StorageTek SL3000 Modular Library System

Systems Assurance Guide

Part Number: 316194102
May 2010
Revision: B

Submit comments about this document by clicking the Feedback [+] link at: http://docs.sun.com

StorageTek SL3000 Modular Library System: Systems Assurance Guide

316194102 Revision: B

Summary of Changes

EC Number	Date	Revision	Description
EC000348	April 2008	A	Initial release.
EC000628	July 2008	AB	Refer to this version for a list of updates.
EC001137	April 2009	AC	Refer to this version for a list of updates.
	May 2010	B	Updates to this revision include: ■ Oracle branding. ■ LTO5 support. ■ PUA Fibre Channel card. ■ Engineering updates

Note – Change bars are included in this revision.

Contents

Figures

Tables

Preface

This guide is intended for StorageTek representatives, partners, customers, and anyone responsible for planning the installation of **Oracle's StorageTek SL3000 Modular Library System.**

Related Information

These publications contain additional information:

Publication Description	Part Number
Principles of Operation	31619400x
Installation Manual	31619420x
Service Manual	31619430x
Troubleshooting Guide	41860910x
User's Guide	31619440x
SNMP Guide for SL3000 Libraries	31619450x
Interface Reference Manual (SCSI Specification)	31619520x
Regulatory and Safety Compliance Manual	820-5506-xx
T9x40 Tape Drive Systems Assurance Guide	MT5003
T10000 Tape Drive Systems Assurance Guide	TM0002

Documentation, Support, and Training

Function	URL	Description
Web Site	http://www.oracle.com/index.html	General information and links.
Documentation ■ Customer: ■ Employee: ■ Partner:	 http://docs.sun.com/ http://docs.sfbay.sun.com/ https://spe.sun.com/spx/control/Login	Search for technical documentation. Download PDF/HTML documents. Order printed documents.
Downloads ■ Customer: ■ Employee:	 http://www.sun.com/download/index.jsp http://dlrequest.sfbay.sun.com:88/usr/login	Download firmware and graphical user interfaces, patches, and features.
Support	http://www.oracle.com/us/support/index.htm	Obtain and escalate support.
Training	http://www.oracle.com/education/training_formats.html	Access training resources. Learn about Oracle courses.
Online Account	https://reg.sun.com/register	Register for an Online Account.

This table is in transition and subject to change to links within Oracle.

Oracle Welcomes Your Comments

Oracle is interested in improving its documentation and welcomes your comments and suggestions. Submit your comments by clicking the Feedback [+] link at:

http://docs.sun.com

Please include the title and part number of your document with your feedback:

SL3000 Modular Library System: Systems Assurance Guide PN: 31619410x, Revision B

CHAPTER 1

Introduction

The SL3000 is the latest addition to Oracle's StorageTek modular library family, which includes the SL500 and SL8500 modular library systems.

This chapter introduces you to the SL3000 library, components, and configurations.

FIGURE 1-1 SL3000 Modular Library System—Configuration Example

1. **Base Module—Base**
   (required—one per library)
2. **Drive Expansion Module—DEM**
   (*optional*, must be installed to the *left* of the base module—one per library)
3. **Cartridge Expansion Module—CEM**
   (maximum of eight per library)
4. **Access Expansion Module—AEM**
   (maximum of two per library—required for the Dual TallBot feature)

This library offers customers the benefits of:

- Storage capacity from 200 to 5,925 slots
- Performance from 1 to 56 tape drives
- Bulk cartridge loading capabilities from 234 to 468 cartridges (one or two AEMs)
- Heterogeneous attachments using standard interfaces
- Multiple library management software options and programs

Modular Design

The SL3000 library maintains the fundamentals of a modular design that allows customers the ability to meet the demands of rapidly growing and constantly changing environments.

The SL3000 library was designed to:

- Address medium to large open systems and entry-level mainframe markets.
- Occupy a standard data center footprint with measurements of approximately:

Height	198 cm (78 in.)
Depth	124 cm (49 in.)
Length	From: 91.5 cm (36 in.) a single Base module; [0.9 m (3 ft)] To: 782.4 cm (308 in.) Base, DEM, 8 CEMs, and covers; [7.8 m (25.7 ft)] To: 965.2 cm (380 in.) Base, DEM, 8 CEMs, 2 AEMs, covers; [9.65 m (31.7 ft)]

A maximum configuration consists of 12 modules.

- 1 Base module
- 1 Drive expansion module
- 8 Cartridge expansion modules
- 2 Access expansion modules

See Chapter 3, "Site Planning" for specific details.

Modules

There are currently five types of modules in an SL3000 library:

- Base module (Base) one, *required*
- Drive expansion module (DEM)—maximum of one—*on the left side of a base module only*
- Cartridge expansion module (CEM)—maximum of eight (without conversion to parking expansion modules)—*left* or *right side*
- Parking expansion module (PEM)[1]—must order two, one on each end for the dual robotics feature—*left* and *right ends of the library*
- Access expansion module (AEM)[1]—one or two, on the ends of the library
  - Single AEM provides bulk loading capabilities only.
  - Two AEMs provide bulk loading and a parking zone for the dual robotics feature.
  - Two AEMs are required for the dual robotics feature.

1. You need either two parking expansion or two access expansion modules to support the dual robotics feature. You can not mix and match PEMs with AEMs.

Base Module

FIGURE 1-2 shows an example of the Base Module. This module provides the entry level offering, which 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.

One base module—*and only one*—is required for every library installation.

On the front of this module is:

- A single, 26 cartridge–dual magazine–cartridge access port (CAP).
- A service door for library access.
- A front panel with three LEDs: Library Active, Service Required, and Wait.
- Plus an optional feature for a touch screen operator panel or perforated window.

FIGURE 1-2 Base Module—Front View

Configurations	
8 drive slots, CAP, perforated window (standard configuration)	
Optional Configurations	
16 drive slots, CAP, perforated window 24 drive slots, CAP, perforated window	
8 drive slots, CAP, and Operator panel or window[1.] 16 drive slots, CAP, and Operator panel or window 24 drive slots, CAP, and Operator panel or window	
Dimensions	**Measurement**
Height	197 cm (77.625 in.) to 200 cm (78.63 in.) fully adjusted
Width	76.78 cm (30.23 in.) without covers 91.5 cm (36 in.) with covers
Depth	124 cm (49 in.)
Weight	Frame only: 361 kg (790 lb)
Service clearance Both doors open	Front: 46 cm (18 in.) [allow 56 cm (22 in.)] Rear: 81 cm (32 in.) Total: 262 cm (103 inches)
Side covers	Width: 7.4 cm (2.9 in.) per side cover Cooling clearance: 5 cm (2 in.)[2.] Install: 91 cm (36 in.)[3.]

1. Perforated windows are the standard offering. Arrays may displace an operator panel or window.
2. Recommended cooling clearance.
3. Required to install or remove the sides covers; they swing out and lift off of brackets.

The Base module can contain up to 24 tape drives in any combination that the library supports—see "Tape Drives" on page 24 for a list and description of these drives. Physical capacity varies depending on the configuration—see TABLE 1-1 on page 12.

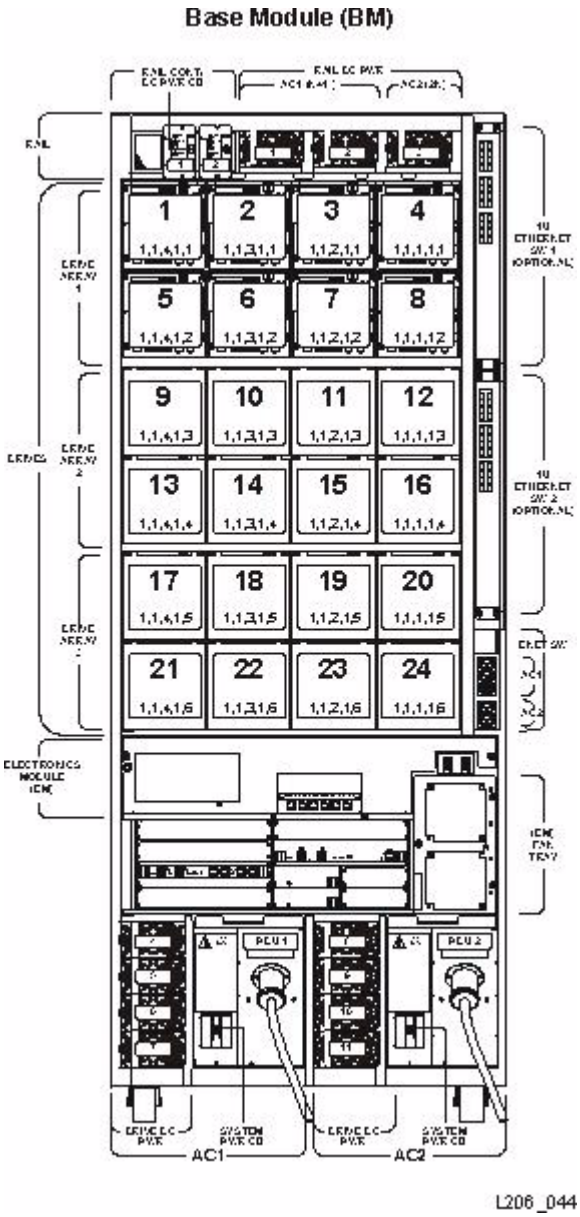
The minimum configuration includes one drive bay that can contain from 1 to 8 tape drives. Two additional drive bays can be added to accommodate either 8 or 16 more drives for a total of 24 drives.

Note – Adding a second drive bay will displace from 55 to 66 cartridge slots; adding a third drive bay will displace from 60 to 72 slots.

The rear door of the Base module allows access to the:

- Electronics control module (ECM)
- Power distribution units (PDUs) and DC power supplies (DCPS)
- Tape drives
- Two 1-unit rack spaces (1 unit = 44.5 mm [1.75 in.]) *not for customer use*

FIGURE 1-3 Base Module—Rear View Drawing



Description
Robotic rail power and HBS cards ■ DCPS 1 and 2 or 3
First drive array (top) The first drive bay is standard. Note: Drive arrays are added from the top ➪ down.
Second drive array (center) Adding a second drive array displaces 55/66 data cartridge slots
Third drive array (bottom) Adding a third drive array displaces 60/72 data cartridge slots
Electronics control module: ■ HBCR and HBT cards ■ MPU2 Fibre Channel card (not shown) ■ Two cPCI power supplies ■ Two cooling fans ■ Two power switches (N+1 and 2N)
Power distribution units (up to 2) ■ PDU 1 and PDU 2 Drive DC power supplies (up to 8) ■ DCPS 4 through 11

Drive Expansion Module

FIGURE 1-4 shows an example of the Drive Expansion Module (DEM). This module is attached adjacent to the Base module on the **left side only**. The DEM allows further expansion of tape drives and provides additional data cartridge capacity.

One drive expansion module—*and only one*—can be included in an installation. Its position is immediately to the left of the centerline (left edge of the base module).

On the front of this module is space for:

- A service door for library access (standard)
- A front panel with three LEDs: Library Active, Service Required, and Wait
- A single, 26 cartridge-dual magazine, cartridge access port *optional feature*
- Touch screen operator panel *optional feature* if not in the base (or window)

FIGURE 1-4 Drive Expansion Module with a Base Module

Configurations
8 drive slots, perforated window 16 drive slots, perforated window 24 drive slots, perforated window 32 drive slots, perforated window
8 drive slots, CAP, perforated window 16 drive slots, CAP, perforated window 24 drive slots, CAP, perforated window 32 drive slots, CAP, perforated window
8 drive slots, CAP, and Operator panel/Window/Arrays[1]. 16 drive slots, CAP, and Operator panel/Window/Arrays 24 drive slots, CAP, and Operator panel/Window/Arrays 32 drive slots, CAP, and Operator panel/Window/Arrays

Dimensions[2]	**Measurement**
Height	197 cm (77.625 in.) to 200 cm (78.63 in.)
Width Module-only: Base and DEM:	 76.78 cm (30.23 in.) 168.3 cm (66.26 in.) with covers
Depth	124 cm (49 in.)
Weight	Frame only: 265 kg (584 lb)
Service clearance Both doors open	Front: 46 cm (18 in.) Rear: 81 cm (32 in.) 262 cm (103 inches)
Side covers [3, 4, 5]	Cooling clearance: 5 cm (2 in.) Install: 91 cm (36 in.)

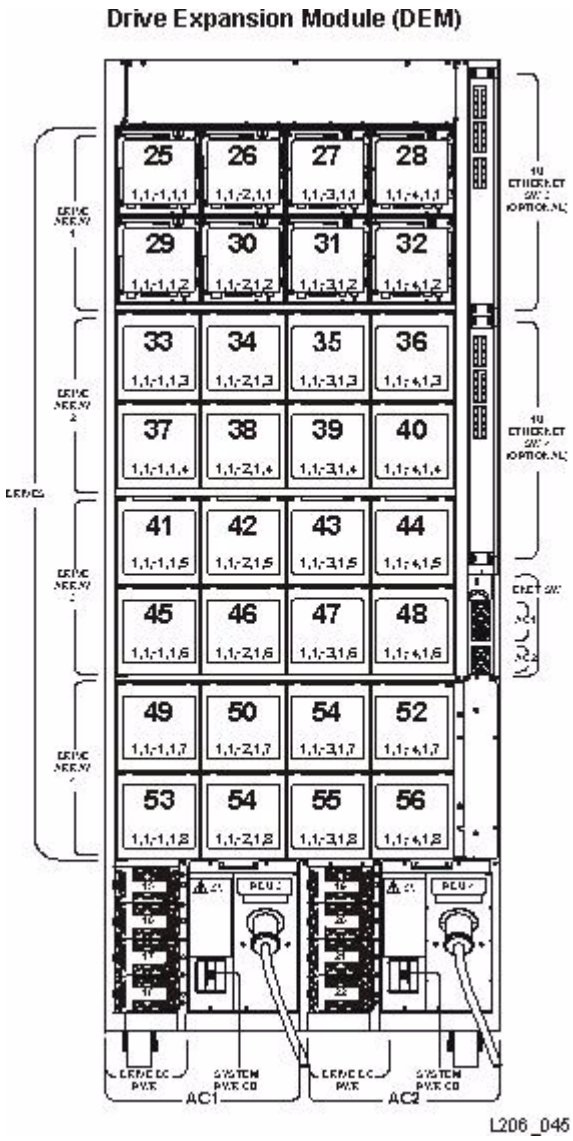
1. Perforated windows are the standard offering. Arrays may displace an operator panel or window.
2. The dimensions of the DEM are the same as the Base module.
3. When installing additional modules, the covers are removed from the Base and replaced on the ends of the last module in the string.
4. Required to install or remove the sides covers; they swing out and lift off of brackets.
5. This is the *recommended* cooling clearance.

The DEM comes with slots to support up to 8 tape drives (standard).

Optional features allow the DEM to increase drive capacity from 16, to 24, and 32 additional tape drive slots. These features allow expansion up to a total of 56 tape drives per library.

There is an additional power system integral to the DEM to support the additional tape drives and two 1-unit rack spaces for vertically mounting auxiliary equipment, such as Ethernet switches (not for customer use).

FIGURE 1-5 Rear View of the Drive Expansion Module



Description
First drive array (top) The first drive bay is standard. Note: Drive arrays are added from the top ➪ down.
Second drive array Adding a second drive array displaces 55/66 slots
Third drive array Adding a third drive array displaces 60/72 slots
Fourth drive array Adding a fourth drive array displaces 65/78 slots or all the slots on the rear wall
Power distribution units (up to 2) ▪ PDU 3 and PDU 4
Drive DC power supplies (up to 8) ▪ DCPS 15 through 22

Note: Physical capacity varies depending on the configuration—see TABLE 1-1 on page 12.

Cartridge Expansion Module

FIGURE 1-6 is the Cartridge Expansion Module (CEM) and provides additional cartridge slot capacity and growth—no tape drives are present within this module.

A maximum of eight (8) CEMs are supported on a single library in addition to the base module (required) and optional drive expansion module if installed.

Important:

- As a best practice, the initial CEM should be installed to the right of a base module, then a second to the left of the drive expansion module. Then again to the right, and the last one to the left. This method provides the best usage of the cartridge slots.

  The exception is if an extra CAP is installed and physical capacity is less important than having redundant CAPs. If redundant CAPs are required, install the CEM with a CAP on the left. This assumes no DEM is installed. If one is installed, then place the CEM on the right and install a CAP on the DEM.

- A balance of CEMs—to the left and to the right—provides for the most efficient operation. Cartridge expansion modules can be installed with up to 4 to the right and up to 4 to the left. However, this increase in the amount of robotic travel results in a decrease of overall library performance.

- When using redundant robotic units, the addition of parking expansion modules in place of the CEMs or the use of access expansion modules is required at both ends of the library.

Each CEM adds approximately 438 to 620 data cartridge slots to the library depending on the direction of growth (left or right) and options (CAP or no CAP).

FIGURE 1-6 Cartridge Expansion Module with Base Module

Configuration (next to Base with 24 drive slots)	
CEM (expanded left) CEM with optional CAP (left)	
CEM (expanded right) CEM with optional CAP (right)	
Dimensions	**Measurement**
Height	197 cm (77.625 in.) to 200 cm (78.63 in.) fully adjusted
Width	76.76 cm (30.22 in.) 84.12 cm (33.12 in.) with cover
Depth	77.47 cm (30.5 in.)
Weight	Frame only: 175 kg (385 lb)
Side covers[1] Side clearance[2]	Cooling clearance: 5 cm (2 in.) Install: 91 cm (36 in.)
Service clearance (Front and Rear)	None required

1. When installing additional modules, the covers are removed from existing modules and replaced on the ends of the last module in the string.
2. Required to install or remove the sides covers; they swing out and lift off of brackets.

Parking Expansion Module

FIGURE 1-7 is the Parking Expansion Module (PEM). This module is the same as a cartridge expansion module except with 6 columns of arrays (3 on the front wall and 3 on the rear wall) that are inaccessible. This allows the library to **park** a defective robot without blocking access to cartridges for the other operational robot.

Notes:

1. Parking expansion modules must be installed as the last module in the string; on both right- *and* left-sides. This allows a defective robot to be parked out of the way of the operational robot, allowing operations to continue.
2. A PEM is a converted CEM. Conversion is done by changing an internal module ID label that is shipped with the redundant TallBot feature.
3. The arrays do not need to be removed; this allows the customer to restore this module to a CEM; however, any data cartridges in those arrays will be *inaccessible*.
4. Customers can order an optional CAP with a left expansion module; however, a CAP on the right PEM is inaccessible.

FIGURE 1-7 Parking Expansion Module with Base Module

Configuration
PEM (expanded left) 308 slots PEM (expanded right) 312 slots 620 slots total Always installed in pairs for redundant robotics.

Dimensions[1]	Measurement
Height:	197 cm (77.625 in.) to 200 cm (78.63 in.) fully adjusted
Width:	76.76 cm (30.22 in.) 84.12 cm (33.12 in.) with cover
Depth:	77.47 cm (30.5 in.)
Weight:	Frame only: 103.4 kg (277 lb)
Side covers:[2] Side clearance:[3]	Cooling clearance: 5 cm (2 in.) Install: 91 cm (36 in.)
Service clearance:	None

Notes:

1. The dimensions of the PEM are the same as the cartridge expansion module.
2. When installing additional modules, the covers are removed from existing modules and replaced on the ends of the last module in the string. PEMs must be the last modules in the string.
3. Required to install or remove the sides covers; they swing out and lift off of brackets.

Access Expansion Module

FIGURE 1-8 shows the *optional* Access Expansion Module (AEM), which provides:

- Bulk loading and unloading of up to 234 cartridges at a time *per module*.
- Non-disruptive robot maintenance through the use of a safety door (or "garage" door), which sections off a defective robot from the other library modules.

  A service representative can safely access the disabled robot through the AEM access door while the library remains online. If redundant robots are installed, the library can continue normal operations through the remaining functional robot.

The library can have either *one* or *two* AEMs.

1. With one AEM, installed on either end of the string (recommend the left side*), the library supports bulk load and unload features only.

   * *Note:* Installing the AEM on the left side gains an additional 104 cartridge slots from the previous module.

2. With two AEMs, one installed on each end of the library string, the library supports both bulk load/unload, and the non-disruptive, redundant, robotic features.

Note – AEMs and PEMs cannot be installed in the same library.

FIGURE 1-8 Access Expansion Module—Front View

Configurations	
Expanded left 234 slots	Plus 104 slots from the previous module
Expanded right 234 slots	
Single AEM = Bulk load capabilities only Dual AEMs = Bulk load and redundant robotics feature.	
Dimensions	**Measurement**
Height:	197 cm (77.625 in.) to 200 cm (78.63 in.) fully adjusted
Width:	91.5 cm (36.0 in.) without covers 99 cm (39 in.) with covers
Depth:	77.47 cm (30.5 in.)
Weight:	Frame only: 204.2 kg (450 lb)
Side covers[1] Side clearance[2]	Cooling clearance: 5 cm (2 in.) Install: 91 cm (36 in.)

Notes:

1. When installing additional modules, the covers are removed from existing modules and replaced on the ends of the last module in the string.
2. Required to install or remove the sides covers; they swing out and lift off of brackets.

Addressing

The modules of the library consist of walls, columns, and rows that house cartridges, tape drives, cartridge access ports, and robotic units.

The SL3000 uses five parameters separated by comma's to indicate locations or addresses in the library. These parameters are < L, R, C, S, W >, which is:

- **L**ibrary (L) = Library number
- **R**ail (R) = Rail
- **C**olumn (C) = Horizontal location in the library
- **S**ide (S) = Walls
- Ro**w** (W) = Vertical location in the library

Library and Rail

The library and rail parameters do not apply to this library and are constants. These parameters will always be 1 (one).

Columns

There are two types of columns that provide the *horizontal* locations for components; such as data cartridges, tape drives, and cartridge access ports:

- *Positive numbered* are to the right of the centerline*
- *Negative numbered* are to the left of the centerline*

Note – Centerline* is the left-edge of the Base module.

Columns are numbered from left to right; tape drive arrays have 4 columns per module; media or data cartridge arrays have 6 columns per module.

Side

There are two types of walls in the SL3000 library:

- Front wall parameter is 1
- Rear wall parameter is 2

Rows

Rows provide the *vertical* locations for components and are numbered from the top down from 1 (top) to 52 (bottom).

See Appendix A, "Addressing" for specifics about the various addressing schemes used with the SL3000 Library.

Physical Capacities

The SL3000 is scalable, with physical storage capacities from 200 to 5,925 storage slots. TABLE 1-1 on page 12 provides detailed physical capacities for each module type.

To calculate the total accessible physical storage slots for a configuration, start with the standard configuration slot count, outlined with a heavy border, and then make the appropriate adjustments for options and positioning.

Following are some examples:

- Base Module with operator's panel, a module installed on the right, and three total drive arrays:

  320 + 0 + 13 – 55 – 60 = 218

- DEM, a module installed on the left, window arrays, a CAP, and four drive arrays:

  410 + 88 + 23 – 77 – 66 – 72 – 78 = 228

- CEM installed to the left of CenterLine, a module installed on the left, and a CAP:

  516 + 104 – 78 = 542

- PEMs (always installed in pairs), one with a CAP, one without:

  308 + 312 – 78 = 542

- AEMs are considered CAPs and do not include any capacity for the library.

To calculate the final accessible storage capacity, select the slot counts for each module, then add them together to reach the total slot count for the library with the configuration selected.

In addition, the SL3000 features **Capacity on Demand**. This feature allows you to:

- Pay for only the capacity you actually use, then
- Expand capacity—with minimal disruption—when you need it.

See "Capacity on Demand" on page 160 for details about installing and managing library storage capacity.

TABLE 1-1 Accessible Physical Slot Count Per Module

Module Options	Standalone or Position-Independent	Adjacent Module Installed on the: Right	Adjacent Module Installed on the: Left	Total Count
Base Module				
Standard (with viewing window), standalone	320	+13	+88	
With operator's panel	+0			
With window storage arrays	+23			
With second drive array	-55		-66	
With third drive array	-60		-72	
Drive Expansion Module (DEM)				
Standard (with viewing window and no CAP)	—	410	+88	
With window storage arrays	—	+23		
With CAP	—	-77		
With second drive array	—	-55	-66	
With third drive array	—	-60	-72	
With fourth drive array	—	-65	-78	
Cartridge Expansion Module (CEM)				
Standard (no CAP), to the left of CenterLine	516	+0	+104	
Standard (no CAP), to the right of CenterLine	620	+0	+0	
With CAP	-78			
Parking Expansion Module (PEM)				
Standard (no CAP), to the left of CenterLine	—	308		
Standard (no CAP), to the right of CenterLine	—		312	
With CAP	—	-78		
Access Expansion Module (AEM)				
Standard to the left of CenterLine	—	0	+104	
Standard to the right of CenterLine	—		0	
Total accessible storage slot count				

Power Options

SL3000 libraries require that the customer select one of the following, *single phase*, AC power options for the Base and Drive Expansion modules, these are:

- **120 VAC**, 50/60 Hz, at 20 Amps
  (range: 100–127 VAC, 47–63 Hz, 16 Amps)
  limited support for T9840 and T10000 drives; no redundant TallBot support
- **240 VAC**, 50/60 Hz, at 30 Amps
  (range: 200–240 VAC, 47–63 Hz, 24 Amps)—full featured

AC Power Configurations

SL3000 libraries have two power configurations:

- **N+1**, offering DC power redundancy only.
- **2N**, offering both AC and DC power redundancy.

Power Redundancy

The SL3000 provides full redundancy for tape drives, robotics units, and electronics. The following redundancy options are available:

- **N+1**—One AC PDU, with one extra DC power supply for DC power redundancy. This is the standard power configuration for the SL3000. This configuration requires at least a 20 Amp circuit breaker at the customer's branch service panel.
- **2N**—Two PDUs for AC redundancy; each PDU has a set of DC power supplies (N DC power supplies). This configuration requires a second, separate customer power source.
- **2N+1**—Two PDUs for AC redundancy; each PDU has extra DC power supplies for N+1 redundancy for each PDU. The second PDU does not have N+1 for the TallBot.

N+1 Power Configuration—Standard

N+1 is the standard power configuration for the libraries and contains one system power distribution unit (PDU).

Note – The N+1 power configuration offers DC power redundancy only.

The N+1 system PDU connects to the customer's branch circuit and requires at least a 20 Amp circuit breaker at the customer's branch service panel.

2N Power Configuration—Optional

The *optional* 2N power configuration contains two system power distribution units (PDU_1 and PDU_2) and requires a second—separate—customer power source.

Note – The 2N power configuration offers *both* AC and DC power redundancy.

AC Power Cables

TABLE 1-2 lists the cables available from StorageTek or qualified electricians, which *must* be ordered for the appropriate power configuration.

Keep in mind that you must order:

- N+1: One power cord for each, the Base module and DEM if installed.
- 2N: Two power cords for each, the Base module and DEM if installed.

TABLE 1-2 Power Cable Part Numbers and Descriptions

Power Source	Description	Circuit Breaker	Connector Type		Power Cord Length/Type	Part Numbers	
			Wall	Library		Item	X-Option
120 VAC/ 20A	US / Japan	20 A	L5-20P	L5-20R	3.7 m (12 ft) 12 AWG	419813801	XSL3000-PC20110-Z
240 VAC / 30A	US	30 A	L6-30P	L6-30R	3.7 m (12 ft) 12 AWG	419813701	XSL3000-PC30220-Z
240 VAC / 30A	International	30 A	330P6W	L6-30R	4 m (13 ft) HAR	419813601	XSL3000-IPC30220Z

Robotic DC Power Configurations

Each Base module ships with two 1200 Watt—load sharing—DC power supplies for the robotic units; the location of these supplies determines if it is an N+1 or 2N configuration.

See FIGURE 1-3 on page 4 for the location of these power supplies (on the top of the Base Module).

Electronic Control Module DC Power Configurations

Dual 200 Watt cPCI power supplies distribute power to the electronics control module, which are located below the HBT card, supporting either an N+1 or 2N configuration.

- For an N+1 configuration, two cPCI power supplies are installed on the left.
- For a 2N configuration, one cPCI power supply is installed on each side.
- For a 2N+1 configuration, two cPCI power supplies are installed on each side.

Single Drive Type DC Power Configurations

This library uses 1200 Watt—load sharing—DC power supplies (DCPS) for distribution of +48 VDC power for the tape drives across a power grid.

Each Base module and DEM ship with two (2) DC power supplies. Depending on the number of tape drives ordered, additional power supplies may be required.
To determine the number of supplies required, you must determine:

- Power configuration (120 VAC or 240 VAC)
- Tape drive type (T10000, T9840, or LTO)
- Number of drives

See TABLE 1-3 on page 15 to help determine the number of supplies required.

- This table shows only the installation of a single drive type.
- See Mixed Drive Types on page 16 when mixing tape drives in the same module.

TABLE 1-3 Tape Drive DC Power Supply Requirements

Module Type	PDU Type	Maximum Number of Drive Types			Power Configuration		
		T10000	T9840	LTO	N+1	2N	N+1 & 2N Total
Base	120 VAC	1 – 8	1 – 7	1 – 16	1 + 1 = 2	1 + 1 = 2	2 + 2 = 4
		9 – **13**	8 – **12**	17 – **24**	2 + 1 = 3	2 + 2 = 4	3 + 3 = 6
DEM	120 VAC	1 – 8	1 – 7	1 – 16	1 + 1 = 2	1 + 1 = 2	2 + 2 = 4
		9 – **16**	8 – **14**	17 – **32**	2 + 1 = 3	2 + 2 = 4	3 + 3 = 6
Base	240 VAC	1 – 12	1 – 1	1 – **24**	1 + 1 = 2	1 + 1 = 2	2 + 2 = 4
		13 – **24**	12 – 22	N/A	2 + 1 = 3	2 + 2 = 4	3 + 3 = 6
		N/A	23 – **24**	N/A	3 + 1 = 4	3 + 3 = 6	4 + 4 = 8
DEM	240 VAC	1 – 12	1 – 11	1 – 25	1 + 1 = 2	1 + 1 = 2	2 + 2 = 4
		13 – 24	12 – 22	26 – **32**	2 + 1 = 3	2 + 2 = 4	3 + 3 = 6
		25 – **32**	23 – **32**	N/A	3 + 1 = 4	3 + 3 = 6	4 + 4 = 8

Note: The base and drive expansion modules each come with 2 DC power supplies as standard.

Mixed Drive Type DC Power Configurations

When mixing tape drive types in a library, you need to **calculate** the total **Watt consumption** for the selected drives. To do this:

1. Determine the number of tape drives for each drive type.
2. Multiply that by the Watts per drive for each drive type TABLE 1-4.
3. Add the total Watts for all drive types.
4. Use TABLE 1-5 to compare Watts to PDU type.
5. Use TABLE 1-6 to determine the number of DC power supplies needed.

TABLE 1-4 Watts Per Drive

Drive Type	Watts Used by Each Drive	Drives supported by a Power Supply	
		120 VAC	240 VAC
T9840	123.9	7	11
T10000	115.2	8	12
LTO	56.9	16	25

TABLE 1-5 Available Watts Per Module

Module Type	PDU Type	Watts Available for Tape Drives
Base	120 VAC	1553
	240 VAC	3234
DEM	120 VAC	1868
	240 VAC	4313

Watt Limitation per Supply	
120 VAC	240 VAC
951 W	1426 W

TABLE 1-6 DC Power Supplies Per Module

PDU Type	Total Watts	Power Configuration		
		N+1	2N	N+1 & 2N Total
120 VAC	1 - 951	1 + 1 = 2	1 + 1 = 2	2 + 2 = 4
	952 - 1,868	2 + 1 = 3	2 + 2 = 4	3 + 3 = 6
240 VAC	1 - 1,426	1 + 1 = 2	1 + 1 = 2	2 + 2 = 4
	1,427 - 2,852	2 + 1 = 3	2 + 2 = 4	3 + 3 = 6
	2,853 - 4,278	3 + 1 = 4	3 + 3 = 6	4 + 4 = 8

Drive Type	# of Drives	Multiplied By Watts (TABLE 1-4)	Add for Total Watts Per Type	Total Watts (TABLE 1-6)	Power Configuration		
					Option (N+1 or 2N)	PDU Type (TABLE 1-5)	DCPS (TABLE 1-6)

TABLE 1-7 provides an example about how to calculate mixed drive types in both the Base module and drive expansion module:

TABLE 1-7 Mixed Drive Type Power Configuration—Calculation Example

Drive Type		# of Drives	Multiplied By (TABLE 1-4)	Add for Total Watts Per Type	Total Watts (TABLE 1-6)	Power Configuration		
						Option	PDU Type (TABLE 1-5)	DCPS (TABLE 1-6)
Base	T10000	6	115.2	691.2	**1889.8**	N+1	120 VAC	not
	T9840	6	123.9	743.4		2N	120 VAC	supported
	LTO	8	56.9	455.2		N+1	240 VAC	2 + 1 = 3
						2N	240 VAC	2 + 2 = 4
DEM	T10000	4	115.2	460.8	**1184**	N+1	120 VAC	2 + 1 = 3
	T9840	4	123.9	495.6		2N	120 VAC	2 + 2 = 4
	LTO	4	56.9	227.6		N+1	240 VAC	2 + 1 = 3
						2N	240 VAC	2 + 2 = 4

Notice in the above example, the:

- Base module requires a 240 VAC PDU with either an N+1 or 2N power option.
- DEM requires either a 120 VAC or 240 VAC PDU with either an N+1 or 2N option.
- Remember, you *cannot* mix 120 VAC with 240 VAC PDUs within the library.

What you need to order:

Module	PDU Type	Option	DC Redundancy	Minus 2 (-2)	Additional DCPS
Base	120 VAC	N+1			
		2N			
	240 VAC	N+1	2 + 1 = 3	1	1
		2N	2 + 2 = 4	2	2
DEM	120 VAC	N+1	2 + 1 = 3	1	1
		2N	2 + 2 = 4	2	2
	240 VAC	N+1	2 + 1 = 3	1	1
		2N	2 + 2 = 4	2	2

Remember, two DC power supplies are shipped standard for the tape drives, robotics, and electronics control module in the Base module.

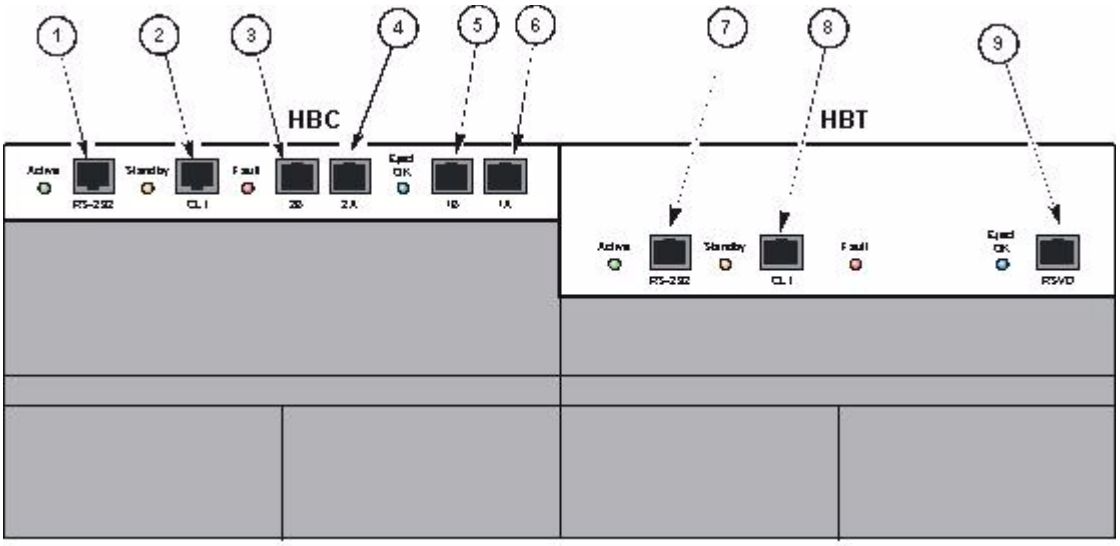
Two DC power supplies are shipped standard for the tape drives in the drive expansion module.

You only need to order additional DC power supplies to support the type and number of tape drives for the selected configuration.

Electronics Control Module

All of the electronics, control, and host connectivity is located in the electronics control module (ECM). The ECM is located in the rear of the Base module.

FIGURE 1-9 Electronics Control Module



HBCR Card

1. RS-232 serial port (reserved)
2. RS-232 serial port, CSE connection (Command Line Interface—not customer accessible)
3. Port 2B—Primary Port—Ethernet 10/100 Base-T
4. Port 2A—Dual TCP/IP—Ethernet 10/100 Base-T
5. Port 1B—Ethernet 10/100 Base-T (reserved)
6. Port 1A—Ethernet 10/100 Base-T (reserved)

HBT Card

7. RS-232 serial port (reserved)
8. RS-232 serial port, CSE connection (Command Line Interface—not customer accessible)
9. RSVD port—Ethernet 10/100 Base-T (reserved)

HBCR LEDs

- Active = Always lit during operation
- Standby = Inactive
- Fault = Indicates the controller detected a fault
- Eject OK = Inactive

HBT LEDs

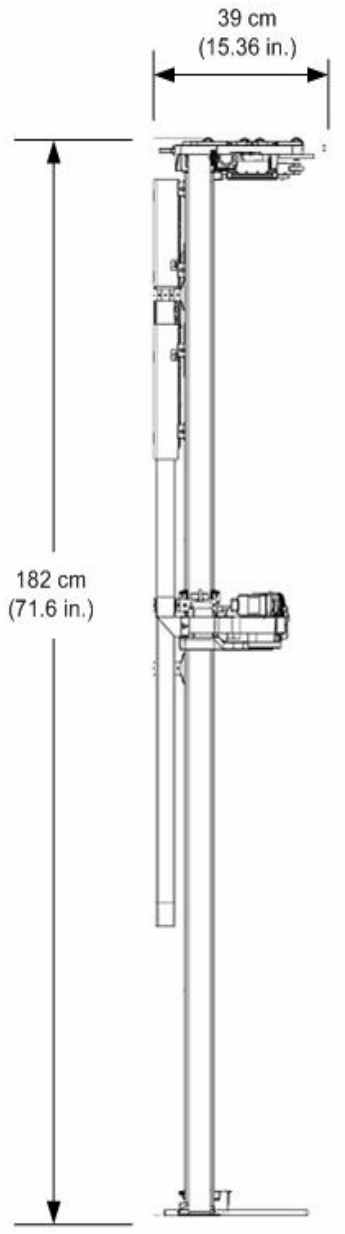
- Active = Always lit during operation
- Standby = Inactive
- Fault = Indicates the controller detected a fault
- Eject OK = Inactive

Notes:

- The ECM also ships with an optional MPU2 or **PUA card** for Fibre Channel interface connections.
- This card is not shown, but is installed below the HBCR card.
- An HBCR library controller is included with the SL3000.

Robotic Units

FIGURE 1-10 TallBot



Height	182 cm (71.6 in.)
Width	30 cm (11.84 in.)
Depth	39 cm (15.36 in.)
Weight	8.6 kg (19 lb)

The robotic unit in an SL3000 library is called a TallBot. Each library can have either one (standard) or two (redundant) TallBots called "Dual Bots" or Dual Robotics."

TallBots are responsible for the movement and cataloging—or *auditing*—of cartridges throughout the library.

TallBots are driven along two extrusions—called rails—on the rear wall of the library; one rail at the top and one rail attached to the floor. Each module contains pre-installed, segmented extrusions.

Two copper strips are inserted into the *top* extrusion that provide both a power and a signal path for TallBot operation.

- Power comes from +48 VDC, 1200 Watt, load sharing supplies.
- Signals are received and transmitted between the TallBots and the library controller (HBCR card).
- A Rail Power Enable module is installed as a safety circuit for rail power.

Gears on the TallBot motors mesh with molded plastic tracks that are installed within the extrusions.

Handling of the cartridges by the TallBots include:

- Retrieving cartridges—GET operation—from the CAP or slot
- Inserting cartridge—PUT operation—into a CAP or slot
- GETs and PUTs of cartridges to and from wall slots
- Mounts and dismounts of cartridges to and from tape drives

TallBots contain a bar-code scanner that:

- Reads the configuration blocks in each module during library initialization
- Targets on cartridge storage/CAP slots and tape drives Targets are shaped |\| similar to an "N".
- Identifies volume serial numbers (VOLSERs) of cartridges during CAP entries and Audits.

VOLSERs are read during audits and CAP entries only. After that, cartridges are assigned locations within the library—slots.

During GET operations, the library uses the slot locations of the cartridges to complete the required task.

Redundant TallBot—Dual Bot operation offers an option that:

- Increases the speed for robotic operations
- Backs up robotic operation in case one should fail

This option requires 200—240 VAC, 2N power and parking expansion modules or the access expansion modules at *each* end of the library. A defective TallBot will take itself offline and moves or is pushed into one of these modules, allowing the library to continue operations with one TallBot until time can be scheduled to replace the defective TallBot.

Cartridge Access Ports

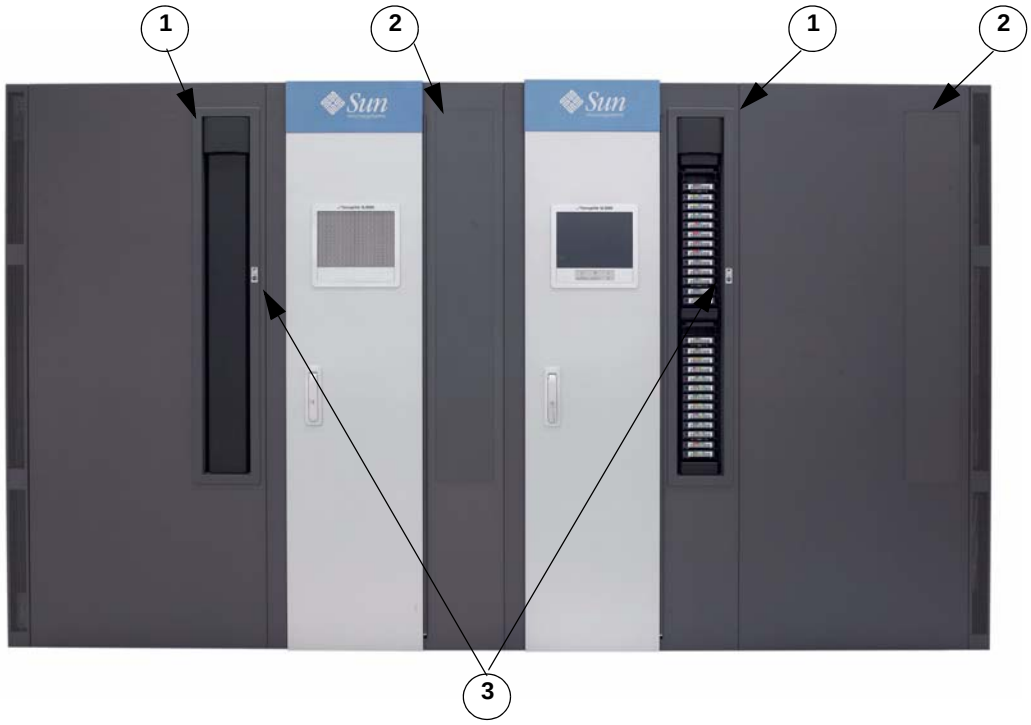
The cartridge access port—CAP—is a vertically-mounted, rotating cylinder with two removable 13-slot magazines (26 slots total).

- The Base module comes with a CAP as a *standard* feature.
- Drive and Cartridge expansion modules have an *optional* feature to contain a CAP for a maximum of up to 10 standard (rotational) CAPs per SL3000 library.

  Note – A CAP in the right-side Parking Expansion Module *is not accessible* and should be unplugged.

Each CAP comes with a small keypad including indicators and a user interface to operate that specific CAP.

FIGURE 1-11 Cartridge Access Port and Key Pad



1. Cartridge access ports (rotational CAPs)
2. Blank covers. When a CAP is not installed, a blank cover is installed. This can always be upgraded in the future to include a CAP.
3. Keypad and indicator user interface.

Best Practices:

- If partitioning, the recommendation is to install enough CAPs to provide at least one CAP for each partition. This allows each partition to contain its own, *dedicated* CAP.
- CAP control is split down the centerline. Make sure there is a left- and right-side CAP to support the library. If a CAP encounters a failure, all CAPs following that one will be unusable until the defective CAP is serviced. For this reason, the recommendation is to install CAPs in a balanced fashion around the centerline.

Bulk Load Cartridge Access Ports

The Access Expansion Modules have the ability for the customer to add cartridges in bulk, up to 234 cartridges on each side, *without disrupting library operations*.

FIGURE 1-12 Bulk Load CAPs—Access Expansion Modules

Best Practices:

When entering and ejecting cartridges in smaller quantities, use the smaller rotational CAPs to complete the job. These CAPs are easier to use and take less time to audit than the larger AEM bulk load CAPs.

Although, operation of the cartridge access port does not directly affect the performance of the library, here are some guidelines that can help with the operation:

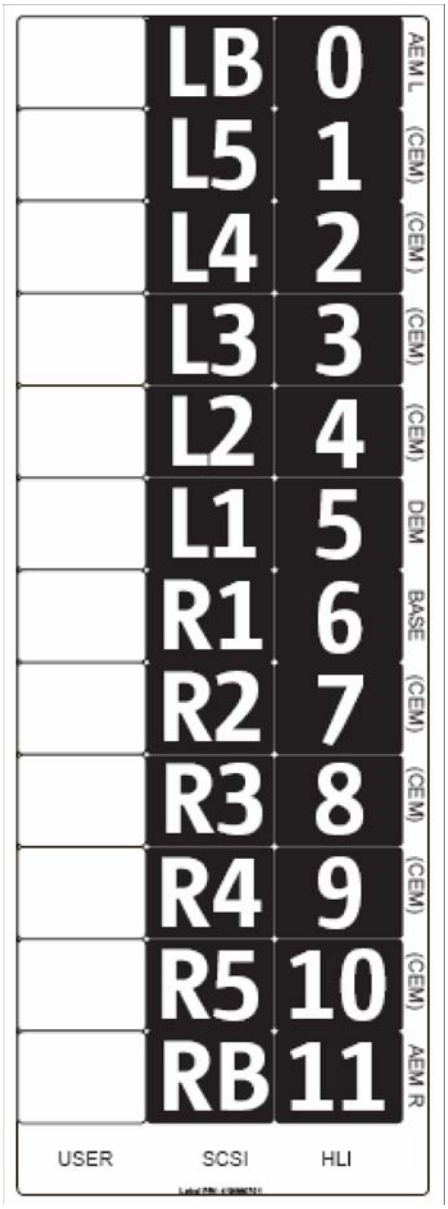
- Whenever possible, enter cartridges through the cartridge access ports.
- When planning the workloads, place applications that require significant enters and ejects adjacent to the CAP magazines.

Tip:
Place labels outside on the library wall indicating which CAP and which magazine gets what type of cartridge. See "CAP Labels" on page 22.

- Insert cartridges with the correct orientation:
  - Fully seated and laying flat within the slots
  - Parallel to the floor
  - Hub-side down
  - Barcode label pointing out and below the readable characters.

CAP Labels

FIGURE 1-13 Cartridge Access Port Labels



Labels are provided for the customer to identify the cartridge access ports. These labels include:

- Left (L) and Right (R) SCSI labels
- Sequential numbered labels for HLI
- Create your own labels, which allows the customer to write on the label to identify the CAPs as they want

Cooling

Cooling within the SL3000 is divided into three areas:

- Library (Electronics control module)
- Tape drives
- DC power supplies

Library Electronics Control Module

There are two (2) fans located to the right of the electronics control module that provide cooling for the electronics in the library. Air is drawn from the sides of the library and flows through the fans to the rear of the library.

