

HP StorageWorks

Enterprise Modular Library E-Series user guide



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i n v e n t

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Enterprise Modular Library E-Series user guide

Regulatory model number LVLDC-0401

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About this guide

This guide provides information about:

- Installing the HP StorageWorks Enterprise Modular Library (EML) E-Series.
- Preparing the EML for use.
- Operating the EML.
- Troubleshooting the EML.
- Removing and replacing components.
- Relocating the EML.

Intended audience

This guide is intended for system administrators, system engineers, and operators who need physical and functional knowledge of the EML E-Series Library.

Related documentation

In addition to this guide, please see these other documents for this product:

- *HP StorageWorks Enterprise Modular Library E-Series getting started poster*
- *HP StorageWorks Interface Manager and Command View TL user guide*
- *HP StorageWorks Library and Tape Tools (L&TT) user guide*

These and other HP documents can be found on the HP web site: <http://www.docs.hp.com>.

Document conventions and symbols

Table 1 Document conventions

Convention	Element
Medium blue text: Figure 1	Cross-reference links and e-mail addresses
Medium blue, underlined text (http://www.hp.com)	Web site addresses
Bold font	<ul style="list-style-type: none">• Key names• Text typed into a graphical user interface (GUI) element, such as into a box• GUI elements that are clicked or selected, such as menu and list items, buttons, and check boxes
<i>Italics font</i>	Text emphasis
Monospace font	<ul style="list-style-type: none">• File and directory names• System output• Code• Text typed at the command-line
<i>Monospace, italic font</i>	<ul style="list-style-type: none">• Code variables• Command-line variables
Monospace, bold font	Emphasis of file and directory names, system output, code, and text typed at the command-line



WARNING! Indicates that failure to follow directions could result in bodily harm or death.



CAUTION: Indicates that failure to follow directions could result in damage to equipment or data.



IMPORTANT: Provides clarifying information or specific instructions.



NOTE: Provides additional information.



TIP: Provides helpful hints and shortcuts.

Rack stability



WARNING! To reduce the risk of personal injury or damage to equipment:

- Extend leveling jacks to the floor.
 - Ensure that the full weight of the rack rests on the leveling jacks.
-

For information on implementing these safety features, see the *HP10000 Series Rack reference guide*. Information on HP rack products can be obtained at <http://www.hp.com/products/racks>.

Taking ESD precautions

Components within the library contain static-sensitive parts. To prevent damage to these parts while performing installation, maintenance, or replacement procedures, observe the following electrostatic discharge (ESD) precautions:

- Always use Ethernet cables that come with your product.
 - Use an antistatic wrist strap when touching internal rack components. To use the wrist strap properly, place the band around your wrist and attach the clip to the rack frame. Keep the strap on until you are ready to close the rack doors.
 - Keep static-sensitive parts in their shipping containers until ready for installation.
 - Do not place static-sensitive parts on any metal surface. If you need to put down a static-sensitive part, place it inside its protective shipping bag or on a grounded antistatic mat.
 - Avoid direct contact with static-sensitive parts. Avoid touching connectors and discrete components.
 - Close rack doors when not working on the rack.
 - Be careful when installing the rack or handling components in dry climates or environments where cold weather heating is used. Environments such as these with lower relative humidity have greater potential to produce static electricity.
-



NOTE: In environments with high potential for static electricity, take additional precautions, such as the use of an antistatic smock or a grounded antistatic mat.

HP technical support

Telephone numbers for worldwide technical support are listed on the HP web site: <http://www.hp.com/support/>. Collect the following information before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- System configuration
- Applicable error messages
- Operating system type and revision level
- Detailed, specific questions

For continuous quality improvement, calls may be recorded or monitored.

HP strongly recommends that customers sign up online using the Subscriber's choice web site at <http://www.hp.com/go/e-updates>.

- Subscribing to this service provides you with e-mail updates on the latest product enhancements, newest versions of drivers, and firmware documentation updates as well as instant access to numerous other product resources.
- After signing up, you can quickly locate your products by selecting **Business support** and then **Storage** under Product Category.

HP-authorized reseller

For the name of your nearest HP-authorized reseller:

- In the United States, call 1-800-345-1518.
- Elsewhere, visit <http://www.hp.com> and click **Contact HP** to find locations and telephone numbers.

Helpful web sites

For additional product information, see the following web sites:

- <http://www.hp.com>
- <http://www.hp.com/go/storage>
- <http://www.hp.com/support/>
- <http://www.docs.hp.com>
- <http://www.hp.com/support/cvtl>
- <http://www.hp.com/products/racks>

1 Library overview

The HP StorageWorks Enterprise Modular Library (EML) E-Series is a self-contained, fully automated tape cartridge storage and retrieval system. The EML is a part of the Extended Tape Library Architecture (ETLA), using HP controller-based manageability interfaces communicating over a SAN to provide reliability, security, network awareness, and diagnostic features to tape libraries.

This chapter covers the following EML topics:

- [Physical description](#), page 13
- [Functional description](#), page 23

Physical description

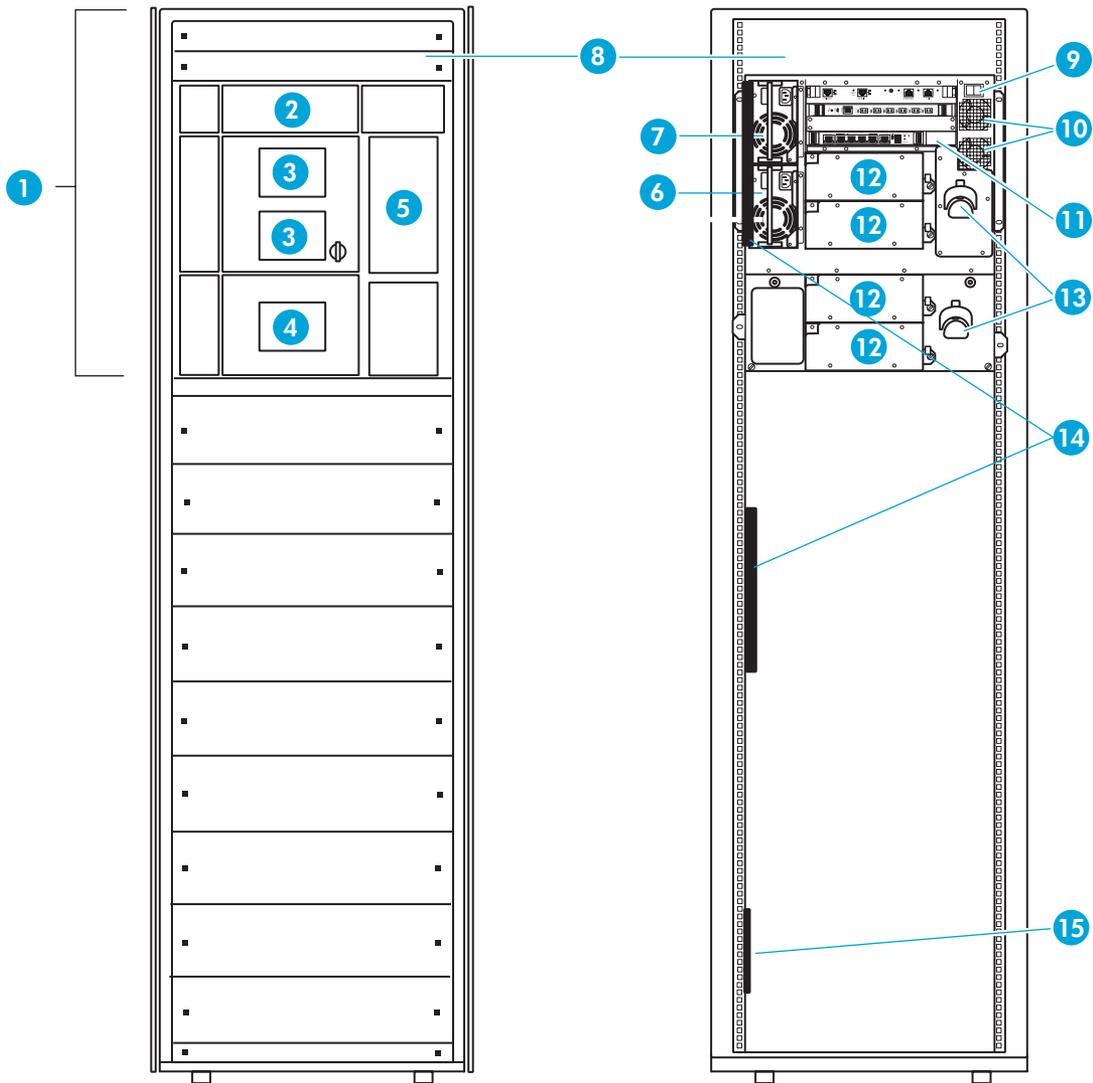
The EML arrives fully contained in a 42U rack on a shock pallet. The rack contains one power distribution unit (PDU) mounted on the side, and two extension bars (power strips) containing 10-amp outlets mounted to the rear rails. The front and rear doors are perforated to allow sufficient air circulation, with the split rear doors allowing full access to library modules, without blocking rack aisles.

The EML is orderable in three HP rack configurations:

- Model 103e (see [Figure 1](#))—A 12U design consisting of a base module that contains a robot, an operator control panel (OCP), load port, card cage (with a preinstalled library robotics controller and Interface Manager card), and mounting space for up to four tape drives. A total of 103 Linear Tape-Open (LTO) slots (98 permanent and 5 configurable) are available. Tape drives and Fibre Channel (FC) interface controllers are ordered separately.
- Model 103e bundle with drives and media—The same as the model described above, with four HP Ultrium 460 tape drives, FC interface controller, media, cables, and cleaning cartridge included. The tape drives and interface controller come preinstalled in the rack.
- Model 245e (see [Figure 2](#))—A 24U design consisting of the components in the Model 103e configuration, plus an 8U drive expansion module with load port, and a 4U card cage expansion module. A total of 245 LTO slots (230 permanent and 15 configurable) are provided with eight tape drives allowed. Tape drives and FC interface controllers are ordered separately.

In addition, HP provides kits that enable you to expand the library configuration to 42U (with 2U at the top of the rack reserved for customer use). An additional power distribution unit (PDU) and redundant power supplies can be added to the EML to provide failsafe power features (see [“Installing a redundant PDU”](#) on page 125 for guidelines). A fully-configured rack can provide a maximum of 442 LTO slots (407 permanent and 35 configurable) with as many as 16 tape drives (see [Figure 3](#)). All configurations, with their slot and tape drive capacities, are listed in [Table 24](#) in Appendix A.

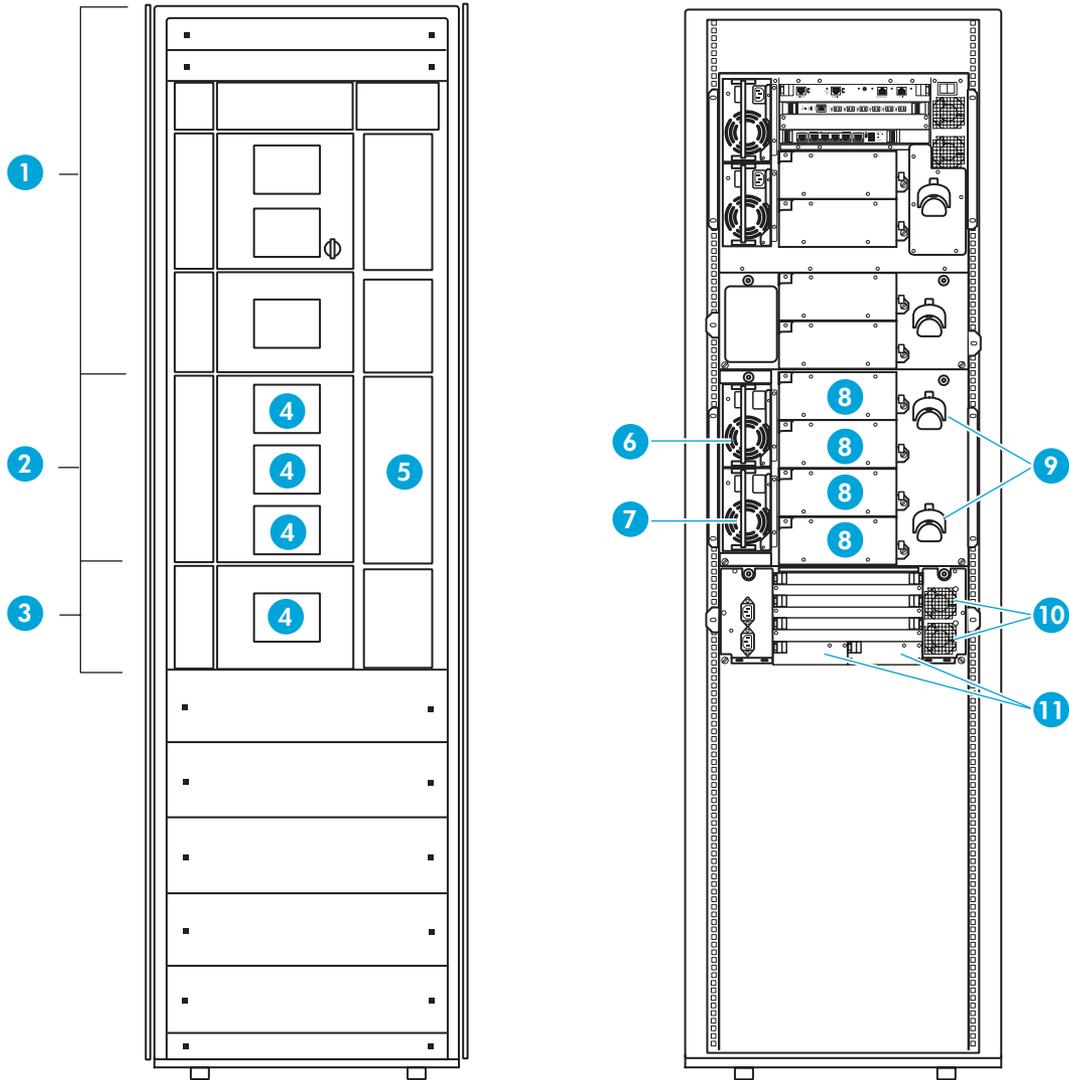
Components described in the following sections comprise an orderable EML or can be installed in an EML for additional capacity.



10447

- | | |
|---|--|
| <ul style="list-style-type: none"> 1 Base module 2 Robotics unit (internal) 3 Viewing window 4 Operator control panel 5 Load port (5-cartridge capacity) 6 Redundant power supply module (optional) 7 Primary power supply module | <ul style="list-style-type: none"> 8 Customer reserved space (2U) 9 Library main power switch 10 Library fans 11 Base module card cage 12 Tape drives 13 Cable management features 14 Extension bars (power strips) 15 Power distribution unit |
|---|--|

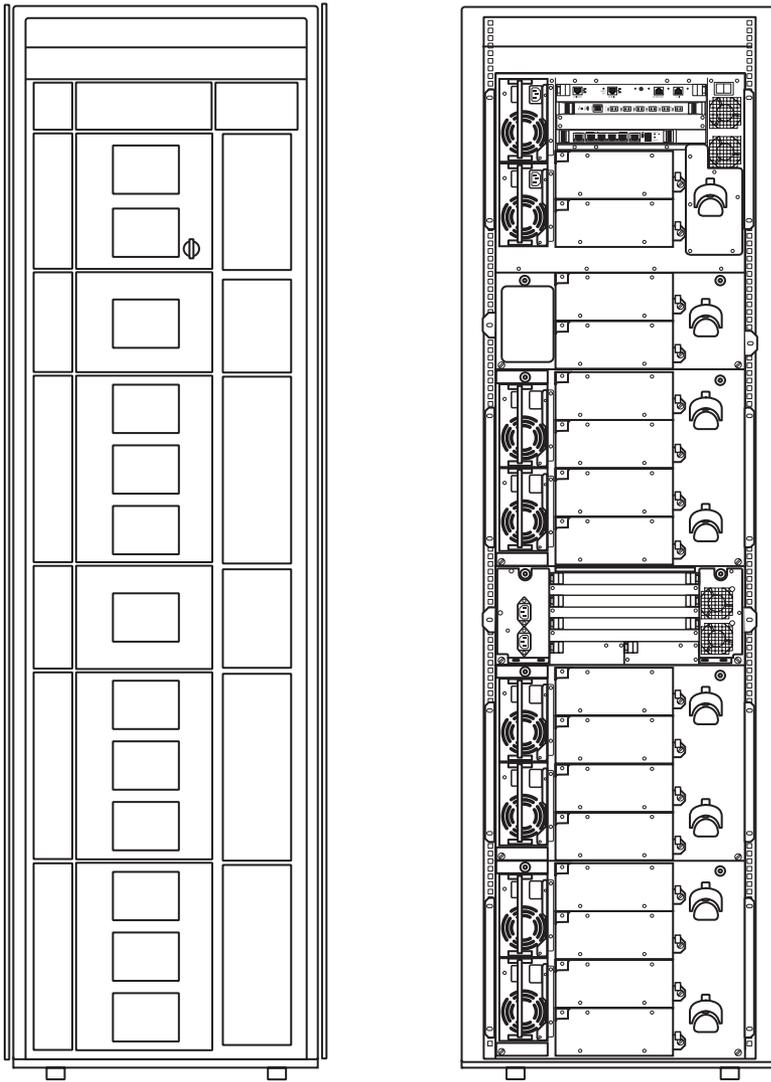
Figure 1 Enterprise Modular Library E-Series, Model 103e



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- | | |
|-------------------------------------|--|
| 1 See Model 103e figure | 7 Redundant power supply module (optional) |
| 2 Tape drive expansion module | 8 Tape drives |
| 3 Card cage expansion module | 9 Cable management features |
| 4 Viewing window | 10 Card cage module fans |
| 5 Load port (10-cartridge capacity) | 11 Redundant card cage power supplies |
| 6 Primary power supply module | |

Figure 2 Enterprise Modular Library E-Series, Model 245e



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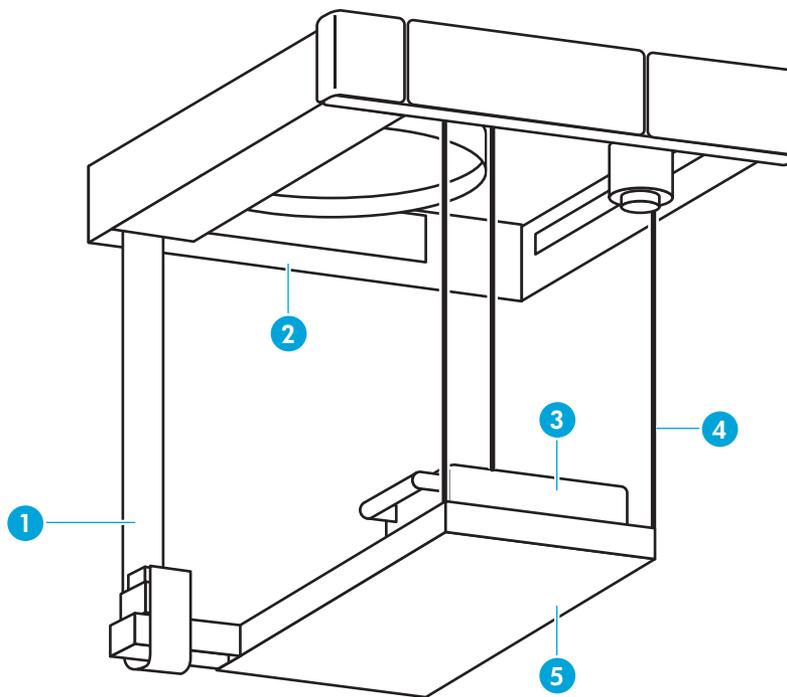
Figure 3 Example of a fully expanded Enterprise Modular Library E-Series

Base module

The 12U base module (see [Figure 1](#)) resides below the 2U space at the top of the rack reserved for customer use. The module contains a total of 103 LTO slots. Nine of these slots can be configured as reserved, and five slots are configurable within a load port through the use of a removable magazine. The number of usable permanent slots depends on whether it is the lowest module vertically placed in the library. The library floor is always attached to the lowest library module. If the library floor is attached to the base module, the last two rows (containing 16 slots) are blocked and cannot be used.

The robotics unit (see [Figure 4](#)) is located at the top of the base module. When fully retracted (or *parked*), the robot is fully contained within a 2U space. For safety reasons, the robot is parked before the front door can be opened.

Within the robotics unit, a lift table assembly contains a motor, pulleys, and cables to move the table up and down to a desired level in the library. The picker assembly moves front and back, and side-to-side along the table. A bar code scanner, attached to the bottom of the hand assembly, scans targets on rack components for alignment, as well as bar code labels on tape cartridges, if they are present. The picker has fingers that remove and insert cartridges among storage slots, tape drives, or load ports.

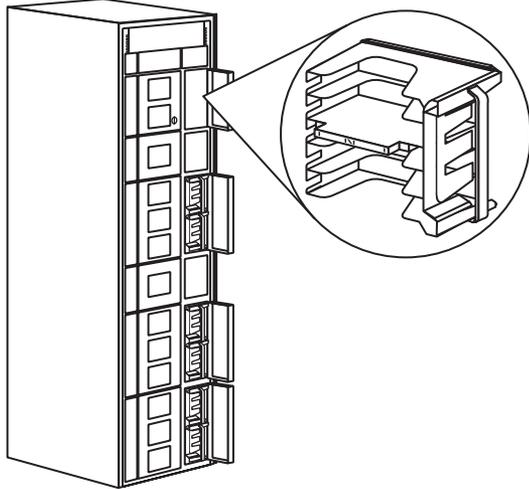


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|-----------------------|------------------------------|
| 1 Lift flex cable | 4 Lift suspension cable (4x) |
| 2 Lift drive assembly | 5 Table |
| 3 Picker assembly | |

Figure 4 Robotic unit

The base module has two windows on the front for viewing the robotic motion inside the library. A load port door is located to the right front (see [Figure 5](#)) where a 5-cartridge magazine can be loaded with tape cartridges for insertion into or removal from the library. The load port can also be used for additional tape storage. An operator control panel (OCP) is located at the bottom front of the module.



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Figure 5 Library load ports on 42U configuration

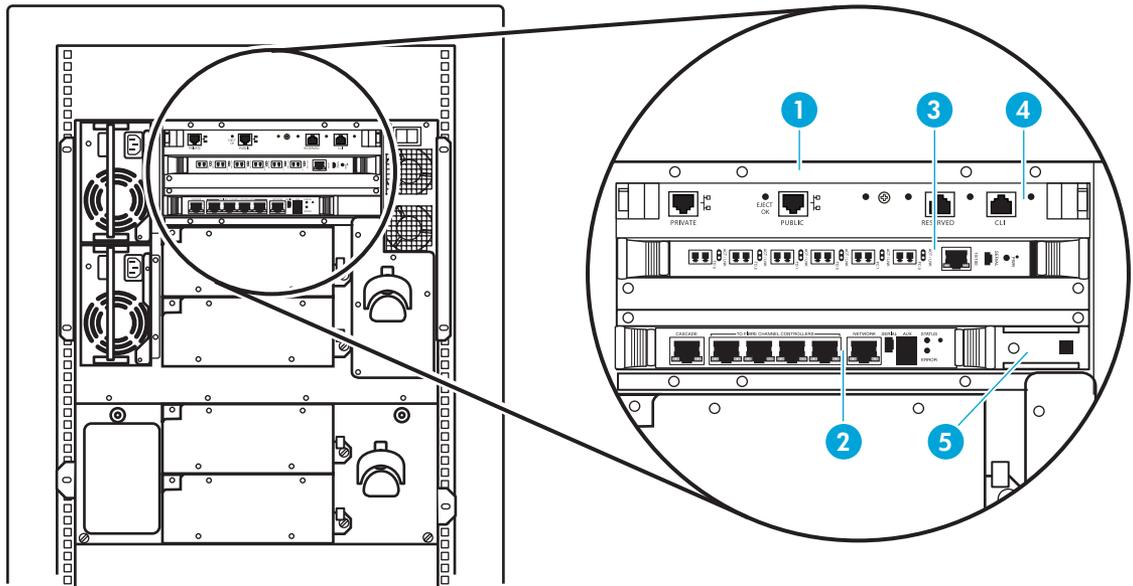
The base module contains an autoranging power supply (a redundant power supply is optional), card cage, cable management feature, and space for mounting up to four LTO-technology tape drives on the back.

The card cage in the base module (see [Figure 6](#)) provides four cPCI slots for the following:

- Library robotics controller (see [Figure 7](#))—A single slot, 6U-wide cPCI board having Ethernet ports and an RS-232 port. One Ethernet port connects this controller to the Interface Manager card.
- HP StorageWorks Interface Manager card (see [Figure 8](#))—A single slot, 4U-wide cPCI board having six Ethernet ports. This board contains 128 MB of dynamic random access memory (DRAM) plus a 256 MB CompactFlash card, both in their own sockets. A 2U-wide adapter panel next to the 4U-wide Interface Manager card allows it to fit in the lowest 6U-wide card cage slot.
- HP StorageWorks e2400-FC 2G interface controller (see [Figure 9](#))—A single slot, 6U-wide cPCI board, having two 2-Gbps FC ports for connecting to the SAN, along with four 2-Gbps FC ports to connect up to four HP Ultrium tape drives.
- An empty card slot reserved for future use.

The cable management feature is a spool, mounted near the tape drives, that allows LAN and FC cables to be dressed and routed away from hot plug or hot swap components.

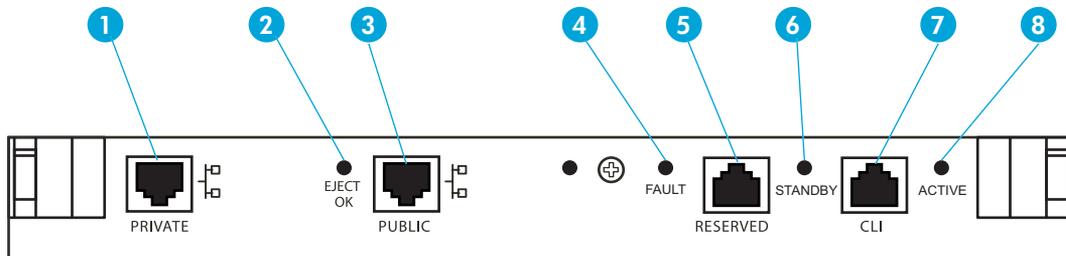
Ultrium 460 tape drives (see [Figure 10](#)) come installed in one orderable 103e library model option bundled with tape media. Ultrium 460 or 960 tape drives are ordered separately with the other 103e and 245e EML model options.



