data Transfer Elements. The numbering scheme follows these rules:

1. The numbering starts in the upper left drive slot in the Base Module.
2. The numbering increases from left to right and top to bottom (skipping any empty drive slots).

3. When the numbering reaches the lower right drive slot on the Base Module, it crosses to the Drive Expansion Module (A to B in Figure B–5).
4. The numbering continues left to right, top to bottom, and ends at the lower right slot of the DEM.

***Figure B–5 SCSI Data Transfer Element Numbering (viewed from front of library)***




## Element Numbering Examples

The library in the example has been simplified and is not an exact representation of a SL3000 library.

### Default Numbering

Figure B–6 and Figure B–7 provide an example of default SCSI element numbering. The example library includes:

- Four modules: one Base, one DEM, and two CEMs
- 166 data cartridge slots: numbered 2000 to 2165
- 40 tape drive bays (two tape drives are missing, one in each module): numbered 1000 to 1037
- Two CAPs, each with seven slots: numbered 10 to 23

***Figure B–6 SCSI Element Numbering - Rear Wall (viewed from front of library)***

Center Line

Left Right

| CEM | | DEM | | | | Base | | | | CEM | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2000 | 2010 | 1023 | 1024 | 1025 | 1026 | 1000 | 1001 | 1002 | 1003 | 2060 | 2070 |
| 2001 | 2011 | 1027 | 1028 | | 1029 | 1004 | 1005 | 1006 | 1007 | 2061 | 2071 |
| 2002 | 2012 | 1030 | 1031 | 1032 | 1033 | 1008 | 1009 | 1010 | 1011 | 2062 | 2072 |
| 2003 | 2013 | 1034 | 1035 | 1036 | 1037 | 1012 | 1013 | 1014 | 1015 | 2063 | 2073 |
| 2004 | 2014 | 2020 | 2026 | 2032 | 2038 | 1016 | | 1017 | 1018 | 2064 | 2074 |
| 2005 | 2015 | 2021 | 2027 | 2033 | 2039 | 1019 | 1020 | 1021 | 1022 | 2065 | 2075 |
| 2006 | 2016 | 2022 | 2028 | 2034 | 2040 | 2044 | 2048 | 2052 | 2056 | 2066 | 2076 |
| 2007 | 2017 | 2023 | 2029 | 2035 | 2041 | 2045 | 2049 | 2053 | 2057 | 2067 | 2077 |
| 2008 | 2018 | 2024 | 2030 | 2036 | 2042 | 2046 | 2050 | 2054 | 2058 | 2068 | 2078 |
| 2009 | 2019 | 2025 | 2031 | 2037 | 2043 | 2047 | 2051 | 2055 | 2059 | 2069 | 2079 |

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***Figure B–7 SCSI Element Numbering - Front Wall (viewed from front of library)***

Center Line

Left Right

| CEM | | DEM | | | | Base | | | | CEM | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2080 | 2090 | 2100 | 2107 | CAP 10 | | 2123 | 2130 | CAP 17 | | 2146 | 2156 |
| 2081 | 2091 | 2101 | 2108 | 11 | | 2124 | 2131 | 18 | | 2147 | 2157 |
| 2082 | 2092 | 2102 | 2109 | 12 | | 2125 | 2132 | 19 | | 2148 | 2158 |
| 2083 | 2093 | 2103 | 2110 | 13 | | 2126 | 2133 | 20 | | 2149 | 2159 |
| 2084 | 2094 | 2104 | 2111 | 14 | | 2127 | 2134 | 21 | | 2150 | 2160 |
| 2085 | 2095 | Door Latch | 2112 | 15 | | Door Latch | 2135 | 22 | | 2151 | 2161 |
| 2086 | 2096 | | 2113 | 16 | | | 2136 | 23 | | 2152 | 2162 |
| 2087 | 2097 | | 2114 | 2117 | 2120 | | 2137 | 2140 | 2143 | 2153 | 2163 |
| 2088 | 2098 | 2105 | 2115 | 2118 | 2121 | 2128 | 2138 | 2141 | 2144 | 2054 | 2164 |
| 2089 | 2099 | 2106 | 2116 | 2119 | 2122 | 2129 | 2139 | 2142 | 2145 | 2055 | 2165 |

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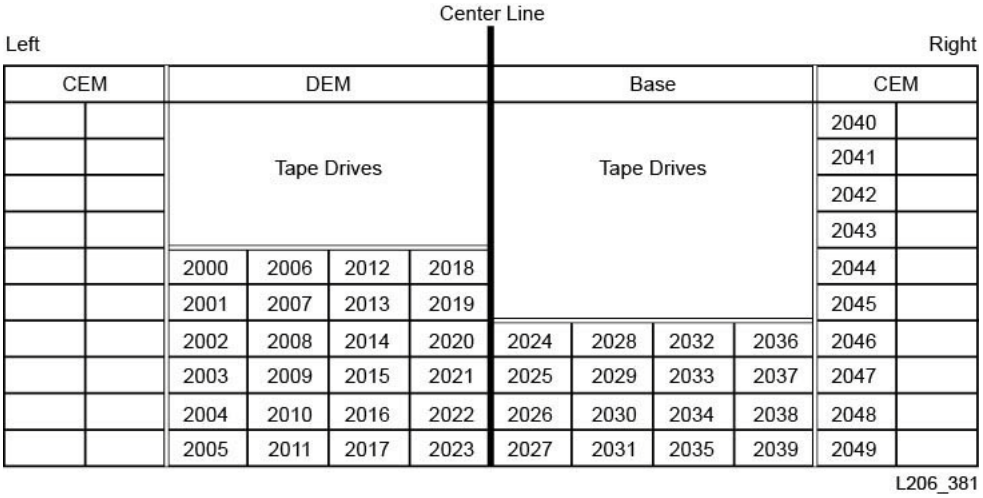
## User-Defined Numbering

Figure B–8 and Figure B–9 provide an example of user-defined SCSI element numbering. The library in the example has been simplified and is not an exact representation of a SL3000 library. For simplification, the active areas selected are only on the rear wall.

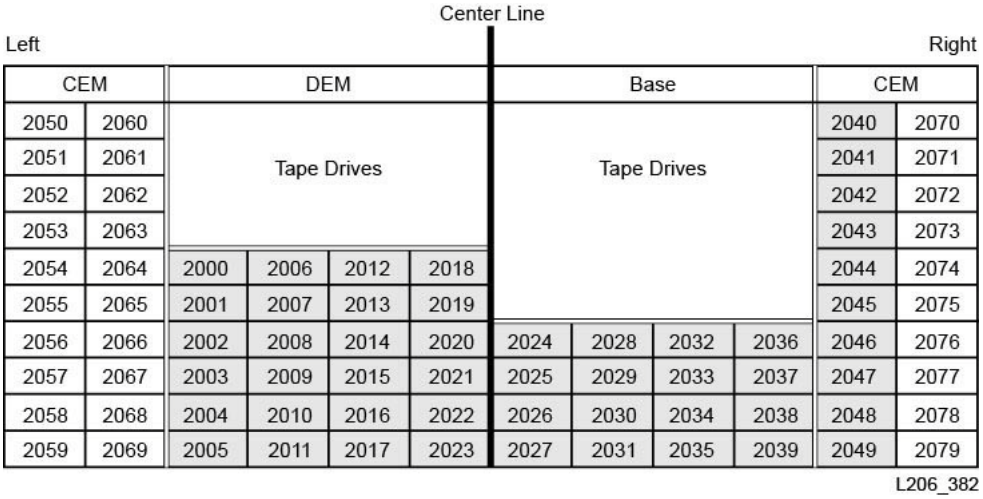
For this example, the user has decided to activate 50 cells, beginning with the DEM. As a result, the SCSI storage element numbering begins at 2000 with the upper left-most active cell in the DEM. The cells in the left CEM are currently inactive and are therefore not numbered (Figure B–8).

***Figure B–8 User Defined Capacity SCSI Element Numbering - Rear Wall***




At a later date, the user decides to activate the remaining 30 cells in the library. Since the active capacity was initially user-defined, the SCSI numbering does not re-assign numbering to the previously-activated cells. The SCSI storage element numbering for the newly-activated cells is appended (Figure B–9).

***Figure B–9 User Defined Added Capacity SCSI Element Numbering - Rear Wall***




# Comparison of Addressing Schemes

*Internal Firmware*

- Uses: library, rail, column, side, and row.
- Begins at 1 and uses negative numbers.
- Side indicates the front or rear wall of the library.
- Drive bays have column values 1 to 4 (BM) and -1 to -4 (DEM).

*HLI-PRC*

- Uses: LSM, panel, row, and column.
- Begins at 0 with no negative numbers.

- Panel indicates the front or rear wall of a specific module.
- Drive bays always have column value of 0.

*FC-SCSI Element*

- Uses single positive number for the element ID.
- Cartridge slots begin at 2000, tape drives begin at 1000, CAPs begin at 10.
- Inactive slots and empty drive bays are skipped when element numbers are assigned.
- Default element numbering is reassigned with any library configuration change.
- Element numbering depends on active capacity.

# Tape Drive Numbering

All of the tape drives in the SL3000 library are physically located at the rear of the Base Module or Drive Expansion Module. There are four addressing schemes used to define the location of drives:

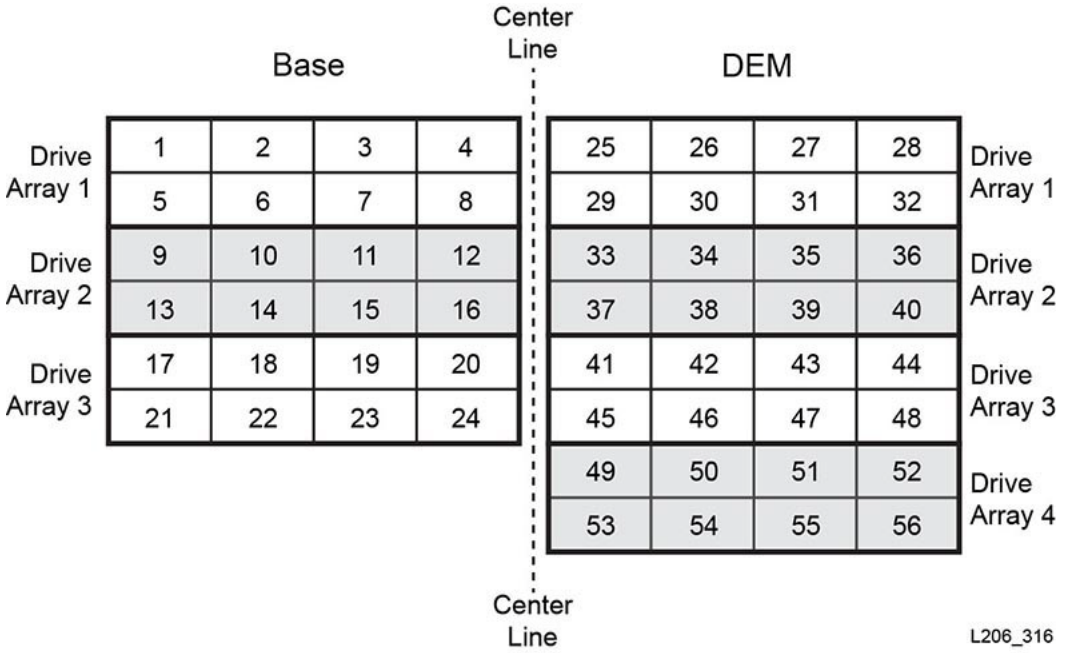
- "Hardware Numbering" on page B-12
- "Internal Firmware" on page B-13
- "HLI-PRC" on page B-14
- FC-SCSI Element numbering (see "Default SCSI Data Transfer Element Numbering Scheme" on page B-8).

