maintenance and service guide

# **hp** StorageWorks MSL5000 and MSL6000 series tape libraries

Sixth Edition (April 2005)

**Part Number:** 231911-006

This guide is to be used for troubleshooting and reference when servicing the HP StorageWorks MSL5000 and MSL6000 Series tape libraries.

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MSL5000 and MSL6000 Series Tape Libraries Maintenance and Service Guide
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# about this guide

This maintenance and service guide provides information to help you:

- service HP StorageWorks MSL5000 and MSL6000 Series tape libraries.
- troubleshoot HP StorageWorks MSL5000 and MSL6000 Series tape libraries.
- apply the new box-swap strategy to MSL6030 tape library models

"About this Guide" topics include the following sections:


- Overview, page 14
- Conventions, page 15
- Rack Stability, page 18
- Getting Help, page 19


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**Note:** Unless noted, service procedures in this guide are the same for all two-drive (5U) and four-drive (10U) tape library models even though illustrations for parts and components may not be up-to-date.

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# Overview

This section covers the following topics:


- Intended Audience
- Related Documentation


## Intended Audience

This book is intended for use by authorized service technicians who are experienced with servicing MSL5000 and MSL6000 Series tape libraries.

## Related Documentation

In addition to this guide, HP provides corresponding information:

- *HP StorageWorks MSL6000 Series Tape Libraries User Guide*
- *HP StorageWorks MSL6000 Series Pass-Through Mechanism Reference Guide*
- *HP StorageWorks Network Storage Router User Guide*

# Conventions

Conventions consist of the following:

- Document Conventions
- Text Symbols
- Equipment Symbols

## Document Conventions

The document conventions included in Table 1 apply in most cases.

**Table 1: Document Conventions**

| Element | Convention |
|---|---|
| Cross-reference links | Blue text: Figure 1 |
| Key and field names, menu items, buttons, and dialog box titles | **Bold** |
| File names, application names, and text emphasis | *Italics* |
| User input, command and directory names, and system responses (output and messages) | `Monospace font`<br>`COMMAND NAMES` are uppercase monospace font unless they are case sensitive |
| Variables | `<monospace, italic font>` |
| Website addresses | Blue, underlined sans serif font text: http://www.hp.com |

## Text Symbols

The following symbols may be found in the text of this guide. They have the following meanings.

**WARNING:** Text set off in this manner indicates that failure to follow directions in the warning could result in bodily harm or death.

**Caution:** Text set off in this manner indicates that failure to follow directions could result in damage to equipment or data.

**Note:** Text set off in this manner presents commentary, sidelights, or interesting points of information.

## Equipment Symbols

The following equipment symbols may be found on hardware to which this guide pertains. They have the following meanings.

Any enclosed surface or area of the equipment marked with these symbols indicates the presence of electrical shock hazards. Enclosed area contains no operator serviceable parts.

**WARNING:** To reduce the risk of personal injury from electrical shock hazards, do not open this enclosure.

Any RJ-45 receptacle marked with these symbols indicates a network interface connection.

**WARNING:** To reduce the risk of electrical shock, fire, or damage to the equipment, do not plug telephone or telecommunications connectors into this receptacle.

Any surface or area of the equipment marked with these symbols indicates the presence of a hot surface or hot component. Contact with this surface could result in injury.

**WARNING:** To reduce the risk of personal injury from a hot component, allow the surface to cool before touching.

Power supplies or systems marked with these symbols indicate the presence of multiple sources of power.

**WARNING:** To reduce the risk of personal injury from electrical shock, remove all power cords to completely disconnect power from the power supplies and systems.

Any product or assembly marked with these symbols indicates that the component exceeds the recommended weight for one individual to handle safely.

**WARNING:** To reduce the risk of personal injury or damage to the equipment, observe local occupational health and safety requirements and guidelines for manually handling material.

# Rack Stability

Rack stability protects personnel and equipment.

**WARNING:** To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
- The full weight of the rack rests on the leveling jacks.
- In single rack installations, the stabilizing feet are attached to the rack.
- In multiple rack installations, the racks are coupled.
- Only one rack component is extended at any time. A rack may become unstable if more than one rack component is extended for any reason.

# Getting Help

If you still have a question after reading this guide, contact an HP authorized service provider or access our website: http://www.hp.com/products/tapestorage.

## HP Technical Support

Call technical support at the nearest location. Telephone numbers for worldwide technical support are listed on the HP website under support: http://www.hp.com/support.

Be sure to have the following information available before calling:

- Technical support registration number (if applicable)
- Product serial numbers
- Product model names and numbers
- Applicable error messages
- Application software and revision

## HP Storage Website

The HP website has the latest information on this product, as well as the latest drivers. Access storage at: http://www.hp.com/products/tapestorage. From this website, select the appropriate product or solution.

## HP Authorized Reseller

For the name of your nearest HP authorized reseller:

- In the United States, call 1-800-345-1518.
- In Canada, call 1-800-263-5868.
- Elsewhere, see the HP website for locations and telephone numbers: http://www.hp.com.

# Illustrated Parts Catalog

1

This chapter provides the illustrated parts breakdown and a spare parts list for HP StorageWorks MSL5000 and MSL6000 Series tape libraries. The MSL5000 and MSL6000 Series tape libraries consist of two-drive models and four-drive models. Table 2 lists two-drive models.

**Table 2: MSL5000 and MSL6000 Series Two-drive (5U) Model Tape Libraries**

| Model Number | Number of Tape Cartridge Slots | Tape Drive Technology |
|---|---|---|
| MSL5026 | 26 | SDLT/DLT |
| MSL5030 | 30 | HP LTO Ultrium 1 |
| MSL6026 | 26 | SDLT 600 |
| MSL6030 | 30 | HP LTO Ultrium 2<br>HP LTO Ultrium 3 |

Four-drive models are listed in Table 3.

**Table 3: MSL5000 and MSL6000 Series Four-drive (10U) Model Tape Libraries**

| Model Number | Number of Tape Cartridge Slots | Tape Drive Technology |
|---|---|---|
| MSL5052 | 52 | SDLT/DLT |
| MSL5060 | 60 | HP LTO Ultrium 1 |
| MSL6052 | 52 | SDLT 600 |
| MSL6060 | 60 | HP LTO Ultrium 2<br>HP LTO Ultrium 3 |

**Note:** See Applying the New Box-Swap Strategy to MSL6030 Models on page 341 to reference additional illustrated parts for two-drive MSL6030 libraries.

See Table 4 through Table 7 for referenced spare parts.

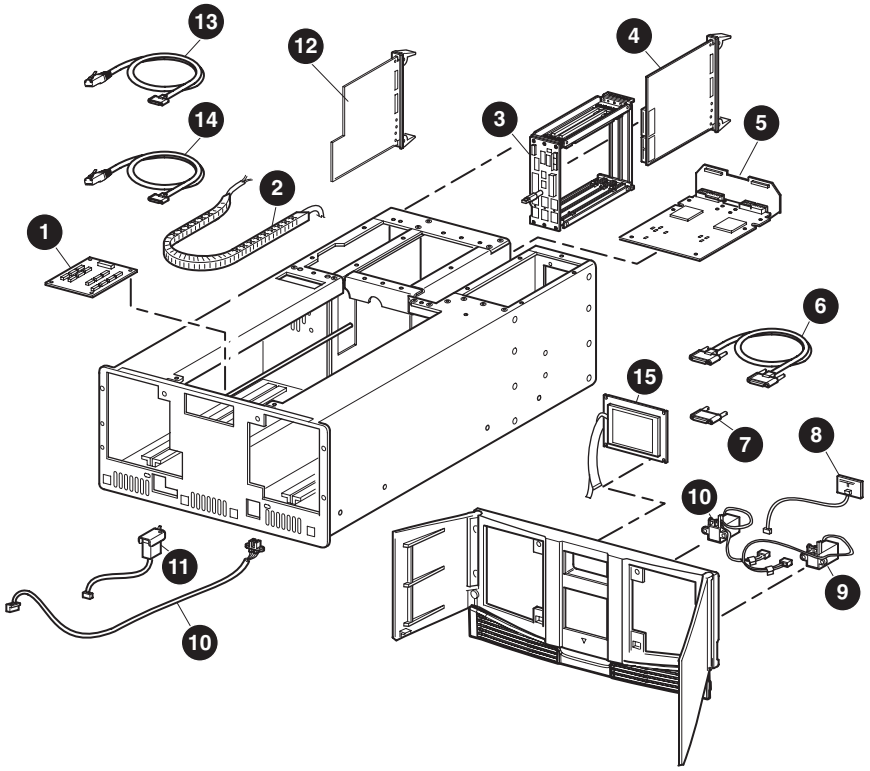


**Figure 1: Electrical spare parts exploded view (two-drive 5U models)**

**Table 4: Part Numbers for Electrical Spare Parts (Two-Drive 5U Models)**

| Figure Legend | Spare Part Description | Part Number |
|---|---|---|
| 1. | Control panel board (5U, non-auto power on)<br>Control panel board (5U, auto power on) | 231685-001<br>331226-001 |
| 2. | Flex cable kit | 231677-001 |
| 3. | Backplane board | 231674-001 |
| 4. | Library controller board | 231671-001 |
| 5. | Ultra 2 SCSI library hot-plug board[1]<br>Very high density I/O SCSI board<br>Ultra 3 SCSI library hot-plug board<br>Very high density I/O SCSI board | 331925-001<br>(MSL5000)<br>331229-001<br>(MSL6000) |
| 6. | SCSI very high density cable, 0.5 m (1.64 ft) male-to-male | 231687-002 |
| 7. | Very high density SCSI terminator (LVD) | 231683-001 |
| 8. | Front panel LED board | 231678-001 |
| 9. | Solenoid latch set | 231667-001 |
| 10. | Opto sensor cable set (6)[2] | 303072-001 |
| 11. | Mail slot solenoid | 231684-001 |
| 12. | Fibre Channel card, Ultra 2 SCSI (optional)<br>Fibre Channel card, Ultra 3 SCSI (optional) | 271666-001<br>320101-001 |
| 13. | Fibre Channel serial cable (optional) | 300576-001 |
| 14. | Library serial cable - RJ11-089 (optional) | 252850-001 |
| 15. | LCD touch display with board[3] | 231666-001 |

1. Spares for the library hot-plug board may be ordered with the 231672-001 part number.
2. The opto sensor cable set includes the pass-through opto sensor. The pass-through opto sensor is not shown in Figure 1.
3. The LCD touch display is also referred to as the GUI touch screen.

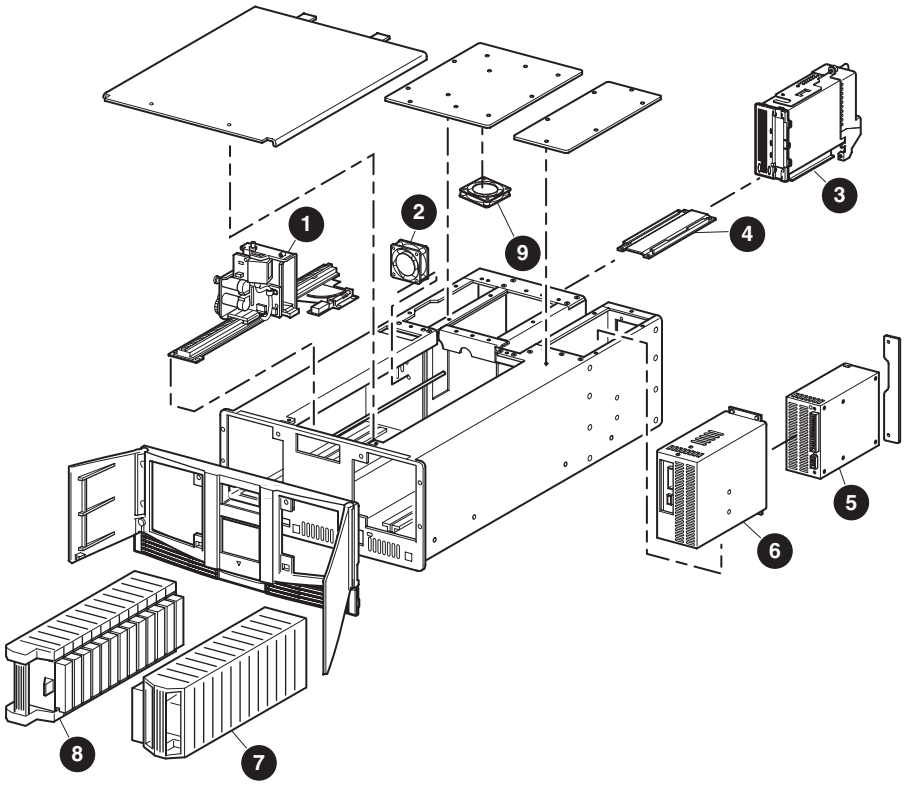


**Figure 2: Mechanical spare parts exploded view (two-drive 5U models)**

**Table 5: Part Numbers for Mechanical Spare Parts (two-drive 5U models)**

| Figure Legend | Spare Part Description | Part Number |
|---|---|---|
| 1. | Robot with bar code reader | 303071-001 |
| 2. | 18CFM backplane fan (w/Y cable) | 305551-001 |
| 3. | Tape drive, 110/220 GB, SDLT (MSL5000)<br>Tape drive, 160/320 GB (not shown)<br>Tape drive, 300/600 GB, SDLT (not shown)[1]<br>Tape drive, 40/80 GB, DLT (not shown) (MSL5000)<br>Tape drive, 100/200 GB, LTO Ultrium 1 (not shown)<br>Tape drive, 200/400 GB, LTO Ultrium 2 (not shown)[2] | 233125-001<br>293532-001<br>390303-001<br>231669-001<br>303074-001<br>390834-001 |
| 4. | Drive guide | 231682-001 |
| 5. | Power supply | 231668-001 |
| 6. | Power supply receiver with board (5U) | 231681-001 |
| 7. | Right magazine (DLT/SDLT)<br>Right magazine (LTO) | 231680-001<br>303076-001 |
| 8. | Left magazine (DLT/SDLT)<br>Left magazine (LTO) | 231679-001<br>303075-001 |
| 9. | Card cage fan | 263643-001 |

1. Spares for SDLT 600 tape drives do not offer hot-plug capability.
2. Spares for Ultrium LTO 3 tape drives do not offer hot-plug capability.

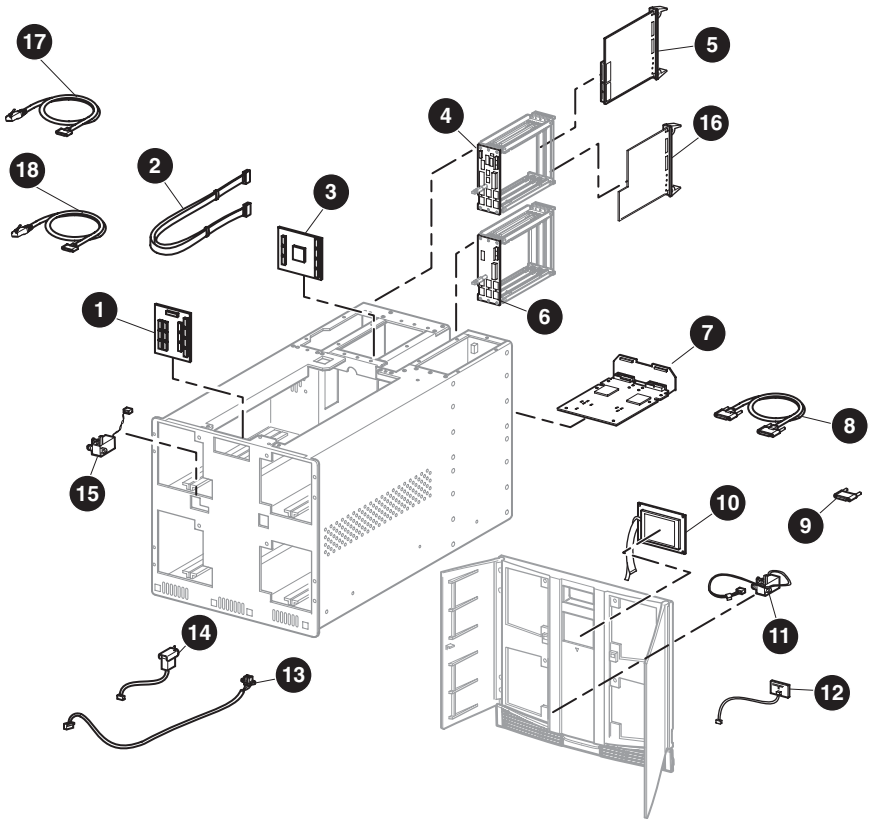


**Figure 3: Electrical spare parts exploded view (four-drive 10U models)**

**Table 6: Part Numbers for Electrical Spare Parts (Four-drive 10U Models)**

| Figure Legend | Spare Part Description | Part Number |
|---|---|---|
| 1. | Control panel board, 10U (non-auto power on)<br>Control panel board, 10U (auto power on) | 263645-001<br>331227-001 |
| 2. | Flex cable kit | 263641-001 |
| 3. | Controller board (vertical) | 263640-001 |
| 4. | Backplane board | 234893-001 |
| 5. | Library controller board | 231671-001 |
| 6. | Backplane expansion board | 263642-001 |

**Table 6: Part Numbers for Electrical Spare Parts (Four-drive 10U Models)**

| Figure Legend | Spare Part Description | Part Number |
|---|---|---|
| 7. | Ultra 3 SCSI library hot-plug board[1]<br>Very high density I/O SCSI board<br>Ultra 3 SCSI library (no hot-plug)<br>Very high density I/O SCSI board | 331925-001<br>(MSL5000)<br>390393-001<br>(MSL6000) |
| 8. | SCSI very high density cable, 0.5 m (1.64 ft) | 231687-002 |
| 9. | Very high density SCSI terminator (LVD) | 231683-001 |
| 10. | LCD touch display[2] with board | 231666-001 |
| 11. | Solenoid latch set | 231667-001 |
| 12. | Front panel LED board | 231678-001 |
| 13. | Opto sensor cable set (10)[3] | 303073-001 |
| 14. | Magazine solenoid | 265362-001 |
| 15. | SPS-solenoid, mail slot (5052) | 279245-001 |
| 16. | Fibre Channel card, Ultra 2 SCSI (optional)<br>Fibre Channel card, Ultra 3 SCSI (optional) | 271666-001<br>320101-001 |
| 17. | Fibre Channel serial cable (optional) | 300576-001 |
| 18. | Library serial cable, RJ11-DB (optional) | 252850-001 |

1. Spares for the library hot-plug board may be ordered with the 231672-001 part number.
2. The LCD touch display is also referred to as the GUI touch screen.
3. The opto sensor cable set includes the pass-through opto sensor. The pass-through opto sensor is not shown in Figure 3.

