HP StorageWorks MSL2024, MSL4048, MSL8048, and MSL8096 Tape Libraries User and service guide

This guide provides information on installing, configuring, upgrading, and troubleshooting the Tape Library. This guide is intended for system administrators and other users who need physical and functional knowledge of the Tape Library.

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Legal and notice information

Contents

Figures

Tables

1 Features and overview

The HP StorageWorks MSL2024, MSL4048, MSL8048, and MSL8096 Tape Libraries provide compact, high-capacity, low-cost solutions for simple, unattended data backup. This unique design houses up to 12 tape cartridges for each U of height, with easy access to tape cartridges via removable magazines and one or more mailslots (see Table 1). Each magazine can hold up to 12 tape cartridges.

The Libraries are compatible with most operating systems. However, the Libraries require either direct support from the operating system or a compatible backup application to take full advantage of their many features. To verify compatibility, go to http://www.hp.com/go/ebs.

The Libraries are customer expandable with exchangeable tape drives. The Libraries support Ultrium full-height and half-height tape drives. To see the tape drives currently available for each Tape Library, see the MSL QuickSpecs at http://www.hp.com/go/tape. For a list of all supported configurations, go to http://www.hp.com/go/ebs.

Table 1 Library capacity

	MSL2024	MSL4048	MSL8048	MSL8096
Form factor	2U	4U	8U	8U
Maximum cartridge slots	24	48	48	96
Mailslots	0, 1	0, 3	0, 3	0, 3, 12, 15
Maximum full-height tape drives	1	2	4	4
Maximum half-height tape drives	2	4	4	4
Maximum storage capacity: LTO-2 media	Native: 4.8 TB (24 x 200 GB) Compressed (2:1): 9.6 TB	Native: 9.6 TB (48 x 200 GB) Compressed (2:1): 19.1 TB	NA	Native: 19.1 TB (96 x 200 GB) Compressed (2:1): 38.2 TB
Maximum storage capacity: LTO-3 media	Native: 9.6 TB (24 x 400 GB) Compressed (2:1): 19.1 TB	Native: 19.1 TB (48 x 400 GB) Compressed (2:1): 38.2 TB	Native: 19.1 TB (48 x 400 GB) Compressed (2:1): 38.2 TB	Native: 38.2 TB (96 x 400 GB) Compressed (2:1): 76.4 TB
Maximum storage capacity: LTO-4 media	Native: 19.1 TB (24 x 800 GB) Compressed (2:1): 38.2 TB	Native: 38.2 TB (48 x 800 GB) Compressed (2:1): 76.4 TB	Native: 38.2 TB (48 x 800 GB) Compressed (2:1): 76.4 TB	Native: 76.4 TB (96 x 800 GB) Compressed (2:1): 152.8 TB
Maximum storage capacity: LTO-5 media	Native: 36 TB (24 x 1.5 TB) Compressed (2:1): 72 TB	Native: 72 TB (48 x 1.5 TB) Compressed (2:1): 144 TB	Native: 72 TB (48 x 1.5 TB) Compressed (2:1): 144 TB	Native: 144 TB (96 x 1.5 TB) Compressed (2:1): 288 TB

Maximum data transfer rates are shown in Table 2, Table 3, Table 4, Table 5, Table 6, and Table 7.

Table 2 MSL2024 Ultrium 448 Tape Library specifications

Characteristic	Specification
Tape drive	LTO-2, half-height
Maximum data transfer rate — one drive	Native: 24 MB/s (86 GB/hr) Compressed 2:1): 48 MB/s (172 GB/hr)
Maximum data transfer rate — two drives	Native: 48 MB/s (172 GB/hr) Compressed (2:1): 96 MB/s (344 GB/hr)

Table 3 MSL2024. MSL4048, MSL8048, and MSL8096 Ultrium 920 Tape Library specifications

Characteristic	Specification
Tape drive	LTO-3, half-height
Maximum data transfer rate — one drive	Native: 60 MB/s (215 GB/hr) Compressed (2:1): 120 MB/s (430 GB/hr)
Maximum data transfer rate — two drives	Native: 120 MB/s (430 GB/hr) Compressed (2:1): 240 MB/s (860 GB/hr)
Maximum data transfer rate — three drives	Native: 180 MB/s (645 GB/hr) Compressed (2:1): 360 MB/s (1290 GB/hr)
Maximum data transfer rate — four drives	Native: 240 MB/s (860 GB/hr) Compressed (2:1): 480 MB/s (1720 GB/hr)

Table 4 MSL2024, MSL4048, MSL8048, and MSL8096 Ultrium 960 Tape Library specifications

Characteristic	Specification
Tape drive	LTO-3, full-height
Maximum data transfer rate — one drive	Native: 80 MB/s (288 GB/hr) Compressed (2:1): 160 MB/s (576 GB/hr)
Maximum data transfer rate — two drives	Native: 160 MB/s (576 GB/hr) Compressed (2:1): 320 MB/s (1152 GB/hr)
Maximum data transfer rate — three drives	Native: 240 MB/s (864 GB/hr) Compressed (2:1): 480 MB/s (1728 GB/hr)
Maximum data transfer rate — four drives	Native: 320 MB/s (1152 GB/hr) Compressed (2:1): 640 MB/s (2304 GB/h)

Table 5 MSL2024. MSL4048, MSL8048, and MSL8096 Ultrium 1760 Tape Library specifications

Characteristic	Specification
Tape drive	LTO-4, half-height

Characteristic	Specification
Maximum data transfer rate — one drive	Native: 80 MB/s (288 GB/hr) Compressed (2:1): 160 MB/s (576 GB/hr)
Maximum data transfer rate — two drives	Native: 160 MB/s (576 GB/hr) Compressed (2:1): 320 MB/s (1152 GB/hr)
Maximum data transfer rate — three drives	Native: 240 MB/s (864 GB/hr) Compressed (2:1): 480 MB/s (1728 GB/hr)
Maximum data transfer rate — four drives	Native: 320 MB/s (1152 GB/hr) Compressed (2:1): 640 MB/s (2304 GB/hr)

Table 6 MSL2024, MSL4048, MSL8048, and MSL8096 Ultrium 1840 Tape Library specifications

Characteristic	Specification
Tape drive	LTO-4, full-height
Maximum data transfer rate — one drive	Native: 120 MB/s (432 GB/hr) Compressed (2:1): 240 MB/s (864 GB/hr)
Maximum data transfer rate — two drives	Native: 240 MB/s (864 GB/hr) Compressed (2:1): 480 MB/s (1,728 GB/hr)
Maximum data transfer rate — three drives	Native: 360 MB/s (1,296 GB/hr) Compressed (2:1): 720 MB/s (2,592 GB/hr)
Maximum data transfer rate — four drives	Native: 480 MB/s (1,728 GB/hr) Compressed (2:1): 960 MB/s (3,456 GB/hr)

Table 7 MSL2024, MSL4048, MSL8048, and MSL8096 Ultrium 3000 and 3280 Tape Library specifications

Characteristic	Specification
Tape drive	LTO-5. Ultrium 3000 is half-height, Ultrium 3280 is full-height
Maximum data transfer rate — one drive	Native: 140 MB/s (504 GB/hr) Compressed (2:1): 280 MB/s (1,004 GB/hr)
Maximum data transfer rate — two drives	Native: 280 MB/s (1,004 GB/hr) Compressed (2:1): 560 MB/s (2,008 GB/hr)
Maximum data transfer rate — three drives	Native: 420 MB/s (1,512 GB/hr) Compressed (2:1): 840 MB/s 3,024 GB/hr)
Maximum data transfer rate — four drives	Native: 560 MB/s (2,008 GB/hr) Compressed (2:1): 1,120 MB/s (4,016 GB/hr)

Library options

Redundant power supply

The MSL4048, MSL8048, and MSL8096 Tape Libraries have a redundant power supply option. The redundant power supply allows the Library to continue operating when one power supply fails. With the redundant power supply system, the Library can monitor the status of each power supply and power supply fan. The redundant power supply can be installed without powering off the Library.

For instructions on installing the redundant power supply, see Installing a redundant power supply, page 227.

HP StorageWorks 1/8 G2 & MSL Encryption Kit

The Encryption Kit provides secure generation and storage of encryption keys. The Encryption Kit may be used with any HP StorageWorks 1/8 G2 Tape Autoloader or the MSL2024, MSL4048, MSL8048 and MSL8096 Tape Library with at least one LTO-4 or later generation tape drive. The Encryption Kit cannot be used with the MSL6000.

The Encryption Kit includes two USB key server tokens. One key server token is available for use as backup for the other.

To use the Encryption Kit, a key server token is inserted in the USB port on the back of the Library, and encryption is enabled and configured from the RMI.

The Encryption Kit supports your manual security policies and procedures by providing secure storage for encryption keys. Access to the key server tokens and their backup files is protected with user-specified passwords. You will need to create processes to protect the tokens and secure the passwords.

IMPORTANT:

When encryption is enabled with the Encryption Kit, the Library will not use encryption keys from other sources, such as a key management system or application software. Disable encryption in applications writing to the Library when encryption is enabled with the Encryption Kit. Applications that attempt to control encryption while encryption is enabled with the Encryption Kit will not be able to do so, which can cause backups or other write operations to fail.

HP StorageWorks MSL Library Extender

The Library Extender combines two Tape Libraries to create a single extended library. Before installing the Extender, the Libraries must be installed in the rack rails supplied with the Libraries in adjacent rack locations, one Library above the other. See the example shown in Figure 1.

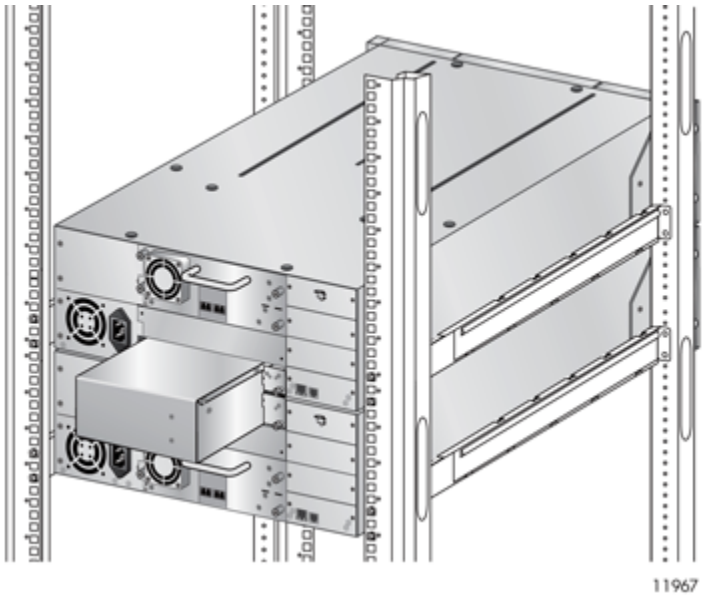


Figure 1 Library Extender installed with two MSL4048 Tape Libraries

The Extender occupies the lower half-height drive bay of the upper Library and the top half-height drive bay of the lower Library.

The upper Library controls the extended library and is called the *master* Library. The extended library uses only the master Library OCP, USB port, and Ethernet connection.

The lower Library is controlled by the master Library. The lower Library OCP, USB port, and Ethernet connection are not used by the extended library.

Table 8 Library Extender supported configurations

Master Library	Lower Library	Total slots	Total half-height drive bays	Total full-height drive bays
MSL4048	MSL4024	72	3+1	1+0
MSL4048	MSL4048	96	3+3	1+1
MSL8096	MSL2024	120	3+1	3+0
MSL8096	MSL4048	144	3+3	3+1

If you are using the Encryption Kit with both Libraries and then install the Library Extender, you will need to combine the encryption keys onto a single key server token. The extended library only uses the USB port and key server token in the master Library; the USB port in the lower Library is inactive. See the Encryption Kit user guide for instructions on combining the encryption keys from both key server tokens onto a single token. If the number of keys on the two tokens is greater than 100, use the **Number of Keys to Backup** option to generate a backup file with a subset of the keys from one of the tokens to restore to the other token.

Upgrading the MSL8048

The MSL8048 can be upgraded to the capacity of an MSL8096 with TA739A, the HP StorageWorks MSL8048 48 to 96 slot license. The license enables 48 additional storage slots, including 12 slots

that can be configured as additional mailslots. To purchase the upgrade license, contact your HP sales representative or visit the HP website: http://www.hp.com.

Use the RMI **Configure: License Key** screen to manage the license key.

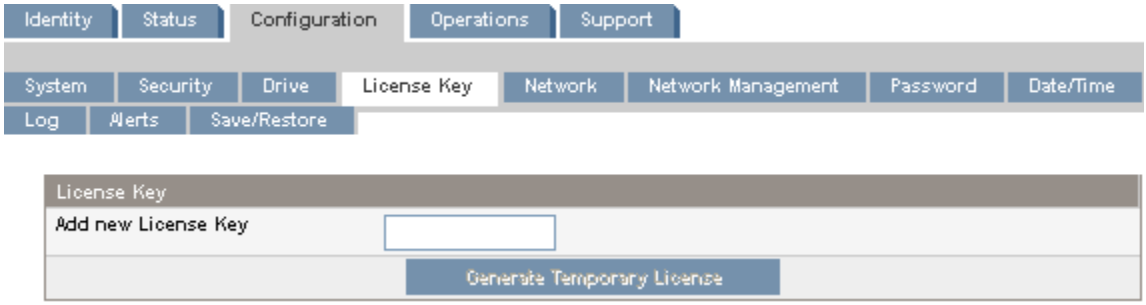


Figure 2 RMI Configure: License Key screen

After you order the upgrade license, you can access the additional slots immediately by generating a temporary license key. The temporary key can only be enabled once and is valid for 30 days.

NOTE:

The temporary key is intended to provide instant access to the upgrade capabilities until you receive the permanent key. The temporary key expires after 30 days. If you do not have a permanent license key before the temporary key expires, you will lose access to the additional storage slots when the temporary license key expires.

When you receive the permanent license key from HP, enter the key and press **Submit**. The permanent license takes effect when the Library is rebooted. You may need to reboot the Library to enable the additional slots.

Command View TL TapeAssure

HP StorageWorks Command View TL software provides a browser-based GUI for remote management and monitoring of most HP libraries through a LAN. With Command View TL, you can view and analyze the performance and health of the LTO-4 and LTO-5 tape drives and media in multiple HP MSL2024, MSL4048, MSL8048, and MSL8096 Tape Libraries and 1/8 G2 Tape Autoloaders at the same time. In addition, the information shown in TapeAssure is more extensive than that shown in the RMI.

Command View TL software is installed on a management station. The management can also be used to manage HP StorageWorks EML and ESL Tape Libraries. For best performance, the management station should be in the same physical location and on the same IP subnet as the Library. Command View TL software is available for download without charge from the HP website at http://www.hp.com/support/cvtl.

For information on installing and using Command View TL, see the *HP StorageWorks Interface Manager and Command View TL User Guide*, available from the HP website at http://www.hp.com/support/cvtl.

Command View TL support is included in all Library firmware that supports LTO-5 tape drives. To find and download the most up-to-date firmware revision, visit the HP website at http://www.hp.com/support.

Interface specifications and requirements for parallel SCSI drives

The parallel SCSI Libraries use the SCSI interface types described in Table 9. The Libraries use a separate SCSI ID for each tape drive, with dual LUNs on the master drive's SCSI ID to control the tape drive (LUN 0) and Library robotic (LUN 1). HP recommends that each Ultrium tape drive be put on its own bus when possible.

Table 9 Parallel SCSI interface types

LTO generation	SCSI Interface
LTO-2	Ultra 160 SCSI LVD/SE
LTO-3, LTO-4	Ultra 320 SCSI LVD

The parallel SCSI Libraries incorporate a wide SCSI-2 or SCSI-3 low-voltage differential (LVD) SCSI bus. Make sure your SCSI host adapter or controller supports these standards.

IMPORTANT:

The Libraries are NOT compatible with a high-voltage differential (HVD) SCSI bus. Do not put the Library on a narrow (50-pin) parallel SCSI bus because doing so will severely degrade performance.

Parallel SCSI host bus adapters (HBAs)

For optimum performance, place each tape drive on its own parallel SCSI bus with a host bus adapter that can transfer data as fast as the Library can read and write. The HBA must also be supported by your operating system. Refer to the EBS matrix at http://www.hp.com/go/ebs for current HBA compatibility information.

- For LTO-3 or LTO-4 tape drives, use an Ultra 320 HBA.
- For LTO-2 tape drives, use an Ultra 320 or Ultra 160 HBA.

IMPORTANT:

Do not connect an Ultrium tape drive to an SE SCSI bus, as it severely degrades Library performance. A single-ended SCSI host bus adapter severely degrades Library performance and limits cable length. Also, if any SE devices are on the SCSI bus, all of the devices on the bus slow down to SE speed, severely degrading performance.

Multiple LUN support

The Library uses a single SCSI ID and two logical unit numbers (LUN). LUN 0 controls the tape drive and LUN 1 controls the robotic. The Library requires an HBA that supports multiple LUNs. If multiple LUN support is not enabled, the host computer cannot scan beyond LUN 0 to discover the Library. It just sees the tape drive.

Parallel SCSI HP Smart Array controllers, RAID controllers, and most on-board HBAs do not support multiple LUNs. Refer to the EBS matrix at http://www.hp.com/go/ebs for current HBA compatibility information.

IMPORTANT:

The Library requires an HBA that supports multiple LUNs, which is also called "LUN scanning."

Default SCSI IDs

The default SCSI ID for parallel SCSI tape drives is managed by the Library. The default SCSI ID for all full-height tape drives is 4.

The default SCSI ID for half-height tape drives depends on the model.

- **MSL2024:** The default SCSI ID of the bottom drive bay is 4 and the default SCSI ID of the top drive bay is 5 as shown in Figure 3.

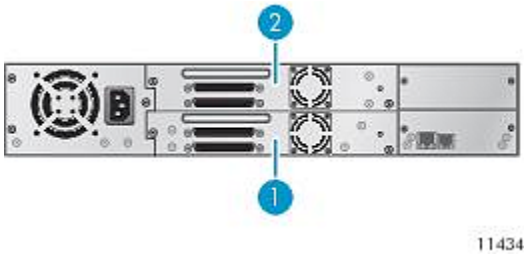


Figure 3 MSL2024 default SCSI IDs

1. Default SCSI ID 4
2. Default SCSI ID 5

- **MSL4048:** The default SCSI ID for the bottom drive of each pair is 4 and for the top drive is 5 as shown in Figure 4.

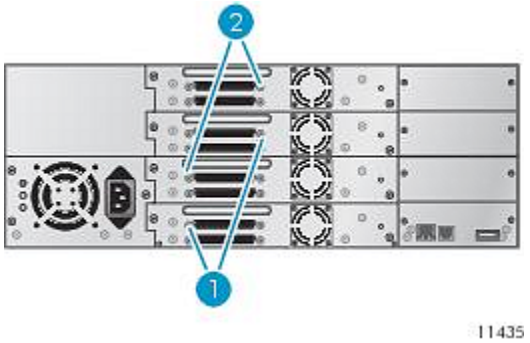


Figure 4 MSL4048 default SCSI IDs

1. Default SCSI ID 4
2. Default SCSI ID 5

- **MSL8048 and MSL8096:** The default SCSI address for all tape drives is 4 as shown in Figure 5.

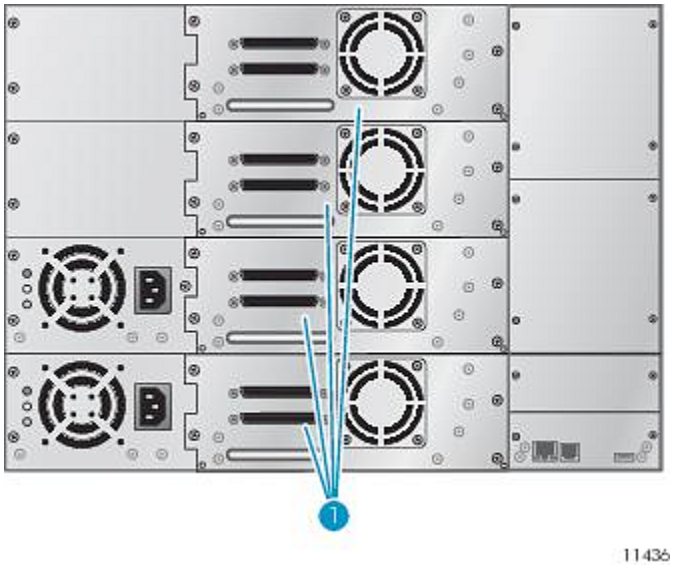


Figure 5 MSL8048 and MSL8096 parallel SCSI tape drive default SCSI addresses

1. Tape drives with SCSI address 4

Interface specifications and requirements for Fibre Channel drives

The Fibre Channel tape drive can be connected directly to the server with a host bus adapter (HBA) or through a storage area network (SAN).

Table 10 FC drive interface speeds

LTO generation	Supported speeds
LTO-3	1 Gb, 2 Gb or 1 Gb, 2 Gb, 4 Gb
LTO-4	1 Gb, 2 Gb, 4 Gb
LTO-5	2 Gb, 4 Gb, 8 Gb

If you plan to connect the Library directly to the server, you will need a 2 Gb, 4 Gb, or 8 Gb Fibre Channel HBA. A 4 Gb HBA is recommended for LTO-4 tape drives. An 8 Gb HBA is recommended for LTO-5 tape drives for optimal performance. Check the EBS matrix at http://www.hp.com/go/ebs to verify that your HBA is supported on your server and qualified for the Library.

In a SAN installation, all switches between the host and the Library must be of the appropriate type. For example, a 2 Gb switch in the path may result in performance degradation when backing up highly compressible data to a 4 Gb tape drive. Configure zoning so only the backup servers may access the Library.

Interface specifications and requirements for SAS drives

The server must have an HP or third party SAS host bus adapter with an external connector.

Table 11 SAS drive interface speeds

LTO generation	Supported speeds
LTO-3, LTO-4	1.5 Gb, 3 Gb
LTO-5	1.5 Gb, 3 Gb, 6 Gb

The device uses multiple LUNs to communicate with the Library. Most SAS RAID controllers do not support multiple LUNs. Check the EBS matrix at http://www.hp.com/go/ebs to find a SAS HBA that is supported on your server and qualified with the Library.

Most SAS HBA ports provide four SAS channels. Each tape drive uses one channel. The SAS fanout cable recommended for this product will connect up to four SAS tape drives to a single SAS HBA port.

Any of the four drive cable ends can be used for any of the tape drives. If you use a different cable, verify that the mini-SAS connectors on the tape drive end are keyed for location 4.

△ CAUTION:

High quality SAS cables rated at the transfer rate of the SAS components are required. Always verify that the SAS cable you are using is rated for the data transfer speed of the interface of your components. SAS cables described as "equalized" may not support 6 Gb/s data rates and should not be used with LTO-5 tape drives unless these cables are verified for 6 Gb/s data rates. For optimum performance, only use HP cables of the length specified as qualified for your products.

See "About SAS" on page 40 for more information about SAS.

LTO-4 and later generation tape drives and encryption

The LTO-4 and later generation tape drives include hardware capable of encrypting data while writing data, and decrypting data when reading. Hardware encryption can be used with or without compression while maintaining the full speed and capacity of the tape drive and media.

Encryption is the process of changing data into a form that cannot be read until it is deciphered with the key used to encrypt the data, protecting the data from unauthorized access and use. LTO tape drives use the 256-bit version of the industry-standard AES encrypting algorithm to protect your data.

To make use of this feature you need:

- The HP StorageWorks 1/8 G2 & MSL Encryption Kit or a backup application that supports hardware encryption.
- LTO-4 or LTO-5 media; no encryption will be performed when writing LTO-3 and earlier generations of tape.

Table 12 Backward read compatibility

	LTO-4 drive	LTO-5 drive
LTO-1 media	Incompatible	Incompatible

	LTO-4 drive	LTO-5 drive
LTO-2 media	Read only	Incompatible
LTO-3 media	Read/Write (no encryption)	Read only
LTO-4 media — unencrypted	Read/Write	Read/Write
LTO-4 media — encrypted	Read/Write with encryption key	Read/Write with encryption key
LTO-5 media — unencrypted	Incompatible	Read/Write
LTO-5 media — encrypted	Incompatible	Read/Write with encryption key

Your company policy will determine when you need to use encryption. For example, it may be mandatory for company confidential and financial data, but not for personal data. Company policy will also define how encryption keys should be generated and managed. Backup applications that support encryption will generate a key for you or allow you to enter a key manually.

Using the Encryption Kit

The Encryption Kit includes two USB key server tokens. One key server token is available for use as a backup for the other. Alternatively, you can save the encryption keys to a file and store that file in a safe location.

To use the Encryption Kit, a key server token is inserted in the USB port on the back of the Library, and encryption is enabled and configured from the RMI.

The Encryption Kit supports your manual security policies and procedures by providing secure storage for encryption keys. Access to the key server tokens and their backup files is protected with user-specified passwords. You will need to create processes to protect the tokens and secure the passwords.

IMPORTANT:

When encryption is enabled with the Encryption Kit, the Library will not use encryption keys from other sources, such as a key management system or application software. Disable encryption in applications writing to the Library when encryption is enabled with the Encryption Kit. Applications that attempt to control encryption while encryption is enabled with the Encryption Kit will not be able to do so, which can cause backups or other write operations to fail.

See the Encryption Kit user guide for additional information on using the Encryption Kit.

Using application-managed encryption

Hardware encryption is turned off by default and is switched on by settings in your backup application, where you also generate and supply the encryption key. Your backup application must support hardware encryption for this feature to work. See http://www.hp.com/go/ebs for an up-to-date list of other suitable backup software.

NOTE:

The Library can only obtain encryption keys from one source. Using the Encryption Kit will prevent application-managed encryption.

Encryption is primarily designed to protect the media once it is offline and to prevent it being accessed from another machine. You will be able to read and append the encrypted media without being prompted for a key as long as it is being accessed by the machine and application that first encrypted it.

There are two main instances when you will need to know the key:

- If you try to import the media to another machine or another instance of the backup application
- If you are recovering your system after a disaster

NOTE:

Encryption with keys that are generated directly from passwords or passphrases may be less secure than encryption using truly random keys. Your application should explain the options and methods that are available. Please refer to your application's user documentation for more information.

If you are unable to supply the key when requested to do so, neither you nor HP Support will be able to access the encrypted data.

This guarantees the security of your data, but also means that you must be careful in the management of the encryption key used to generate the tape.

CAUTION:

You should keep a record or backup of your encryption keys and store them in a secure place separate from the computer running the backup software.

For more information about AES encryption, encryption keys, and using hardware encryption with your HP Ultrium tape drive, see the White Papers on http://h18006.www1.hp.com/storage/tapewhitepapers.html.

For detailed instructions about enabling encryption please refer to the documentation supplied with your backup application or with the HP StorageWorks 1/8 G2 and MSL Encryption Kit. This will also highlight any default states, for example when copying tapes, that may need changing if using encrypted tapes.

Logical libraries

You can configure a Tape Library with multiple tape drives into logical libraries. Each logical library must contain at least one tape drive. Each logical library is configured independently, allowing use by different backup applications and with different backup policies. For example, one logical library could perform a backup operation for one department while the second logical library restores data for another department. Or, one logical library could have encryption enabled while another has encryption disabled. Data cartridges in one logical library cannot be shared with other logical libraries.

All logical libraries have access to the mailslot, if the mailslot is enabled. The Tape Library prohibits a cartridge that was placed in the mailslot by one logical library from being moved into another

logical library. The Library allows a cartridge that was placed in the mailslot by the operator to be moved into any logical library. If sharing the mailslot among logical libraries is an issue in your environment or is not supported by your backup application, disable the mailslot.

Each logical library has a unique serial number and World Wide Identifier (WWID), which can be found in the RMI **Identity: Library** screen. For more information on WWIDs, see "World Wide identifiers" on page 41.

NOTE:

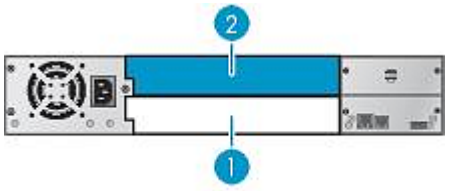
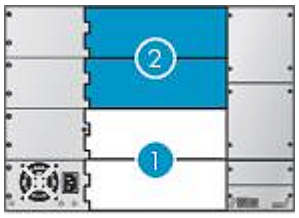
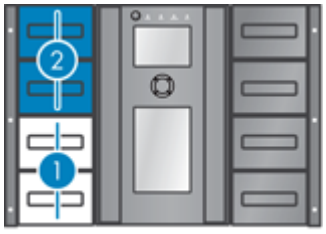
Libraries that require a license to enable all slots must have all slots licensed to operate with the Library Extender.

Partitioning the MSL2024 and MSL8048 Tape Libraries

An MSL2024 Tape Library with two tape drives can be configured into two logical libraries. Each logical library is assigned one tape drive and one magazine.

An MSL8048 with at least two tape drives can be configured into two logical libraries. Each logical library is assigned at least one tape drive and two magazines.

Table 13 MSL2024 and MSL8048 Tape Libraries partitioned into two logical libraries

	Tape drives	Magazines
MSL2024		
MSL8048		

1. Logical library 1 tape drives and magazines
2. Logical library 2 tape drives and magazines

Partitioning the MSL4048 and MSL8096 Tape Libraries

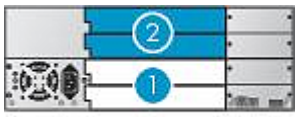
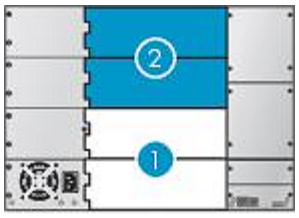
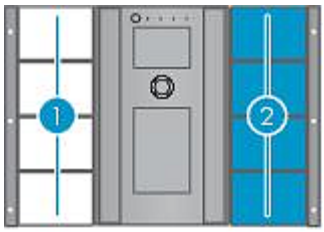
The MSL4048 and MSL8096 Tape Library can be configured into two to four logical libraries, depending on the number of tape drives installed. The MSL4048 supports up to two full-height tape drives or up to four half-height tape drives. The MSL8096 supports up to four half-height or full-height tape drives. For the tape drives and magazines assigned to each logical library see Table 14 on page 30, Table 15 on page 31, and Table 16 on page 31.

Each logical library includes the tape drives in specific drive locations. You may need to move a tape drive if there is not a tape drive in the top half of the Library. If the Library only has two tape drives installed in the bottom two drive bays, move one tape drive to the top half of the Library. Power off the tape drive from the RMI **Configuration: Drive** screen before moving the tape drive. For instructions on removing and replacing a tape drive, see "Removing and replacing a tape drive" on page 221.

NOTE:

The MSL4048 Tape Library will not operate with a full-height tape drive installed in the middle two half-height drive bays. Only install a full-height tape drive in either the upper or lower two half-height drive bays.

Table 14 MSL4048 and MSL8096 Tape Libraries partitioned into two logical libraries

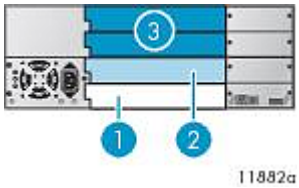
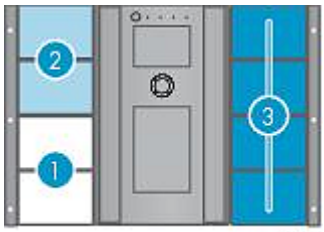
	Tape drives	Magazines
MSL4048	 11880a  11880c	 11880
MSL8096	 11881a	 11881

1. Logical library 1 tape drives and magazines.
2. Logical library 2 tape drives and magazines.

NOTE:

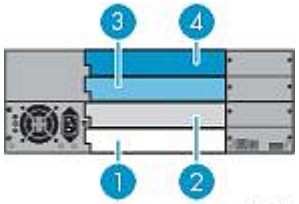
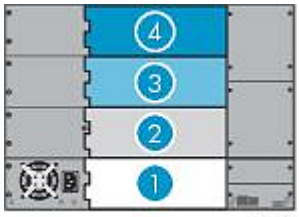
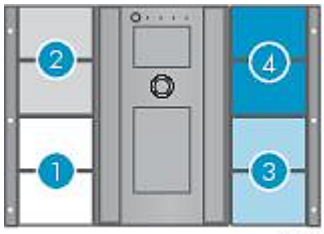
In the MSL8096, half-height tape drives are installed in the bottom half of each drive bay.

Table 15 MSL4048 and MSL8096 Tape Libraries partitioned into three logical libraries

	Tape drives	Magazines
MSL4048	 11882a	 11882
MSL8096	 11883a	 11883

1. Logical library 1 tape drive and magazines
2. Logical library 2 tape drive and magazines
3. Logical library 3 tape drives and magazines.

Table 16 MSL4048 and MSL8096 Tape Libraries partitioned into four logical libraries

	Tape drives	Magazines
MSL4048	 11877	 11876
MSL8096	 11879	 11878

1. Logical library 1 tape drive and magazines
2. Logical library 2 tape drive and magazines
3. Logical library 3 tape drive and magazines
4. Logical library 4 tape drive and magazines

Front panel overview

The front panel provides access to the power button, operator control panel, left and right magazines, LEDs, and the mailslot as shown in Figure 6, Figure 7, and Figure 8. See "Operator control panel (OCP)" on page 104 for MSL2024 OCP functions. See "MSL4048, MSL8048, and MSL8096 operator control panel" on page 131 for MSL4048, MSL8048, and MSL8096 OCP functions.

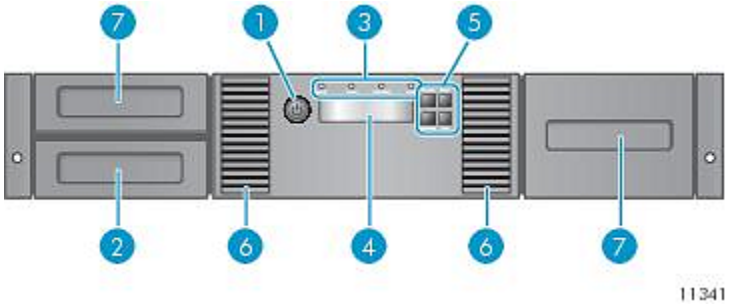


Figure 6 MSL2024 front panel overview

1. Power button
2. Magazine, mailslot location
3. Front panel LEDs
4. Front panel LCD screen
5. Control buttons
6. Air vents
7. Magazines

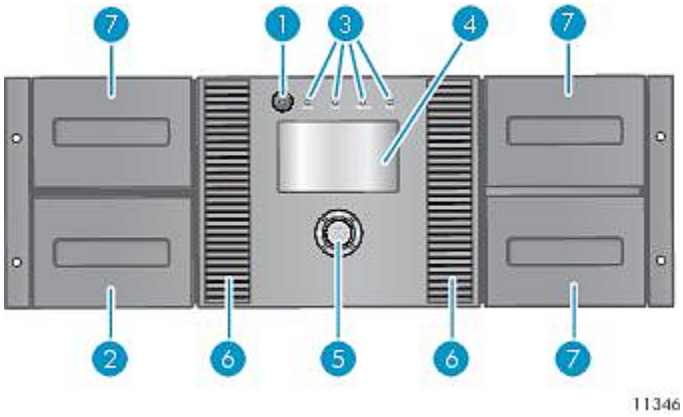


Figure 7 MSL4048 front panel overview

1. Power button
2. Magazine, mailslot location
3. Front panel LEDs
4. Front panel LCD screen
5. Control buttons
6. Air vents
7. Magazines

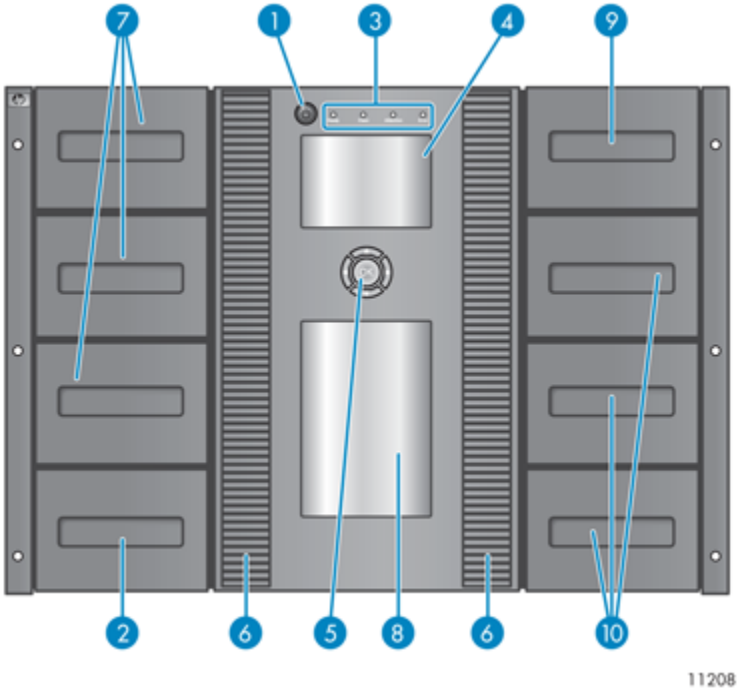


Figure 8 MSL8048 and MSL8096 front panel overview

1. Power button	2. Magazine, mailslot location
3. Front panel LEDs	4. Front panel LCD screen
5. Control buttons	6. Air vents
7. Magazine	8. Observation window
9. 12-slot mailslot (MSL8096 only)	10. Magazine (MSL8096 only)

The operator control panel includes four LEDs that indicate system status information as shown in Figure 9.

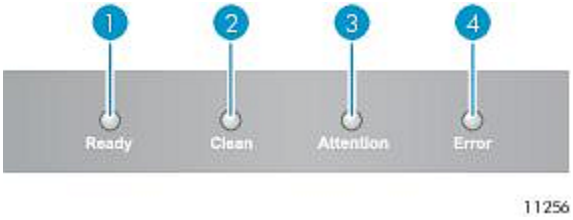


Figure 9 Operator control panel LEDs

1.	Green	**Ready**. Illuminated when power is on. Blinking when there is tape drive or robotics activity.
2.	Amber	**Clean**. Illuminated when the tape drive has determined that a cleaning cartridge should be used. Cleaning is only necessary when the device directs you to do so. Additional cleaning is not necessary.

3.	Amber	**Attention**. Illuminated if the device has detected a condition that requires attention by the operator.
4.	Amber	**Error**. Illuminated if an unrecoverable error occurs. A corresponding error message displays on the LCD screen (see "Troubleshooting" on page 153 for more information).

Back panel overview

The back panel provides access to the drive interface connectors, the tape drives, the power connector, the Ethernet, serial and USB ports, and the magazine release holes. The Libraries support parallel SCSI, SAS, and Fibre Channel tape drives. For example, Figure 10 shows an MSL4048 with a full-height parallel SCSI tape drive, Figure 11 shows an MSL8048 or MSL8096 with two Fibre Channel tape drives, and Figure 12 shows an MSL2024 with a SAS drive.

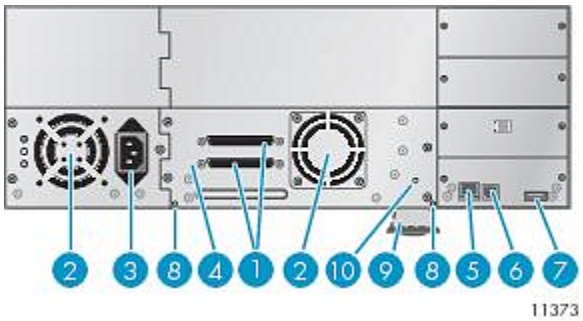


Figure 10 MSL4048 back panel overview with a full-height parallel SCSI tape drive

1. 68–pin parallel SCSI connector	2. Fan
3. Power connector	4. Tape drive
5. Ethernet port	6. Serial port (Factory use only)
7. USB port	8. Magazine release hole
9. Pull-out tab containing the serial number and other product information	10. Tape drive LED

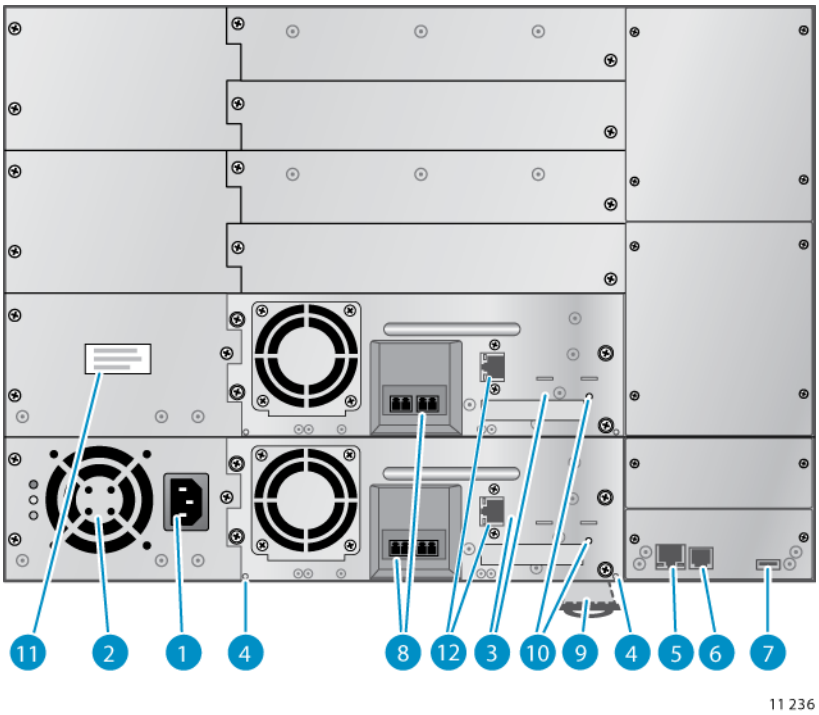


Figure 11 MSL8084 or MSL8096 back panel overview with Fibre Channel drives

1. Power connector	2. Fan vent
3. Tape drive	4. Magazine release hole
5. Ethernet port	6. Serial port (Factory use only)
7. USB port	8. Fibre Channel ports. Port A is on the left, port B is on the right.
9. Pull-out tab containing the serial number and other product information.	10. Tape drive LED
11. Redundant power supply location	12. Tape drive Ethernet port (LTO-5 only)

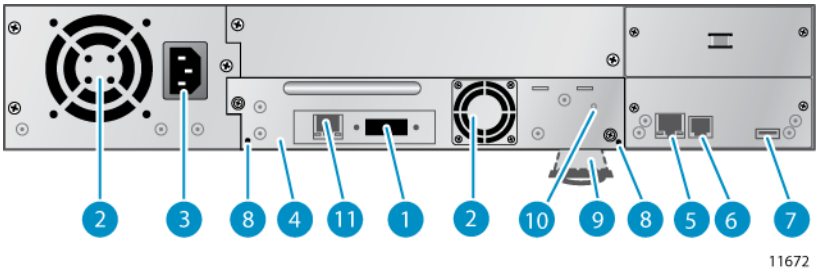


Figure 12 MSL2024 back panel overview with SAS tape drive

1. SAS port	2. Fan vent
3. Power connector	4. Tape drive

5. Ethernet port

6. Serial port (Factory use only)

7. USB port

8. Magazine release hole

9. Pull-out tab containing the serial number and other product information

10. Tape drive LED

11. Tape drive Ethernet port (LTO-5 only)

The device requires a 110/220 volt AC power connection.

Tape drive LED

Each tape drive has a green LED, which indicates that the tape drive is powered on (see Figure 13).

Figure 13 Tape drive LED

1. Tape drive LED

Power supply back panel (MSL4048, MSL8084, and MSL8096)

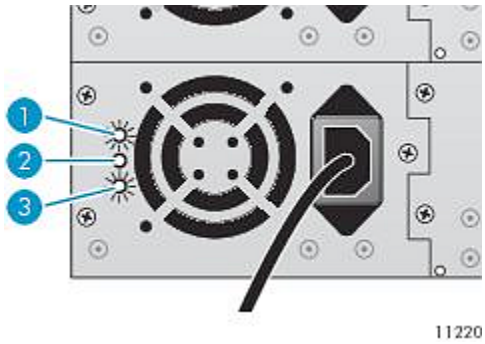


Figure 14 Power supply LEDs

1. Blue	AC power is connected.
2. Yellow	Fan failure. The fan is running too slow or is defective.
3. Green	The power supply is producing good power for the Library.

2 Installing the Tape Library

This chapter contains the information you need to install and configure your Tape Library. The installation steps are:

- Preparing the host
- Planning the SCSI configuration, Planning the SAS configuration, or Planning the Fibre Channel configuration
- Choosing a location
- Unpacking the shipping container
- Identifying product components
- Removing the shipping lock
- Mounting the device in a rack
- Installing the Tabletop Conversion Kit
- Installing tape drives
- Installing a redundant power supply
- Changing the SCSI address
- Connecting the SCSI cable (parallel SCSI devices only)
- Connecting the Fibre Channel cables (Fibre Channel devices only)
- Connecting the SAS cable (SAS devices only)
- Powering on the device
- Configuring the device
- Verifying the connection
- Labeling and loading the tape cartridges
- Verifying the installation
- Configuring additional features

Preparing the host

IMPORTANT:

Use proper procedures to prevent electrostatic discharge (ESD) (see "Appendix: Electrostatic discharge" on page 265). Use wrist-grounding straps and anti-static mats when handling internal components.

Follow these general steps:

- If the host server is connected to a network, check with the system administrator before powering off the computer.
- For parallel SCSI Tape Libraries, install a parallel SCSI host bus adapter (HBA) that supports multiple LUNs. Refer to the manuals for the host computer and the HBA for installation information. See "Parallel SCSI host bus adapters (HBAs)" on page 23 for HBA requirements.

- For SAS Tape Libraries, install a SAS host bus adapter (HBA) with an external SAS connector that supports multiple LUNs. Refer to the manuals for the host computer and the HBA for installation information. See "Planning the SAS configuration" on page 40 for configuration requirements.
- For Fibre Channel Tape Libraries, install an FC host bus adapter (HBA) or verify that you have sufficient ports available on a compatible Fibre Channel switch. See "Planning the Fibre Channel configuration" on page 41 for configuration requirements.
- Install application software and compatible drivers on the host computer. See the application software manuals for installation and configuration information.
- For parallel SCSI devices, make sure multiple LUN support is enabled on the HBA and operating system. See "Multiple LUN support" on page 23.

Planning the parallel SCSI configuration

If the host computer will have multiple parallel SCSI devices, you must decide how they will be configured into one or more parallel SCSI busses.

About parallel SCSI busses

A parallel SCSI bus consists of the host bus adapter (HBA), the parallel SCSI devices, the parallel SCSI cables, and the terminators. The HBA and devices are connected in a chain, with each device connected to the next. The last device must have a SCSI terminator. Each device in the chain must have a unique SCSI address (SCSI ID).

Complex devices, such as the Library, assign sub-addresses, called logical unit numbers (LUNs), to different parts of the device. The HBA and operating system must support multiple LUNs, also called LUN scanning, for the application software to operate the Library. HP Smart Array controllers, most third-party RAID controllers, and many on-board SCSI controllers do not support multiple LUNs.

An HBA might have one or two channels, with each channel supporting one parallel SCSI bus. Check to see how many channels the HBA has and what devices are already connected to the HBA. Some devices, such as parallel SCSI disk drives, could be inside the server.

The devices on a parallel SCSI bus share bandwidth so be careful about which devices you put together on a bus. Also, putting a single-ended (SE) SCSI device on the bus will slow all of the devices on the bus down to SE speed. Check each device's interface specifications to see what kind of parallel SCSI interface it has.

Optimizing throughput

If possible, put each tape drive on its own parallel SCSI bus. For optimum performance, each LTO-3 or LTO-4 tape drive must be on its own Ultra 320 SCSI bus. Two LTO-2 tape drives can share an Ultra 320 SCSI bus or each tape drive can be on its own Ultra 160 bus. This will give you the best performance and easiest installation.

If a tape drive must share a parallel SCSI bus with one or more other devices or the Library has multiple tape drives that must share a bus, follow these guidelines to plan your parallel SCSI busses for the highest performance:

- Do not put a tape drive on the same parallel SCSI bus as a disk drive because the system and backup performance will be slow when data is written from the hard drive to tape or from tape to the hard drive.
- Do not put a tape drive on the same parallel SCSI bus as a disk array because the disk and the tape drive performance will be affected, most RAID controllers do not support multiple LUNs, and the data on the disk array could become corrupted.

- Avoid putting an SE SCSI device on the same bus as a tape drive because the SE device will slow the tape drive to SE speed and reduce the allowable cable length.

SCSI addresses

NOTE:

The HBA also has a SCSI address, which is typically 7.

Verify that each device on the bus has a unique SCSI address. If these pre-configured addresses will not be unique on a bus, you will need to change the SCSI address of one or more of the tape drives during the installation process.

- **MSL2024:** For full-height tape drives the default SCSI address is 4. For half-height drives, the default SCSI address for the bottom drive is 4 and the default SCSI address for the top drive is 5 as shown in Figure 15 on page 39.

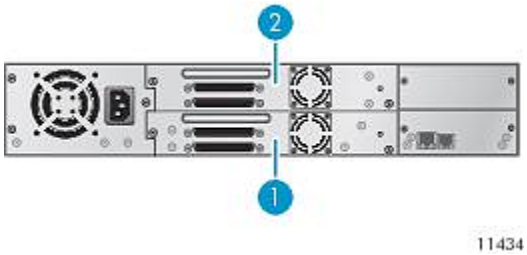


Figure 15 MSL2024 parallel SCSI tape drive default SCSI addresses

1. Tape drive with SCSI address 4
2. Tape drive with SCSI address 5

- **MSL4048:** For full-height tape drives the default SCSI address is 4. For half-height drives, the default SCSI address for the bottom drive in each full-height drive bay is 4 and the default SCSI address for the top drive is 5 as shown in Figure 16 on page 39.

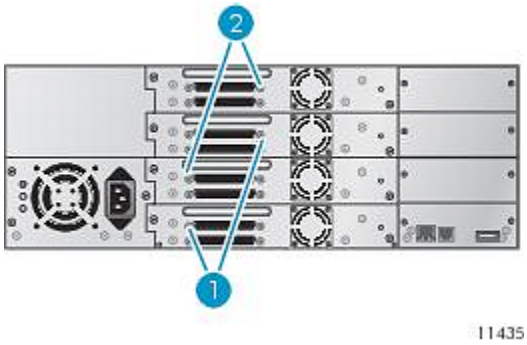


Figure 16 MSL4048 parallel SCSI tape drive default SCSI addresses

1. Tape drives with SCSI address 4
2. Tape drives with SCSI address 5

- **MSL8048 and MSL8096**: The default SCSI address for all tape drives is 4.

NOTE:

Use the HP Library & Tape Tools to check your server's parallel SCSI configuration. The HP Library & Tape Tools utility is available without cost at http://www.hp.com/support/TapeTools.

Planning the SAS configuration

The key steps in planning the SAS configuration are obtaining a suitable HBA and cable.

The Library uses two SCSI logical unit numbers (LUNs) and requires an HBA with multiple LUN support. Most HP SAS RAID controllers support Tape Libraries; many non-HP SAS RAID controllers to not support Tape Libraries. To verify the specifications of your HBA or find a list of compatible HBAs, review the compatibility matrix on the Enterprise Backup Solutions web site at: http://www.hp.com/go/ebs.

CAUTION:

Do not connect the Library to a SAS RAID controller unless the EBS matrix shows that the controller is qualified with the Library. The server might not be able to boot when the Library is connected to a non-supported SAS RAID controller.

About SAS

Serial Attached SCSI (SAS) is a computer bus technology mainly used to transfer data to and from storage devices, including disk drives and tape drives. SAS-1 (LTO-4) is designed to transfer data at 3 Gb/sec, which is comparable to the speed attained by Ultra320 SCSI. SAS-2 (LTO-5) is designed to transfer data at 6 Gb/sec.

SAS cables and connectors

SAS uses serial connections, with a direct connection between the host server and each of the storage devices. This eliminates the need to configure SCSI busses and assign SCSI IDs, as is required for parallel SCSI devices.

Most SAS HBA ports have four SAS channels. A tape drive uses one channel, so each HBA port can support up to four tape drives. You can use a cable with one connector on each end, but only one channel will be used. The HP SAS fanout cable recommended for use with the Library can connect up to four SAS tape drives to a single SAS HBA port. See Figure 17 on page 41.

Figure 17 Example SAS fanout cable

The Library has a mini-SAS connector on each tape drive. The connector is keyed in location 4, which is the standard location for end devices. If you use a cable other than the one recommended for use with the product, verify that it is keyed in location 4.

△ CAUTION:

Mini-SAS connectors are keyed. Do not force a SAS cable's mini-SAS connector into the tape drive mini-SAS connector because it might be keyed differently.

SAS signal rates require clean connections and a minimum number of connections between the HBA and the device. Do not use adapters or converters between the HBA and the device. HP recommends a maximum SAS cable length of six meters.

△ CAUTION:

High quality SAS cables rated at the transfer rate of the SAS components are required. Always verify that the SAS cable you are using is rated for the data transfer speed of the interface of your components. SAS cables described as "equalized" may not support 6 Gb/s data rates and should not be used with LTO-5 tape drives unless these cables are verified for 6 Gb/s data rates. For optimum performance, only use HP cables of the length specified as qualified for your products.

World Wide identifiers

A SAS tape drive is identified by a unique identifier called a World Wide Name (WWN) or World Wide Identifier (WWID). The Library assigns the World Wide identifier to the drive bay. When a tape drive is replaced, the World Wide identifier is re-assigned to the new tape drive.

The operating system tracks the World Wide identifier for the drive on each HBA channel. Each of the drive connectors on the fanout cable is associated with an HBA channel. Once a drive has been plugged in, it should remain on the same channel to retain the association between the HBA channel and World Wide identifier.

Planning the Fibre Channel configuration

You can connect the Library directly to the server with a host bus adapter (HBA) or indirectly through a storage area network (SAN) with a switch.

You must provide a Fibre Channel cable for each tape drive in the Library. The tape drive has an LC-style connector.

Each full-height Fibre Channel tape drive in the Library has two Fibre Channel ports. Only one port may be used at a time, but both ports can be connected for path fail over if your application supports path fail over. If you are using only one port, you can use either port.

Direct connection

If you plan to connect the Library directly to the server, you will need a 2 Gb, 4 Gb, or 8 Gb Fibre Channel HBA. A 4 Gb HBA is recommended for LTO-4 tape drives. An 8 Gb HBA is recommended for LTO-5 tape drives for optimal performance. Check the EBS matrix at http://www.hp.com/go/ebs to verify that your HBA is supported on your server and qualified for the Library.

A server that uses Fibre Channel disks needs at least two FC ports. Using the same port for disk and tape access will cause performance degradation.

SAN connection

All switches between the host and the Library must be of the appropriate type. A 2 Gb switch in the path may result in performance degradation when backing up highly compressible data.

Configure zoning on the Fibre switch so only the backup servers may access the Library. See the switch manual for information on zoning.

Choosing a location

If you plan to mount the device in a rack, select an open rack location, ideally near the center of the rack or higher, with access to the host server and a power outlet.

If you plan to set the MSL2024 or MSL4048 Tape Library on a table in the tabletop conversion cover, select a level area large enough to support both edges of the device with access to the host server and a power outlet. Do not set the MSL8048 or MSL8096 Tape Library on a table or other surface.

IMPORTANT:

The MSL8048 and MSL8096 Tape Libraries must be mounted in the enclosed rack rails. The MSL2024 and MSL4048 Tape Libraries must be mounted in the enclosed rack rails or in the optional tabletop conversion cover. Placing the Library on a surface, such as a table top or rack shelf, without the tabletop conversion cover could result in Library errors.

If installing the Library with the Library Extender, determine the master and lower units, and install them in adjacent rack locations, with the master Library directly above the lower Library. To install the Extender, both Libraries must be installed in the rack rails.

Table 17 Library extender supported configurations

Master Library	Lower Library
MSL4048	MSL2024
MSL4048	MSL4048
MSL8096	MSL2024

Master Library	Lower Library
MSL8096	MSL4048

Choose a location that meets the criteria shown in Table 18 on page 43:

Table 18 Location criteria

Criteria	Definition
Tabletop requirements	The MSL2024 and MSL4048 Tape Libraries can only be placed on a flat surface if they are installed in the optional tabletop conversion cover. Do not put the MSL8048 or MSL8096 Tape Library on a flat surface; it must be mounted in a rack with the included rack kit. Select a location that is flat, sturdy, and close to the host server. Ensure that all of the plastic feet on the tabletop conversion cover will be supported. Do not place the device on the floor or other carpeted surface. Do not place the Library on its sides or upside down, or stack items on top of it. The Tabletop Conversion cover is not a structural top so no weight may be placed on top of the cover.
Rack requirements	HP Rack 5000, 10000 Series, HP Rack System/E
Rack space requirements	MSL2024: 2U MSL4048: 4U MSL8048 and MSL8096: 8U
Room temperature	10-35° C (50-95° F)
Power source	AC power voltage: 100-127 VAC; 200-240 VAC Line frequency: 50-60 Hz Place the device near an AC outlet. The AC power cord is the product's main AC disconnect device and must be easily accessible at all times.
Weight without media	MSL2024: 13.6 kg (29.9 lb) — 15.6 kg (34.3 lb) MSL4048: 18.6 kg (40.9 lb) — 24.6 kg (54.1 lb) MSL8048 and MSL8096: 44.6 kg (98.3 lb) — 46.6 kg (102.7 lb)
Weight with media	MSL2024: 18.4 kg (40.5 lb) — 20.4 kg (44.9 lb) MSL4048: 28.2 kg (62.0 lb) — 34.2 kg (75.2 lb) MSL8048: 54.2 kg (117.4 lb) — 56.2 kg (121.9 lb) MSL8096: 66.8 kg (147.2 lb) — 68.8 kg (151.7 lb)
Air quality	The device should be placed in an area with minimal sources of particulate contamination. Avoid areas near frequently used doors and walkways, stacks of supplies that collect dust, printers, and smoke-filled rooms. Excessive dust and debris can damage tapes and tape drives.
Humidity	20-80 percent relative humidity non-condensing
Clearance	Back: Minimum of 15.4 cm (6 inches) Front: Minimum of 30.8 cm (12 inches) Sides: Minimum of 5.08 cm (2 inches)

Unpacking the shipping container

Before you begin, clear a level work surface near where you will place the Library.

△ CAUTION:

If the temperature in the room where the device will be installed varies by 15° C (30° F) from the room where it was stored, allow it to acclimate to the surrounding environment for at least 12 hours before unpacking it from the shipping container.

Unpacking the Tape Library:

1. Inspect the container for shipping damage. If you notice any damage, report it to the shipping company immediately.
2. Open the shipping container and remove the packaging foam and accessories that cover the device.
3. Lift the device out of the carton, place it on the work surface.

△ CAUTION:

Do not place the Library on either end or its sides as this may damage it.

4. Remove any other accessories from the shipping container. Save the packaging materials for future use.

Identifying product components

Confirm that you received the following product components:

- Two rack rails
- *Getting started* poster
- Accessory package
  - Two bags of M6 screws: The bag you choose is dependent upon the type of rack you have. Each bag is labeled:
    - Bag of eight M6 screws for the HP Rack 5000 or Rack 10000 Series (9.5 mm square holes in the rack column) with two clip nuts for the MSL4048 or four clip nuts for the MSL8048 or MSL8096.
    - Bag of eight M6 screws for the HP Rack System/E (7.1 mm round holes in the rack column) with two clip nuts for the MSL4048 or four clip nuts for the MSL8048 or MSL8096.
  - One parallel SCSI cable and terminator for each parallel SCSI tape drive
  - Ethernet cable
- Documentation kit
  - HP Worldwide Warranty
  - HP Safety CD
  - HP product documentation survey

For Fiber Channel Libraries you must provide a Fibre Channel cable for each tape drive. For SAS Libraries, you must provide a SAS cable with the correct connector for your HBA. HP recommends

using a SAS fanout cable that connects up to four tape drives to the SAS HBA. (See "SAS cables and connectors" on page 40.) For ordering information for supported cables, see the MSL QuickSpecs at: http://www.hp.com/go/tape

Removing the shipping lock

Skip this step for the MSL8048 and MSL8096.