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|--|-------------------------------|
| 1 Base module card cage | 4 Library robotics controller |
| 2 Interface Manager card | 5 Adapter panel |
| 3 HP StorageWorks e2400-FC 2G interface controller | |

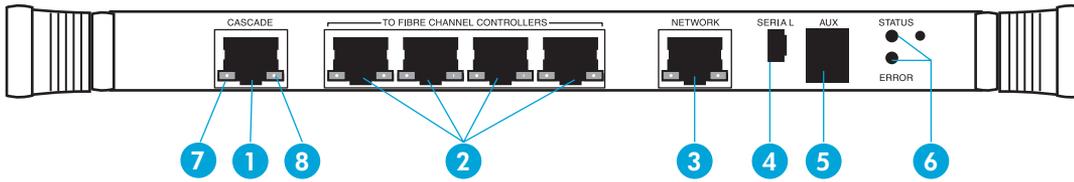
Figure 6 Base module card cage



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- | | |
|---|------------------------------|
| 1 Private Ethernet port (not used) | 5 Reserved port (not used) |
| 2 Eject OK LED | 6 Standby LED |
| 3 Public Ethernet port (connection to Interface Manager card) | 7 CLI port (RS-232—not used) |
| 4 Fault LED | 8 Active LED |

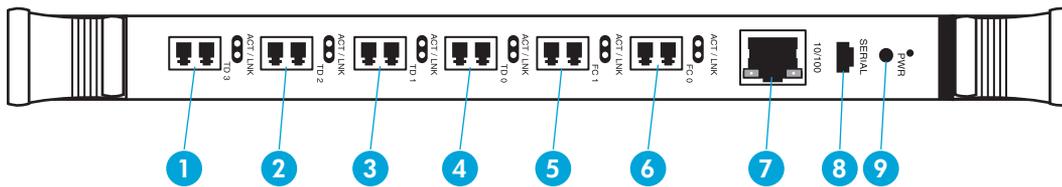
Figure 7 Library robotics controller



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- | | |
|---|---|
| 1 Cascade Ethernet port (connection to library robotics controller) | 5 Auxiliary RJ-11 serial connector (not used) |
| 2 Private Ethernet ports to e2400-FC 2G interface controllers | 6 Board status LEDs |
| 3 Network Ethernet port (to LAN) | 7 Green link speed LED |
| 4 Serial port | 8 Green light activity LED |

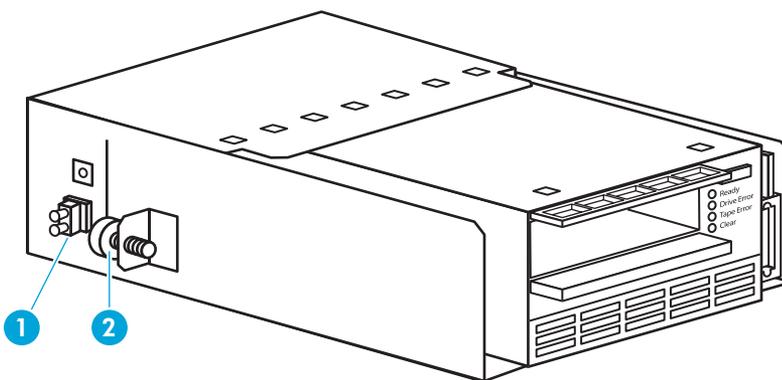
Figure 8 HP StorageWorks Interface Manager card



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- | | |
|--|--|
| 1 Tape drive FC port 3 | 6 FC port 0 (connection to host or switch) |
| 2 Tape drive FC port 2 | 7 Ethernet port (connection to Interface Manager card) |
| 3 Tape drive FC port 1 | 8 Serial port |
| 4 Tape drive FC port 0 | 9 Power indicator |
| 5 FC port 1 (connection to host or switch) | |

Figure 9 HP StorageWorks e2400-FC 2G interface controller



10415

- | | |
|---------------------------|---------------------------------------|
| 1 Fibre Channel connector | 2 Mounting bracket with captive screw |
|---------------------------|---------------------------------------|

Figure 10 Ultrium tape drive

Expansion modules

Two expansion modules are available to increase library capacity beyond that provided by the base module. These expansions modules are:

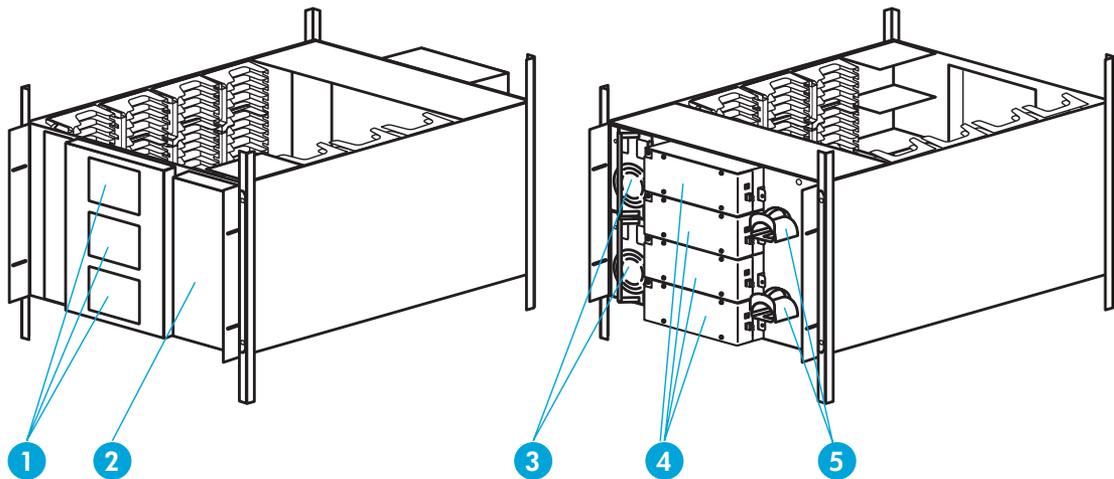
- Tape drive expansion module.
- Card cage expansion module.

Tape drive expansion module

The tape drive expansion module (see [Figure 11](#)) is an 8U chassis containing 94 LTO slots (84 permanent and 10 configurable). The number of usable slots depends on whether it is the lowest module vertically placed in the library. If the library floor is attached to this module, the bottom row (containing seven slots) is blocked and cannot be used.

The tape drive expansion module has three windows on the front for viewing the robotic motion inside the library. To the right is a 10-cartridge configurable load port that holds two 5-cartridge magazines.

On the back, the module contains one primary power supply with a slot provided for another optional redundant power supply. Up to four HP Ultrium tape drives can be installed on the module. Cable management features are provided for cable routing and dressing.



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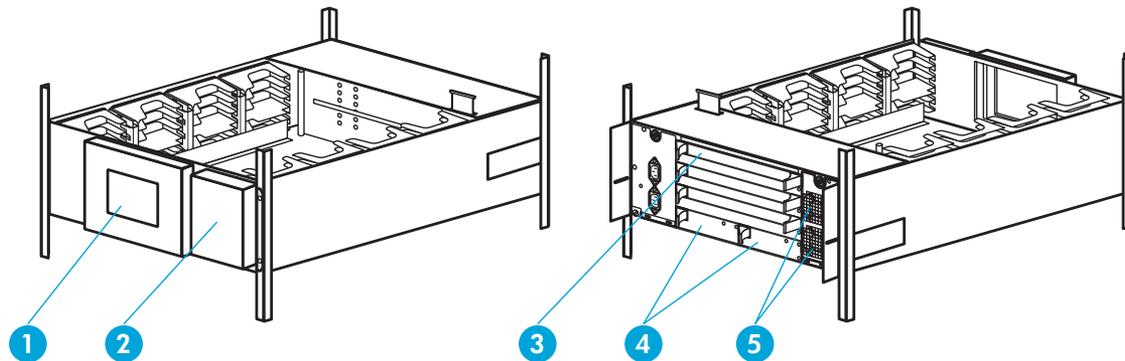
- | | |
|--|-----------------------------|
| 1 Viewing windows | 4 Tape drives |
| 2 10-cartridge capacity load port | 5 Cable management features |
| 3 Power supplies (optional redundant power supply shown) | |

Figure 11 Tape drive expansion module

Card cage expansion module

The card cage expansion module (Figure 12) is a 4U chassis that contains 48 permanent LTO slots and space for additional interface controllers. This module must be located directly below the 8U tape drive expansion module in a 24U library configuration. The number of usable slots depends on whether it is the lowest vertically-placed module in the library. If the library floor is attached to this module, the bottom two rows (containing 16 slots) are blocked and cannot be used.

The front of the chassis has one window for viewing robotic motion inside the library. On the back, six PCI card slots are available for additional e2400-FC 2G interface controllers to expand the library tape drive capacity. One interface controller is added for every four additional tape drives. Two redundant power supplies are located at the bottom of the card cage, and two cooling fans are on the right.



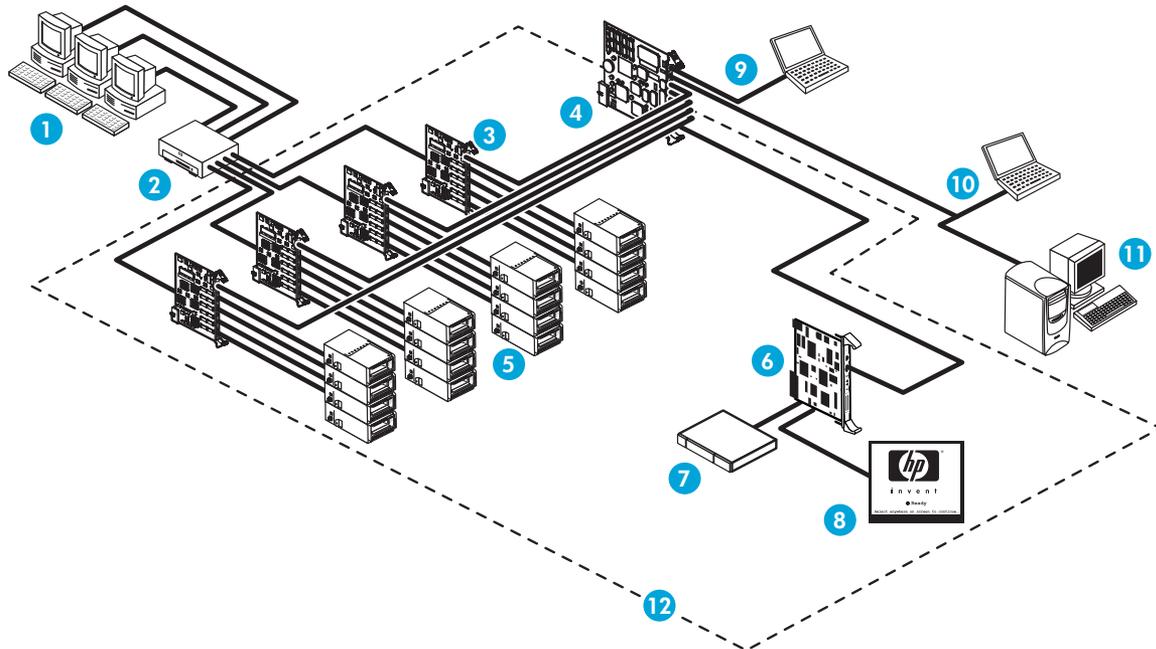
10437

- 1 Viewing windows
- 2 Blank facade
- 3 Card slot
- 4 Redundant power supplies
- 5 Fans

Figure 12 Expansion card cage module

Functional description

The EML receives commands and data throughout the SAN from hosts running applications from approved independent software vendors (ISVs). This traffic is sent to interface controllers over FC links from host bus adapters installed on the host systems. FC switches most likely route this host traffic to the library (see Figure 13). One interface controller is assigned to a maximum of four tape drives. The interface controllers route read and write commands over Fibre Channel to the tape drives, and medium changer commands to the Interface Manager card, which passes these on to the library robotics controller over Ethernet.



10438

- | | |
|--|--------------------------|
| 1 Hosts | 7 Robot |
| 2 Fibre Channel switch | 8 Operator control panel |
| 3 e2400-FC 2G interface controller (up to 4) | 9 Serial connection |
| 4 Interface Manager card | 10 Telnet connection |
| 5 HP Ultrium tape drives (up to 16) | 11 Management station |
| 6 Library robotics controller | 12 Library boundary |

Figure 13 EML network

In addition to receiving traffic from the interface controllers, the Interface Manager card receives command and diagnostic requests over an Ethernet connection from three other possible sources. The majority of requests come from a management station where Command View TL software resides. Other sources can be through a Telnet session or serially over an RS232 interface. The Interface Manager card works in the background to manage library functions. It configures the interface controllers to direct commands from host systems to the appropriate tape drive or to the robotics controller.

The library robotics controller receives commands over an internal Ethernet network and from the OCP. It manages robotics movement, monitors the door and load port sensor status, and stores library information in volatile memory.

A functional description of the components and software that make up the EML is described next.

Controller cards

This section explains the function of the major three cards that control the library.

HP StorageWorks Interface Manager card

The HP StorageWorks Interface Manager is an HP proprietary management card designed to consolidate and simplify the management of multiple Fibre Channel interface controllers installed in the library. It also provides SAN-related diagnostics and management for library components, including the interface controllers, drives, and robotics. The Interface Manager card, in conjunction with HP StorageWorks Command View TL software, provides remote management of the library via a serial, Telnet, or Web-based graphical user interface.

The Interface Manager card communicates with the management station over the LAN. The management station is a Microsoft® Windows®-based PC (server) that hosts the Command View TL software. Ideally, the management station should have a static IP address and be dedicated for use with the Interface Manager and Command View TL software.

Any client machine on the LAN can communicate with the Interface Manager either through the graphical user interface (GUI) or through a Telnet command line interface (CLI). At a higher level, multiple libraries, each containing an Interface Manager card, can be connected to a single management station. Each Interface Manager card can communicate with only one management station, but the management station can communicate with multiple Interface Manager cards.

After being configured, the Interface Manager card is used to configure the interface controllers, based on knowledge of the library and SAN. As robot commands are received from the interface controllers, the Interface Manager card acts as a switch to relay these commands to the library robotics controller. The Interface Manager card contains on-board Flash memory to provide a persistent history of the library and storage network health.

HP StorageWorks e2400-FC 2G interface controller

The e2400-FC 2G interface controller is an HP proprietary card that provides Fibre Channel connectivity for the tape drives and robotics in the SAN. Commands, data, and status information are transferred to and from this controller, from hosts, the robotics unit, and the tape drives. One interface controller can manage up to four Ultrium tape drives.

Library robotics controller

The library robotics controller contains firmware to control the robotics unit, communicate with the Interface Manager card, manage the library servo and vision control, and monitor the door and load port sensor status.

Robot commands are sent from hosts in the SAN to an interface controller, which directs them over an internal Ethernet network to the library robotics controller. The library robotics controller translates these commands into movements to be performed by the robot.

Load ports and magazines

The load ports are mechanical devices on the front of the library that enable you to import and export tape cartridges to and from the library through removable magazines, or act as additional library storage slots. These two functions for a load port cannot be mixed; you must either designate an entire load port to be import/export slots or storage slots. The base module contains a load port capable of using one 5-cartridge magazine. The 8U expansion modules contain load ports capable of using two 5-cartridge magazines each.

Tape drives

The Ultrium tape drive is a high performance streaming tape drive that uses LTO technology. The EML E-Series uses the Ultrium 460 (LTO 2) and Ultrium 960 (LTO 3) tape drives, which are backwards compatible with LTO 1 technology.

The Ultrium 960 includes support for both rewriteable and Write-Once, Read-Many (WORM) data cartridges. WORM data cartridges provide an enhanced level of data security against alteration of data on the tape cartridge because you cannot erase or overwrite data on the cartridge. To check whether your backup or archive software applications supports WORM cartridges, see the following web site: <http://www.hp.com/go/connect>.

For optimum performance, always use a data cartridge that matches the specification of your tape drive. [Table 2](#) shows drive compatibility and tape capacity. Other comparisons between the Ultrium 460 and 960 tape drives can be found in [Table 28](#) on page 104.

Table 2 Ultrium compatibility

Tape drive	200 GB*	400 GB*	800 GB*	WORM 800 GB*
Ultrium 460	Read/write	Optimum	Not supported	Not supported
Ultrium 960	Read only	Read/write	Optimum	Optimum

* Values assume a 2:1 compression ratio

Data cartridges and cleaning cartridges are specifically formatted for use with Ultrium drives. To order Ultrium media, see "[Ordering HP tape cartridges and bar code label packs](#)" on page 123.

Operator control panel

The OCP displays library status information and allows you to access the library menus with a touch screen. Use these menus to view and change the library settings, media, obtain status, or run diagnostic tests. Functions provided by the OCP are:

- Robotic and tape drive firmware revision reporting.
- Library configuration.
- Library and tape drive serial number reporting.
- Critical component status report.
- Critical component failure notification.
- Ability to move tapes to and from any location.
- Ability to configure bar code label length and justification reporting to the front panel and to the host.
- Access to error information.
- Adjust screen contrast.

LTO slots

All the modules that make up the library contain a mapping for arrays of LTO slots (or *cells*) for cartridges and tape drives. Each module has a different number of available slots, but a common numbering scheme for identifying the slot location. Some slots may not be available in the lowest library module when the floor is installed.



CAUTION: Never operate the library with the floor removed. The robot can be damaged.

The library numbers LTO slots using the following scheme:

- In general, the library numbers slots one module at a time, starting with the top module. For slot numbering purposes, the 12U base module is considered to be two modules: an 8U base unit and a 4U card cage.
- Within each module, numbering starts with column 1 (leftmost column when facing the front) and increments downward starting from the top row to the bottom row in the module.
- From the bottom row in a column, numbering continues clockwise to the next column (at the top) until the last column is reached in the module. Each module is handled in a like manner until the last (bottom) module is reached.
- Any reserved slots, located in the first column of the base module, and taking up as many as nine slots, are not included in the numbering scheme. A common use for reserved cells is for holding cleaning cartridges.
- If the physical load port slots are configured as import/export slots, they are skipped and not counted in the numbering of storage slots. If the physical load port slots are instead configured as storage slots, they are counted in the numbering scheme in the same physical manner as being in a column within a module.

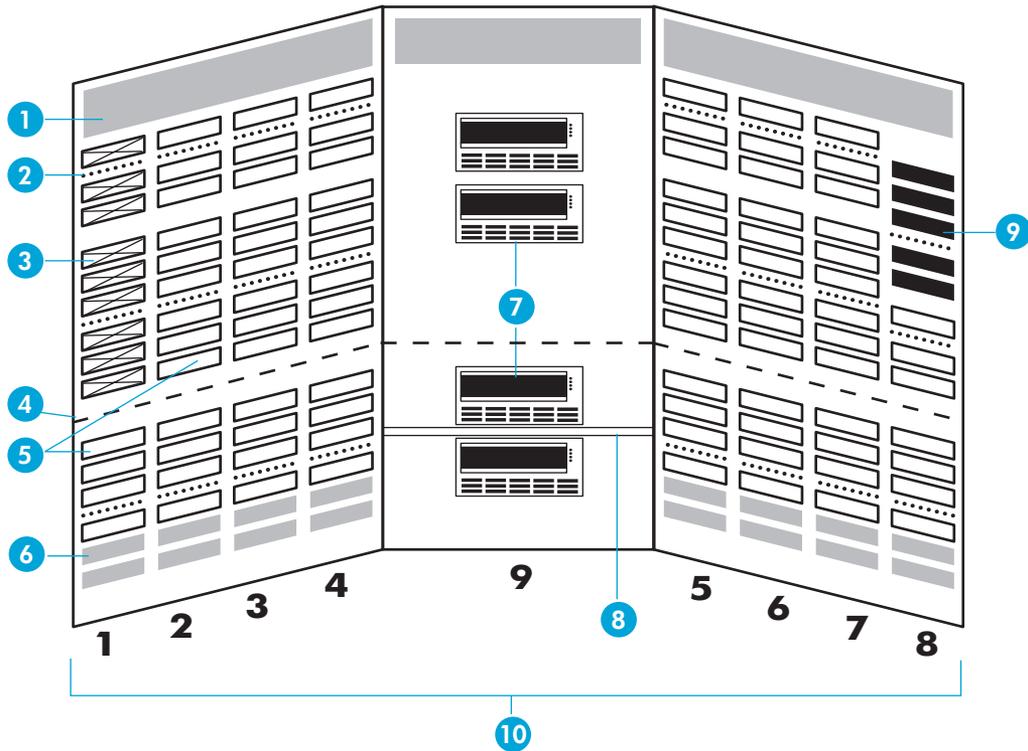


NOTE: Reconfiguring the load port as either import/export or for storage slots changes slot numbering in any lower modules the next time an inventory is performed.

Drives also have their own starting address in SCSI and are numbered from top to bottom. A drive element number is taken if the drive is present upon initial boot. An added drive is not recognized until a subsequent reboot, so the drives numbers are not changed until the next library reboot if a drive is removed or added.

The slot mappings for the various modules are shown below:

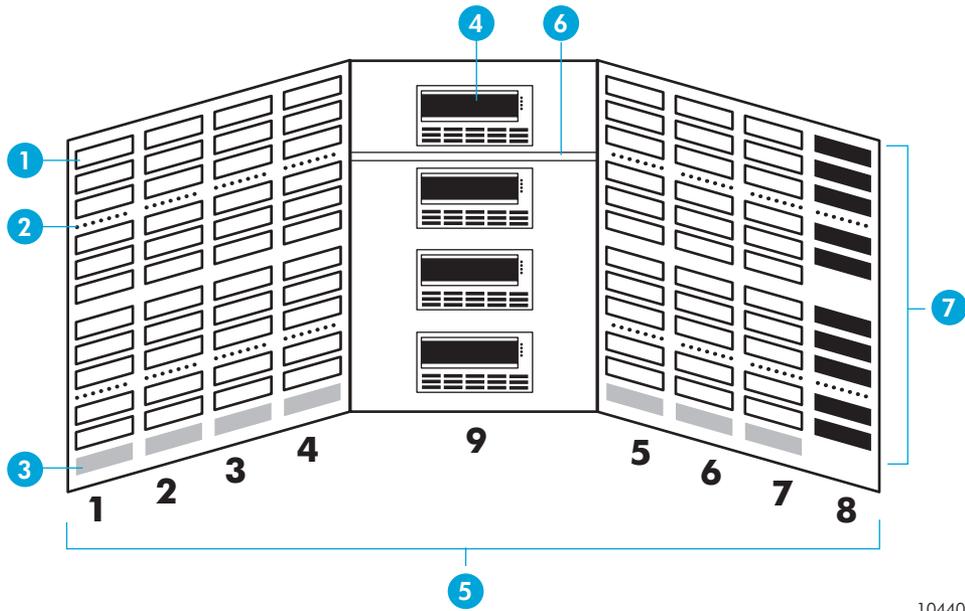
- Base module ([Figure 14](#))
- Drive expansion module ([Figure 15](#))
- Card cage expansion module ([Figure 16](#))



10439

- | | |
|---|--|
| 1 Robot park zone | 6 Slots unavailable for use when module is last in library and has floor installed |
| 2 Array targets | 7 Tape drives |
| 3 Reserved slots | 8 Expansion identification label |
| 4 Software demarcation between upper and lower modules for slot counting purposes | 9 Load port |
| 5 Slots available for data cartridges | 10 Column numbering |

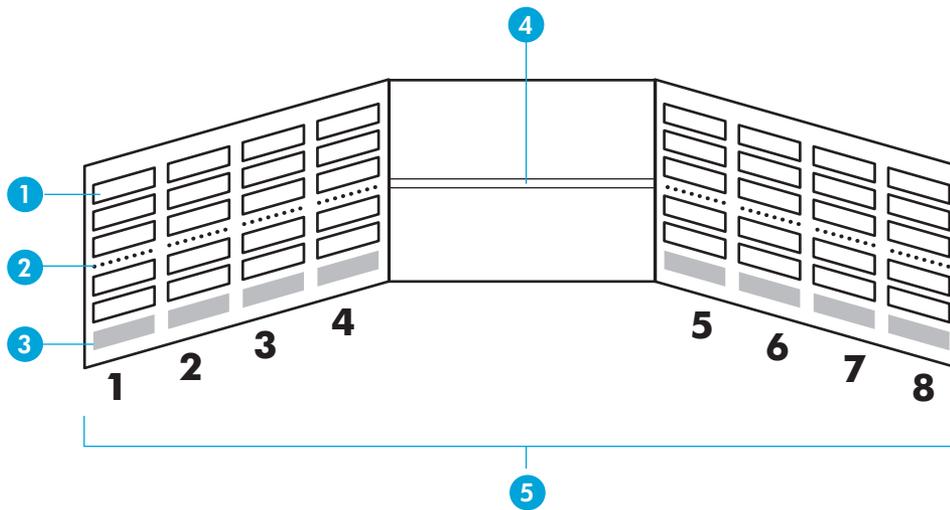
Figure 14 Base Module slot mapping



10440

- | | |
|--|----------------------------------|
| 1 Slots available for data cartridges | 4 Tape drives |
| 2 Array targets | 5 Column numbering |
| 3 Slots unavailable for use when module is last in library and has floor installed | 6 Expansion identification label |
| | 7 Load port |

Figure 15 Drive expansion module slot mapping



10442

- | | |
|--|----------------------------------|
| 1 Slots available for data cartridges | 4 Expansion identification label |
| 2 Array targets | 5 Column numbering |
| 3 Slots unavailable for use when module is last in library and has floor installed | |

Figure 16 Card cage expansion module slot mapping

Slot counts are based on the following assumptions:

- Capacity includes reserved slots for cleaning cartridges.
- Reserved slots are located only in the base module on the left side as you open the front door. These slots are configurable.
- A drive expansion module must be installed below the base module.
- When both the drive and card cage expansion modules are installed, the drive expansion module must be installed below the base module and above the card cage expansion module.
- The last module in the rack requires an installation of the floor. The floor limits the distance the robot can travel, which makes the bottom rows in the module inaccessible for tapes.

HP StorageWorks Command View TL

Command View TL provides a browser-based GUI for remote management and monitoring of the Interface Management card through a LAN. Command View TL is the preferred method for controlling the Interface Manager card. In conjunction with the Interface Manager card, Command View TL provides the following:

- Configuration and management of the Interface Manager card and Fibre Channel interface controllers
- Management of the entire library system
- Hardware inventory and identity information
- Status information for connected hardware
- Error reporting and comprehensive error logs
- Firmware management
- License management

Command View TL is installed on a management station and communicates with the Interface Manager card through the LAN. The management station processes information from the Interface Manager card and *serves up* the Command View TL GUI. You can access Command View TL from the management station directly, or through any client on the LAN using a browser-based GUI. Multiple Command View TL clients can be simultaneously open across the LAN, and multiple EML libraries can be managed through the Command View TL software.

See the Command View TL documentation at <http://www.hp.com/support/cvttl> for prerequisites, installation, and operating instructions.

HP StorageWorks Library and Tape Tools

HP StorageWorks Library and Tape Tools (L&TT) is a collection of storage hardware management and diagnostic tools assembled into a single, convenient program. L&TT offers a GUI or command screen interface (CSI), allowing you to perform the following functions with the EML:

- Installation check—Guides you through a basic installation check of the EML. The software helps you choose an appropriate host bus adapter, ensuring that the device is detected by the system, and verifying key device functionality.
- Device identification—Identifies the storage products connected to the system, along with key information on product configuration and status.
- Troubleshooting tests—Provides various tests to verify product functionality or to isolate product issues. Tests include device self-tests, read/write tests on drives, exerciser tests for autoloaders and libraries, and specific device utilities.

- Support ticket generation—If you experience a problem with a storage product, L&TT can generate a support ticket that includes essential information for troubleshooting the problem.
- Automatic notification of Web updates—If a connection to the Internet is present and Web updates are enabled in the tool preferences, L&TT automatically informs you of the following updates, if available, each time the program is started:
 - New versions of L&TT
 - New firmware files for connected devices
 - New device-specific functionality (such as new or updated tests) for connected devices

For more information on L&TT, access <http://www.hp.com/support/tapetools>.

2 Installing the Library

This chapter describes how to unpack the HP StorageWorks Enterprise Modular Library (EML) E-Series, and install, cable, and configure components. The chapter topics are:

- [Selecting an installation location](#), page 31
- [Receiving and unpacking](#), page 33
- [Component installation](#), page 39
- [Cabling the library](#), page 43
- [Install HP StorageWorks Command View TL](#), page 45
- [Install HP StorageWorks Library and Tape Tools](#), page 45

NOTE: Kits ship with US standard power cables. Non-US power cables are not included.

Selecting an installation location

When choosing an installation site for the EML, consider the requirements in the following sections.

Floor space

When deciding where to place your library, leave at least 122 centimeters (48 inches) of clearance all the way around the pallet and above the rack to allow the removal of packing material. After unpacking the library, you need:

- At least 86 centimeters (34 inches) of clearance in front of the rack to allow the door to open all the way.
- At least 75 centimeters (30 inches) of clearance in the rear of the rack to provide access to components.

Power requirements



WARNING! To reduce the risk of personal injury, fire, or damage to the equipment, do not overload the AC supply branch circuit that provides power to the rack. Consult the electrical authority having jurisdiction over your facility wiring and installation procedures.

When planning for power distribution requirements for your rack configuration:

- The power load must be balanced between available AC supply branch circuits.
- The overall system AC current load must not exceed 80 percent of the branch circuit AC current rating.
- If an uninterruptible power supply (UPS) is used, the load should not exceed 80 percent of the UPS marked electrical current rating.

The installation of this equipment must be in accordance with local and regional electrical regulations governing the installation of Information Technology Equipment by licensed electricians. This equipment is designed to operate in installations covered by the National Electric Code (ANSI/NFPA-70, 1993) and the code for the Protection of Electronic Computer/Data Processing Equipment (NFPA-75, 1992).



WARNING! This product can only be used with an HP approved power cord for your specific geographic region. Use of a non-HP approved power cord may result in: 1) not meeting individual country specific safety requirements; 2) insufficient conductor ampacity that could result in overheating with potential personal injury and/or property damage; and 3) fracturing resulting in the internal contacts being exposed, which potentially could subject the user to a shock hazard. HP disclaims all liability in the event a non-HP approved power cord is used.

For electrical power ratings on options, see the product rating label or user documentation supplied with that option.

Grounding requirements

For proper operation and safety, all powered rack-mountable components are required to be properly grounded in accordance with (NFPA-70, 1993), Article 250. All power distribution devices, branch wiring, and receptacles must be listed as grounding-type devices.

When using power strips for electrical distribution, ensure that ground integrity is maintained for each connection made. Plug each component into a reliably grounded outlet.