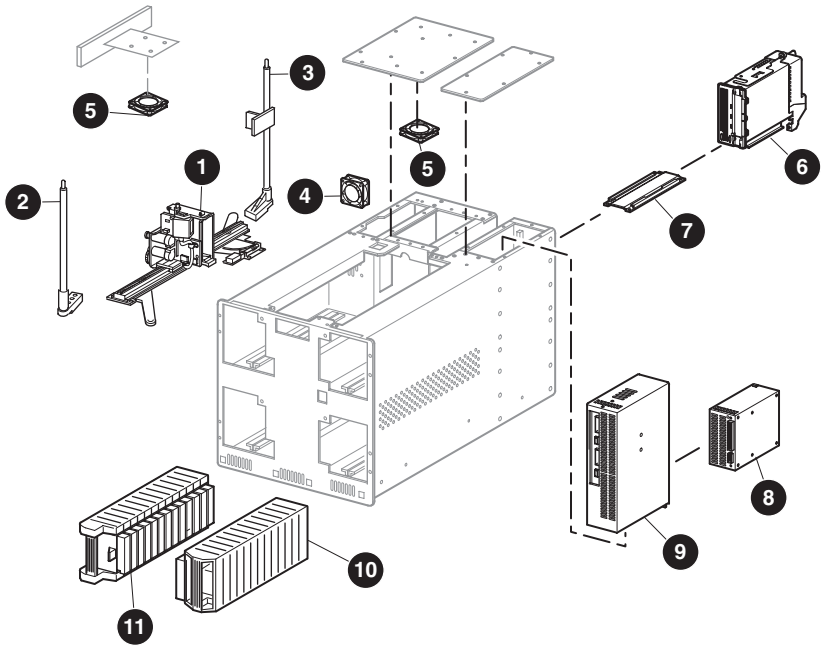


**Figure 4: Mechanical spare parts exploded view (four-drive 10U models)**

**Table 7: Part Numbers for Mechanical Spare Parts (Four-drive 10U Models)**

| Figure Legend | Spare Part Description | Part Number |
|---|---|---|
| 1. | Robot with bar code reader | 303070-001 |
| 2. | Front screw rail | 263637-001 |
| 3. | Rear screw rail | 263638-001 |
| 4. | 18CFM backplane fan (w/ Y cable) | 305551-001 |
| 5. | Card cage fan | 263643-001 |

**Table 7: Part Numbers for Mechanical Spare Parts (Four-drive 10U Models)**

| Figure Legend | Spare Part Description | Part Number |
|---|---|---|
| 6. | Tape drive, 110/220 GB, SDLT (MSL5000)<br>Tape drive, 160/320 GB, SDLT (not shown)<br>Tape drive, 300/600 GB, SDLT (not shown)[1]<br>Tape drive, 40/80 GB, DLT (not shown), MSL5000<br>Tape drive, 100/200 GB, LTO Ultrium 1 (not shown)<br>Tape drive, 200/400 GB, LTO Ultrium 2 (not shown)[2]<br>Tape drive, 960 , LTO Ultrium 3 (not shown)[3] | 233125-001<br>293532-001<br>390303-001<br>231669-001<br>303074-001<br>390834-001<br>390302-001 |
| 7. | Drive guide | 231682-001 |
| 8. | Power supply | 231668-001 |
| 9. | Power supply receiver with board, 5052 | 234892-001 |
| 10. | Right magazine (DLT/SDLT)<br>Right magazine (LTO) | 231680-001<br>390307-001 |
| 11. | Left magazine (DLT/SDLT)<br>Left magazine (LTO) | 231679-001<br>390308-001 |

1. Spares for SDLT 600 tape drives do not offer hot-plug capability.
2. Spares for LTO Ultrium 2 tape drives do not offer hot-plug capability.
3. Spares for LTO Ultrium 3 tape drives do not offer hot-plug capability.

# Preparing for Service

# 2

This chapter provides information you will need when servicing HP StorageWorks MSL5000 and MSL6000 Series tape libraries. This chapter covers the following topics:


- Required Tools, page 32
- Electrostatic Discharge Information, page 33
- Preparation Procedures, page 34
- Weight Warning, page 35
- Rack Warning, page 36
- Library Warnings and Precautions, page 37
- Manually Opening the Magazine Doors, page 38
- Parking the Shuttle Assembly for Service or Shipping, page 41
- Removing and Replacing the Library Covers, page 45

# Required Tools

To service a library you may need the following tools:

- Flat-blade screwdrivers (large and small)
- Phillips screwdriver (including stubby or right-angle, #1 and #2)
- Cross-slot screwdriver
- 22m Allen wrench
- Miniature grabber tool if screwdrivers are not magnetized
- Wire cutters (for removing cable ties)
- 0.50 hex key
- Needle nose pliers
- Ground strap
- *HP StorageWorks MSLUtil* diagnostic software
- *HP Insight Manager* software
- *HP Library and Tape Tools (L&TT)* diagnostic software

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**Note:** You may use the *HP StorageWorks Library and Tape Tools (L&TT)* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is a diagnostic tool that is designed to aid in the installation and maintenance of HP tape and magneto-optical storage products. *L&TT* includes several features designed for use by both HP storage customers and trained service personnel. The key features include:

- Diagnostic tools for tape and magneto-optical devices designed for simple troubleshooting
- Multiple options for retrieving and updating both the latest firmware and the most current version of *L&TT*

*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.

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# Electrostatic Discharge Information

To prevent electrostatic damage, observe the following precautions:

**Caution:** A discharge of static electricity can damage static-sensitive devices or microcircuitry. Proper packaging and grounding techniques are necessary precautions to prevent damage.

- 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 library 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 nonconductive 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.

# Preparation Procedures

System power in the library does not completely shut off using the LCD touch display. You must turn off library power using the On/Off switches, which are located at the rear of each power supply, and then disconnect the AC power cords from all associated power supplies to completely remove all power from the library.

**WARNING:** MSL5000 and MSL6000 Series tape libraries with four drives are equipped with dual-redundant power supplies. To reduce the risk of electrical shock or damage to the equipment, turn off both power supply On/Off switches, and disconnect both power supply cords when servicing this equipment.

**WARNING:** To reduce the risk of electric shock or damage to the equipment, disconnect power from the library by unplugging the power cords from either the electrical outlets or power supplies before servicing this equipment.

**WARNING:** To avoid damage to equipment or bodily harm, it is necessary to be knowledgeable of electrostatic discharge information before conducting the preparation procedures. For electrostatic discharge information, see "Electrostatic Discharge Information" described on page 33.

# Weight Warning

**WARNING:** The MSL5000 Series tape library weighs 31.1 kg (69 lbs.) when fully assembled. The MSL6000 Series tape library weighs 63.5 kg (140 lbs.) when fully assembled. To reduce the risk of personal injury or damage to equipment: 1) observe local health and safety requirements and guidelines for manual material handling, 2)obtain adequate assistance to lift and stabilize libraries during installation or removal, and 3)remove all tape drives and power supplies to reduce the overall weight of libraries.

# Rack Warning

**WARNING:** To reduce the risk of personal injury or damage to the equipment, be sure that:

- The leveling jacks are extended to the floor.
- The full weight of the rack rests on the leveling jacks.
- The stabilizing feet are attached to the rack if it is a single rack installation.
- The racks are coupled in multiple rack installations.
- Only one component is extended at a time. A rack may become unstable if more than one component is extended for any reason.

# Library Warnings and Precautions

**WARNING:** To reduce the risk of personal injury from electric shock and hazardous energy levels, only authorized service technicians should attempt to repair this equipment. Improper repairs could create hazardous conditions.

**WARNING:** To reduce the risk of personal injury from hazardous energy or damage to the equipment when working on energized libraries:

- Remove all watches, rings, and any other loose-fitting jewelry.
- Do not use conductive tools inside the library that could bridge live parts.

**WARNING:** To reduce the risk of electric shock or damage to equipment:

- Do not disable the power cord grounding plugs. Grounding plugs are important safety features.
- Plug power cords into grounded electrical outlets that are easily accessible at all times.
- Install power supplies before connecting power cords to the power supplies.
- Unplug power cords before removing power supplies from the library.

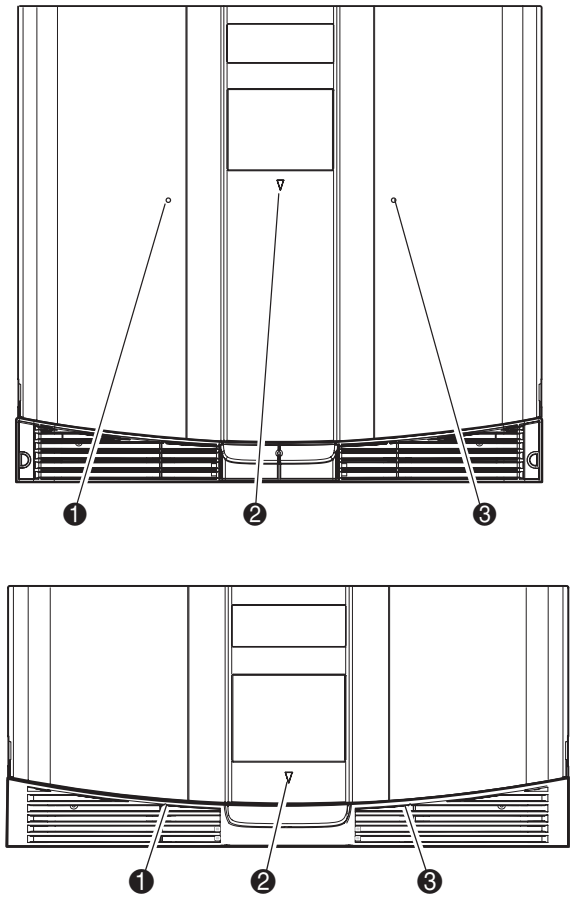
**WARNING:** The installation of options and servicing of this product must be performed by individuals who are knowledgeable of the procedures, precautions, and hazards associated with equipment containing hazardous energy circuits.

# Manually Opening the Magazine Doors

The magazine doors have both an electrical release through the use of the LCD touch display and a manual release. HP recommends that you open the magazine doors using the LCD touch display. However, if the LCD touch display fails, you can manually open the magazine doors by pushing a paper clip into the mechanical releases as shown in Figure 5.

**Caution:** To avoid data loss or damage to the equipment, the magazine doors should be opened manually only in an emergency.

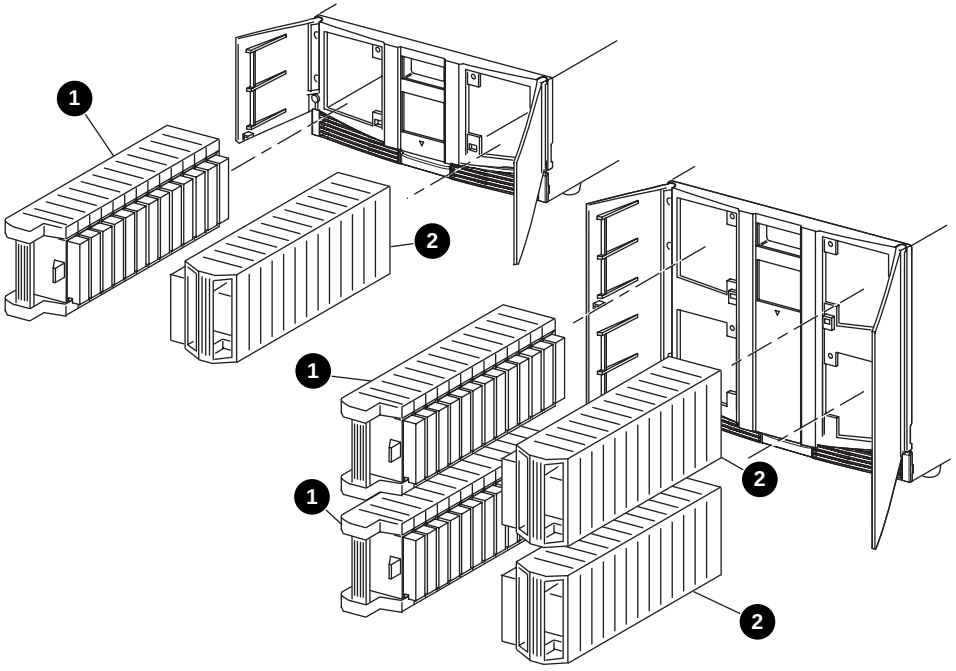
1. Locate the door release access holes as shown in Figure 5.
2. Using a thin, stiff metal rod (such as a 0.050 hex key, or a straightened paper clip), push the rod into the manual access door release until the door opens.




1. Left magazine release
2. Status LED
3. Right magazine release

**Figure 5: Manually opening the magazine doors**

3. The magazine can now be removed. See Figure 6.




1. Left Magazines, with integrated mail slot
2. Right Magazines

**Figure 6: Magazine Removal**

# Parking the Shuttle Assembly for Service or Shipping

Many of the removal and replacement procedures require that the shuttle assembly be in the parked position to provide access to parts to be removed. When shipping the library, it is important that the shuttle assembly be in the parked position to prevent damage while being handled in transit.

## Parking the Shuttle Assembly (Library Operational)

To park the shuttle when the library is operational:

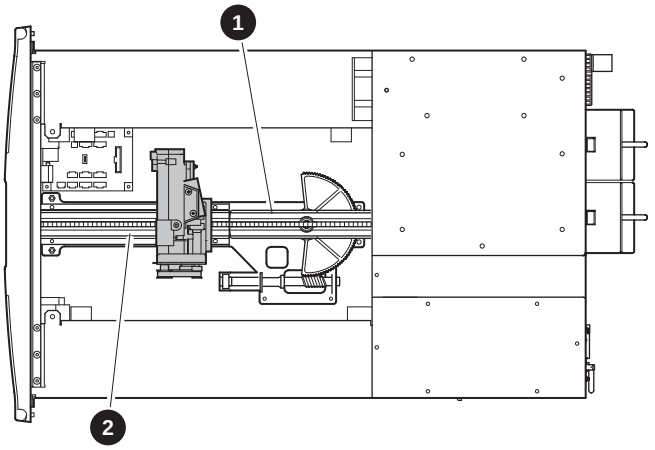
1. Turn off library power using the LCD touch display. The controlled power-off sequence automatically moves the shuttle assembly to the parked position.
2. Turn off the master power switches on all power supplies, which are located at the rear of the library.
3. Remove the power cords from the receptacle.

It is now safe to proceed with service or shipment.

## Parking the Shuttle Assembly (Library Not Operational)

To park the shuttle when the library is not operational:

1. Turn off the master power switches on the power supplies, which are located at the rear of the library. Unplug the power cords.
2. Look through the view port at the front of the library to determine whether the shuttle assembly is in the parked position (see Figure 7).




1. Rotating track section
2. Stationary track section

**Figure 7: Shuttle assembly in the parked position**

**Note:** If the shuttle assembly is in the parked position or anywhere on the stationary track section, then it is safe to service or ship the library.

**Note:** Not all removal and replacement procedures require the shuttle assembly to be in the parked position.

3. If the shuttle assembly is on the rotating track section, then it must be moved to the stationary section for shipment. To move the shuttle assembly to the stationary section, complete the following steps:
   a. Remove the top front cover following the instructions in "Removing and Replacing the Library Covers" on page 45.
   b. Turn the rotating track section counter-clockwise to align the track sections.

c. Release the brake by moving the brake release lever to the right (see arrow in Figure 8 or Figure 9).

d. Push the shuttle assembly at the base near the track until the shuttle assembly is completely on the stationary track section (see Figure 8 or Figure 9).