The shipping lock prevents the robotic transport mechanism from moving during shipment. You must remove the shipping lock before powering on the device. The shipping lock is held in place with a piece of tape and is located in the top center of the device. After the shipping lock is removed, it should be stored on the back panel of the device for future use.

To remove and store the shipping lock:

1. Locate the tape and lock at the top of the device (see Figure 18 on page 45) .

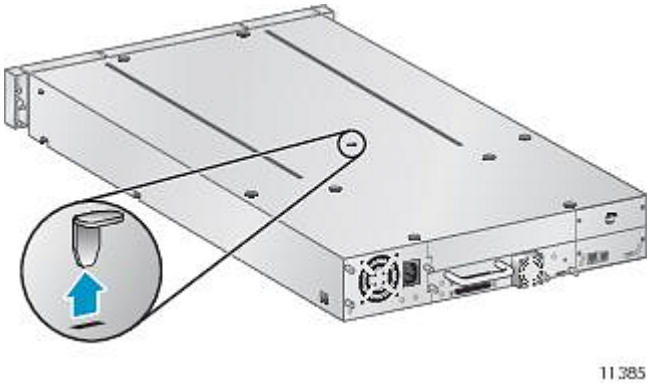


Figure 18 Shipping lock location

2. Remove the tape, then remove the lock.
3. Store the lock on the back panel of the device (see Figure 19). The shipping lock storage location for the MSL4048 is on the back panel, similar to the location on the MSL2024.

Figure 19 Shipping lock storage location

Mounting the device in a rack

If you plan to set the MSL2024 or MSL4048 Library on a table or rack shelf, skip this step and continue with "Installing the Tabletop Conversion Kit" on page 48. The MSL8048 and MSL8096 Libraries must be installed in a rack with the supplied rails.

⚠ WARNING!

The HP StorageWorks MSL2024 Tape Library weighs up to 15.6 kg (34.3 lb) without media and up to 20.4 kg (44.9 lb) with media (24 cartridges). The MSL4048 Tape Library weighs up to 24.6 kg (54.1 lb) without media and up to 34.2 kg (75.2 lb) with media (48 cartridges). The MSL8048 Tape Library weighs up to 46.6 kg (102.7 lb) without media and up to 66.5 kg (151.7 lb) with media (48 cartridges). The MSL8096 Tape Library weighs up to 46.6 kg (102.7 lb) without media and up to 68.8 kg (151.7 lb) with media (96 cartridges).

When moving the Library, to reduce the risk of personal injury or damage to the Library: 1) observe local health and safety requirements and guidelines for manual material handing, 2) always remove all tapes to reduce the overall weight of the Library, and 3) obtain adequate assistance to lift and stabilize the Library during installation or removal.

The device easily installs into the HP Rack System/E, or the HP Rack 5000 or HP Rack 10000 series. You need a #2 and a #3 Phillips screwdriver for this procedure.

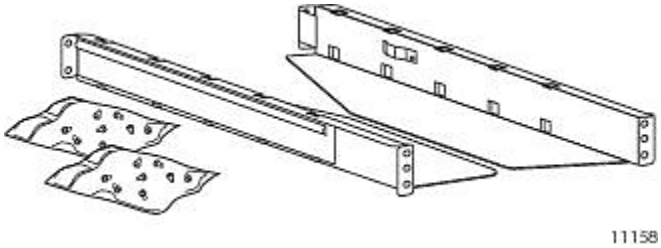


Figure 20 Rack kit

- Two rails
- Two bags of eight M6 screws.

The accessory package contains two sets of eight M6 screws, along with four clip nuts for the MSL4048 or six clip nuts for the MSL8048 or MSL8096. Select the bag of screws appropriate for your type of rack.

- The HP Rack System/E rack has 7.1 mm round holes in the rack column. The packet for this rack type is labeled **HP Rack System/E**.
- The HP Rack 5000 and 10000 series have 9.5 mm square holes in the rack column. The packet for these rack types is labeled **HP Rack 5000, 10000 Series.**

To install the rails into the rack:

1. Using the screws for your rack type and a #3 Phillips screwdriver, secure one rail to each side of the rack in your chosen rack location.

2. Secure the front of one rail to the front of the rack. Extend the rail to the depth of the rack and secure the rail to the back of the rack. The front of the rails are straight and the back are angled, as shown in Figure 21 on page 47.

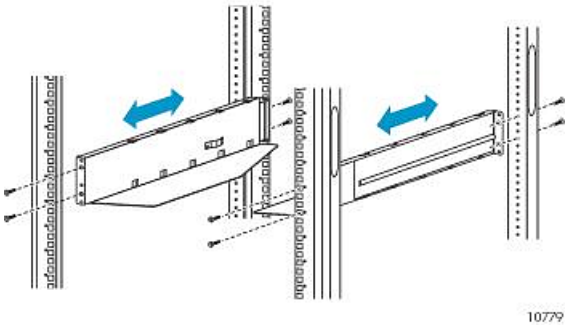
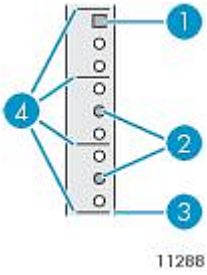


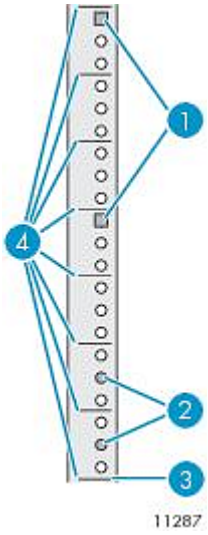
Figure 21 Installing the rails into the rack

3. For the MSL4048, MSL8048, and MSL8096 insert the clip nuts on the front of the rack in the locations shown. These will be used to secure the Library to the rack.

MSL4048



MSL8048 and MSL8096



1. Clip nut location
2. Rail screw location
3. Bottom of the Library
4. U marker

To install the device on the rails and into the rack:

1. Locate the captive screws on the front bezel (see Figure 22). The MSL2024 has two captive screws. The MSL4048 has four captive screws and the MSL8048 and MSL8096 have six captive screws.
2. Slide the device onto the rails.

3. From the front of the device, secure the front bezel to the rack using a #2 Phillips screw driver placed through the small holes in the mounting bracket to tighten the captive screws on each side of the device.

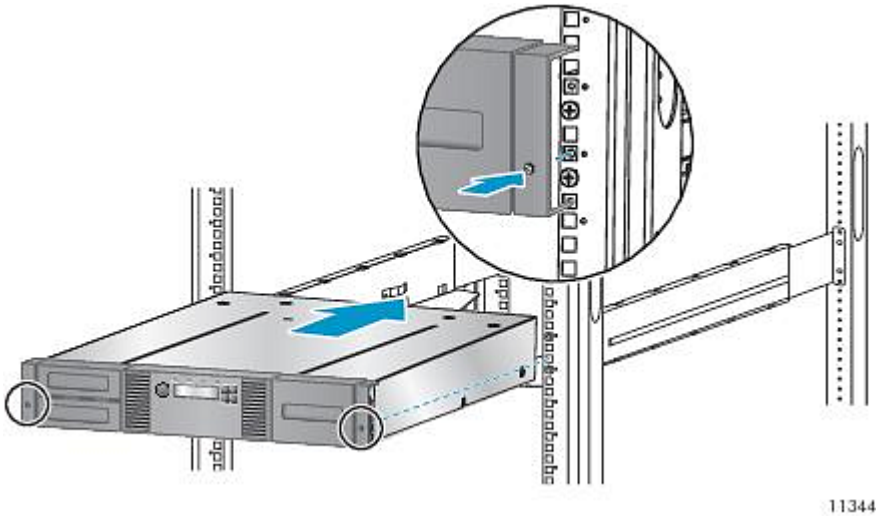


Figure 22 Securing the Tape Library to the rack

Installing the Tabletop Conversion Kit

The Rack to Tabletop Conversion Kit supports the edges of the Library, but is not a structural top.

IMPORTANT:

You may not place any weight on top of the Tape Library, even with the cover installed.

To install the cover:

1. Place the cover on a flat, level surface behind the device.
2. Slide the device into the cover until the front panel of the device is aligned with the cover (see Figure 23).

Figure 23 Installing the tabletop conversion cover

3. Tighten the captive screws on the front panel until the cover is secure.

Installing tape drives

If your Library does not have a tape drive installed, install the tape drives now. If the Library already has a tape drive and you purchased additional tape drives, you can install them now or wait until after the Library installation is complete.

To install tape drives:

1. Locate an appropriate vacant drive bay on the back of the Library.
   - MSL2024: The first tape drive should be installed in the bottom drive bay. If the first tape drive is a half-height tape drive, you can install an additional half-height tape drive in the top bay.
   - MSL4048: The first tape drive should be installed in the bottom drive bay. Install each additional tape drive in the drive bay directly above the existing tape drives. If you leave a space and later add a tape drive in the space, the new tape drive will be assigned the next higher drive number, leaving the tape drives numbered out of order. If the settings are restored to the factory defaults or the Library is power-cycled, the drives will be renumbered and you might need to update the configuration of your backup servers.

NOTE:

The Library will not operate with a full-height tape drive installed in the second and third half-height drive bays. Install a full-height tape drive either in the bottom two drive bays or the top two drive bays.

NOTE:

If you plan to partition the Library into two logical libraries, the second tape drive must be installed in the third half-height drive bay. For tape drive locations for two logical libraries, see Table 14 on page 30.

   - MSL8048 and MSL8096: The first tape drive should be installed in the bottom drive bay. The MSL8048 and MSL8096 have four tape drive connectors in the locations where full-height tape drives would be installed. When installing a half-height tape drive, install it in the drive bay directly above a full-height tape drive or above a half-height drive and half-height face plate pair as shown in Figure 24.

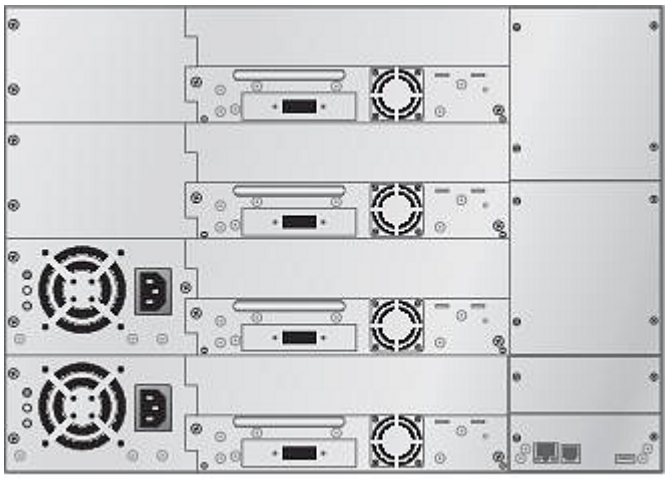


Figure 24 MSL8048 and MSL8096 locations for half-height drives

Remove the face plate covering the drive bay by removing the screws holding it in place. Remove one drive bay cover to install a half-height tape drive; remove two drive bay covers to install a full-height tape drive.

NOTE:

If you plan to partition the Library into two logical libraries, the second tape drive must be installed in the third drive bay. For tape drive locations for two logical libraries, see Table 14 on page 30.

2. Holding the tape drive by the handle and supporting it from the bottom, slide the tape drive into the drive bay until it is flush with the back of the Library as shown in Figure 25.

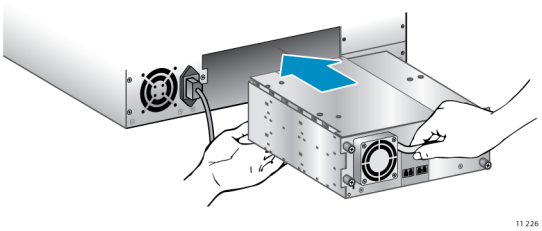


Figure 25 Installing a tape drive

3. Tighten the blue captive screws with your fingers to secure the tape drive to the chassis.

Installing a redundant power supply

If you have a redundant power supply for the MSL4048, MSL8048, or MSL8096 Tape Library, you may install it now or wait until the installation process is complete.

To install the redundant power supply:

1. Verify that the power to the Library is off and the power cord is not attached.
2. On the back of the Library, locate the second power supply bay, which is right above the existing power supply.
3. Using a #2 Phillips screwdriver, remove the screws that attach the bay cover to the chassis.
4. Position the new power supply on the alignment rails and push it into the Library until it is flush with the back panel, as shown in Figure 26.

Figure 26 Installing the new power supply

5. Tighten the blue thumbscrews by hand to secure the power supply to the chassis as shown in Figure 27.

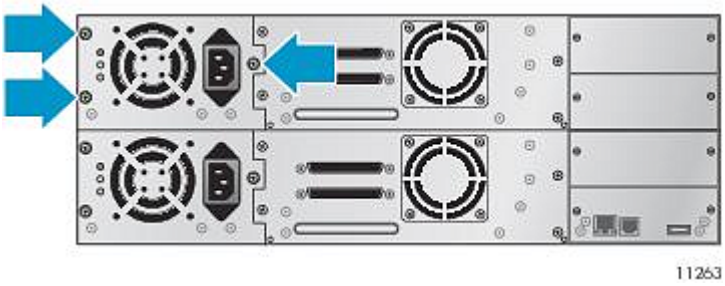


Figure 27 Redundant power supply thumbscrews

Changing the SCSI address (parallel SCSI drives only)

On a parallel SCSI device, if you need to change the SCSI ID for one or both of the tape drives, do so before connecting the Library to the host computer.

The pre-configured SCSI address for all full-height tape drives in the MSL2024 and MSL4048, and for all drives in the MSL8048 and MSL8096 is 4. For half-height drives in the MSL2024 and MSL4048, the bottom drive of any pair has SCSI address 4 and the top drive has SCSI address 5. If these pre-configured addresses will not be unique on a bus, you must change the SCSI ID of one or more tape drives.

To change the SCSI ID:

1. Plug the power cord into the power connector on the back panel and then plug the cord into the power outlet.
2. From the front panel, push the round power button to power on the device.
3. From the front panel, set the new SCSI ID for any drives that must have a different SCSI ID. For the MSL2024, see "Changing the SCSI address — parallel SCSI devices (Configuration > Change Drive)" on page 115. For the MSL4048, MSL8048, or MSL8096, see "Changing the drive configuration (Configuration > Drives)" on page 144.
4. Power off the device by depressing the power button on the front panel.

TIP:

The SCSI ID can also be changed from the RMI **Configure: Drive** screen once the RMI is configured. See Changing the drive configuration, page 87.

Connecting the parallel SCSI cable (parallel SCSI devices only)

NOTE:

LTO-3 and LTO-4 tape drives are Ultra 320 SCSI LVD devices. Use only cables and terminators specified for Ultra 320 or labeled as MultiMode. LTO-2 tape drives are Ultra 160 SCSI LVD/SE devices; use only cables and terminators specified for Ultra 160 or Ultra 320, or labeled as MultiMode.

NOTE:

For optimal performance, a parallel SCSI tape drive should be the only device on the bus.

To connect the parallel SCSI cable to the device:

1. HP recommends that the host server be powered off before attaching new devices.
2. Attach one end of the parallel SCSI cable (included in the accessory package) to one of the connectors on the back panel of the tape drive (see Figure 28).

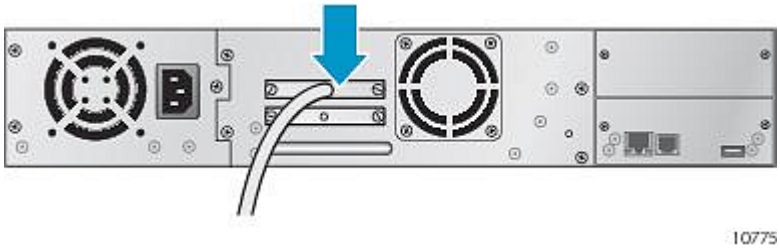


Figure 28 Attaching the parallel SCSI cable to the tape drive

3. Attach the other end of the parallel SCSI cable to the connector on the parallel SCSI host bus adapter or to the connector on the previous device on the parallel SCSI bus.

NOTE:

The host bus adapter should be Low Voltage Differential Signaling (LVDS). A Single-Ended (SE) SCSI host bus adapter works, but severely degrades performance and limits cable length. If any SE devices are on the same parallel SCSI bus, all of the devices on the parallel SCSI bus slow to SE speed, which severely degrades performance. Never attach an LTO-3 or LTO-4 tape drive to an SE SCSI bus.

4. Attach the terminator to the remaining parallel SCSI connector on the back panel of the tape drive if the Library is the last or only device on the parallel SCSI bus. Otherwise, attach one end of a parallel SCSI cable to the remaining port and the other end to the next device on the parallel SCSI bus. Make sure the last device on the parallel SCSI bus is properly terminated.

Connecting the Fibre Channel cables (Fibre Channel devices only)

To connect the Fibre Channel cables to the Library:

1. Remove the FC port caps if necessary. Attach one end of the Fibre Channel cable to Port A on the tape drive as shown in Figure 29.

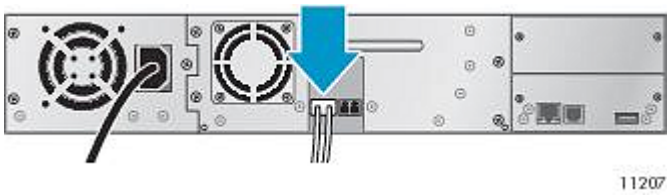


Figure 29 Attaching the Fibre Channel cable

2. Attach the other end of the FC cable to a switch or HBA.

NOTE:

It is recommended that you cable Port A only and that you configure Port B for Auto Detect on Fibre Speed and Port Type.

Connecting the SAS cable (SAS devices only)

To connect the SAS cable to the device:

1. Attach the HBA end of the SAS cable into the connector on the HBA. If you are using a SAS fanout cable, the end of the cable with only one connector, shown facing backwards in Figure 30, should be plugged into the connector on the HBA.

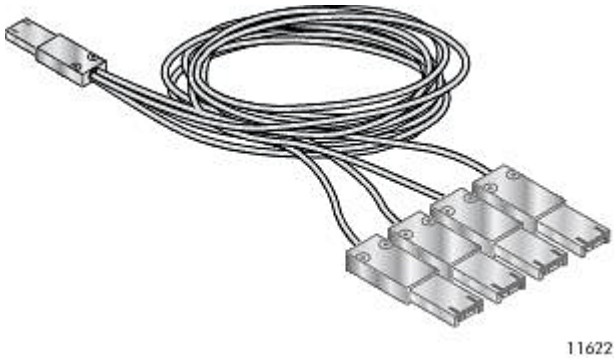


Figure 30 Example SAS fanout cable

2. If you are using a cable with a single connector on each end, attach the other end into the connector on the tape drive.

   If you are using a SAS fanout cable, attach one mini-SAS connector into the connector on each tape drive. The unused ends of the SAS fanout cable are single channel and not suitable for use with disk arrays. Use the other ends to connect tape drives, or coil and secure them to the rack to minimize stress on the connectors.

TIP:

Mini-SAS connectors are keyed. Do not force a SAS cable's mini-SAS connector into the tape drive mini-SAS connector because it might be keyed differently.

NOTE:

Each of the tape drives uses one channel and the HP cable recommended for use with the Library maps each of the four channels from the HBA to one channel on the drive end.

You can plug any of the four drive connectors into any tape drive.

NOTE:

SAS signal rates require clean connections between the HBA and tape drive. Do not use adapters or converters between the HBA and the tape drive. For reliable operation, use a maximum SAS cable length of six meters.

Powering on the device

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) an unapproved power cord could fracture 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.

To power on the Library:

1. To use the web-based management interface, connect an Ethernet cable to a working LAN connection and to the Ethernet connector on the back of the Library.
2. Attach the power cable to the power connector on the back panel of the Library (see Figure 31).

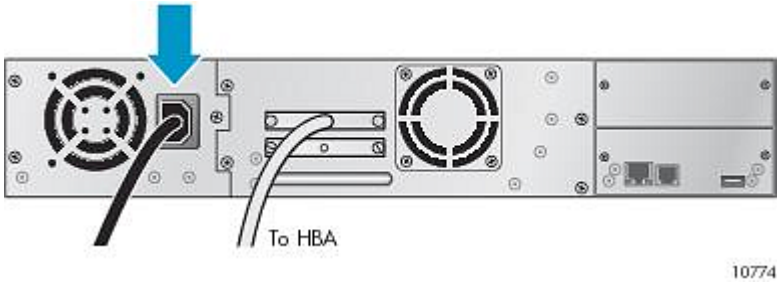


Figure 31 Attaching the power cord

3. Plug the power cable into the nearest properly grounded power outlet.
4. Power on the device by pressing the power button located on the front panel. Check the LCD screen to make sure it has power. If not, check the power connections and your power source. During the Power On Self Test (POST), all four LEDs are illuminated briefly, followed by a flashing **Ready** LED. When the initialization sequence is complete, the Home screen is displayed. If the inventory takes over five minutes, the splash screen is displayed. Press any button to see the Home screen.
5. Plug in the host server and all attached devices.
6. Power on any other devices you powered off earlier.
7. Power on the server.

Configuring the device

Now that the Library is connected to the host and powered on, configure it for your environment.

To configure the Library :

1. Set the administrator password. Setting an administrator password provides access to the administrator functions with the RMI or OCP, and restricts access to administrator functions to only those who know the administrator password. The Library comes with a null administrator password, which until set allows unrestricted access to all administrative functions through the OCP but not the RMI. Once the administrator password has been set from the OCP, it can be changed from either the OCP or RMI. (For the MSL2024, see "Changing the administrator password (Configuration > Change Admin Password)" on page 113. For the MSL4048, MSL8048, and MSL8096, see "Changing the administrator password (Configuration > Set Admin Password)" on page 144.)
2. Set the date and time. The date and time are used by the Library to record events and should be set during the initial installation process. (For the MSL2024, see "Setting the date and time (Configuration > Library Date/Time)" on page . For the MSL4048, MSL8048, and MSL8096, see "Setting the Library date and time (Configuration > Set Date and Time)" on page .)
3. Configure the Library network settings. Configuring the Library network settings enables you to monitor, configure, and control most Library functions from the RMI. By default, the device will obtain an IP address from an IPv4 DHCP server. Optionally, you can configure the device to use a static IP address. Once logged into the RMI, you can administer further network changes through the RMI. (For the MSL2024, see "Configuring network settings (Configuration > Configure Network Settings)" on page 118. For the MSL4048, MSL8048, and MSL8096, see "Changing the network configuration (Configuration > Network Configuration)" on page 144.)

   The device supports IPv4 and IPv6 Internet Protocols. By default, the device is configured to use IPv4, the most common version. You can enable IPv6 or both Internet Protocols from the OCP or RMI. You must finish configuring IPv6 from the RMI. (See "Changing the network configuration" on page 88.)
4. Configure the Fibre Channel ports (Fibre Channel tape drives only). HP recommends leaving the Fibre Channel ports at the default settings:

   - Fibre speed: Automatic
   - Port type: Auto Detect

   The drive will choose the appropriate settings. To change the settings from the remote management interface, see "Changing the drive configuration" on page 87. To change the settings from the operator control panel, see "Changing the drive configuration — Fibre Channel devices (Configuration > Change Drive)" on page 115 for the MSL2024 or "Changing the drive configuration (Configuration > Drives)" on page 144 for the MSL4048, MSL8048, and MSL8096.

Verifying the connection

To verify the connection between the host computer and the Library:

1. Install the application software and/or drivers that are compatible with the Library. Software compatibility information is available at http://www.hp.com/go/automated. Backup software packages may require additional software or licensing to communicate with the robotics.

2. Verify the connection between the Library and the host:
   - Install the HP Library & Tape Tools Diagnostic/Installation Check Utility, available at http://www.hp.com/support/TapeTools, onto the host server. This utility verifies that the unit is connected and communicating with the host server. It also verifies that the device is functioning and provides diagnostic information. Run the HP Library & Tape Tools **Installation Check** from the programs menu to verify your connections.

   NOTE:

   L&TT may also be run from a CD, Compact Flash drive, or remote directory after installation on another computer. See the *HP StorageWorks Library and Tape Tool User guide* for instructions for installing L&TT on a computer other than the server.

   - Confirm that the host server's operating system recognized the device in Microsoft® Windows® XP, Windows® Server 2003 or in Windows 2000® by going to: **Settings > Control Panel > System > Hardware > Device Manager > Tape Drive and/or Media Changer**.

   For more information on verifying the connection of parallel SCSI devices, consult the operating system documentation.

Labeling and loading the tape cartridges

Before using your new Library you must load tape cartridges into the magazines.

To prepare your tape cartridges and load them into the Library:

1. Obtain tape cartridges compatible with your Library. (See "Tape cartridges" on page 59.)
2. Label any unlabeled tape cartridges to improve inventory time. (See "Labeling tape cartridges" on page 61.)
3. Remove one of the magazines from the Library with the RMI or OCP:
   - RMI: see "Releasing and replacing the magazines" on page 99.
   - MSL2024 OCP: see "Unlocking, removing, and replacing magazines (Operations > Unlock Left or Right Magazine)" on page 122.
   - MSL4048, MSL8048, and MSL8096 OCP: see "Unlocking, removing, and replacing magazines (Operations > Unlock Left or Right Magazine)" on page 122.

   The Library will not perform any other action while a magazine is out of the device.
4. Insert the tape cartridges into the magazine. (See "Magazines" on page 63.)
5. Slide the magazine into the Library.
6. Repeat steps 2 through 5 for each of the other magazines.

Verifying the installation

Verify that the device has the current firmware revision.

To see the firmware revision on the MSL2024 front panel:

1. From the Home screen, press **Next** until the display shows **Status/Information**. Press **Enter**.
2. Press **Next** until the display shows **Library Information**. Press **Enter**.
3. Press **Next** until the display shows the **Firmware Rev**.

To see the firmware revision on the MSL4048, MSL8048, and MSL8096 front panel:

1. Use the control keys to navigate to **Info > Identity > Library**.
2. The **Library Controller FW Revision** field shows the Library firmware revision.

To find the current firmware revision, visit the HP Support website: http://www.hp.com/support.

If necessary, update the device firmware:

- From the RMI, see "Determining and updating firmware " on page 100.
- From the MSL2024 OCP, see "Upgrading firmware (Support > Library FW Upgrade, Support > Drive FW Upgrade)" on page 127.
- From the MSL4048, MSL8048, and MSL8096 OCP, see "Updating library and drive firmware (Support > FW Upgrade)" on page 150.
- Using HP Library and Tape Tools (L&TT), which can be downloaded free of charge from http://www.hp.com/support/TapeTools.

After configuring the Library, you can save the configuration settings to a USB flash drive from the OCP or to a file from the RMI **Configuration: Save/Restore** screen. Having a backup of the Library configuration is helpful when recovering from a configuration error, setting up multiple devices with similar configurations, or if the Library needs service. See Saving and restoring the device configuration and restoring factory defaults, page 95.

Configuring additional features

The Library has many features to customize it for your organization.

- Partitioning a Library with multiple tape drives into logical libraries. See "Changing the system configuration" on page 82.
- Enabling and configuring SNMP network management or Command View TL TapeAssure. See "Configuration: Network Management" on page 90.
- Setting up email event notification. See "Setting event notification parameters" on page 95.
- Naming the Library, which is done from the RMI Configuration: Network screen. See Changing the network configuration, page 88.
- To use the RMI and OCP in Japanese, enable the Japanese language option through the RMI. See "Changing the system configuration" on page 82.

3 Tape cartridges and magazines

This chapter explains which media to use with your Library, and how to label and write-protect your tape cartridges. Careful labeling and handling of the tape cartridges will prolong the life of the tape cartridges and the Tape Library.

Tape cartridges

Use the Ultrium data and cleaning tape cartridges designed for your model of Tape Library. You can order data and cleaning cartridges at http://www.hp.com/go/storagemedia.

Table 19 Ultrium 448 tape drive

Cartridge type	Part number
HP LTO2 Ultrium 400 GB Data Cartridge, red	C7972A
HP Ultrium universal cleaning cartridge, (50 cleans), orange	C7978A

Table 20 Ultrium 920 and 960 tape drive

Cartridge type	Part number
HP LTO3 Ultrium 800 GB RW Data Cartridge, yellow	C7973A
HP LTO3 Ultrium 800 GB WORM Data Cartridge, two-tone (yellow and white)	C7973W
HP Ultrium universal cleaning cartridge, (50 cleans), orange	C7978A

Table 21 Ultrium 1760 and 1840 tape drive

Cartridge type	Part number
HP LTO4 Ultrium 1.6 TB RW Data Cartridge, green	C7974A
HP LTO4 Ultrium 1.6 TB WORM Data Cartridge, two-tone (green and gray)	C7974W
HP Ultrium universal cleaning cartridge, (50 cleans), orange	C7978A

Table 22 Ultrium 3000 and 3280 tape drive

Cartridge type	Part number
HP LTO5 Ultrium 3 TB RW Data Cartridge, blue	C7975A
HP LTO5 Ultrium 3 TB WORM Data Cartridge, two-tone (blue and gray)	C7975W

Cartridge type	Part number
HP Ultrium universal cleaning cartridge, (50 cleans), orange	C7978A

NOTE:

The LTO-3 and later tape drives support both rewriteable and WORM data cartridges. Write-Once, Read-Many (WORM) data cartridges provide an enhanced level of data security against accidental or malicious alteration of data on the tape cartridge. The WORM data cartridge can be appended to maximize the full capacity of the tape cartridge, but you will be unable to erase or overwrite data on the cartridge. WORM data cartridges are clearly identified by their distinctive, two-tone cartridge color. To check whether your backup or archive software application supports WORM cartridges, see the following website: http://www.hp.com/go/storagemedia.

Using and maintaining tape cartridges

CAUTION:

Do not degauss Ultrium data cartridges! These data cartridges are pre-recorded with a magnetic servo signal. This signal is required to use the cartridge with the Ultrium tape drive. Keep magnetically charged objects away from the cartridge.

To ensure the longest possible life for your data cartridges, follow these guidelines:

- Use only the data cartridges designated for your device.
- Clean the tape drive when the **Clean** drive LED is illuminated.

CAUTION:

Use only Ultrium Universal cleaning cartridges.

- Do not drop a cartridge. Excessive shock can damage the internal contents of the cartridge or the cartridge case itself, making the cartridge unusable.
- Do not expose data cartridges to direct sunlight or sources of heat, including portable heaters and heating ducts.
- The operating temperature range for data cartridges is 10 to 35° C. The storage temperature range is -40 to +60° C in a dust-free environment in which relative humidity is always between 20 percent and 80 percent (non-condensing).
- If the data cartridge has been exposed to temperatures outside the specified ranges, stabilize the cartridge at room temperature for the same length of time it was exposed to extreme temperatures or 24 hours, whichever is less.
- Do not place data cartridges near sources of electromagnetic energy or strong magnetic fields such as computer monitors, electric motors, speakers, or X-ray equipment. Exposure to electromagnetic energy or magnetic fields can destroy data and the embedded servo code written on the media by the cartridge manufacturer, which can render the cartridge unusable.
- Place identification labels only in the designated area on the cartridge.

Labeling tape cartridges

The device contains a bar code reader that reads the tape labels and stores the inventory data in memory. The device then provides the inventory information to the host application, OCP, and RMI. Having a bar code label on each tape cartridge enables the bar code reader to identify the cartridge quickly, thereby speeding up inventory time. Make it a practice to use bar code labels on your tape cartridges.

TIP:

The bar code scanner must scan each tape or the back of the storage slot until it reads the bar code label for the cartridge or storage slot, or determines that the slot is empty. The bar code scanner can identify a properly labeled cartridge on the first scan. It can identify an empty slot on the second scan. It will try several more scans and then tap on the cartridge before determining that an unlabeled cartridge is in the slot, which takes about four times as long as identifying a properly labeled cartridge. The inventory time for an MSL8048 or MSL8096 filled with unlabeled cartridges is about 30 minutes. Even if you do not need the bar code information, use bar code labels to speed up inventory time.

A proper bar code label includes the Media ID in the last two characters of the bar code. If an Ultrium 4 or Ultrium 5 tape drive is installed in the Tape Library or is in the removed state, the Tape Library will not load a cartridge with an Ultrium 4 or Ultrium 5 Media ID or an unlabeled cartridge into an Ultrium 3 or earlier generation tape drive.

Though not recommended, checking Ignore Barcode Media ID in the RMI Configuration: System screen will keep the Library from interpreting bar code Media IDs.

Your host software may need to keep track of the following information via the associated bar code:

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

IMPORTANT:

Misusing and misunderstanding bar code technology can result in backup and restore failures. To ensure that your bar code labels meet HP's quality standards, always purchase them from an approved supplier and never print bar code labels yourself.

To order bar code labels from an HP-authorized reseller:

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

For more information, see the *Bar Code Label Requirements, Compatibility and Usage* white paper available from http://www.hp.com/support.

Ultrium tape 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. Only apply labels as shown:

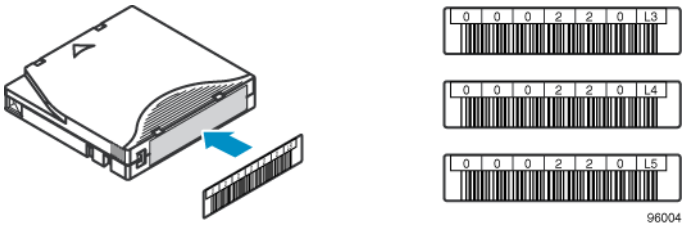


Figure 32 Apply the label within the recessed area

IMPORTANT:

The bar code label should only be applied as shown, with the alphanumeric portion facing the hub side of the tape cartridge. Never apply multiple labels onto a cartridge because extra labels can cause the cartridge to jam in a tape drive.

Write-protecting tape cartridges

All rewriteable data cartridges have a write-protect switch to prevent accidental erasure or overwriting of data. Before loading a cartridge into the device, make sure the write-protect switch on the front of the cartridge is in the desired position.

- Slide the switch to the **left** to allow the device to write data to the cartridge (see Figure 33, 1).
- Slide the switch to the **right** to write-protect the cartridge. An indicator, such as a red mark or small padlock, is visible showing that the cartridge is write-protected (see Figure 33, 2).

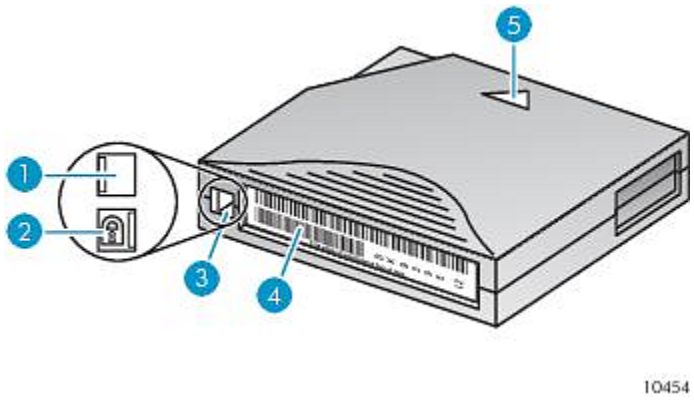


Figure 33 Write-protecting the data cartridge

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

Read and write compatibility

HP Ultrium data cartridges are fully supported and compatible with HP StorageWorks Ultrium tape products (see Backward read compatibility). Because HP Ultrium media is Ultrium logo compliant, it may be used with any other non-HP device that bears the Ultrium logo.

Table 23 Read and write compatibility

	LTO-1 drive	LTO-2 drive	LTO-3 drive	LTO-4 drive	LTO-5 drive
LTO-1 media	Read/Write	Read/Write	Read only	Incompatible	Incompatible
LTO-2 media	Incompatible	Read/Write	Read/Write	Read only	Incompatible
LTO-3 media	Incompatible	Incompatible	Read/Write	Read/Write (no encryption)	Read only
LTO-4 media — unencrypted	Incompatible	Incompatible	Incompatible	Read/Write	Read/Write
LTO-4 media — encrypted	Incompatible	Incompatible	Incompatible	Read/Write with encryption key	Read/Write with encryption key
LTO-5 media — unencrypted	Incompatible	Incompatible	Incompatible	Incompatible	Read/Write
LTO-5 media — encrypted	Incompatible	Incompatible	Incompatible	Incompatible	Read/Write with encryption key

△ CAUTION:

Ultrium 2 and Ultrium 3 tape drives require the most recent firmware to immediately identify Ultrium 4 media. Without the most recent firmware, loading an Ultrium 4 cartridge into an earlier generation drive may result in a long media identification and unload time. The drive may not identify the media and return a load error before the application software times out waiting for the load. HP strongly recommends keeping your tape drives updated to the most recent firmware.

Magazines

The device has removable magazines. Magazine access is password protected. For safety reasons, the robotic motion is stopped when a magazine is removed.

The magazines can be released using the operator control panel (OCP), the remote management interface (RMI), or by a manual release. HP recommends that you release the magazine using the OCP or RMI. The magazine must only be removed manually when the OCP or RMI process has failed, or the device no longer has power.

IMPORTANT:

To manually release a magazine, see "Releasing the magazines manually" on page 176. However, this manual process should only be used if the magazine cannot be released using the operator control panel or the remote management interface.

The slot numbering scheme for the MSL2024 is shown in Figure 34.

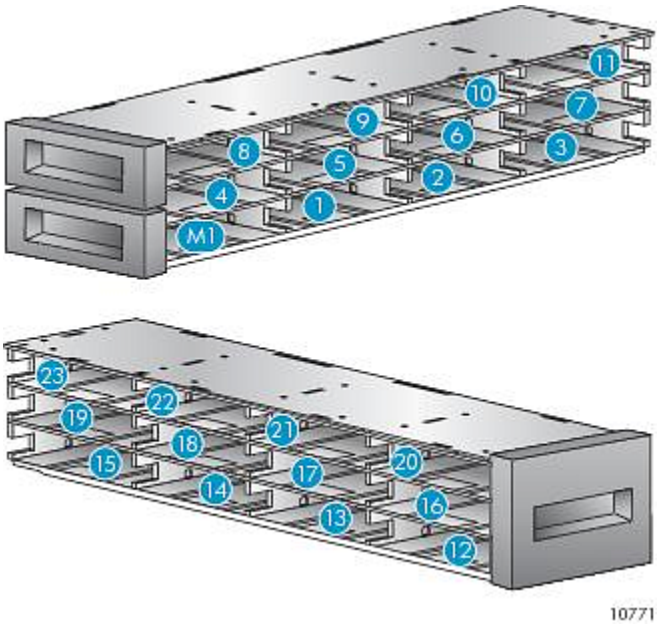


Figure 34 MSL2024 slot numbering with the single mailslot enabled

When the mailslot is disabled, the mailslot (M1) becomes Slot 1 and all other slots are re-numbered accordingly.

On the MSL4048, MSL8048, and MSL8096, the storage slots are numbered starting with the of the lower-left magazine, as shown in Figure 35, Figure 36, and Figure 37.

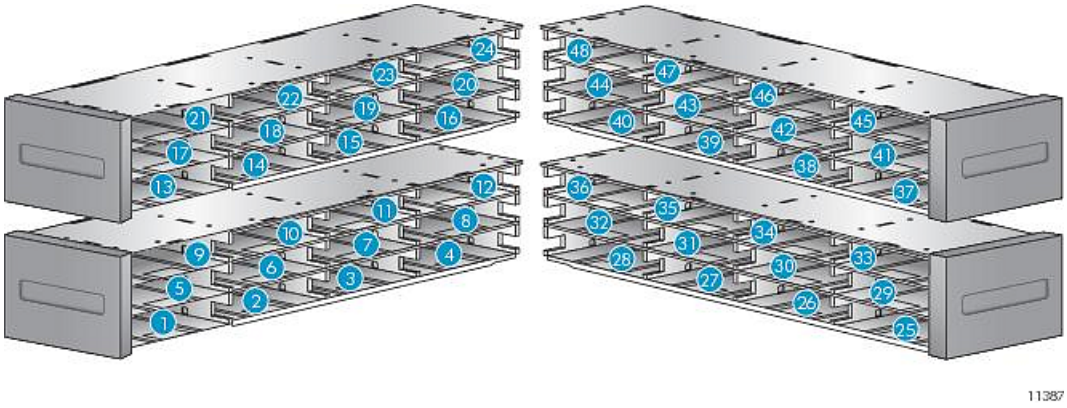


Figure 35 MSL4048 slot numbering with mailslot disabled

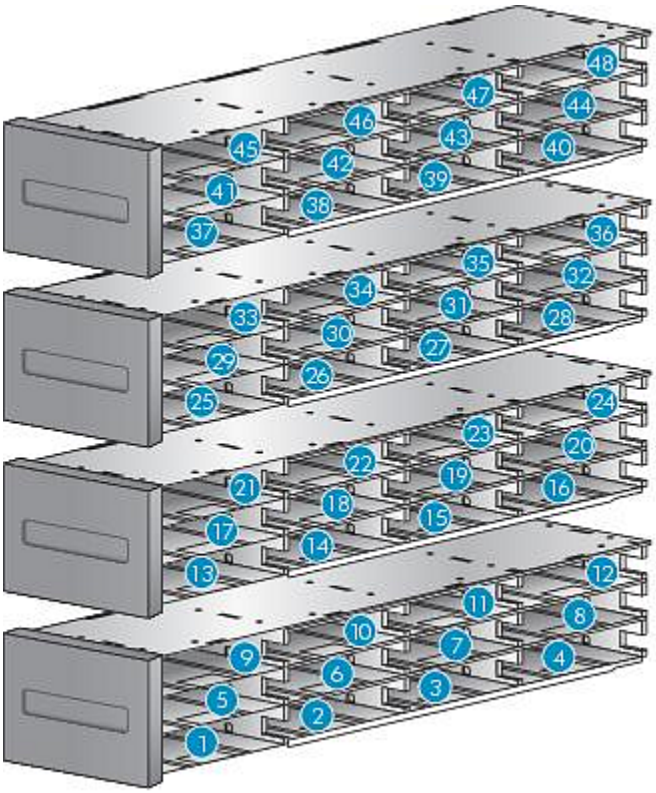


Figure 36 MSL8048 slot numbering with mailslot disabled

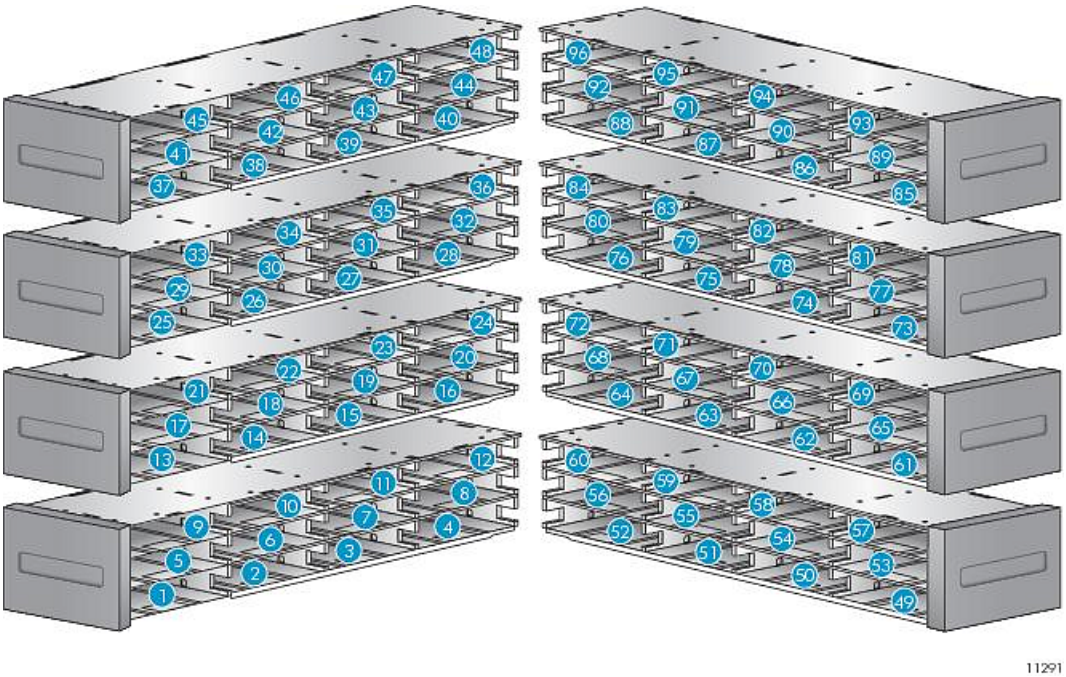


Figure 37 MSL8096 slot numbering with mailslots disabled

When the MSL4048 or MSL8048 mailslot, or the MSL8096 lower-left mailslot is enabled, all of the storage slot numbers are adjusted, as shown in Figure 38. The storage slots in the other magazines are renumbered accordingly.

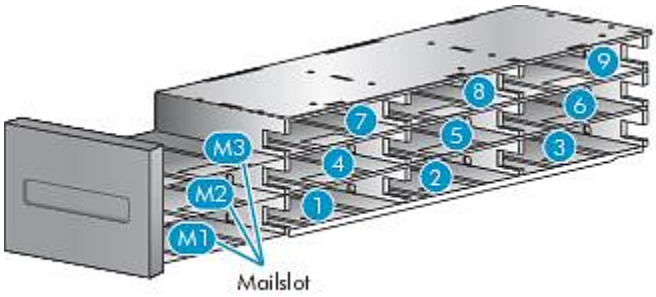


Figure 38 MSL4048, MSL8048, and MSL8096 lower-left magazine slot numbering with mailslot enabled

On the MSL8096, when the upper-right mailslot is enabled, the numbering of the storage slots in the other magazines is not affected. Mailslot numbering for the upper-right magazine when just the upper-right mailslot is enabled is shown in Figure 39. When both mailslots are enabled, the mailslot numbers in the upper-right magazine are adjusted, as shown in Figure 40.

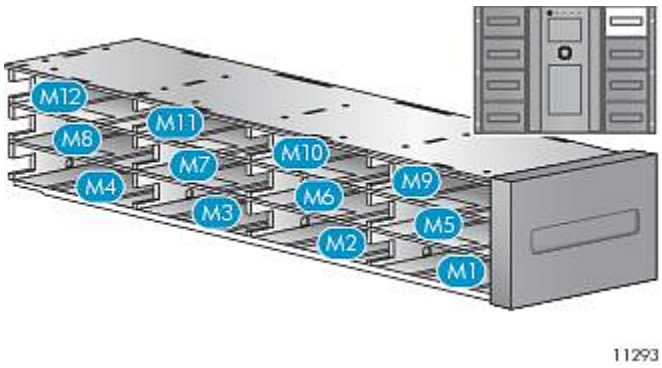


Figure 39 MSL8096 upper-right magazine slot numbering with only the upper-right mailslot enabled

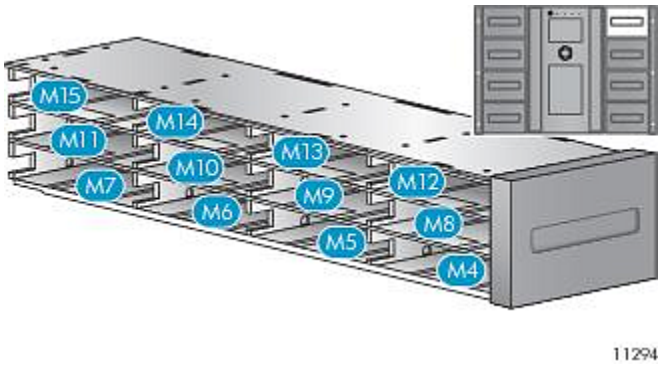


Figure 40 MSL8096 upper-right magazine slot numbering with both mailslots enabled

TIP:

For the slot numbering for your Library in its current configuration, see the RMI's "Status: Inventory page" on page 81.

4 Operating the Tape Library

The Tape Library can be operated by the following methods:

- **Remote management interface (RMI)** — this interface lets you monitor and control the Library from a web page. You can access most Library functions from the RMI.
- **Operator control panel (OCP)** — this interface lets you operate the device from the front panel.
- **Host backup software** — You can perform any functions provided by the backup software.

NOTE:

The device's network settings must be configured and the administrator password set to use the RMI.

Remote management interface (RMI)

Overview

The remote management interface (RMI) lets you monitor and control your device through the World Wide Web (WWW). The RMI hosts a dedicated, protected Internet site that displays a graphical representation of your device.

Before using the RMI, you must configure the device network settings and set the administrator password with the OCP. (See "Configuring network settings (Configuration > Configure Network Settings)" on page 118 and "Changing the administrator password (Configuration > Change Admin Password)" on page 113.)

To start the RMI, open any HTML browser and enter the IP address of the device in the browser's address bar.

TIP:

Check the **Help** screens in the RMI for additional information. The help pages are updated with most firmware updates and often contain technical details that are not contained in this document. To access RMI help, click **Help** on the right side of the Web page banner, as shown in "Getting help" on page 71.

The following functions are available through the RMI:

Login

To login, select the **Account Type**, enter a password if required, and then click **Sign In**. See Figure 41.

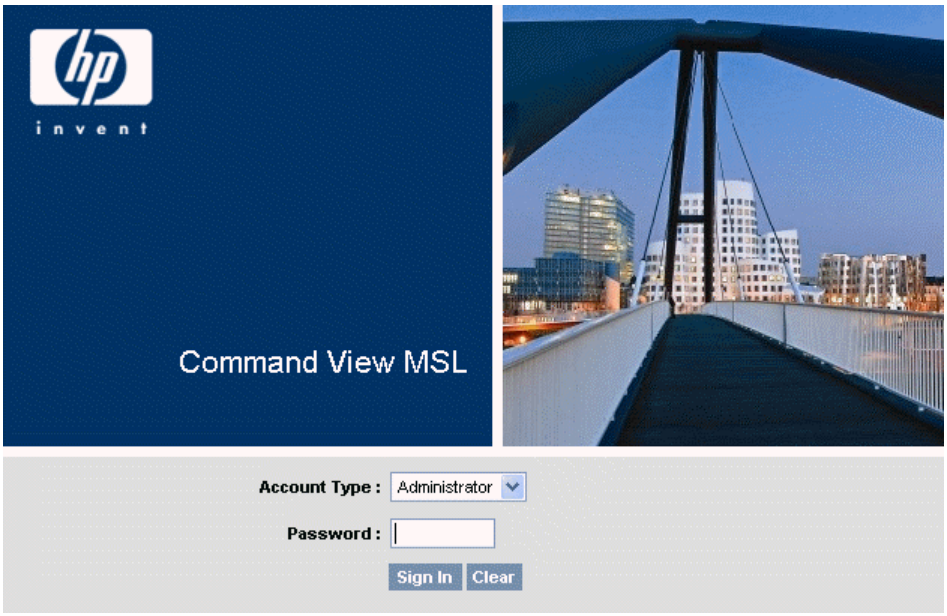


Figure 41 RMI login page

The Account Types are:

- User — no password is required (leave the password box blank).
- Administrator — the administrator password is required. The same administrator password is used for the RMI and OCP. There is not a default administrator password; the administrator password must be set with the OCP before it can be used with the RMI. If the administrator password is lost, contact HP to generate a temporary password that will grant administrator access.
- Service —**access to this level is by HP Service personnel only.** The service password is set at the factory. The same service password is used for the RMI and OCP.

The user login provides access to the Identity and Status options, but not the Configuration, Operations, and Support options. Administrator level provides access to all screens except for the Log configuration and HP Service screens.

TIP:

By default, the administrator password is unset; all of the digits are null. You must set the administrator password from the OCP to protect the administrator functions on the OCP and enable the administrator functions in the RMI.

Status pane

The System Status pane (see Figure 42) shows the current device and drive status. The System Status pane for the MSL4048, MSL8048, and MSL8096 also shows the power supply status.

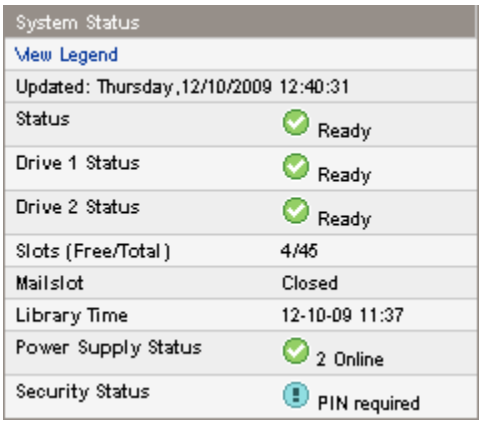


Figure 42 System Status pane

The System Status pane displays the following:

- Updated — the day, date, and time of the most recent status view. This timestamp comes from your computer and may be different from the Library Time at the bottom of the pane. Click your browser's reload button to refresh the system status.
- Library Name — the name of the device, which was set in the Configuration: System screen.
- Status of the Library and tape drives

The green **Status Ok** icon indicates that the device is fully operational and that no user intervention is required.

The blue exclamation point **Status Warning** icon indicates that user attentionis necessary, but that the device can still perform most operations.

The red X **Status Error** icon indicates that user intervention is required and that the device is not capable of performing some operations.

- Slots (Free/Total) — **Free** is the number of empty storage slots. **Total** is the number of storage slots available to the host software, which does *NOT* include reserved slots.
- Mailslot — shows whether the mailslot is open, closed, or disabled.
- Library Time — the date and time from the Library, which can be set from the OCP or RMI. The Library Time is updated when the system status is refreshed. The time of the most recent refresh is the Updated time at the top of the pane. If you call HP Service to request a temporary administrator password, refresh the system status with your browser reload button and then give the service engineer this Library Time.
- Power Supply Status (MSL4048, MSL8048, and MSL8096)
  - MSL4048 — Online — The power supply is installed.
  - MSL8048 and MSL8096 — Good — The power supply is functioning correctly.
  - MSL8048 and MSL8096 — Functional, fan failure — the power supply is supplying power to the Library, but the fan has failed so the power supply could fail soon. The power supply should be replaced.
  - Installed, failed — The power supply installed in the unit is not working and the Library no longer has redundant power. The power supply should be replaced.

NOTE:

If the MSL4048 has two power supplies and one fails, after a power cycle the Library will not recognize the failed power supply as installed in the Library.

The number of power supplies installed in the Library is displayed next to the icon.

- MSL8048 and MSL8096 — Removed — a power supply was installed in this location before but has been removed. Power Supply 1 will always show **Removed** when it is missing. Power Supply 2 will show **Removed** until the Library is rebooted.

Getting help

For additional information about fields on the RMI screens, click on **Help** in the upper right corner (see Figure 43). The help pages are updated with most firmware updates and often contain technical details that are not contained in this document.

Figure 43 Help button

Identity

Viewing static device information

The Identity: Library page provides static information about the device.

Library Information	
Serial Number	MXA07080HF
Product ID	MSL G3 Series
Currently Installed Library Firmware	7e29 / 3.00e
Bootcode Firmware Revision	0.50
Barcode Reader	SB625
Library Mode	Automatic, Sequential
WWide Node Name	20000017A4FD6335

Figure 44 Identity: Library page

When the Library is partitioned into multiple logical libraries, the information for the Library and the logical libraries is presented as shown in Figure 45.

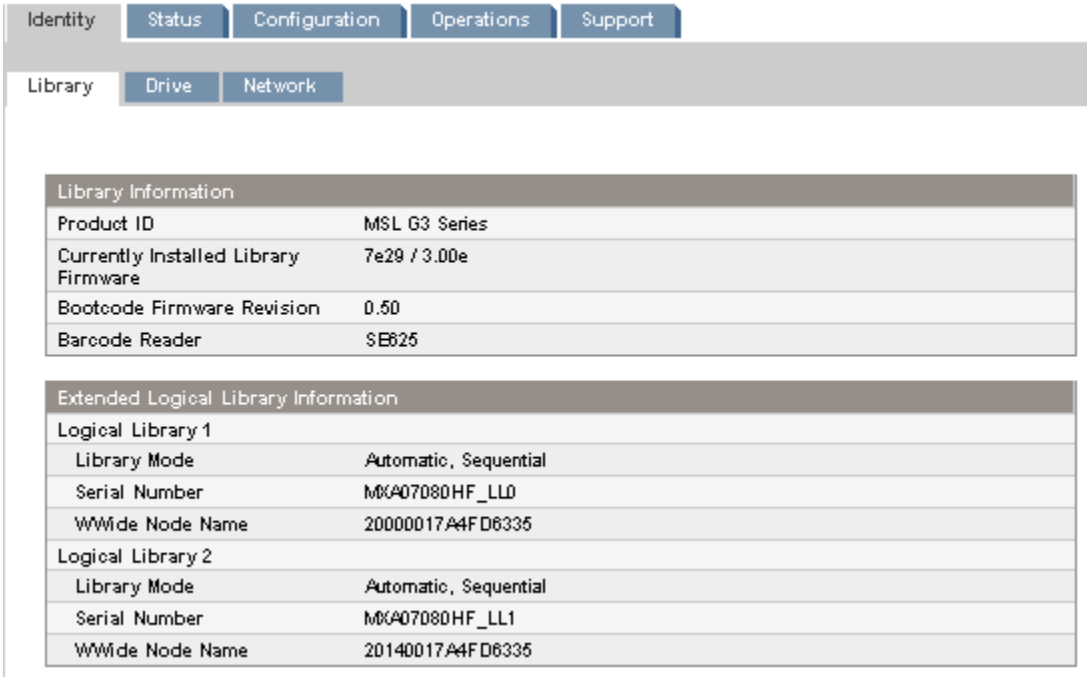


Figure 45 Identity: Library page with two logical libraries

You can see, but not modify, the following:

- Serial Number — the electronic serial number for the device. It should match the serial number printed on the device's label, located on the pull out tab under the drive on the back of the device. When the device is configured into multiple logical libraries, the serial number includes the serial number on the device and the logical library number.
- Product ID — how the device identifies itself to the host computer.
- Currently Installed Library Firmware x.xx / y.yy
  - x.xx is the version of the Library controller firmware
  - y.yy is the version of the robotics firmware.
- Bootcode Firmware Revision
- Barcode Reader — version of barcode reader in the device.
- Library Mode
  - Automatic — the device will switch from Sequential to Random mode if it receives media changer SCSI commands.
  - Manual — the device will stay in the current mode until another mode is configured by a user.
  - Random — the device will not automatically load and unload tapes. Instead, it will wait for commands from the backup software or the OCP to load and unload tapes.
  - Sequential — the device will automatically unload the tape in the drive when the host software sends an unload command to the drive and then automatically load the tape from the next highest sequentially numbered full slot.
  - Loop — in Loop mode, the Library will load the tape from the lowest numbered full slot after the tape from the highest numbered full slot is unloaded. If Loop is not listed, the Library will stop automatically loading and unloading tapes after the tape from the last full slot is unloaded.

△ CAUTION:

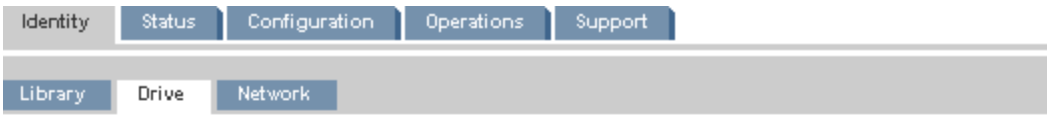
Since loop mode will endlessly cycle through the tapes, it is possible to overwrite old data. Make sure that there are enough tapes in the Library or that the tapes are regularly rotated in and out to ensure that data you want to save is not overwritten.

- Autoload — the device will automatically load the tape from the lowest numbered full slot on power up.