WARNING! To reduce the risk of electric shock or damage to equipment, do not disable the power cord grounding feature. This equipment is designed to be connected to a grounded (earthed) power outlet that is easily accessible and located as close as possible to the equipment. The grounding plug is an important safety feature.

Receiving and unpacking

This section explains how to examine and unpack the library, and move it to its final installation location. The library is shipped in packing materials designed to protect it from damage during transit. These instructions help ensure that the library continues to be safeguarded after it arrives at the installation site.

Tools needed for unpacking

These tools are needed for unpacking and setting up the library:

- Safety goggles
- Snips for plastic or metal bands
- Knife or scissors for tape
- Ratchet with 9/16-inch socket (or 9/16-inch open-end wrench)
- Carpenter's level

Receiving the library

Upon receiving the library:

- Unpack the library as close to the installation site as possible.
- Inspect the shipping pallet and carton for damage that might have occurred during shipment.
- Report any damage to the shipper.



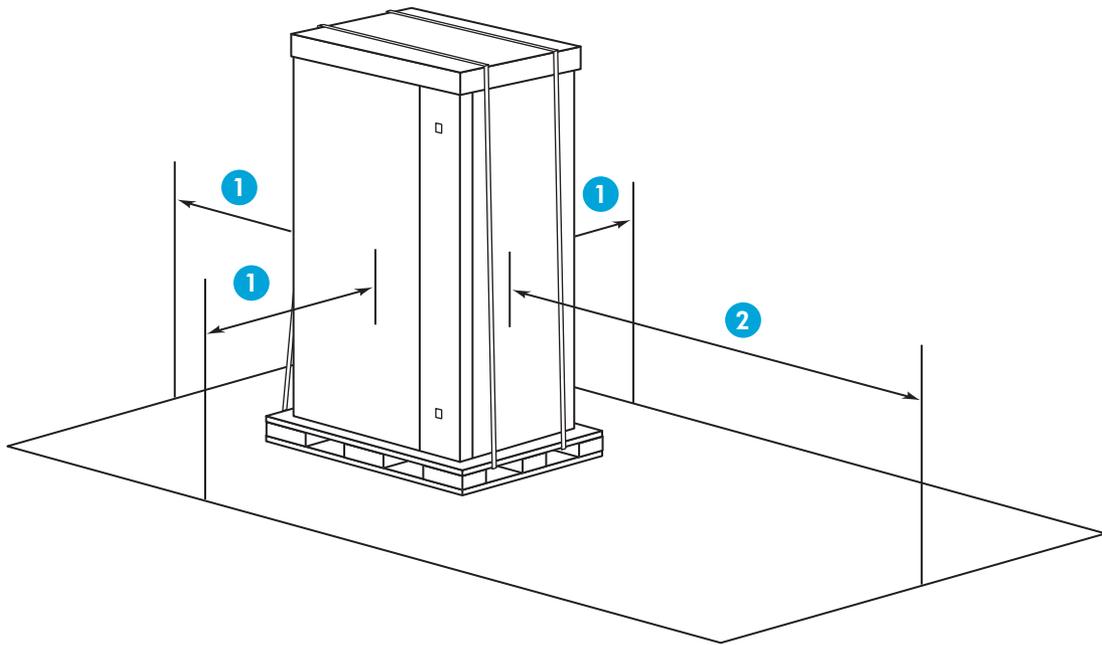
WARNING! Libraries can weigh up to 305 kg (670 lbs), depending on their configuration. At least two people should move and install the library.

Unpacking the library

1. Note the side of the pallet where the library is to be unloaded. The library can be unloaded only from the ramp side of the pallet. The ramp side is designated by holes and arrows on one side of the pallet.
2. Verify the minimum floor space requirements (see [Figure 17](#)).



NOTE: Figure 17 shows the minimum floor space required by the library at its unboxing site. Unboxing the library requires a minimum of 122 cm (4 ft) on all (1) sides. Side (2), used for the unloading ramp, requires 3.05 m (10 ft). The minimum height required for unpacking the library is 2.16 m (85 in).



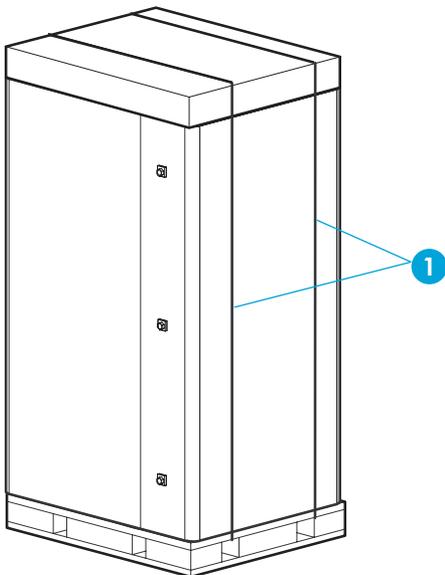
10414

1 122 cm (4 ft)

2 3.05 m (10 ft)

Figure 17 Minimum floor space requirements—unpacking site

3. Cut the bands (1) that secure the library and packing material to the pallet (see Figure 18).



gl01001

1 Bands

Figure 18 Removing the bands

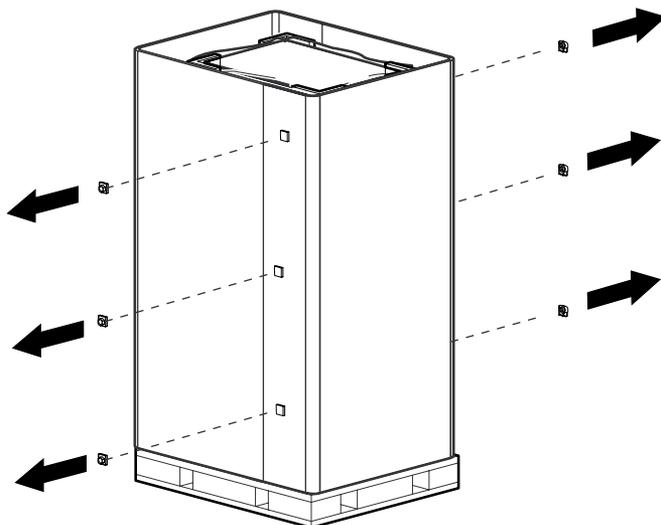
4. Lift the cardboard box top cover straight up, and remove it from the box (see [Figure 19](#)).



gl01002

Figure 19 Removing the box top cover

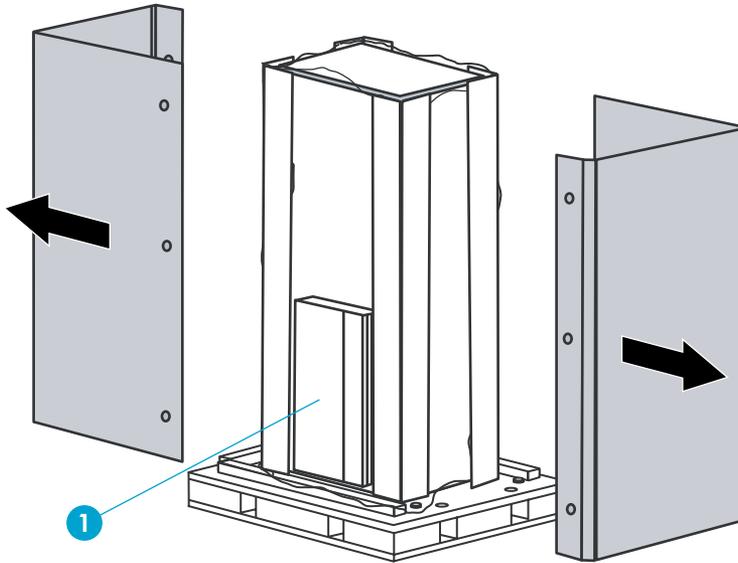
5. Remove the cardboard box retaining clips (see [Figure 20](#)).



gl01003

Figure 20 Removing the box retaining clips

6. Remove the two cardboard sides around the rack (see [Figure 21](#)). Take the ramp (1) assembly off the pallet, and set it aside temporarily.

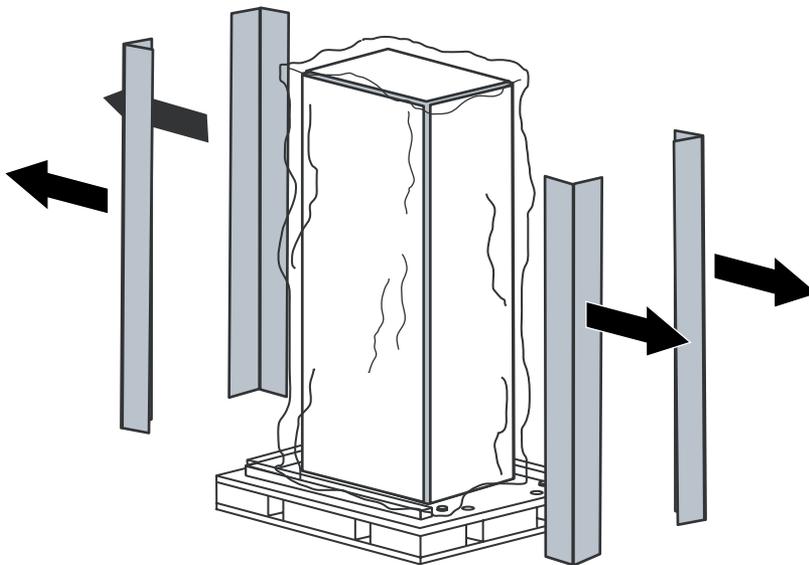


g101004

- 1 Ramp assembly

Figure 21 Removing the cardboard sides

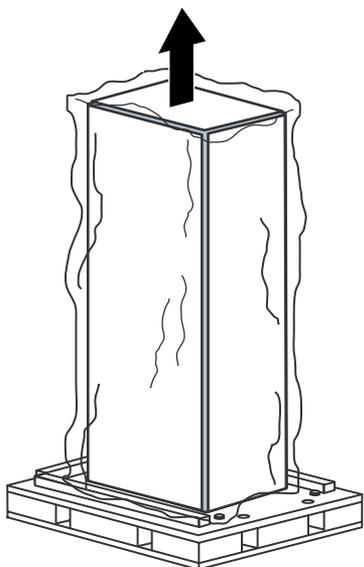
7. Remove the four corner posts on each corner of the rack (see [Figure 22](#)).



g101005

Figure 22 Removing the corner posts

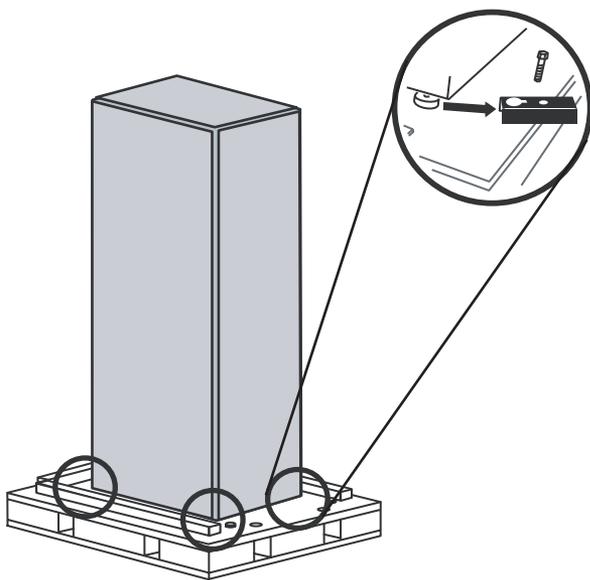
8. Remove the plastic bag covering the rack (see [Figure 23](#)).



gl01006

Figure 23 Removing plastic bag over rack

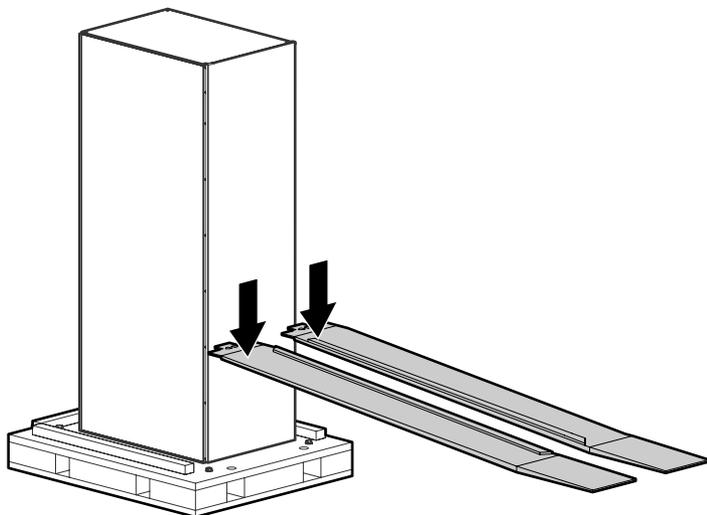
9. Unbolt and remove the four hold-down brackets securing the rack to the pallet (see [Figure 24](#)).



gl01007

Figure 24 Unbolt rack hold-down brackets

10. Remove the ramp assembly from its container. Using the single and double arrows marked on each ramp leg and the pallet, match the ramp arrows to the pallet and press into place (see [Figure 25](#)).



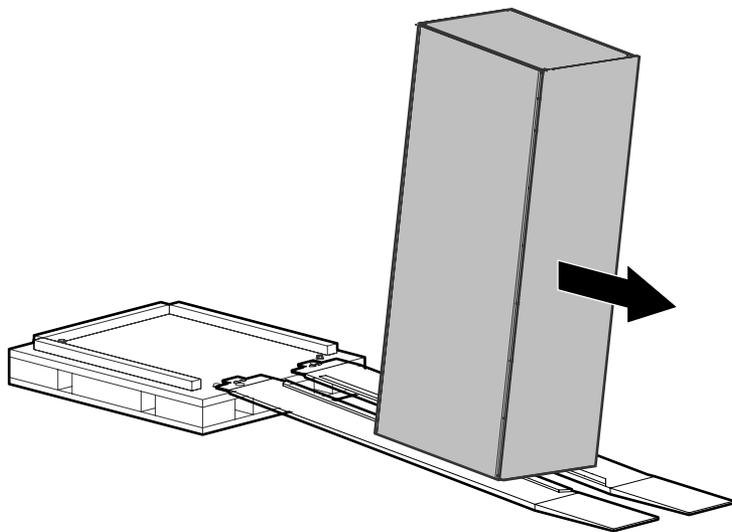
gl01008

Figure 25 Attaching the ramp assembly



WARNING! Two people are required to navigate the rack off the pallet.

11. Roll the rack down the ramp assembly to a location where setup can be completed (see [Figure 26](#)).



gl01009

Figure 26 Rolling the rack down the ramp

Positioning the library

1. Stabilize the library by lowering the leveling feet:
 - a. Rotate each foot of the library until it makes contact with the floor.
 - b. Rotate each foot an additional 1/4 turn to begin raising the library.
 - c. Level the library using a carpenter's level.
2. Inspect the library for any damage that may have occurred during shipment.

Storing the packaging materials

The packaging materials removed from the EML can be used when moving the library to another location. Store the library packaging materials:

1. Detach the ramp and place on top of the pallet.
2. Fold the shipping bag.
3. Place the shipping bag, cap, side posts, brackets, and other packaging materials on the pallet.
4. Fold the cardboard sides and place on top of the packaging materials on the pallet.
5. Secure the packaging materials to the pallet and store for future use.

Component installation

Verify that you have the following equipment and accessories available before beginning the installation process. For a native Fibre Channel (FC) environment, you need the following:

- One or more Ultrium tape drives (these come preinstalled in one orderable EML configuration)
- One HP StorageWorks e2400-FC 2G interface controller for every four tape drives (comes preinstalled in one configuration)
- Four FC drive cables and one Ethernet cable for each e2400-FC 2G interface controller



NOTE: Only use Ethernet cables provided with the library. If the library uses a LAN extension connector, plug into it, and not directly to a card.

-
- One Interface Manager card (preinstalled in EML)
 - One library robotics controller (preinstalled in EML)
 - One FC cable for each interface controller connection to a host or switch (not included)
 - One Ethernet cable for an Interface Manager card connection to the management station
 - One Ethernet cable for an Interface Manager card connection to the library robotics controller (preinstalled)
 - Tape cartridges for appropriate tape drives
 - Power source

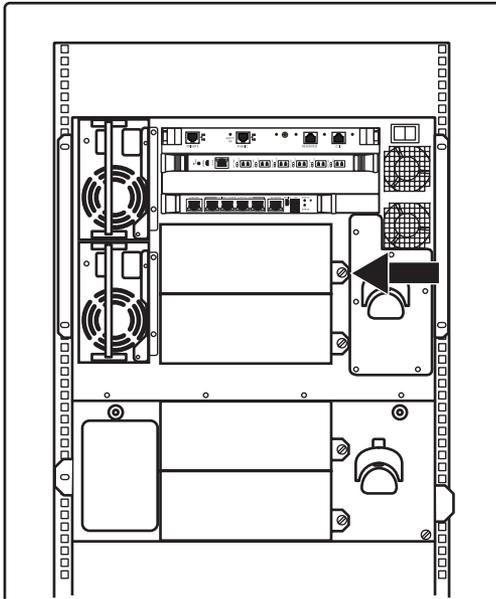
Installing tape drives



CAUTION: Parts can be damaged by electrostatic discharge (ESD). Keep parts in their containers until needed. Ensure that you are properly grounded when touching static-sensitive components.

Drive assemblies ship separately from the library in most configurations. You may have to install up to 16 drives.

1. Open each drive kit and inspect the contents for potential damage or missing parts.
2. Using a slotted screwdriver, loosen the captive screw on the flat plate covering the drive bay for each drive needed for installation (see [Figure 27](#)). Remove and discard the cover plates.



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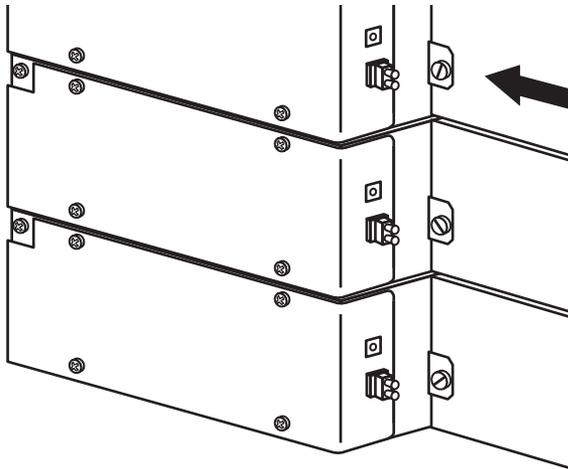
Figure 27 Remove drive cover plates



NOTE: HP recommends that tape drives be installed from top to bottom, with no gaps between drive openings. For example, a configuration using four tape drives would start at the first slot at the top of the rack and use the first four drive openings.

3. Slide each tape drive into an open bay. Insert the drive until the mounting bracket on the drive assembly contacts the back of the module chassis.

- Using a slotted screwdriver, secure all the drives by tightening their captive screws in the mounting bracket into the rack chassis (see [Figure 28](#)).



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Figure 28 Tighten the mounting bracket captive screw

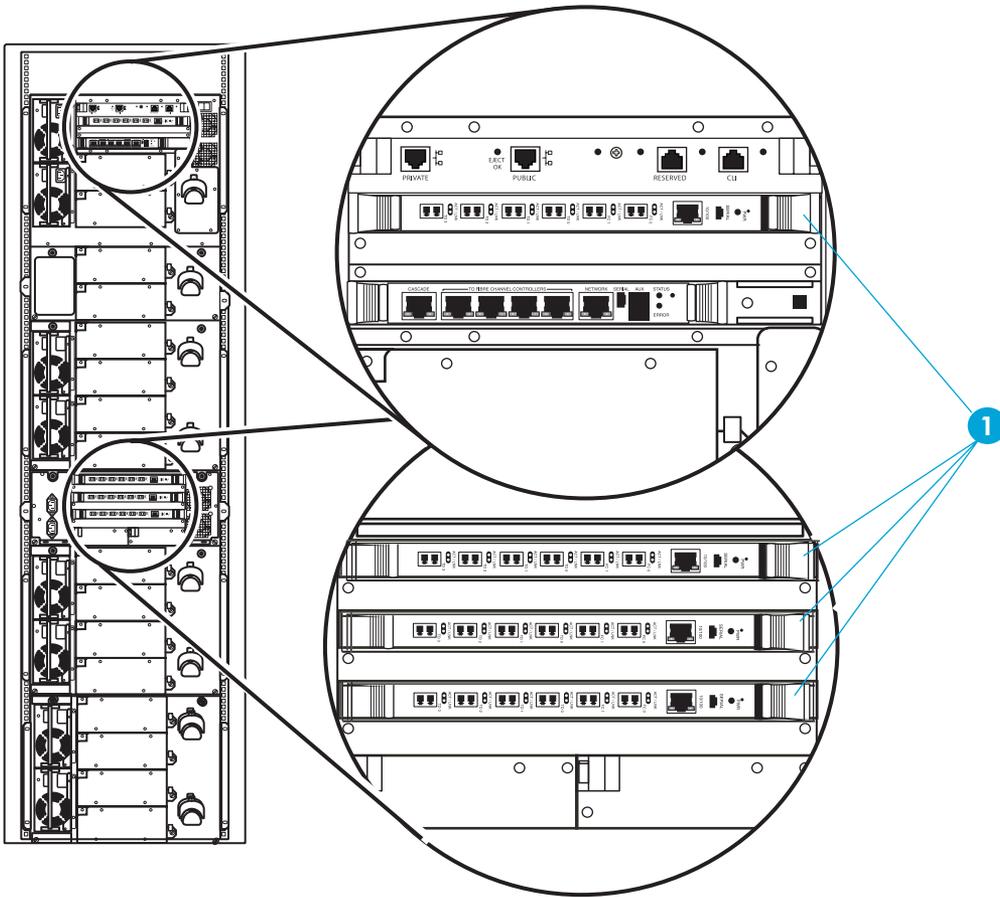
Installing the HP StorageWorks e2400-FC 2G interface controllers

CAUTION: Parts can be damaged by ESD. Keep parts in their containers until needed. Ensure that you are properly grounded when touching static-sensitive components.

The e2400-FC 2G interface controllers ship separately from the library in most configurations. One interface controller can support up to four tape drives. To install these controllers:

- Open each kit and inspect for potential damage or missing parts. Each kit should contain:
 - An Ethernet cable
 - A serial cable

2. Identify the proper slot in the card cage for the e2400-FC 2G interface controller. One must be installed in the base module card cage, and up to three can be installed in the card cage expansion module (see [Figure 29](#)).



10461

1 Interface controller cards

Figure 29 Interface controller locations



TIP: A step stool can be helpful to reach the interface controller slot in the base module card cage located near the top of the library rack.

3. Using a #1 Phillips screwdriver, remove and discard a slot cover for each interface controller needed for installation.
4. With the ports labeled TD# (where # denotes port numbers 0 through 3) to your left as you face the back of the library, slide the controller into the card cage slot. Move the ejector handles inward to fully seat the card.
5. Using a #1 Phillips screwdriver, tighten the ejector handle screws.

NOTE: Cabling is performed in the next section, "[Cabling the library](#)" on page 43.

Cabling the library

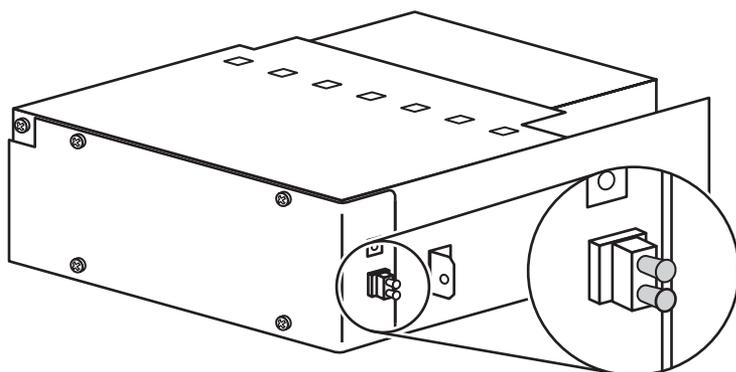
Cabling the HP StorageWorks e2400-FC 2G interface controllers

The following procedure describes how to cable the e2400-FC 2G interface controllers:



NOTE: Each e2400-FC 2G interface controller card ships with an Ethernet cable. The tape drives ship with a fiber optic cable. These parts are needed for the following procedures.

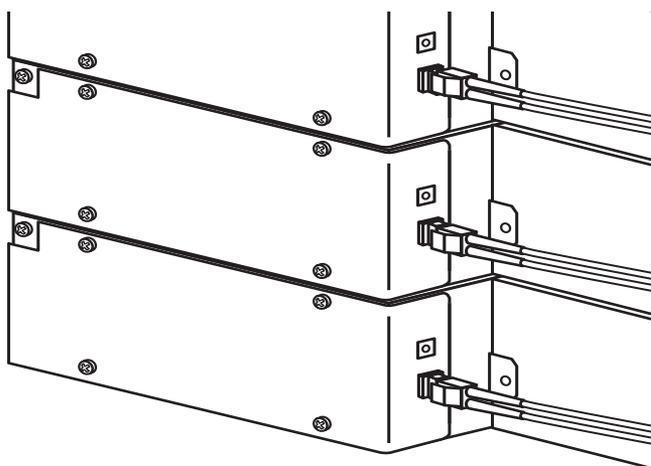
1. Remove the end caps from the Fibre Channel connector on each tape drive to be cabled (see [Figure 30](#)).



10418

Figure 30 Tape drive FC connector

2. Insert an FC cable into the tape drive connector port (see [Figure 31](#)) and connect the other end to a TD# port on an interface controller. Attach a label on each end of the cable to mark the port designations.



10425

Figure 31 Tape drive FC connections

3. Finish cabling a total of up to four tape drives to the TD# ports on the e2400-FC 2G interface controllers.

 **CAUTION:** To avoid damaging the FC cable, do not pinch or sharply bend the cable tighter than a 2-inch diameter. Allow a radial bend when attaching the FC cable to the cable clip.

4. Plug an FC cable (not supplied) into the FC 0 port on the interface controller and plug the other end into either the host bus adapter (HBA) port on a host or into an FC switch that is connected to the host. Attach labels to each end of the cable.
 5. If a second host is available, plug an FC cable (not supplied) into the FC 1 port on the interface controller and plug the other end into the HBA port on the host or into an FC switch. Attach labels to each end of the cable.
 6. Plug the Ethernet cable (included in kit) into the Ethernet port on the interface controller and plug the other end into one of the TO FIBRE CHANNEL CONTROLLERS ports on the Interface Manager card. Attach a label to each end of the Ethernet cable to mark the port designations.
-

 **CAUTION:** Use the Ethernet cables provided with the interface controller card kit. Damage to cards can result from cables that are unshielded.

Cabling the Interface Manager card

Ethernet connections to the Interface Manager card from the e2400-FC 2G interface controllers were made in “[Cabling the HP StorageWorks e2400-FC 2G interface controllers](#)” on page 43. To complete cabling for the Interface Manager card:

1. Plug one end of an Ethernet cable into the CASCADE port of the Interface Manager card and plug the other end into the PUBLIC port on the library robotics controller.
 2. Plug one end of an Ethernet cable into the NETWORK port of the Interface Manager card and plug the other end into the Ethernet port of your management station.
-

 **CAUTION:** If the library is prewired with an Ethernet adapter, plug into the adapter, and not a card. Damage can result to cards by not using the adapter.

3. Label each end of the Ethernet cables with the port designations.
-

Connecting the power cables

1. Plug a power supply cord into each primary power supply on the base module and tape drive expansion modules, and plug the other end into a PDU power strip. If a second PDU and redundant power supplies are installed, plug the power supply cord of each module into separate PDU sources. For example, plug the power cord of the primary power supply in the base module into a power strip from PDU 1, and plug the redundant power supply cord in the base module into a power strip from PDU 2.
2. Plug a power cord into each receptacle on the card cage expansion unit and plug the other ends into a PDU power strip. If a second PDU is installed, plug each cord into a power strip from separate PDUs for AC redundancy.
3. Plug each PDU power cord (if more than one) into separate AC power circuits to establish AC redundancy.

Installation checklist

After installing all library components, look at the back of the library and review the following checklist:

- All tape drives should have one Fibre Channel cable connected to a port in an e2400-FC 2G interface controller (TD0 through TD3).
- All e2400-FC 2G interface controllers should have one Ethernet connection to the Interface Manager card (TO FIBRE CHANNEL CONTROLLERS port).
- All e2400-FC 2G interface controllers should have one or two Fibre Channel connections to the SAN through the FC0 or FC1 ports.
- The Interface Manager card should have one Ethernet connection from the CASCADE port to the PUBLIC port on the library robotics controller.
- The Interface Manager card should have one Ethernet connection from the NETWORK port to an Ethernet port on your management station.
- Each power supply on the base module or tape drive expansion module is plugged into a power strip.
- Each power strip is plugged into a power distribution unit.
- Each power distribution unit is plugged into a factory AC outlet.