## Hardware Numbering

The physical hardware numbering of tape drives is assigned by the HBC controller card. The card automatically assigns a number, 1-56, to each drive bay.

**Note:** The perspective in Figure B–10 is from the drive-side (rear) of the library.

*Figure B–10 Tape Drive Physical Hardware Numbering (viewed from rear of library)*

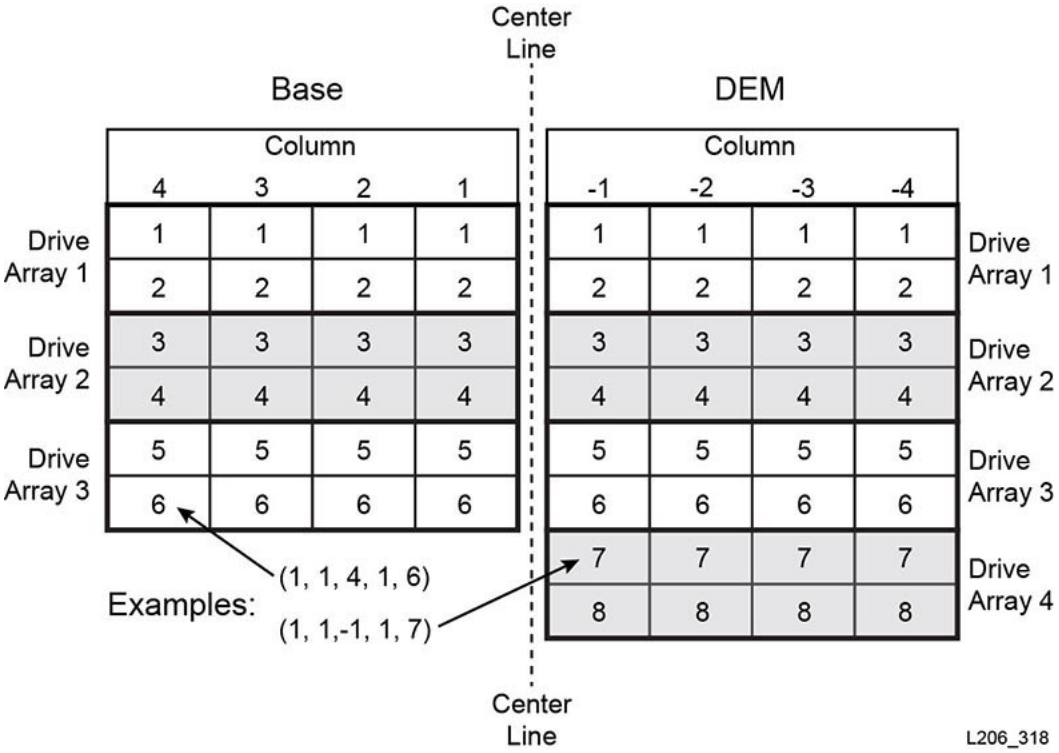



## Internal Firmware

The firmware addressing (library, rail, column, side, row) distinguishes a drive based on column and row. The library, rail, and side values are always equal to 1.

**Note:** The perspective in Figure B–11 is from the drive-side (rear) of the library.

***Figure B–11 Tape Drive Internal Firmware Addressing (viewed from rear of library)***

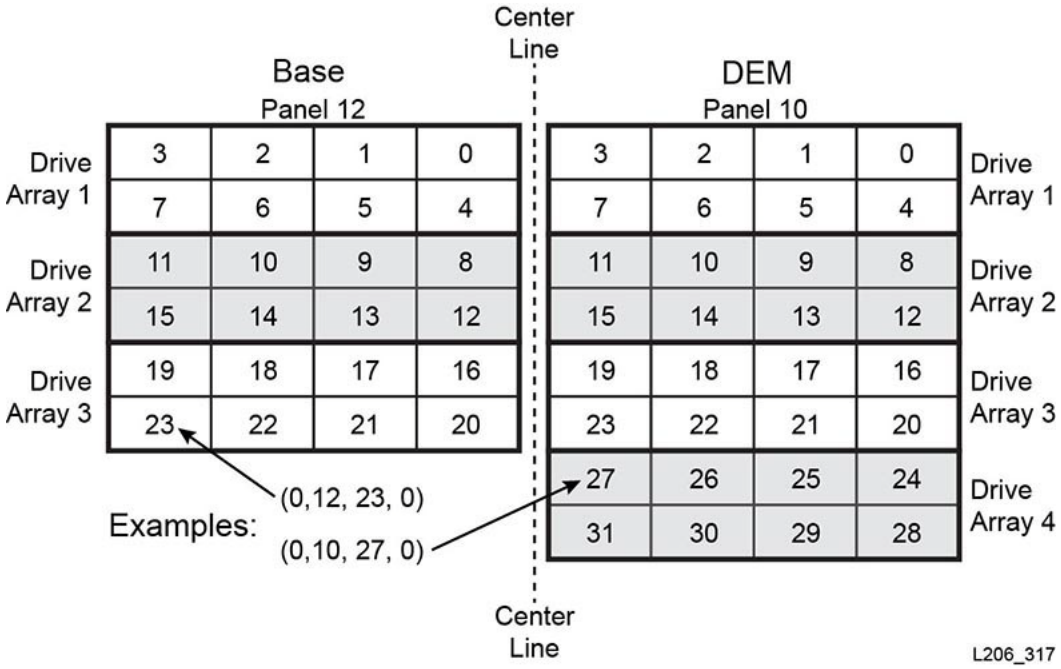



## HLI-PRC

The HLI-PRC uses drive IDs instead of row values. Therefore, the addressing is LSM, panel, drive, column. HLI distinguishes a drive based on the panel and drive value. The LSM and column values are always equal to 0.

**Note:** The perspective in Figure B–12 is from the drive-side (rear) of the library.

*Figure B–12 Tape Drive HLI-PRC Addressing (viewed from rear of library)*




# Addressing of Components—CAPs and Robots

The addressing of components, such as CAPs and robots, have unique addressing rules:

- The **library** and **rail** values are always 1.
- A **row** value of 0 indicates the address is referring to the device, not a slot in the device.
- The **column** value of a rotational CAP depends on module location.

> **Note:** "Left" and "right" are in reference to viewing the library from the CAP-side (front) unless otherwise specified.

## Cartridge Access Ports - Internal Firmware

Both rotational CAPs and AEMs are considered cartridge access ports for addressing purposes.

### Rotational CAPs

#### Column

The column value depends on the size of the library and the location of the module that contains the CAP.

For modules to the left of centerline, the CAP column value corresponds to the second column from the right of the module. For example, in a DEM, the column value for the CAP would be -2 and a CEM to the left of the DEM would have a CAP column value of -8.

For modules to the right of centerline, the CAP column value corresponds to the fifth column from the left of the module. For example, a CAP in the Base has a column value of 5 and a CEM to the right of the Base would have a CAP column value of 11.

#### Side
The side value is always 2, since the CAPs are only located on the front of the module.

#### Row
When addressing the device: the row value is 0.

When addressing a specific slot: the row value is the slot in the CAP magazine (values 1 to 26).

#### Example - Rotational Firmware Addressing
For this example, the library has a Base, DEM, and four CEMs (two on each side). The address refers to the sixth cell down in the CAP in the CEM on the far left.

The firmware address is: (1, 1, -14, 2, 6)

### AEM CAPs

#### Column
The column value when referencing the CAP is:

- -31 for left AEM
- 31 for right AEM

The column value when referencing a slot in the CAP:

- -31 to -33 for left AEM
- 31 to 33 for right AEM

#### Side
Indicates the front or rear CAP doors on the library.

- Rear wall = 1
- Front wall = 2

#### Row
When addressing the device: the row value is 0.

When addressing a specific slot: the row value is the slot in the CAP (values 1 to 26).

#### Example - AEM CAP Firmware Addressing
For this example, the address is referencing a cartridge slot in the right AEM. The slot is the 37th down in the far right column in the rear CAP door.

The firmware address is: (1, 1, 33, 1, 37)

## Cartridge Access Ports - HLI

CAPs have CAP IDs instead of panel values. CAP IDs range from 0 to 11, depending on location.

### Rotational CAPs

#### LSM
Always equal to 0.

#### CAP ID
Ranges from 1 to 10

- CEMs left of centerline = 1 to 4 (left to right)
- DEM = 5
- Base Module = 6
- CEMs right of centerline = 6 to 10 (left to right)

#### Row
The value is the slot in the CAP (can be values 0 to 25).

#### Column
The value always equals 0.

#### Example - Rotational CAP HLI Addressing
For this example, the library has a Base, DEM, and eight CEMs (four on each side). The address refers to the sixth cell down in the CAP in the CEM on the far left.

The HLI address is: (0, 1, 5, 0)

### AEM CAPs

#### LSM
Always equal to 0.

#### CAP ID
Left AEM equals 0.

Right AEM equals 11.

#### Row
The value is the slot in a column (can be values 0 to 38).

#### Column
Rear wall = columns 0 to2

Front wall = columns 3 to 5

## Robots - Internal Firmware

#### Column
The column value is always 0.

#### Side
If there is only one robot: the side value is always 1.

For redundant robot configurations:

- Left robot = 1
- Right robot = 2

#### Row
When addressing the device: the row is 0.

When addressing the specific slot: the row is the slot value (1).

**Example - Robot Firmware Addressing**

For this example, the address is referring to the right robot in a redundant robotics library.

The firmware address is: (1, 1, 0, 2, 0)

# C

# Wall Diagrams

This appendix explains special library cells, such as reserved system slots and the module identification blocks. Additionally, the appendix contains library wall maps for each possible module configuration.