- WWide Node Name — a world wide unique identifier that the Library reports over SCSI and may be used by operating systems or software applications to identify and track the Library.

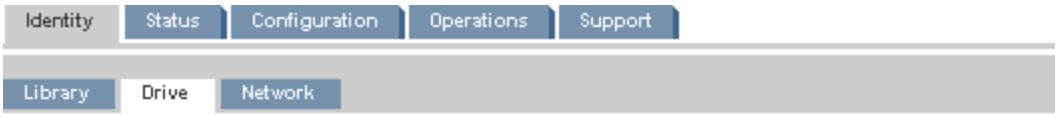
Viewing static drive information

The Identity: Drive page (SCSI), Identity: Drive page (Fibre Channel), and Identity: Drive page (SAS) provide detailed information about the tape drives. You will only see the fields that apply to the interface type of the drives installed in this Library.



Drive Information	1 (LUN)
Vendor ID	HP
Product ID	Ultrium 3-SCSI
Serial Number	HU10650KDN
Firmware Revision	G63W
SCSI ID	4
Physical Drive Slot Number	1
SCSI Element Address	1
Autoloader LUN Hosted By Drive	Yes
Data Compression	Yes
Interface Type	SCSI

Figure 46 Identity: Drive page (parallel SCSI)



Drive Information	1 (LUN)
Vendor ID	HP
Product ID	Ultrium 4-SCSI
Serial Number	HU171200N6
Firmware Revision	H44W
Physical Drive Slot Number	1
Element Address	1
Library LUN Hosted By Drive	Yes
Data Compression	Yes
Interface Type	Fibre Channel
WWide Node Name	20010017A4FD732A
Port A	
WWide Port Name	20020017A4FD732A
Port Type	Automatic
Speed	Automatic - 4 Gb/s
Port B	
WWide Port Name	20030017A4FD732A
Port Type	Automatic
Speed	Automatic - 4 Gb/s

Figure 47 Identity: Drive page (Fibre Channel)

Drive Information	1 (LUN)
Vendor ID	HP
Product ID	Ultrium 3-SCSI
Serial Number	HU10731K6A
Firmware Revision	C24W
World Wide ID - Port A	50060B00007FADD8
Physical Drive Slot Number	1
Element Address	1
Library LUN Hosted By Drive	Yes
Data Compression	Yes
Interface Type	SAS

Figure 48 Identity: Drive page (SAS)

You can see, but not modify, the following:

- Vendor ID — will always be HP.
- Product ID — product identification information that is given by the drive.
- Serial Number — electronic serial number of the drive. It should match the physical serial number of the drive.

- Firmware Revision — version of the currently installed drive firmware.
- SCSI ID (parallel SCSI drive only) — SCSI address of the drive. The LUN for the tape drive is 0. If a drive is removed or powered off, its number will be reserved. If a drive is added between two other drives, it is assigned the next available number. The drive numbers are persistent until the factory defaults are restored or the Library is power cycled.
- World Wide ID (SAS drive only) — world wide unique name for the drive. The World Wide ID is assigned by the library controller to the drive bay and cannot be changed by the user. When a tape drive is replaced, the World Wide ID is re-assigned to the replacement drive.
- Physical Drive Slot Number — the physical location of the drive. By default, the drives are numbered from the bottom of the device up, starting with number 1.
- SCSI Element Address (parallel SCSI or SAS drive) or Element Address (FC drive) — element address. The SCSI Element Address is set at the factory and can only be configured by a host application.
- Library LUN Hosted by Drive — Yes, if this drive is hosting the Library at LUN 1.
- Data Compression — Yes, if the host has hardware compression turned on for the drive.
- Interface Type — SCSI, Fibre Channel, or SAS
- WWide Node Name (FC drive only) — world wide unique number for the drive. The Library assigns WWNames to the drive bays. When a tape drive is replaced, the WWName is re-assigned to the replacement drive.
- Port information for each configured port (FC drive only)
  - WWide Port Name — world wide unique identifier for the port. The WW Node and Port Name will be slightly different.
  - Port Type — the current setting of the drive port. Direct connected devices are typically Loop. Devices connected to a switch are typically Fabric.
  - Speed

Viewing network information

The Identity: Network page displays information about the network configuration.

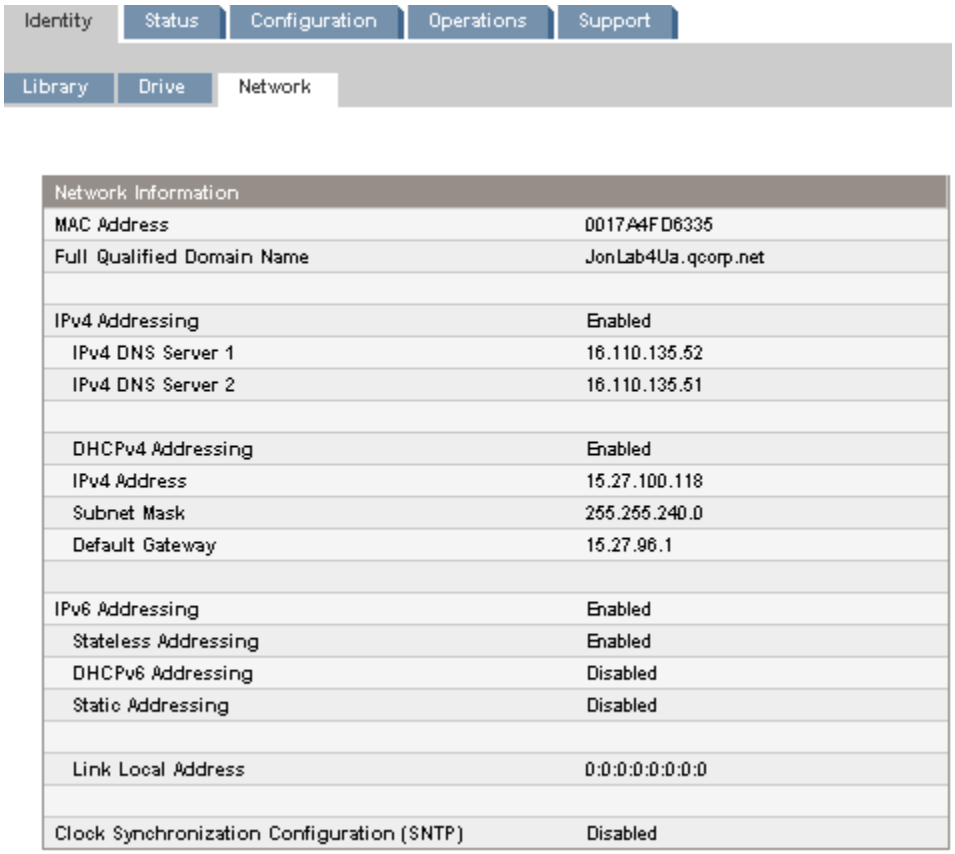


Figure 49 Identity: Network page

You can see, but not modify:

- MAC Address — a unique identifier for the library controller network interface
- Full Qualified Domain Name — the fully qualified domain name for the device
- Clock Synchronization Configuration (SNTP) — When Enabled, the device will obtain the current time and date from the configured SNTP server.

When IPv4 Addressing is Enabled, you can see, but not modify:

- IPv4 DNS Server 1 and IPv4 DNS Server 2 — addresses of the configured DNS servers used when DHCP Addressing is not Enabled.
- DHCPv4 Addressing — When Enabled, the device will request an IP address from a DHCP server each time the device is booted.
- IPv4 Address — the Library network address
- Subnet Mask — The network mask of the library controller used when DHCP Addressing is not Enabled.
- Default Gateway — the gateway used when DHCP Addressing is not Enabled.

When IPv6 Addressing is Enabled, you can see, but not modify:

- Stateless Addressing — when Enabled, the device will generate an address for itself based on the routing information obtained from a router advertisement and the MAC address. The device can manage up to five global addresses at the same time, which can be assigned from different routers.
- DHCPv6 Addressing — when Enabled, the Library will request an IP address from a DHCP server each time the device is booted.

- Static Addressing — when Enabled, the device will use a statically-configured address.
- Static Assigned Address — the IPv6 address when Static Addressing Enabled is On.

Status

Viewing dynamic device information

The Status: Library page displays dynamic information about the device. When you click **Refresh**, the status is updated immediately.

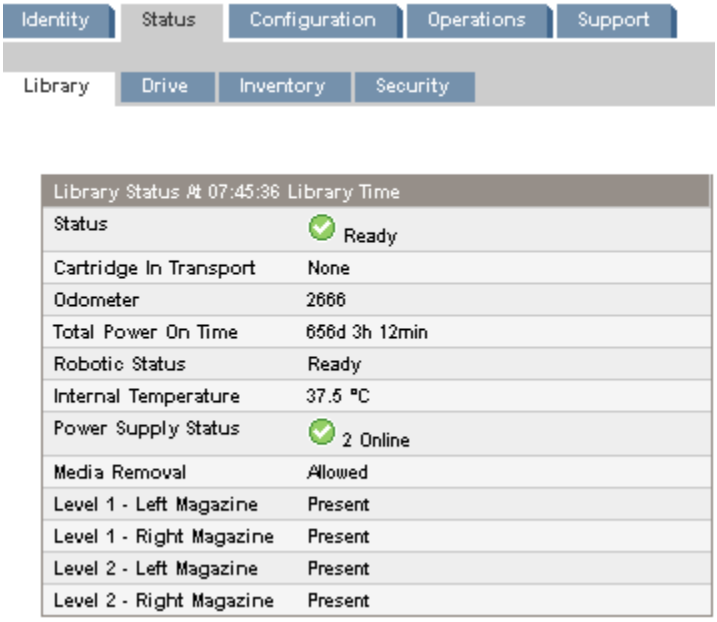


Figure 50 Status: Library page

You can see, but not modify, the following:

- Status — the overall status of the device

  The device is fully operational and no user interaction is required.

  User attention is necessary, but the device can still perform most operations.

  User intervention is required and the device is not capable of performing some operations.

- Cartridge in Transport — the slot number where the tape currently in the robot originated. None if there is not a tape in the robotic.
- Odometer — the total number of moves the device has performed since its manufacture.
- Total Power On Time — the number of days, hours, and minutes that the device has been powered on since its manufacture.
- Robotic Status — the current status of the robotics and a description of the operation the robot is currently performing.
- Internal Temperature — the internal temperature reported by the device.
- Power Supply Status — the current status of each of the installed power supplies. (MSL4048, MSL8048, and MSL8096)

- MSL4048 — Online — The power supply is installed.
- MSL8048 and MSL8096 — Good — The power supply is functioning correctly.
- MSL8048 and MSL8096 — Functional, fan failure — the power supply is supplying power to the Library, but the fan has failed so the power supply could fail soon. The power supply should be replaced.
- Installed, failed — The power supply installed in the unit is not working and the Library no longer has redundant power. The power supply should be replaced.

NOTE:

If the MSL4048 has two power supplies and one fails, after a power cycle the Library will not recognize the failed power supply as installed in the Library.

The number of power supplies installed in the Library is displayed next to the icon.

- MSL8048 and MSL8096 — Removed — a power supply was installed in this location before but has been removed. Power Supply 1 will always show **Removed** when it is missing. Power Supply 2 will show **Removed** until the Library is rebooted.

- Media Removal — Prevented, if the backup software is preventing media removal from the device. When media removal is prevented, the mailslot and magazine functionality is disabled.
- Left Magazine — Present, if the device senses the presence of the left magazine. (MSL2024)
- Level `n`. Left Magazine — Present, if the Library senses the presence of the left magazine at level n. The magazine levels are numbered from the bottom of the Library to the top. For example, Level 1. Left Magazine is the bottom magazine on the left side looking at the Library from the front. (MSL4048, MSL8048, and MSL8096)
- Right Magazine — Present, if the device senses the presence of the right magazine. (MSL2024)
- Level `n`. Right Magazine — Present, if the Library senses the presence of the right magazine at level n. (MSL4048, MSL8048, and MSL8096)

Viewing dynamic drive information

The Status: Drive page (parallel SCSI), Status: Drive page (Fibre Channel), and Status: Drive page (SAS) provide detailed information about the drives present in the Library. When you click **Refresh**, the status is updated immediately.

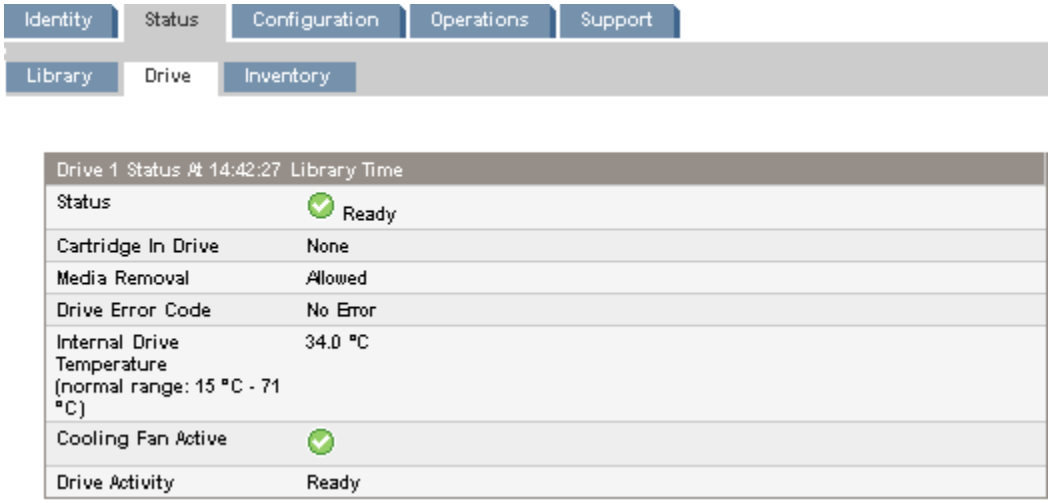


Figure 51 Status: Drive page (parallel SCSI)

Drive 1 Status At 11:41:34 Library Time	
Status	Ready
Cartridge In Drive	None
Media Removal	Allowed
Drive Error Code	No Error
Internal Drive Temperature (normal range: 15 °C - 75 °C)	34.0 °C
Cooling Fan Active	
Drive Activity	Ready
Encryption Status	Configured to encrypt
Port A Status	Login complete
Speed	4 Gb/s
Port Type	Loop (L)
ALPA	0x02
Port B Status	No light detected

Figure 52 Status: Drive page (Fibre Channel)

Drive 1 Status At 12:35:03 Library Time	
Status	Ready
Cartridge In Drive	None
Media Removal	Allowed
Drive Error Code	No Error
Internal Drive Temperature (normal range: 15 °C - 67 °C)	34.0 °C
Cooling Fan Active	
Drive Activity	Ready
Encryption Status	Encryption off
Port A Status	Not ready, not connected
Speed	-
Hashed SAS address	32D9CB

Figure 53 Status: Drive page (SAS)

You can see, but not modify, the following:

- Status of the drive

  The drive is operating normally.

  The device is functional, but might have an issue that should be addressed.

  The drive is in a failed state.

- Cartridge in Drive — information about the cartridge, if any, currently in the drive.
- Drive Error Code — the current drive error code if the drive is in a failed state. See "Drive error codes" on page 205 for a list of drive error codes.
- Internal Drive Temperature — internal temperature reported by the drive. The normal temperature range is provided for reference and varies depending on the type of tape drive. The tape drive will send out errors if there is any possibility of error due to temperature.

NOTE:

The Internal Drive Temperature is not the temperature of the tape path in the drive nor is this the operating environment temperature.

- Cooling Fan Active — On if the cooling fan is on
- Drive Activity — the current drive activity
- Encryption status — The current status of encryption on the drive.
- Port A Status and Port B Status (Fibre Channel tape drives) — current status of the ports
- Port A Status (SAS tape drives) — current status of the port
- Speed (Fibre Channel and SAS drives) — the current speed setting of the drive port
- Port Type (Fibre Channel drives only) — the current setting of the drive port. Direct connected devices are typically Loop. Devices connected to a switch are typically Fabric.
- N-Port ID (Fibre Channel drives only) — Fabric address. Only relevant when in Fabric mode.
- ALPA (Fibre Channel drives only) — Loop address. Only relevant when in Loop mode.
- Hashed SAS address — A short version of the SAS World Wide Identifier (WWI) that is generated using a well-defined hash algorithm and is suitable for device identification in most systems. Some management software may report this value.

Viewing the tape cartridge inventory

The Status: Inventory page provides detailed information about the tapes in the tape drives, with a summary of tapes in magazine slots.

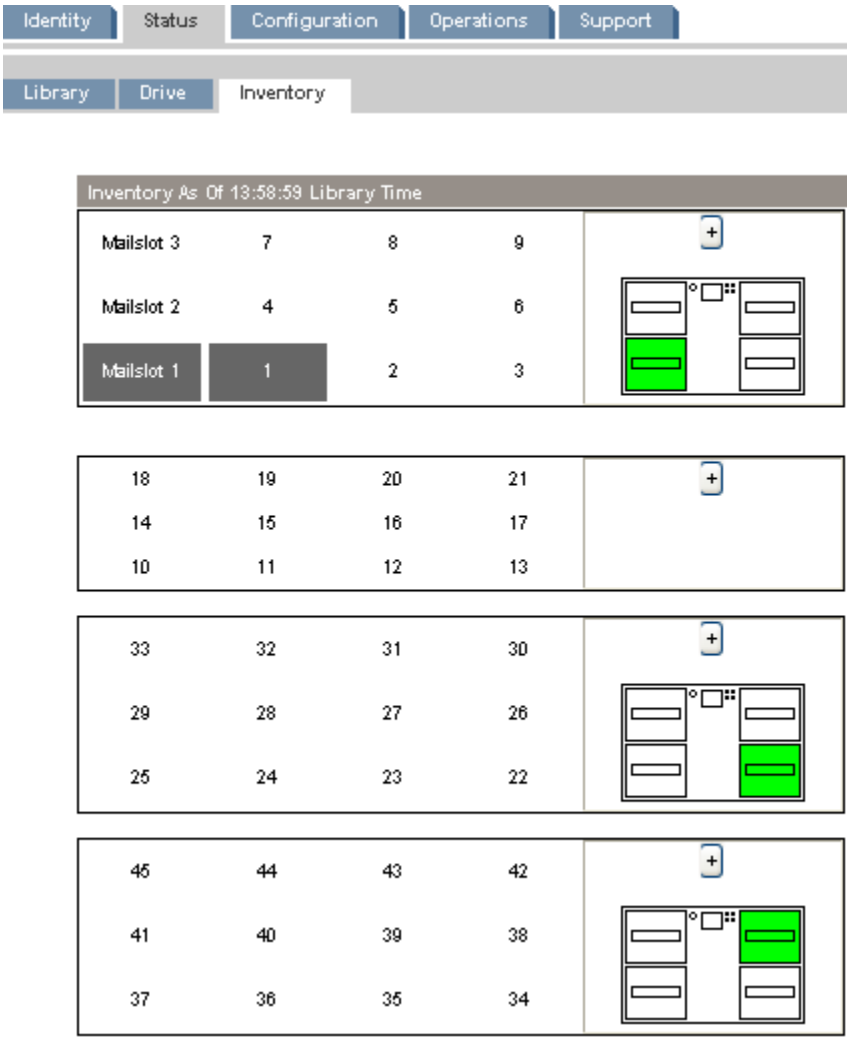


Figure 54 Status: Inventory page

A dark rectangle indicates a full slot, a red rectangle indicates a cartridge with a problem, and a white rectangle indicates an empty slot.

To see detailed information about the tapes in a magazine, click on the + button to expand the display for the magazine (see Figure 55).

Media Details

Slot #	Attn	Status	In Drive	Label	Media Loads	Comment
Mailslot	Closed	Empty		----------		
1		Full		----------		
2		Full		DK9381L2		
3		Full		NCN930L2		
4		Empty		----------		
5		Full		DK9382L2		
6		Full		DK9380L2		
7		Full		KR2222L3		
8		Empty		----------		
9		Full		NCP401L2		
10		Full		DK9389L2		
11		Full		NCN919L2		

Figure 55 Status: Inventory: Media details pane

In the media details pane,

- Slot # — lists "Mailslot" or the index number of each slot in the magazine from lowest to highest.
- Attn — indicates an attention state for storage slots or provides information on the mailslot state.
- Status — Full or Empty.
- In Drive — shows when the tape from this slot is in a drive.
- Label — the bar code label data for the tape in the slot.
- Media Loads — the number of times this tape has been loaded into a drive in its lifetime. This field may be blank if the tape has not been loaded into a drive in this device or if the inventory has changed.
- Comment — any additional information about the tape in the slot (for example, Clean Tape if the cartridge is a cleaning tape).

Configuration

Changing the system configuration

Use the "Configuration: System page" on page 83 to modify the system configuration.

System configuration changes are only applied after the **Apply Selections** or the **Submit** button is selected. After making the selection, a warning page informs you of the impact of the proposed change. In some cases a pop-up screen asks you to confirm the change. Many changes also require the device to reboot. You may need to click **Refresh** to see the changes.

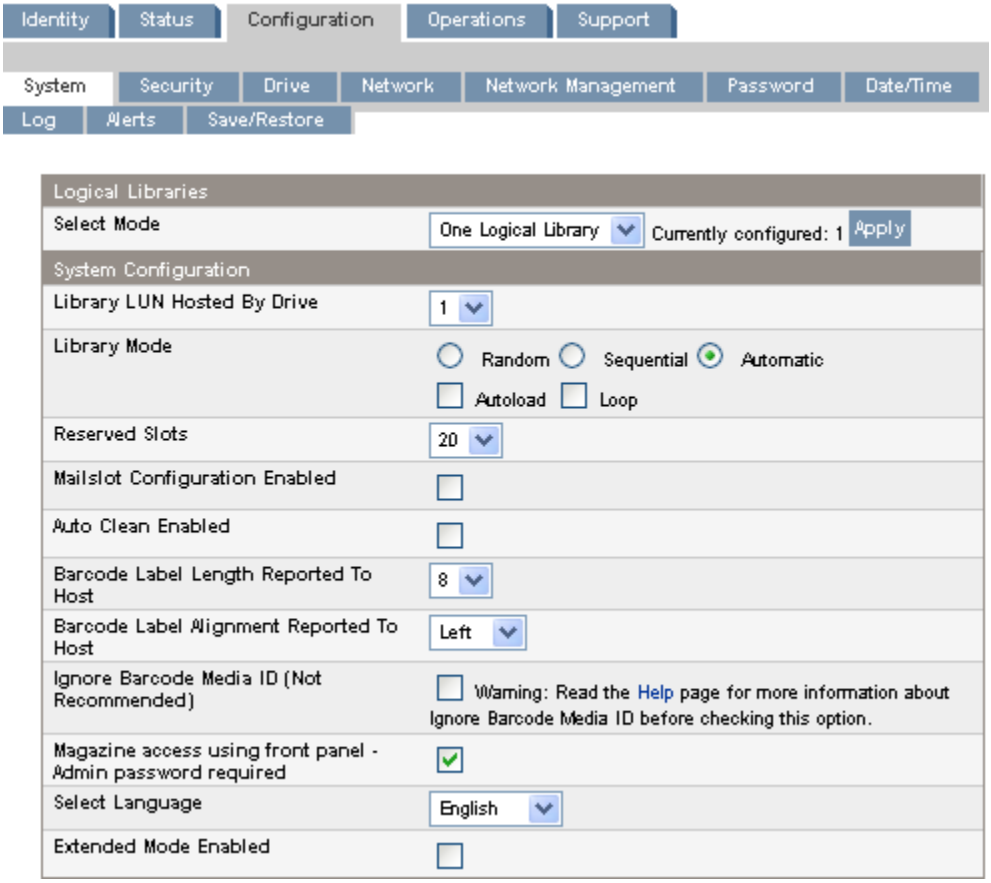


Figure 56 Configuration: System page with one logical library

When the Library is configured into multiple logical libraries, the settings for the Library are separated from those for each logical library, as shown in the Configuration: System page.

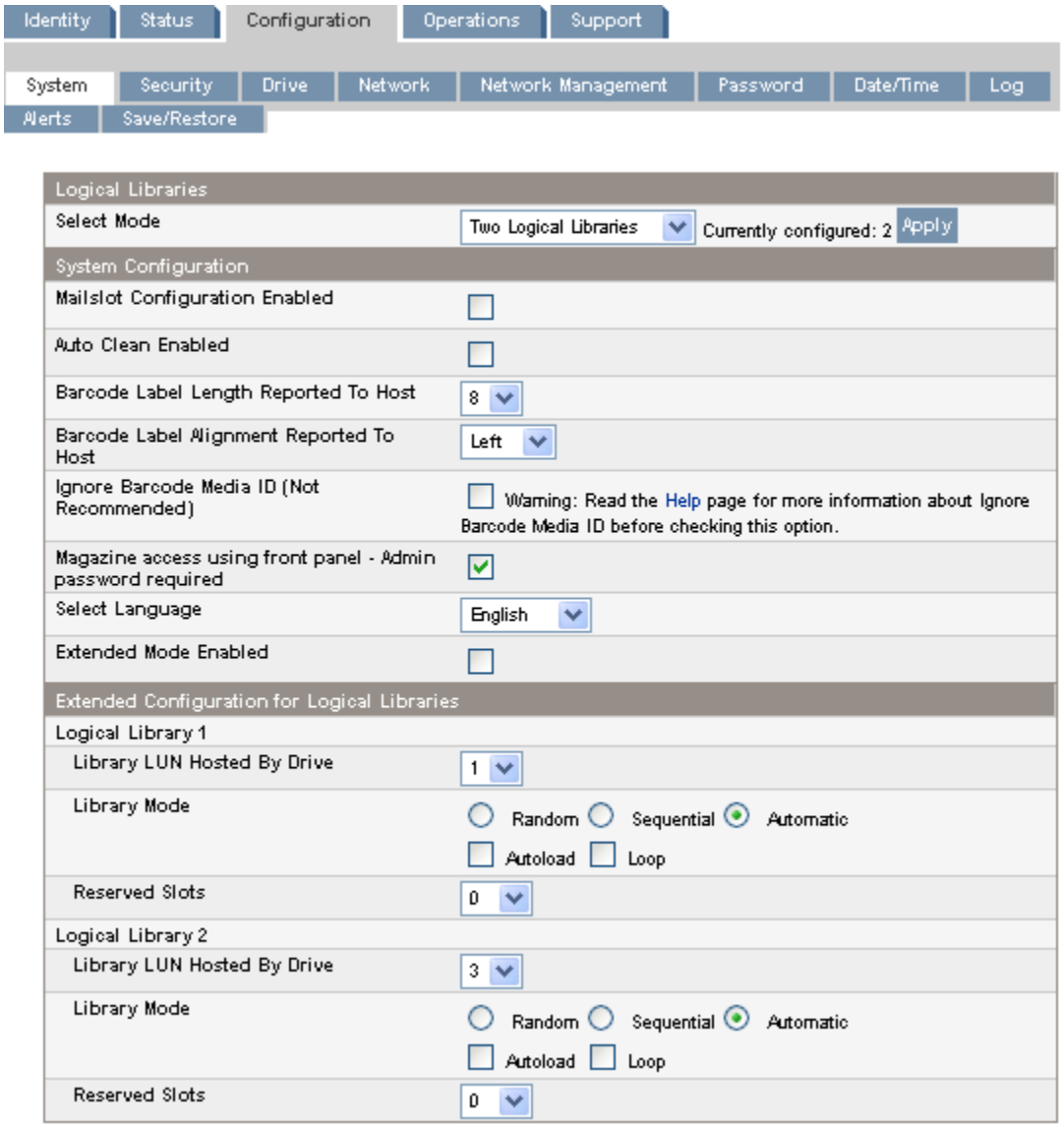


Figure 57 Configuration: System page for two logical libraries

To enable logical libraries, select the number of logical libraries in the **Logical Libraries** pane and click **Apply** in that pane. For more information about logical libraries, see "Logical libraries" on page 28.

The following settings affect all of the logical libraries:

- Mailslot Configuration Enabled (MSL2024, MSL4048, and MSL8048) — configures the mailslot in the lower left magazine as a mailslot or storage slots. The MSL2024 mailslot has one slot; the MSL4048 and MSL8048 mailslot has three slots. Enabling the mailslot will reduce the total number of storage slots. The default is disabled.

  If the mailslot is enabled, all logical libraries will have access to the mailslot. If allowing all logical libraries access to the mailslot is a concern or all of the slots are needed as storage slots, disable the mailslot.

△ CAUTION:

Since the mailslot is located where the lowest numbered storage slot would be, enabling and disabling the mailslot will re-number all of the other storage slots. After enabling or disabling the mailslot, update the backup software inventory. You might also need to re-configure the backup software to adjust the number of storage slots and presence of the mailslot.

- Mailslot Configuration (MSL8096) — configures the mailslot in the lower-left magazine and upper-right magazine as mailslots or storage slots. Enabling a mailslot will reduce the number of storage slots. The default is 0 mailslots enabled.

  If the mailslot is enabled, all logical libraries will have access to the mailslot. If allowing all logical libraries access to the mailslot is a concern or all of the slots are needed as storage slots, disable the mailslot.

  From the MSL8096 RMI, you can enable either or both of the mailslots by selecting the number of mailslot slots in the **Mailslot Configuration** drop down list.

  - **0** disables both mailslots.
  - **3** enables the lower-left mailslot only.
  - **12** enables the upper-right mailslot only.
  - **15** enables both mailslots.

△ CAUTION:

Since the lower-left mailslot is located where the lowest numbered storage slots would be, enabling and disabling it will re-number all of the storage slots. On the MSL8096, enabling or disabling the lower-left magazine also affects the numbering of the slots in the upper-right mailslot. After enabling or disabling the lower left mailslot, update the backup software inventory. You might also need to re-configure the backup software to adjust the number of storage slots and presence of the mailslot.

- Auto Clean Enabled — When auto clean is enabled, the device automatically loads a cleaning cartridge when a tape drive needs to be cleaned. The Tape Library can load a cleaning cartridge from any logical library to any tape drive. The device identifies a tape cartridge as a cleaning cartridge if it has a bar code label that starts with CLN or after an unlabeled cleaning tape has been loaded into the tape drive.

  The device can use a cleaning cartridge from any slot, even if the slot is not active. The device keeps track of the usage count for each of the cleaning cartridges. When multiple cleaning cartridges are available, the device will first choose an unknown cleaning cartridge so the device can start tracking the cartridge's usage count. If the device knows the usage count for all of the cleaning cartridges, the device will choose the one with the highest usage count.

  Auto cleaning is disabled by default. You can enable automatic cleaning even if there are no cleaning cartridges in the device. In this case, the device will display a warning message.

△ CAUTION:

Only enable automatic cleaning in either the backup application or the device, not both.

- Barcode Label Length Reported to Host — the number of bar code characters reported to the host application. This option provides interchange compatibility with libraries with more limited bar code reading capabilities. The default is 8.

- Barcode Label Alignment Reported to Host — configures the end of the bar code label characters to report to the host application when reporting fewer than the maximum number of characters. For example, when reporting only six characters of the bar code label `12345678`, if alignment is left, the device will report `123456`. If alignment is right, the device will report `345678`. The default is left.
- Ignore Barcode Media ID — when disabled, the barcode Media ID on the tape cartridges will be checked by the device. The device will only allow appropriate tape cartridges to be loaded into tape drives. The barcode Media ID is the last two characters of the barcode. For example, an LTO-4 labeled cartridge will not be allowed to move into an LTO-3 tape drive. See "Backward read compatibility" on page 63. When Ignore Barcode Media ID is enabled, the device will move any tape to any tape drive. If the cartridge is incompatible with the tape drive, a message will be displayed. HP strongly recommends that all tape cartridges have barcodes with the correct Media ID.
- Magazine access using front panel - Admin password required — when enabled, the Administrator password is required to remove the magazines from the front panel. When disabled, the magazines may be removed using the operator control panel without entering a password. The default is to require the Administrator password.
- Select Language — The language option affects the text on the RMI, the error messages, and the help pages. It does not affect the OCP menus, which will always be in English.
- Extended Mode Enabled — When the Library Extender is properly installed and extended mode is enabled, the Libraries will operate as an extended library.

The following settings are configurable for each logical library:

- Library LUN Hosted By Drive — specifies the master tape drive for the logical library. The default is the lowest numbered tape drive in the logical library. If a logical library has only one tape drive, it is the master drive for the logical library. If a logical library has more than one tape drive, you may specify the master. The number is the physical drive number.
- Library Mode — specifies the library mode for each logical library. The default mode is Automatic.

  The device supports three behavior modes: Random, Sequential, and Automatic. The device automatically detects the required mode from the series of SCSI commands it receives; however, you can also change the mode. Choose the operating mode based on the capabilities of the software controlling the tape cartridges.

  Random mode — In Random mode, the device does not automatically load tapes into the tape drives; it waits for commands from the software or operator to load and unload tapes. Random mode is used with a full featured or a robotics-aware backup application and is the most common mode of operation. Your backup software must support robotics, which may require an additional software module.

  Sequential mode — In Sequential mode, the device automatically loads and unloads tapes from the drive. Sequential mode is used when the backup software is NOT robotics-aware or was designed for standalone drives only.

  In Sequential mode, the logical library will only use the lowest-numbered tape drive in the logical library.

  The operator begins the sequence by loading the desired tape into the tape drive. When a tape is unloaded for any reason, the device automatically removes the tape from the drive, returns it to its original slot, then loads the tape from the next available higher numbered slot.

  To further determine how you want tapes loaded into the tape drive while in Sequential mode, you can set the **Loop** and **Autoload** options.

  - When **Autoload** mode is set, the device automatically loads the cartridge from the lowest-numbered full slot into the tape drive. It then follows standard sequential operation. After configuring Autoload mode, you must do one of the following for Autoload mode to take effect:
    - Power cycle the device from the front panel.

- Reboot the device from the RMI Support: Reboot screen.
- Move the lowest-numbered cartridge to the drive before starting the backup application. If the mailslot is enabled, the lowest cartridge location will be in the mailslot.

- When **Loop** mode is on, the original first cartridge in the sequence is reloaded after the device has cycled through all available cartridges. If Loop mode is off and the last cartridge has been unloaded, the device stops loading cartridges until you load another manually.

△ CAUTION:

Use caution when choosing Loop mode because it makes it possible to overwrite data on previously written cartridges.

When the device is partitioned into logical libraries, each logical library operates as an independent library. Thus, the device only loads tapes from the slots associated with one logical library into the tape drive associated with that logical library; it will not load tapes from slots associated with another logical library. Only the lowest-numbered tape drive in a multi-drive logical library will be used.

Automatic mode: In Automatic mode, the device switches from Sequential mode into Random mode when it receives certain SCSI commands. Automatic mode is the default setting.

- Reserved Slots — The number of slots in the logical library that are not available to the backup software. You can store cleaning tapes in reserved slots, or leave reserved slots empty. The slots are reserved from the highest slot number down. The default is to make the maximum number of slots active. Each logical library must have at least two active slots.

Changing the drive configuration

This page shows the current configuration of all drives and allows modification to the configuration. You can also select **Power on** through this page. (See Configuration: Drive page (parallel SCSI), Configuration: Drive page (Fibre Channel), or Configuration: Drive page (SAS)).

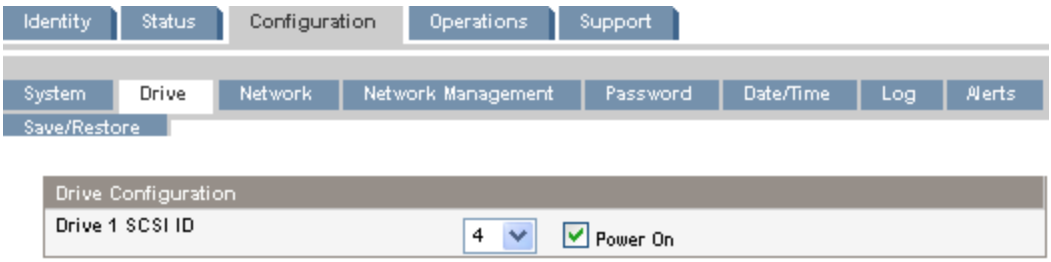


Figure 58 Configuration: Drive page (parallel SCSI)

For each parallel SCSI drive, you may change the

- SCSI ID — the SCSI address for a parallel SCSI tape drive.
- Power On — power the tape drive on or off.

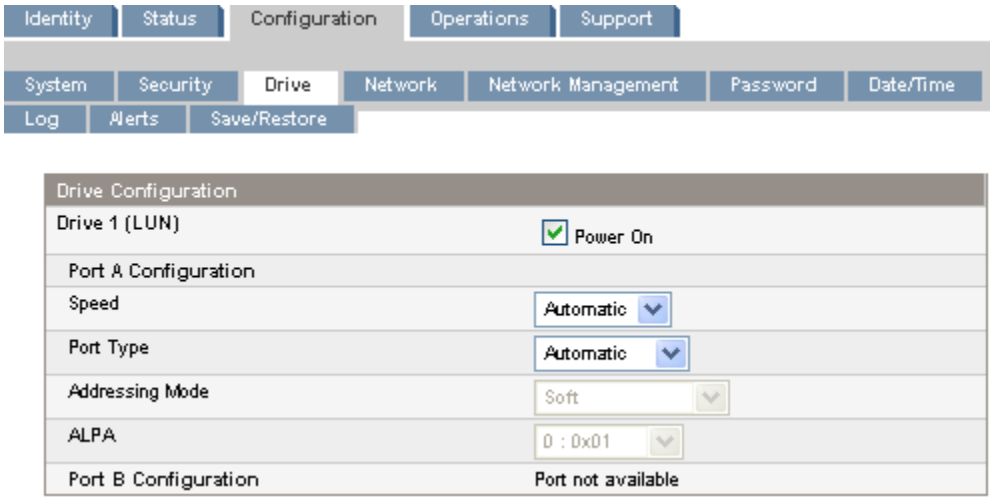


Figure 59 Configuration: Drive page (Fibre Channel)

For a Fibre Channel tape drive, you can use this screen to configure the FC ports. The port fields are:

- Speed — Automatic, 1 Gb/s, 2 Gb/s, 4 Gb/s, or 8 Gb/s. Only speeds supported by the drive are listed. The default is Automatic.
- Port Type — Automatic, Fabric (N), or Loop (NL). Direct connected devices are typically Loop. Devices connected to a switch are typically Fabric. The default is Automatic.
- Addressing Mode — addressing mode when the port type is Loop: Hard, Soft, or Hard auto-select. If the Addressing Mode is Hard, you must configure a fixed ALPA address that is unique on the loop. If the Addressing Mode is Soft, the system will assign an ALPA during fabric login. If the Addressing mode is Hard auto-select, the device will acquire an ALPA at the initial system setup and then fix that as a hard address from then on.
- ALPA — Arbitrated Loop Port Address

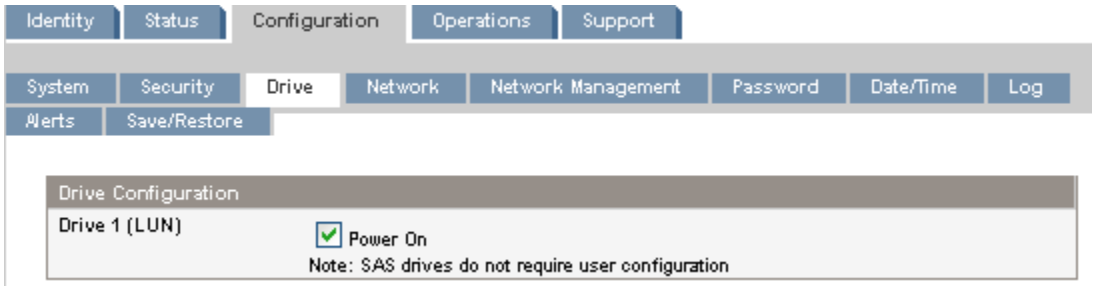


Figure 60 Configuration: Drive page (SAS)

Changing the network configuration

Use the Configuration: Network page to modify the current network configuration. When you request a change, a pop-up box will ask you to confirm the changes.

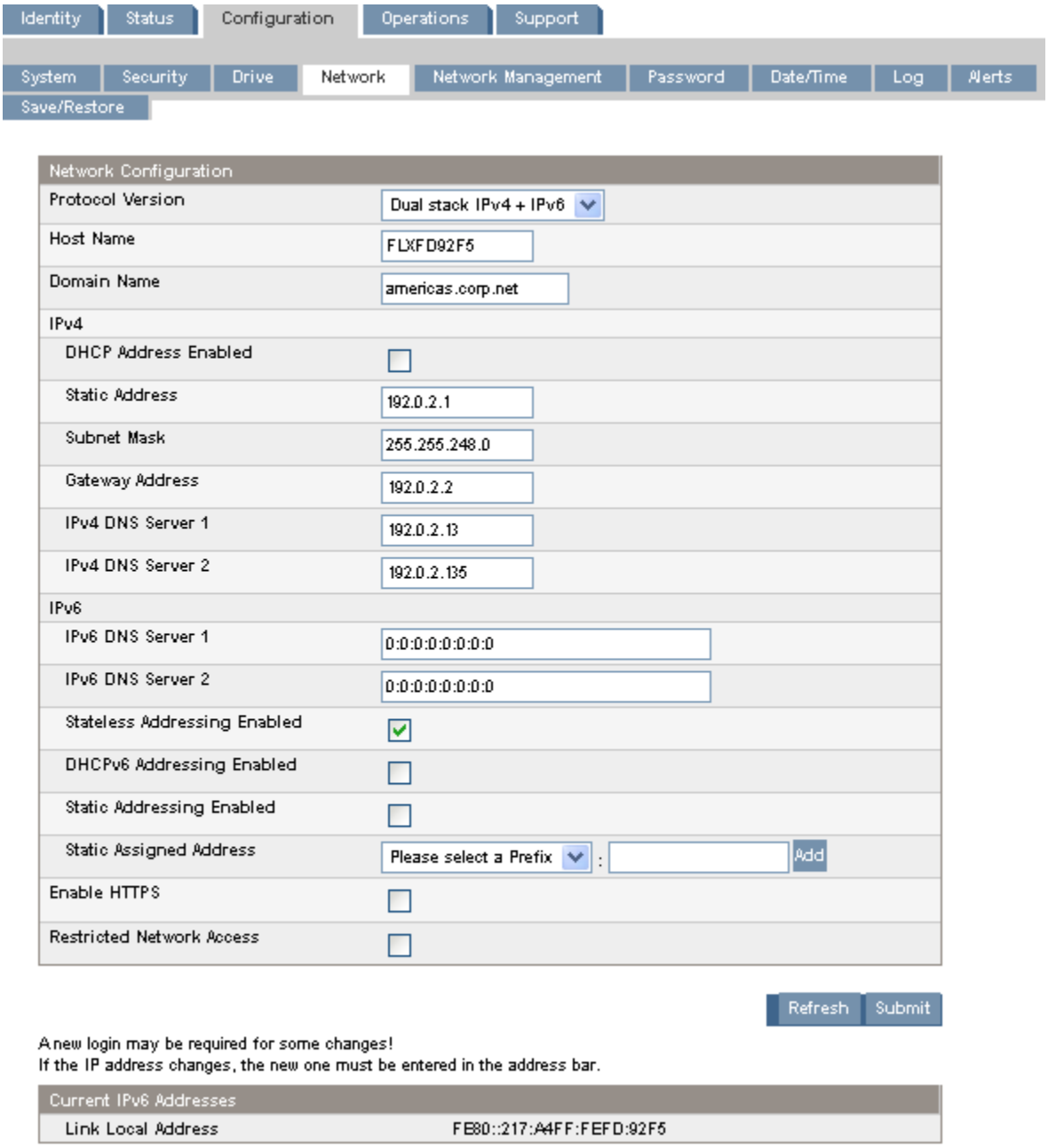


Figure 61 Configuration: Network page

You may change the:

- Protocol version — selects the Internet Protocols that will be enabled. Select IPv4 only, IPv6 only, or both IPv4 and IPv6 protocols. The default is the IPv4 protocol only.
- Host Name — enter the host name provided by your network administrator for the Library.
- Domain name — enter the domain name provided by your network administrator for the Library.
- Enable HTTPS — when On, the RMI can only be accessed through an HTTPS connection.
- Restricted Network Access — when On, disables all non-essential network functionality that is not required for normal product operation. In most circumstances leave this On.

For IPv4, you may change the:

- DHCP Address — when On, the Library will request an IP address from a DHCP server each time the device is booted. The default is On.
- Static Address — configures the IP address if DHCP is not enabled.
- Subnet Mask — configures the network mask of the library controller if DHCP Address is not On.
- Gateway Address — configures the gateway address if DHCP Address is not On.
- IPv4 DNS Server 1 and IPv4 DNS Server 2 — configures the addresses of up to two DNS servers if DHCP Address is not On.

For IPv6, you may change the:

- IPv6 DNS Server 1 and IPv6 DNS Server 2 — configures the addresses of up to two DNS servers if DHCPv6 is not enabled.
- Stateless Addressing Enabled — when On, the Library will generate an address for itself based on the routing information obtained from a router advertisement and the MAC address. The Library can manage up to five global addresses at the same time, which can be assigned from different routers. The default is On.
- DHCPv6 Addressing Enabled — when On, the Library will request an IP address from a DHCP server each time the device is booted. The default is Off.
- Static Addressing Enabled — when On, the Library will use a statically-configured address. The default is Off.
- Static Assigned Address — configures the address when Static Addressing Enabled is On. You can select the standard prefix, `FE80:`, or the prefix of a nearby router. Enter the remainder of the address and click **Add**.

To remove an IPv6 static IP address, click **Delete** next to the address in the **Current IPv6 Addresses** pane.

Configuration: Network Management

Use the Configuration: Network Management page to enable and configure SNMP (Simple Network Management Protocol), which allows applications such as HP Systems Insight Manager (http://www.hp.com/products/SystemInsightManager) to manage the device. The device supports both SNMP configuration and SNMP traps. SNMP can only be configured with the RMI; it cannot be configured with the OCP.

Command View TL TapeAssure provides comprehensive summaries and detailed information about the properties, performance, utilization, and health of all tape drives and media for all monitored HP libraries. This data can be exported on demand or at scheduled times to a comma-separated values (.csv) file for analysis with spreadsheet programs or custom scripts.

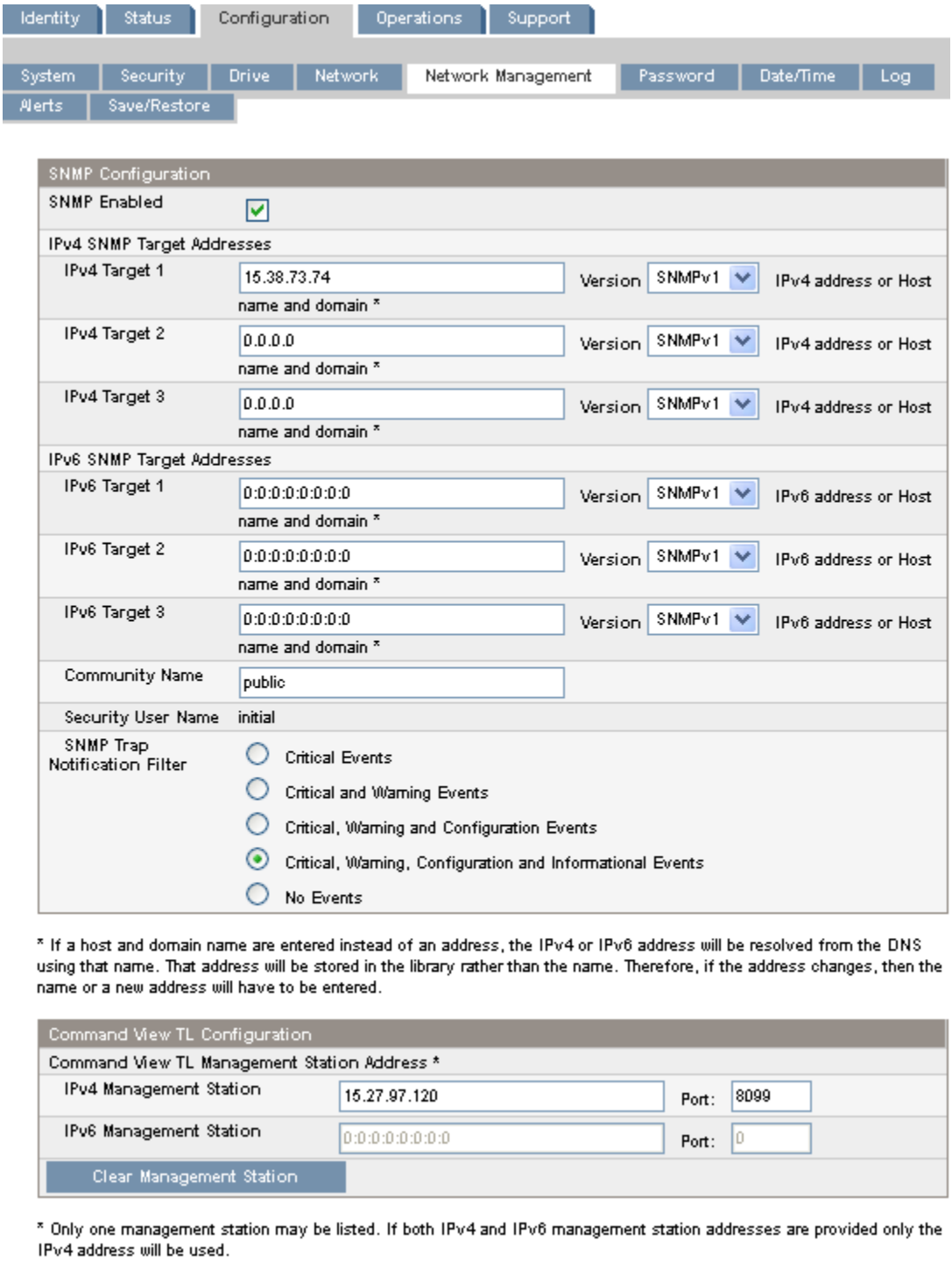


Figure 62 Configuration: Network Management page

You may change the:

- SNMP Enabled — When checked, the device can be managed by computers listed in the SNMP Target IP Addresses field.
- SNMP Target IP Addresses — the IP addresses for up to three computers running IPv4 SNMP management software and up to three computers running IPv6 SNMP management software. IP addresses will not be cleared if SNMP is disabled, but those targets will no longer be able to

manage the Library and will not receive traps from the Library. You can select the SNMP version for each target address.

- Community Name — a string used to match the SNMP management station and device. It must be set to the same name on both the management station and the Library. The default community name is *public*.
- SNMP Trap Notification Filter — the types of events for which the device should send SNMP traps.
- IPv4 or IPv6 Management Station — IP address of the Command View TL management station. Only one management station can be configured. If both IPv4 and IPv6 IP addresses are provided, only the IPv4 address will be used

Configuring HP Systems Insight Manager for the Tape Library

The Library uses the HP NetCitizen MIB, which is supported by HP Systems Insight Manager (SIM) and many other applications. To detect the Tape Library using a remote management application, such as HP SIM, you must first add the IP address for the management system as an SNMP target using the network configuration. SNMP queries are only accepted from configured targets.

To configure the Library for use with HP SIM:

1. From the RMI, add the HP SIM management station as an SNMP target.
2. If the Library IP address is in an HP SIM automatic discovery IP address list, the SIM management station will detect the Library at the next scheduled scan.

To configure HP SIM for manual discovery:

1. In the HP SIM toolbar, click **Options > Discovery**.
2. Click the **Manual** tab.
3. Enter the Library's IP address or system name.

SIM 5.1 will automatically detect the system type and product name.

To manually identify the Library with SIM 5.0 and older:

1. In the HP SIM **System and Event Collections** pane, click **Systems by Type**.
2. In the **Systems by Type** pane, click **All systems**.
3. Click the link with the IP address or name of the Tape Library.
4. Click the **Tools & Links** tab.
5. Click **Edit System Properties**.
6. Set **System Type** to **Tape Library**.
7. Enter the **Product Model** of your Tape Library.
8. Click **OK**.

Changing the administrator password

Use the Configuration: Password page to change the administrator password for the RMI and OCP.

NOTE:

You must set the administrator password with the OCP before you can access administrator functionality in the RMI. For MSL2024, see "Changing the administrator password (Configuration > Change Admin Password)" on page 113. For MSL4048, MSL8048, and MSL8096, see "Changing the administrator password (Configuration > Set Admin Password)" on page 144.

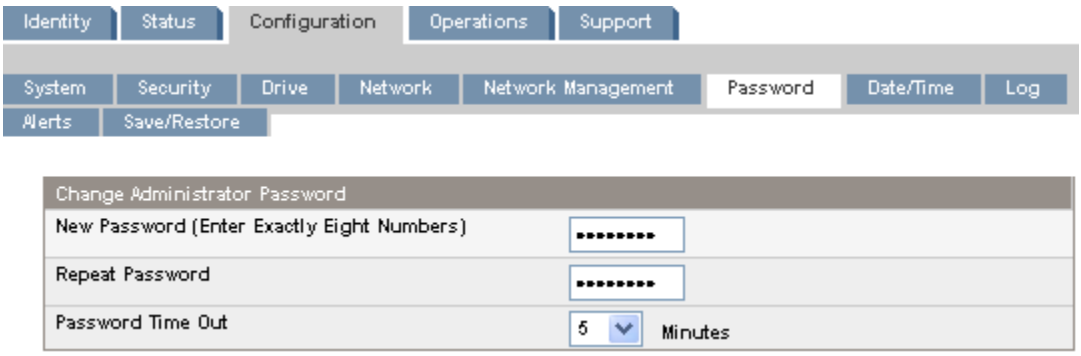


Figure 63 Configuration: Password page

You may change the:

- Password — The password is exactly eight numbers, each from 0 to 9.
- Password Time Out — The number of minutes that the current administrator login session will remain logged in without user interaction.

Setting the date and time

Use the Configuration: Date/Time page to set the date and time.

NOTE:

The device does not adjust its time to daylight saving time; the time must be adjusted manually.

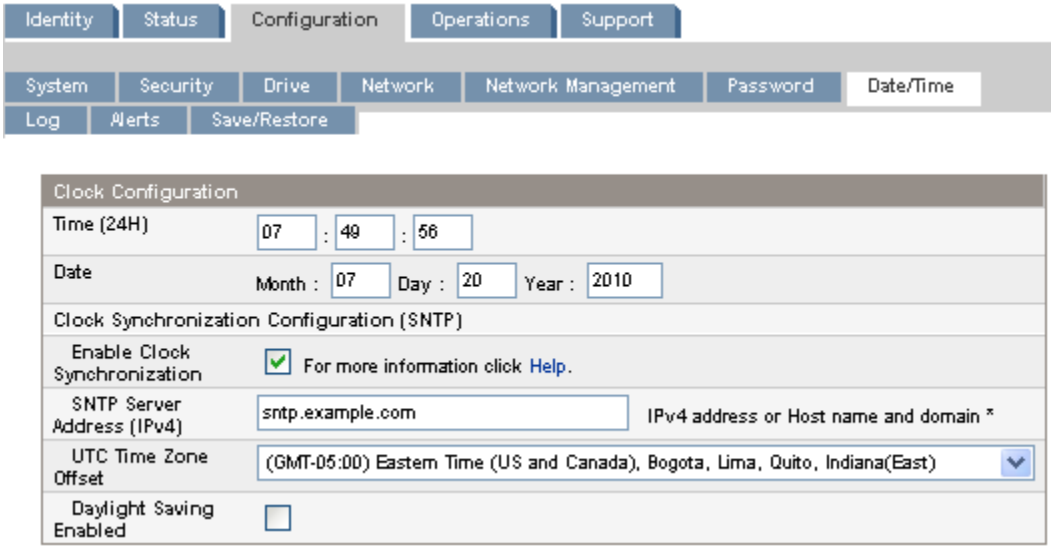


Figure 64 Configuration: Date/Time page

You may change the:

- Time — configures the hours, minutes, and seconds for the internal clock. The time is based on a 24-hour clock, where 1:00 pm is 13:00.
- Date — configures the current month, day, and year for the internal clock.
- Enable Clock Synchronization — When enabled, the device will use the configured Simplified Network Time Protocol (SNTP) service to obtain the current date and time.
- SNTP Server Address — the IP address of an SNTP server. The SNTP server may be configured with either an IPv4 or IPv6 address, or with a host and domain name. If a host and domain name are entered, the IP address will be resolved from the DNS using that name. The device will store the resulting address, rather than the name. If the address changes, enter the name or a new address so the device can find the server again.
- UTC Time Zone Offset — Select the time zone for your area.
- Enable Daylight Savings Adjustment — Enabling daylight saving time will advance the local time by one hour. This setting does NOT automatically adjust the device time for daylight saving time based on the calendar. You must manually enable this setting when daylight saving time starts in your area and disable it when daylight saving time ends.

Setting error log mode

The Configuration: Log page can only be accessed by HP Service personnel.

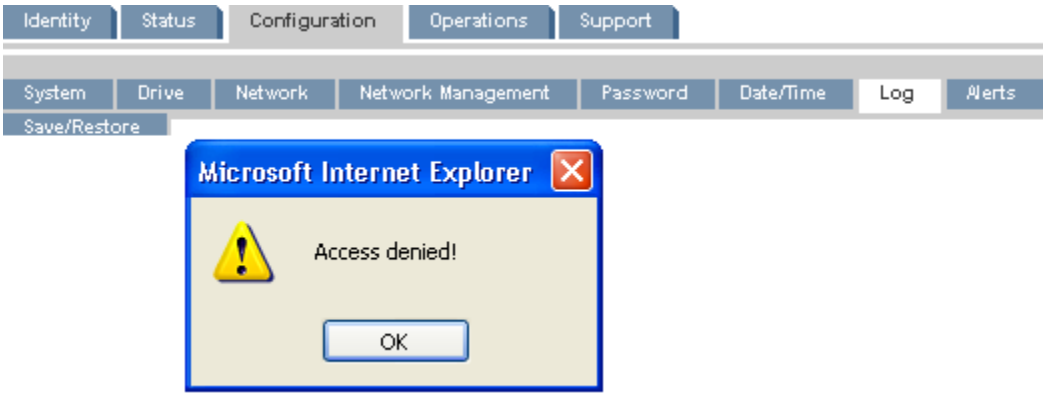


Figure 65 Configuration: Log page

Setting event notification parameters

The Configuration: Alerts page lets you configure e-mail notification of device events.

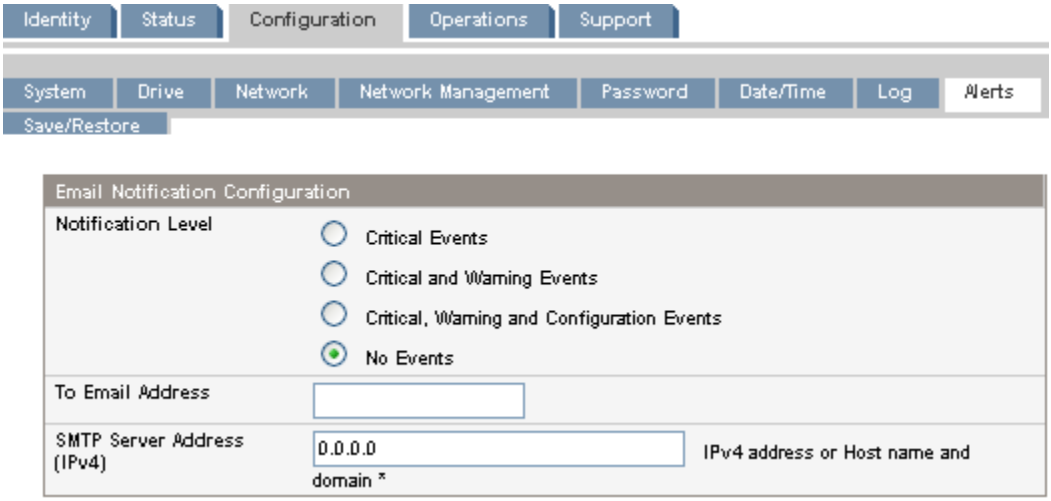


Figure 66 Configuration: Alerts page

You may change the:

- Notification Level — the types of events for which the device should send e-mail
- To Email Address — the address to which to send the reported events (e.g. firstname.lastname@example.com). Only one email address can be configured.
- Email Domain — domain of the return e-mail address (e.g. example.com)
- SMTP Server Address — IP address of the SMTP server

Saving and restoring the device configuration and restoring factory defaults

Use the Configuration: Restore defaults page to restore the factory defaults, reset the administrator password to null, or save the device configuration database to a file. The device will perform an inventory after the defaults are restored.

