



Planning Guide Planning Guide Planning Guide Planning Guide

Quantum Scalar *i*2000 Library

Scalar *i*2000

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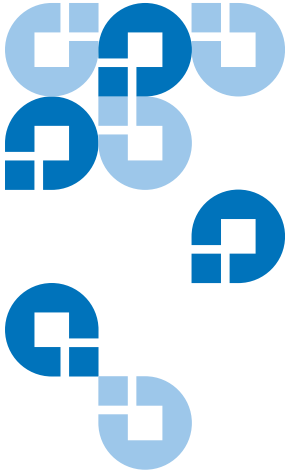
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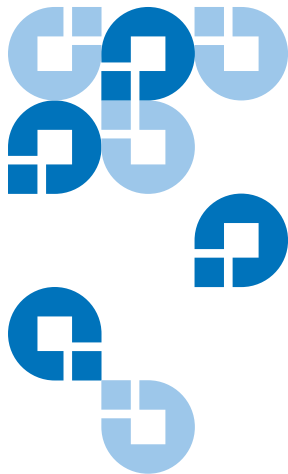


Contents

Chapter 1	About This Guide and Your Product	1
	Product Safety Statements.....	1
	Product Model Number.....	2
	Explanation of Symbols and Notes.....	2
	Other Documents You Might Need.....	3
	Getting More Information or Help.....	4
<hr/>		
Chapter 2	Description	5
	Control Module.....	7
	Expansion Modules.....	19
	I/O Management Unit.....	21
	Host Attachment.....	23
	Remote Management.....	23
	Managing Your Remote Library.....	24
	Capacity on Demand.....	28
	Encryption and Quantum’s Encryption Key Manager.....	28

Chapter 3	System Specifications	30
	Performance Specifications.....	30
	Environmental Specifications.....	31
	Electrical Specifications.....	31
	Physical Specifications.....	35
	Module Foot Pad Positions.....	53
	Module Floor Cutout.....	54
	Drive Requirements and Compatibility.....	55
	Barcode Requirements.....	58

Chapter 4	Site Preparations	60
	General Information.....	61
	Physical Environment.....	63
	Access Conditions.....	64
	Required Configuration Information.....	69
	SAN Readiness.....	71
	Additional Comments.....	71



Chapter 1

About This Guide and Your Product

This guide contains information necessary for site planning prior to the installation of the Scalar i2000. This guide is intended for anyone interested in learning about or anyone that needs to know how plan for the installation of the Scalar i2000.



CAUTION

Be sure to read all operating instructions in this manual and in the *System, Safety, and Regulatory Information Guide* before operating this product.

This guide is intended to be used by system administrators, information technology professionals, and Quantum professional services and service personnel who will be involved with the installation of the library.

Product Safety Statements

This product is designed for data storage and retrieval using magnetic tape. Any other application is not considered the intended use. Quantum will not be held liable for damage arising from unauthorized use of the product. The user assumes all risk in this aspect.

This unit is engineered and manufactured to meet all safety and regulatory requirements. Be aware that improper use may result in

bodily injury, damage to the equipment, or interference with other equipment.



WARNING

BEFORE POWERING ON OR USING THIS EQUIPMENT, READ THE SYSTEM, SAFETY, AND REGULATORY INFORMATION GUIDE. KEEP THE GUIDE FOR FUTURE REFERENCE.

Product Model Number

The Scalar i2000 model number is as follows: SCi2000

Explanation of Symbols and Notes

The following symbols appear throughout this document to highlight important information.



WARNING

INDICATES A POTENTIALLY HAZARDOUS SITUATION WHICH, IF NOT AVOIDED, COULD RESULT IN DEATH OR BODILY INJURY.



CAUTION

Indicates a situation that may cause possible damage to equipment, loss of data, or interference with other equipment.



Note

Indicates important information that helps you make better use of your system.

Other Documents You Might Need

The following documents are also available for this product. These documents can be found on the product CD or at www.quantum.com/support.

- *Scalar i2000 User's Guide* (6-00421-xx)
- Quantum Intelligent Libraries Basic SNMP Reference (6-01159-xx)
- *System, Safety, and Regulatory Information Guide* (6-00618-xx)



Note

Release Notes are also available for this product. The Release Notes describe changes to your system or firmware since the last release, provide compatibility information, and discuss any known issues and workarounds. The Release Notes can be found in the product box or at www.quantum.com/support.

Getting More Information or Help

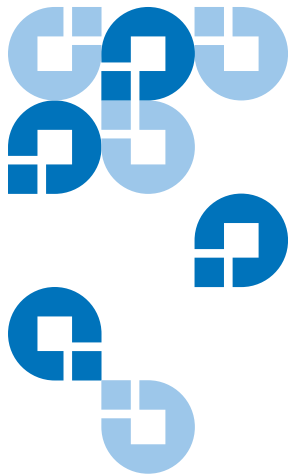
More information about this product is available on the Service and Support website at www.quantum.com/support. The Service and Support Website contains a collection of information, including answers to frequently asked questions (FAQs). You can also access software, firmware, and drivers through this site.

For further assistance, or if training is desired, contact Quantum:

Global Call Handling 1-800-284-5101

For additional contact information: www.quantum.com/support

To open a Service Request: www.quantum.com/esupport



Chapter 2 Description

The Scalar i2000 library automates the retrieval, storage, and control of cartridges. The cartridges are mounted and retrieved from tape drives using a robotic assembly that is driven by application software from the host without operator intervention.

The library can be installed on a solid or a raised floor. The library has a standard 19-inch rack footprint and can be placed in a standard server rack space. Access is from the access and service doors so the library can be placed with either side against a wall, or between racks.

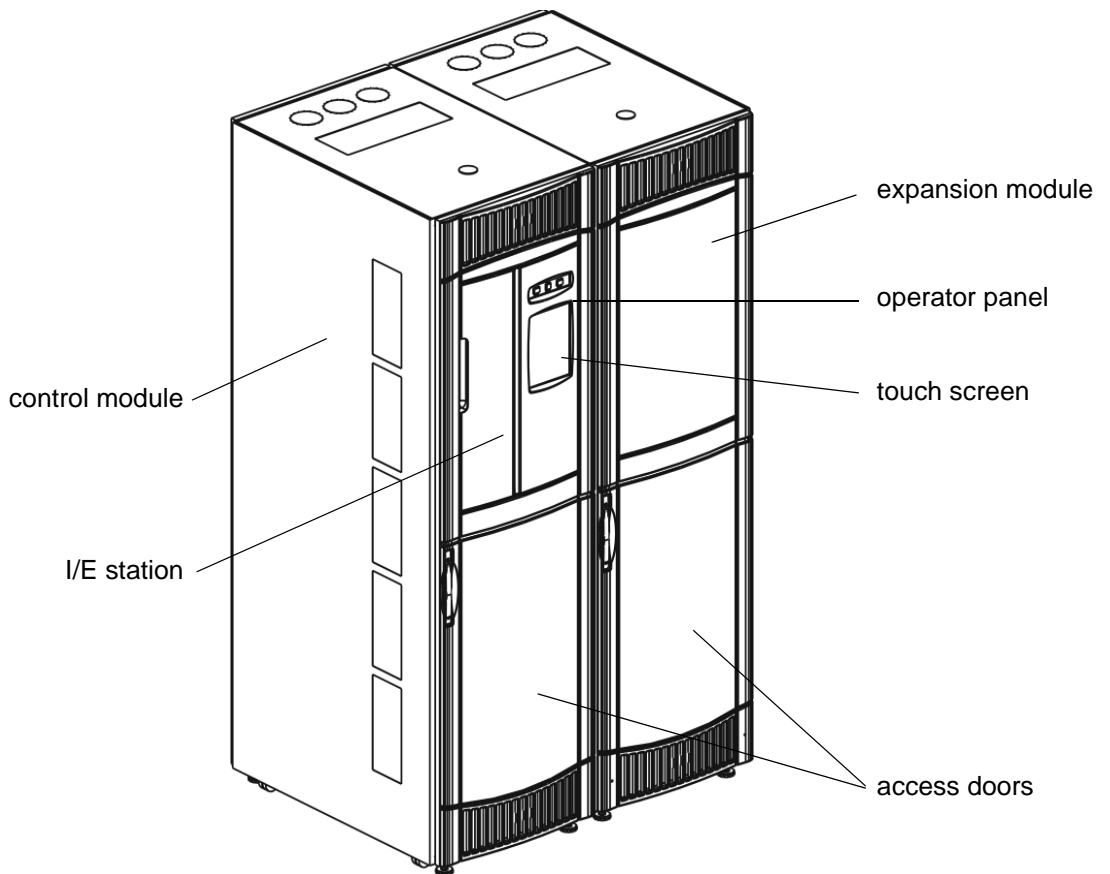
The library is designed for ease of installation, configuration, and field upgrades. The minimum library configuration consists of one control module. Up to seven expansion modules can be added to the control module as storage and tape drive requirements change. The maximum library can be configured to accommodate from 102 through 3,492 LTO or from 100 through 2,915 SDLT cartridges, from 1 through 96 tape drives, and from 1 through 8 Import/Export (I/E) stations. See [figure 1](#) on page 6.

This chapter provides a description of the following features and components:

- [Control Module](#) on page 7
- [Expansion Modules](#) on page 19
- [I/O Management Unit](#) on page 21
- [Host Attachment](#) on page 23
- [Remote Management](#) on page 23

- [Managing Your Remote Library](#) on page 24
- [Capacity on Demand](#) on page 28
- [Magazine and Drive Location in the Control Module](#) on page 16

Figure 1 Front View of a Control Module and Expansion Module

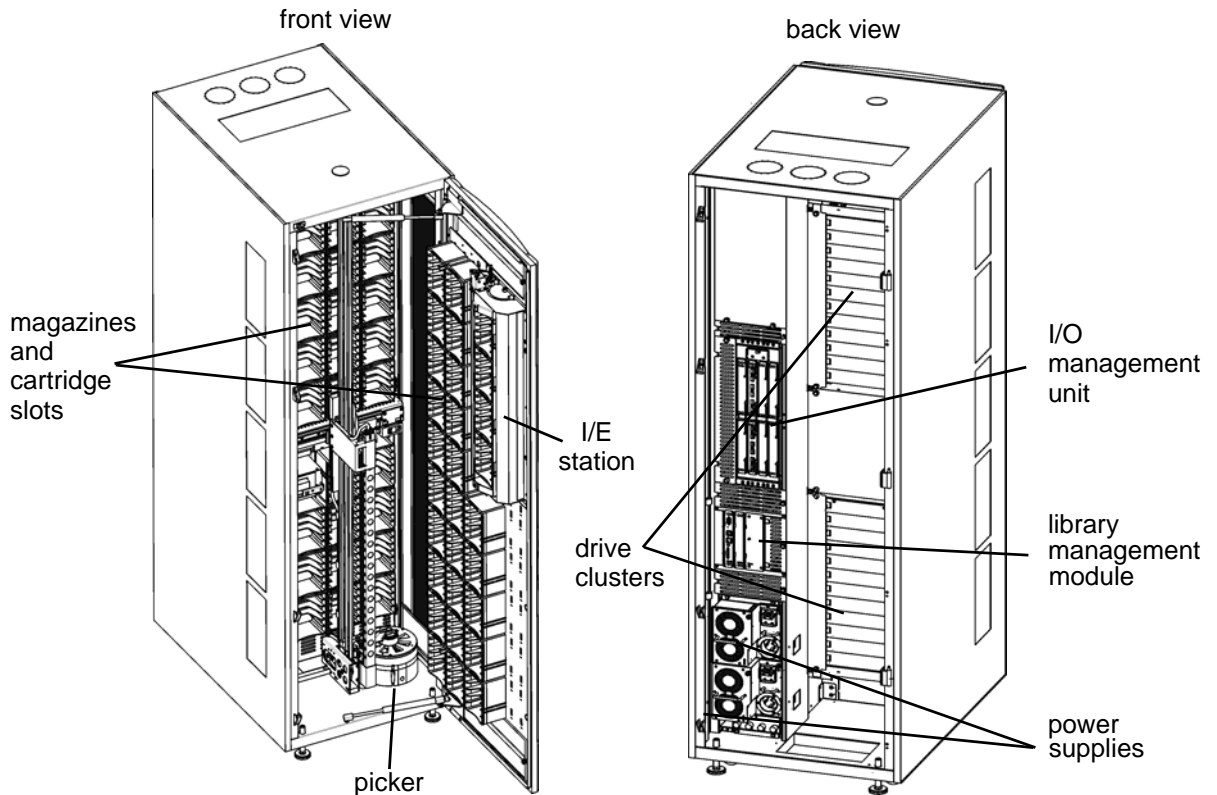


Control Module

The control module contains the following components, as shown in [figure 2](#) on page 8.