**Note:** Push the shuttle assembly from the bottom and not the top when manually moving the assembly.

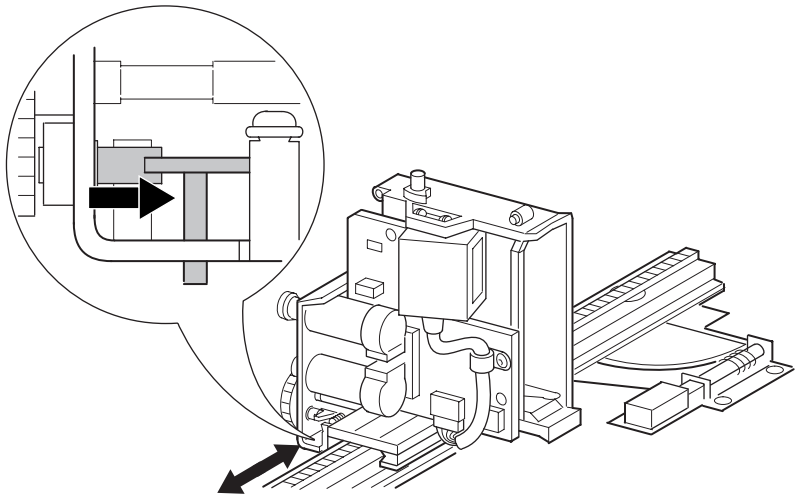


**Figure 8: Shuttle assembly brake**

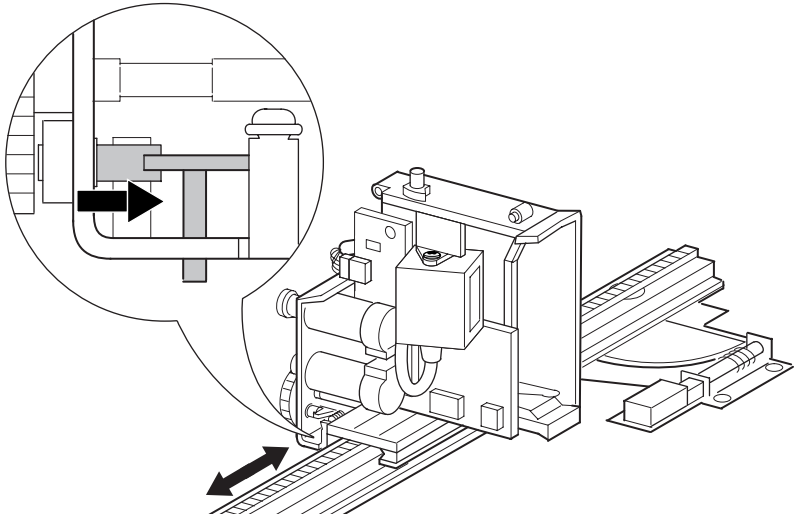


**Figure 9: Shuttle assembly brake (LTO-compatible)**

e. Engage the brake release lever, and verify that it is locked. (The brake should be resting in an opening on the wheel, and the shuttle assembly cannot be moved.)

f. Replace the top front cover, if no other servicing inside the library is required, following the instructions in "Removing and Replacing the Library Covers" on page 45.

The library can now be safely shipped or serviced.

# Removing and Replacing the Library Covers

To remove the tabletop model outside cover:

1. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
2. Remove the four screws that secure the cover to the library chassis (see Figure 10 and Figure 11).
3. Carefully slide the cover toward the rear of the library until it clears the front panel. Lift the cover up and away from the library chassis.
4. Replace the tabletop model outside cover by reversing these removal procedures.

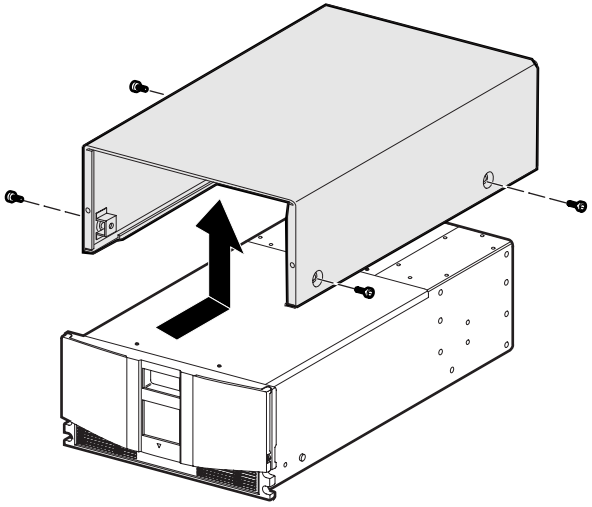


**Figure 10: Removing the outside cover (two-drive 5U models)**

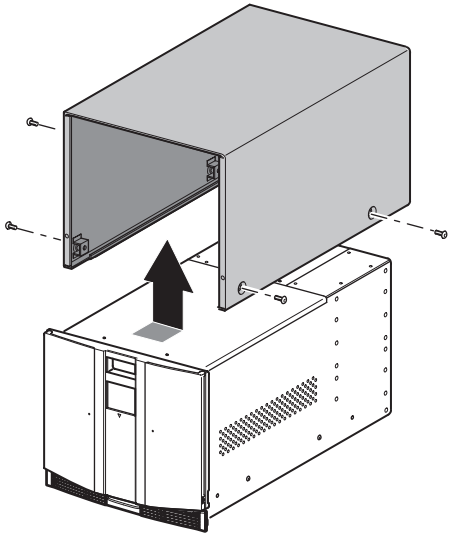


**Figure 11: Removing the outside cover (four-drive 10U models)**

The library has three inside covers (see Figure 12):

- The top front cover can be removed to gain access to the shuttle assembly, magazine solenoids, and control panel board.
- The left rear cover is used to prevent internal access to any installed power supply.
- The right rear cover is used to prevent internal access to the installed tape drives and card cage/backplane assemblies.

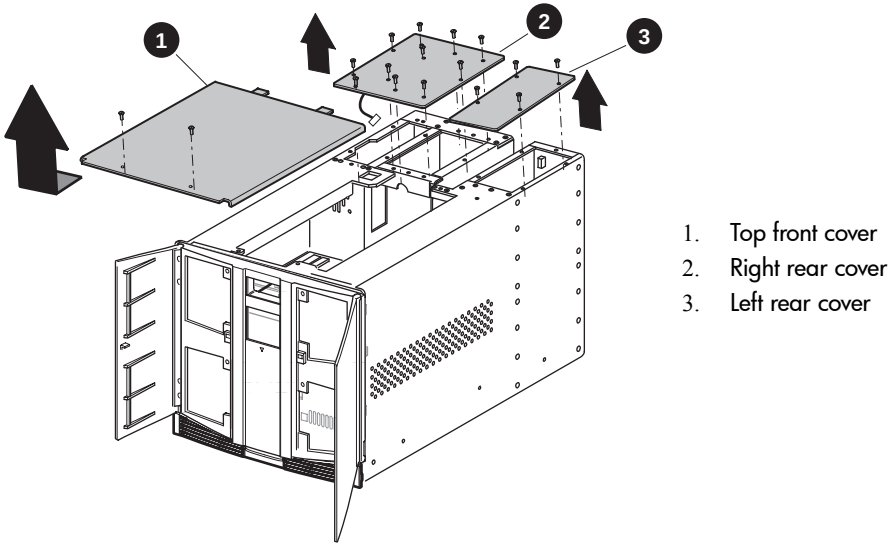



**Figure 12: Removing the top front, left, and right rear covers (four-drive 10U model shown)**

To remove the top front cover:

1. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
2. Remove the two screws that secure the cover to the library chassis (see Figure 12).
3. Carefully slide the cover toward the front of the library to release the two rear tabs. Lift the cover up and away from the library chassis.
4. Replace the top front cover by reversing the removal procedures.

To remove the left rear cover:

1. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
2. Remove the screws that secure the cover to the library chassis.
3. Lift the cover up and away from the library chassis.

4. Replace the left rear cover by reversing these removal procedures.

To remove the right rear cover:

1. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
2. Remove the screws that secure the covers to the library chassis.
3. Carefully tilt the cover up from the center of the library chassis, and disconnect the cable from the card cage/backplane fan.

**Note:** Some older model libraries do not have a card cage/backplane fan installed.

**Note:** For older MSL5000 Series tape libraries, if the Fibre Channel card is present or has been previously used, a cooling kit retrofit may have been installed.

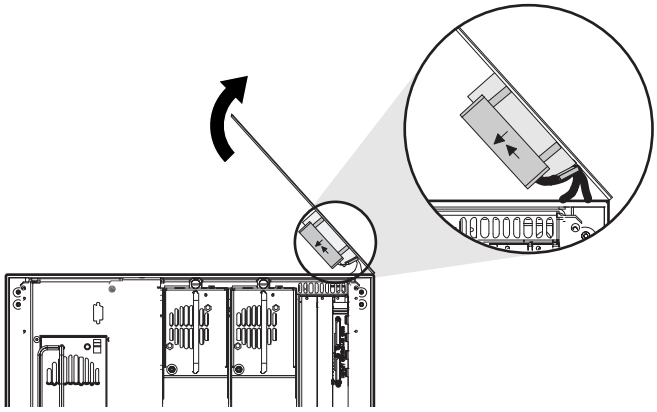


**Figure 13: Disconnecting the cooling fan**

4. Lift the cover up and away from the library chassis.
5. Replace the right rear cover by reversing these removal procedures.

# Replacing Two-Drive (5U) Model Electrical Components

3

This chapter provides procedures for removing and replacing two-drive (5U) model electrical components for the following MSL5000 and MSL6000 Series tape libraries:

- MSL5026
- MSL5030
- MSL6026
- MSL6030 (Old LTO Ultrium 2 based models)

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**Note:** See the Illustrated Parts Catalog on page 21 to verify spare part numbers when replacing electrical components for two-drive (5U) tape library models.

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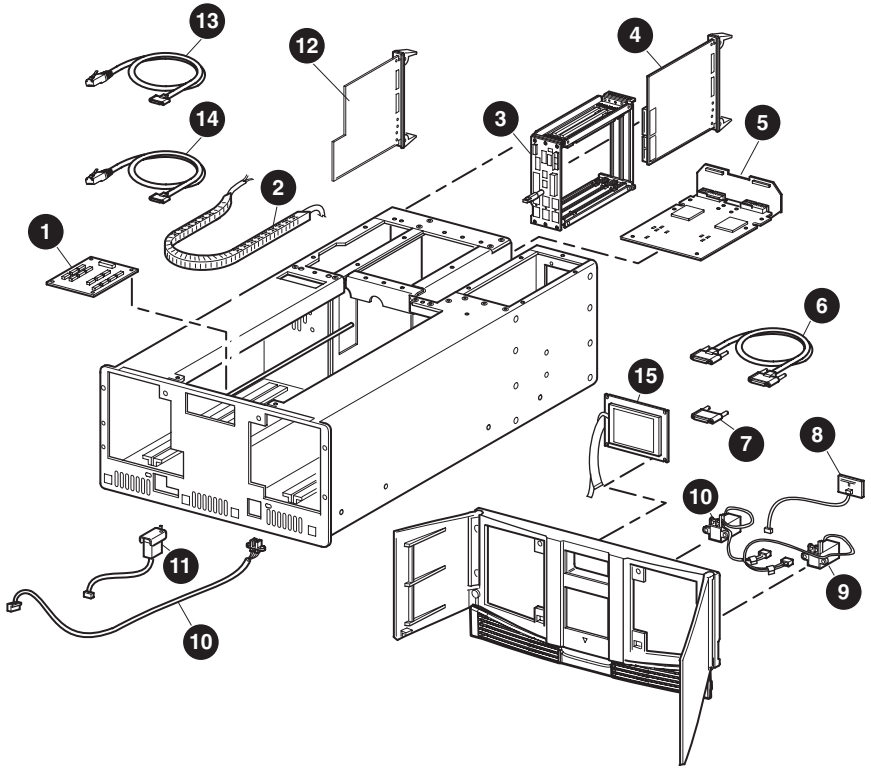
Procedures covered in this chapter include:


- Removing and Replacing the Front Panel, page 52
- Removing and Replacing the LCD Touch Display, page 58
- Removing and Replacing the Front Panel LED Board, page 60
- Removing and Replacing the Magazine Door Latch Solenoids, page 62
- Removing and Replacing the Pass-Through Opto Sensor, page 65
- Removing and Replacing the Control Panel Board (Auto Power On and Non-Auto Power On), page 65
- Removing and Replacing the Mail Slot Solenoid, page 73
- Removing and Replacing the Library Controller Board, page 75
- Removing and Replacing the Fibre Channel Thermal Unit, page 79
- Removing and Replacing the Fibre Channel Card, page 85
- Removing and Replacing the Card Cage/Backplane Assembly, page 91

- Removing and Replacing the Very High Density I/O SCSI Board/Ultra SCSI 2 Library Board, page 96
- Removing and Replacing a Magazine Opto Sensor, page 99
- Removing and Replacing the Shuttle Assembly Flex Cable, page 102




1. Control panel board (non-auto power on/auto power on)
2. Flex cable kit
3. Backplane board
4. Library controller board
5. Ultra 2 SCSI library hot-plug board/very high density I/O SCSI board
6. SCSI very high density cable, 0.5 m (1.64 ft)
7. Very high density SCSI terminator (LVD)
8. Front panel LED board
9. Solenoid latch set
10. Opto sensor set cable (6)
11. Mail slot solenoid
12. Fibre Channel card (optional)
13. Fibre Channel serial cable (optional)
14. Library serial cable - RJ11-089 (optional)
15. LCD touch display with board

**Figure 14: Electrical components for two-drive (5U) models**

# Removing and Replacing the Front Panel

The front panel assembly mounts on the front of the library chassis. It includes a replaceable LCD touch display, front panel LED board, and solenoids for the left and right magazine door lock mechanisms. The front panel must be removed to replace the LCD touch display, front panel LED board, and the magazine door latch solenoids.

Before removing the front panel, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Ensure that the shuttle assembly is parked (see the "Preparing for Service" chapter on page 31 for additional information).
3. Open the magazine doors, and remove the two magazines. Be sure that the magazine doors remain open.
4. Remove the top front cover.

After completing step 1 through step 4 above:

1. Locate the control panel board at the bottom of the library chassis, behind the front panel (see Figure 15).

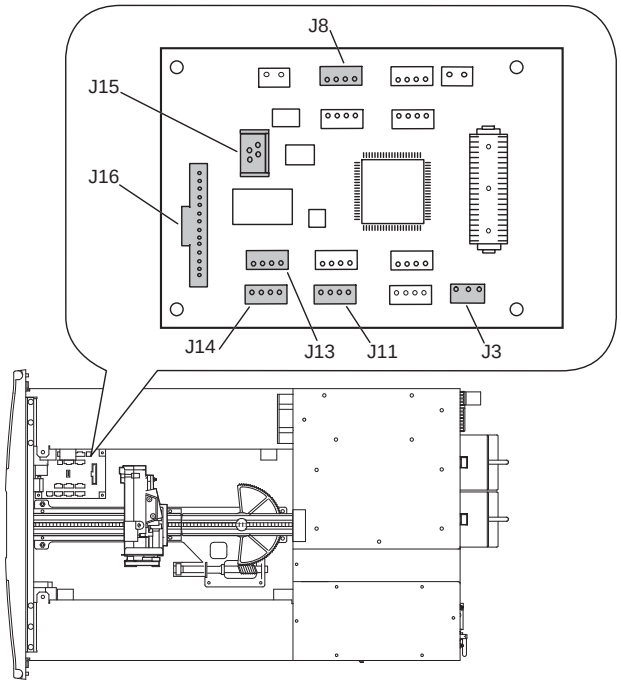



**Figure 15: Control panel board**

2. Disconnect and label cables from connections J3, J13, J14, and J16. Disconnect the zero insertion force cable at J15 by sliding the body of the connector up to release the flex cable. Remove the flex cable from the connector (see Figure 16).

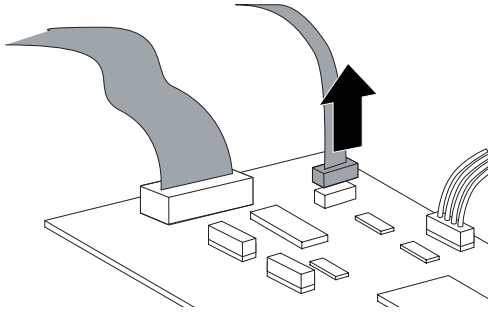
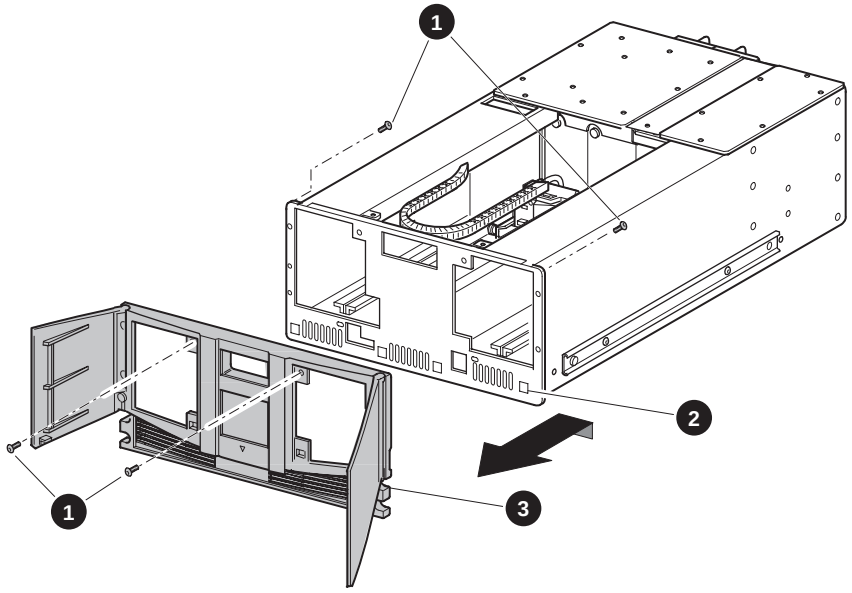


**Figure 16: Disconnecting the J15 connector**

3. While holding the front panel against the library chassis, remove the two screws that secure the front panel to the library chassis (see Figure 17).
4. Remove the two screws behind the chassis ears located at the top corners.
5. Carefully pivot the top of the front panel away from the library chassis approximately 2.54 cm (1 inch). Lift up on the front panel so that the four tabs that secure it at the bottom clear the library chassis (see Figure 17).
6. Guide the cables out through the library chassis opening (see Figure 17) while removing the front panel.




1. Chassis ear screws
2. Molded tab opening (4)
3. Molded tab (4)

**Figure 17: Removing the front panel**

To replace the front panel:

1. Position the front panel near the library chassis, and then guide the cables through the library chassis opening (see Figure 18). Make sure that the flex cable stays on top of the 15-pin flat cable and does not get twisted or folded as it goes through the library chassis.