IMPORTANT:

Once you reset the administrator password to null, you will not be able to access the administrator functions in the RMI until you set an administrator password through the OCP. To *change* the administrator password, use "Configuration: Password page" on page 93.

The saved configuration database will make it easier to recover the device configuration if you need to replace the chassis or library controller. This feature is also useful when installing multiple devices. Either save the configuration before configuring the network or ensure that only one device with the same network configuration is on the network at a time until they have unique network identities.

NOTE:

You can save the device configuration to a USB flash drive from the OCP. For the MSL2024, see "Saving and restoring the Library configuration (Configuration > Save/Restore Configuration)" on page 120. For the MSL4048, MSL8048, and MSL8096, see "Saving and restoring the Library configuration (Configuration > Save/Restore)" on page .

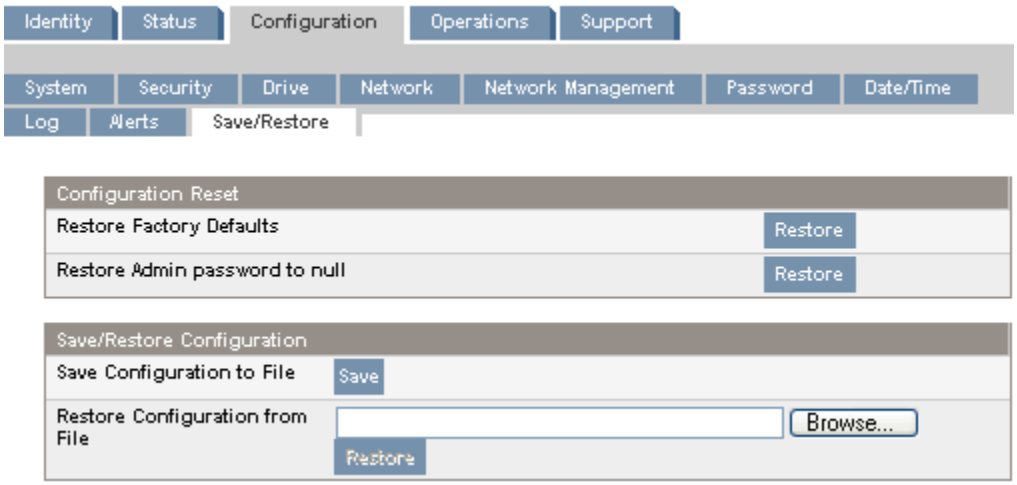


Figure 67 Configuration: Save/Restore page

The restored factory default settings are:

- SCSI addresses:
  - MSL2024: A full-height tape drive has SCSI ID 4. The bottom half-height tape drive has SCSI ID 4 and the top drive has SCSI ID 5.
  - MSL4048: All full-height tape drives have SCSI ID 4. Half-height drive slots have SCSI ID of 4, 5, 4, 5 from the bottom up.
  - MSL8048 and MSL8096: All tape drives have SCSI ID 4.
- Fibre Channel drive configuration: Automatic speed, auto port type
- Master drive: reset to Drive 1 or the lowest numbered existing drive
- Drive power: all drives powered on
- Active slots: maximum possible
- Library mode: Automatic
- Loop: No

- Event log levels and filter: continuous trace and all levels and filters active (for HP Service use only)
- Barcode reader label length: 8
- Barcode reader alignment: Left
- Error recovery: On
- Mailslot configuration: mailslot disabled
- Auto clean: disabled
- SNMP: disabled, but saved addresses do not change
- E-mail notification: disabled, but configurations retained

The following settings are not reset:

- Administrator password
- Network settings (network is always enabled and the network addresses are retained)
- Date and time

IMPORTANT:

When the defaults are restored, the Library will rediscover and renumber the tape drives from the bottom of the Library up. If a tape drive was added between two other tape drives since the last time the drives were discovered, that tape drive and the ones above it will be renumbered. You might need to update the configuration of the backup application when tape drives are renumbered.

To save the device configuration to a file, click **Save** and follow the instructions on the RMI to specify a file location.

To restore the device configuration from a file, browse to the location of the saved configuration file and click **Restore**.

The configuration settings that are saved to file are:

- Administrator password
- Mailslot configuration
- All network settings, including DHCP, DNS, IPv4 and IPv6 addresses
- Barcode reader label length and barcode reader alignment
- Reserved slots
- Display contrast setting (MSL4048, MSL8048, and MSL8096 only)
- Library mode
- All drive configuration settings
- Auto clean
- SNMP addresses and configurations
- Log tracing configuration
- Email notification configuration (SMTP address, email address, filter level)
- Option to allow the magazine access without the administrator password
- Option to ignore the barcode media ID
- Logical library configuration
- Encryption and security settings

Operations

Moving media

Use the Operations: Move Media page to move tape cartridges within the device.

IMPORTANT:

Moving media manually can interfere with backup software operations. Ensure backups are complete before moving media.

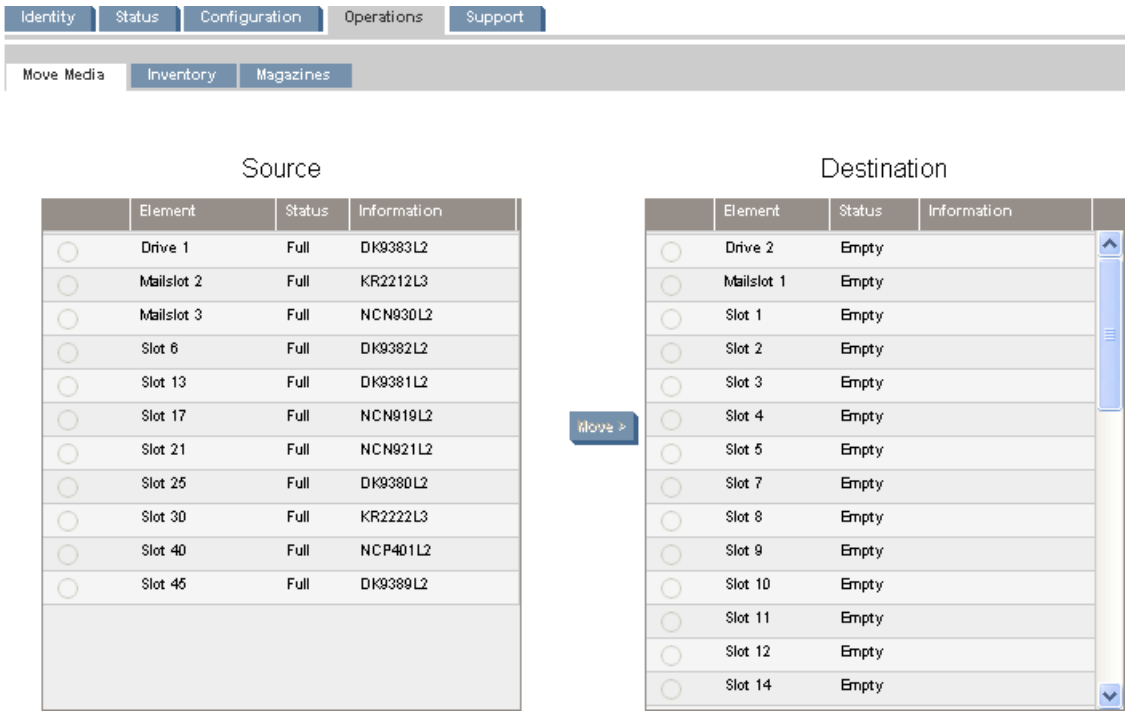


Figure 68 Operations: Move Media page

To move a tape, select the source and destination and then click the **Move** button in the center of the screen to start the move.

Updating the current media inventory

Use the Operations: Inventory page to have the device re-scan the tapes to update the media inventory.

Figure 69 Operations: Inventory page

Releasing and replacing the magazines

Use the Operations: Magazine page to release the left, right, or both magazines. When you click **Release**, the device will unlock the magazine and display **Left Magazine Unlocked** or **Right Magazine Unlocked** on the OCP screen. Once the magazines are unlocked, you can remove any of the magazines on that side. If you do not remove the magazine within a few seconds, the device will lock it. When you replace the magazine, the device will inventory the magazine's tape cartridges.

Figure 70 Operations: Magazines page

NOTE:

To manually release a magazine, see "Releasing the magazines manually" on page 176. However, this manual process should only be used if the magazine cannot be released using the OCP or RMI.

Support

CAUTION:

Some RMI operations take the device offline. This inactive mode can interfere with host-based application software, causing data loss. Ensure that the device is idle before attempting to perform any remote operations that take it offline.

Performing general diagnostics

Use the Support: General Diagnostic page to run general tests to verify the usability and reliability of the device. Select the test and enter the number of test cycles before starting the test. To cancel the test early, click on the **Stop** button.

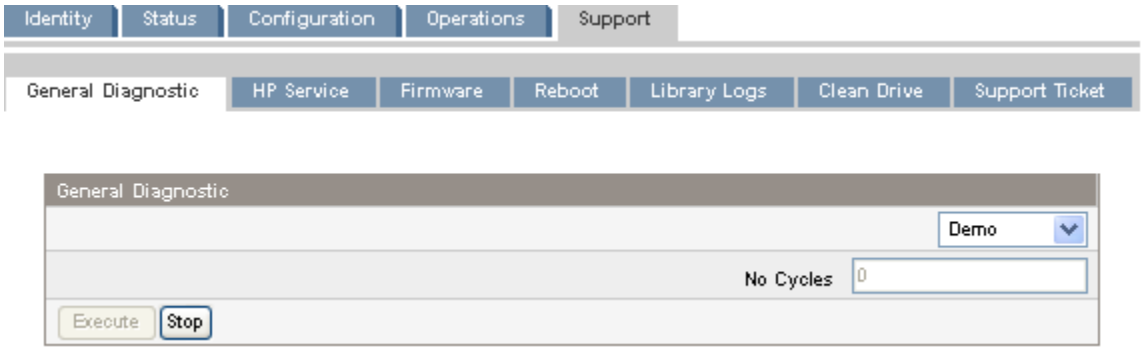


Figure 71 Support: General Diagnostic page

The available tests are:

- Demo — moves cartridges from the slots to the drives and back. At the end of the test the cartridges are returned to their original slots.
- Slot to slot — shuffles the cartridges between slots to exercise the robot. At the end of the test the cartridges are NOT returned to their original slots.

The demo and slot to slot test are intended to show the device operating. For service and diagnostics, execute the wellness test from the OCP. See "The wellness test" on page 177.

HP Service - **Service restricted**

The Support: HP Service page page can only be accessed by service personnel to execute detailed tests on the different components of the device or special read/write diagnostics on the drives.

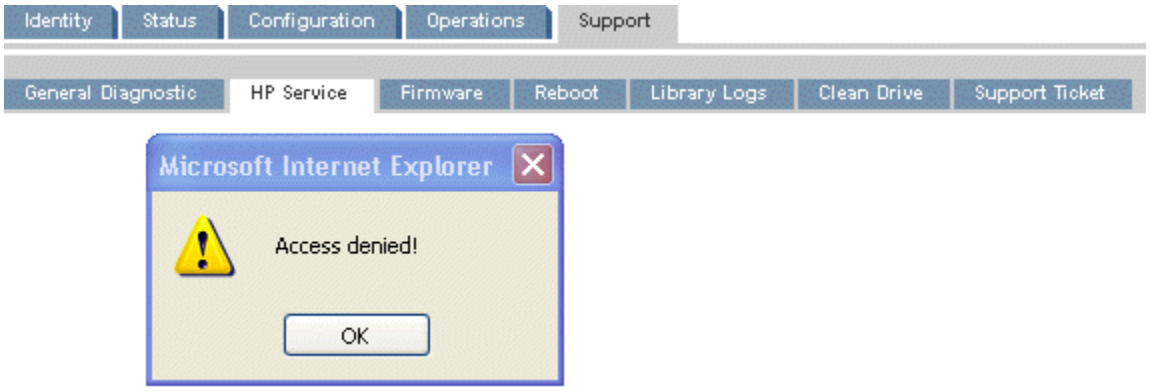


Figure 72 Support: HP Service page

Determining and updating firmware

Use the Support: Firmware page to see the current version of the device and drive firmware, and upload new firmware. The firmware files must be in the HP L&TT format with the .frm file extension. You can find firmware files on the HP Support website: http://www.hp.com/support. After the firmware is updated, the device or tape drive with updated firmware is reset.

△ CAUTION:

Do not interrupt the device while a firmware update is in progress. Updating the tape drive firmware can take several minutes because the firmware is transferred through a serial connection.

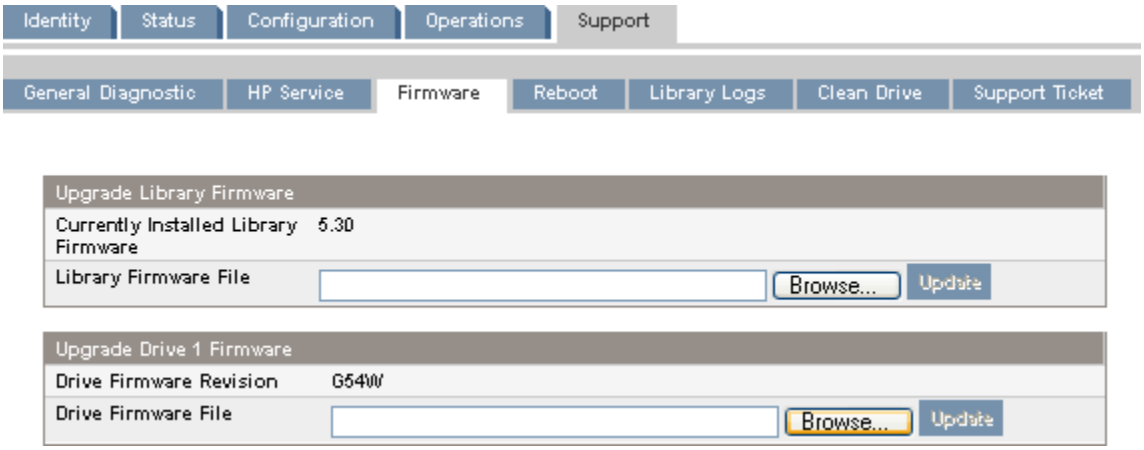


Figure 73 Support: Firmware page

Rebooting the device

Use the Support: Reboot page to do a soft reset of the device, which will run the Power On Self Test (POST) and scan for a new inventory. The RMI web page will refresh itself after a short time delay. This time should be sufficient to reload the page. However, during a reboot, the connection to the device may be lost. If the connection is lost, you will have to reload the page manually.

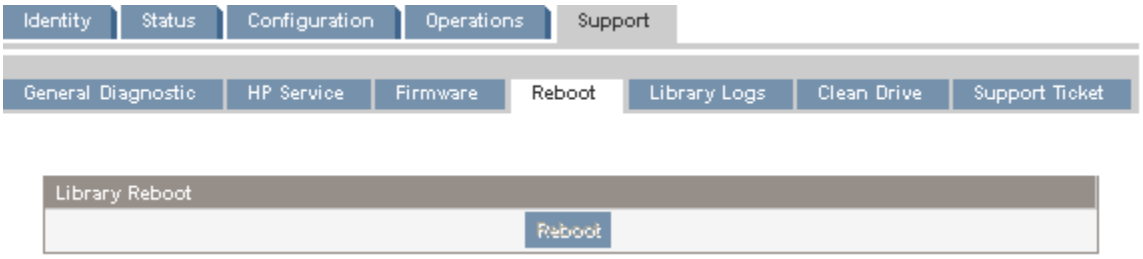


Figure 74 Support: Reboot page

Viewing logs

From the Support: Library Logs page you can see the device logs. The available logs are: Error Trace, Informational Trace, Warning Trace, Configuration Change Trace, and Standard Trace.

The log entries are displayed in order of most recent to oldest. The format for the log entries is: YY.MM.DD HH.MM.SS.ss LIB/ERR<80 89 62 40

- YY.MM.DD — the date displayed as Year.Month.Day
- HH.MM.SS.ss — the time displayed as Hour.Minute.Second.Hundredths of a second
- First code — hard or soft error. The code after LIB/ERR (80 in the example) will be 80 or 40. 80 indicates a hard error, 40 indicates a soft error.
- Second code — the main error code (89 in this example). See "Error codes" on page 180 for a list of error codes and recovery procedures.
- Third code — the sub-code (62 in this example). See "Error sub-code descriptions" on page 196 for a list of sub-codes.
- Fourth code — sub-code-specific information for factory use only

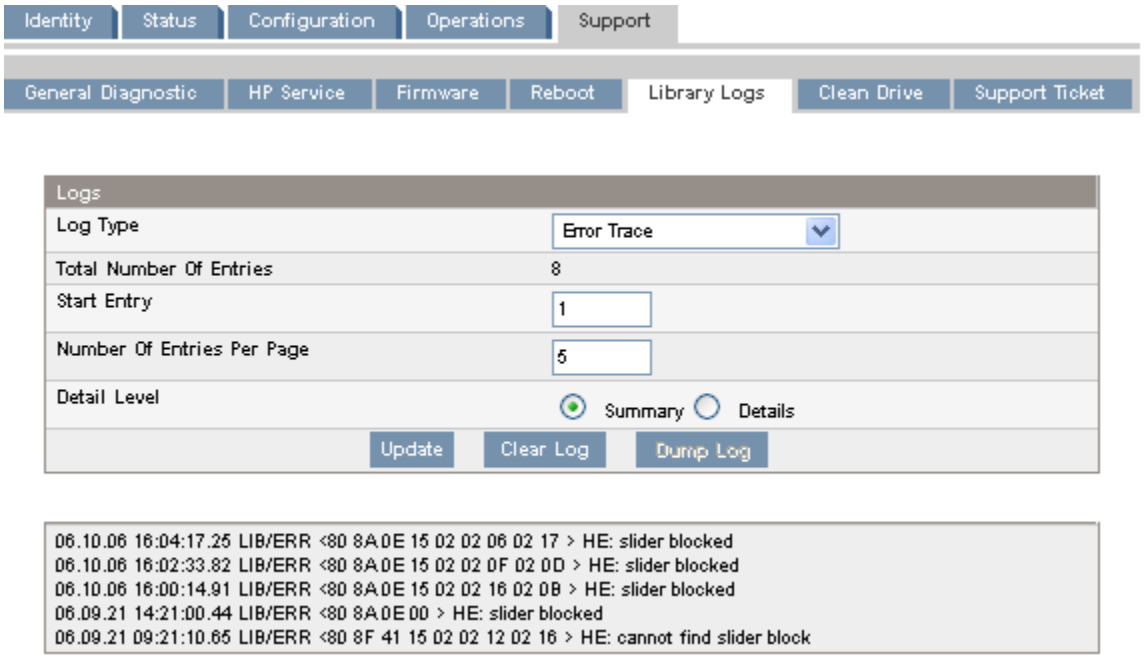


Figure 75 Support: Library logs page

Cleaning tape drives

Use the Support: Clean Drive page to clean the tape drives.

- Slot # — select the slot number of the cleaning tape
- Drive — select the drive to be cleaned

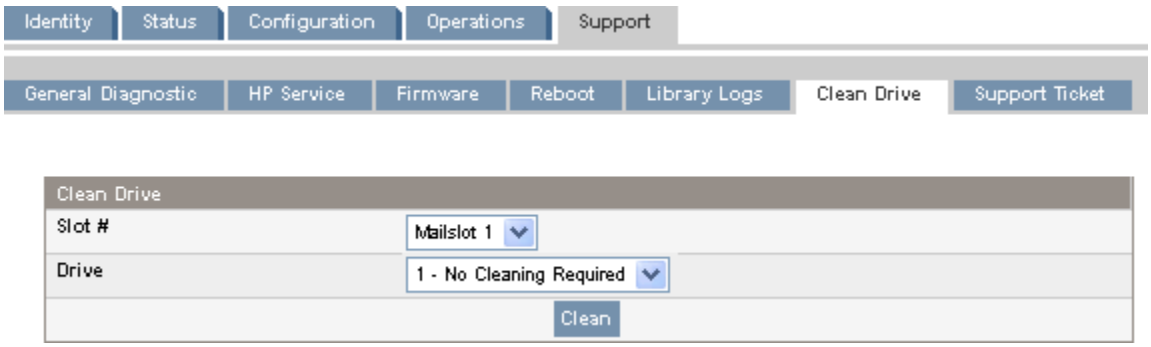


Figure 76 Support: Clean Drive page

Downloading a support ticket

Use the Support: Support ticket page to download a support ticket for the Library or tape drives. The support ticket can help a service engineer or system administrator diagnose a device problem.

NOTE:

LTO 2 and 3 tape drives must be empty to download support tickets. LTO 4 tape drives with firmware newer than H36W (FC), B34W (parallel SCSI) or U24W (SAS) will automatically generate a support ticket during an unload and that ticket may be downloaded at any time. LTO 4 tape drives with older firmware must be empty to download a support ticket. Gathering a current ticket for an LTO 4 tape drive may cause a temporary performance decrease while the ticket is generated.

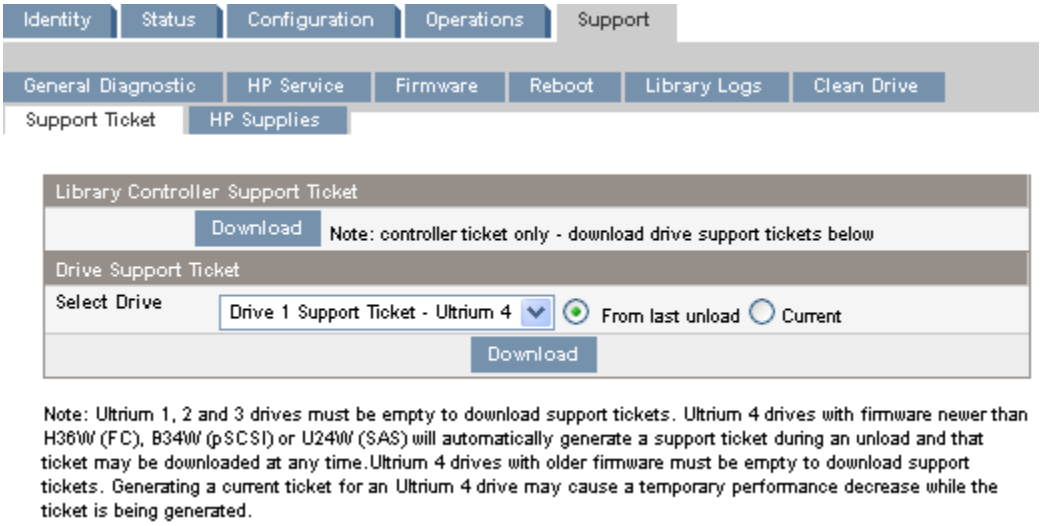


Figure 77 Support: Support Ticket page

MSL2024 Operator control panel (OCP)

The operator control panel on the front of the device includes a 2-line by 16-character green backlit liquid crystal display (LCD), four function keys, and four LEDs. This panel provides everything you need to monitor the device status and control its functions.

The following functions are available through the OCP:

- "Upgrading firmware (Support > Library FW Upgrade, Support > Drive FW Upgrade)" on page 127
- "Forcing the drive to eject a tape (Support > Force Drive To Eject Tape)" on page 130
- "Viewing logs (Support > Library Error Log)" on page 129
- "Downloading a support ticket (Support > Download Support Ticket)" on page 129

LED indicators

The operator panel includes four LEDs that provide a summary of the device status as detailed in Figure 78.

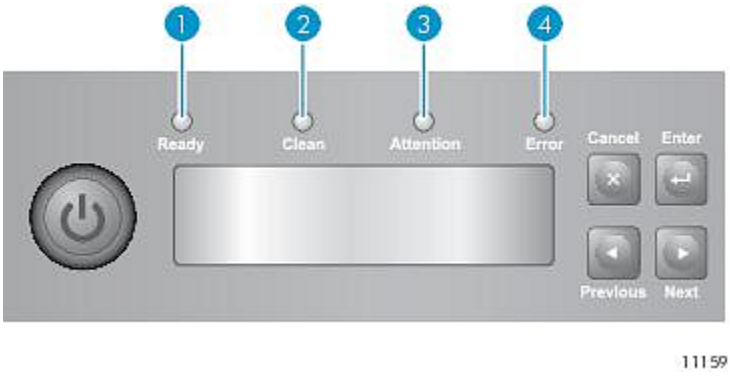


Figure 78 LEDs

1.	Green	**Ready**. Illuminated when power is on. Blinking during tape drive or robotics activity.
2.	Amber	**Clean**. Illuminated when a cleaning cartridge should be used.
3.	Amber	**Attention**. Illuminated if the device has detected a condition that requires attention.
4.	Amber	**Error**. Illuminated if an unrecoverable error occurs. A corresponding error message displays on the LCD screen.

Library home screen

The first line of the Home screen displays the device's product name. The second line displays a brief status message.

Drive status definitions are listed in Table 24.

Table 24 Drive status

Status	Definition
IDLE	Drive has a tape inserted, but there is no activity
RD	Drive is reading
FWD	Drive is forwarding
WR	Drive is writing

Status	Definition
LD	Drive is loading a tape
ULD	Drive is unloading a tape
CLN	Drive is cleaning
RWD	Drive is rewinding
SEEK	Drive is seeking
MOV	Performing a tape move or tape exchange operation
ERASE	Drive is erasing a tape
CAL	Drive is calibrating
TEST	Performing a test
UPGR	Performing a firmware upgrade operation
DCR	Decrypting
ENC	Encrypting

Operator control panel buttons

The four operator control panel buttons, described in Figure 79, let you traverse the OCP menu structure and enter information.

Figure 79 Operator control panel buttons

Cancel	Cancels the current menu option, returns to the previous menu level, or returns to the Home screen.
Enter	Enters the menu or selects the option displayed on the LCD screen.
Previous	Selects the previous item or value in the currently displayed menu.
Next	Selects the next item or value in the currently displayed menu.

Understanding the menu structure

The OCP options are organized under five menus: Unlock Mailslot, Status/Information, Configuration, Operations, and Support.

NOTE:

The Unlock Mailslot menu is only displayed when the mailslot is enabled. To enable the mailslot, see "Configuring the mailslot (Configuration > Configure Mailslot)" on page 114

From the Home screen, press **Enter** to bring up the first menu item. From a menu, use the **Previous** and **Next** keys to cycle through the menus, press **Enter** to see the first option in the menu, or press **Cancel** to return to the Home screen.

From an option, use the **Previous** and **Next** keys to cycle through the options in the menu, press **Enter** to select the option, or press **Cancel** to return to the menu list.

The menu structure is shown in Figure 80.

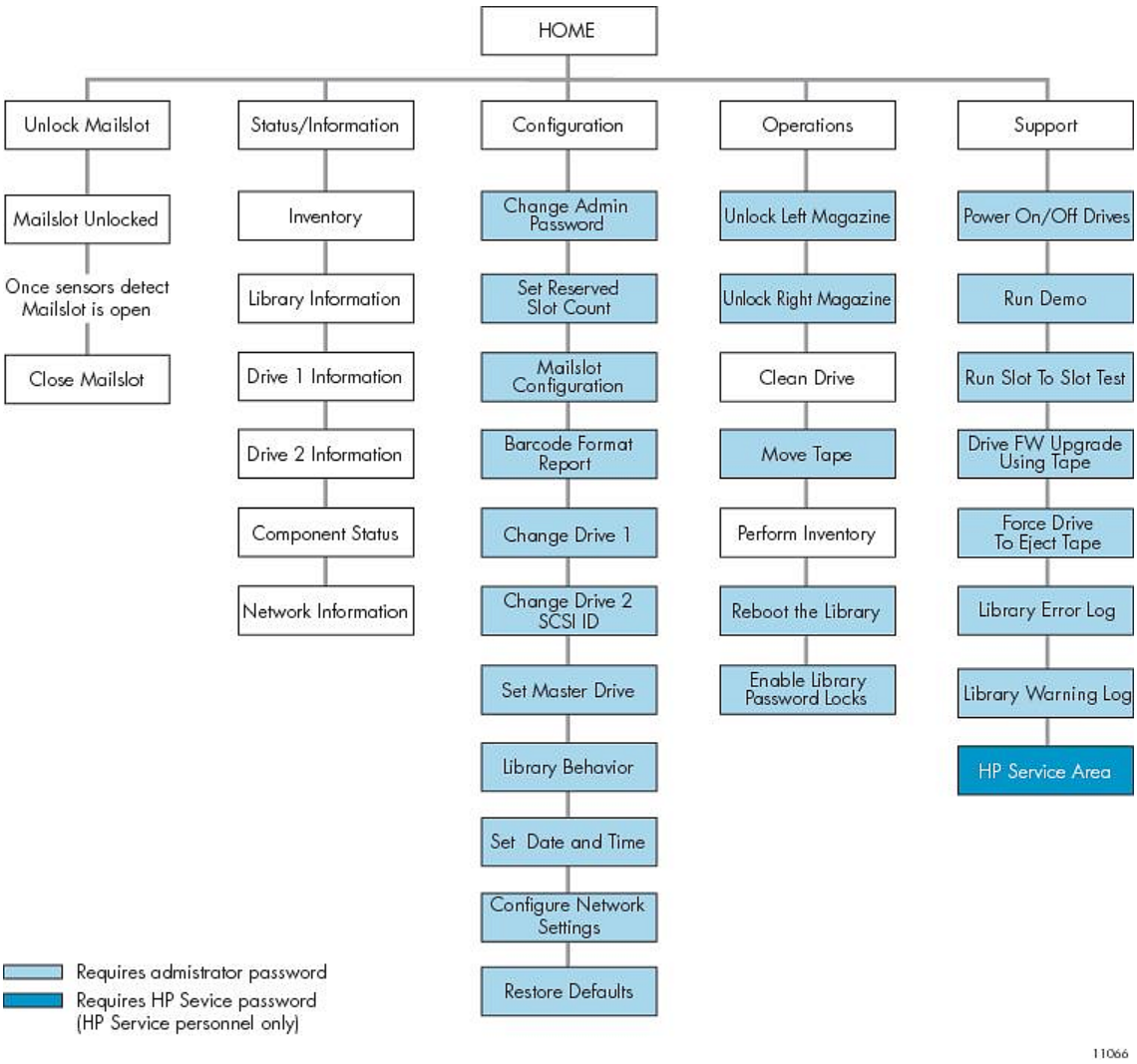


Figure 80 Library menu tree

The administrator password accesses all of the available functionality, except for the HP Service Area. A user without the administrator password has access to the **Unlock Mailslot** and **Status/Information** menus.

Entering the administrator password

TIP:

By default, the administrator password is unset; all of the digits are null. You must set the administrator password from the OCP to protect the administrator functions on the OCP and enable the administrator functions in the RMI.

Options that require a password will prompt for a password before allowing access to the restricted screens. Once entered, the administrator password does not need to be entered again unless there is no user activity for five minutes or the password lock is enabled.

The number **1** should be flashing. To enter the password, do the following:

1. From the operator control panel, press **Next** to scroll to the first number of the password.
2. Press **Enter**. The number you selected is replaced with an asterisk (*), and the cursor proceeds to the next text box.
3. Repeat steps 1 and 2 until you have entered all eight numbers. After the last number has been entered, the screen continues to the restricted area.

NOTE:

If you forget the administrator password, you cannot enter a new password. You must call your customer service representative.

Unlocking the mailslot (Unlock Mailslot)

The mailslot in the left magazine is used only with host system software that supports this feature. The mailslot feature allows you to insert or remove a single tape without removing the entire magazine. The benefit of using a mailslot is that the device will not inventory the rest of the slots in the magazine so the device can return to service sooner. The mailslot is in the left magazine.

NOTE:

The Unlock Mailslot menu is only displayed when the mailslot is enabled. To enable the mailslot, see "Configuring the mailslot (Configuration > Configure Mailslot)" on page 114

To access the mailslot:

1. From the Home screen, press **Next** until the screen displays **Unlock Mailslot**. Press **Enter** to select.
2. The mailslot ejects automatically. Pull the mailslot out to access the tape (see Figure 81).
3. The screen displays **Close Mailslot**.
4. Remove the tape cartridge from the mailslot and insert a different tape cartridge.

5. Push the magazine back into the device.

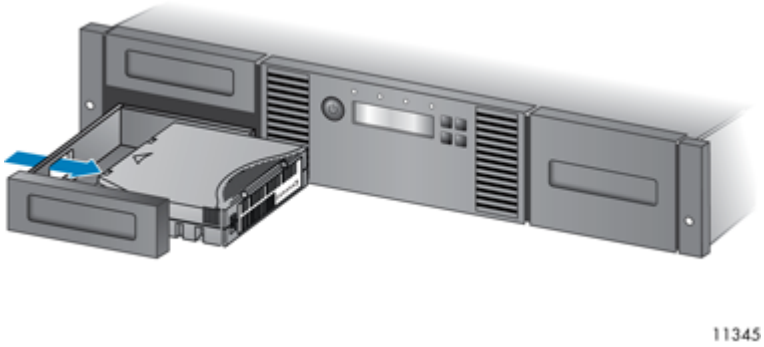


Figure 81 Removing a tape from the mailslot

Status/Information

The Status/Information menu provides access to the following status options:

- "Inventory (Status/Information > Inventory)" on page 109
- "Library information (Status/Information > Library Information)" on page 110
- "Drive information (Status/Information > Drive Information)" on page 111
- "Component status (Status/Information > Component Status)" on page 111
- "Network information (Status/Information > Network Information)" on page 112

To access the Status/Information menu:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Status/Information**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays your selected function. Press **Enter** to select.

Inventory (Status/Information > Inventory)

This option provides information on which slots have cartridges and which are empty. The second line on the screen displays one of:

- Full (tapes without bar code labels)
- Bar code identification from the tape
- Empty

The device has the following inventory locations:

- Mailslot
- Left magazine
- Right magazine
- Drive 1
- Drive 2 (if two drives are present)

Each location provides different information:

- Drive or Mailslot: The screen display may read **Mailslot AESO32L3**, where AESO32L3 is an example of the bar code number on the tape, or it may read **Full** or **Empty.**
- Left or right magazine: The screen display may read **Left Magazine** or **Right Magazine.** The second line on the display indicates which slots have a tape or are empty. Slots in the left magazine are

numbered 1-12 or 1-11, and slots in the right magazine are numbered 12-23 or 13-24. Each slot is represented by a character, as shown in Table 25.

Table 25 Display indication definitions

Character displayed	Definition
X	Slot has a tape
-	Slot is empty
m	Mailslot is enabled but does not have a tape
M	Mailslot has a tape
C	Slot has a cleaning tape
!	Media needs attention, often as a result of a damaged or incompatible cartridge

NOTE:

If the mailslot is enabled, the storage slot count is reduced.

To view more details about the contents of each slot, press **Enter** when the screen displays either **Left Magazine** or **Right Magazine**.

To view the tape inventory:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Status/Information**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Inventory**. Press **Enter** to select.
3. By using **Previous** or **Next**, you can select from the following inventory locations:
   - Mailslot
   - Left magazine
   - Right magazine
   - Drive 1
   - Drive 2 (if two drives are present)
4. To view the inventory of a magazine, press **Enter** when the OCP displays **Left** or **Right Magazine**. The OCP will display the contents of the lowest numbered slot in the magazine. The display will show the tape bar code number, **Full**, or **Empty**.
5. Use **Previous** or **Next** to scroll through the remaining slots in the magazine. Press **Cancel** to choose another inventory location.
6. To view the inventory of a tape drive, press **Previous** or **Next** until the screen displays **Drive 1**, or **Drive 2**. The display will show the tape bar code number, **Full**, or **Empty**. Press Enter to view the source of the tape loaded in the drive. For example, **Drive 1 Tape Source = Slot 2**, indicates that the tape in Drive 1 was loaded from slot 2.

Library information (Status/Information > Library Information)

To obtain information about your device:

1. From the Home screen press **Previous** or **Next** until the screen displays **Status/Information**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Library Information**. Press **Enter** to select.

   By using **Previous** or **Next**, you can select from the following information screens:

   - Library Time
   - Firmware rev.
   - Product ID
   - Serial number
   - SCSI ID and LUN (SCSI devices only)
   - Slots and Mailslots
   - Master drive
   - Odometer
   - Power On Time
   - WWide Node Name for the FC node to which the Library is connected. (Fibre Channel devices only)

Drive information (Status/Information > Drive Information)

To obtain drive information:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Status/Information**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Drive 1 Information** or **Drive 2 Information**. Press **Enter** to select.
3. By using **Previous** or **Next**, you can select from the following information screens:

   - Serial number
   - Drive type
   - Firmware revision
   - SCSI ID (parallel SCSI tape drives only)

   For a Fibre Channel tape drive, you can also select from the following information screens:

   - The WWide Node Name for the FC node to which the tape drive is connected.
   - The WWide Port Name and Port Type for Port A.
   - The WWide Port Name and Port Type for Port B.

   World Wide names are assigned automatically; they cannot be configured.

Component status (Status/Information > Component Status)

To obtain component status:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Status/Information**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Component Status**. Press **Enter** to select.

3. By using **Previous** or **Next**, you can select from the following information screens:
   - Drive activity
   - Library status
   - Drives status
   - Fan status

   The second line of the screen will display one of the following:
   - Good — the component is operating normally.
   - Warning — the component might have an issue that should be addressed. The device is functional.
   - Critical — the component has an error condition that should be addressed. The device may not be fully functional.
   - Failed — the component has a known failure and should be replaced.

Network information (Status/Information > Network Information)

To access network settings for the device:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Status/Information**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Network Information**. Press **Enter** to select.
3. Press **Previous** or **Next** to access the following information:
   - IPv4 Network Enabled or Disabled
   - IPv6 Network Enabled or Disabled
   - Host Name
   - Domain Name
   - MAC Address
4. For IPv4 Network or IPv6 Network, press **Enter** and then use **Previous** or **Next** to access the network addresses and configuration.

Configuration

The Configuration menu provides access to the following configuration functions:

- "Saving and restoring the Library configuration (Configuration > Save/Restore Configuration)" on page 120

To access the Configuration menu:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays your selected function. Press **Enter** to select.

Configuring logical libraries (Status/Information > Set Logical Libraries)

Use **Set Logical Libraries** to configure a two-drive Tape Library into one or two logical libraries. Access to this feature requires the administrator password. For more information about logical libraries, see "Logical libraries" on page 28.

To change the administrator password:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Set Logical Libraries**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. Press **Previous** or **Next** to scroll through the display until the desired number of logical libraries is displayed, then press **Enter**.

Changing the administrator password (Configuration > Change Admin Password)

Use **Change Admin Password** to set or change the administrator password. Once the administrator password is set, you must know the administrator password or the service password to change the administrator password. Passwords consist of exactly eight numbers each between the values of 0 and 9.

Screens that require a password prompt for the password before allowing access to the restricted areas. Once entered, the administrator password does not have to be entered a second time unless there is no user activity for five minutes. Enter the administrator password if you are prompted to do so.

To change the administrator password:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Change Admin Password**. Press **Enter** to select.
3. The first number is flashing. Press **Previous** or **Next** to change the value of the flashing number. When the flashing number shows the desired value, press **Enter** to select.
4. The screen displays the second number flashing. Repeat Step 3 until you have entered all eight characters. Press **Enter** to select. After the last number has been entered, the password has been set to the new password.

NOTE:

If you forget the administrator password, you cannot enter a new password. You must call your customer service representative.

Setting the number of reserved slots (Configuration > Set Reserved Slot Count)

Reserved slots can be accessed by the remote management interface (RMI) and the operator control panel (OCP), but are invisible to the host and backup software. For example, you might keep a cleaning cartridge in a reserved slot if your backup software does not manage the cleaning process. You can reserve up to 22 slots. Access to this feature requires the administrator password.

To set the reserved slot count:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Set Reserved Slot Count**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. Press **Previous** or **Next** to scroll through the display until the desired number of slots is displayed, then press **Enter**.

Configuring the mailslot (Configuration > Configure Mailslot)

The mailslot is a single slot at the front of the left magazine that you can access without removing the whole magazine. Loading a tape through the mailslot is faster than opening the magazine because the device does not need to inventory the rest of the magazine slots when you use the mailslot. Also, the device can continue to function when the mailslot is open. Access to this feature requires the administrator password.

To enable or disable the mailslot:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Configure Mailslot**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. The screen displays either **Mailslot Enabled** or **Mailslot Disabled**.
5. Press **Previous** or **Next** until the screen displays **Disable Mailslot?** or **Enable Mailslot?.** Press **Enter** when the correct action is displayed.

Bar code reporting format (Configuration > Barcode Format Reporting)

You can configure how the tape bar code is displayed in the OCP and RMI, and how it is reported to the host software. You can configure the number of characters to display and the whether the numbers should be justified to the left or right. For example, when reporting only six characters of the bar code label `12345678`, if alignment is left, the device will report `123456`. If alignment is right, the device will report `345678`. The default configuration is **8 Left**. Access to this feature requires the administrator password.

To configure the bar code report format:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Barcode Format Reporting**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays either **Display Format** or **Host Format**. The second line displays the number of characters and the current format. To change the current format, press **Enter** to select either **Display** or **Host**. An example of the screen display is **# of characters 8**.

4. Press **Previous** or **Next** until the desired number of characters is listed. Press **Enter** to select.
5. The screen displays either **Alignment Left** or **Alignment Right**. Use **Previous** or **Next** to toggle between the two choices. Press **Enter** to select the correct alignment.

Changing the SCSI address — parallel SCSI devices (Configuration > Change Drive)

△ CAUTION:

If you change the SCSI ID, you might need to cycle power on the host server and reconfigure your backup software before you can use the device.

This option changes the SCSI address of a tape drive. The tape drive logical unit number (LUN) will always be LUN 0 on the SCSI address. The Library SCSI address will be the same as the master drive, but will use LUN 1. Access to this feature requires the administrator password.

To change the drive SCSI address:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Change Drive 1** or **Change Drive 2**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. The screen displays the current SCSI ID. Press **Previous** or **Next** to change the SCSI ID number. Press **Enter** to select. An example of the screen display is **Drive 1 SCSI ID 6**.

Changing the drive configuration — Fibre Channel devices (Configuration > Change Drive)

This option allows you to configure the FC ports for your tape drive.

Each drive has two ports, A and B.

NOTE:

HP recommends that you cable Port A only and that you configure Port B for **Auto Detect** on **Fibre Speed** and **Port Type**.

To configure the FC settings:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Change Drive 1**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. The screen displays **Port A**. Press **Enter** to select and display **Fibre Speed**.
5. Press **Enter** to display **Set Fibre Speed**. Press **Previous** or **Next** to toggle through the speed settings (Auto Detect, 1 Gb/s, 2 Gb/s, 4 Gb/s, or 8 Gb/s). Only speeds supported by the drive are listed. Press **Enter** to select the required speed.
6. The screen displays **Port Type**. Press **Enter** to display **Set Port Type**. Press **Previous** or **Next** to toggle through the port types (Fabric (N), Loop (NL), or Auto Detect). Press **Enter** to select the required port type.

7. If you selected **Fabric (N)** or **Auto Detect**, configuration is now complete; go to step 9. If you selected **Loop (NL)**, **Set Port Loop Mode** is displayed. Press **Previous** or **Next** to toggle through the loop modes (Soft, Hard, or Hard Auto Select). Press **Enter** to select the required loop mode.
8. If you selected **Soft** or **Hard Auto Select**, configuration is now complete; go to step 9. If you selected **Hard**, **Set ALPA** is displayed with the first number flashing. Press **Previous** or **Next** until the flashing number reads correctly. Press **Enter** to move to the next number. Repeat this step until all numbers in the address are correct. Press **Enter**.
9. Press **Enter** to save the settings and reset the port.
10. The screen displays **Port B**.
11. Press **Enter** to select and display **Fibre Speed**. Select **Auto Detect**. Press **Enter**.
12. Press **Enter** to select and display **Port Type**. Select **Auto Detect**. Press **Enter**.

Setting the master drive (Configuration > Set Master Drive)

△ CAUTION:

If you change the SCSI ID, you might need to cycle power on the host server and reconfigure your backup software before you can use the device.

To set the master drive:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Set Master Drive**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. Press **Previous** or **Next** until the screen displays either **Master Drive Drive 1** or **Master Drive Drive 2**.
5. Press **Enter** to select the displayed configuration. The screen displays either **Drive 1 Set to Master**, or **Drive 2 Set to Master**, and the Ready LED blinks.

Setting behaviors (Configuration > Library Behavior)

The Library supports three behavior modes: Random, Sequential, and Automatic. The Library automatically detects the required mode from the series of SCSI commands it receives; however, you can also change the mode. Choose the operating mode based on the capabilities of the software controlling the tape cartridges. The Library mode can be set independently for each logical library. Access to this feature requires the administrator password.

Random mode: In Random mode, the device does not automatically load tapes into the tape drive; it waits for commands from the software or operator to load and unload tapes. Random mode is used with a full featured or a robotics-aware backup application and is the most common mode of operation. Your backup software must support robotics, which may require an additional software module.

Sequential mode: In Sequential mode, the device automatically loads and unloads tapes from the drive. Sequential mode is used when the backup software is NOT robotics-aware or was designed for standalone drives only.

In Sequential mode, the Library will only use the lowest-numbered tape drive.

The operator begins the sequence by loading the desired tape into the tape drive. When a tape is unloaded for any reason, the device automatically removes the tape from the drive, returns it to its original slot, then loads the tape from the next available higher numbered slot.

To further determine how you want tapes loaded into the tape drive while in Sequential mode, you can set the **Loop** and **Autoload** options.

- When **Autoload** mode is set, the device automatically loads the cartridge from the lowest-numbered full slot into the tape drive. It then follows standard sequential operation. After configuring Autoload mode, you must do one of the following for Autoload mode to take effect:
  - Power cycle the device from the front panel.
  - Reboot the device from the RMI Support: Reboot screen.
  - Move the lowest-numbered cartridge to the drive before starting the backup application. If the mailslot is enabled, the lowest cartridge location will be in the mailslot.
- When **Loop** mode is on, the original first cartridge in the sequence is reloaded after the device has cycled through all available cartridges. If Loop mode is off and the last cartridge has been unloaded, the device stops loading cartridges until you load another manually.

△ CAUTION:

Use caution when choosing Loop mode because it makes it possible to overwrite data on previously written cartridges.

When a Library is partitioned into logical libraries, each logical library operates as an independent library. Thus, the Library only loads tapes from the slots associated with one logical library into the tape drive associated with that logical library; it will not load tapes from slots associated with another logical library.

Automatic mode: In Automatic mode, the device switches from Sequential mode into Random mode when it receives certain SCSI commands. Automatic mode is the default setting.

To set a behavior mode:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Library Behavior**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. Press **Previous** or **Next** until the screen displays **Library Mode**. Press **Enter**.
5. The screen displays **Set Library Mode**, followed by the current Library mode: **Automatic**, **Sequential**, or **Random**. To change the mode, press **Enter**.
6. Press **Previous** or **Next** to scroll through the screens for **Automatic**, **Sequential**, or **Random**. Press **Enter** to select the Library mode.

7. If you enabled Sequential mode, you can configure the Autoload and Loop options:
   a. Press **Previous** or **Next** until the screen displays **Autoload Mode Disable** or **Autoload Mode Enable**. To change the Autoload mode, press **Enter**. The screen displays either **Disable Autoload Mode** or **Enable Autoload Mode.** Press **Previous** or **Next** to toggle between the enabled and disabled screens. Press **Enter** to select the Autoload mode. The display shows the new Autoload mode.
   b. Press **Previous** or **Next** until the screen displays either **Loop Mode Disable** or **Loop Mode Enable**. To change loop mode, press **Enter.** The screen displays either **Enable Loop Mode** or **Disable Loop Mode.** Press **Previous** or **Next** to toggle between the enabled and disabled screens. Press **Enter** to select the loop mode.

Setting the date and time (Configuration > Library Date/Time)

NOTE:

When setting the hours, the time is based on a 24-hour clock. There is no a.m. or p.m. designation.

Use **Set Date and Time** to set the date and time used to record events. Access to this feature requires the administrator password.

To set the date:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Library Date/Time**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. The screen displays **Set Yr/Month/Day 2006 / 07 / 21** with a flashing number. Press **Previous** or **Next** to change the value of the flashing number. Press **Enter** to accept the value of the flashing number and move to the next number.
5. Repeat Step 5 until all numbers in the date are correct. Press **Enter**.
6. The screen displays (example) **Set Hour / Mins 16 : 52** with the first number flashing. Press **Previous** or **Next** until the flashing number reads correctly. Press **Enter** to move to the next number. Repeat this step until all numbers in the time are correct. Press **Enter**.

Configuring network settings (Configuration > Configure Network Settings)

The device can automatically obtain an IP address from a DHCP server when the device is powered on. The device also supports user-specified fixed addresses through the front panel.

The device also supports SNMP. You can enable SNMP and configure the target addresses with the RMI. See "Changing the network configuration" on page 88.

To configure IPv4 network settings:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Configure Network Settings**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays **IPv4 Networking Enabled**. Press **Enter** to select.
4. Press **Previous** or **Next** until the screen displays **DHCP Enabled**. To change the setting, press **Enter**. Press **Next** until the screen shows the desired setting. Press **Enter** to accept the new setting.

5. If DHCP is disabled, press **Previous** or **Next** until the screen displays **IP Address**. The second line displays the current IP address.
6. To change the IP address, press **Enter**. The screen displays **Set IP Address** with the first number flashing. Press **Previous** or **Next** to change the flashing number to the correct value.
7. Press **Enter** to select the next number, until all numbers have been set. The screen displays **New IP Address.**
8. Press **Previous** or **Next** until the screen displays **Subnet Mask Address**. To change the **Subnet Mask Address**, press **Enter**. The screen displays **Set Subnet Mask Address,** with the first number flashing.
9. Press **Previous** or **Next** to change the flashing number to the correct value. Press **Enter** to select the next number.
10. Repeat Step 9 until all numbers have been set. The screen displays **New Subnet Address.**
11. Press **Previous** or **Next** until the screen displays **Gateway Address**. To change the **Gateway Address**, press **Enter**. The screen displays **Set Gateway Addr,** with the first number flashing.
12. Press **Previous** or **Next** to change the flashing number to the correct value. Press **Enter** to select the next number.
13. Repeat Step 12 until all numbers have been set. The screen displays **New Gateway Addr.** Press **Enter**.

To enable IPv6:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Configure Network Settings**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays **IPv6 Networking**. Press **Enter** to select.
4. The screen displays **IPv6 Network Addressing Disabled**. To change the setting, press **Enter**.
5. Press **Next** until the screen displays the desired setting. Press **Enter** to accept the new setting.
6. Configure IPv6 networking from the RMI. See "Changing the network configuration" on page 88.

Configuring automatic cleaning (Configuration > Configure Auto Cleaning)

When auto clean is enabled, the device automatically loads a cleaning cartridge when a tape drive needs to be cleaned. The device identifies a tape cartridge as a cleaning cartridge if it has a barcode label that starts with CLN or after an unlabeled cleaning tape has been loaded into the tape drive.

The device can use a cleaning cartridge from any slot, even if the slot is reserved. The device keeps track of the usage count for each of the cleaning cartridges. When multiple cleaning cartridges are available, the device will first choose an unknown cleaning cartridge so the device can start tracking the cartridge usage count. If the deviceknows the usage count for all of the cleaning cartridges, the device will choose the one with the highest usage count.

Auto cleaning is disabled by default. You can enable automatic cleaning even if there are no cleaning cartridges in the device. In this case, the device will display a warning message.

△ CAUTION:

Only enable automatic cleaning in either the backup application or the device, not both.

To configure automatic cleaning:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Configure Auto Cleaning**. Press **Enter** to select.
3. The screen displays **Auto Cleaning Disabled** or **Auto Cleaning Enabled** depending on the current setting. To change the auto cleaning configuration, press **Enter**.
4. Press **Previous** or **Next** until the screen displays the configuration you want. Press **Enter**.

Restoring factory defaults (Configuration > Restore Defaults)

The device can reset most of the configurations to the factory defaults, while retaining the settings necessary to use the RMI. The device will perform an inventory after the defaults are restored.

The restored settings are:

- SCSI addresses: The SCSI ID for the bottom drive is 4; the SCSI ID for the top drive is 5. The Library will no longer recall a drive that has been removed.
- Fibre Channel drive configuration: Automatic speed, auto port type
- Master drive: reset to Drive 1 or the lowest numbered existing drive
- Drive power: all drives powered on
- Active slots: maximum possible
- Library mode: Automatic
- Loop: No
- Event log levels and filter: continuous trace and all levels and filters active (for HP Service use only)
- Barcode reader label length: 8
- Barcode reader alignment: Left
- Error recovery: On
- Mailslot configuration: mailslot disabled
- Auto clean: disabled
- SNMP: disabled, but saved addresses to not change
- E-mail notification: disabled, but configurations retained

The following settings are not reset:

- Administrator password
- Network settings (network is always enabled)
- Date and time

To restore the factory defaults:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Restore Defaults**. Press **Enter** to select.

Saving and restoring the Library configuration (Configuration > Save/Restore Configuration)

Use this option to save the configuration settings to a USB flash drive. The saved configuration information will make it easier to recover the device configuration if you need to replace the chassis.

This feature is also useful when installing multiple devices. Either save the configuration before configuring the network or ensure that only one device with the same network configuration is on the network at a time until they have unique network identities.

To save the device configuration settings to a USB flash drive:

1. Insert the USB flash drive in the USB port on the back of the device.
2. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays **Save/Restore Configuration**. Press **Enter** to select.
4. Enter the administrator password if prompted.
5. The screen displays **Save Configuration to USB**. Press **Enter** to save.
6. When the save operation is completed, remove the USB flash drive from the USB port.

To restore the device configuration settings from a USB flash drive:

1. Insert the USB flash drive in the USB port on the back of the device.
2. From the Home screen, press **Previous** or **Next** until the screen displays **Configuration**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays **Save/Restore Configuration**. Press **Enter** to select.
4. Enter the administrator password if prompted.
5. Press **Previous** or **Next** until the screen displays **Restore Config from USB**. Press **Enter**.
6. Press **Previous** or **Next** until the screen displays the filename of the device configuration file on the USB drive. Press **Enter** to select the firmware file.
7. When the restore operation is completed, remove the USB flash drive from the USB port.

NOTE:

You can save the configuration settings to a file from the RMI. See "Saving and restoring the device configuration and restoring factory defaults" on page 95

Operations

The Operations menu provides access to the following options:

- "Unlocking, removing, and replacing magazines (Operations > Unlock Left or Right Magazine)" on page 122
- "Cleaning a tape drive (Operations> Clean Drive)" on page 122
- "Moving tapes in the Library (Operations > Move Tape)" on page 123
- "Updating tape cartridge inventory (Operations > Perform Inventory)" on page 124
- "Rebooting the Library (Operations> Reboot Library)" on page 124
- "Enabling password locks (Operations > Enable Library Password Locks)" on page 125

To access the Operations menu:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Operations**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays your selected function. Press **Enter** to select.

Unlocking, removing, and replacing magazines (Operations > Unlock Left or Right Magazine)

These OCP options let you gain access to the left and right magazine. Access to the magazines requires the use of the administrator password.

To remove a magazine:

1. From the Home screen, press **Previous** or **Next** on the OCP until the screen displays **Operations**.
2. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays either **Unlock Left Magazine** or **Unlock Right Magazine**.
4. Press **Enter** to select the desired magazine to unlock.
5. Enter the administrator password if requested.
6. The display reads **Left Magazine Unlocked** or **Right Magazine Unlocked**.
7. Pull the released magazine out of the device.
8. The screen now displays **Insert Left Magazine** or **Insert Right Magazine**. The device cannot perform any other operation until the magazine is replaced. After exchanging tapes in a magazine, slide the magazine completely into the device. The magazine locks into place once it is correctly installed and the device inventories the magazine. The Ready LED blinks while the device inventories the magazine and then stops when the operation is complete.

Cleaning a tape drive (Operations> Clean Drive)

When the **Clean** LED is on, a tape drive needs to be cleaned. Cleaning times can range from a few seconds to a few minutes during which time the **Ready** LED blinks. Use only the designated cleaning cartridge for your tape drive model. All cartridges are available at http://www.hp.com/go/storagemedia.

Use only Ultrium Universal cleaning cartridges.

IMPORTANT:

If the cleaning cartridge is not a valid cleaning cartridge, the LCD screen displays **Invalid Tape** and the cartridge is returned to its original location.

IMPORTANT:

If the **Clean** LED or the **Attention** LED (on load or unload) lights when inserting the same cartridge after you have cleaned the drive, there may be a problem with that cartridge.

If you use the operator control panel to clean the tape drive, load the cleaning cartridge into the mailslot or any other empty slot before beginning the cleaning steps. If you would like to keep a cleaning cartridge in the device, the backup software must manage tape drive cleaning or be configured to bypass the slot containing the cleaning cartridge.

To clean the tape drive:

1. Make sure a cleaning cartridge is in the mailslot or one of the magazines.
2. From the Home Screen, press **Previous** or **Next** until the screen displays **Operations**. Press **Enter** to select.

3. Press **Previous** or **Next** until the screen displays **Clean Drive**. Press **Enter** to select.
4. Use **Previous** or **Next** until the screen displays **Drive 1** or **Drive 2**. The second line can display either **Clean Required** or **Good** for both drives. Select the drive for **Clean Required**.
5. When the screen displays the correct drive, press **Enter**. The screen displays either **Cleaning Tape Slot 4** or **Cleaning Tape Slot XX**, where *XX* represents flashing blocks. If a slot number is displayed, the tape in that slot has a bar code label identifying the tape as a cleaning tape. If a slot number is displayed, continue to Step 6. If no slot number is displayed, it indicates that the device is not able to detect that a cleaning tape with a bar code is in the device. In this case, the operator must select the slot where a cleaning tape resides.
6. Use **Previous** or **Next** to display the location of a cleaning tape.
7. When the correct location for the cleaning tape is displayed, press **Enter** to select. While the device cleans the drive, **Cleaning Drive 1 in progress** or **Cleaning Drive 2 in progress** it displays.
8. After the cleaning cycle is complete, the screen displays either **Cleaning Drive 1 Complete**, or **Cleaning Drive 1 Failed**. If the cleaning cycle failed, press **Enter** to display the error code and message explaining the failure.

The device returns the cleaning cartridge to the original slot. If you loaded the cartridge from the front panel, you should now unload it either by using the mailslot, or by removing the magazine. When the tape drive cleaning cycle is complete, the **Clean** LED turns off (if previously on).

Moving tapes in the Library (Operations > Move Tape)

Use this option to move a cartridge from a tape drive, a tape slot in any magazine or the mailslot to any other location not already holding a tape. You can also load and unload tape cartridges to and from the installed tape drives. You must first select where you want to move the tape from and then indicate where you want to move the tape to. Access to this command requires the administrator password.

To move a tape:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Operations**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Move Tape**. Press **Enter** to select.
3. Enter the administrator password if prompted. Use **Previous** or **Next** to select from the possible sources:
   - Mailslot
   - Right Magazine
   - Left Magazine
   - Drive 1
   - Drive 2 (if two drives are present)
4. When the correct source is displayed, press **Enter** to select.
5. If the source selected is a magazine, use **Previous** or **Next** to select the slot. Only slots with tapes are listed. The second line displays the bar code for the tape or reads **Full**.
6. Once the correct slot is displayed, press **Enter** to select.

