



XLS-832700 and XLS-8161100

Tape Libraries

Product Specification

501600 Rev 07-01-19

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1.1 Scope

This product specification describes the Qualstar XLS Series of intelligent tape libraries. It provides detailed specifications, configuration options, and installation requirements. This document is intended for use by individuals evaluating, purchasing, or integrating the XLS library.

1.2 Related Documentation

For additional information about the XLS, refer to the documents listed in Table 1-1.

Subject	Document	Qualstar Document
Installation	XLS Installation Manual	501601
Operation and Administration	XLS User Guide	501603
Service	XLS Technical Service Manual	501610
Medium Changer Interface	XLS Interface Manual	501611
Approved Data Cartridges	Approved Data Cartridges	PIN-038
Barcode Label Specification	Barcode Label Information and Specifications	PIN-040
SCSI-3 Primary Command Set	ANSI INCITS 301:1997, SCSI-3 Primary Commands (SPC)	
SCSI-3 Medium Changer Command Set	NCITS 314:1998, SCSI-3 Medium Changer Commands (SMC)	
Fibre Channel Standard	ANSI X3.269:1996 Fibre Channel Protocol (FCP)	

Table 1-1 Related Documents

This chapter provides an introduction to the Qualstar XLS family of tape libraries and describes the major features and components.

2.1 General Description

The Qualstar XLS family of enterprise-class tape libraries combines an efficient design with an intelligent system architecture. XLS libraries are designed to accommodate customer storage needs now and in the future.

Shown in Figure 2-1, the XLS uses two building blocks: the Library Resource Module (LRM) and the Media Expansion Module (MEM). The LRM is a fully featured unit that contains the control electronics, the power system, the robotic handler, the tape drives, the I/O ports, and a variable number of cartridge slots. The optional MEM is a rotary tape carousel that derives its power, control, and cartridge handling from an attached LRM.

The XLS-832700 holds up to 32 tape drives, up to 655 cartridges, and up to four, 10-slot I/O ports. The XLS-8161100 houses up to 16 tape drives, up to 1,066 cartridges, and up to four I/O ports. Because tape drive and cartridge storage areas within the LRM are interchangeable, all models offer a wide range of cartridge-to-drive ratios.

All models can be expanded by adding one or two MEMs. The XLS-89000 (also referred to as a MEM) holds an additional 1,075 cartridges. A single MEM can also be shared between two LRMs, and groups of LRMs and MEMs can be linked together to form even larger systems. The high-density design can provide over 113 tapes per square foot of floor space.

A system controller within the LRM oversees the operation of the robotics, tape drives, and power supplies of all interconnected units. It also hosts the X-Link™ library management interface, which can be accessed locally using the touch screen or remotely across a LAN or the Internet. Remote management is also supported over Ethernet using SNMP.

Resources in the XLS can be subdivided into as many as eight independent logical library partitions, with each partition controlled across its own Fibre Channel host connection.

Access to the control functions of the XLS is protected by user names and passwords.

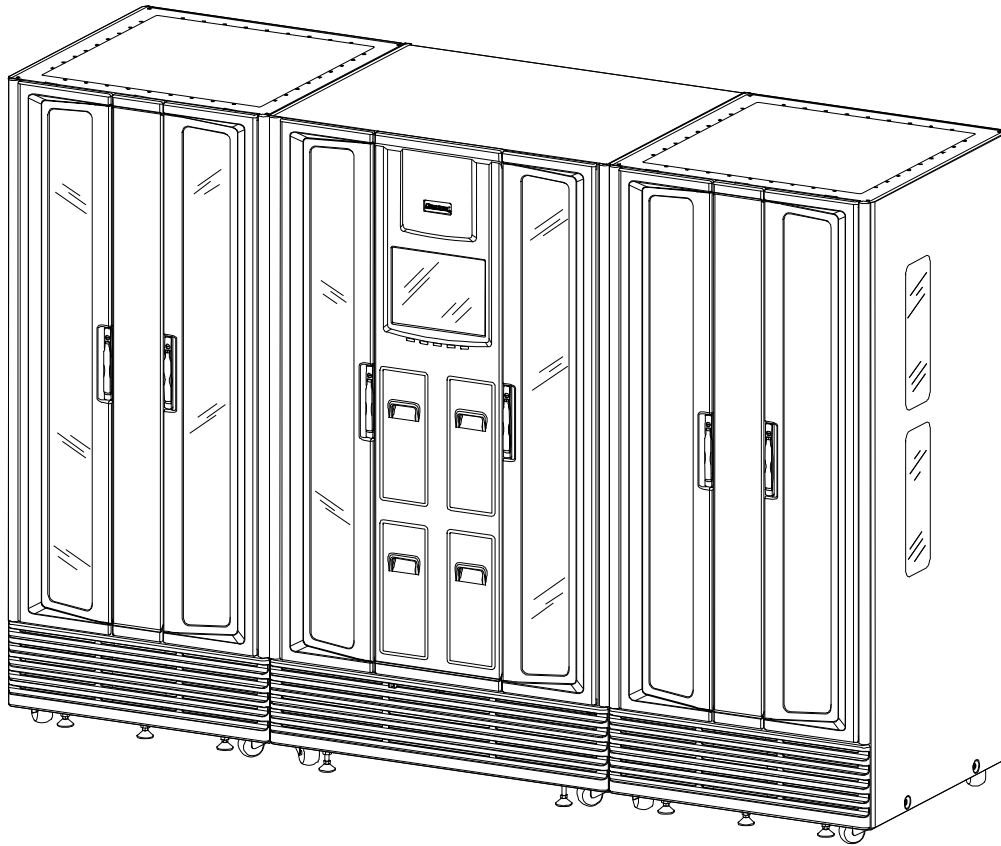


Figure 2-1 XLS-832700 or XLS-8161100 LRM with two XLS-89000 MEMs

2.2 XLS Standard Features

The following features are standard for all models:

- Interchangeable tape drive and cartridge storage areas within the Library Resource Module (LRM) to provide customizable performance-to-capacity ratios.
- Ability to attach one or two Media Expansion Modules (MEMs) for additional capacity. The XLS-89000 MEM can store up to 1,075 cartridges.
- Linux-based system controller to oversee the operation of the robotics, sensors, and power supplies and to provide the library's management and control interfaces.
- Internal CAN protocol for highly reliable inter-processor communications.
- Integrated support for Fibre Channel library interface adapter cards (LIAs). Up to four dual-ported LIAs enable host software to control the library's medium-changer interface using the standard SCSI-3 command set.
- Support for up to eight independent, user-configurable library partitions. Each partition (referred to as a *logical library*) is a subset of the available tape drives, cartridge slots, and I/O ports.
- Supports Fibre Channel LTO tape drives; future support for other half-inch tape formats and drives.
- Supports Internet Protocol Version 6 (IPv6).
- Robotic handler with integrated barcode reader to provide automated inventory tracking and optical calibration of storage and tape drive positions.
- Up to four I/O ports to facilitate the import and export of cartridges. Each I/O port includes a removable 10-cartridge magazine.
- Fifteen-inch color touch screen for local configuration, monitoring, and control using X-Link.
- Ethernet port for access to X-Link using standard Internet browsers.
- Highly visible colored LEDs to provide instantaneous status of the library, power supplies, and tape drives from a distance.
- Comprehensive security system to protect the library from unauthorized access. Key locks and electronic locks secure the doors. The Inventory Sentry monitors intrusions into the storage areas and minimizes off-line time.
- Encryption Key Management enables use of the powerful data encryption capability built into every LTO tape drive. Simple, easy-to-use, library-based key management allows Administrators to assign a separate key to each partition. The data on all tapes within a partition are encrypted and decrypted with a single key.

2.3 X-Link Features

With a web-based design that supports standard Internet browsers, the X-Link library management interface can be accessed locally using the color touch screen or remotely over a LAN or the Internet. The local and remote functions are identical, and multiple simultaneous connections are supported.