- [Library Management Module](#) on page 8
- [Import/Export Station](#) on page 10
- [Cartridges](#) on page 10
- [Tape Drives](#) on page 12
- [Cartridge Magazines](#) on page 15
- [Operator Panel](#) on page 17
- [Power System](#) on page 19

Figure 2 Front and Back View
of the Control Module

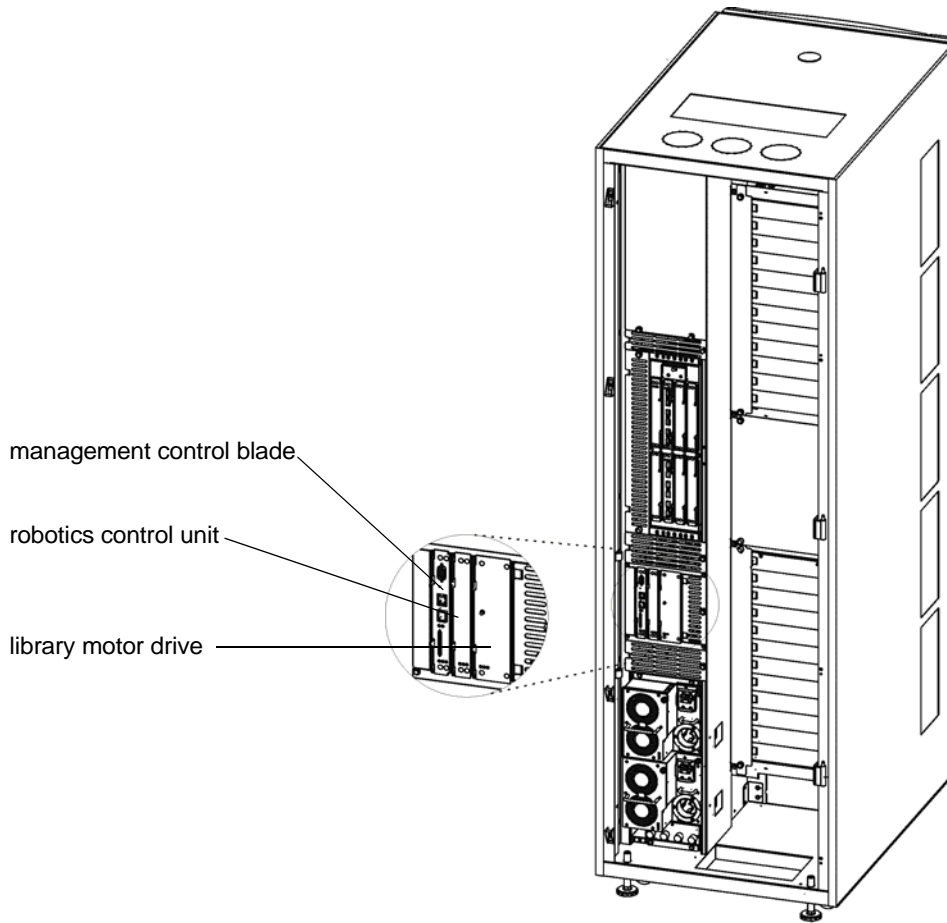


Library Management Module

The library management module controls system hardware and enables external devices to perform configuration and obtain system status. The library management module contains the following boards:

- Management control blade (MCB) - Manages the library, passing commands to and from the robotics control unit as well as the storage area network (SAN) components.
- Robotics control unit (RCU) - Controls the picker and accessor functionality.
- Library motor drive (LMD) - Distributes power to the picker along with the X and Y-axis circuits. It also distributes power to the touch screen.

Figure 3 Library Management
Module Boards



Cartridge Accessor

The cartridge accessor moves cartridges between storage cells, tape drives, and the I/E station. A picker is used to get or put cartridges in a storage cell or a tape drive slot. The picker moves along an X and Y axis and can pivot 180°. A barcode scanner on the picker assembly identifies cartridges located in storage cells.

Import/Export Station

I/E stations enable you to import and export cartridges without interrupting normal library operation. The I/E station is installed on the front of the control module or any of the seven expansion modules. See [figure 1](#) on page 6 and [figure 2](#) on page 8 to see the location of the I/E station.

Each I/E station has a capacity of 24 LTO or 20 SDLT cartridges that are located in four removable magazines.



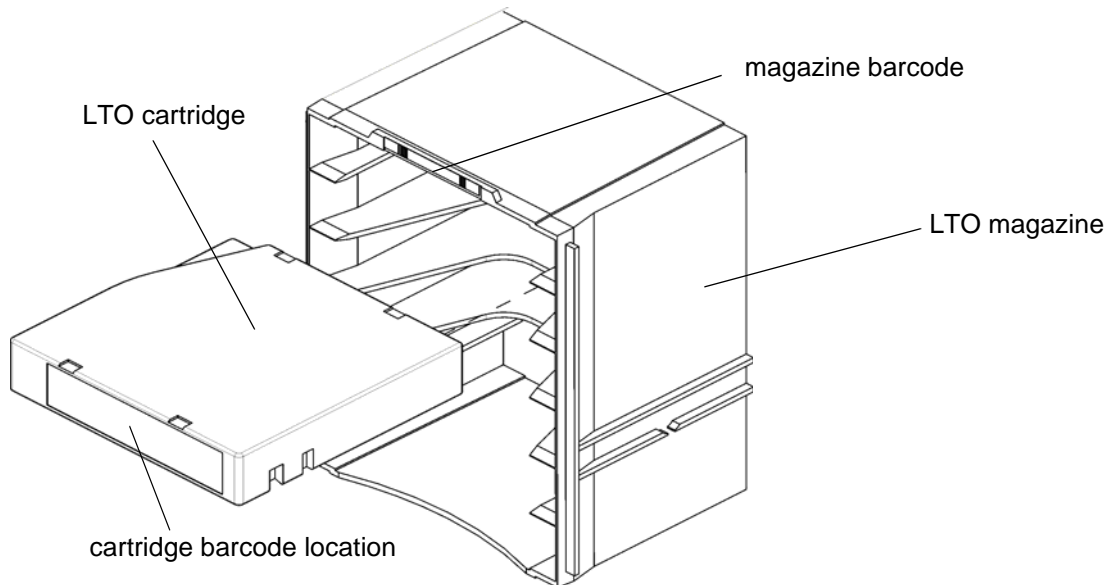
Note

The I/E station cannot be configured as a storage location, but can be part of a logical division of library resources known as partitions.

Cartridges

Cartridges are stored in magazines within the library and identified by an operator-attached, machine-readable barcode label. The library supports barcode labels with 14 characters plus a one- or two-character media identifier depending on drive type, LTO or SDLT. The library currently supports Code 39 (3 of 9) type barcode labels.

Figure 4 Example of LTO
Cartridge Insertion into a
Magazine



See [Mixed Media Support and Rules](#) on page 13 for details about the use of drives and cartridges. See [Barcode Requirements](#) on page 58 for additional specification information.

WORM Support

The Scalar i2000 library supports WORM (write once, read many) technology in LTO-3 and LTO-4 tape drives. WORM requirements include:

- Cartridges
- Firmware
- WORM-supported LTO-3 tape drives
- WORM-supported LTO-4 tape drives

WORM allows non-erasable data to be written once and provides extra data security by prohibiting accidental data erasure. When the library firmware and WORM-supported LTO-3 and LTO-4 tape drive code are installed on a library with LTO-3 and LTO-4 tape drives, the WORM feature is supported whenever the operator uses WORM cartridges.

Tape Drives

The tape drives are enclosed in a universal drive sled. You can hot swap and hot add all types of drives. The library supports the following tape drives types:

- IBM LTO-1 or LTO-2 LVD-SCSI
- IBM LTO-1, LTO-2, LTO-3, or LTO-4 FC Multi-mode
- HP LTO-3 and HP LTO-4 FC Multi-mode
- Quantum SDLT-320 LVD-SCSI
- Quantum SDLT-600 FC
- Quantum DLT-S4 FC

Quantum's Scalar i2000 library supports LTO-4 tape media encryption using the IBM LTO-4 Fibre Channel drives only. All IBM LTO-4 FC drives are encryption-capable, but to use the Q-EKM software application, you must purchase a Q-EKM license and provide a server or servers on which to install Q-EKM. Q-EKM does not currently support encryption on other tape drive types or manufacturer brands, even if they are assigned to a partition selected for encryption. For more information, see [Encryption and Quantum's Encryption Key Manager](#) on page 28.

The control module and expansion modules have upper and lower drive clusters. Each library must have at least one tape drive. Each drive cluster can house up to six tape drives for a total of 12 drives. Additional drives can be added to each of the expansion modules in the configuration. This enables you to have a total of 96 drives.



Note

The term *drive cluster* defines a grouping of up to six tape drives below or above the middle X-axis rail. See [figure 2](#) on page 8 for the locations of drive clusters.

The drives must be installed in the bottom-to-top order in the control module before any are added to the first expansion module. See [figure 6](#) on page 16 for details about the use of drives and cartridges. Refer to [Drive Requirements and Compatibility](#) on page 55 for LTO and SDLT drive requirements.



Note

When you add drives, you lose storage slots.

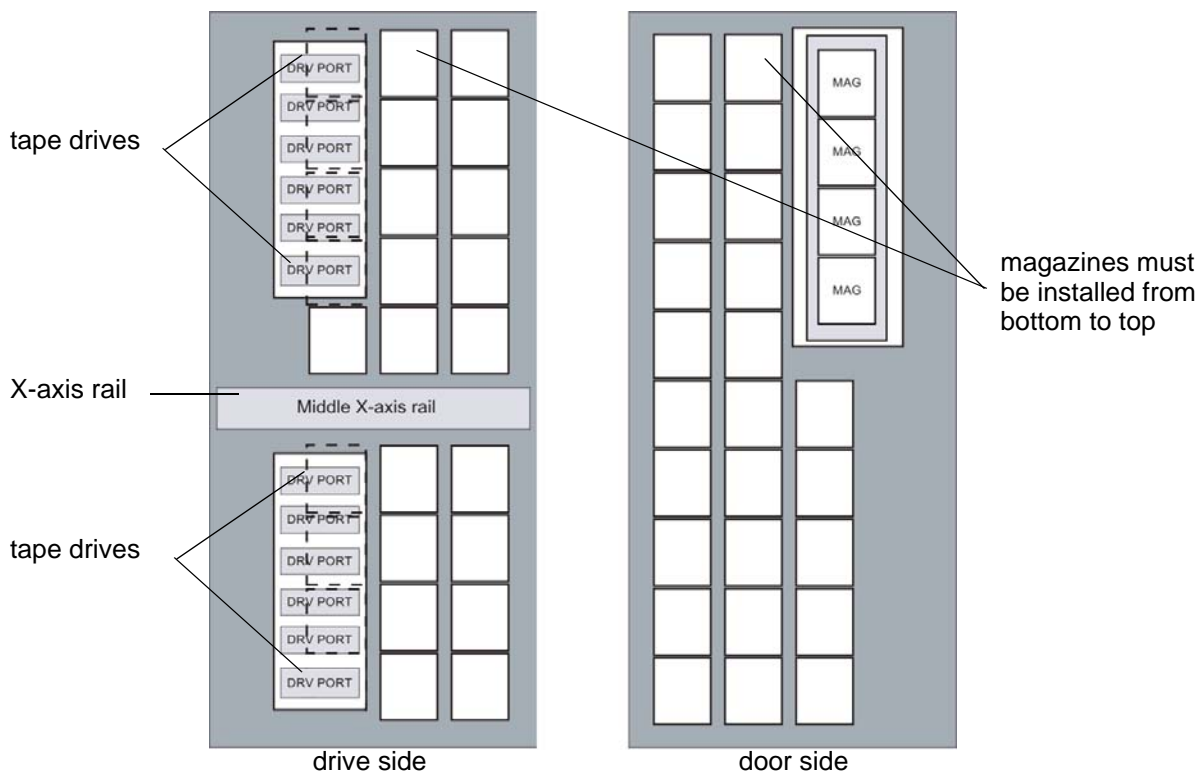
Mixed Media Support and Rules

The library supports both LTO and SDLT cartridges and drives in the same configuration, providing you adhere to the following rules:

- When purchasing a library with mixed media, the new orders must specify the base system technology (either LTO or SDLT) and the number of magazines, the number of drives, and the number of I/E magazines for each media type they need. The base system is considered the primary media type used in the library.
- Multiple media can be mixed at the magazine level.
- The supported multiple media are LTO-1, LTO-2, LTO-3, LTO-3 WORM, LTO-4, LTO-4 WORM, SDLT-320, SDLT-600, and DLT-S4.
- If you are loading cartridges into the library via the I/E station, you must have a magazine of each of the two types of media in the I/E station (LTO and SDLT).
- Mixed media can be within the 100 slot capacity increment, with the following restrictions:
 - SDLT must be ordered in multiples of five because the magazines hold five cartridges.
 - LTO must be ordered in multiples of six because the magazines hold six cartridges.
- Regardless of the mixed quantities of each media type, the total slots licensed will still be in multiples of 100.
- Field upgrades of the library to existing single media systems must specify a mixed media picker kit, if mixed media will be used in the upgraded library.
- Drive types can be installed in any order. For example, an LTO drive can occupy the first drive position, an SDLT drive can occupy the second, and another LTO can occupy the third drive position.
- However, drives must be installed starting in the lower most drive slot of the control module. Once the control module has 12 drives installed from bottom to top, you must move to bottom drive position of the first expansion module.
- The library must include at least one drive for each type of cartridge used.

- Magazines must be installed in the control module starting with back rack (drive side). Once the back rack (drive side) is full, you must then install magazines in the door side, starting with the top left corner. See [figure 5](#) on page 14.
- The secondary media type is installed beginning at storage slot 4,096 or the first media magazine. See [figure 5](#) on page 14.

Figure 5 Magazine Installation Order



Cartridge Magazines

The cartridge magazine is a storage assembly that installs on the drive side or door side of the control module or expansion module. It contains the cartridge slots and provides flexibility when adding storage cartridges to a module. There are two types of magazines, one for SDLT and another for LTO. Because the two magazines are the same size they can be mixed in the library. The SDLT magazines hold five cartridges and the LTO magazines hold six cartridges.

Table 1 Cartridge Capacities
in Library Modules

Type of Cartridge	Cartridges per Magazine	Magazines per Control Module ^a	Magazines per Expansion Module ^b	Control Module Cartridge Capacity ^c	Expansion Module Cartridge Capacity ^d
SDLT	5	44 min/51 max	50 min/76 max	220 min/255 max	250 min/380 max
LTO	6	44 min/51 max	50 min/76 max	264 min/306 max	300 min/456 max

a. The minimum is based on having 11 additional drives installed. The maximum is based on having one drive and one I/E station installed.