---

**Note:** The cables must be routed through the lower right portion of the L-shaped opening close to the bottom of the library chassis.

---

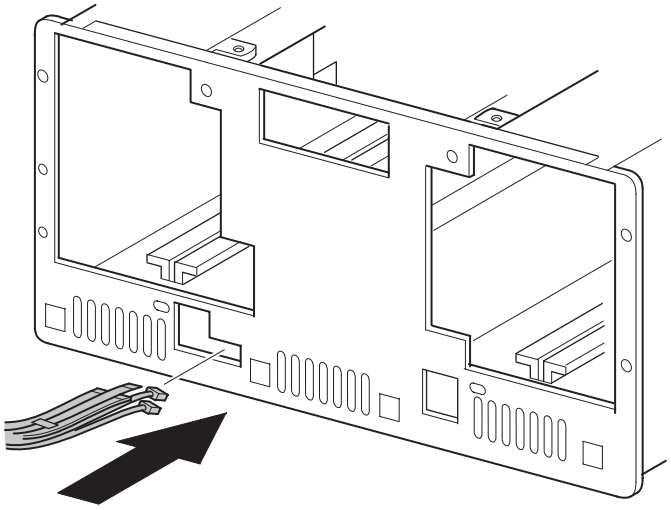


**Figure 18: Routing the front panel cables**

2. Pivot the front panel away from the library chassis at a slight angle, and position the four tabs at the bottom of the front panel in the library chassis openings. Slip the tabs over the library chassis.
3. Pivot the top of the front panel against the library chassis.
4. Replace the four screws that secure the front panel to the library chassis.
5. Reconnect the cables to connectors J3, J13, J14, J16, J8 and, if present, J11. Carefully connect the zero insertion force cable at J15.
6. Replace the top front cover.
7. Reconnect the power cord.
8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *HP StorageWorks Library and Tape Tools (L&TT)* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is a diagnostic tool that is designed to aid in the installation and maintenance of HP tape and magneto-optical storage products. *L&TT* includes several features designed for use by both HP storage customers and trained service personnel. The key features include:

- Diagnostic tools for tape and magneto-optical devices designed for simple troubleshooting
- Multiple options for retrieving and updating both the latest firmware and the most current version of *L&TT*

*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.

9. Restart the application software.

# Removing and Replacing the LCD Touch Display

The LCD touch display is mounted on the inside of the front panel. To remove:

1. Remove the front panel. See “Removing and Replacing the Front Panel” on page 52.
2. Use a cushioning material to protect the finish of the front panel, and place the front panel face down on a flat work surface.
3. Remove the four screws (with insulating washers) that secure the LCD touch display to the front panel (see Figure 19).
4. Lift the LCD touch display up and away from the front panel.
5. Note cable location, and then disconnect the cable.

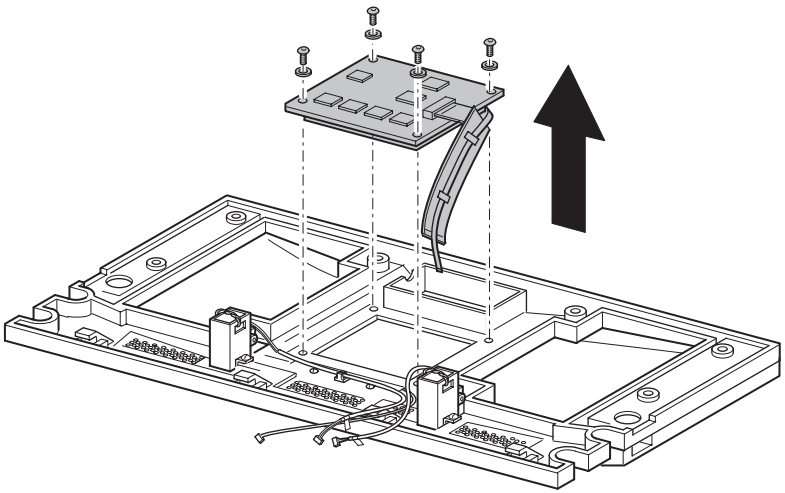


**Figure 19: Removing the LCD touch display**

To replace the LCD touch display:

1. With the magazine door lock solenoid wires properly routed (see Figure 19), place the LCD touch display on the mounting posts with the ribbon cable and flex cable to the right.
2. Replace the four mounting screws and insulating washers, with the insulating washers between the mounting screw washer and the board (see Figure 19).
3. Reconnect the cable that was disconnected in step 5 above.

4. Replace the front panel. See Removing and Replacing the LCD Touch Display on page 58.
5. Reconnect the power cord.
6. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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7. Restart the application software.

# Removing and Replacing the Front Panel LED Board

The front panel LED board is mounted inside the front panel. To remove:

1. Remove the front panel board. See "Removing and Replacing the Front Panel" on page 52.
2. Remove the LCD touch display assembly. See "Removing and Replacing the LCD Touch Display" on page 58.
3. Cut the cable tie (located near the left door solenoid) that ties the two solenoid cables and the front panel LED board to the front panel.
4. Remove the two screws that mount the LED to the front panel. (See Figure 20.)
5. Lift the front panel LED board up and away from the front panel.
6. Note the cable location, and then disconnect the cable.

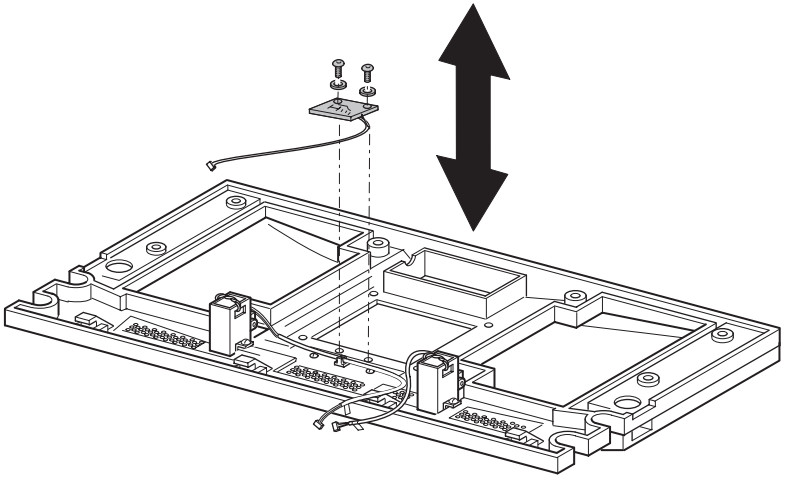

**Figure 20: Removing the front panel LED board**

To replace the front panel LED board:

1. Position the front panel LED board on the mounting posts, with the cable to the right.
2. Replace the two mounting screws. (See Figure 20).
3. Reconnect the cable that was disconnected in step 6 above.
4. Replace the LCD touch display assembly.

5. Replace the front panel.
6. Reconnect the power cord.
7. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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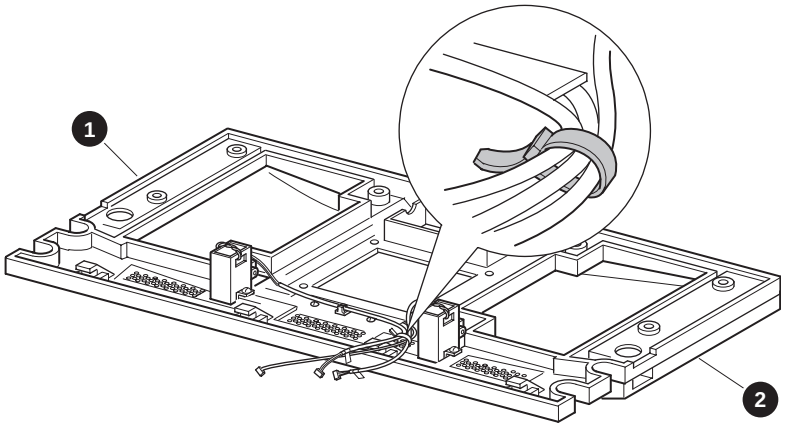
8. Restart the application software.

# Removing and Replacing the Magazine Door Latch Solenoids

The magazine door latch solenoids for the left and right magazine door lock mechanisms are mounted on the inside of the front panel. To remove the magazine door latch solenoids:

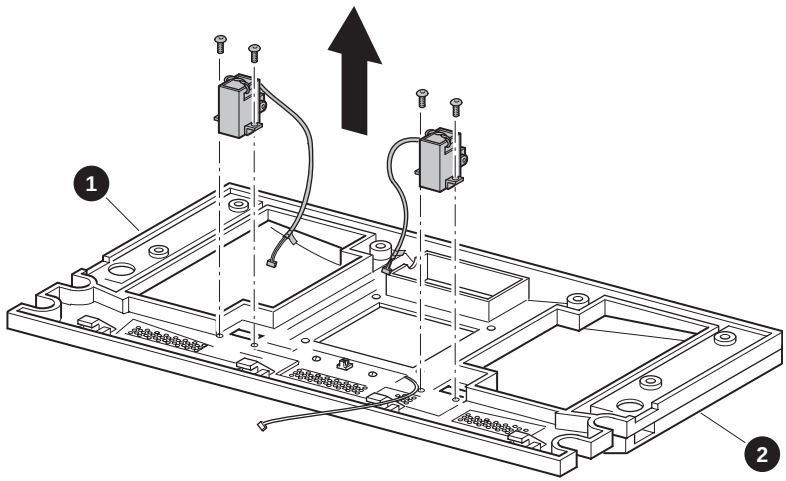
1. Remove the front panel. See “Removing and Replacing the Front Panel” on page 52.
2. For the right magazine door latch solenoid, remove the LCD touch display. See “Removing and Replacing the LCD Touch Display” on page 58.
3. Remove the cable tie that is near the left door solenoid that ties the two solenoid cables and the power LED cable together (see Figure 21).




1. Front panel, right
2. Front panel, left

**Figure 21: Magazine door latch solenoid cable tie**

4. Remove the two screws that mount the solenoid to the front panel (see Figure 22).
5. Note cable locations, and then disconnect the cables.




1. Panel, right
2. Panel, left

**Figure 22: Removing the magazine door latch solenoids**

To replace the magazine door latch solenoids:

1. With both magazine doors open, position the front panel solenoid in the front panel. Secure using the previously removed mounting screws (see Figure 22).
2. For the right solenoid, route the cables across the panel to the left solenoid.
3. Replace the cable tie in the location where you removed it.
4. Reconnect the cables that were disconnected in step 5 on page 63.
5. Replace the LCD touch display array. See Removing and Replacing the LCD Touch Display on page 58.
6. Replace the front panel. See Removing and Replacing the Front Panel LED Board on page 60.
7. Reconnect the power cord.

8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. L&TT is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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9. Restart the application software.

# Removing and Replacing the Pass-Through Opto Sensor

The pass-through opto sensor is mounted inside the chassis at the bottom of the pass-through opening.

**Note:** The pass-through opto sensor is included with the opto sensor cable set. Refer to Figure 1 for part number details.

Before removing the pass-through opto sensor, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Park the shuttle assembly.
3. Remove the top front cover and right rear cover.

After completing step 1 through step 3 above:

1. Remove the drive 0 shoe assembly. See “Removing and Replacing a Tape Drive” on page 113.
2. Remove the screw from the card cage/backplane access plate, and lift it out of the library (see Figure 23).

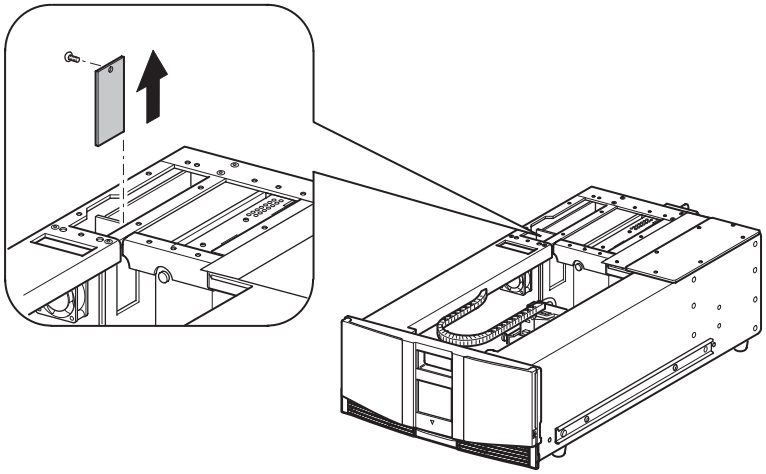


**Figure 23: Removing the card cage/backplane access plate**

3. Remove the two screws that mount the pass-through opto sensor to the chassis (see Figure 24).

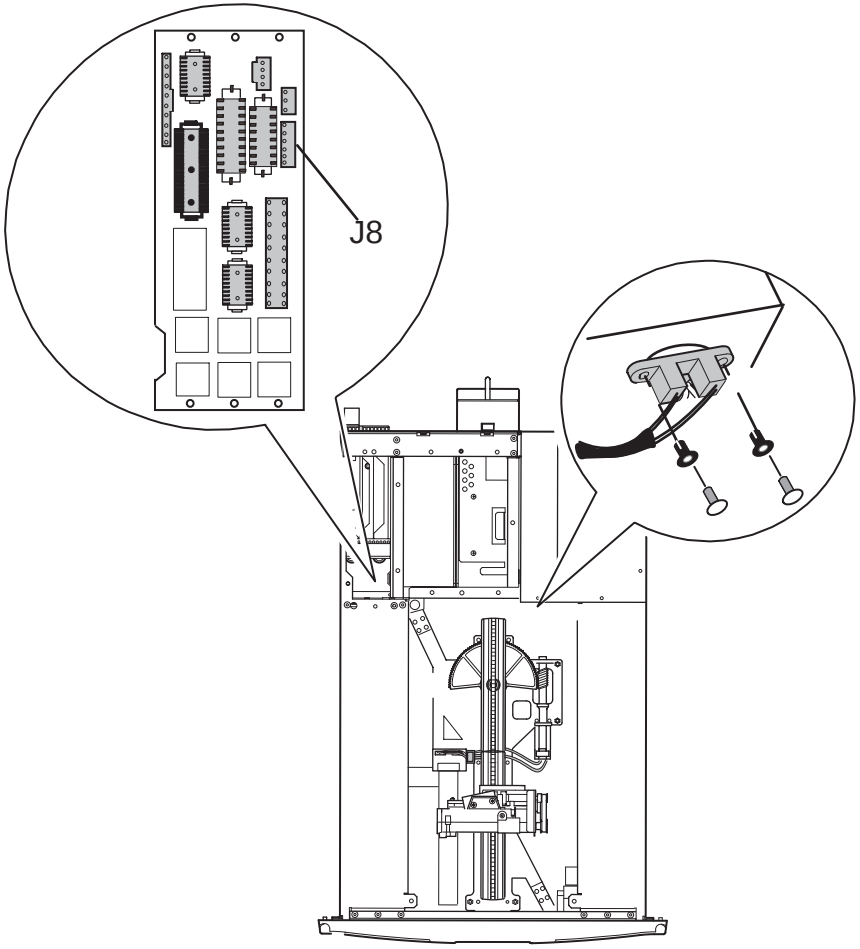
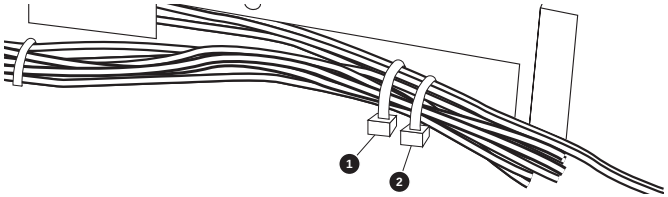



**Figure 24: Removing the pass-through opto sensor**

4. Remove the cable ties (see Figure 25) that secure the pass-through opto sensor cable to the main wiring harness.




1. Cable tie, left
2. Cable tie, right

**Figure 25: Cable ties**

5. Disconnect the cable at J8 on the card cage/backplane board (see Figure 24).
6. Carefully work the cable through the opening under the left magazine track and into the main chassis area to remove the pass-through opto sensor.

To replace the pass-through opto sensor:

1. Position the pass-through opto sensor in the mounting hole with the cable routed along the main wiring harness to the left.
2. Replace the two mounting screws (see Figure 24).
3. Replace the cable ties (see Figure 25) in the locations they were removed from in step 4 of the removal instructions on page 68.
4. Carefully work the cable through the opening under the left magazine track and into the card cage/backplane area.
5. Feed the cable through, and reconnect to J8 on the card cage/backplane board (see Figure 24).
6. Replace the card cage/backplane connector access plate, and replace the screw (see Figure 23).
7. Replace the drive shoe assembly.
8. Replace the outside cover, top front cover, and right rear cover.
9. Reconnect the power cord.

10. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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11. Restart the application software.

# Removing and Replacing the Control Panel Board (Auto Power On and Non-Auto Power On)

The control panel board is mounted in the bottom of the library chassis directly behind the front panel.

**Note:** The control panel board is manufactured with either the Auto Power On or the non-Auto Power On option. Original MSL5000 Series tape libraries are shipped with the non-Auto Power On feature; however, the board can be upgraded with the Auto Power On feature. MSL6000 Series tape libraries are shipped with the Power On feature. Removal and replacement is the same for the control panel board with either feature.

If the control panel board includes the Auto Power On feature, the feature is enabled by default.

Before removing the control panel board, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the magazine doors, and remove the left magazine.
3. Park the shuttle assembly.
4. Remove the top front cover.

After completing step 1 through step 4 above:

1. Remove the front panel. See "Removing and Replacing the Front Panel" on page 52.
2. Disconnect and label the remaining cables at J1, J9, J10, J12, and J8 and J11, if present (see Figure 26).