Features of X-Link include the following:

- Menu-based organization that includes customizable content, intuitive controls, and comprehensive, context-sensitive help.
- Installation and configuration wizards to streamline the installation process.
- Configurable access to various library functions. Using the familiar user group paradigm, a library administrator can control what tasks each user can perform. All X-Link users must have valid user IDs and passwords.
- A View Hardware capability that allows library operators to obtain status information about the tape drives and other hardware components.
- Comprehensive event manager to track and log recent library events. The library can be configured to send email and pager alerts to specified users when an event occurs.
- Support for the SNIA Storage Media Library (SML) SNMP MIB, using messages. The MIB can be downloaded at www.qualstar.com/sniamib
- Exportable reports and tables. Inventory reports, event logs, and other tables can be exported to Microsoft Excel, XML, or comma-separated value (CSV) files.
- “Never lost” manuals. The XLS ships with paper manuals, but electronic versions are always available in Adobe Acrobat PDF format from X-Link or from Qualstar’s web site.

2.4 XLS High Availability Features

The XLS is designed for 24/7/365 operation and includes the following features for high availability and “online” serviceability:

- N+1 redundant power system.
- Redundant AC input power option.
- Dual controller disk raid option.
- System health monitor and restart manager.
- Automated event reporting via email and pager alerts.
- Remote configuration and management.

- Journaling file system on the system controller for faster recovery from power losses and system resets.
- Hot-swappable tape drives and controller fans. These components can be replaced while the library and all other tape drives remain up and running. For safety reasons, the robot will not move while a drive slot is unoccupied. Safety covers must be inserted in place of unused tape drives.
- Ability to send email and pager alerts to designated users when an XLS module or field replaceable unit (FRU) fails.

2.5 Features

Table 2-1 lists the options available for each XLS model:

Feature	XLS-832700		XLS-8161100		Notes
	Standard	Optional	Standard	Optional	
Fibre Channel LIAs		1 to 3	1	1 to 3*	Each LIA includes two ports, providing up to 8* independent connections.
I/O ports	2	Add 2 more	1	Add 1 or 3 more	Each port holds 10 cartridges.
Drive bays	2	6 more	1	3 more	Each drive bay holds 4 tape drives.
Door slots		110 or 220		110 or 220	Will obscure the front windows.
N+1 Redundant AC/DC Power Supplies	Standard		Standard		User may add optional power supplies
Redundant AC Power Input		Optional		Optional	Automatic failover if primary source is lost.
Electronic door locks	Standard		Standard		Allow entry to the library to be controlled from X-Link.
Mirrored disk drive		Optional		Optional	Mirrors XLS system configuration

* Up to three LIAs if dual controller disk option is installed.

Table 2-1 Options for the XLS-832700 and XLS-8161100

2.6 Library Resource Module (LRM)

The LRM, shown in Figures 2-2 and 2-3, contains the following components:

- Controller/power bay including the system controller and power supplies
- Dual-port Fibre Channel LIAs
- X-Link interface with touch screen
- Robotic handler and barcode reader
- Tape drives
- I/O ports
- Cartridge slots
- Two motor driven carousels containing cartridge slots in the XLS-8161100
- Doors, windows, and security features

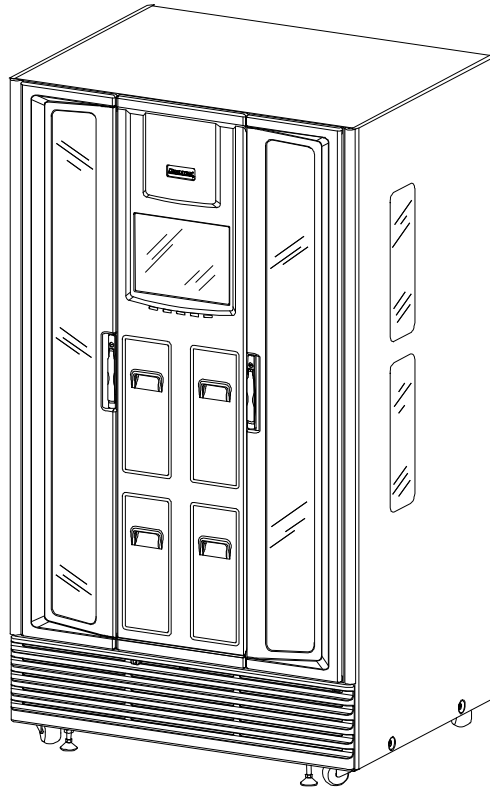


Figure 2-2 XLS-832700 or XLS-8161100 Library Resource Module (LRM)

2.6.1 Controller/Power Bay

The controller/power bay at the rear of the LRM houses the following components:

- **System controller.** The system controller consists of a Linux-based computer. It includes two hot-swappable cooling fans.
- **Main power disconnect switch.** The single disconnect switch for the library is a 20-amp circuit breaker. When this switch is shut off, all XLS functions are immediately powered down.
- **AC power connector.** The power connector is a single-phase, 100 to 240 volt service connection. A single North American or international power cord is provided to power both the LRM and any attached MEMs unless the optional redundant power input module is purchased. Refer to Table 4-3 for more information.
- **Power supplies.** One to seven removable power supply modules provide power to all components within the LRM, the tape drives, and any attached MEMs. N+1 power redundancy is standard on the XLS-832700 and XLS-816100. N + 2 power redundancy is optional on all models. Power module status is monitored by X-Link and alerts are issued if necessary.

The controller/power bay and individual power supplies slide in and out of the back of the LRM for servicing.

2.6.2 System Controller

The system controller is a Linux-based computer. The system controller:

- Controls the operation of the robotics, sensors, power supplies, and any attached MEMs
- Communicates with each tape drive to monitor tape drive status, receive tape drive alerts, and so on.
- Manages all communications between the medium changer and the host applications
- Maintains an up-to-date cartridge inventory
- Hosts X-Link
- Communicates with other system controllers in attached LRMs

2.6.2.1 Ethernet Connectors

On all XLS models the system controller includes Ethernet connectors on the rear panel. The Ethernet connectors allow the library to be connected to a network for remote X-Link management or directly to a laptop or other standalone computer to facilitate local configuration and service operations.

The XLS also supports remote management over a LAN or the Internet using the standard SNIA Storage Media Library SNMP MIB protocol. The MIB can be downloaded at www.qualstar.com/snua-mib.

2.6.2.2 Library Interface Adapter Cards

The system controller includes expansion slots for up to four Fibre Channel library interface adapter cards (LIAs). Each LIA has two ports, allowing the medium changer interface in the XLS to be concurrently connected to up to eight independent computers.

2.6.2.3 Cooling Fans and Air Filter

Two cooling fans in the system controller draw air in through the grille and air filter on the front of the LRM and exhaust it out the back. (Individual fans are also included in each tape drive assembly and power supply module.) Sensors can detect a failed fan, causing email or pager alerts to be issued to specified users. A calendar-based reminder can be emailed to designed maintenance personnel when air filter replacement is due.

Both the system controller fans and the air filters may be changed without interrupting XLS operations.

2.6.3 Power Supplies

The LRM uses distributed power regulation where all operational voltages are developed locally from a common 24-volt DC power bus. This includes everything in the LRM and any attached MEMs. Active over-current protection on all 24-volt feeder busses protects the system from high-current faults. The controller/power bay includes slots for up to seven 24-volt DC power supplies.

The number of power supplies required varies with the number of installed drive bays and attached MEMs (see Section 4.1 for details). Multiple power supplies share the total load equally, thus reducing the stress on each power supply and greatly extending their service life. Each supply has two cooling fans.

A redundant power supply is standard on the XLS-832700 and XLS-8161100 and it provides true N+1 redundancy. The individual power supplies slide in and out of the back of the LRM and are secured with captive screws.

A redundant AC power input module is available and allows the XLS Library to be connected to two independent power sources, providing a redundant power source in the event one of the power sources should fail. The unit powers the load from the first power input normally. The unit switches to the second power input if the first has failed. The unit will switch back to the first input when it has functioned properly for a period of time.

Features of the redundant power input module include the following:

- An input voltage range of 90-264 VAC with 20 amps maximum current.
- A transfer time between 4-13 milliseconds providing for uninterruptible service.