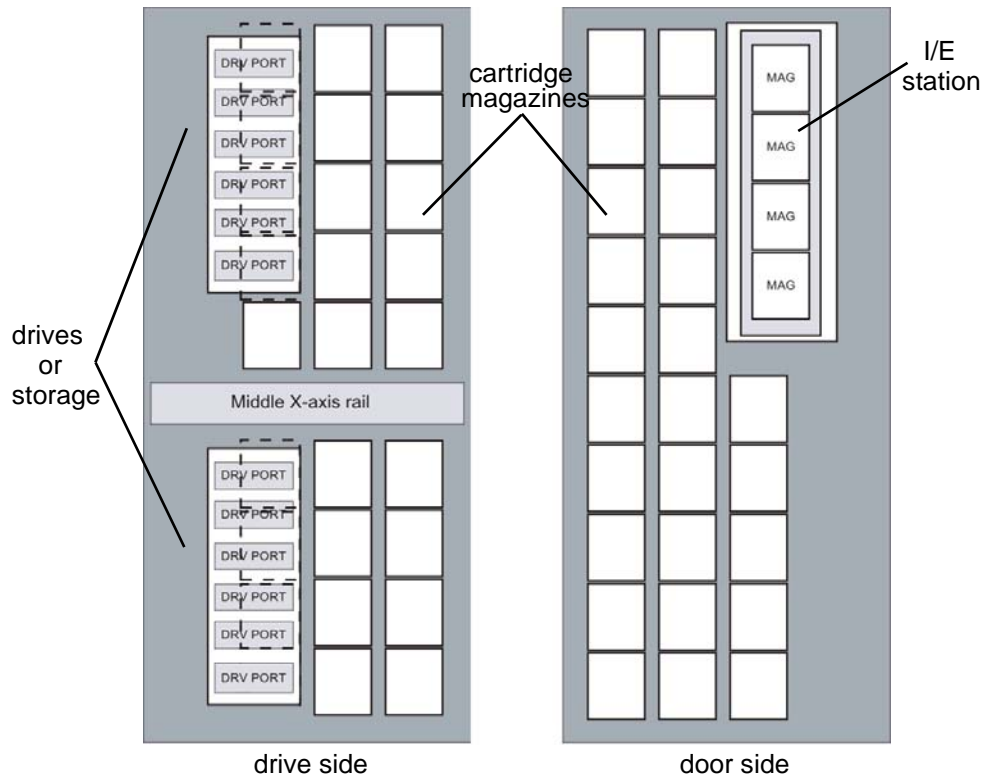
b. The minimum is based on having an I/E station and 12 drives installed. The maximum is based on having no drives or an I/E station installed.

c. The minimum is based on having 11 additional drives installed. The maximum is based on having one drive and one I/E station installed.

d. The minimum is based on having an I/E station and 12 drives installed. The maximum is based on having no drives or an I/E station installed.

Each magazine has a barcode label that the scanner reads for identification and inventory. An optional, snap-on dust cover is available for the magazines. The magazines with the dust cover have interlocked stacking that enables easier storage of the media when they are removed from the library for external storage.

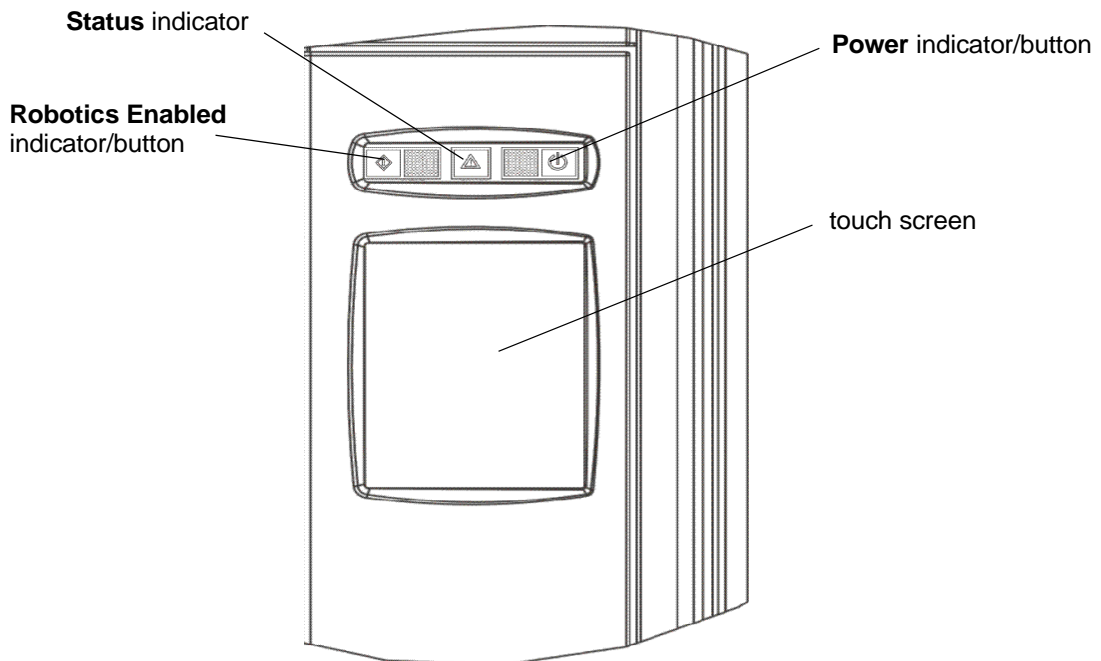
Figure 6 Magazine and Drive Location in the Control Module



Operator Panel

The operator panel is located on the front of the control module and consists of indicators and a touch screen (see [figure 7](#)). The buttons are for library control and power while the indicators provide library status.

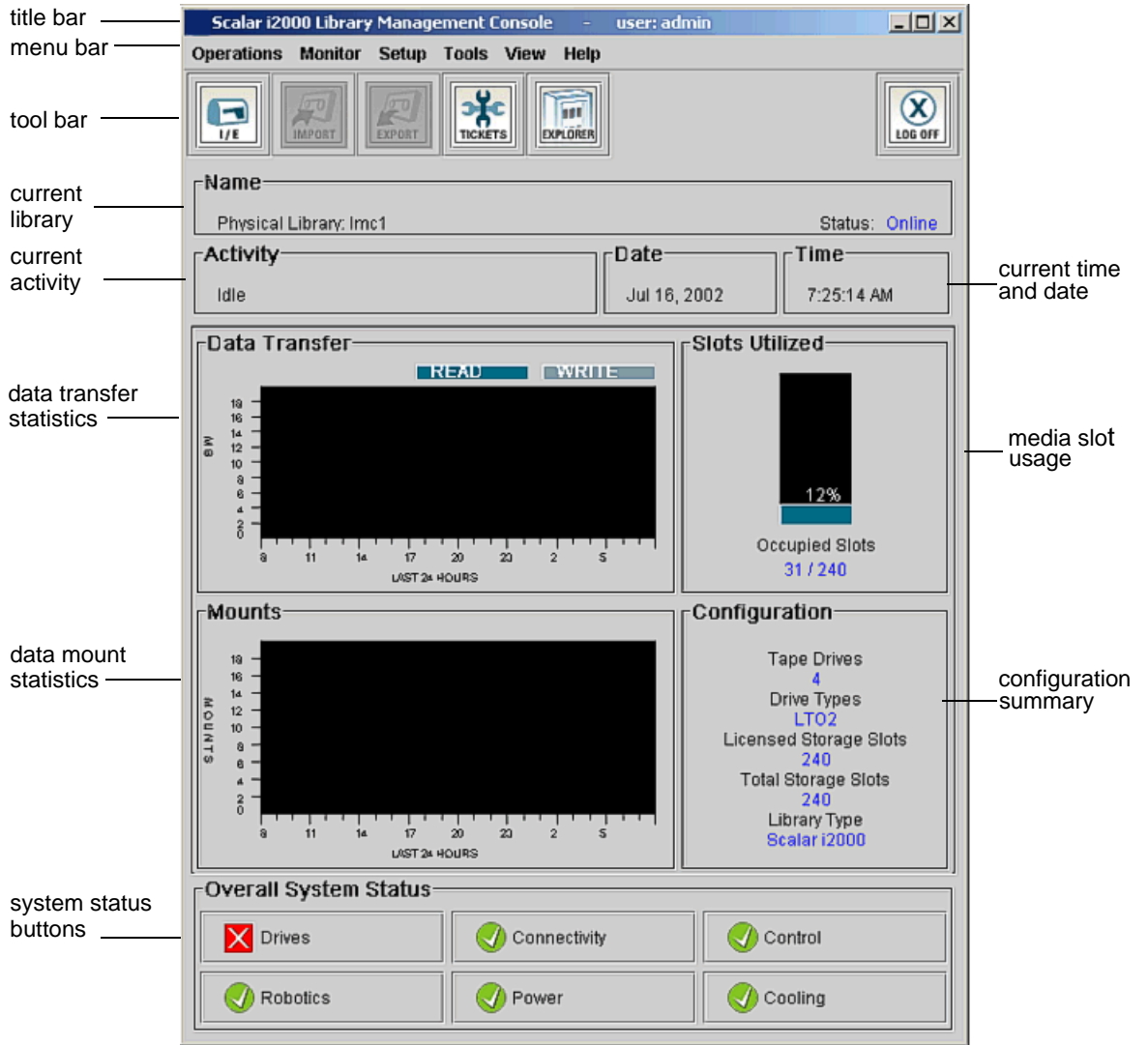
Figure 7 Operator Panel



The touch screen is the library navigation point and provides access to the Library Management Console (LMC), which is shown in [figure 8](#) on page 18. The LMC consists of five primary areas:

- Title bar—provides the library name
- Menu bar—provides menu access to all library management commands
- Tool bar—provides quick access to the most commonly executed functions
- Library information panel—provides real-time library information
- Overall system status—provides real-time status information for the six subsystems of the physical library

Figure 8 LMC



For additional information on the touch screen and the LMC, refer to the *Scalar i2000 User's Guide*.

Power System

The library supports single and redundant power configurations. The single configuration has a single AC line input and single DC power supply. The redundant configuration has dual AC line input and dual DC power supplies. You can hot swap a power supply if you have a redundant power supply. You can hot add a second power supply.

The power system consists of the following:

- Power supply
- Power distribution unit
- AC power cord

A single power switch, located on the front door, turns on and off all power for the control module and attached expansion modules. Each power distribution unit has a second circuit breaker, located in the rear of the module, that controls the module power supply output. The power supply has three LEDs that provide status information. The power system also has four fuses for system protection.

Expansion Modules

Expansion modules enable the library to expand by adding space for tape drives, an I/E station, and cartridges. Each expansion module adds from 300 through 456 LTO or from 250 through 380 SDLT cartridge slots depending on the number of tape drives installed and whether an I/E station is installed. See [figure 9](#) on page 20 for location information. The library's maximum configuration includes up to seven expansion modules for a total of eight modules. Expansion modules can be added only to the right of the control module.

The expansion modules can accommodate the following functional units:

- I/O management unit
- Tape drives
- Cartridge storage
- I/E station (optional)
- AC power compartment (required only if drives are added)

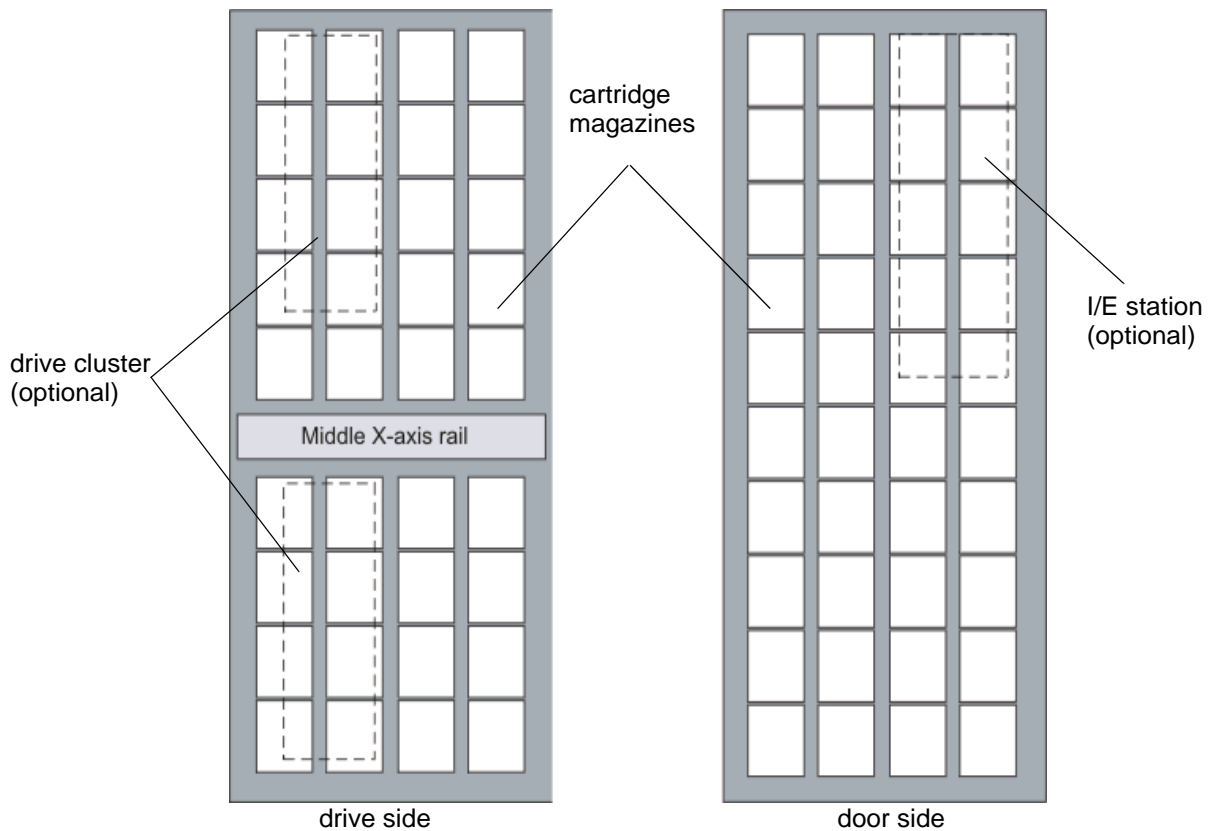
If an expansion module contains only cartridges, all power is derived from the control module.