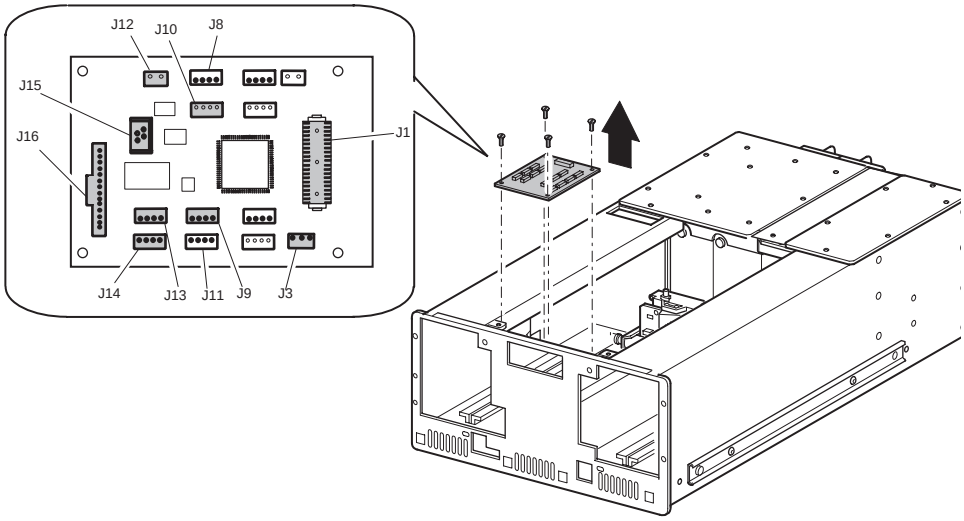


**Figure 26: Removing the control panel board**

3. Remove the three or four screws that secure the control panel board to the library chassis (see Figure 26).
4. Lift the control panel board up and away from the library chassis.

To replace the control panel board:

1. Position the control panel board over the mounting standoffs at the bottom of the library chassis, with connector J1 facing the rear of the library.
2. Replace the screws that secure the control panel board to the library chassis. (See Figure 26).
3. Reconnect the cables at J1, J9, J10, J12, and J8 and J11, if present (see Figure 26).
4. Replace the front panel. Removing and Replacing the Front Panel LED Board on page 60.
5. Replace the top front cover.

6. Replace the left magazine, and close the door.
7. Reconnect the power cord.
8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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9. Restart the application software.

# Removing and Replacing the Mail Slot Solenoid

The mail slot solenoid is mounted on the underside of the left magazine track near the front of the library.

Before removing the mail slot solenoid, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the magazine doors, and remove the left magazine.
3. Park the shuttle assembly.
4. Remove the top front cover.

After completing step 1 through step 4 above:

1. Disconnect the cable at J12 on the control panel board (see Figure 26).
2. While supporting the mail slot solenoid below the magazine track, remove the two flat-head mounting screws that face the center of the magazine track (see Figure 27).

**Note:** Use a stubby or right-angle screwdriver for this procedure.

3. Remove the mail slot solenoid from beneath the magazine track.

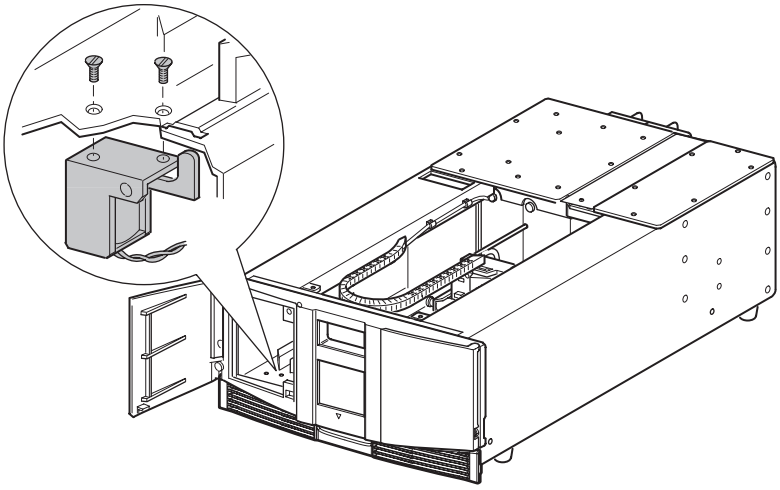

**Figure 27: Removing the mail slot solenoid**

To replace the mail slot solenoid:

1. Position the mail slot solenoid underneath the magazine track with the locking tab to the right (see Figure 27). The top of the tab must be in the slot.
2. Align the mounting holes, and install the two previously removed flat-head screws (see Figure 27).
3. Reconnect the cable at J12 on the control panel board (see Figure 26).
4. Replace the left magazine, and then close the door.
5. Replace the top front cover.
6. Reconnect the power cord.
7. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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8. Restart the application software.

# Removing and Replacing the Library Controller Board

The library controller board is installed inside the card cage/backplane assembly on the right at the rear of the library.

**Note:** The library controller board must be installed in the right-most slot. It will not function in the other slots.

To remove the library controller board:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Exit the application software. If possible, note the **Library Options** and **SCSI Options** settings through the LCD touch display so the settings can be reset, if necessary.
3. Using the LCD touch display, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.

4. For replacement purposes, note the location of the SCSI interface cables, SCSI terminator, 10Base-T cable (if present), and RS-232 cable (if present), and then remove each cable (see Figure 28.

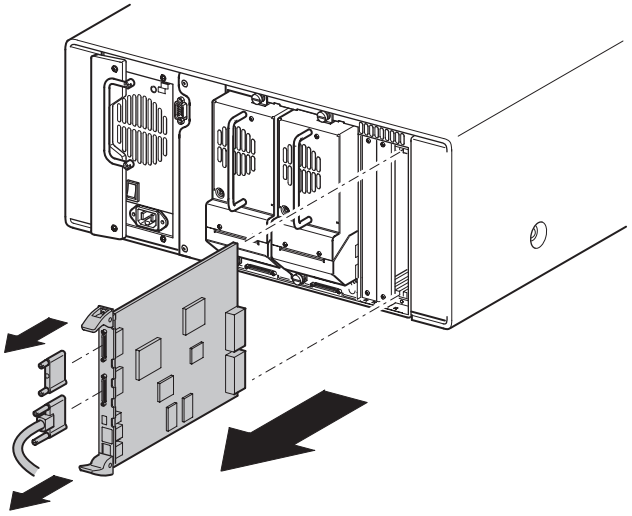

**Figure 28: Removing cables, the terminator, and the library controller board**

5. Completely loosen the two captive screws on the ejector handles of the controller board.

6. Disconnect the library controller board by spreading the ejector handles (see Figure 29).

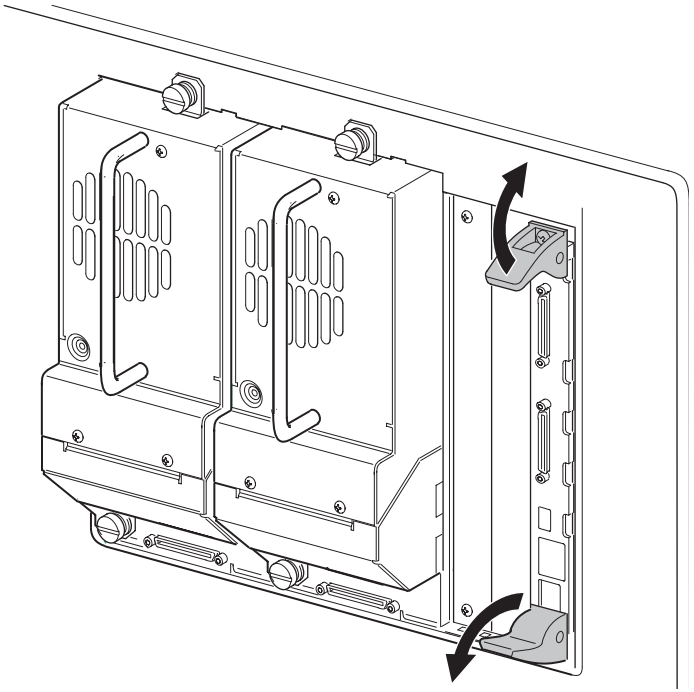

**Figure 29: Spreading the ejector handles**

7. Pull the library controller board out of the library card cage/backplane.

To replace the library controller board:

1. Position the replacement controller board with the SCSI connectors toward the top, and then align the edges of the board with the slots in the library's card cage/backplane (see Figure 28).

**Caution:** The controller board must be in the right-hand slot and in the upper level for 10U libraries.

2. Push the controller board into the card cage/backplane until the ejector handles pivot toward each other. Move the ejector handles toward each other to fully seat the board.

3. Tighten the two captive screws on the ejector handles (see Figure 29).
4. Reconnect the SCSI interface cable, SCSI terminator, 10Base-T cable (if present), and RS-232 cable (if present).
5. Reconnect the power cord, and turn on the master power switch on the power supply. If necessary, turn the library on by using LCD touch display touch display.

---

**Note:** An error code (`3031`) displays after the first power on with the new controller board. This is expected because the replacement controller board did not have this library's serial number stored in memory.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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6. If you have an MSL6000 series tape library, restore the user defaults using the LCD touch display. Access the screen to set defaults by choosing **Menu** > **Maintenance** > **Set User Defaults** from the LCD touch display.
7. If the host operating system requires a restart to discover SCSI devices, then reboot the host.
8. Restart the application software.

# Removing and Replacing the Fibre Channel Thermal Unit

The Fibre Channel thermal unit ensures proper cooling of the Fibre Channel card by using enhanced airflow through the interior of the library.

**Caution:** The installation of the Fibre Channel thermal unit is used on all libraries except those that are not dark gray. Failure to install these into libraries that are not dark gray could result in damage to the equipment or data loss.

**Caution:** To avoid damage to equipment or prevent data loss, this part must be installed by an HP service representative.

**Caution:** This part is not hot pluggable.You must power down the library before replacing this part.

To remove the Fibre Channel thermal, complete the following steps:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Using the LCD touch display, open the front left side door, and remove the left side tape cartridge magazine.

3. Using the LCD touch display, turn the library off. Turn off the master power switch for the power supply at the back of the library, and then remove the AC power cord.

---

**Note:** This process automatically moves the shuttle assembly robot to the parked position. See "Parking the Shuttle Assembly for Service or Shipping" on page 41 for additional information on parking the shuttle assembly.

---

4. For rack mounted libraries, remove the library from the rack. For tabletop libraries, remove the outer cover. See the *HP StorageWorks MSL6000 Series Tape Library User Guide* for detailed instructions.
5. Remove the front cover, and set aside. Remove the right rear cover, and discard, but keep the screws. See Figure 30.

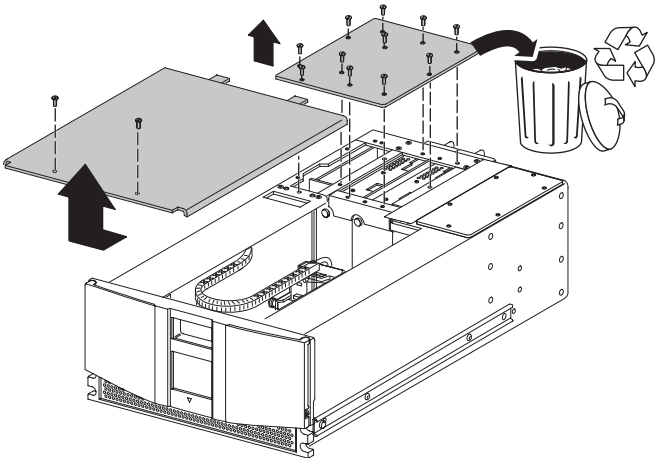

**Figure 30: Removing front and rear covers**

6. Remove the cooling baffle plate, and discard (See Figure 31).

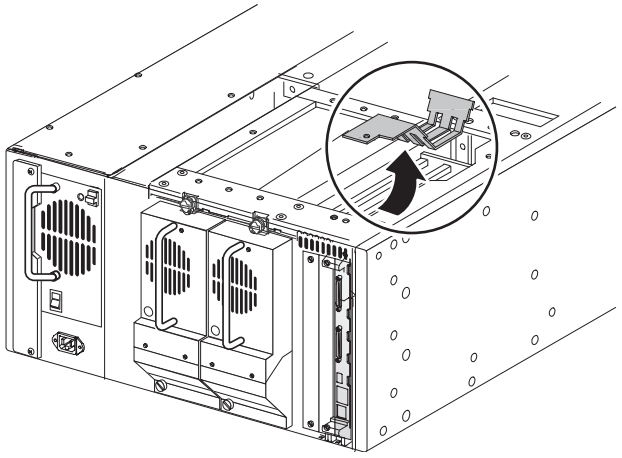

**Figure 31: Removing the cooling baffle plate**

7. Disconnect the card cage cooling fan cable from the card cage (J11), and remove the fan and finger guard from the chassis (see Figure 32). Access to the fan mounting fasteners is through the area left vacant by removal of the left side magazine.

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**Note:** This fan will not be reused.

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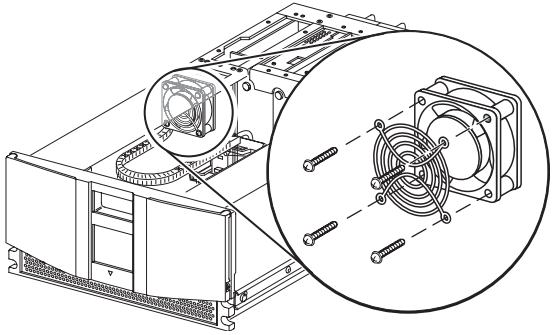

**Figure 32: Removing the fan and finger guard from chassis**

To replace the Fibre Channel thermal unit:

1. Obtain the replacement fan, and thread the power cable with the Y connector through the access slot at the top of the chassis toward the backplane (see Figure 33).

**Caution:** Verify that the arrow at the top of the fan points toward the front of the library. This orientation directs the airflow away from the card cage and toward the front of the library. Install the replacement card cage cooling fan and finger guard with two screws.

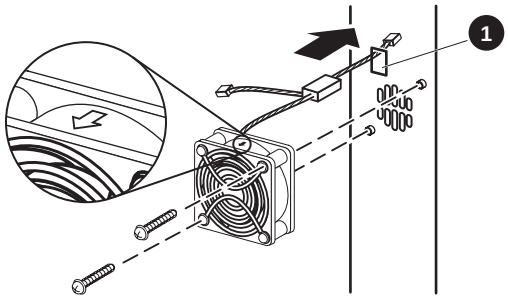


**Figure 33: Threading power cable with Y connector**

2. Connect the 3-pin connector (on the card cage replacement fan) to the card cage/backplane at the J11 location (see Figure 34).

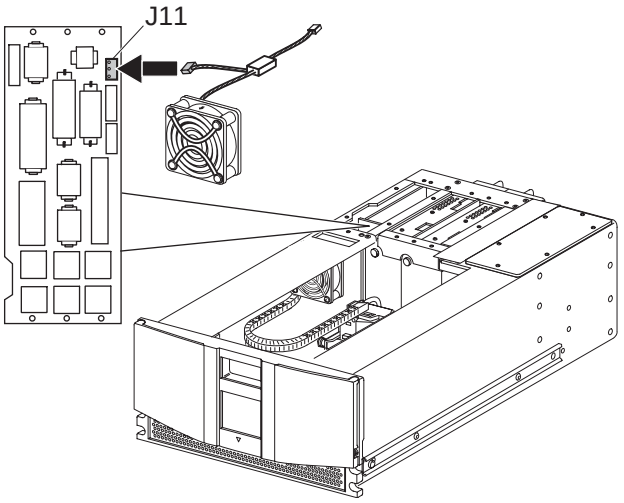


**Figure 34: Connecting the 3-pin connector to the card cage/backplane**

3. Position the outside edge of the thermal upgrade kit cover, and lower it toward the unit. Connect the card cage fan's other cable to the fan on the thermal upgrade kit cover.
4. Make sure that the fan power cables do not bind between the cover and the top of the library chassis.

---

**Note:** As the cover is lowered, offset the rear edge of the cover approximately 2.54 cm (1-inch) in front of the rear edge of the library (see Figure 35). This enables you to slide the cooling fan/baffle under the outer lip of the library.

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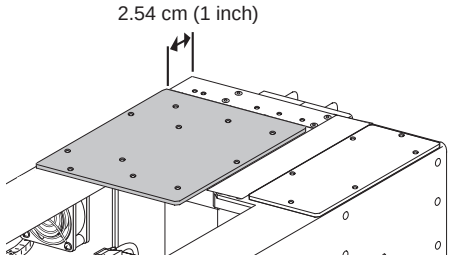



**Figure 35: Offsetting the rear edge of the cover**

5. When the cover lies flat on top of the unit, slide it back to align the mounting holes. Replace the 11 screws to secure the new right rear cover.
6. Replace the two screws to replace the top cover.
7. Reconnect the power cord.
8. For rack mounted libraries, reinstall the library into the rack. For tabletop libraries, replace the outer cover. See the *HP StorageWorks MSL6000 Series Tape Libraries User Guide* for detailed instructions.
9. Replace the left side tape cartridge magazine, and close the door. Proceed to the "Removing and Replacing the Fibre Channel Card" section on page 85.

# Removing and Replacing the Fibre Channel Card

The Fibre Channel card is a SCSI-to-Fibre Channel card. The card allows libraries to be added to storage area networks (SAN). All the SCSI cables of the library and drives are connected to bridges that then can be connected to a fibre switch or hub.

---

**Note:** If you are replacing a card, save the configuration settings, if possible by using the FTP user interface.

ftp > **login > bin > get *.cfg <*path*><*filename*>.cfg**

Refer to the *HP StorageWorks Network Storage Router User Guide* for more information.