- Over current protection provided by 20 amp circuit breakers on both sides of each line.
- No requirement for line frequencies or line voltages to match.
- No requirement for power sources to be in-phase.
- Soft startup (starts up at zero crossings).
- Voltage, Frequency and Power reporting over CAN interface.
- LED status indicators.
- Redundant internal cooling fans with faults monitored by the library.

An Uninterruptible Power Source (UPS) with a rechargeable battery is integrated into the controller/power bay. If primary power fails, this module provides sufficient 24-volt DC bus power to properly terminate all control processes before shutting down the XLS. Due to their high power requirements, tape drives are powered down immediately upon a primary power failure unless an external UPS is provided.

The internal UPS module is user replaceable with an expected operational life of approximately five years. UPS protection is typically restored in approximately 10 minutes following the restoration of power. Status LEDs on the UPS module include Primary Power, Charging, Discharging, and Fault. The internal UPS may be changed without interrupting the library operations.

2.6.4 Touch Screen and X-Link Interface

Each LRM includes a 15-inch, color touch screen. The X-Link interface can be accessed locally from the touch screen or remotely by using one of the Ethernet connectors to attach the XLS to a LAN or the Internet. The interface and available functions are the same regardless of how they are accessed.

Permission to access X-Link is maintained and configured by an administrator. Access is password protected.

2.6.4.1 Configuration Wizards

X-Link includes a installation and configuration wizard:

- The Create Logical Library wizard assists while creating one or more logical libraries (partitions of the XLS physical system), providing a convenient way for installers to specify and assign information about fibre channel port ID's, tape drives, cartridge slots, and I/O ports.

2.6.4.2 X-Link Home Page

The X-Link home page provides information for about status, events, contacts, and a configuration summary. In addition, the home page provides an access point to the following library management tasks:

- **Logical library tasks**, including modifying the resources assigned to each logical library partition, editing administrator information, monitoring events, and opening the I/O ports.
- **Event tasks**, including viewing, sorting, and exporting the library's event log.
- **User and user group tasks**, including adding and modifying information about library users and setting up permissions for different user groups.
- **Physical library tasks**, including viewing hardware status, moving cartridges, locking and unlocking doors, managing tape drives, and shutting down the library.
- **Settings and policies tasks**, including managing e-mail, SNMP, and event log settings.
- **Configuration tasks**, including managing administrator and network connection information.
- **Service tasks**, including running diagnostic routines.

A context-sensitive, searchable help system is available from every screen and provides detailed information about each option.

2.6.4.3 LEDs

Located directly below the touch screen, the five status LEDs indicate the library's operational status at a glance, as shown in Table 2-2.

LED	State	Indicates
Attention	Flashing yellow - slow	Operator intervention is required; for example, a door is unlocked or opened.
Attention	Flashing yellow - fast	Operator intervention is required; for example, a light curtain is blocked.
Attention	Solid yellow	An I/O port is open.
Robot Activity	Flashing green	The handler or the carousel is moving.
Fault	Flashing red	The XLS has experienced an unrecoverable error or it is has been shut down from the X-Link interface.

Table 2-2 LED states

In addition to the front panel LEDs, status LEDs are included on the back of each tape drive assembly and each power supply as well as the redundant power input module.

2.6.5 Robotic Handler and Barcode Reader

A robotic tape handler within each LRM moves on four axes to access cartridges anywhere in the LRM or within an attached MEM.

The servos are self-calibrating and require no adjustments. All servos are closed loop and digitally controlled with optical position sensors to ensure fast, smooth, trouble-free cartridge handling.

The barcode reader scans barcode labels on all cartridges to establish and maintain an up-to-date cartridge inventory. The system controller stores the cartridge inventory in a database and makes it available to the host applications.

2.6.5.1 Barcode Labels

Barcode labels must conform to the *ANSI/AIM BCI-1995, Uniform Symbol Specification (USS-39)*. Detailed specifications for XLS barcodes and labels can be found in Qualstar Product Information Note 040, "Barcode Label Information and Specifications". To obtain this document, go to www.qualstar.com and click on the Support tab.

Pre-printed barcode labels, which are both human- and machine-readable, are available from multiple sources, including Qualstar.

2.6.6 Tape Drives

The XLS-832700 can accommodate up to thirty-two tape drives, which are installed in two to eight drive bays (4 drives per bay). The XLS-8161100 can accommodate up to 16 tape drives, which are installed in one to four drive bays. The tape drive data paths are independent of the medium changer interface.

2.6.6.1 Drive Bays

Drive bays can be installed at the factory or exchanged with cartridge bays in the field, allowing for customized capacity and performance. Each drive bay holds up to four tape drives and can be swapped with a cartridge bay, which holds 30 cartridges. LRMs are pre-wired to support a full complement of drive bays. Additional power supplies may be required when adding drive bays. Contact Qualstar Technical Support.

2.6.6.2 Tape Drive Assemblies

An XLS tape drive assembly consists of a tape drive enclosed in a drive carrier. The drive carrier provides regulated and switched power to the tape drive and a cooling fan. Fibre Channel tape drive assemblies include a duplex LC multi-mode Fibre Channel receptacle and three LEDs.

Two captive screws secure each tape drive assembly in position. Tape drive models and interface types may be mixed within a drive bay. For safety reasons, any unused slots must be filled with a blank drive cover. (The handler is prevented from moving if any of the tape drive slots are unoccupied.)

The XLS communicates with each tape drive using a serial connection within the drive carrier. The serial connection allows the library to monitor tape drive status, set target IDs, receive tape drive alerts, and so on.

Depending on the capabilities of the application software being used, the Fibre Channel tape drive assemblies can be hot swapped. That is, you can remove and

replace tape drive assemblies without powering down the library. The library automatically detects the presence of a new tape drive.

2.6.7 I/O Ports

I/O ports on the front of the LRM allow cartridges to be imported or exported without opening the doors or interrupting XLS operations. Each I/O port holds 10 cartridges in a removable magazine. The XLS can include one, two, or four I/O ports. For each I/O port that is not installed, the library includes 10 additional cartridge storage slots.

Access to the I/O ports is controlled by the application software and X-Link. Each I/O port uses a removable magazine suitable for long-term storage. Removable dust covers are provided with each I/O port magazine.

2.6.8 Cartridge Slots

The XLS-8161100 can house up to 1,066 storage slots. The XLS-832700 can house up to 655 cartridges. The slot count is reduced by 30 for each drive bay that is added.

2.6.9 Doors, Windows, Locks, and Security Features

2.6.9.1 Doors and Windows

The XLS-832700, XLS-8161100 and XLS-89000 MEM all have two doors. All doors have windows for viewing robot operations; these windows are blocked on the LRM if the optional door slots are installed. There are also smaller viewing windows on the LRM's side panels and on the rear of the XLS-8161100. When an MEM is attached to an LRM, the side panel is moved to the outside of the MEM.

2.6.9.2 Door Locks

All doors include key locks and electronic locks. A user name and password are required to unlock the doors. Pending operations are completed and the handler is parked in a safe location before the doors are unlocked. All robotic motion immediately stops when doors are opened.

2.6.9.3 Inventory Sentry

The Inventory Sentry consists of a highly sensitive "light curtain," which allows the XLS to precisely monitor all areas within the LRM and MEM cabinets, as follows:

- When the doors are closed, the Inventory Sentry can detect if a cartridge is protruding out of a slot. If this is the case, the XLS prevents the handler from moving to avoid damage.
- When the doors are open, the Inventory Sentry can detect when someone reaches into the cabinet, possibly to add or remove a cartridge. If the light curtain is violated, the XLS reestablishes its cartridge inventory as soon as all doors are closed. To speed the time it takes to become ready, the XLS audits only the potentially affected areas of the cabinet, including all slots on the doors.

2.6.9.4 Door-Opened Sensors

Each door includes a door-opened sensor to protect the integrity of the cartridge inventory. The sensor detects if the door was opened while the library power is off, thus reducing the time required to recover from a power-off event.

When the power is reapplied, the XLS checks the state of the door-opened sensors and performs one of the following actions:

- If a sensor indicates that a door was opened while the power was off, the XLS audits all cartridge locations before becoming ready.
- If the sensors indicate that the doors were not opened while the power was off, the XLS bypasses the inventory audit, thus minimizing the time to become ready.