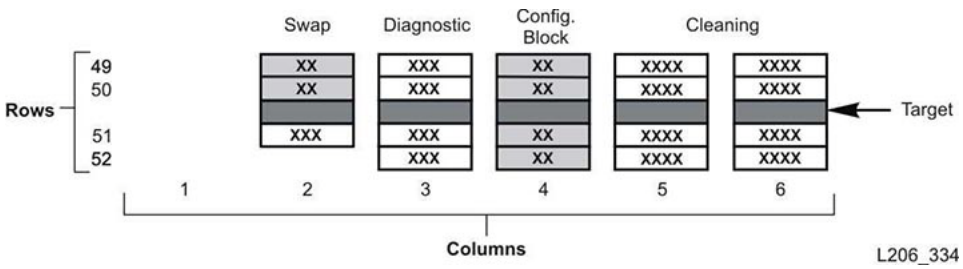


## Reserved System Slots

Both the Base Module and the Drive Expansion Module have reserved system cells on the lower rear wall. These cells provide special functions for the library and tape drives. Do not place data cartridges in a reserved slot. The reserved cells are composed of:

- Two swap cells in column 2, rows 49 and 50.
- One diagnostic cell in column 2, row 51, and four diagnostic cells in column 3, rows 49, 50, 51, and 52.
- A module identification block in column 4, rows 49, 50, 51, and 52 (see Figure C–1).
- Four cleaning cartridges in column 5, rows 49, 50, 51, and 52, and four cleaning cartridges in column 6, rows 49, 50, 51, and 52.

***Figure C–1 Reserved System Cells***




## Module Identification Block

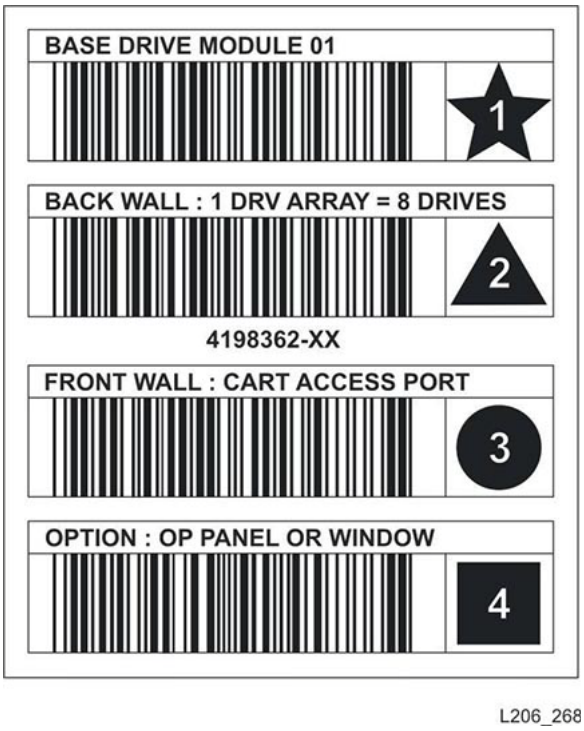
Each module has an identification block with labels that identify the module configuration. This block is on the lower rear wall in the forth column from the left, rows 49, 50, 51, and 52.

During an initialization or after an upgrade, the robotic assembly visits the module identification block to determine the module configuration.

The block identifies the:

- *Type of module*: Base Module, Drive Expansion Module, Cartridge Expansion Module, Parking Expansion Module, or Access Expansion Module.
- *Back wall configuration*: 1 drive array, 2 drive arrays, 3 drive arrays, 4 drive arrays, arrays, bulk load magazines, or empty.
- *Front wall configuration*: Arrays, cartridge access port, CAP window, empty, or bulk load magazines.
- *Options*: Arrays, op panel or window, empty, or service bay.

***Figure C–2 Module Identification Block Base Module Example***




## Special Labels

The CAPID/ label and NOMAG/ label are special labels that do not include an icon.

- CAPID/ is mounted only at the top of all CAPs as a generic identifier for the library if the CAP does not have any magazines installed on which to target.
- NOMAG/ is mounted behind the removable magazines in the bulk load AEM.

***Table C–1 Special Labels***

| Function | Label Text | Barcode | Icon |
|---|---|---|---|
| Cartridge Access Port ID | SPECIAL: CAP IDENTIFICATION | CAPID/ | None |
| No Magazines | SPECIAL: NO MAGAZINES | NOMAG/ | None |

# Wall Diagrams

- Base Module front wall (Figure C–3)
- Base Module rear wall (Figure C–4 and Figure C–5)
- DEM front wall (Figure C–6 and Figure C–7)
- DEM rear wall (Figure C–8 and Figure C–9)
- CEM front wall (Figure C–10)
- CEM rear wall (Figure C–11)
- Left PEM (Figure C–12)
- Right PEM (Figure C–13)
- Left AEM (Figure C–14)
- Right AEM (Figure C–15)