- These fans are monitored by the HBCR card for proper operation.
- An amber Fault indicator is on the fan assembly to indicate a failure.

While there are two (2) dedicated fans, one (1) fan is sufficient to provide adequate cooling for the library and the electronics. Nevertheless, since the fans can be replaced without interfering with library operations, it is best to replace a defective fan when it is detected.

Tape Drives

Each tape drive tray contains a fan for drive cooling. Power for the fans is supplied through the tape drive's power converter card. Air is drawn from the front of the drive and flows through the fan to the rear of the drive/library.

DC Power Supplies

Each 1200 Watt DC power supply contains a fan that pulls air from the library, through the rear of the supply, and out the rear of the library.

Tape Drives

TABLE 1-8 lists the supported tape drives, interfaces, and media types for the SL3000 library.

TABLE 1-8 Supported Tape Drives

Vendor	Drive Type[2]	Interface Type[3]	Media
StorageTek	T9840C T9840D* *Encryption feature	Fibre Channel FICON ESCON	9840 VolSafe capable
	T10000A* T10000B* *Encryption feature	2 Gb/4 Gb Fibre Channel FICON	T10000 Standard, Sport, and VolSafe
HP	LTO3 LTO4* LTO5* *Encryption feature	Fibre Channel	LTO3, LTO4, and LTO5 WORM (LT) LTO2 (read-only)[4]
IBM	LTO3 LTO4* LTO5* *Encryption feature	Fibre Channel	LTO3, LTO4, and LTO5 WORM (LT) LTO2 (read-only)[4]
Notes: 1. StorageTek T9940 tape drives are *not* supported. 2. The Quantum SDLT 600 and DLT-S4 tape drives are *not* supported. 3. The parallel version of the small computer system interface (SCSI) is not a supported connection. 4. LTO 2 media is supported for backward compatibility of LTO products (data migration). Plus future releases of the above tape drive technologies, media, and interfaces			

See Appendix C, "Tape Drives and Media" for more information.

Drive Tray

A single universal drive tray accommodates the different tape drives and interfaces.

The targeting system is the same as the other StorageTek SL-series libraries (SL500 and SL8500); therefore, the tape drive automation bezels are identical.

The drive trays, however, are different.

Instead of a single layer tray, the SL3000 drive trays have two layers:

- Power supply and connections are on the top, and the
- Tape drive is under the power supply.

FIGURE 1-14 SL3000 Tape Drive Trays

Measurements:

- Height: 16.5 cm (6.5 in.)
- Width: 16.5 cm (6.5 in.)
- Depth: 49.5 cm (19.5 in.)

Each tray slides into a drive bay located within an 8-drive array.

A drive array can be removed to expand the cartridge capacity, or installed to increase tape drive capacity.

Internal power supply cards and cabling are unique depending on the drive-type and interface within the drive tray.

Cabling to the drive itself is at the rear of the drive tray and library, then routed through the strain relief system. Cabling access is allowed for both under-floor and ceiling routed cables.

Interfaces

SL3000 libraries support several types of interfaces for a variety of uses and platforms:

- Host connectivity and library management
- Service
- Monitoring

Host Connectivity

There are two types of host connections to the library:

- Small computer system interface (SCSI)[2] over a physical Fibre Channel interface, or
- Ethernet (TCP/IP) using 10/100 Base-T and CAT-5 cables.

Important:
When implementing a new library into a network, it is strongly recommended that the customer, system and network administrators, and StorageTek representatives work closely together to define the configuration and connection.

The design of the SL3000 library allows connection to either Fibre Channel or Ethernet environments. This design allows for several combinations of a host interface in both partitioned and non-partitioned configurations.

- In a non-partitioned configuration, the library can use only *one* (1) interface type—either Fibre Channel or Ethernet (a second Ethernet connection can be used to access StorageTek Library Console)
- In a partitioned configuration, the library can use both interface types.

  The library may have only SCSI partitions, only Ethernet partitions, or a combination of both—up to a total of *eight* (8) partitions.

Addressing between these two host connections varies:

- Ethernet hosts use a host library interface -panel, row, column (HLI-PRC) numbering scheme.
- SCSI hosts expect a sequential element numbering scheme with each element type (slots, tape drives, and CAPs) given its own sequential range.

  SCSI Media Changer-3 (SMC-3) is supported.

SCSI

The SL3000 library uses the small computer system interface (SCSI) protocol and command set over a physical Fibre Channel (FC-SCSI) connection.

There are two optional Fibre Channel cards that provide connection to the library:

- MPU2 = Single port connection (older availability)
- PUA = Dual port connection (newer model containing two ports)

2. SCSI protocol and command set over a physical Fibre Channel interface.

Note – The StorageTek implementation of Fibre Channel conforms to:

- American National Standards Institute (ANSI), and
- National Committee for Information Technology Standards (NCITS)

Supported topologies include:

Switched Fabric: *This topology is **recommended** for the library.*

A switched fabric provides dynamic inter-connections between nodes and multiple, simultaneous Fibre Channel connections for the network. If the library is connected to a Fibre Channel switch or fabric-capable host, it configures itself as a switched topology and can support up to 16 million ports logged into the fabric.

Arbitrated Loop: *While the library supports the arbitrated loop topology, this connection scheme is **not recommended** for new or future implementations. StorageTek does not recommend the arbitrated loop connection by setting Hard ALPAs (Arbitrated Loop Physical Addresses).*

Arbitrated Loops provide multiple connections for devices that *share* a *single loop* and allows *only* point-to-point connections between an initiator and target during communications. An arbitrated loop can connect only up to 126 ports.

Refer to the *SL3000 Interface Reference Manual* PN 31619520x for more information. This manual contains information about the small computer system interface command set plus information about Fibre Channel operations, command implementations, topologies, cables, and connectors.

TCP/IP

The library can also use TCP/IP protocol over an Ethernet physical interface, (CAT-5, Ethernet, 10/100 BaseT cable) to manage and communicate with the host and library management applications. To connect to and communicate with the library, this interface enables both:

- Open system platforms with ACSLS
- Enterprise-level mainframes with HSC /VSM

The library controller (HBCR card) is responsible for coordinating all component operations within the library and providing the interface connection with the host.

Connections

There are two separate Ethernet connections on the HBCR card for host to library communications—Ports 2A and 2B.

- Port 2A provides the Dual TCP/IP connection—this is an *optional feature* for SL3000 libraries. If not used for Dual TCP/IP, it can be used for connection to StorageTek Library Console.
- Port 2B provides the primary host connection—this is the standard connection for SL3000 libraries.

Both ports comply with the Institute of Electrical and Electronics Engineers standard–IEEE 802.3–for Ethernet networks. Both ports are capable of auto-negotiating the:

- Method of transmission
  - Half-duplex: Transmits data in just one direction at a time
  - Full-duplex: Transmits data in two directions simultaneously
- Speed of the transmission
  - 10Base-T: 10 megabits per second (Mbps)
  - 100Base-T: 100 megabits per second (Mbps)

Network

- Whenever possible, use a dedicated, private network for communication between the library and host management software.

  A private network connection using an Ethernet hub or switch is recommended for maximum throughput and minimum resource contention.
- If a shared network is required, these actions can help with the communication between the host and the library:
  - Directly connect the library to a switch.
  - Place the library on its own subnet.
  - Use a managed switch that can:
    – Set priorities on ports to give the host and library higher priority.
    – Provide dedicated bandwidth between the host and the library.
    – Create a VLAN between the host and the library.
- Use a virtual private network (VPN) to insulate host to library traffic.

Service

The command line interface (CLI) is a library interface for **service representatives only**. This interface allows these representatives to configure and diagnose the library.

Note – Customers are not allowed to access the CLI interface. Only trained and qualified representatives or partners can access the CLI.

There are two ways to access and use the CLI:

- **Serial Port Connection** on the HBCR card (RS-232) and a HyperTerminal connection to enter the commands.
- **Ethernet Port Connection** (ports 1A, 2A, or 2B) on the HBCR card and use a secure shell (PuTTY) to enter the commands.

Monitoring

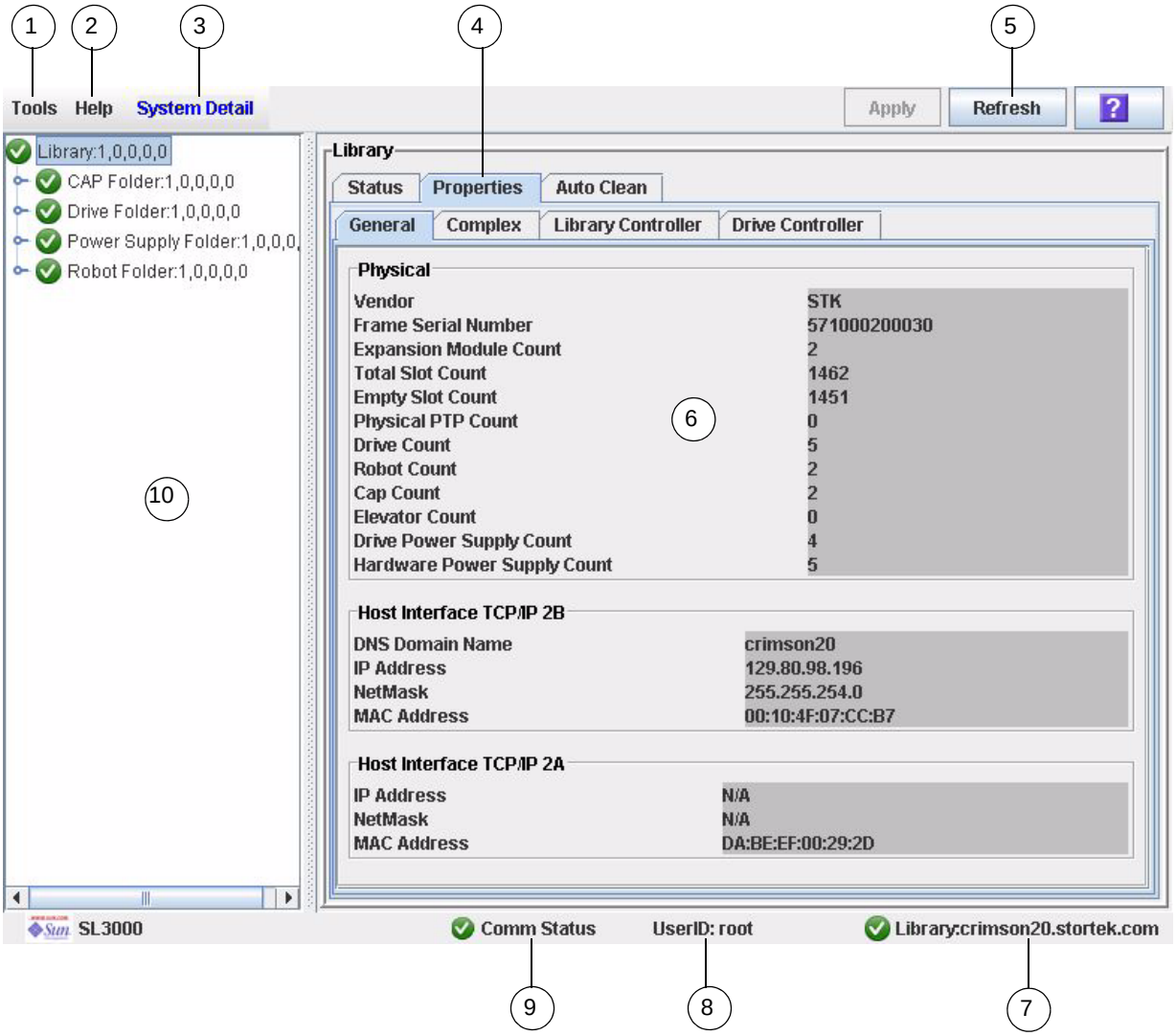
There are several ways to monitor this library, using:

- StorageTek Library Console (local and remote)
- Web-launched Library Console
- Simple Network Management Protocol (SNMP)

StorageTek Library Console

The StorageTek Library Console (SLConsole or Library Console) is a graphical user interface that allows management of the library either locally from an operator panel attached to the library or remotely running on a computer (PC) or Solaris workstation.

FIGURE 1-15 Library Console—Example Screen



1. Tools Menu
2. Help Menu
3. Title Bar
4. Function Tabs
5. Options Bar
6. Display Area
7. Library Health Indicator
8. UserID
9. Communications Health Indicator
10. Device Tree

Web-launched Library Console

The Web-launched library console—also called the SLConsole—is a standard feature of the SL3000 library and is included on a CD shipped with each library. Installing the software on this CD enables the SLConsole to be installed on a centralized Web server. Individual clients can then use a supported Web browser to download the console. Using the SLConsole allows customers to connect to any SL3000 library for which they have a valid user ID.

The Web-launched SLConsole is delivered to clients as a Java Web Start process, which executes outside the browser.

Security Considerations

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

The customer is responsible for implementing all appropriate additional security systems, including firewalls and user access.

Client Requirements

Customers can download the SLConsole to clients meeting the following requirements:

Platform	■ Solaris 9—SPARC ■ Solaris 10—SPARC ■ Windows 2003 Server—32-bit ■ Windows XP Client—32-bit ■ Windows Vista—32-bit
Browser	■ Mozilla Firefox, version 1.5 or higher ■ Microsoft Internet Explorer, version 5.5 or higher ■ Java 1.5 Plug-in (the browser will install this automatically if it is not present already)
Other	■ Ethernet connection to the SL3000 library ■ Ethernet connection to the SLConsole server

Web-launched SLConsole Updates

Updates to the SLConsole only need to be installed on the centralized Web server.

Once the updates are installed on the server, they are downloaded automatically to all clients whenever the application is started on the client.

Simple Network Management Protocol

Simple Network Management Protocol (SNMP) is an application layer protocol that performs network management operations over an Ethernet connection using a User Datagram Protocol (UDP/IP).

Occasionally, the library may encounter a condition that an administrator or operator would want to know about, such as an open door that causes the library to stop. These conditions—or alerts—are called SNMP traps.

The Simple Network Management Protocol allows:

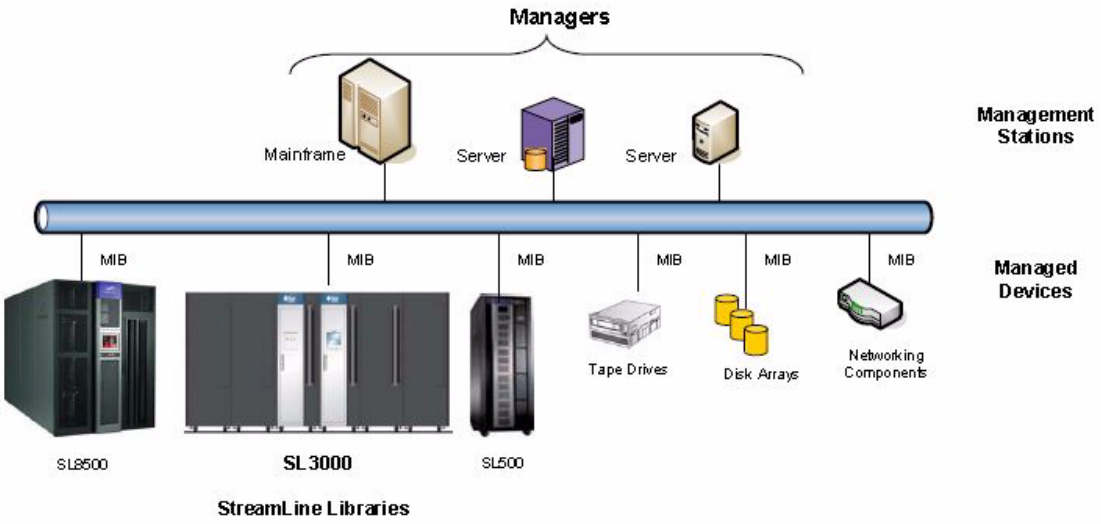
- Libraries to inform the systems administrator of potential problems.
- Systems administrators to query the library for configuration, operation, and statistical information.

The SL3000 library supports:

- **SNMPv2c** of the simple network management protocol for machine status queries. Note: with this version, any information transmitted is *not* secure.
- **SNMPv3** of the simple network management protocol is reserved for *proprietary* information. Because this version supports encryption and stronger user identification it is the preferred protocol for proprietary data.

This functionality requires the use of a Management Information Base (MIB) on the controller card. The MIB contains information that specifically describe the library, components, and configuration. FIGURE 1-16 on page 31 illustrates one example of SNMP in a library setting.

FIGURE 1-16 SNMP Example



Refer to the *SL3000 SNMP Reference Guide* PN 31619450x for more information.

This reference guide provides information about SNMP and the implementation on StorageTek SL3000 modular libraries.

Library Management Software

Library management software applications control the library, manage the volume database—location and attribute information—plus command activities such as mounts, dismounts, enters, and ejects.

There are several software components depending on the platform, connection type, and operating system that support the SL3000 for both mainframe and open system platforms.

Note – The same library management software the customer currently has and is familiar with can probably be upgraded to support the SL3000 library.

TABLE 1-9 lists the compatibility matrix for library management software.

TABLE 1-9 Library Software Compatibility Matrix

Product	Required Version[1] (or higher)
ACSLS	7.3 (Put0801 for AEM Support) 8.0 (supports ejects of less than 42 cartridges at one time)
ExHPDM	6.1 or 6.2
ExLM	6.0 or 6.2
ExPR	6.1 or 6.2
NCS ■ SMC ■ HSC (MVS and VM) ■ Lib Station ■ VTCS	6.1 or 6.2 Check for the latest PTF availability and compatibility.
VSM ■ VSM4e ■ VSM4 ■ VSM5	6.1 or 6.2 (includes VTCS and VTSS)
VTL ■ VTL Plus ■ VTL-V ■ VTL-E	1.0 or 2.0
ELS*	7.0
* ELS = Enterprise Library Software—replacement for the NearLine Control Solution (NCS)	
[1]Make sure the latest PTFs and PUTs are installed.	

Nearline Control Solution

StorageTek Nearline Control Solution (NCS) software provides library management and connectivity with mainframe products such as MVS and VM.
This includes the following software applications (and more not listed):

- Storage Management Component (SMC)
- Host Software Component (HSC)
- Virtual Storage Manager (VSM)

Storage Management Component

Storage Management Component (SMC) is the interface between mainframe operating systems and the StorageTek automated library control systems, such as HSC and MVS/CSC. SMC's primary functions are:

- Influencing tape allocation according to hardware requirements and customer policies to ensure that appropriate tape drives are selected.
- Intercepting tape management, and operating system mount, dismount, and swap messages and translating them in order to request the required tape hardware functions from the appropriate NCS automated library control system.
- Coordinating requests among multiple StorageTek automated libraries.

Note – SMC must reside on every MVS host that accesses the SL3000 library plus real and virtual tape hardware. SMC may communicate with multiple automated libraries, using cross address space facilities to communicate with applications running on the same host, and TCP/IP to communicate with HSC systems executing on other hosts.

Host Software Component

The library incorporates the Host Software Component (HSC) to accomplish automated mounting and dismounting of cartridges for library-attached tape drives. HSC may be started on several partitions on the same or different mainframes where all copies work together to fulfill the library control requirements of partitions with connected instances of SMC.

When an SL3000 library is in a configuration with an MVS host, the host must run a version of the StorageTek Host Software Component (HSC) along with the Storage Management Component to:

- Influence allocations
- Intercept mount and dismount messages
- Receive requests from the interface and translates them into commands

HSC, SL3000 AEM CAP LINKLIBs are:

LINKLIB Updates
SOS610.SPRG1.EVT.I6673474.DR022709.LINKLIB
SOS620.SPRG1.EVT.I6673474.DR022709.LINKLIB
SES700.SPRG1.EVT.I6673474.DR022709.LINKLIB

Note – These LINKLIBs are not replacements for any current LINKLIBs. They need to be **added** to the top of the STEPLIB chain in the HSC PROCs.

Virtual Storage Manager

VSM is a virtual tape system that optimizes the tape storage systems for mainframe platforms.

VSM-type solutions consist of a server, disk storage, and front-end software, that complement the physical tape and library products.

The server, disk, and software provide a buffer or cache between the operating systems and the tape drives for storage in a library.

Hardware for a VSM solution consists of:	Software for a VSM solution consists of:
Fault tolerant RAID 6+ disk array	Virtual tape control system (**VTCS**) software resides on the host operating system in the same address space as HSC.
Library and/or library storage modules (LSMs)	
Real (physical) tape drives (RTDs) in a library	
Multi-volume cartridges (MVCs)—physical cartridges	HSC 6.1+ minimum

LibraryStation

LibraryStation provides a communications interface between HSC and one or more open systems clients running on different hosts.

LibraryStation provides an operator command set that allows you to control operation through the HSC operator console.

Extended High Performance Data Mover

Extended High Performance Data Mover (ExHPDM) is utility software that performs high-speed backup and restore of data sets by interleaving very large block sizes on high-speed, high-capacity tape devices.

ExHPDM achieves its speed by treating all data equally regardless of the type. Its only function is to move data from disk to very fast tape and back again.

ExHPDM's version of the best method to move data is to enable tape devices to move data at their maximum available speed by:

- Using 256 Kilobyte (KB) blocks or chunks of data
- Interleaving the 256 KB blocks onto single or multiple tape volumes.

The ExHPDM software moves blocks of data in parallel from several concurrently executing MVS application programs. The data from the application programs is buffered into 256 KB tape block sizes in the application program's address space and the 256 KB blocks are interleaved onto single or multiple tape volumes.

Expert Library Manager

Expert Library Manager (ExLM) software manages the contents of library storage modules (LSMs) and provides virtual tape management functions.

ExLM includes ExLM Explorer, a graphical user interface that you can use to configure ExLM by creating configuration files instead of parameter files.

ExLM provides the following management services:

- Maintain sufficient levels of scratch volumes by:
  - Distributing scratch volumes
  - Synchronizing the scratch status with the tape management system (TMS)
- Ejecting scratch volumes that have been marked defective by the TMS.
- Requesting additional scratch volumes on the Enter Report.
- Maintain sufficient levels of free cells by:
  - Ejecting excess scratch volumes and less active data volumes.
  - Distributing free cells across LSMs within an ACS.
  - Maintain sufficient levels of cleaning cartridges.

ExLM runs as a batch job. You specify the job processing options by creating parameter files with a text editor or by creating configuration files with the ExLM Explorer GUI.

Expert Performance Reporter

Expert Performance Reporter (ExPR) software collects performance data and generates reports about status and performance. ExPR has both an MVS component and a PC component.

- ExPR MVS, which resides on an MVS host system, builds and maintains a database of historical performance data that it collects from the library, from the MVS operating system, and optionally from the site's tape management system.

  Tabular performance and exception reports are generated directly from this database for display in the MVS environment. For ExPR MVS, all processes are controlled by a batch task interface.

- ExPR PC, which resides on one or more PCs, is a Windows application that manages user-customized subsets of the mainframe database on the PC. Data that is transferred from the mainframe database can be queried and displayed in graphical or tabular performance, exception, and quick summary reports.

  Data can also be ported to a Microsoft Excel-compatible spreadsheet and other external applications for further processing.

Enterprise Library Software

Enterprise Library Software (ELS) incorporates NCS products, VTCS products, and provides customers with a single, integrated software suite. This suite is designed to:

- Provide the ability to enable tape libraries and virtual solutions, as well as
- Pro-actively monitor and manage this environment on a continuous basis.

ELS 7.0 is the successor to NCS 6.2 and VTCS 6.2 and consolidates HSC, VTCS, ExPR, ExLM, and ExHPDM. New functions include capacity planning and a management reporting GUI.

Automated Cartridge System Library Software

FIGURE 1-17 on page 36 shows an example of an Automated Cartridge System Library Software (ACSLS) configuration.

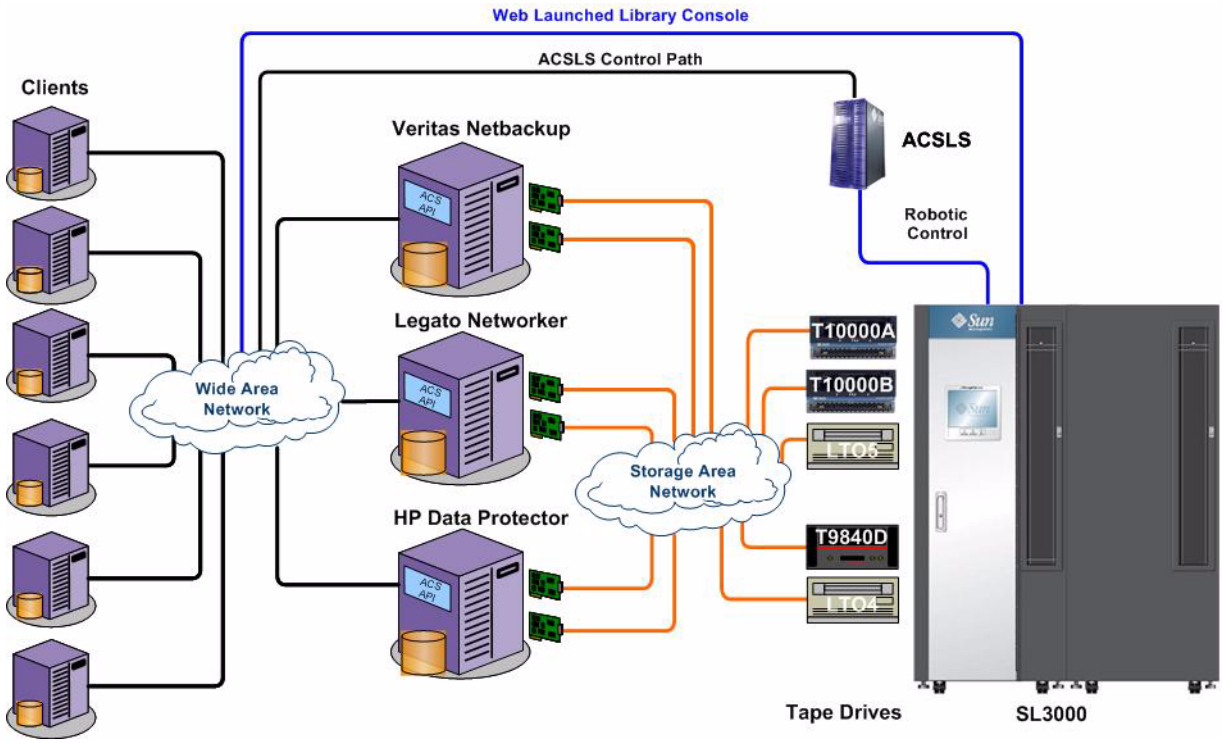
ACSLS is an open systems software package that manages library contents and controls library hardware to mount and dismount cartridges on tape drives.

This application also provides library management services such as cartridge tracking, pooling, reports, and library control.

ACSLS Version 7.3 or greater is required for interfacing with the SL3000 library.

Note – ACSLS 7.3 requires PUT 0801 for AEM Support.

FIGURE 1-17 ACSLS Example



In this example, ACSLS is providing the Library Management Software.

When using ACSLS, this application is sold to support a certain number of slots.

Independent Software Vendors

There are a variety of Independent Software Vendors (ISVs) that have tested their applications and support connection to the SL3000; for example, some applications include:

- BakBone NetVault 7.4+
- CA ArcServe 11.5+
- HP Data Protector 5.5/6.0
- Legato NetWorker 7.3/7.4
- SAM FS 4.6
- Tivoli Storage Manager 5.5.1
- Veritas BackupExec 11.0
- Veritas Netbackup 6.0/6.5

Note – Not every application is listed.

On different platforms, such as:

- HP, HP-UX
- IBM AIX
- Linux, both Red Hat and Suse
- Microsoft Windows
- Solaris

Note – Not every application is tested on every platform or platform version.

Check with a Marketing or Sales Representative, Application Vendor, and the Interoperability Tool at: https://extranet.stortek.com/interop/interop to make sure the selected solution (platform, application, tape drives, network, etc.) is supported.

TABLE 1-10 ACSLS 7.3 Qualification Summary

Backup Application	Solaris	IBM AIX	HP-UX	Microsoft Windows	Linux	
					Red Hat	SUSE
Legato NetWorker 7.3/7.4	Yes	Yes	Yes	Yes	Yes	Yes
Tivoli Storage Manager 5.5.1	Yes	Yes	Yes	Yes	Yes	Yes
Symantec Netbackup 6.0/6.5	Yes	Yes	Yes	Yes	Yes	TBD
CA ArcServe 11.5+	Yes	Yes	Yes	Yes	N/A	N/A
HP Data Protector 5.5/6.0	Yes	N/A	Yes	Yes	N/A	N/A
BakBone NetVault 8.2+	Yes	Yes	Yes	Yes	Yes	Yes
SAM-FS 4.6	Yes	N/A	N/A	N/A	N/A	N/A

Standards of Conformance

TABLE 1-11 lists the standards to which the SL3000 complies.

TABLE 1-11 Standard of Compliance

Country	**Standard**
U.S.A.	Federal Communications Commission (FCC). Title 47, Part 15, Subpart B, and as an Unintentional Radiators Class A
Japan	Voluntary Control Council for Interference (VCCI), Class A (CISPR22)
European Union (CE mark)	Electromagnetic Compatibility Directive 89/336/EEC and 2004/108/EC (including EN55022, EN55024, EN61000-3-2, EN61000-3-3 and amendments)
Australia / New Zealand	EMC Framework AS/NZS 3548
Taiwan	Bureau of Standards, Metrology and Inspection (BSMI) Law, Taiwan CNS13438
Canada	Canadian EMC Law ICES-003
Korea	Korean EMC Law
Emissions	**European Union Test Requirements**
HF Radiated	EN55022 Class A
HF Conducted	EN55022 Class A
Harmonic Current	EN61000-3-2
Voltage Fluctuations and Flicker	EN61000-3-3
Directive	**Description**
RoHS	Reduction of Hazardous Substances
WEEE	Waste Electrical and Electronic Equipment (e-waste)
Standard	**Description**
EDS 3-3	AC Powerline
EDS 5-6	Product Safety Requirements
EDS 6-3	Electrostatic Discharge (ESD) Immunity
CP-7-1-2	Product Safety

CHAPTER 2

Systems Assurance

This chapter contains information about the systems assurance process.

The system assurance process is the exchange of information among team members to ensure that no aspects of the sale, order, installation, and implementation are overlooked. This process promotes an error-free installation and contributes to the overall customer satisfaction.

Systems assurance team members—the customer and StorageTek—ensure that all aspects of the process are planned carefully and performed efficiently.

System Assurance Planning Meetings

The purpose of the system assurance planning meetings are to:

- Introduce the customer to the SL3000 modular library
- Explain the system assurance process and establish the team
- Prepare for the installation and implementation
- Schedule and track the entire process

TABLE 2-1 on page 40 provides a list of tasks to start with.

Make any adjustments or add more tasks as the team needs to ensure a quality process.

TABLE 2-1 System Assurance Checklist

Task	Completed?
Introduce the team members to the customer. Complete the Team Member Contact sheets. Make additional copies as necessary.	Yes ❑ No ❑
Describe the SL3000 modular library, options, and features for the customer. See Chapter 1, "Introduction" for information and topics.	Yes ❑ No ❑
Identify and define the customer's requirements. *Comments:*	Yes ❑ No ❑
Understand the customer's expectations. *Comments:*	Yes ❑ No ❑
Review the information in Chapter 3, "Site Planning" *Comments:*	Yes ❑ No ❑
Review and complete the surveys in Chapter 4, "Customer Site Survey" *Comments:*	Yes ❑ No ❑
Identify any additional items the customer might need. ▪ Library management software and additional hardware activation keys ▪ Media—data and cleaning cartridges, labels, media services ▪ Tape drives, drive tray conversions, encryption ▪ Cables and network components ▪ Service delivery platform (SDP)	Yes ❑ No ❑
Review the Order Work Sheets in Chapter 5, "Ordering". *Comments:*	Yes ❑ No ❑
Determine the installation schedule: Equipment arrival date: _____ Installation date: _____	Yes ❑ No ❑

Customer Contact Sheet

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Note – Customer team members may include: IT professionals, systems and network administrators, finance, security, and facility planners.

StorageTek Member Contact Sheet

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Name: _____
Title: _____
Telephone Number: _____
FAX Number: _____
Cell Phone / Pager: _____
E-mail Address: _____

Note – StorageTek Representatives may include: marketing, sales, and account representatives, systems engineers (SEs), Professional Services (PS), installation coordinators, and trained services personnel.

CHAPTER 3

Site Planning

FIGURE 3-1 SL3000 Library—Front Door Open

This chapter consists of the following topics to assist in planning an installation.

Specifications

FIGURE 3-2 Metric Dimensions (frame measurements)

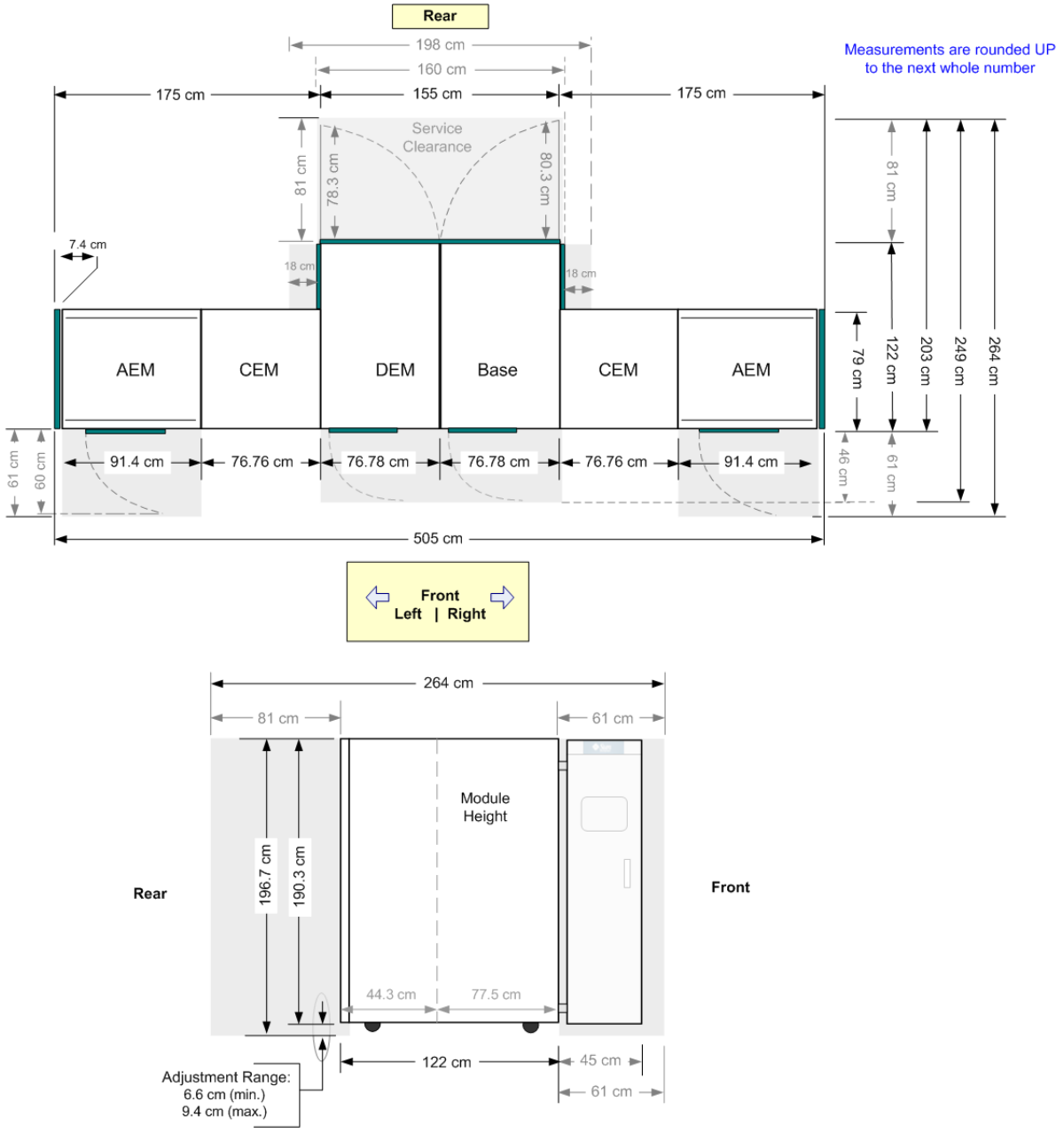
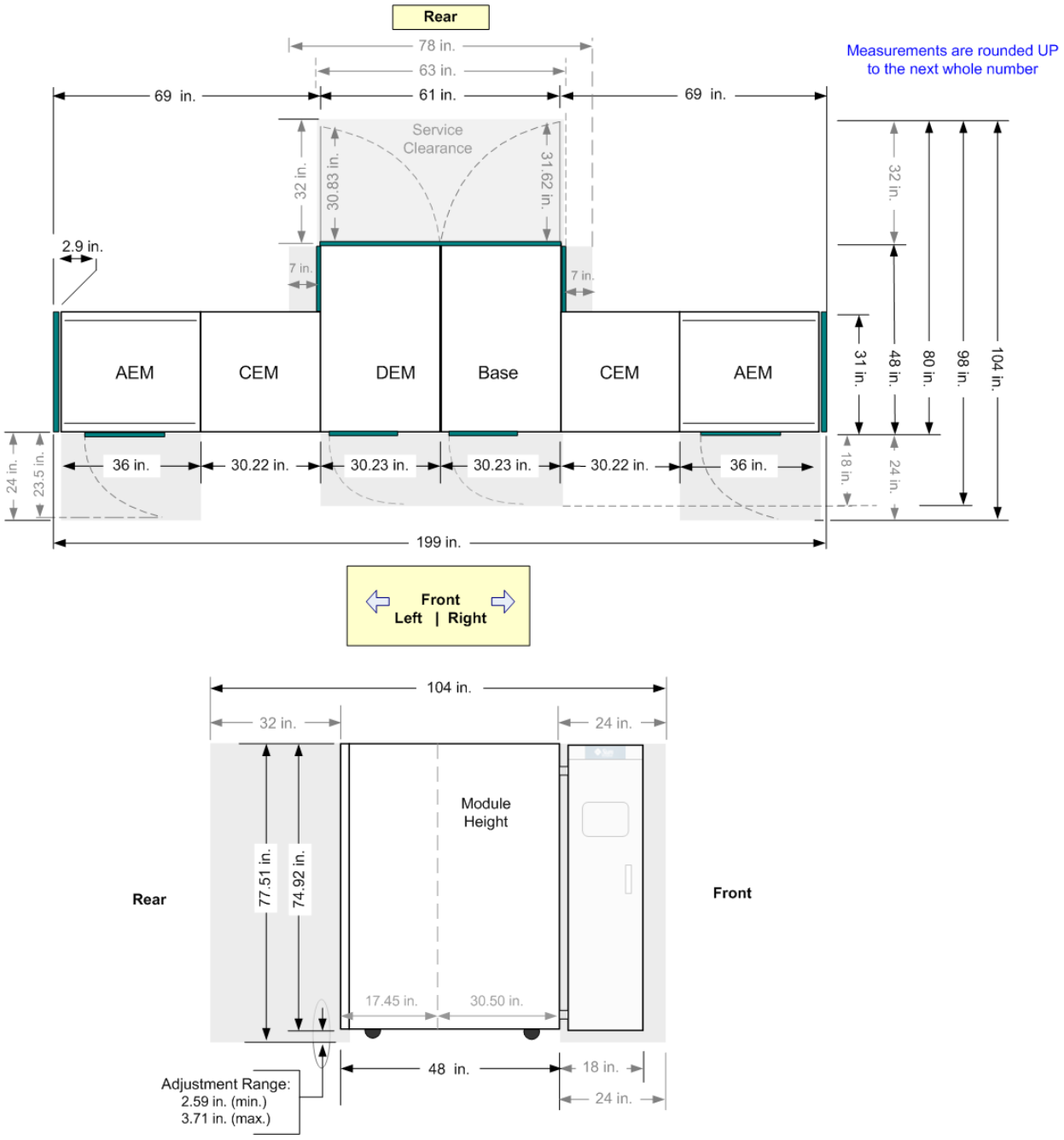


FIGURE 3-3 Standard Dimensions (frame measurements)



For individual specifications see:

- "Base Module" on page 46
- "Drive Expansion Module" on page 46
- "Cartridge and Parking Expansion Modules" on page 47
- "Access Expansion Module" on page 47
- "Covers, Doors, and Service Clearances" on page 47
- "Service Clearances" on page 48
- "Floor Loading" on page 50
- "Fire Suppression Planning" on page 51
- "Pallets" on page 57
- "Customer's Floor" on page 59

Base Module

TABLE 3-1 Base Module Specifications

Dimension	Measurement
Height	196.7 cm (77.45 in.) on casters, to 200.15 cm (78.8 in.), fully adjusted [adjustment = 3.43 cm (1.35 in.)]
Width	76.8 cm (30.23 in.) without covers* 81.3 cm (32 in.) without side covers 91.6 cm (36.03 in.) with end covers*
Depth (doors closed) Depth (with service access)	121.8 cm (47.95 in.) 248.8 cm (97.95 in.)

Weight	■ Frame only = 361 kg (796 lb)
	■ Shipping weight = 411 kg (905 lb)
	■ Installed, with:
	  ■ 8 drives and media = 623 kg (1372 lb)
	  ■ 16 drives and media = 661 kg (1457 lb)
	  ■ 24 drives and media = 687 kg (1514 lb)

Side cover (end cap)	7.4 cm (2.9 in.) width and 18.5 kg (41 lb) per side
***Side Covers:** Are shipped with the base module. As you add more modules, the side covers are removed from this module and installed on the new module (either left, right, or both).	

Drive Expansion Module

TABLE 3-2 Drive Expansion Module Specifications

Dimension	Measurement
Height	Same as base module
Width (module only)	76.8 cm (30.23 in.) without covers 158.1 cm (62.26 in.) without covers 168.3 cm (66.26 in.) with Base Module and end covers
Depth (doors closed) Depth (with service access)	121.8 cm (47.95 in.) 248.8 cm (97.95 in.)

Weight	■ Frame only, no CAP = 265 kg (584 lb)
	■ Shipping (frame only, no CAP) 314 kg (693 lb)
	■ Shipping (frame plus CAP) = 321 kg (708 lb)
	■ Installed with:
	  ■ 8 drives and media, no CAP = 540 kg (1190 lb)
	  ■ 16 drives and media, no CAP = 596 kg (1314 lb)
	  ■ 24 drives and media, no CAP = 647 kg (1426 lb)
	  ■ 32 drives and media, no CAP = 709 kg (1564 lb)
	  ■ 8 drives and media, with CAP = 582 kg (1284 lb)
	  ■ 16 drives and media, with CAP = 621 kg (1369 lb)
	  ■ 24 drives and media, with CAP = 660 kg (1456 lb)
	  ■ 32 drives and media, with CAP = 723 kg (1594 lb)

Cartridge and Parking Expansion Modules

TABLE 3-3 Cartridge and Parking Expansion Module Specifications

Dimension	Measurements	
	CEM	**PEM**
Height	Same as base module	
Width	76.8 cm (30.22 in.) module only 168.28 cm (66.25 in.) with Base Module and side covers	
Depth	77.5 cm (30.5 in.) frame only	
Weight	■ Frame only 175 kg (385 lb) ■ Shipping = 213 kg (469 lb) ■ Installed, with media = 340 kg (749 lb)	■ Frame only = 122.5 kg (270 lb) ■ Shipping = 213 kg (469 lb)

Access Expansion Module

TABLE 3-4 Access Expansion Module Specifications

Dimension	Measurement
Height	Same as base module
Width	91.5 cm (36.0 in.) without covers 98.8 cm (38.9 in.) with one side cover
Depth	77.5 cm (30.5 in.)
Weight	204.2 kg (450 lb)

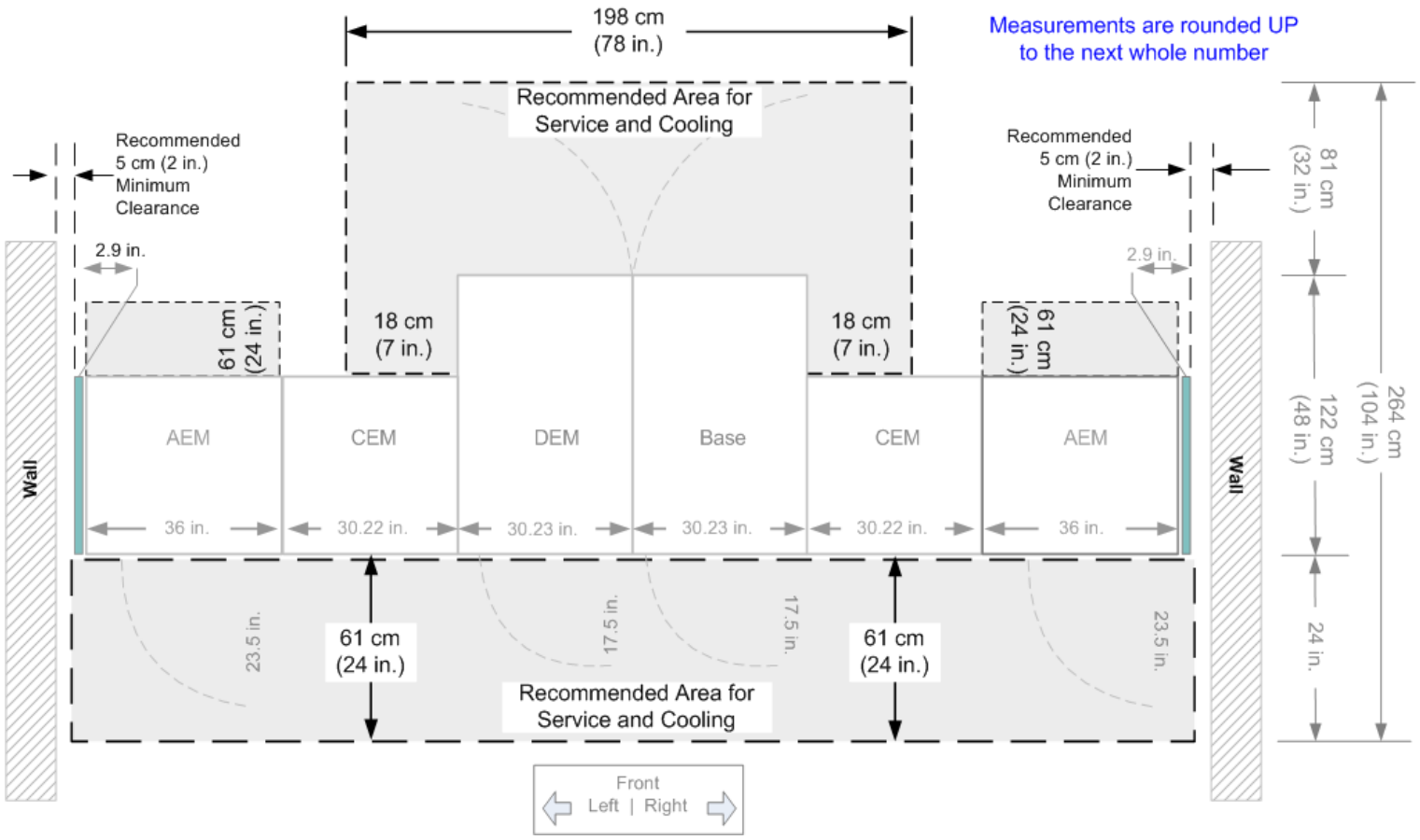
Covers, Doors, and Service Clearances

TABLE 3-5 Covers, Doors, and Service Clearance Specifications

Dimension	Measurement	
Height	190 cm (77.45 in.) frame on casters	Adjustable by 3.5 cm (1.35 in.)
Door thickness	Front: 1.9 cm (0.75 in.) Rear: 4.5 cm (1.75 in.)	
Door latches	2.53 cm (0.9 in.) *Important: The latch adds another 2.5 cm (1 in.) depending on the module location and measurement use.*	
Service clearance Both doors open	Front without AEM: Front with AEM: Rear: Total:	46 cm (18 in.) 61 cm (24 in.) 81 cm (32 in.) 264 cm (104 in.)
Side cover (end cap)	7.4 cm (2.9 in.) width and 18.5 kg (41 lb) per side	
***Side Covers:** Are shipped with the Base Module. As you add more modules, the side covers are removed from the Base Module and installed on the new module (either left, right, or both).		