The sensors will function for at least 24 hours after a power outage.

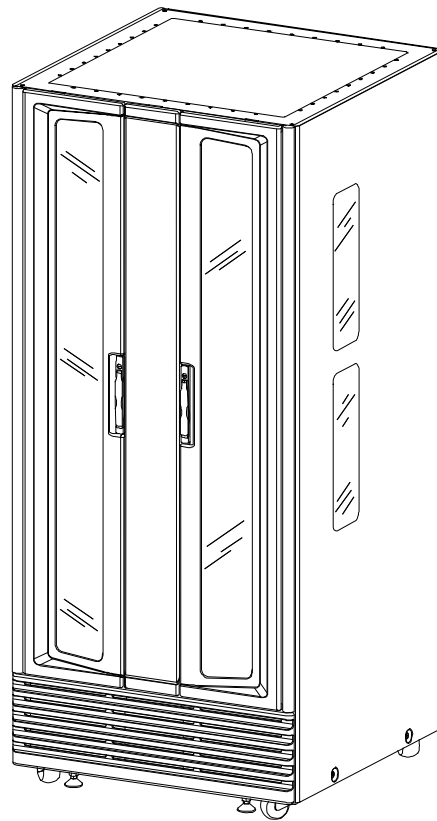
2.7 Media Expansion Modules (MEMs)

Shown in Figure 2-6, the Media Expansion Module (MEM) includes a motor-driven carousel containing cartridge slots. The XLS-89000 can accommodate 1,075 cartridges. One or two MEMs can be attached to a single LRM.

The handler reaches into the MEM to pick, place, and scan the barcode of any cartridge. The carousel rotates in either direction to minimize the cartridge access time.

Like the LRM, the MEM includes the following features:

- Two doors with windows
- Key locks and electronic locks
- Inventory Sentry feature
- Door-opened sensors



XLS-89000
MEM

Figure 2-3 Media Expansion Module (MEM)

2.8 Example: Cartridge Capacities with a Single 832700 LRM

Drive Bays	Cartridge Slots*	Door Slots (optional)	MEMs		Total Cartridge Slots*
			Quantity	XLS-89000	
2	435	220	0		655
4	375	220			595
8	255	220			475
2	435	220	1	1,075	1,730
					1,190
4	375	220		1,075	1,670
					1,130
8	255	220	1,075	1,550	
				1,010	
2	435	220	2	2,150	2,805
					1,725
4	375	220		2,150	2,745
					1,665
8	255	220	2,150	2,625	
				1,545	
2	435	220	2	1,075	2,265
4	375	220		1,075	2,205
8	255	220		1,075	2,085

* Includes two I/O ports. If four I/O ports are installed, subtract 20 slots.

Table 2-3 Example cartridge capacities in XLS systems with a single 832700 LRM

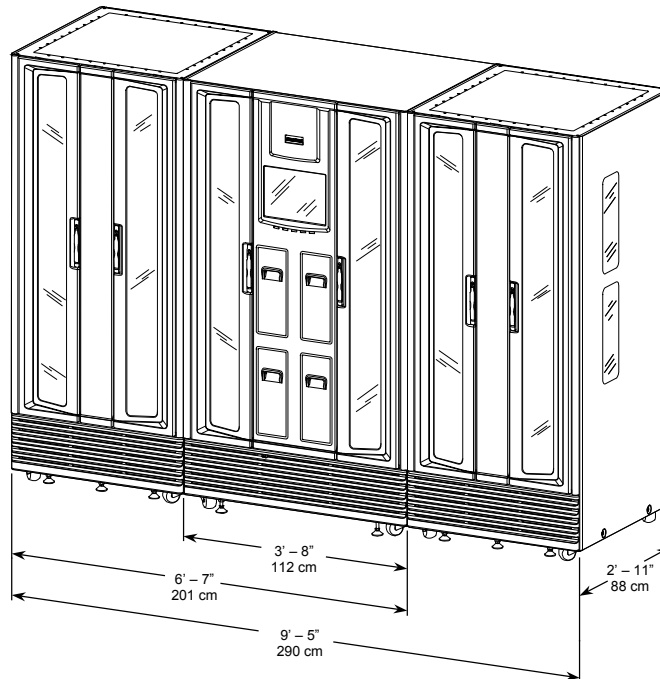


Figure 2-4 XLS system with a 832700 or 8161100 LRM and two 89000 MEMs

2.9 Example: Cartridge Capacities with Two 832700 LRMs

Drive Bays	Cartridge Slots*	Door Slots (optional)	MEMs		Total Cartridge Slots*
			Quantity	XLS-89000	
4	1,945	440	0		2,385
8	1,825	440			2,265
16	1,585	440			2,025
4	1,945	440	1	1,075	3,460
					2,920
8	1,825	440		1,075	3,340
					2,800
16	1,585	440	1,075	3,100	
				2,560	
4	1,945	440	2	2,150	4,535
					3,455
8	1,825	440		2,150	4,415
					3,335
16	1,585	440	2,150	4,175	
				3,095	
4	1,945	440	2	1,075	3,995
8	1,825	440		1,075	3,875
16	1,585	440		1,075	3,635

* Includes four I/O ports total. If eight I/O ports are installed, subtract 40 slots.

Table 2-4 Example cartridge capacities in XLS systems with two 832700 LRMs

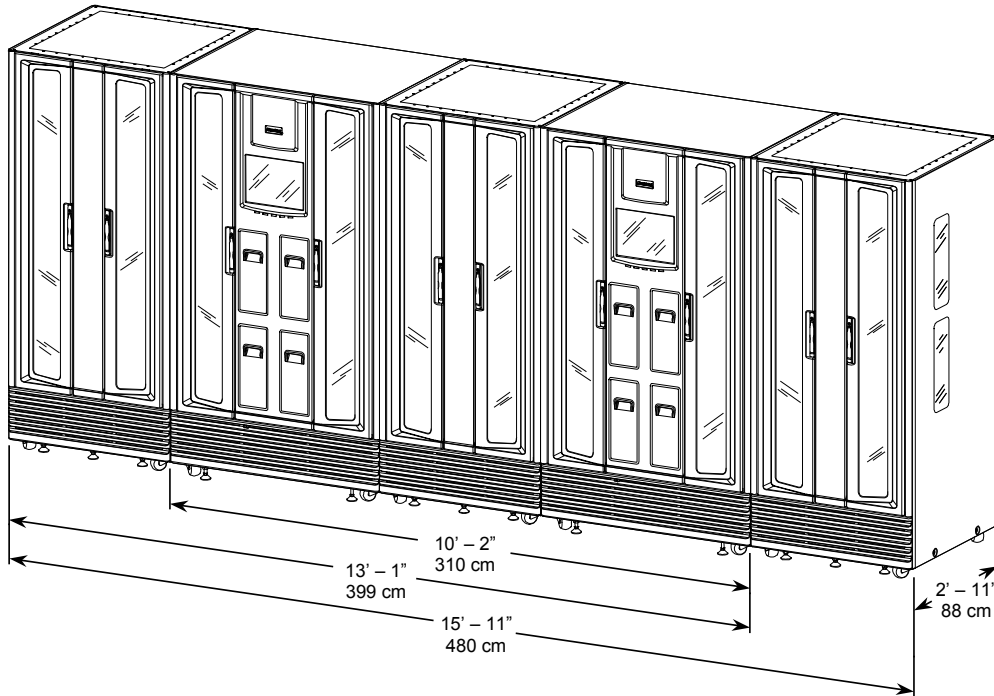


Figure 2-5 Example XLS system with two 832700 or 8161100 LRMs and three 89000 MEMs

2.10 Example: Cartridge Capacities with Three 832700 LRMs

Drive Bays	Cartridge Slots*	Door Slots (optional)	MEMs		Total Cartridge Slots*	
			Quantity	XLS-89000		
6	3,455	660	0		4,115	
12	3,275	660				
24	2,915	660				
6	3,455	660	1	1,075	5,190	
						4,650
12	3,275	660		1,075	5,010	
					4,470	
24	2,915	660	1,075	4,650		
				4,110		
6	3,455	660	2	2,150	6,265	
					5,185	
12	3,275	660		2,150	6,085	
					5,005	
24	2,915	660	2,150	5,725		
				4,645		
6	3,455	660	2	1,075	5,725	
12	3,275	660		1,075	5,545	
24	2,915	660		1,075	5,185	

* Includes six I/O ports total. If twelve I/O ports are installed, subtract 60 slots.