Install HP StorageWorks Command View TL

Command View TL is the preferred graphical user interface (GUI) for remote management and monitoring of your library through an Interface Manager card over a LAN. From any client on the LAN, users can use a browser to access Command View TL, which is hosted on a management station.

Read the HP StorageWorks Interface Manager and Command View TL documentation for information on installing and configuring version 1.5.5 or later on the EML. This documentation can be obtained at <http://www.hp.com/support/cvtl>.

Install HP StorageWorks Library and Tape Tools

Library and Tape Tools (L&TT) is a collection of storage hardware management and diagnostic tools that is available by a free download from the Web. Install this application on a host server. For download and general information, access the web site at <http://www.hp.com/support/tapetools>.

3 Preparation for use

This chapter provides instructions for preparing the Enterprise Modular Library (EML) E-Series for use. Topics include:

- [Preparing tape cartridges](#), page 47
- [Inserting tape cartridges into permanent slots](#), page 49
- [Removing the robot shipping restraints](#), page 50
- [Setting the IP address for the HP StorageWorks Interface Manager card](#), page 50
- [EML configuration through the OCP](#), page 51

Preparing tape cartridges

 **CAUTION:** Handle tape cartridges with care. Do not drop, mishandle, or place them near sources of electromagnetic interference. Rough handling can damage the cartridge, making it unusable and potentially hazardous to the tape drives.

Labeling tape cartridges

 **CAUTION:** The misuse and misunderstanding of bar code technology can result in backup and restore failures. To ensure that your bar codes meet HP quality standards, always purchase them from approved suppliers and never print bar code labels yourself. For more information, see the order form provided with the library, as well as the *Bar Code Label Requirements, Compatibility and Usage* white paper available from <http://h18006.www1.hp.com/storage/tapewhitepapers.html>.

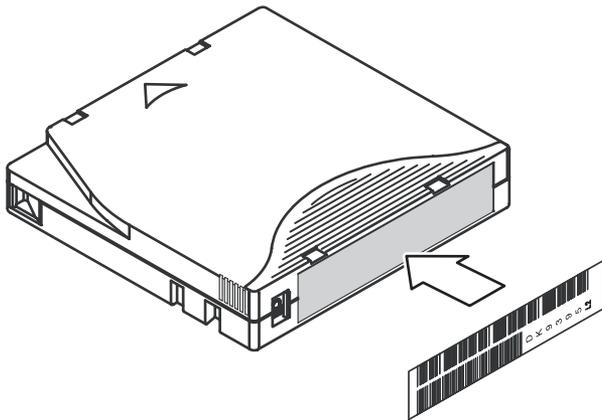
 **NOTE:** For information on ordering tape cartridges and bar code labels, see “[Ordering HP tape cartridges and bar code label packs](#)” on page 123.

Attaching a bar code label to each tape cartridge enables the library and application software to identify the cartridge quickly, thereby speeding up inventory time. When a bar code label is not used, the library simply designates that tape slot as being full. Even though the library functions without bar code labels, make it a practice to use them on your tape cartridges. Your host software can use bar code labels to track the following information:

- Date of format or initialization
- Media pool of tape
- Data residing on the tape
- Age of the backup
- Errors encountered while using the tape (to determine if the tape is faulty)

Ultrium bar code labels

Ultrium cartridges have a recessed area located on the face of the cartridge next to the write-protect switch. Use this area for attaching the adhesive-backed bar code label (see [Figure 32](#)). Only apply labels onto the cartridge in this designated area.

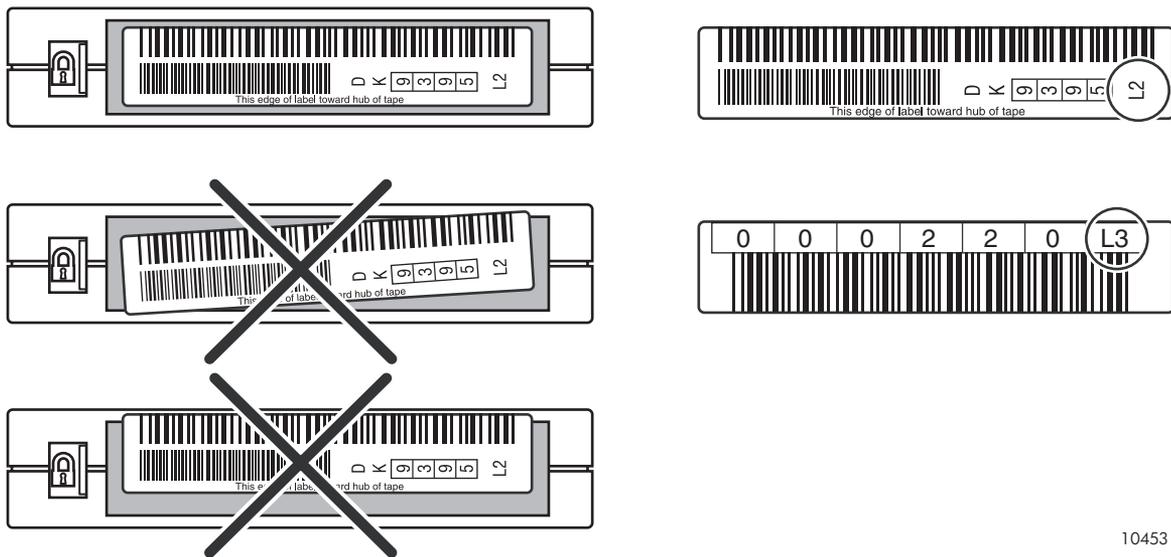


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Figure 32 Attaching an Ultrium bar code label

For successful operation of your tape library, place the bar code label *entirely* within the recessed area, ensuring that no part of the label extends outside.

CAUTION: Apply the bar code label as shown in [Figure 33](#), with the alphanumeric portion facing the hub side of the cartridge (LTO2) or numeric portion away from the hub (LTO3). Never apply multiple labels onto a cartridge, because extra labels can cause the cartridge to jam inside a tape drive.



10453

Figure 33 Proper HP Ultrium LTO2 or LTO3 bar code label placement

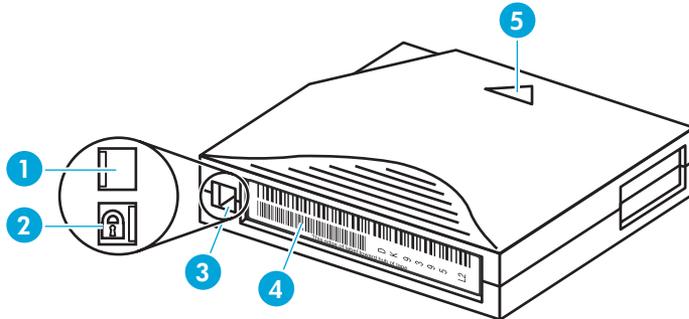
Media label identifiers

Always use the proper bar code labels for your drive technology. An L2 identifier (Ultrium 460) or L3 identifier (Ultrium 960) is located at the end of the 8-character HP Ultrium bar code labels on data cartridges. The universal LTO cleaning cartridges have a CLN and L1 media identifier on the label.

Setting the write-protect switch

Each tape cartridge has a sliding write-protect switch (Figure 34). This switch determines whether new data can be written to the tape cartridge (write-enabled) or whether data on the tape cartridge is protected from being erased or overwritten (write-protected).

By moving the switch to the left, the tape cartridge is write-enabled. By moving the switch to the right, the tape cartridge is write-protected.



10454

- | | |
|------------------------|-------------------|
| 1 Write enabled | 4 Bar code label |
| 2 Write protected | 5 Insertion arrow |
| 3 Write protect switch | |

Figure 34 Write-protecting HP Ultrium tape cartridges

Inserting tape cartridges into permanent slots

The preferred method of loading tape cartridges into the library is through the load port. Inserting tapes through the front library door, though not suggested, should only be done when bulk loading. The use of the load port improves inventory time and working with independent software vendor (ISV) applications. Procedures for using the operator control panel to move cartridges to the tape slots on the library side and rear panels are described in [Chapter 4](#).

CAUTION: Handle tape cartridges with care. Do not drop or bang them, or place them near sources of electromagnetic interference. Rough handling can displace the tape leader, making the cartridge unusable and potentially hazardous to the tape drives.

EML configuration through the OCP

Use the OCP to configure library settings before first use. After the library is powered up, configure these settings as described in "[Configuration screen](#)" on page 61:

- Administrative password
- Load ports
- Network settings
- Bar code reporting format
- Reserve slots
- Inventory mode

4 Library operation

This chapter describes operating procedures for the Enterprise Modular Library (EML) E-Series. The topics in this chapter are:

- [Powering on the library](#), page 53
- [Initialization](#), page 53
- [Front door interlock](#), page 54
- [Inserting tape cartridges into the load port](#), page 54
- [Using the OCP](#), page 55
- [Performing an inventory](#), page 64
- [Controls and indicators](#), page 65
- [Powering off the library](#), page 72

Powering on the library

1. Close and latch the library front door.
2. Open the back doors of the library rack and press the library main power switch (see [Figure 48](#) on page 69) to the 1 (On) position.

NOTE: The following step applies only when the library is powered up for the first time or when a new e2400-FC 2G interface controller is installed. This step is necessary to put the interface controller in managed mode.

3. If this is the first time the library has been powered on after delivery, or if a new e2400-FC 2G interface controller was installed, wait approximately two minutes and power off the main power switch. Wait several seconds and then power on the main power switch again.
4. Close the library rack back doors.



NOTE: The library requires several minutes to power on. Nothing displays on the operator control panel (OCP) for the first few minutes of this process.

Initialization

Initialization occurs when the library is powered on or when the library front door is opened and closed. During initialization, the library robotics controller applies voltage to the motors (picker, table, wrist, and lift drive). The robotics components ranges of motion are tested, the targets and labels are read for calibration purposes, and the slots and tape drives are inventoried by the bar code reader. This information is stored on the library robotics controller.



TIP: The library inventory process is faster when bar code labels are used on all your tape cartridges, and the library is configured to only use bar code labels.

Front door interlock

The library front door cannot be opened until a password-protected command to unlock the door is made through the OCP. This command parks the robot, and actuates a lever that allows the door to be opened. Even if the unit is powered off, the robot must be parked before the door is opened. If the robot is not parked prior to removing power, then the door cannot be readily opened.

Inserting tape cartridges into the load port

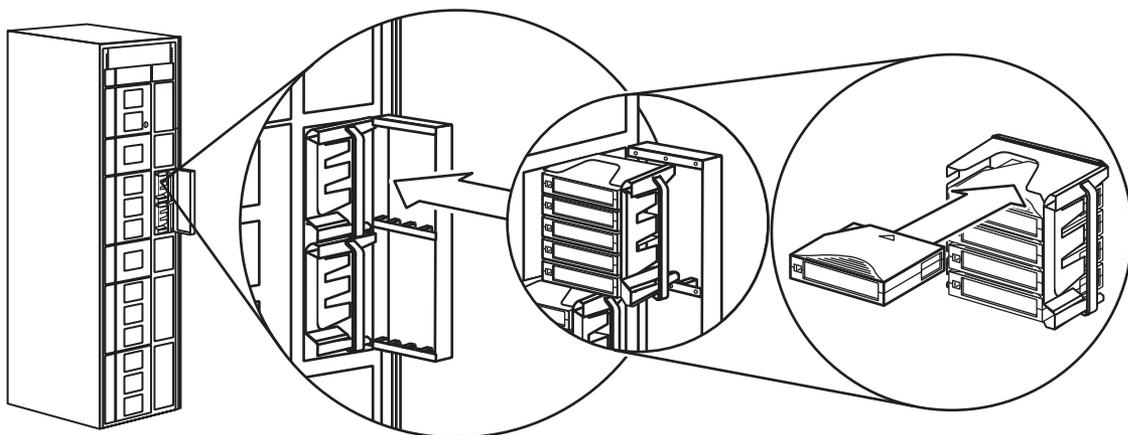
Tape cartridges are inserted into 5-cartridge magazines, which are placed into either the 5-cartridge load port or a 10-cartridge load port. To use a load port:

1. Prepare the tape cartridges to be inserted by affixing a bar code label and write-protecting or write-enabling each cartridge as desired.
2. Select **Operations > Unlock Load Ports** on the OCP. All load port doors open.
3. Pull the magazine from the load port along its track and remove the magazine from the library.
4. Insert the cartridge into any available magazine slot with the write-protect switch positioned to the left.



CAUTION: Excessive force when inserting a magazine can cause a cartridge to unseat and extend into the path of the robot.

5. Align the magazine with the track on the load port door and gently slide the magazine through the spring door and fully into the load port (see [Figure 36](#)).
6. After all load port doors are closed, the library inventories the load ports.



10443

Figure 36 Inserting a magazine into the load port

Using the OCP

The OCP is an LCD screen located on the front of the library that is operated by touch. The icons, text, and tabs on the OCP allow you to obtain information about the library, execute library commands, and test library functions.

OCP icons

Table 3 displays icons that can appear on the OCP.

Table 3 OCP icons

Icon	Description
	Critical error—A component failure had made the library inoperable.
	Warning—A component failure has degraded library activity, but the library is still operable.
	Ready—The library is online and ready for operation.
	Thumbtack out—The screen is eligible to be selected for display after a period of inactivity.
	Thumbtack in—The screen has been selected for display after a period of inactivity. Only one screen at a time can be thumbtacked.
	Item selection—The item can be selected from a menu list.
	Password required—A password is required to access this feature.

Home screen

The first screen displayed after library initialization is the Home screen (Figure 37). After the library status is determined (ready, warning, or error), that status is displayed on the Home screen, and you can touch the screen to access other functional and operational screens.

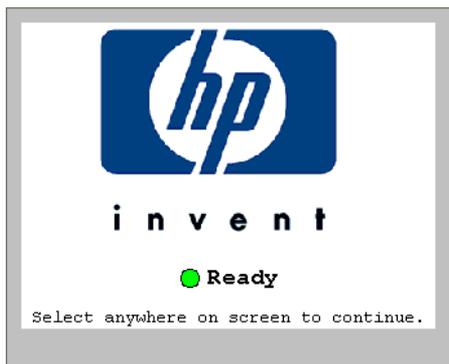
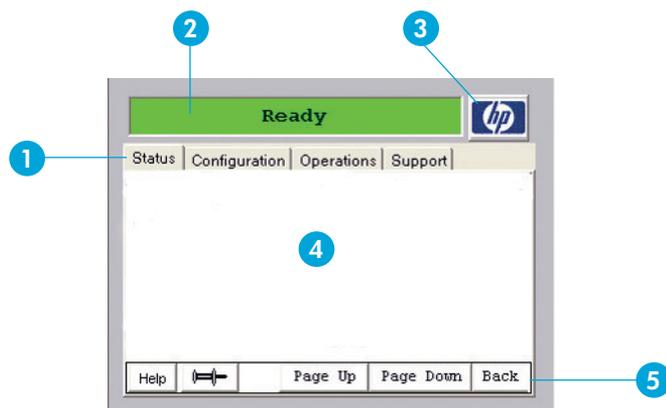


Figure 37 Home screen

OCP tabs and status bar

After touching the Home screen, you are presented with a navigation screen containing a status bar to the left of an HP logo, two rows of tabs, and an area for detailed screen information in the center (see Figure 38).



- | | |
|-----------------------|------------------------------------|
| 1 Top-level menu tabs | 4 Detailed screen information area |
| 2 Status bar | 5 Navigation tabs |
| 3 HP logo | |

Figure 38 OCP navigation

The status bar is a quick indicator of library health. The bar is green when the library is functioning normally, solid yellow during a warning condition, and solid red during an error condition. Touching the status bar takes you to the Health Summary screen.

The detailed functions of the four top-level menu tabs (Status, Configuration, Operations, and Support) are discussed later. Selecting any of these four tabs takes you to menu items under that screen category.

Five navigation tabs can be displayed at the bottom of the screen. One of the tabs can be the thumbtack (in or out) that was discussed in "OCP icons" on page 55. The remaining tabs are:

- **Help**—Displays help text for features appearing on that screen.
- **Page Up**—Scrolls text to a previous page when text is longer than a page in size.
- **Page Down**—Scrolls text to the following page when text is longer than a page in size.
- **Back**—Moves you one level up in the menu tree. All screens except the Home, test status, error message, and keypad screens have this tab at the lower, right corner. Returning to the Home screen removes all password privileges from screens granted access.

Timeouts

The library enters a timeout state after five minutes of inactivity. In this state:

- The OCP backlight turns off.
- Password privileges are removed on all screens granted access.
- The OCP returns to either the Home screen or a thumbtack screen, when one is designated. If a thumbtacked screen consists of more than one page, the pages cycle every five seconds.

Touching a screen in a timeout state turns on the backlight. Subsequent touches after the backlight is lit perform the requested command.

The following are special timeout cases:

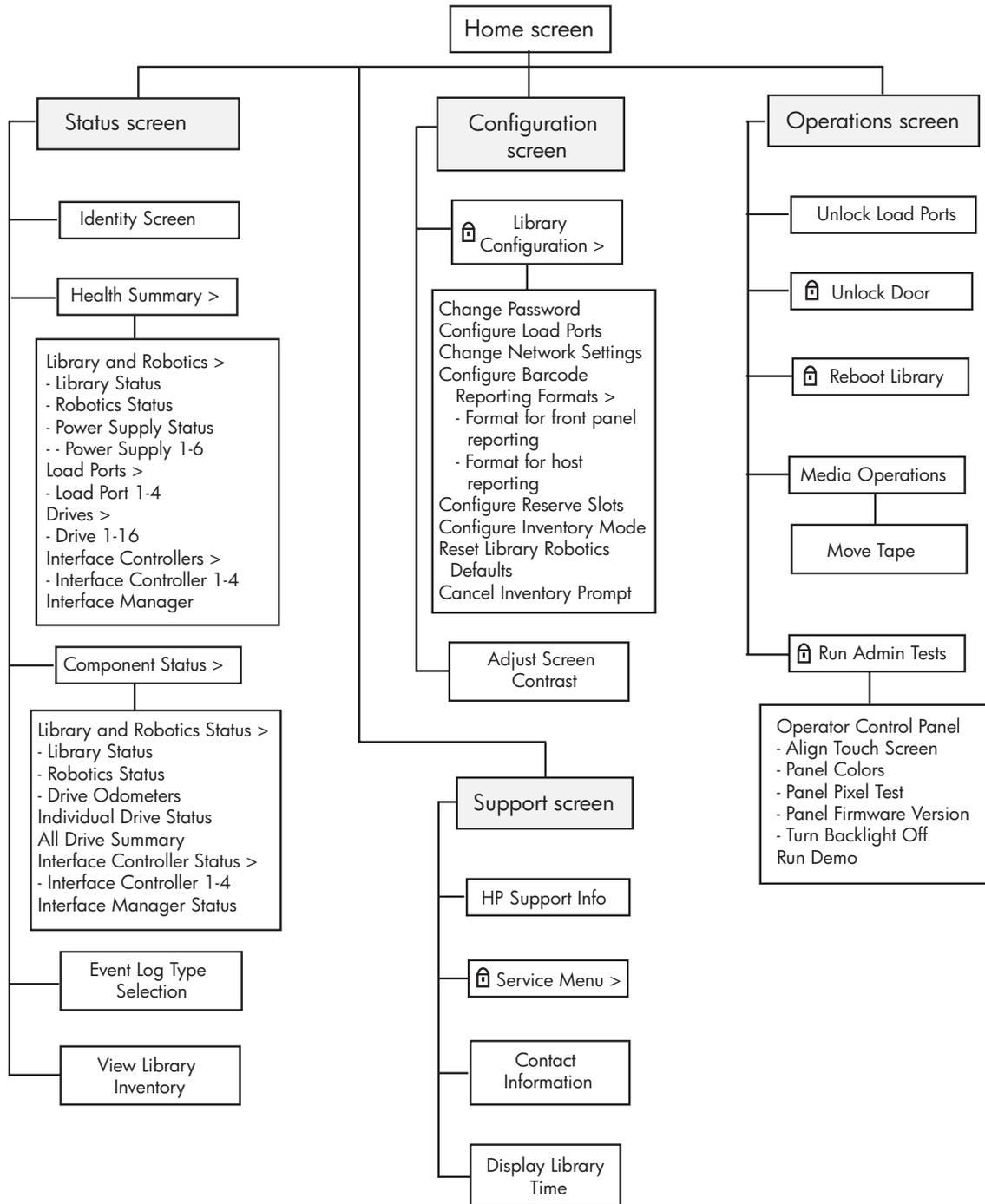
- When a service password is entered, the length of time to enter a timeout state changes from 5 minutes to 30 minutes. If the OCP is touched during the 30-minute period, the library reverts to a normal 5-minute period before a timeout.
- If a warning condition occurs while the library is timed-out, the backlight comes on for 30 minutes. If the OCP is touched during this 30-minute period, the library reverts to a normal 5-minute period before a timeout. Otherwise, the library re-enters a normal timeout state after 30 minutes.
- If an error condition occurs while the library is timed-out, the backlight comes on for 60 minutes. If the OCP is touched during this 60-minute period, the library reverts to a normal 5-minute period before a timeout. Otherwise, the library re-enters a normal timeout state after 60 minutes.

For certain functions, the timeout feature is disabled and re-enabled when the function completes. This occurs:

- During an operation and until the operation completes. For example, the OCP does not time out while a drive clean operation is in progress but waits for the operation to complete before starting the 5-minute timeout counter.
- While displaying the results of any test operation. Select the **Cancel** or **OK** button to return to the test menu screen.
- When displaying an error report or menu after an error. The screen is treated as temporarily thumbtacked, which clears the passworded screens after the normal timeout period, but displays the screen until it is acknowledged.
- When success or failure messages display for an operation. The screen is temporarily thumbtacked, clearing the passworded screens after the normal timeout period, but the screen is displayed until acknowledged.

OCP functions

The OCP allows you to perform various functions on the library. [Figure 39](#) provides a list of the OCP functions available from the Home screen.



g101010

Figure 39 OCP functions

Status screen

The Status screen (Figure 40) provides access to the current state of every EML component. Table 4 describes the information you can obtain from these status screens.

Power supplies, load ports, tape drives, and interface controllers are all numbered from top to bottom in the rack. However, power supplies are numbered by slot, so if a slot is not filled with a power supply, the slot still receives a number. For example, the highest power supply slot in the rack is power supply 1. The next lower power supply slot is power supply number 2. If a power supply is on the same level horizontally (like those in the card cage expansion module), the one to the right (facing the back of the rack) has the next highest number. If a component is removed, the numbering does not change until the library is rebooted. After a reboot, all components are rediscovered and reassigned numbers from top to bottom.

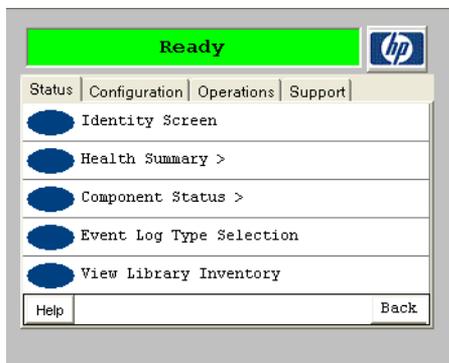


Figure 40 OCP Status screen

Table 4 Status screen functions

Function	Description
Identity Screen	<p>Contains basic configuration information. The library name and IP address is obtained from Command View TL. Other information comes from the robot firmware.</p> <p>The number of interface controllers and drives installed in the library are listed, as well as the total number of available storage slots. For example, load port slots configured as storage slots are counted in the total of available slots, while load ports used to move media in and out of the library are not counted in the total.</p> <p>This screen also shows the library model, library serial number, and library firmware version.</p>
Health Summary	<p>Displays a status icon and health information for the library, robot, power supplies, load ports, drives, interface controllers, and Interface Manager card.</p>

Table 4 Status screen functions (continued)

Function	Description
Component Status	<p>Identifies the status of the overall library and individual components:</p> <ul style="list-style-type: none">• Library and Robotics—Displays library and robotics characteristics, and drive odometer. The odometer counts the number of loads for each drive. The load count is reset when a drive is replaced.• Individual Drive Status—Displays detailed drive information for each drive on individual screens. Select the Page Up and Page Down tabs to move between available drives.• All Drive Summary—Displays an overall status of all installed tape drives and whether they contain media.• Interface Controller Status—Displays the status for individual interface controllers, showing the number of host ports, device ports, and firmware revision.• Interface Manager Status—Displays health and configuration characteristics of the Interface Manager card.
Event Log Type Selection	<p>Allows you to filter informational, warning, and critical events. The five most recent events of any category are displayed with the oldest displayed first and the most recent displayed last. Filtering events does not remove them from the log.</p>
View Library Inventory	<p>Identifies the status of each drive and slot location.</p>

Configuration screen

The Configuration screen (Figure 41) provides administrator access to screens that allow you to change the library configuration or adjust the contrast of the OCP screen. Table 5 describes the settings that you can change using these screens.

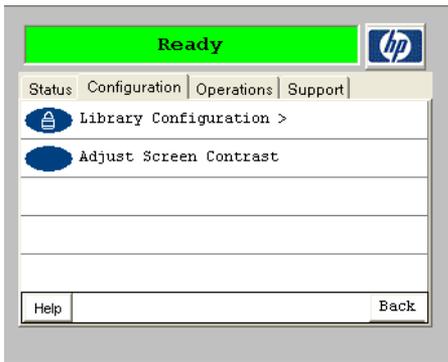


Figure 41 OCP Configuration screen

Table 5 Configuration screen functions

Function	Description
Library Configuration	<p>Allows the following items to be configured:</p> <ul style="list-style-type: none"> Change Password—The library ships with a null password. Passwords must be set to exactly eight characters, consisting of the numbers 0 through 9 and the period character. If you forget your password, contact HP support. HP support can generate a temporary password that will allow you to access the library. Configure Load Ports—This GUI shows the number of installed load ports and enables you to toggle between using each as a load port or for tape slots. Configure it as a Load Port to move tapes in and out of the library. Configure as Slots to increase the number of storage slots in the library. Changing a load port configuration causes a library reboot. Change Network Settings—This configures the network settings for the Interface Manager card, which can be automatically set with DHCP (the default), or manually with a static IP address. Use the Address Config: button to toggle between these two options. If you are manually setting the network addresses, select each address element separately to set the network configuration. Configure Barcode Reporting Formats—This defines how bar codes are displayed on the OCP and sent to the host. Bar code reporting can be configured as 6 to 8 characters and left or right aligned. If 6 characters with left alignment is chosen, any characters after the six are truncated. With 6 characters and right alignment, only the last six characters are shown with the beginning characters truncated. Configure Reserve Slots—Up to nine slots can be reserved for special purposes, such as cleaning tapes. The default is none. Select the number you want to reserve and select Save. Configure Inventory Mode—This allows you to require bar codes on tape cartridges, or to make them optional. Requiring bar codes significantly improves inventory time.
Adjust Screen Contrast	Use the up and down arrows to adjust the screen contrast. The screen refreshes each time an arrow is pressed. Select the OK button when finished.

Operations screen

The Operations screen (Figure 42) provides access to screens that allow you to unlock load ports, unlock the library door, reboot the library, move tapes, clean drives, and run administrative tests. Table 6 describes the operations that can be performed with these screens.

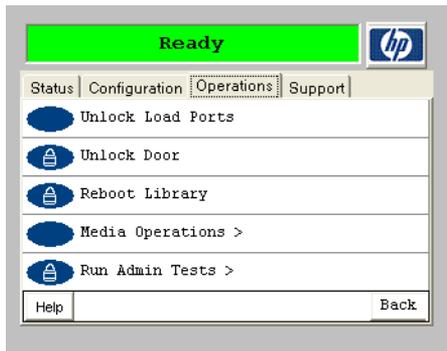


Figure 42 OCP Operations screen

Table 6 Operations screen functions

Function	Description
Unlock Load Ports	Instructs the robot to unlock all load port doors. When all doors are closed, each load port is scanned and inventoried.
Unlock Door	Parks the robot, which allows the library door to be opened. The library is reinventoried after the door is closed.
Reboot Library	Performs a library reboot. An inventory of all tape slots is performed during the reboot, and all hardware controllers and tape drives are rediscovered.
Media Operations	<p>Performs the following tasks:</p> <ul style="list-style-type: none"> Move tape—Select a Source and Element Type (where you want to move a tape <i>from</i>) and a Destination and Element Type (where you want to move a tape <i>to</i>). <p>Element types consist of a drive, load port (I/O), or slot location. Numbers can be entered from the keypad. The up/down arrows cycle you through full (source) or empty (destination) locations.</p> <p>After choosing a source and destination, click Move.</p>

Table 6 Operations screen functions (continued)

Function	Description
Run Admin Tests	<p>Performs the following tests:</p> <ul style="list-style-type: none">• Screen<ul style="list-style-type: none">• Align Screen—Touch and release the screen near the rectangle in the center. As you approach the rectangle at some point, it changes color. The color change takes place when the border of the rectangle is touched. This is where the touch pad and visual screen should be aligned. Use the Up/Down/Left/Right buttons to align the screen.<p>There is no visual effect when using the adjustment buttons. Use the touch screen again to verify the adjustment. Select the Save tab to make the adjustments permanent.</p>• Colors—Displays the range of colors available to the OCP.• Pixel—Tests for bad screen pixels. Select the Test button to turn all pixels black. Touch the screen to turn all pixels white. Touch the screen again to end the test.• Version—Displays the version of the OCP firmware.• Backlight Off—When pressed, turns the OCP backlight off.• Run Demo—Performs tape swaps between slots and load ports. Set the number of loops to be performed (must be at least one). When the demo completes, the cartridges are back in their original configuration.