Note

To ensure ethernet communication, control management blades (CMB) must be installed in each expansion module of a multi-module configuration. If the last expansion module does not contain FC I/O blades, a CMB is not necessary.

Figure 9 Magazine and Drive Location in the Expansion Module



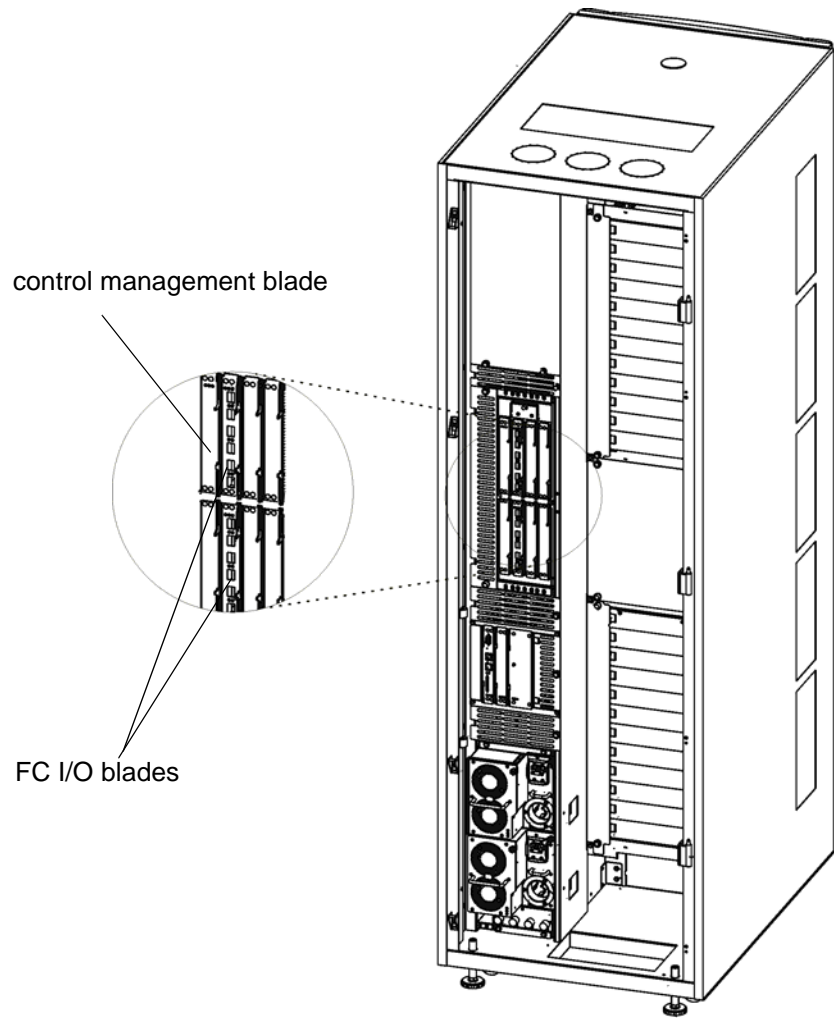
I/O Management Unit

The I/O management unit provides connectivity to a SAN fabric and the hosts, as shown in [figure 10](#) on page 22. The I/O management unit houses six FC I/O blades which provide the FC connections for the 12 Fibre Channel drives in the module. The I/O management unit can be used to perform all tape drive and library host communication functions in a library that is attached to a SAN.

I/O management units may be installed in the control module and expansion modules. The I/O management unit supports the following two blades:

- The control management blade performs unit status monitoring including power and I/O present conditions, and internal network switch functions connecting I/O blades with the library management module.
- The FC I/O blade has an embedded controller providing connectivity and value added features to enhance the performance and reliability of tape operations. The FC blade has six auto-negotiating FC data ports with a maximum of 4 Gbps and backplane connections. FC I/O blades provide two host communication ports and four connection ports to tape drives.

Figure 10 I/O Management Unit



Host Attachment

Requests issued from the host application result in cartridge movement in the library. The primary requests issued are for mounting and dismounting cartridges in and out of the tape drives and for importing and exporting cartridges in and out of the library. The library manages the physical location. In addition to requesting cartridge movement in the library, the host application can use the FC or SCSI command interface to obtain status, configuration information, and cartridge storage information from the library.

Hosts can be attached to the library in the following ways:

- SDLT-320 SCSI-interfaced drives can be connected to the SAN when they are directly connected to an external Storage Networking Controller (SNC) 5100. There is no area provided to mount the SNC inside the library modules, so you must plan for extra rack space near the library.
- FC and SCSI drives can be directly-attached to host systems or to the SAN. In these configurations, the MCB has one library control port (Fibre Channel or SCSI) connecting to the controlling host computer.
- Attachment of the FC drives to the FC I/O blade in the I/O management unit. There are two ports on each FC I/O blade that can be connected directly to the host or to the SAN.

Remote Management

The library can be managed locally or remotely using the LMC. Locally, the LMC is displayed on the touch screen on the front of the library. Remotely, the LMC is accessed through a client instance of the ADIC Management Console (AMC) software on any computer on the network. You also can access the LMC using a Java-enabled browser.

The AMC also provides additional monitoring of a SAN-attached library over your existing network, including library subsystem health and status information and early fault notification to a management server via SNMP. For more information, refer to the *Quantum Intelligent Libraries Basic SNMP Reference* manual.

Managing Your Remote Library

Remote management of the Scalar i2000 is accomplished using the Library Management Console, (LMC). This interface, which is identical to the front panel interface, uses Java RMI communications to provide real time updates to LMC clients. This enables the library to provide end-users with status changes and events as they occur.

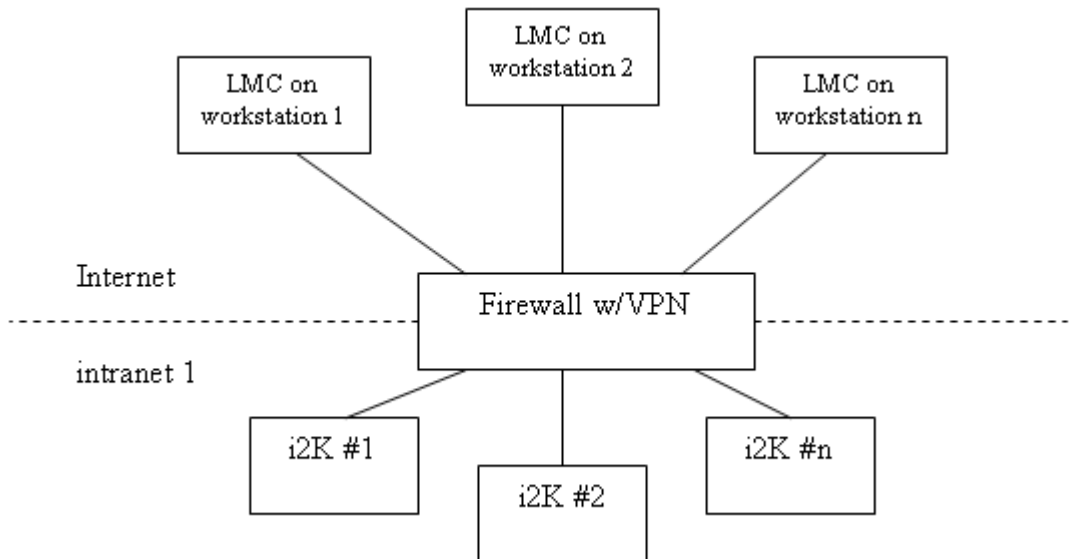
At a high level, remote access can be managed using security functions embedded within the Scalar i2000. This includes authentication via individual user names/passwords and access control settings which enable or disable specific access protocols (FTP, SSH, even LMC) to limit what type of remote management is possible.

In addition to this, most customers should have one or more firewalls in place to govern remote access. As with any Internet accessible service, the LMC requires a communication path so that data can be transmitted between clients and the Scalar i2000. How this communication path is managed depends on the user's configuration. The following three scenarios typical configurations.

Scenario 1: Internet based clients managing multiple internal Scalar i2000s

For most organizations, a single administrator will not be managing all storage resources. In this instance, as shown in [figure 11](#) on page 25, multiple administrators and even Quantum service personnel may be asked to remotely access Scalar i2000s.

Figure 11 Multiple Workstations



In the scenario shown in [figure 11](#), Quantum highly recommends using virtual private network (VPN) software to control access to the Scalar i2000. VPNs offer authentication and encryption services to protect data transmissions and determine who can access a corporate network. By using VPN, the LMC client appears to be inside the firewall and have unrestricted access when communicating with the library.

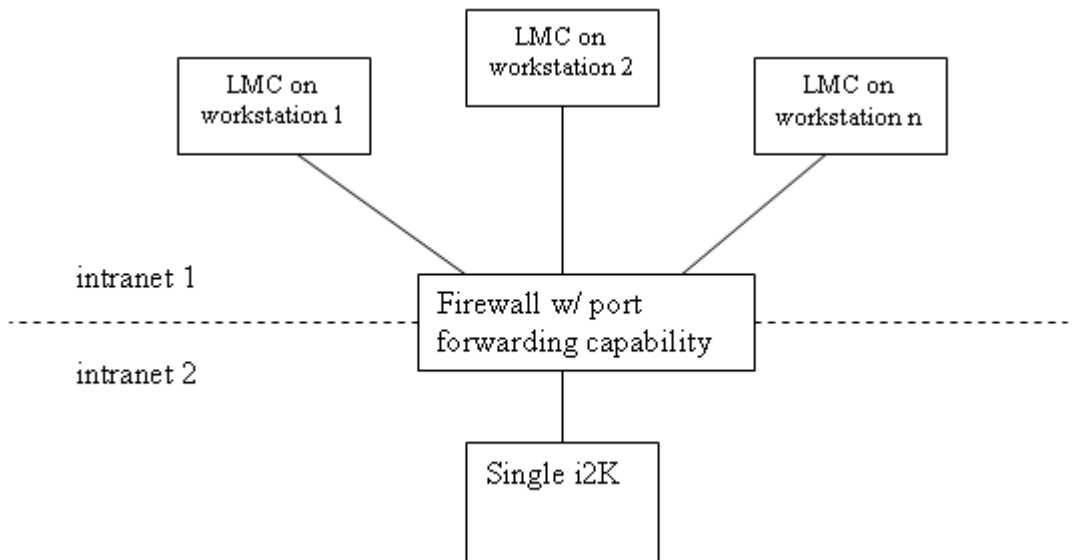
While a VPN is recommended, customers could use port blocking to provide access. In this instance, the following firewall requirements must exist:

- Inbound access to port 1099 (Java RMI server port)
- Stateful access control – used with most web technologies (for example, web mail) to enable a server to communicate with the client that started the connection

Scenario 2: Internal clients accessing a single library across an internal firewall

Another common customer configuration, is that a customer will want to allow multiple internal clients to manage a single Scalar i2000. For instance, as shown in [figure 12](#) on page 26, network operation/ data center staff providing monitoring services of specific resources. Administrators are inside the corporate firewall, but security considerations necessitate an additional firewall between administrators and the resources they manage.

Figure 12



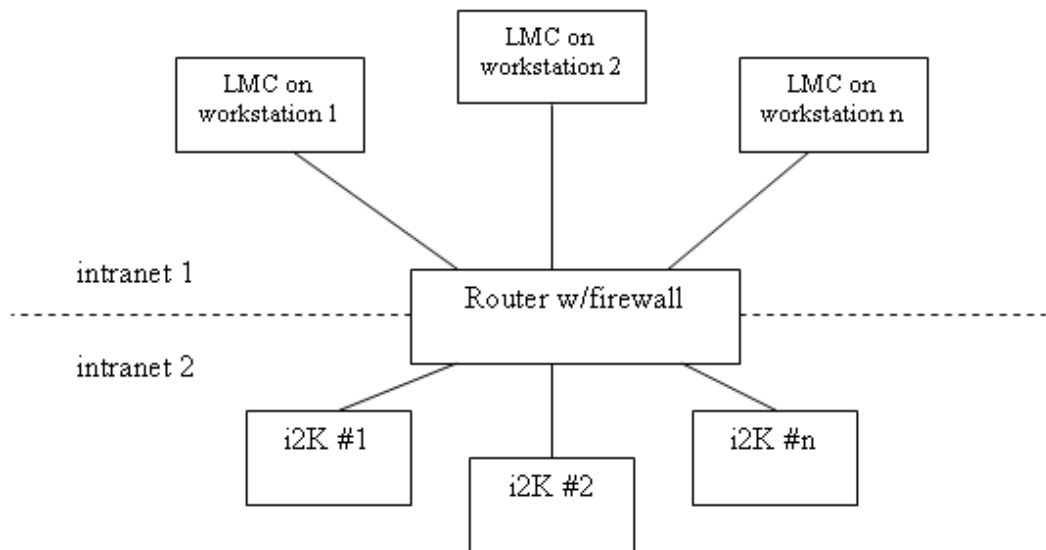
In the scenario shown in [figure 12](#) customers can utilize port forwarding functionality to enable specific access to a Scalar i2000. Port forwarding works by taking all host communications directed to a specific port and forwarding them to a single IP device. In this case, port forwarding would be configured so that all communications to the Java RMI server port (1099) would be directed to the IP address of the Scalar i2000.

The benefit of this solution is that it forces all traffic to a single library and prevents any other traffic using port 1099 from going to other devices. This does mean that only a single Scalar i2000 can be accessed. Multiple Scalar i2000 libraries could not be accessed.

Scenario 3: Internal clients accessing multiple libraries across an internal firewall

Many customers use a layered system of firewalls to safeguard resources. In the scenario shown in [figure 13](#), a customer may have multiple Scalar i2000s which need to be administered by internal staff (for instance data center / network operations staff) – with a firewall in between the administrators and libraries.