Table 2-5 Example tape cartridge capacities in XLS systems with three 832700 LRMs

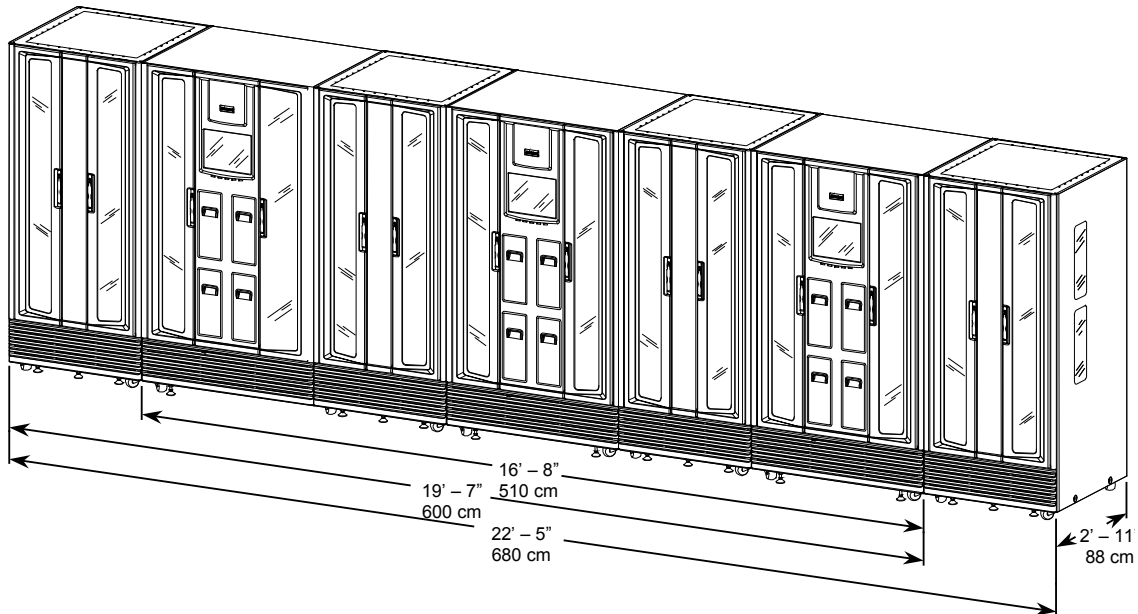


Figure 2-6 Example XLS system with three 832700 or 8161100 LRMs and four 89000 MEMs

2.11 Example: Cartridge Capacities with a Single 8161100 LRM

Drive Bays	Cartridge Slots*	Door Slots (optional)	MEMs		Total Cartridge Slots*
			Quantity	XLS-89000	
1	846	220	0		1,066
2	816	220			1,036
1	846	220	1	1,075	2,141
2	816	220		1,075	2,111
1	846	220	2	2,150	3,216
2	816	220		2,150	3,186

* Includes two I/O ports. If four I/O ports are installed, subtract 20 slots.

Table 2-6 Example cartridge capacities in XLS systems with a single 8161100 LRM

2.12 Example: Cartridge Capacities with Two 8161100 LRMs

Drive Bays	Cartridge Slots*	Door Slots (optional)	MEMs		Total Cartridge Slots*
			Quantity	XLS-89000	
1	1,692	440	1	1,075	3,207
2	1,632	440		1,075	3,147
1	1,692	440	2	2,150	4,282
2	1,632	440		2,150	4,222
1	1,692	440	3	3,225	5,357
2	1,632	440		3,225	5,297

* Includes four I/O ports. If eight I/O ports are installed, subtract 40 slots.

Table 2-7 Example cartridge capacities in XLS systems with two 8161100 LRMs

2.13 Example: Cartridge Capacities with Three 8161100 LRMs

Drive Bays	Cartridge Slots*	Door Slots (optional)	MEMs		Total Cartridge Slots*
			Quantity	XLS-89000	
1	2,538	660	2	2,150	5,348
2	2,448	660		2,150	5,258
1	2,538	660	3	3,225	6,423
2	2,448	660		3,225	6,333
1	2,538	660	4	4,300	7,498
2	2,448	660		4,300	7,408

* Includes six I/O ports. If twelve I/O ports are installed, subtract 60 slots.

Table 2-8 Example cartridge capacities in XLS systems with three 8161100 LRMs

2.14 Example: Cartridge Capacities with Four 8161100 LRMs

Drive Bays	Cartridge Slots*	Door Slots (optional)	MEMs		Total Cartridge Slots*
			Quantity	XLS-89000	
1	3,384	880	3	3,225	7,489
2	3,264	880		3,225	7,369
1	3,384	880	4	4,300	8,564
2	3,264	880		4,300	8,444
1	3,384	880	5	5,375	9,639
2	3,264	880		5,375	9,519

* Includes eight I/O ports. If sixteen I/O ports are installed, subtract 80 slots.