Service Clearances

FIGURE 3-4 Service Clearances—Minimum and Recommended



Clearance:
Front—Use, Front door opening, CAP processing
Rear—Service, tape drives, cabling
Sides—Cooling
Overall width
Overall length—(Variable)

Minimum Measurements:
44.5 cm (17.51 in.), AEM 60 cm (23.5 in.)
80.3 cm (31.62 in.)
5 cm (2 in.)
122 cm (48 in.)
Variable by number of modules
From: 91.5 cm (36 in.) To: 965.2 cm (380 in.)

Recommended Clearances:
Front: 61 cm (24 in.)
Rear: 81 cm (32 in.)
Side: 5 cm (2 in.) minimum

Side Clearance During Installation

The SL3000 requires only a 5 cm (2 in.) clearance on the sides of the library; however, during the initial installation, 46 cm (18 in.) is required to install the end (side) covers.

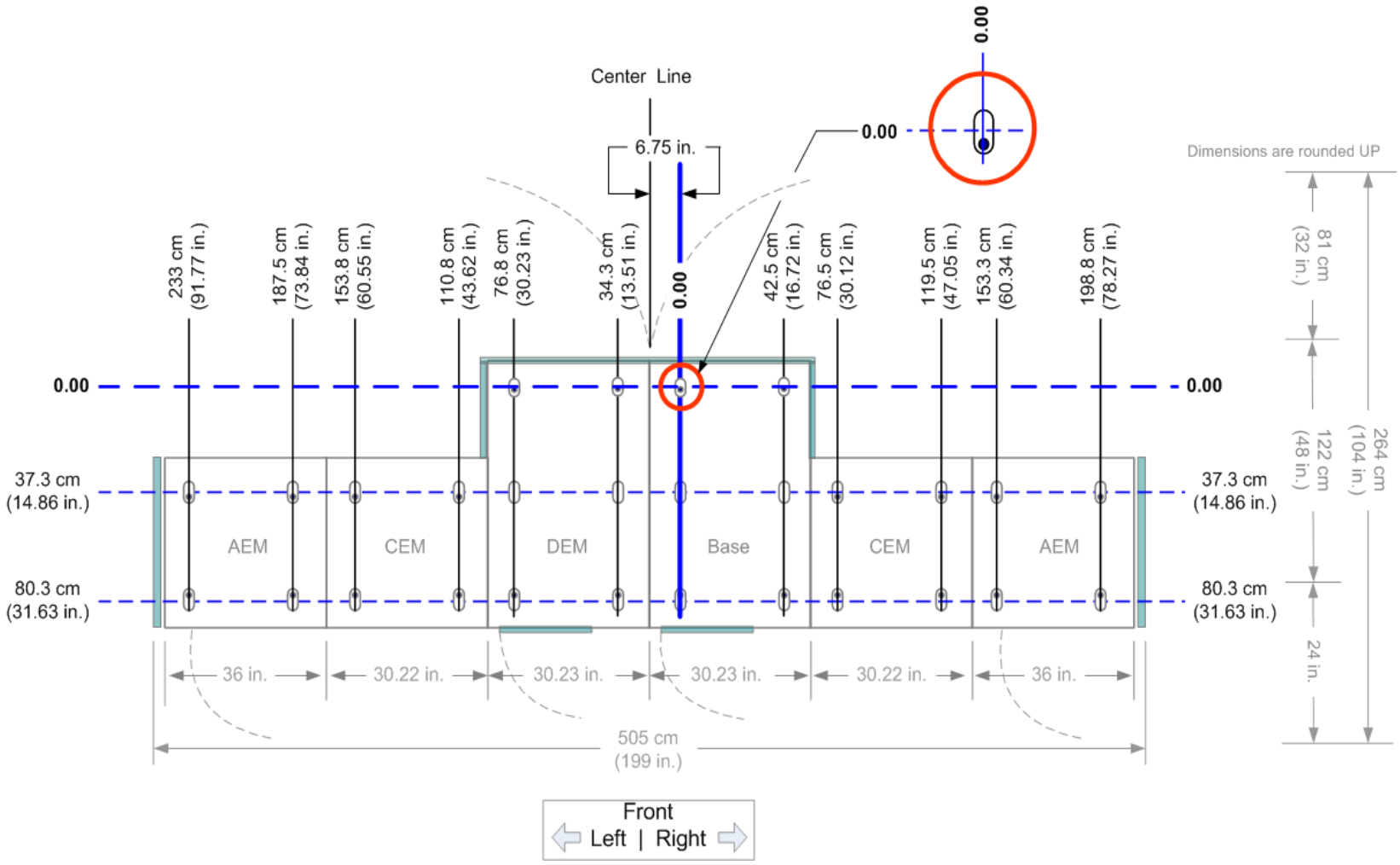
FIGURE 3-5 End Cover Clearance

To tighten or loosen the end covers requires a 5/16-inch hex key wrench.

- To remove the end covers:
  Swing the bottom of the end cover away from the library approximately 46 cm (18 in.).
- To install:
  Place the cover on the brackets and swing it into place.

Floor Loading

FIGURE 3-6 Floor Loading—Load Pads

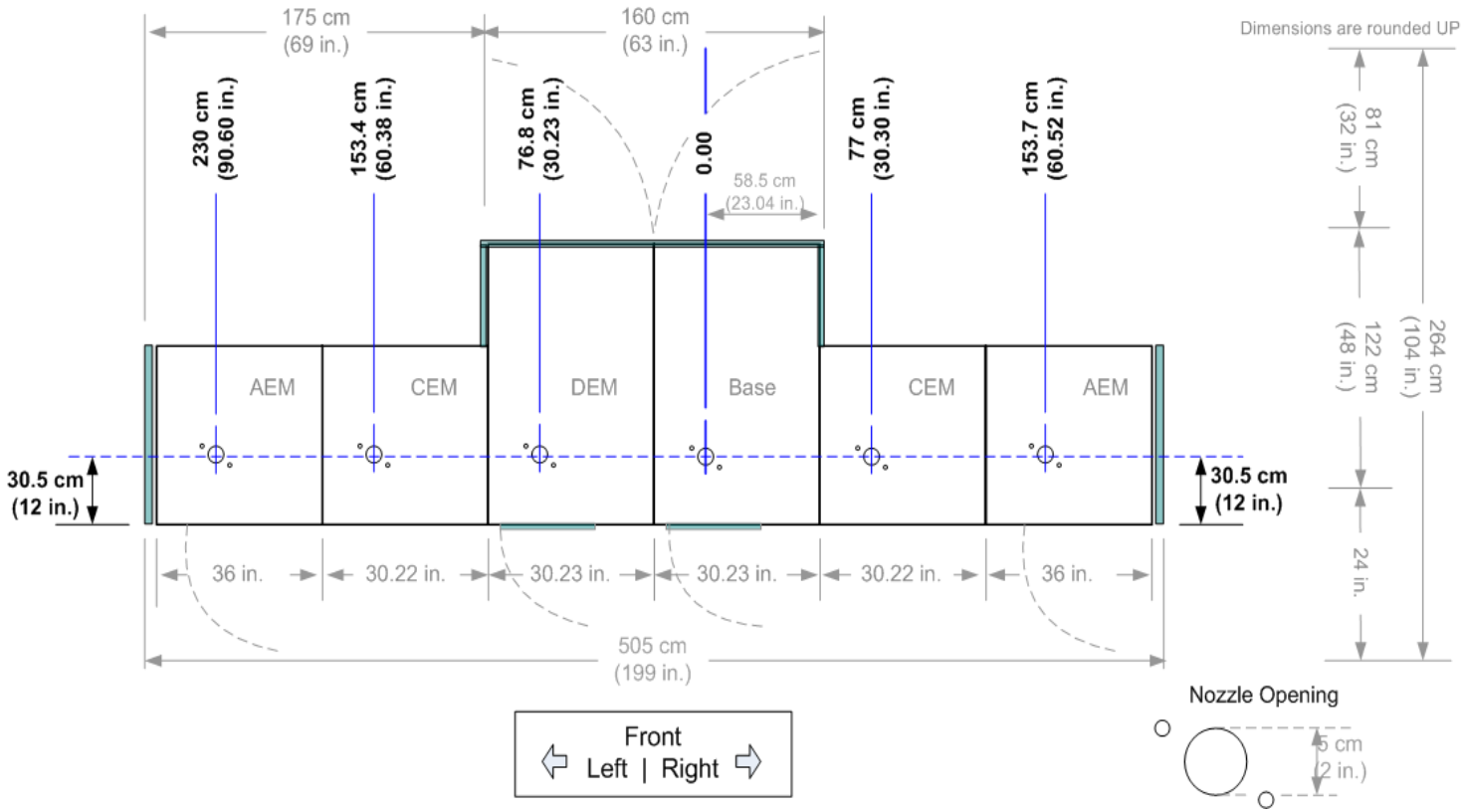


The customer's floor must be capable of supporting 454 kg (1000 lb) per weight distribution pad. This weight represents the modules, with components, and cartridges.

Fire Suppression Planning

FIGURE 3-7 shows the accesses for fire suppression planning. The library does *not* ship with a fire suppression system, although features have been incorporated into the library to allow for one. Professional Services offers systems which can be installed on site.

FIGURE 3-7 Fire Suppression Ceiling Access (Viewed from the top of the library)



Details:

- Openings = One per module that measure 5 cm (2 in.) diameter Note: Do not cut/alter the provided opening without contacting Professional Services.
- Plates = Cover the openings and measure 7 cm (2.75 in.) square and 1 cm (0.48 in.) thick.
- These plates are what contractors can use to drill in to for a custom fit of the nozzles.
- Screws = Two T25 Torx screws
- Nozzle protrusion into the library to clear robotic operation = 1 cm (0.4 in.) from the *top* of the library

Environmental Requirements

Although the SL3000 library will function over a full list of environmental ranges as specified below, *optimal reliability* is achieved if the environment is maintained between the recommended ranges.

TABLE 3-6 Environmental Specifications

Description	Optimum	Recommended Range	Full Operating Range
Temperature Operating Non-operating	22°C (72°F)	20° – 25°C (68° – 77°F)	+16° to 32°C (60° to +90°F) +4° to +32°C (+40° to +90°F)
Relative Humidity Operating Non-operating	45%	40% – 50%	20% to 80% (non-condensing) 20% to 80% (non-condensing)
Wet bulb (operating)	25.6°C (78°F) maximum, non-condensing		
Heat Output	See "Power Consumption" on page 54 and "Calculating Power Consumption" on page 55 for details		
Power Consumption			
**Maximum loading includes 56 tape drives, 2 TallBots, and up to 10 CAPs.			

Important:
Although this equipment is designed to operate in environmental conditions of 20% to 80% humidity, industry best practices recommends computer rooms maintain a relative humidity of 40% to 50% for best performance.

TABLE 3-7 Environmental Definitions

British thermal units (Btu)	A measure of the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit. British thermal units are most commonly associated with power over a unit of time—Btu per hour (Btu/hr).
Relative Humidity	A measure of water vapor in the air.
Temperature	The measurement of hot and cold to specific scales, such as Celsius (also called centigrade) and Fahrenheit. The Celsius temperature scale uses 0° for the freezing point of water and 100° for the boiling point of water. The Fahrenheit temperature scale uses 32° for the freezing point and 212° for the boiling point.
Watt	A watt is a unit of power or the amount of energy per unit of time. Often the term watt is used for expressing energy consumption as kW (kilo-Watts).
Wet bulb	The difference in temperature between wet bulb (humidity) and dry bulb (temperature) provides a measure of atmospheric humidity.

Airborne Contaminants

Control over contaminant levels in a computer room is an extremely important consideration when evaluating an environment. The impact of contamination on sensitive electronic hardware is well recognized, but the most harmful contaminants are often overlooked because they are so small.

Library rail components, tape drives, and media are subject to damage from airborne particulates (0.3 microns and smaller). The operating environment should strive to adhere to the requirements of:

- A Class 100,000 Clean Room
- ISO 14644-1 Class 8 or 9 environment

For more information refer to the *Data Center Site Planning Guide* at:

http://dlc.sun.com/pdf/805-5863-13/805-5863-13.pdf

For example:
Excessive concentrations of certain gasses can accelerate **corrosion** and cause failure in electronic components. Gaseous contaminants are a particular concern in a computer room because of the sensitivity of the hardware.

TABLE 3-8 lists some recommendations for gaseous limits.

TABLE 3-8 Gas Limit Recommendations

Chemical Name	Formula	ASHRAE	OSHA (PEL)	ACGIH	NIOSH
Acetic Acid	CH_3COOH	Not defined	10 ppm	Not defined	Not defined
Ammonia	NH	3500 µg/m^3	350 ppm	25 ppm	Not defined
Chlorine	Cl	2100 µg/m^3	31 ppm (c)	Not defined	0.5 ppm (c)
Hydrogen Chloride	HCl	Not defined	5 ppm (c)	Not defined	Not defined
Hydrogen Sulfide	H_2S	50 µg/m^3	320 ppm (c)	10 ppm	10 ppm
Ozone	O_3	235 µg/m^3	30.1 ppm	Not defined	Not defined
Petrol-hydrocarbons	$C_n H_n$	Not defined	500 ppm	75 ppm	300 ppm
Sulfur Dioxide	SO_2	80 µg/m^3	35 ppm	2 ppm	0.5 ppm (c)
Sulfuric Acid	H_2SO_4	Not defined	1 ppm	Not defined	1 ppm (c)

PEL: Permissible Exposure Limit
ppm: Parts Per Million
µg/m^3: Micrograms Per Cubic Meter
(c): ceiling

Power Consumption

TABLE 3-9 provides the power consumption (Watts), CO2 emission values, and Btu/hr for the SL3000 library.

TABLE 3-9 Power Consumption Quick Reference

Component		Qty	Idle			Maximum Continuous		
			Watts	C02 Emissions[1]	Btu/hr	Watts	C02 Emissions[1]	Btu/hr
Base Library[2] (required) Includes one ECM[3], one robot[4], and one CAP		1	179	3.668963	611.106	239	4.9	816
Internal Ethernet Switch (required)		each	40	0.82	136.56	40	0.82	136.56
Additional robot (optional)[4]		1	28	0.573916	95.592	55	1.1	188
Operator Panel (optional)[5]		1	29	0.594413	99.006	37	0.8	126
Additional CAP (optional)[6]		each	10	0.20497	34.14	14	0.3	47.8
Tape Drive and Tray Assembly[7]	T9840C	each	91.6	1.8775252	312.7224	122.6	2.5	419
	T10000	each	73	1.496281	249.222	115.2	2.4	393
	LTO	each	37	0.758389	126.318	56.9	1.2	194
Access Expansion Module (optional, 1 or 2)		each	8	0.163976	27.312	30	0.6	102

Notes:

1. **CO2 Emissions** is kg of C02 per day, which is equal to 0.020497 Watts.
2. **Drive Expansion Module**; use the individual components (CAPs, Ethernet switches, and tape drives). **Cartridge Expansion Module**; none required.
3. **Electronic Control Module** includes one HBCR and one HBT cards, two cooling fans. [Watts = 141 (idle) 170 (max.); CO2 = 2.89 (idle) 3.48 (max)]
4. One SL3000 can support up to two **robots**
5. One SL3000 can support one **Operator Panel**
6. One SL3000 can support up to ten **CAPs**
7. **Drive Tray** includes HBD card, drive DC to DC power supply, fans-if applicable, and the drive itself. The SL3000 supports up to 56 drives total.

Calculating Power Consumption

To calculate Power and CO2 emissions:

- Use [kg of C02 per day] equals *.020497 [watts].
- Use the constant that is applicable for your country.

To convert electrical values to British Thermal Units (Btu/hr), multiply the number of Watts by 3.412 or 1 kW = 3.412 Btus.

3.41214 x Watts = Btu/hr

Many manufacturers publish kW, kVA, and Btus for their equipment. Often, dividing the Btu value by 3412 does not always equal the published kW value.

- Where the information is provided by the manufacturer, use it.
- Where it is not, use the formula.

To calculate Btus:

- Add up all the applicable Wattage values for the configuration.
- Multiply the total Watts sum by 3.412.
- This equals the number of Btu/hr.

For example:
Using the maximum continuous values for the following components

Qty	Component	Watts
1	SL3000 Base module (including one ECM, one Robot, one CAP)	239
1	Internal Ethernet switch	40
16	LTO drives	910.4
	Total:	1189.4

Multiply that by 3.412, which equals 4058.2 Btu/hr maximum continuous operation.

Another example:

Qty	Component	Watts
1	SL3000 Base module (including one ECM, one Robot, one CAP)	239
1	Internal Ethernet switches	40
8	T9840 drives	732.8
1	Drive Expansion Module	—
1	Internal Ethernet switch	40
8	T10000 drives	584
4	Cartridge Expansion Modules	—
3	Optional CAPs (3 x 10 Watts)	30
	Total:	1665.8

Multiply that by 3.412, which equals 5683.7 Btu/hr maximum continuous operation.

Installation Considerations

The SL3000 library has several installation requirements that must be considered. The following sections outline some basic considerations that must be made when planning for an installation.

Available Space

You and your customer must determine:

- The number and types of modules to be installed.
- Are there additional modules in the future? If so, allow space for this growth.
- The amount of space required to install the equipment.

  A suggested working area (not including the space required for the pallets) is approximately 19 m^2 (200 ft^2).

Installation Time and Personnel

TABLE 3-10 shows the estimated times for the installation of modules and components.

At least two qualified service representatives should install the library.
These times **do not** include library initialization, testing, audits, and feature upgrades.

TABLE 3-10 Installation Time Estimates

Module/Component	Time Estimate	Personnel Required	Total Person Hours
Base Module with 8 drives (standard)	3 hours	2	6 hours
Base Module and Drive Expansion Module	5 hours	2	10 hours
Base Module and Cartridge Expansion Module	4 hours	2	8 hours
Each additional Cartridge Expansion Module	2 hours	2	4 hours
Two Parking Expansion Modules	2 hours	2	4 hours
Access Expansion Modules (each)	2 hours	2	4 hours
CAPs	1 hour	2	2 hours
Tape Drive (each drive)	0.5 hours	1	0.5 hours
Operator Panel or Window	0.75 hours	1	0.75 hours
Firmware	0.2 hours	1	0.2 hours
Integration (cables, hubs, switches, connections)	8 hours	1	8 hours
Media install (each)	0.02 hours	1	variable

To achieve the estimated installation time and make the best use of personnel, some tasks can be performed simultaneously. For example, while one person is installing a CAP, the other person could be installing tape drives.

Pallets

The SL3000 library modules and other components are shipped on pallets.

Note – If palletized equipment must be transported on elevators, the cars must be capable of safely handling the weight.

FIGURE 3-8 lists each module and its shipping specifications.

FIGURE 3-8 Pallet and Module Shipping Information

Module	Height	Width	Depth	Weight
Base Drive	216 cm (85 in.)	97 cm (38.3 in.)	134 cm (53 in.)	410 kg (905 lb)
Drive Expansion	216 cm (85 in.)	97 cm (38.3 in.)	134 cm (53 in.)	321 kg (708 lb)
Cartridge Expansion	216 cm (85 in.)	97 cm (38.3 in.)	96 cm (38 in.)	213 kg (469 lb)
Parking Expansion	216 cm (85 in.)	97 cm (38.3 in.)	96 cm (38 in.)	213 kg (469 lb)
Access Expansion	216 cm (85 in.)	97 cm (38.3 in.)	148 cm (58 in.)	260 kg (570 lb)

Important: *Possible Physical Injury.*
Either a split-pallet or pallet-ramp design is used to ship and provide safe removal of the module at the customer site. SL3000 library modules are shipped with wheels (casters) already attached to allow for easy positioning within the data center. Once positioned, the modules must be raised from their wheel-base to rest upon load plates for stability and/or leveling purposes.

The suggested library adjustment height is 200 cm (77.6 in.). Therefore, make sure that the top of the library does not interfere with ceiling fixtures in the data center.

Pallet Double Stacking

Important: *Possible Physical Injury.*
Many SL3000 modules are being delivered stacked, unsecured, on a second pallet by the shipping companies due to the narrow pallet design.

Field personnel are trying to remove the modules by tilting and sliding the palleted module off the second pallet underneath.

Do not attempt to remove an SL3000 module from a second pallet without the proper equipment. The safe removal of a library module from the second pallet requires a forklift operated by a qualified operator. Under no circumstances are StorageTek employees to attempt removal of the stacked module from the second pallet.

In the event that a safe method of removal cannot be accomplished after delivery at the customer site, please notify your install coordinator. Inform them that the library may need to be picked up from the site by the delivery company, taken off the second pallet, and re-delivered.

Delivery personnel are not authorized to remove the modules from the second pallet without the proper equipment.

FIGURE 3-9 Do Not Stack on Second Pallet

Customer's Floor

The library can be installed on a raised, solid, or carpeted floor and have a smooth surface.

- If raised, there should not be ventilation panels directly below the library.
- If solid, to avoid tripping, route cables from the ceiling.
- If carpeted, make sure the carpet is approved for computer-room equipment and provides protection from electrostatic discharge (ESD).

The load-bearing capacity of the customer's floor is another consideration.

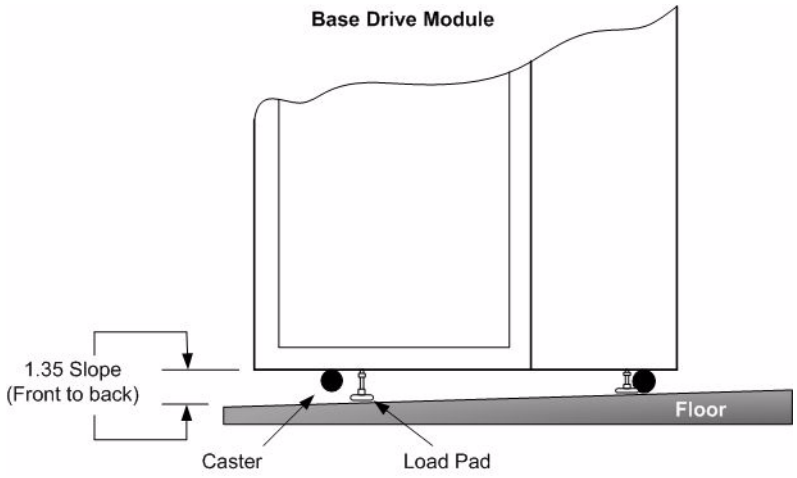
- A single Base module, when fully populated, weighs:
  - From 623 kg (1372 lb) with 8 drives and media
  - To 687 kg (1514 lb) with 24 drives and media
- An additional drive expansion module, when fully populated, weighs:
  - From 482 kg (1290 lb) with 8 tape drives
  - To 723 kg (1594 lb) with 32 tape drives

Additionally, since modules are joined together and the TallBots travel along a rail, each module must be adjusted so that TallBots travel along a level plane.

Some customer floors may contain *slight* slopes in them, so these variations must be taken into account. Any excessive out-of-plane conditions could cause binding, premature wear, and damage to the TallBots.

FIGURE 3-10 shows an example of this; allowing for a slope of 3.4 cm (1.35 in.).

FIGURE 3-10 Floor Slope



Height adjustment	197 cm (77.45 in.) on casters, to 200 cm (78.95 in.), fully adjusted
Caster height:	6.6 cm (2.59 in.) minimum adjustment
Adjustment range:	0 – 3.5 cm (0 – 1.35 in.)
To:	10 cm (3.94 in.) maximum adjustment

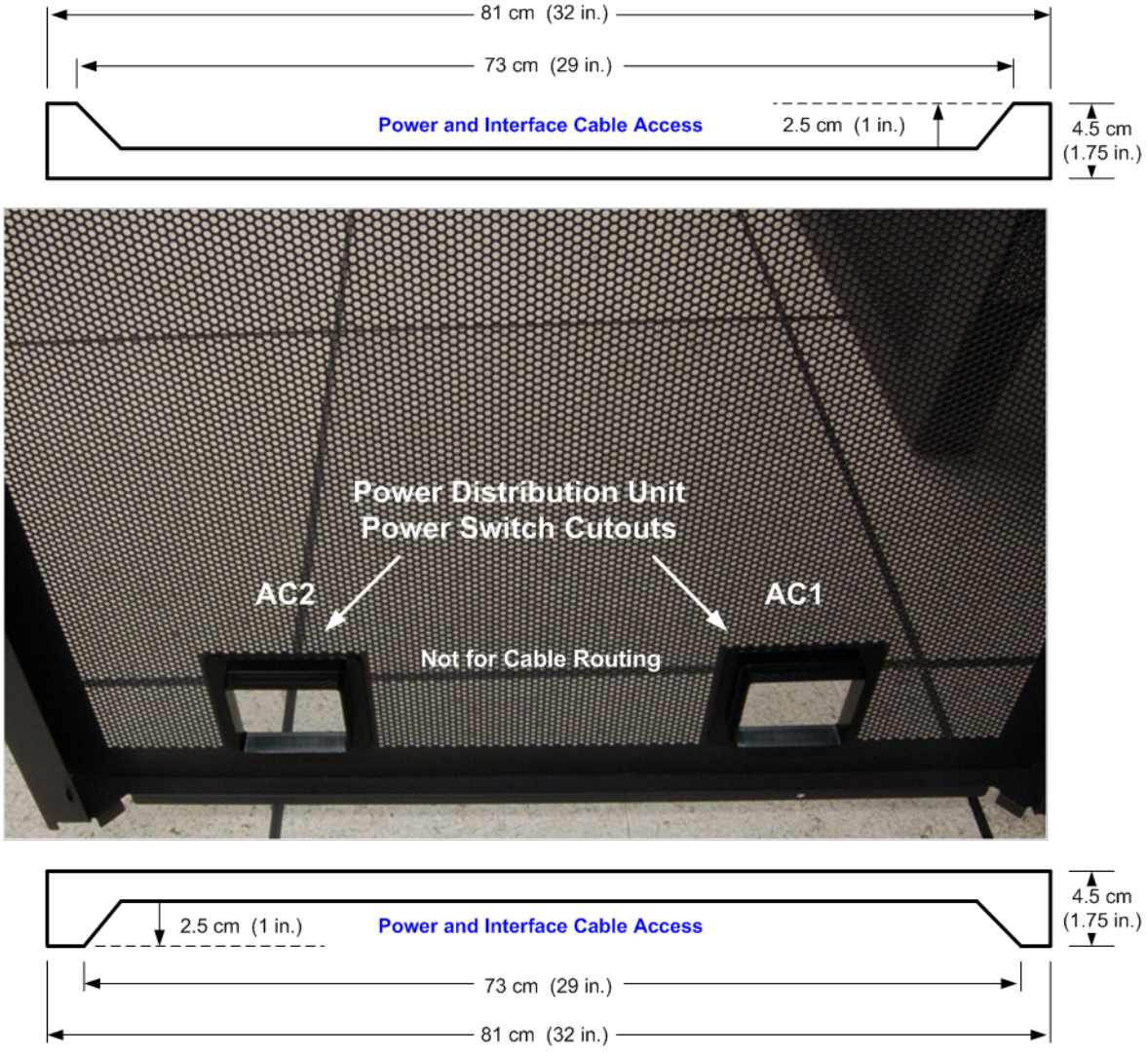
Cable Routing

The SL3000 library has rear door cut-outs on both the *top* and *bottom* of the door to allow for cable routing. This is a 5 cm (2 in.) opening the runs 73 cm (29 in.) along the length of the door with cable routing hardware and reliefs available.

FIGURE 3-11 shows a Base Module rear door with standard 61 cm (24 in.) square floor tiles visible through the door perforations as a comparison. Because of the openings in the rear door, several different floor (or ceiling) cut-outs will work to route cables.

When planning to route cables, make sure to include locations for power, drive interface, library control, and Ethernet cables. As a best practices, when possible, route power cables through one cut-out and signal cables through another cut-out.

FIGURE 3-11 Cable Routing



Seismic or Earthquake Ratings

The requirements for seismic compatibility vary dramatically throughout the world. As such, StorageTek does not offer a standard “seismic” feature for the SL3000.

- It is recommended that any customer who has seismic concerns work with local experts who are familiar with the local code and requirements.
- Professional Services can also be engaged to help coordinate this activity.

Caution – *Bodily injury and equipment damage:* A qualified seismic engineer must be consulted to verify seismic zone exposures and adequate site preparation.

For sites in areas of seismic activity, the customer may wish to permanently fix the library position for added stability. The SL3000 library provides mounting holes in the floor of each module where half-inch carriage bolts (mounting studs) can be used to permanently fix the library’s position.

FIGURE 3-12 shows the locations of the casters, leveling pads, and the mounting holes.

FIGURE 3-12 Seismic Mounting Locations

Base and DEM Details

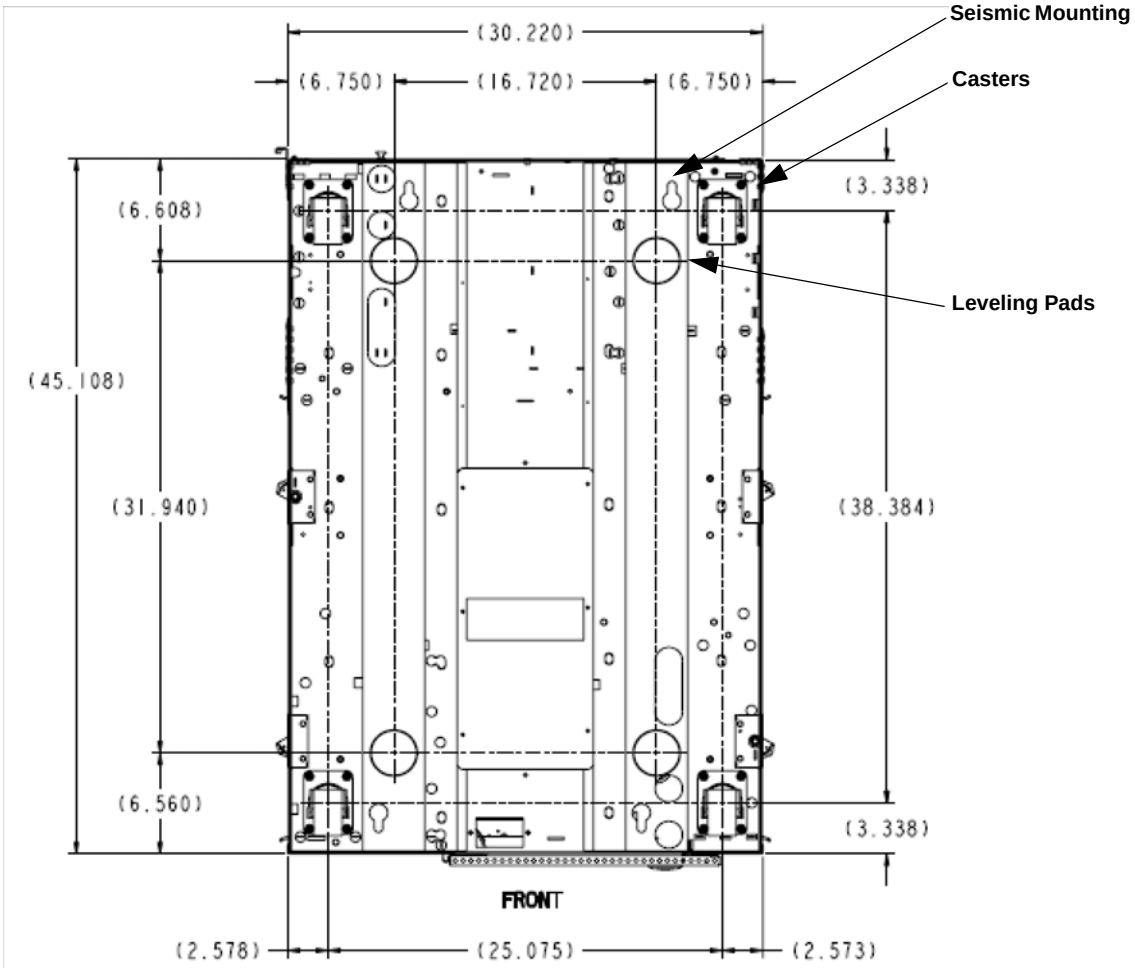


FIGURE 3-12 Seismic Mounting Locations (Continued)

CEM Details

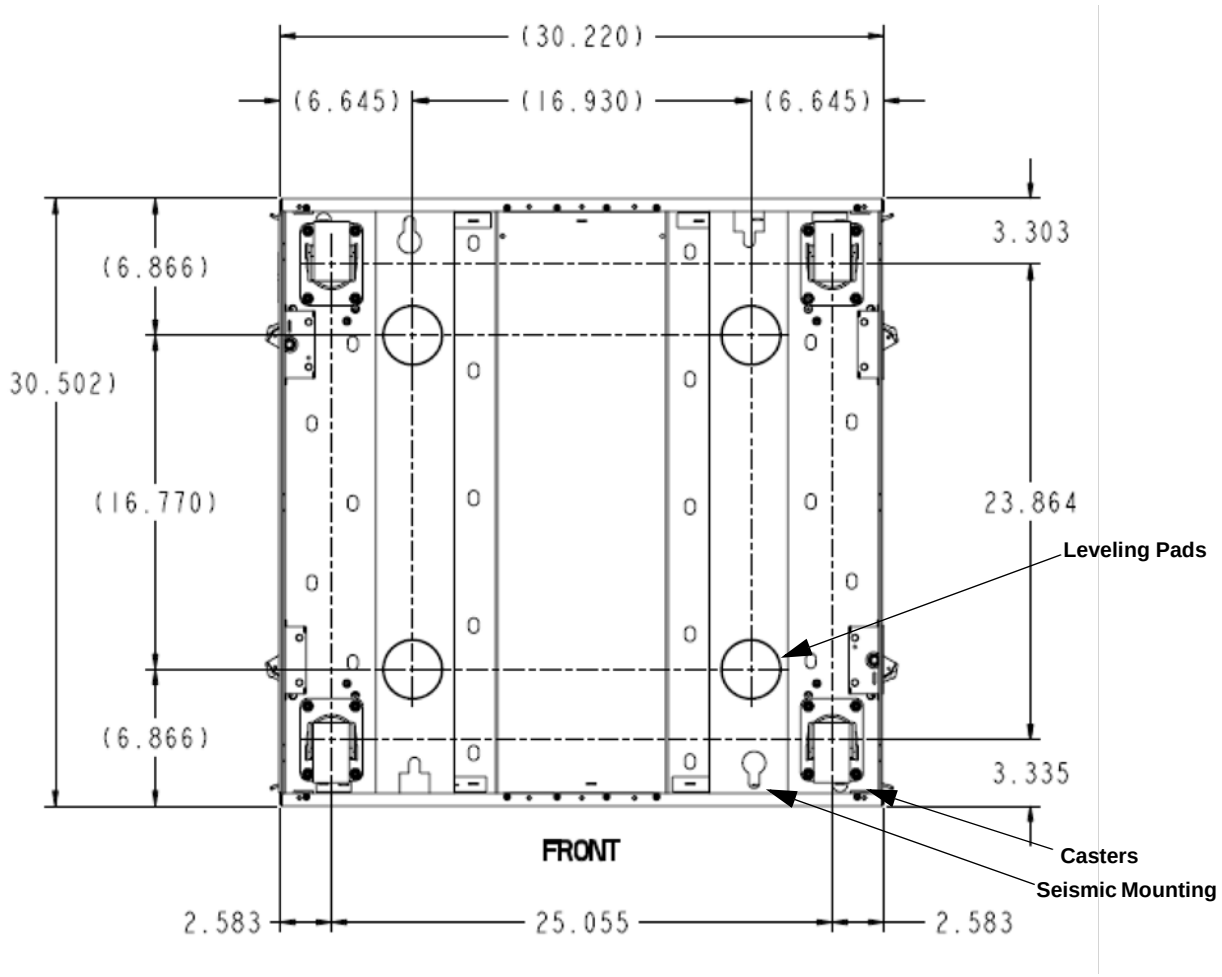
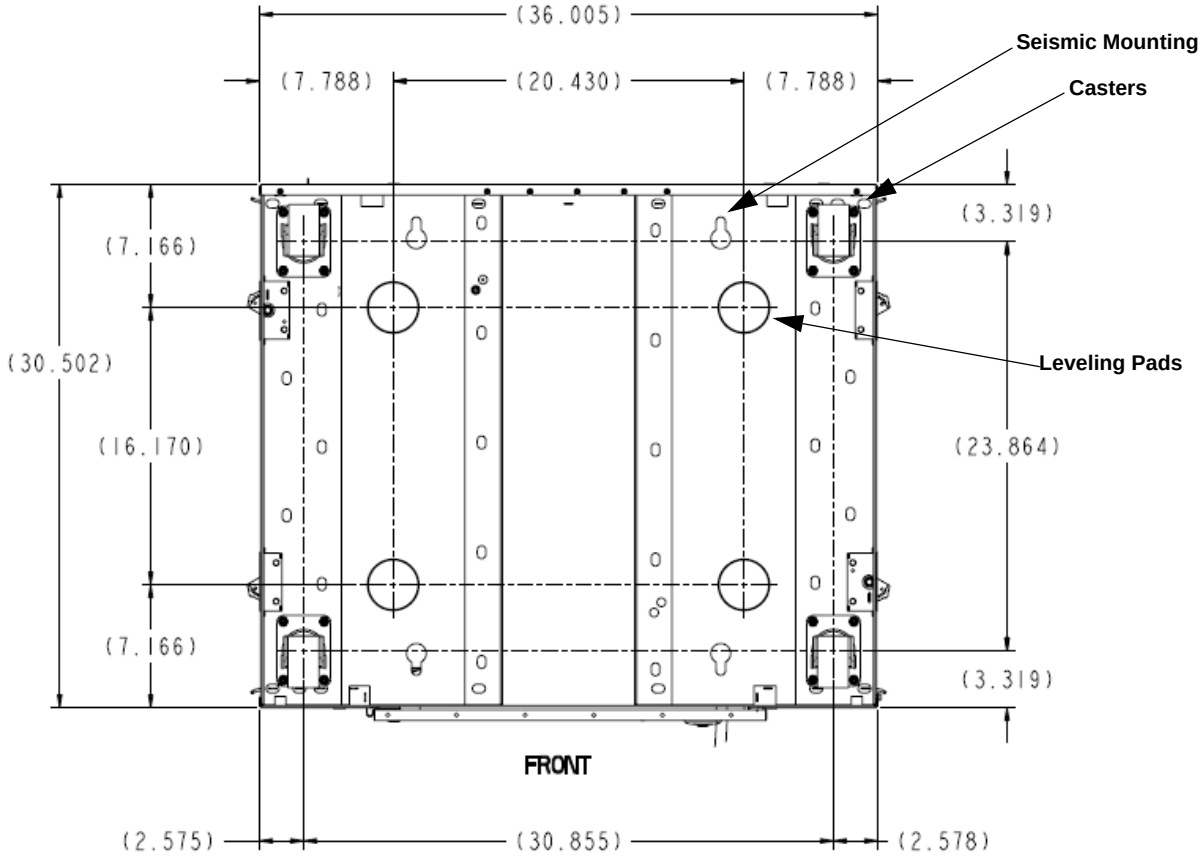


FIGURE 3-12 Seismic Mounting Locations (Continued)

AEM Details



Installation Tools—Required

TABLE 3-11 lists the installation tools required for the SL3000. There is no special district installation toolkit required.

Note – If you already have SL8500 libraries in your area, the extractor, hex wrench and rack alignment tool can also be used for the SL3000; if these few special tools are not available, you must order them separately.

A Web site that lists all tools available is located at the following URL:
http://sunsolve.central.sun.com/handbook_internal/FieldTools/

TABLE 3-11 Installation Tools

Standard Tools	Part Number	Use
Tool bag	24100254	
Torx screwdriver and T8, T10, T15, T25 bits	4850	■ **T8:** Removal and replacement of the PUK card. ■ **T10:** PUO, PUW, PUN, PUF, PUZ cards. ■ **T15:** Operator panel, window, blank plate, arrays ■ **T25:** Removal/replacement of shipping brace, track adjustment, CAP screws, Ethernet switch
3/8-in. drive ratchet wrench	3010420130	See 5/16-in. attachment
Wire side cutters	24100041	Cutting shipping straps
Adjustable wrench (must be adjustable to accept 7/8-in. nut)		Locking the weight distribution pad's nut with the height adjustment bolt.
Phillips screwdriver		
Flat blade screwdriver		
Special Tools		
5/16-in. hex Allen on 3/8-in. drive	3010420646	Module height adjustment, joining modules
9/16-in. socket on 3/8-in.-drive		Module removal from pallet
Copper rail connector extraction tool	313921001	Track terminator removal (supplied with base module installation kit)
Rail separator/joiner	4199410xx	Supplied with base module installation kit. Used for releasing/joining extrusions
Pallet jack	Obtain locally	Movement of pallets
Serial cable for laptop	24100134	CLI access to library
Crossover cable for laptop	24100163	CLI access to library
Drive tray power-on tool	314831204	See description below.

In addition to these tools, the following items are required:

- Flashlight
- Step stool
- Volt/Ohmmeter

Drive Tray Power-on Tool

A tool is available to assist you in removing a stuck tape within a library tape drive. This tool allows you to power-on a drive *outside* the library for the primary function of removing a cartridge stuck within a library drive.

The kit part number is 314831204; which contains the instructions for its use (document 102084) and a drive power cable (part 419632401).

An AC power cord is required to use this tool. You must order this separately:

- Part number 10187018 (Europe)
- Part number 10187019 (North America)

Optional Power Drill

While the amount of fastening hardware is minimal, you may also use a power drill to speed up the process of tightening nuts and screws. If a power drill is used, you must adjust the torque setting to:

- 2.8 Nm (25 in.-lb) for T-25 screws
- 0.6 Nm (5 in.-lb) for T-10 screws

Array Extraction Tool

To facilitate removal of cartridge arrays, an optional array extraction tool can be ordered: part 24100275.

Installation Kits

Installation kits are supplied with each module. These contain the hardware required to install each module. Kit part numbers are:

- 419838301—Base module
- 419844301—Drive expansion and cartridge expansion modules

AC Power Configurations and Cables

SL3000 libraries require that the customer select one of the following, *single phase*, AC power options for the base and drive expansion modules, these are:

- 110 VAC, 50/60 Hz, at 20 Amps (range: 100–127 VAC, 50–60 Hz, 16 Amps)
- 240 VAC, 50/60 Hz, at 30 Amps (range: 200–240 VAC, 50–60 Hz, 24 Amps)

AC power configurations are either N+1 (standard) or 2N (redundant feature).

Make sure to plan for the locations of power cables and list the locations for their associated circuit breakers.

Cables *must* be ordered for the appropriate power configuration.

TABLE 3-12 lists the cables available from StorageTek or qualified electricians.

Keep in mind that you need to order:

- N+1: One power cord for the Base module and one power cord for the drive expansion module if installed.
- 2N: Two power cords for the Base module and two power cords for the drive expansion module if installed.

TABLE 3-12 Power Cable Part Numbers and Descriptions

Power Source	Description	Circuit Breaker	Connector Type		Power Cord Length/Type	Part Numbers	
			Wall	Library		Item	X-Option
120 VAC/ 20A	US/Japan	20 A	L5-20P	L5-20R	3.7 m (12 ft) 12 AWG	419813801	XSL3000-PC20110-Z
240 VAC / 30A	US	30 A	L6-30P	L6-30R	3.7 m (12 ft) 12 AWG	419813701	XSL3000-PC30220-Z
240 VAC / 30A	International	30 A	330 P6W	L6-30	4 m (13 ft) 12 AWG	419813601	XSL3000-IPC30220Z

Important:
Best practices call for:
- N+1: Two separate power sources for a Base with a DEM installed.
- 2N: Four separate power sources would be prudent for this same configuration.

The cables listed in TABLE 3-12 are available from StorageTek or qualified electricians.

Keep in mind that you will need:

- One power cable each for the Base module and the drive expansion module in an N+1 power configuration, and
- Two cables each for a 2N power configuration

Obtaining a Password

StorageTek representatives, partners, and the customer must obtain a password before any configuration of the library is possible. To save time, obtain this password *before* beginning the installation.

The StorageTek Library Console (SLC) security system (the primary interface to the library) requires activation of the site user accounts with an activation password.

This activation password is only valid the first time logging-in.

Two activation passwords are needed:

- Service representative or partner
- Customer

After initially logging into the Command Line Interface (CLI) with the "service" user ID and service activation password, a prompt is displayed to set a new password. You can then share this new password with other users requiring access to the library.

For the customer, log into the CLI with the "admin" user ID and admin activation password. Customers can then set their new password for the StorageTek Library Console, using the same user account (such as Customer Administrator).

Before you request an Activation Password:

- The person requesting the passwords *must* have a valid User ID and password to access the software keys in the Support Web site:

  http://crcapplications/keyswebapp/

- The person accessing the CRC with the User ID must be authorized to use the Activation Password application.

  Contact Global Services if you are not able to access the Activation Password application.

Notes:

- The system validates the above information and retrieves an activation password for the library.
- The activation password is case sensitive. You must type this password exactly as it was issued to you by the Activation Password application.

Installing the Library Console Software

A service representative must load and activate the Library Console software to configure the library and before customer use. Software for the StorageTek Library Console (also called SLC, SLConsole, or Library Console) is download from:

http://dlrequest.sfbay.sun.com:88/usr/login

Enter “SLConsole” into the Search block. Service representatives load this software onto a personal computer.

Customers must also load this software to a remote, customer supplied, personal computer, workstation, and optional touch screen operator panel if present.

Hardware Activation Keys

Using hardware activation keys allows customers to install selected optional features on the SL3000 library. The following features are controlled by an Activation utility:

- Service (including Log Snapshot)
- Capacity on Demand
- Partitioning
- Dual Robot
- Dual TCP/IP Port
- Log Snapshot

Hardware Activation Key Files

A hardware activation key file is typically delivered to the customer using an e-mail. This key file is a digitally signed Java Archive (`.jar`) file that contains one or more activation keys for features purchased. In order to ensure that features are installed on the correct library, the key file includes the serial number of the target library and can only be installed for that library.

All SL3000 features purchased for a library are included in a single key file.

When the customer orders and installs a new key file, it overlays any previously installed key files on the library.

Therefore, it is *essential* that the contents of a new key file are verified before installing it. This verification is necessary in order to ensure that the file contains all the features purchased for that library.

If it does not contain all the features purchased, when you install the new file you could potentially remove features that have previously been installed on the library.

SL3000 Configuration Work Sheet

Enter the library and drive configurations in the table below.