---

To remove the Fibre Channel card:

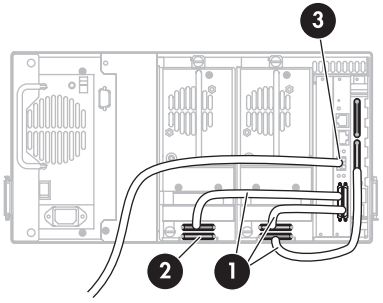
1. Using the LCD touch display, turn the library off. Turn off the master power switch for each power supply at the back of the library, and then remove the AC power cord.

---

**Note:** This process automatically moves the robot to the parked position. See "Parking the Shuttle Assembly for Service or Shipping" on page 41 for additional information on parking the shuttle assembly.

---

2. Remove the SCSI interface cable, SCSI terminator, Ethernet cable (if present), and RS-232 cable (if present). See Figure 36.




1. SCSI cable
2. Terminator
3. Fibre cables

**Figure 36: Cable connections (two-drive, 5U, model)**

**Note:** See Configuration Examples on page 367 for cabling examples using SDLT 600, LTO 2 (new) and LTO 3 tape drives.

3. Remove the center option slot cover plate, if required (see Figure 37).

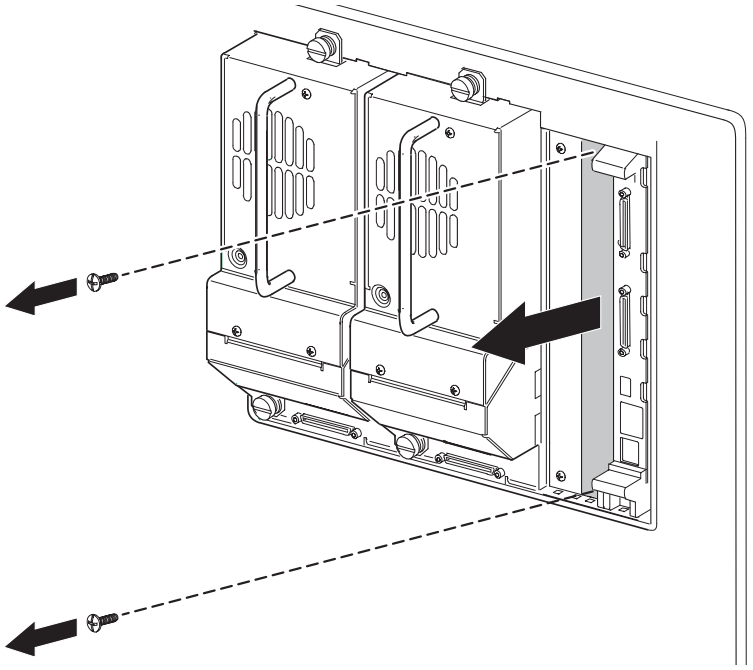


**Figure 37: Removing the option slot cover plate**

4. If you are replacing an existing Fibre Channel card, remove the existing Fibre Channel card.

**Caution:** To avoid damage to the library, ensure that the Fibre Channel cards are installed in the correct option slots. If you are installing one Fibre Channel card, place it in the middle slot next to the controller board. If you are installing two Fibre Channel cards, place the second one in the center slot on the bottom level of the library.

To replace the Fibre Channel card:

1. Carefully insert the Fibre Channel card into the upper (see Figure 38), and lower guide rails of the appropriate option slot with the SCSI connectors downward.

**Note:** You will feel some resistance when the Fibre Channel card begins to connect with the library backplane. Apply just enough force to seat the Fibre Channel card firmly to ensure proper connection by rotating the ejector handles inward.

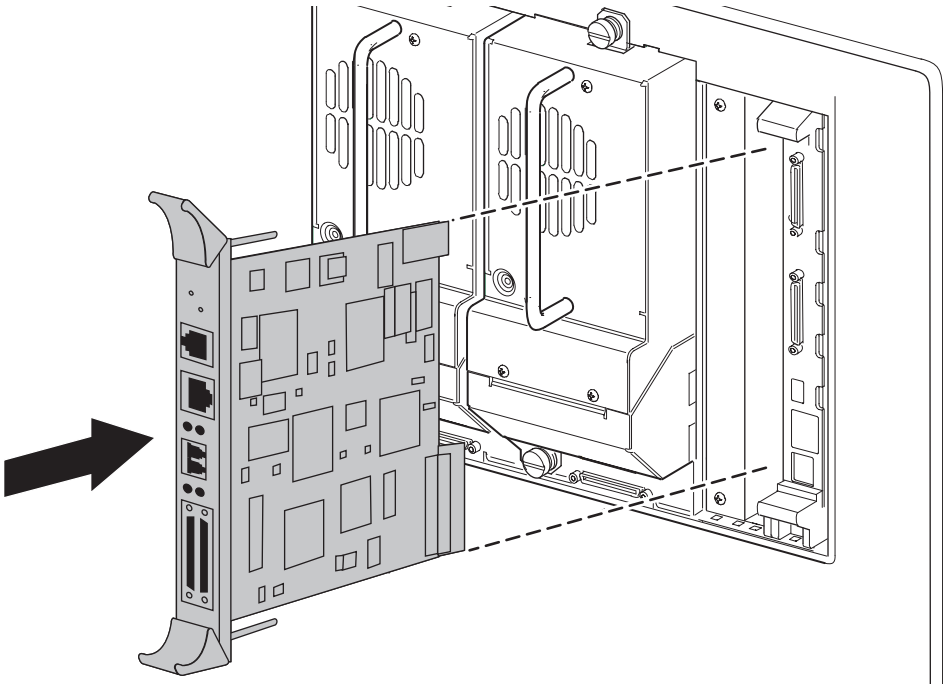


**Figure 38: Inserting the new Fibre Channel card**

2. Tighten the board captive screws (see Figure 39).

**Caution:** Libraries that are not dark gray require the installation of the Fibre Channel thermal unit. Failure to install the kit into libraries that are not dark gray could result in damage to the equipment or data loss. Refer to the "Removing and Replacing the Fibre Channel Thermal Unit" section on page 79 for more information.

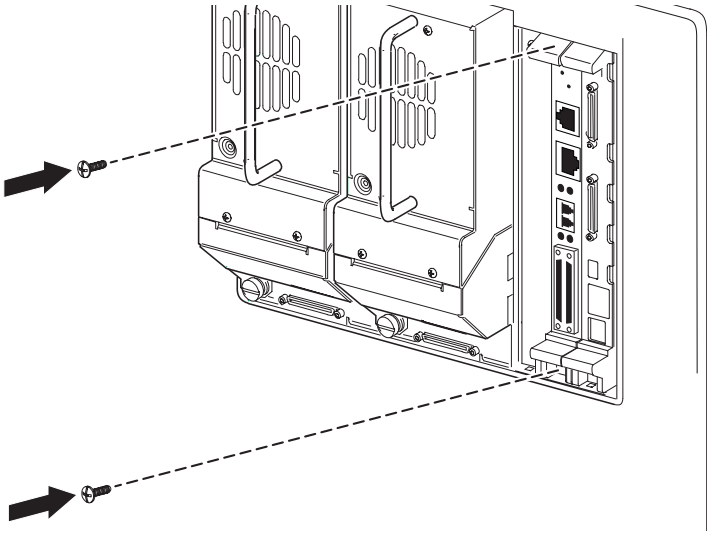


**Figure 39: Tightening board captive screws**

3. Reconnect the cables disconnected in step 2 on page 85. Connect the cables to the Fibre Channel card (see Figure 36).
4. Connect each power cord, and then turn on the master power switch for the power supply. If necessary, turn the library on by touching the LCD touch display.
5. Configure the Fibre Channel card.

**Note:** Refer to the *HP StorageWorks Network Storage Router User Guide* for detailed procedures on configuring the Fibre Channel card.

a. Cable up the serial interface, and use your host application to communicate over the serial bus.

   The defaults are: 115200 Bits per second, 8 Data bits, No Parity, 1 Stop bit, and Xon/Xoff Flow Control.

b. Use the serial user interface to set the Ethernet configurations (DHCP, IP address, Subnet, and Gateway).

   Choose **Configuration > Ethernet and SNMP Configuration**.

c. Save Configuration.

   Choose **Configuration > Ethernet and SNMP Configuration**.

d. Reboot the Fibre Channel card.

   Choose **Main Menu**.

e. Document the Fibre Channel card IP address

   Choose **Configuration > Ethernet and SNMP Configuration**.

f. Enter the Visual User Interface by opening your web browser and entering the Fibre Channel card IP address.

   The defaults are: Logon-root Password-password.

g. Set the Real-Time Clock.

   Choose **System > Real-Time Clock**.

h. Set the Fibre Channel port Performance Mode (1GB or 2GB, depending on the hardware to which the Fibre Channel card is connected. The Fibre Channel card is not auto switching).

   Choose **Ports > FC Port**.

i. Assign Port 0 Device Map to the hosts that need to communicate with the library.

   Choose **Mapping**.

j. Choose **Port 0 Device Map**, and click **Edit/View**.

   Choose **Mapping**.

k. Set the Fill Map Priority to Bus/Target and Fill Map.

Choose **Mapping > Select Map > Edit/View**.

l. For SCSI Ultra 3 drives (for example, Ultrium 460), configure only one drive per SCSI bus. For SCSI Ultra 2 drives (for example, SDLT 220, SDLT 320, Ultrium 230, and all DLT drives) configure a maximum of 2 drives per SCSI bus.

Choose **Mapping > Select Map > Edit/View**.

m. Active Fabric (AF) should be the last LUN used on the map. Do not move AF to map LUN 0. (The device-specific LUN=0 is normal.

Choose **Mapping > Select Map > Edit/View**.

n. Remove Gaps in the LUN sequence.

Choose **Mapping > Select Map > Edit/View**.

o. Reboot the Fibre Channel card.

Choose **Reboot**.

6. Complete the following substeps for direct connect (point-to-point) configurations:

a. Set Port Mode to `Auto Sense`.

Choose **Ports > FC Port**.

b. Set Hard AL_PA to `Enable`.

Choose **Ports > FC Port**.

c. Click **Set AL_PA** to select any available AL_PA. The only other used AL_PA should be the host bus adapter (HBA). Using a high number will help to avoid potential conflicts.

Choose **Ports > FC Port**.

d. Reboot the Fibre Channel card.

Choose **Reboot**.

# Removing and Replacing the Card Cage/Backplane Assembly

The card cage/backplane assembly is located on the right side at the rear of the library. To remove the card cage/backplane assembly:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
3. Exit the application software, and halt the operating system.
4. Using the LCD touch display, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.
5. Remove the right rear cover.
6. Remove the library controller board. See "Removing and Replacing the Library Controller Board" on page 75.
7. Remove any option cards installed in the slots next to the library controller board.
8. Remove tape drive 0 and tape drive 1. See "Removing and Replacing a Tape Drive" on page 113.

9. Remove the flat-head screw from the cooling baffle, and then slide the baffle toward the front of the library to remove it (see Figure 40).

**Note:** The cooling baffle is not present on models that have a cooling fan installed on the right rear cover.

**Note:** For older MSL5000 Series tape libraries, if the fibre card is present or has been previously used, a cooling kit retrofit may have been installed.

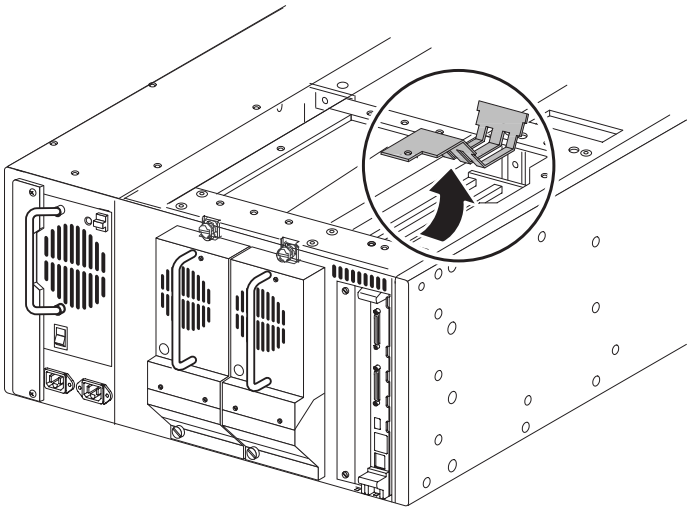


**Figure 40: Removing the cooling baffle**

10. Remove the screw from the card cage/backplane assembly connector access plate, and then lift the access plate out of the library (see Figure 23).

**Note:** Some models of the MSL5026 library do not have this side access plate.

11. From outside the chassis, remove the card cage/backplane connector access plate (two screws). If necessary, remove the drive 0 tape drive guide and the tape drive shield (see “Removing and Replacing a Tape Drive Guide”on page 118 and “Removing and Replacing the Tape Drive Shield” on page 120 for removal instructions).
12. From outside the chassis, remove the two flat-head screws at the top of the card cage/backplane assembly (see Figure 41).

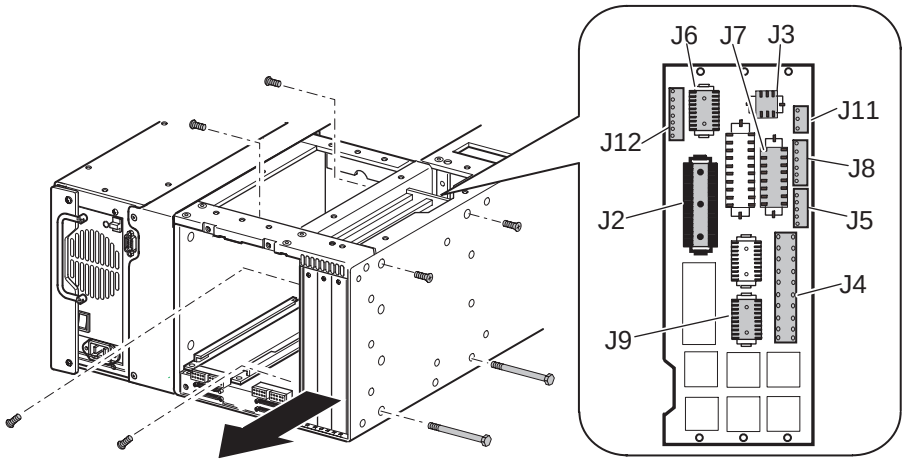



**Figure 41: Removing the card cage/backplane assembly**

13. From outside the chassis, remove the two flat-head through-bolts at the bottom of the card cage (see Figure 41)
14. From inside the tape drive bay, remove the two flat-head screws at the top of the card cage (see Figure 41).
15. Remove the screw that secures the card cage/backplane assembly board stiffener to the library chassis (see Figure 41).
16. With the card cage loose, work from inside the tape drive bay at the top to remove the cable connections J2-J9, and J11 and J12 on the backplane (see Figure 41).
17. Slide the card cage/backplane assembly halfway out.
18. From inside the card cage, support the grounding strip plate and spacer, and then remove the two flat-head mounting screws from inside the tape drive bay. Remove the grounding strip plate and spacer (see Figure 41).

19. Slide the card cage/backplane assembly the rest of the way out of the library.

To replace the card cage/backplane assembly:

1. Position the card cage/backplane assembly at the rear of the library with connectors J3 and J6 at the top and facing the front of the library.
2. Slide the card cage/backplane assembly about halfway into the opening (see Figure 41).
3. From inside the tape drive bay, position the grounding strip plate and spacer next to the tape drive bay wall.

---

**Note:** The grounding strip contacts should be facing the card cage side and the rear of the library chassis.

---

4. From inside the tape drive bay, replace the two flat-head mounting screws (see Figure 41).
5. Slide the card cage/backplane assembly the rest of the way into the opening.

---

**Note:** Lift the cables toward the top of the unit to avoid trapping any cables beneath the card cage.

---

6. With the card cage/backplane assembly still loose, replace the cables J2-J9, and J11 and J12 on the backplane (see Figure 41).

---

**Note:** For ease of installation, replace the cables moving from left to right and bottom to top.

---

7. From outside the library chassis, replace the two flat-head screws at the top of the card cage and the two flat-head through-bolts at the bottom of the card cage (see Figure 41).
8. From inside the drive bay, replace the two flat-head screws at the top of the card cage (see Figure 41).
9. From inside the tape drive bay, replace the two flat-head screws at the top of the card cage (see Figure 41).
10. Replace the one screw from the backplane board stiffener.

11. Replace the drive 0 drive guide. See "Removing and Replacing a Tape Drive Guide" on page 118.
12. Replace the card cage/backplane assembly connector access plate and mounting screw (see Figure 23).
13. Position the card cage shield near the backplane, and then slide the shield into position on top of the card cage. Replace the flat-head mounting screw (see Figure 40).
14. Replace the right rear cover.
15. Replace the tape drive shield.
16. Replace the drive 0 and drive 1 shoe assembly.
17. Replace the library controller board and any option cards.
18. Reconnect the power cord.
19. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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20. Restart the application software.

# Removing and Replacing the Very High Density I/O SCSI Board/Ultra SCSI 2 Library Board

The Very High Density I/O SCSI and SCSI Ultra 2 library board is located at the rear of the library directly under the tape drive bays.