Table 2-9 Example cartridge capacities in XLS systems with four 8161100 LRM

3

Physical Specifications

3.1 Dimensions

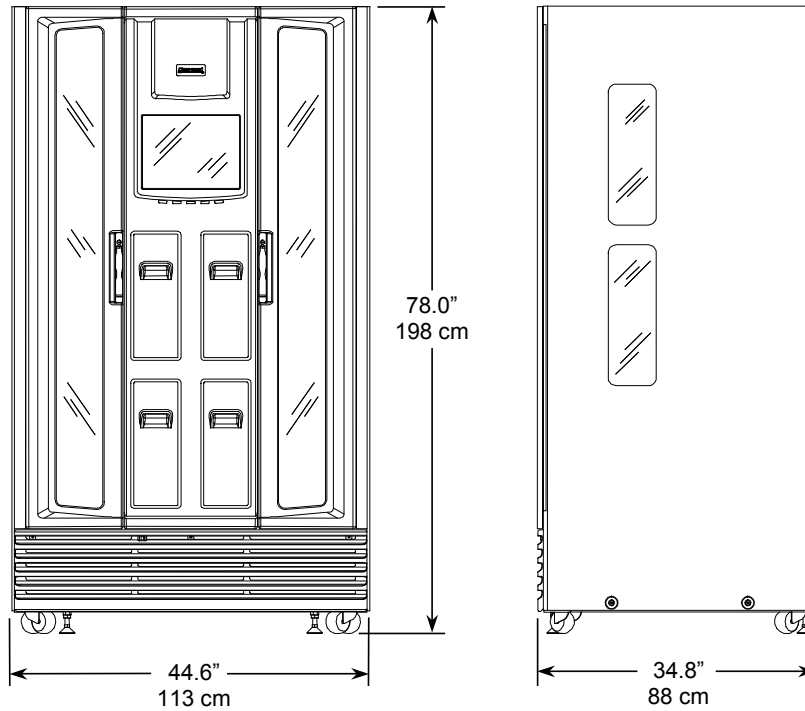


Figure 3-1 832700 LRM external dimensions

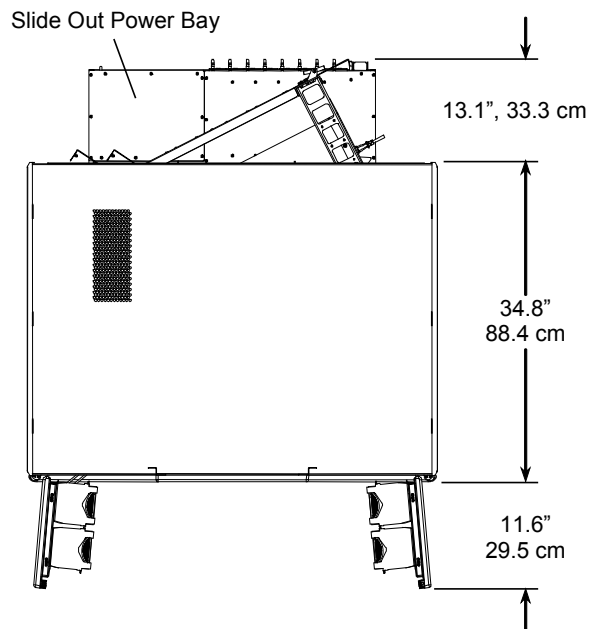


Figure 3-2 832700 LRM plan view showing service access requirements

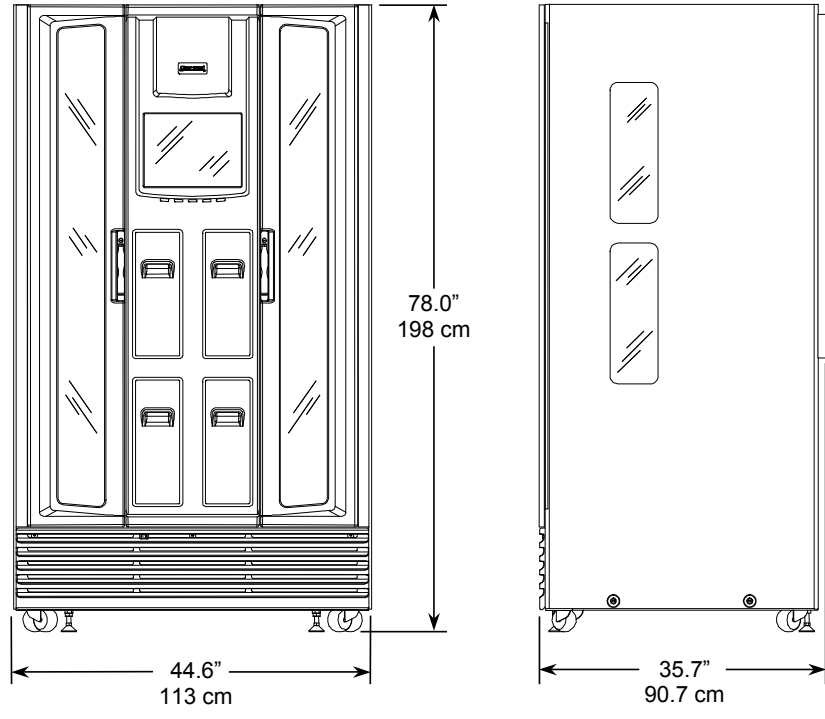


Figure 3-3 8161100 LRM external dimensions

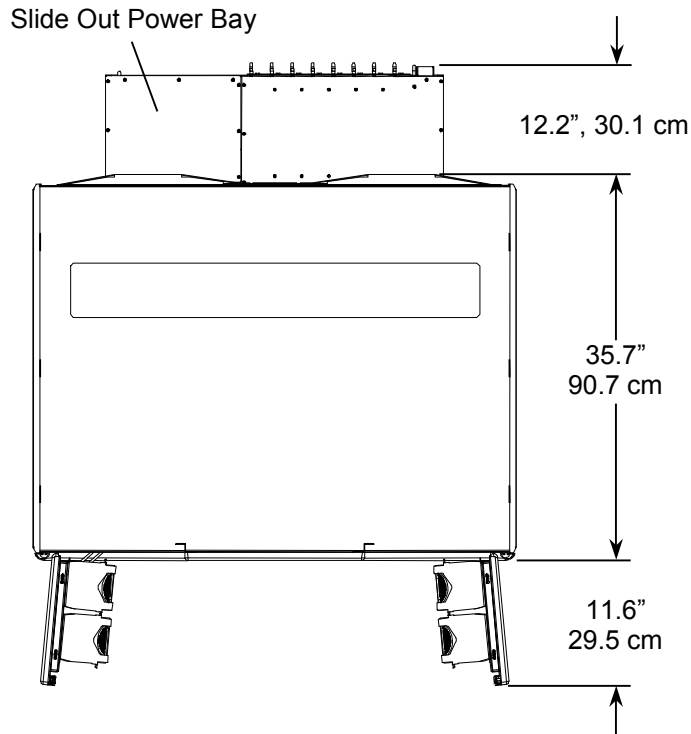


Figure 3-4 8161100 LRM plan view showing service access requirements

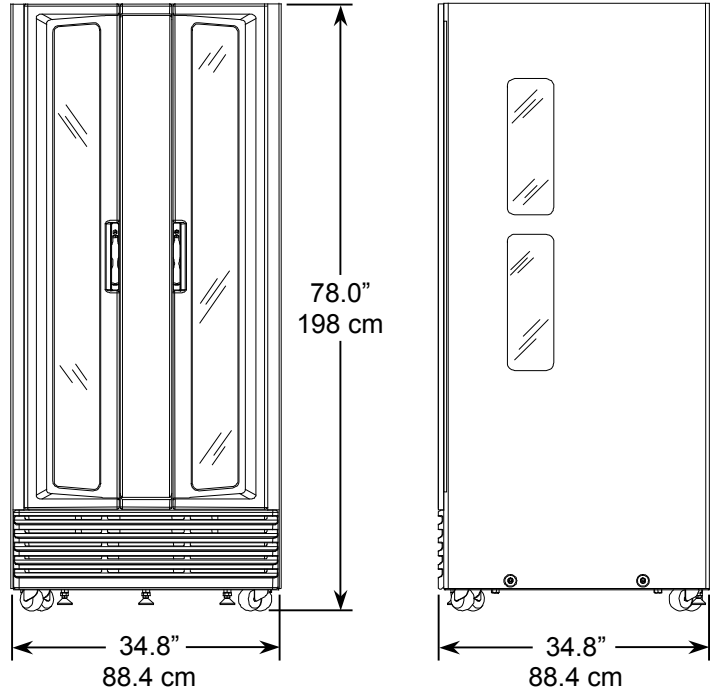


Figure 3-5 89000 MEM external dimensions

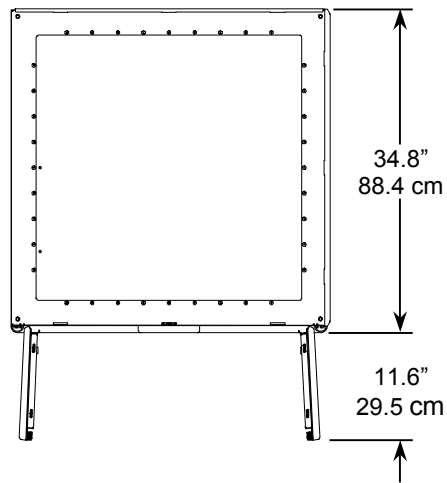


Figure 3-6 89000 MEM plan view with doors opened

3.2 Weights

Unit	Tape Drives Installed	Cartridge Slots Filled	Net Weight Empty (lbs / kg)	Net Weight Loaded (lbs / kg)	Floor Loading (lbs/ft ² / kg/m ²)
LRM 832700	4	655	800 / 363	1,193 / 541	111 / 539
LRM 832700	32	475	800 / 363	1,437 / 652	133 / 650
LRM 8161100	4	1,066	1,011 / 459	1,550 / 703	144 / 701
LRM 8161100	16	976	1,011 / 459	1,634 / 741	151 / 739
MEM 89000	0	1,075	519 / 235	1,057 / 479	125 / 614

Table 3-1 XLS Weights and Floor Loading

3.3 Exterior Color

The exterior color of the LRM and MEM is textured black.

3.4 Logo

A blue and brushed metal Qualstar logo is standard on the LRM. There is no logo on the MEM.

3.5 Physical Installation

Both the LRM and MEM are attached to and shipped on pallets. Removing the equipment from the pallet entails removing the protective cardboard exterior, restraint screws, attaching the supplied ramps to the edge of the pallet, and rolling the equipment off the pallet.

Both the LRM and MEM are fitted with casters and will both roll through a standard 36-inch (0.92-meter) wide doorway. When installed, the cabinets must be leveled with the height-adjustable feet.