***Figure C–3 Base Module, Front Wall***

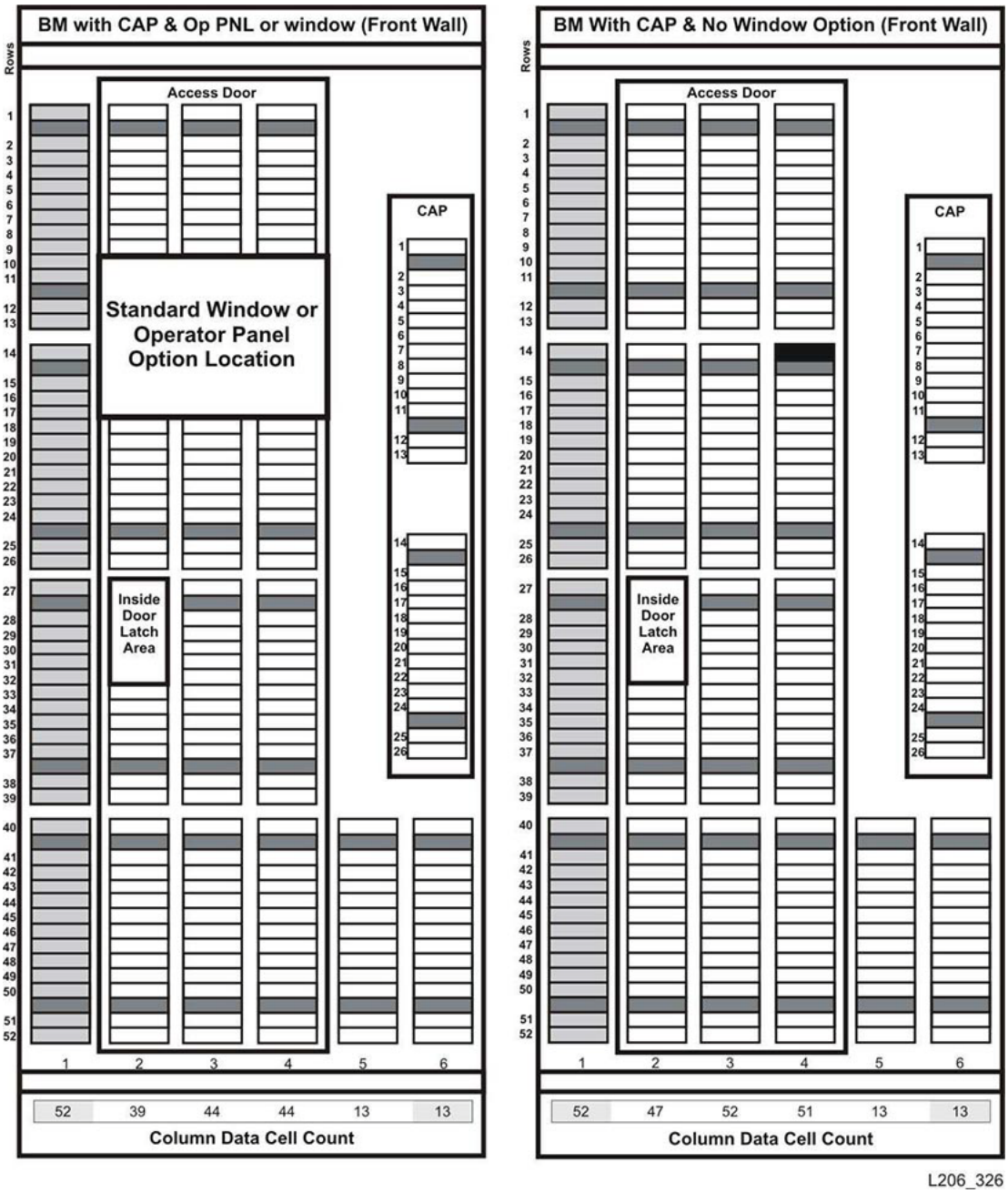


***Figure C–4 Base Module, Rear Wall***

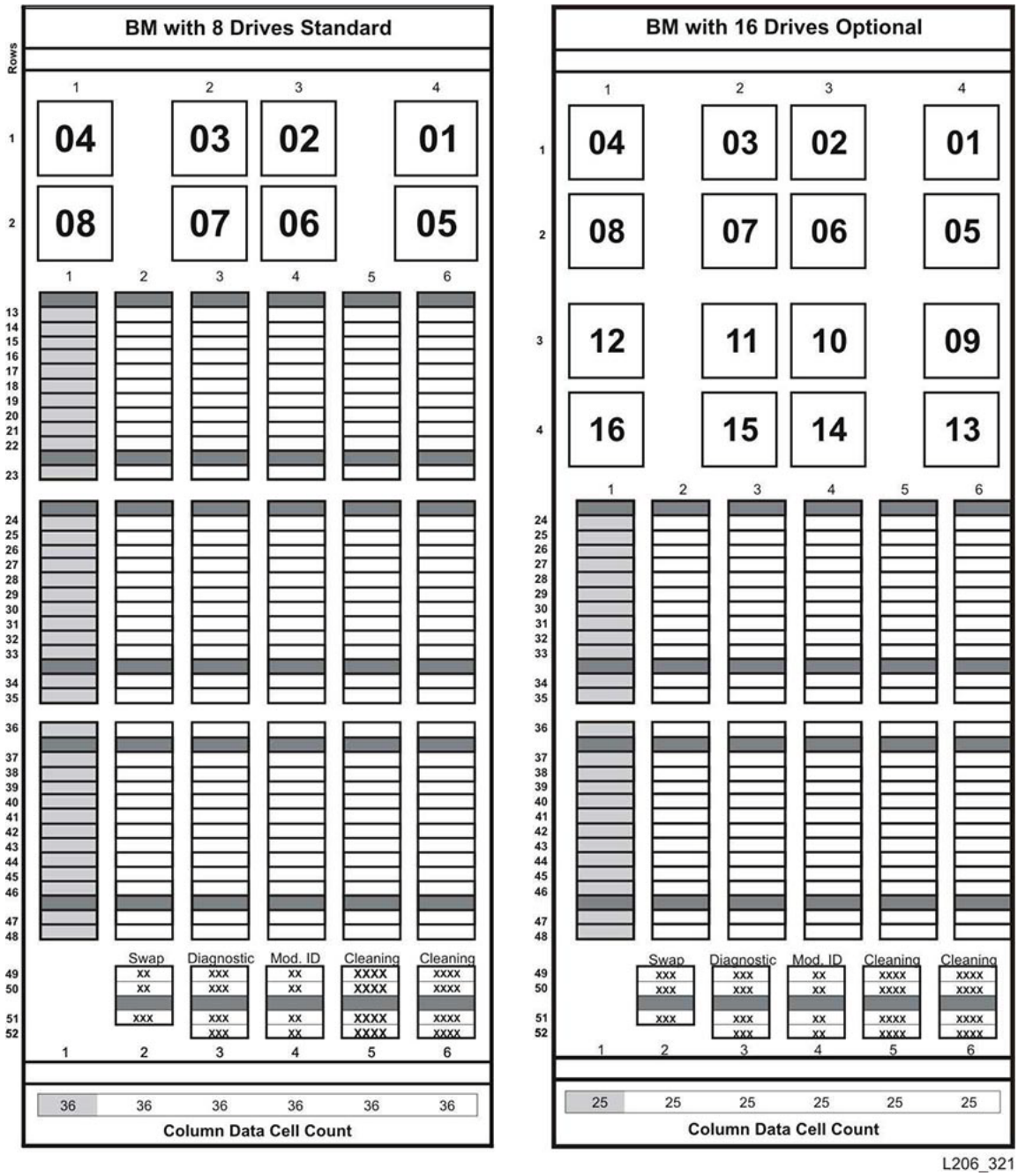


***Figure C–5 Base Module, rear wall with 24 drives***

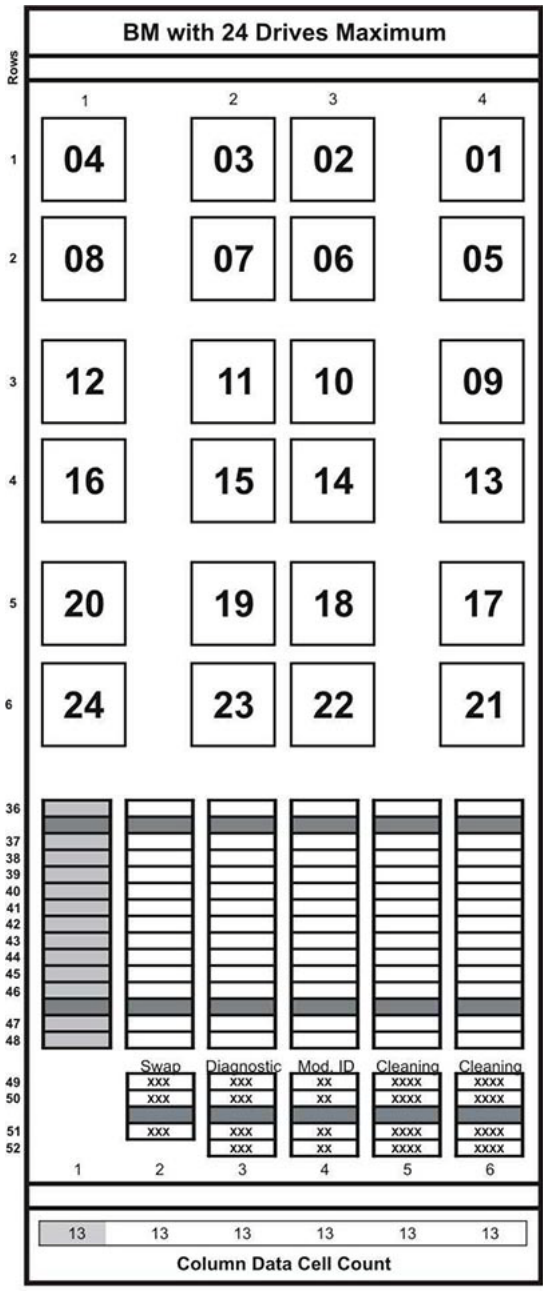



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***Figure C–6 DEM Front Wall***