Support screen

The Support screen (Figure 43) provides access to screens showing HP support information, service tasks, contact information, and allows you to display the library time. Table 7 describes the support information that can be obtained with these screens.

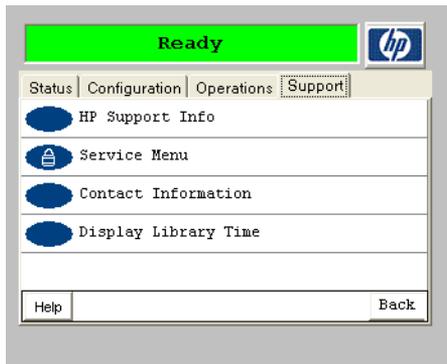


Figure 43 OCP Support screen

Table 7 Support screen functions

Function	Description
HP Support Info	Provides alternate locations where useful information can be obtained.
Service Menu	To be used only by authorized HP service personnel.
Contact Information	Provides contact information as recorded by Command View TL.
Display Library Time	This date and time are used for support purposes and do not necessarily reflect the local date and time.

Performing an inventory

There are three ways to perform an inventory with the library OCP:

- Powering on the library
- Rebooting the library (**Operations > Reboot Library**)
- Opening and closing the front library doors (**Operations > Unlock Door**)

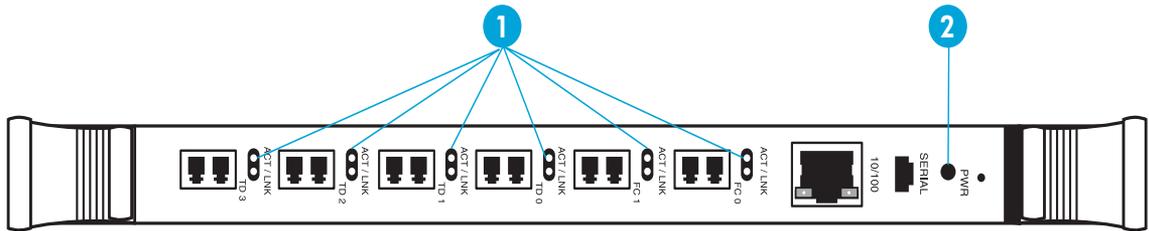
You must configure the library to use or not use bar code labels (**Configuration > Library Configuration > Configure Inventory Mode**). If bar code labels are not used, the inventory time may take as long as an hour, and a cartridge in a slot is only known to the library as being full.

Controls and indicators

This section illustrates and describes the function of the controls and indicators on the EML.

HP StorageWorks e2400-FC 2G Interface Controller card

Figure 44 and Table 8 show and describe the indicators located on the FC interface controller card.



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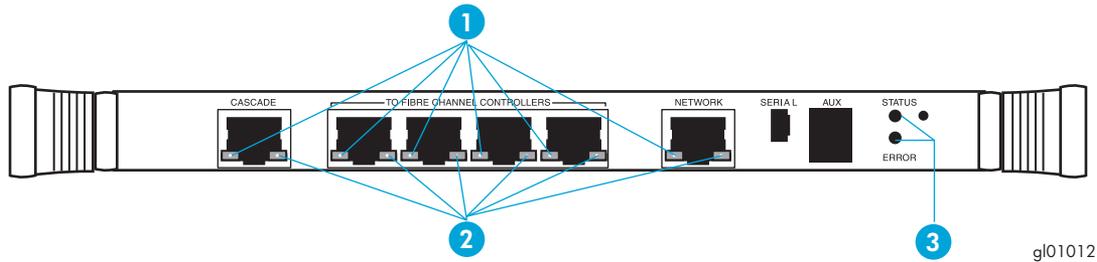
Figure 44 e2400-FC 2G interface controller indicators

Table 8 e2400-FC 2G interface controller indicators

Index No.	Control/indicator	Function
1	ACT/LNK indicators	ACT indicator—When lit, shows port activity. LNK indicator—When lit, shows a valid link is established.
2	PWR indicator	When green, power is applied to the module. When yellow, Power-On-Self-Test (POST) is in process or processor problems exist.

HP StorageWorks Interface Manager card

Figure 45 and Table 9 show and describe the control and indicators located on the FC interface controller card.



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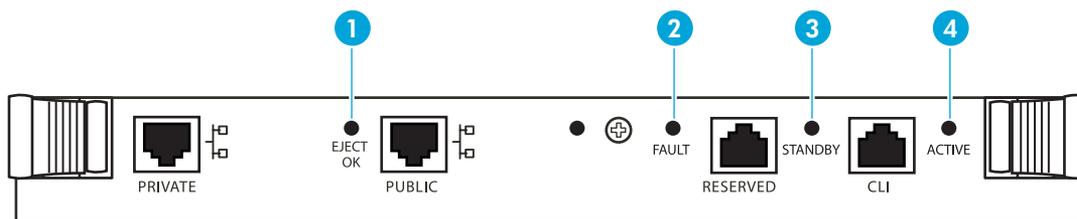
Figure 45 Interface Manager card reset and indicators

Table 9 Interface Manager card reset and indicators

Index No.	Control/indicators		Function
1	Green link speed LED		On—Port operating at 100 Mbps. Off—Port is operating at 10 Mbps, or port is not connected (see link activity LED).
2	Green link activity LED		Off—Port disconnected/no link. On—Port connected to another Ethernet device. Flashing—Data is being transmitted or received.
3	Red LED	Green LED	
	On	Off	BIOS code failed to run.
	Blinks 1x per 5 second interval	Off	Hardware POST failed. No firmware images are loaded.
	Blinks 2x per 5 second interval	Off	No CompactFlash disk or valid boot sector image found.
	Blinks 3x per 5 second interval	Off	Specified firmware image files cannot be found. Neither the current nor the previous image was found.
	Blinks 4x per 5 second interval	Off	Load or execute command failed (boot code remains at end of process). This indicates that load, decompress, or execution failed on both the current and previous image files.
	Off	Blinks 1x per 5 second interval	Normal state. Load or execute command succeeded. Boot code successfully loaded, decompressed, and initiated one of the image files.

Library robotics controller

Figure 46 and Table 8 show and describe the control and indicators located on the FC interface controller card.



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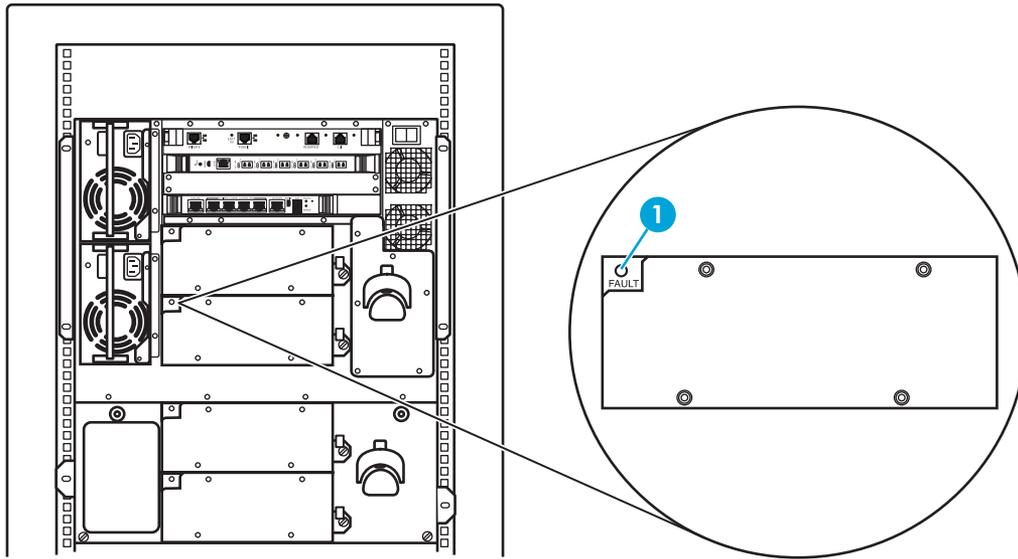
Figure 46 Library robotics controller indicators

Table 10 Library robotics controller indicators

Index No.	Control/indicator	Function
1	EJECT OK LED	Not used.
2	FAULT LED	When flashing (red), indicates the card detects a board fault or software initialization in progress.
3	STANDBY LED	Not used.
4	ACTIVE LED	Always lit (green) when power applied.

HP StorageWorks Ultrium tape drive

Figure 47 and Table 11 show and describe the indicator located on back of the HP Ultrium 460 tape drive.



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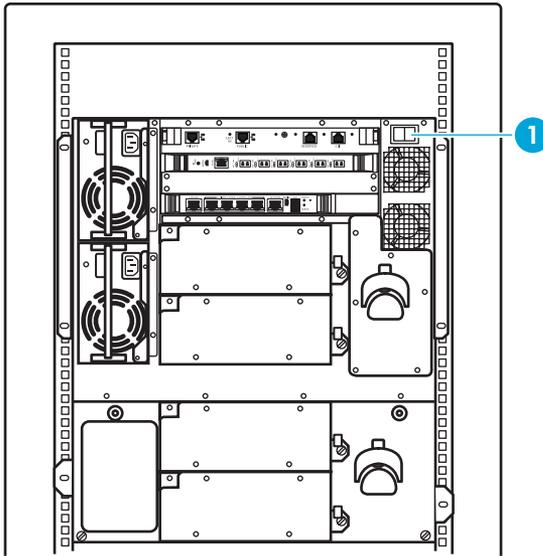
Figure 47 HP Ultrium tape drive indicator

Table 11 HP Ultrium tape drive indicator

Index No.	Control/indicator	Function
1	FAULT LED	When lit (yellow), indicates the library robotics controller software has detected a failure that requires the replacement of the tape drive assembly, or signals that a hot swap can occur. When not lit, indicates normal operation.

Library main power switch

Figure 48 and Table 12 show and describe the function of the library main power switch located at the back of the library at the top of the base module.



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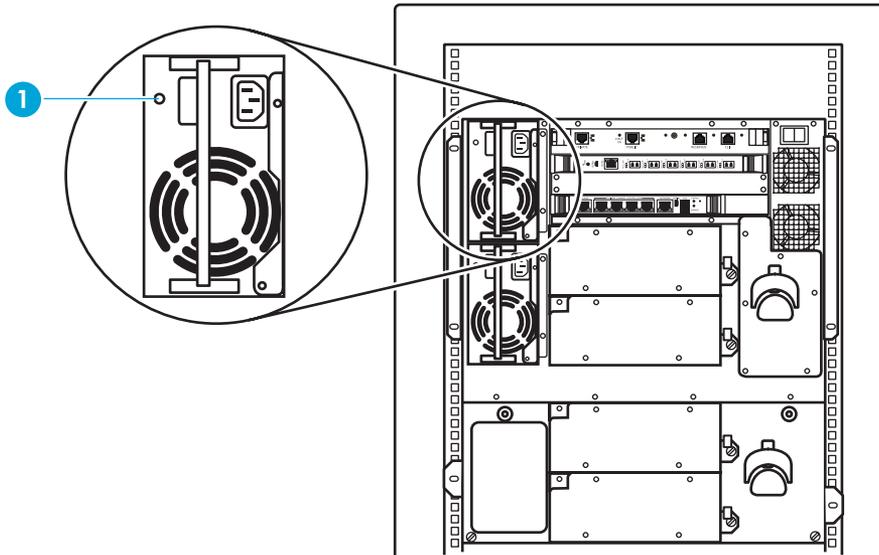
Figure 48 Library main power switch control

Table 12 Library main power switch control

Index No.	Control/indicator	Function
1	Switch	When switched On (1), powers on all library power supplies. When switched Off (0), places all library power supplies in standby mode.

Base module (or tape drive expansion module) power supply

Figure 49 and Table 13 show and describe the indicator located on the autoranging power supply.



10446

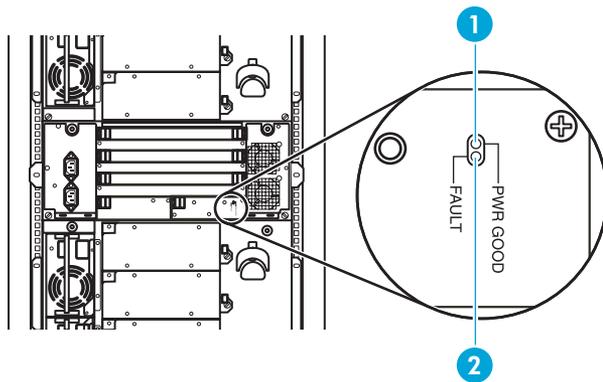
Figure 49 Autoranging power supply indicator

Table 13 Autoranging power supply indicator

Index No.	Indicator	Function
1	Power LED	<p>When lit (green), indicates that all four DC outputs and the fan speed are within specification, and the AC boost circuit is active.</p> <p>When not lit, indicates the main library power switch is turned off or the power supply is in a failed condition and is available for a hot swap.</p>

Card cage expansion module power supply

Figure 50 and Table 14 show and describe the function of the indicators located on the power supply in the card cage expansion module.



10450

Figure 50 Card cage expansion module power supply indicators

Table 14 Card cage expansion module power supply indicators

Index No.	Control/indicator	Function
1	PWR GOOD LED	When lit (green), all DC outputs and the AC input is within operational limits.
2	FAULT LED	When lit (amber), one or all of the DC outputs or the AC input is not within operational limits. This can be an indication that the module power cord is not fully seated into a power receptacle at either end, or that the main library power switch has been turned off.

Power distribution unit

Figure 51 and Table 15 show and describe the function of the control and indicators located on the power distribution unit and the attached extension bars (power strips).

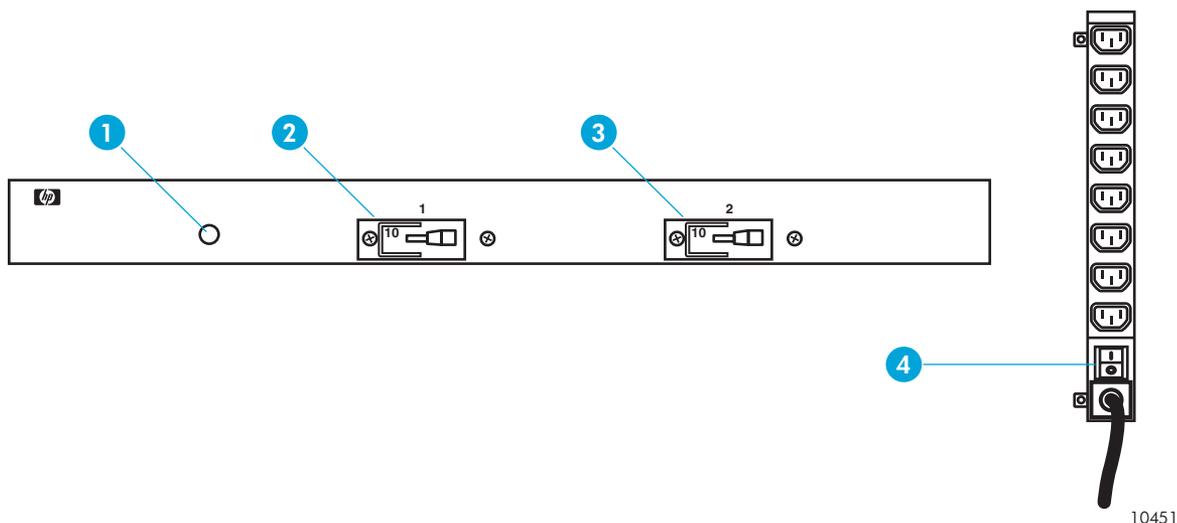


Figure 51 Power distribution unit controls and indicator

Table 15 Power distribution unit controls and indicator

Index No.	Control/indicator	Function
1	Power LED	When lit (red), shows power is applied to the unit. When not lit, indicates the PDU is not receiving power.
2	PDU Switch 1	When switched On, applies power to power strip 1.
3	PDU Switch 2	When switched On, applies power to power strip 2.
4	Power strip power switch	When set to I (On), applies power to the power strip. When set to O (Off), removes power from the power strip.

Powering off the library

1. Verify that all jobs have completed processing.
2. Using the OCP, select **Operations > Media operations > Unlock Door**. The robot is parked.
3. Open the back doors of the library rack.
4. Press the main power switch (Figure 48 on page 69) to the O (Off) position.

5 Maintenance

This chapter describes how to solve problems you may encounter during setup and operation of the Enterprise Modular Library (EML) E-Series. Troubleshooting is discussed, and removal and replacement procedures are described for end-user replaceable parts (EURPs). Topics discussed are:

- [Diagnostic support tools](#), page 73
- [Troubleshooting](#), page 74
- [Removal and replacement](#), page 85
- [Periodic and routine maintenance](#), page 94

Diagnostic support tools

The following tools are available to help you troubleshoot the library:

- HP StorageWorks Command View TL
- HP StorageWorks Library and Tape Tools

HP StorageWorks Command View TL

Command View TL version 1.5.5 or later provides SAN-related diagnostics for the major EML components such as interface controllers, drives, and robotics. Only Command View TL can pull support tickets for the interface controllers, Interface Manager, and the management station. Any firmware updates should be performed with Command View TL.

To use the Web-based GUI or command line interface for library diagnostics, see the *HP StorageWorks Interface Manager and Command View TL user guide*.

HP StorageWorks Library and Tape Tools

Library and Tape Tools (L&TT) is installed on the host, which provides a major advantage when troubleshooting host connectivity and performance. In addition, with L&TT you can:

- Identify all Fibre Channel devices connected to your system.
- View detailed configuration, identification, inventory, and drive information for the library.
- Run advanced diagnostic tests, including connectivity, read/write, media validation, and testing library functionality.
- View library and drive error logs.
- Generate a detailed support file that can be e-mailed or faxed to your support representative for analysis.

The L&TT diagnostic provides an intuitive GUI with integrated context-sensitive help, and can be downloaded free of charge. Go to <http://h18006.www1.hp.com/products/storageworks/ltt> and select **HP L&TT tool**.

Troubleshooting

An incorrect installation or configuration can cause platform problems. In this case, the library appears to be operating normally, but no data can be interchanged, or performance is poor. You also might or might not get an error code on the operator control panel (OCP). To identify an error caused by this type of problem, check your installation and configuration setup.

General drive errors usually result from a miscommunication between a library processor and a tape drive processor, drive and tape interaction issues, or a mechanical malfunction within the library. Both platform problems and general tape drive errors display an error message or event code on the OCP. Use the event code or pull a support ticket to report errors to your authorized service provider, or in some cases, to determine a recovery procedure.

The library depends on several other components to operate correctly. Errors that seem to be caused by the library are often a result of issues on the host, the network cabling, or with the application software. When troubleshooting the library, begin by ruling out these components.

Your application software may need to be reconfigured or, in some cases, reinstalled after you have installed additional drives or slots into the library. Changing the number of load ports, number of reserved slots, or changing between Ultrium 460 and 960 tape drives, may require changes to software. Some application software may require the purchase of additional add-on components and/or licenses when increasing the number of storage slots or drives. Contact your application software provider for more information, or if newly installed storage slots or drives are not recognized by your application software.

The OCP can be an aid in determining the cause of errors. Check the event log on the Status screen for the five most recent informational, warning, or critical events. The last event listed on the screen is the most recent event that occurred. Events have a date stamp, code numbers, a brief text description of the problem, and usually a location of module or slot where the error took place.

Use [Table 16](#) after you isolate your problem to a category or specific area of the EML, and then go to the reference mentioned that describes a corrective action. Try the corrective action, and if it does not remedy the problem, contact your authorized service provider.

Table 16 Fault isolation to a specific area

Problem area or category	Where to find corrective action
Startup problems	Go to Table 17 on page 75
OCP problems	Go to Table 18 on page 77
Robotics problems	Go to Table 19 on page 78
Operating problems	Go to Table 20 on page 79
Tape drive problems	Go to Table 21 on page 80
Interface Manager controller card problems	Go to Table 22 on page 81
FC interface controller problems	Go to "Fibre Channel interface controller problems" on page 82

Startup problems

Table 17 describes corrective actions for problems which occur during startup.

Table 17 Startup problems

Problem	Corrective action
The library does not power on.	Verify that: <ul style="list-style-type: none"> • The power cord is connected to a grounded electrical outlet. • Each PDU power switch is on, as well as the switch on the power strips. • Power cords from PDU power strips are installed and seated. • The library main power switch is on.
The library or tape drives are not detected by the Interface Manager or Command View TL software.	<ul style="list-style-type: none"> • Check cable connections. • Check the cabling. Ensure all radial bends do not exceed a 2-inch diameter. • Verify that the drives and library are powered on and can be seen by the OCP and hosts. • Check the log files for network problems. • Ensure that the interface controllers are powered on and ready.
During initialization, the library robot stops moving and the OCP status bar is red.	Check the last entry in the critical error log on the OCP. Use the following errors as examples in correcting the problem: <p>0100: Module # does not have RLP(2)</p> <ul style="list-style-type: none"> • Check power to the module number. Refer to the checks listed above under “The library does not have power.” <p>5501: Failed target calibration for MRC: X, X. X</p> <ul style="list-style-type: none"> • Verify that nothing is obstructing the bar code reader. • Verify the magazine is installed and seated properly. • Check for defective magazine target markings.

Table 17 Startup problems (continued)

Problem	Corrective action
	<p>0000: End of Text</p> <p>Open the library door and check the picker for a tape cartridge. If so, remove the tape and place it into an empty slot. Close the library door to initiate an inventory.</p>
One or more tape drives fail during startup.	<ul style="list-style-type: none">• Verify the OCP does not show the drive power as off.• Check power supply indicator for power to that module.• Check that the drive is properly cabled and ready.• Check the link indicators on the e2400-FC 2G interface controllers for a valid link to the drives.• Check whether the FAULT indicator is lit on the back of the drive. If so, diagnose the problem.• Ensure the tape drive has the appropriate firmware.

OCP problems

Table 18 describes corrective actions for OCP problems.

Table 18 OCP problems

Problem	Corrective action
The OCP is blank.	<ul style="list-style-type: none">• Touch the OCP to wake it from sleep mode.• Confirm that the power is on.• Use Command View TL software or the Interface Manager CLI to check for errors. See the <i>HP StorageWorks Interface Manager and Command View TL user guide</i>.
The OCP does not respond to touch.	<ul style="list-style-type: none">• Verify that the Ethernet cable is properly connected between the library robotics controller PUBLIC port and the CASCADE port on the Interface Manager card.• Use Command View TL or the Interface Manager CLI to check for errors on the OCP.
An error message is displayed on a red OCP status bar.	<ul style="list-style-type: none">• Review latest error messages in the critical and warning event logs to help decipher the message and determine the cause.
A warning message is displayed on a yellow OCP status bar.	<ul style="list-style-type: none">• Check the Health Status on the OCP to determine cause.• Review latest event details in the warning event log to determine as cause.

Robotics problems

Table 19 describes corrective actions for robotics problems.

Table 19 Robotics problems

Problem	Corrective action
The robot does not move at power on.	<ul style="list-style-type: none"> • Verify that all internal shipping restraints have been removed. • Check that the library front door is closed. • Review latest error messages in the critical and warning event logs to help decipher the message and determine the cause.
The picker partially grips a tape cartridge.	<ul style="list-style-type: none"> • Issue a Move Tape command using the OCP to move the cartridge from the picker to an empty storage bin. • Review latest error messages in the critical and warning event logs to help decipher the message and determine the cause. • Power cycle the library.
The bar code reader fails.	<ul style="list-style-type: none"> • Use the OCP to open the library doors and: <ul style="list-style-type: none"> • Verify that nothing obstructs the reader. • Verify that nothing is obstructing the robot. • Verify that all tape cartridges are fully inserted into the storage slots and no tapes are lying on the library floor. • Check that approved bar code labels are being used and are correctly applied. • Close the library doors to recalibrate the library.
The robot times out or hangs.	<ul style="list-style-type: none"> • Verify that nothing obstructs the robot. • Retry the operation. • Power cycle the library to recalibrate. • Review latest error messages in the critical and warning event logs to help decipher the message and determine the cause.
The robot fails during an operation.	<ul style="list-style-type: none"> • Review latest error messages in the critical and warning event logs to help decipher the message and determine the cause.
The robot drops a cartridge.	<ul style="list-style-type: none"> • Use the OCP to open the library doors. Retrieve the cartridge, orient it properly, and place the cartridge in an empty storage bin. (Do not try to place the cartridge in the picker.) • Close the doors to perform an inventory.

Operating problems

Table 20 describes the corrective action for problems that occur during library operation.

Table 20 Problems during library operation

Problem	Corrective action
The host computer cannot communicate with the library.	<ul style="list-style-type: none"> • Verify that the host computer was added to the Secure Manager using the Command View TL software, and was given access to library components. • Verify there is power to library components. • Verify cable connections and termination. • Verify that the interface controller link LEDs show activity. • Restart the host and the library.
A tape cartridge (medium) is reported not present.	<ul style="list-style-type: none"> • Verify that the designated cartridge is present and properly seated. (For a tape drive, ensure that the cartridge is completely unloaded.) Then, retry the command. • Perform an inventory by opening and closing the library doors.
A move command failed.	<ul style="list-style-type: none"> • Read the error message for detailed information. • Check the source and destination. The source should hold the cartridge to be moved; the destination should be empty. • Ensure that the picker is empty and that there are no obstructions. • Retry the command.
Long inventory times.	<ul style="list-style-type: none"> • Use bar coded media and configure the library to use bar codes. Expect inventory times ranging from 30 minutes for a 24U library to 1 hour for a 40U library with unlabeled media.
Redundant power supply warning.	<ul style="list-style-type: none"> • A warning indicates that the redundant power supply failed. Verify AC power to the power supply. If it is receiving power, replace the power supply.

Tape drive problems

Table 21 describes the corrective action for problems with the tape drives.

Table 21 Tape drive problems

Problem	Corrective action
The library is unable to communicate with a drive.	This is indicated by a Drive Communication Time-out error. <ul style="list-style-type: none">• Check link indicators on the e2400-FC 2G interface controllers.• Reseat the drive.• Check drive status on the OCP and with Command View TL.
The tape drive does not eject a cartridge.	<ul style="list-style-type: none">• Attempt the operation from the application software.• Open the front door, reach in, and press and hold the Eject button on the drive in question.• Power off the library, disconnect the FC cables, power on the library, open the front door, and press and hold the Eject button on the drive in question.
The tape drive reports a read/write error.	<ul style="list-style-type: none">• Try using a new tape.• Clean the drive.• Test the drive with HP StorageWorks L&TT.

Interface Manager card problems

In addition to the Command View TL GUI, the Interface Manager card can be managed through a command line interface (CLI). These CLI commands can be used to diagnose problems. You can access the CLI either through a direct RS-232 serial connection or by using Telnet over the LAN. Refer to the *HP StorageWorks Interface Manager and Command View TL user guide* for instructions on using the CLI.

Table 22 describes common symptoms relating to the Interface Manager card and how to resolve them.