   You have now selected the tape you would like to move. The screen now requests the destination for this tape.

7. Use **Previous** or **Next** to select from the possible destinations as follows:
   - Mailslot
   - Right Magazine
   - Left Magazine
   - Drive 1
   - Drive 2 (if two drives are present)
8. When the correct destination is displayed, press **Enter** to select.
9. If the destination selected is a magazine, use **Previous or Next** to display the slot. Only empty slots are listed.

Once the correct slot is displayed, press **Enter** to select. The device now moves the tape from the selected source, to the selected destination. While the device moves the tape, the screen displays **Moving Tape**. Once the tape has been moved, the screen displays either **Move Complete**, or **Move Failed**. If the move failed, press **Enter** to display the error code and message explaining the failure.

Updating tape cartridge inventory (Operations > Perform Inventory)

This option updates the device's tape cartridge inventory. The device checks each slot and drive to determine which tape, if any, is present.

To update the tape cartridge inventory:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Operations**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Perform Inventory**. Press **Enter** to select.
3. While the inventory is in progress, the screen displays **Inventory in Progress...**
4. The Library now checks the drive and each slot for the presence of a tape to update the inventory information. The **Ready** LED blinks during this operation.

NOTE:

This command is only needed if the inventory in the device is different than the inventory displayed on the front panel, which would not happen under normal conditions.

Rebooting the Library (Operations> Reboot Library)

This option reboots the device and forces a new cartridge inventory, clearing any current error condition.

CAUTION:

This option interrupts the current backup or restore operation and causes the operation to fail. Use this option if the device is in an error state.

To reboot:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Operations**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Reboot Library**. Press **Enter** to select.

3. The **Ready** LED blinks during the reboot operation.

Enabling password locks (Operations > Enable Library Password Locks)

This option locks the restricted areas. This is typically used if you do not want to wait for the time out to reset the locks. Power cycling or rebooting the device also resets the locks.

To enable the password locks:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Operations**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Enable Library Password Locks**. Press **Enter** to select.

Support

The Support menu provides access to the following support options:

- "Powering a drive on or off (Support > Power On/Off Drives)" on page 125
- "Running the demonstration (Support > Run Demo)" on page 126
- "Running the slot to slot test (Support > Run Slot To Slot Test)" on page 126
- "Running the wellness test (Support > Run Wellness Test)" on page 127
- "Upgrading firmware (Support > Library FW Upgrade, Support > Drive FW Upgrade)" on page 127
- "Viewing logs (Support > Library Error Log)" on page 129
- "Downloading a support ticket (Support > Download Support Ticket)" on page 129
- "Forcing the drive to eject a tape (Support > Force Drive To Eject Tape)" on page 130

To access the Support menu:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays your selected function. Press **Enter** to select.

Powering a drive on or off (Support > Power On/Off Drives)

Use this option to power a drive on or off without interrupting power to the rest of the device and the second drive. This is typically used when replacing one drive in a two-drive configuration. Access to this feature requires the administrator password.

To power on or off the drive or drives:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Power On/Off Drives**. Press **Enter** to select.
3. Enter the administrator password, if prompted.
4. Press **Previous** or **Next** until the screen displays the drive you need to power on or off. The screen displays **Drive 1**. The second line in the display displays the current state, which is either **Power ON** or **Power OFF**.
5. To change the power status, press **Enter**. The screen displays either **Press Enter to Power off DRV 1**, or **Press Enter to Power on DRV 1**. Press **Enter** to select. The **Ready** LED blinks during the operations.

Running the demonstration (Support > Run Demo)

Use this option to run a device demonstration program. The demonstration continues until the **Cancel** button is pressed on the operator control panel. During the demonstration the device will move cartridges to the tape drive and back. At the end of the demonstration the cartridges are returned to their original slots. Access to this feature requires the administrator password.

To run the demonstration:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Run Demo**. Press **Enter** to select.
3. Enter the administrator password if prompted.
4. Use **Previous** and **Next** to select the number of cycles: 270, 540, 1080, or Endless. Press **Enter** to start the demonstration.
5. While the test is running, the first line of the screen displays **Demo Test**. The second line displays the number of cycles completed and the number of errors. The **Ready** LED blinks until the test is complete.

NOTE:

To stop the demonstration, press **Cancel** on the operator control panel.

Running the slot to slot test (Support > Run Slot To Slot Test)

Use this option to show the robot's ability to move media in and out of each of the magazine slots. Access to this feature requires the administrator password.

NOTE:

At the end of the test, the cartridges are NOT returned to their original slots.

To run the slot to slot test:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Run Slot To Slot Test**. Press **Enter** to select.
3. Enter the administrator password, if prompted.
4. Press **Previous** or **Next** until the screen displays **Select Number of Cycles.** Use **Previous** or **Next** to select the number of cycles: 270, 540, 1080, or Endless. Press **Enter**.
5. While the test is running, the screen displays progress as shown: **Run Slot To Slot**. The second line on the display shows the number of cycles completed. The **Ready** LED blinks until the test is complete.
6. When the test is complete, the screen displays the number of cycles completed and the number of errors. If the test failed, press **Enter** to display the error and message describing the cause.

NOTE:

To stop the slot to slot test, press the **Cancel** button.

Running the wellness test (Support > Run Wellness Test)

Use this option to check the health of the device for the specified number of loops. If a failure occurs during the test, check the error code and failure message for more information. Access to this feature requires the administrator password. For more information about the wellness test, see "The wellness test" on page 177.

For complete testing, enable the mailslot and ensure that each top-row corner slot contains a tape cartridge. During the test, the device will open the mailslot and ask you to insert a tape cartridge. You can use any compatible Ultrium data tape cartridge for this test.

IMPORTANT:

The device will remove any tape cartridges from tape drives and go offline when running the wellness test. Verify that any applications using the device have completed before starting the wellness test.

To run the wellness test:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Run Wellness Test**. Press **Enter** to select.
3. Enter the administrator password, if prompted.
4. On a device with two tape drives, press **Previous** or **Next** to select the tape drive to test: **Drive 1**, **Drive 2**, or **All Drives**. Press **Enter** to select the drive option.
5. Use **Previous** or **Next** to select a number of cycles: 1 - 10. Press **Enter**.
6. While the test is running, the screen displays progress as shown: **Wellness test**. The second line on the display shows the number of cycles completed. The **Ready** LED blinks until the test is complete.
7. When the test is complete, the screen displays the test completion status, including any recoveries or errors that may have occurred. See "Error codes" on page 180 for a list of error codes and error messages.

NOTE:

To stop the wellness test, press the **Cancel** button.

Upgrading firmware (Support > Library FW Upgrade, Support > Drive FW Upgrade)

The Library allows two types of firmware to be upgraded — one for the tape drive and the other for the Library itself. You can upgrade both types of firmware from a USB flash drive. You can also upgrade the tape drive firmware from a firmware upgrade tape. Access to this feature requires the administrator password.

To upgrade Library firmware from a USB flash drive:

1. Download current Library firmware using HP Library & Tape Tools or from the HP support website: http://www.hp.com/support/storage. Copy the firmware onto the USB flash drive.

TIP:

The display will only show the first 16 characters of the file name. If the USB drive has multiple firmware files, ensure that you can distinguish the files from the first 16 characters in their file names.

2. Insert the USB flash drive into the USB port on the back of the device.
3. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
4. Press **Previous** or **Next** until the screen displays **Library FW upgrade**. Press **Enter** to select.
5. Enter the administrator password if prompted.
6. Press **Previous** or **Next** until the screen displays the filename of the Library firmware file on the USB drive. Press **Enter** to select the firmware file.
7. If the upgrade failed, press **Enter** to display the error code and message describing the cause of the failure.
8. Remove the USB flash drive from the USB port.

To upgrade drive firmware from a USB flash drive:

1. Download current tape drive firmware using HP Library & Tape Tools or from the HP support website: http://www.hp.com/support/storage. Copy the firmware onto the USB flash drive.

TIP:

The display will only show the first 16 characters of the file name. If the USB drive has multiple firmware files, ensure that you can distinguish the files from the first 16 characters in their file names.

2. Insert the USB flash drive into the USB port on the back of the device.
3. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
4. Press **Previous** or **Next** until the screen displays **Drive FW Upgrade**. Press **Enter** to select.
5. Enter the administrator password if prompted.
6. Press **Previous** or **Next** until the screen displays **Drive FW Upgrade by USB**. Press **Enter** to select.
7. Press **Previous** or **Next** until the screen displays the filename of the drive firmware file on the USB drive. Press **Enter** to select the firmware file.
8. If the upgrade failed, press **Enter** to display the error code and message describing the cause of the failure.
9. Remove the USB flash drive from the USB port.

To update drive firmware from a firmware upgrade tape:

1. Load a firmware upgrade tape into the mailslot or any open slot. If all slots are full, remove a data tape to make room for the firmware upgrade tape.

2. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays **Drive FW Upgrade**. Press **Enter** to select.
4. Enter the administrator password if prompted.
5. Press **Previous** or **Next** until the screen displays **Drive FW Upgrade by Tape**. Press **Enter** to select.
6. Press **Previous** or **Next** until the screen displays one of the following: **Drive 1.** The second line may read: **Firmware: G39W** or **Drive 2 Firmware: G39W** or **All Drives**. Press **Enter** to select the appropriate drive to upgrade.
7. Press **Previous** or **Next** until the display shows the correct slot location of the firmware upgrade tape installed in the device (example) **FW Tape Location Slot: Mailslot**. Press **Enter** to select the correct firmware tape location. The screen displays **Upgrading Drive FW**.
8. When the update is complete, the screen displays either **Success Export FW Tape**, or **Failed Export FW Tape**. If the upgrade failed, press **Enter** to display the error code and message describing the cause of the failure.
9. Remove the firmware upgrade tape from the device using either the mailslot or by removing the magazine where the tape has been placed.

Viewing logs (Support > Library Error Log)

The Library keeps a log of recent error and warning messages. See "Error codes" on page 180 for more information about error codes.

To access the error or warning log:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Library Error Log** to see error messages or **Library Warning Log** to see warnings. Press **Enter** to select.
3. Enter the administrator password, if prompted.
4. Press **Enter** to see the message description. Press **Cancel** to return to the message code.
5. Press **Next** to see the next message.

Downloading a support ticket (Support > Download Support Ticket)

A support ticket contains information that can help a system administrator or support engineer diagnose device problems. Use this option to download a support ticket to a USB flash drive. Downloading the support ticket to a USB flash drive lets you view the ticket on a computer that is not connected to the device. You can view the support ticket with the Library & Tape Tools.

To download a support ticket:

1. Insert a USB flash drive into the USB port on the back panel.
2. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays **Download Support Ticket**. Press **Enter** to select.

Forcing the drive to eject a tape (Support > Force Drive To Eject Tape)

Use this option to make the tape drive eject the tape and place it into an open slot. Before issuing this command, attempt to eject the tape with the move command (See "Moving tapes in the Library (Operations > Move Tape)" on page 123).

To force the tape to eject:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Support**. Press **Enter** to select.
2. Press **Previous** or **Next** until the screen displays **Force Drive To Eject Tape**. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays **Drive 1** or **Drive 2**. The second line on the display shows the bar code number of the tape, **Full**, or **Empty.** Press **Enter** to select the desired drive to eject the tape.
4. If the tape is successfully ejected from the drive, the screen displays the slot location where the tape was moved to.

NOTE:

If the drive has difficulty ejecting the tape, suspect bad or damaged media.

MSL4048, MSL8048, and MSL8096 operator control panel

Overview

The front panel includes:

- A liquid crystal display (LCD) that shows Tape Library status information and is used to access the OCP menus.
- LEDs that illuminate to indicate Library conditions and alerts.
- Navigation buttons that allow you to scroll through, select, and make changes to different OCP menus and settings.

This panel provides everything you need to monitor Library status and access the OCP menus.

Operations available using the OCP

- Info menu
  - "Viewing status information (Info > Status)" on page 140
  - "Viewing Library identity information (Info > Identity Library)" on page 140
  - "Viewing drive identity information (Info > Identity Drives)" on page 141
  - "Viewing inventory information (Info > Inventory)" on page 141
  - "Viewing network information (Info > Network)" on page 141
- Configuration menu
  - "Logical Libraries (Configuration > Set Logical Libraries)" on page 142
  - "Changing the library configuration (Configuration > Library)" on page 142
  - "Changing the drive configuration (Configuration > Drives)" on page 144
  - "Changing the network configuration (Configuration > Network Configuration)" on page 144
  - "Barcode reporting format (Configuration > Barcode Reporting)" on page 144
  - "Changing the administrator password (Configuration > Set Admin Password)" on page 144
  - "Restore defaults (Configuration > Restore Defaults)" on page 145
  - "Setting the Library date and time (Configuration > Set Date and Time)" on page 146
  - Display Contrast
  - "Saving and restoring the Library configuration (Configuration > Save/Restore)" on page 146
- Operations menu
  - Opening the mailslot (Operations > Open Mailslot), page 147
  - Unlocking, removing and replacing magazines (Operations > Unlock Left/Right Magazines), page 147
  - Moving Media (Operations > Move Media), page 148
  - Performing Inventory (Operations > Inventory), page 148
  - Enabling Password Locks (Operations > Enable Password Locks), page 148
- Support menu
  - "Powering drives on and off (Support > Power on/off Drives)" on page 149
  - "Cleaning the tape drive (Support > Clean Drive)" on page 149
  - "Running tests (Support > Run Tests)" on page 149
  - "Viewing logs (Support > View Logs)" on page 150

- "Updating library and drive firmware (Support > FW Upgrade)" on page 150
- "Force ejecting a drive (Support > Force Drive Eject)" on page 151
- "Downloading a support ticket (Support > Support Ticket)" on page 151
- "Rebooting the tape library (Support > Reboot) " on page 151

Operator control panel navigation buttons

Four menus are accessed through the operator control panel: **Info**, **Configuration**, **Operations** and **Support**. Use the navigation buttons to select menu items and work with the screen displays. The navigation buttons have different functions depending upon where you are in the menu structure (see Table 26 and Table 27).

Table 26 OCP buttons

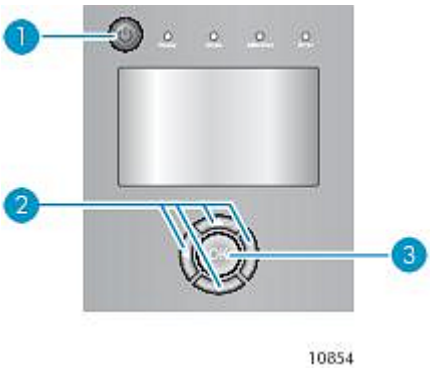
Operator control panel buttons	Number	Description
	1.	Power button
	2.	Navigation buttons
	3.	OK button

Table 27 Navigation buttons

▶	Right	Moves to the next item at the current menu level. When a top-level menu item is highlighted, this moves to the next menu item, for example, from Info to Configuration. When a digit is highlighted on a screen field, this moves to the next digit. If there is no next item, this button is not active.
◀	Left	Moves to the previous item at the current menu level. When a top-level menu item is highlighted, this moves to the previous menu item, for example, from Configuration to Info. When a pull-down menu is displayed, the left button can be used to close or collapse that menu. When a digit is highlighted on a screen field, this moves to the previous digit. If there is no previous item, this button is not active.
▲	Up	Scrolls upwards through available choices at the current menu level. (If used on the top item it returns to the bottom item.) When a menu pull-down is displayed, this scrolls through all items for that menu. When a screen is displayed, this highlights individual lines. When editable fields are highlighted, this scrolls through available choices for that field.
▼	Down	Scrolls downwards through available choices at the current menu level. (If used on the bottom item it returns to the top item.) If used from a top-level menu item, it highlights the top selection in the sub-menu. When a sub-menu is displayed, this scrolls through all items for that menu. When a screen is displayed, this highlights individual lines. When editable fields are highlighted, this scrolls through available choices for that field.

OK	OK	Selects the highlighted menu or screen item. If used from a top-level menu item, it displays the sub-menu with no items highlighted; press OK a second time to return to the top-level menu. When a sub-menu is displayed, OK selects the highlighted menu item. In a configuration screen, the OK button toggles from navigation to editing a selection. Navigate to an option you wish to change and press OK to edit it. Once the item has been changed, press OK again to go back into navigation mode. The OK button is also used for selecting highlighted choices such as <Save> or <Cancel>.

Using the OCP

Each time the Tape Library is powered on or rebooted, or after five minutes of inactivity, a splash screen is briefly displayed, after which the OCP menu is displayed, showing current system status information.

You will be required to enter the administrator password for all functions that are password-protected.

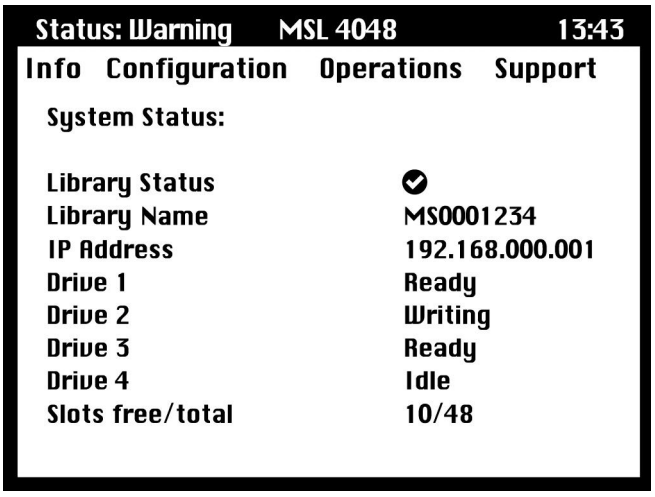


Figure 82 OCP menu, showing initial system status information

The OCP menu includes a status message bar, menu bar, and display area. Initial system status information includes basic Library, drive, and magazine status and information. All drives that have been activated are included. If drives are subsequently removed or powered down, they will still be listed on this screen until you restore defaults.

Status message bar

The highlighted line above **Info**, **Configuration**, **Operations** and **Support** is always visible. It shows the time and overall status of the Library. Status definitions are listed in Table 28.

Table 28 Library status

Status	Definition
Ready	Library is ready for normal operation
Warning	Library is in a warning condition such as a drive needs cleaning (normal operation)
Error	Library is in an error condition (normal operation)
Offline	Library is running tests

Status	Definition
Load	Library is loading a tape
Unload	Library is unloading a tape

Menu bar

The menu bar contains four groups of menu functions:

- Info
- Configuration
- Operations
- Support

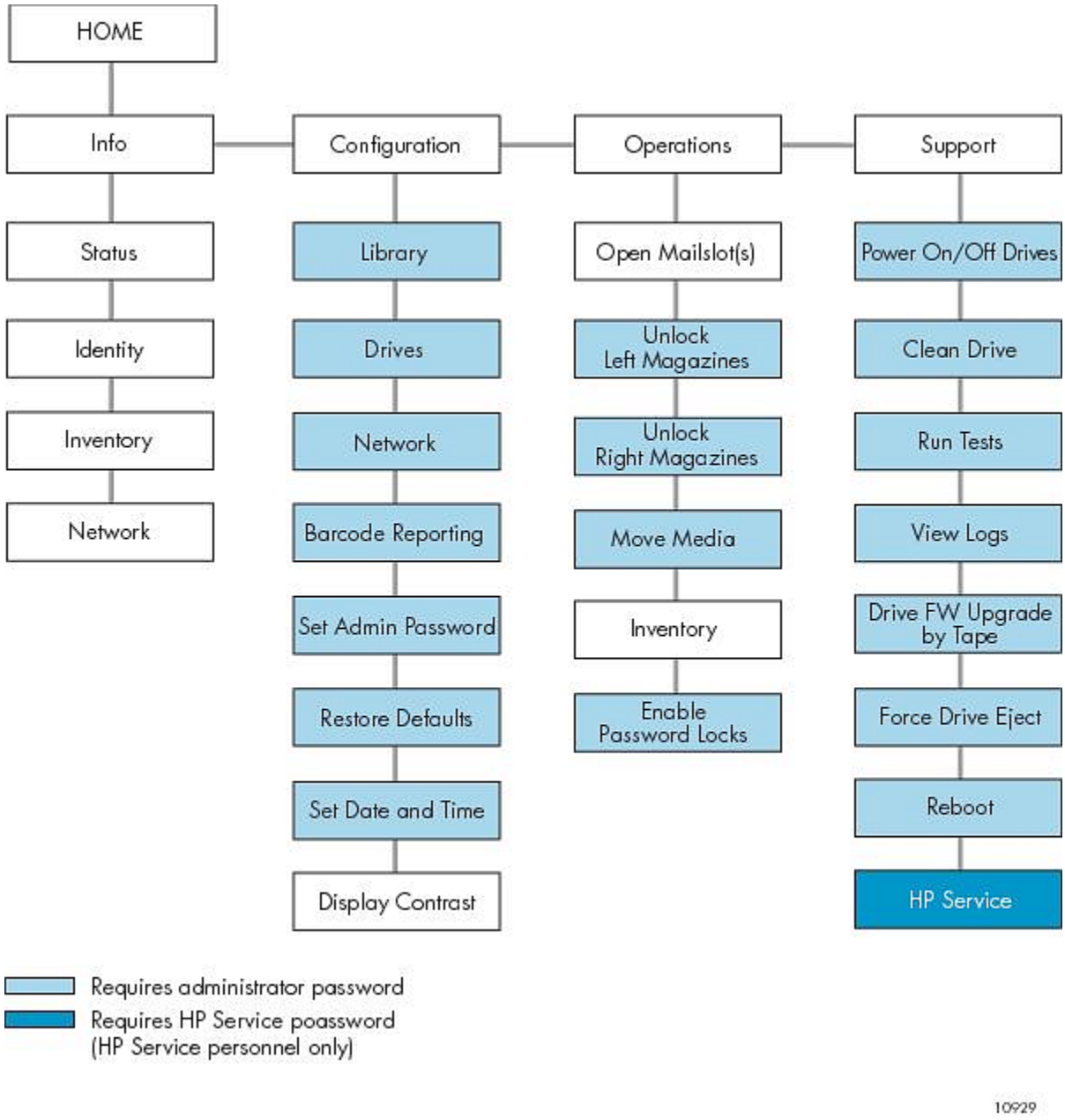


Figure 83 Operator control panel menu

Administrator password

TIP:

By default, the administrator password is unset; all of the digits are null. You must set the administrator password from the OCP to protect the administrator functions on the OCP and enable the administrator functions in the RMI.

The administrator password grants access to all OCP functions except **HP Service**. A user without knowledge of the administrator password can access:

- **Info:** Status, Identity Library, Identity Drives, Inventory, and Network
- **Configuration:** Display Contrast
- **Operations:** Open Mailslots, Inventory, and Enable Password Locks

All other **Configuration**, **Operations**, and **Support** options are locked.

After five minutes of inactivity, the OCP returns to the splash screen. To access password-protected tasks, you must reenter the administrator password.

The administrator password is originally null. HP strongly recommends that you assign a password during the installation process, see Changing the administrator password (Configuration > Set Admin Password). You will not be able to access the administrator functions of the Tape Library from the remote management interface (RMI) until the administrator password is set.

Screens that require entry of a password are indicated by a padlock icon on the menu list and prompt the user to enter the password before allowing access to the restricted screens. Once entered, the administrator password does not need to be entered a second time unless there is no user activity for five minutes or unless the password locks are re-enabled.

Passwords must be exactly eight digits consisting of the numbers 0 through 9.

To enter a password when prompted, do the following:

1. The left most digit of the password will be highlighted; each non-highlighted digit will appear as an X. Use the ▲ Up and ▼ Down buttons until the correct digit is displayed. Use the ◀ Left and ▶ Right buttons to select the other digits and use the ▲ Up and ▼ Down buttons to alter the values.
2. Press **OK** to submit the password. The screen continues to the restricted area.

NOTE:

If you forget the administrator password, you cannot enter a new password. You must call your customer service representative.

Illustrated menu option and navigation examples

The following examples illustrate how to use the menu options and navigation buttons to open mailslots and to move media. Subsequent menu options described in this chapter do not include step-by-step instructions.

Opening mailslots (Operations > Open Mailslots)

The mailslots are used only with host system software that supports this feature. The mailslot feature allows you to insert or remove up to three tapes for the MSL4048 and MSL8084, or up to 15 tapes for the MSL8096.

Left magazines are available without mailslots, with one mailslot, or with three mailslots. The MSL4048, MSL8048, and MSL8096 Tape Libraries are shipped with the 3-mailslot magazine on the lower left side. Mailslot-capable left magazines are marked with a white dot on the lower right corner that aligns with a white dot on the front bezel, as shown in Figure 84. Placing a mailslot magazine in any location other than the lower-left location will result in the magazine being treated as a magazine with no mailslots.

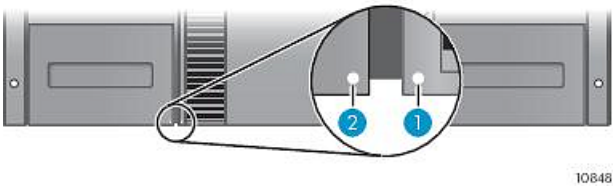


Figure 84 Mailslot-capable magazine and slot, each marked with a white dot

The Library will eject the mailslot in the lower left magazine when instructed to open mailslots. After the mailslot is closed, the Library will inventory the tapes in the mailslot, but not the rest of the tapes in the magazine, which allows the Library to resume operations sooner.

On the MSL8096, the upper-right magazine can be configured as a 12–slot mailslot. All of the right-side magazines are the same so it does not have a special marking. When instructed to open both mailslots, the Library first ejects the lower-left mailslot and then unlocks the upper-right mailslot a few seconds later. The Library does not *eject* the upper-right mailslot. The upper-right mailslot remains unlocked until 30 seconds after the lower-left mailslot is replaced. After the upper-right mailslot is replaced, the Library inventories all of the tapes in the magazine. The OCP displays a series of informative messages so you can see what the Library is doing.

NOTE:

If you exchange the magazine in the lower-left position with one that has different mailslot capabilities, the Library displays a warning that the mailslot type is incompatible with the configuration.

To access the mailslots:

1. Highlight **Operations -> Open Mailslots** and press **OK** to select it.

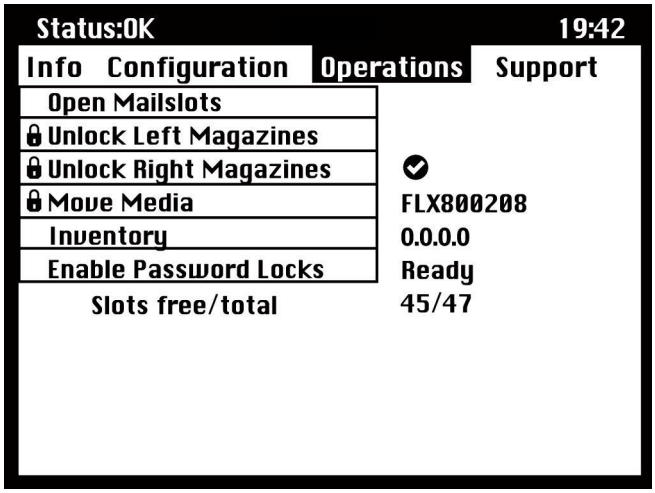


Figure 85 Operations menu

2. On the MSL8096, if both mailslots are enabled, select which mailslots to open. The menu will cycle through **Bottom Left (3)**, **Both (15)**, or **Top Right (12)**.

3. The mailslot located in the lower left magazine ejects automatically. Pull the magazine out until you can access the tape cartridge (see Figure 86).

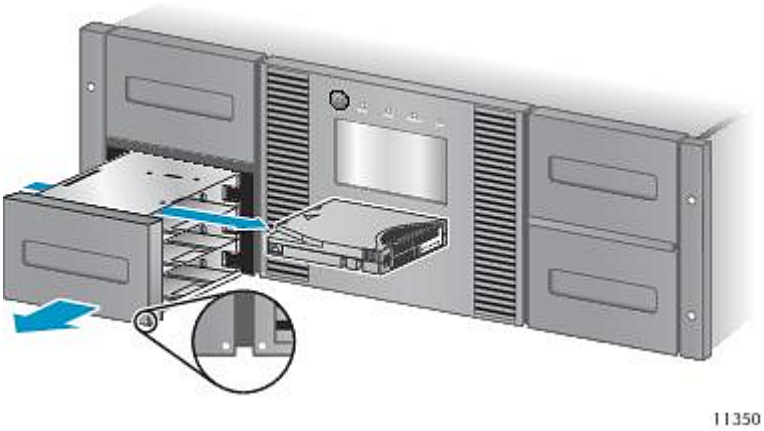


Figure 86 Removing the existing tape from the mailslot

On the MSL8096, the magazine in the upper right side will be unlocked if it is configured as a mailslot and you choose to open it. To open the upper right magazine, grasp the magazine and pull it straight out until you can access the desired slot.

NOTE:

The following message may be displayed: **Mailslot opening**. No button pushes are accepted during this time.

NOTE:

If the SCSI Prevent/Allow Media Removal bit is set, the mailslot cannot be unlocked/opened from the front panel and the following message is displayed:
Media Removal Prevented by Host Software. Press **OK** to continue and return to the open mailslot pull-down menu. Try the operation again from the backup software.

4. The following message is displayed: **Please close Mailslot(s)**. Remove the existing tape cartridges from the mailslot and insert new tape cartridges, as required.
5. Push the mailslot back into the Library.

Moving Media (Operations > Move Media)

This option instructs the Library to move a cartridge from a tape drive, a tape slot in any magazine or the mailslot in the left magazine to any other location not already holding a tape. This option also lets you load and unload tape cartridges to and from the installed tape drives. To use this command, you must first select where you want to move the tape from (in one of the Source fields), and then indicate where you want to move the tape to (in one of the Destinations fields).

Source Type: This toggles between all available sources: mailslot, magazines, and the active drives.

Source -> Source by Label: If appropriate, this toggles between available source cartridges. In the following example, the source type is a magazine, so you need to select a cartridge from the magazine. You can do this by selecting a specific slot (Source field) or specifying the target cartridge's barcode (Source by Label field). Only Full source slots are available for selection.

Destination Type: This toggles between all available destinations: Mailslot, Magazine and Drive.

Destination: If appropriate, this option allows you to specify the cartridge destination. For a magazine, select a slot. Only Empty destination slots are available for selection.

Access to the **Move Media** option requires the use of the administrator password.

To move a tape in the Library:

1. Highlight **Operations ->** Move Media and press **OK** to select it.

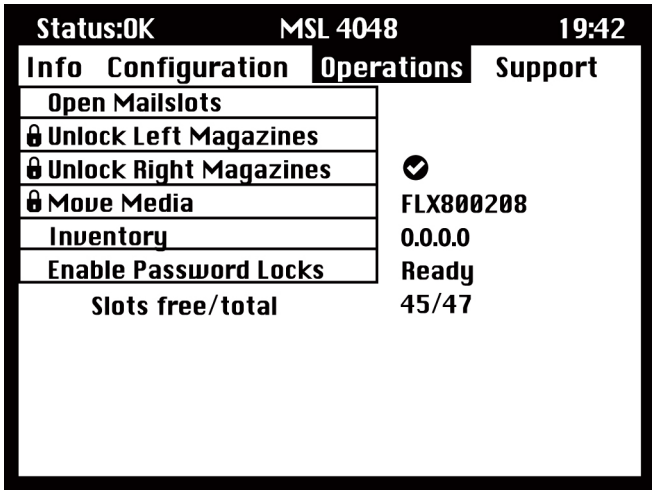


Figure 87 Operations menu

2. Enter the administrator password if prompted.
3. Use the Up and Down arrows to move to the **Source Type** field and press **OK**.
4. Use the Up and Down arrows to change the value of the highlighted field. When the highlighted field shows the desired value, press **OK** to select.
5. If appropriate, move to the **Source** field and press **OK**. Repeat step 4 to specify the source cartridge.
6. Use the Up and Down arrows to move to the **Destination Type** field and press **OK**.
7. Use the Up and Down arrows to change the value of the highlighted field. When the highlighted field shows the desired value, press **OK** to select.
8. If appropriate, move to the **Destination** field and press **OK**. Repeat step 7 to specify the cartridge destination
9. Use the Up and Down arrows to move to the **<Move>** area and press **OK** to carry out the operation (or move to the **<Cancel>** area and press **OK** to cancel the operation).

   The Library now moves the tape from the selected source to the selected destination. While the tape is being moved, the screen displays **Moving Tape**. Once the tape has been moved, the screen displays either **Move Complete**, or **Move Failed**. If the move failed, press **OK** to display the error code and message explaining the failure.

Info menu

The **Info** menu options provide the following options. None of these options is password protected.

- "Viewing status information (Info > Status)" on page 140
- "Viewing Library identity information (Info > Identity Library)" on page 140

- "Viewing drive identity information (Info > Identity Drives)" on page 141
- "Viewing inventory information (Info > Inventory)" on page 141
- "Viewing network information (Info > Network)" on page 141

Viewing status information (Info > Status)

Status information can be displayed for the system, the Library, or for a specific drive.

NOTE:

The number of drives available for selection in the Status menu depends on the number of drives that have been active in the Library. For a Library that has only two drives, the menu displays Drive 1 and Drive 2. For a Library that has four drives, the menu displays Drive 1, Drive 2, Drive 3 and Drive 4 (even though the status of some may be offline or missing).

- **Library:** displays the status of the Library without the drives. It shows the Library status, odometer, power on time, robotic status, slot and barcode of any cartridge in transport, number of free and total slots, and status of the mailslots.
- **Drives:** displays the status of the selected drive. It shows the drive status, source slot, tape barcode, error code (if appropriate), drive temperature, status of cooling fan, and drive activity.

  For Fibre Channel drives, the following additional items are displayed:
  - The link status of each port may be: No Light, Logged In, Logged Out, ALPA Conflict, or Negotiation Link. No Light or ALPA Conflict indicates an error condition. See "Fibre Channel connection problems" on page 158.
  - The speed for each port: 1 Gb/s, 2 Gb/s, 4 Gb/s, or 8 Gb/s. Only speeds supported by each port are displayed.

NOTE:

Use the Left or Right buttons to toggle through the status information for all drives without returning to the **Info -> Status** sub-menu.

Viewing identity information (Info > Identity Library)

Displays

- Library serial number
- Library product ID
- Controller and bootcode firmware revisions
- Library mode
- Number of reserved slots
- Status of the mailslot
- Library LUN Host Drive

A Fibre Channel Library also displays the WW Node Name for the FC node to which it is connected.

World Wide names are assigned automatically; they cannot be configured.

Viewing identity information (Info > Identity Drives)

Displays the status of the selected drive. It shows the SCSI ID, physical drive number, serial number, firmware revision, element address, the ID string, and whether the drive is the Library LUN host drive.

The following additional information is displayed for a Fibre Channel drive:

- WWide Node Name for the FC node to which the tape drive is connected.
- WWide Port Name and Port Type for Port A.
- WWide Port Name and Port Type for Port B.

NOTE:

Use the Left or Right buttons to toggle through the identity information for all drives without returning to the **Info -> Identity** menu.

World Wide names are assigned automatically; they cannot be configured.

Viewing inventory information (Info > Inventory)

Inventory information can be displayed for a magazine or for a drive.

- **Magazine:** The first inventory screen displays the contents of magazine number 1 (lower left). The top section of this screen shows which mailslots are occupied (shaded background) or empty (white background). If the mailslot is enabled, the storage slot count is reduced. The lower section gives more information about each slot. Mailslots are identified in the Slot column as MS1, MS2 or MS3. The label shows any barcode details. Slots containing tapes without barcodes are labeled Full. Info shows whether the tape is write-protected (WP) or if that media needs attention (!) Use the Left or Right buttons to scroll through and view the inventory for all magazines.
- **Drive:** This screen displays the contents of each drive. The Label column identifies which tape is in the drive and the Source column identifies the slot from which it came. Other information defines the type of tape (data or cleaning) and whether tapes are write-protected or valid/invalid.

Viewing network information (Info > Network)

This option provides information about the network setting for the Library. This screen will show information about the network connectivity of the Library. If DHCP is ON, the values currently being found by DHCP for IP Addr, Netmask and Gateway will be displayed.

Configuration menu

The Configuration menu provides the following options:

- "Logical Libraries (Configuration > Set Logical Libraries)" on page 142
- "Changing the library configuration (Configuration > Library)" on page 142
- "Changing the drive configuration (Configuration > Drives)" on page 144
- "Changing the network configuration (Configuration > Network Configuration)" on page 144
- "Barcode reporting format (Configuration > Barcode Reporting)" on page 144
- "Changing the administrator password (Configuration > Set Admin Password)" on page 144
- "Restore defaults (Configuration > Restore Defaults)" on page 145
- "Setting the Library date and time (Configuration > Set Date and Time)" on page 146

- Display Contrast
- “Saving and restoring the Library configuration (Configuration > Save/Restore)” on page 146

Changing the number of logical libraries (Configuration > Logical Libraries)

This option allows you to specify the number of logical libraries for the physical Tape Library. For more information about logical libraries, see “Logical libraries” on page 28.

Access to this feature requires the administrator password.

Changing the Library configuration (Configuration > Library)

This option allows you to specify the drive that is assigned as master drive and the Library mode, and define how many slots are active and whether the mailslots are enabled.

Access to this feature requires the administrator password.

- **Library Master Drive:** This option designates which drive acts as the master and hosts the Library LUN.

NOTE:

The Library's SCSI ID will be the master drive's SCSI ID with a LUN of 1.

- **Library Mode:** The Library supports three behavior modes: Random, Sequential, and Automatic. The Library automatically detects the required mode from the series of SCSI commands it receives; however, you can also change the mode. Choose the operating mode based on the capabilities of the software controlling the tape cartridges. The Library mode can be set independently for each logical library.
- **Reserved Slots:** This option sets the number of reserved slots in the Library. Reserved slots are slots that can be accessed by the remote management interface (RMI) and the operator control panel (OCP), but are invisible to the host and backup software. On the MSL4048 and MSL8048, you can reserve up to 46 slots. On the MSL8096, you can reserve up to 94 slots.
- **Mailslots enabled:** This option enables or disables mailslots. On the MSL4048 and MSL8048, all three mailslots are enabled or disabled based on this setting. On the MSL8096, you can choose to enable the lower-left mailslot (three slots), the upper-right mailslot (12 slots), both mailslots (15 slots), or disable the mailslots.
- **Auto Cleaning**: This option enables or disables automatic cleaning.

Library modes

The Library supports three behavior modes: Random, Sequential, and Automatic.

Random mode: In Random mode, the device does not automatically load tapes into the tape drives; it waits for commands from the software or operator to load and unload tapes. Random mode is used with a full featured or a robotics-aware backup application and is the most common mode of operation. Your backup software must support robotics, which may require an additional software module.

Sequential mode: In Sequential mode, the device automatically loads and unloads tapes from the drive. Sequential mode is used when the backup software is NOT robotics-aware or was designed for standalone drives only.

In Sequential mode, the Library will only use the lowest-numbered tape drive.

The operator begins the sequence by loading the desired tape into the tape drive. When a tape is unloaded for any reason, the device automatically removes the tape from the drive, returns it to its original slot, then loads the tape from the next available higher numbered slot.

To further determine how you want tapes loaded into the tape drive while in Sequential mode, you can set the **Loop** and **Autoload** options.

- When **Autoload** mode is set, the device automatically loads the cartridge from the lowest-numbered full slot into the tape drive. It then follows standard sequential operation. After configuring Autoload mode, you must do one of the following for Autoload mode to take effect:
  - Power cycle the device from the front panel.
  - Reboot the device from the RMI Support: Reboot screen.
  - Move the lowest-numbered cartridge to the drive before starting the backup application. If the mailslot is enabled, the lowest cartridge location will be in the mailslot.
- When **Loop** mode is on, the original first cartridge in the sequence is reloaded after the device has cycled through all available cartridges. If Loop mode is off and the last cartridge has been unloaded, the device stops loading cartridges until you load another manually.

△ CAUTION:

Use caution when choosing Loop mode because it makes it possible to overwrite data on previously written cartridges.

When a Library is partitioned into logical libraries, each logical library operates as an independent library. Thus, the Library only loads tapes from the slots associated with one logical library into the tape drive associated with that logical library; it will not load tapes from slots associated with another logical library. Only the lowest-numbered tape drive in a multi-drive logical library will be used.

Automatic mode: In Automatic mode, the device switches from Sequential mode into Random mode when it receives certain SCSI commands. Automatic mode is the default setting.

Automatic cleaning

When auto clean is enabled, the Tape Library automatically loads a cleaning cartridge when a tape drive needs to be cleaned. The Library identifies a tape cartridge as a cleaning cartridge if it has a barcode label that starts with CLN or after an unlabeled cleaning tape has been loaded into the tape drive.

The Library can use a cleaning cartridge from any slot, even if the slot is reserved. The Library keeps track of the usage count for each of the cleaning cartridges. When multiple cleaning cartridges are available, the Library will first choose an unknown cleaning cartridge so the Library can start tracking the cartridge's usage count. If the Library knows the usage count for all of the cleaning cartridges, the Library will choose the one with the highest usage count.

Auto cleaning is disabled by default. You can enable automatic cleaning even if there are no cleaning cartridges in the device. In this case, the device will display a warning message.

△ CAUTION:

Only enable automatic cleaning in either the backup application or the Library, not both.

Changing the drive configuration (Configuration > Drives)

Parallel SCSI drives: This option allows you to configure the SCSI ID of the drive.

△ CAUTION:

If you change the SCSI ID, you must also cycle power on the host server and reconfigure the backup software before using the Library.

Fibre Channel drives: This option allows you to configure the Fibre Speed, Type, ALPA, and Loop mode for the drive's Fibre Channel ports. See "Changing the drive configuration" on page 87 for more information about configuring the Fibre Channel ports.

Access to this feature requires the administrator password.

To change the drive configuration:

1. Highlight the setting you want to change. Press **OK** to select the value field.
2. Press the ▲ Up or ▼ Down buttons until the correct value is displayed. Press **OK** to accept the value.
3. Press the ▲ Up or ▼ Down buttons to navigate to **<Save>**. Press **OK** to save.

Changing the network configuration (Configuration > Network)

The Library can automatically obtain an IP address from a DHCP server when the Library is powered up. The Library also supports user-specified fixed addresses through the front panel. This option allows the operator to set the network settings or allow the Library to autoconfigure using the DHCP server settings.

Access to this feature requires the administrator password.

Barcode reporting format (Configuration > Barcode Reporting)

This option sets the format for displaying the tape bar codes for both the operator control panel and the host. With this option, you can configure the number of characters to display and the justification of those numbers to the left or right. Access to this feature requires the administrator password.

Setting and changing the administrator password (Configuration> Set Admin Password)

This option allows you to change the administrator password. Access to this feature requires the administrator password or the Service password. Passwords consist of exactly eight characters each between the value of 0 and 9.

Restricted areas (indicated by a padlock icon) prompt for this administrator password before granting access. Once entered, the administrator password does not have to be entered a second time unless there is no user activity for five minutes. To access this screen, enter the administrator password first, if you have not already done so.

NOTE:

If you forget the administrator password, you cannot enter a new password. You must call your customer service representative.

Restore defaults (Configuration > Restore Defaults)

This option returns the Library to its original shipping configuration, leaving the settings necessary for the RMI. Access to this feature requires the administrator password.

The following settings are reset:

- SCSI addresses:
  - MSL4048: For full-height tape drives the default SCSI address is 4. For half-height drives, the default SCSI address for the bottom drive in each full-height drive bay is 4 and the default SCSI address for the top drive is 5 as shown in Figure 88.

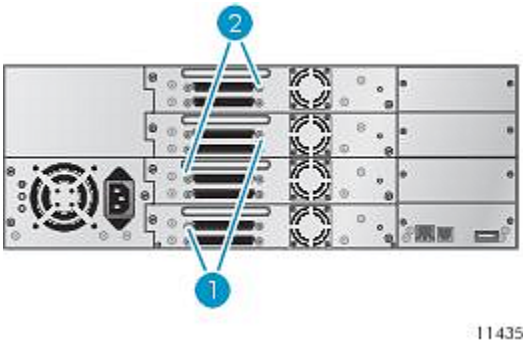


Figure 88 MSL4048 parallel SCSI tape drive default SCSI addresses

1. Tape drives with SCSI address 4
2. Tape drives with SCSI address 5

  - MSL8048 and MSL8096: The default SCSI address for all tape drives is 4.

  The Library will no longer recall drives that have been removed.
- Master drive: reset to Drive 1 or the lowest numbered existing drive
- Drive power: all drives powered on
- Active slots: maximum possible
- Library mode: Automatic
- Loop: No
- Event log levels and filter: continuous trace and all levels and filters active (for HP Service use only)
- Barcode reader label length: 8
- Barcode reader alignment: Left
- Error recovery: On
- Mailslot configuration: mailslot disabled
- Auto clean: disabled
- SNMP: disabled, but saved addresses do not change
- E-mail notification: disabled, but configurations retained

The following settings are not reset:

- Administrator password
- Network settings (network is always enabled and the network addresses are retained)
- Date and time

IMPORTANT:

When the defaults are restored, the Library will rediscover and renumber the tape drives from the bottom of the Library up. If a tape drive was added between two other tape drives since the last time the drives were discovered, that tape drive and the ones above it will be renumbered. You might need to update the configuration of the backup application when tape drives are renumbered.

Setting the Library date and time (Configuration > Set Date and Time)

This option sets the date and time used by the Library to record events. Access to this feature requires the administrator password.

NOTE:

Time is based on a 24-hour clock. There is no a.m. or p.m. designation. For example: 1:00 p.m. is 13:00.

Saving and restoring the Library configuration (Configuration> Save/Restore)

This option saves the Library configuration to a USB flash drive and restores the configuration from the USB flash drive.

The configuration settings that are saved are:

- Administrator password
- Mailslot configuration
- All network settings, including DHCP, DNS, IPv4 and IPv6 addresses
- Barcode reader label length and barcode reader alignment
- Reserved slots
- Display contrast setting
- Library mode
- All drive configuration settings
- Auto clean
- SNMP addresses and configurations
- Log tracing configuration
- Email notification configuration (SMTP address, email address, filter level)
- Option to allow the magazine access without the administrator password
- Option to ignore the barcode media ID
- Logical library configuration
- Encryption and security settings

Operations menu

The Operations menu contains the following Library operation options:

- "Opening the mailslot (Operations > Open Mailslot)" on page 147
- "Unlocking, removing and replacing magazines (Operations > Unlock Left/Right Magazines)" on page 147

- "Moving Media (Operations > Move Media)" on page 148
- "Performing Inventory (Operations > Inventory)" on page 148
- "Enabling Password Locks (Operations > Enable Password Locks)" on page 148

Opening the mailslot (Operations > Open Mailslot)

The mailslots are used only with host system software that supports this feature. The mailslot feature allows you to insert or remove up to three tapes for the MSL4048 and MSL8048, or up to 15 tapes for the MSL8096.

Left magazines are available without mailslots, with one mailslot, or with three mailslots. The MSL4048, MSL8048, and MSL8096 Tape Libraries are shipped with the three-mailslot magazine on the lower left side. Mailslot-capable left magazines are marked with a white dot on the lower right corner that aligns with a white dot on the front bezel, as shown in Figure 89. Placing a mailslot magazine in any location other than the lower-left location will result in the magazine being treated as a magazine with no mailslots.

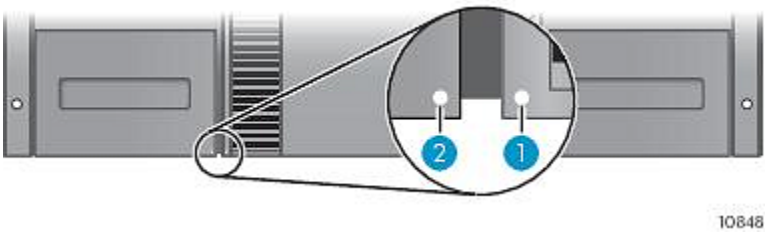


Figure 89 Mailslot-capable magazine and slot, each marked with a white dot

The Library will push the mailslot open when instructed to open mailslots. After the mailslot is closed, the Library will inventory the tapes in the mailslot, but not the rest of the tapes in the magazine, which allows the Library to resume operations sooner.

On the MSL8096, the whole magazine on the upper right of the Library can also be used for mailslots. All of the right magazines are the same so it does not have a special marking. The Library will unlock the upper right magazine when instructed to open mailslots, but will not push the magazine out. After the magazine is replaced, the Library will inventory all of the tapes in the magazine.

NOTE:

If you exchange the magazine in the lower-left position with one that has different mailslot capabilities, the Library displays a warning that the mailslot type is incompatible with the configuration.

Unlocking, removing and replacing magazines (Operations > Unlock Left/Right Magazines

This option grants access to the left and right magazines. After exchanging tapes in a magazine, slide the magazine completely into the Library. The magazine locks into place. Access to the magazines requires the use of the administrator password.

On the MSL4048, once all left or right magazines are correctly installed, the Library inventories the magazines. The Ready LED blinks during the inventory operation.

On the MSL8048 and MSL8096, the Library leaves all magazines on a side unlocked for several seconds. During that time, you can pull out as many magazines on the side as you want. A magazine is locked when it is pushed back into the Library. The Library will wait about 30 seconds after the last magazine is installed before starting the inventory. Before the inventory starts, you can unlock the magazines on either side.

NOTE:

Due to the Library design, all left or all right magazines will be unlocked. The Library will halt robotic functions until all magazines are present. It is not possible to unlock all of the magazines at once from the front panel.

Moving Media (Operations > Move Media)

This option instructs the Library to move a cartridge from a tape drive, a tape slot in any magazine or a mailslot to any other location not already holding a tape. This option also lets you load and unload tape cartridges to and from the installed tape drives. To use this command, you must first select where you want to move the tape from (in one of the Source fields), and then indicate where you want to move the tape to (in one of the Destinations fields).

Source Type: This toggles between all available mailslot, magazines. and drives.

Source -> Source by Label: If appropriate, this toggles between available source cartridges. Only Full source slots are available for selection.

Destination Type: This toggles between all available destinations: Mailslot, Magazine, and Drive.

Destination: If appropriate, this option allows you to specify the cartridge destination. For a magazine, select a slot. Only Empty destination slots are available for selection.

Access to the **Move Media** option requires the use of the administrator password.

Performing Inventory (Operations > Inventory)

This option updates the inventory status of the Library. The Library checks each slot and drive for bar codes and determines if tapes are present or not.

NOTE:

This command is needed only if the inventory in the Library is different than the inventory displayed on the front panel, which would not happen under normal conditions.

Enabling Password Locks (Operations > Enable Password Locks)

This option locks the restricted areas. This is typically used if the operator does not want to wait for the time out to reset the locks. Power cycling or Library Reset also resets the locks.

Support menu

The following **Support** menu options are available:

- "Powering drives on and off (Support > Power on/off Drives)" on page 149
- "Cleaning the tape drive (Support > Clean Drive)" on page 149
- "Running tests (Support > Run Tests)" on page 149
- "Viewing logs (Support > View Logs)" on page 150
- "Updating library and drive firmware (Support > FW Upgrade)" on page 150
- "Force ejecting a drive (Support > Force Drive Eject)" on page 151

- "Downloading a support ticket (Support > Support Ticket)" on page 151
- "Rebooting the tape library (Support > Reboot) " on page 151

Powering drives on and off (Support > Power on/off Drives)

This option allows the powering up or down of a drive without interrupting power to the rest of the Library and the other drives. This is typically used when replacing one drive. Access to this feature requires the administrator password.

Cleaning the tape drive (Support > Clean Drive)

This option allows you to clean the drives. Access to this feature requires the administrator password.

When the **Clean** drive LED is on, the tape drive needs to be cleaned. Cleaning times can range from a few seconds to a few minutes during which time the **Ready** LED blinks. Use only the designated cleaning cartridge for your tape drive model. All cartridges are available at http://www.hp.com/go/storagemedia.

Use only Ultrium Universal cleaning cartridges in the Library.

IMPORTANT:

If the cleaning cartridge is not a valid cleaning cartridge, the LCD screen displays **Invalid Tape** and the cartridge is exported.

IMPORTANT:

If the **Clean** drive LED, or the Media **Attention** LED (on load or unload) occurs when inserting the same cartridge after you have cleaned the drive, there may be a problem with that cartridge.

When using the operator control panel to clean the tape drive, import the cleaning cartridge into the mailslot or any other empty slot before beginning the cleaning steps. If you would like to keep a cleaning cartridge in the Library, the backup software must manage tape drive cleaning or be configured to bypass the slot containing the cleaning cartridge.

The **Clean** drive option lets you load a cleaning tape into any active drive. To use this command, you must first select the drive to be cleaned and then select where you want to load the cleaning tape from.

- **Source Type**: This toggles between all available sources: Mailslot, Magazine.
- **Source/Source by Label**: If appropriate, this toggles between available source cartridges. Barcode labels beginning with CLN are automatically displayed at the top of the list.

After cleaning, the Library returns the cleaning cartridge to the original slot. If you loaded the cartridge from the front panel, you should now unload it from that slot either by using the mailslot, or by removing the magazine. When the tape drive cleaning is complete, the **Clean** LED turns off (if previously on).

Running tests (Support > Run Tests)

This option allows you to run a demo, a wellness test or a slot to slot test and to specify the number of test cycles required. You can abort the test at any time, if required. Access to this feature requires the administrator password. For more information about the wellness test, see "The wellness test" on page 177.

NOTE:

Abort is available only on the operator control panel. You cannot abort a test that has been started from the RMI.

Viewing logs (Support > View Logs)

This option allows you to view the following logs: Error, Warning, Informational, Configuration, and All Events possible. Access to this feature requires the administrator password.

Updating Library and drive firmware (Support > FW Upgrade)

The Tape Library allows two types of firmware to be upgraded — one for the tape drives and the other for the Tape Library itself. You can upgrade both types of firmware from a USB flash drive, the RMI, or L&TT. You can also upgrade drive firmware from a firmware upgrade tape.

Using a USB flash drive to upgrade firmware (Support > FW Upgrade> By USB)

This option allows you to upgrade Tape Library or tape drive firmware using a USB flash drive in the Tape Library's USB port on the back panel. No operations will be available until the upgrade completes. Access to this feature requires the administrator password.

To update firmware using a USB flash drive:

1. Download current firmware using HP Library & Tape Tools or from the HP support website: http://www.hp.com/support/storage. Copy the firmware onto the USB flash drive.
2. Insert the USB flash drive into the USB port on the back of the device.
3. From the **Support** menu, select **FW Upgrade > By USB**.
4. Select the target for the upgrade, which will be one of the tape drives or the Library, and select the filename of the firmware.
5. Click **Upgrade**.
6. When the upgrade is complete, remove the USB flash drive from the USB port.

Using HP Library & Tape Tools to update Library and drive firmware

You can download Library and drive firmware using the HP Library & Tape Tools diagnostic utility. This utility may already be installed on your server. If not, download it from http://www.hp.com/support/tapetools.

Online help and instructions are included with HP Library & Tape Tools. The firmware download procedure involves these simple steps:

1. Run the HP Library & Tape Tools utility.
2. If prompted to download new firmware from the website, select **Yes**; otherwise, select **Get Firmware from Web** under the **File** menu.
3. Select the desired firmware revisions for the Library that you would like to download firmware to, and then click **Download**. The firmware file is copied into the HP Library & Tape Tools firmware folder.
4. Close the firmware window.

5. Select the Library in the **By Product** device list tab, and then select the **Firmware** button. The latest revision available for the Library is automatically selected.
6. Click **Start Update** to update the firmware for the Library.

Using a firmware upgrade tape to update drive firmware (Support> FW Upgrade > By Tape)

This option allows the updating of drive code using a firmware upgrade tape. No operations will be available until the update completes. Access to this feature requires the administrator password. To use this command, select the drive or drives to be upgraded, and then select where you want to load the firmware upgrade tape from.

- **Source Type**: This toggles between all available sources: magazines and drives.
- **Source**: This toggles between available source cartridges. You can select a specific slot (Source field) or specify the firmware upgrade tape's barcode (Source by Label field). Unlabeled tapes need to be accessed by their slot number.

NOTE:

To use the **All Drives** function all the drives must be of the same type. If they are not, you are warned: "Not all drives the same. Upgrade drives individually". Press **OK** to return to the option list with All Drives highlighted.

Force ejecting a drive (Support > Force Drive Eject)

This option attempts to force the tape drive to eject the tape and place it into an open slot in the Library. Access to this feature requires the administrator password.

Before issuing this command, HP recommends that you attempt to eject the tape using the backup software and move command on the operator control panel. While a drive is being force ejected, a window indicating the process is ongoing should appear. No operations will be available until force eject completes.

NOTE:

If the drive has difficulty ejecting the tape, suspect bad or damaged media.

Downloading a support ticket (Support > Support Ticket)

A support ticket provides information that can help you or a service engineer diagnose problems with the Tape Library. You can view the support ticket with Library & Tape Tools version 4.2 and later. Downloading the support ticket to a USB flash drive lets you view the ticket on a computer that is not connected to the Tape Library. Access to this feature requires the administrator password.

Rebooting the Tape Library (Support > Reboot)

This option reboots the Tape Library and the tape drives within the Library and forces a new cartridge inventory, clearing any current error condition. It updates drive lists in sub-menus. Access to this feature requires the administrator password.

△ CAUTION:

This option interrupts the current backup or restore operation and causes the operation to fail. It is primarily used if the Library is in an error state.

5 Troubleshooting

△ CAUTION:

This Library is designed to operate when installed in a rack using the included rack rails. The MSL2024 and MSL4048 can also be set on a flat surface when mounted in the optional Rack-to-Tabletop Conversion Kit. Operating the Library without one of these kits, such as on a flat surface without the Rack-to-Tabletop Conversion Kit, could result in device errors. Placing any weight on top of the device might also cause errors.

△ CAUTION:

Shipping Lock: The shipping lock must be removed for the robotics to work properly on the MSL2024 and MSL4048. The device displays a robot move error if the shipping lock is not removed (see "Removing the shipping lock" on page 45).

TIP:

For an online troubleshooting tool, go to http://www.hp.com/support/MSLG3Tstree. The problems and solutions in the troubleshooting tree are updated more frequently than this manual.

Detection problems after installing a parallel SCSI device

The MSL4048 Library will not operate with a full-height tape drive installed in the middle two half-height drive bays. Verify that the full-height tape drive is installed in a supported position. A full-height drive may only be installed in either the upper or lower two half-height drive bays.

Problems encountered after installation are often caused by improper parallel SCSI bus configuration, application software configuration errors, or an incorrectly configured operating system. If the application software or operating system does not communicate with the device after installation, determine the extent of the detection problem:

- Does the application software detect the tape drive?
- Does the application software detect the Library?
- Does the operating system detect the tape drive?
- Does the operating system detect the Library?
- Does the operating system detect the Library, but list it as a generic device?

Based on the extent of the detection problem, check the following:

- If neither the application software nor operating system detects the tape drive, or they do not detect both the tape drive and the Library:

- Check the SCSI ID and change it if necessary. The default SCSI ID for each tape drive will be 4 or 5 depending on the Library model and drive slot:
  - MSL2024: For full-height tape drives the default SCSI address is 4. For half-height drives, the default SCSI address for the bottom drive is 4 and the default SCSI address for the top drive is 5 as shown in Figure 90.