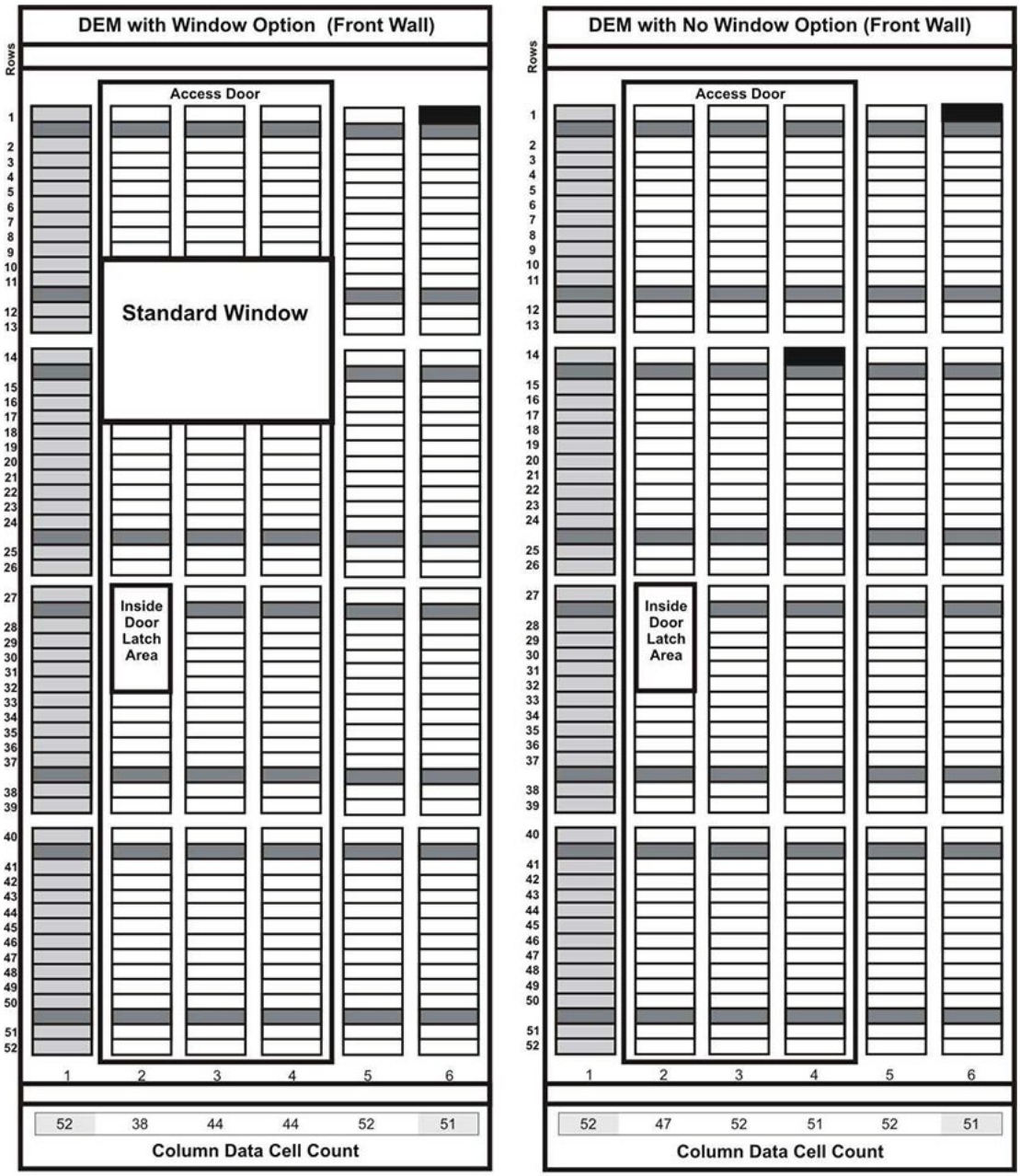


***Figure C–7 DEM Front Wall (continued)***

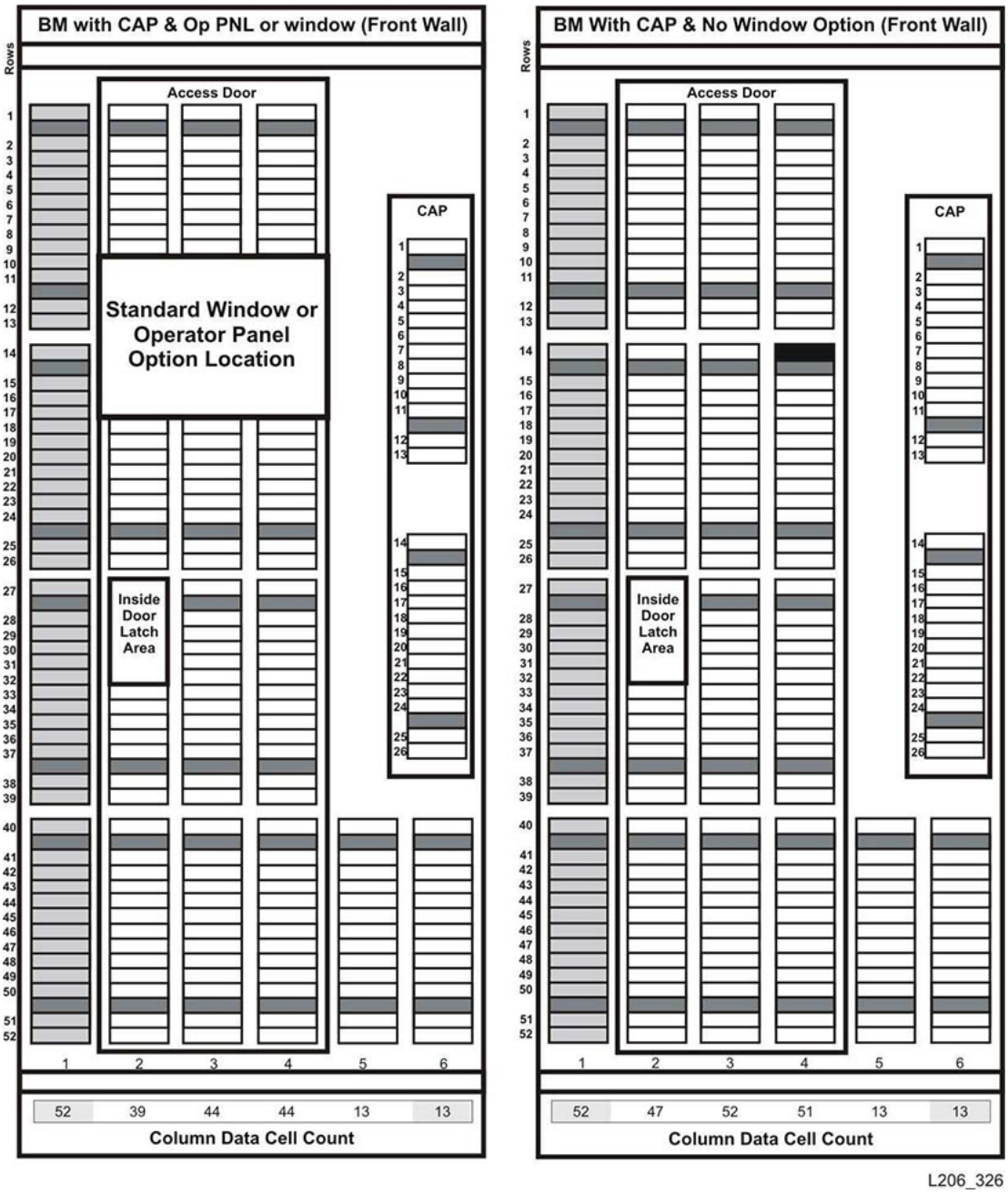


***Figure C–8 DEM Rear Wall***

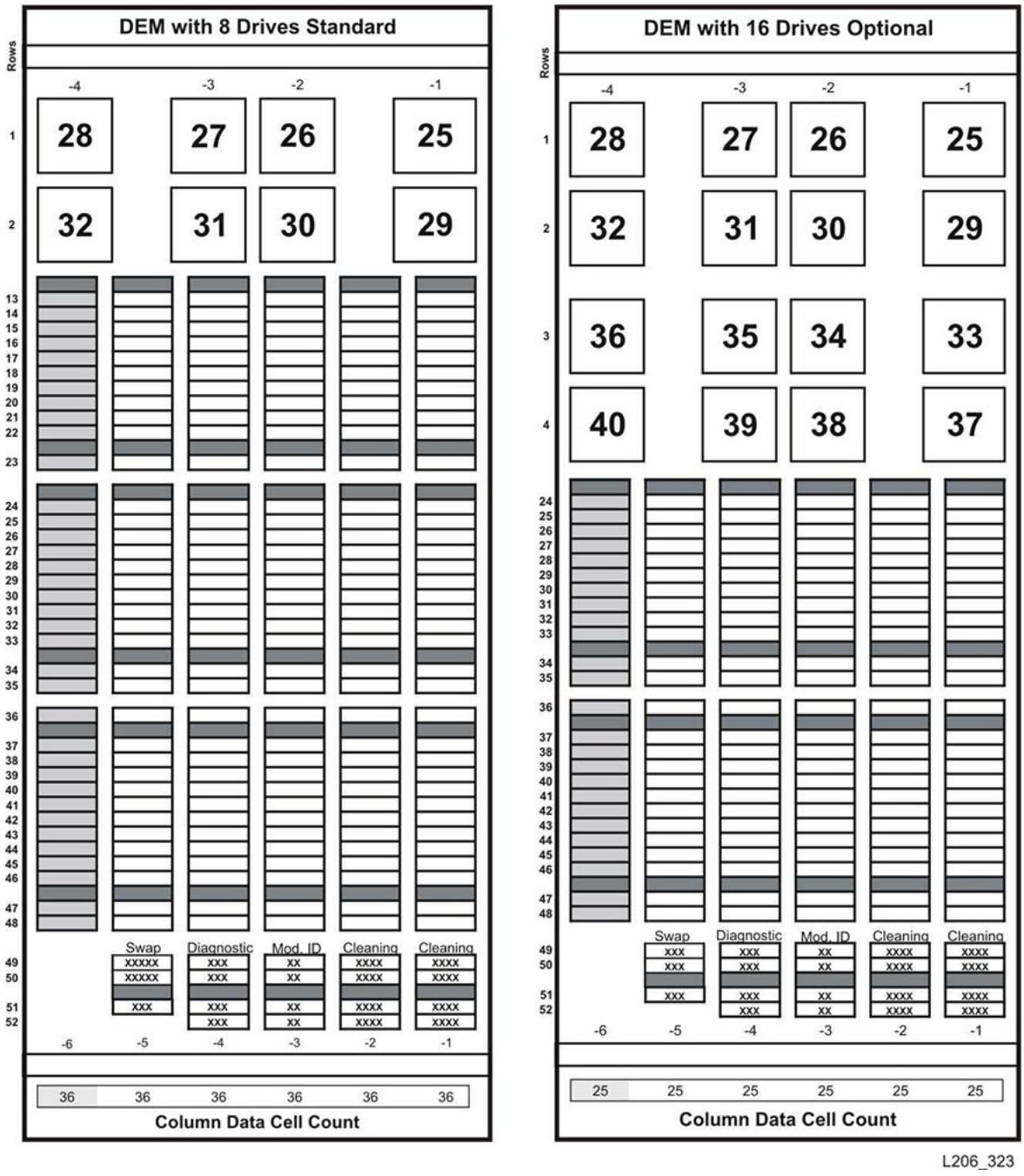


***Figure C–9 DEM Rear Wall (continued)***

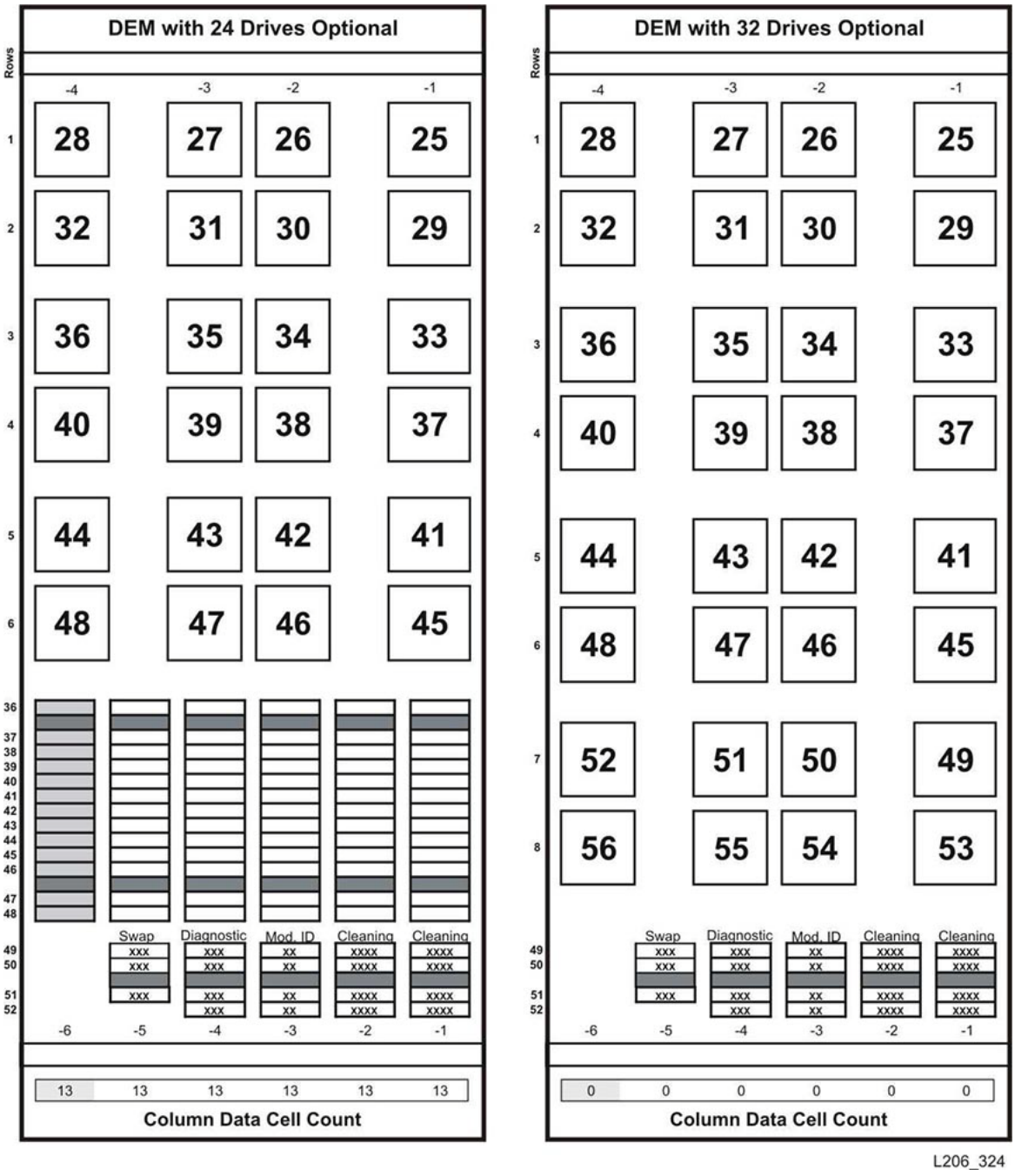


***Figure C–10 Cartridge Expansion Module, Front Wall***

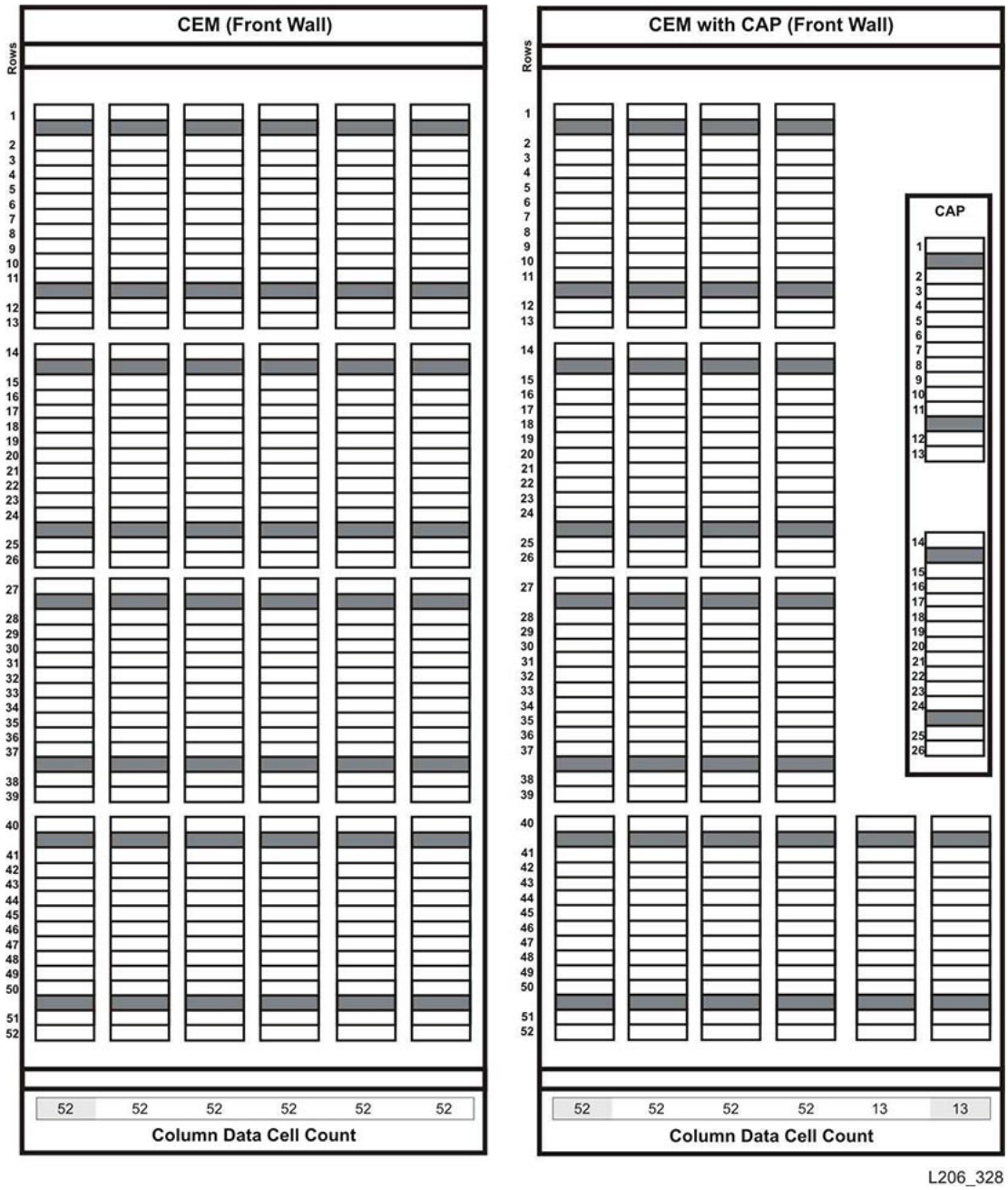


***Figure C–11 Cartridge Expansion Module, Rear***

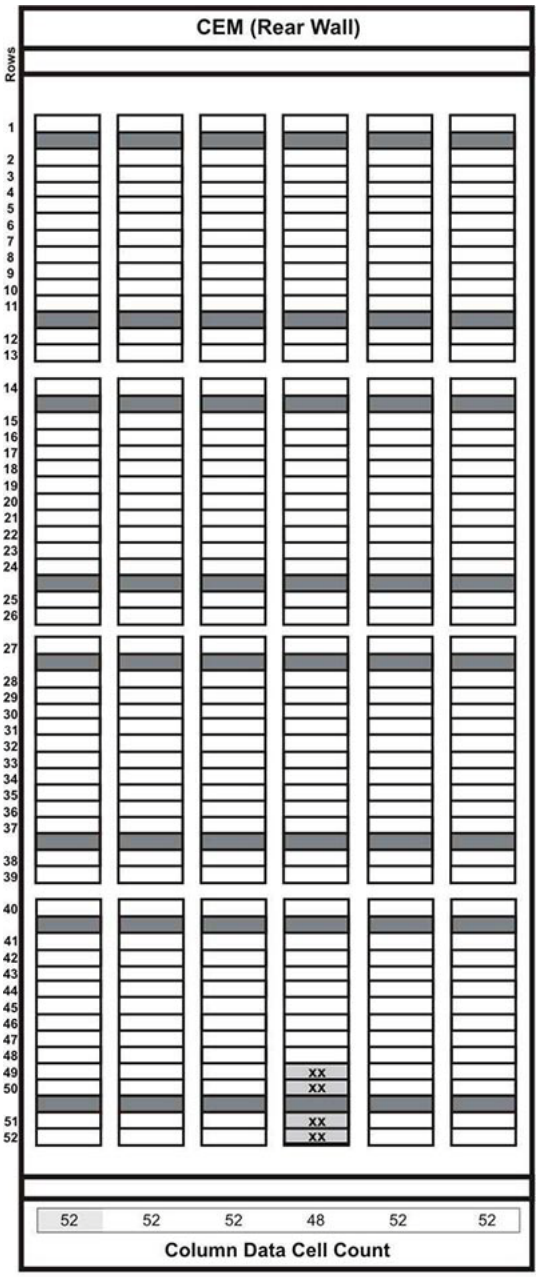


***Figure C–12 Parking Expansion Module, Left***

***Figure C–13 Parking Expansion Module, Right***

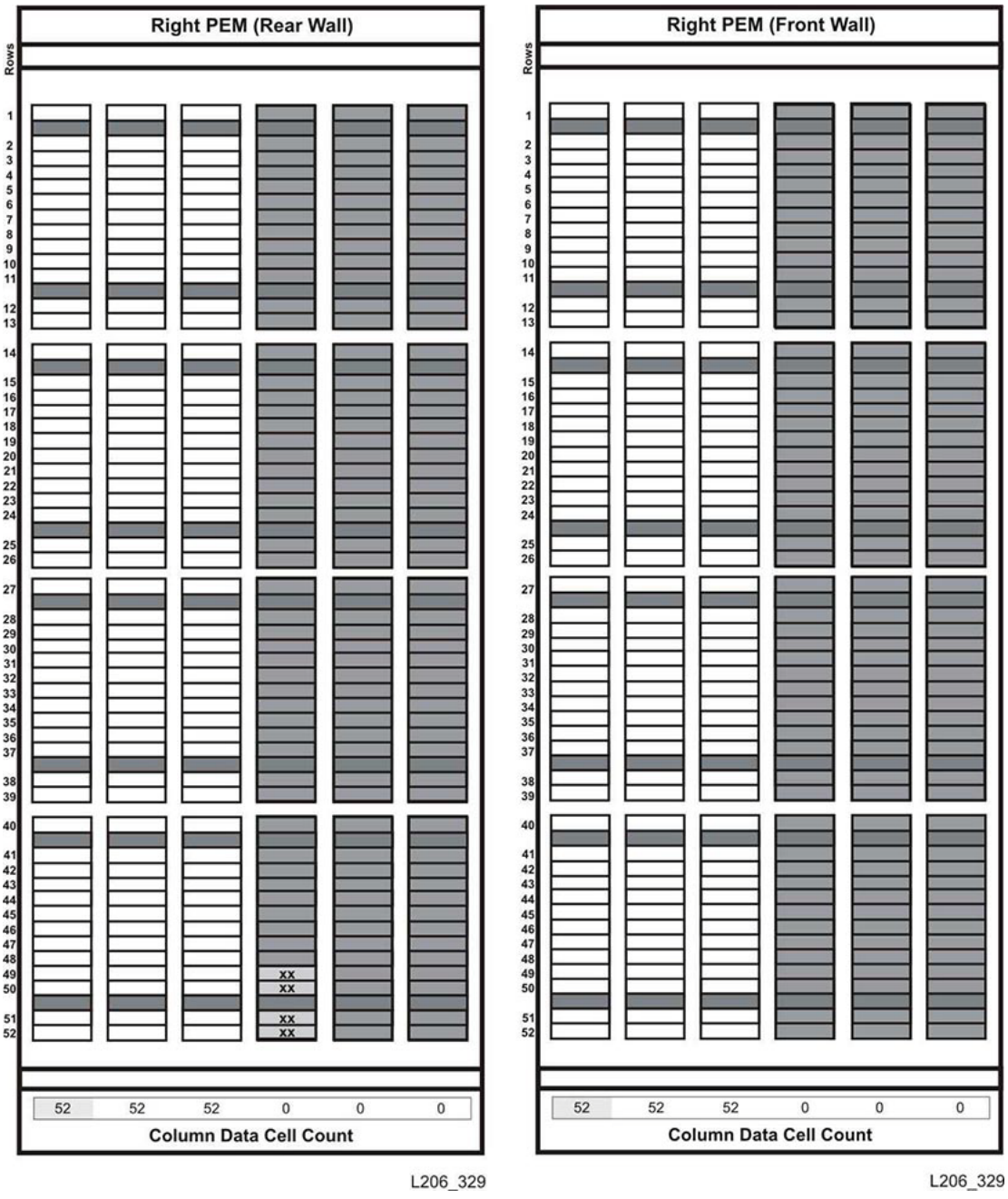


***Figure C–14 Access Expansion Module, Left***

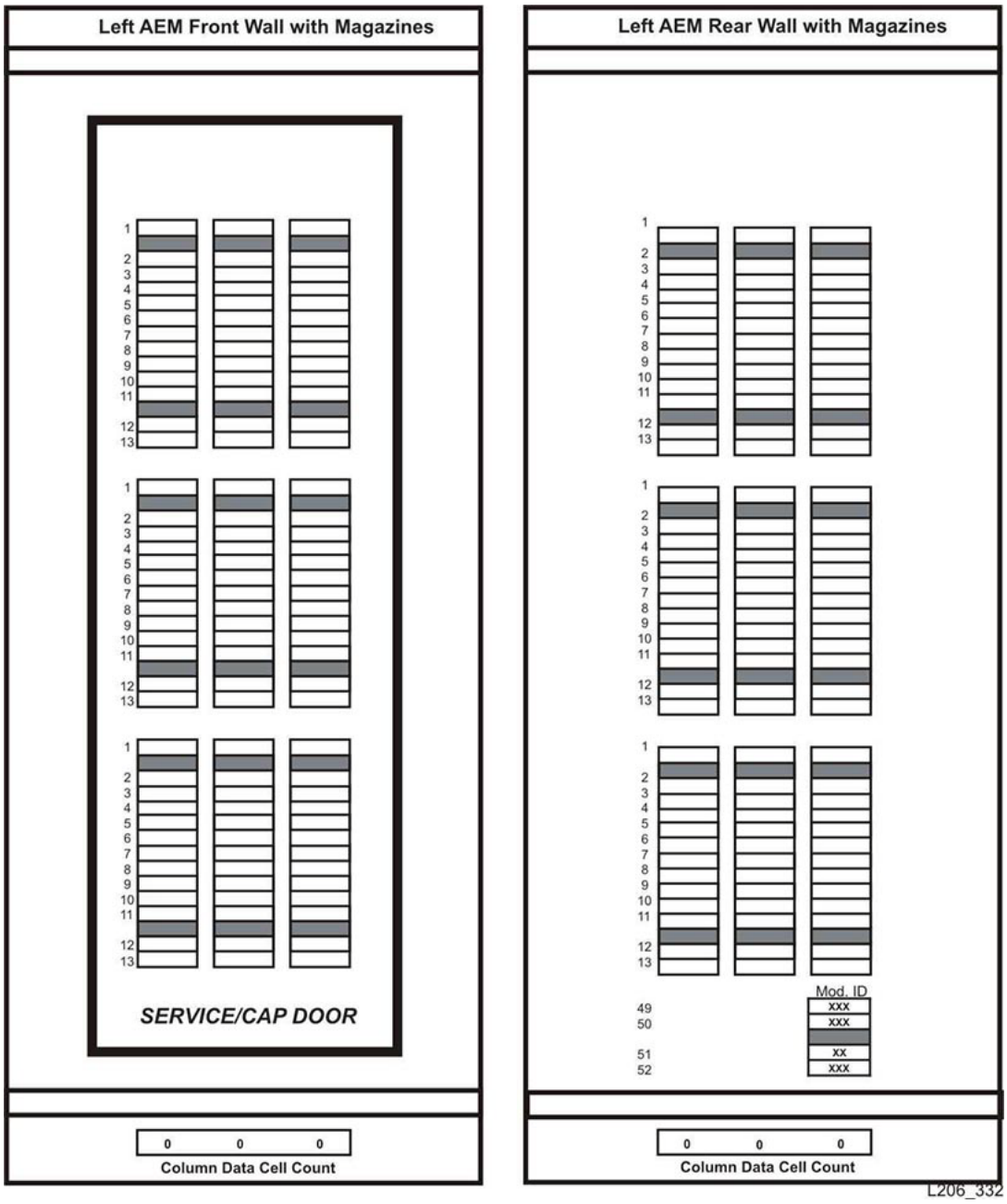
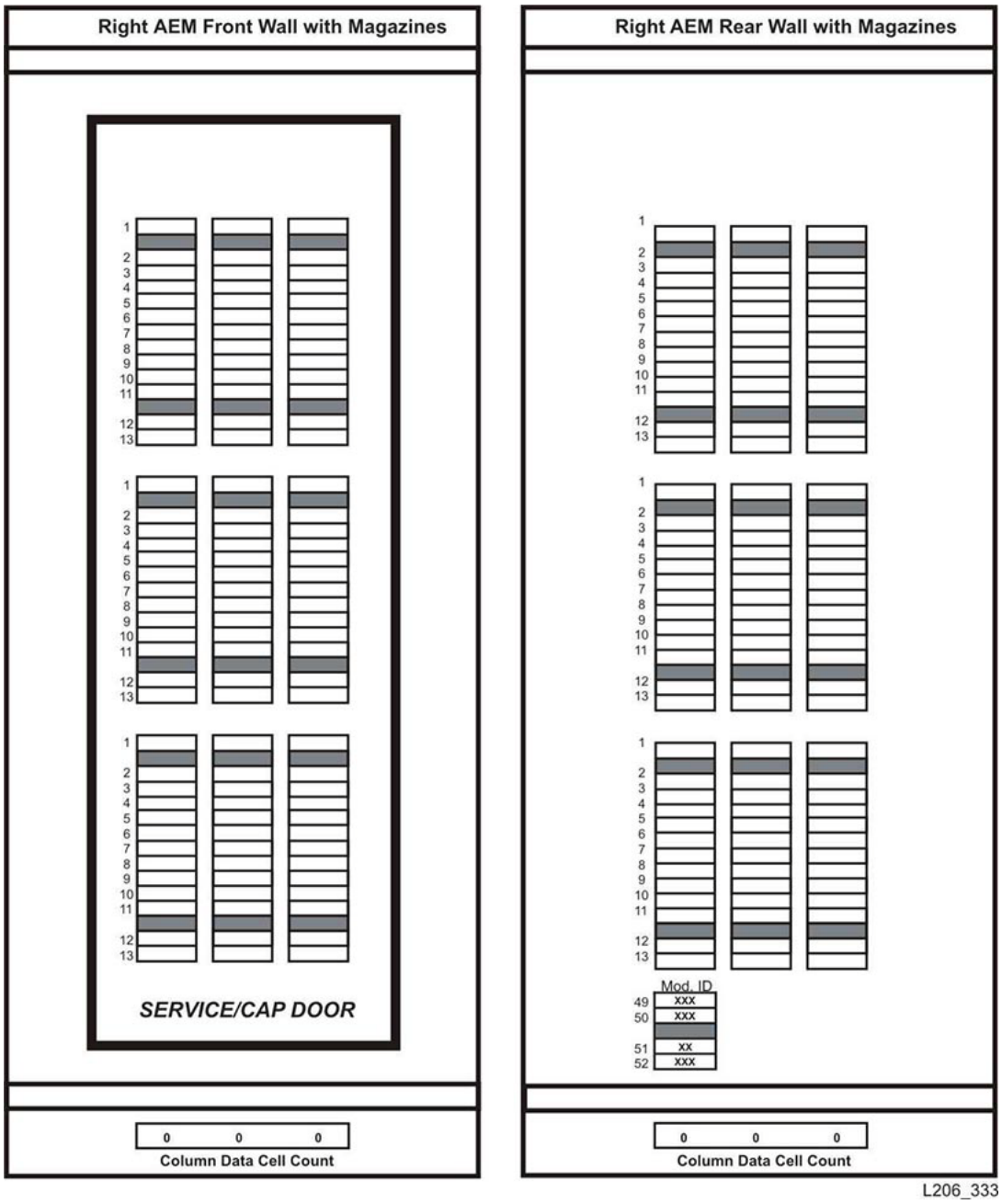


***Figure C–15 Access Expansion Module, Right***



# D

# Controlling Contaminants

This chapter includes information on the importance of preventing contaminants.



## Environmental Contaminants

Control over contaminant levels in a computer room is extremely important because tape libraries, tape drives, and tape media are subject to damage from airborne particulates. Most particles smaller than ten microns are not visible to the naked eye under most conditions, but these particles can be the most damaging. As a result, the operating environment must adhere to the following requirements:

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

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

## Required Air Quality Levels

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

Airborne particulate levels must be maintained within the limits of *ISO 14644-1 Class 8 Environment*. This standard defines air quality classes for clean zones based on airborne particulate concentrations. This standard has an order of magnitude less particles than standard air in an office environment. Particles ten microns or smaller are harmful to most data processing hardware because they tend to exist in large numbers, and can easily circumvent many sensitive components' internal air filtratio systems. When computer hardware is exposed to these submicron particles in great numbers they endanger system reliability by posing a threat to moving parts, sensitive contacts and component corrosion.

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

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

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

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

## Contaminant Properties and Sources

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

- It must have the physical properties that could potentially cause damage to the hardware.

- It must be able to migrate to areas where it can cause the physical damage.

The only differences between a potential contaminant and an actual contaminant are time and location. Particulate matter is most likely to migrate to areas where it can do damage if it is airborne. For this reason, airborne particulate concentration is a useful measurement in determining the quality of the computer room environment. Depending on local conditions, particles as big as 1,000 microns can become airborne, but their active life is very short, and they are arrested by most filtration devices. Submicron particulates are much more dangerous to sensitive computer hardware, because they remain airborne for a much longer period of time, and they are more apt to bypass filters.