Figure 13



To enable LMC access between firewall zones, two solutions are possible depending on the customer configuration. If the two zones are on the same IP subnet, then the firewall will provide IP address and port blocking functionality and should follow these rules:

- Inbound access to port 1099 (Java RMI server port) by client IP addresses
- Stateful access control – used with most web technologies (e.g. web mail) to enable a server to communicate with the client that started the connection

If the two zones are on different subnets, or an IP address translation is performed to mask the library's true IP address, then the firewall must provide routing rules that allow the client IP addresses to access specific library IP addresses.

Capacity on Demand

If you purchased capacity on demand, the library is initially licensed for a default configuration of 100 SDLT or 102 LTO storage slots. The number of storage slots differs between media types because the library only supports full magazines for capacity on demand.

The library's license key must be enabled during installation to configure those parts of the library that are governed by additional licensing. Customer license keys are available from Quantum Technical Assistance Center (ATAC).

The capacity on demand library can be expanded from a single module to up to eight modules. With capacity on demand, you can purchase enough storage to accommodate your current needs. As your storage needs change you can add storage in blocks of 100 cartridges, without being required to purchase additional hardware. Capacity on demand begins at 100 cartridges and can be increased to as many as 3,492 LTO or 2,915 SDLT cartridges inside one library.

For more information, refer to the *Scalar i2000 User's Guide*.

Encryption and Quantum's Encryption Key Manager

The default setting for IBM LTO-4 encryption-capable drives permits external application-managed encryption support on all encryption-capable tape drives and media within a partition.

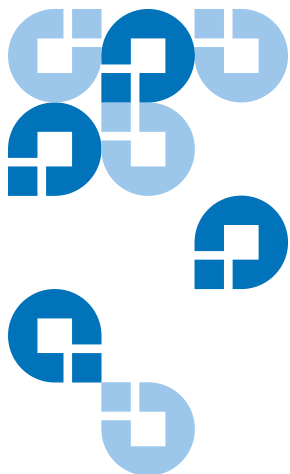
Optionally, you can purchase the Quantum Encryption Key Manager (Q-EKM). Q-EKM is a licensed Java software program that generates, protects, stores, and manages the encryption keys. These keys are used to encrypt the information being written to tape media and read from tape media. Policy control and keys pass through the library-to-drive interface; therefore encryption is transparent. Q-EKM was designed to generate and communicate encryption keys for IBM LTO-4 FC drives in Quantum libraries across the customer's environment.

Currently, the Scalar i2000 library supports encrypting LTO-4 tape media using IBM LTO-4 Fibre Channel drives only. All IBM LTO-4 FC drives are encryption-capable, but to use the Q-EKM software application, you must purchase a Q-EKM license and provide a server or servers on which to install Q-EKM. Q-EKM does not currently support encryption on other tape drive types or manufacturer brands, even if they are assigned to a partition selected for encryption.

If you choose to purchase and use the licensed Q-EKM application, you must supply a server on which to install EKM. Professional Q-EKM integration must be performed by Quantum or Quantum authorized service personnel. For more information, contact the Global Call center at www.quantum.com/support.

Note: In order for Q-EKM to work properly, you must upgrade both your library and tape drive firmware to the latest released versions. For instructions on performing the firmware upgrades, see the *Scalar i2000 User's Guide* (6-00421-11).

For more information about installing and configuring the Q-EKM server and Q-EKM best practices, see the *Quantum Encryption Key Manager User's Guide* (6-01847-xx).



System Specifications

This section provides performance, environmental, electrical, and physical specifications for modules in the library. The major sections include:

- [Performance Specifications](#) on page 30
- [Environmental Specifications](#) on page 31
- [Electrical Specifications](#) on page 31
- [Physical Specifications](#) on page 35
- [Module Foot Pad Positions](#) on page 53
- [Module Floor Cutout](#) on page 54
- [Barcode Requirements](#) on page 58
- [Barcode Requirements](#) on page 58

Performance Specifications

The performance of the library is 130 cartridge exchanges per hour (EPH) for an eight-module system with a maximum EPH of 265.

Environmental Specifications

[Table 2](#) lists the key environmental information for the library.

Table 2 Environmental Specifications

Temperature	Humidity	Altitude	BTU/Heat Dissipation	
			Minimum ^a	Maximum ^b
LTO: 59°F - 89.6°F (16°C - 32°C) SDLT: 64°F - 82°F (18°C - 28°C) ^c	15 - 75%	10,000 ft	.375 kwh 1280 BTU	4.3 kwh 14651 BTU

a. Configuration includes a control module with one drive.

b. Configuration includes a control module and seven expansion modules with a total of 48 drives and four I/O management units with a total of 12 I/O blades (three blades in each of the four I/O management units).

c. Once an SDLT cartridge is used for archival storage these temperature ranges apply.

Electrical Specifications

Although each system is configured with a single AC power source, redundant power is an option. If redundant power is chosen, the control module and all expansion modules that contain tape drives require two independent AC power sources.



CAUTION

You must install your library with two independent power sources to have redundant power. You will not have redundant power if you use only one AC power source.

The power cable length for each of these inputs is 14 feet (4.26 m). See [table 3](#).

For North America, the NEMA L6 - 30 power cord ships by default.

Table 3 Electrical Specifications for Control and Expansion Modules

Location	Voltage (Single Phase, 50 - 60 Hz)	Required Protective Service	Delivered Power Connector	AMPs
North America	110	30	NEMA L5 - 30	30
North America	208	30	NEMA L6 - 30 ^a	30
North America	208	15	NEMA L6 - 15	15
International	240	16	IEC60309 2P+E	20 ^b or 16 ^c

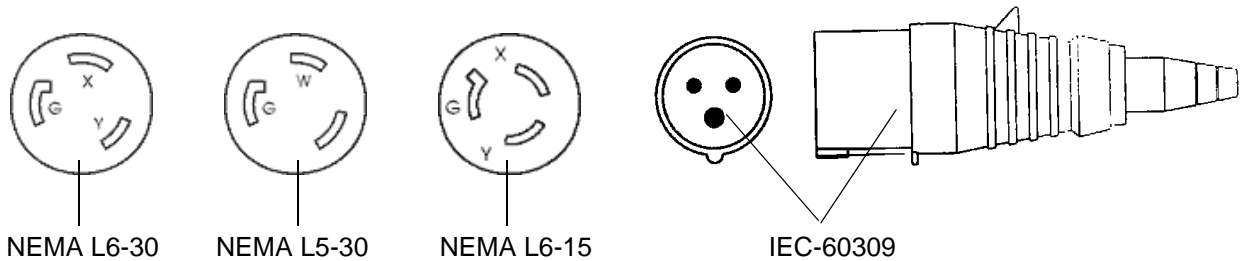
a. For North America, the NEMA L6 - 30 power cord ships by default.

b. 20 amps in North America

c. 16 amps international.

The L5-30, L6-15, and IEC60309 power connectors are shown in [figure 14](#).

Figure 14 Supported Power Connectors



The typical power consumption for each module is listed in [table 4](#) on page 33.

Table 4 Typical Module Power Consumption

Module	AMP @ 110 V	AMP @ 220 V	kW	BTU/hr
Control Module				
Minimum (1 drive)	3.4	1.7	.375	1280
Each additional drive	0.446	0.223	.050	167
Maximum (12 drives)	8.31	4.2	0.92	3121
I/O management unit	0.69	0.35	0.075	258
Each FC I/O blade	1.0	0.5	0.110	376
Maximum (12 drives, 1 I/O management unit, and 3 I/O blades)	12	6	1.32	4508
Expansion Module				
Minimum (no drives)	0	0	0	0
Each additional drive	0.446	0.223	.050	167
Maximum (12 drives)	5.31	2.7	0.58	1990
I/O management unit	0.69	0.35	0.075	258
Each FC I/O blade	1.0	0.5	0.110	376
Maximum (12 drives, 1 I/O management unit, and 3 I/O blades)	9	4.5	.99	3381

Table 5 Scalar i2000 Power
Consumption Characteristics

230V / 50 Hz / 1 pH.								
Robot Operating								
Total Number Drives	12	12	12	12	6	3	1	0
Operational Drives	12	6	3	1	6	3	1	0
KW	0.77	0.76	0.75	0.74	0.54	0.48	0.35	0.31
KVA	0.82	0.8	0.79	0.79	0.58	0.52	0.38	0.35
KVAR (capacitive)	0.28	0.26	0.26	0.26	0.22	0.21	0.16	0.16
Power Factor	0.94	0.94	0.94	0.95	0.93	0.92	0.9	0.89
Crest Factor	1.85	1.85	1.82	1.82	1.87	1.8	1.68	1.6
Amps (RMS)	3.63	3.54	3.53	3.55	2.58	2.15	1.85	1.6
Amps (Peak)	7.097	7.214	7.063	6.983	5.532	4.714	3.924	2.588
208 v / 60 Hz / 1 pH.								
Robot Operating								
Total Number Drives	12	12	12	12	6	3	1	0
Operational Drive	12	6	3	1	6	3	1	0
KW	0.77	0.76	0.76	0.75	0.54	0.43	0.35	0.31
KVA	0.82	0.81	0.8	0.8	0.57	0.46	0.38	0.34
KVAR (capacitive)	0.28	0.27	0.27	0.27	0.18	0.17	0.15	0.14
Power Factor	0.94	0.94	0.94	0.94	0.95	0.93	0.92	0.91
Crest Factor	1.68	1.69	1.7	1.7	1.69	1.61	1.56	1.58
Amps (RMS)	4.06	3.92	4.04	3.91	2.78	2.31	1.93	1.75
Amps (Peak)	7.227	7.244	7.078	7.122	7.045	4.422	3.975	2.787

Customer Library Connection Types and Speeds

[Table 6](#) lists the library connection types and speeds.

Table 6 Library Connections
Types and Speeds

Connection ^a	Connector	Speed
Fibre Channel on FC I/O Blade	LC	2 gigabit/sec (6404) 4 gigabit/sec (7404)
Fibre Channel on management control blade	LC	1 gigabit/sec
Ethernet on management control blade	RJ45	10/100 Base-T
SCSI-2 on management control blade	68-pin VHDCI	Ultra-2 SCSI

a.The DB-9 serial connection on the management control blade is not intended for customer use.

Physical Specifications

This section contains the physical specifications for the library modules.

If the library is installed on a raised floor, the raised floor should be stabilized to prevent any horizontal movement. The library has four point loads each on the control and expansion modules. See [table 7](#) on page 36.



Note

The Scalar i2000 control module-only weight is approximately 600 lbs. This is the weight of a control module without packaging or media.

Table 7 Physical Specifications

Height	Width	Depth	Maximum Weight	Distributed Load	Point Load
Control Module^a					
77.4 in. 1965.9 mm	24.3 in. 616.7 mm	38.3 in. 973.9 mm	899 lb 408.6 kg	139.1 lb/ft ² 680.4 kg/m ²	73.8 lb/in ² 5.2 kg/cm ²
Expansion Modules^b					
77.4 in. 1965.9 mm	23.6 in. 599 mm	38.3 in. 973.9 mm	885 lb 402.3 kg	140.9 lb/ft ² 689.6 kg/m ²	72.7 lb/in ² 5.1 kg/cm ²
Storage-Only Expansion Modules^c					
77.4 in. 1965.9 mm	23.6 in. 599 mm	38.3 in. 973.9 mm	777 lb 353.2 kg	123.7 lb/ft ² 605.4 kg/m ²	63.8 lb/in ² 4.5 kg/cm ²

a.Includes 12 drives, populated I/O management unit, redundant power, and full media.

b.Includes 12 drives, populated I/O management unit, redundant power, and full media.

c.Includes media and unpopulated I/O management unit.

Shipping Pallet Specifications

The library control modules and expansion modules are each shipped on the same type of specially designed pallet. The pallet's dimensions are listed in [table 8](#) on page 37.

Control Module and Expansion Module Pallet Specifications

Table 8 Pallet Dimensions

Height	Width	Length
84 in. 2133.6 mm	41 in. 1041.4 mm	81 in. 2057.4 mm

IEX Considerations

When adding expansion modules, you must consider IEX versions.

- 1 Take a snapshot of the library.
- 2 Find out what the IEX H/W Rev is for all the IEX board.
- 3 If any IEX H/W Rev is under 2, replace the IEX board.
- 4 If any IEX FW level is under 130, replace the IEX board.

Configuration One

The first configuration consists of the control module. The minimal configuration contains one I/E station and one drive. Options include:

- Combination of up to 12 drives (LTO and SDLT can be mixed)
- Redundant power supply

A diagram of the first configuration is shown in [figure 15](#) on page 38. Physical specifications are listed in [table 9](#) on page 38.

Figure 15 Configuration One
Diagram

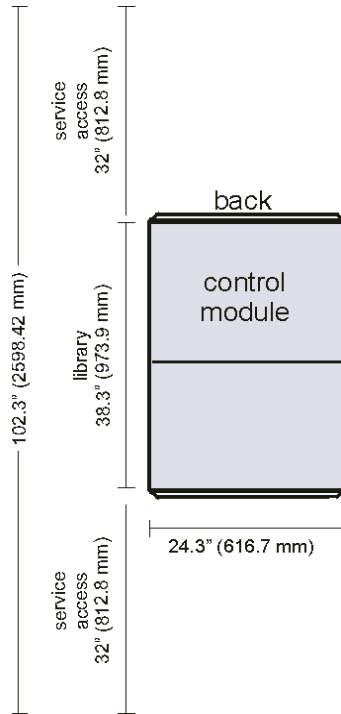


Table 9 Configuration One
Specifications

Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	24.3 in. 616.7 mm	38.3 in. 973.9 mm	899 lb 408.6 kg	139.1 lb/ft ² 680.4 kg/m ²	73.8 lb/in. ² 5.2 kg/cm ²

a. Weight includes library fully loaded with drives, populated I/O management units, redundant power, and full media.