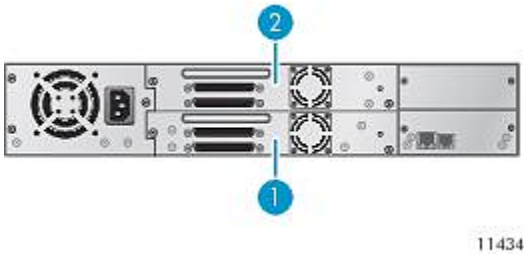


Figure 90 MSL2024 parallel SCSI tape drive default SCSI addresses

1. Tape drives with SCSI address 4
2. Tape drives with SCSI address 5

  - MSL4048: For full-height tape drives the default SCSI address is 4. For half-height drives, the default SCSI address for the bottom drive in each full-height drive bay is 4 and the default SCSI address for the top drive is 5 as shown in Figure 91.

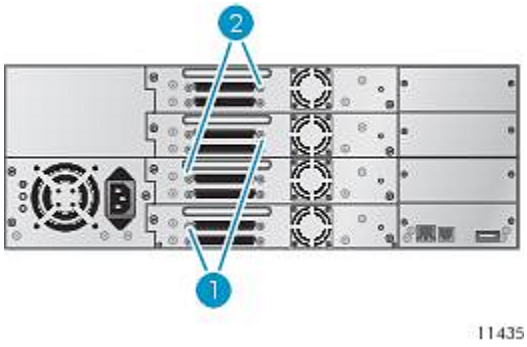


Figure 91 MSL4048 parallel SCSI tape drive default SCSI addresses

1. Tape drives with SCSI address 4
2. Tape drives with SCSI address 5

  - MSL8048 and MSL8096: The default SCSI address for all tape drives is 4 as shown in Figure 92.

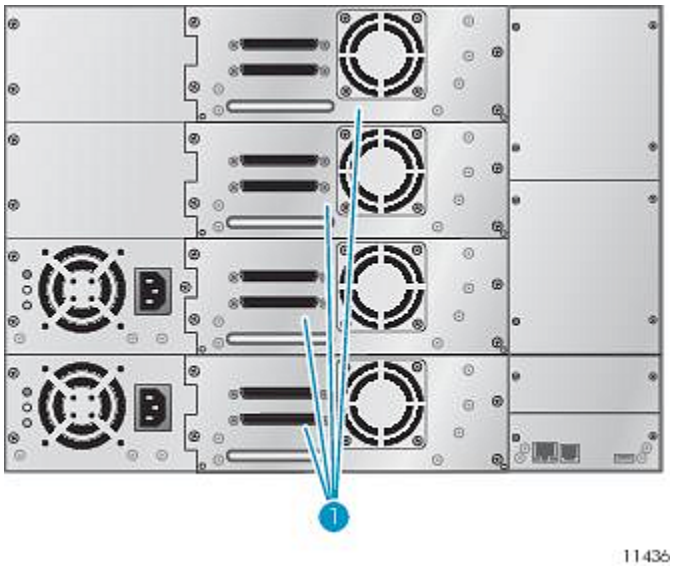


Figure 92 MSL8048 and MSL8096 parallel SCSI tape drive default SCSI addresses

1. Tape drives with SCSI address 4

Depending on other devices attached to the same parallel SCSI bus and their SCSI IDs, you may need to change the SCSI ID before using the device. Review the manuals for the other devices on the parallel SCSI bus or your operating system to determine which SCSI IDs are currently in use. Change the SCSI ID with the OCP (for the MSL2024 see "Changing the SCSI address — parallel SCSI devices (Configuration > Change Drive)" on page 115, for the MSL4048, MSL8048, and MSL8096 see "Changing the drive configuration (Configuration > Drives)" on page 144) or RMI (see "Changing the drive configuration" on page 87).

- Verify that all parallel SCSI cables are securely connected on both ends. Check the length and integrity of your parallel SCSI cabling. Check the parallel SCSI connector for bent pins. The length of the internal parallel SCSI cabling inside the device is 0.5 m (1.6 ft). This length must be included in any calculations of cable length.
  - For LVD SCSI, the maximum length with only a single device on the parallel SCSI bus is 25 m (82 ft).
  - For Ultra 320 or multiple devices on an LVD bus, the maximum combined internal/external length is 12 m (40 ft).
  - If you have a combination of LVD and SE devices on the bus, the maximum cable length reverts to the SE specification, which for Ultra devices is 3 m (10 ft) for four or fewer devices, and 1.5 m (5 ft) for more than four devices.

- If the application software or operating system detects the tape drive, but not the Library:
  - Verify that multiple LUN support is enabled on the HBA. The device uses two Logical Unit Numbers (LUNs) to control the tape drive (LUN 0) and robotic (LUN 1). The device requires an HBA with multiple LUN support and multiple LUN support must be enabled on the host computer. When multiple LUN support is not enabled, the host computer can see the tape drive, but not the Library.

NOTE:

Many RAID or array controllers do not provide multiple LUN support.

- If the application software or operating system does not detect any devices on the HBA:
  - Verify that your parallel SCSI host adapter is installed correctly. Refer to the manual that came with your parallel SCSI host adapter for installation and troubleshooting instructions. Pay particular attention to any steps describing configuration settings. Make sure that the host adapter is properly seated in the motherboard slot and the operating system correctly detects the host adapter. Make sure that the proper device driver is installed for the parallel SCSI host adapter.
- If the Library is detected by the operating system, but not by the application software:
  - Refer to the documentation included with your backup application for instructions on how to verify proper installation. Some backup software packages require an additional module to communicate with the robotics.
- If the Library is detected by the operating system, but is listed as an unknown or generic device:
  - Make sure that the proper device driver, if applicable, is installed for the device. Check your software provider's website for the latest drivers and patches.

NOTE:

Many backup applications use their own drivers. Before installing a driver, make sure it is not in conflict with the application software.

If you continue to have problems with a parallel SCSI Library, check the following:

- Ensure that the device is compatible with the parallel SCSI host adapter and backup application you plan to use. For a list of compatible parallel SCSI host bus adapters and application software, check with your parallel SCSI host adapter manufacturer, backup application vendor, or the HP support website at http://www.hp.com/go/ebs.

NOTE:

The host bus adapter should be SCSI-3 LVDS. A single-ended parallel SCSI host bus adapter severely degrades performance. Also, if any SE devices are on the same parallel SCSI bus, all of the devices on the bus slow down to SE speed, which severely degrades performance.

The Library is NOT compatible with a standard differential (Diff) or high-voltage differential (HVD) SCSI bus.

- Verify that your HBA is supported by the host computer and qualified with the Library. Refer to the EBS matrix at http://www.hp.com/go/ebs for current HBA compatibility information.
- If one of the ports on the device is not connected to another parallel SCSI device, the port must be terminated. Only the devices physically located at the beginning and end of the parallel SCSI bus should be terminated. Refer to the manuals supplied with the other devices on the parallel SCSI bus for information on enabling or disabling termination on those devices.
  - To terminate the second parallel SCSI port on the device, locate the terminator in the accessories package and press it firmly into either of the two parallel SCSI connectors on the back panel. Secure the terminator by tightening the finger-screws until snug. The supplied terminator is “dual mode” and works on both Low-Voltage Differential (LVD) and Single Ended (SE) SCSI buses. Check all parallel SCSI and power connections and confirm that the unit is attached to a valid SCSI SE or LVDS bus.

Detection problems after installing a SAS device

Problems encountered after installation are often caused by improper SAS cable connections, application software configuration errors, or an incorrectly configured operating system. If the application software or operating system does not communicate with the device after installation, determine the extent of the detection problem:

- Does the application software detect the tape drive?
- Does the application software detect the Library?
- Does the operating system detect the tape drive?
- Does the operating system detect the Library?
- Does the operating system detect the Library, but list it as a generic device?

Based on the extent of the detection problem, check the following:

- If neither the application software nor operating system detects the tape drive, or they do not detect both the tape drive and the Library:
  - Verify that all SAS cables are securely connected on both ends. If the mini-SAS connectors that connect to the tape drive and some HBAs will not plug in, check the key. The mini-SAS connector on the tape drive is keyed at location four, which is the standard location for end devices. If the connector on the cable is keyed in a different location, not only will the connector not plug in, but the cable probably will not work.
  - Check the length and integrity of your SAS cabling. For reliable operation, do not use a SAS cable longer than six meters. Do not use a cable adapter or converters between the HBA and the Library.
  - Check the SAS connectors for damage or debris.
  - Verify that your HBA is supported by the host computer and qualified with the Library. Refer to the EBS matrix at http://www.hp.com/go/ebs for current HBA compatibility information.
  - Verify that your HBA has the latest firmware.
- If the application software or operating system detects the tape drive, but not the Library:
  - Verify that multiple LUN support is enabled on the HBA. The device uses two Logical Unit Numbers (LUNs) to control the tape drive (LUN 0) and robotic (LUN 1). The device requires an HBA with multiple LUN support and multiple LUN support must be enabled on the host computer. When multiple LUN support is not enabled, the host computer can see the tape drive, but not the Library.

  NOTE:

  Many RAID or array controllers do not provide multiple LUN support.

- If the application software or operating system does not detect any devices on the HBA:
  - Verify that the SAS host adapter is installed correctly. Refer to the manual that came with your host adapter for installation and troubleshooting instructions. Pay particular attention to any steps describing configuration settings. Make sure that the host adapter is properly seated in the motherboard slot and the operating system correctly detects the host adapter.
  - Verify that the proper device driver is installed for the SAS host adapter.
- If the Library is detected by the operating system, but not by the application software:

- Refer to the documentation included with your backup application for instructions on how to verify proper installation. Some backup software packages require an additional module to communicate with the robotics.

- If the Library is detected by the operating system, but is listed as an unknown or generic device:
  - Make sure that the proper device driver, if applicable, is installed for the device. Check your software provider's website for the latest drivers and patches.

NOTE:

Many backup applications use their own drivers. Before installing a driver, make sure it is not in conflict with the application software.

If you continue to have problems with a SAS Library, check the following:

- Ensure that the device is compatible with the SAS host adapter and backup application you plan to use.
- Verify that your HBA is supported by the host computer and qualified with the Library.
- Ensure you are using a compatible, high-quality cable. See the product QuickSpecs for a list of supported cables.

Fibre Channel connection problems

The MSL4048 Library will not operate with a full-height tape drive installed in the middle two half-height drive bays. Verify that the full-height tape drive is installed in a supported position. A full-height drive may only be installed in either the upper or lower two half-height drive bays.

Use the Status screen to check the link connection for your tape drive.

If the screen shows Logged Out:

- Check that the Fibre speed is set to Automatic (on the RMI) or Auto Detect (on the OCP), or that the correct fibre speed is selected. If you are unsure of the speed of the HBA or switch that the Library is connected to, try Automatic (on the RMI) or Auto Detect (on the OCP).
- Check that the correct port type, fabric or loop, is selected. Loop requires additional configuration. If you are unsure of the correct port type, try Automatic (on the RMI) or Auto Detect (on the OCP).

If the screen shows No Link, the Speed Status is – and the Link LED on the back of the drive is off:

- The speed is probably set incorrectly. Try setting the speed to Automatic (on the RMI interface) or Auto Detect (on the OCP).
- If there are still issues, change the port type to Auto Detect.

If the screen shows No Light:

- The cable is not plugged in correctly. Check that it is connected correctly to Port A of the tape drive.
- The cable is damaged. FC cables are delicate. If the cable has been bent or twisted sharply, it may be broken and must be replaced.

If the screen shows ALPA Conflict:

- There might be a conflict with the ALPA address on Loop ports. Select Soft for the Loop mode to allow the system to select an available address each time the tape drive connects to the FC fabric. If your server configuration does not support changing addresses, try using the Hard Auto-Select option for the Loop mode. This allows the system to select an available address when it first connects, and then retain that address for future connections.

Operation problems

Table 29 Power problems

Problem	Solution
Device does not power on.	1. Check all power cord connections. 2. Make sure the power button on the front panel has been pressed, and the green **READY** LED is lit. 3. Make sure the outlet has power. Try another working outlet. 4. Replace the power cord.
No display messages appear.	1. Make sure the power cord is connected. 2. Make sure the power button on the front panel has been pressed, and the green **READY** LED is lit. 3. Power cycle the device. 4. If the display is still blank but the device seems to be powered on, try to get the device status or error information from the RMI.
All power supply LEDs are off (MSL4048, MSL8048, and MSL8096).	1. Check all power cord connections. 2. Make sure the power button on the front panel has been pressed, and the green **READY** LED on the front panel is lit. 3. Make sure the outlet has power. Try another working outlet. 4. Replace the power cord.
Blue power supply LED is lit and green power supply LED is off (MSL4048, MSL8048, and MSL8096).	The blue LED is lit when the power supply is plugged into a good outlet. The green LED is lit when the power supply is producing good power. 1. Replace the power supply.
Yellow power supply LED is lit (MSL4048, MSL8048, and MSL8096).	The yellow LED is lit when the power supply fan is not rotating at an acceptable speed. 1. Check the power supply fan for obstructions. 2. Replace the power supply.

Table 30 Failure/attention indications displayed on the front panel

Problem	Solution
"!" in operator panel inventory display.	Export the data cartridge marked with an **!** in the inventory. The cartridge is either damaged, incompatible with the drive, or the wrong type for the attempted operation. For the MSL2024, see "Moving tapes in the Library (Operations > Move Tape)" on page 123 for more information. For the MSL4048, MSL8048, and MSL8096, see"Moving Media (Operations > Move Media)" on page 138.
The LCD displays an error code.	Look up the error code, try to resolve the failure, and power cycle the device (see "Error codes" on page 180). On the MSL2024 OCP, press **Enter** to see the error message for the error code.

Table 31 Tape movement problems

Problem	Solution
Tape stuck in drive.	Try the following steps, in this order, to remove the stuck tape. NOTE: The tape drive must rewind the tape before ejecting it. This can take as long as five minutes, depending on how much tape must be rewound. Once the tape is rewound, the eject cycle will take fewer than 16 seconds. The **READY** light flashes while the tape rewinds. Wait for the tape to finish rewinding before attempting another operation. 1. Attempt to unload the tape from your backup software. 2. Shut down the backup software and stop the operating system's removable storage services. From the OCP, attempt to unload or move the tape to a slot. (For MSL2024, see "Moving tapes in the Library (Operations > Move Tape)" on page 123. For MSL4048, MSL8048, and MSL8096, see "Moving Media (Operations > Move Media)" on page 148). 3. Power down the unit, disconnect the cable from the drive, power up the unit, and wait until the tape drive is idle or ready. From the OCP, attempt to unload or move the tape to a slot. 4. From the OCP, attempt a force eject or emergency unload operation. (For MSL2024, see "Forcing the drive to eject a tape (Support > Force Drive To Eject Tape)" on page 130. For MSL4048, MSL8048, and MSL8096, see "Force ejecting a drive (Support > Force Drive Eject)" on page 151) IMPORTANT: Inspect the tape cartridge that was stuck. Damage or misplaced labels on the cartridge could have caused the load/unload failure. Discard any tape cartridge found to have issues.

Problem	Solution
Tape stuck in storage slot.	To remove a stuck tape from a storage slot: If the operator control panel or the remote management interface is still operational: 1. Move the tapes from the drives to the magazines using the **Move Tape** command. (For MSL2024, see "Moving tapes in the Library (Operations > Move Tape)" on page 123. For MSL4048 or MSL8096, see "Moving Media (Operations > Move Media)" on page 148.) 2. Use the magazine removal process to release the magazine and remove it from the device. To use the MSL2024 operator control panel, see "Unlocking, removing, and replacing magazines (Operations > Unlock Left or Right Magazine)" on page 122. To use the MSL4048 or MSL8096 operator control panel, see "Unlocking, removing and replacing magazines (Operations > Unlock Left/Right Magazines)" on page . To use the RMI, see "Releasing and replacing the magazines" on page 99. If neither one of these processes works, see "Releasing the magazines manually" on page 176. 3. Manually remove the cartridge from the magazine by inserting a finger in the hole at the back of the magazine. Some tapes need to be inserted and removed several times to condition them for free movement in and out of the magazine.

Table 32 Media problems

Problem	Solution
Cleaning or data cartridge incompatible with drive.	Make sure you are using data and cleaning cartridges that are compatible with the drive and model of your device (see "Tape cartridges" on page 59) and that you are using the correct cartridge type for the operation. The device automatically unloads incompatible cartridges, the **Attention** LED flashes, and an exclamation point (!) displays in the inventory display for the indicated slot number. Export the media to clear the state.
Cannot write to or read from tape.	• Make sure that the cartridge is not a WORM cartridge that has already been used. • Make sure that the cartridge is write enabled (move the write-protect switch to the enabled position). • Make sure the data cartridge is compatible with the drive model. LTO tape drives can read data cartridges from two generations back and write to data cartridges one generation back. (See "Backward read compatibility" on page 63.) • Make sure you are using an Ultrium cartridge that has not been de-gaussed. **Do not degauss Ultrium cartridges!** • Make sure that the cartridge has not been exposed to harsh environmental or electrical conditions and is not physically damaged in any way. • Many backup applications do not read or write to cartridges that were created using a different backup application. In this case, you may have to perform an erase, format, or label operation on the cartridge. • Make sure you understand any data protection or overwrite protection schemes that your backup application may be using, which could prevent you from writing to a given cartridge. • Retry the operation with a different, known good tape. • Clean the tape drive. (For MSL2024, see"Cleaning tape drive" on page 102. For MSL4048, MSL8048, and MSL8096, see "Cleaning the tape drive (Support > Clean Drive)" on page 149.)

Table 33 Parallel SCSI device not detected

Problem	Solution
Device not detected	• Check that the HBA supports multiple LUNs and this feature is enabled. If not, only the tape drive will be detected. • Check for conflicting SCSI IDs. • Power on the device before powering on the host computer. • Make sure the Library does not have the drive off line and that the Library is not running a test. • Attach the device to an LVDS SCSI host adapter/bus. • The parallel SCSI cable length might be too long. Use a shorter cable or remove other devices from the bus. • Parallel SCSI bus not properly terminated. See "SCSI detection problems" on page 153. • Check that the device is fully powered up and is not in an error state. • Check the parallel SCSI connector and terminator for bent pins. See "SCSI detection problems" on page 153 for more detailed troubleshooting help.
Changed drive SCSI ID, but the host server does not recognize the new ID.	• Make sure that all parallel SCSI devices on the same bus have unique SCSI ID numbers. • Only SCSI IDs 0 through 7 are available on a narrow (50 pin) bus. If the device is on a narrow bus and has a SCSI ID of 8 or greater, the host server will not detect the drive. If you must use SCSI IDs 8 or greater, use a wider bus. • Reboot the host server.

Table 34 Attention LED is lit

Problem	Solution
Both the Attention and Cleaning LEDs are lit.	This is most likely caused by a dirty drive that cannot read a tape and marks the tape invalid. 1. View the inventory with the RMI. Note the slots that have tapes marked with `!`. 2. Remove any magazines that contain tapes marked with `!`. 3. Remove the tapes that were marked with `!`. 4. Inspect each removed tape for damage, check that the tape is compatible with the drive, and ensure that it is not past its usage life. See "Tape cartridges" on page 59. Discard any tapes that are damaged or past their usage life. Do not use cartridges that are incompatible with the tape drive. 5. Reload the magazines with tapes that have passed inspection and new tapes to replace cartridges that did not pass inspection. 6. Replace the magazines. 7. Clean the tape drive.
A particular cartridge sets off the cleaning light.	Check the cartridge for contamination by loose debris.

Problem	Solution
A cartridge recently imported from a different environment is causing issues.	Media that is moved from one environment to another can cause issues until it has acclimated to the new conditions. A cartridge should be acclimated for at least 24 hours before being used, particularly if it has been stored at a substantially different temperature or level of humidity than the device.
The Attention LED is lit but the Cleaning LED is not lit after a cartridge load.	The Library was unable to complete the requested operation with the selected tape cartridge. • Use only cartridges that are compatible with the drive type (see "Tape cartridges" on page 59). • Use the correct type of cartridges for the operation. For example, use a cleaning cartridge for cleaning. • Make sure you are using an Ultrium Universal cleaning cartridge (see "Tape cartridges" on page 59).
The Cleaning LED is lit after using a cleaning cartridge.	The cleaning cartridge is expired. A cleaning cartridge will expire after 50 cleaning cycles.
A particular cartridge sets off the Attention LED and possibly the Cleaning LED.	If the Media Attention LED is cleared and the drive has been cleaned, and then immediately re-displays each time a particular cartridge is reloaded, that cartridge should be suspected as being defective. • If this occurs, export the cartridge and load a known good cartridge. In some cases, a cartridge can be worn out, have a defective Cartridge Memory, or have been formatted as a Firmware Upgrade Cartridge. • Any cartridge that is suspected of being defective or contaminated should NOT be reused in any drive. • If the bad cartridge is a cleaning cartridge, it might be expired.

Table 35 Inventory problems

Problem	Solution
The inventory labels the cartridge **Full** instead of showing its bar code	• Verify that the label is an HP label. The bar code reader might not be able to read other labels. • Verify that the label is properly applied. See "Labeling and loading the tape cartridges" on page 57. • Verify that the label is not soiled.
The inventory process takes a long time	Apply high-quality HP labels to all tape cartridges. During the inventory process, the bar code reader attempts to read the bar code on the cartridge or the bar code on the back of the storage slot until it identifies the cartridge or determines that the slot is empty. The reader can usually identify a properly-labeled cartridge the first time, while determining that an unlabeled cartridge is in a storage slot can take four times as long.

Table 36 RMI network connection issues

Problem	Solution
Cannot connect to the remote management interface (RMI)	• Verify that the device is connected to the LAN with a CAT 5E, 6, or 6E Ethernet cable. • Verify that the link LED on the RJ45 (LAN) connector is lit when the device is powered up. If the LED is not lit, the device is not communicating with the LAN. See your network administrator for help. • Verify that the device has been configured with a valid static network address or DHCP has been enabled so the device can obtain a network address. If using DHCP, write down the device's network address from the OCP Information menu. If the device did not obtain a valid address via DHCP, verify that the DHCP server is up and the device has network access to it. If necessary, set a static network address instead. • Enter the device's IP address into the address bar of a web browser connected to the same LAN as the device. If the RMI web page does not display, ping the device's IP address. If the ping fails, verify that the device has a valid network address and that there are no firewalls or other obstructions to network traffic between the computer with the web browser and the device. See your network administrator for help.

Table 37 Cleaning problems

Problem	Solution
Cannot load the cleaning cartridge.	• Make sure you are using an Ultrium Universal cleaning cartridge (see "Tape cartridges" on page 59). • Make sure the cleaning cartridge has not expired. A cleaning cartridge will expire after 50 cleaning cycles. • Contact your service representative.

Performance problems

TIP:

For more performance troubleshooting information, see the *Performance Troubleshooting Guide* at http://www.hp.com/support/pat.

The process of backing up files goes through many devices, from the files in the file system on the disk, through the backup server, and out to the Library, all managed by software running on an operating system. The backup process can only run as fast of the slowest link in this chain.

To find the performance bottlenecks in your system, check the specifications and performance of the:

Average file size

The hard drive must seek to the position of a file before it can start reading. The more time the disks are seeking to files, the lower the performance.

To determine the average file size, divide the size of the backup by the number of files. See the performance impact of your system's average file size in Table 38.

Table 38 Performance impact of various file sizes

Average file size	Performance impact	Recommendations
<64 k: small files	**POOR**. Lots of small files require the disk to perform many random accesses instead of a continuous read.	• If possible, do NOT use a file-by-file backup method. • For backups with an average file size <64 k, HP recommends using a sequential/image backup that backs up the hard drive or LUN image instead of the individual files. The drawback with the sequential/image backup method is that you might only be able to restore the entire disk image and not individual files. If you can restore individual files, the restore operation will be very slow.
64 k – 1 mb: medium files	**NEUTRAL**. Performance accessing medium-sized files should be okay. The disks will still need to do a fair number of random accesses.	No change is necessary but using a sequential backup method, such as an image backup, could offer some performance gains. See above for drawbacks.

Average file size	Performance impact	Recommendations
>1 mb: large files	**GOOD**. Large files let the disk do less seeking and spend more time doing continuous reads.	None.
Image or sequential backup	None. File size is irrelevant for Image or sequential backups.	None.

File system type

The file system determines the organization of the files on the disks. When the files are spread over multiple disks with multiple controllers, some disks can be seeking while others are reading. Find the performance impact of your system's file system in Table 39

Table 39 Performance impact of various file systems

File system	Performance impact	Recommendations
Disk array	**GOOD**. Disk arrays typically provide excellent access to data. They usually include many disks, which improves bandwidth.	None.
Server or workstation with RAID	**VARIABLE**. RAID uses a group of disks to improve performance, and in the case of RAID 5, provides some parity protection in case one of the drives fail.	To achieve optimal performance, your array must support the following transfer rate: • LTO-2 HH: 48 MB/s • LTO-3 HH: 120 MB/s • LTO-3 FH: 160 MB/s • LTO-4 HH: 160 MB/s • LTO-4 FH: 240 MB/s • LTO-5: 280 MB/s Also, make sure that the server or workstation is used as little as possible during the backup, and close down programs such as virus scanners, which check each file that is opened.
Server or workstation with a single disk (spindle)	**POOR**. A single disk cannot retrieve or write data fast enough for any of the supported tape drives.	Upgrade to a disk array or RAID 5 with the minimum number of disks needed for your tape drives, or use concurrency or multithreading in the backup software to pull from more than one disk at a time. The drawback with concurrency or multithreading is that it slows the restore operation. Also, make sure that the server or workstation is used as little as possible during the backup, and close down programs such as virus scanners, which check each file that is opened.

Connection from the host server to the disks

The connection between the host server and the disks determines how much data can be transferred from the disks to the host computer at a time. A connection with insufficient bandwidth cannot provide enough data for the tape drives to write at full speed. Find the performance impact of your system's disk connection in Table 40.

Table 40 Performance impact of various disk connections

Connection type	Performance impact	Recommendations
Fibre: 1 Gb	• LTO-2: **GOOD**. When fully used, a 1 Gb fibre connection can provide enough bandwidth for two LTO-2 tape drives. • LTO-3, LTO-4, LTO-5: **POOR**. A 1 Gb fibre connection is inadequate for an LTO-3, LTO-4, or LTO-5 tape drive.	For good performance, use a faster connection with LTO-3, LTO-4, and LTO-5 tape drives.
Fibre: 2 Gb	• LTO-2: **GOOD**. When fully used, a 2 Gb fibre connection can provide enough bandwidth for 4 LTO-2 tape drives. • LTO-3: **GOOD**. When fully used, a 2 Gb fibre connection can provide enough bandwidth for an LTO-3 tape drive. • LTO-4 HH: **GOOD**. When fully used, a 2 Gb fibre connection can provide enough bandwidth for an LTO-4 HH tape drive. • LTO-4 FH: **NEUTRAL**. A fully used 2 Gb fibre connection can provide enough bandwidth for many data sets but is not enough for 2:1 compressible data. • LTO-5: **POOR**. A 2 Gb fibre connection is inadequate for an LTO-5 tape drive.	For good performance, use a faster connection if you have multiple LTO-3 or LTO-4 tape drives, or an LTO-5 tape drive.
Fibre: 4 Gb	**GOOD**. When fully used, a 4 Gb fibre connection can provide enough bandwidth for the following number of tape drives: • LTO-2: 8 • LTO-3 HH: 4 • LTO-3 FH: 2 • LTO-4 HH: 2 • LTO-4 FH: 1 • LTO-5: 1	
Fibre: 8 Gb	**GOOD**. When fully used, an 8 Gb fibre connection can provide enough bandwidth for the following number of tape drives: • LTO-2: 16 • LTO-3 HH: 6 • LTO-3 FH: 5 • LTO-4 HH: 3 • LTO-4 FH: 2 • LTO-5: 2	

Connection type	Performance impact	Recommendations
SAS: 3 Gb	**GOOD**. When fully used, a 3 Gb high-performance RAID array can support up to the following number of tape drives: • LTO-2: 10 • LTO-3: 6 • LTO-4 HH: 6 • LTO-4 FH: 4 • LTO-5: 3	
SAS: 6 Gb	**GOOD**. When fully used, an 6 Gb high-performance RAID array can support up to the following number of tape drives: • LTO-2: 20 • LTO-3: 12 • LTO-4 HH: 12 • LTO-4 FH: 8 • LTO-5: 2	
Parallel SCSI: Ultra 320	• LTO-2: **GOOD**. When fully used and assuming that the connection to the disks does not force the speed to a lower parallel SCSI type, an Ultra 320 connection can provide enough bandwidth for five LTO-2 tape drives. • LTO-3: **GOOD**. When fully used and assuming that the connection to the disks does not force the speed to a lower parallel SCSI type, an Ultra 320 connection ban provide enough bandwidth for a single LTO-3 tape drive. • LTO-4 HH: **GOOD**. When fully used and assuming that the connection to the disks does not force the speed to a lower parallel SCSI type, an Ultra 320 connection can provide enough bandwidth for a single LTO-4 HH tape drive. • LTO-4 FH: **NEUTRAL**. When fully used, an Ultra 320 connection provides enough bandwidth for a single LTO-4 FH tape drive. • LTO-5: **POOR**. An Ultra 320 connection is inadequate for an LTO-5 tape drive.	If cables not designed for Ultra 320 speeds are used or there are more than a couple devices on the bus, the bus may slow down to Ultra 160 speeds.

Connection type	Performance impact	Recommendations
Parallel SCSI: Ultra 160	• LTO-2: **GOOD**. When fully used and assuming that the connection to the disks does not force the speed to a lower parallel SCSI type, an Ultra 160 connection can provide enough bandwidth for two LTO-2 tape drives. • LTO-3: **MARGINAL**. An Ultra 160 connection is barely adequate for an LTO-3 tape drive. The bus would be saturated when providing 2:1 compressible data to an LTO-3 tape drive. • LTO-4 HH: **MARGINAL**. An Ultra 160 connection is barely adequate for an LTO-4 HH tape drive. The bus would be saturated when providing 2:1 compressible data to an LTO-4 HH tape drive. • LTO-4 FH: **POOR**. An Ultra 160 connection is barely adequate for streaming anLTO-4 FH tape drive with uncompressible data and will not sustain maximum data rates with compressible data. • LTO-5: **POOR**. An Ultra 160 connection is inadequate for an LTO-5 tape drive.	Upgrade to Ultra 320 for parallel SCSI disk drives when using an LTO-3 or LTO-4 tape drive, especially if your data is greater than 2:1 compressible.
Parallel SCSI: Ultra 2 (80)	• LTO-2: **MARGINAL**. When fully used and assuming that the connection to the disks does not force the speed to a lower parallel SCSI type, an Ultra 2 (80) connection barely provides enough bandwidth for an LTO-2 tape drive. • LTO-3, LTO-4, LTO-5: **POOR**. An Ultra 2(80) connection is inadequate for an LTO-3, LTO-4, or LTO-5 tape drive.	Upgrade to Ultra 320 for parallel SCSI disk drives when using an LTO-3 or LTO-4 tape drive.
Parallel SCSI: Ultra Wide, Fast Wide	**POOR**. Ultra Wide and Fast Wide are inadequate transport mechanism for LTO tape drives.	Upgrade to a faster transport medium, such as Ultra 320 SCSI.
Ethernet: 10 Gigabit	**GOOD**. When fully used, a 10 Gigabit Ethernet connection can provide enough bandwidth for the following number of tape drives: • LTO-2: 14 • LTO-3 HH: 5 • LTO-3 FH: 4 • LTO-4 HH: 4 • LTO-4 FH: 2 • LTO-5: 2	
Ethernet: 1 Gigabit	• LTO-2: **MARGINAL**. A 1 Gigabit Ethernet connection barely provides enough bandwidth for an LTO-2 tape drive when two concurrent streams are used. The drawback of using concurrency is that restore operations take longer. • LTO-3, LTO-4, LTO-5: **POOR**. A 1 Gigabit Ethernet connection is inadequate for an LTO-3, LTO-4, or LTO-5 tape drive.	Upgrade to Fibre Channel or 10 Gig Ethernet if using LTO-3, LTO-4, or LTO-5 tape drives.

Connection type	Performance impact	Recommendations
Ethernet: 100 Base T, 10 Base T	**POOR**. 100 Base T and 10 Base T Ethernet do not have enough bandwidth to support any of the drives and would require too many streams to make concurrency practical.	Upgrade to Gigabit Ethernet or Fibre Channel.
Internal disks on backup server	**POOR**. Add-in RAID controllers, RAID on a chip (ROC), RAID on the mother board (ROMB), internal parallel SCSI, and internal IDE (non-RAID) are inadequate transport mechanisms for LTO tape drives.	Use a dedicated disk array or upgrade to RAID 5.

Operating system configuration

The operating system configuration and other programs running on the host computer can impact the ability of the host computer to transfer files from the disks to the tape drive.

Windows

To improve backup performance and improve SAN stability, shutdown and disable the Windows Removable Storage Manager unless the backup software requires it:

1. From the Windows **start** menu, select **Control Panel**.
2. In the Control Panel, select **Administrative Tools**.
3. In the Administrative Tools, select **Services**.
4. In Services, right-click **Removable Storage** and select **Stop**. The Status should be blank as shown in Figure 93.

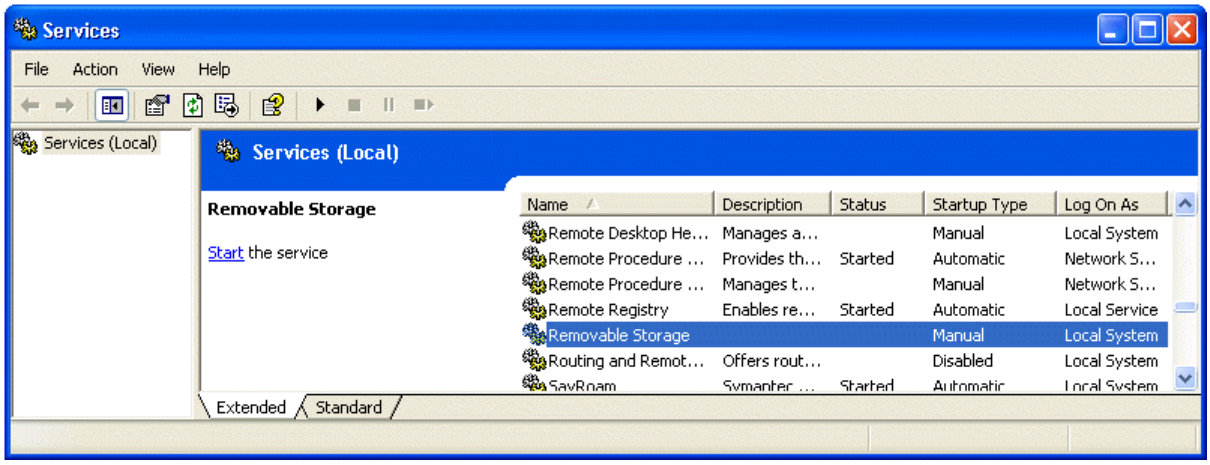


Figure 93 Removable Storage service

5. Right-click **Removable Storage** again and select **Properties**.
6. Change the **Startup type** to Disabled and click **OK**.

Stop as many programs as possible while a backup or restore is in progress. Be especially aware of monitoring applications, such as anti-virus software, which check every file that is read. If you are

concerned about viruses and backup performance, perform a virus scan before starting the backup, and shut down the anti-virus software while the backup is running.

Novell

You might need to tweak some Novell operating system parameters to achieve good backup performance.

- The MAXIMUM PACKET RECEIVE BUFFERS and MINIMUM PACKET RECEIVE BUFFERS parameters may need to be increased (if currently maxed out, try setting the MINIMUM to the current MAXIMUM and then double the value for the MAXIMUM on the backup server and any remote servers that are backed up).
- The MAXIMUM DIRECTORY CACHE BUFFERS and MINIMUM DIRECTORY CACHE BUFFERS parameters may need to be increased (if currently maxed out, try setting the MINIMUM to the current MAXIMUM and then double the value for the MAXIMUM on the backup server and any remote servers that are backed up.)
- Set TCP DELAYED ACKNOWLEDGEMENTS to OFF.
- Since Novell volumes may be compressed, hardware compression may lower the performance and capacity. If the volumes are compressed, make sure that the backup software does not uncompress the data on read and has hardware and software compression disabled.

NOTE:

Disabling the hardware compression should not be necessary on Ultrium drives as they sense the compression ratios and can automatically adjust if they receive non-compressable data.

- Stop as many programs as possible while a backup or restore is in progress. Be especially aware of monitoring applications, such as anti-virus software, which check every file that is read. If you are concerned about viruses and backup performance, perform a virus scan before starting the backup, and shut down the anti-virus software while the backup is running.

Backup server

The backup server must have enough RAM and processor power to transfer the files from the disk to the tape drive. See Table 41 for the minimum RAM and CPU speed needed for each tape drive. In some cases, a multi-processor server may be required.

NOTE:

Processor speed numbers as based on Intel x86 type processors. Use the equivalent on a RISC or other type of processor.

Table 41 Backup server requirements

Tape drive	Minimum RAM/drive	Processor power/drive
LTO-2	512 MB	1 GHz
LTO-3 HH	1 GB	2 GHz
LTO-3 FH, LTO-4 HH	1 GB	2 GHz

Tape drive	Minimum RAM/drive	Processor power/drive
LTO-4 FH	2 GB	3 GHz
LTO-5	2 GB	4 GHz

In addition to having enough RAM and processing power, ensure that the PCIe bus is at least 64 bit, has a speed of 66 MHz or better, and is not overloaded by too many high-bandwidth cards. PCIe is preferred.

Backup type

Each type of backup has its own impact on performance, depending on how well it can keep data streaming to the tape drive.

File-by-file with a full-featured backup application

Performance impact: **VARIABLE**.

File-by-file backup with a full-featured backup application can be fast enough if the average file size is at least 64 k and there are not too many fragmented files. Full-featured backup applications also offer the best speeds for single file restores and allows for backing up only specific data. Check the compatibility matrix on the EBS website for a list of full-featured backup applications supported on your operating system for your Library: http://www.hp.com/go/ebs.

If the average file size is less than 64 k or if the file system is very fragmented, file-by-file backup will have poor performance. If the file system has a lot of fragmentation, use a de-fragmentation utility to make the files contiguous again. If the average file size is less than 64 k, HP recommends that you use a sequential/image backup that backups up the hard drive or LUN image instead of the individual files. The drawback with sequential/image backups is that they may only be able to restore the entire disk image and not individual files. If they can restore individual files, the restore operation will be very slow.

File-by-file with a native application

Performance impact: **POOR**.

Native backup applications based on tar, cpio, NT Backup, etc. do not have the extra features needed to manage the bandwidth requirements of the faster tape drives and should only be used to test basic functionality.

To get the best backup and restore performance, use a full-featured backup application. If the average file size is less than 64 k, use a sequential/image backup for best performance. However, a sequential/disk image backup might not allow you to restore individual files or the restore process will be very slow.

Disk image, flash, or sequential

Performance impact: **GOOD**.

A disk image or sequential backup backs up an entire disk, partition, or LUN by looking at the disk sector by sector instead of file by file. The entire disk contents is backed up contiguously, without the disk seeking, which prevents performance degradation caused by small or fragmented files.

If you are more concerned about backup performance than single-file restore, disk image or sequential backups can offer a real performance benefit. The disadvantage is that backup and restore operations

work on an entire disk, partition, or LUN. You might not be able to backup a subset of files or restore a single file. If you can restore a single file, the restore process will be slow.

Database backup

Performance impact: **VARIABLE**.

To improve performance when backing up data from a database:

- Use specific backup agents for the database.
- Use the latest versions of the databases.
- Do not backup individual mailboxes.
- Do not backup specific records or do a record-by-record backup.
- Do not backup when the database is in heavy use.

Connection from the host server to the Library

For the best performance, the connection from the host server to the device must have enough bandwidth to provide enough data to keep the tape drive streaming.

NOTE:

Unlike most tape technologies, an LTO tape drive can write data as fast as the server can send it, even if the tape drive is not streaming.

Find the performance impact of your system's Library connection in Table 42

Table 42 Performance impact of various Library connections

Connection type	Performance impact	Recommendations
Parallel SCSI: Ultra 320	**GOOD**. When fully used, an Ultra 320 SCSI connection can provide enough bandwidth for the following number of tape drives, assuming 2:1 compression: • LTO-2: 2 • LTO-3, LTO-4: 1	Ultra 320 is an excellent transport medium, but only has enough bandwidth for one LTO-3 or LTO-4 drive per bus. NOTE: If the parallel SCSI cables are not designed for Ultra 320 speeds or more than a couple devices are on the parallel SCSI bus, the bus may slow down to Ultra 160 speed.

Connection type	Performance impact	Recommendations
Parallel SCSI: Ultra 160	• LTO-2: **GOOD**. When fully used and assuming that the connection to the disks does not force the speed to a lower parallel SCSI type, an Ultra 160 connection can provide enough bandwidth for two LTO-2 tape drives. • LTO-3: **MARGINAL**. An Ultra 160 connection is barely adequate for an LTO-3 tape drive. The bus would be saturated with 2:1 compressible data. • LTO-4: **POOR**. An LTO-4 tape drive is unable to sustain maximum transfer speeds with 2:1 compressible data.	Ultra 160 is a good transport medium, but does not have enough bandwidth for LTO-3 or LTO-4 tape drives. If using LTO-3 or LTO-4, upgrade to an Ultra 320 HBA, especially if you have greater than 2:1 compressible data.
Parallel SCSI: Ultra 2 (80)	• LTO-2: **MARGINAL**. Ultra 2 (80) barely has enough bandwidth for one LTO-2 drive. • LTO-3, LTO-4: **POOR**. An Ultra 2 (80) connection is inadequate for an LTO-3 or LTO-4 tape drive.	Upgrade to Ultra 320.
Parallel SCSI: Ultra Wide, Fast Wide	Ultra Wide and Fast Wide are inadequate for all of the currently supported tape drives.	Upgrade to Ultra 320.
Fibre Channel: 1 Gb	**POOR**. One gigabit fibre is inadequate for an LTO tape drive.	For LTO-3 tape drives, upgrade to 2 or 4 Gb Fibre Channel. For LTO-4 or LTO-5 tape drives, upgrade to 4 Gb Fibre Channel. Upgrade to 4 Gb Fibre Channel.
Fibre Channel: 2 Gb	• LTO-3: **GOOD**. When fully used, 2 Gb Fibre Channel has plenty of bandwidth for an LTO-3 tape drive. • LTO-4: **MARGINAL**. An LTO-4 tape drive is unable to sustain maximum transfer speeds with 2:1 compressible data. • LTO-5: **POOR**. Two gigabit fibre is inadequate for an LTO-5 tape drive.	For LTO-4 or LTO-5 tape drives, upgrade to 4 Gb Fibre Channel. Upgrade to 4 Gb Fibre Channel.
Fibre Channel: 4 Gb, 8 Gb	**GOOD**. When fully used, 4 Gb and 8 Gb Fibre Channel have sufficient bandwidth for all supported tape drives.	
SAS: 3 Gb, 6 Gb	**GOOD**. When fully used, 3 Gb and 6 Gb SAS have sufficient bandwidth for all supported tape drives.	

Media

Once the data gets to the tape drive, it must be written onto the tape. If there are no bottlenecks and the Library starts having performance problems:

- Try a new cartridge. A marginal cartridge can cause performance problems when the tape drive has to retry writing to bad spots on the tape.
- Clean the tape drive. See "Tape cartridges" on page 59 for instructions.

Service and repair

Releasing the magazines manually

If you cannot remove the magazines via the OCP or RMI, do the following:

1. Unplug the power cord from the device.
2. From the back of the device, find the access holes for the right and left magazines. See Figure 94.

Figure 94 Access holes for the right and left magazines

1. Right magazine release
2. Left magazine release

3. To manually release magazines, insert the end of a small metal pin or straightened paper clip into the appropriate magazine access hole at the back of the device about 1.5 cm (0.6 inch), while another person grasps the magazines on that side and pulls them out of the front of the unit. For the MSL4048, MSL8048, and MSL8096, all magazines on a side are released and should be removed at the same time. See Figure 95.

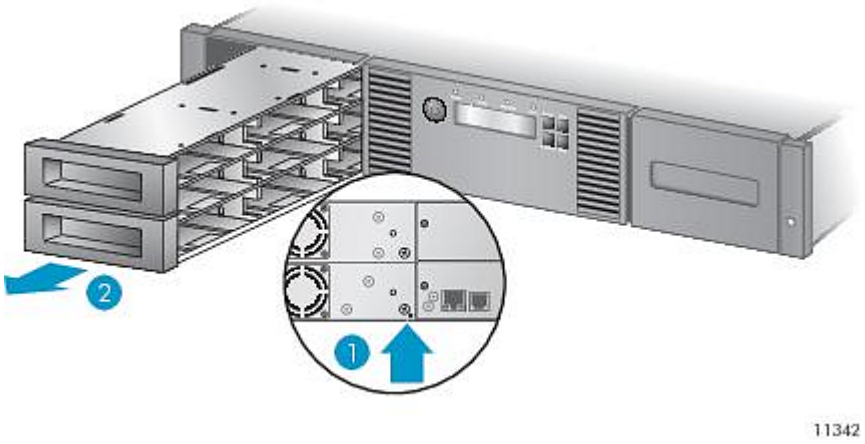


Figure 95 Releasing the magazine

1. Push a paper clip into the access hole.
2. Pull the magazine out of the front of the unit.

IMPORTANT:

Do not force the pin once you encounter resistance. Doing so can damage the device.

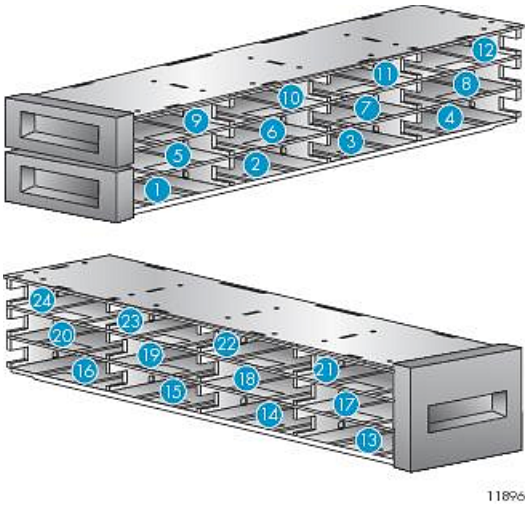
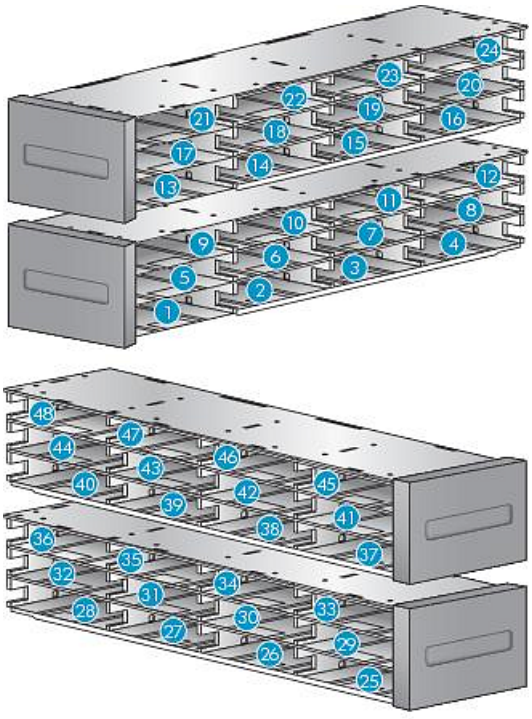
4. Repeat step 3 for the other magazine if necessary.
5. If other tapes are still in the device, or if you were unable to manually remove the magazines and drive, contact HP customer service for further instructions. See "HP technical support" on page 241.

The wellness test

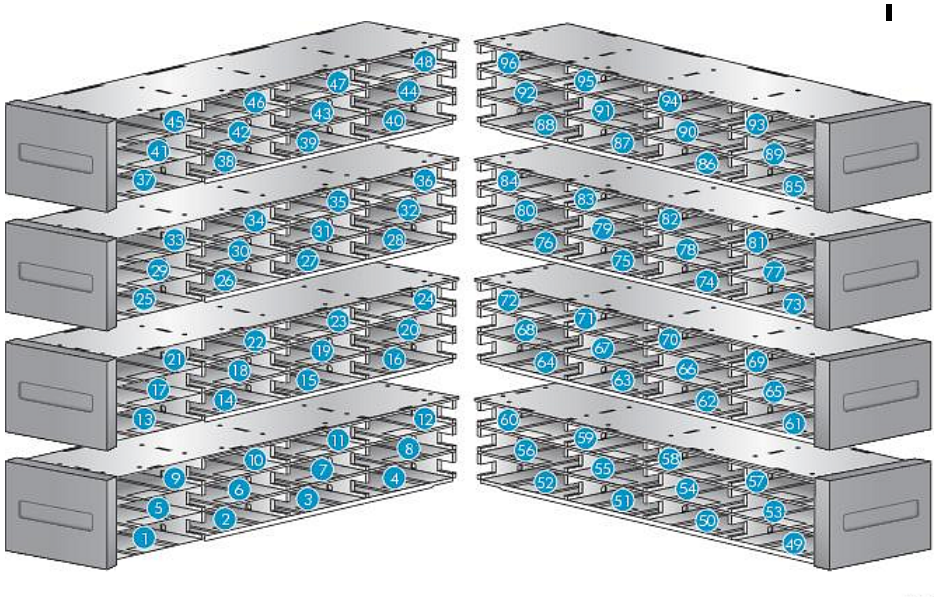
The wellness test exercises all Library and tape drive hardware, except the external connections, and is useful for verifying that a device is working correctly. The wellness test requires operator interaction with the mailslot so cannot be initiated from the RMI.

For complete testing, enable the mailslot and ensure that each top-row corner slot contains a tape cartridge.

Table 43 Top-row corner slot positions

2U top-row corner slots with mailslot disabled: 9, 12, 21, 24	 11896
4U top-row corner slots with mailslot disabled: 21, 24, 45, 48	 11407

MSL8096 top-row corner slots with mailslot disabled: 45, 48, 93, 96



IMPORTANT:

The Library will remove any tape cartridges from the tape drives and go offline when running the wellness test. Verify that any applications using the device have completed before starting the wellness test.

You can have the device run up to 10 cycles of the wellness test. If the Library has more than one tape drive installed, you can select whether to run the test on one or all of the tape drives. The wellness test operates on the whole Library, without regard to logical libraries.

The wellness test requires operator interaction and can only be run from the OCP. During the wellness test:

1. The operator starts the wellness test from the OCP. The administrator password is required.
2. The device performs a self test and verifies that it can communicate with the tape drive.
3. The device returns any tape cartridges from the tape drives to their home slots. If the home slot for a cartridge is not known, the device will move the cartridge to the mailslot and prompt the operator to remove it.
4. The device prompts the operator to enter the number of cycles to run the test.
5. The device opens the mailslot and prompts the operator to insert a scratch cartridge. In the MSL8096, the 12-slot mailslot does not pop out; the operator must open it.
6. The operator inserts a scratch cartridge into the lowest-numbered mailslot. If no mailslots are enabled or the operator closes the mailslot without inserting a cartridge into the lowest-numbered mailslot, the device will perform a shortened version of the wellness test, skipping step 7.
7. The device loads the scratch cartridge into the first tape drive, unloads the scratch cartridge from the tape drive, and returns the scratch cartridge to the mailslot. If the operator selected to test all of the tape drives, the device will load the scratch cartridge into each tape drive before returning it to the mailslot.

8. The device moves the tape cartridge from the four top-row corner slots to the tape drive load point and then returns the tape cartridge to its slot. If one of the top-row corner slot positions does not contain a tape cartridge, the device will skip that location. If none of the top-row corner slots contain a tape cartridge, the device displays an error message.
9. If additional cycles remain to be run, the test will return to step 7 if there is a tape cartridge in the mailslot or step 8 if there is not a cartridge in the mailslot.
10. At the conclusion of the test, the device pops open the mailslot and waits for the operator to remove the scratch tape. In the MSL8096, if only the 12-slot mailslot is configured, the Library will prompt the operator to open the mailslot and remove the scratch tape cartridge.
11. The device displays the test completion status, including any recoveries or errors that may have occurred.

Error codes

If an error occurs during operation, the device stops the current operation and displays an error code on the LCD screen. Unless otherwise noted in "Operation problems" on page 159, record the error code or error message from the LCD screen, and then try to resolve the error by cycling power to the device and retrying the operation.

To check the overall operation of the device, run the wellness test from the RMI or OCP. The wellness test exercises all robotic movements and checks the status of the electrical components and communication. To run the wellness test from the RMI, see "Performing general diagnostics" on page 99. To run the wellness test from the MSL2024 OCP, see "Running the wellness test (Support > Run Wellness Test)" on page 127. To run the wellness test from the MSL4048, MSL8048, and MSL8096 OCP, see "Running tests (Support > Run Tests)" on page 149.

If the error persists, contact support personnel, see "HP technical support" on page 241.

There are three ways to obtain error codes from the device:

- On the MSL2024 OCP or the MSL4048, MSL8048, and MSL8096 OCP
- On the RMI
- On an L&TT support ticket or report

Finding error code information on the MSL2024 OCP

When an error first occurs, the error message and error code are displayed on the OCP, as shown in Figure 96.

Figure 96 Initial OCP error message

The code **9B** is the main error code, and **37** is the error sub-code.

If you review the Error Log in the Support menu, the OCP error log displays the error code, as shown in Figure 97.

Figure 97 Error code in the OCP Error Log

The code **9B** is the main error code, **37** is the error sub-code, and **31** is sub-code specific information for factory use only. When you press **Enter**, the OCP displays the error message, as shown in Figure 98.

Figure 98 Error message in the OCP Error Log

If you press **Next**, the OCP will display additional information, if available, as shown in Figure 99.

Figure 99 No additional information in the OCP error log

If you press **Next** again, the OCP will display the date and time in the format: **YYYY-MM-DD** followed by the time in 24–hour clock format, where 1:00 pm is 13:00, as shown in Figure 100.

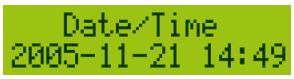


Figure 100 Date and time in the OCP error log

Finding error code information on the MSL4048, MSL8048, and MSL8096 OCP

Error codes are displayed in pop-up messages when an error occurs during an operation that is initiated from the operator control panel.

The message shows the error code and a description of the error.

For example:

8D 52Mechanical Block

where:

8D is the main error code 52 is the error sub-code.

The error log contains a list of all errors, with a separate row for each error. The log shows the Date/Time, Code, and Description.

For example,

24/06/05 01:48 D7 50 System Error

where:

24/06/05 is the date in the format DD-MM-YY 01:48 is the time in 24–hour format. For example, 1:00 pm is 13:00. D7 is the main error code 50 is the error sub-code

Finding error code information on the RMI

You can find error codes on the RMI Support: Library Logs page. The available logs are: Error Trace, Informational Trace, Warning Trace, Configuration Change Trace, and Standard Trace.

The log entries are displayed in order of most recent to oldest. The format for the log entries is: YY.MM.DD HH.MM.SS.ss LIB/ERR<80 89 62 40

- YY.MM.DD — the date displayed as Year.Month.Day
- HH.MM.SS.ss — the time displayed as Hour.Minute.Second.Hundredths fo a second
- First code — hard or soft error. The code after LIB/ERR (80 in the example) will be 80 or 40. 80 indicates a hard error, 40 indicates a soft error.
- Second code — the main error code (89 in this example). See "Error codes" on page 180 for a list of error codes and recovery procedures.
- Third code — the sub-code (62 in this example). See "Error sub-code descriptions" on page 196 for a list of sub-codes.
- Fourth code — sub-code-specific information for factory use only

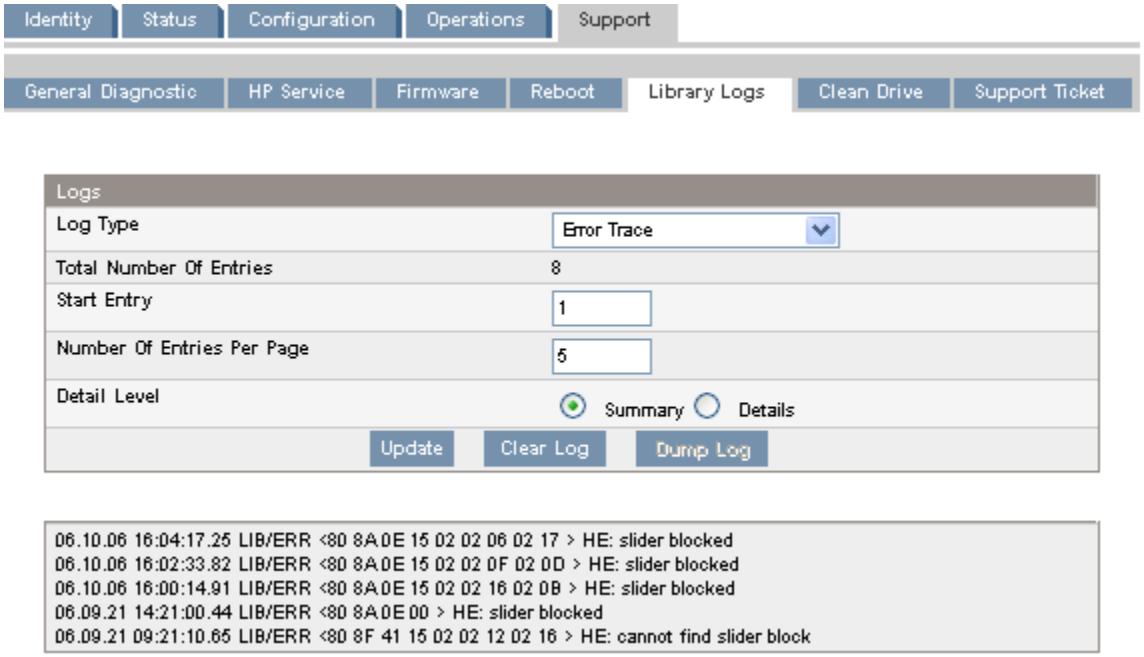


Figure 101 Support: Library logs page

Finding error code information on an L&TT support ticket or report

An L&TT support ticket or report contains detailed information about the device configuration, along with errors and warnings. The support ticket and report contain the same information. The report is easier to read, but must be generated and read on the host computer. The support ticket can be downloaded from the device and then viewed on any computer with L&TT installed.

To generate and view a report or support ticket from L&TT:

1. In the L&TT **By Product** or **By Connection** tab, select the device from the device list.
2. Click the **Health** button on the main toolbar to generate and display a standard report. or click the **Support** button on the main toolbar to display the **Support** screen for additional report or support ticket options.

To download a support ticket from the device, do one of the following:

- From the RMI **Support: Support ticket** screen, click **Download**.
- Insert a USB flash drive into the USB port on the rear panel and then from the OCP, select **Download support ticket to USB**.

TIP:

Each support ticket downloaded from the RMI will only contain information for the Library itself or one drive. To capture all support information, download a ticket from the Library and from each drive. To generate a consolidated support ticket with all support data in a single compressed file download the support ticket with L&TT.

To view a downloaded support ticket:

1. From the L&TT **File** menu, select **Load Support Ticket**.
2. Select the support ticket file in the browser.

The top of the support ticket contains basic configuration information about the device, as shown in Figure 102.