Table 22 Common Interface Manager issues

Symptom	Possible cause	Solution
Command View TL server does not detect the Interface Manager card.	Bad network connection	<ul style="list-style-type: none"> Verify that the Interface Manager card and the management station are correctly connected to the LAN. Use LEDs to troubleshoot Ethernet cabling (Table 9). Ping the Interface Manager to verify network health.
	Interface Manager card not powered on or in ready state	<ul style="list-style-type: none"> Power on the library. Observe status and link LEDs (Table 9). Check for proper level of firmware. See the <i>HP StorageWorks Interface Manager and Command View TL user guide</i> for information.
	Incorrect IP address	<p>Verify that the correct IP address of the Interface Manager card is entered in Command View TL.</p> <ul style="list-style-type: none"> See the <i>HP StorageWorks Interface Manager and Command View TL user guide</i> for information on using CLI commands to verify the network IP address. Configure Command View TL with the correct IP address. See the <i>HP StorageWorks Interface Manager and Command View TL user guide</i> for information on adding a library or visit http://www.hp.com/support/cvttl. See the <i>HP StorageWorks Interface Manager and Command View TL user guide</i> for information on adding the library to Command View TL.
Interface Manager card does not detect one or more FC interface controllers.	Bad network connection	<ul style="list-style-type: none"> Verify that the Interface Manager card is properly connected to the FC interface controllers and that the cables are good. Use LEDs to troubleshoot Ethernet cabling (Table 9).
	Defective Interface Manager card or FC interface controller	<ul style="list-style-type: none"> Observe status and link LEDs (Table 9). Replace defective card or controller.
Interface Manager card does not detect drives or library.	Timing issues	<ul style="list-style-type: none"> Reset the corresponding FC interface controller.
	Drive not powered on or in ready state	<ul style="list-style-type: none"> Ensure the drive is not powered off. Troubleshoot the drive.
Interface Manager unresponsive, with link activity light stuck on or off	Possible ESD failure	Reboot the library.

Table 22 Common Interface Manager issues (continued)

Symptom	Possible cause	Solution
Command View TL does not run in the browser.	Incompatible browser version or Java™ support not enabled	<ul style="list-style-type: none">• Verify that you are using a minimum of Microsoft Internet Explorer 6.0 SP1 or later, or Netscape Navigator 6.2 or later.• Ensure Java support is enabled in the browser.
	Java Runtime Environment (JRE) not installed	<ul style="list-style-type: none">• Download and install the Java 2 Platform, Standard Edition 1.4.2 or later from http://www.java.com.
	Bad network connection or network down	<ul style="list-style-type: none">• Check all physical network connections. If the connections are good, contact your network administrator.• Ping the management station. If pinging fails and the IP address is correct, contact your network administrator.
	Wrong IP address	<ul style="list-style-type: none">• Check the IP address of the management station. On the management station, open a command shell and enter <code>IPCONFIG</code>. You must use this IP address (or the network name of the management station) in the URL to access Command View TL.
	Management station not running, or Command View TL service not running on management station	<ul style="list-style-type: none">• Check to see if the management station is operational.• Use the Services applet to verify that the Command View TL service is running on the management station. Select Start > Settings > Control Panel > Administrative Tools > Services.

Fibre Channel interface controller problems

Most problems with the interface controller occur during the initial installation. Before proceeding with advanced troubleshooting techniques, verify all connections and review the configuration.

LED indicators

The LED indicators on the e2400-FC 2G interface controllers (see [Figure 44](#)) are useful for diagnosing various problems:

- FC port LEDs— Indicate FC activity (ACT) and link (LNK) status. If the link LED is not lit, it can indicate a problem with an FC link. Verify the FC port configuration and cabling.
- Ethernet LEDs— Indicate activity and link status. If one of these indicators is not lit or stays continuously lit, it can indicate a problem with the network connection or cabling. Verify the network connection. The port must be connected to a 10/100Base-T Ethernet network to function properly.

Basic troubleshooting

Simplify the installation by reducing it to the most basic configuration. Then, add elements one at a time, verifying the operation after each step.

Basic troubleshooting includes verifying the setup and the connections, including verifying:

- The FC port connection.
- The interface controller configuration.
- Devices.
- Host configuration.
- HBA device driver information.
- Serial port configuration.

Each of these topics is discussed in the following sections.

Verifying FC port connection

Most hubs and switches have link indicators showing link status. When the FC interface controller is connected and powered on, the link indicator appears solid. If it is not, check the cabling or connections.

To verify links:

- Disconnect and reconnect the FC cable. This procedure causes momentary activity of this indicator as the link reinitializes. Verify that the library is not running any tasks before disconnecting any cables.
- Verify that the cable type for the FC interface controller and the attached hub, HBA, or switch are similar.
- When using optical media, verify that the attached device is using non-OFC (Optical Fiber Communication) type optical devices.

NOTE: By default, the FC port speed is set to 2 Gb/s. Changes to the FC port speed must be manually set, such as for 1 Gb/s. If set incorrectly and the FC interface controller is plugged into a Loop or Fabric, the unit can receive framing errors, which can be found in the trace logs; the fiber link light will be off because of the incorrect FC link speed.

Verifying the interface controller configuration

To verify the interface controller configuration, ensure that:

- The FC interface controller speed is set correctly.
- The connection type is set correctly.
- The host is added to Secure Manager in Command View TL and given permission to communicate with the library.

Verifying devices

HP recommends using Command View TL to verify that the devices are functional.

Verifying the host configuration

In some cases, the FC HBA or host device driver may not be working properly. Check the configuration of these elements.

Check the release notes for the device driver to see if there are any specific issues or a required configuration. Also, ensure that you are using the current version of the HBA driver.

Older applications can have expectations about what constitutes a valid SCSI ID, and thus may not correctly handle certain mappings. This is not an issue for the operating system or most applications. However, some applications may exhibit difficulties addressing target IDs greater than 15 (16 and higher). To resolve this situation in a direct attach configuration, configure the FC interface controller to use hard addressing and set the AL_PA to a value that the HBA can map, with an ID less than 16.

Verifying HBA device driver information

Review the HBA device driver `Readme.txt` file for configuration specifics. An HBA may require a different configuration. HBAs typically come with utility programs to view or change their configurations.

Verifying serial port configuration

If you are having problems connecting to the serial interface, verify the configuration of the terminal or terminal emulation program.

Table 23 Terminal configuration settings

Attribute	Setting
BAUD Rate	Autobaud, 9600, 19200, 38400, 57600, 115200
Data Bits	8
Stop Bit	1
Parity	None
Flow Control	None or XON/XOFF

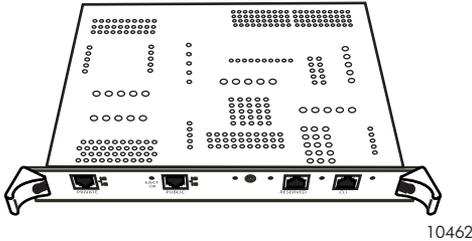
If problems persist, verify the cabling.

If a valid Ethernet IP address is configured, serial configuration settings can also be set via Telnet.

Removal and replacement

This section contains procedures for removing and replacing items that are end-user replaceable. Before randomly replacing suspect components, see the troubleshooting section to isolate a problem to that component. Afterwards, see “[Controls and indicators](#)” on page 65 to verify the component is functioning normally.

Library robotics controller

Part Number	375814-001 (Library robotics controller)
Location	Top card cage slot in the base unit
Characteristics	Contains one Ethernet connection to the Interface Manager card
Function	Controls the robot
Library robotics controller	

Required tools

A #1 Phillips screwdriver is needed for this procedure.

Replacing the library robotics controller

To remove the library robotics controller card:

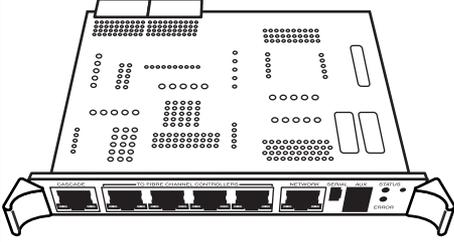
1. Terminate all library activity and verify that the picker is empty.
2. Power off the library:
 - a. Open the door at the rear of the rack.
 - b. Set the library main power switch at the upper right corner to the Off position (see [Figure 48](#) on page 69).
 - c. Ensure all power indicators on the power supplies are off.
3. Identify the library robotics controller at the top card cage slot of the base module.
4. Remove all cabling to the library robotics controller while noting cable locations for later reconnection.
5. Use a #1 Phillips screwdriver to loosen the captive screw in the ejector handles at both ends of the controller.
6. Press the red ejector buttons, and then push the ejector handles outward until the controller disengages from the card cage. Pull on the ejectors to remove the controller from the card cage.
7. Place the controller into an ESD bag.

To install the replacement library robotics controller:

1. Note the proper orientation of the controller to be installed into the base module card cage slot.
2. Holding the ejectors, slide the replacement controller into the card cage slot. As the controller seats into the backplane, push the ejector handles inward to fully seat the controller.
3. Tighten the captive screws in both ejector handles.

4. Connect the cables to the controller.
5. Power on the library:
 - a. Set the library main power switch at the upper right corner to the On position (see [Figure 48](#) on page 69).
 - b. Observe that all power indicators on the power supplies show that power was restored.
 - c. Verify that the library robotics controller ACTIVE indicator is lit (see [Figure 46](#) on page 67).
6. Close the rear rack door.

HP StorageWorks Interface Manager card

Part Number	340213-001 (Interface Manager card) 342215-001 (Memory Module)
Location	Bottom card cage slot in the base module
Characteristics	Contains six Ethernet connections to the robotics controller, Fibre Channel interface controllers, and Network port
Function	Manages the Fibre Channel interface controllers in order to monitor and manage the library
Interface Manager card	 <p>10463</p>

Required tools

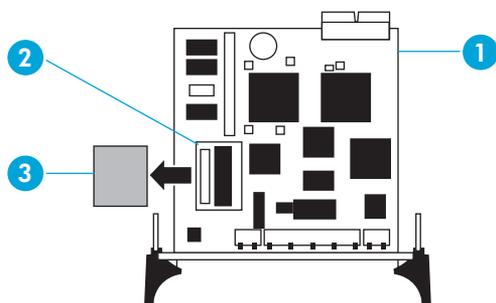
A #1 Phillips screwdriver is needed for this procedure.

Replacing the Interface Manager card

To remove the Interface Manager card:

1. Power off the library:
 - a. Open the door at the rear of the rack.
 - b. Set the library main power switch at the upper right corner to the Off position (see [Figure 48](#) on page 69).
 - c. Ensure all power indicators on the power supplies are off.
2. Identify the Interface Manager. It is located in the bottom slot of the base module card cage.
3. Remove all cabling to the Interface Manager card while noting cable locations for later reconnection.
4. Use a #1 Phillips screwdriver to loosen the captive screws in the ejector handles at both ends of the Interface Manager. Push the ejector handles toward the outside, and then pull on them to remove the card.
5. Relocate the memory module:
 - a. Position the existing Interface Manager card battery-side up to access the memory module.

- b. Grasp the edges of the memory module and slide it out of the flash memory slot. If needed, push a pen into the corner notches of the flash memory slot to unseat the memory module.



gl10032

- | | |
|--------------------------|-----------------|
| 1 Interface Manager card | 3 Memory module |
| 2 Flash memory slot | |

Figure 52 Removing the memory module from the Interface Manager card

- c. Remove the replacement Interface Manager card from its protective sleeve and place it on your work surface (facing battery-side up).
- d. With the connector going in first, align the sides of the memory module with the flash memory slot on the replacement Interface Manager card. Gently slide the memory module into the slot until it is securely seated.
- e. If the memory module does not slide in easily, the module is upside down. Pull the module back out, flip it over, and re-insert it into the slot.

To install the replacement Interface Manager card:

1. Align the replacement Interface Manager card with the guides in the base module card cage and slide the card into the library. Tighten the captive screws.
2. Reconnect the cables to the interface controller exactly as they were connected to the original board.
3. Power on the library:
 - a. Set the library power switch at the upper right corner to the On position (see [Figure 48](#) on page 69).
 - b. Observe that all power indicators on the power supplies show that power was restored.
 - c. Verify that the library robotics controller ACTIVE indicator is lit (see [Figure 46](#) on page 67).
4. Verify that the status LEDs indicate a normal state (see [Table 9](#) on page 66).

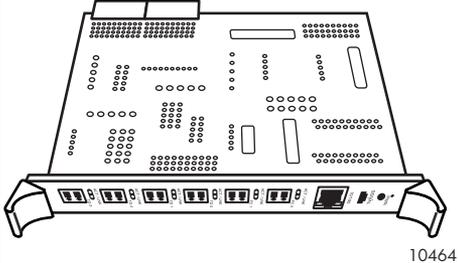


NOTE: Because all the configuration settings of the Interface Manager card are stored in the memory module that you replaced earlier, your replacement Interface Manager card retains the configuration of the original card. To verify or change these settings, see the *HP StorageWorks Interface Manager and Command View TL user guide*.

5. Close the back door of the library.

The Interface Manager card replacement is complete.

HP StorageWorks e2400-FC 2G interface controller

Part number	356690-001
Location	In the second card cage slot in the base module or in one of the slots in the card cage expansion module
Characteristics	Contains 2 HBA or switch FC ports, 4 tape drive FC ports, 1 Ethernet port, and 1 serial port
Function	Manages up to four tape drives and provides bidirectional connectivity for 2 Gb/sec FC interfaces
Interface Controller	

Required tools

A #1 Phillips screwdriver is required for this procedure.

Replacing an HP StorageWorks e2400-FC 2G interface controller

To remove the interface controller:

1. Open the back door of the library.
2. Identify the e2400-FC 2G interface controller to be replaced.

Some indications of a defective controller are when the power is on, the ACT/LNK LEDs are not lit instead of green; the power LED might also be off. You may need to find out which drives are connected to each controller to identify the controller to replace.

3. Set the library main power switch at the upper right corner to the Off position (see [Figure 48](#) on page 69).
4. Remove the existing interface controller:
 - a. Note the cable connections for easier reconnection to the replacement controller.
 - b. Carefully disconnect the Fibre Channel and Ethernet cables from the e2400-FC 2G interface controller by pressing on the connector tabs and removing the cables.
 - c. Use a #1 Phillips screwdriver to loosen the captive screws in the black ejector handles at both ends of the e2400-FC 2G interface controller.
 - d. Push the ejector handles outward, and then pull on the ejectors to remove the controller from the card cage.

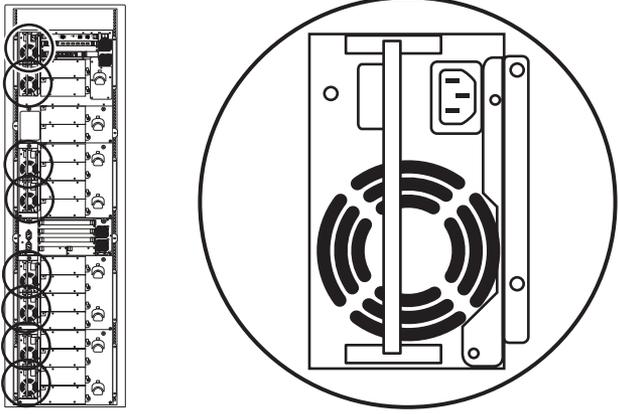
To install the replacement interface controller:

1. Align the controller with the card cage guides, and then slide the controller into the card cage slot.
2. Tighten the ejector handle screws.
3. Connect the Fibre Channel and Ethernet cables exactly as they were on the original controller.
4. Set the library main power switch to the On position. If a new interface controller is used as the replacement, then once the library has been powered on for two minutes, it is powered off, then powered back on.
5. Verify that the power LED and Fibre Link LEDs on the controller are solid green. The link LEDs indicate a good connection.

6. Close the back door of the library.
7. Use the Interface Manager CLI or the HP StorageWorks Command View TL to verify detection of the new controller, and to perform configuration and firmware updates, if necessary.

The interface controller replacement procedure is complete.

Base module (or tape drive expansion unit module) power supply

Part number	375815-001
Location	Primary or redundant power supply in the base module or the tape drive expansion unit
Characteristics	<ul style="list-style-type: none"> • Hot-swappable • Input rating: 100–240 VAC / 50-60 Hz / 7.2A • Output rating: +3.3 VDC, +5 VDC, +12 VDC, -12 VDC • 360 Watts total output power
Function	Provides power to base module and tape drive expansion module.
Power Supply	 <p style="text-align: right;">10465</p>

Required tools

A Torx T-15 screwdriver is required for this procedure.

Replacing a power supply

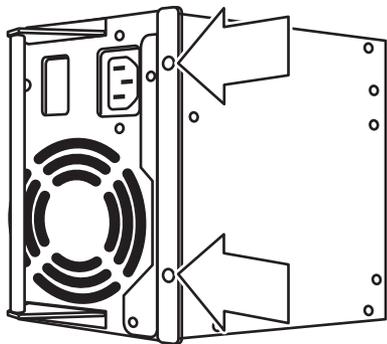
To remove a power supply from the base module or expansion module:

1. Open the back door of the library.
2. Identify the power supply to be replaced.
3. Remove power to the library by turning off the library main power switch (see [Figure 48](#) on page 69).

NOTE: If the faulty power supply is redundant, the library does not have to be powered off during this procedure.

4. Unplug the power supply power cord that is connected to the AC power strip.

5. Remove the two 6-32x3/8 Torx screws securing the power supply to the base or expansion module with a T-15 screwdriver (see [Figure 53](#)).



10466

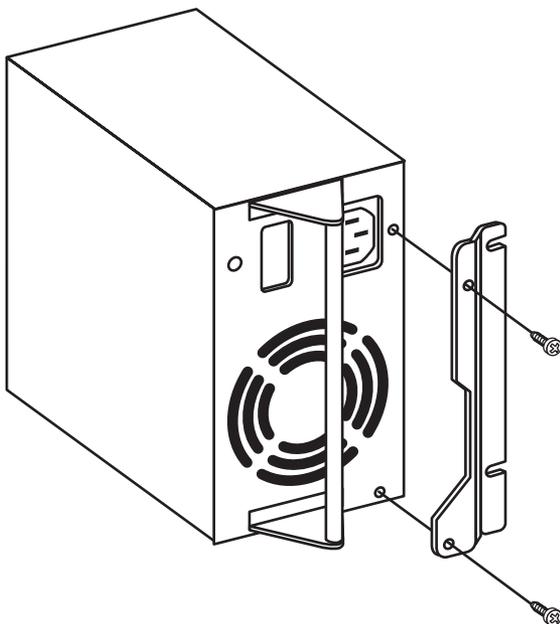
Figure 53 Screws securing power supply to base module

6. Pull the power supply handle to remove the power supply.



WARNING! The power supply can be hot.

7. Remove the power supply bracket on the removed power supply by removing the two 6-32x1/4 Torx screws securing it to the power supply (see [Figure 54](#)).



10467

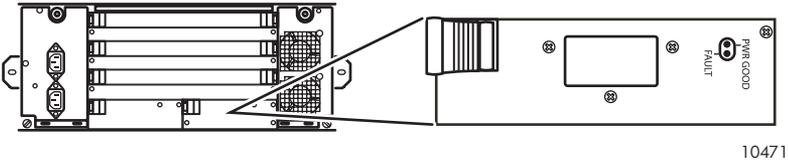
Figure 54 Removing the power supply bracket

To install the replacement power supply into the base or tape drive expansion module:

1. Attach the power supply bracket to the replacement power supply using the two 6-32x1/4 Torx screws.
2. Slide the replacement power supply into the spot vacated by the removed power supply, and then secure with the two 6-32x3/8 screws previously removed.
3. Connect the power cord of the replacement power supply to the desired rack power strip. The LED should be solid green.

4. If power was removed to the library, turn on the library main power switch.
 5. Close the back door of the library.
- The power supply replacement procedure is complete.

Card cage expansion module power supply

Part number	375816-001
Location	Bottom of the card cage expansion module
Characteristics	<ul style="list-style-type: none"> • Hot-swappable • 3U x 8HP size with two LEDs
Function	Provides up to 150 W to card cage
Power supply	

Required tools

A #1 Phillips screwdriver is required for this procedure.

Replacing a card cage expansion module power supply

To remove the power supply:

1. Identify the power supply to be replaced.
2. Use a #1 Phillips screwdriver to loosen the captive screws in the black ejector handle at one end and the screw at the other end.
3. Pull the power supply out of its slot.



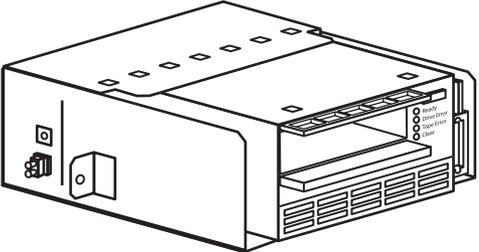
WARNING! The power supply can be hot.

To install the replacement power supply:

1. Hold the power supply with its ejector handle on the left.
2. Slide the power supply into the card cage slot.
3. Tighten the ejector handle screw and the mounting screw on the other end.

The power supply replacement procedure is complete.

HP StorageWorks Ultrium tape drive

Part number	375817-001 (Ultrium 460) 381676-001 (Ultrium 960)
Characteristics	<ul style="list-style-type: none">• Hot-swappable• 1/2 inch cartridge tape drive
Function	Writes data to and reads data from Linear Tape-Open (LTO) cartridges
HP Ultrium 460 or 960	 gl01014

Required tools

A flat blade screwdriver is required for this procedure.

Replacing a tape drive module

To remove the tape drive module:

1. Open the back door of the library.
2. Identify the tape drive to be replaced. The FAULT LED light may be lit (see [Figure 47](#) on page 68).
3. Disconnect the FC cable from the drive to be replaced by pressing down on the cable connector tab and pulling the connector away from the drive.



CAUTION: To avoid damaging FC cables, do not pinch or sharply bend the cables tighter than a 5-centimeter (2-inch) diameter.

4. Remove the FC cable from the cable clip.
5. Using a slotted screwdriver, loosen the captive screw at the right side of the drive module.
6. Grasp the drive and pull the drive from its bay.

To install the replacement tape drive module:

1. Insert the new drive module into the vacant drive bay and tighten the captive screw to secure the drive to the chassis.

2. Connect the FC cable to the FC connector on the new drive (see [Figure 55](#)). The FC cable connector clicks into place.

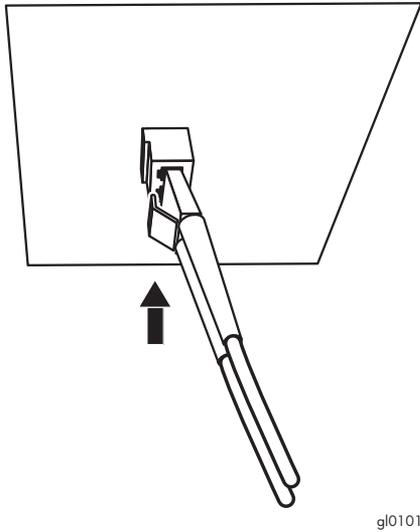


Figure 55 Connecting the FC cable into the new drive

CAUTION: To avoid damaging FC cables, do not pinch or sharply bend them tighter than a 5-centimeter (2-inch) diameter. Allow a radial bend before attaching the FC cables.

3. Use the Command View for Tape Libraries user interface to reboot the interface controller card. See the *HP StorageWorks Interface Manager and Command View TL user guide* for detailed procedures.
4. Verify that the FC port LED on the interface controller card is solid green.
5. Close the back door of the library.



NOTE: Replacement drives put into drive bays previously discovered at power up are recognized by the EML. Drives placed into new drive bays are not recognized until after a reboot.

6. If the drive was placed into a previously unused drive bay, reboot the library.
7. Check the drive status on the OCP to verify that the drive is recognized. Alternatively, ensure that Command View TL recognizes the replaced drive using the console. See the *HP StorageWorks Interface Manager and Command View TL user guide* for detailed procedures.
8. Close the back door of the library.
9. If necessary, upgrade the drive firmware using the Interface Manager CLI. See the *HP StorageWorks Interface Manager and Command View TL user guide* for detailed procedures on upgrading drive firmware.

The tape drive replacement procedure is complete.

Periodic and routine maintenance

This section describes maintenance that occurs on a scheduled or as-need basis.

Maintaining tape cartridges



NOTE: In addition to the information provided in this manual, access the *HP StorageWorks Ultrium Tape Drive User's Guide* from <http://www.hp.com/support> for more information.

For longer life of recorded or unrecorded tape cartridges:

- Do not carry cartridges loosely in a container that exposes them to unnecessary physical shock. Dropping or bumping cartridges can dislodge and damage internal components.
- Store tape cartridges vertically in their protective cases until needed. Store tape cartridges in a clean environment that duplicates the conditions of the room in which they will be used.
- Use tape cartridges in temperatures between 50°F to 104°F (10°C and 40°C).
- If a tape cartridge has been exposed to extreme heat or cold, stabilize the tape cartridge at room temperature for the same amount of time it was exposed for up to 24 hours.
- Keep cartridges out of direct sunlight, and do not place tape cartridges near electromagnetic interference sources, such as terminals, motors, and video or X-ray equipment. Doing so can cause data on the tape cartridge to be altered or erased.
- Do not touch the tape medium or open the tape door unnecessarily. Dust and skin oils can contaminate the tape, impact performance, and cause damage.
- Store tape cartridges in a dust-free environment where the relative humidity is between 20 percent and 80 percent. For longer tape cartridge life, store the tape cartridge at 40 percent to 60 percent relative humidity.
- Use only HP qualified bar code labels. Apply them only in the designated areas of the tape cartridge, and do not apply more than one per cartridge.
- Follow guidelines provided by the tape cartridge manufacturer.



CAUTION: Do not touch the tape leader or the tape medium. Dust or skin oils can contaminate the tape performance, and cause damage.

Cleaning Ultrium tape drives

Be aware of the following:

- Ultrium tape drives have been developed to have a minimal cleaning requirement.
- An HP Ultrium universal cleaning cartridge can be used up to 50 times. If you are using an older HP Ultrium cleaning cartridge, check the documentation that came with your media.



CAUTION: Only use HP Ultrium universal cleaning cartridges in Ultrium 460 or Ultrium 960 tape drives. See ["Ordering HP tape cartridges and bar code label packs"](#) on page 123 for obtaining supplies. The same cleaning cartridge is used for all Ultrium drives.

-
- If the cleaning cartridge is ejected immediately, it has expired, or is not an Ultrium cleaning cartridge, discard it and use a new one.

To clean the tape heads:

1. Move a cleaning cartridge into the drive using your application software. The tape drive automatically loads the cartridge and cleans the heads. The cleaning cycle can take up to five minutes.
2. Move the cleaning cartridge back to the proper storage bin using your application software.

6 Moving the library

This section explains how to move or ship the Enterprise Modular Library (EML) E-Series. These instructions are divided into the following topics:

- [Checking the new installation site](#), page 97
- [Preparing the library for a short move](#), page 97
- [Preparing the library for long-distance relocation](#), page 98
- [Repacking the library](#), page 98
- [Preparing the library for operation](#), page 99

To ship the library or move it using a motor vehicle (for example, truck, or forklift), follow the instructions in this section.

To move the library to a new location within the same building or facility, follow all instructions in this section except for those found in "[Repacking the library](#)" on page 98.

NOTE: These procedures require the original packing materials of the library. If you do not have the original packing materials, contact your support representative for ordering information.



CAUTION: Moving or shipping the library without proper packing materials can result in damage to library components. HP strongly recommends that an HP authorized service representative move a library to another location.

Checking the new installation site

Check the new installation site for the library using the guidelines found in "[Selecting an installation location](#)" on page 31. Verify that the new location meets all applicable clearance, environmental, and power requirements.

Preparing the library for a short move

1. Empty cartridges from the tape drives.
2. At a minimum, attach the robot shipping straps (see [Figure 35](#) on page 50). For added protection, also install the spring clip to prevent movement of the reduction gear.
3. Roll the library carefully on level surfaces to its destination.

Preparing the library for long-distance relocation

1. Unload all tape cartridges from the tape drives using your application software.
2. Power off the library.
3. Unlock and open the front door.
4. Remove all tape cartridges from the library bins.
5. Carefully pack all tapes for shipment.
6. Install shipping restraints on the robot (see [Figure 35](#) on page 50 for location).
7. Disconnect library cables from hosts, switches, or local networks and pack them with other library accessories.
8. If the library needs to be crated, proceed to the next section.

Repacking the library

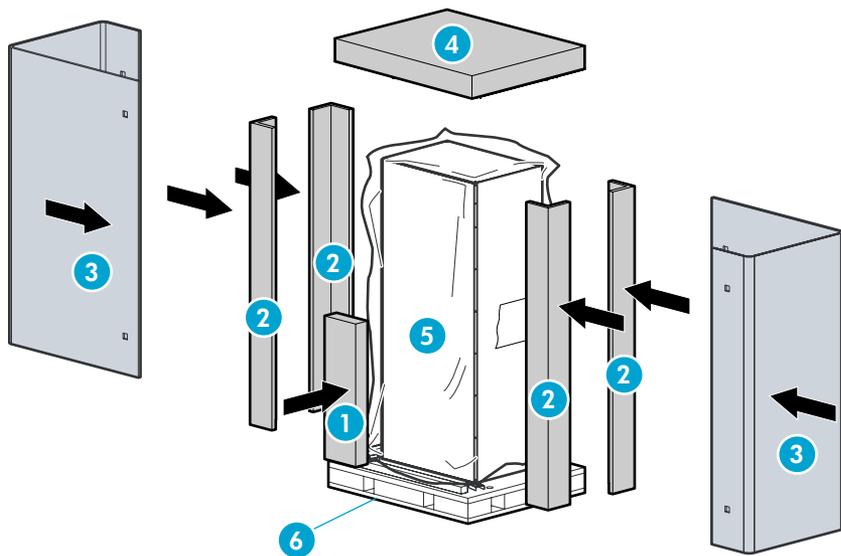
Use this section if you need to:

- Ship the library to the new site.
- Transport the library by forklift or similar means.