TABLE 3-13 SL3000 Library Configuration

Account Information			
Site Location Number:	Account Name:		
Address:			
Contact phone numbers:			
Library Information			
Library S/N	Library name	Library IP addresses	
		. . .	. . .
Number of modules (Total): ____		Total Number of Slots: Activated Slots:	
❑ DEM	❑ CEMs (How many?___)	❑ PEMs	❑ AEMs How many?____
CAPs (Total): ____		TallBots: ❑ 1 ❑ 2 (2 TallBots require 2 PEMs or AEMs)	
Partitioned?	❑ Yes ❑ No	❑ TCP/IP ❑ Fibre Channel	How many?____ How many?____
Host Interface	❑ Ethernet ❑ Fibre Channel	Host software ❑ ACSLS	Version:
Touch Screen Operator Panel?	❑ Yes ❑ No	❑ HSC	
Web-launch SLC Server		❑ Other:	
Power Configuration	❑ N+1	❑ 2N	DC Power Supplies
Circuit Breaker Locations:			
Number of Tape Drives:	T10000: A* ❑ B* ❑	T9840: C ❑ D* ❑	LTO: 3 ❑ 4* ❑
Encryption-capable*:	❑ Yes ❑ No	❑ Yes ❑ No	❑ Yes ❑ No
Comments:			

TABLE 3-13 SL3000 Library Configuration (Continued)

Base Module — Tape Drive Information			
Drive Type (model)	Drive Address	Interface Type (FC, FICON, ESCON)	IP Address
1.			. . .
2.			. . .
3.			. . .
4.			. . .
5.			. . .
6.			. . .
7.			. . .
8.			. . .
9.			. . .
10.			. . .
11.			. . .
12.			. . .
13.			. . .
14.			. . .
15.			. . .
16.			. . .
17.			. . .
18.			. . .
19.			. . .
20.			. . .
21.			. . .
22.			. . .
23.			. . .
24.			. . .

TABLE 3-13 SL3000 Library Configuration (Continued)

Drive Expansion Module — Tape Drive Information			
Drive Type (model)	Drive Address	Interface Type (FC, FICON, ESCON)	IP Address
25.			. . .
26.			. . .
27.			. . .
28.			. . .
29.			. . .
30.			. . .
31.			. . .
32.			. . .
33.			. . .
34.			. . .
35.			. . .
36.			. . .
37.			. . .
38.			. . .
39.			. . .
40.			. . .
41.			. . .
42.			. . .
43.			. . .
44.			. . .
45.			. . .
46.			. . .
47.			. . .
48.			. . .
49.			. . .
50.			. . .
51.			. . .
52.			. . .
53.			. . .
54.			. . .
55.			. . .
56.			. . .

CHAPTER 4

Customer Site Survey

Use this chapter to prepare for the installation by reviewing the information and completing the "Site Preparation Checklist" on page 74

Other information—surveys—in this chapter includes:

Interoperability

Important:
Not sure if your customer's software of choice supports StorageTek hardware?
Do the different network components support each other?
Check out the Interoperability Tool at: https://extranet.stortek.com/interop/interop

This tool is designed for connectivity information on all supported products sold regardless of the brand. It can assist in completing a product qualification form.

The configurations listed are reflective of the most up-to-date information reported from various sources, including testing labs and our technology partners.

The Interop Tool only lists configurations with valid connectivity, *it does not validate.*

Site Preparation Checklist

Use the following checklist to ensure that the customer is ready to receive the library and to ensure that you are ready to start the installation.

See Chapter 3, "Site Planning" for supporting information such as measurements, weights, and service clearances.

TABLE 4-1 Site Preparation Checklist

Question	Answer	Comments
Delivery and Handling		
Does the customer have a delivery dock? If not, where will the equipment be delivered?	Yes ❑ No ❑	**Important:** Check the delivery route that the library must travel from the loading dock to the installation location. Make sure there are no obstructions and that the library will fit through doors, hallways, and into elevators.
If a delivery dock is available, what are the hours of operation?	_____	
Are there street or alley limitations that may hinder the delivery? For example: limited access, one-way traffic, truck size?	Yes ❑ No ❑	
Is the dock close to the computer room where the equipment will be installed? If no, how far does the equipment need to be moved?	Yes ❑ No ❑ Distance: _____	
Is an elevator required to move the equipment to the appropriate floor? What type of elevator is being used? Such as: Class A or C, freight, low-rise, passenger, service, hydraulic, pneumatic.	Yes ❑ No ❑ Description:	
What is the capacity of the elevator? What are the dimensions of the elevator?		
Are there any ramps or slopes that you need to move equipment over to get to the installation site? What is the angle?	Yes ❑ No ❑ Degrees: _____	
Will there be people available to handle the number of, size of, and weight of the shipping pallets?	Yes ❑ No ❑	
Will there be equipment available to handle the pallets (forklifts or pallet jacks)?	Yes ❑ No ❑	

TABLE 4-1 Site Preparation Checklist (Continued)

Question	Answer	Comments
Is there a *staging area* where the pallets can be placed with access to the installation site?	Yes ❑ No ❑	
Are there doorway or hallway height and width limitations that may prevent moving the equipment on the shipping pallets? Will you need to *unpack* the equipment to move it to the installation site?	Yes ❑ No ❑ Yes ❑ No ❑	Note: The SL3000 is delivered with casters and can roll into position.
Physical Placement		
The library does not require raised flooring, *but it is highly recommended.* Does the site have raised flooring? Has the floor been laser-leveled?	 Yes ❑ No ❑ Yes ❑ No ❑	
Does the customer have floor tile cut-outs available for AC power, interface cables, and vented floor tiles?	Yes ❑ No ❑	
Does the intended site have enough room to install and service the equipment?	Yes ❑ No ❑	
Can the customer's floor support the weight of the library configuration?	Yes ❑ No ❑	
Are there plans for expansion? If so, when? What type of expansion? How many *slots* does the customer *currently* have? How many expansion modules does the customer *currently* have?	Yes ❑ No ❑ Date: _____ ❑ Drives ❑ Cartridges ❑ Activation keys Slots: _____ CEMs: _____	
Can the customer's floor support the weight of future expansions?	Yes ❑ No ❑	
Is the ceiling above the library clear of obstructions such as smoke detectors, sprinklers, and vents.	Yes ❑ No ❑	
Does the equipment need to move over carpet? If so, is there protection from electrostatic discharge (ESD)?	Yes ❑ No ❑	

TABLE 4-1 Site Preparation Checklist (Continued)

Question	Answer	Comments
Environmental		
Does the site meet the environmental requirements for: ■ Temperature? ■ Relative Humidity? ■ Air flow (front, back, sides)? ■ Cooling requirements?	Yes ❑ No ❑	Temperature: 16°–32°C (60°–90°F) Humidity: 20–80%, non-condensing Current measurements: ■ Temperature ■ Relative Humidity
Does the site contain features and materials that guard against electrostatic discharge?	Yes ❑ No ❑	
Does the customer have a large dumpster and means to dispose of the packing material? Are there special requirements to dispose of or recycle the packing material, pallets, and cardboard?	Yes ❑ No ❑ Yes ❑ No ❑	
Is there concern about Seismic or Earthquake ratings for the SL3000?	Yes ❑ No ❑	
Power		
Does the intended site meet the power requirements of the equipment?	Yes ❑ No ❑	
Have arrangements been made for a qualified electrician to connect power?	Yes ❑ No ❑	
Does the site have multiple, separate circuits for power redundancy?	Yes ❑ No ❑	For 2N power configurations only
Does the customer plan to use multiple branch circuits for redundancy?	Yes ❑ No ❑	
Building Codes		
Do local, city, state, or federal codes need to be checked and approved for: ■ Wiring configurations? ■ Fire suppression requirements? ■ Clearances? ■ Safety?	 Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑	
Does the customer require a fire suppression system?	Yes ❑ No ❑	The SL3000 supports a fire suppression system; however, this is the responsibility of the customer, their insurance company, local fire department, and building codes.

TABLE 4-1 Site Preparation Checklist (Continued)

Question	Answer	Comments
Connectivity		
Is the customer using an Open Systems or an Enterprise platform?	Open ❑ Enterprise ❑	
Have you completed the Site Survey forms?	Yes ❑ No ❑	
Have you referred to the Interop Tool at https://extranet.stortek.com/interop/interop?	Yes ❑ No ❑	
Does the customer want to install equipment in the library rack space?	Yes ❑ No ❑	Note: The SL3000 has limited rack space and is for use with drive connectivity: encryption and SDP.
Have you completed a cable plan (configuration drawing)?	Yes ❑ No ❑	
Have you determined the type of and number of cables required? Library: ■ Ethernet: Host connections ■ Fibre Channel: Host connections Tape drives: ■ Fibre Channel: Data path ■ FICON or ESCON: Data path ■ Ethernet: SDP or encryption	Yes ❑ No ❑	
Is the customer prepared to supply Ethernet cables for the network?	Yes ❑ No ❑	
Can the customer provide the required number of "static" IP addresses?	Yes ❑ No ❑	
Will interface cables be run from outside the computer room?	Yes ❑ No ❑	Cables that run outside a computer room require flammability ratings of CL2/CL2P.
Tape Drives (See Appendix C, "Tape Drives and Media" on page 169)		
Does the customer have the correct type and number of tape drives? Are new or additional drives required? How many? What types? Are conversions required, such as drive trays, or interface ports (SFPs)? How many?	Yes ❑ No ❑ Yes ❑ No ❑ _____ _____ Yes ❑ No ❑ _____	Supported Drives: ■ T10000A* and B* ■ T9840C and D* ■ LTO3, 4*, and 5* * Encryption-capable

TABLE 4-1 Site Preparation Checklist (Continued)

Question	Answer	Comments
Media Factors (See Appendix C, "Tape Drives and Media" on page 169)		
Does the customer have the correct type and number of data cartridges? Are additional cartridges required? Are cleaning cartridges required? Are labels required? How many? What types?	Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ _____ _____	
Does the customer need additional CAP magazines, cartridge racks or furniture?	Yes ❑ No ❑	
Human Interface		
Are there any issues that may prevent operators from entering the library? Such as handicapped (wheel-chair), too short to reach drives in the upper bays, too tall to easily enter the library.	Yes ❑ No ❑	The width between the front and rear walls is 45 cm (18 in.), which may be difficult for some to move freely inside the library.
Where will the remote operator panels be located?	Yes ❑ No ❑	
Remote Support		
Will the customer allow StorageTek to use remote support?	Yes ❑ No ❑	
Has the SDP Systems Assurance Guide been completed?	Yes ❑ No ❑	
Has the SDP appliance and mounting hardware been ordered?	Yes ❑ No ❑	
Professional Services, Data Center Services, and Data Migration Services		
Are Professional Services required for: ■ Assessments and Migration ■ Fire suppression systems ■ Media conversion services ■ Drive and media relocations ■ Network upgrades ■ Training	 Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑ Yes ❑ No ❑	
Is the customer moving existing products and services to an SL3000 library?	Yes ❑ No ❑	

System Configuration

The following two pages provide space where you can record information about the **customers' operating systems** and configurations.

TABLE 4-2 Operating System Survey

Question	Answer
1. How many and what types of operating systems or platforms does the customer have? **Open-Systems:** • Windows: 2000, NT... Make & Model: Quantity: • UNIX: Solaris, AIX, HP-UX... Make & Model: Quantity: • Linux... Make & Model: Quantity: **Mainframe:** • MVS Make & Model: Quantity: • VM Make & Model: Quantity: **Other (Specify):** Make & Model: Quantity:	
2. Are there plans for: • New purchases? • Future upgrades? • If so, what?	
3. How many systems/servers are used as: • Backup servers? • File servers? • Print servers? • Exchange servers?	

TABLE 4-3 System Configuration

System _____	**Processor** _____	**Processor** _____
Vendor Make & Model		
Operating System Type		
Version Number & Patch Level		
Number of Channels		
IP Address		
HBA Vendor & Model		
HBA Firmware Versions		
Switch & Port Numbers		
Switch Make & Model		
ESCD and HCD support		
ESCON Director Make & Model		
ESCON Manager		
FICON support		
EREP		
Ports		
System _____	**Processor** _____	**Processor** _____
Vendor Make & Model		
Operating System		
Version Number & Patch Level		
Number of Channels		
IP Address		
HBA Vendor & Model		
HBA Firmware Versions		
Switch & Port Numbers		
Switch Make & Model		
ESCD and HCD support		
ESCON Director Make & Model		
ESCON Manager		
FICON support		
EREP		
Ports		

Applications

The following pages provide space where you can record information about the **customer's applications**.

TABLE 4-4 Customer Applications

Question	Answer
1. How many servers or systems perform backups? 2. How are backups performed, manually or automatically?	
3. On what days are backups performed? 4. What types of backups are performed and when? • Full: • Incremental: • Differential: 5. How many hours are available for: • Full backups? • Daily Backups?	
6. How much data is backed up: • Per day? • Per week? • Per month? 7. How much data changes daily (%)?	
8. Are backup windows being met? 9. How long does it actually take? 10. How long should a backup take? 11. Is a different backup schedule needed?	
12. How long does the customer keep the different levels of backed up data? 13. How many copies are made (including the original)? 14. How many copies are archived?	
15. How often are restores necessary? 16. Why are restores necessary? 17. What are the restore requirements? 18. What are the restore objectives?	

TABLE 4-5 Backup and Archive Software

Selection	Type of Backup and Archive Software	Version
❑	Symantic Veritas NetBackup Backup Manager	
❑	IBM Tivoli Storage Manager (TSM)	
❑	Legato NetWorker	
❑	CA Brightstor	
❑	HP Omniback	
❑	ASM	
❑	E-Mail Archive	
❑	SAM FS	
❑	Other (Specify) ❑ ❑	

Table 57. Network Management Software

Selection	Type of Network Management	Version
❑	Symantic Veritas	
❑	IBM Tivoli NetView	
❑	HP OpenView	
❑	HP SUNNet	
❑	RMS/GSM	
❑	Other (Specify) ❑ ❑	

Table 58. Library Attachment Software

Selection	Type of Library Attachment	Version
❑	HSC	
❑	ACSLS (TCP/IP attach only)	
❑	ACSLS HA (TCP/IP attach only)	
❑	Fibre Channel	
❑	Other (Specify) ❑ ❑	

SCSI Media Changer Applications

TABLE 4-6 SCSI Media Changer (SMC) Qualification Summary

Backup Application	Solaris	IBM AIX	HP-UX	Microsoft Windows	Linux		NetApp ONTAP
					Red Hat	SUSE	
Legato NetWorker 7.3/7.4	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Tivoli Storage Manager 5.5.1	Yes	Yes	Yes	Yes	Yes	Yes	N/A
Symantec Backup Exec 11.0	N/A	N/A	N/A	Yes	N/A	N/A	N/A
Symantec Netbackup 6.0/6.5	Yes	Yes	Yes	Yes	Yes	TBD	N/A
Symantec Netbackup 6.0/6.5 (Partition)	Yes	Yes	Yes	Yes	Yes	TBD	N/A
CA ArcServe 11.5+	Yes	Yes	Yes	Yes	Yes	Yes	N/A
HP Data Protector 5.5/6.0	Yes	N/A	Yes	Yes	TBD	TBD	N/A
BakBone NetVault 8.2+	Yes	Yes	Yes	Yes	Yes	TBD	N/A
SAM-FS 4.6	Yes	N/A	N/A	N/A	N/A	N/A	N/A
Netapp ONTAP 7.2.3	N/A	N/A	N/A	N/A	N/A	N/A	Yes

Brocade	Yes	Yes	Yes	Yes	Yes	TBD	N/A
Cisco	Yes	Yes	Yes	Yes	Yes	TBD	N/A
QLogic	Yes	N/A	N/A	Yes	Yes	TBD	N/A
Emulex	Yes	N/A	N/A	Yes	Yes	TBD	N/A

Databases

TABLE 4-7 Customer Databases

Question	Answer
1. How much primary storage exists? Total capacity.	
2. What type and size of disk drives does the customer have?	
Make: Model: Capacity: Quantity:	
Make: Model: Capacity: Quantity:	
3. What is the RAID configuration? 4. What type of Failover product and Version is the customer using?	
5. Does all primary storage require backup? If not, how much does? 6. Are additional storage devices needed?	
7. What Data Base Management Systems (DBMS's) does the customer have? 8. What types of databases need backups? 9. What is the size of the smallest database? 10. What is the size of the largest database? 11. How often does the customer backup each database?	
12. What type of data is the customer backing up? 13. How valuable is the data in each database? 14. Do the different databases have different backup requirements?	
15. How is the customer currently protecting the databases (tape backup, mirroring, snapshot)? 16. If mirroring, how many mirrors? 17. Is mirroring installed because failover is required?	

Hardware Configurations

List any existing hardware the customer currently has:

- Does the customer have any existing libraries? ❑ Yes ❑ No
- Does the customer have any existing tape drives? ❑ Yes ❑ No
- Does the customer have any existing media for reuse? ❑ Yes ❑ No
- Does the customer have an existing storage area network? ❑ Yes ❑ No
- Are migration services required? ❑ Yes ❑ No

Library

- Will this SL3000 library be replacing existing libraries? ❑ Yes ❑ No
- Replacing existing StorageTek libraries? ❑ Yes ❑ No
- If so, what are the module numbers? _____

TABLE 4-8 Existing Libraries

Libraries	Description
Manufacturer	
Make & Model	
Cartridge Capacity	
Library Management Software	
Interface type	

Manufacturer	
Make & Model	
Cartridge Capacity	
Library Management Software	
Interface type	

Manufacturer	
Make & Model	
Cartridge Capacity	
Library Management Software	
Interface type	

Tape Drives

- Does the customer have existing StorageTek tape drives? ❑ Yes ❑ No
- Does the customer need more tape drives? ❑ Yes ❑ No
- What types of drives are needed? _____

TABLE 4-9 Tape Drive Types

Tape Drive Type	Yes	No	Vendor
3480 or 3490-type devices (18/36 track)	❑	❑	
DLT 7000 or 8000	❑	❑	
StorageTek T9840*	❑	❑	
StorageTek T9940	❑	❑	
StorageTek T10000*	❑	❑	
SDLT 320, SDLT 600, or DLT-S4	❑	❑	
LTO Generation 1, 2, 3, or 4*	❑	❑	
Notes: See "Tape Drive X-options and Conversion Bills" on page 116 for conversion kits from other StorageTek libraries to SL3000 library operation. See the T9X40 and T10000 SAGs for drive tray conversion kits to adapt T9840 and T10000 drives from other StorageTek libraries to SL3000 library operation.			

TABLE 4-10 Existing Tape Drives

Tape Drives	Description	Quantity
Manufacturer		
Make & Model		

Manufacturer		
Make & Model		

Manufacturer		
Make & Model		

Manufacturer		
Make & Model		

Does the customer plan to use encryption-capable tape drives? ❑ Yes ❑ No

Data Cartridges

- Approximately, how many tape cartridges does the customer have? _____
- Does the customer need more tapes? ❑ Yes ❑ No
- Data cartridges? ❑ Yes ❑ No
- Cleaning cartridges? ❑ Yes ❑ No

TABLE 4-11 Existing Tape Cartridges

Tape Cartridges	Description	Quantity
Data Cartridge Type		
Manufacturer		

Data Cartridge Type		
Manufacturer		

Data Cartridge Type		
Manufacturer		

Data Cartridge Type		
Manufacturer		

Data Cartridge Type		
Manufacturer		

Cleaning Cartridge Type		
Manufacturer		

Cleaning Cartridge Type		
Manufacturer		

Cleaning Cartridge Type		
Manufacturer		

Network and Components

- Does the customer have an existing storage area network? ❑ Yes ❑ No
- Are additional network devices required? ❑ Yes ❑ No
- What are they? _____
- Does the customer use *zones* in the network? ❑ Yes ❑ No
- Are there frequent reconfigurations of the network? ❑ Yes ❑ No
- Are there multiple floors involved with this network? ❑ Yes ❑ No
- Are there inter-connections of hubs and switches? ❑ Yes ❑ No
- Are there remote connections to hubs and switches? ❑ Yes ❑ No
- Is this a campus network? ❑ Yes ❑ No
- Are trunk cables used? ❑ Yes ❑ No
- Are patch panels used? ❑ Yes ❑ No

TABLE 4-12 Fibre Channel Switches

Information	Switch 1	Switch 2	Switch 3
Manufacturer			
Make & Model			
Software version			
Speed			
Number of Ports			
Port types			
GBIC Module types			
Number of Open Ports			
IP Addresses			
IP Addresses			

TABLE 4-13 Ethernet Hubs and Switches

Information	Hub/Switch 1	Hub/Switch 2	Hub/Switch 3
Manufacturer			
Make & Model			
Number of Ports			
Software version			
Speed			
Duplex			
Number of Open Ports			
IP Addresses			
IP Addresses			

TABLE 4-14 Fibre Channel Switch Connections

FC Switch Information	Switch 1	Switch 2	Switch 3
Vendor			
Model Number			
Port 0 Connection and Status			
Port 1 Connection and Status			
Port 2 Connection and Status			
Port 3 Connection and Status			
Port 4 Connection and Status			
Port 5 Connection and Status			
Port 6 Connection and Status			
Port 7 Connection and Status			
Port 8 Connection and Status			
Port 9 Connection and Status			
Port 10 Connection and Status			
Port 11 Connection and Status			
Port 12 Connection and Status			
Port 13 Connection and Status			
Port 14 Connection and Status			
Port 15 Connection and Status			
Port 16 Connection and Status			
Port 17 Connection and Status			
Port 18 Connection and Status			
Port 19 Connection and Status			
Port 20 Connection and Status			
Port 21 Connection and Status			
Port 22 Connection and Status			
Port 23 Connection and Status			
Port 24 Connection and Status			
Port 25 Connection and Status			
Port 26 Connection and Status			
Port 27 Connection and Status			
Port 28 Connection and Status			
Port 29 Connection and Status			
Port 30 Connection and Status			
Port 31 Connection and Status			

ESCON Directors

- How many ESCON Directors does the customer have? _____
- Is an extended distance facility or feature installed? ❑ Yes ❑ No
- Are patch panels used? ❑ Yes ❑ No
- How many ports? _____
  (18, 36, 72)
- Are trunk cables used? ❑ Yes ❑ No
  How many? _____
- What type of connectors are used? _____
  (ST, MTP, ESCON, MTRJ)
- Are couplers used? ❑ Yes ❑ No
- Are adapters used? ❑ Yes ❑ No
- Are standard or custom ESCON jumper cables used? ❑ Std ❑ Custom
- Are there any FICON Bridge Ports? ❑ Yes ❑ No
- Are Fibre Transport Services used with trunk cables? ❑ Yes ❑ No

TABLE 4-15 ESCON Directors

Information	Director 1	Director 2	Director 3
Manufacturer			
Make & Model			
Software version			

Ports per card			
Number of LED ports			
Number of XDF ports			
Number of FICON ports			
Number of Bridge cards			
Number of Open ports			

Channel Addresses			
Channel Addresses			

IP Addresses			
IP Addresses			

FICON Directors

FICON products use a mapping layer based on the existing ANSI standards and physical cabling for Fibre Channel but uses different switches called directors similar to ESCON.

- What type of operating system does the customer have? _____ (z/OS, OS/390, 9672 G5/G6, etc.)
- How many FICON Directors does the customer have?_____
- Are cascaded directors used to extend distance? ❑ Yes ❑ No
- Are patch panels used? ❑ Yes ❑ No
- How many ports? _____
- Are trunk cables used? ❑ Yes ❑ No
  How many? _____
- What type of connectors are used? _____

TABLE 4-16 FICON Director Worksheet

FICON Director Worksheet								
Manufacturer:				**Type:**			**Model:**	
HCD Switch ID: **Director Domain ID (@)**					**Cascaded Directors** ❑ **Yes** ❑ **No** **Fabric Name:**			
Director F_Ports					**Attached N_Ports or E_Ports**			
Slot #	**Port #**	**Port Address**	**Type (LX / SX)**	**Port Name**	**Node (CU/Chnl)**	**Device Type**	**Model**	**ISL CU Intf. CHPID**

Cables

Cables types and distances that apply to the library and tape drives are explained in the follow sections.

Library Network Cables

The maximum distances that the SL3000 Tape Library supports on a Fibre Channel link is determined by the link speed, the type of fiber (50 or 62.5 micron), and the device to which the library is attached.

The library can be used in a 62.5-micron-cable Storage Area Network (SAN). However, the cable that connects the library to the network must be a 50-micron cable because the library uses 50-micron cables internally.

Refer to your switch vendor to determine what is supported in the customers storage area network.

In a SAN, the typical support distances for 62.5-micron cables are:

- 4 Gbps link speed = up to 70 m (230 ft)
- 2 Gbps link speed = up to 150 m (492 ft)
- 1 Gbps link speed = up to 175 m (574 ft)

Typical supported distances for 50-micron cables (used to connect with the library) are:

- 4 Gbps link speed = up to 150 m (492 ft)
- 2 Gbps link speed = up to 300 m (984 ft)
- 1 Gbps link speed = up to 500 m (1640 ft)

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

A list of cables is supplied in "Cables" on page 118.

Tape Drive Cables

A list of cables is supplied in "Cables" on page 118.

If the drives are connected to the optional Ethernet switches (see "Ethernet Switch/Harnesses" on page 108) to connect to the drives, the cable connections between each drive and the switch are at the rear of the base or drive expansion modules.

Using World Wide Names

This section discusses the World Wide Name (WWN) addresses that the SL3000 Tape Library assigns to drives. The WWN does not change when the drive is swapped or replaced and host parameters do not need to be changed or re-configured.

Normally, blocks of World Wide Name (WWN) addresses are assigned to manufacturers by the IEEE Standards Committee and are built into devices during manufacture. In the case of the SL3000 Tape Library, however, the library assigns World Wide Node Names and World Wide Port Names to the drives. This technique is referred to as "library-centric world wide names." Potential drive slots are each assigned a WWN which does not change when a drive is swapped or replaced.

In the SL3000 Tape Library, a WWN for a drive is implemented through an algorithm that uses the frame serial number of the library and the drive's position within the library. Only the last two digits change within the library. The second-to-the-last digit represents the frame number (starting at 0 for Frame 1) and the last digit is the drive row (starting at 1). The WWN of the drive is location-dependent and not device-dependent. That is, each time a drive is reset or powered on, the library re-establishes the WWN so that a drive in frame x, row y always retains the same WWN—host parameters do not need to be changed or re-configured. The library's configuration can also easily survive a reboot. The following sections describe methods that involve World Wide Names in resolving these issues.

Tape Drive Dynamic World Wide Name

Each connection (port) in a Fibre Channel environment must have a unique ID called the World Wide Name (WWN). The WWN is a 64-bit address that identifies each individual device.

When a tape drive logs-in to a Fibre Channel network, the WWN is validated for access by comparing Port Name, Node Name, and Port ID. All three of these identifiers must match or this indicates the configuration has changed and the port is blocked from access.

The dynamic World Wide Name (dWWN) feature assigns world wide names to the library drive slots rather than the drives themselves which allows you to swap or replace devices, such as tape drives, without bringing down the entire operating system.

Using Persistent Binding

When a server is booted, devices are discovered and assigned SCSI target and LUN IDs. It is possible for these SCSI assignments to change between boots. Some operating systems do not guarantee that devices will always be allocated the same SCSI target ID after rebooting. Also, some software depends on this association, so you do not want it to change. The issue of SCSI ID assignment is addressed by persistent binding.

Persistent binding is a host bus adapter (HBA) function that allows a subset of discovered targets to be bound between a server and device. Implemented by a World Wide Node Name (WWNN) or World Wide Port Name (WWPN), persistent binding causes a tape drive's World Wide Name to be bound to a specific SCSI target ID. After a configuration has been set, it survives reboots and any hardware configuration changes because the information is preserved. If a drive needs to be replaced, the new drive assumes the WWNN of the old drive because the WWNN for the drive is location-dependent within the library. Because the WWNN does not change, persistent binding does not need to be changed, which would otherwise cause an outage.

Using Zoning to Isolate Devices and Enhance Security

For security reasons, it is important to limit the devices that a server or servers can recognize or access. Also, some performance configurations and Storage Area Network (SAN) configurations can result in a device being seen multiple times from the same server. For example, if you have two host bus adapters (HBAs) from the same server connected to a tape drive in the SL3000 Tape Library, the drive will be detected and appear as two logical devices. That is, there will be two special files for one physical device. Zoning can address these issues.

Zoning allows you to partition your SAN into logical groupings of devices so that each group is isolated from the other and can only access the devices in its own group. Two types of zoning exist: hardware zoning and software zoning. Hardware zoning is based on physical fabric port number. Software zoning is defined with the World Wide Node Name (WWNN) or World Wide Port Name (WWPN).

While zoning can be re-configured without causing an outage, some zoning configurations can become complicated. The advantage of the library's WWNN implementation is that you can avoid the exposure of introducing zoning errors because there is no need to change the zoning configuration if a drive needs service or replacement.

CHAPTER 5

Ordering

Use this chapter to help order the SL3000 library, configurations, X-Options, additional features, and conversion bills.

Information in this chapter includes:

- "Ordering Flowchart" (below): provides an ordering process
- "Library Part Number Details" on page 106: lists what is included with each part
- "Library X-Options" on page 110: identifies the upgrades to the library
- "Tape Drive Selection" on page 112: lists the numbers for the tape drives
- "Tape Drive X-options and Conversion Bills" on page 116: identifies upgrades
- "Cables" on page 118: lists the supported interface cables for the library and drives

Ordering Flowchart—Just the Facts

FIGURE 5-1 shows the different steps to order a new SL3000 library.
TABLE 5-1 steps you through a typical ordering process for a new SL3000 library.

- For more information about capacities, see:

  "Physical Capacities" on page 11

- For more information about DC power supplies, see:

  "Single Drive Type DC Power Configurations" on page 15
  "Mixed Drive Type DC Power Configurations" on page 16

- For more information about what is included for the initial order (Step 1), see:

  "Library Part Number Details" on page 106

Part numbers are composed of many elements. For example, SL3000-BM1-200-Z-N is:

- **SL3000** indicates the library model number
- **BM1** indicates a Base module configuration (1)
- **200** indicates the library has a capacity of 200 data cartridges
- **Z** indicates compliance with ROHS requirements
- **N** indicates Oracle's addition or update to the part number

Note – An 'X' in front of the model number indicates an X-option, which is an upgrade or conversion—such as: XSL3000-CEM-N—which adds a Cartridge Expansion module to the base module in the library.

FIGURE 5-1 Ordering Flowchart

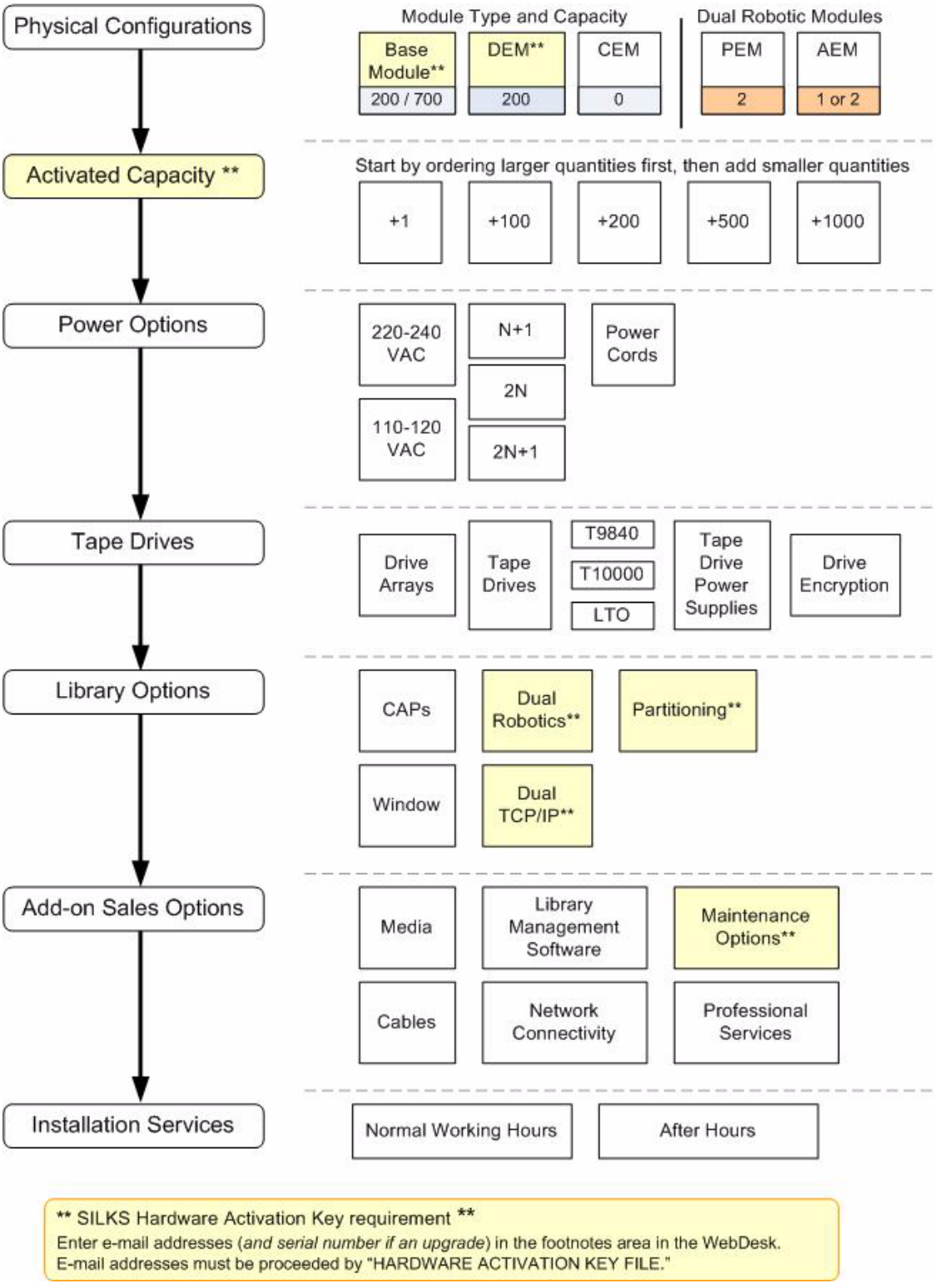


TABLE 5-1 Ordering Flowchart

1. Select an initial base library **configuration** from Step 1 items "**a** through **g**" below. Identify any additional expansion modules as required in Steps 2, 3, 4, and 5.
2. Determine the number of slots needed in Step 6. *Suggestion:* Identify the number of physical slots currently needed, then *add* some capacity to meet the needs for future growth.
3. Determine the power configuration. Calculate the number of power supplies required to power the library and options selected in Steps 7, 8, and 9.
4. Select the quantity and type of tape drives. Note: The SL3000 supports Any Cartridge, Any Slot true mixed media using Steps 10, 11, 12, and 13.
5. Select the library options with Steps 14 through 20.
6. Determine any "Add-on" sales options such as tape drive quantities and types, media, networking.
7. Select an equivalent installation option.

Physical Configurations		
Step Number	**Marketing Number**	**Comments**
1. Select a configuration for the **Base library:**		*Required* ■ One of these part numbers is required for the initial order, then build from there. ■ Maximum quantity of 1 is required for a library order. ■ See "Library Part Number Details" on page 106 for a description of what comes with each part number. ■ Additional capacity above either 200 or 700 slots requires an upgrade. See "Additional Capacity" on page 108. ■ See "Hardware Activation Key Files" on page 105 for information about features.
a. Up to 343 physical (with 200 activated slots) ❑ Installation ❑ After hours installation	a. SL3000-BM0-200-Z-N EIS-SLBASE-E EIS-SLBASE-E-AH	
b. Up to 953 physical (with 200 activated slots) ❑ Installation ❑ After hours installation	b. SL3000-BM1-200-Z-N EIS-SL3K-BSE1CEM-E EIS-SL3BS1CEM-E-AH	
c. Up to 1557 physical (with 200 activated slots) ❑ Installation ❑ After hours installation	c. SL3000-BM2-200-Z-N EIS-SL3K-BSE2CEM-E EIS-SL3BS2CEM-E-AH	
d. Up to 953 physical (with 200 activated slots) ❑ Installation ❑ After hours installation	d. SL3000-BM1-700-N EIS-SL3K-BSE1CEM-E EIS-SL3BS1CEM-E-AH	
e. Up to 1557 physical (with 700 activated slots) ❑ Installation ❑ After hours installation	e. SL3000-BM2-700-N EIS-SL3K-BSE2CEM-E EIS-SL3BS2CEM-E-AH	
f. Up to 2177 physical (with 700 activated slots) ❑ Installation ❑ After hours installation	f. SL3000-BM3-700-N EIS-SL3K-BSE3CEM-E EIS-SL3BS3CEM-E-AH	
g. Up to 2797 physical (with 700 activated slots) ❑ Installation ❑ After hours installation	g. SL3000-BM4-700-N EIS-SL3K-BSE4CEM-E EIS-SL3BS4CEM-E-AH	

TABLE 5-1 Ordering Flowchart (Continued)

Optional Module Selections:		
2. Order a **Drive Expansion Module**? ■ When more than 24 tape drives are required or ■ When a specific configuration is needed (for example, special drive placement, or to maximize performance) ❑ Installation ❑ After hours installation	XSL3000K-DEM200-N EIS-SL-CEMDEM-E EIS-SL-CEMDEM-E-AH	*Optional* ■ One DEM maximum per library ■ Ordering a DEM adds ▪ 200 "activated" slots ▪ 8 drive slots Maximum of 32 drive slots
3. Order any **Cartridge Expansion Modules**? ■ When ordering items "**a** to **f**" for a Base library configuration (Step 1), and ■ When more physical slot capacity is needed ❑ Installation ❑ After hours installation	XSL3000-CEM-Z-N EIS-SL-CEMDEM-E EIS-SL-CEMDEM-E-AH	*Optional* ■ Eight CEMs maximum per library. ■ Includes all the CEMs bundled with the Base library configuration ■ See "Hardware Activation Key Files" on page 105 for more information.
Dual Robotics Modules		
4. Order **Parking Expansion Modules**? ■ When ordering the Redundant Robotic option. ▪ Two 2 PEMs, one on each end, *is required* to support dual robotics. ▪ This can be 2 CEMs, then converted to two PEMs. ▪ The library requires the 2N power configuration. ▪ There is a loss of physical capacity when choosing this option. Make sure the library capacity still meets customer needs ❑ Installation ❑ After hours installation	XSL3000-CEM-Z-N EIS-SL-CEMDEM-E EIS-SL-CEMDEM-E-AH	*Optional* ■ Two PEMs are required per library ■ Two existing or two new CEMs are converted to PEMs ■ Left side PEM supports an *optional* CAP ■ Right side PEM does not support an *optional* CAP
5. Order **Access Expansion Modules**? ■ When a Bulk Load CAP is needed (1). ■ When ordering the Redundant Robotic option (2). ❑ Installation ❑ After hours installation	XSL3000-AEM-RT-Z-N XSL3000-AEM-LFT-N EIS-SL-CEMDEM-E EIS-SL-CEMDEM-E-AH	*Optional* Either: ■ One = Bulk Load (either end; however, left end provides more capacity) ■ Two = Redundant robotics option

TABLE 5-1 Ordering Flowchart (Continued)

Additional Activated Capacity		
6. Order additional **Capacity**? When more physical slot capacity is needed Remember: a. Base library configurations come standard with 200 or 700 activated slots. b. The DEM adds 200 activated slots. c. Order larger quantities first, then add more quantities to meet customer needs.		*Optional* See "Hardware Activation Key Files" on page 105 for more information.
■ 1,000 incremental slots	XSL3000K-1000SLOT-N	
■ 500 incremental slots	XSL3000K-500-SLOT-N	
■ 200 incremental slots	XSL3000K-200-SLOT-N	
■ 1 incremental slots	XSL3000K-1-SLOT-N	
❑ Installation ❑ After hours installation	EIS-SL3-CAPY-E EIS-SL3-CAPY-E-AH	
Note: Capacity keys are customer-installable. Therefore, installation parts are optional. If installation is ordered, only a quantity of 1 install part is needed, regardless of the quantity ordered.		
Power Options		
7. Determine the type of **AC Power** required:		***Required*** At least one PDU is required *in each*: ■ The Base Module ■ The Drive Expansion Module (if applicable)
■ 200—240 VAC, 30 Amp (PDU) ❑ Installation ❑ After hours installation	■ XSL3000-PDU-240-N EIS-SL3K-PWR-E EIS-SL3K-PWR-E-AH	
■ 100—127 VAC, 20 Amp (PDU) ❑ Installation ❑ After hours installation	■ XSL3000-PDU-110-N EIS-SL3K-PWR-E EIS-SL3K-PWR-E-AH	
■ Are you installing a DEM? If so, the *same* type PDU must be installed in *both* the base and DEM.	■ Increase the quantity to 2 Keep install quantity at 1	
8. Determine the type of **Power Redundancy**		See "Power Options" on page 13 and the Power Configuration tables to determine how many DC power supplies are needed. (continued)
■ **N+1** One AC PDU, with one extra DC supply than is required for the drives and a single TallBot	XSL3000-DCPWR-Z-N Use Step 12 to determine the amount of DC power supplies required. No other parts are required.	

TABLE 5-1 Ordering Flowchart (Continued)

■ **2N** Two AC PDUs, each with its own set of DC power supplies for the drives and the TallBots *Required for dual TallBot operation	XSL3000-DCPWR-Z-N Double the number of PDUs from above. Use Step 12 to determine the amount of DC power supplies required. No other parts are required	(continued) See "Power Options" on page 13 and the Power Configuration tables to determine how many DC power supplies are needed.
■ **2N+1** *Two* AC PDUs, each with *one* extra DC power supply than is required for the drives and the TallBots. This has N+1 for the first and second PDU. ❏ Installation ❏ After hours installation	Double the number of PDUs from above. In addition, add the following: ■ XSL3000-DCPWR-Z-N, quantity 1 for the TallBot ■ XSL3000-EM-DCPWR-N, quantity 2 for the ECM ■ XSL3000-DCPWR-Z-N for some quantity of drives EIS-SL3K-PWR-E EIS-SL3K-PWR-E-AH	
9. Include **Power Cords** for the PDU. You need one power cord for every PDU. How many PDUs were selected? ■ 200—240 VAC, 30 Amp, U.S. ■ 200—240 VAC, 30 Amp, International ■ 100—127 VAC, 20 Amp No installation parts required.	■ XSL3000-PC30220-N ■ XSL3000-IPC30220-N ■ XSL3000-PC20110-N	***Required*** Order one power cord for each PDU ordered.

TABLE 5-1 Ordering Flowchart (Continued)

Tape Drives		
10. **Drive Arrays.** This step determines the number of drive arrays needed to support the tape drives. **How many tape drives will be *installed*?** **Base:** One array (1-8 tape drives) is standard ■ 9 to 16 tape drives (order 1 array) ■ 17 to 24 tape drives (order 2 arrays) **DEM:** One array (25-32 drives) is standard ■ 33 to 40 tape drives (order 1 array) ■ 41 to 48 tape drives (order 2 arrays) ■ 49 to 56 tape drives (order 3 arrays) **Note:** This step assumes all available drive slots are filled before ordering more capacity. If this assumption is incorrect, discuss the configuration options to make sure you have enough drive arrays installed. No installation parts required.	Quantity: a. Standard component. No extra parts required b. 1of XSL3000-DRVARY-Z-N c. 2 of XSL3000-DRVARY-Z-N d. 2 of XSL3000-DRVARY-Z-N plus 1 XSL3000K-DEM200-N e. 3 of XSL3000-DRVARY-N plus 1 XSL3000K-DEM200-N f. 4 of XSL3000-DRVARY-N plus 1 XSL3000K-DEM200-N g. 5 of XSL3000-DRVARY-N plus 1 XSL3000K-DEM200-N	*Optional* Depends on the number of drives needed. Each array holds up to 8 tape drives. Maximum quantity of: ■ 3 in the Base module ■ 4 in the DEM **Important:** As drive arrays are installed, rear wall slots are removed. Make sure the library capacity still meets the customer needs.
11.Order **Tape Drives** as required. Refer to the StorageTek Tape Drive guides for more information about the T9840 and T10000 tape drives.	See "Tape Drive Selection" on page 112 and: ■ TABLE 5-4 for T9840 ■ TABLE 5-5 for T10000 ■ TABLE 5-6 for LTO	
12. **Tape Drive DC Power Supplies** (DCPS). This is a critical step—Make sure to use the tables provided in TABLE 1-3 on page 15 through TABLE 1-7 on page 17 or use the configuration presentation. You need to know: a. How many drives are to be installed? (include new and transferred drives) b. What type of drives? (T9840C/D, T10000A/B, or LTO) c. What is the PDU configuration? (From Step 7). d. What is the power redundancy? (From Step 8). Use this information to calculate the number of DC power supplies needed for *both* the Base module and DEM. No installation parts required.	XSL3000-DCPWR-Z-N	Quantities vary depending on: ■ PDU-type ■ Power redundancy ■ Tape drive types ■ Number of drives

TABLE 5-1 Ordering Flowchart (Continued)

13.Is tape drive **Encryption** wanted? If so, you must order the following parts. These parts are cumulative. Adding these parts expands on the configuration. a. Supports drives 1 to 8 (Base) b. Supports drive 9 to 16 (Base) c. Supports drive 17 to 24 (Base) d. Supports drive 1 to 8 (DEM) e. Supports drive 9 to 16 (DEM) f. Supports drive 17 to 24 (DEM) g. Supports drive 24 to 32 (DEM) **Note:** This step is based on where drive are located within the library base module or drive module. If this assumption is incorrect—for example, a specific configuration need, special drive placement, or to maximize performance— discuss the configuration options to make sure you have enough Ethernet switches and cables.	 a. XSL3000-ETHRNT1-N b. XSL3000-ETHRNT2-N c. XSL3000-ETHRNT3-N d. XSL3000-ETHRNT1-N e. XSL3000-ETHRNT2-N f. XSL3000-ETHRNT3-N g. XSL3000-ETHRNT4-N	*Optional* **Note:** These parts can also provide connection for the Service Delivery Platform (SDP).
Optional Features		
14.Is **Partitioning** needed? If yes, then add this part. No installation parts required.	XSL3000K-PART-N	*Optional* 1 feature option per library See "Hardware Activation Key Files" on page 105.
15.Are extra **Cartridge Access Ports** needed? If yes, then add this part. How many additional CAPs are needed? One CAP comes standard in the Base module. ❏ Installation ❏ After hours installation	XSL3000-CAP-Z-N EIS-SL3K-ACCE-E EIS-SL3K-ACCE-E-AH	*Optional* ■ One CAP per module ■ Library total = 10 (including the Base) ■ A maximum of 9 may be ordered

TABLE 5-1 Ordering Flowchart (Continued)

16.**Operator Panel** or **Window Arrays**? The Base module and DEM ship with a perforated panel (standard). If this panel is acceptable, no other order is needed. However, two other options are available: ■ Local touch screen operator panel (Base module only) OR ■ Window arrays—adds 23 physical slots (Base or DEM) ❑ Installation ❑ After hours installation No installation parts required.	 ■ XSL3000-OP-PANL-N ■ XSL3000-W-ARRAY-N EIS-SL3-OPT-E EIS-SL3-OPT-E-AH	*Optional*
17.**Redundant TallBots**? Does the customer want dual robotics? If so... The library requires *either* 2 PEMs (Step 4) or 2 AEMs (Step 5) in the library configuration. The library requires a 2N power configuration and 200-240 VAC Power Supplies (Steps 7, 8, and 9). ❑ Installation ❑ After hours installation	XSL3000K-DUALBOT-N EIS-SL3K-BOT-E EIS-SL3K-BOT-E-AH	*Optional* 1 order per library (total of 2 Tallbots) See "Hardware Activation Key Files" on page 105
18.Decide if the **Dual TCP/IP** feature is wanted for host connectivity? If so, add this part. **Note:** The Dual TCP/IP feature provides *dual path* functionality, not redundancy. No installation parts required.	XSL3000K-2TCPIP-N	*Optional* 1 per library (total of 2 ports) See "Hardware Activation Key Files" on page 105
19.Decide if the **Dual Fibre Channel** feature (PUA2 card) is wanted for host connectivity? If so, add this part.	XSL3000K-2FCPORT XSL3000K-2FCARD	
20.Decide if extra **CAP magazines** are needed. If so, add this part.	XSL3000-CAP-MAG-N	
Add-on Sales Options		
21.Order appropriate **Media** as needed.	See Appendix C	
22.Order **Cleaning Cartridges** as required.	See Appendix C	
23.Order **Tape Drive Interface Cables** as required.	See "Fibre Channel, ESCON, and Ethernet Cables" on page 118.	