Configuration Two

The second configuration consists of the control module and one expansion module. Options include:

- Up to 12 additional LTO or SDLT drives (for a total of 24 drives) (LTO and SDLT can be mixed)
- Redundant power supply
- One additional I/E station
- Additional storage (up to 456 LTO or 380 SDLT cartridges)

The second configuration is shown in [figure 16](#) on page 40. Physical specifications are listed in [table 10](#) on page 40.

Figure 16 Configuration Two
Diagram

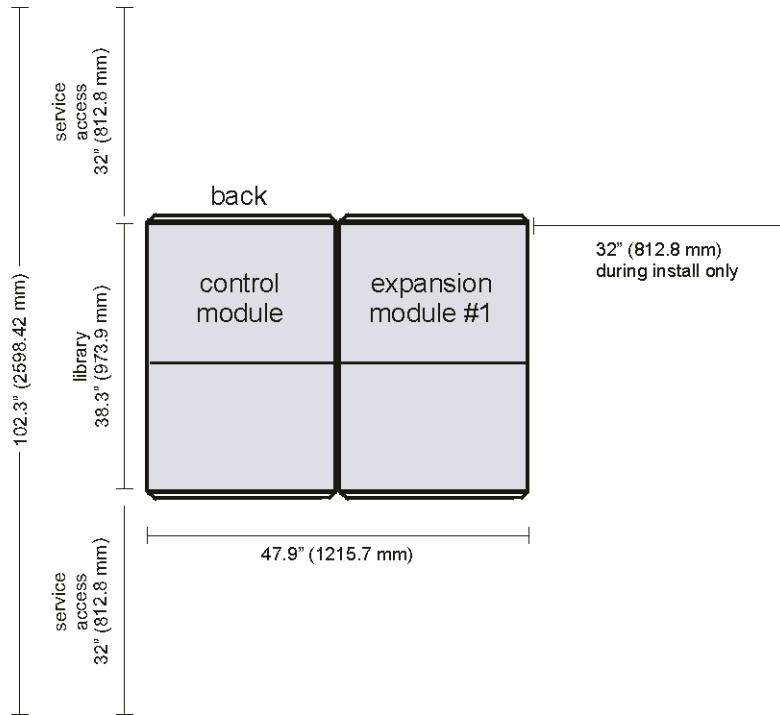


Table 10 Configuration Two
Specifications

Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	47.9 in. 1215.7mm	38.3 in. 973.9 mm	1784 lb 810.9 kg	140 lb/ft ² 684.9 kg/m ²	73.3 lb/in ² 5.2 kg/cm ²

a. Weight includes library fully loaded with drives, populated I/O management units, redundant power, and full media.

Configuration Three

The third configuration consists of one control module and two expansion modules. Options include:

- Up to 12 additional LTO or SDLT drives (for a total of 36 drives) (LTO and SDLT can be mixed)
- Redundant power supplies
- Up to two additional I/E stations
- Additional storage (up to 456 LTO or 380 SDLT cartridges)

The third configuration is shown in [figure 17](#) on page 42. Physical specifications are listed in [table 11](#) on page 42.

Figure 17 Configuration Three
Diagram

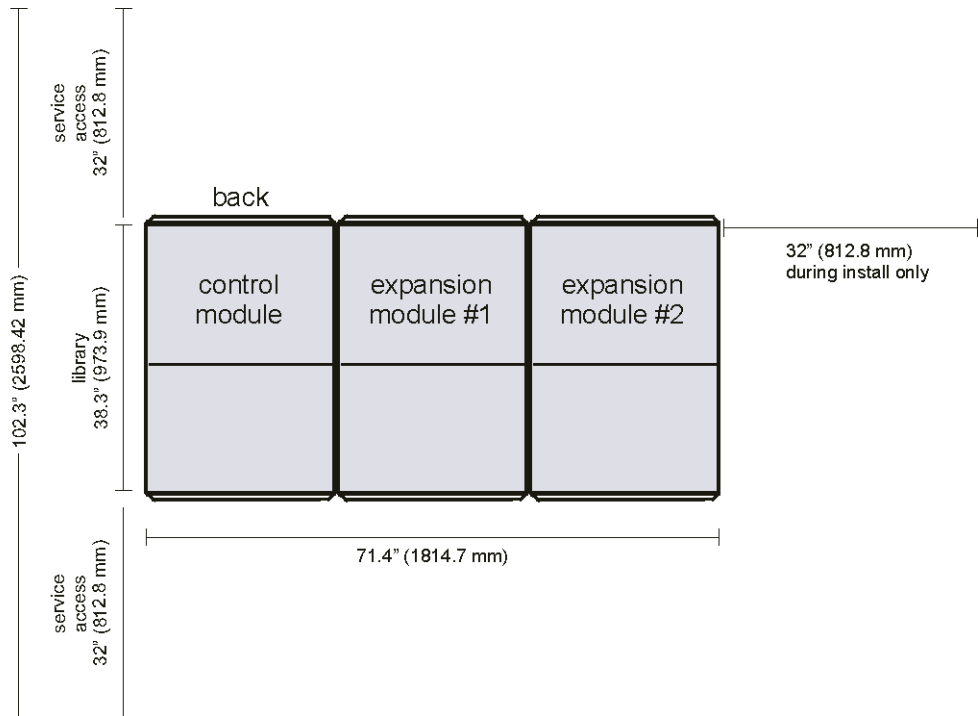


Table 11 Configuration Three
Specifications

Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	71.4 in. 1814.7 mm	38.3 in. 973.9 mm	2669 lb 1213.2 kg	140.3 lb/ft ² 686.4 kg/m ²	73.1 lb/in ² 5.1 kg/cm ²

a. Weight includes library fully loaded with drives, populated I/O management units, redundant power, and full media.

Configuration Four

The fourth configuration consists of the control module and three expansion modules. Options include:

- Up to 12 additional LTO or SDLT drives (for a total of 48 drives) (LTO and SDLT can be mixed)
- Redundant power supplies
- Up to three additional I/E stations
- Additional storage (up to 456 LTO or 380 SDLT cartridges)

The fourth configuration is shown in [figure 18](#) on page 44. Physical specifications are listed in [table 12](#) on page 44.

Figure 18 Configuration Four
Diagram

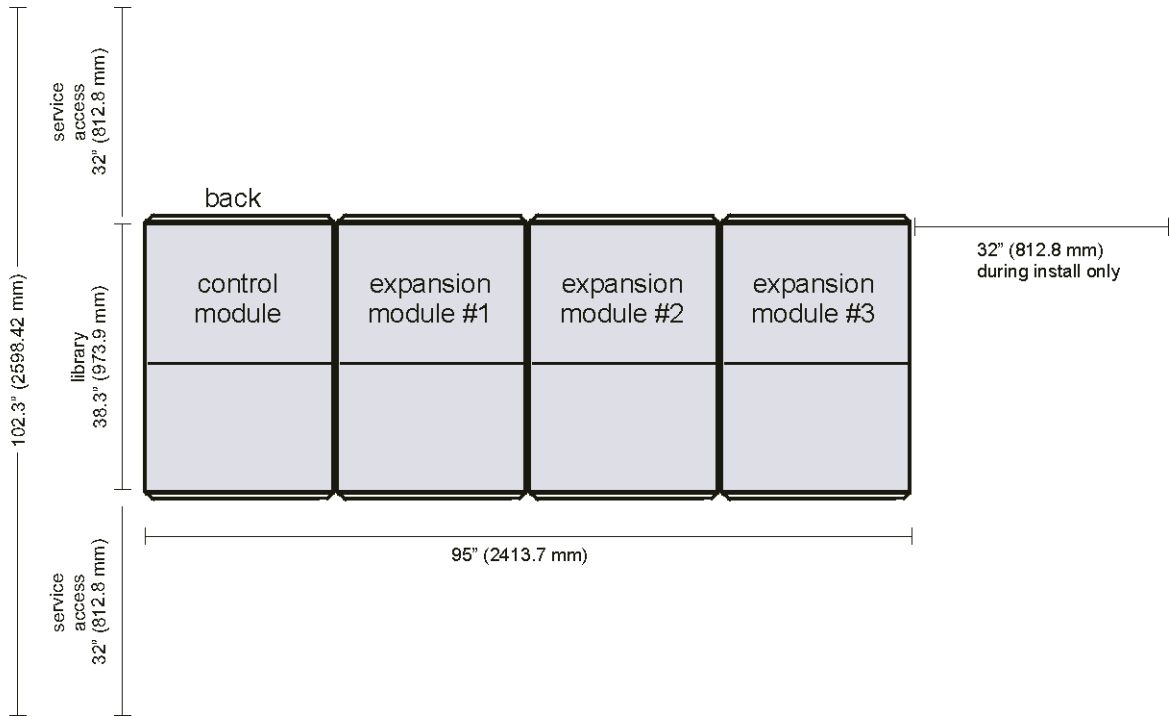


Table 12 Configuration Four
Specifications

Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	95.0 in. 2413.7 mm	38.3 in. 973.9 mm	3554 lb 1615.5 kg	140.5 lb/ft ² 687.2 kg/m ²	73 lb/in ² 5.1 kg/cm ²

a. Weight includes library fully loaded with drives, populated I/O management units, redundant power, and full media.

Configuration Five

The fifth configuration consists of the control module and four expansion modules. Options include:

- Up to 12 additional LTO or SDLT drives (for a total of 60 drives) (LTO and SDLT can be mixed)
- Redundant power supplies
- Up to four additional I/E stations
- Additional storage (up to 456 LTO or 380 SDLT cartridges)

The fifth configuration is shown in [figure 19](#) on page 46. Physical specifications are listed in [table 13](#) on page 46.

Figure 19 Configuration Five
Diagram

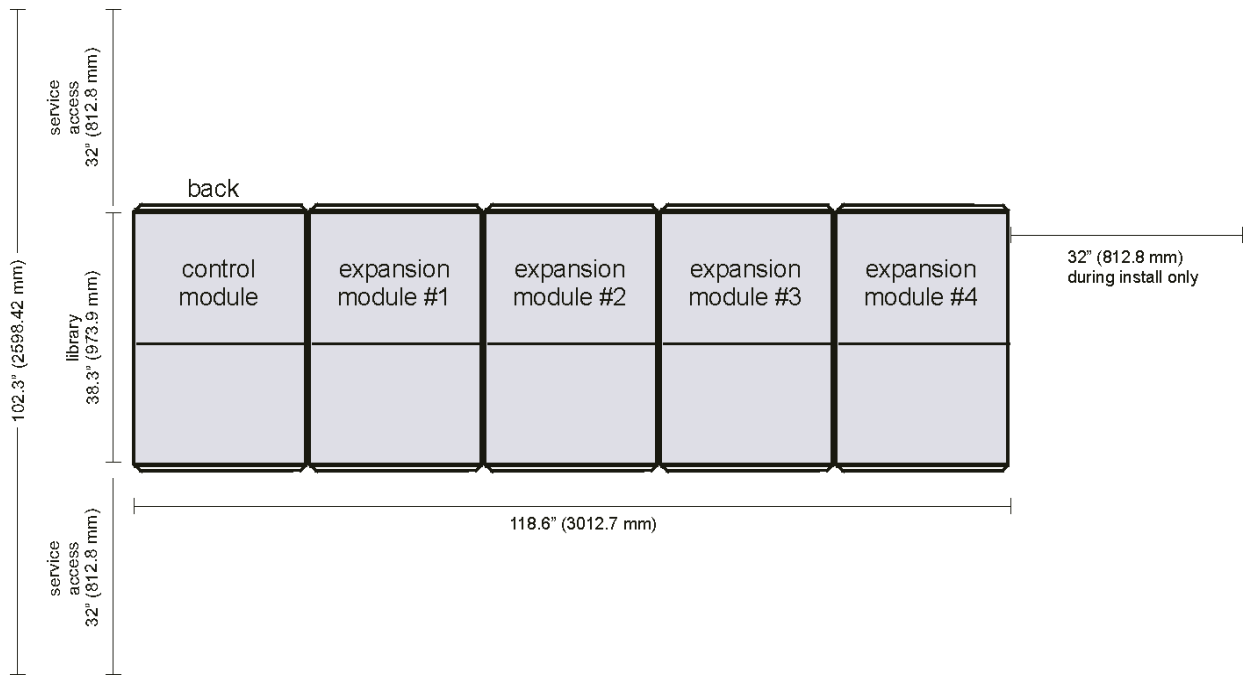


Table 13 Configuration Five
Specifications

Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	118.6 in. 3012.7 mm	38.3 in. 973.9 mm	4331 lb 1968.6 kg	123.7 lb/ft ² 605.4 kg/m ²	63.8 lb/in ² 4.5 kg/cm ²

a. In this example, the weight includes a library that has the first four modules fully loaded with drives, populated I/O management units, redundant power, and full media. In this example, the last module will be loaded only with full media.

Configuration Six

The sixth configuration consists of the control module and five expansion modules. Options include:

- Up to 12 additional LTO or SDLT drives (for a total of 72 drives) (LTO and SDLT can be mixed)
- Redundant power supplies
- Up to five additional I/E stations
- Additional storage (up to 456 LTO or 380 SDLT cartridges)

The sixth configuration is shown in [figure 20](#) on page 48. Physical specifications are listed in [table 14](#) on page 48.