## Operator Activity

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

## Hardware Movement

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

## Outside Air

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

## Stored Items

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

## Outside Influences

A negatively pressurized environment can allow contaminants from adjoining office areas or the exterior of the building to infiltrate the computer room environment through gaps in the doors or penetrations in the walls. Ammonia and phosphates are often associated with agricultural processes, and numerous chemical agents can be produced in manufacturing areas. If such industries are present in the vicinity of the data center facility, chemical filtration may be necessary. Potential impact from

automobile emissions, dusts from local quarries or masonry fabrication facilities or sea mists should also be assessed if relevant.

### Cleaning Activity

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

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

## Contaminant Effects

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

### Physical Interference

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

### Corrosive Failure

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

### Shorts

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

### Thermal Failure

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

## Room Conditions

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

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

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

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

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

It is extremely important that only appropriate materials and methodology are used in the encapsulation process. Inappropriate sealants or procedures can actually degrade the conditions they are meant to improve, impacting hardware operations and

reliability. The following precautions should be taken when encapsulating the supply air plenum in an on-line room:

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

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

## Exposure Points

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

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

## Filtration

Filtration is an effective means of addressing airborne particulate in a controlled environment. It is important that all air handlers serving the data center are

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

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

| Dust spot efficiency % | Fractional Efficiencies % for: 3.0 micron | Fractional Efficiencies % for: 1.0 micron | Fractional Efficiencies % for: 3.0 micron |
|---|---|---|---|
| 25-30 | 80 | 20 | <5 |
| 60-65 | 93 | 50 | 20 |
| 80-85 | 99 | 90 | 50 |
| 90 | >99 | 92 | 60 |
| DOP 95 | -- | >99 | 95 |

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