TABLE 5-1 Ordering Flowchart (Continued)

24.Order **Control Path** cables.	See TCP/IP—"Ethernet Cables" on page 120	
25.**Network Connectivity**. Order Ethernet switches and host bus adapters (HBAs)		
26.**Mainframe connection**? Order HSC.	Refer to the HSC documentation	
27.**Open systems connection**? Order ACSLS.	Refer to the ACSLS documentation	
28.**AS400 connection**? Order ACSLS	Refer to the ACSLS documentation	
29.Order **Backup and Restore Application** of choice: ▪ Solstice Backup™ software ▪ VERITAS NetBackup software ▪ See additional listings on page 37		
Important: The product warranty is void if not installed by a trained professional.		
30.Order product **Installation** services	See the list of parts in "Library Part Number Details" on page 106. Add installation parts for the corresponding library parts. Note: Not all parts require installation.	*Required* Professional installation is required.
31.Order **Maintenance** services	Add the appropriate maintenance service. The library comes standard with: ▪ One year, ▪ Next day warranty	*Optional* See "Hardware Activation Key Files" on page 105

Hardware Activation Key Files

Hardware Activation keys are files required to enable certain features purchased for the SL3000 library. Any parts that contain the phrase “MUST REQUEST HARDWARE ACTIVATION KEY FILE” in the description require an activation key file to be loaded into the SL3000 library.

Activation Files for New Libraries

To ensure proper hardware activation key file creation and delivery:

1. Only place ONE library on any sales order or quote.
   The reason for this requirement is that we have to create the hardware activation keys specific to *each* library. If two libraries are on the same order, we do not know which features should be applied to which library.
2. E-mail addresses:
   In the footnotes section of your Webdesk quotes, place all the e-mail addresses (limit of three addresses) where you want the hardware activation key file sent.
   a. Proceed each e-mail with the words “HARDWARE ACTIVATION KEY FILE”.
   b. The hardware activation file is customer-installable.

Upgrades to Existing Libraries

To ensure proper hardware activation key file creation and delivery:

1. Only place ONE library on any sales order or quote.
   The reason for this requirement is that we have to create the hardware activation keys specific to *each* library. If two libraries are on the same order, we do not know which features should be applied to which library.
2. E-mail addresses:
   In the footnotes section of your Webdesk quotes, place all the e-mail addresses (limit of three addresses) where you want the hardware activation key file sent.
   a. Proceed each e-mail with the words “HARDWARE ACTIVATION KEY FILE”.
   b. The hardware activation file is customer-installable.
3. Include the Library Serial Number.
   The library serial number **must be included** in the footnotes area of the Webdesk quote along with the e-mail addresses.

All SL3000 base libraries require an activation key file to be installed during the initial installation. Other parts that require activation are:

- Activated slot capacity
- Drive Expansion Module
- Partitioning
- Dual Robotic feature
- Dual TCP/IP control path
- Dual Fibre Channel (FC) control path
- Maintenance Service Upgrades
- Log Snapshot

Library Part Number Details

The following describes what is included with each initial marketing part number on page 97. Each number comes with the following "standard" components:

- Library controller, two Ethernet ports—only one active port[3]—for TCP/IP library
- Native Fibre Channel port (MPU2 card) for SCSI-controlled libraries
- One tape drive bay (holds up to 8 T9840C/D, T10000A/B, or LTO3/4/**5** drives)
- Perforated panel in the front door
- One 26-slot cartridge access port (CAP): with two 13-slot removable magazines
- Two 1200 Watt DC tape drive power supplies
- Two 1200 Watt DC TallBot power supplies
- Two 200 Watt electronics control module power supplies
- StorageTek Library Console (SLC) remote management application

SL3000-BM0-200-Z-N (base library) includes:

- Base module
- 200 activated slots
- Up to 320 physical cartridge slots

SL3000-BM1-200-Z-N (base library with *one cartridge expansion module*) includes:

- Base module
- One cartridge expansion module (CEM)
- 200 activated slots
- Up to 953 physical cartridge slots

SL3000-BM2-200-Z-N (base library with *two cartridge expansion modules*) includes:

- Base module
- Two cartridge expansion modules (CEMs)
- 200 activated slots
- Up to 1557 physical cartridge slots

SL3000-BM1-700-N (base library with *one cartridge expansion module*) includes:

- Base module
- One cartridge expansion module (CEM)
- 700 activated slots
- Up to 953 physical cartridge slots

SL3000-BM2-700-N (base library with *two cartridge expansion modules*) includes:

- Base module
- Two cartridge expansion modules (CEMs)
- 700 activated slots
- Up to 1557 physical cartridge slots

SL3000-BM3-700-N (base library with *three cartridge expansion modules*) includes:

- Base module
- Three cartridge expansion modules (CEMs)
- 700 activated slots
- Up to 2177 physical cartridge slots

SL3000-BM4-700-N (base library with *four cartridge expansion modules*) includes:

- Base module
- Four cartridge expansion modules (CEMs)
- 700 activated slots
- Up to 2797 physical cartridge slots

3. Single active port. Ready for optional feature upgrade to Dual TCP/IP (XSL3000K-2TCPIP).

X-Option Details

The following sections list the various X-options available to upgrade your SL3000.

Modules

XSL3000K-DEM200-N (Drive Expansion Module) includes:
- Drive expansion module (DEM)
- Hardware activation keys to increase slot capacity by 200 slots
- Up to 498 physical cartridge slots
- One tape drive bay (holds up to 8 T9840C/D, T10000A/B, or LTO3/4 drives)
- Perforated panel in the front door
- Two 1200 Watt DC tape drive power supplies

XSL3000-CEM-Z-N (Cartridge Expansion Module) includes:
- Cartridge expansion module
- No additional activated cartridge slots
- 516—620 physical cartridge slots
- No additional drive support

XSL3000-AEM-LFT-N (Access Expansion Module) includes:
- Access expansion module (left)
- No additional activated cartridge slots
- No additional drive support

XSL3000-AEM-RT-Z-N (Access Expansion Module) includes:
- Access expansion module (right)
- No additional activated cartridge slots
- No additional drive support

Power

XSL3000-PDU-110-N (AC power distribution unit)
- 100 – 127 VAC, 20 Amp
- Must order appropriate power cord (see XSL3000-PC20110-Z)

XSL3000-PC20110-N (Power cord)
- 3.6 m (12 ft) U.S./Japan power cord for XSL3000-PDU-110-Z:
  L5-20P wall end plug, L5-20R library end plug

XSL3000-PDU-240-N (AC power distribution unit)
- 200 – 240 VAC, 30 Amp
- Must order appropriate power cord, see:
  – XSL3000-PC30220-Z for US
  – XSL3000-IPC30220-Z for international

XSL3000-PC30220-N (Power cord)
- 3.6 m (12 ft) U.S. power cord for XSL3000-PDU-240-Z:
  L6-30P wall end plug, L6-30R library end plug

XSL3000-IPC30220-N (Power cord)
- 4 m International power cord for XSL3000-PDU-240-Z:
  330 P6W wall end plug, L6-30R library end plug

XSL3000-DCPWR-Z-N
- 1200 Watt DC power supply for tape drives and TallBot

XSL3000-EM-DCPWR-Z-N
- 200 Watt power supply for the electronics control module

Partitioning

XSL3000K-PART-N (Partitioning)
- Physical partitioning hardware activation key files
- Hardware activation key files sent through e-mail

Additional Capacity

XSL3000K-1-SLOT-N (cartridge key file for **one incremental slot**)
- Increases activated capacity by one slot
- Hardware activation key files sent through e-mail

XSL3000K-100-SLOT-N (cartridge key file for **100 incremental slot**)
- Increases activated capacity by 100 slots
- Hardware activation key files sent through e-mail

XSL3000K-200-SLOT-N (cartridge key file for **incremental slot**)
- Increases activated capacity by 200 slots
- Hardware activation key files sent through e-mail

XSL3000K-500-SLOT-N (cartridge key file for **500 incremental slot**)
- Increases activated capacity by 500 slots
- Hardware activation key files sent through e-mail

XSL3000K-1000-SLOT-N (cartridge key file for **1,000 incremental slot**)
- Increases activated capacity by 1,000 slots
- Hardware activation key files sent through e-mail

Ethernet Switch/Harnesses

XSL3000-ETHRNT1-N
- 24-port Ethernet switch
- Ethernet cable harness to connect 8 tape drives, Drive Bay Array 1

XSL3000-ETHRNT2-N
- 24-port Ethernet switch
- Ethernet cable harness to connect 8 tape drives, Drive Bay Array 2

XSL3000-ETHRNT3-N
- 24-port Ethernet switch
- Ethernet cable harness to connect 8 tape drives, Drive Bay Array 3

XSL3000-ETHRNT4-N
- 24-port Ethernet switch
- Ethernet cable harness to connect 8 tape drives, Drive Bay Array 4

Additional Upgrades

XSL3000-CAP-Z-N (Cartridge Access Port)
- One 26-slot CAP, includes two 13-slot removable media magazines
- Set of CAP labels
- No increased capacity

XSL3000-DRVARY-Z-N (Drive Bays)
- One Array adds 8 drive bay slots to the base or drive expansion modules

XSL3000-OP-PANL-N (Operator Panel)
- Local touch screen operator panel

XSL3000-W-ARRAY-N (Window Cartridge Arrays)
- Cartridge (slot) arrays for installation in the window area
- Adds 23 additional slots
- No additional capacity is added

XSL3000K-DUALBOT-N (Redundant TallBot)
- Second TallBot assembly
- Two parking expansion module labels to convert CEMs to PEMs
- Hardware activation key files sent through e-mail

XSL3000K-2TCPIP-N (Dual TCP/IP)
- Dual TCP/IP option
- Hardware activation key files sent through e-mail

XSL3000-CAP-MAG-N (Additional CAP magazines)

XSL3000K-2FCPORT (Fibre Channel ports)
- Dual Fibre Channel option
- Hardware activation key files sent through e-mail

XSL3000K-2FCCARD (Fibre Channel card)
- PUA card option
- Hardware activation key files sent through e-mail

Library X-options and Conversion Bills

TABLE 5-2 lists the X-options available and cross-references them with the conversion bills that are included when the feature ships. Required hardware and instructions are included with the module or component.

TABLE 5-2 Library X-Options

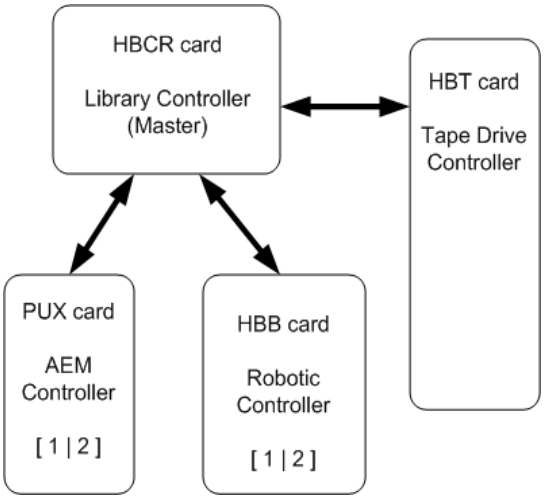
X-option	Conversion Bill	Description	Svc Rep's Required	Person Hours
XSL3000-DCPWR-Z-N	104314	+48 VDC Supply, Load Sharing, Drive	1	0.25
XSL3000-DCPWR-Z-N	104315	+48 VDC Supply, Load Sharing, Rail	1	0.25
XSL3000-DRVARY-Z-N	104528	8-Drive Array Assembly	1	2
XSL3000-PDU-110-N	104537	2N Power, 110 VAC (2)	1	0.25
XSL3000-PDU-240-N	104536	2N Power, 240 VAC—Domestic (2)	1	0.25
XSL3000-PDU-240-N	104538	2N Power, 240 VAC—International (2)	1	0.25
XSL3000-EM-DCPWR-N	104590	cPCI Redundancy (Electronics Module 2N power per CCD)	1	1.5
XSL3000-CAP-Z-N	104526	Cartridge Access Port (CAP)	1	1
XSL3000-CEM-Z-N	104520	Cartridge Expansion Module	2	4
XSL3000-DEM200-N	101564	Drive Expansion Module	2	4
XSL3000-OP-PANL-N	104524	Operator Panel	1	0.5
XSL3000-W-ARRAY-N	104522	Window	1	0.5
XSL3000K-DUALBOT-N	104638	Redundant TallBot, Requires 2N power	1	0.5
XSL3000K-2TCPIP-N	104695	Dual TCP/IP Port Key	1	1
XSL3000-ETHRNT1-N	104691	Ethernet switch/harness, Drive Bay Array 1	1	1
XSL3000-ETHRNT2-N	104692	Ethernet switch/harness, Drive Bay Array 2	1	1
XSL3000-ETHRNT3-N	104693	Ethernet switch/harness, Drive Bay Array 3	1	1
XSL3000-ETHRNT4-N	104694	Ethernet switch/harness, Drive Bay Array 4	1	1
XSL3000K-PART-N	104700	Partition key	1	1
XSL3000K-1-SLOT-N	104682	1 Cartridge slot upgrade key	1	1
XSL3000K-100-SLOT-N	104683	100 Cartridge slot upgrade key	1	1
XSL3000K-200-SLOT-N	104684	200 Cartridge slot upgrade key	1	1
XSL3000K-500-SLOT-N	104685	500 Cartridge slot upgrade key	1	1
XSL3000K-1000SLOT-N	104686	1000 Cartridge slot upgrade key	1	1

Log SnapShot Feature

The Log SnapShot feature is a utility that gathers, compresses, and encrypts logs from a given controller card or from an entire SL-Series library such as the SL3000 library.

FIGURE 5-2 shows an overview of these controller cards in an SL3000 library.

FIGURE 5-2 SL3000 Controller Cards and Log SnapShot Feature



- Library controller (HBCR cards)
- Tape drive controller (HBT card)
- Robotic controller (HBB cards)
- Cartridge access port controller (PUX cards)

A **service representative** issues command line interface (CLI) commands to invoke the Log SnapShot utility.

Notes:

- The CLI Log SnapShot commands are protected and require the correct log-in ID and password to use them.
- Only authorized StorageTek engineers or advanced service representatives have access to the data obtained from the Log SnapShot utility.
- Log SnapShot for maintenance.
  See "Hardware Activation Keys" on page 68 and "Hardware Activation Key Files" on page 105 for more information.

Tape Drive Selection

If you have answers to the following questions, the task of locating the pertinent part number becomes much easier:

TABLE 5-3 Tape Drive Selection

Ask your customer...	Tape Drive
What tape drive model is required?	❑ T9840C ❑ T9840D* ❑ T10000A* ❑ T10000B* ❑ HP LTO3 ❑ HP LTO4* ❑ IBM LTO3 ❑ IBM LTO4
What type of host interface is needed?	❑ Fibre Channel ❑ FICON ❑ ESCON[1]
How many FICON or Fibre Channel interface ports?	❑ 1 Port ❑ 2 Ports
What type of interface transceiver?	❑ Longwave[2] ❑ Shortwave[3]

* Encryption-capable
1. ESCON drives have only one port.
2. Long wavelength ports require single-mode (9 micron fiber) cables.
3. Short wavelength ports require multimode cables.

The part numbers are composed of many of the elements listed in the table above. For example, the part number 9840D-FI-S30-1PLZ describes:

- **9840D** indicates the tape drive model number
- **FI** indicates a FICON interface
- **S30** indicates the library model (SL3000)
- **1PL** indicates the drive has a single longwave port (1PL)
- **Z** indicates that the drive complies with ROHS requirements

Another example, the part number Y-LTO4-HP4FC-SL30Z describes:

- **Y** indicates the tape drive is *Used*
- **LTO4** indicates the tape drive model
- **HP4FC** indicates the drive is from HP and it has a 4 Gb Fibre Channel interface
- **SL30Z** indicates the library model (SL3000) and complies with ROHS requirements

TABLE 5-4 through TABLE 5-6 on page 115 list the marketing numbers with descriptions for the tape drives supported in the SL3000 library.

T9840 Tape Drive Marketing Numbers

TABLE 5-4 T9840 Marketing Numbers and Descriptions

Marketing Number	Description
T9840 Model D	
9840D-FC-SL3000Z	T9840D, Fibre Channel, 2Gb, SL3000[2]
9840D-ES-SL3000Z	T9840D, ESCON, SL3000
9840D-FI-S30-1PSZ	T9840D, FICON, 1PSW (single-port short-wave[2]), SL3000
9840D-FI-S30-2PSZ	T9840D, FICON, 2PSW (dual-port short-wave[2]), SL3000
9840D-FI-S30-1PLZ	T9840D, FICON, 1PLW (single-port long-wave[3]), SL3000
9840D-FI-S30-2PLZ	T9840D, FICON, 2PLW (dual-port long-wave[3]), SL3000
9840D-FI-S30-2PMZ	T9840D, FICON, 2PMW (one long- and one short- wave[2,3]), SL3000
T9840 Model C	
9840C-FC-SL3000Z	T9840C, Fibre Channel, 2Gb, SL3000[2]
9840C-ES-SL3000Z	ESCON, SL3000
9840C-FI-S30-1PSZ	T9840C, FICON, SL3000, 1PSW (single-port short-wave[2])
9840C-FI-S30-2PSZ	T9840C, FICON, SL3000, 2PSW (dual-port short-wave[2])
9840C-FI-S30-1PLZ	T9840C, FICON, SL3000, 1PLW (single-port long-wave[3])
9840C-FI-S30-2PLZ	T9840C, FICON, SL3000, 2PLW (dual-port long-wave[3])
9840C-FI-S30-2PMZ	T9840C, FICON, SL3000, 2PMW (dual-port mixed-wave[2,3])

1. Interface transceivers (SFP modules) do not ship with the tape drive for the identified library.
2. .Short wave ports require 50/125 micron cables.
3. Long wave ports require 9/125 micron cables

T10000 Tape Drive Marketing Numbers

TABLE 5-5 T10000 Models A and B Marketing Part Numbers and Descriptions

Marketing Number	Description
T10000 Model A	
T10A-4FC-SW-30Z	SL3000 Fibre Channel Drive Short Wavelength
T10A-4FC-LW-30Z	SL3000 Fibre Channel Drive Long Wavelength
T10A-4FC-MW-30Z	SL3000 Fibre Channel Drive Mix Wavelength
T10A-FI-C-SW-30Z	SL3000 FICON Crypto Drive Short Wave
T10A-FI-C-LW-30Z	SL3000 FICON Crypto Drive Long Wave
T10A-2FI-C-MW-30Z	SL3000 FICON Crypto Drive Mix Wave
T10000 Model B	
T10B-4FC-LW-30Z	SL3000 Fibre Channel Drive Long Wavelength
T10B-4FC-MW-30Z	SL3000 Fibre Channel Drive Mix Wavelength
T10B-4FC-SW-30Z	SL3000 Fibre Channel Drive Short Wavelength
T10B-4FI-LW-30Z	SL3000 FICON Drive Long Wavelength
T10B-4FI-MW-30Z	SL3000 FICON Drive Mix Wavelength
T10B-4FI-SW-30Z	SL3000 FICON Drive Short Wavelength
1. Interface transceivers (SFP modules) do not ship with the tape drive for the identified library. 2. Long wave ports require 9/125 micron cables. 3. Short wave ports require 50/125 micron cables.	

LTO Tape Drive Marketing Numbers

TABLE 5-6 LTO3 and LTO4 Marketing Part Numbers and Descriptions

Marketing Number	Description
New Drives	
LTO3-HP4FC-SL3000Z	HP LTO3 Fibre Channel 4Gbit drive for the SL3000 library
LTO4-HP4FC-SL3000Z	HP LTO4 Fibre Channel 4Gbit drive for the SL3000 library
LTO5-HP4FC-SL3000Z	HP LTO5 Fibre Channel 4Gbit drive for the SL3000 library
LTO3-IB4FC-SL3000Z	IBM LTO3 Fibre Channel 4Gbit drive for the SL3000 library
LTO4-IB4FC-SL3000Z	IBM LTO4 Fibre Channel 4Gbit drive for the SL3000 library
LTO4-IB4F-AS4-SL3Z	IBM LTO4 FC 4Gbit drive AS400 attach for the SL3000
LTO5-IB4FC-SL3000Z	IBM LTO5 Fibre Channel 4Gbit drive for the SL3000 library
Used Drives - *No Warranty*	
Y-LTO3-HP4FC-SL30Z	HP LTO3 Fibre Channel 4Gbit drive for the SL3000 library
Y-LTO4-HP4FC-SL30Z	HP LTO4 Fibre Channel 4Gbit drive for the SL3000 library
Y-LTO3-IB4FC-SL30Z	IBM LTO3 Fibre Channel 4Gbit drive for the SL3000 library
Y-LTO4-IB4FC-SL30Z	IBM LTO4 Fibre Channel 4Gbit drive for the SL3000 library
Y-LTO4-IB4F-A4SL3Z	IBM LTO4 Fibre Channel 4Gbit drive AS400 attach for the SL3000

Tape Drive X-options and Conversion Bills

These tables list the X-options available for converting drives to support the SL3000.

Drive Tray Conversions

TABLE 5-7 Drive Tray Conversion Kits

Drive Type	Marketing Number	Operation Type (Library)
T9840 C/D	9840BCD-FCFI-SL3-Z	T9840 B/C/D FI/FC tray to SL3000
T10000 A/B	T10AB-FCFI-SL3-Z	T10KA/B FI/FC Tray C/B-SL3000
HP LTO 3/4	LTO-HPF-L7S30-CKZ	L180/700/1400
	LTO-HPF-S5S30-CKZ	SL500
IBM LTO 3/4	LTO-IBF-L7S30-CKZ	L180/700/1400/L5500/9310
	LTO-IBF-S5S30-CKZ	SL500

General T-Series Port Conversions

TABLE 5-8 T-Series Port Conversion Marketing Part Numbers and Descriptions

Marketing Number	Conversion Bill	Description
X9840D-1SFP-LWZ		T9840D FC/FI, 1SFP, LW CKIT
X9840D-2SFP-LWZ		T9840D FC/FI, 2SFP, LW CKIT
X9840D-2SFP-MWZ		T9840D FC/FI, 2SFP, MW CKIT
X9840D-1SFP-SWZ		T9840D FC/FI, 1SFP, SW CKIT
X9840D-2SFP-SWZ		T9840D FC/FI, 2SFP, SW CKIT
2 Gigabit Drive		
XT10A-1LW-CKITZ	105119	T10KA 1 Port FICON Long Wave Conversion Kit
XT10A-1SW-CKITZ		T10K 2 Gbit 1 port Short Wave
XT10A-2LW-CKITZ	105120	T10KA 2 Port FICON Long Wave Conversion Kit
XT10A-2MW-CKITZ	105121	T10KA 2 Port FICON Mix Wave Conversion Kit
XT10A-2SW-CKITZ	105118	T10KA 2 Port FICON Short Wave Conversion Kit
XT10A-2-1LW-CKITZ		T10K 2 Gbit Fibre Channel or FICON 1 port LW
XT10A-2-1SW-CKITZ		T10K 2 Gbit Fibre Channel or FICON 1 port SW
XT10A-2-2LW-CKITZ		T10KA 2 Gbit FI or FC 2 port Long Wave Kit
XT10A-2-2MW-CKITZ		T10KA 2 Gbit FI or FC 2 port Mix Wave Kit
XT10A-2-2SW-CKITZ		T10KA 2 Gbit FI or FC 2 port Short Wave Kit
4 Gigabit Drive		
XT10A-4-2LW-CKITZ		T10KA 4 Gbit 2 port Long Wave
XT10A-4-2MW-CKITZ		T10KA 4 Gbit 2 port Mix Wave
XT10A-4-2SW-CKITZ		T10KA 4 Gbit 2 port Short Wave

General LTO Port Conversions

TABLE 5-9 LTO Dual Port Conversion Marketing Part Numbers and Descriptions

Marketing Number	Description	Conversion Kit
XL4-HF-SL30-DPCKZ	StorageTek LTO4 FC dual port conversion kit for the SL3000 library. Allows customers to install second data port in HP LTO4 drive tray assembly currently installed in SL3000 library. RoHS-5.	SL3000 HP LTO4 DP Conv kit
XL4-IF-SL30-DPCKZ	StorageTek LTO4 FC dual port conversion kit for the SL3000 library. Allows customers to install second data port in IBM LTO4 drive tray assembly currently installed in SL3000 library. RoHS-5.	SL3000 IBM LTO4 DP Conv kit
XL3-HF-SL30-DPCKZ	StorageTek LTO3 FC dual port conversion kit for the SL3000 library. Allows customers to install second data port in HP LTO3 drive tray assembly currently installed in SL3000 library. RoHS-5.	SL3000 HP LTO3 DP Conv kit

Cables

Fibre Channel, ESCON, and Ethernet Cables

The following tables list the cables available for the SL3000 library and tape drives.

Note – SL3000 drive trays accept only LC fiber cable connectors. If you are using cables with SC connectors, you must add an adapter (see TABLE 5-10 on page 118).

Fibre Channel Cables

- LC connectors are the industry standard for all 2 Gb-capable Fibre Channel devices.
- SL3000 drive trays accept only LC fiber cable connectors.

Part numbers and descriptions for Fibre Channel cables are listed in TABLE 5-11 through TABLE 5-14 on page 119.

Part numbers for the LC-to-SC adapter is listed in TABLE 5-10 on page 118.

Plenum-rated Cables

The following tables list cables as either **Riser** or **Plenum**. Plenum-rated cables have a higher flammability rating and are used for under-the-floor applications.

TABLE 5-10 LC-to-SC Adapter Kit

Description	Part
LC-to-SC Adapter kit	315447901
Note – When using cables with SC connectors, you must use an adapter. Library drive trays support *only* LC connectors.	

TABLE 5-11 Fiber Optic Cables: LC-to-LC, 50/125 Micron, Multimode Cables

Description	Length	Part
Optical Cable, LC to LC Duplex, Riser	3 m (9.8 ft)	CABLE10800340-Z
Optical Cable, LC to LC Duplex, Riser	5 m (16.4 ft)	CABLE10800341-Z
Optical Cable, LC to LC Duplex, Riser	10 m (32.8 ft)	CABLE10800310-Z
Optical Cable, LC to LC Duplex, Riser	50 m (164 ft)	CABLE10800311-Z
Optical Cable, LC to LC Duplex, Riser	100 m (328 ft)	CABLE10800312-Z
Optical Cable, LC to LC Duplex, Plenum	10 m (32.8 ft)	CABLE10800313-Z
Optical Cable, LC to LC Duplex, Plenum	50 m (164 ft)	CABLE10800314-Z
Optical Cable, LC to LC Duplex, Plenum	100 m (328 ft)	CABLE10800315-Z

TABLE 5-12 Fiber Optic Cables: LC-to-SC, 50/125 Micron, Single Mode Cables

Description	Length	Part
Optical Cable, LC-to-SC Duplex, Riser	2 m (6.6 ft)	CABLE10800345-Z
Optical Cable, LC-to-SC Duplex, Riser	5 m (16.4 ft)	CABLE10800346-Z
Optical Cable, LC-to-SC Duplex, Riser	10 m (32.8 ft)	CABLE10800317-Z
Optical Cable, LC-to-SC Duplex, Riser	50 m (164 ft)	CABLE10800318-Z
Optical Cable, LC-to-SC Duplex, Riser	100 m (328 ft)	CABLE10800319-Z
Optical Cable, LC-to-SC Duplex, Plenum	10 m (32.8 ft)	CABLE10800320-Z
Optical Cable, LC-to-SC Duplex, Plenum	50 m (164 ft)	CABLE10800321-Z
Optical Cable, LC-to-SC Duplex, Plenum	100 m (328 ft)	CABLE10800322-Z

TABLE 5-13 Fiber Optic Cables: LC-to-LC, 9/125 Micron, Single Mode Cables

Description	Length	Part
Optical Cable, LC-to-LC Duplex, Riser	3 m (9.8 ft)	CABLE10800302-Z
Optical Cable, LC-to-LC Duplex, Riser	10 m (32.8 ft)	CABLE10800331-Z
Optical Cable, LC-to-LC Duplex, Riser	50 m (164 ft)	CABLE10800333-Z
Optical Cable, LC-to-LC Duplex, Riser	100 m (328 ft)	CABLE10800306-Z
Optical Cable, LC-to-LC Duplex, Plenum	10 m (32.8 ft)	CABLE10800330-Z
Optical Cable, LC-to-LC Duplex, Plenum	50 m (164 ft)	CABLE10800332-Z
Optical Cable, LC-to-LC Duplex, Plenum	100 m (328 ft)	CABLE10800305-Z

TABLE 5-14 LC-to-SC, 9/125 Micron Cables

Description	Length	Part
Optical Cable, LC-to-SC Duplex, Riser	10 m (32.8 ft)	CABLE10800335-Z
Optical Cable, LC-to-SC Duplex, Riser	50 m (164 ft)	CABLE10800337-Z
Optical Cable, LC-to-SC Duplex, Riser	100 m (328 ft)	CABLE10800304-Z
Optical Cable, LC-to-SC Duplex, Plenum	10 m (32.8 ft)	CABLE10800334-Z
Optical Cable, LC-to-SC Duplex, Plenum	50 m (164 ft)	CABLE10800336-Z
Optical Cable, LC-to-SC Duplex, Plenum	100 m (328 ft)	CABLE10800303-Z

ESCON Cables

Part numbers for ESCON cables are listed in TABLE 5-15.

TABLE 5-15 ESCON Cables

Description	Part
13 m (4 ft) Riser	CABLE10800289-Z
31 m (100 ft) Riser	CABLE10800290-Z
61 m (200 ft) Riser	CABLE10800291-Z
107 m (350 ft) Riser	CABLE10800292-Z
13 m (4 ft) Plenum	CABLE10800285-Z
31 m (100 ft) Plenum	CABLE10800286-Z
61 m (200 ft) Plenum	CABLE10800287-Z
107 m (350 ft) Plenum	CABLE10800288-Z

Ethernet Cables

Part numbers for Ethernet cables are listed in TABLE 5-16.
These cables provide the interface connection for TCP/IP (HLI-PRC).

TABLE 5-16 Ethernet Cables

Description	Part
2.4 m (8 ft), 24 AWG, CAT5, Shielded	CABLE10187033-Z
10.7 m (35 ft), 24 AWG, CAT5, Shielded	CABLE10187034-Z

APPENDIX **A**

Addressing

This appendix provides information about the various numbering and addressing schemes for the SL3000 library, which include:

- CenterLine Technology with positive and negative column numbers
- Firmware—Library, Rail, Side, Column, Row (L, R, S, C, W)
- Host library interface–panel row column (HLI–PRC)
  - Internal—Software—tape drive numbering
  - External—Physical Hardware—tape drive numbering
- Out-of-the-box numbering (default)
- Small Computer System Interface (SCSI) element numbering

This appendix provides a comparison of the walls and slots in the library.

CenterLine Technology

The SL3000 uses *CenterLine Technology* to help balance the work load and improve performance of the library.

Using the left side of the Base module—which is the only "required" module—as the centerline, customers can add other *modules* either to the left and/or to the right.

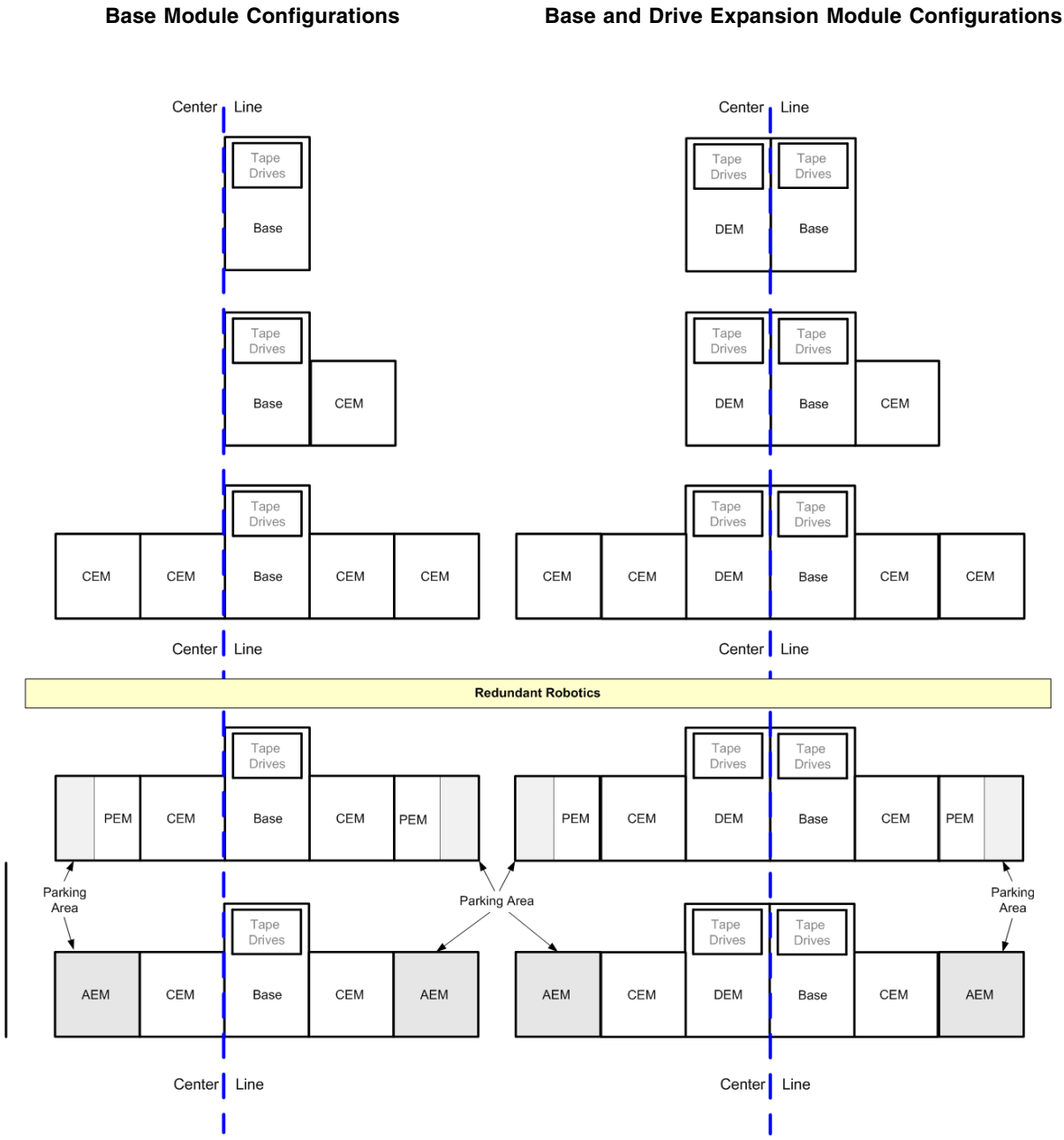
FIGURE A-1 on page 122 shows the *centerline* and provides some comparisons using minimum to maximum configurations, with the:

- Base module (BM) only
- Base and drive expansion modules (DEM)
- Additions of cartridge expansion modules (CEMs)

Note – Only the base and drive expansion modules contain tape drives. Cartridge expansion modules contain only data cartridges.

Keep in mind that a balance of modules will balance performance.

FIGURE A-1 CenterLine Technology



Addressing

The SL3000 employs a fixed module address scheme using five parameters separated by commas to indicate locations—or addresses—in the library.
These parameters are: L, R, C, S, W

TABLE A-1 Addressing Scheme

Library	This parameter indicates the library number in a complex. The SL3000 does not have Pass-thru Ports; therefore, it is the only library in a complex. This parameter will always be 1.
Rail	The SL3000 only has one rail. This parameter will always be 1.
Column	Columns indicate the horizontal location of a cartridge or drive from the logical center—or centerline—of the library. The numbers get larger as you get farther away from center: ▪ A minus sign (–) indicates locations to the left of center. ▪ A plus sign (+ or nothing) indicates locations to the right of center. These numbers vary depending on the number of expansion modules added to the library. (Each module has 6 columns)
Side	The side parameter indicates the rear or the front walls of the library. ▪ Rear wall = 1 ▪ Front wall = 2
Ro**w**	Rows indicate the vertical location of a cartridge or drive and are numbered from the top (1) down (52). These are always positive numbers.

In summary, columns are numbered using a Centerline[4], then going to the left using negative numbers and to the right using positive numbers for the front and rear walls. An example is shown in FIGURE A-2 on page 124.

Important:
This means that, as modules are added, the panel numbering remains constant.

This is a key benefit of a fixed addressing scheme; it allows the library to add capacity with minimal impact.

4. CenterLine Technology not only provides a basis for library addresses and numbering, it also contributes to optimization and library performance.

Columns

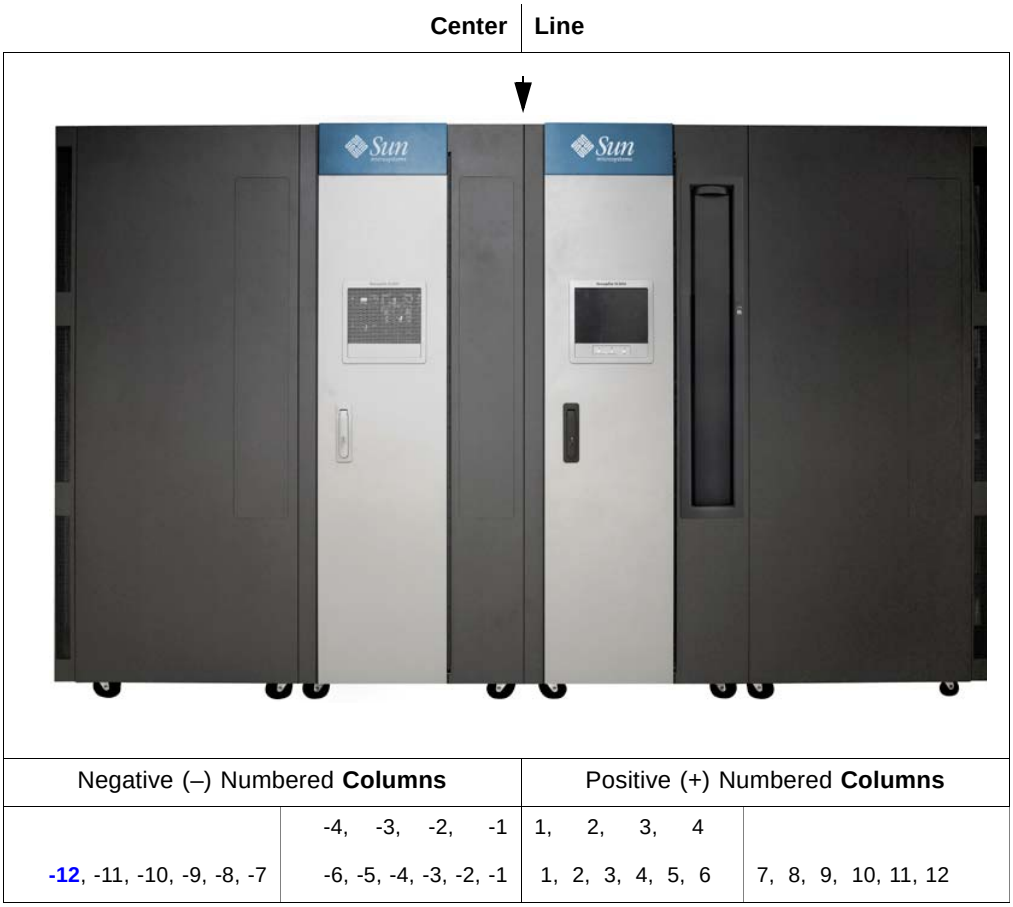
Columns indicate the horizontal location of a cartridge or drive from the logical center—or centerline—of the library.

The numbers get larger as you get farther away from center using:
- A minus sign (–) indicates locations to the left of center.
- A plus sign (+, or nothing) indicates locations to the right of center.

These numbers vary depending on the number of expansion modules.
- Each Base and DEM has 4 columns for tape drives;
- Each module has 6 columns for data cartridges.

FIGURE A-2 shows a Base (which is required), a DEM installed to the left, with two CEMs (one on each end), to show how the columns are numbered for both tape drives and data cartridges.

FIGURE A-2 Centerline and Column Addressing



	Negative (–) Numbered **Columns**		Positive (+) Numbered **Columns**	
Drives		-4, -3, -2, -1	1, 2, 3, 4	
Cartridges	**-12**, -11, -10, -9, -8, -7	-6, -5, -4, -3, -2, -1	1, 2, 3, 4, 5, 6	7, 8, 9, 10, 11, 12

Notes:
- One and only one Base is required for every configuration
- One DEM can be installed directly to the left of the Base or,
- CEMs can be installed to the left and to the right
- Negative numbered columns are to the left of centerline
- Positive numbered columns are to the right of centerline
- The last column on the left is not accessible to allow for robotic clearance of the side cover (in FIGURE A-2 this is column -12)

Walls

The side parameter in the addressing scheme is for the rear or the front walls:

- Rear wall = 1
- Front wall = 2

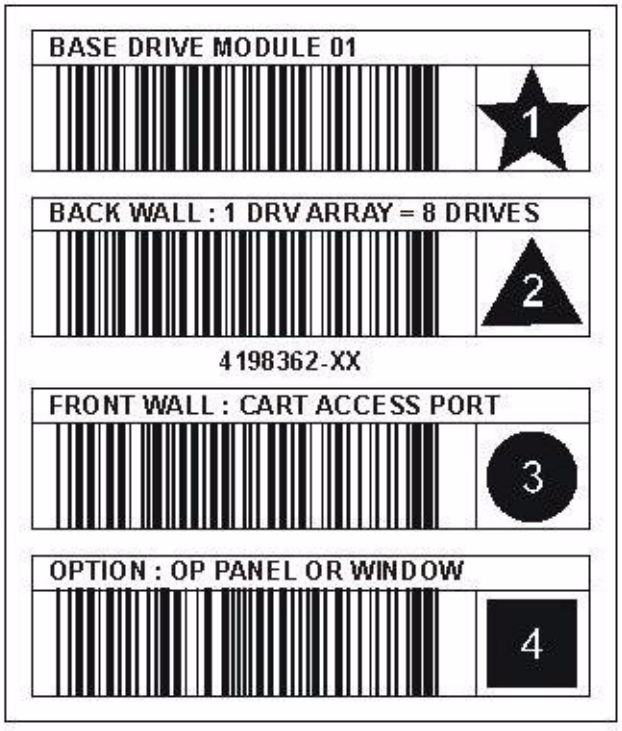
Module Identification Block

Each module has an identification block with labels that identify the configuration for that module. This block is on the lower rear wall in column 4, rows 49, 50, 51, and 52. This block identifies the:

- Type of module (star)
- Back wall configuration (triangle)
- Front wall configuration (circle)
- Options for that module (square)

During an initialization, the robotic assembly visits the module identification block to determine the configuration of the module and installed options.

FIGURE A-3 Module Identification Block



1 Module types:

Base Module 01/
Drive Expansion Module 01/
Cartridge Expansion Module 01/
Parking Expansion Module 01/
Access Expansion Module 01/02

2 Back wall configuration:

BACK WALL: 1 Drv Array = 8 drives
BACK WALL: 2 Drv Array = 16 drives
BACK WALL: 3 Drv Array = 24 drives
BACK WALL: 4 Drv Array = 32 drives
BACK WALL: Arrays
BACK WALL: Bulk Load Magazines
BACK WALL: Empty

3 Front wall configuration:

FRONT WALL: Arrays
FRONT WALL: Cart Access Port
FRONT WALL: CAP Window
FRONT WALL: Empty
FRONT WALL: Bulk Load Magazines

4 Options:

OPTION: Arrays
OPTION: Op Panel or Window
OPTION: Empty
OPTION: Service Bay (Parking Expansion Module)

Because the SL3000 library is flexible and modular, you can upgrade or add options without removing and replacing the module. For example:

- Adding another tape drive bay to the rear of the library
- Including a CAP or operator panel to the front of a module

Simply add the upgrade and replace the configuration label for that component.

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.

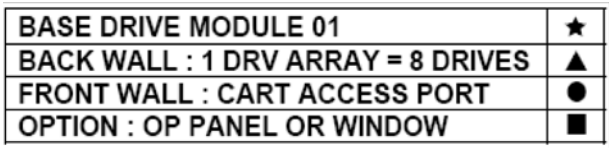
TABLE A-2 Special Labels

Function	Label Text	Barcode	Icon
Cartridge Access Port ID	SPECIAL: CAP IDENTIFICATION	CAPID/	none
No Magazines	SPECIAL: NO MAGAZINES	NOMAG/	none

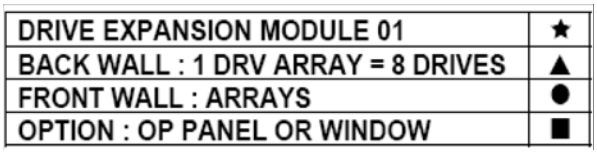
These views (examples) are of the label sets used for each module that shows the four labels required. Only one of each of the icons (star, triangle, circle, square) can be in the four configuration label locations.

TABLE A-3 Module Identification Block Examples

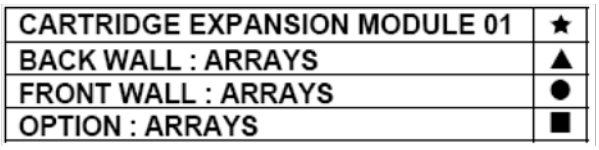
Base Module with one Drive Block for eight drives, a CAP installed and no Op Panel or Window installed



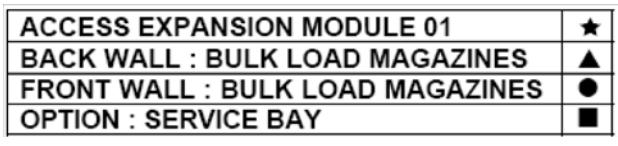
Drive Expansion Module (DEM) with one Drive Block for eight drives, no CAP and no Op Panel or Window installed



Cartridge Expansion Module (CEM) with no Drives, no CAP and no Op Panel or Window installed.
There is also an additional label to convert to the **Parking Expansion Module**.



Access Expansion Module (AEM) with no Drives, no CAP, no Op Panel or Window installed. It includes Bulk Load Magazines on the front and back walls and has the safety door to allow service without interruption.



HLI–PRC Addressing

The host library interface–panel, row, column (HLI–PRC) address is an 8-digit, comma-separated value that represents the library storage module, (LSM), Panel, Row, and Column. This addressing scheme is used by HLI clients, including ACSLS and HSC, to represent library slots accessible to those HLI clients.

Note – The SL3000 firmware address identifies the physical location of the cartridge in the library and the HLI–PRC refers to the address assigned by the host software.

The slot location appears in the following format:

LL	PP	RR	CC

where,

LL: LSM number (00h)

PP: Panel—Because there is no way to identify negative numbers with this scheme, panel numbers provide the location relative to the Base module. Descending numbers *left* and ascending numbers *right* of the CenterLine.