Table 3-1 above shows the floor loading presented by the XLS. The installation space requirements for an XLS system are modest. Table 3-3 lists the floor space needed by various XLS-832700 and XLS-8161100 configurations. The addition of 24 inches (0.6 meters) of aisle space on all but one side is recommended. XLS doors require only 12 inches (0.3 meters) of aisle space.

XLS-832700 or XLS-8161100					
LRMs	MEMs		Total Sq. Feet	Total Sq. Meters	
	Quantity	XLS-89000			
1	0		10.8	1.0	
	1	1	19.2	1.8	
				16.2	1.5
	2	2	2	27.6	2.6
				21.6	2.0
		1	1	24.6	2.3
2	1	1	30.0	2.8	
			27.0	2.5	
	2	2	38.4	3.6	
			32.4	3.0	
		1	35.4	3.3	
	3	3	3	46.8	4.3
			37.8	3.5	
4		4	66.0	6.1	
3	2	2	49.2	4.6	
			43.2	4.0	
	3	3	57.6	5.3	
			48.6	4.5	
	4	4	66.0	6.1	
			54.0	5.0	

Table 3-2 Recommended floor space for the XLS-832700 and XLS-8161100

A single 100-240 volt, single-phase, 50/60-Hertz power source is required for the XLS. An Uninterruptible Power Source (UPS) is always recommended for the XLS and the equipment connected to it. See Table 4-2 for UPS requirements. Redundant AC power input is supported via the optional redundant power input module.

4

Power Requirements

4.1 AC Power Requirements and Consumption

The XLS operates from the single-phase alternating current power sources (mains) shown in Table 4-1.

Rated Line Voltage	Maximum Operating Line Voltage	Minimum Operating Line Voltage	Line Frequency Range
115–240 VAC	260 VAC	105 VAC	48–62 Hz

Table 4-1 XLS mains requirements

Other than selecting the appropriate AC power cord for connection to the mains, the XLS requires no changes to operate from any input voltage within the rated line voltage. Power is connected to LRM cabinets only. MEM cabinets get their power from an adjacent LRM.

Power consumption varies with the number of tape drives installed; the number of tape drives operating simultaneously, and the occurrence of robotic motion. The XLS is equipped with one or more Power Factor Corrected (PFC) power supplies. Table 4-2 lists power requirements for a few typical system configurations. From this information, the actual power needs of any system configuration can be determined. Use the peak watts data to calculate the power system requirements and use the average BTUs/Hr to size the cooling system requirements.

In Table 4-2, the peak watts power figures indicate the power consumed when the robotics are accelerating and all of the tape drives are writing. The maximum power levels are not expected to last for more than two seconds at a time.

Systems with a large number of tape drives should only be connected to a 208- to 240-volt source to reduce the peak AC input current as the integral circuit breaker will trip at 20-amps. The input power to the LRM is nearly constant over changes in incoming line voltage. Low line voltages proportionally increase the incoming AC current and may cause the LRM or external circuit breaker to trip prematurely.

4.1.1 Power Source Disturbances

The XLS includes a small 24VDC module with battery backup to allow the library to shut down properly in case of power source disturbances. If the primary power drops below 90 VAC for more than 20 milliseconds, the XLS commences the following routine:

1. Immediately powers down the tape drives
2. If a cartridge is already in the handler, it is returned to its last origin or held in a safe manner
3. The robotic handler is parked at the bottom of its travel
4. All XLS system files are closed and all control processes are shut down
5. The system controller is shut down

4.1.2 Power Entry

Power is normally connected to the LRM cabinet through a 20-amp, 3-pin connector. An internal AC line filter reduces EMI conducted emissions and protects the XLS from noise on the power lines. A built-in 20-amp switch/circuit breaker disconnects the power source from the XLS and is manually resettable. If the optional redundant power input module is installed power can be connected from two independent power sources through two 20-amp, 3-pin connectors allowing for automatic failover if the primary source is lost.

Some examples of power consumption requirements are listed in Table 4-2. Tape drive power includes a SCSI terminator for each drive.

Peak Watts in Table 4-2 assumes that all modules within the XLS are drawing maximum current. This state is virtually impossible to actually achieve. For example, if all drives were reading or writing data, the robot will not be in motion since no tapes are waiting to be moved.

System Configuration	Consumption	
	Peak Watts	Average BTUs/hr
1 LRM, 4 tape drives	475	1,100
1 LRM, 16 tape drives	727	1,300
1 LRM, 32 tape drives, 1 MEM	862	2,750
1 LRM, 8 tape drives, 2 MEMs	610	1,400
1 LRM, 32 tape drives, 2 MEMs	1,100	3,000

Table 4-2 Approximate XLS power consumption examples

4.1.3 Power Cords

The XLS end of all non redundant power input module power cords is terminated in a mating 20-amp, 3-pin locking connector. Table 4-3 lists the standard detachable six-foot (or two-meter) power cords that are available.

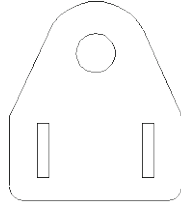

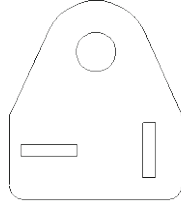
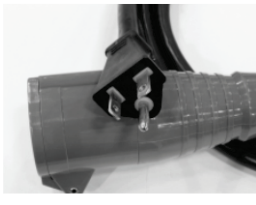
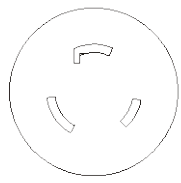

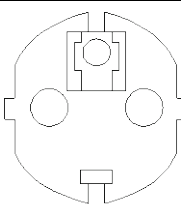
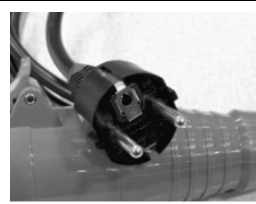
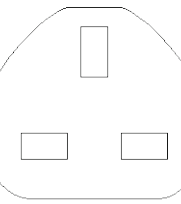

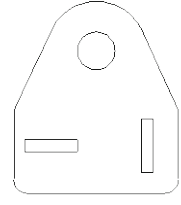

Country	Volts/Amps	Qualstar Part Number	Power Cord Styles
North America	105-125V 15A	664-0101-9	 
North America	105-125V 20A	664-0104-3	 
North America	220-240V 20A	664-0102-7	 
Other	230-240V 16A	664-0103-5	 
United Kingdom	200-240V 13A	664-0105-0	 
North America	105-125V 20A	664-0106-8	 

Table 4-3 Available standard XLS power cords

XLS models equipped with the redundant power input module come supplied with two power cords. The cords are three-conductor 14 AWG SJT PVC-jacketed cords terminated with an IEC 60320 C-19 type connector at the XLS end. Table 4-4 lists the power cords that are available for redundant power input module equipped libraries.

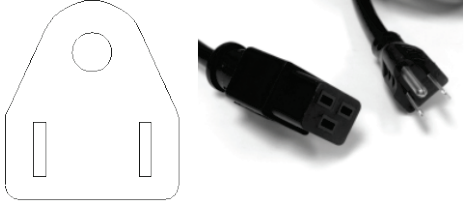
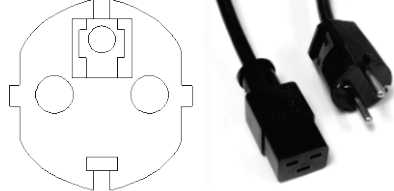

Country	Volts/Amps	Qualstar Part Number	Power Cord Styles
North America	105-125V 15A	664-0107-6	
Other	230-240V 16A	664-0200-9	
United Kingdom	200-240V 13A	664-0201-7	

Table 4-4 Available power cords for redundant power input module option

5

Performance Specifications

5.1 Data Cartridge Handling Times

Table 5-1 lists the average time required for the XLS to pick a cartridge from a storage slot and place it in a tape drive and to pick a cartridge from a tape drive and return it to a storage slot. In the table:

- The **Average Times** assume random locations for the tape drives and storage slots.
- The **Worse Case Times** are for moves from the storage slot or tape drive at bottom left corner of the unit to the tape drive or storage slot at the top right corner.