**Caution:** The very high density I/O SCSI and library board is shipped as one spare and is not to be separated.

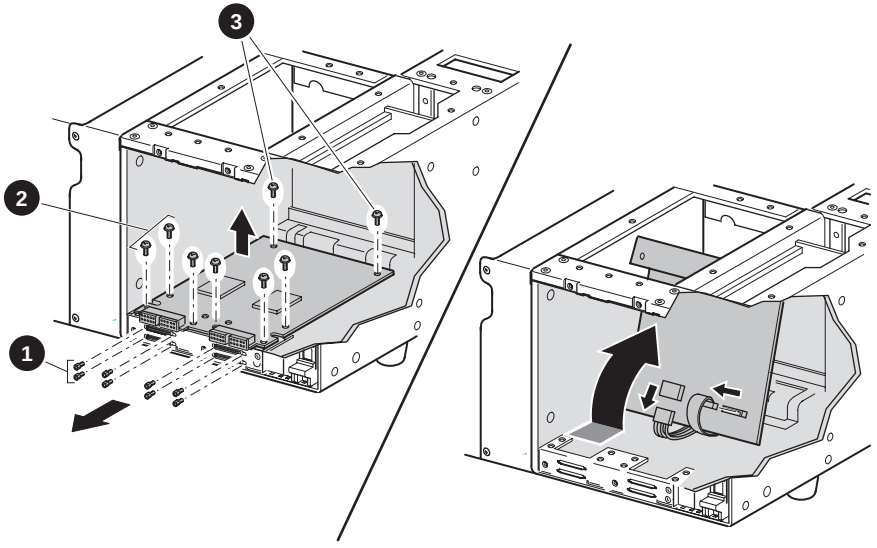
Use this procedure to replace the board. To remove the High Density I/O SCSI board/library board:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
3. Exit the application software, and halt the operating system.
4. Using the LCD touch display, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.
5. Note the location of any SCSI interface cables and SCSI terminators that are attached to the tape drive SCSI connectors (for replacement procedures), and remove the cables.
6. Remove the right rear cover.
7. Remove the drive shoe assemblies. See "Removing and Replacing a Tape Drive" on page 113.
8. Remove the tape drive guides. See "Removing and Replacing a Tape Drive Guide" on page 118.
9. Remove the tape drive shield. See "Removing and Replacing the Tape Drive Shield" on page 120.

10. Remove eight jackscrews from the SCSI connectors (see Figure 42).
11. Remove the six screws that secure the I/O SCSI board/library board assembly to the library chassis (see Figure 42).
12. Slide the I/O SCSI board/library board assembly toward the front of the library until it is possible to pivot the rear of it up (toward the front of the library). This allows access to the bottom of the library board.




1. Jack screws
2. I/O SCSI board/ library board screws (front)
3. I/O SCSI board/library board screws (rear)

**Figure 42: Removing the very high density I/O SCSI board**

13. Remove the cables at J3 and J4.
14. Remove the I/O SCSI board/library board assembly from the library.

To replace the I/O SCSI board/library board:

1. Position the I/O SCSI board in the drive bays with the SCSI connectors to the rear of the library.
2. Pivot the rear of the board up and toward the front of the library to access the bottom of the board.
3. Replace the cables at J3 and J4.

4. Guide the I/O SCSI board/library board assembly into place, aligning it with the mounting holes.
5. Replace the eight jack screws that secure the I/O SCSI board/library board assembly to the library chassis.
6. Replace the six screws that mount the board to the chassis.
7. Replace the tape drive shield.
8. Replace the drive guides.
9. Replace the right rear cover.
10. Replace the drive shoe assemblies.
11. Replace the SCSI cables and SCSI terminators.
12. Reconnect the power cord.
13. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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14. Restart the application software.

# Removing and Replacing a Magazine Opto Sensor

Optical sensors are located at the rear of the left and right magazine tracks. The cable for a left magazine sensor is 45.7 cm (18 inches); the cable for a right magazine sensor is 73.6 cm (29 inches) long.

Before removing a magazine opto sensor, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Remove the appropriate magazine for the opto sensor to be replaced.
3. Remove the top front cover.

After completing step 1 through step 3 above:

1. Locate the control panel board in the library chassis bottom behind the front panel.
   a. Remove the white cable at J8 for the left LTO magazine opto sensor.
   b. Remove the black cable at J10 for the left SDLT/DLT magazine opto sensor.
   c. Remove the white cable at J11 for the right LTO magazine opto sensor.
   d. Remove the black cable at J9 for the right SDLT/DLT magazine opto sensor.
2. Follow the cable to the rear of the library, and then cut the cable ties to free it. For a right magazine opto sensor, continue at the rear of the library chassis bottom, and cut the cable ties that are below the tape drive bays and Pass-Through Mechanism (PTM) opening.
3. Remove the two screws that secure the magazine opto sensor to the track.
   - The two mounting holes at the front of the track are for the SDLT/DLT opto sensor.
   - The two mounting holes towards the rear of the track are for the LTO opto sensor.

4. Lift the magazine opto sensor from the magazine track while guiding the cable through the opening in the magazine track (see Figure 43).

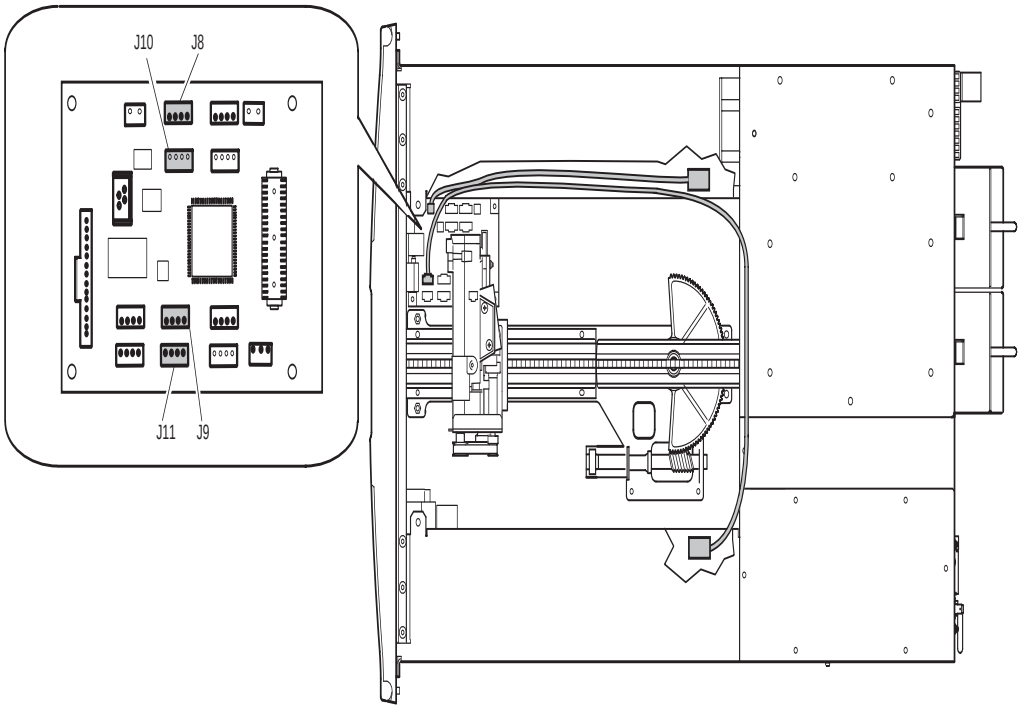


**Figure 43: Removing a magazine opto sensor**

To replace a magazine opto sensor:

**Note:** The right magazine opto sensor is 78.7 cm (31 inches) long.

1. Guide the connector end of the cable through the opening in the magazine track.
2. Replace the two screws that secure the magazine opto sensor to the magazine track. Be sure to use the correct front mounting holes.

3. Route the cable in the library chassis bottom along with the other cables. Replace the cable ties below the tape drive bays and PTM opening for the right magazine sensor and the cable ties leading to the control panel board for both magazine opto sensors.
4. Replace the cable at J8/J9 for the left magazine opto sensors, as applicable, or J10/J11 for the right magazine opto sensors, as applicable.
5. Replace the top front cover.
6. Reconnect the power cord.
7. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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8. Restart the application software.

# Removing and Replacing the Shuttle Assembly Flex Cable

The flex cable is mounted inside the chassis above the left magazine and connects to the shuttle assembly. No other field replaceable units (FRUs) need to be removed to remove the flex cable/chain assembly.

## Positioning the Shuttle Assembly

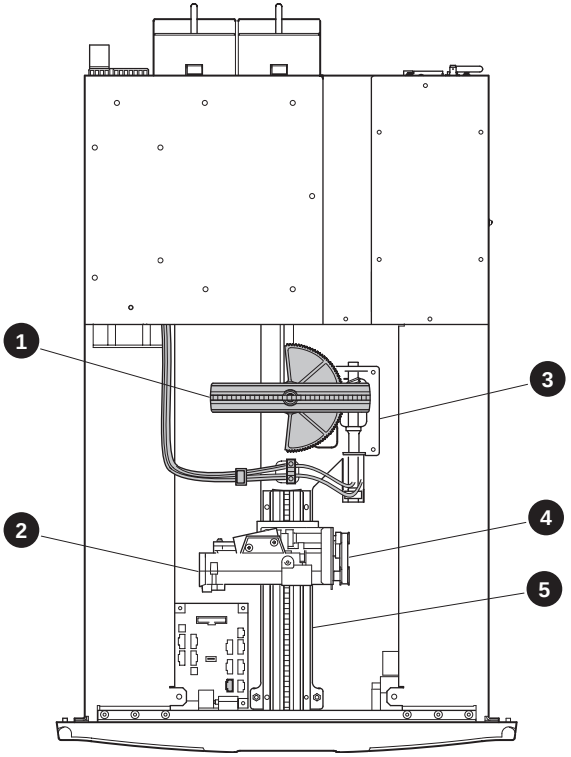
If the library is operational:

1. On the default display of a standalone model, touch the **Magazine Access** button, and then choose the left magazine. Remove and replace the magazine.
2. On a multi-module system, press the Magazine Access button on the default display of the Master module, and select the module to be serviced. Select the left magazine. Remove and replace the magazine.
3. Close the magazine door. The shuttle assembly will move to the left magazine and inventory the slots. The shuttle assembly cartridge opening will now be on the correct side of the magazine for this procedure.
4. Using the LCD touch display, remove the magazines.
5. Using the LCD touch display, park the shuttle assembly by turning the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.
6. Remove the top front and right rear covers. See “Removing and Replacing the Library Covers” on page 45.
7. Proceed to step 1 under “Removing the Flex Cable” on page 104.

If the library is not operational:

1. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.
2. Remove the two magazines. See “Manually Opening the Magazine Doors” on page 38.
3. Remove the top front and right rear covers. See “Removing and Replacing the Library Covers” on page 45.
4. If the shuttle assembly is positioned as shown in Figure 44, with the cartridge opening to the left and near the center of its front to back travel, it is in the correct position for this procedure. Continue with step 2 under, “Removing the Flex Cable” on page 104.

5. If it is pointing left but not at the center of travel, release the brake, and push the shuttle assembly at the base near the track until it is centered. See "Parking the Shuttle Assembly for Service or Shipping" on page 41.
6. If it is pointing right, release the brake, and push the shuttle assembly to the center of the rotating track section.
7. Operate the worm gear drive link to rotate the track section 180 degrees (see Figure 44).
8. Release the brake, and move the shuttle assembly to the center of travel. It should now be positioned as shown in Figure 44.




1. Rotating track section
2. Cartridge opening
3. Worm gear drive link
4. Pulleys
5. Stationary track section

**Figure 44: Shuttle assembly in parked position**

## Removing the Flex Cable

1. Remove the screw from the card cage/backplane assembly connector access plate, and lift it out of the library.
2. Remove the cables at J6 and J3 on the card cage/backplane assembly (see Figure 45).

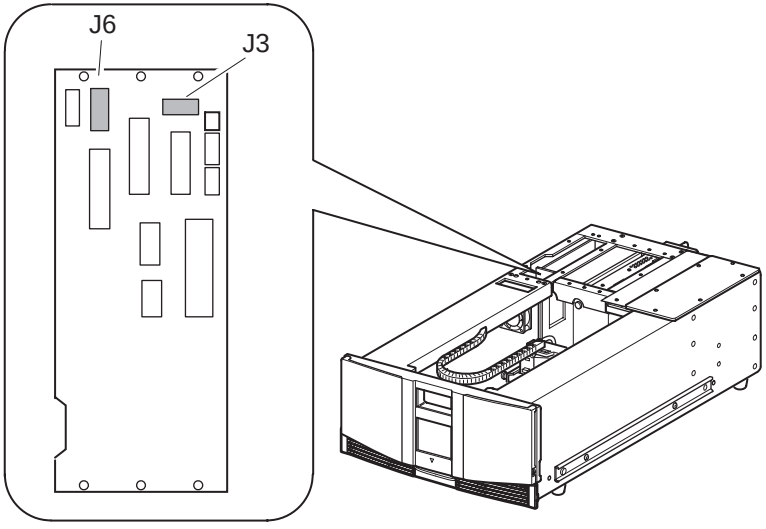
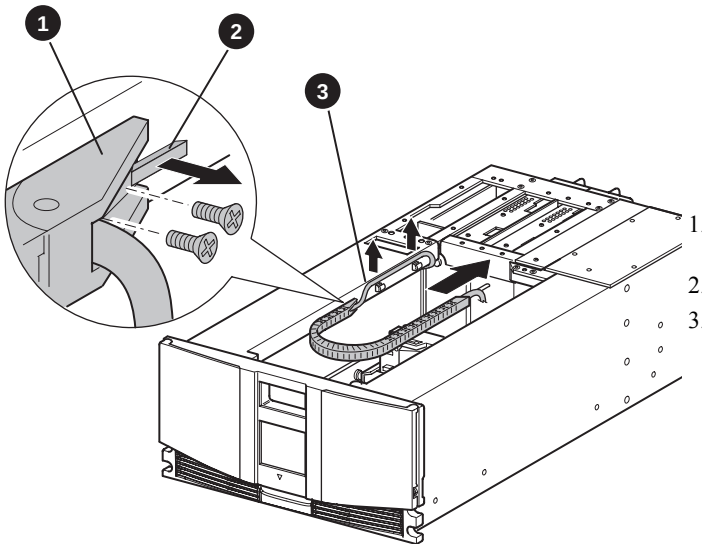



**Figure 45: Removing the J6 and J3 connections**

3. From inside the library chassis area, guide the cables through the library chassis opening and into the library chassis area.
4. Remove the cable clamps that secure the cable onto the flange above the left magazine.
5. Cut the cable tie at the flex chain mounting block, and move the cables to reveal two flat-head mounting screws (see Figure 46).
6. Remove the two flat-head screws that secure the mounting block to the library chassis flange.
7. Remove the screw holding the cable clamp above the pulleys on the shuttle assembly.




1. Flex chain mounting block
2. Projection
3. Cable tie

**Figure 46: Removing the flex cable**

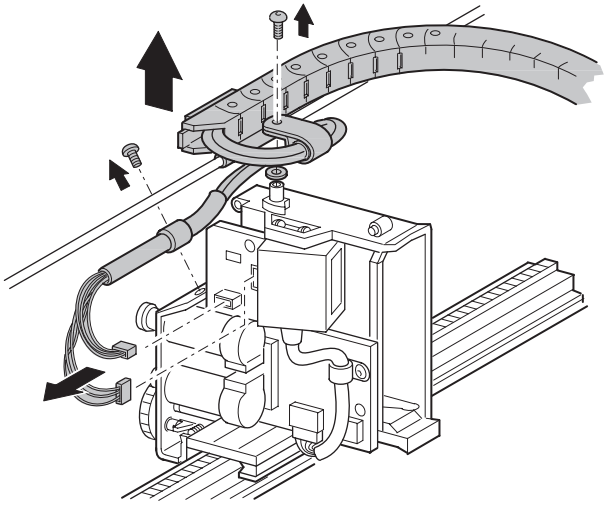
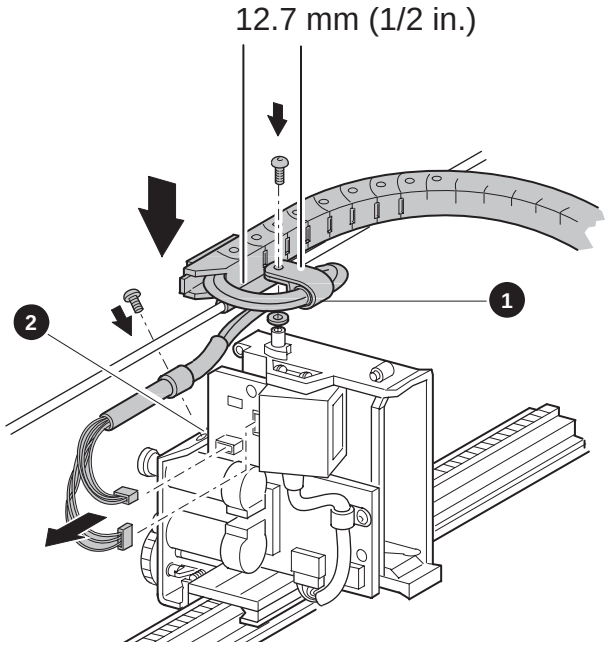


**Figure 47: Removing the flex cable from the shuttle assembly**

8. Note the location of cables at J3 and J9 (Compaq libraries) or J2 and J5 (HP libraries) on the shuttle assembly board, and then remove each cable (see Figure 47).
9. Remove the screw, washer, spacer and cable clamp where the flex chain pivots on the top of the shuttle assembly (see Figure 47.)
10. Carefully lift the flex cable and cable support rod up and off the pivot point.
11. Slide the flex cable pivot block towards the rear of the library and off the end of the cable support rod.
12. Remove the flex cable from the library.

To replace the flex cable:

1. Position the flex cable inside the library chassis area with the flex chain straight along the right side of the cable support rod, with the pivot block facing the rear of the library.
2. Slide the pivot block over the end of the cable support rod and up to the pivot point on the shuttle assembly.
3. Lift the cable support rod and flex cable pivot block up and onto the pivot point on the shuttle assembly.
4. Where the cables exit the flex chain at the pivot point, bend the cables in a circle to the left (counter-clockwise) and back under the flex chain and cable support rod (see Figure 48).
5. With the cable clamp at the pivot point, replace the cable clamp on the cable with the flat side up and the open side to the right.
6. Replace the spacer, cable clamp, screw and washer on the pivot block but do not tighten the screw at this time.