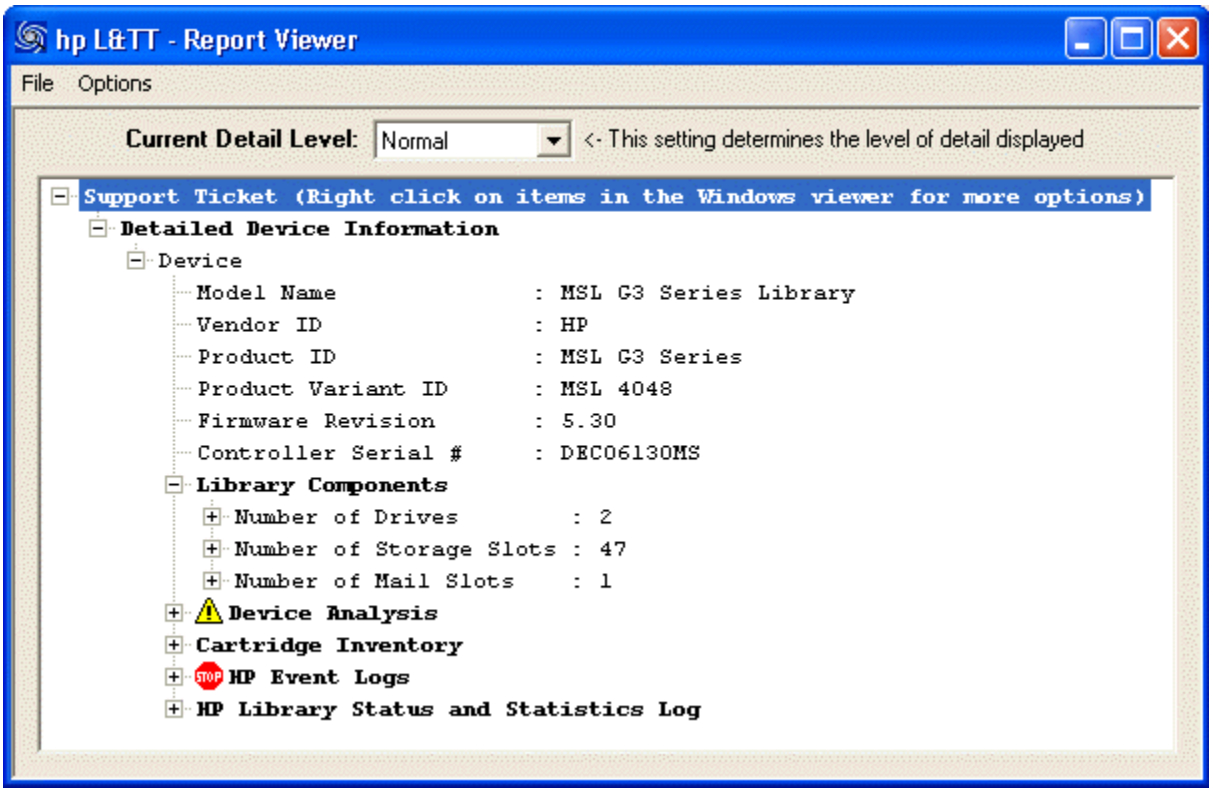


Figure 102 Support ticket in viewer

Expand **HP Event Logs** to see events divided into three categories:

- Events in the last 24 hours
- Events in the last 31 days
- Events older than 31 days

Set the **Current Detail Level** to see additional types of events:

- **Normal** will only show critical events or hard errors.
- **More details** will also show warning and configuration events.
- **Everything** shows all events.

Critical events are designated with a STOP sign icon. Expand the event for more information, as shown in Figure 103.

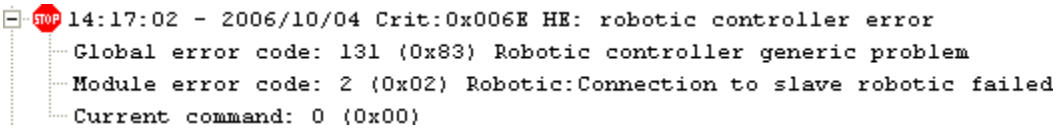


Figure 103 Critical event details

- The time stamp is in the format hours : minutes : seconds. The hours are in 24–hour clock format. For example, in this case `14` is 2 p.m.
- The date is in the format year/month/day.
- The event ID is the number on the header line, `0x006E` in this example. It uniquely maps to an error code.
- `HE` designates a hard error. The STOP sign icon and the word `Crit` before the event ID also indicate a hard error.
- The text description in the header (“robotic controller error” in this example) is the simple text description of the main error code.
- The main error code `(0x83)` is displayed in parenthesis as the **Global error code**. The error codes are described in Main error codes. The text after the main error code (`Robotic controller generic problem` in this example) is the text description for the error code.
- The error sub-code `(0x02)` is displayed in parenthesis as the **Module error code**. The error sub-codes are described in Error sub-code descriptions. The text after the error sub-code (`Robotic: connection to slave robotic failed` in this example) is name of the component followed by the text description of the error sub-code.
- The **Current command** provides information for factory use only.

Main error code descriptions

Table 44 Main error codes

Error code	Description	Details and solution
80	Cannot initialize bar code reader	Power-cycle the unit and retry the operation.
81	No response from bar code reader	• Power-cycle the unit and retry the operation. • Update the firmware to the latest version.
82	No response from EEPROM on robotic controller	Power-cycle the unit and retry the operation.
83	Robotic controller generic problem	• Power-cycle the unit and retry the operation. • If the Library robotics OR library controller were just replaced, update the firmware to the latest version. • If this error occurs right after a firmware update, update the firmware again — the robotics firmware may not have been properly updated the first time. CAUTION: Never replace the Library robotics and library controller at the same time. Critical Library identification data will be lost.
84	Setting of gripper[1] motor parameters failed	• Power-cycle the unit and retry the operation. • If the robotics have been replaced, update the firmware. (MSL8048 and MSL8096 only). • Update the firmware to the latest version.
85	Setting of slider[2] motor parameters failed	
86	Setting of elevator[3] motor parameters failed	
87	Setting of rotation[4] motor parameters failed	
88	Setting of sled[5] motor parameters failed	
89	Gripper[1] obstructed	• Ensure that nothing is obstructing the gripper. • If the device was moved, verify that each of the tape cartridges is properly seated in a magazine. • Run the wellness test.

Error code	Description	Details and solution
8A	Slider[2] obstructed	• If this error occurs with subcode 45 and new media, remove the magazine and manually load and unload the new media five times for each new cartridge to condition the new cartridges. • Update the firmware to the latest version. Many firmware enhancements have been made to reduce the occurrence of this error. • If this error occurs with sub-code 43, it could be the result of a misaligned magazine in combination with failed sensor cable. Ensure that the magazine is fully and correctly inserted, and then check whether the device can detect when the magazine is removed. • Remove all magazines and ensure that nothing is obstructing the robot. With the magazines removed, you can see inside the device with a flashlight. For increased visibility, also remove the tape drives. • MSL2024 only: If this error occurs after a firmware update and with subcode 0E on a unit that previously had a firmware revision earlier than 2.00, this error was caused by the firmware using a sensor that was unused in the earlier versions of firmware. There could be a problem with the sensor. Power cycle the unit and if the problem persists, contact HP service. • If this error occurs on a tape load or unload, power off the tape drive. Remove the drive and inspect the front of the drive for any obstructions, such as an improperly placed label. • Run the wellness test.
8B	Elevator[3] obstructed	• MSL8048 and MSL8096 only: If the robotics was just replaced, update the firmware to the latest version. • Update the firmware to the latest version. There have been a few firmware enhancements to reduce the occurrence of this error. • Remove all magazines and ensure that nothing, such as a loose tape in the device, is obstructing the raising and lowering movement of the robot. • Run the wellness test.

Error code	Description	Details and solution
8C	Rotation[4] obstructed	• If the device was moved or shipped with tape cartridges in the magazines, verify that none of the cartridges is loose, obstructing access to the tape drive. • Remove all magazines and check for any kind of obstruction. • Run the wellness test.
8D	Sled[5] obstructed	• MSL8048 and MSL8096: If the robotic has been replaced, update the Library firmware to the latest version. • MSL2024 and MSL4048: If this error occurs on the first power-on after unpacking or moving the device, or after replacing the chassis, ensure that the shipping lock was removed from the top and stored on the back panel (see "Removing the shipping lock" on page 45). • If the device was moved or shipped with tape cartridges in the magazines, verify that the cartridges did not come out of the magazines to obstruct the robotic. • Ensure that nothing is stacked on top of the device because any weight on top of the device can bow the top cover down and interfere with the robotics. • Ensure that the device is either mounted in a rack with its rack kit or in a tabletop conversion cover. The device must be supported under both of its side edges or the bottom can bow and impede robotic movement. • Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
8E	Ends of gripper[1] movement not in expected range	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.

Error code	Description	Details and solution

8F	Ends of slider[2] movement not in expected range	• Early firmware versions were not able to use as much force to get or place media in a magazine. Upgrading the Library firmware might resolve this issue.
		• If the error consistently happens on the same slot, try different tape cartridges in that slot.
		  • If the failure remains with the same slot, the magazine may be at fault.
		  • If the failure follows the tape cartridge, the tape cartridge may be at fault.
		• If the device is performing an operation that automatically returns a tape cartridge to a certain slot, make sure another tape is not loaded in that slot.
		• Run the wellness test

90	Ends of elevator[3] movement not in expected range	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
91	Ends of rotation[4] movement not in expected range	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
92	Ends of sled[5] movement not in expected range	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
93	Gripper[1] reached a position beyond expected range	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
94	Slider[2] reached a position beyond expected range	
95	Elevator[3] reached a position beyond expected range	
96	Rotation[4] reached a position beyond expected range	
97	Sled[5] reached a position beyond expected range	
98	Cartridge present sensor not found	• Power cycle the device and retry the operation.
99	Slider[2] home sensor not found	
9A	Rotation[4] home sensor not found	

Error code	Description	Details and solution
9B	Sled[5] position sensor not found	• Power cycle the device and retry the operation. • Remove the magazines and verify that all the clear plastic inserts in the magazine storage slots, except the mailslots, are present and firmly seated. • Run the wellness test.
9C	Gripper[1] range of motion out of specification	• Remove all magazines and look for any obstructions to the robot. • Update the firmware to the latest version. • Run the wellness test.
9D	Slider[2] range of motion out of specification	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
9E	Elevator[3] range of motion out of specification	
9F	Rotation[4] range of motion out of specification	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
A0	Sled[5] range of motion out of specification	• Remove all magazines and look for any obstructions to the robot. • Run the wellness test.
A1	Open Mailslot failed	• Retry the operation. • Ensure that nothing is obstructing the opening of the mailslot. • Remove the magazine and check for issues such as a tape label preventing the mailslot from opening.
A2	Error during elevator locking.	• Remove magazines and look for any obstructions to the robot. • Run the wellness test.
A3	Sled motor #2 blocked. (MSL8048 and MSL8096 only)	• Remove magazines and look for any obstructions to the robot. • If this error occurs after a robot or library controller replacement it may be due to a firmware revision mismatch between the robotic and library controller. Update the Library firmware to the latest version to resolve the mismatch. • Run the wellness test.
A4	Cannot find sled #2 block within the expected range. (MSL8048 and MSL8096 only)	
A5	Sled home sensor #2 not found (MSL8048 and MSL8096 only)	
A6	Elevator sensor not found (MSL8048 and MSL8096 only)	
B0	Command from the library controller to robotics controller did not complete in time allotted	• Reset the device and retry the operation.

Error code	Description	Details and solution
B1	Robot controller reported format error on command from Library controller	• Reset the device and retry the operation.
B2	Communication to robot from Library controller failed	• Update the firmware to the latest version. • Power cycle the device and retry the operation.
B3	Robot stopped due to a released magazine	• Check that all magazines are completely inserted and retry the operation. • If this error was caused by a manual magazine removal, replace the magazine and try the operation again. • In earlier firmware versions, the device could appear unresponsive if a magazine was left out of the device too long. Power cycle the device to restore operation. Update to the latest firmware version to prevent this issue in the future.
B4	"Tape in gripper[1]" sensor did not report the expected value	• Update the firmware to the latest version. • Remove the magazines and inspect them for a stuck tape. If no tapes are stuck in the magazines, shine a light in one of the open magazine bays to see if there is a tape in the robot or drive. If there is a tape in the robot, replace the magazines and power-cycle the device. If there is a tape in a drive, replace the magazines and run the Force Tape Eject operation. (For MSL2024, see "Forcing the drive to eject a tape (Support > Force Drive To Eject Tape)" on page 130). For MSL4048, MSL8048, or MSL8096, see "Force ejecting a drive (Support > Force Drive Eject)" on page 151.) • Run the wellness test
B5	Robotic controller not responding to command from Library controller	• Update the firmware to the latest version. • MSL8048 and MSL8096: If this error occurs with sub-code 02, verify that the robotics cable is installed correctly. • Power cycle the device and retry the operation.
B8	Library Extender missing.	See Table 47, page 201 for details. • If this is a new installation, verify that the Extender is installed properly and that both Libraries are powered on. • Update the firmware to the latest version. • Power cycle both Libraries.

Error code	Description	Details and solution
B9	Communication error on the I²C bus between the master Library and the Extender.	See Table 48, page 201 for details. • If this is a new installation, verify that the Extender is installed properly and that both Libraries are powered on. • Update the firmware to the latest version. • Power cycle both Libraries.
BA	Communication error on the serial connection between the master and lower Libraries.	The master Library cannot communicate with the lower Library. • If this is a new installation, verify that the Extender is installed properly and that both Libraries are powered on. • Update the firmware to the latest version. • Power cycle both Libraries.
BB	Stack link not established due to communication issues between the master and lower Libraries.	The master Library has some communication with the lower Library, but not enough to function. • If this is a new installation, verify that the Extender is installed properly and that both Libraries are powered on. • Update the firmware to the latest version. • Power cycle both Libraries.
BC	Power of lower Library not detected in time.	The lower Library did not respond to the master Library within the specified time. • Verify that the lower Library is powered on. • Verify that extended mode is enabled in the lower Library. • Power cycle both Libraries. • If the lower Library is an MSL4048a 4U, verify that its power supply status is **Good**  . • Verify that the master and lower Libraries have the most recent firmware versions.
BD	Library Extender has reported an error condition.	See Table 49, page 202. • Power cycle both Libraries. • Run the Library Extender cycle test. • Retry the operation.
BE	Extender or library stack incompatibility.	The Extender is incompatible with the Libraries, or the firmware versions on the Libraries and Extender are incompatible with each other. See Table 50, page 203. • Download the current library extender firmware bundle to update the Libraries to compatible firmware versions. • Retry the operation.

Error code	Description	Details and solution
C0	Network initialization failed	• Check the network cable. • Check that the network configuration is correct. • If DHCP is enabled, ensure that a DHCP server is up an running on the device's network. • Power cycle the device and try again.
C1	Telnet interface initialization failed	• Check the network cable. • Check that the network configuration is correct. • Power cycle the device and try again.
C2	Web server initialization failed	
C3	EEPROM parameter failure	• Power cycle the device and try again.
C4	LAN card initialization failed.	
C5	EEPROM write data to failure.	
C6	Ping command did not reach target	• Check the network cable. • Check that the network configuration is correct. • Power cycle the device and try again.
C7	Cannot upgrade firmware from USB	• Ensure that the correct file was selected. • Retry firmware upgrade. • If not successful, attempt a different firmware upgrade method.
C8	Cannot upgrade firmware from FTP	
C9	Cannot upgrade robotic firmware from Flash.	• Retry firmware upgrade. • If not successful, attempt a different firmware upgrade method. • If still not successful, contact HP customer support.
D0	ROM checksum incorrect	• Retry Library firmware upgrade. • Ensure that the firmware is correct for the device. • If the device continues to fail, contact HPcustomer support.
D1	RAM error during Power-On-Self-Test	Power-cycle the unit.
D2	Read or Write to NVRAM on library controller failed	Power-cycle the unit.
D3	Time controller failed during Power-On-Self-Test	Power-cycle the unit.
D4	Internal UART serial communication error	

Error code	Description	Details and solution
D5	Communication to display failed	Power-cycle the unit.
D6	Library controller memory error	
D7	Firmware upgrade error	This error can occur is an attempt is made to upgrade a drive with the wrong personality or version for that drive. • Ensure that the correct drive firmware is being used to update the drive. • If the correct drive firmware is being used, update the Library firmware. • Power cycle the device and attempt the operation again.
D8	Library controller data base error	Power-cycle the unit.
DA	When running the wellness test, the bar code did not match the previous value for that tape	• Check the bar code label for proper application and damage. • Run the wellness test again.
DC	I2C Bus failure.	• Power-cycle the device. • On the MSL4048, MSL8048, and MSL8096, power off the Library and re-seat the library controller from the back panel.
E0	Incompatible magazine detected. The mailslot was enabled with a different mailslot magazine type than is currently in the Library. For example, the mailslot was enabled with a three-slot mailslot magazine and then the lower-left magazine was replaced with a one-slot mailslot magazine.	• Either replace the lower left magazine with the original magazine, or disable and re-enable the mailslot to reconfigure the Library with the new mailslot configuration. Note: You will need to reconfigure your backup software. • If the issue continues, inspect the magazine for damage and missing light pipes or magazine prism pieces (clear plastic pieces in each slot).
E1	Key server token backup not successful (not enough available space on target token)	• Retry the backup with a token with space for more keys. NOTE: Each token can hold 100 keys. Keys cannot be overwritten or deleted; only unique keys will be written to the token.
E2	Unsupported hardware detected. Some hardware that is connected to the Library requires updated Library firmware.	• Update the Library firmware to the current version.

Error code	Description	Details and solution
E3	Error during key server token backup; backup process unsuccessful.	• Retry the backup with a different token. • If the error occurs again, contact HP customer support.

E4	Drive firmware does not support encryption.	• Ensure that all tape drives that support encryption (LTO-4 and later generations) are at the minimum firmware required for the Encryption Kit:
		  • Ultrium 1760 SCSI: W22W
		  • Ultrium 1760 SAS: U26W
		  • Ultrium 1840 SCSI: B45W
		  • Ultrium 1840 SAS: H44W
		• If necessary, update the tape drive firmware to the current version.

E5	Drive generation does not support encryption.	• When encryption is enabled with the Encryption Kit, ensure that all tape drives in the logical library support encryption (LTO-4 and later generations). When possible, avoid including LTO-2 and LTO-3 tape drives in a logical library when encryption is enabled.
E6	Key Server Token restore process did not complete, Key Server Token restore failed.	• Retry the operation on the same key server token. • Retry the operation on a new key server token.
E7	Incorrect Key Server Toke Type. Token not supported within this device.	• Verify that the USB device is an HP key server token from the HP StorageWorks 1/8 G2 & MSL Encryption Kit. • Retry the operation on a new key server token.
E8	Encryption Kit not available due to incompatible library controller.	• The first MSL2024 Libraries do not support the Encryption Kit. Contact your HP service representative to upgrade your MSL2024 chassis to a newer version.
F0	Drive exceeded temperature specification	• Check ambient temperature to ensure that it is within operating specifications. • Check all fans to determine whether they are working properly.
F1	Library controller lost communication with the drive	• Power-cycle the device and retry the operation. • Update Library and drive firmware to the latest versions. • Re-seat the tape drive to ensure a good connection to the device. • If possible, try the drive in another drive bay.
F2	Drive sled[5] not present	

Error code	Description	Details and solution
F3	Drive hardware error	• Cycle power, after several occurrences, contact technical support.
F4	Load time-out. The drive has run into a time-out while loading a tape.	• Check that the tape cartridge is supported and has not exceeded its usage life. Inspect it for damage. • Retry the operation. • Clean the drive. The error sub-code 00 indicates drive 1, sub-code 01 indicates drive 2, and so on. • If the issue continues, remove the drive and inspect the opening for any obstructions. • Attempt the Force Tape Eject process. Once the tape cartridge is ejected, unlock the magazine holding the cartridge and inspect the cartridge for damage. Discard the tape cartridge if it is damaged. (For MSL2024, see "Forcing the drive to eject a tape (Support > Force Drive To Eject Tape)" on page 130). For MSL4048, MSL8048, or MSL8096, see "Force ejecting a drive (Support > Force Drive Eject)" on page 151.)
F5	Time allotted for drive unloading exceeded	• Retry the operation. • Attempt the Force Tape Eject process. Once the tape cartridge is ejected, unlock the magazine holding the cartridge and inspect the cartridge for damage. Discard the tape cartridge if it is damaged. (For MSL2024, see "Forcing the drive to eject a tape (Support > Force Drive To Eject Tape)" on page 130). For MSL4048, MSL8048, or MSL8096, see "Force ejecting a drive (Support > Force Drive Eject)" on page 151.)
F6	No drive installed. A tape drive has never been installed.	• Install at least one tape drive. • If a tape drive is installed, re-seat it by removing it and replacing it.
F7	Support ticket download from drive not possible.	• Upgrade the tape drive firmware to the current version and try to download the support ticket again. • Use the OCP or RMI to power cycle the tape drive and then retry the operation. • Attempt to use L&TT to get the tape drive support ticket.

Error code	Description	Details and solution
F8	Invalid drive command	• Update the tape drive firmware to the current version. • Try the operation again. • If the error occurs again contact HP customer support.
F9	Invalid drive parameter	
FA	SDCI microcode error	
FB	Drive logged out	• Update the tape drive firmware to the current version. • Try the operation again. • If the error occurs again contact HP customer support.
FC	Internal SCSI command failed with check condition	
FD	Internal SCSI command timeout	

[1]Gripper: The part of the robotics assembly that pinches media in order to grip it.

[2]Slider: The part of the robotics assembly that plunges in and out for **get** and **put** operations.

[3]Elevator: The part of the robotics assembly that moves in the vertical direction.

[4]Rotation: The part of the robotics assembly that turns the robot to face each magazine and the drive.

[5]Sled: The part of the robotics assembly that moves the robot towards the OCP or back towards the drive.

Error sub-code descriptions

Table 45 Robotic error sub-codes

Sub-code	Description
01	Mechanical initialization failure
02	Connection to slave robotic failed
03	Error motor initialization
04	Error during gripper[1] close
05	Error slider[2] home positioning
06	Error elevator[3] home movement
07	Error during sled[5] movement to rotation[4] position
08	Error during rotation[4] initialization, get range failed
09	Error elevator[3] init
0A	Error during rotation[4] to far position
0B	Error first sled[5] init, move to sensor failed

Sub-code	Description
0C	Error during sled[5] movement to rotation[4] position
0D	Error during rotation[4] to slide position
0E	Error slider[2] init, get range failed
0F	Error during slider[2] forward movement
10	Error gripper[1] init, get range failed
11	Error during slider[2] home movement
12	Error during rotation[4] to FAR position
13	Error sled[5] init, move to sensor failed
14	Error during sled move — check shipping lock
20	Error inventory scan
21	Error during gripper[1] close
22	Error slider[2] home movement
23	Error during move gripper[1] to scan pos
24	Error reading bar code label
28	Error Extra inventory scan
29	Error during closing gripper[1]
2A	Error slider[2] preposition movement
2B	Error during opening gripper[1]
2C	Error during sled[5] movement up to sensor
2D	Error slider[2] preposition backwards movement
30	Error slot preposition
31	Error during sled[5] movement in FLMoveRotation
32	Command sending to robotic failed
33	Error during elevator[3] movement in FLMoveRotation function

Sub-code	Description
34	Error during rotation[4] in FLMoveRotation function
35	Error during elevator[3] movement in FLMoveRotation function
36	Error during sled[5] movement in FLMoveSled function
37	Error during sled[5] positioning to sensor in FLMoveSled function
38	Error during sled[5] positioning to mailslot in FLMoveSled function
39	Error during sled[5] positioning without sensor
3A	Error during elevator movement without sensor
3B	Error slot position sensor not found
40	Movement to/from slot failed
41	Error during first slider[2] movement
42	Error during first gripper[1] movement
43	Error during second slider[2] movement
44	Error during second gripper[1] movement, get range failed
45	Error during third slider[2] movement, move home failed
46	Error during set hold current to avoid torsion
50	Preposition to drive failed
51	Elevator[3] movement to home sensor failed
52	Sled[5] movement to home sensor failed
53	Error during sled[5] movement to drive position
54	Error during rotation[4] to drive position
55	Error during elevator[3] movement in drive position
56	Error during sled[5] movement to rotation position.
57	Error during rotation to end position.
60	Move from/to drive failed

Sub-code	Description
61	Error during first slider[2] movement
62	Error during first gripper[1] movement
63	Error during second slider[2] movement
64	Error during second gripper[1] movement, get range failed
65	Error during third slider[2] movement, move home failed
70	Release magazine failed
71	Error during sled[5] movement to rotation[4] position
72	Error during rotation[4] to unlock position
73	Error during move sled[5] to block
80	Opening mailslot failed
81	Error during movement to mailslot open position
82	Error during moving back, sensor was found
90	Movement to home position failed
91	Elevator[3] movement to home position failed
92	Error during sled[5] movement to rotation[4] position
93	Error during rotation[4] to home or far position
94	Sled[5] movement to home sensor position failed
95	Sled[5] movement to transport position failed
99	Error during rotation movement to rotation minimum position
A0	Movement to mailslot failed
A1	Sled[5] movement to sensor failed
A2	Sled[5] movement to rotation[4] position failed
A3	Elevator[3] movement to home position failed
A4	Error during rotation[4] to far position

Sub-code	Description
A5	Sled[5] movement to mailslot position failed
A6	Error during elevator movement to position
A7	Error during mailslot detection
B0	EEPROM on robotics controller not accessible or error during read/write operation
B1	Save/restore configuration settings: not enough internal memory available for creating the file and restoring the file respectively
B2	Save/restore configuration settings: restore buffer corrupted, checksum calculation failed
B3	Save/restore configuration settings: database field corrupted
B4	Save/restore configuration settings: invalid personality
B5	Save/restore configuration settings: invalid file
C0	Check on magazine type failed
C1	Rotation[4] movement during check on magazine type failed
C2	Elevator[3] movement during check on magazine type failed
C3	Sled[5] movement during check on magazine type failed
C4	Sled[5] movement to sensor during check on magazine type failed
D0	12-mailslot magazine release failed
D1	Elevator[3] movement to home position during 12-mailslot magazine release failed
D2	Sled[5] movement to rotation position during 12-mailslot magazine release failed
D3	Rotation[4] movement to far position during 12-mailslot magazine release failed
D4	Sled[5] movement to home position during 12-mailslot magazine release failed
D5	Sled[5] movement during 12-mailslot magazine release failed
D6	Rotation[4] movement during 12-mailslot magazine release failed
D7	Elevator[3] movement during 12-mailslot magazine release failed
D8	Slider[2] pre-position during 12-mailslot magazine release failed
D9	Open gripper[1] movement during 12-mailslot magazine release failed.

[1]Gripper: The part of the robotics assembly that pinches media in order to grip it.

[2]Slider: The part of the robotics assembly that plunges in and out for **get** and **put** operations.

[3]Elevator: The part of the robotics assembly that moves in the vertical direction.

[4]Rotation: The part of the robotics assembly that turns the robot to face each magazine and the drive.

[5]Sled: The part of the robotics assembly that moves the robot towards the OCP or back towards the drive.

Table 46 Device error sub-codes

Error code	Description
90	Robotic load not reached Cartridge Present sensor
91	No activity after Load command
92	Time-out while loading tape
93	No activity after load command
94	Time-out drive Unload
95	Drive terminated unsuccessfully
96	Tape not ejected at robot unload
97	Slot not free at robot unload
98	Cartridge not seated in load phase 1

Table 47 Sub-codes for error B8

Sub-code	Message
40	Library Extender expected
41	Lower Library expected
42	Master Library expected

Table 48 Sub-codes for error B9

Sub-code	Message
31	No device present
32	I²C write error

Sub-code	Message
33	I²C read error

Table 49 Sub-codes for error BD

Sub-code	Message	Cause	Solution
01	Sensor master home not found.	The Extender robotic cannot locate its home position within the master Library.	• Power cycle the master Library. • Run the Library Extender cycle test. • Retry the operation.
02	Sensor lower home not found.	The Extender robotic cannot locate its home position within the lower Library.	• Power cycle the lower Library. • Run the Library Extender cycle test. • Retry the operation.
03	Motor blocked in master home position.	The Extender robotic is stuck in its home position within the master Library.	• Power cycle the master Library and run the Library Extender cycle test. • Retry the operation. If the motor is still blocked, remove the Extender from the Libraries, and then inspect the Extender and master Library for a physical blockage. Re-install the Extender.
04	Motor blocked in lower home position.	The Extender robotic is stuck in its home position within the lower Library.	• Power cycle both Libraries and run the Library Extender cycle test. • Retry the operation. If the motor is still blocked, remove the Extender from the Libraries, and then inspect the Extender and Libraries for a physical blockage. Re-install the Extender. • Retry the operation.
05	Motor blocked between master and lower home position.	The Extender robotic is stuck between its two home positions.	
06	Motor blocked and hot.	The Extender robotic is stuck and the motor is hot.	
10	Motor error.	The library controller could not start the motor in the Extender robot.	• Power cycle both Libraries. • If this is a new installation or the Libraries have been moved, verify that the Extender is installed properly and that both Libraries are powered on.

Sub-code	Message	Cause	Solution
11	Motor block in extender path.	Debris is keeping the Extender robotic from moving.	• Power cycle both Libraries and run the Library Extender cycle test. • Retry the operation. If the motor is still blocked, remove the Extender from the Libraries, and then inspect the Extender and master Library for a physical blockage. Re-install the Extender.
12	Motor position not valid.	The Extender robotic does not know where it is positioned.	• Power cycle both Libraries and run the Library Extender cycle test. • Retry the operation.
13	Extender has not been initialized yet.	The library controller issued a move command to the Extender, but the Extender was not initialized.	• Power cycle both Libraries and run the Library Extender cycle test. • If this is a new installation or the Libraries have been moved, verify that the Extender is installed properly and that both Libraries are powered on.
14	Motor is hot.	The motor that moves the Extender robotic has exceeded its thermal limit.	• Verify that airflow to the Extender has not been blocked.
21	Timeout while waiting for extender becoming ready.	The Extender did not respond to the master Library within the specified time.	• Verify that the Extender is installed properly and that both Libraries are powered on.

Table 50 Sub-codes for error BE

Sub-code	Message	Cause	Solution
51	Extender personality not matching.	The Extender is not an HP StorageWorks MSL Library Extender.	• Verify that the Extender is an HP StorageWorks MSL Library Extender.
52	Lower Library personality not matching.	The lower Library is not an HP StorageWorks MSL2024 or MSL4048 Tape Library.	• Verify that the lower Library is an HP StorageWorks MSL2024 or MSL4048 Tape Library.

Sub-code	Message	Cause	Solution
53	Extender firmware not matching.	The firmware version of the Extender is not compatible with the firmware version of the master Library.	• Update the extended library firmware with the current firmware bundle, which will update both Libraries and the Extender with compatible firmware versions.
54	Lower Library firmware level not matching.	The firmware versions of the master Library and lower Library are not compatible with each other.	• Disable extended mode, update both Libraries to the most recent released versions, and then re-enable extended mode.
55	Incompatible height form factor for master Library.	The master Library is not an MSL4048 or MSL8096.	• Verify that the master (top) Library is an MSL4048 or MSL8096.
56	Incompatible height form factor for lower Library.	The lower Library is not an MSL2024 or MSL4048.	• Verify that the lower Library is an MSL2024 or MSL4048.
57	Extender firmware corrupted	The firmware upgrade failed, possibly because of a power failure during the upgrade operation.	• Power cycle the master Library. (The master Library will attempt to download the Extender firmware to the Extender when the master Library is powered on.)

Table 51 Sub error codes related to robotics errors during movement to extender position

Sub-code	Message
F0	Invalid stack configuration (1U cannot be the master or lower Library)
F1	Error during elevator home movement
F2	Error during sled movement to home sensor
F3	Error during sled movement to extender position
F4	Error during rotation movement to extender position
F5	Error during elevator movement to extender position
F6	Error during sled movement to rotate position
F7	Error during rotation movement
F8	Error cartridge present sensor during cartridge transfer from robotics to extender carrier (and reverse)
F9	Cartridge present sensor deviates from expected parameter
FA	Error during first slider movement (movement with opened gripper) from/to extender position

Sub-code	Message
FB	Error during first gripper movement (open gripper) from/to extender position
FC	Error during second gripper movement (close gripper) from/to extender position
FD	Error during third slider movement (move to block) from/to extender position
FE	Error during third gripper movement (close gripper) from extender position
FF	Error during fourth slider movement (pull back) from/to extender position

Drive error codes

Table 52 Drive error codes

Error code	Description
01	Drive broken
02	Temperature exceeds limit
03	Tape error
04	Cleaning cartridge is expired
05	Drive needs cleaning
06	Library lost communication with the drive
07	Warning that the tape is nearing its end of life

Warning events

Table 53 Warning event codes

Event code	Description	Details and Solution
30	SCSI: transport element full	The application software made an illegal request.
31	SCSI: all slots empty	
32	SCSI: invalid opcode	
33	SCSI: invalid element address	
34	SCSI: invalid field in CDB	
35	SCSI: invalid drive specified	
36	SCSI: SEND DIAGNOSTIC command: invalid test number	
37	SCSI: invalid LUN	
38	SCSI: parameter list length error	
39	SCSI: parameter list error: invalid field	
3A	SCSI: parameter list error: parameter not supported	
3B	SCSI: parameter value invalid	The application software made an illegal request.
3C	SCSI: saving parameters not supported	
3D	SCSI: invalid ID message	
3E	SCSI: destination element full	
3F	SCSI: source slot or drive empty	
40	SCSI: wrong checksum	
41	SCSI: command sequence error	
42	SCSI: drive disabled	The application software requested to use a drive that is disabled. Check the device configuration.
43	SCSI: mailslot disabled	The application software requested to use the mailslot, but the mailslot is disabled. Check the device configuration.

Event code	Description	Details and Solution
44	SCSI: flash image does not fit bootcode	Check the version of firmware used for the upgrade. The firmware is incompatible with this device.
45	SCSI: media removal prevented by drive	The application software has locked media removal and either the software or device user interface attempted to remove the media. NOTE: This IS NOT a hardware issue. If the issue cannot be resolved with the application software, power off the device, disconnect the data cable, and then power on the device.
46	SCSI: media removal prevented by library	
47	SCSI: flash image does not fit personality	Check the firmware file used for the upgrade. The firmware is incompatible with this device.
48	SCSI: tape drive not supported by this library	The tape drive is not supported by the firmware in this device. Upgrade the device firmware to the most up-to-date version. Verify that the drive has an HP MSL-G3 or 1/8 G2 firmware revision. If firmware is not the correct type, the wrong tape drive has been installed. Use only HP-approved support to insure that the correct tape drives are used.
49	SCSI: incompatible magazine, magazine not accessible	Verify that a supported magazine for that slot is inserted. If the magazine is in the lower left position, verify that the type of magazine is consistent with the mailslot configuration.
4A	Source not ready	• Retry the operation. • Check the status of extended Libraries.
4B	Destination not ready	• Retry the operation. • Check the status of extended Libraries.
4C	Reservation failed	The application software made an illegal request.
4D	Library controller busy	Retry the operation.
4E	Invalid robotic request	
4F	Robotic not initialized	

Event code	Description	Details and Solution
50	Cartridge location in a different partition; move across partition boundaries was initiated.	The Library will not move a cartridge from one logical library to another logical library. To move a cartridge from one logical library to another: 1. Move the cartridge to the mailslot. 2. Remove the cartridge from the mailslot. 3. Close the mailslot. 4. Replace the cartridge in the mailslot. 5. Move the cartridge to a slot in the new logical library.
51	Incompatible medium	• Verify that the drives are installed correctly. • Verify that the cartridge and tape drive generation are compatible. See "Backward read compatibility" on page 63. • Verify that the tape is correct for the operation initiated.
52	All slots full; no movement possible	Remove a cartridge from the device to make a slot available for the move operation.
53	Wellness test: invalid test setup	Load tapes in the four top-level corner slots. See"The wellness test" on page 177.
55	Invalid license key	• Verify that the correct license key was entered. • Verify that the **Caps Lock** key is not depressed. The key is case sensitive.
56	No decryption key available on token	Ensure that the key server token containing the key used to encrypt the tape is installed in the USB port.
57	Key server token PIN required	Use the RMI to enter the PIN for the key server token that is installed in the USB port. NOTE: The PIN is required every time a token is installed in the USB port and every time the Library is powered on.
58	Parity error	• Retry the operation. • If the problem continues, contact HP customer support.
59	Error log overflow	
5A	Unable to downgrade firmware while encryption enabled.	Disable encryption before downgrading firmware.
5B	Invalid cartridge. LTO3 media is not supported with encryption enabled.	• Verify that the tape cartridge is supported. • Update the tape drive firmware to the latest version to use LTO3 media.

Event code	Description	Details and Solution
5C	IPv6 will not be supported after downgrading firmware.	Change the network settings to IPv4 before downgrading firmware.
5D	Wrong drive firmware — invalid drive firmware type.	Drive firmware is specific to the drive model and interface. Select the drive firmware specific to this drive. If the firmware file could have been renamed, obtain a new copy of the firmware file
5E	Illegal drive position of FH drive.	In an MSL4048, a full-height tape drive may not be installed in the middle two drive bays; it must be installed in either the upper two drive bays or lower two drive bays. Reinstall the tape drive in a supported drive bay.
5F	No firmware downgrade possible.	The device firmware may not be downgraded in cases that would compromise encrypted data, critical component support, or license terms. Check the configuration settings. If the device has been using the Encryption Kit, you may need to disable encryption before downgrading firmware. If the Library Extender is installed, you may need to uninstall the Library Extender before downgrading firmware.
60	Cleaning tape installed.	Complete the cleaning process and retry the operation.
61	Cleaning failure. Cleaning process could not be performed.	• Check cleaning tape and exchange if necessary. • Retry the operation.
62	Cleaning tape expired.	Exchange the cleaning tape.
63	Invalid cartridge. Drive has rejected the cartridge as invalid.	• Verify that the cartridge generation and technology are supported by the device. See "Tape cartridges" on page 59. • Retry the operation. • If problems persist, exchange the data cartridge.
64	Invalid cleaning cartridge. Drive has rejected the cartridge as invalid.	
65	Invalid upgrade cartridge. Drive has rejected the cartridge as invalid.	• Retry the operation. • If problems persist, exchange the data cartridge.
66	Diagnostic tape write protect.	The diagnostic test needs to write data but the tape being used for the test is write protected. Ensure that the device has a tape that is not write protected for use during the diagnostic test.

Event code	Description	Details and Solution
67	Incompatible medium	The drive tried to read or write data from a tape from an incompatible LTO generation. For compatibility information see Backward read compatibility, page 63.
70	SCSI message error	Check the SCSI cable connection and verify that the maximum cable length is not exceeded. Verify that the SCSI bus is properly terminated.
71	SCSI parity error	
72	SCSI invalid message	
73	SCSI: overlapped command attempt	The application software made an illegal request.
74	SCSI: echo buffer overwritten	
80	Movement retry. Robotics movement did not succeed but was successful on a retry.	Recovered error move operation. No action required. Occasional retries are normal operation.
81	Drive sled fan alert. Fan motion has stopped.	• Check the tape drive fan on the Library back panel to see whether the fan is operational and not obstructed. NOTE: The sub-error code indicates the affected tape drive. For example, 00 is drive 1 and 01 is drive 2. NOTE: Fan only operates when cooling is required.
82	Clean request from the tape drive	Clean the indicated tape drive using a valid cleaning tape. NOTE: The sub-error code indicates the affected tape drive. For example, 00 is drive 1 and 01 is drive 2.
83	Media attention	Evaluate media status using L&TT.
84	Tape drive tape alert; tape drive reported a warning or critical tape alert.	Evaluate drive status using L&TT.
85	DHCP request has failed	• Check the network to ensure connection to the DHCP server. • Check that the network configuration is correct. • If DHCP is enabled, ensure that the DHCP server is up and running on the device's network. • Power cycle the device and retry the operation.

Event code	Description	Details and Solution
86	Autoclean media warning; not enough media present to support autocleaning.	Insert a valid cleaning cartridge into the Library.
87	Drive not supported; the tape drive was disabled because it cannot be used in this Library.	Replace the drive with a compatible tape drive.
88	Drive firmware revision has not changed after a tape drive firmware upgrade.	• Verify that the firmware image is correct for the tape drive. • Retry the operation. • Retry using an alternate firmware upgrade method.
89	Power supply fan has failed. Redundancy may be at risk.	• Verify that the indicated fan is operational and not physically obstructed. • Upgrade to the latest version of firmware. NOTE: The sub-error code indicates the affected power supply. 00 is the bottom power supply. 01 is the second power supply.
8A	Power supply has failed. Redundancy is not available.	• Check the AC power cable connection. • Verify that the indicated power supply is correctly installed and the thumbscrews are tight. NOTE: The sub-error code indicates the affected power supply. 00 is the bottom power supply. 01 is the second power supply.
8B	One of the redundant power supplies has failed.	• Check the AC power cable connections. • Verify that both power supplies are correctly installed and the thumbscrews are tight.
8C	Invalid robotics code; does not match with the loaded Library firmware.	Install new Library firmware, which will install a compatible robotics firmware version.
8E	Cleaning tape nearly expired. Only one or two cleaning operations remain.	Obtain a new cleaning tape for use when the current cleaning tape expires.
8F	I^2C bus recovery	Contact HP Service if this unexpected condition occurs.
90	Power supply has failed. Master Library power redundancy not available.	• Verify that both power supplies are correctly installed and the thumbscrews are tight. • Check AC power cable connections NOTE: The MSL2024 does not have a redundant power supply option.
91	Power supply has failed. Lower Library power redundancy not available.	

Event code	Description	Details and Solution
92	VPD data recovery.	Power cycle the device and retry the operation.
DB	External drive cooling fan failure (fan motion has stopped). The subcode indicates which drive sled fan is affected. Subcode 00: drive sled #1 Subcode 01: drive sled #2 etc.	Verify that the fan for the indicated drive sled is operational and not obstructed. NOTE: The fan only operates when cooling is required.
DD	Power supply cooling fan failure. Power supply x fan has failed. Redundancy may be at risk. (MSL8048 and MSL8096 only) The subcode indicates which power supply fan is affected. Subcode 00: lower power supply Subcode 01: upper power supply	• Verify that the fan for the indicated power supply is operational and not obstructed. • Upgrade to the latest version of Library firmware. • If the problem continues, replace the power supply
DE	Power supply x has failed. Redundancy is not available. (MSL8048 and MSL8096 only) The subcode indicates which power supply fan is affected. Subcode 00: lower power supply Subcode 01: upper power supply	
DF	One of the redundant power supplies has failed. Redundancy is not available. (MSL4048 only) The subcode indicates which power supply fan is affected. Subcode 00: lower power supply Subcode 01: upper power supply	• Verify that the power supply is correctly inserted and that the thumbscrews are tightened. • Power cycle the device. • If the problem continues, contact HP customer support.
E9	Power supply redundancy not available in the master Library.	• Verify that the power supplies in the Library are inserted correctly and that the thumbscrews are adjusted. • Check the AC power cable connections. NOTE: The MSL2024 does not have a redundant power supply option.
EA	Power supply redundancy not available in the lower Library.	
F2	Drive sled missing.	• Power cycle the device and retry the operation. • Re-seat the tape drive to ensure a good connection to the device. • MSL8048 and MSL8096: Verify that the drive is installed in one of the four locations that has a drive connector.

Configuration change events

Table 54 Configuration change events

Value	Configuration event	Description
0x41	Drive SCSI changed	Drive SCSI ID has changed
0x42	Library SCSI changed	Library SCSI ID changed (*)
0x43	Drive enable	Drive was enabled
0x44	Drive disable	Drive disabled
0x45	Master drive assigned	Drive master assigned
0x46	Drive sled added	Drive sled added
0x47	Drive sled removed	Drive sled removed
0x48	Library mode changed	Library mode changed (automatic, sequential, random)
0x49	Element address	Element address changed
0x4A	Net parameter	Network parameter has changed
0x4B	Slots reserved	Slots reserved
0x4C	Mailslot support	Mailslot support
0x4D	Admin password	Admin password has changed
0x4E	Date/time set	Date and time of RTC set
0x4F	Barcode format	Barcode format alignment changed
0x50	Default config set	Default configuration set
0x51	FW upgrade Library	Library firmware was upgraded
0x52	FW upgrade drive	Drive firmware was upgraded
0x53	Auto-clean feature set	Auto-cleaning switched on or off
0x54	Drive FC parameters	Drive Fibre Channel parameters changed
0x55	Power supply added	A power supply was added to the system
0x56	Key server token was removed	A key server token was removed
0x57	Key server token was inserted	A key server token was inserted
0x58	Encryption has been enabled	Encryption has been enabled
0x59	Encryption has been disabled	Encryption has been disabled
0x60	Extender unit has been inserted	The Library Extender has been inserted
0x61	Extender unit has been removed	The Library Extender has been removed

Value	Configuration event	Description
0x62	Extender unit has been enabled	The Library Extender has been enabled
0x63	Extender unit has been disabled	The Library Extender has been disabled
0x64	Library door lock status change	The status of the Library door lock has changed
0x65	Hostname has been changed	Hostname has been changed
0x66	Database has been restored from robot	The Library configuration has been restored from the robot
0x67	Serial number has been changed	The serial number has been changed
0x68	World wide identifier base has been changed	The world wide identifier base has been changed
0x69	EUI64 identifier has been changed	EUI64 identifier has been changed
0x6E	License key has been added or removed	License key has been added or removed
0x6F	User interface language change	User interface language has changed

Information events

Table 55 Informational events

Value	Informational event	Description
0x01	Move element	Move element command
0x02	Inventory rescan	The inventory was rescanned
0x03	Drive clean	Drive cleaning process
0x04	Mailslot open	Open mailslot command
0x05	Mailslot close	Close mailslot
0x06	Magazine remove	Magazine remove event
0x07	Magazine reinsertion	Magazine insertion event
0x08	Power on	Power on event
0x09	Power off	Power off event
0x0A	User login	User login at interface (RMU, OCP, SERIAL)
0x0B	User logout	User logout at interface (RMU, OCP, SERIAL)
0x0C	System test run	System test run
0x0D	Wellness test run	The wellness test was run
0x0E	Bus reset occurred	A bus reset occurred
0x0F	Device reset	Device reset command

Value	Informational event	Description
0x10	Abort	SCSI task aborted
0x11	Drive tape alert flag	Drive reported informational tape alert flag
0x12	Power on init done	Power on init completed successful
0x13	Incorrect key server token PIN entered	Incorrect key server token PIN entered
0x14	Backup initiated on key server token	Incorrect key server token PIN entered
0x15	Backup off key server token finished	The backup of the key server token has finished.
0x16	A new write key was automatically generated on the key server token.	A new write key was automatically generated on the key server token.
0x17	A new write key was manually generated on the key server token.	A new write key was manually generated on the key server token.
0x18	More than 5 invalid key server token PIN attempts	More than five attempts were made to set the key server token with invalid PINs.
0x19	Restore initiated on key server token	A restore operation was initiated on the key server token.
0x1A	Restore off key server token finished	A restore operation was completed on the key server token.
0x1B	Key server token is over 90% full	The key server token is over 90% full.
0x1C	Key server token contains keys that have not been backed up.	The key server token contains keys that have not been backed up.

Using HP Library & Tape Tools to diagnose problems

With HP Library & Tape Tools installed on the host server you can:

- Identify all parallel SCSI devices connected to your system.
- View detailed configuration, identification, inventory, and drive information for the device.
- Easily update device and drive firmware.
- Run advanced diagnostic tests, including connectivity, read/write, media validation, and testing the functionality of the device.
- View device and drive error logs.
- Generate a detailed support ticket that can be e-mailed or faxed to your support representative for analysis.

The HP Library & Tape Tools diagnostic provides an intuitive graphical user interface with integrated context-sensitive help. It can be downloaded free of charge from http://www.hp.com/support/TapeTools.

To diagnose problems with L&TT:

1. Run L&TT on the host server. You can install L&TT on the host server, or run it from a CD-ROM or USB flash drive on the host server.
2. Pull a support ticket for the device.
3. Look at the device analysis results for additional information about the device's operation.

6 Upgrading and servicing the Tape Library

△ CAUTION:

A discharge of static electricity can damage static-sensitive devices or microcircuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage.

To prevent electrostatic damage, observe the following precautions:

- Transport products in static-safe containers such as conductive tubes, bags, or boxes.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free stations.
- Cover the device with approved static-dissipating material. Provide a wrist strap connected to the work surface and properly grounded tools and equipment.
- Keep the work area free of nonconducting materials, such as ordinary plastic assembly aids and foam packing.
- Make sure you are always properly grounded when touching a static-sensitive component or assembly.
- Avoid touching pins, leads, or circuitry.
- Use conductive field service tools.

⚠ WARNING!

The HP StorageWorks MSL2024 Tape Library weighs up to 15.6 kg (34.3 lb) without media and up to 20.4 kg (44.9 lb) with media (24 cartridges). The MSL4048 Tape Library weighs up to 24.6 kg (54.1 lb) without media and up to 34.2 kg (75.2 lb) with media (48 cartridges). The MSL8048 Tape Library weighs up to 46.6 kg (102.7 lb) without media and up to 56.2 kg (122.6 lb) with media (96 cartridges). The MSL8096 Tape Library weighs up to 46.6 kg (102.7 lb) without media and up to 68.8 kg (151.7 lb) with media (96 cartridges).

⚠ 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.
- Install stabilizing feet on the rack.
- Extend only one rack component at a time. Racks may become unstable if more than one component is extended.

△ CAUTION:

Before moving the Library, remove all media. During a move, the cartridges could come out of the storage slots and damage the Library.

Possible tools needed

To service the Library you may need one or more of the following tools:

- Flat-blade screwdrivers (large and small)
- Short-handle #1 Phillips screwdriver
- #2 and #3 Phillips screwdrivers
- Ground strap
- Paper clip or pin (for manual magazine removal)
- HP Library and Tape Tools (L&TT) diagnostic software

NOTE:

You may use the HP StorageWorks Library and Tape Tools (L&TT) diagnostic utility to perform diagnostic functions for the Library. L&TT is a diagnostic tool designed to aid in the installation and maintenance of HP tape storage products. L&TT includes several features designed for use by both HP storage customers and trained service personnel. L&TT is available for download at the following HP website at no cost: http://www.hp.com/support/TapeTools. Frequent firmware image updates to the website are released on the Internet. For optimal performance, HP recommends that you update your system periodically with the latest device firmware.

Installing a new tape drive

The MSL2024, MSL4048, MSL8048, and MSL8096 Tape Libraries support HP Ultrium tape drives. The MSL2024 Tape Library can support one full-height tape drive or up to two half-height tape drives. The MSL4048 Tape Library can support up to two full-height drives or up to four half-height drives. The MSL8048 and MSL8096 can support up to four tape drives.

To add an Ultrium tape drive:

1. Locate the next vacant drive bay on the back of the Library, which should be directly above the currently installed drives. The MSL8048 and MSL8096 only have drive connectors at the locations of the full-height drives, so you must leave a half-height space above a half-height drive, as shown in Figure 104.

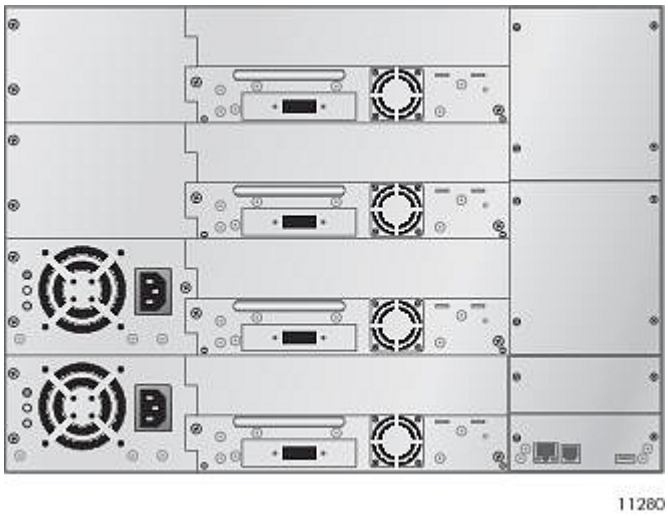


Figure 104 MSL8048 and MSL8096 half-height drive bay locations

NOTE:

Tape drives are numbered from the bottom of the Library up starting with 1. If you leave a space and later add a drive in the space, the new drive will be assigned the next available number, leaving the drives numbered out of order. If the settings are restored to the factory defaults or the Library is power-cycled, the drives will be renumbered and you might need to update the configuration of your backup software.

NOTE:

The MSL4048 Library will not operate with a full-height tape drive installed in the second and third half-height drive bays. Install a full-height tape drive either in the bottom two drive bays or the top two drive bays.

Remove the face plate covering the drive bay by removing the screws holding it in place.

2. Holding the tape drive by the handle and supporting it from the bottom, slide it into the drive bay until it is flush with the back of the Library (see Figure 105).

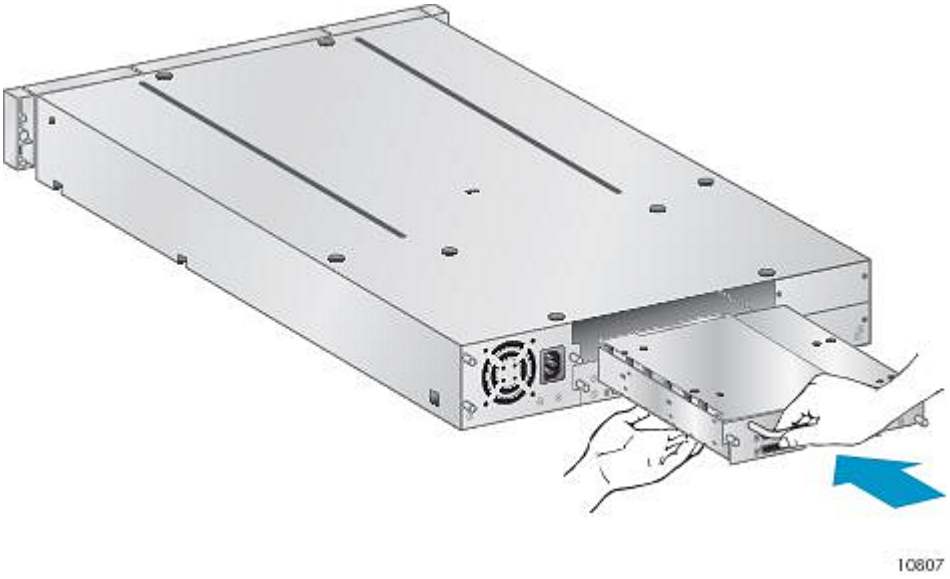


Figure 105 Installing a new tape drive

3. Tighten the blue captive screws (see Figure 106) by hand to secure the tape drive to the Library chassis.

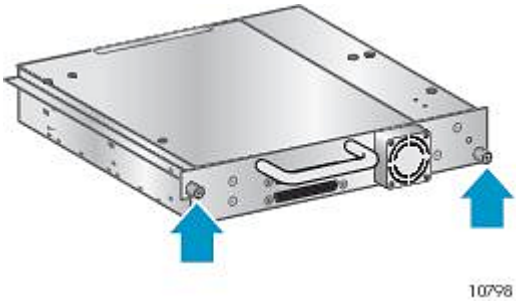


Figure 106 Tighten the blue thumbscrews

4. Plan the configuration for the new tape drive:
   - Parallel SCSI: See "Planning the SCSI configuration" on page 38. If the tape drive's SCSI address must be changed, do so before connecting the drive to the host. See "Changing the SCSI address" on page 52.
   - SAS: See "Planning the SAS configuration" on page 40.
   - Fibre Channel: See "Planning the Fibre Channel configuration" on page 41.

5. Connect the tape drive to the host:
   - Parallel SCSI: Connect one of the connectors on the parallel SCSI cable to the tape drive and connect the other end of the cable to the HBA or other device on the same parallel SCSI bus. If the tape drive is the last device on the parallel SCSI bus, attach the terminator to the other parallel SCSI connector on the tape drive.
   - SAS: The cable recommended for use with the SAS Library can connect up to four SAS tape drives to an HBA. Any tape drive can be connected with any of the four tape drive ends of the cable. Plug one of the unused mini-SAS connectors on the tape drive end of the cable into the connector on the tape drive.
   - Fibre Channel: Plug one end of the Fibre Channel into a port on the tape drive. Plug the other end of the cable into the HBA or switch.
6. If necessary, upgrade the Library and drive firmware using HP Library & Tape Tools, the RMI, or a USB flash drive.

Removing and replacing a tape drive

Tape drives are installed at the back of the Library.

NOTE:

This part is hot-swappable. You do not need to power off the Library to replace a drive.

CAUTION:

Powering off the master drive interrupts SCSI communication to the Library and robotics.

To remove a tape drive:

1. Using the remote management interface or the operator control panel, unload any tape cartridge from the drive you would like to remove, if present.
2. Power off the drive from the OCP or RMI. ((For the MSL2024 "Powering a drive on or off (Support > Power On/Off Drives)" on page 125. For the MSL4048, MSL8048, and MSL8096, see "Powering drives on and off (Support > Power on/off Drives)" on page 149.)
3. Make sure the LED on the tape drive is off (see Figure 107).

Figure 107 Drive LEDs

1. Tape drive LED

4. Remove the cables and terminator, if applicable, from the tape drive being removed.

5. Loosen the blue captive thumbscrews on the drive (see Figure 108). Half-height drives have two captive thumbscrews; full-height drives have four captive thumbscrews.

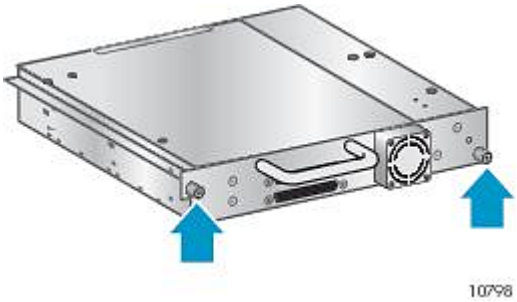


Figure 108 Captive screws on the tape drive

6. Pull straight back on the tape drive handle to remove the tape drive from the Library (see Figure 109).

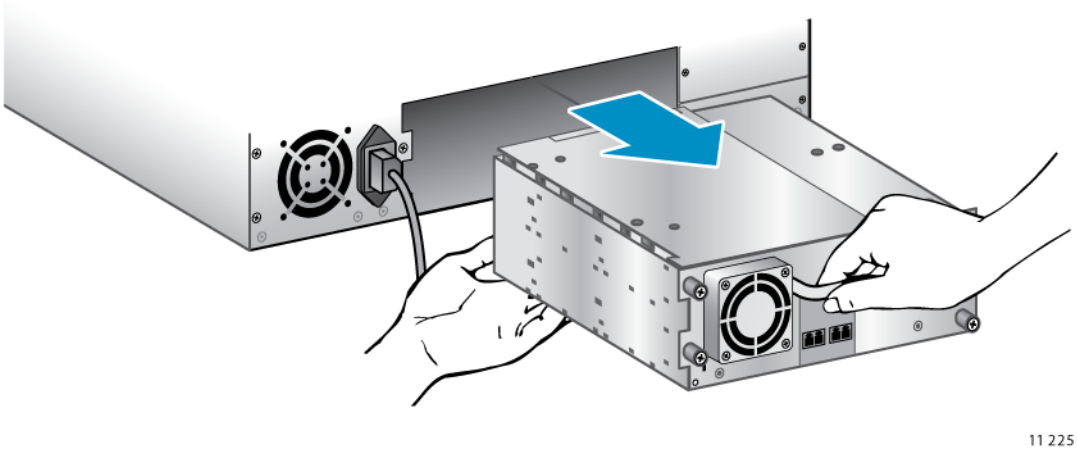


Figure 109 Removing a tape drive

To replace a tape drive:

1. Before installing the new drive, inspect the connectors on the tape drive. Ensure that the connectors are intact, free of any foreign objects, and have no cracks or deformed or bent contacts.

2. Slowly insert the new tape drive into the drive bay, and align the connectors on the Library while supporting the drive assembly until the drive seats itself against the back of the Library (see Figure 110).

△ CAUTION:

Push in on the tape drive handle while supporting the bottom of the tape drive until it is properly seated. Damage to the connector pins may occur if this procedure is not followed.