- Even numbers = rear walls
- Odd numbers = front walls

Panels:

- Base module = Panels 12 and 13
- Drive expansion module added to the left = Panels 10 and 11
- Modules added to the right of the Base = Start at panels 14 and 15 and end at the last module panels 22 and 23

Exception: If a cartridge expansion module is added to the left of the Base module in place of a drive expansion module, that module's panel numbering start at 8 and 9.
This allows for a drive expansion module to be installed at a later date without the necessity of re-numbering the modules.

RR: Row—Vertical location in a number of rows on the panel (0 to 51).

CC: Column—Horizontal location of a specific slot in a row (0 – 5).

The following two pages provide several examples with different configurations.

FIGURE A-4 Panel Numbering for HLI-PRC Addressing

						Center	Line					
Panel Numbers Rear Wall	0	2	4	6	8	10	12	14	16	18	20	22
Module	**AEM**	**CEM**	**CEM**	**CEM**	**CEM**	**DEM**	**Base**	**CEM**	**CEM**	**CEM**	**CEM**	**AEM**
	<- TallBot Area of Travel ->											
Front Wall Panel Numbers	1	3	5	7	9	11	13	15	17	19	21	23

FIGURE A-5 Panel Numbering for HLI–PRC Addressing—Example 1

												Center	Line											
Module	**Cartridge Expansion**						**Drive Expansion**						**Base**						**Cartridge Expansion**					
Rear Wall	**Panel 8**						**Panel 10**						**Panel 12**						**Panel 14**					
Column	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
	<- TallBot Area of Travel ->																							
Column	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5
Front Wall	**Panel 9**						**Panel 11**						**Panel 13**						**Panel 15**					

FIGURE A-6 Panel Numbering for HLI–PRC Addressing—Example 2

													Center	Line										
Module	**Cartridge Expansion**						**Base**						**Cartridge Expansion**											
Rear Wall	**Panel 8**						**Panel 12**						**Panel 14**											
Column	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
	<- TallBot Area of Travel ->																							
Column	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5						
Front Wall	**Panel 9**						**Panel 13**						**Panel 15**											

FIGURE A-7 Panel Numbering for HLI–PRC Addressing—Example 3, With two PEMs

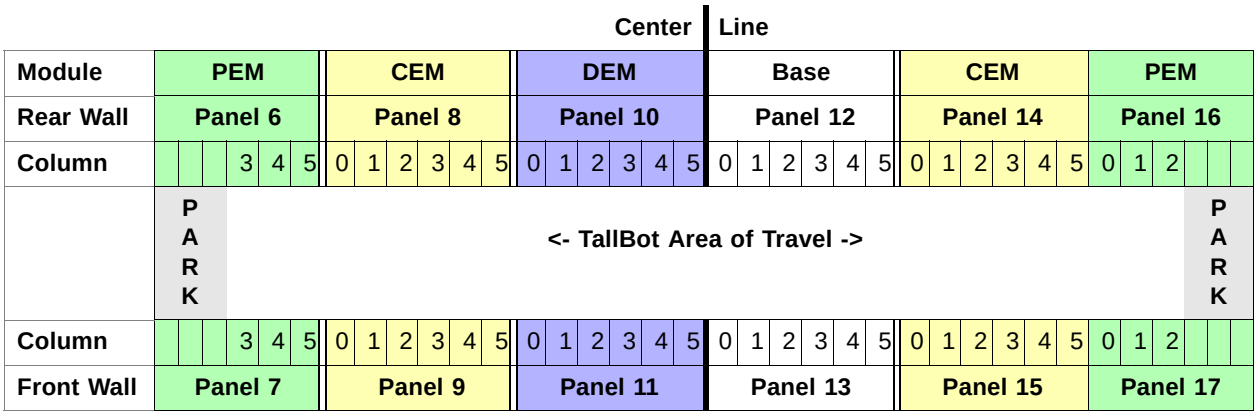
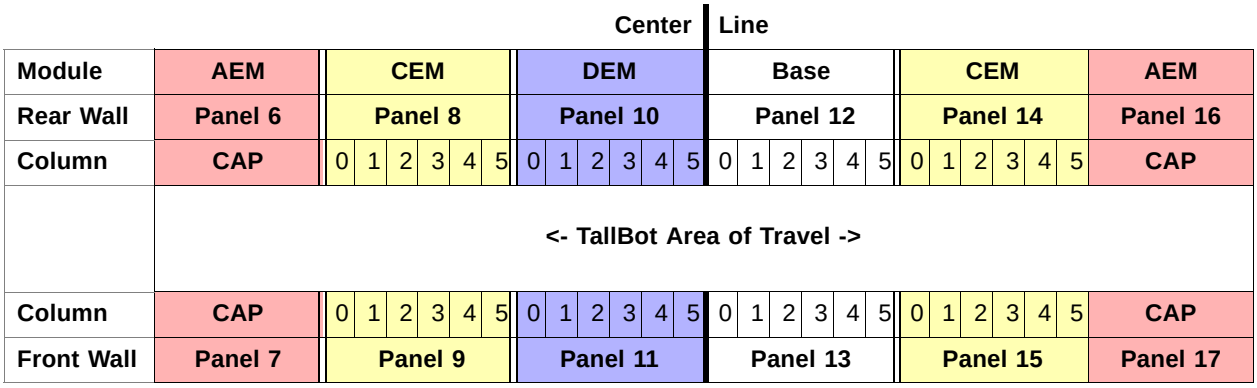


FIGURE A-8 Panel Numbering for HLI–PRC Addressing—Example 4, With two AEMs



Drive Numbering

All of the tape drives in the SL3000 library are physically located in the Base and drive expansion modules.

TABLE A-4 A: shows the *internal*—**software**—mapping (*inside* the library),
TABLE A-4 B: shows the *external*—**physical**—numbering (*outside* the library)

TABLE A-4 Base and Drive Module Tape Drive Numbering Scheme—Software and Hardware

A: Internal - Software Drives Numbers (Front View)

Panel 10 (-) Negative Column Numbers				Panel 12 (+) Positive Column Numbers			
Center				Line			
Drive Expansion Module				**Base Module**			
0	1	2	3	0	1	2	3
4	5	6	7	4	5	6	7
8	9	10	11	**8**	9	10	11
12	13	14	15	12	13	14	15
16	17	18	19	16	17	18	19
20	21	22	23	20	21	22	**23**
24	25	26	27	Cartridge Arrays			
28	29	30	**31**				

B: External - Physical Drive Numbers (Rear View)

Panel 12 (+) Positive Column Numbers				Panel 10 (-) Negative Column Numbers			
Center				Line			
Base Module				**Drive Expansion Module**			
1	2	3	4	25	26	27	**28**
5	6	7	8	29	30	31	32
9	10	11	**12**	33	34	35	36
13	14	15	16	37	38	39	40
17	18	19	20	41	42	43	44
21	22	23	24	45	46	47	48
Electronics Control Module				49	50	51	52
				53	54	55	56

These tables show a matching of drives (the highlighted drives). *For example:*

- Drive expansion module: Internal/software Drive 0 matches with external/physical Drive 28
- Base module: Internal/software Drive 8 matches with external/physical Drive 12
- Base module: Internal/software Drive 23 matches with external physical Drive 21
- Drive expansion module: Internal/software Drive 31 matches with external/physical Drive 53

Out-of-the Box Slot Numbering

There are several factors to be aware of about the operations of the library when configuring and planning for content, these are:

- Default, out-of-the-box behavior
- Partitioning
- Addition of capacity using previously installed slots (Capacity on Demand)

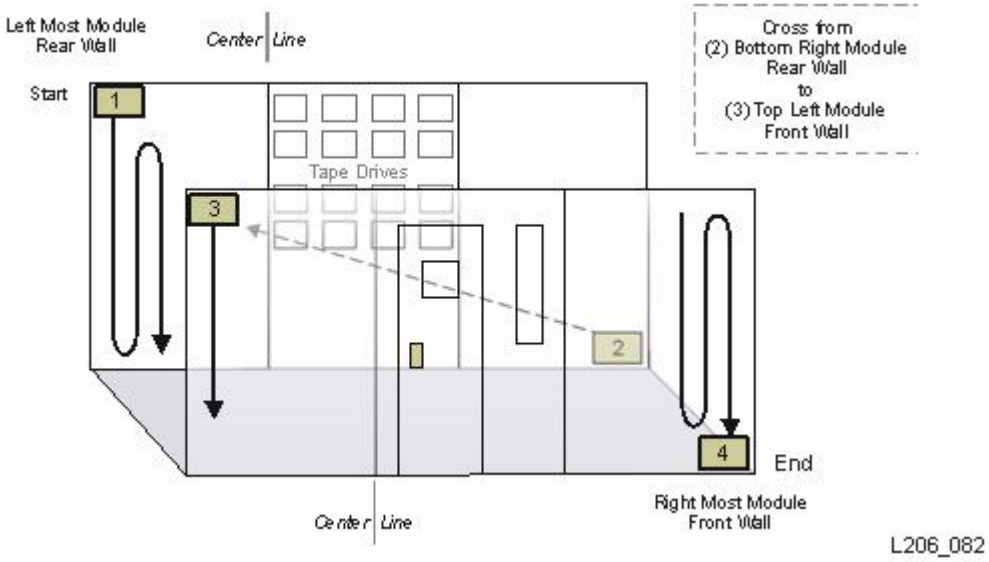
Note – Slot numbering and library addressing are two different functions.
- Slot numbering is an *internal*, library controller, function.
- Library addressing is an *external* design for physical slot location.

FIGURE A-9 shows how the library numbers the slots and uses the following steps to describe it.

Internal slot numbering:

1. *Starts* in the upper left slot on the rear wall of the first module to the left. The numbering counts from **top to bottom** and from **left to right**.
2. When the numbering reaches the last slot on the rear wall it *crosses* sides.
3. Then *continues* at the upper left slot on the front wall of the first module. Counts from top to bottom and from left to right.
4. *Ends* at the lower slot on the front wall of the last module.

FIGURE A-9 Slot Numbering—Out-of-the-Box



Slot numbering determines which slots are activated when the capacity is applied. For example, if the activated capacity for the library is 200 slots, the slot numbering for the first 200 is determined by the numbering made available, or active, to the host clients.

Also, if using a SCSI interface, the slot numbering determines the element numbering assigned to each element type and reports this to the SCSI clients.

FIGURE A-10 serves as a *default* diagram for the discussions about Partitioning and Capacity on Demand.

This figure has three modules with a capacity of 76 slots and 24 tape drives or three 8-drive bays.

FIGURE A-10 Out-of-the-Box Numbering

		Center Line							
CEM			Base				CEM		
1	11	21	Drv_1	Drv_2	Drv_3	Drv_4	47	57	67
2	12	22	Drv_5	Drv_6	Drv_7	Drv_8	48	58	68
3	13	23	Drv_9	Drv_10	Drv_11	Drv_12	49	59	69
4	14	24	Drv_13	Drv_14	Drv_15	Drv_16	50	60	70
5	15	25	Drv_17	Drv_18	Drv_19	Drv_20	51	61	71
6	16	26	Drv_21	Drv_22	Drv_23	Drv_24	52	62	72
7	17	27	31	35	39	43	53	63	73
8	18	28	32	36	40	44	54	64	74
9	19	29	33	37	41	45	55	65	75
10	20	30	34	38	42	46	56	66	76

Tape drive numbering:

1. Starts in the upper left slot of the first drive bay in the Base module.

   The numbering counts from **left to right** then from **top to bottom**, opposite that of the slot numbering.

2. When the numbering reaches the last drive in the Base module, it crosses to the drive expansion module if installed.

3. Then continues at the upper left slot in the first drive bay in the DEM. Counts from **left to right** then from **top to bottom**.

4. Ends at the lower right slot for the last drive in the DEM.

Default SCSI Element Ordering

Using the concepts described in "Out-of-the Box Slot Numbering" on page 131, this section adds the principles for determining the SCSI Element number sequences in the SL3000 library.

The examples in FIGURE A-11 on page 134 are referenced by looking at the front of the library then view *through* the front wall.
These examples are not intended to be an exact representation of the SL3000 library resources.

SCSI Element numbering consists of:

- Storage Elements (slots)—Numbered **top to bottom, left to right**, and back to front.
- Import/Export Elements (CAPs)—Numbered **top to bottom, left to right**.

  Note – Storage and Import/Export elements are numbered sequentially by slot. No slots are skipped or are left out.
- Data Transfer Elements (drives)—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.

  Note – A vacant drive slot when the library powers on will not be included in the element number sequence. This is important to know because Open Systems backup applications do not tolerate Data Transfer Elements that cannot or do not respond when you power-on the library.

Elements in the example in FIGURE A-11 on page 134 include:

- 4 modules—One Base, one DEM, and two CEMs
- 166 data cartridge slots—2000 to 2165
- 38 tape drives—1000 to 1037 (2 tape drives are missing, 1 in each module)
- 2 CAPs, each with 7 slots—slot addresses 10 to 23

FIGURE A-11 SCSI Element Numbering

(Left) **Looking From the FRONT of the Library** **(Right)**

Looking “at” the back wall (through the front wall)

		Negative Column Numbers		Center Line		Positive Column Numbers					
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

Looking “through” the front wall

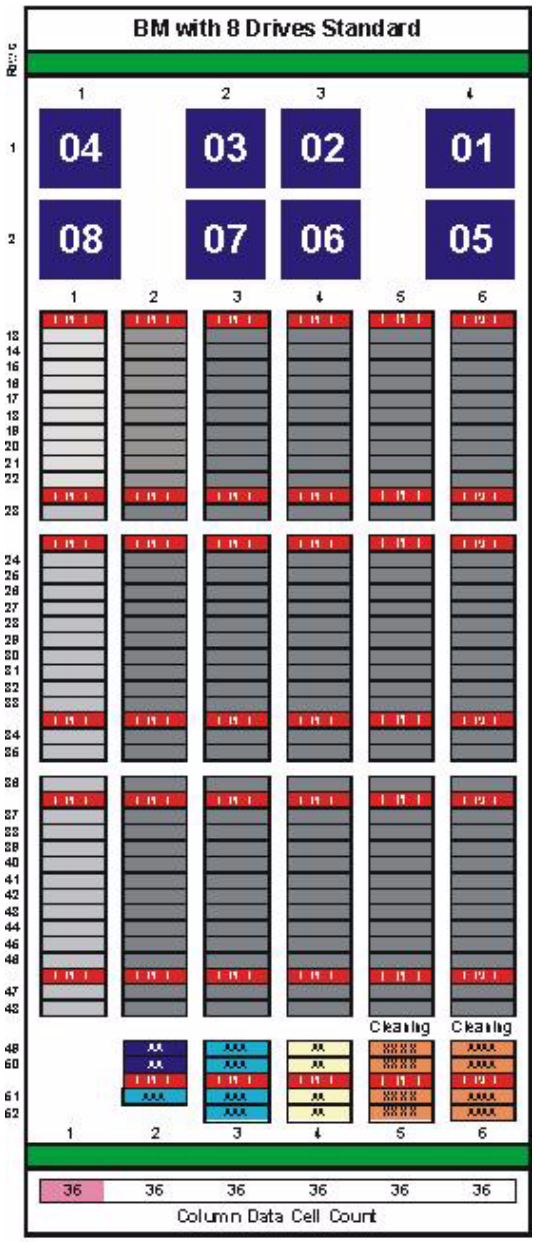
		Negative Column Numbers		Center Line		Positive Column Numbers					
CEM		**DEM**				**Base**				**CEM**	
2080	2090	2100	2107	**CAP 10**		2123	2130	**CAP 17**		2146	2156
2081	2091	2101	2108	**11**		2124	2131	**18**		2147	2157
2082	2092	2102	2109	**12**		2125	2132	**19**		2148	2158
2083	2093	2103	2110	**13**		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	2154	2164
2089	2099	2106	2116	2119	2122	2129	2139	2142	2145	2155	**2165**

Slot Maps Illustrated

FIGURE A-12 on page 136 through FIGURE A-24 on page 148 provide illustrations of the various walls that are available for the SL3000 library.

FIGURE A-12 SL3000 Slot Map—Base Module (1 of 3)

Base Module Configuration Options—Back Wall[1]



Cartridge row numbering begins with 13.

Configuration 1: 8 Tape Drives (One Drive Array)
Drive Columns 1—4, Rows 1 & 2
Data Cartridge Slots = 180[2].
Cartridge Columns 1—6[3].

Configuration 2: 16 Tape Drives (Two Drive Arrays)
Drive Columns 1—4, Rows 1—4
Data Cartridge Slots = 125[2].
Cartridge Columns 1—6[3].

See FIGURE A-13 on page 137

Configuration 3: 24 Tape Drives (Three Drive Arrays)
Drive Columns 1—4, Rows 1—6
Data Cartridge Slots = 65[2].
Cartridge Columns 1—6[3].

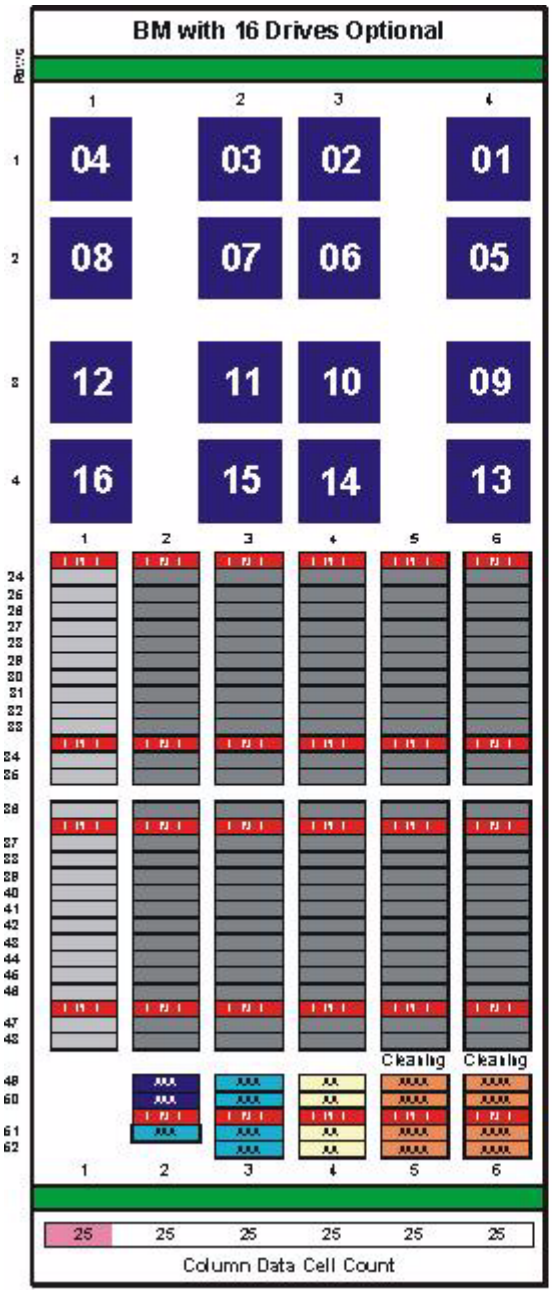
See FIGURE A-13 on page 137

Standard Storage Arrays

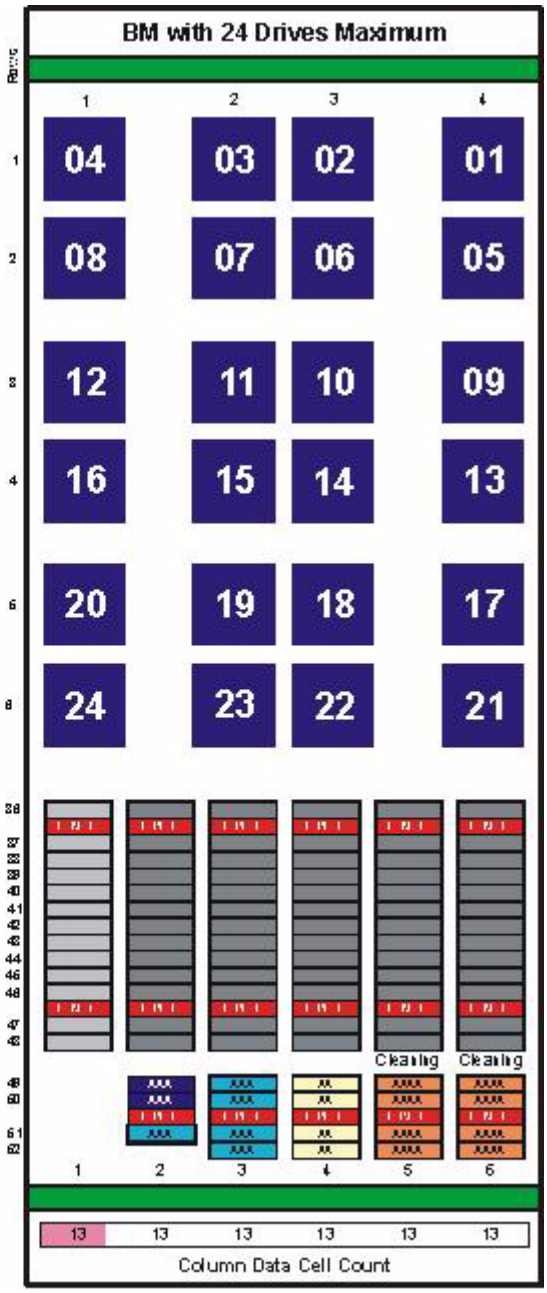
Reserved (System) Slots (from left to right)
- 2 drop off slots (Column 2, Rows 49 & 50)
- 1 swap slot (Column 2, Row 51)
- Diagnostic slots (Column 3, Rows 49—52)
- 4 slots for the Module Identification Block (Column 4, Rows 49—52)
- 8 slots for cleaning/diagnostic cartridges
  - (Column 5, Rows 49—52)
  - (Column 6, Rows 49—52)

Notes:
1. Perspective is from the front of the module.
2. These slot counts are for a standalone base module. Cartridge arrays in Column 1 are not accessible unless an adjoining module is installed. When another module is added to the left, the slot count will increase by 13, 25 or 36, depending on the number of drive arrays.
3. For locating cartridges, column numbering begins with + 1, counting from the left edge of this module's wall. The positive numbering scheme increments from this module's edge throughout all modules attached to the right. For example, if a module is attached to the right, its column numbering will start with +7.

FIGURE A-13 SL3000 Slot Map—Base Module (2 of 3)

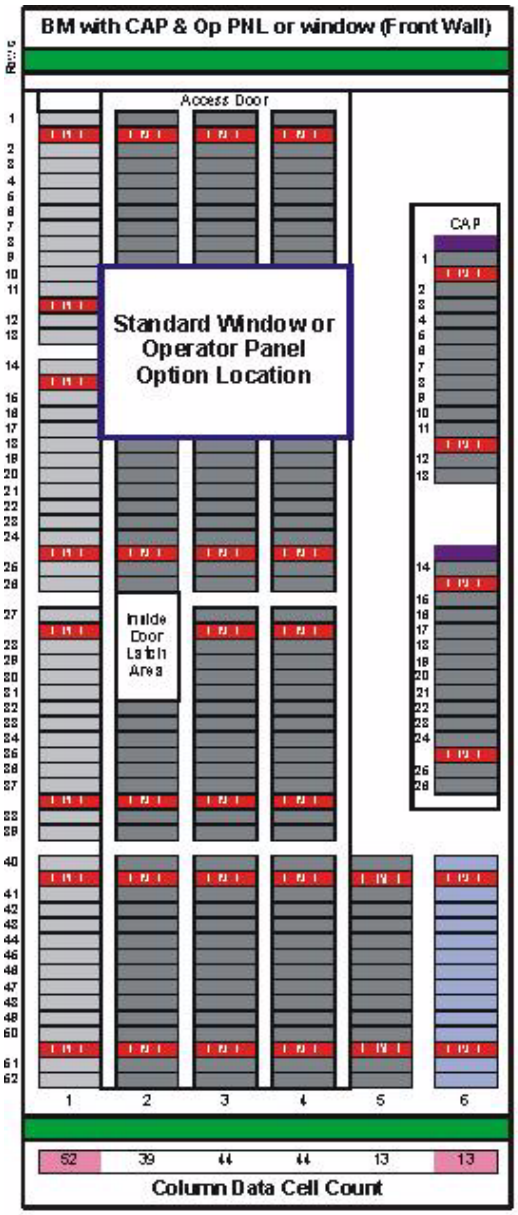


Notes: Perspective is from the front of the library.
Cartridge arrays in left column not accessible without an adjoining module.
Data cartridge count:
– 125 (No expansion)
– 150 (With expansion left)
See FIGURE A-12 on page 136 *for reserved slots*



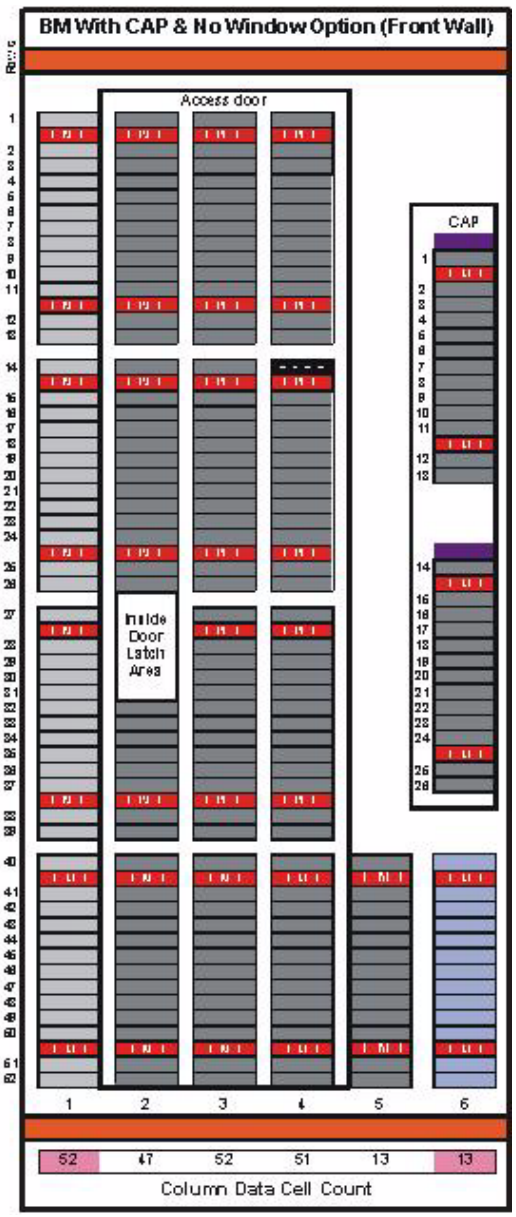
Notes: Perspective is from the front of the library.
Cartridge array in left column not accessible without an adjoining module.
Data cartridge count:
– 65 (No expansion)
– 78 (With expansion left)
See FIGURE A-12 on page 136 *for reserved slots*

FIGURE A-14 SL3000 Slot Map—Base Module (3 of 3)



Notes: Perspective is from the front of the library.
Left column not accessible without an adjoining module.
Column 1 and array in Column 6 not accessible without an adjoining module.

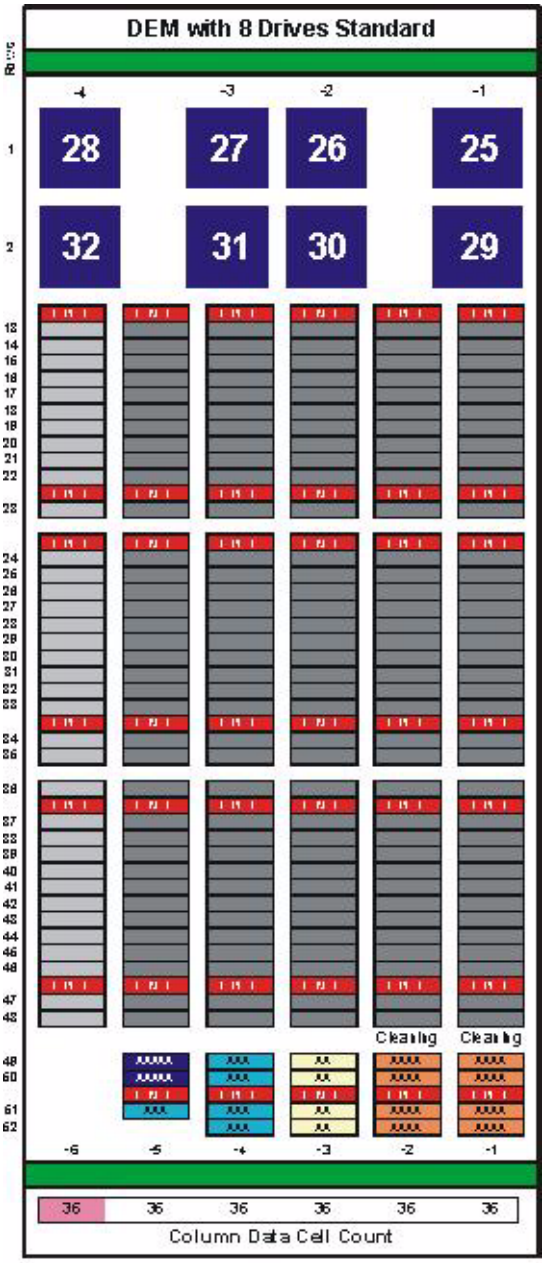
Data cartridge count:
– 140 (No expansion)
– 192 (With expansion left)
– 153 (With expansion right)
– 205 (With expansion left & right)



Notes: Perspective is from the front of the library.
Left column not accessible without an adjoining module.
Column 1 and array in Column 6 not accessible without an adjoining module.
Data cartridge count:
– 163 (No expansion)
– 215 (With expansion left)
– 176 (With expansion right)
– 228 (With expansion left & right)

FIGURE A-15 SL3000 Slot Map—Drive Expansion Module (1 of 5)

Configuration Options—Back Wall[1.]



Cartridge row numbering begins with 13

Configuration 1: 8 Tape Drives[2.] (One Drive Array)
Drive Columns -1— -4, Rows 1 & 2
Data Cartridge Slots = 180[3.]
Cartridge Columns -1— -6[4.]

Configuration 2: 16 Tape Drives (Two Drive Arrays)
Drive Columns -1— -4, Rows 1—4
Data Cartridge Slots = 125[3.]
Cartridge Columns -1— -6[4.]

See FIGURE A-16 on page 140

Configuration 3: 24 Tape Drives (Three Drive Arrays)
Drive Columns -1— -4, Rows 1—6
Data Cartridge Slots = 65[3.]
Cartridge Columns -1— -6[4.]

See FIGURE A-16 on page 140

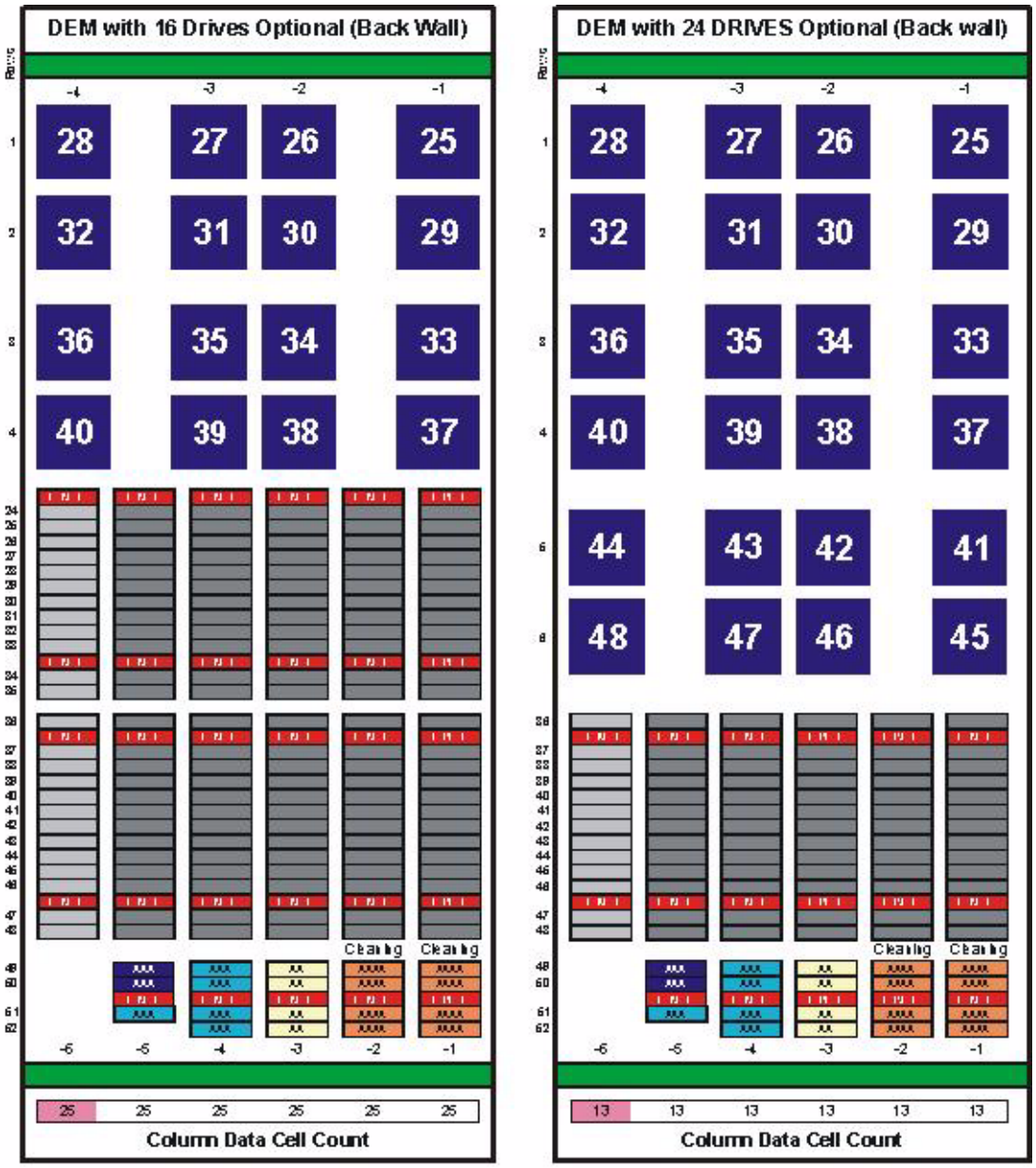
Configuration 4: 32 Tape Drives (Four Drive Arrays)
Drive Columns -1— -4, Rows 1—6

See FIGURE A-17 on page 141

System Slots (from left to right, *not reserved*)
- 3 slots for either diagnostic or cleaning cartridge (Column -5, Rows 49, 50 & 52)
- 4 slots for either diagnostic or cleaning cartridges (Column -5, Rows 49—51)
- 4 slots for the Module Identification Block (Column -3, Rows 49—52)
- 8 slots for either diagnostic or cleaning cartridges
  - (Column -2, Rows 49—52)
  - (Column -1, Rows 49—52

1. Perspective is from the front of the module.
2. Drive slot numbering always begins with 25.
3. These hardware slot counts are for a Drive Expansion Module without an adjoining module to the left. Cartridge arrays in Column -6 are not accessible unless an adjoining module is installed to the left. When another module is added to the left, the slot count will increase by 13, 25 or 36, depending on the number of drive arrays.
4. For locating cartridges, column numbering begins with - 1, counting from the right edge of this module's wall. The negative numbering scheme continues from this module's edge throughout all modules attached to the left. For example, if a module is attached to the left, its column numbering will start with -7.

FIGURE A-16 SL3000 Slot Map—Drive Expansion Module (2 of 5)



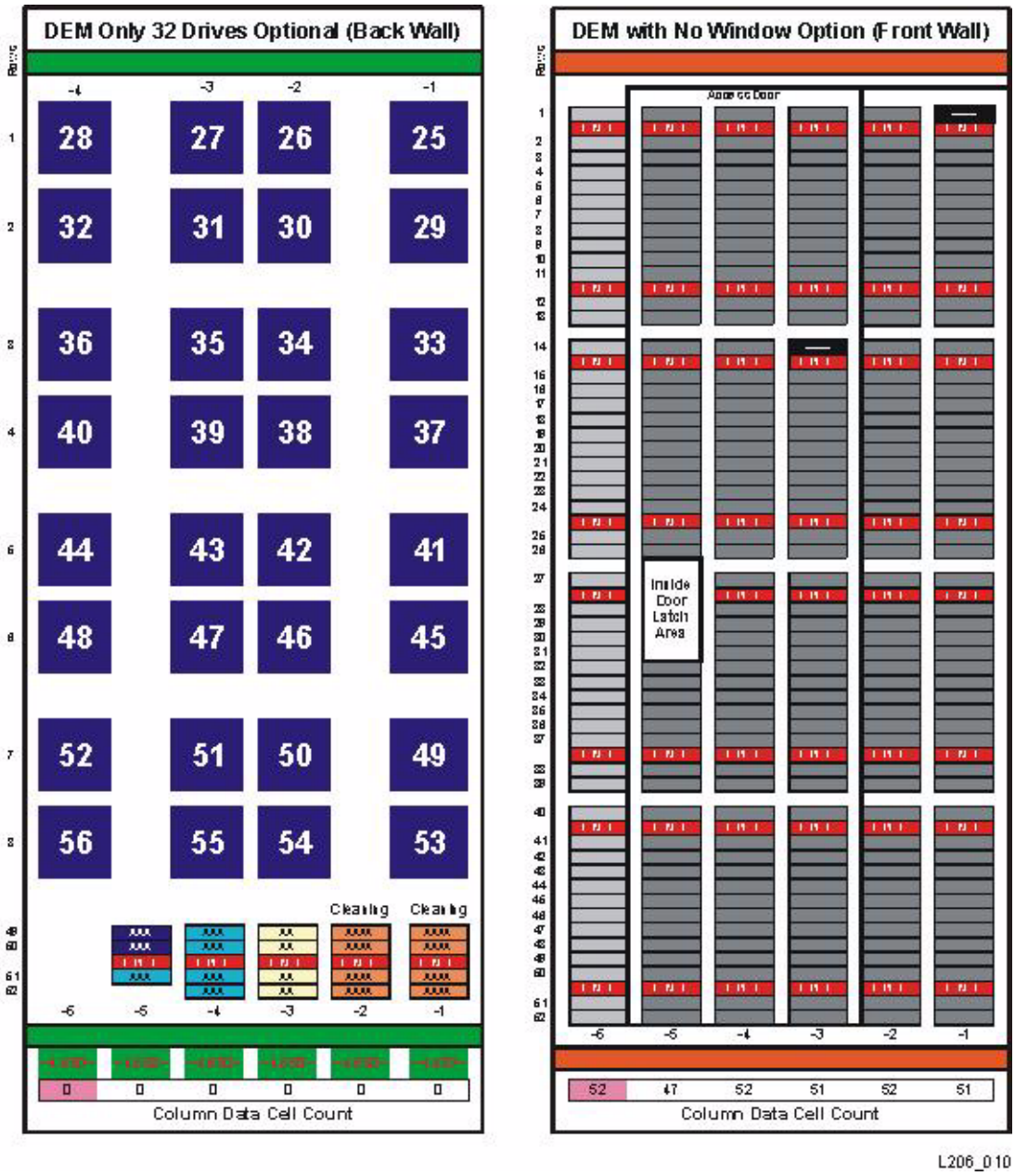
Notes: Perspective is from the front of the module.
Cartridge arrays in left column not accessible without an adjoining module.

Data cartridge count:
– 125 (No expansion)
– 150 (With expansion)
No drop-off/swap slots; all system slots available for DG/CLN

Notes: Perspective is from the front of the module.
Cartridge array in left column not accessible without an adjoining module.

Data cartridge count:
– 65 (No expansion)
– 78 (With expansion)
No drop-off/swap slots; all system slots available for DG/CLN

FIGURE A-17 SL3000 Slot Map—Drive Expansion Module (3 of 5)



Notes: Perspective is from the front of the module.
No data cartridge slots.
No drop-off/swap slots; all system slots available for DG/CLN

Notes: Perspective is from the front of the module.
Left column is not accessible without an adjoining module.
Data cartridge count:
– 253 (No expansion)
– 305 (With expansion)

FIGURE A-18 SL3000 Slot Map—Drive Expansion Module (4 of 5)

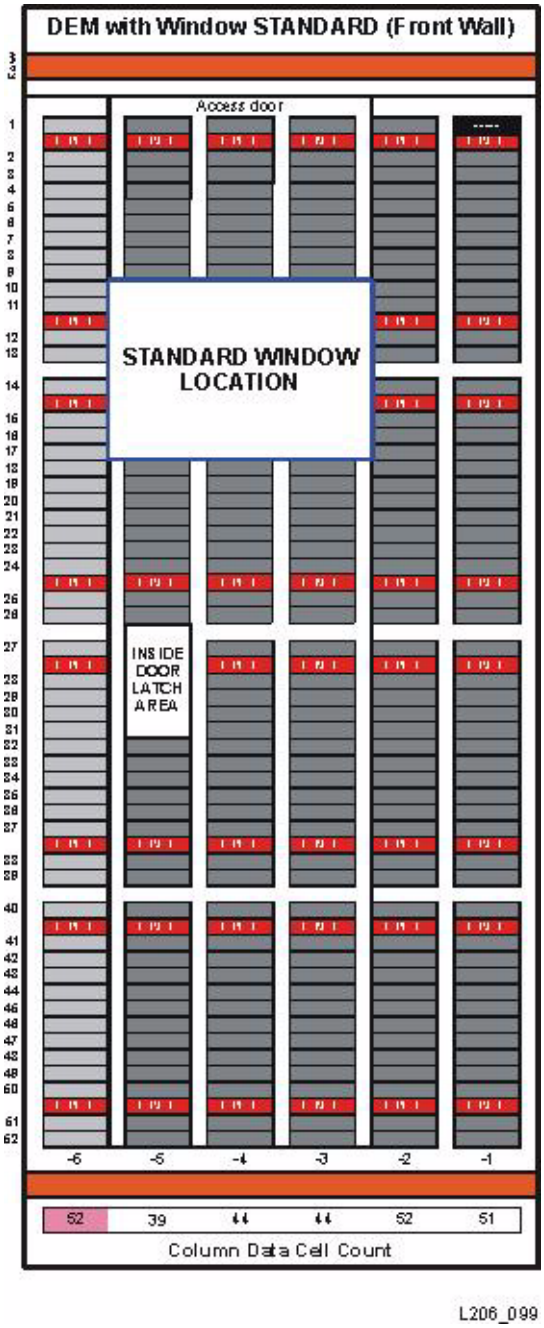
Notes: Perspective is from the front of the module. Left column is not accessible without an adjoining module.

Data cartridge count
– 153 (No expansion)
– 205 (With expansion)

Notes: Perspective is from the front of the module. Left column is not accessible without an adjoining module.

Data cartridge count:
– 176 (No expansion)
– 228 (With expansion)

FIGURE A-19 SL3000 Slot Map—Drive Expansion Module (5 of 5)



Notes: Perspective is from the front of the module.
Left column is not accessible without an adjoining module.
Black slot location is inaccessible.

Data cartridge count
– 230 (No expansion)
– 282 (With expansion)

FIGURE A-20 SL3000 Slot Map—Cartridge Expansion Module, Back Wall

Notes:

- Perspective is from the front of the module.
- This depicts a CEM installed to the left of a module (note the negative numbering for the columns).
- Left column is not accessible without an adjoining module on the *left*. Therefore, if this is the last module on the left, the left column is not accessible (due to robotic hand design).
- If this were installed to the right of a module, the column numbering would continue with positive numbering.
- Both left and right column are accessible when it is installed on the *right* (due to the design of the robotic hand).
- Data cartridge count
  - 256 (No expansion or the last module on the *left)*
  - 308 (With expansion or if the last module installed on the *right*)

FIGURE A-21 SL3000 Slot Map—Cartridge Expansion Module, Front Wall, Installed on the Right

Notes: Perspective is from the front of the module.
Data cartridge count = 312

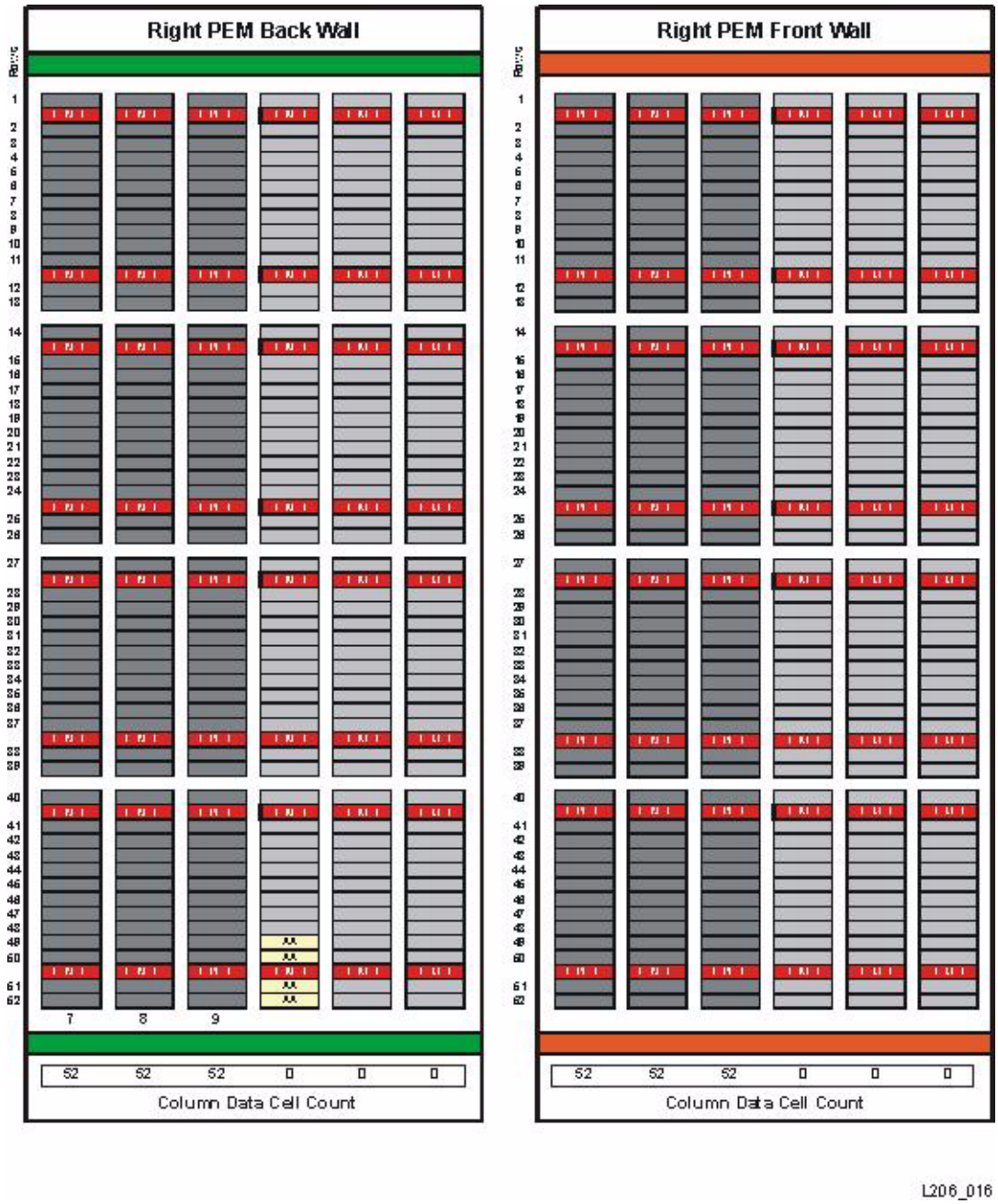
Notes: Perspective is from the front of the module.
Data cartridge count = 234

FIGURE A-22 SL3000 Slot Map—Cartridge Expansion Module, Installed on the Left

Notes: Perspective is from the front of the module.
Left column is not accessible without an adjoining module.
Data cartridge count:
– 260 (No expansion)
– 312 (With expansion)

Notes: Perspective is from the front of the module.
Left column is not accessible without an adjoining module.
Data cartridge count:
– 182 (No expansion)
– 234 (With expansion)

FIGURE A-23 SL3000 Slot Map—Parking Expansion Module, Installed on the Right



Notes: Perspective is from the front of the module.
Right 3 columns not accessible (for TallBot parking).
Data cartridge count = 156
Four cartridge slots reserved for module identifier block labels.