WARNING! Use at least two people to perform any steps that involve lifting or guiding the library.

To pack the library for a new site (see [Figure 56](#)):



gl01013

- | | |
|---------------------|------------------|
| 1 Ramps | 4 Cap |
| 2 Corner posts | 5 Antistatic bag |
| 3 Corrugated sheets | 6 Shock pallet |

Figure 56 Repacking the library

1. Place the library on the shock pallet:
 - a. Raise the library support feet.
 - b. With the help of at least one person, roll the library to a position in front of the pallet ramp.
 - c. Roll the library onto the pallet.
2. Secure the library:
 - a. Place the antistatic bag over the library, and secure it into place.
 - b. Use the four shipping bolts to secure the library to the pallet.
 - c. Remove the ramps from the pallet and place them in a box.
3. Place the ramp box and accessory kits onto the pallet.
4. Place the four corner posts against the rack.
5. Wrap the cardboard sheets around the library, and fasten using the plastic restraining clips.
6. Place the top (cap) onto the packed library.
7. Secure the packed library with two restraining bands.

Preparing the library for operation

After shipping or moving the library, see ["Installing the Library"](#) on page 31 to:

- Prepare the new installation site.
- Receive the library.
- Uncrate the library.
- Position the library.
- Remove the robot shipping restraints.
- Install and configure the library.

A Specifications and characteristics

This appendix describes the allowable configurations for the Enterprise Modular Library (EML) E-Series and the physical, electrical, and environmental characteristics of the library.

Table 24 EML configurations

Configuration	Height in "U"	Maximum slots available	Configurable load port slots	Configurable reserved slots	Number of possible drives
Model 103e (base module)	12	103	0–5	0–9	1–4
Model 245e (base module, tape drive expansion module, and card cage expansion module)	24	245	0–15	0–9	1–8
Model 245e plus one 8U tape drive expansion module	32	348	0–25	0–9	1–12
Model 245e plus two 8U tape drive expansion modules	40	442	0–35	0–9	1–16

Table 25 Library component specifications

Characteristic	Specification
<p>HP 10642 rack with 1 PDU</p> <p>Physical:</p> <p>Weight</p> <p>Dimensions (HxDxW)</p> <p>Electrical:</p> <p>AC voltage range</p> <p>Load capacity</p>	<p>114.84 kg (253 lb)</p> <p>199.9 x 100.8 x 61.0 cm (78.7 x 39.7 x 24 in)</p> <p>200–240 V, 50/60 Hz</p> <p>3680 VA (@ 230 VAC)</p>
<p>Base module (12U) with 1 power supply, 2 tape drives, and robot (base module consists of base unit (8U) and drive expansion module (4U))</p> <p>Physical:</p> <p>Weight</p> <p>Dimensions (HxDxW)</p> <p>Electrical:</p> <p>Power rating</p>	<p>Base unit: 45 kg (98 lb) Drive expansion module: 20.5 kg (44.8 lb)</p> <p>Base unit 35.6 x 81.1 x 48.0 cm (14.0 x 31.9 x 18.9 in)</p> <p>Drive expansion module: 17.8 x 81.1 x 48.0 cm (7.0 x 31.9 x 18.9 in)</p> <p>2 A (at 200 VAC) combined max peak</p>
<p>Card cage expansion module (4U)</p> <p>Physical:</p> <p>Weight (with 1 power supply and 3 e2400-FC 2G cards)</p> <p>Dimensions (HxDxW)</p> <p>Electrical:</p> <p>Power rating</p>	<p>20 kg (43.8 lb)</p> <p>17.8 x 76.3 x 48.0 cm (7.0 x 30.0 x 18.9 in)</p> <p>1.25 A (at 200 VAC)</p>

Table 25 Library component specifications (continued)

Characteristic	Specification												
Drive expansion module (8U) with 1 power supply and 4 tape drives Physical: Weight Dimensions (HxDxW) Electrical: Input power Power rating Input current	 41 kg (90.0 lb) 35.6 x 81.1 x 48.0 cm (14.0 x 31.9 x 18.9 in) 288 Watts 297 VA 1.5 A (at 200 VAC)												
Main power supply Weight	 2.3 kg (5.4 lb)												
Card cage expansion module power supply Weight	 0.8 kg (1.8 lb)												
HP LTO Ultrium drive and tray Weight	 3.6 kg (7.9 lb)												
LTO Ultrium cartridge Weight	 220 g (7.8 oz)												
HP StorageWorks e2400-FC 2G interface controller Dimensions Power requirements	 6U wide x 4HP tall <table border="0"> <tr> <td>Voltage</td> <td>Current</td> <td>Power</td> <td>Peak</td> </tr> <tr> <td>3.3 VDC</td> <td>1.5 A</td> <td>4.95 W</td> <td>2.85 A for 4 ms</td> </tr> <tr> <td>5.0 VDC</td> <td>2.7 A</td> <td>13.50 W</td> <td>3.2 A for 0.7 sec</td> </tr> </table> Total power=18.45 W	Voltage	Current	Power	Peak	3.3 VDC	1.5 A	4.95 W	2.85 A for 4 ms	5.0 VDC	2.7 A	13.50 W	3.2 A for 0.7 sec
Voltage	Current	Power	Peak										
3.3 VDC	1.5 A	4.95 W	2.85 A for 4 ms										
5.0 VDC	2.7 A	13.50 W	3.2 A for 0.7 sec										
HP StorageWorks Interface Manager card Dimensions Power requirements	 4U wide x 4HP tall <table border="0"> <tr> <td>Voltage</td> <td>Current</td> <td>Power</td> <td>Peak</td> </tr> <tr> <td>3.3 VDC</td> <td>0.65 A</td> <td>2.14 W</td> <td>2.0 A</td> </tr> <tr> <td>5.0 VDC</td> <td>0.8 A</td> <td>4.0 W</td> <td>2.0 A</td> </tr> </table> Total power=6.14 W	Voltage	Current	Power	Peak	3.3 VDC	0.65 A	2.14 W	2.0 A	5.0 VDC	0.8 A	4.0 W	2.0 A
Voltage	Current	Power	Peak										
3.3 VDC	0.65 A	2.14 W	2.0 A										
5.0 VDC	0.8 A	4.0 W	2.0 A										

Table 26 Library environmental specifications

Item	Measurements		
	Operating	Storage	Transporting
Temperature	+10 to +35°C (+50 to +95°F)	+10 to +40°C (+50 to +104°F)	-40 to +60°C (-40 to +140°F)
Humidity	20 to 80%	10 to 95%	10 to 95%
Web bulb (maximum, noncondensing)	+29.2°C (+84.5°F)	+35°C (+95°F)	+35°C (+95°F)
Altitude	76 to 4,500 m (-250 to 15,000 ft)		

Table 27 Acoustics

Item	Operating	Idle
Sound power	7.5 Bels (A)	7.5 Bels (A)
Sound pressure Bystander position	7.5 Bels (A) (60 dB)	7.5 Bels (A)

Table 28 HP StorageWorks Ultrium tape drive comparisons

Characteristic	Ultrium 460	Ultrium 960
Capacity (native)	200 GB	400 GB
Transfer rate (native)	Up to 30 MB/sec	Up to 80 MB/sec ¹
Data rate matching	10–30 MB/sec	27–80 MB/sec
Host interfaces	2 Gb FC	2 Gb FC
Head channels	8	16
Bit density	7.86 kbp	10.2 kbp
Number of tracks	512	704
Media length	609 m	680 m
WORM media support	No	Yes
Media compatibility		
Read	Ultrium Generation 1, 2	Ultrium Generation 1, 2, 3
Write	Ultrium Generation 1, 2	Ultrium Generation 2, 3

¹ HP classifies the performance of the HP StorageWorks Ultrium 960 as 80 x 1000 x 1000 bytes per second—80 MB/sec (that is, to base 10) in common with most other disk and tape drive vendors. Most applications, however, measure performance as 1024 x 1024 bytes per second.

B Regulatory compliance notices

This appendix contains regulatory notices for the HP StorageWorks Enterprise Modular Library (EML) E-Series.

Regulatory compliance identification numbers

For the purpose of regulatory compliance certifications and identification, this product has been assigned a unique regulatory model number. The regulatory model number can be found on the product nameplate label, along with all required approval markings and information. When requesting compliance information for this product, always refer to this regulatory model number. The regulatory model number is not the marketing name or model number of the product.

Product specific information:

Regulatory model number: LVLDC-0401

FCC and CISPR classification: Class A

Contains fiber optic transceiver with a Class 1 laser. See Class 1 laser statement.

Battery statements



WARNING! This product contains three Lithium batteries located on removable circuit boards:

- The e2400-FC 2G interface controller card AS# AA928-6001 has a Dallas Semiconductor real-time clock P/N DS17887-3 with an internal Lithium battery.
- The Interface Manager card AS# 340252-001 has a CR2032 removable button cell battery.
- The library robotics controller card RLC-66000061 has a CR2450 removable button cell battery.

Lithium may be considered a hazardous material. Dispose of these batteries in accordance with local, state, and federal laws. In addition:

- Do not attempt to recharge the batteries if removed from the cards.
- Do not expose the batteries to water or to temperatures higher than 60°C (140°F).
- Do not abuse, disassemble, crush, or puncture the battery.
- Do not short external contacts or dispose of in fire or water.
- Replace batteries only with designated HP spares.

Batteries, battery packs, and accumulators should not be disposed of together with the general household waste. To forward them to recycling or proper disposal, please use the public collection system or return them to HP, and authorized HP Partner, or their agents.

For more information about battery replacement or proper disposal, contact an authorized reseller service provider.

Dutch battery statement

Verklaring betreffende de batterij



WAARSCHUWING: dit apparaat bevat mogelijk een batterij.

- Probeer de batterijen na het verwijderen niet op te laden.
 - Stel de batterijen niet bloot aan water of temperaturen boven 60° C.
 - De batterijen mogen niet worden beschadigd, gedemonteerd, geplet of doorboord.
 - Zorg dat u geen kortsluiting veroorzaakt tussen de externe contactpunten en laat de batterijen niet in aanraking komen met water of vuur.
 - Gebruik ter vervanging alleen door HP goedgekeurde batterijen.
-

Batterijen, accu's en accumulators mogen niet worden gedeponerd bij het normale huishoudelijke afval. Als u de batterijen/accu's wilt inleveren voor hergebruik of op de juiste manier wilt vernietigen, kunt u gebruik maken van het openbare inzamelingssysteem voor klein chemisch afval of ze terugsturen naar HP of een geautoriseerde HP Business of Service Partner.

Neem contact op met een geautoriseerde leverancier of een Business of Service Partner voor meer informatie over het vervangen of op de juiste manier vernietigen van accu's.

French battery statement

Avis relatif aux piles



AVERTISSEMENT : cet appareil peut contenir des piles.

- N'essayez pas de recharger les piles après les avoir retirées.
 - Évitez de les mettre en contact avec de l'eau ou de les soumettre à des températures supérieures à 60°C.
 - N'essayez pas de démonter, d'écraser ou de percer les piles.
 - N'essayez pas de court-circuiter les bornes de la pile ou de jeter cette dernière dans le feu ou l'eau.
 - Remplacez les piles exclusivement par des pièces de rechange HP prévues pour ce produit.
-

Les piles, modules de batteries et accumulateurs ne doivent pas être jetés avec les déchets ménagers. Pour permettre leur recyclage ou leur élimination, veuillez utiliser les systèmes de collecte publique ou renvoyez-les à HP, à votre Partenaire Agréé HP ou aux agents agréés.

Contactez un Revendeur Agréé ou Mainteneur Agréé pour savoir comment remplacer et jeter vos piles.

German battery statement

Hinweise zu Batterien und Akkus



VORSICHT: Dieses Produkt enthält unter Umständen eine Batterie oder einen Akku.

- Versuchen Sie nicht, Batterien und Akkus außerhalb des Gerätes wieder aufzuladen.
 - Schützen Sie Batterien und Akkus vor Feuchtigkeit und Temperaturen über 60°.
 - Verwenden Sie Batterien und Akkus nicht missbräuchlich, nehmen Sie sie nicht auseinander und vermeiden Sie mechanische Beschädigungen jeglicher Art.
 - Vermeiden Sie Kurzschlüsse, und setzen Sie Batterien und Akkus weder Wasser noch Feuer aus.
 - Ersetzen Sie Batterien und Akkus nur durch die von HP vorgesehenen Ersatzteile.
-

Batterien und Akkus dürfen nicht über den normalen Hausmüll entsorgt werden. Um sie der Wiederverwertung oder dem Sondermüll zuzuführen, nutzen Sie die öffentlichen Sammelstellen, oder setzen Sie sich bezüglich der Entsorgung mit einem HP Partner in Verbindung.

Weitere Informationen zum Austausch von Batterien und Akkus oder zur sachgemäßen Entsorgung erhalten Sie bei Ihrem HP Partner oder Servicepartner.

Italian battery statement

Istruzioni per la batteria



AVVERTENZA: Questo dispositivo può contenere una batteria.

- Non tentare di ricaricare le batterie se rimosse.
 - Evitare che le batterie entrino in contatto con l'acqua o siano esposte a temperature superiori a 60° C.
 - Non smontare, schiacciare, forare o utilizzare in modo improprio la batteria.
 - Non accorciare i contatti esterni o gettare in acqua o sul fuoco la batteria.
 - Sostituire la batteria solo con i ricambi HP previsti a questo scopo.
-

Le batterie e gli accumulatori non devono essere smaltiti insieme ai rifiuti domestici. Per procedere al riciclaggio o al corretto smaltimento, utilizzare il sistema di raccolta pubblico dei rifiuti o restituirli a HP, ai Partner Ufficiali HP o ai relativi rappresentanti.

Per ulteriori informazioni sulla sostituzione e sullo smaltimento delle batterie, contattare un Partner Ufficiale o un Centro di assistenza autorizzato.

Japanese battery statement

バッテリーに関する注意



警告: 本製品はバッテリーを内蔵している場合があります。

- バッテリーを取り外している場合は、充電しないでください。
- バッテリーを水にさらしたり、60°C (140°F) 以上の温度にさらさないでください。
- バッテリーを誤用、分解、破壊したり、穴をあけたりしないでください。
- 外部極を短絡させたり、火や水に投棄しないでください。
- バッテリーを交換する際は、HP指定の製品と交換してください。

バッテリー、バッテリーパック、蓄電池は一般の家庭廃棄物と一緒に廃棄しないでください。リサイクルまたは適切に廃棄するため、公共の収集システム、HP、HPパートナー、またはHPパートナーの代理店にお送りください。

バッテリー交換および適切な廃棄方法についての情報は、HPのサポート窓口にお問い合わせください。

Spanish battery statement

Declaración sobre las baterías



ADVERTENCIA: Este dispositivo podría contener una batería.

- No intente recargar las baterías si las extrae.
- Evite el contacto de las baterías con agua y no las exponga a temperaturas superiores a los 60 °C (140 °F).
- No utilice incorrectamente, ni desmonte, aplaste o pinche las baterías.
- No cortocircuite los contactos externos ni la arroje al fuego o al agua.
- Sustituya las baterías sólo por el repuesto designado por HP.

Las baterías, los paquetes de baterías y los acumuladores no se deben eliminar junto con los desperdicios generales de la casa. Con el fin de tirarlos al contenedor de reciclaje adecuado, utilice los sistemas públicos de recogida o devuélvalas a HP, un distribuidor autorizado de HP o sus agentes.

Para obtener más información sobre la sustitución de la batería o su eliminación correcta, consulte con su distribuidor o servicio técnico autorizado.

Federal Communications Commission notice

Part 15 of the Federal Communications Commission (FCC) Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference-free radio frequency spectrum. Many electronic devices, including computers, generate RF energy incidental to their intended function and are, therefore, covered by these rules. These rules place computers and related peripheral devices into two classes, A and B, depending upon their intended installation. Class A devices are those that may reasonably be expected to be installed in a business or commercial environment. Class B devices are those that may reasonably be expected to be installed in a residential environment (for example, personal computers). The FCC requires devices in both classes to bear a label indicating the interference potential of the device as well as additional operating instructions for the user.

FCC rating label

The FCC rating label on the device shows the classification (A or B) of the equipment. Class B devices have an FCC logo or ID on the label. Class A devices do not have an FCC logo or ID on the label. After you determine the class of the device, refer to the corresponding statement.

Class A equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

Class B equipment

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit that is different from that to which the receiver is connected.
- Consult the dealer or an experienced radio or television technician for help.

Declaration of Conformity for products marked with the FCC logo, United States only.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

For questions regarding this FCC declaration, contact us by mail or telephone:

- Hewlett-Packard Company
P.O. Box 692000, Mail Stop 510101
Houston, Texas 77269-2000
- Or call 1-281-514-3333

Modification

The FCC requires the user to be notified that any changes or modifications made to this device that are not expressly approved by Hewlett-Packard Company may void the user's authority to operate the equipment.

Cables

When provided, connections to this device must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

Canadian notice (Avis Canadien)

Class A equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la class A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Class B equipment

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la class B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union notice

Products bearing the CE marking comply with the EMC Directive (89/336/EEC) and the Low Voltage Directive (73/23/EEC) issued by the Commission of the European Community.

Compliance with these directives implies conformity to the following European Norms (in parentheses are the equivalent international standards and regulations):

- EN 55022 (CISPR 22)—Electromagnetic Interference
- EN55024 (IEC61000-4-2, 3, 4, 5, 6, 8, 11)—Electromagnetic Immunity
- EN61000-3-2 (IEC61000-3-2)—Power Line Harmonics
- EN61000-3-3 (IEC61000-3-3)—Power Line Flicker
- EN 60950 (IEC60950)—Product Safety

Japanese notices

ご使用になっている装置にVCCIマークが付いていましたら、次の説明文をお読み下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスB情報技術装置です。この装置は、家庭環境で使用することを目的としていますが、この装置がラジオやテレビジョン受信機に近接して使用されると、受信障害を引き起こすことがあります。取扱説明書に従って正しい取り扱いをして下さい。

VCCIマークが付いていない場合には、次の点にご注意下さい。

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Japanese power cord statement

製品には、同梱された電源コードをお使い下さい。
同梱された電源コードは、他の製品では使用出来ません。

Please use the attached power cord.
The attached power cord is not allowed to use with other product.

Korean notices

Class A equipment

A급 기기 (업무용 정보통신기기)

이 기기는 업무용으로 전자파적합등록을 한 기기이오니 판매자 또는 사용자는 이 점을 주의하시기 바라며, 만약 잘못판매 또는 구입하였을 때에는 가정용으로 교환하시기 바랍니다.

Class B equipment

B급 기기 (가정용 정보통신기기)

이 기기는 가정용으로 전자파적합등록을 한 기기로서 주거지역에서는 물론 모든지역에서 사용할 수 있습니다.

Taiwanese notices

BSMI Class A notice

警告使用者:

這是甲類的資訊產品，在居住的環境中使用時，可能會造成射頻干擾，在這種情況下，使用者會被要求採取某些適當的對策。

Taiwan battery recycle statement

Recovery mark:	Recovery text:
Four-in-one recycling symbol	"Please recycle waste batteries"
	廢電池請回收

Laser compliance

This device may contain a laser that is classified as a Class 1 Laser Product in accordance with U.S. FDA regulations and the IEC 60825-1. The product does not emit hazardous laser radiation.



WARNING! Use of controls or adjustments or performance of procedures other than those specified herein or in the laser product's installation guide may result in hazardous radiation exposure. To reduce the risk of exposure to hazardous radiation:

- Do not try to open the module enclosure. There are no user-serviceable components inside.
- Do not operate controls, make adjustments, or perform procedures to the laser device other than those specified herein.
- Allow only HP Authorized Service technicians to repair the unit.

The Center for Devices and Radiological Health (CDRH) of the U.S. Food and Drug Administration implemented regulations for laser products on August 2, 1976. These regulations apply to laser products manufactured from August 1, 1976. Compliance is mandatory for products marketed in the United States.

Dutch laser notice



WAARSCHUWING: dit apparaat bevat mogelijk een laser die is geclassificeerd als een laserproduct van Klasse 1 overeenkomstig de bepalingen van de Amerikaanse FDA en de richtlijn IEC 60825-1. Dit product geeft geen gevaarlijke laserstraling af.

Als u bedieningselementen gebruikt, instellingen aanpast of procedures uitvoert op een andere manier dan in deze publicatie of in de installatiehandleiding van het laserproduct wordt aangegeven, loopt u het risico te worden blootgesteld aan gevaarlijke straling. Het risico van blootstelling aan gevaarlijke straling beperkt u als volgt:

- Probeer de behuizing van de module niet te openen. U mag zelf geen onderdelen repareren.
- Gebruik voor de laserapparatuur geen andere knoppen of instellingen en voer geen andere aanpassingen of procedures uit dan die in deze handleiding worden beschreven.
- Alleen door HP geautoriseerde technici mogen het apparaat repareren.

French laser notice



AVERTISSEMENT : cet appareil peut être équipé d'un laser classé en tant que Produit laser de classe 1 et conforme à la réglementation de la FDA américaine et à la norme 60825-1 de l'IEC. Ce produit n'émet pas de rayonnement dangereux.

L'utilisation de commandes, de réglages ou de procédures autres que ceux qui sont indiqués ici ou dans le manuel d'installation du produit laser peut exposer l'utilisateur à des rayonnements dangereux. Pour réduire le risque d'exposition à des rayonnements dangereux :

- Ne tentez pas d'ouvrir le boîtier renfermant l'appareil laser. Il ne contient aucune pièce dont la maintenance puisse être effectuée par l'utilisateur.
 - Tout contrôle, réglage ou procédure autre que ceux décrits dans ce chapitre ne doivent pas être effectués par l'utilisateur.
 - Seuls les Mainteneurs Agréés HP sont habilités à réparer l'appareil laser.
-

German laser notice



VORSICHT: Dieses Gerät enthält möglicherweise einen Laser, der nach den US-amerikanischen FDA-Bestimmungen und nach IEC 60825-1 als Laserprodukt der Klasse 1 zertifiziert ist. Gesundheitsschädliche Laserstrahlen werden nicht emittiert.

Die Anleitungen in diesem Dokument müssen befolgt werden. Bei Einstellungen oder Durchführung sonstiger Verfahren, die über die Anleitungen in diesem Dokument bzw. im Installationshandbuch des Lasergeräts hinausgehen, kann es zum Austritt gefährlicher Strahlung kommen. Zur Vermeidung der Freisetzung gefährlicher Strahlungen sind die folgenden Punkte zu beachten:

- Versuchen Sie nicht, die Abdeckung des Lasermoduls zu öffnen. Im Inneren befinden sich keine Komponenten, die vom Benutzer gewartet werden können.
 - Benutzen Sie das Lasergerät ausschließlich gemäß den Anleitungen und Hinweisen in diesem Dokument.
 - Lassen Sie das Gerät nur von einem HP Servicepartner reparieren.
-

Italian laser notice



AVVERTENZA: AVVERTENZA Questo dispositivo può contenere un laser classificato come prodotto laser di Classe 1 in conformità alle normative US FDA e IEC 60825-1. Questo prodotto non emette radiazioni laser pericolose.

L'eventuale esecuzione di comandi, regolazioni o procedure difformi a quanto specificato nella presente documentazione o nella guida di installazione del prodotto può causare l'esposizione a radiazioni nocive. Per ridurre i rischi di esposizione a radiazioni pericolose, attenersi alle seguenti precauzioni:

- Non cercare di aprire il contenitore del modulo. All'interno non vi sono componenti soggetti a manutenzione da parte dell'utente.
 - Non eseguire operazioni di controllo, regolazione o di altro genere su un dispositivo laser ad eccezione di quelle specificate da queste istruzioni.
 - Affidare gli interventi di riparazione dell'unità esclusivamente ai tecnici dell'Assistenza autorizzata HP.
-

Japanese laser notice



警告: 本製品には、US FDA規則およびIEC 60825-1に基づくClass 1レーザー製品が含まれている場合があります。本製品は人体に危険なレーザー光は発しません。

本書およびレーザー製品のインストールガイドに示されている以外の方法で制御、調整、使用した場合、人体に危険な光線にさらされる場合があります。人体に危険な光線にさらされないため、以下の項目を守ってください。

- モジュール エンクロージャを開けないでください。ユーザーが取り扱えるコンポーネントは含まれていません。
- 本書に示されている以外の方法で、レーザー デバイスを制御、調整、使用しないでください。
- HPの正規サービス技術者のみが本ユニットの修理を許可されています。

Spanish laser notice



ADVERTENCIA: Este dispositivo podría contener un láser clasificado como producto de láser de Clase 1 de acuerdo con la normativa de la FDA de EE.UU. e IEC 60825-1. El producto no emite radiaciones láser peligrosas.

El uso de controles, ajustes o manipulaciones distintos de los especificados aquí o en la guía de instalación del producto de láser puede producir una exposición peligrosa a las radiaciones. Para evitar el riesgo de exposición a radiaciones peligrosas:

- No intente abrir la cubierta del módulo. Dentro no hay componentes que el usuario pueda reparar.
 - No realice más operaciones de control, ajustes o manipulaciones en el dispositivo láser que los aquí especificados.
 - Sólo permita reparar la unidad a los agentes del servicio técnico autorizado HP.
-

Recycling notices

Disposal of waste equipment by users in private household in the European Union



This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service, or the shop where you purchase the product.

Czechoslovakian notice

Likvidace zařízení soukromými domácími uživateli v Evropské unii



Tento symbol na produktu nebo balení označuje výrobek, který nesmí být vyhozen spolu s ostatním domácím odpadem. Povinností uživatele je předat takto označený odpad na předem určené sběrné místo pro recyklaci elektrických a elektronických zařízení. Okamžité třídění a recyklace odpadu pomůže uchovat přírodní prostředí a zajistí takový způsob recyklace, který ochrání zdraví a životní prostředí člověka.

Další informace o možnostech odevzdání odpadu k recyklaci získáte na příslušném obecním nebo městském úřadě, od firmy zabývající se sběrem a svozem odpadu nebo v obchodě, kde jste produkt zakoupili.

Danish notice

Bortskaffelse af affald fra husstande i den Europæiske Union



Hvis produktet eller dets emballage er forsynet med dette symbol, angiver det, at produktet ikke må bortskaffes med andet almindeligt husholdningsaffald. I stedet er det dit ansvar at bortskaffe kasseret udstyr ved at aflevere det på den kommunale genbrugsstation, der forestår genvinding af kasseret elektrisk og elektronisk udstyr. Den centrale modtagelse og genvinding af kasseret udstyr i forbindelse med bortskaffelsen bidrager til bevarelse af naturlige ressourcer og sikrer, at udstyret genvindes på en måde, der beskytter både mennesker og miljø. Yderligere oplysninger om, hvor du kan aflevere kasseret udstyr til genvinding, kan du få hos kommunen, den lokale genbrugsstation eller i den butik, hvor du købte produktet.

Dutch notice

Verwijdering van afgedankte apparatuur door privé-gebruikers in de Europese Unie



Dit symbool op het product of de verpakking geeft aan dat dit product niet mag worden gedeponeerd bij het normale huishoudelijke afval. U bent zelf verantwoordelijk voor het inleveren van uw afgedankte apparatuur bij een inzamelingspunt voor het recyclen van oude elektrische en elektronische apparatuur. Door uw oude apparatuur apart aan te bieden en te recyclen, kunnen natuurlijke bronnen worden behouden en kan het materiaal worden hergebruikt op een manier waarmee de volksgezondheid en het milieu worden beschermd. Neem contact op met uw gemeente, het afvalinzamelingsbedrijf of de winkel waar u het product hebt gekocht voor meer informatie over inzamelingspunten waar u oude apparatuur kunt aanbieden voor recycling.