## Positive Pressurization and Ventilation

A designed introduction of air from outside the computer room system will be necessary in order to accommodate positive pressurization and ventilation requirements. The data center should be designed to achieve positive pressurization in relation to more loosely controlled surrounding areas. Positive pressurization of the more sensitive areas is an effective means of controlling contaminant infiltration through any minor breaches in the room perimeter. Positive pressure systems are designed to apply outward air forces to doorways and other access points within the data processing center in order to minimize contaminant infiltration of the computer room. Only a minimal amount of air should be introduced into the controlled environment. In data centers with multiple rooms, the most sensitive areas should be the most highly pressurized. It is, however, extremely important that the air being used to positively pressurize the room does not adversely affect the environmental

conditions in the room. It is essential that any air introduction from outside the computer room is adequately filtered and conditioned to ensure that it is within acceptable parameters. These parameters can be looser than the goal conditions for the room since the air introduction should be minimal. A precise determination of acceptable limits should be based on the amount of air being introduced and the potential impact on the environment of the data center.

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

# Cleaning Procedures and Equipment

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

Operator awareness is another consideration. Maintaining a fairly high level of cleanliness will raise the level of occupant awareness with respect to special requirements and restrictions while in the data center. Occupants or visitors to the data center will hold the controlled environment in high regard and are more likely to act appropriately. Any environment that is maintained to a fairly high level of cleanliness and is kept in a neat and well organized fashion will also command respect from the room's inhabitants and visitors. When potential clients visit the room they will interpret the overall appearance of the room as a reflection of an overall commitment to excellence and quality. An effective cleaning schedule must consist of specially designed short-term and long-term actions. These can be summarized as follows:

***Table D–1 Frequency of Actions***

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

## Daily Tasks

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

## Weekly Tasks

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

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

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

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

## Quarterly Tasks

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

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

### Bi-Annual Tasks

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

## Activity and Processes

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

# Glossary

### 2N

A PDU that supplies power to the redundant AC power grid and the third and fourth accessory racks. See also **N+1** and **2N+1**.

### 2N+1

Two PDUs for AC redundancy. Each PDU has extra DC power supplies for N+1 redundancy for each PDU.