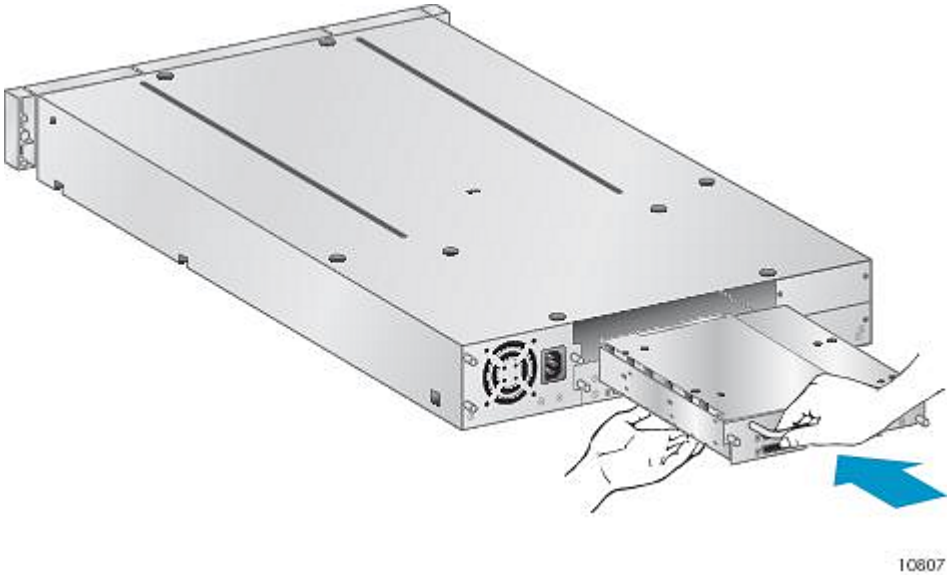


Figure 110 Installing a tape drive

3. Tighten the blue captive thumbscrews by hand until the drive is secure.
4. Attach the cords and terminator, if necessary, that you removed from the old tape drive.
5. Power on the tape drive.
6. If necessary, upgrade the Library and drive firmware using HP Library & Tape Tools, the RMI, or a USB flash drive.

NOTE:

If you are upgrading a parallel SCSI drive, be sure to use supported cabling configurations. See "Planning the SCSI configuration" on page 38.

NOTE:

Use *L&TT* to upgrade the drive to the latest firmware. You can download the latest version of *L&TT* at: http://www.hp.com/support/TapeTools.

NOTE:

The Library assigns the WWNames used by Fibre Channel drives to the drive locations. When you replace a tape drive, the WWName is re-assigned to the replacement drive.

The Library assigns SAS World Wide IDs to the drive locations. When you replace a SAS tape drive, the World Wide ID is re-assigned to the replacement drive.

Removing and replacing a magazine

CAUTION:

Only remove a magazine manually in an emergency or if you need to remove the magazines from both sides of the device. Failure to follow normal procedure can cause data loss and equipment damage.

If possible, the magazines should be released using the OCP or RMI. HP recommends that you release the magazines using the OCP or RMI; however, if the OCP process fails, or if a magazine needs to be removed when the power to the device is off, you can release the magazines manually.

TIP:

The MSL4048, MSL8048, and MSL8096 have multiple magazines on each side. The Library will release all of the magazines on a side at the same time. If you want to remove more than one magazine from a side, pull the magazines that need to be removed out a few centimeters or inches immediately after the Library releases them. You can then remove the magazines from the Library one at a time.

Using the MSL2024 operator control panel

Removing magazines requires the administrator password.

To remove a magazine:

1. From the Home screen, press **Previous** or **Next** until the screen displays **Operations**.
2. Press **Enter** to select.
3. Press **Previous** or **Next** until the screen displays either **Unlock Left Magazine** or **Unlock Right Magazine**.
4. Press **Enter** to select the desired magazine to unlock.
5. Enter the administrator password if requested.
6. The display reads **Left Magazine Unlocked** or **Right Magazine Unlocked**.
7. Pull the released magazine out of the device.
8. The screen displays **Insert Left Magazine** or **Insert Right Magazine**. *The Library cannot perform any other operation until the magazine is replaced.* After exchanging tapes in a magazine, slide the magazine completely into the Library. The magazine locks into place after it is correctly installed and the Library inventories the magazine.

Using the MSL4048, MSL8048, and MSL8096 operator control panel

Removing magazines requires the administrator password.

To remove magazines:

1. From the **Operations** menu, select **Unlock Left Magazines** or **Unlock Right Magazines**.

NOTE:

The MSL8048 will only unlock the left magazines.

2. Enter the administrator password if requested.
3. Pull all the magazines you want to remove out a few centimeters or inches to move them past the latch.
4. Pull the magazines out one at a time.
5. *The Library cannot perform any other operation until the magazines are replaced.* After exchanging tapes in a magazine, slide the magazine completely into the Library. Each magazine locks into place after it is correctly installed. When all magazines are in place, the Library inventories the replaced magazines.

Using the remote management interface

To login, select the Administrator Account Type, enter the administrator password, and press **Sign In.**

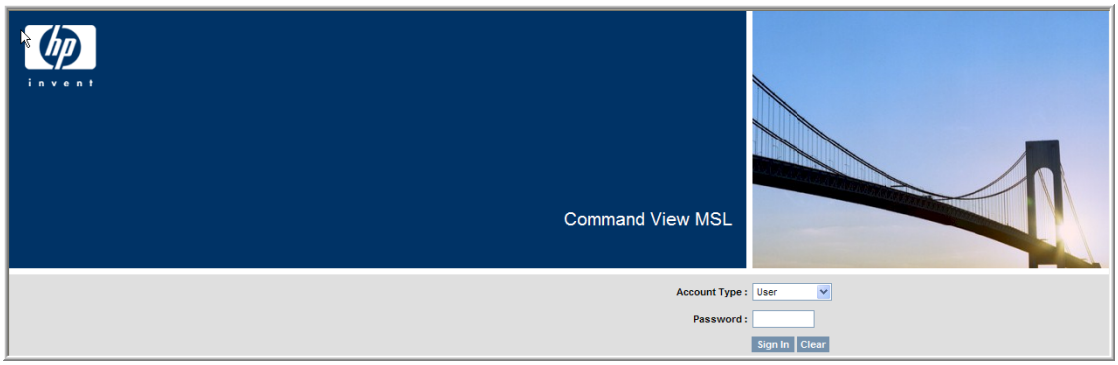


Figure 111 RMI login page

Go to the Operations: Magazines page. This page allows you to release the right, left, or both magazines from the Library.

Figure 112 Operations: Magazines page

Using the manual magazine release

1. From the back of the Library determine which magazine needs to be removed using Figure 113. The magazines are released from the magazine release holes on the bottom tape drive plate. For the MSL4048, MSL8048, and MSL8096, the Library will release all magazines on a side at the same time.

Figure 113 Manual magazine release holes

1. Right magazine release
2. Left magazine release

2. Push a small metal pin or paper clip about 1.5 cm (0.6 inch) into the appropriate release hole to push on the release latch (see Figure 114) while another person grasps the magazine and removes it from the Library.

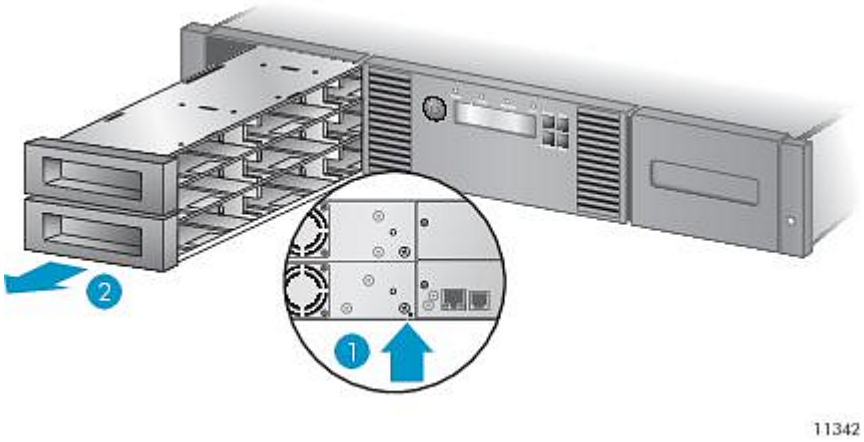


Figure 114 Removing the left magazine

1. Insert a pin into access hole
2. Release and remove the magazine

IMPORTANT:

Do not force the pin once you encounter resistance. Doing so can damage the Library.

Installing a redundant power supply (MSL4048, MSL8048, and MSL8096 only)

The MSL4048, MSL8048, and MSL8096 Tape Libraries have an optional redundant power supply system, which allows the Library to continue operating when one power supply fails. With the redundant power supply system, the Library can monitor the status of each power supply and power supply fan. The redundant power supply can be installed without powering off the Library.

In this procedure you will:

- Remove the power supply bay cover.
- Install the new power supply.
- Verify the installation.

CAUTION:

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

To install a redundant power supply:

1. From the back of the Library, use a Phillips screwdriver to remove the power supply bay cover. The cover is designated with a label.
2. Position the new power supply on the alignment rails and push it into the Library until it is flush with the back panel, as shown in Figure 115.

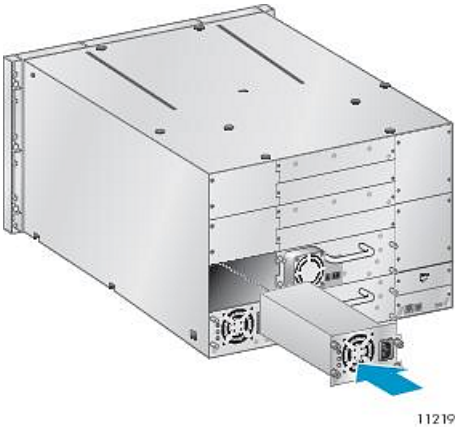


Figure 115 Installing the new power supply

3. Tighten the blue thumbscrews to secure the power supply to the Library as shown in Figure 116.

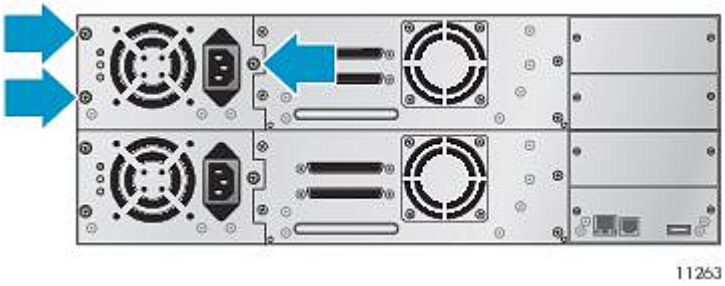


Figure 116 Securing the power supply to the Library

4. Attach an AC power cord to the new power connector and plug the other end into a power outlet.

5. Verify that the new power supply is operating properly. The blue and green LEDs on the power supply module should be lit and the yellow LED should be off, as shown in Figure 117. Both power supplies should be listed on the OCP screen.

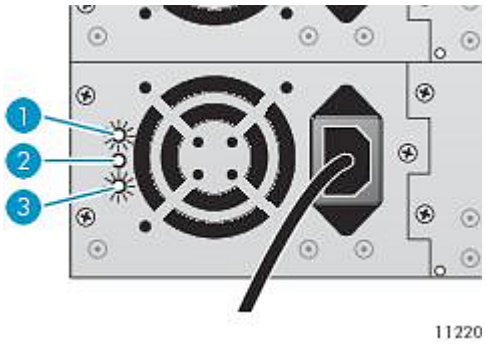


Figure 117 Power supply LEDs

1. Blue	AC power is connected.
2. Yellow	Fan failure. The fan is running too slow or is defective.
3. Green	The power supply is producing good power for the Library.

Replacing the power supply (MSL4048, MSL8048, and MSL8096)

This process applies to the MSL4048, MSL8048, and MSL8096 only. A redundant power supply can be replaced without powering off the Library.

In this process you will:

- Power off the Library, if necessary, and unplug the power cord. (Only Libraries with a single power supply.)
- Remove the old power supply.
- Install the new power supply.
- Verify the replacement.

△ CAUTION:

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

To replace a power supply:

1. If the Library only has one power supply, power off the Library from the front panel, if possible, and remove the AC power cord. Otherwise, just remove the AC power cord from the power supply to be replaced.

2. Loosen the three captive thumbscrews on the power supply. Grasp a thumbscrew stem on each side of the power supply and while supporting the bottom, pull the power supply out of the Library, as shown in Figure 118).

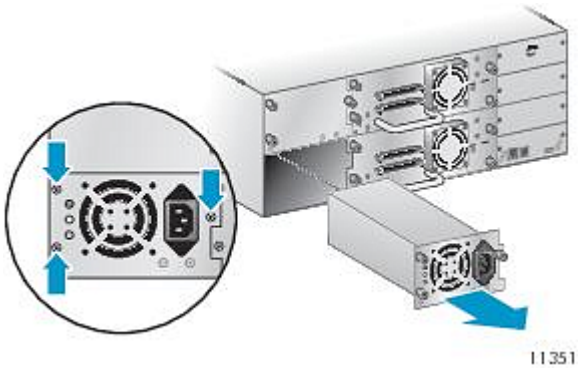


Figure 118 Removing the old power supply

3. Position the new power supply on the alignment rails and slide it into the Library until it is flush with the back panel, as shown in Figure 119. Tighten the three blue thumbscrews to secure the power supply.

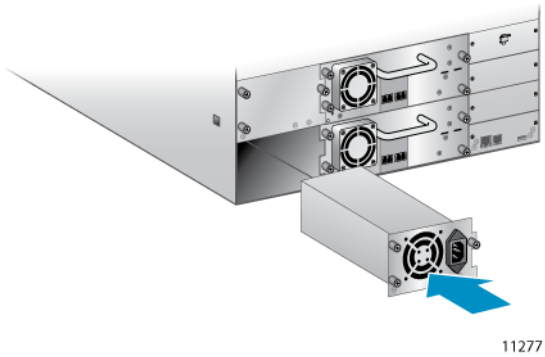


Figure 119 Installing the new power supply

4. Attach an AC power cord to the replaced power supply and plug into a power outlet. Power on the Tape Library, if necessary.

5. Verify that the new power supply is operating properly. On a power supply with LEDs, the blue and green LEDs on the power supply module should be lit and the yellow LED should be off. See Figure 120. Otherwise, verify that the power supply fan is running and the OCP does not show a warning message about the power supply.The blue and green LEDs on the power supply module should be lit and the yellow LED should be off. See Figure 120.

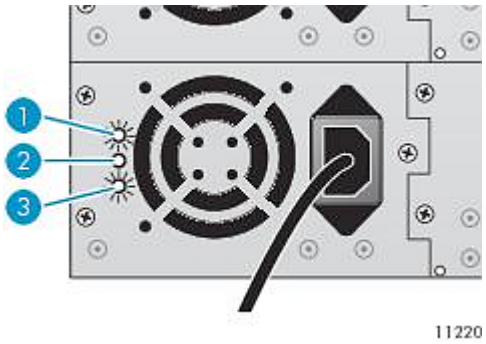


Figure 120 Power supply LEDs

1. Blue	AC power is connected.
2. Yellow	Fan failure. The fan is running too slow or is defective.
3. Green	The power supply is producing good power for the Library.

Replacing the library controller (MSL4048, MSL8048, and MSL8096)

This process applies to the MSL4048, MSL8048, and MSL8096 only. In this process you will:

- Record the Library settings.
- Power off the Library, unplug the power cord, and remove the Ethernet cable.
- Remove the old library controller.
- Install the new library controller.
- Verify the replacement.

△ CAUTION:

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

△ CAUTION:

This part is not hot-pluggable. You must power off the Library to replace the library controller.

To replace the library controller:

1. Record the Library's settings by writing down the values displayed in the OCP or the RMI.
2. Power off the Library from the front panel. Remove the Ethernet cable, if applicable.

3. Loosen the two captive thumbscrews on the library controller and remove it from the Library, as shown in Figure 121).

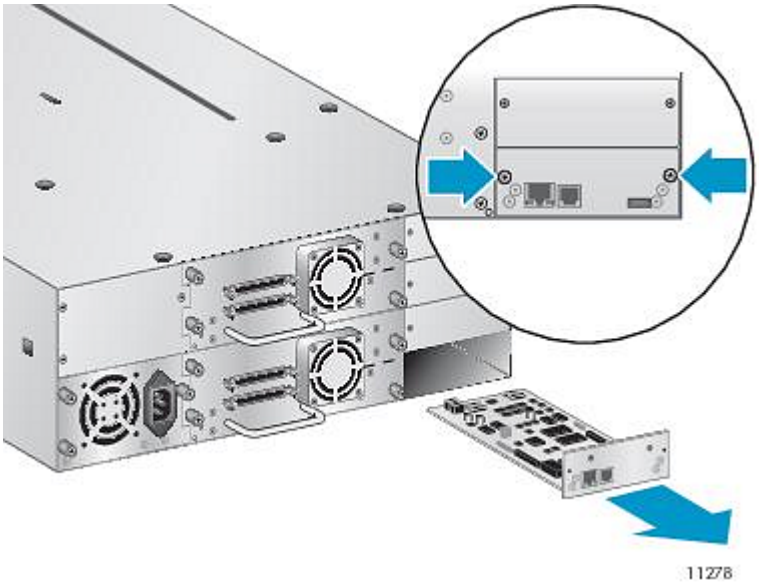


Figure 121 Removing the library controller

4. Position the new library controller on the alignment rails and slide it into the Library until it is flush with the back panel, as shown in Figure 122. Tighten the two blue thumbscrews to secure the card to the Library.

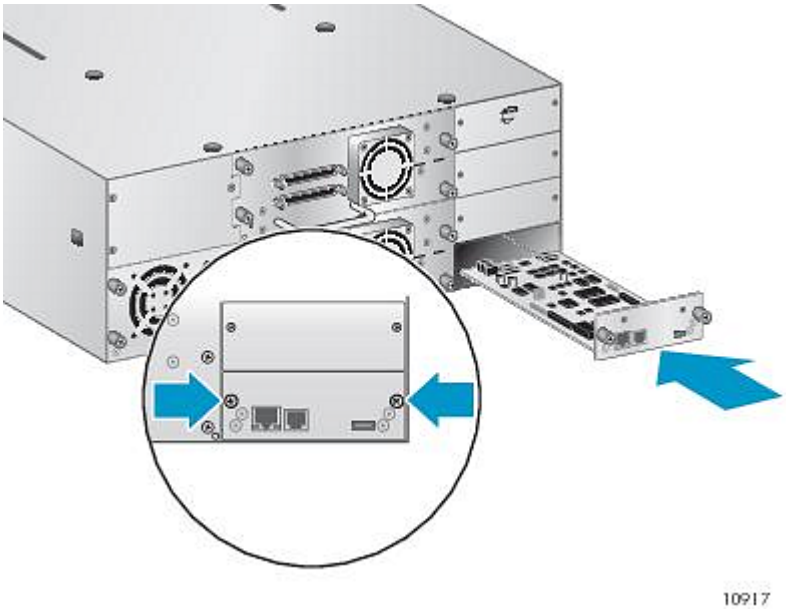


Figure 122 Installing the new library controller

5. Replace the Ethernet cable, if applicable. Power on the Tape Library.

6. Confirm that the Library recognized the new library controller by checking the System Status on the front panel, as shown in Figure 123.

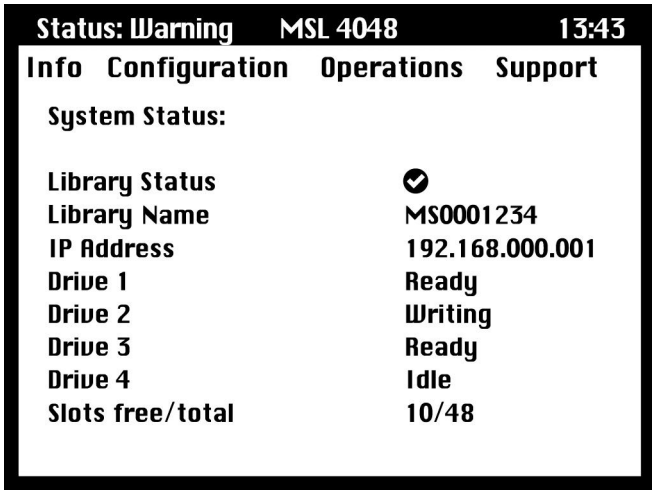


Figure 123 MSL4048, MSL8048, and MSL8096 system status

7. Restore the previous settings by manually entering them in the OCP or RMI.
8. Run HP StorageWorks Library & Tape Tools (L&TT) diagnostic software to verify that the Library and drives have the latest firmware. L&TT can be downloaded without charge from http://www.hp.com/support/TapeTools. If necessary, upgrade the Library firmware through L&TT, the RMI, or a USB flash drive.

Removing and replacing the base chassis

This process applies to the MSL2024 and MSL4048 only. In this process you will:

- Record configuration settings.
- Remove the tape cartridge from the tape drive.
- Remove the cables, drives, and magazines from the Library.
- Remove the power supply and library controller. (MSL4048 only).
- Remove the Library from the rack or tabletop conversion cover.
- Replace the base chassis.
- Reinstall the Library into the rack or tabletop conversion cover.
- Replace the cables, tape drives, and magazines.
- Replace the power supply and library controller. (MSL4048 only).
- Reconfigure the Library.

⚠ WARNING!

The HP StorageWorks MSL2024 Tape Library weighs up to 15.6 kg (34.3 lb) without media and up to 20.4 kg (44.9 lb) with media (24 cartridges). The MSL4048 Tape Library weighs up to 24.6 kg (54.1 lb) without media and up to 34.2 kg (75.2 lb) with media (48 cartridges).

Recording configuration settings

If the OCP or RMI works, save the configuration settings to the USB flash drive from the OCP or to a file from the RMI. You will need these settings to re-configure the Library after replacing the chassis.

TIP:

For the MSL4048, the configuration settings are saved on the library controller card and *should* transfer to the new chassis when you install the library controller card in the new chassis. Recording the configuration settings is a good idea in case the library controller card has a problem or is damaged during the transfer to the new chassis.

Removing the tape cartridge from the tape drive

Before beginning, be sure no cartridges are in the tape drives. To move a cartridge with the MSL2024 OCP, see "Moving tapes in the Library (Operations > Move Tape)" on page 123. To move a cartridge with the MSL4048 OCP, see "Moving Media (Operations > Move Media)" on page 138. To move a cartridge with the RMI, see "Moving media" on page 98.

CAUTION:

If you cannot remove the tape cartridge from the tape drive, handle the tape drive gently during the rest of the procedure to avoid damaging the tape and losing data.

Removing the cables, magazines, and tape drives

If the OCP or RMI are operational, remove the magazines using the RMI or OCP.

Power off the Library. Remove the power cord and other cables from the Library.

If the magazines have not been removed, remove the magazines from the device using the manual process (see "Releasing the magazines manually" on page 176).

To remove the tape drives:

1. Loosen the blue captive thumbscrews on the drive (see Figure 124).

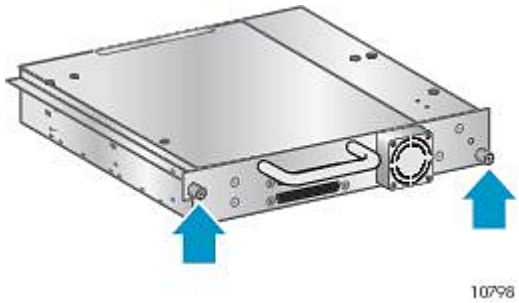


Figure 124 Captive screws on the tape drive

2. Pull straight back on the tape drive handle to remove the tape drive from the Library (see Figure 125).

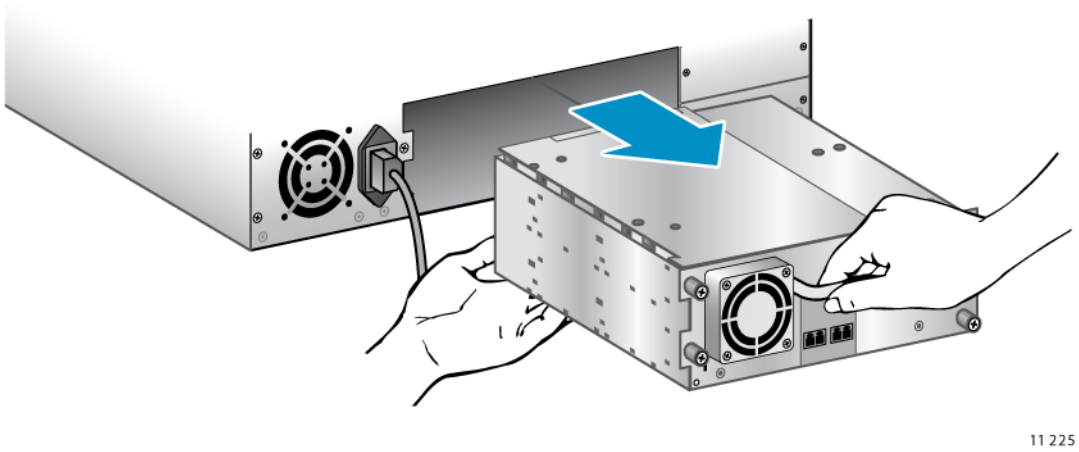


Figure 125 Removing a tape drive

3. Repeat Steps 1 and 2 for all other tape drives.

Removing the power supply and library controller (MSL4048 only)

On the MSL4048, the power supply and library controller are moved to the new chassis.

To remove the power supply:

1. Loosen the three captive thumbscrews on the power supply.
2. Grasp a thumbscrew stem on each side of the power supply. Support the bottom while pulling the power supply out of the Library, as shown in Figure 126.

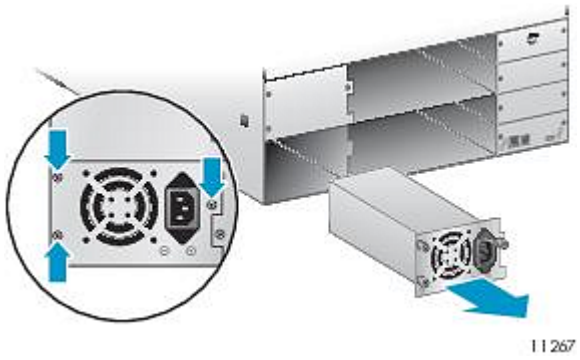


Figure 126 Removing the power supply

To remove the library controller:

1. Loosen the two blue thumbscrews on the library controller and remove it from the Library, as shown in Figure 127.

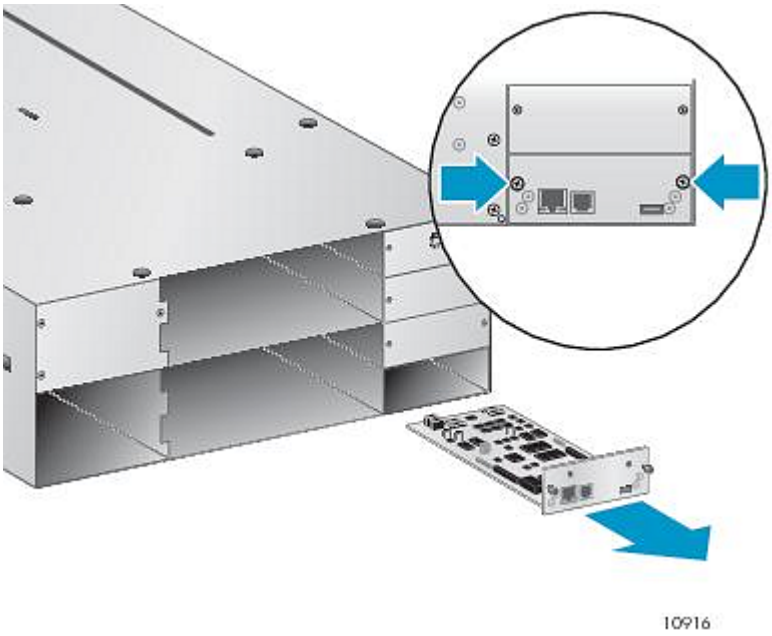


Figure 127 Removing the library controller

2. Place the library controller into a static safe bag.

Removing the base chassis

You will need a #2 Phillips screwdriver to remove and replace the base chassis assembly from the rack or cover.

△ CAUTION:

Lift the Library from the side edges. Lifting the Library from the magazine or tape drive openings can damage the Library.

To remove the base chassis from the rack or table top conversion cover:

1. Obtain adequate assistance to lift and stabilize the Library during removal and replacement.

2. From the front of the Library (see Figure 128, 1) loosen the screws inside the left and right front bezel (these are captive screws and cannot be removed), then 2) slide the Library out of the rack or cover using assistance.

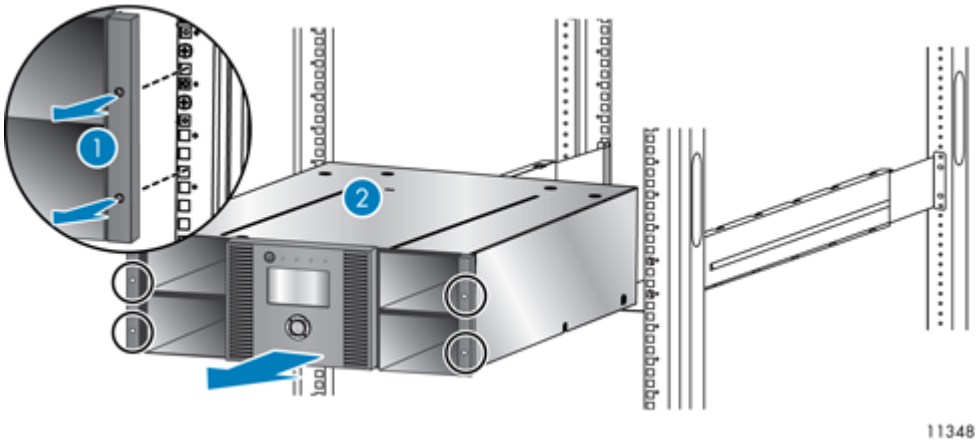


Figure 128 Removing the base chassis from the rack

Unpacking the new chassis

Unpack the new chassis and place it on a sturdy table. Save the packaging materials to return the old chassis.

Replacing the base chassis

△ CAUTION:

Lift the chassis from the side edges. Lifting the chassis from the magazine openings can damage the chassis.

To replace the Library components and install the base chassis in the rack or in the tabletop conversion cover:

1. The shipping lock on the MSL2024 and MSL4048 prevents the robotic transport mechanism from moving during shipment. You must remove the shipping lock before powering on the device. The shipping lock is held in place with a piece of tape and is located in the top center of the new chassis. After the shipping lock is removed, it should be stored on the back panel of the chassis for future use.

   To remove and store the shipping lock:

   a. Locate the tape and lock at the top of the chassis (see Figure 129).

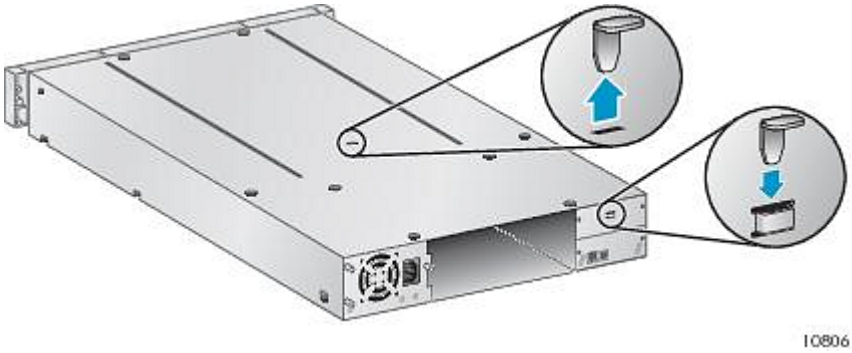


Figure 129 Shipping lock location

   b. Remove the tape, then remove the lock.
   c. Store the lock on the back panel of the device (see Figure 130).

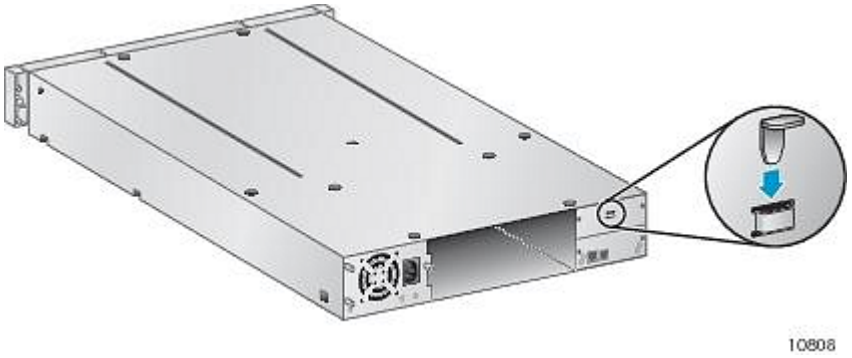


Figure 130 Shipping lock storage location

2. Mount the Library in a rack or in the tabletop conversion cover.

   To mount the Library in a rack:

   a. With assistance, slide the Library onto the metal rails that are already in position in the rack.
   b. From the front of the device, secure the front bezel to the rack using a #2 Phillips screw driver placed through the small holes in the mounting bracket to tighten the captive screws on each side of the device.

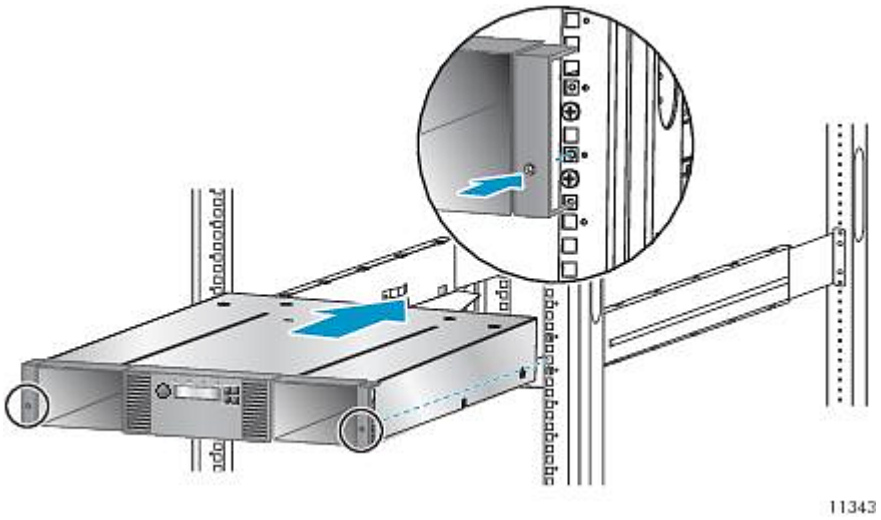


Figure 131 Securing a Tape Library to the rack

   To replace the tabletop conversion cover:

   a. Set the new base chassis on a sturdy surface in front of the cover.
   b. Slide the chassis into the cover until the front panel of the chassis is aligned with the cover.
   c. Tighten the captive screws on the chassis front panel until the cover is secure.
3. Replace the tape drives.
4. Replace the magazines.
5. Replace the cords and cables.
6. For the MSL4048, replace the power supply and library controller.
7. Reconnect the cables and power cord.
8. Power on the Library.
9. Reconfigure the Library.

7 Support and other resources

HP technical support

Telephone numbers for worldwide technical support are listed on the HP support website: 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
- Error messages
- Operating system type and revision level
- Detailed questions
- An L&TT Support Ticket, which can be downloaded to a USB drive from the front panel or downloaded to a file with the remote management interface.

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

HP websites

For additional information, see the following HP websites:

- http://www.hp.com — HP corporate website
- http://www.hp.com/go/storage — HP storage products
- http://www.hp.com/go/ebs — compatibility information
- http://www.hp.com/service_locator — HP Support website
- http://www.hp.com/support/mslg3tstree — interactive troubleshooting tool
- http://www.hp.com/support/manuals — documentation about HP products
- http://www.hp.com/support/tapetools — HP Library & Tape Tools diagnostic software

Typographic conventions

Table 56 Document conventions

Convention	Element
Blue text: Table 56	Cross-reference links and e-mail addresses
Blue, underlined text: http://www.hp.com	Website addresses

Convention	Element
Bold text	• Keys that are pressed • Text entered into a GUI element, such as a box • GUI elements that are clicked or selected, such as menu and list items, buttons, tabs, and check boxes
Italic text	Text emphasis
`Monospace` text	• File and directory names • System output • Code • Commands, their arguments, and argument values
`Monospace, italic` text	• Code variables • Command variables
`Monospace, bold` text	Emphasized monospace text

⚠ 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.

Customer Self Repair

HP customer self repair (CSR) programs allow you to repair your StorageWorks product. If a CSR part needs replacing, HP ships the part directly to you so that you can install it at your convenience. Some parts do not qualify for CSR. Your HP-authorized service provider will determine whether a

repair can be accomplished by CSR. See Table 57 for the Customer Self Repair status of replaceable parts for this product.

For more information about CSR, contact your local service provider. For North America, see the CSR website:

http://www.hp.com/go/selfrepair

Table 57 Customer self repair parts

Part	Customer Self Repair Status
Magazine	Mandatory CSR
Media	Mandatory CSR
Tape drive	Mandatory CSR
External cables and SCSI terminator	Mandatory CSR
Chassis (MSL2024 and MSL4048)	MSL2024: Mandatory CSR MSL4048: Optional CSR
Power supply (MSL4048, MSL8048, and MSL8096)	Mandatory CSR
Library controller (MSL4048, MSL8048, and MSL8096)	Mandatory CSR
Rack mount kit	Optional CSR
Rack to tabletop conversion kit (MSL2024 and MSL4048)	Mandatory CSR
Front bezel assembly (MSL8048 and MSL8096)	Optional CSR
OCP display board (MSL8048 and MSL8096)	On-site only
LED board (MSL8048 and MSL8096)	On-site only
Robotic assembly (MSL8048 and MSL8096)	On-site only

Subscription service

HP recommends that you register your product at the Subscriber's Choice for Business website: http://www.hp.com/go/e-updates.

After registering, you will receive e-mail notification of product enhancements, new driver versions, firmware updates, and other product resources.

HP-authorized reseller

For the name of your nearest HP-authorized reseller:

- In the United States, call 1–800–282–6672
- Elsewhere, visit the HP website: http://www.hp.com, then click **Contact HP** to find locations and telephone numbers.

A Technical specifications

Physical specifications

Table 58 MSL2024 Tape Library physical specifications: all models

Characteristics	Product alone	Packaged
Height	87.5 mm (3.44 inches)	250 mm (9.84 inches)
Width	445 mm (17.5 inches)	580 mm (22.83 inches)
Depth	775.5 mm (30.53 inches)	990 mm (38.97 inches)
Weight	15 kg (33.07 pounds)	25.5 (56.22 pounds)

Table 59 MSL4048 Tape Library physical specifications: all models

Characteristics	Product alone	Packaged
Height	174 mm (6.85 inches)	344 mm (13.54 inches)
Width	445 mm (17.5 inches)	596 mm (23.46 inches)
Depth	776 mm (30.55 inches)	994 mm (39.13 inches)
Weight	20.6 kg (45.32 pounds)	33.2 (73.04 pounds)

Table 60 MSL8048 and MSL8096 Tape Library physical specifications: all models

Characteristics	Product alone	Packaged
Height	352 mm (13.86 inches)	533 mm (20.98 inches)
Width	480 mm (18.9 inches)	589 mm (23.19 inches)
Depth	806 mm (31.73 inches)	987 mm (38.86 inches)
Weight	46.6 kg (102.7 pounds)	66.6 (146.8 pounds)

Environmental specifications

Table 61 Environmental specifications

Characteristic	Specification
Temperature	
Operating	10° to 35° C
Non-operating	-30° to 60° C
Recommended operating temperature	10° to 35° C
Temperature shock immunity - maximum rate of change	10° C per hour
Miscellaneous	
Dust concentration	less than 200 microgram/cubic meter
Altitude	3050 meters (10,000 ft.)
Humidity	
Operating	20% to 80% RH non-condensing
Non-operating	20% to 80% RH non-condensing

B Regulatory compliance and safety

This section contains regulatory notices for the HP StorageWorks MSL Tape Libraries.

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.

The Regulatory Compliance label is located on the bottom of the device. To view this information, from the back of the device, tilt the device up until the label is visible.

Product specific information:

Regulatory model number: LVLDC-0501

FCC and CISPR classification: Class A

These products contain laser components. See Class 1 laser statement in the Laser compliance notices section.

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 your product, visit http://www.hp.com.

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 regulatory notice

This product complies with the following EU Directives:

- Low Voltage Directive 2006/95/EC
- EMC Directive 89/336/EEC or 2004/108/EC

Compliance with these directives implies conformity to applicable harmonized European standards (European Norms) which are listed on the EU Declaration of Conformity issued by Hewlett-Packard for this product or product family.

This compliance is indicated by the following conformity marking placed on the product:

	This marking is valid for non-Telecom products and EU harmonized Telecom products (e.g., Bluetooth).

Certificates can be obtained from http://www.hp.com/go/certificates.

Hewlett-Packard GmbH, HQ-TRE, Herrenberger Strasse 140, 71034 Boeblingen, Germany

Japanese notices

Japanese VCCI-A notice

この装置は、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は適切な対策を講ずるよう要求されることがあります。

VCCI-A

Japanese VCCI-B notice

この装置は、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-B

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

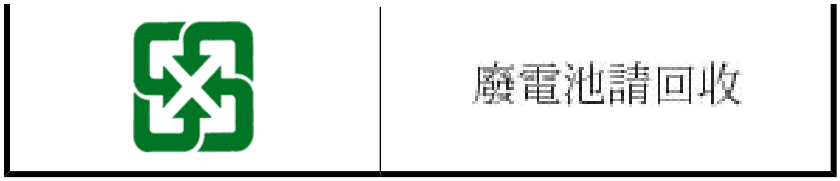
BSMI Class A notice

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 notices

English laser notice

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

English notice

Disposal of Waste Equipment by Users in Private Households in the European Union

This symbol means do not dispose of your product with your other household waste. Instead, you should protect human health and the environment by handing over your waste equipment to a designated collection point for the recycling of waste electrical and electronic equipment. For more information, please contact your household waste disposal service

Bulgarian notice

Изхвърляне на отпадъчно оборудване от потребители в частни домакинства в Европейския съюз
Този символ върху продукта или опаковката му показва, че продуктът не трябва да се изхвърля заедно с другите битови отпадъци. Вместо това, трябва да предпазите човешкото здраве и околната среда, като предадете отпадъчното оборудване в предназначен за събирането му пункт за рециклиране на неизползваемо електрическо и електронно борудване. За допълнителна информация се свържете с фирмата по чистота, чиито услуги използвате.

Czech notice

Likvidace zařízení v domácnostech v Evropské unii
Tento symbol znamená, že nesmíte tento produkt likvidovat spolu s jiným domovním odpadem. Místo toho byste měli chránit lidské zdraví a životní prostředí tím, že jej předáte na k tomu určené sběrné pracoviště, kde se zabývají recyklací elektrického a elektronického vybavení. Pro více informací kontaktujte společnost zabývající se sběrem a svozem domovního odpadu.

Danish notice

Bortskaffelse af brugt udstyr hos brugere i private hjem i EU
Dette symbol betyder, at produktet ikke må bortskaffes sammen med andet husholdningsaffald. Du skal i stedet den menneskelige sundhed og miljøet ved at afl evere dit brugte udstyr på et dertil beregnet indsamlingssted for af brugt, elektrisk og elektronisk udstyr. Kontakt nærmeste renovationsafdeling for yderligere oplysninger.

Dutch notice

Inzameling van afgedankte apparatuur van particuliere huishoudens in de Europese Unie
Dit symbool betekent dat het product niet mag worden gedeponeerd bij het overige huishoudelijke afval. Bescherm de gezondheid en het milieu door afgedankte apparatuur in te leveren bij een hiervoor bestemd inzamelpunt voor recycling van afgedankte elektrische en elektronische apparatuur. Neem voor meer informatie contact op met uw gemeentereinigingsdienst.

Estonian notice

Äravisatavate seadmete likvideerimine Euroopa Liidu eramajapidamistes

See märk näitab, et seadet ei tohi visata olmeprügi hulka. Inimeste tervise ja keskkonna säästmise nimel tuleb äravisatav toode tuua elektriliste ja elektrooniliste seadmete käitlemisega egelevasse kogumispunkti. Küsimuste korral pöörduge kohaliku prügikäitlusettevõtte poole.

Finnish notice

Kotitalousjätteiden hävittäminen Euroopan unionin alueella

Tämä symboli merkitsee, että laitetta ei saa hävittää muiden kotitalousjätteiden mukana. Sen sijaan sinun on suojattava ihmisten terveyttä ja ympäristöä toimittamalla käytöstä poistettu laite sähkö- tai elektroniikkajätteen kierrätyspisteeseen. Lisätietoja saat jätehuoltoyhtiöltä.

French notice

Mise au rebut d'équipement par les utilisateurs privés dans l'Union Européenne

Ce symbole indique que vous ne devez pas jeter votre produit avec les ordures ménagères. Il est de votre responsabilité de protéger la santé et l'environnement et de vous débarrasser de votre équipement en le remettant à une déchetterie effectuant le recyclage des équipements électriques et électroniques. Pour de plus amples informations, prenez contact avec votre service d'élimination des ordures ménagères.

German notice

Entsorgung von Altgeräten von Benutzern in privaten Haushalten in der EU

Dieses Symbol besagt, dass dieses Produkt nicht mit dem Haushaltsmüll entsorgt werden darf. Zum Schutze der Gesundheit und der Umwelt sollten Sie stattdessen Ihre Altgeräte zur Entsorgung einer dafür vorgesehenen Recyclingstelle für elektrische und elektronische Geräte übergeben. Weitere Informationen erhalten Sie von Ihrem Entsorgungsunternehmen für Hausmüll.

Greek notice

Απόρριψη άχρηστου εξοπλισμού από ιδιώτες χρήστες στην Ευρωπαϊκή Ένωση
Αυτό το σύμβολο σημαίνει ότι δεν πρέπει να απορρίψετε το προϊόν με τα λοιπά οικιακά απορρίμματα. Αντίθετα, πρέπει να προστατέψετε την ανθρώπινη υγεία και το περιβάλλον παραδίδοντας τον άχρηστο εξοπλισμό σας σε εξουσιοδοτημένο σημείο συλλογής για την ανακύκλωση άχρηστου ηλεκτρικού και ηλεκτρονικού εξοπλισμού. Για περισσότερες πληροφορίες, επικοινωνήστε με την υπηρεσία απόρριψης απορριμμάτων της περιοχής σας.

Hungarian notice

A hulladék anyagok megsemmisítése az Európai Unió háztartásaiban
Ez a szimbólum azt jelzi, hogy a készüléket nem szabad a háztartási hulladékkal együtt kidobni. Ehelyett a
leselejtezett berendezéseknek az elektromos vagy elektronikus hulladék átvételére kijelölt helyen történő
beszolgáltatásával megóvja az emberi egészséget és a környezetet.További információt a helyi köztisztasági
vállalattól kaphat.

Italian notice

Smaltimento di apparecchiature usate da parte di utenti privati nell'Unione Europea
Questo simbolo avvisa di non smaltire il prodotto con i normali rifi uti domestici. Rispettare la salute umana e l'ambiente conferendo l'apparecchiatura dismessa a un centro di raccolta designato per il riciclo di apparecchiature elettroniche ed elettriche. Per ulteriori informazioni, rivolgersi al servizio per lo smaltimento dei rifi uti domestici.

Latvian notice

Europos Sąjungos namų ūkio vartotojų įrangos atliekų šalinimas
Šis simbolis nurodo, kad gaminio negalima išmesti kartu su kitomis buitinėmis atliekomis. Kad apsaugotumėte žmonių sveikatą ir aplinką, pasenusią nenaudojamą įrangą turite nuvežti į elektrinių ir elektroninių atliekų surinkimo punktą. Daugiau informacijos teiraukitės buitinių atliekų surinkimo tarnybos.

Lithuanian notice

Nolietotu iekārtu iznīcināšanas noteikumi lietotājiem Eiropas Savienības privātajās mājsaimniecībās
Šis simbols norāda, ka ierīci nedrīkst utilizēt kopā ar citiem mājsaimniecības atkritumiem. Jums jārūpējas par cilvēku veselības un vides aizsardzību, nododot lietoto aprīkojumu otrreizējai pārstrādei īpašā lietotu elektrisko un elektronisko ierīču savākšanas punktā. Lai iegūtu plašāku informāciju, lūdzu, sazinieties ar savu mājsaimniecības atkritumu likvidēšanas dienestu.

Polish notice

Utylizacja zużytego sprzętu przez użytkowników w prywatnych gospodarstwach domowych
w krajach Unii Europejskiej
Ten symbol oznacza, że nie wolno wyrzucać produktu wraz z innymi domowymi odpadkami. Obowiązkiem użytkownika jest ochrona zdrowa ludzkiego i środowiska przez przekazanie zużytego sprzętu do wyznaczonego punktu zajmującego się recyklingiem odpadów powstałych ze sprzętu elektrycznego i elektronicznego. Więcej informacji można uzyskać od lokalnej firmy zajmującej wywozem nieczystości.

Portuguese notice

Descarte de equipamentos usados por utilizadores domésticos na União Europeia
Este símbolo indica que não deve descartar o seu produto juntamente com os outros lixos domiciliares. Ao invés disso, deve proteger a saúde humana e o meio ambiente levando o seu equipamento para descarte em um ponto de recolha destinado à reciclagem de resíduos de equipamentos eléctricos e electrónicos. Para obter mais informações, contacte o seu serviço de tratamento de resíduos domésticos.

Romanian notice

Casarea echipamentului uzat de către utilizatorii casnici din Uniunea Europeană
Acest simbol înseamnă să nu se arunce produsul cu alte deşeuri menajere. În schimb, trebuie să protejaţi sănătatea umană şi mediul predând echipamentul uzat la un punct de colectare desemnat pentru reciclarea echipamentelor electrice şi electronice uzate. Pentru informaţii suplimentare, vă rugăm să contactaţi serviciul de eliminare a deşeurilor menajere local.

Slovak notice

Likvidácia vyradených zariadení používateľmi v domácnostiach v Európskej únii

Tento symbol znamená, že tento produkt sa nemá likvidovať s ostatným domovým odpadom. Namiesto toho by ste mali chrániť ľudské zdravie a životné prostredie odovzdaním odpadového zariadenia na zbernom mieste, ktoré je určené na recykláciu odpadových elektrických a elektronických zariadení. Ďalšie informácie získate od spoločnosti zaoberajúcej sa likvidáciou domového odpadu.

Spanish notice

Eliminación de los equipos que ya no se utilizan en entornos domésticos de la Unión Europea

Este símbolo indica que este producto no debe eliminarse con los residuos domésticos. En lugar de ello, debe evitar causar daños a la salud de las personas y al medio ambiente llevando los equipos que no utilice a un punto de recogida designado para el reciclaje de equipos eléctricos y electrónicos que ya no se utilizan. Para obtener más información, póngase en contacto con el servicio de recogida de residuos domésticos.

Swedish notice

Hantering av elektroniskt avfall för hemanvändare inom EU

Den här symbolen innebär att du inte ska kasta din produkt i hushållsavfallet. Värna i stället om natur och miljö genom att lämna in uttjänt utrustning på anvisad insamlingsplats. Allt elektriskt och elektroniskt avfall går sedan vidare till återvinning. Kontakta ditt återvinningsföretag för mer information.

Turkish notice

Türkiye Cumhuriyeti: EEE Yönetmeliğine Uygundur

Battery replacement notices

Dutch battery notice

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 gedeponeerd 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 notice

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 notice

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 notice

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 notice

バッテリに関する注意

警告:本製品はバッテリを内蔵している場合があります。

- バッテリを取り外している場合は、充電しないでください。
- バッテリを水にさらしたり、60℃ (140°F) 以上の温度にさらさないでください。
- バッテリを誤用、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、バッテリ 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 notice

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.

Power cords

The power cord set must meet the requirements for use in the country where the product was purchased. If the product is to be used in another country, purchase a power cord that is approved for use in that country.

The power cord must be rated for the product and for the voltage and current marked on the product electrical ratings label. The voltage and current rating of the cord should be greater than the voltage and current rating marked on the product. In addition, the diameter of the wire must be a minimum of 1.00 mm^2 or 18 AWG, and the length of the cord must be between 1.8 m (6 ft) and 3.6 m (12 ft). If you have questions about the type of power cord to use, contact an HP authorized service provider.

NOTE:

Route power cords so that they will not be walked on and cannot be pinched by items placed upon or against them. Pay particular attention to the plug, electrical outlet, and the point where the cords exit from the product.

C Electrostatic discharge

To prevent damaging the system, be aware of the precautions you need to follow when setting up the system or handling parts. A discharge of static electricity from a finger or other conductor may damage system boards or other static-sensitive devices. This type of damage may reduce the life expectancy of the device.

Topics include:

Preventing electrostatic damage

To prevent electrostatic damage, observe the following precautions:

- Avoid hand contact by transporting and storing products in static-safe containers.
- Keep electrostatic-sensitive parts in their containers until they arrive at static-free workstations.
- Place parts on a grounded surface before removing them from their containers.
- Avoid touching pins, leads, or circuitry.
- Always be properly grounded when touching a static-sensitive component or assembly. See the next section.

Grounding methods

There are several methods for grounding. Use one or more of the following methods when handling or installing electrostatic-sensitive parts:

- Use a wrist strap connected by a ground cord to a grounded workstation or computer chassis. Wrist straps are flexible straps with a minimum of 1 megohm (±10 percent) resistance in the ground cords. To provide proper ground, wear the strap snug against the skin.
- Use heel straps, toe straps, or boot straps at standing workstations. Wear the straps on both feet when standing on conductive floors or dissipating floor mats.
- Use conductive field service tools.
- Use a portable field service kit with a folding static-dissipating work mat.

If you do not have any of the suggested equipment for proper grounding, have an HP authorized reseller install the part.

NOTE:

For more information on static electricity, or assistance with product installation, contact your HP authorized reseller.

Glossary

barcode reader	A component of the robot that is used for cartridge identification and position calibration.
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.
cell	The slot in the magazine 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.
cleaning cartridge	A tape cartridge that contains special material to clean the tape path in a transport or drive. Ultrium cleaning cartridge labels have a CLN prefix.
CLI	Command Line Interface
daisy chaining	Parallel SCSI peripherals can be daisy chained together. Each device has a second port used to connect the next device in line. The last device in the chain must be terminated.
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 device uses to record data onto tapes.
drive bay	The space where the drive module resides.
drive cleaning	A device 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.
encryption	The process of changing data into a form that cannot be read until it is deciphered, protecting the data from unauthorized access and use.
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 now also runs over shielded, twisted-pair cable. Ethernet is a 10 or 100 Megabytes-per-second LAN.

event A significant device occurrence (such as drive errors, online/offline transition, drive cleaning, and other information) that is listed in an automated log.

export The action in which the device places a cartridge into the mailslot so that the operator can remove the cartridge. Also called eject.

FC Fibre Channel.

Fibre Channel A network technology primarily used for storage networks.

G Gigabyte. A unit of storage, abbreviated as G or GB, equal to 1,024 Megabytes.

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 device through visual screens.

HBA An acronym for host bus adapter, an interface card which plugs into the computer's bus and connects it to the network.

host One or more computers that generate and communicate data to the device.

hot-plug, hot swap The plugging in or removal of a drive into a system with the power turned on.

HVDS High voltage differential signaling, also called differential SCSI. HVDS supports cable lengths up to 25 meters.

import The process of placing a cartridge into the cartridge access port so that the robot can insert it into a storage slot.

inventory The process of reading and storing in memory the bar code identification and locations of all cartridges in the Library.

LAN Local Area Network. A computer network covering a local area, such as a home, office, or small building, that is usually based on Ethernet technology.

LCD Liquid crystal display. A type of display that uses two sheets of polarizing material with a liquid crystal solution.

LED Light emitting diode. An electronic device that lights up when electricity is passed through it.

LTO An acronym for Linear Tape-Open technology. An “open format” technology, which means that users will have multiple sources of products and media.

LUN Logical Unit Number. An address for a component of a SCSI device, similar to an apartment number. In this device, the host computer sends the SCSI commands for the Library to LUN 1 of the Master tape drive and sends SCSI commands for the tape drive itself to LUN 0.

LVDS Low Voltage Differential Signaling. A low noise, low power, low amplitude method for high-speed (gigabits per second) data transmission over copper wire.

MAC address Media Access Control address. A unique identifier attached to most forms of networking equipment, which is part of the Ethernet specification.

magazine A removable array that holds cartridges and is placed into the load port of the Tape Library.

mailslot All or part of a magazine used to import cartridges into the Library.

Megabyte A unit of storage abbreviated as M or MB, equal to 1,024 x 1,024 = 1,048,576 bytes.

MIB Management Information Base. A type of database used to manage the devices in a communications network.

parallel SCSI A suite of closely related standards in which parallel SCSI devices are connected in parallel to form busses. Each parallel SCSI standard has its own bus width, clock speed, maximum throughput, maximum cable length, and maximum number of devices on the bus.

parallel SCSI devices External parallel SCSI devices with two ports, one for the incoming cable and another for the outgoing cable to the next device. (see daisy chaining).

put An activity in which a robot places a cartridge into a slot or drive.

RAID Redundant Array of Inexpensive Disks. A group of disks that work together to improve performance. RAID 5 provides some parity protection in case one of the disks fails.

RMI Remote Management Interface. A web-based interface used to monitor and control the device. The RMI is a website that is hosted on the device.

robot An electro-mechanical device that transports tape cartridges to and from the magazines and drives.

robotics unit The unit that includes the robotic components and that controls the movement of the robot between storage slots, drives, and load ports.

SAS Serial Attached SCSI. A computer bus technology and serial communication protocol for direct attached storage devices, including disk drives and high-performance tape drives.

SCSI Pronounced *scuzzy*, an acronym for Small Computer System Interface, a standard interface and command set for transferring data between mass storage and other devices. The host computer uses SCSI commands to operate the device. Depending on the model, the physical connection between the host computer and the tape drives will use a parallel SCSI, SAS, or Fibre Channel interface.

SCSI address See SCSI ID.

SCSI devices Computer devices with a SCSI interface. In this document, *SCSI devices* refers to devices with a parallel SCSI interface.

SCSI ID Each device on a parallel SCSI bus is identified by its SCSI ID, which is a number in the range 0–7 on a narrow bus and 0–15 on a wide bus.

SE Single Ended SCSI. The original SCSI bus technology, which uses single ended signaling — where the signal is referenced to ground. SE SCSI busses have lower signal rates and much shorter allowed cable lengths. SE SCSI should not be used with Ultrium tape drives.

slot The location in the magazine in which a tape cartridge is stored. Also called a cell.

tape cartridge A container holding magnetic tape that can be processed without separating the tape from the container. The device uses data and cleaning cartridges. These cartridges are not interchangeable.

tape drive An electro-mechanical device that moves magnetic tape and includes mechanisms for writing and reading data to and from the tape.

Terabyte A unit of storage, abbreviated as T or TB, equal to 1,024 Gigabytes.

terminator The last device at the end of a parallel SCSI chain must be terminated by terminator into the connector. An appropriate terminator is shipped with parallel SCSI devices.

U A measure of chassis height. 1U in rack measurement is 44.45 millimeters (1.75 inches).

USB Universal Serial Bus. A serial bus standard used to interface devices.

World Wide Identifier A unique identifier in a Fiber Channel or SAS storage network, also called a World Wide Name (WWN). The first three bytes are derived from an IEEE Organizationally Unique Identifier (OUI), which identifies the manufacturer or vendor. The remaining five bytes are assigned by the vendor.

WORM An acronym for Write Once Read Many times, a class of optical recording systems that allow recording and adding data, but not altering recorded data.

Index

D

E

T

V

W