Estonian notice

Seadmete jäätmete kõrvaldamine eramajapidamistes Euroopa Liidus



See tootel või selle pakendil olev sümbol näitab, et kõnealust toodet ei tohi koos teiste majapidamisjäätmetega kõrvaldada. Teie kohus on oma seadmete jäätmed kõrvaldada, viies need elektri- ja elektroonikaseadmete jäätmete ringlussevõtmiseks selleks ettenähtud kogumispunkti. Seadmete jäätmete eraldi kogumine ja ringlussevõtmine kõrvaldamise ajal aitab kaitsta loodusvarasid ning tagada, et ringlussevõtmine toimub viisil, mis kaitseb inimeste tervist ning keskkonda. Lisateabe saamiseks selle kohta, kuhu oma seadmete jäätmed ringlussevõtmiseks viia, võtke palun ühendust oma kohaliku linnakantselei, majapidamisjäätmete kõrvaldamise teenistuse või kauplusega, kust Te toote ostsite.

Finnish notice

Laitteiden hävittäminen kotitalouksissa Euroopan unionin alueella



Jos tuotteessa tai sen pakkauksessa on tämä merkki, tuotetta ei saa hävittää kotitalousjätteiden mukana. Tällöin hävitettävä laite on toimitettava sähkölaitteiden ja elektronisten laitteiden kierrätyspisteeseen. Hävitettävien laitteiden erillinen käsittely ja kierrätys auttavat säästämään luonnonvaroja ja varmistamaan, että laite kierrätetään tavalla, joka estää terveyshaitat ja suojelee luontoa. Lisätietoja paikoista, joihin hävitettävät laitteet voi toimittaa kierrätettäväksi, saa ottamalla yhteyttä jätehuoltoon tai liikkeeseen, josta tuote on ostettu.

French notice

Élimination des appareils mis au rebut par les ménages dans l'Union européenne



Le symbole apposé sur ce produit ou sur son emballage indique que ce produit ne doit pas être jeté avec les déchets ménagers ordinaires. Il est de votre responsabilité de mettre au rebut vos appareils en les déposant dans les centres de collecte publique désignés pour le recyclage des équipements électriques et électroniques. La collecte et le recyclage de vos appareils mis au rebut indépendamment du reste des déchets contribue à la préservation des ressources naturelles et garantit que ces appareils seront recyclés dans le respect de la santé humaine et de l'environnement. Pour obtenir plus d'informations sur les centres de collecte et de recyclage des appareils mis au rebut, veuillez contacter les autorités locales de votre région, les services de collecte des ordures ménagères ou le magasin dans lequel vous avez acheté ce produit.

German notice

Entsorgung von Altgeräten aus privaten Haushalten in der EU



Das Symbol auf dem Produkt oder seiner Verpackung weist darauf hin, dass das Produkt nicht über den normalen Hausmüll entsorgt werden darf. Benutzer sind verpflichtet, die Altgeräte an einer Rücknahmestelle für Elektro- und Elektronik-Altgeräte abzugeben. Die getrennte Sammlung und ordnungsgemäße Entsorgung Ihrer Altgeräte trägt zur Erhaltung der natürlichen Ressourcen bei und garantiert eine Wiederverwertung, die die Gesundheit des Menschen und die Umwelt schützt. Informationen dazu, wo Sie Rücknahmestellen für Ihre Altgeräte finden, erhalten Sie bei Ihrer Stadtverwaltung, den örtlichen Müllentsorgungsbetrieben oder im Geschäft, in dem Sie das Gerät erworben haben.

Greek notice

Απόρριψη άχρηστου εξοπλισμού από χρήστες σε ιδιωτικά νοικοκυριά στην Ευρωπαϊκή Ένωση



Το σύμβολο αυτό στο προϊόν ή τη συσκευασία του υποδεικνύει ότι το συγκεκριμένο προϊόν δεν πρέπει να διατίθεται μαζί με τα άλλα οικιακά σας απορρίμματα. Αντίθετα, είναι δική σας ευθύνη να απορρίψετε τον άχρηστο εξοπλισμό σας παραδίδοντάς τον σε καθορισμένο σημείο συλλογής για την ανακύκλωση άχρηστου ηλεκτρικού και ηλεκτρονικού εξοπλισμού.

Η ξεχωριστή συλλογή και ανακύκλωση του άχρηστου εξοπλισμού σας κατά την απόρριψη θα συμβάλει στη διατήρηση των φυσικών πόρων και θα διασφαλίσει ότι η ανακύκλωση γίνεται με τρόπο που προστατεύει την ανθρώπινη υγεία και το περιβάλλον. Για περισσότερες πληροφορίες σχετικά με το πού μπορείτε να παραδώσετε τον άχρηστο εξοπλισμό σας για ανακύκλωση, επικοινωνήστε με το αρμόδιο τοπικό γραφείο, την τοπική υπηρεσία διάθεσης οικιακών απορριμμάτων ή το κατάστημα όπου αγοράσατε το προϊόν.

Hungarian notice

Készülékek magánháztartásban történő selejtezése az Európai Unió területén



A készüléken, illetve a készülék csomagolásán látható azonos szimbólum annak jelzésére szolgál, hogy a készülék a selejtezés során az egyéb háztartási hulladéktól eltérő módon kezelendő. A vásárló a hulladékká vált készüléket köteles a kijelölt gyűjtőhelyre szállítani az elektromos és elektronikai készülékek újrahasznosítása céljából. A hulladékká vált készülékek selejtezés kori begyűjtése és újrahasznosítása hozzájárul a természeti erőforrások megőrzéséhez, valamint biztosítja a selejtezett termékek környezetre és emberi egészségre nézve biztonságos feldolgozását. A begyűjtés pontos helyéről bővebb tájékoztatást a lakhelye szerint illetékes önkormányzattól, az illetékes személtakarító vállalatától, illetve a terméket elárúsító helyen kaphat.

Italian notice

Smaltimento delle apparecchiature da parte di privati nel territorio dell'Unione Europea



Questo simbolo presente sul prodotto o sulla sua confezione indica che il prodotto non può essere smaltito insieme ai rifiuti domestici. È responsabilità dell'utente smaltire le apparecchiature consegnandole presso un punto di raccolta designato al riciclo e allo smaltimento di apparecchiature elettriche ed elettroniche. La raccolta differenziata e il corretto riciclo delle apparecchiature da smaltire permette di proteggere la salute degli individui e l'ecosistema. Per ulteriori informazioni relative ai punti di raccolta delle apparecchiature, contattare l'ente locale per lo smaltimento dei rifiuti, oppure il negozio presso il quale è stato acquistato il prodotto.

Latvian notice

Nolietotu iekārtu iznīcināšanas noteikumi lietotājiem Eiropas Savienības privātajās māsaimniecībās



Šāds simbols uz izstrādājuma vai uz tā iesaiņojuma norāda, ka šo izstrādājumu nedrīkst izmest kopā ar citiem sadzīves atkritumiem. Jūs atbildat par to, lai nolietotās iekārtas tiktu nodotas speciāli iekārtotos punktos, kas paredzēti izmantoto elektrisko un elektronisko iekārtu savākšanai otrreizējai pārstrādei. Atsevišķa nolietoto iekārtu savākšana un otrreizējā pārstrāde palīdzēs saglabāt dabas resursus un garantēs, ka šīs iekārtas tiks otrreizēji pārstrādātas tādā veidā, lai pasargātu vidi un cilvēku veselību. Lai uzzinātu, kur nolietotās iekārtas var izmest otrreizējai pārstrādei, jāvērsas savas dzīves vietas pašvaldībā, sadzīves atkritumu savākšanas dienestā vai veikalā, kurā izstrādājums tika nopirkts.

Lithuanian notice

Vartotojų iš privačių namų ūkių įrangos atliekų šalinimas Europos Sąjungoje



Šis simbolis ant gaminio arba jo pakuotės rodo, kad šio gaminio šalinti kartu su kitomis namų ūkio atliekomis negalima. Šalintinas įrangos atliekas privalote pristatyti į specialią surinkimo vietą elektros ir elektroninės įrangos atliekoms perdirbti. Atskirai surenkamos ir perdirbamos šalintinos įrangos atliekos padės saugoti gamtinius išteklius ir užtikrinti, kad jos bus perdirbtos tokiu būdu, kuris nekenkia žmonių sveikatai ir aplinkai. Jeigu norite sužinoti daugiau apie tai, kur galima pristatyti perdirbtinas įrangos atliekas, kreipkitės į savo seniūniją, namų ūkio atliekų šalinimo tarnybą arba parduotuvę, kurioje įsigijote gaminį.

Polish notice

Pozbywanie się zużytego sprzętu przez użytkowników w prywatnych gospodarstwach domowych w Unii Europejskiej



Ten symbol na produkcie lub jego opakowaniu oznacza, że produktu nie wolno wyrzucać do zwykłych pojemników na śmieci. Obowiązkiem użytkownika jest przekazanie zużytego sprzętu do wyznaczonego punktu zbiórki w celu recyklingu odpadów powstałych ze sprzętu elektrycznego i elektronicznego. Osobna zbiórka oraz recykling zużytego sprzętu pomogą w ochronie zasobów naturalnych i zapewnią ponowne wprowadzenie go do obiegu w sposób chroniący zdrowie człowieka i środowisko. Aby uzyskać więcej informacji o tym, gdzie można przekazać zużyty sprzęt do recyklingu, należy się skontaktować z urzędem miasta, zakładem gospodarki odpadami lub sklepem, w którym zakupiono produkt.

Portuguese notice

Descarte de Lixo Elétrico na Comunidade Européia



Este símbolo encontrado no produto ou na embalagem indica que o produto não deve ser descartado no lixo doméstico comum. É responsabilidade do cliente descartar o material usado (lixo elétrico), encaminhando-o para um ponto de coleta para reciclagem. A coleta e a reciclagem seletivas desse tipo de lixo ajudarão a conservar as reservas naturais; sendo assim, a reciclagem será feita de uma forma segura, protegendo o ambiente e a saúde das pessoas. Para obter mais informações sobre locais que reciclam esse tipo de material, entre em contato com o escritório da HP em sua cidade, com o serviço de coleta de lixo ou com a loja em que o produto foi adquirido.

Slovakian notice

Likvidácia vyradených zariadení v domácnostiach v Európskej únii



Symbol na výrobku alebo jeho balení označuje, že daný výrobok sa nesmie likvidovať s domovým odpadom. Povinnosťou spotrebiteľa je odovzdať vyradené zariadenie v zbernom mieste, ktoré je určené na recykláciu vyradených elektrických a elektronických zariadení. Separovaný zber a recyklácia vyradených zariadení prispieva k ochrane prírodných zdrojov a zabezpečuje, že recyklácia sa vykonáva spôsobom chrániacim ľudské zdravie a životné prostredie. Informácie o zberných miestach na recykláciu vyradených zariadení vám poskytne miestne zastupiteľstvo, spoločnosť zabezpečujúca odvoz domového odpadu alebo obchod, v ktorom ste si výrobok zakúpili.

Slovenian notice

Odstranjevanje odslužene opreme uporabnikov v zasebnih gospodinjstvih v Evropski uniji



Ta znak na izdelku ali njegovi embalaži pomeni, da izdelka ne smete odvreči med gospodinske odpadke. Nasprotno, odsluženo opremo morate predati na zbirališče, pooblaščen za recikliranje odslužene električne in elektronske opreme. Ločeno zbiranje in recikliranje odslužene opreme prispeva k ohranjanju naravnih virov in zagotavlja recikliranje te opreme na zdravju in okolju neškodljiv način. Za podrobnejše informacije o tem, kam lahko odpeljete odsluženo opremo na recikliranje, se obrnite na pristojni organ, komunalno službo ali trgovino, kjer ste izdelek kupili.

Spanish notice

Eliminación de residuos de equipos eléctricos y electrónicos por parte de usuarios particulares en la Unión Europea



Este símbolo en el producto o en su envase indica que no debe eliminarse junto con los desperdicios generales de la casa. Es responsabilidad del usuario eliminar los residuos de este tipo depositándolos en un "punto limpio" para el reciclado de residuos eléctricos y electrónicos. La recogida y el reciclado selectivos de los residuos de aparatos eléctricos en el momento de su eliminación contribuirá a conservar los recursos naturales y a garantizar el reciclado de estos residuos de forma que se proteja el medio ambiente y la salud. Para obtener más información sobre los puntos de recogida de residuos eléctricos y electrónicos para reciclado, póngase en contacto con su ayuntamiento, con el servicio de eliminación de residuos domésticos o con el establecimiento en el que adquirió el producto.

Bortskaffande av avfallsprodukter från användare i privathushåll inom Europeiska Unionen



Om den här symbolen visas på produkten eller förpackningen betyder det att produkten inte får slängas på samma ställe som hushållssopor. I stället är det ditt ansvar att bortskaffa avfallet genom att överlämna det till ett uppsamlingsställe avsett för återvinning av avfall från elektriska och elektroniska produkter. Separat insamling och återvinning av avfallet hjälper till att spara på våra naturresurser och gör att avfallet återvinns på ett sätt som skyddar människors hälsa och miljön. Kontakta ditt lokala kommunkontor, din närmsta återvinningsstation för hushållsavfall eller affären där du köpte produkten för att få mer information om var du kan lämna ditt avfall för återvinning.

C Ordering HP tape cartridges and bar code label packs

HP recommends using HP tape cartridges in your HP StorageWorks tape library. See [Table 29](#) for a list of HP media, pre-labeled media, and bar code label packs. These can be purchased directly from HP, or through an authorized reseller or sales office.

- For the location of an HP authorized reseller:
 - Call 1-800-345-1518 (U.S. only).
 - Call 1-800-263-5868 (Canada only).
 - Outside of North America, see the HP web site for locations and telephone numbers: <http://www.hp.com/support>.
- To order through HP:
 - Call 1-800-538-8787 (North America only).
 - Visit us online at <http://www.hp.com/go/storagemedia>.

Table 29 HP media and bar code labels

Drive type/product	HP part number
<p>Ultrium 460</p> <ul style="list-style-type: none"> • Data cartridge • Pre-labeled data cartridge • Universal cleaning cartridge • Bar code label pack (100 data labels, 10 cleaning labels) 	<p>C7972A (400 GB*)</p> <p>C7972AL (400 GB*—Europe, Americas only)</p> <p>C7978A</p> <p>Q2002A</p>
<p>Ultrium 960</p> <ul style="list-style-type: none"> • Data cartridge, read/write • Data cartridge, WORM (write once, read many) • Pre-labeled data cartridges, read/write, 20 pack • Pre-labeled data cartridges, WORM, 20 pack • Universal cleaning cartridge • Bar code label pack, read/write (100 data labels, 10 cleaning labels) • Bar code label pack, WORM (100 data labels, 10 cleaning labels) 	<p>C7973A (800 GB*)</p> <p>C7973W (800 GB*)</p> <p>C7973AL (800 GB*—Europe, Americas only)</p> <p>C7973WL (800 GB*—Europe, Americas only)</p> <p>C7978A</p> <p>Q2007A</p> <p>Q2008A</p>

*Capacity values assume a 2:1 compression ratio

D Installing a redundant PDU

This appendix provides suggestions as to when an additional, redundant power distribution unit (PDU) should be installed in the HP StorageWorks Enterprise Modular Library (EML) E-Series.

The EML product comes with one PDU installed. For a variety of reasons, it may be desirable or necessary to add a second PDU to the EML rack. The factors that determine when to add a second PDU are described below.

The main PDU components are:

- High voltage modular PDU, 200–240 VAC, 16 amp, part number 252663-B24 (kit includes two extension bars and mounting hardware)
- Main power cord, L6-20P 20 amp, 220 V, twist lock, part number 340653-001
- Power cords (PDU to library), 1/2 meter, part number 142257-B28

Leakage current

The most overriding reason to add a second PDU to the rack is to meet safety requirements for leakage current. Regulations limit the amount of leakage current per power outlet to 3.5 mA. This is the amount of current that may be returned through the ground line to the wall outlet, and therefore is the amount of leakage current allowed per PDU.

The individual power supplies of the EML may each contribute a maximum of 0.5 mA. This means no more than seven of the EML power supplies may be attached to a single PDU. A fully configured EML, with redundant power supplies, would necessitate 10 power supplies. In that configuration, a second PDU is certainly required. Even a 32U-high configuration of the EML with redundant power supplies would require a second PDU. Even if redundant power supplies are not currently installed, you should consider adding a second PDU when the EML is expanded above 24U in height. With a second PDU installed, upgrading to redundant power supplies in the future is simplified by being able to just slide them into place and connect them to the power strip.

If equipment is added to the EML rack from other sources, it is your responsibility to determine the maximum leakage current from all the equipment using the PDU so that the 3.5 mA limit on a single PDU is not exceeded.

Redundancy

Another important reason to add a second PDU to the EML rack is to add another layer of power redundancy to the product. As redundant power supplies are added to EML modules, the system can be made even more failsafe by powering individual power supplies, one from each module, with separate AC power circuits. This requires a second PDU.

Every EML module level (for example, the base module, card cage expansion module, tape drive expansion module, and so on) can have redundant power supplies added as an option. Each module level, with each power supply powered from different AC circuits, ensures continued EML operation should one of the AC power outlets fail. The location of the power strips for the second PDU are installed in a manner such that the power cords of the redundant power supplies of each module level can easily reach the PDU.

Power rating

As was the case with leakage current, if equipment is added to the EML rack from other sources, it is your responsibility to ensure the power rating of the PDU and power cords are not exceeded by the load of this additional equipment. The power rating of the PDU is sufficient to power up to seven power supplies in the EML that are allowed by the leakage current specification. You must check the power ratings of any additional equipment added to the rack, the power rating of the PDU, and the power rating of the power cords, to ensure all are within specified limits.

Placement of redundant PDU components

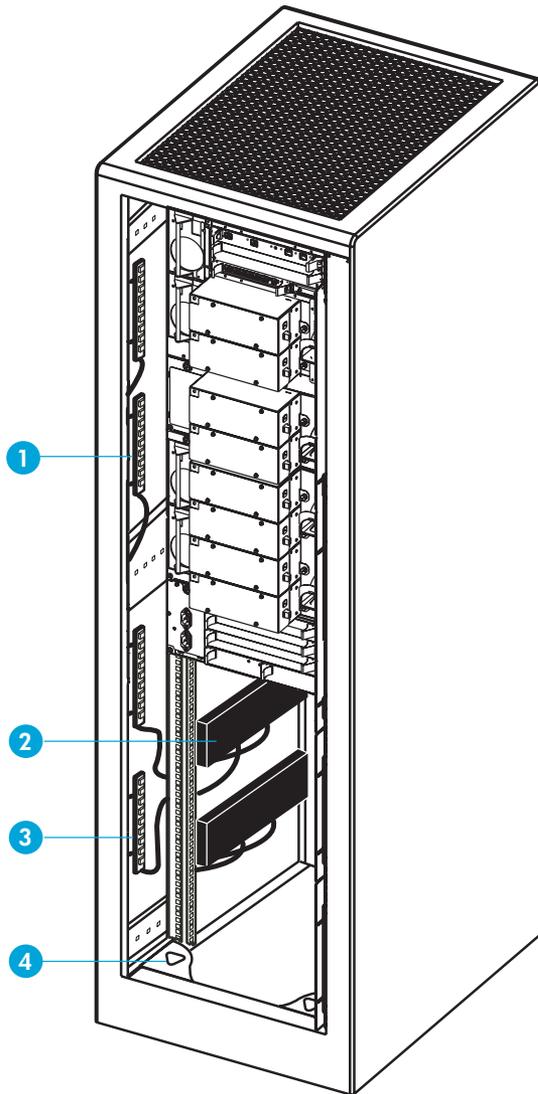
The EML primary PDU (#1) and two power strips (#1 and #3) are installed at the factory. The redundant PDU (#2) is installed above the primary PDU, also in a 0U side mount orientation. The top of PDU #1 is approximately 13 inches from the caster boss. The top of PDU #2 is placed approximately 25 inches from the caster boss (see [Figure 57](#)).

Power strip #2 is placed equidistant between power strips #1 and #3.

Power strip #4 is placed in a position low in the rack so that it does not interfere with the power cords coming from PDU #1 to power strips #1 and #3.

With properly placed power strips in a fully redundant 40U configuration, the top six power supply cords go to power strips #1 and #2. One power cord at each redundant level goes to each power strip.

Similarly, the bottom four power cord in a fully redundant configuration are divided between power strips #3 and #4. By using half meter power cords, the dressing should be minimal.



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- | | |
|----------------------|------------------|
| 1 Power strip #2 | 3 Power strip #4 |
| 2 Redundant PDU (#2) | 4 Caster boss |

Figure 57 Redundant PDU and power strip placement

Installation of redundant PDU components

Refer to the instructions provided with your redundant PDU for installation steps. After installation, dress all cords with cable ties. In addition, use cable ties to lock the power cords coming out of the PDU that go to each power strip.

Glossary

array	(1) A section of vertical or horizontal tape cartridge receptacles inside a library. (2) A molded unit that holds multiple cartridges.
backplane	The storage system electronic printed circuit board into which storage system devices can be plugged.
bar code reader	A component of the robot that is used for cartridge identification and position calibration.
base module	The 12U module in every HP Enterprise Modular Library E-Series that contains the robotics unit, tape drives, and card cage for controller cards. For slot numbering purposes, the base module is divided into a base unit (8U) and tape drive expansion module (4U).
blind mate connector	A connector that allows hot plugging instead of manually placing a cable between two fixed connectors.
card	<i>Also called</i> printed wire assembly or printed circuit board.
cartridge	The plastic housing around a cartridge tape. A plastic leader block is attached to the tape for automatic threading when loaded in transport. The spine of the cartridge contains a label listing the volume identification number.
cartridge array	See array.
cell	The slot in the tape library that is used to store a tape cartridge.
Class A digital device	Class A equipment is intended for commercial installation.
Class I laser product	Class 1 lasers are products where the power of the laser beam produced (the accessible emission) is always below the Maximum Permissible Exposure value. Therefore, for Class 1 lasers the output power is below the level at which it is believed eye damage will occur. Exposure to the beam of a Class 1 laser will not result in eye injury. Class 1 lasers may therefore be considered eye safe.
Class II laser product	Class 2 lasers are limited to a maximum output power of 1 mW. A person receiving an eye exposure from a Class 2 laser, either accidentally or as a result of someone else's deliberate action (misuse) will be protected from injury by their natural blink reflex. This is a natural involuntary response which causes the individual to blink and avert their head thereby terminating the eye exposure.
cleaning cartridge	A tape cartridge that contains special material to clean the tape path in a transport or drive. LTO cleaning cartridges labels have CLN prefixes.
CLI	Command Line Interface
CompactPCI (cPCI®)	Industry standard bus used for card-to-card bus expansion.
containment box	A box in the HP Enterprise Modular Library robotics unit that holds the lift flex cable. The cable retracts into the box as the table is raised.
data cartridge	A term used to distinguish a cartridge onto which a tape drive may write data from a cartridge used for cleaning purposes.

drive	The device that the library uses to record data onto tapes.
drive cleaning	A library feature that uses a cleaning cartridge to clean a tape drive.
drive module	The entire assembly that houses the drive, including the metal housing and connectors.
ESD	Electrostatic discharge. The release of static electricity from one conductor to another.
Ethernet	A local-area, packet-switched network technology. Originally designed for coaxial cable, it is now found running over shielded, twisted-pair cable. Ethernet is a 10- or 100-megabytes-per-second LAN.
event	A significant library occurrence (such as drive errors, online/offline transition, drive cleanings, and other information) that is listed in an automated log.
export	The action in which the library places a cartridge into the cartridge access port so that the operator can remove the cartridge from the library. <i>Also called</i> eject.
extension bars	The power strips connected to the power distribution unit.
Fibre Channel	A bidirectional, full-duplex, point-to-point, serial data channel structured for high performance capacity. The Fibre Channel is an interconnection of multiple communication ports, called N_Ports. These N_Ports are interconnected by a switching network, called a fabric, to a point-to-point link, or an arbitrated loop. Fibre Channel is a generalized transport mechanism with no protocol of its own. A Fibre Channel does not have a native input/output command set, but can transport existing Upper Level Protocols (ULP) such as SCSI. Fibre Channel operates at speeds of 200 MB per second. Fibre Channel operates over distances of up to 100 m over copper media or up to 10 km over optical links.
flash memory	Firmware memory for the current and previous version of library firmware.
front door	A door on the front of a library through which service personnel or operators can access the interior of the library.
get	An activity in which a robot obtains a cartridge from a slot or drive.
GUI	Graphical user interface. Software that allows the user to control the library environment through visual screens.
HBA	Host bus adapter. A circuit board residing in the host system that handles requests to and from the host system and the library.
host	One or more computers that generate and communicate data to the library.
hot-swappable	The capability that allows a component to be replaced while power to the component is maintained. This feature allows hardware maintenance actions and hardware upgrades to proceed without disrupting subsystem availability.
HP Enterprise Modular Library E-Series	An automated tape library composed of a: <ul style="list-style-type: none"> • Base module • Drive expansion module (optional) • Card cage expansion module (optional)
HP (unit of measure)	Horizontal pitch. A measurement of the width of a chassis. EML circuit card assemblies sitting horizontally in card cages are measured vertically in these units where one HP is 5.08 millimeters (0.2 inches).
import	The process of placing a cartridge into the cartridge access port so that the robot can insert it into a storage slot.

interlock switch	A switch that disconnects power to library mechanisms, excluding tape drives, when the front door is opened.
Initialization	A procedure that activates a machine reset, initiates wake-up diagnostics (from EPROMs) and loads functional code.
inventory	The process of reading and storing in memory the bar code identification and locations of all cartridges in the library.
lift drive assembly	A component of the robotics unit that moves the table assembly vertically among the library modules.
lift drive pulley	A component of the lift drive assembly used to move the table assembly vertically along the lift pole to cartridge slots and drives.
lift flex cable	The cable that carries control and power signals to the table assembly. This cable automatically adjusts to the position of the table assembly in library.
lift pole	The device that guides the vertical movement of the table assembly.
lift reduction gear	The component of the lift drive assembly that controls the lift drive pulley.
lift suspension cables	Four cables used to lift and lower the table assembly between the library modules.
load port	A device in the library that allows an operator to insert or remove cartridges during library operations.
logical library	A virtual representation of a physical library. <i>Also called</i> virtual library partition.
LTO	Linear Tape-Open. A technology that creates tape devices and media based on common specification, licensing, and compliance standards and allows tape device users to use tape products and media from various sources. Ultrium 460 tape drives (LTO-2) are HP's second generation of LTO tape drives and the Ultrium 960 tape drives (LTO-3) are third generation tape drives.
magazine	A removable array that holds cartridges and is placed into the load port.
PCI	Peripheral component interconnect. The PCI bus typically runs at speeds of 33 MHz or 66 MHz and is usually 32 bits wide. This means that it passes 32 bits of data simultaneously as if down 32 separate wires. Some of the most recent computers include wider 64-bit PCI buses, and already certain very high-end video capture cards offer improved performance if connected to a 64-bit PCI bus.
picker	The portion of the picker assembly that grasps and holds a cartridge.
picker assembly	A part of the library robot whose function is to grasp cartridges and move them between storage slots and drives. A bar-code scanner on the hand assembly reads cartridge volume labels.
put	An activity in which a robot places a cartridge into a slot or drive.
PWA	Printed wiring assembly.
reach mechanism	A component of the robot that moves the gripper to get or put a cartridge at a designated location.
robot	An electro-mechanical device that transports tape cartridges to and from locations in the library.
robotics unit	The unit that includes the robotics components and that controls the movement of the robot between storage slots, drives, and load ports.

RS-232C	Short for Recommended Standard-232C, a standard interface approved by the Electronic Industries Association (EIA) for connecting serial devices. This standard is for asynchronous transfer between computer equipment and accessories. Data is transmitted bit by bit in a serial fashion. The RS-232 standard defines the function and use of all 25 pins of a DB-25 type connector.
slot	The location in the library in which a tape cartridge is stored. <i>Also called cell.</i>
slot database	The cartridge and slot records collected by the EML inventory.
storage cell	See slot.
suspension cable	One of four cables used to raise and lower the table.
table assembly	A component of the robotics unit that carries the picker assembly vertically among the library modules.
tape cartridge	A container holding magnetic tape that can be processed without separating the tape from the container. The library uses data and cleaning cartridges. These cartridges are not interchangeable.
tape drive	An electromechanical device that moves magnetic tape and includes mechanisms for writing and reading data to and from the tape.
tape drive assembly	An interface to control/monitor tape drive operation.
U	A measure of chassis height. 1U in rack measurement is 44.45 millimeters (1.75 inches). Circuit card assemblies using the cPCI standard use the Eurocard range of circuit card sizes, where 3U cards are 100 x 160 mm (3.94 x 6.3 inches) and 6U cards are 230 x 160 mm (9.187 x 6.3 inches). The HP StorageWorks Interface Manager card is considered 4U wide with dimensions of 161.9 x 157.3 mm (6.4 x 6.2 inches).
wrist	A component of the hand assembly that rotates the hand horizontally.
World Wide Name (WWN)	A 64-bit integer that identifies a Fibre Channel port.

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