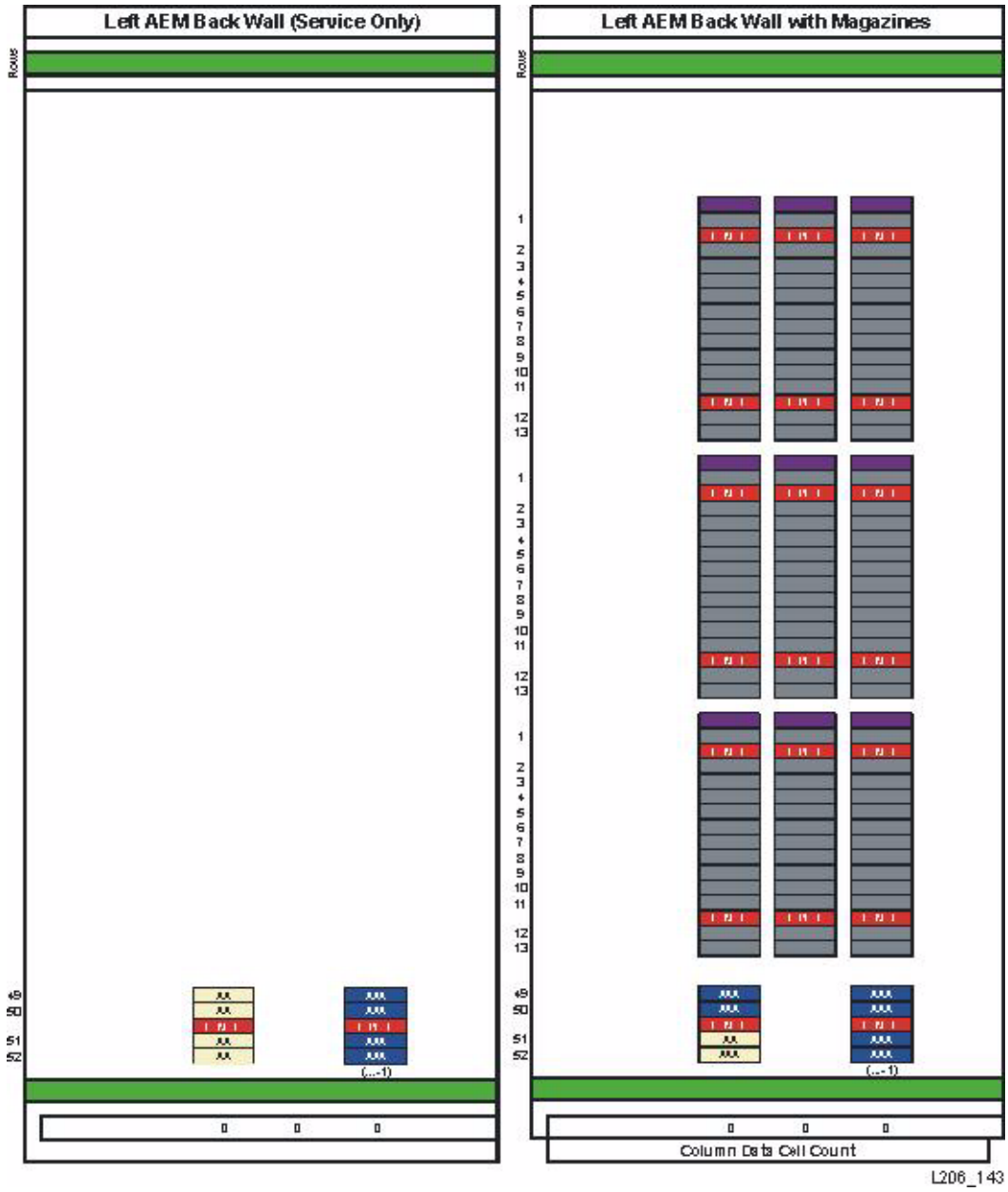
Notes: Perspective is from the front of the module.
Right 3 columns not accessible (for TallBot parking).
Data cartridge count = 156

FIGURE A-24 SL3000 Slot Map—Parking Expansion Module, Installed on the Left

Notes: Perspective is from the front of the module.
Left 3 columns not accessible (for TallBot parking).
Data cartridge count = 152
Four cartridge slots reserved for module identifier block labels.

Notes: Perspective is from the front of the module.
Left 3 columns not accessible (for TallBot parking).
Data cartridge count = 156

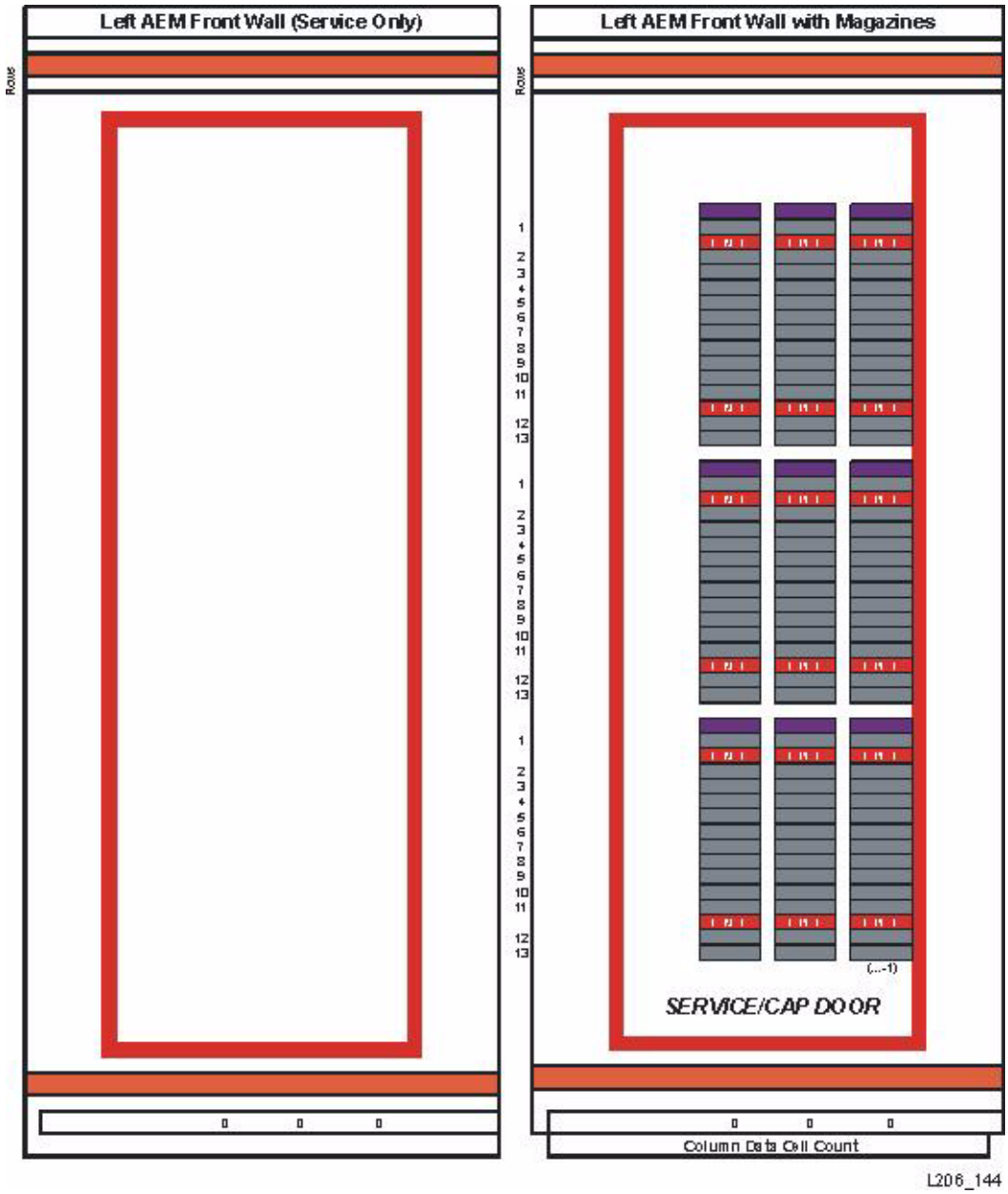
FIGURE A-25 SL3000 Slot Map—Access Expansion Module, Installed on the Left (Rear Wall)



Notes: Perspective is from the front of the module.

- Nine magazines of 13 cartridges each.
- Front wall capacity = 117 cartridges.
- Total CAP capacity = 234 slots.
- Four cartridge slots reserved for module identifier block labels.
- Four slots reserved for special cartridges.
- Regains an additional 52 data cartridge slots from the previous module (104 total).

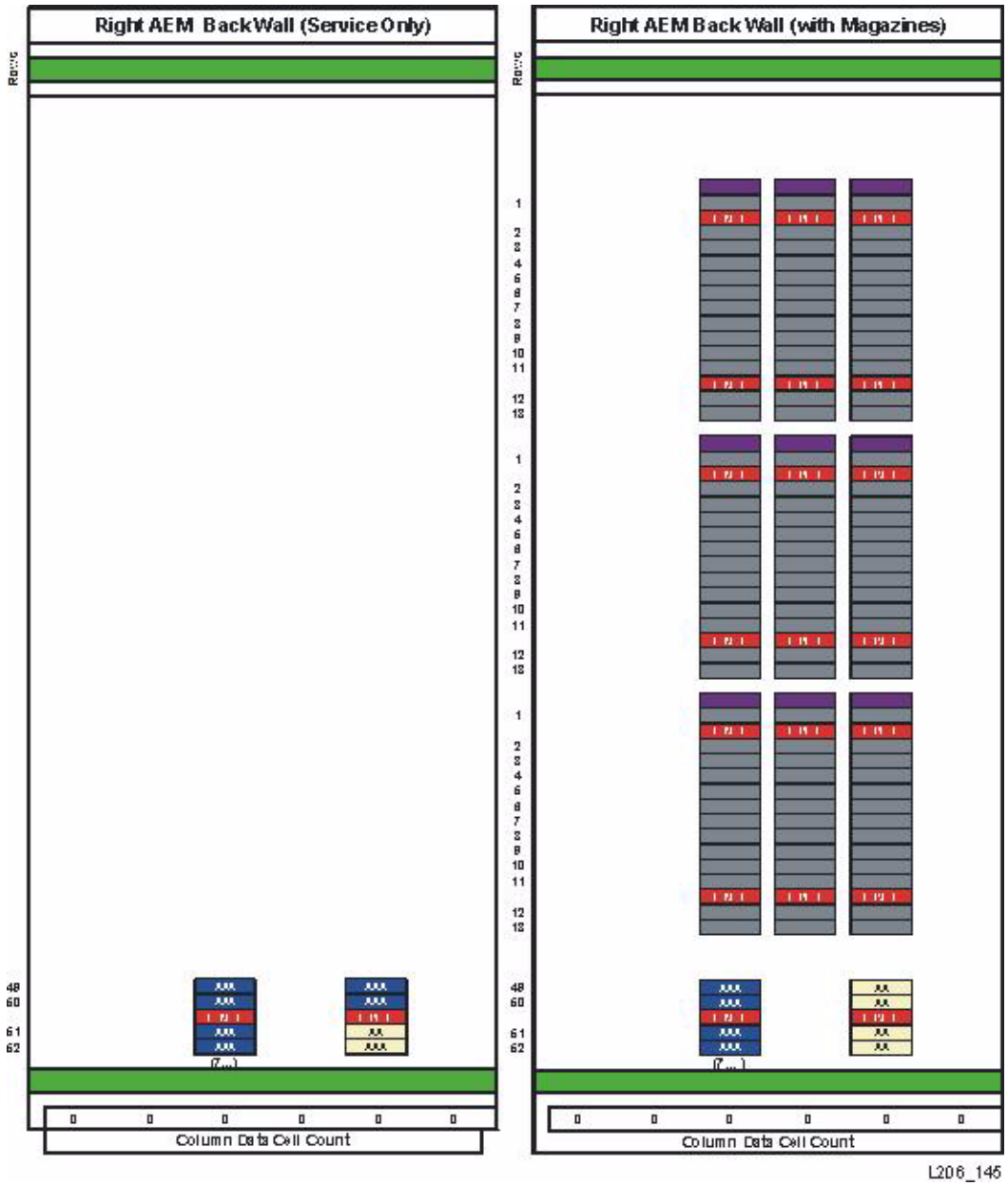
FIGURE A-26 SL3000 Slot Map—Access Expansion Module, Installed on the Left (Front Wall)



Notes: Perspective is from the front of the module.

- Nine magazines of 13 cartridges each.
- Front wall capacity = 117 cartridges.
- Total CAP capacity = 234 slots.
- Regains an additional 52 data cartridge slots from the previous module (104 total).

FIGURE A-27 SL3000 Slot Map—Access Expansion Module, Installed on the Right (Rear Wall)

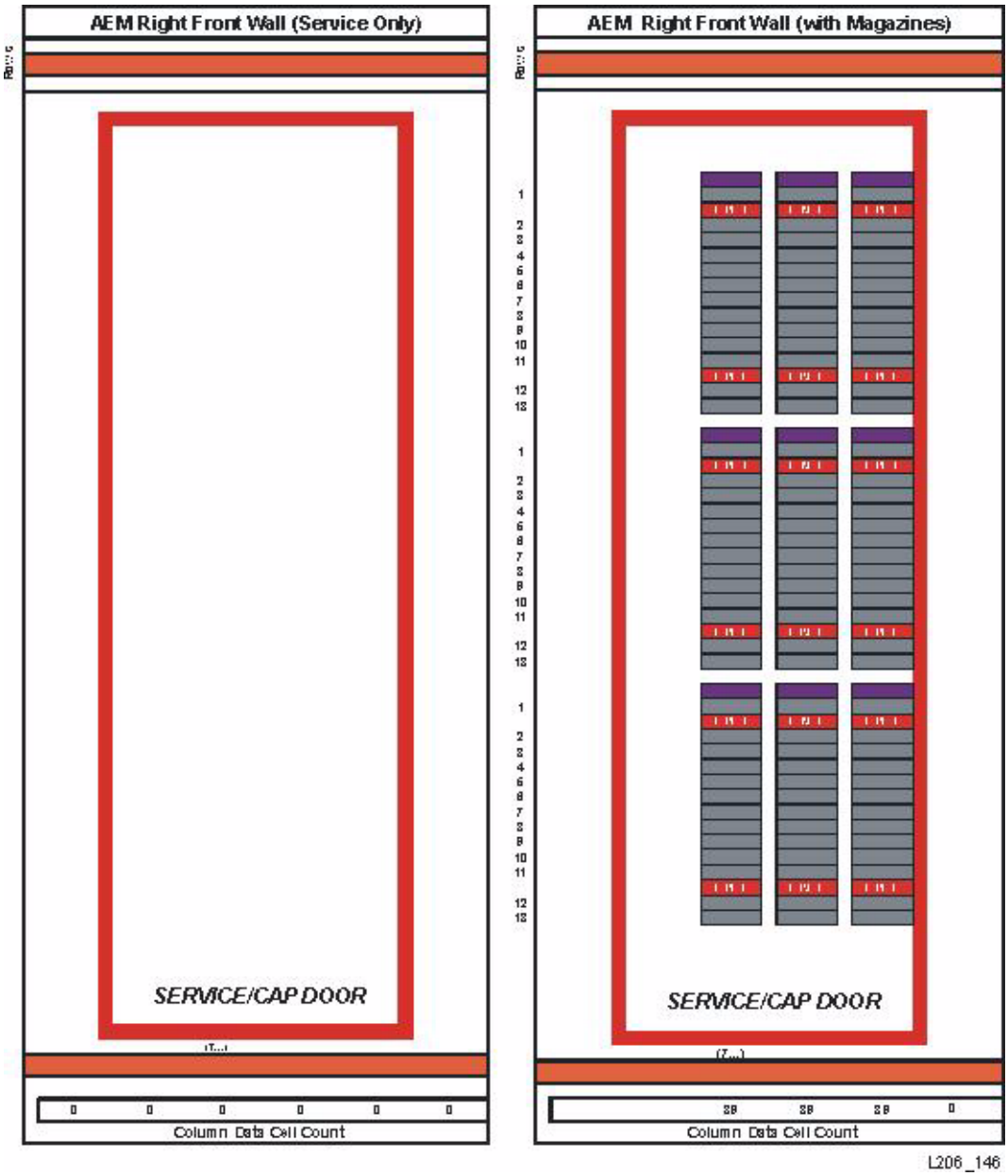


Notes: Perspective is from the front of the module.

- Nine magazines of 13 cartridges each.
- Rear wall capacity = 117 cartridges.
- Total CAP capacity = 234 slots.
- Four cartridge slots reserved for module identifier block labels.
- Four slots reserved for special cartridges.

FIGURE A-28 SL3000 Slot Map—Access Expansion Module, Installed on the Right (Front Wall)

Notes: Perspective is from the front of the module.



- Nine magazines of 13 cartridges each.
- Front wall capacity = 117 cartridges.
- Total CAP capacity = 234 slots.

Reserved and System Slots

There are three reserved slots within the base module only.

These slots must be left empty.

Two slots are reserved for drop-off locations and one slot is reserved as a swap slot. All remaining system slots (in both the base and drive expansion modules) can be used for diagnostic or cleaning cartridges.

TABLE A-5 lists the 12 system slots for diagnostic or cleaning cartridges in the base drive module.

Note: there are a total of 17 system slots for diagnostic or cleaning cartridges in the drive expansion module.

There are no reserved slots the cartridge or parking expansion modules.

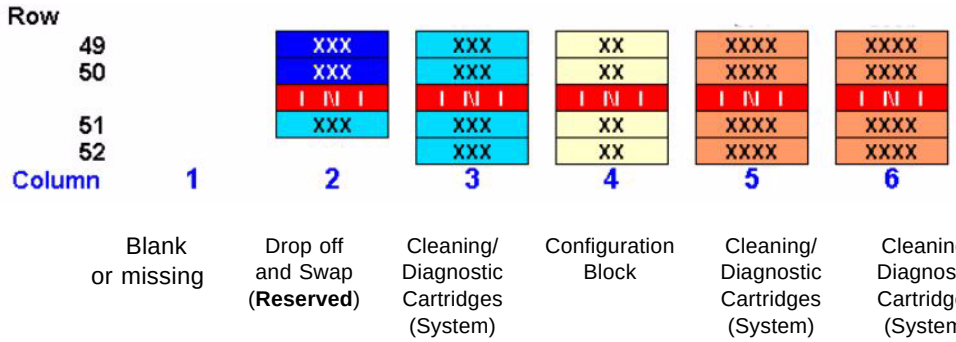
TABLE A-5 Reserved/System Slots

Slot Locations	Module Type	Use	Location
1, 1, 2, 1, 49—50	Base module	Drop off slots (*Reserved*)*	Back wall of the Base module
1, 1, -4, 1, 49—50	Drive expansion module	Cleaning/Diagnostic Cartridges	Back wall of the DEM
1, 1, 2, 1, 51	Base module	Swap slot (*Reserved*)*	Back wall of the Base module
1, 1, -5, 1, 51	Drive expansion module	Cleaning/Diagnostic Cartridges	Back wall of the DEM
1, 1, 5, 1, 49—52 1, 1, 6, 1, 49—52	Base module	Cleaning/Diagnostic Cartridges	Back wall of the Base module
1, 1, -1, 1, 49—52 1, 1, -2, 1, 49—52	Drive expansion module	Cleaning/Diagnostic Cartridges	Back wall of the DEM
Note: Do *not* place data cartridges in a reserved slot. These slots are masked from the customer's database (that is, an online TallBot will never go to these slots).			

FIGURE A-29 on page 154 shows an example of the reserved/system slots in the *base module*:

1. Drop off slots (2) in column 2, rows 49 and 50—Reserved.
2. Swap slot (1) in column 2, row 51—Reserved.
3. Cleaning/Diagnostic slots (4) in column 3, rows 49, 50, 51, and 52—System.
4. Configuration block in column 4, rows 49, 50, 51, and 52.
5. Cleaning/Diagnostic slots (4) in column 5, rows 49, 50, 51, and 52—System.
6. Cleaning/Diagnostic slots (4) in column 6, rows 49, 50, 51, and 52—System.

FIGURE A-29 Reserved/System Slot Locations—*Base Module Only*



APPENDIX **B**

Optimization

This appendix provides information about how to optimize the SL3000 library using content management and the elements of partitioning.

Planning for Content

When planning the content of an SL3000 library, there are no pass-thru mechanisms or elevators that you need to take into consideration. Therefore, the most important aspect is to evaluate *content* with respect to the *physical structure*.

SL3000 physical structure includes:

- CenterLine Technology
- Modular design to increase both cartridge capacity and tape drive performance
- Library addressing for partitioning and capacity on demand
- Single rail with one (standard) or two (optional and redundant) TallBots
- Up to 10 standard—rotational—cartridge access ports (CAPs)
- One bulk load or two bulk load cartridge access ports
- Two Access Expansion Modules (a redundant robotic feature)
- From 1 to 56 tape drives

Robotic Rails and TallBots

The *robotic units* in an SL3000 library are called *TallBots*. Each library can have either one (standard) or two (redundant) TallBots that are driven along two extrusions, called rails, on the rear wall of the library.

Rails are continuous and allow the TallBots to travel the length of the library from end-to-end. However, in a dual (2) TallBot configuration, there is a robotic safety zone that prevents collisions.

When using redundant TallBots, Access *or* Parking Expansion Modules must be installed at *both* ends of the library string. This is shown in FIGURE A-1 on page 122.

- Parking Expansion Modules (PEMs) have an area of inaccessible cartridge slots in the event of a TallBot failure. The defective TallBot either moves into or is pushed into this area while the other—redundant—TallBot continues library operations.
- Access Expansion Modules provide an area or "garage" where the defective TallBot is parked. A service representative can then replace this TallBot without interrupting library operations.

Using redundant TallBots for content management offers:

- Increased speed for library operations—two robotic units working in parallel
- Redundant operations should one unit fail

Cartridge Access Ports

The SL3000 can have from 1 to 10 cartridge access ports spread across the entire library. This means the library can have a CAP for each module.

Note – The CAP is a standard feature for the Base module and optional features for the DEM and CEMs.

Although, operation of the cartridge access port does not directly affect the performance of the library, here are some guidelines that can help with the operation:

- Whenever possible, enter cartridges through the cartridge access ports.
- When planning the workloads, place applications that require significant enters and ejects adjacent to the CAP magazines.

Tip:
Place labels outside on the library wall indicating which CAP and which magazine gets what type of cartridge. See "CAP Labels" on page 22.

- When planning the workloads, place applications that require significant enters and ejects in modules that have a CAP.
- Use the *watch_vols* utility for ACSLS.
- Insert cartridges with the correct orientation:
  - Fully seated and laying flat within the slots
  - Parallel to the floor
  - Hub-side down
  - Barcode label pointing out and below the readable characters.

Along with the standard (rotational) CAPs, the SL3000 provides bulk load capabilities using the features of the Access Expansion Module. See "Bulk Load Cartridge Access Ports" on page 21.

Managing Cartridges

Managing cartridges in the library can have an affect on performance.
Some considerations include:

- Use a library management application such as ExLM with HSC to keep active volumes and compatible drives closer together and to migrate less active volumes farther away from the drives.
- Use a *float* option. When float is on, the management software can automatically select a new home slot for a cartridge on a dismount. **Note:** Make sure the library contains enough *free slots* to allow the selection of a new home slot during the dismount.
- Cluster cartridges. Group and/or partition the cartridges by workload with enough tape drives to support the maximum, peak activity.
- Enter cartridges through the CAP.
  - When manually placing cartridges in the library with the front door open, library operations cease and the library management software must perform a full audit to update the library database to match the actual contents.
  - When entering cartridges through the CAP, the library stays online so mounts can continue and the library automatically updates the database.
- Eject cartridges. There are two ways (host functions) to eject cartridges: Ordered and Unordered.
  - When the host specifies an Ordered eject, the library places the cartridges in a specific sequence. This operation is significantly slower than unordered ejects. Ordered ejects are used for vaulting, which simplifies the external operations.
  - When the host specifies an Unordered eject, the library ejects cartridges as it can, often in a random order.
- Manage the available space in the library:
  - Plan for times of peak activity.
  - Keep an adequate supply of scratch cartridges in the library.
  - Move inactive cartridges out of the library to ensure there is adequate space for active cartridges.

Planning for Tape Drives

During the installation, having an understanding about how to logically group and install the tape drives can improve performance. Strategies to use when determining where to install the tape drives include:

- Install tape drives that use the same media types closer to those slots.
  For example: Place T9840 drives on the left side of the drive bay with their cartridges to the left; and LTO drives on the right side with their matching media to the right.
- Install enough tape drives to adequately handle peak workloads.
- Configure heavy tape applications so they do not exceed the performance limits of the library configuration.
- Use a tool such as **QuickLine** or a Tape Library Configurator to determine the optimal drive configurations.

Library Addressing

There are several factors to be aware of when configuring and planning for content. These are:

- Default, out-of-the-box numbering behavior on page 131
- Partitioning
- Addition of capacity using previously installed slots (Capacity on Demand)

Slot numbering and library addressing are two different functions.

- Slot numbering is an *internal*, library controller, function.
- Library addressing is an *external* design for physical slot location.

Numbering Diagram Example

FIGURE B-1 serves as a *example* diagram for the discussions about Partitioning and Capacity on Demand. The actual library layout will depend upon your module configurations.

This figure has three modules with a capacity of 76 slots and 12 tape drives.

FIGURE B-1 Out-of-the-Box Numbering

		Center	Line						
CEM			Base Module				CEM		
1	11	21	Drive	Drive	Drive	Drive	47	57	67
2	12	22	Drive	Drive	Drive	Drive	48	58	68
3	13	23	Drive	Drive	Drive	Drive	49	59	69
4	14	24	Drive	Drive	Drive	Drive	50	60	70
5	15	25	Drive	Drive	Drive	Drive	51	61	71
6	16	26	Drive	Drive	Drive	Drive	52	62	72
7	17	27	31	35	39	43	53	63	73
8	18	28	32	36	40	44	54	64	74
9	19	29	33	37	41	45	55	65	75
10	20	30	34	38	42	46	56	66	76

Notice the numbering starts in the upper left corner, counts the slots top to bottom, and left to right. This is the standard behavior of the library for all configurations.

Note – FIGURE B-1 is only an example. There are no default shared resources. All resources must be specifically allocated.

Partitioning

The definition of a partition is “to divide into parts or shares”.

Benefits:
Partitioning a library means the customer can have:

- More than one operating system and application managing the library.
- An improvement in the protection or isolation of files.
- An increase in system and library performance.
- An increase in user efficiency.

Customized fit:
Partitions may be customized to fit different requirements, such as:

- Giving multiple departments, organizations, and companies access to the resources of the library
- Isolating clients at service centers
- Separating different encryption key groups
- Dedicating partitions for special tasks

Defining partitions:

- Partitions are defined by assigning rectangular boundaries.
  Currently the SL3000 supports up to *60 rectangular boundaries* per partition within the library.
- As slots are added to a partition they are deducted from the total activated capacity.

Note – If a partition contains slots that are being displaced because an optional CAP is being installed, the customer *must remove all these slots from any partition definitions prior to shutting down the library.* Failure to do this will result in a service call and engineering assistance to recover partition definitions.

Non-Disruptive Partitioning

The non-disruptive partitioning (NDP) feature minimizes the number of host interruptions that occur when partitions are modified. The library does not need to be taken offline for every partition change, and hosts are insulated from partition changes that do not affect them directly.

Prior to this feature, whenever a partition was changed in any way, all partitions would go offline while the library controller database was updated. As a result, library outages needed to be coordinated across all hosts connected to a partitioned library.

The specific functions of the NDP feature vary, depending on the type of host-partition connection. For details, refer to the SL3000 User’s Guide.

Note – Although partition changes are not disruptive to library hosts, it is recommended that you make the library unavailable to other users before committing your partition workspace changes.

Capacity on Demand

Capacity on Demand is a *non-disruptive* optional feature that allows the customer to add capacity to the library using previously installed, yet inactive slots.

Non-disruptive Capacity Changes

Changes to active capacity result in minimal disruptions to library operations. The specific library behavior depends on the type of host connection, HLI or FC-SCSI.

Note – Although changes to active capacity are not disruptive to library hosts, it is recommended that you make the library unavailable to other users before committing the active storage region changes.

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.

With FC-SCSI libraries, whenever you make any of the following changes, the library goes offline temporarily with a Unit Attention condition:

- Activate or de-activate a storage cell
- Add, change, or remove a host connection
- Remove an empty drive slot

Multiple error messages may be generated, and 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. In the case of adding or removing drives, the device SCSI numbering is updated as well.

Rectangular Boundaries

Rectangular boundaries provide the customer with a resource to better optimize cartridge placement within the library.

To do this, the customer selects boundaries within the library by using the same method as defining a partition.

This rectangular boundary can be just one or two slots, a row, a column, or an entire module.

Available slots use the same numbering scheme of the library within the boundaries—starting in the upper left, then counting to the lower right—for the *activated capacity* of the library.

1. FIGURE B-2 on page 162, Number 1, shows how the customer has defined:

- Two selected partitions (A and B) using
- Four Rectangular boundaries called AR1, BR1, BR2, and BR3
- For a library activated for 50 slots
  AR1-1 through 20, BR1-1 through 8, BR2-9 through 28, and BR3-29 through 30.

Concentrating on A's boundary are examples of what the customer can do to:

2. Add 5 more slots.
   Create two new boundaries under the tape drives (FIGURE B-2, Number 2)
   - AR2 slots 21 through 24 and
   - AR3 slot 25

   Note: Because there are no more slots under AR2-24, the customer needed to go to the right and create a boundary for the fifth additional slot (AR3-25), an example of a single slot rectangle boundary.

3. Add 12 more slots.
   Create two new boundaries (FIGURE B-2, Number 3)
   - AR2 slots 21 through 28 and
   - AR3 slots 29 through 32

   Note: Because there are no more slots to the right of AR2-28, the customer needed to go to another area of the library with installed, yet inactive, slots to continue with the addition. To do this, the boundary AR3 was created to the left of boundary AR1.

FIGURE B-2 Adding Capacity to Partitions

1) Original 50 Active Slots

CEM			Base Module				CEM		
	AR1-1	**11**	**Drive**	**Drive**	**Drive**	**Drive**	**BR2-9**	19	**BR3-29**
	2	**12**	**Drive**	**Drive**	**Drive**	**Drive**	10	20	30
	3	**13**	**Drive**	**Drive**	**Drive**	**Drive**	11	21	
	4	**14**	**Drive**	**Drive**	**Drive**	**Drive**	12	22	
	5	**15**	**Drive**	**Drive**	**Drive**	**Drive**	13	23	
	6	**16**	**Drive**	**Drive**	**Drive**	**Drive**	14	24	
	7	**17**			**BR1-1**	5	15	25	
	8	**18**			2	6	16	26	
	9	**19**			3	7	17	27	
	10	**20**			4	8	18	28	

2) Adding 5 More Slots (AR2-21 to 24) and (AR3-25)

	AR1-1	11	**Drive**	**Drive**	**Drive**	**Drive**	**BR2-9**	19	**BR3-29**
	2	12	**Drive**	**Drive**	**Drive**	**Drive**	10	20	30
	3	13	**Drive**	**Drive**	**Drive**	**Drive**	11	21	
	4	14	**Drive**	**Drive**	**Drive**	**Drive**	12	22	
	5	15	**Drive**	**Drive**	**Drive**	**Drive**	13	23	
	6	16	**Drive**	**Drive**	**Drive**	**Drive**	14	24	
	7	17	**AR2-21**	**AR3-25**	**BR1-1**	5	15	25	
	8	18	**22**		2	6	16	26	
	9	19	**23**		3	7	17	27	
	10	20	**24**		4	8	18	28	

3) Adding 12 More Slots (AR2-21 to 28) and (AR3-29 to 32)

AR3-29	**AR1-1**	11	**Drive**	**Drive**	**Drive**	**Drive**	**BR2-9**	19	**BR3-29**
30	2	12	**Drive**	**Drive**	**Drive**	**Drive**	10	20	30
31	3	13	**Drive**	**Drive**	**Drive**	**Drive**	11	21	
32	4	14	**Drive**	**Drive**	**Drive**	**Drive**	12	22	
	5	15	**Drive**	**Drive**	**Drive**	**Drive**	13	23	
	6	16	**Drive**	**Drive**	**Drive**	**Drive**	14	24	
	7	17	**AR2-21**	**25**	**BR1-1**	5	15	25	
	8	18	**22**	**26**	2	6	16	26	
	9	19	**23**	**27**	3	7	17	27	
	10	20	**24**	**28**	4	8	18	28	

Guidelines

The SL3000 can support up to *eight* partitions using a variety of interface types: only Ethernet partitions, only SCSI partitions, or combinations of both.

Essential guidelines for understanding partitions are:

- Clear communication between the system programmers, network administrators, library software representatives and administrators, and service representatives.
- Customers must be current on maintenance levels of their library management software.
- A clearly written and drawn out plan for partitioning must be completed and agreed upon by all partition members. A form for the written plan is supplied in "Planning the Partitions" on page 166; to assist you in drawing out the plan, see FIGURE B-4 on page 167.

Remember:

- One partition will not recognize another partition within the library. Other partitions are either not reported or marked as inaccessible.
- CAPs may be allocated to one or more partitions. *However:*
  - Sharing a CAP between HLI and SCSI partitions is *not* permitted
  - CAP sharing among SCSI partitions is *not recommended*.
- Since CAPs can be either shared or dedicated among partitions:
  - Automatic mode for shared CAP operations is not supported
  - Automatic mode for dedicated CAP operations is supported
- If a host has a CAP reserved for enter/eject operations for a partition, no other hosts or partitions can have access to the CAP.

  Note: The SL3000 has an optional feature to add cartridge access ports to the drive expansion and cartridge expansion modules for a total of up to *10 CAPs*.

Note – For SCSI hosts, automatic CAP mode is supported for one partition at a time *if the shared CAP is associated with that partition*. A shared CAP that has been associated with a partition acts as a dedicated CAP until the association changes.

- Duplicate VOLSERs are supported by the library; however, the library management software may not support this unless the duplicate VOLSERs are in different partitions.
  - With HSC-managed partitions, the duplicate VOLSERs must be in different control data sets.
  - With ACSLS-managed partitions, the duplicate VOLSERs must be on different ACSLS servers.

Planning the Data Path

When planning for partitions, you also need to be aware of the location, quantity, type, and need for the tape drives and media.

Likewise, having a clear understanding about how to logically group and install the tape drives and locate media for the different hosts, control data sets, and interface types is necessary.

When planing for partitions:

- Make sure the tape drive interface supports that operating system.
  - Open system platforms do *not* support ESCON or FICON interfaces.
  - Not all mainframes support Fibre Channel or LTO tape drives.
- Make sure the media types match the application.
- Install tape drives that use the same media types in the same partition.

Important:
Complete a Partition Plan using "Planning the Partitions" on page 166 and FIGURE B-4 on page 167. Make sure this information is placed with the library or account log.

Host Software Precautions

Important:
When you partition or re-partition a library, you do not have to reboot or IPL the library; however, when you apply the changes to the partitioning, the library will go offline temporarily. For this reason, it is best to minimize any disruptions to the operating systems and library management software before you partition.

The amount of time the library goes offline is minimal, **from 10 to 15 seconds.** However, *this action affects the entire library*, not just the changed partitions.

Any changes of this type are considered disruptive.

An example of a procedure that all hosts (ACSLS or HSC) should follow when partitioning or changing partitions is:

1. Plan the distribution of cartridges, such as enters, ejects, and moves.
2. Stop all host activity, such as mounts and dismounts, enters and ejects, any moves, plus any tape drive activity.
3. For HLI hosts, modify the library offline:
4. Use the remote SLC software to change the partitioning configuration.
5. For HLI hosts, make the hosts accessible to the library by varying the library back online.
   Audit the library with the host software to update the accessible cartridges and storage slots in the host software's database.
   SCSI hosts will need to re-learn the library if anything has changed on their partition.
6. Restart the host activity.

Performance Zone

The performance zone is an area within the SL3000 library that is closest to the tape drives (see FIGURE B-3 on page 165). Because of the physical location, volumes in this zone have faster access and response times to the tape drives; this includes both front and rear walls.

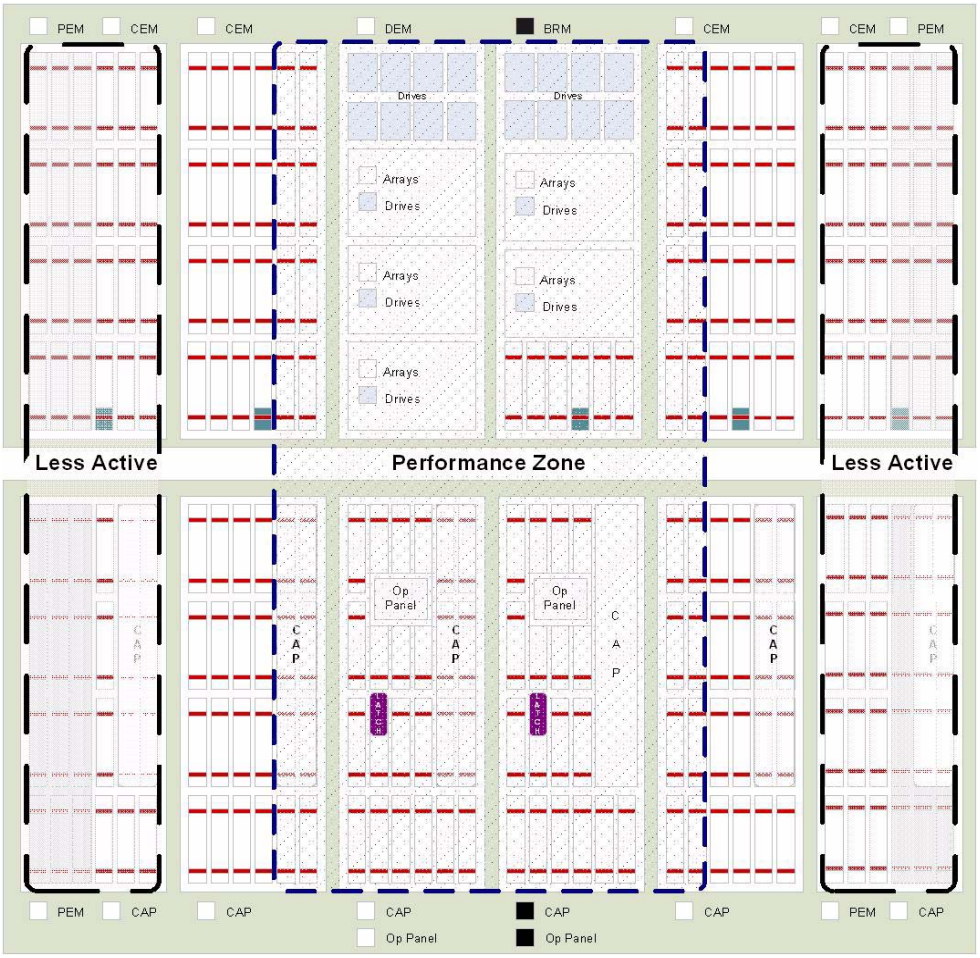
Selection of the volumes to reside in this zone is critical to obtain the best performance. Limit these volumes to those that benefit most from their location.

Candidates that fit well into the performance zone are:

- Applications such as VSM, HSM, and ABARS
- Volumes that tend to be recalled regularly
- Most recently created volumes
- Volumes that need fast access time
- Volumes that require very few ejects

Volumes that do not meet any of the above criteria should be moved out of this area. Once this zone is full, volumes would extend into the regular storage area.

FIGURE B-3 Performance Zone

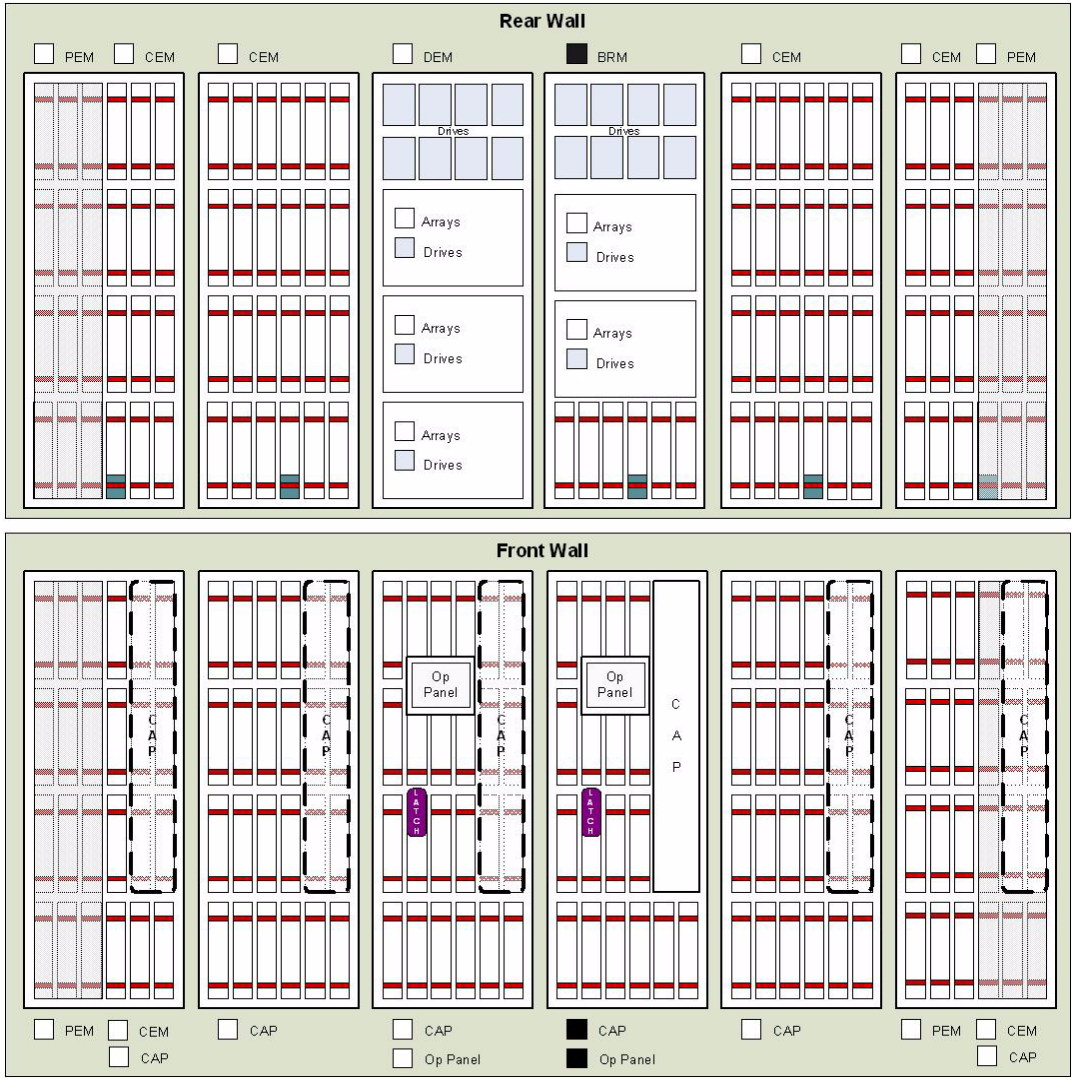


Planning the Partitions

TABLE B-1 Partition Planning

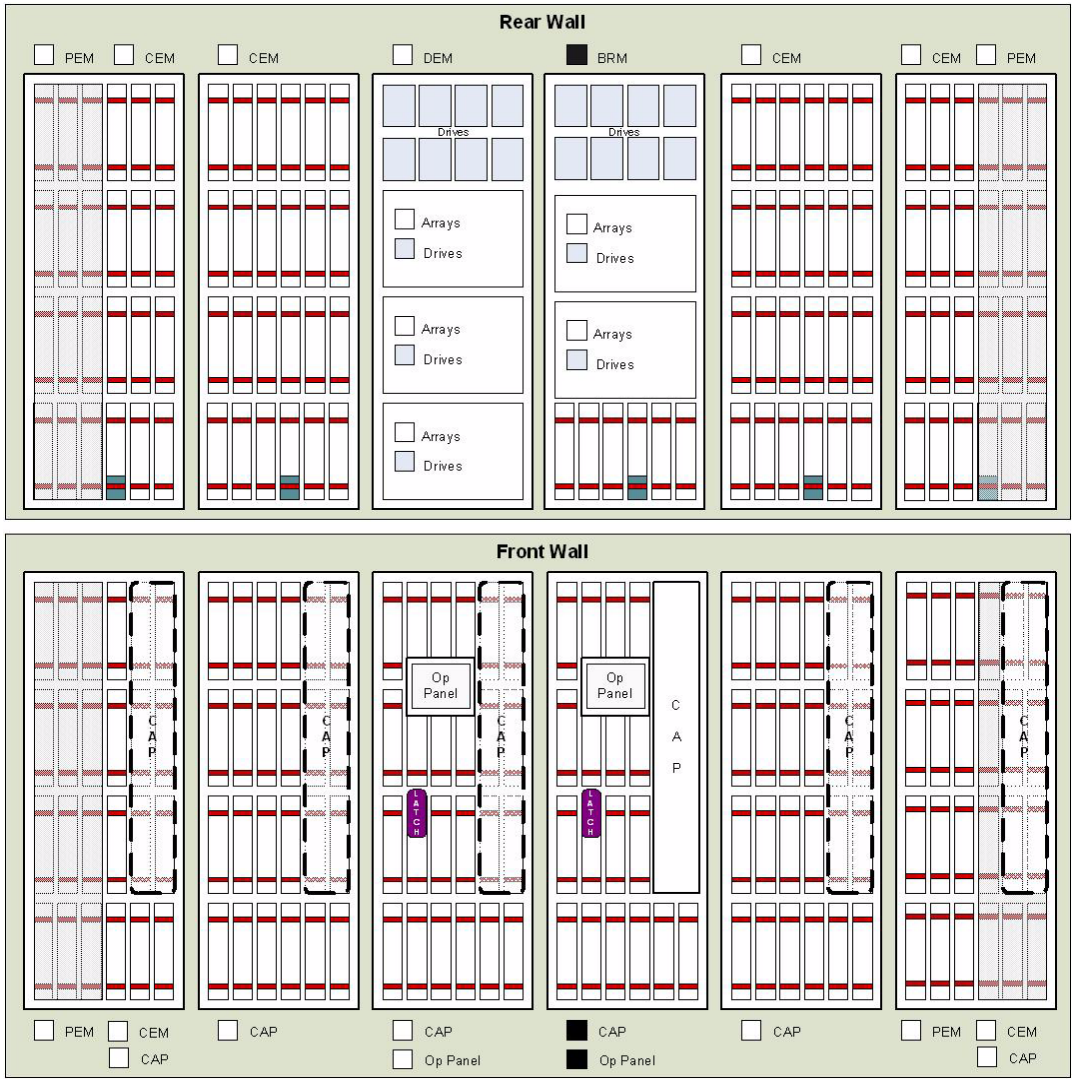
Identify and define the customer requirements				
How many partitions are there in the library? (Eight partitions is the maximum)				
How many slots are there in the library?				
Answer the following for each partition: ■ How many slots for a partition? ■ What type of operating systems? ■ What type of library management software? ■ What type of applications are being used? ■ CAP planning—HLI, SCSI, shared, dedicated, number of slots?	**Slots** 1. 2. 3. 4. 5. 6. 7. 8.	**Interface Type** 1. 2. 3. 4. 5. 6. 7. 8.	**Management Software** 1. 2. 3. 4. 5. 6. 7. 8.	**Applications** 1. 2. 3. 4. 5. 6. 7. 8.
How many data cartridges are needed?				
How many free slots are needed?				
How many scratch cartridges are needed?				
What type and quantities of tape drives?				