Figure 20 Configuration Six
Diagram

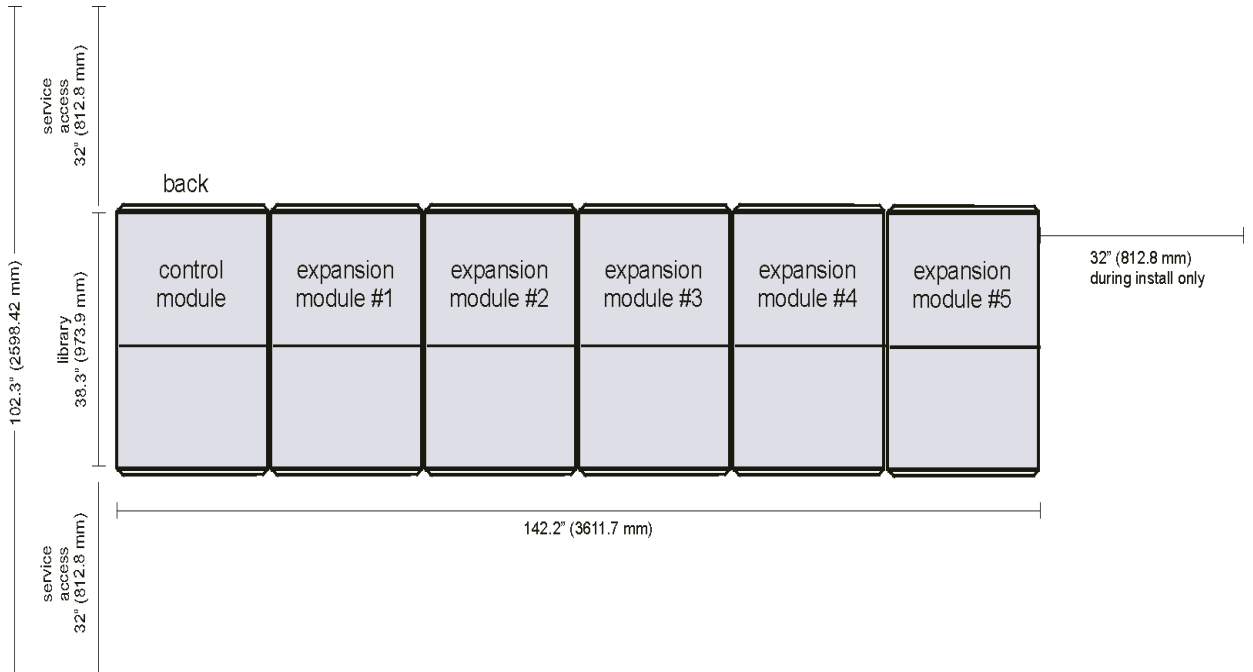


Table 14 Configuration Six
Specifications

Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	142.2 in. 3611.7 mm	38.3 in. 973.9 mm	5108 lb 2321.8 kg	123.7 lb/ft ² 605.4 kg/m ²	63.8 lb/in ² 4.5 kg/cm ²

a. In this example, the weight includes a library that has the first four modules fully loaded with drives, populated I/O management units, redundant power, and full media. In this example, the last module will be loaded only with full media.

Configuration Seven

The seventh configuration consists of the control module and six expansion modules. Options include:

- Up to 12 additional LTO or SDLT drives (for a total of 84 drives) (LTO and SDLT can be mixed)
- Redundant power supplies
- Up to six additional I/E stations
- Additional storage (up to 456 LTO or 380 SDLT cartridges)

The seventh configuration is shown in [figure 21](#) on page 50. Physical specifications are listed in [table 15](#) on page 50.

Figure 21 Configuration Seven
Diagram

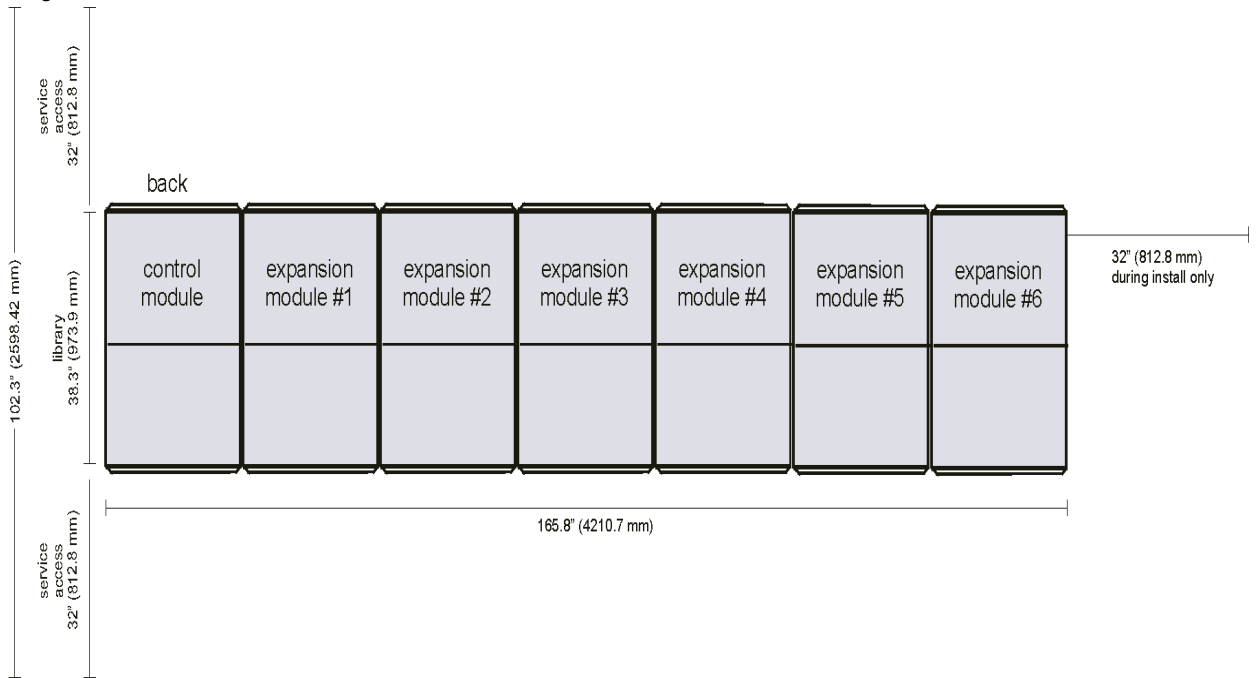


Table 15 Configuration Seven
Specifications

Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	165.8 in. 4210.7 mm	38.3 in. 973.9 mm	5885 lb 2675 kg	123.7 lb/ft ² 605.4 kg/m ²	63.8 lb/in ² 4.5 kg/cm ²

a. In this example, the weight includes a library that has the first four modules fully loaded with drives, populated I/O management units, redundant power, and full media. In this example, the last module will be loaded only with full media.

Configuration Eight

The eighth configuration consists of the control module and seven expansion modules. The options available are:

- Up to 12 additional LTO or SDLT drives (for a total of 96 drives) (LTO and SDLT can be mixed)
- Redundant power supplies
- Up to seven additional I/E stations
- Additional storage (up to 456 LTO or 380 SDLT cartridges)

The eighth configuration is shown in [figure 22](#) on page 52. Physical specifications are listed in [table 16](#) on page 52.

Figure 22 Configuration Eight
Diagram

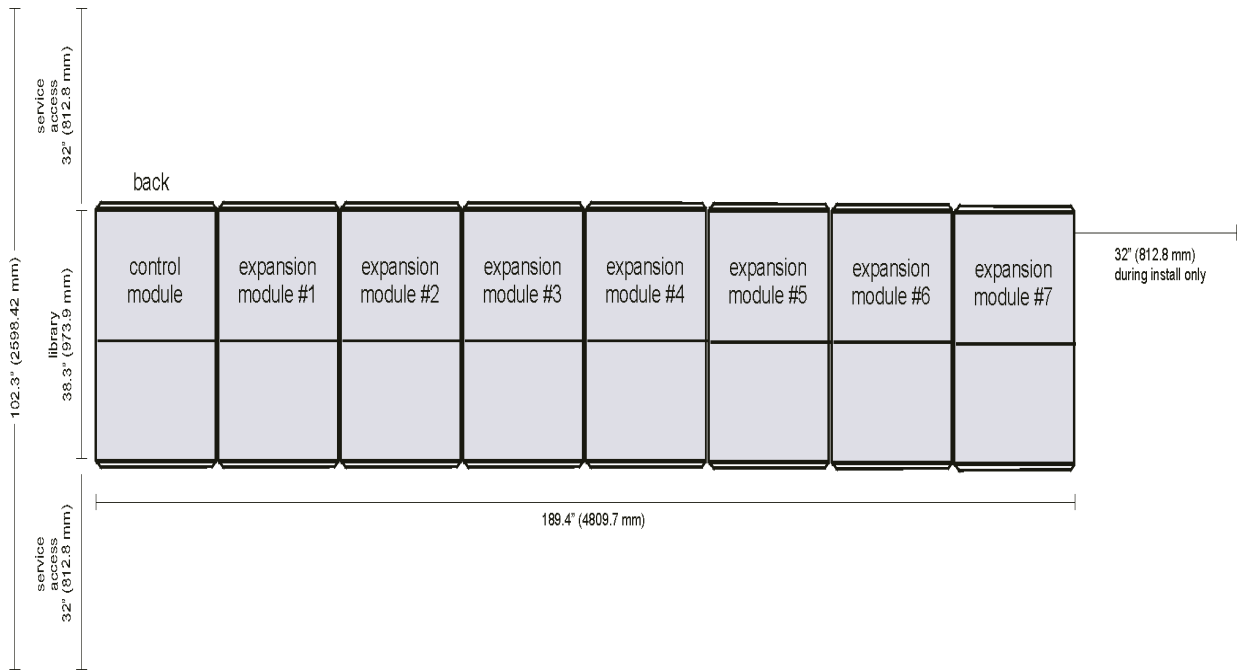


Table 16 Configuration Eight
Specifications

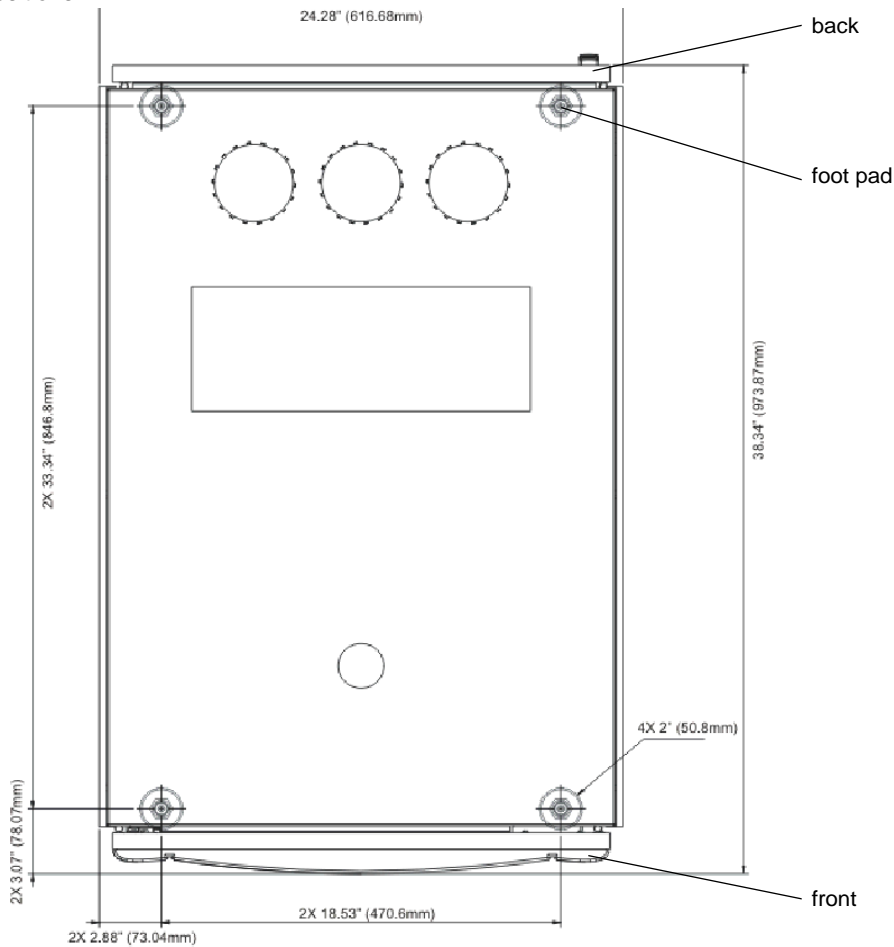
Height	Width	Depth	Maximum Weight ^a	Maximum Distributed Load	Maximum Point Load
77.4 in. 1965.9 mm	189.4 in. 4809.7 mm	38.3 in. 973.9 mm	6662 lb 3028.2 kg	123.7 lb/ft ² 605.4 kg/m ²	63.8 lb/in ² 4.5 kg/cm ²

a. In this example, the weight includes a library that has the first four modules fully loaded with drives, populated I/O management units, redundant power, and full media. In this example, the last module will be loaded only with full media.

Module Foot Pad Positions

The library foot pad positions looking down from the top are shown in [figure 23](#) on page 53. The foot pad positions are the same for the control module and expansion modules.

Figure 23 Library Module Foot Pad Positions



Module Floor Cutout

The foot pad positions are shown from underneath the library in [figure 24](#) on page 54. The module floor cutouts are the same for the control module and expansion modules.