### ACSLS

See **Automated Cartridge System Library Software (ACSLS)**.

### ADI

Automation drive interface.

### AEM

See **access expansion module**.

### access expansion module

Essentially a very large CAP, with all the characteristics of a CAP, such as online/offline state, ability to be shared by partitions, and so on. The cartridge slots in the AEM cannot be used for long-term cartridge storage.

### access door

A door on either side of the front facade through which service personnel can enter the library. Optional CAPs are attached to the right access door.

### activated capacity

The number of storage cells the library is activated to use. This cannot exceed the installed capacity.

### Automated Cartridge System Library Software (ACSLS)

An open systems software package that manages library contents and controls library hardware to mount and dismount cartridges on tape drives. This application also provides library management services such as cartridge tracking, pooling, reports, and library control.

### audit

An inventory of cartridge locations in all areas of the library, including the slots in the storage and reserved areas. Audits occur when:

- The library initializes at power-on.
- After either one or both access doors are opened and closed without activating the service safety door.
- A physical audit request is made through SL Console.

### base module

Provides the entry level offering for an SL3000 library. Consists of a single frame and centralizes the infrastructure for all other modules in the library. This module includes the power supplies, robotic units, electronics control module, cartridge access port, storage slots, tape drives, and operator controls.

### bar code line scan camera

A component of the robot that is used for cartridge identification and position calibration.

### bulk load

Manually loading cartridges into the library, for example, during library installation.

### CAP

See **cartridge access port (CAP)**.

### CDS

Control data set.

### CEM

See **cartridge expansion module**.

### CLI

Command line interface.

### capacity

The storage capacity of the library. See also **activated capacity** and **installed capacity**.

### cartridge

A container holding magnetic tape that can be processed without separating the tape from the container. The library uses data, diagnostic, and cleaning cartridges.

### cartridge access port (CAP)

A bi-directional port built into the door panel of the library which provides for the manual entry or automatic ejection of data or cleaning cartridges. *Same as* import/export mail slot in SCSI and open system libraries.

### cartridge expansion module

An optional module for the library that provides additional cartridge slot capacity and growth.

### cartridge proximity detector

A component that determines if a cell is empty or contains an unlabeled cartridge during a label reading error recovery procedure. *Same as* empty cell detector.

### cell

The location in the library in which a tape cartridge is stored. *Same as* slot.

### cell array

An array that holds multiple cartridges when not in use.

### cleaning cartridge

A tape cartridge that contains special material to clean the tape path in a transport or drive.cold swap

To remove and replace a system component (typically one such as a logic board that has no redundant backup) after system operations have been stopped and system power has been disabled.

### control data set

Data set used by the host software to control the functions of the automated library. Also called a library database.

### DEM

See **drive expansion module (DEM)**.

### dWWN

See **dynamic WWN**.

### data cartridge

A term used to distinguish a cartridge onto which a tape drive may write data from a cartridge used for cleaning or diagnostic purposes.

### diagnostic cartridge

A data cartridge used for diagnostic routines.

### data path

The path where data is transferred between the host and tape drives.

### drive bay

A partitioned section of the tape drive array assembly that holds one tape drive tray assembly.

### drive bay address

A two-digit integer (01–64) that represents the physical locations into which drive tray assemblies are inserted.

### drive expansion module (DEM)

A module that allows further expansion of tape drives.

### drop-off cells

Cells used to hold a cartridge if a robot failure occurs while a cartridge is in the robot hand.

### Dual TCP/IP

Provides two separate host connections between the host software (ACSLS or HSC) and the library controller.

### dynamic WWN

When enabled, dWWN assigns names to library drive slots rather than devices. When a drive is replaced, the new drive receives the same name as the one it replaced,

thereby eliminating the need for system re-configuration. dWWN assigns names to individual tape drive slots rather than devices

### ECM

See **electronics control module**.

### ELS

See **Enterprise Library Software**.

### ESCON

See **Enterprise Systems Connection (ESCON)**.

### EPO

See **emergency power-off (EPO)**.

### eject

See **export**.

### electronics control module

A module that includes the HBK card, HBC/HBCR card and HBT card. The assembly that:

- Processes commands from a host system
- Coordinates the activities of robots and tape drives
- Monitors status inputs from sensors and switches

### emergency power-off (EPO)

(1) A safety scheme that allows a power down of a subsystem or a system as a whole instead of powering it down component-by-component.

(2) A safety switch on a system or in a data center that allows a user to immediately turn off a system or a data center power supply by cutting off the external source power.

### enter

See **import**.

### Enterprise Library Software

The software products that automate tape operations for mainframe users.

### Enterprise Systems Connection (ESCON)

An optical fiber serial interface which supports half duplex data transfers.

### environmental monitors

A collective term for the sensors that track temperatures, fan speeds, and the status of various other mechanism within a library.

### export

The action in which the library places a cartridge into the cartridge access port so that the operator can remove the cartridge from the library. *Same as* eject.

### FRU

Field replaceable unit.

### failover

The act of moving to a secondary or redundant path when the primary path fails. Also, in ACSLS HA, failing over to the standby (alternate) ACSLS server.

### get

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

### gripper

The portion of the hand assembly that grasps the cartridge. (2) The part of the hand assembly that grasps and holds a cartridge during transport.

### HLI/PRC

*Host Library Interface/Panel Row Column*

### hand assembly

A part of the library robot whose function is to grasp cartridges and move them between storage cells and drives. A camera on the hand assembly reads cartridge volume labels.

### host audit

The process of updating the cartridge vol-ids and locations in a host CDS. This audit is initiated by a host command.

### import

The process of placing a cartridge into the cartridge access port so that the library can insert it into a storage cell.

### installed capacity

The number of storage cells physically present in the library.

### interlock switch

A switch that disconnects power to library mechanisms, excluding tape drives, when the front door is opened.

### keypad interface

*See* membrane keypad.

### LCM

See **Library Content Manager (LCM)**.

### LTO

See **linear tape open format (LTO)**.

### LUN

See **logical unit number**.

### Library Content Manager (LCM)

Software that provides content management for mainframe automated tape environments. Works with host software component, virtual storage manager and your tape management system.

### library operator panel

*See* **touch screen operator control panel**.

### linear tape open format (LTO)

A set of tape data format standards created to enable data interchange among different LTO Ultrium tape drive vendors. These standards allow data cartridges to be shared.

### logical library

A virtual representation of a physical library. *Same as* virtual library partition.

### logical unit number

A unique identifier for a physical storage allocation. A LUN could reference an entire RAID set, a single hard disk or partition, or multiple disks or partitions. Unlike a physical LUN, the virtual LUN does not map to a specific device or allocation of storage space but a virtualized space that can be created in excess of the actual physical space available.

### magazine

A removable array that holds cartridges and is placed into the cartridge access port (CAP).

### membrane keypad

A keypad mounted on the front facade used to monitor the status of the library and to operate the CAPs.

### N+1

A power configuration that provides AC power and redundant DC power by adding a second DC power supply to each DC bus. See also **2N**.

### operator panel

See **touch screen operator control panel**.

### orphaned cartridge

A cartridge in a partitioned library that is located in an unallocated cell or drive (that is, a cell or drive not allocated to any defined partition). Cartridges may become orphaned when partition boundaries are changed, partitions are deleted, or cartridges are manually moved to unallocated or inaccessible cells.

### PDU

See **power distribution unit (PDU)**.

### PEM

See **power distribution unit (PDU)**.

### PLI

See **primary library interface (PLI)**.

### parking expansion module (PEM)

An additional module available for the SL3000 library that allows a redundant robot to be parked in it.

### physical audit

Physical audits occur when the robots:

- Scan the cartridge locations in the library
- Verify the volumes

- Update the library control card inventory
- Set the status of the cartridge location to true

### physical library

A physically present library as opposed to a **logical library**.

### 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 alternating current source if the PDUs use separate AC sources) loses power.

### primary library interface (PLI)

The communication path between the operator panel and the library controller.

### put

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

### RE

See **Redundant Electronics (RE)**.

### rail

(1) That portion of the upper robot track assembly that provides power and communication to the robot. (2) All of the cartridge slots and drives accessible through a rail.

### rail assembly

The mechanism on which the robot travels between cartridge arrays and tape drives.

### reach mechanism

A component of the robot that moves the gripper to get or put a cartridge at a designated location.

### Redundant Electronics (RE)

A feature that provides failover protection in enterprise libraries. RE uses two sets of library controller cards. At any given time, one set is active and the other set is standby. The active library controller can failover to the standby in response to a command from ACSLS or the SL Console. Automatic failover can be initiated by the library if a library card fails.

### remote operator console

The customer's operator panel that interfaces with the PLI. *See also* security software layer.

### robot

A mechanism that moves horizontally along a track to transport tape cartridges to and from other locations in the library.

### SSL

See **Secure Sockets Layer (SSL)**.

### Secure Sockets Layer (SSL)

A cryptographic protocol that provides communication security. The communication path between the PLI and the remote operator console occurs through SSL.

### slot

Same as cell.

### TTI

See **tape transport interface (TTI)**.

### 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 cartridges. These cartridges are not interchangeable.

### tape drive

An electromechanical device that moves magnetic tape and includes mechanisms for writing and reading data to and from the tape.

### tape drive tray assembly

The mechanical structure that houses a tape drive, fan assembly, power and logic cards, cables, and connectors for data and logic cables. *Same as* drive tray assembly.

### tape storage area

The area in the library where cartridges are stored.

### tape transport interface (TTI)

An interface to control and monitor tape movement.

### touch screen operator control panel

A flat-panel display with a touch screen interface and a panel mount computer. This feature is attached to the front of the library.

### track

The horizontal path upon which a robot travels.

### track drive mechanism

The component that moves the robot along the track between the cell arrays, CAPs, and tape drives.

### vol-id

Volume ID assigned to a cartridge. Same as **VOLSER**.

### VOLSER

Volume serial number. Same as **vol-id**.

### vacancy plate

A plate that covers an unused bay, such as a drive bay or power supply bay.

### verified audit

Verified audits are invoked from the SL Console and actually validate the status of a specific cartridge slot or range of slots.

### WWN

See **World Wide Name**.

**wrist**

A mechanism in the robot assembly that allows the robot to access the outer and inner storage walls.

**World Wide Name**

A 64-bit address that uniquely identifies each individual device and vendor, much like the MAC address of an Ethernet interface. Each port on a Fibre Channel network must have its own WWN. The WWN is not just a physical hardware address. It also serves as the logical address of a node on the SAN, meaning the SAN configuration changes if any of the attached hardware changes. If a device fails and is replaced, the WWN of the node changes, forcing reconfiguration of the SAN. There are three World wide Names reserved for each drive bay: Node, Port A, and Port B.

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