FIGURE B-4 Planning for Partitions



Partition/Description	Slots	Drives	CAPs
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Library Total:			

FIGURE B-4 Planning for Partitions



Partition/Description	Slots	Drives	CAPs
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
Library Total:			

APPENDIX **C**

Tape Drives and Media

This appendix provides basic information about the tape drives and tape cartridges supported by the SL3000 library.

The SL3000 library supports a variety of tape drives with one requirement, the interface to these drives must be fiber-optic based (Fibre Channel, FICON, or ESCON). The supported tape drives include:

TABLE C-1 Supported Tape Drives

Vendor	Drive Type[2]	Media	Interface Type[3]	Firmware[5]
StorageTek [1]	T9840C	9840 VolSafe capable	Fibre Channel FICON ESCON	1.42.507
	T9840D *			1.42.707 1.42.708 1.42.708
	T10000 A*	T10000 Standard, Sport, VolSafe	Fibre Channel FICON	1.37.113 [6] 1.37.114
	T10000 B*			1.38.207 [6] 1.38.208
HP	LTO3 (2Gb) LTO3 (4Gb) LTO4* **LTO5***	LTO 2 [4] LTO 3 LTO 4 **LTO 5** WORM-LT	Fibre Channel	L63S M63S H44S H58S
IBM	LTO3 LTO4 * **LTO5 ***		Fibre Channel	73P5 7BG2 94D7

Notes:
*Encryption capable
1. StorageTek T9940 tape drives are *not* supported.
2. The Quantum SDLT 600 and DLT-S4 tape drives are *not* supported.
3. The parallel version of the small computer system interface (SCSI) is not a supported interface.
4. LTO 2 media is supported for backward compatibility of LTO products (data migration).
5. Minimum level of firmware or higher required.
6. If the customer has both T10000 A and B drives, you must upgrade the "A" drive to 1.38.107.

Plus future releases of the above tape drive technologies, media, and interfaces.

These drives are capable of reading the data recorded by an earlier generation tape drive from the same family.

There are four types of tape cartridges (media) used with these drives:

- Data
- Write once read many (WORM) or VolSafe secure media
- Cleaning
- Diagnostic (special, reserved data tapes)

Note – The customer can use their existing cartridges. However, they must be compatible with the supported tape drives and still within their warranty period.

A single universal drive tray accommodates the different drives and interfaces.

This appendix provides basic information about the tape drives and tape cartridges supported by the SL3000 library.

More information about the T-series tape drives is available in the following guides:

T9x40 Tape Drive System Assurance Guide (MT5003)

T10000 Tape Drive System Assurance Guide (TM0002)

Environmental - Tape Drive

The following information is a high-level list of key environment specifications for tape drives (see the datasheet for the specific tape drive model to obtain a complete list). This information is provided to enable you to determine if the drive can operate properly in your environment.

Note – The specifications for your drive might differ from the values shown below.

TABLE C-2 Environmental Specifications for Tape Drives

Parameter	Specification
Operating temperature with media	**at 6 cfm airflow:** 10°C to 35°C (50°F to 95°F) **at 8 cfm airflow:** 10°C to 40°C (50°F to 104°F)
Operating *non-condensing* humidity	20% to 80% RH
Wet bulb temperature, *maximum*	26°C (78.8°F)
Operating altitude	0 to 4 km (0 to 13,000 ft)
Suspended particle density	<200 $\mu g/m^3$

Tape Drives

The SL3000 supports three families of tape drives:

- StorageTek T-Series (T9840C and T9840D)
- StorageTek T-Series (T10000A and T10000B)
- Linear Tape-Open (LTO) Ultrium generations 3, 4, **5**, and WORM technology

The **T9840**s are *access-centric* tape drives that use a unique dual-reel cartridge design with mid-point load technology. This design enables fast access and reduces latency by positioning the read/write head in the middle of the tape when the cartridge is loaded. With the dual-reel design, the entire tape path is contained within the cartridge, which reduces contamination and enables the drive's fast access capabilities.

T9840C and D drives are:

- Backward read compatible to the first generation (T9840A) written cartridges
- Not backward write compatible

The **T10000** is a *capacity-centric* tape drive that is capable of storing a native capacity of up to:

- 500 GB (T10000A) and
- 1 TB (T10000B)

These tape drives use dual magneto-resistive (MR) heads to provide 32 channels that write data to the tape and read it back.

The **LTO** Ultrium is a *capacity-centric* tape drive that conforms to an open standard that provides media compatibility across all brands and manufacturers of LTO Ultrium products. The tape cartridge for LTO Ultrium drives is a single-reel hub design.

LTO tape drives are:

- Read compatible backward two generations
- Write compatible backward one generation

Note – Tape drives must support the dynamic World Wide Name feature for them to be placed online by the SL3000 library.

Tape Drive Comparisons

TABLE C-3 Tape Drive Comparison

Specification	StorageTek				HP		IBM	
	T10K A	T10K B	T9840C	T9840D	LTO4	LTO5	LTO4	LTO5
Capacity (native)	500 GB	1 TB	40 GB	75 GB	800 GB	1.5 TB	800 GB	1.5 TB
Transfer rates (native)	120 MB/s	120 MB/s	30 MB/s	30 MB/s	120 MB/s	140 MB/s	120 MB/s	140 MB/s
Buffer size	256 MB	256 MB	64 MB	64 MB	256 MB	256 MB	256 MB	256 MB
Load Time (seconds)	16 sec	16 sec	6.5 sec	8.5 sec	19 sec	12 sec	15 sec	12 sec
Access (seconds)	46 sec	46	8 sec	8 sec	72 sec	60 sec	46 sec	60 sec
Tape speed (m/s)	2–4.95	2–3.74	3.295	3.4	7.0	—	7.0	—
Rewind time (seconds)	90	90	16 / 8	16 / 8	106/54 sec	96/ 78 sec	106/54 sec	96/ 78 sec
Unload Time	23 sec	23 sec	11.5 sec	12 sec	22 sec	17 sec	22 sec	17 sec
Interfaces								
Fibre Channel	2 & 4 Gb/s	4 Gb/s	2 Gb/s	4 Gb/s	4 Gb/s	8 Gb/s	4 Gb/s	8 Gb/s
SCSI / SAS	no	no	no	no	Ultra-320	6 Gb SAS	Ultra-320	6 Gb SAS
FICON	2 Gb/s	2 Gb/s	2 Gb/s	2 Gb/s	Not Supported		Not Supported	
ESCON	2 Gb/s	2 Gb/s	18 MB/s	2 Gb/s				
Compatibility								
Availability (MTBF)	290,000 hrs		290,000 hrs		250,000 hrs		250,000 hrs	
Tracks	768	1152	288	576	896	1280	896	1280
Length–usable	855 m (2805 ft)	855 m (2805 ft)	251 m (889 ft)	251 m (889 ft)	820 m (2690 ft)	850 m (2789 ft)	820 m (2690 ft)	850 m (2789 ft)
VolSafe—WORM	yes	yes	yes	yes	yes	yes	yes	yes

Encryption Capable Tape Drives

There are five types of drive models to choose from:

- StorageTek = T10000A, T10000B, and T9840 Model D only
- HP and IBM = LTO4 and **LTO5**

Tape Drive and Media Comparisons

For your information, the following tables provide tape drive and media support comparisons.

T-Series Tape Drives

TABLE C-4 shows the media compatibilities for the T-Series (T10000 and T9840) drives:

- Encryption-capable T-Series tape drives
- Non-encryption T-Series tape drives

TABLE C-4 T-Series Tape Drive Media Compatibilities

Task	Encryption-capable	Non-encryption
Write new data encrypted	Yes	No
Write new data not encrypted	No	Yes
Read encrypted data with key available	Yes	No
Read non-encrypted data	Yes	Yes
Append non-encrypted data to encrypted tape	No	No

TABLE C-5 shows a comparison between:

- Encryption-enabled and non-encrypted tape drives
- Encrypted and non-encrypted media

TABLE C-5 Tape Drive and Media Support

Tape Drive Types	Media Types	
	Non-encrypted Tapes	Encrypted Tapes
Standard drive (non-encrypted)	■ Fully compatible ■ Read, write, and append	■ **Not capable** of reading, writing to or appending to this tape ■ Can re-write from the beginning of tape (BOT)
Encryption-capable drive	■ **Read** capability only ■ Not capable of appending to this tape ■ Can re-write from the beginning of tape (BOT)	■ Fully compatible ■ Read with correct keys ■ Write with current write key

LTO Tape Drives

HP and IBM Linear Tape-Open (LTO) generations 4 and 5 tape drives are capable of:

- Reading and writing tapes from the current generation
- Reading and writing tapes from one earlier generation
- Reading tapes from two earlier generations

LTO Ultrium drives will always maintain write and read compatibility with other manufacturers' LTO Ultrium drives and tapes that meet the LTO format specification.

TABLE C-6 LTO5 Media Compatibility

Native Capacity (Length)	**Format**	**Capability**	
		Write	**Read**
1.5 TB WORM	LTO5	Yes	Yes
1.5 TB (850m)	LTO5	Yes	Yes
800 GB WORM	LTO4	Yes	Yes
800 GB (820m)	LTO4	Yes	Yes
400 GB WORM	LTO3	No	Yes
400 GB (680m)	LTO3	No	Yes
200 GB (580m)	LTO2	No	No
100 GB (580m)	LTO1	No	No
50 GB (290m)	LTO1	No	No

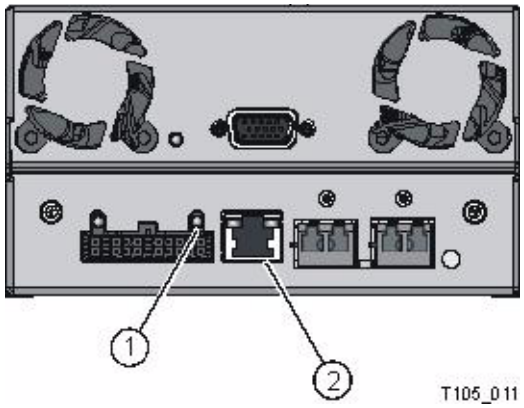
Encryption Capable Drive Trays

FIGURE C-1 shows an example of a T-Series encryption-capable tape drive.

Notice the Encryption LED indicator, this indicator has four states:

- Green: Not enabled for encryption
- Amber: Changing states or needs encryption keys
- Red: Encrypting
- Cycling: Zeroized, return to factory

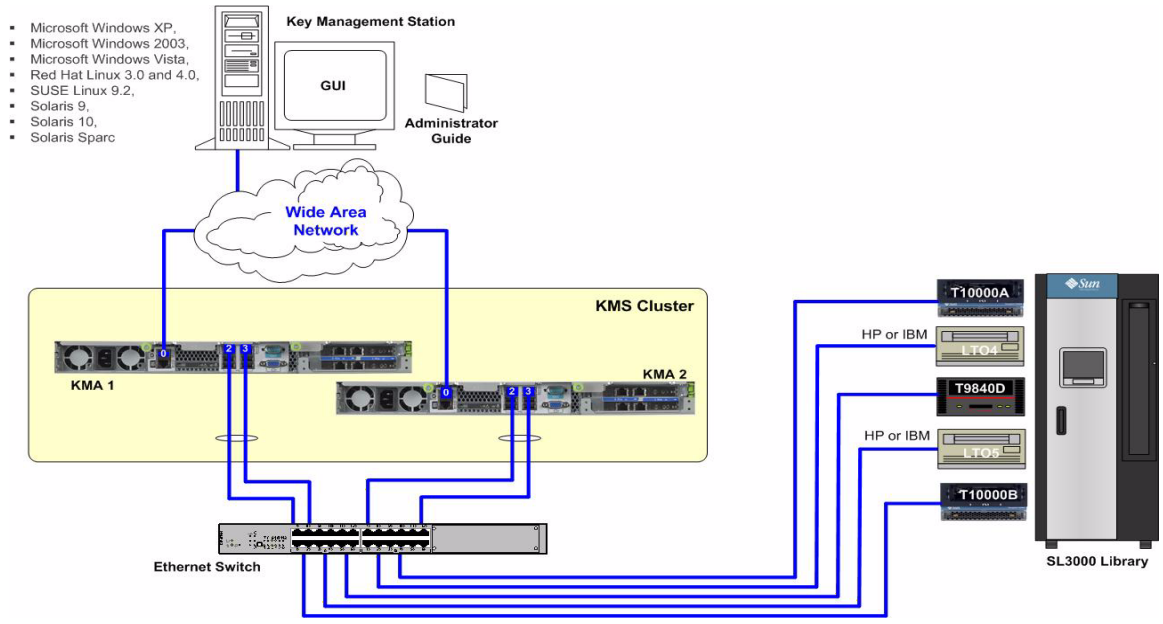
FIGURE C-1 Encryption-capable Drive LEDs



1. Encryption LED
2. Ethernet connector

FIGURE C-2 shows a simple encryption configuration using a StorageTek Crypto Key Management System (KMS 2.x) with an SL3000 library, encryption-capable tape drives, and the two networks, service and management.

FIGURE C-2 Encryption Capable Tape Drive and Library Configuration



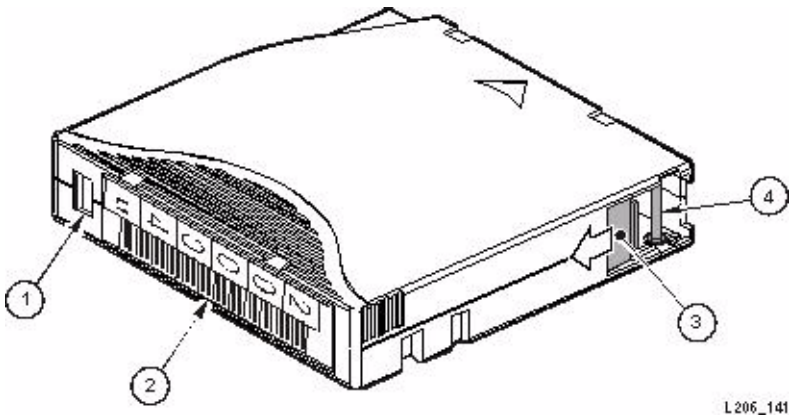
Media

The following figure identifies key elements of a tape cartridge by using an LTO cartridge as a representative example.

- Cartridges have a mechanical write protect switch.
- The volume ID label is required when the cartridge is used in a library.
- An access door is present on single reel cartridges, and it opens when the cartridge is loaded in the drive to enable the tape media to be threaded into the tape drive.
- Cartridges often incorporate a pin that attaches to the leader that is grabbed by the drive to enable threading of the leader onto the internal drive take-up reel.

Note – T9840 cartridges and drives use a mid-tape load, which is different from what is described above.

FIGURE C-3 Tape Cartridge Elements



1. Write-protect switch
2. Volume ID label
3. Access door
4. Leader pin

The volume ID label contains human-readable characters and bar codes.

The label is based on the Code 39 barcode standard. This standard uses discrete barcodes, which means that a fixed pattern of bars represents a single character.

Each character is made up of nine bars—five black bars and four white bars—three of which are wider than the others.

Volume ID Label

The SL3000 supports two categories of media:

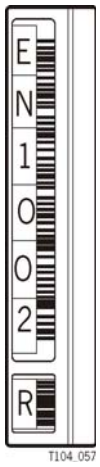
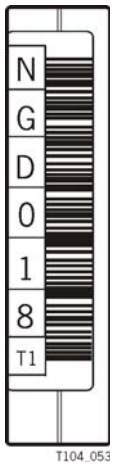
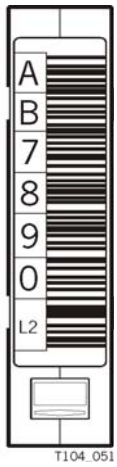
- Linear Tape-Open (LTO) generations 3, 4, and WORM technology
- StorageTek T-Series (T9840C, T9840D, T10000A, and T10000B)

LTO tape cartridges require an eight-character label (see the figure above). This label consists of a six-character customer defined volume serial number, the domain type (L), and the media ID for that particular tape drive technology (1, 2, 3 or 4).

T9840 tape cartridges require a six plus one-character label that consists of the six-character customer label, then a single media ID character (R represents the data cartridge). These labels have a unique barcode format based on the Code 39 standard with a start/stop character—the dollar sign ($).

T10000 cartridges use a label similar to the LTO label. This label requires an eight-character label with domain type (T) and media ID (1).

FIGURE C-4 Data Cartridge Label Examples

T9840 **Six-plus-one**	**T10000** **Eight-characters**	**LTO** **Eight-characters**
		
T9840 cartridge: R = T9840 Data U = Cleaning **Y** = **T9840D** Cleaning Implied domain = 00	**T10000 cartridge:** T1 = T10000 Data CT = Cleaning	**LTO data cartridge:** LT = WORM L4 = Gen 4 (800 GB) L3 = Gen 3 (400 GB) L2 = Gen 2 (200 GB) L1 = Gen 1 (100 GB) CU = Universal cleaning

Cleaning and Diagnostic Labels

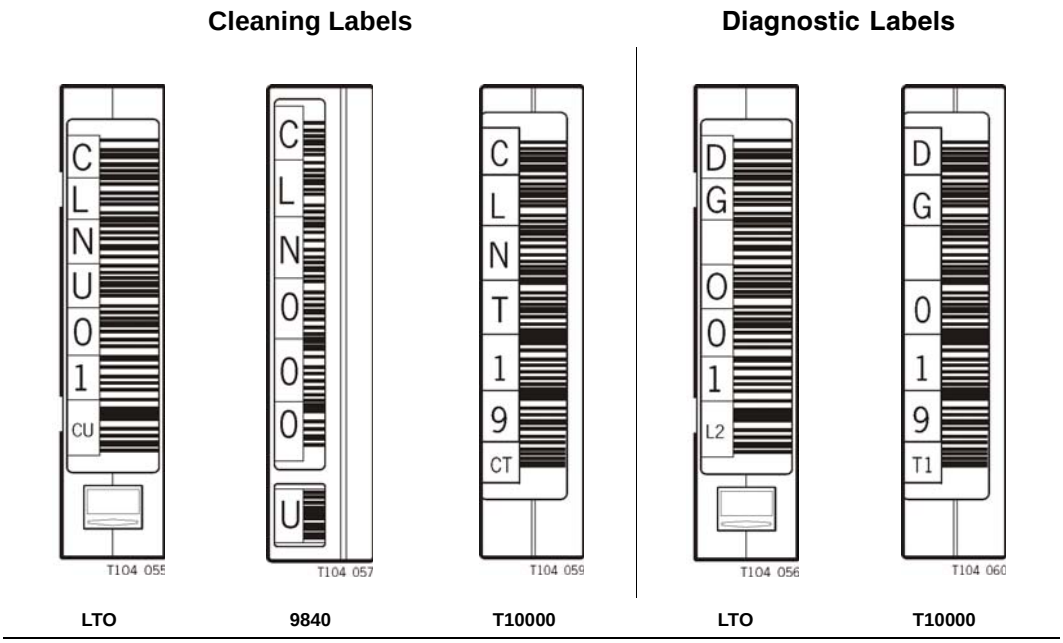
Cleaning and diagnostic cartridges require different labels to distinguish them from data cartridges.

- As the name implies, cleaning cartridges clean the tape path and read/write heads.
- Diagnostic cartridges are for service representatives to run read and write tests on the tape drive. In general, these tapes are standard data cartridges with a special diagnostic label.

The first three alphanumeric characters in the label sequence determine the type of cartridge being used. For example:

[**CLNvnn**], where: **CLN** is the cleaning cartridge identifier, **v** is the drive type identifier, blank, or a space, and **nn** is a sequence of numbers (such as CLNU01 or CLN 02).
[**DG{space}nnn**], where **DG**{space} is the diagnostic cartridge identifier, and **nnn** is a sequence of numbers (such as DG 001, and DG 019).

FIGURE C-5 Cleaning and Diagnostic Cartridge Labels



Media Comparisons

Specifications	9840(C)	9840(D)	T10K(A)	T10K(B)	LTO3	LTO4	LTO5
Capacity, native	40 GB	75 GB	500 GB	1 TB	400 GB	800 GB	1.5 TB
Transfer rate (MB/s)	30	30	120	120	80	120	140
Read/Write speed	3.295	3.4	2–4.95	2–3.74	5.46	—	—
Search/Rewind speed	8.8	8.8	9.5	9.5	7	—	—
Format							
Recording density	6449 fr/mm	6449 fr/mm	—	—	245 kb/in	—	343 kb/in
Number of tracks	288	576	768	1152	704	896	1280
Total length	271 m (889 ft)	271 m (889 ft)	917m (3009 ft)	917m (3009 ft)	680m (2230 ft)	820m (2690 ft)	850 m (2789 ft)
Usable length	251 m (889 ft)	251 m (889 ft)	855m (2805 ft)	855m (2805 ft)	651m (2136 ft)	—	
Availability							
Archival life (years)	15–30	15–30	15–30	15–30	15–30	15–30	15–30
Load/unloads	10,000	10,000	15,000	10,000	5,000	5,000	5,000
Durability (full file writes)	361	361	350	350	260	260	260
Uncorrected bit error rate	$1x10^{-18}$	$1x10^{-18}$	$1x10^{-18}$	$1x10^{-18}$	$1x10^{-17}$	$1x10^{-17}$	$1x10^{-17}$
Permanent errors	Zero	Zero	Zero	Zero	Zero	Zero	Zero
Compatibility							
Read	A, B, C	A, B, C, D	A	A, B	1, 2, 3	2,3,4	3, 4, 5
Write	A, B, C	D	A	B	LTO2, 3	LTO3, 4	LTO4, 5
Supported tape drives	A, B, C	A, B, C, D	A, B	A, B	LTO3	LTO4	LTO5
VolSafe / WORM?	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Barcode characters	6 +1	6 + 1	8	8	8	8	8

Ordering Cartridges and Labels

Tape cartridges are not shipped as part of the SL3000 modular library system and must be ordered separately.

Notes:

- The customer can use their existing cartridges as long as they are compatible with the supported tape drives and still within their warranty period.
- Professional Services and Data Center Services offer transition support and services to help migrate media and drives.
- Make sure that the customer orders the cartridge tape labels before the installation.

StorageTek makes ordering tape cartridges easy.

- Call **1.877.STK.TAPE** to order media from your local reseller or to obtain media pre-sales support.
- E-mail addresses for local support questions:
  us.mediaorders@sun.com
  EMEA.mediaorders@sun.com
  LA.mediaorders@sun.com
- Label kits:

  Label kits are available in either 60 or 200 piece quantities. The 60 piece kit has 60 data and 6 cleaning cartridge labels. The 200 piece kit has 200 data and 20 cleaning cartridge labels. The end-user will affix the labels to the cartridges. The label ranges are sequentially numbered, non-repeating and cannot be customized.

Not sure what you need or what some terms mean?
Check out *StorageTek Tape Media A Variety of Storage Options* for more details.

http://suntape.central.sun.com/media.shtml

Refer to the T-Series Systems Assurance Guides for information about the media part numbers for the T9840 and T10000 tape drives.

- T9840 Systems Assurance Guide, PN: MT5003
- T10000 Systems Assurance Guide, PN: TM0002

Tape Media Policies

There are three media policies:

- *Usage* policy: The tape storage media (tape cartridge) used in a tape drive and/or automated tape system can have a significant impact on the overall performance of the tape drive and/or automated tape
  - StorageTek warrants tape storage media that is StorageTek branded.
  - The customer can be billed for any service provided resulting from or related to problems caused by non-StorageTek branded tape storage media.
- *Endorsement* policy: StorageTek does not certify, recommend or endorse 3rd party brand tape media. StorageTek only recommends StorageTek brand media for use in StorageTek libraries and tape drives.
- *Cancellation* policy: Purchase Orders for tape media entered into the Order Management system (either 'standalone' or included with StorageTek hardware, software or services) are non-cancelable, non-returnable, and cannot be reworked.

Note – The customer is liable for the media portion of the purchase order regardless if the hardware, software or services portion of the purchase order is canceled.

Environmental - Media

The following information is a high-level list of key environment specifications for tape media. The values in the table are typical values, but the specific value for your media could be different. See the datasheet for the particular media that supports the tape drives installed in your library.

TABLE C-7 Environmental Specifications for Media

Parameter	Specification
Operating	
Ambient temperature	10°C to 45°C (50°F to 113°F)
Relative humidity *non-condensing*	20% to 80%
Wet bulb temperature, *maximum*	26°C (78.8°F)
Storage (day-to-day)	
Ambient temperature	16°C to 35°C (60°F to 95°F)
Relative humidity *non-condensing*	20% to 80%
Wet bulb temperature, *maximum*	26°C (78.8°F)

If during storage or transportation a cartridge has been exposed to conditions outside the listed values, condition the media in the operating environment for the time specified by the media manufacturer (the time can vary from 24 to 36 hours).

Tape Media W5C Help Sheet

There are over 180 media part numbers available in the configurator. The following information is available to help:

- Complete the Tape Media portion of the W5C Configurator
- Put together an accurate quote

The Tape Media portion of the configurator is located at: Tape Storage - Tape Media

Notes:

- In the case when information is not available at time of the quote, use TBDTBD as the volume serial number (VOLSER) for a placeholder and the default colors.
- This is the minimum required information to accurately quote Tape Media.
- Options will auto-populate based on previous selections.
- Only the supported options are shown in the following steps (not all the options).

Below are the steps used when putting together the Tape Media configuration.

1. **Media Type**: Select the appropriate media type per customer requirements.

Media Type	Details
9840	Select this media type for T9840C and T9840D tape drives
LTO	Select this media type for LTO3 and LTO4 tape drives
T10K	Select this media type for T10000A and T10000B tape drives

2. **Label Type**: Select the desired label type.

Label Type	Details
Barcode	Select this option for barcode labels
Unlabeled	Select this option for unlabeled media

Note: Select “Unlabeled” if you require label kits without any media.

3. **Function**: Select the function for the media.

Function	Details
Cleaning	Select this option for cleaning cartridges
Data	Select this option for data cartridges
Labels Only	Select this option for barcode label kits without media

4. **Sub-Media**: Select the sub-media type for the drives, such as T9840 “C” or LTO “4”.

Sub-Media	Details
C Drive	Select this sub-media type for the T9840C tape drive
D Drive	Select this sub-media type for the T9840D tape drive
Standard Intialized	Select this sub-media type for the T9840 tape drive
Volsafe C Drive	Select this sub-media type for the T9840C tape drive
Volsafe D Drive	Select this sub-media type for the T9840D tape drive
Sport (120G native)	Select this sub-media type for the T10000 tape drives
Standard (500G native)	Select this sub-media type for the T10000 tape drives
Standard (1TB native)	Select this sub-media type for the T10000B tape drives
Volsafe	Select this sub-media type for the T10000 tape drives
Volsafe Sport	Select this sub-media type for the T10000 tape drives
LTO3	Select this sub-media type for LTO3 tape drives
LTO4	Select this sub-media type for LTO4 tape drives
LTO5	Select this sub-media type for LTO5 tape drives
WORM	Select this sub-media type for LTO tape drives
Label Kits	Select this sub-media type for label kits (see note)

Label Kit Notes:

- Label kits are available in vertical orientation only.
- Labels can be affixed by the end user.
- There are two different quantities available, 60 or 200.
  - The 60 label kit includes 60 data cartridge labels and 6 cleaning cartridge labels
  - The 200 label kit includes 200 data cartridge labels and 20 cleaning cartridge
- The label ranges are randomly numbered and cannot be customized.
- If customization is required, the preferred supplier is Tri-Optic.
  Got to: http://www.tri-optic.com/ or Contact them at: 1.888.438.8362

5. **Applied Labels**: Select the type of applied label required.
   This is the background color for each alpha-numeric character.

Applied Labels	Details
Pastel	For Pastel labels, the following default colors are used for each number in the VOLSER: **0- Lt Red**, **1 - Yellow**, **2 - Lt Olive**, **3 - Blue**, **4- Lt Orange**, **5 - Lt Green**, **6 - Orange**, **7- Lt Aqua**, **8 - Pink**, **9 - Lt Purple**. The default alpha characters are **black** letters on a white background.
Black/White	Label contains **black** letters/numbers on a white background
Vibrant	For Vibrant labels, the following default colors are used for each number in the VOLSER: **0 - Red**, **1- Yellow**, **2 - Lt Green**, **3 - Lt. Blue**, **4- Grey**, **5 - Orange**, **6 - Pink**, **7- Drk. Green**, **8 - Lt Orange**, **9 - Lt Purple**. The default alpha characters are **black** letters on a white background.
Color Scheme Not Applicable	Select this option for Unlabeled media

Applied Label Notes:

- The Black & White palette (black letters on a white background) is standard for all cleaning cartridges for T10K and 9840 tape media.
- The Vibrant palette is standard for all LTO, LTO WORM, 9840 Volsafe, T10000 Volsafe, and T10000 Volsafe Sport data cartridges.
- Only T10000 Standard, T10000 Sport, and 9840 data cartridges are available in Pastel, Black & White, or Vibrant palettes.

6. **Package Type**: Select the appropriate package type per the customer's request.

Package Type	Details
Jewel	Media is packaged in individual plastic jewel cases
Library	Media is packaged in a bulk library pack, no individual jewel cases
Kit	Select this option for a kit of barcode labels without media

7. **Label Alignment**: Select the type of label alignment per the customer's request.

Alignment	Details
Horizontal	VOLSER information can be read from left to right on the media
Vertical	VOLSER information can be read from top to bottom on the media
Orientation Not Applicable	Select this option for unlabeled media

8. **Initialization**: Select the required initialization format per the customer's request.

Format	Details
AS400	Initialization using AS400 format
ASCII	Initialization using ASCII format
EBCDIC	Initialization using EBCDIC format
UNISYS	Initialization using UNISYS format
NA	Select this option if Initialization is not required

Glossary

This glossary defines terms and abbreviations used in this and other product-related publications.

Numerics

2N A power configuration that gives the SL3000 library full AC and DC power redundancy. This configuration allows AC line cords on two separate circuits, either of which can power the entire system. *See also* N+1.

A

access door A door on either the base module or drive expansion module through which service personnel can enter the library. A standard CAP is installed on a base module's access door; an optional CAP may be installed on a drive expansion module's access door.

access expansion module An optional module that can be installed on one or both ends of a library. If only one access expansion module is installed, it must be used as a bulk loading CAP (no storage slots).

If two access expansion modules are installed:

- They must be on the ends of the library—this is required if the dual TallBot option is installed.
- They are used as bulk loading CAPs only (no storage slots).
- They contain a service safety door for non-disruptive replacement of a defective TallBot.
- Access expansion and parking expansion modules *cannot* be mixed within a library.

accessory rack Areas of the base module and the drive expansion module that are used for electronic equipment and for other standard 19-inch rack-mount equipment. Two racks are supplied in each base module and drive expansion module.

Rack mount equipment must be compatible with the power and cooling specifications of the racks.

ACSLS *See* Automated Cartridge System Library Software.

addressing schemes *See the following*:

- SL3000 address
- SL3000 drive bay
- HLI-PRC address
- SCSI elements

alias An alternate name for an entity that is more easily human-readable. Aliases are sometimes used for grouping purposes. *See* also alias identifier.

alias identifier One or more address identifiers that may be recognized by an N_Port in addition to its N_Port identifier. Alias address numbers are used to form groups of N_Ports so that frames may be addressed to a group rather than to individual N_Ports.)

Any Cartridge Any Slot™ technology The StorageTek technology that allows seamless sharing of different media types and drives without hard partitions.

archive (1) The process of making a copy of one or more files or databases that is saved for future reference and readily accessed if needed for restoration. Archive ensures a chance of recovery and is used for long-term retention.

(2) A copy of files that are saved for future recovery purposes in case the original data is lost or corrupted.

array (1) A partitioned unit that holds multiple objects, such as cartridges or tape drive tray assemblies.

(2) A molded unit that holds multiple cartridges.

asynchronous (ASYNC) Not synchronized; not occurring at regular, predetermined intervals. Asynchronous transmissions send one data character at a time, at irregular intervals, rather than in one steady stream; a start bit and a stop bit notify the receiver when the transmission begins and ends. *Contrast with* synchronous.

audit *See* host audit *and* security audit.

Automated Cartridge System Library Software (ACSLS) Software that manages ACS library contents and controls ACS library hardware to mount and dismount cartridges on ACS drives.

automation bezel A tape drive attachment with a locator target for positioning gets and puts to the tape drive.

B

backplane The main circuit board inside electronic equipment that contains the central processing unit, the bus, memory sockets, expansion slots, and other components.

barcode camera A component of the robot that is used for cartridge identification and position calibration.

blind mate connector A connector that allows hot plugging instead of manually placing a cable between two fixed connectors.

bulk load Manually loading cartridges into the library, for example, during library installation.

C

camera A device attached to a robot that reads volume serial number labels on cartridges, instead of scanning the labels with a laser. A camera performs faster and more accurately than a laser scanner.

CAP *See* cartridge access port.

Capacity on Demand A process by which a customer purchases additional slots and enlarges the library's capacity with minimal impact to host applications.

card *Synonymous with* printed wire assembly.

cartridge access port (CAP) A device in the library that allows an operator to insert or remove cartridges during library operations.

Synonymous with import/export mail slot in SCSI and open system libraries.

See also unlocked.

cartridge array An array that holds multiple cartridges. *See also* array.
SL3000 arrays contain 3, 4, 8, 9, 11, or 13 slots, depending on their location.

cartridge bias Left or right justification of a cartridge within a storage slot, CAP, or tape drive.

cartridge mover *See* robot.

cartridge proximity detector A component that determines if a slot is empty or contains an unlabeled cartridge during a label reading error recovery procedure. *Synonymous with* empty slot detector.

CCD (1) Charge couple device.

(2) Slot contents database.

cleaning cartridge A tape cartridge that contains special material to clean the tape path in a tape drive.

CLI Command line interface.

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. *Contrast with* hot swap.

CompactPCI (cPCI®) Industry standard bus used for card-to-card bus expansion.

conversion bill An optional feature ordered by a customer for the library. This contains conversion instructions for installing the feature. *See also* "X-option.'

cPCI *See* CompactPCI.

CSSC *See* Customer Services Support Center.

Customer Services Support Center (CSSC) StorageTek's customer services organization. Customers with StorageTek maintenance contracts may contact the CSSC.

D

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.

data error rate The number of errors that occur per a measurable amount of data on a tape.

destination The drive or slot location in an adjacent library where a cartridge will be mounted or stored. *See also* source.

diagnostic cartridge A data cartridge with a "DG" label that is used for diagnostic routines.

base module The base module in an SL3000 library that houses the electronics module assembly, power distribution units (PDUs), power supplies, accessory racks and equipment, and tape drives for the module. Also referred to as a "base drive module."

base drive module Synonymous with "base module."

drive array assembly An array that is installed in the base drive or drive expansion module for inserting tape drive tray assemblies. The base module holds up to three array assemblies; the drive expansion module can contain four array assemblies, and each array holds up to 8 tape drive tray assemblies.

drive bay A partitioned section of the tape drive array assembly that holds one tape drive tray assembly.

drop-off slots Slots used to hold a cartridge in the event of a robot failure that occurs while a cartridge is in the robot hand.

dWWN *See* dynamic World Wide Name.

dynamic World Wide Name A feature that applies dynamic names to network devices rather than fixed names. When a dWWN-named device is replaced, it is assigned the same WWN as the one replaced, preventing reconfiguration of the network.

E

electronic mail (e-mail) Correspondence in the form of messages transmitted between user terminals over a computer network.

electronics control module The assembly that:

- Processes commands from a host system
- Coordinates the activities of TallBots, CAPs, 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 machine or in a data center that allows a user to immediately power down a machine or a data center power supply by cutting off the external source power.

Enterprise Systems Connection (ESCON) (1) A set of fiber-optic based products and services developed by IBM that allows devices within a storage environment to be dynamically configured. A channel-to-control unit I/O interface that uses optical cables as a transmission medium.

(2) A set of IBM products and services that provide a dynamically-connected environment within an enterprise.

environmental monitors A collective term for the sensors that track temperatures, fan speeds, and the status of various other mechanisms within a library.

EPO *See* emergency power-off.

ESCON *See* Enterprise Systems Connection.

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

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. *Synonymous with* eject.

F

failover The act of moving to a secondary or redundant path when the primary path fails.

FFC Flat flexible cable.

Fibre Channel A bidirectional, full-duplex, point-to-point, serial data channel structured for high performance capacity. The Fibre Channel is an interconnection of multiple communication ports, called N_Ports. These N_Ports are interconnected by a switching network, called a fabric, to a point-to-point link, or an arbitrated loop.

Fibre Channel is a generalized transport mechanism with no protocol of its own. A Fibre Channel does not have a native input/output command set, but can transport existing Upper Level Protocols (ULP) such as SCSI and IPI.

Fibre Channel operates at speeds of up to 200 MB per second. Fibre Channel operates over distances of up to 100 m over copper media or up to 10 km over optical links.

fibre connection (FICON) An IBM S/390-based channel architecture that provides up to 256 channels in a single connection, each having a capacity of 100 MB per second.

FICON *See* fibre connection.

firmware An ordered set of instructions and data stored in a way that is functionally independent of main storage; for example, microprograms stored in a ROM. *See also* microcode.

flash memory A nonvolatile semiconductor storage device that can be reprogrammed electronically without removal from the circuit. Flash must be erased in fixed blocks rather than single bytes. *Synonymous with* flash erasable programmable read-only memory (FEPROM).

G

gateway (1) A 32-bit, or 4-byte number, in dotted decimal format (typically written as four numbers separated by periods, such as 107.4.1.3 or 84.2.1.111) that is applied to an IP Address to identify router interface.

(2) Specialized hardware that connects two otherwise incompatible systems, using different protocols and media, operating locally or over wide areas.

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

gripper (1) 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.

H

hand assembly (1) The robotic element that includes a motor, a gripper for grasping cartridges, and a camera for reading volume serial number labels and targets.

(2) A part of the library robot whose function is to grasp cartridges and move them between storage slots and drives. A camera on the hand assembly reads volume serial number labels and targets.

(3) A part of the library robot whose function is to grasp cartridges and move them between storage slots and drives. A bar-code line scan camera on the hand assembly reads cartridge volume labels.

HLI-PRC address A four-digit, comma-separated value (L,P,R,C) that represents LSM, Panel, Row, and Column. This addressing scheme is used by host LMU interface (HLI) clients, including ACSLS and HSC, to represent library components accessible to those HLI clients.

host audit The process of updating the cartridge VOLIDs and locations (collected by a security audit) in a host CDS. This audit is initiated by a host command.

Host Software Component (HSC) A host-resident software package, implemented on operating systems, that influences device allocation and intercepts mount and dismount requests to automate these requests.

hot-pluggable The capability that allows a service representative to replace FRUs while power to the FRU is maintained. This feature allows hardware maintenance actions and hardware upgrades to proceed without disrupting subsystem availability. *Contrast with* hot swap.

hot swap Removal and replacement of a system component while system power remains on and system operations continue. *Contrast with* cold swap. *Contrast with* hot-pluggable.

Synonymous with online servicing.

hot-swappable (1) A component that can be replaced while the system remains online. *Contrast with* hot-pluggable.

(2) The capability that allows a component to be replaced while power to the component is maintained. This feature allows hardware maintenance actions and hardware upgrades to proceed without disrupting subsystem availability.

I

import The process of placing a cartridge into the cartridge access port so that the library can insert it into a storage slot.

Synonymous with enter.

initial program load (IPL) (1) A process that activates a machine reset and loads system programs to prepare a computer system for operation. Processors having diagnostic programs activate these programs at initial program load execution. Devices

running firmware usually reload the functional firmware from a diskette or disk drive at initial program load execution. *Synonymous with* initial microprogram load (IML).

(2) The initialization procedure that activates a machine reset, initiates wake-up diagnostics (from EPROMs) and loads functional code.

interlock switch A switch that disconnects power to library mechanisms, excluding tape drives, when a front access door is opened.

IPL *See* initial program load.

J

Java An object-oriented computer programming language created by Sun Microsystems.

K

keypad interface *See* membrane keypad.

L

label An identifier associated with a removable media or cartridge. Labels are humanly readable, machine readable, or both. *Synonymous with* VOLSER and volume serial number.

library console (1) *See* StorageTek Library Console.

(2) The customer's operator console that interfaces with the library. *See also* security software layer.

library controller (LC) The HBCR card within the SL3000 library that controls operations and communicates with the operator console and other modules.

library operator console *See* local operator console.

local operator console An optional feature consisting of a flat-panel display with a touch screen interface and a panel mount computer.

This feature is attached to the front door of the base module (or, alternately if desired, the drive expansion module's door). *See also* touch screen operator control panel.

M

magazine (1) A removable array that holds cartridges in the cells provided and is inserted into the cartridge access port (CAP).

(2) A removable container hat holds cartridges and is placed into the cartridge access port (CAP).

(3) A removable array that holds cartridges and is placed into the cartridge access port (CAP). Each SL3000 CAP holds two magazines, each of which holds up to13 cartridges.

membrane keypad A keypad mounted on the front access door of a base module, used to monitor the status of the SL3000 library and to operate the CAPs.

N

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.

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

O

online replacement Replacement or service of a module while the library remains operational. The service person may be required to power off the module before removing or replacing it. *Synonymous with* hot swap.

operator console (1) A panel that enables a user to configure and diagnose the library or drive. *See also* local operator console.

(2) The user interface for libraries or drives. *Synonymous with* operator control panel.

(3) A touch screen panel that enables users to configure, diagnose, or receive status information about the library or drive.

P

parking expansion module Modules that can be installed on the ends of a library configuration. These modules (or access expansion modules) are required for dual TallBot operation.

Parking expansion modules must be installed in pairs and customers lose storage slots to allow space for a defective TallBot. If a defective TallBot is moved into this module, time must be scheduled for its replacement. (*Contrast with* access expansion module.)

partition A subset or portion of an entire library that presents itself to a host client as an independent library. Slots and tape drives included in one partition cannot be seen by another partition. CAPs cannot be shared.

PCI Peripheral component interconnect.

PDU *See* power distribution unit.

peer to peer A form of cooperative processing in which either of the programs involved can initiate communication with another. In a peer network every station can function as both a client and a server.

physical library A single SL3000 library consisting of up to 8 modules. *See also* logical library.

PLC Power line communications.

PLI *See* primary library interface.

Port Addressing In Fibre Channel, Port Addressing is used for login validation, and includes the Port Name, Node Name, and N_Port ID.

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 [AC] source if the PDUs use separate AC sources) loses power.

power grid A power circuit that minimizes power failures that cause the library to cease operations.

power/communication bus rail A rail that sits on the robot track to provide 48 VDC power and communication to the robot.

primary library interface (PLI) The communication path between the operator console and the library controller (the HBCR card.) This consists of Ethernet with TCP/IP and XML.

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

PWA Printed wiring assembly.

R

RaceTrack™ architecture The design and implementation of the SL3000 library's multiple high-performance robotics.

rack unit (u) A standard unit of measurement of vertical space inside a rack mount cabinet. One u equals 44.5 mm (1.75 in.).

rail That portion of the upper robot track assembly that provides power and communication to the robot.

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.

ready A library that has been powered on and has completed its initialization and initial program load (IPL). It is ready to accept user requests.

RealTime Growth™ capability The capability to add pass-thru ports dynamically while the library is operating.

Remote Diagnostic Center (RDC) *See* Customer Services Support Center (CSSC).

remote operator console The customer's operator console that interfaces with the PLI. *See also* security software layer.

reserved slots Cartridge slots that are used only for cleaning and diagnostic cartridges and as drop-off slots.

robot (1) An electromechanical device that moves tape cartridges among the cartridge access ports, storage slots, and drives.

(2) A mechanism that moves horizontally along a track in the SL3000 to transport tape cartridges to and from other locations in the library.

Also called a TallBot.

S

SCSI elements A four-digit number that represents the addressing scheme used by hosts operating on a Fibre Channel interface. *See also* Fibre Channel.

security audit The process of reading and storing in SL3000 library memory the VOLIDs and locations of all cartridges in the library. *See also* host audit.

security software layer (SSL) The communication path between the PLI and the remote operator console.

service area An area between the access expansion module and the library for service representatives to perform replacement of a defective TallBot.

servo power interrupt (SPI) A signal that removes voltage to a motor if overtravel is detected in the motor or a safety condition exists (for example, an access door to the library module is open). When the sensor or switch is made, the drive current to the motor disables and an error posts.

The SPI prevents a servo runaway condition for an out-of-range motor; it also prevents motors from starting up while an access door is open.

SL3000 address A four-digit, comma-separated value (L,R,C,S,W) that represents Library, Rail, Column, Side, and Row. This addressing scheme is used by the SL3000 firmware and internal communications to represent all devices and locations within the library.

SL3000 drive bay A two-digit integer (01–56) that represents the physical locations into which drive tray assemblies are inserted.

slot The location in the library in which a tape cartridge is stored. *Synonymous with* cell.

source The home slot location containing the cartridge that will be passed through to an adjacent library. *See also* destination.

SPI *See* servo power interrupt.

SSi System Server infrastructure.

storage cell *See* slot.

StorageTek Library Console The operator console software application used for the SL3000.

StreamLine™ Library Console™ The previous term used for operator console software application (*See* StorageTek Library Console).

T

TallBot™ High capacity tall robot. One or two TallBots are used in an SL3000 library.

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. *Synonymous with* drive tray assembly.

tape storage area The area in the SL3000 library where cartridges are stored.

tape transport interface (TTI) An interface to control/monitor tape movement.

TallBot™ High capacity tall robot. One or two TallBots are used in an SL3000 library. *Contrast with* HandBot.

touch panel operator control panel An optional feature consisting of a flat-panel display with a touch screen interface and a panel mounted computer.

track The horizontal path upon which a robot travels.

track drive mechanism The component that moves the robot along the track between the slot arrays, CAPs, and tape drives.

TTI *See* tape transport interface.

U

U *See* rack unit.

unlocked In the SL3000 library, status indicating that software has made a CAP available for operator use. An LED is lit when a CAP is unlocked.

UART Universal asynchronous receiver/transmitter.

V

vacancy plate A plate that covers an unused bay, such as a drive bay or power supply bay.

volume serial number (VOLSER or VOLID) (1) An alphanumeric label that the host software uses to identify a volume. It attaches to the spine of a cartridge and is both human- and machine-readable.

(2) A six-character alphanumeric label used to identify a physical volume.

W

World Wide Name (WWN) A 64-bit integer that identifies a Fibre Channel port. *See also* dynamic World Wide Name (dWWN).

World Wide Node Name (WWNN) A globally unique 64-bit identifier assigned to each Fibre Channel node process.

World Wide Port Name (WWPN) (1) A 64-bit network address that identifies the port name.

(2) A globally unique 64-bit identifier assigned to each Fibre Channel port.

WORM *See* write once read many.

write once read many A storage classification for media that can be written only once but read many times.

wrist (1) A mechanism in the robot assembly that allows the robot to access the outer and inner storage walls.

(2) A component of the hand assembly that rotates the hand horizontally.

X

X-option An optional feature ordered by a customer for the library. This contains conversion instructions for installing the feature.

Index

Numerics

A

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

V

W

Oracle Corporation
Worldwide Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065
U.S.A