Figure 24 Module Floor Cutout
(Bottom View)

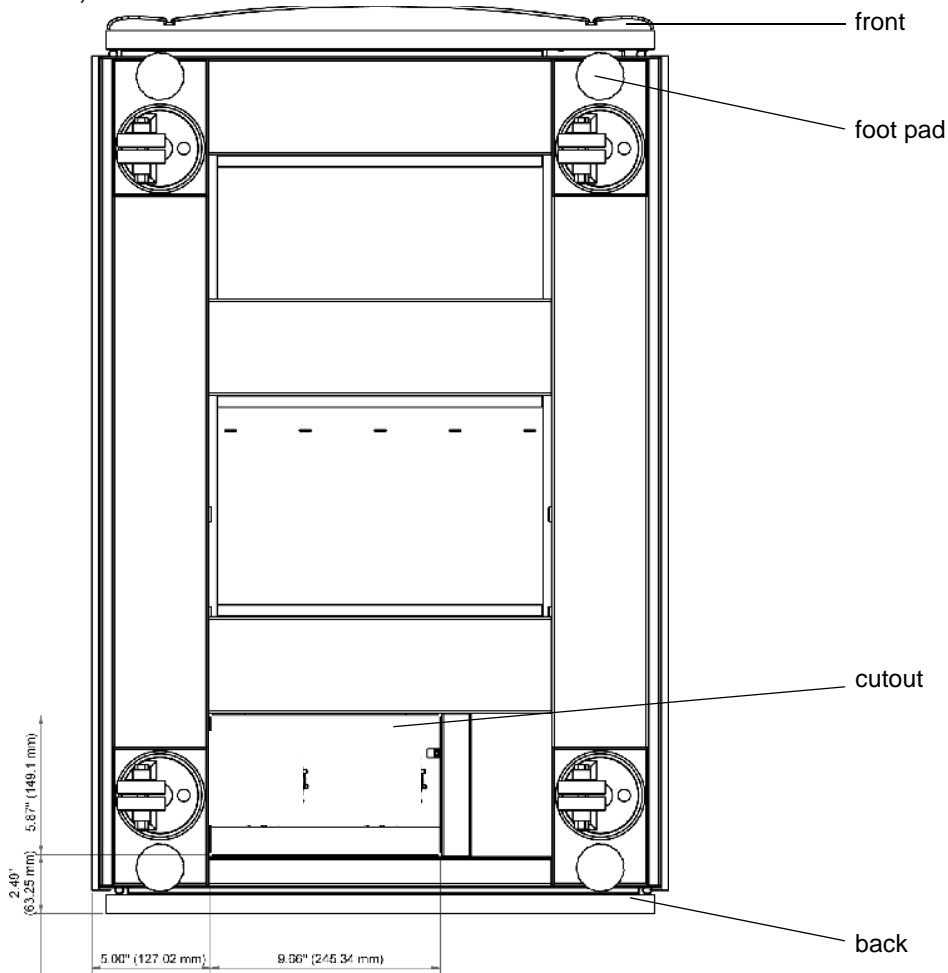
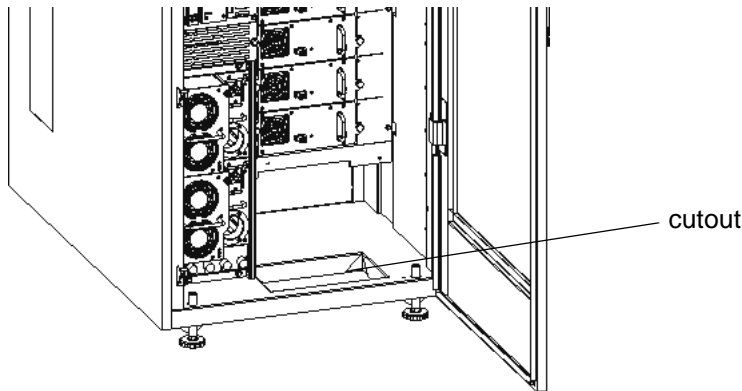


Figure 25 Module Floor Cutout
(Front View)



Drive Requirements and Compatibility

The library supports both FC and SCSI drives. Mixed media configurations are supported. The control module and first three expansion modules can each contain up to 12 full-height FC linear tape-open format (LTO-1, LTO-2, LTO-3, and LTO-4), SDLT-600 tape drives, or SDLT-320 SCSI drives.

LTO Drives

Although all four generations of LTO drives are supported in the library, the drives are not fully compatible (both read/write) as shown in [table 17](#) on page 56.

Table 17 LTO Drive and Cartridge Compatibility

	LTO-1 Cartridges	LTO-2 Cartridges	LTO-3 Cartridges	LTO-3 WORM	LTO-4 Cartridges	LTO-4 WORM
LTO-1 Drives	Reads/ Writes	Not compatible	Not compatible	Not compatible	Not compatible	Not compatible
LTO-2 Drives	Reads/ Writes ^a	Reads/ Writes	Not compatible	Not compatible	Not compatible	Not compatible
LTO-3 Drives	Reads ^b	Reads/ Writes ^c	Reads/ Writes	Write Once, Read Many ^d	Not compatible	Not compatible
LTO-4 Drives	Not compatible	Reads	Reads/ Writes	Write Once, Read Many	Reads/ Writes	Write Once, Read Many ^e

a.LTO-2 drives do not reformat LTO-1 cartridges. The drives will write to the cartridges in the LTO-1 format (100 GB capacity).

b.LTO-3 drives only read LTO-1, they do not write to the LTO-1.

c.LTO-3 drives do not reformat LTO-2 cartridges to contain the same density as the LTO-3 cartridges (400 GB). The LTO-3 drives will write to the LTO-2 cartridges in the LTO-2 format (200 GB capacity).

d.LTO-3 WORM requires the installation of library firmware and WORM-supported LTO-3 tape drive code

e. LTO-4 WORM requires the installation of the library firmware and WORM-supported LTO-4 tape drive code.

All LTO cartridges are the same size, which means they use the same magazines in the library. LTO drives can be directly attached to hosts, attached to the storage area network (SAN), or connected to FC I/O blades in the I/O management unit. SCSI drives must be directly attached to hosts or the SAN.

SDLT and DLT-S Drives

Four generations of SDLT and DLT-S cartridges are supported in the library, but the drives are not fully compatible (both read/write) as shown in [table 20](#).

Table 18 SDLT Drive and Cartridge Compatibility

	SDLT-600 Cartridges	SDLT-320 Cartridges	SDLT-220 Cartridges	SDLT-VS 160 Cartridges
SDLT-600 Drives	Reads/Writes	Reads	Reads	Reads
SDLT-320 Drives	Not compatible	Reads/Writes	Reads/Writes	Not compatible
DLT-S4	Read	Read	Read	Not compatible

The SDLT-600 tape drives support reading and writing to SDLT II cartridges. They also have a backward-read compatibility (BRC) mode. When in this mode, the SDLT-600 is capable of reading SDLT-220 and SDLT-320 tape formats in a SDLT I data cartridge, as well as the SDLT-VS160 tape format in the DLTtape VS1 data cartridge. The SDLT-600 tape drive will eject a data cartridge written in DLT formats other than DLT-VS160.

The SDLT-600 backward-read compatibility transfer rates are given in [table 19](#).

Table 19 SDLT and DLT Tape Drive Backward-Read Compatibility Transfer Rates

Format	Data Cartridge type	Capacity	BRC Transfer Rate^a
SDLT-600	SDLT II	300 GB native 600 GB compressed	36 MB/s native 72 MB/s compressed
SDLT-320	SDLT I	160 GB	12.8 MB/s
SDLT-220	SDLT I	110 GB	8.8 MB/s

Table 19 SDLT and DLT Tape
Drive Backward-Read
Compatibility Transfer Rates

Format (Continued)	Data Cartridge type	Capacity	BRC Transfer Rate ^a
DLT-S4	DLTtape S4	800 GB native 1600 GB compressed	60 MB/s native 120 MB/s compressed
SDLT-VS160	DLTtape-VS1	80 GB	6.4 MB/s

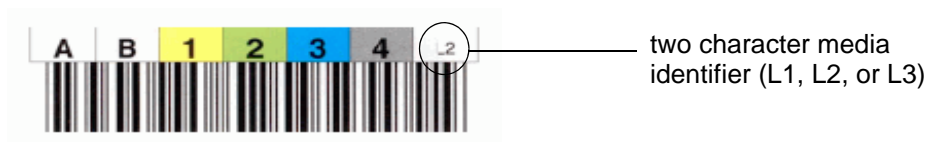
a. The transfer rates shown are nominal based on 80% of actual native read transfer rate of uncompressed data. The DLT-S4 transfer rate shown is 2:1 compression ratio.

All SDLT and DLT cartridges are the same size, which means they will use the same magazines in the library. The SDLT-320 SCSI tape drives are supported in the library, but they must be connected to an FC Host Storage Area Network (SAN) by means of an external Storage Networking Controller (SNC) 5100.

Barcode Requirements

Cartridges must have an external barcode label that is machine-readable to identify the volume serial number. A barcode must use only uppercase letters A to Z and/or numeric values 0 to 9. The library supports Code 39 (3 of 9) type barcode labels.

For LTO media barcodes, the library supports 14 characters for volume serial number plus a two-character media type identifier. For an example of a supported LTO barcode label, refer to the image below.



For SDLT I and SDLT II media barcodes, the library supports 14 characters for volume serial number plus a one-character media type identifier. For specific media type identifiers, see below.

Table 20 SDLT and DLT-S
Barcodes

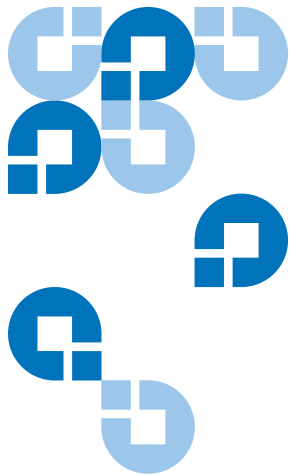
Data Cartridge type	Format	Media Type Identifier
SDLT I	SDLT-220	S1
SDLT I	SDLT-320	S2
SDLT II	SDLT-600	S3
DLT-S4	DLT-S4	S4

The barcode labels will provide the best results. Barcode labels from other sources can be used, but they must meet the following requirements:

- ANSI MH10.8M-1983 Standard
- Number of digits: 6+1 (SDLT) or 6+2 (LTO)
- Background reflection: greater than 25 percent
- Print contrast: greater than 75 percent
- Ratio: greater than 2.2
- Module: 250 mm
- Print tolerance: ± 57 mm

Additional Requirements:

- Height of the visible portion of the barcode: 10 mm ± 2 mm
- Length of the rest zones: 5.25 mm ± 0.25 mm
- No black marks should be present in the intermediate spaces or rest zones
- No white areas should be present on the bars



Chapter 4

Site Preparations

This chapter provides a structure for the collection of all necessary information concerning the delivery site. Record all requested information in the forms provided or create additional sheets as needed. This chapter provides the following information:

- [General Information](#) on page 61
- [Physical Environment](#) on page 63
- [Access Conditions](#) on page 64
- [Required Configuration Information](#) on page 69
- [SAN Readiness](#) on page 71
- [Additional Comments](#) on page 71

General Information

Place any additional information in [Additional Comments](#) on page 71.

Customer name

Mailing address

Shipping address

Sales contact

Telephone

Quantum sales rep.

Quantum account
manager

Installation contact

Telephone

Target installation date

Target operational date

Physical Environment

Place any additional information in [Additional Comments](#) on page 71.

Room dimension

Ceiling projection

Floor type

Floor load capacity

Fire protection

Seismic bracing - If seismic bracing is being used, the pads must be on-site prior to installation.

Type of power connector required

Access Conditions

Access to the library room (elevator, stairs, door widths, etc.)

Dimensions and location of the smallest door or opening

Loading dock specifications (dock height, type of ramps, weather protection, etc.)

Semitrailer accessibility (Y or N)

Preferred/required local carrier company

Where is the trailer location for staging?

Availability of material handling equipment

Location for uncrating

Preferred time of day for unloading and moving materials

Off hours/weekends accessibility for installation team

Procedure for obtaining building passes

Procedure for scheduling the elevator, loading dock

Waste disposal considerations

Bargaining unit considerations

Other considerations

Required Configuration Information

The following is some of the information that will be needed during installation of the library. Place any additional information in [Additional Comments](#) on page 71.

Library name:

License string:

IP address (internal)

IP addresses of the two
network time protocol (NTP)
servers:

1.

2.

SNMP server:

SNMP account:

SNMP sender address

Subnet mask:

Default gateway:

SMTP server IP address:



Note

If your mail server requires a user name and password you can enable this on the library and enter these for e-mail authentication.

E-mail addresses of local administrators to be notified if issues arise with the library:

Operating system and version running off the remote servers that will connect to the library:

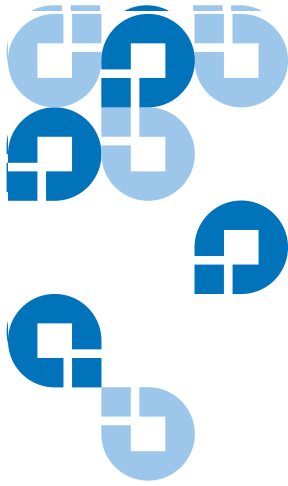
SAN Readiness

All servers or appliances intended to communicate with the Scalar i2000 robotic controller or tape drives must be already installed on the SAN before configuring the library for fiber channel SAN connectivity. Additionally, the World Wide Names (WWNs) of the associated fiber channel HBAs should be visible on the SAN. This is necessary because the Scalar i2000 “Extended Virtual Private SAN” (eVPS) feature can only grant LUN access to WWNs it discovers on the SAN at the time of configuration.

Are all necessary servers or appliances visible on the SAN? (Y or N):

Additional Comments

Record any additional information from other pages. For reference purposes, note the page number with the information. Add and number additional sheets as necessary.



Index

A

audience
intended 1

C

component module
 Import/Export station 10
Contact 2
contacting
 Quantum 4
customer service center
 website 4

D

description
 functional 5
documents
 additional 3
 latest versions 3

release notes 3

E

electrical specifications 31
encryption 28
environmental specifications 31

H

help
 customer service center 4
 service requests 4
host attachment
 SCSI channel attachment 23

I

I/E capacity 10
I/O management unit
 library interface 23
Import/Export Station 10

indicators 17
installation
 drives and blades 55
intended use
 statement 1

L

library interface 23

O

operator panel
 indicators 17

P

physical specifications 35
power
 AC power cord 19
 power distribution unit 19
 power supply 19

Q

Quantum 28
 contacting 4

R

release notes
 location 3
remote management
 library management console 23

S

safety
 intended use 1
 statements 1
 symbols and notes 2
 *System, Safety, and Regulatory
 Information Guide* 1
SAN readiness 71
SCSI channel
 attaching 23
SDLT-320 drives
 attaching through an SNC 23
service requests
 opening 4
shipping pallet specifications 36
site preparation
 building passes 67
 door dimensions 64
 loading dock 65
 other considerations 68
 uncrate 66
specifications
 electrical 31

environmental 31
physical 35
symbols and notes
 explained 2

W

website
 customer service center 4