Condition	Average Time	Worst Case Time
Load drive from slot in LRM	11 seconds	17 seconds
Unload drive and return to slot in LRM	10 seconds	16 seconds
Load drive from slot in MEM	13 seconds	21 seconds
Unload drive and return to slot in MEM	12 seconds	20 seconds
Move cartridge from slot in LRM #1 to drive in LRM #2 through MEM	25 seconds	33 seconds

Table 5-1 Cartridge handling times

5.2 Scan All Barcodes

Table 5-2 lists the typical times required to scan a full complement of data cartridges in the XLS-832700. The table assumes all cartridges use barcode labels and that no retries are needed.

To Scan	Typical Time
465 cartridges in a LRM	270 seconds
665 cartridges in a LRM	385 seconds
1,066 cartridges in a LRM	620 seconds
1,075 cartridges in a 89000 MEM1	600 seconds
120 cartridges in an expansion pod	50 seconds

Table 5-2 Barcode and inventory scanning times

6

Environmental Specifications

6.1 Temperature, Humidity, and Altitude

Parameter	Operating	Non-Operating ¹
Ambient temperature	+5°C to +32°C (+41°F to +90°F)	-20°C to +60°C (-4°F to +140°F)
Temperature gradient (maximum)	1°C/minute, 10°C/hour (2°F/minute, 18°F/hour)	1°C/minute, 20°C/hour (2°F/minute, +36°F/hour)
Relative humidity (non-condensing)	20% to 80%	10% to 90%
Wet bulb temperature	26°C (79°F) maximum	29°C (84°F) maximum
Altitude	-1,000 to +8,000 feet -304.8 to +2,438 meters	-1,000 to +40,000 feet -304.8 to +12,192 meters

1. Includes tape drives.

Table 6-1 Environmental specifications

NOTE

Rapid changes in temperature that produce condensation must never be allowed since the condensed liquid may contaminate bearing lubricants and possibly shorten the expected Mean Time Between Failures.

6.2 Acoustical Noise

Overall noise level at one meter from the front of the XLS shall not exceed:

- With 32 tape drives operating and redundant power supplies: ≤ 69 dBA
- As above plus robotic handler and MEM operating: ≤ 73 dBA

7.1 Mean Exchanges Between Failures

The Mean Exchanges Between Failures (MEBF) rating exceeds 2,000,000 exchange cycles. The MEBF rating excludes tape drives, which are rated separately by their manufacturers. An exchange cycle consists of the following actions:

1. Pick a data cartridge from a storage location.
2. Place the cartridge into a tape drive.
3. Remove a cartridge from a drive.
4. Return the cartridge to the same storage location.

Qualstar Corporation does not warrant either the MEBF or the failure rate to be representative of any particular unit installed for customer use. Failure rates are derived from a large database of test samples. The individual failure rate will vary from unit to unit.

8.1 EEC Directive Compliance (European Economic Community)

The XLS meets or exceeds the requirements of the CE Mark as set forth by:

- Electromagnetic Compatibility Directive 89/336/EEC
- Low Voltage Directive 73/23/EEC
- European Directive on Waste Electrical and Electronic Equipment (WEEE)

8.1.1 Reduction of Hazardous Substances (RoHS)

Qualstar is committed to the implementation of RoHS (Restriction of the use of certain hazardous substances in electrical and electronic equipment) in accordance with the European Directive.

Qualstar tape libraries are classified as “Information Technology Storage Array Systems” for which the RoHS Directive provides an exemption for lead solder. Affected subassemblies must be disposed of appropriately.

8.1.2 XLS Construction Materials

The XLS unit is of riveted construction made from steel that has been pre-plated with zinc for corrosion protection. The G90 steel material meets U.S. ASTM Specification A653.

Exterior side covers are made from 5052-H32 aluminum alloy that has been powder coated in a black textured finish. The aluminum alloy meets U.S. Federal Specification QQ-A-250/8.

Five different types of plastic materials are used within the library as follows:

- The decorative front face coverings are made from vacuum-formed ABS material attached to a steel sub-structure. The ABS material is listed in the current UL Recognized Component Directory and is fire rated UL94V-2 minimum. Exterior surfaces are coated with a textured enamel finish.
- Windows on access doors and side covers are made from clear Polycarbonate. The material is listed in the current UL Recognized Component Directory and is fire rated UL94V-2 minimum.
- Tape and I/O Port magazines are molded from polycarbonate that is filled with 20% glass fiber and 15% Teflon (PTFE) fluoropolymer resin to minimize mechanical wear on the tape cartridges. The polycarbonate material is listed in the current UL Recognized Component Directory and is fire rated UL94V-2 minimum.

- Air filters are fabricated from 25 PPI (pours per inch) Quadrafoam. Quadrafoam is an open cell polyurethane foam coated for flame retardancy and fungus resistance. The filter material is listed in the current UL Recognized Component Directory and is fire rated UL94HF-1 minimum.
- E-Chain Cable Carriers are used to protect flex-print cables from damage during robotic motion. The links are molded from igumid NB polymer, a proprietary compound developed by Igus Incorporated. The material is non-burning and has a UL rating of 94V2 minimum.

Internal wiring is accomplished with UL Style 1429 and UL Style 1430 Hook-Up wire. The insulation on Styles 1429 and 1430 is irradiated PVC for high reliability and high abrasion resistance. This wire meets the requirements of MIL-W-16878, Type B and MIL-W-16878, Type C and is an Underwriters Laboratories Inc. recognized component. UL Style 1429 has a nominal insulation thickness of .010 inches (0,25 mm). UL Style 1430 has a nominal insulation thickness of .016 inches (0,41 mm).

8.2 Emissions/Immunity Standards Compliance

The XLS meets or exceeds the standards set forth by:

- FCC Rules, Part 15, Subpart B, Class A Computing Devices
- CISPR 22 (1993)
- CE per EN55022 (1998) Class A and EN55024 (1998) including:
EN61000-3-2, -3-3, -4-2, -4-3, -4-4, -4-5, -4-6, -4-8 and -4-11

8.3 Safety Standards Compliance

The XLS meets or exceeds the standards set forth by:

- ANSI/UL60950 Third Edition – Certified by ITS – usETL
- CAN/CSA-C22.2 No. 60950-00 Third Edition – Certified by ITS – cETL
- CE per EN 60950 – ITS CB Certificate & Report US/995/ITS

9.1 Mean Time To Repair

The Mean Time To Repair (MTTR) shall not exceed 30 minutes. The MTTR is the average time for an adequately trained and equipped technician to diagnose and correct a malfunction while following the service procedures in the *XLS Technical Service Manual*. Servicing will be limited to replacing field replaceable units (FRUs). Repair time does not include system retest, calibration, or inventory times.

9.2 Preventive Maintenance

The only preventive maintenance required by the XLS consists of periodically cleaning the library and replacing the air filters, which are located on the front of the LRM and MEM. The XLS keeps track of its power-on hours and periodically issues replacement orders. The replacement interval can be changed to match the local environmental conditions. Air filters can be changed without interrupting library operation.

9.2.1 Controller Battery Replacement

The NICAD battery pack used in the controller has a five year operating life. The module must be replaced at five-year intervals to maintain power interruption protection. The module may be replaced by the user without interrupting XLS operation.

9.2.2 Maintaining Controller UPS Protection

Storing the XLS without power for 30 days will cause the battery in the 24-volt DC UPS to discharge to the point where power interruption protection may be lost. The UPS function will be re-established approximately 10 minutes after normal power is restored.

9.3 Tape Drive Cleaning

During normal library operations, tape drive cleaning is managed by the host software applications using cleaning cartridges installed in each logical library partition. In addition to these cleaning cartridges, each LRM includes four reserved cleaning cartridge slots for maintenance and service operations performed using X-Link. These cartridges can be used, for example, if a software application does not perform automated cleaning. The cartridges in the reserved slots are not accessible to the software applications.

9.4 Adjustments

The XLS does not require electrical or mechanical adjustments after any field replaceable unit (FRU) or tape drive is replaced. All adjustments, alignments and calibrations are performed automatically.