1. Cable clamp
2. Cable tie

**Figure 48: Installing the flex chain on the robot (non-LTO libraries)**

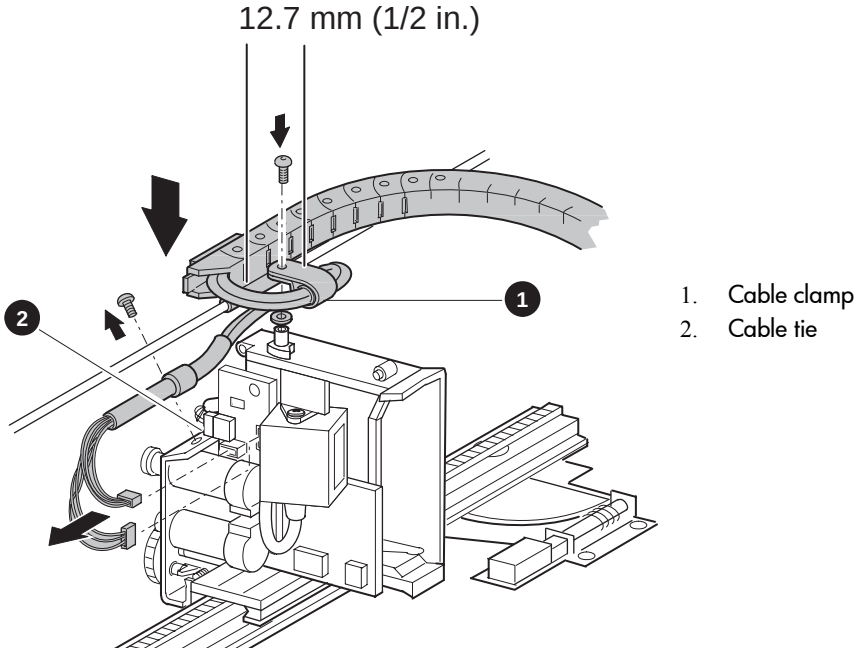



**Figure 49: Installing the flex chain on the robot (LTO-compatible libraries)**

7. Route the cables between the flex chain and the cable clamp to align the cable tie on the cables with the rear edge of the cable clamp. The shrink tubing will be inside the clamp. The cable should exit the cable clamp side-by-side.
8. Tighten the screw against the spacer. Be sure the spacer is inside the screw mounting holes of the clamp. The cable clamp should be able to rotate after tightening the screw.
9. Continue routing the cables counter-clockwise down to the shuttle assembly board. The cables should remain parallel and not be twisted around each other. Replace the cables at J9 and J3 (Compaq libraries) or J2 and J5 (HP libraries) on the shuttle assembly board as they were in step 8 on page 106.
10. Loosely replace the cable clamp above the pulleys. The flat side should be down with the cables above the mounting screw and the shrink tubing inside the clamp. Do not tighten the screw at this time.
11. Align the end of the shrink tubing with the edge of the shuttle assembly board, and tighten the screw.

12. With the flex chain still straight along the cable support rod, move the cables inside the flex chain so that the mid-point of the loop at the pivot point is 1.27 cm (0.5 inches) from the cable clamp.
13. Pivot the mounting block end of the flex cable to the left (clockwise), and position the mounting block over the mounting holes in the chassis flange.
14. Move the cables to gain access to the screw holes, and replace the two flat-head mounting screws. Do not tighten at this time.
15. Release the brake, and move the shuttle assembly as far to the front of the library as possible. The flex chain should be curved under the chassis lip at the front of the chassis. See "Parking the Shuttle Assembly for Service or Shipping" on page 41.
16. While holding the flex chain up against the bottom of the chassis lip, tighten the two screws at the mounting block.
17. Install a cable tie around the cables and the projection on the mounting block (see Figure 46.)
18. Replace the cables in the cable clamps above the magazine.
19. Guide the cables under the chassis flange, over the card cage fan, through the cable opening near the left side of the chassis and into the card cage/backplane area.
20. Replace the cables at J3 and J6 on the card cage/backplane assembly (see Figure 45).
21. Replace the card cage/backplane assembly connector access plate.
22. Replace the top front and right rear covers.
23. Reconnect the power cord.
24. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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25. Restart the application software.

# Replacing Two-Drive (5U) Model Mechanical Parts

4

This chapter provides procedures for removing and replacing two-drive model mechanical components for the following MSL5000 and MSL6000 Series tape libraries:

- MSL5026
- MSL5030
- MSL6026
- MSL6030 (Old LTO Ultrium 2 based models)

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**Note:** See the Illustrated Parts Catalog on page 21 to verify spare part numbers when replacing mechanical parts for two-drive (5U) tape library models.

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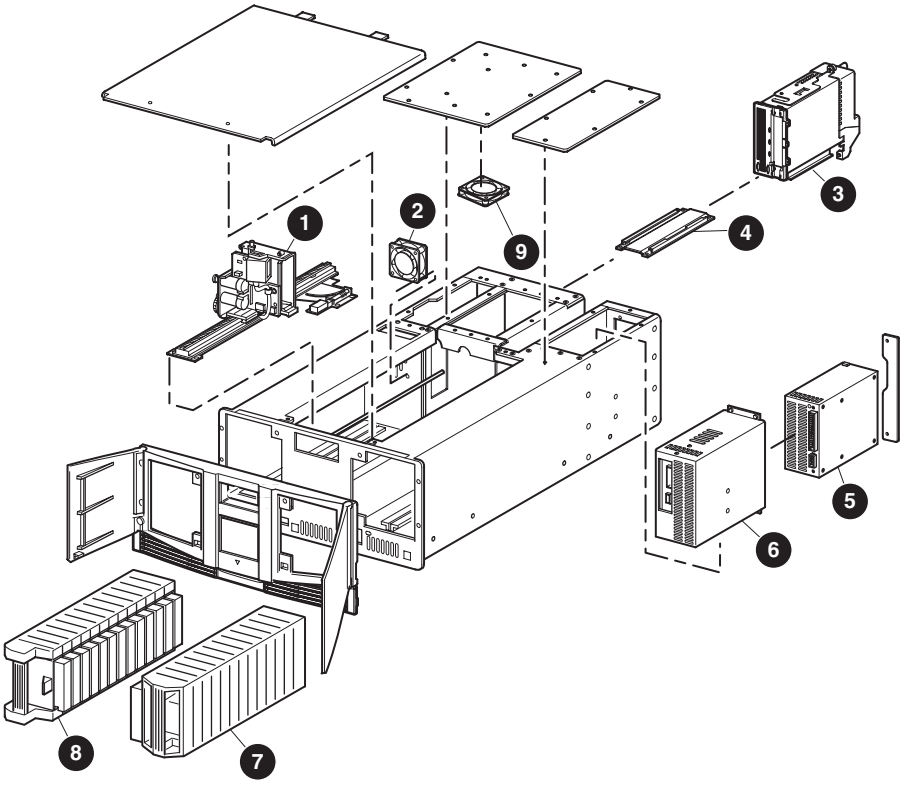
Procedures covered in this chapter include:


- Removing and Replacing a Tape Drive, page 113
- Removing and Replacing a Tape Drive Guide, page 118
- Removing and Replacing the Tape Drive Shield, page 120
- Removing and Replacing the Shuttle Assembly, page 123
- Removing and Replacing the Power Supply, page 129
- Removing and Replacing the Power Supply Receiver, page 133
- Removing and Replacing the Backplane Fan, page 136
- Removing and Replacing the Bar Code Reader, page 140
- Removing and Replacing the Card Cage Fan, page 143




1. Robot with a bar code reader
2. Backplane fan
3. Tape drive
4. Tape drive guide
5. Power supply
6. Power supply receivers
7. Right magazine
8. Left magazine
9. Card cage fan

**Figure 50: Mechanical components for two-drive (5U) models**

# Removing and Replacing a Tape Drive

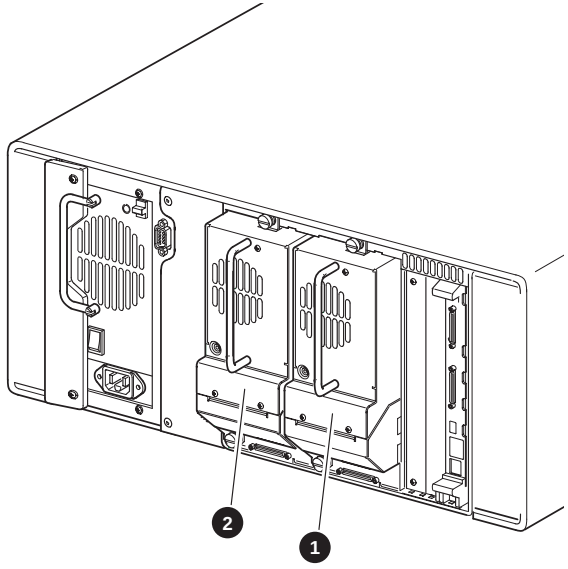
Tape drives are mounted at the rear of the library. The SCSI connectors for the tape drives are part of the drive module and they do not offer hot-plug capability when the tape drive is removed.

**Caution:** This part is not hot-pluggable. Before you install the tape drive, you must take the library off line using the library LCD touch screen.

To remove a drive:

1. Using your application software or the library LCD touch display, unload any tape cartridge from the drive you want to remove.

**Note:** The following procedures are the same when removing and replacing SDLT600, LTO2 (new) and LTO3 tape drives even though illustrations are not up-to-date.




1. Drive 0
2. Drive 1

**Figure 51: Drive shoe assembly with tape cartridge**

2. Using the LCD touch display, deactivate the tape drive to be removed by choosing **Menu** > **Maintenance** > **Replace Drive** > **Deactivate Drive *n***. The screen changes to indicate that Drive *n* can be removed.
3. Make sure that the LED on that tape drive is off.
4. Loosen the two captive thumbscrews at the top center and lower left of the tape drive (see Figure 52).

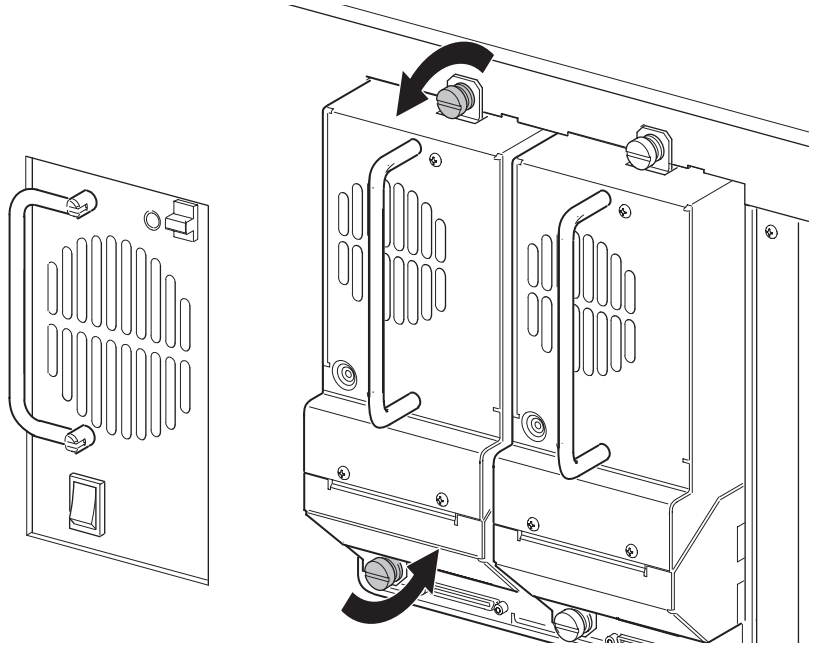


**Figure 52: Loosening captive thumbscrews**

5. Pull straight back on the tape drive handle to remove it from the library. (see Figure 53)

**Note:** Some effort is required to overcome the initial resistance of unplugging the drive from the receiver.

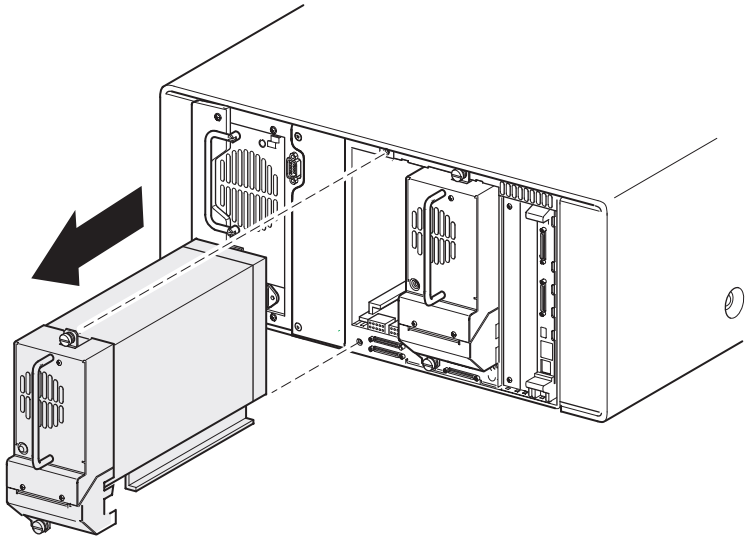


**Figure 53: Removing a drive shoe assembly (with tape drive)**

To replace a tape drive:

**Note:** If you are upgrading to a new drive technology, use *L&TT* to upgrade the library firmware before installing the new tape drive. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

1. Before installing the new drive, inspect the connectors on the tape drive. Ensure that the connectors are intact, are free of any foreign objects, and have no cracks or deformed contacts.
2. Slowly insert the new tape drive into the mounting bay while you align the connectors on the tape drive with the connectors on the library.

3. Tighten the two captive thumbscrews. If this is a new drive, configure the library for it. Refer to the *HP StorageWorks MSL6000 Series Tape Libraries User Guide* for more information.
4. If you are adding a new tape drive to your library, or if you are upgrading an existing drive, be sure to use supported cabling configurations. See the *HP StorageWorks MSL6000 Series Tape Libraries User Guide* for more information. The user guide can be downloaded from http://www.hp.com/support.

**Note:** For optimum performance, Ultrium 460 and 960 drives should be configured with one drive per bus.

5. Use *L&TT* to upgrade the drive to the latest firmware.

**Note:** *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

**Note:** You may need to reconfigure your software application. Drive serial numbers might be used for configuration and to assign drives to the library.

# Removing and Replacing a Tape Drive Guide

A tape drive guide is installed at the bottom of each tape drive bay. This procedure can be used to remove and replace any tape drive guide. Before removing a tape drive guide:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
3. Exit the application software, and halt the operating system.
4. Using the LCD touch display, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.
5. See the "Preparing for Service" chapter that starts on page 31 for information on removing the right rear cover.
6. Remove the appropriate drive shoe assembly. See "Removing and Replacing a Tape Drive" on page 113.
7. Using a long flat-blade screwdriver, remove the four flat-head screws that secure the tape drive guide in the library chassis (see Figure 54).

**Caution:** Chassis screws in MSL5000 Series tape libraries may be aluminum. Gently remove and tighten them to avoid stripping the threading or damaging the tape drive guide.

8. Remove the tape drive guide from the library (see Figure 54).

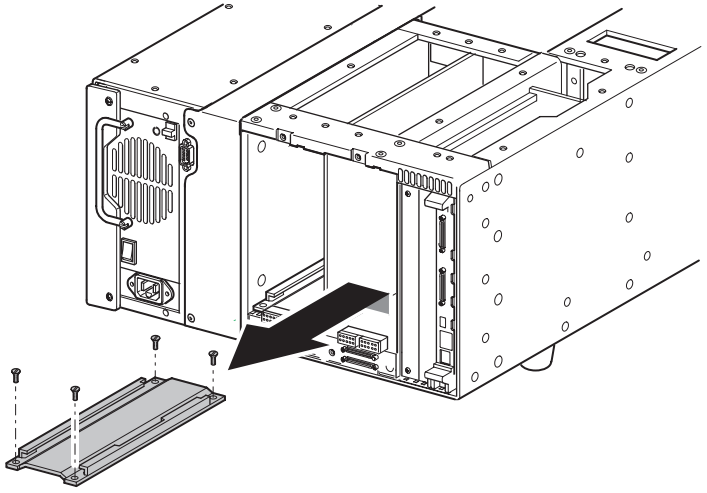


**Figure 54: Removing a tape drive guide**

To replace a tape drive guide:

1. Position the tape drive guide in the tape drive bay with the two straight-sided holes facing the rear of the library (see Figure 54).
2. Replace the four flat-head screws that secure the tape drive guide in the library chassis (see Figure 54).

**Caution:** Chassis screws in MSL5000 Series tape libraries may be aluminum. Gently remove and tighten them to avoid stripping the threading or damaging the tape drive guide.

3. Replace the right rear cover.
4. Replace the appropriate drive shoe assembly.

# Removing and Replacing the Tape Drive Shield

A tape drive shield is installed between the drive 0 and drive 1 shoe assemblies.

Before removing a tape drive shield:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
3. Exit the application software, and halt the operating system.
4. Using the LCD touch display, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.
5. See the "Preparing for Service" chapter that starts on page 31 for information on removing the right rear cover.
6. Remove the drive 0 and drive 1 shoe assemblies. See "Removing and Replacing a Tape Drive" on page 113.
7. Remove the drive 0 guide. See "Removing and Replacing a Tape Drive Guide" on page 118.
8. Remove two flat-head screws that secure the tape drive shield to the library chassis (see Figure 55).
9. Gently push the bottom of the shield to the right to allow the top to clear the chassis lip.
10. Pull the tape drive shield out and away from the tape drive bay.

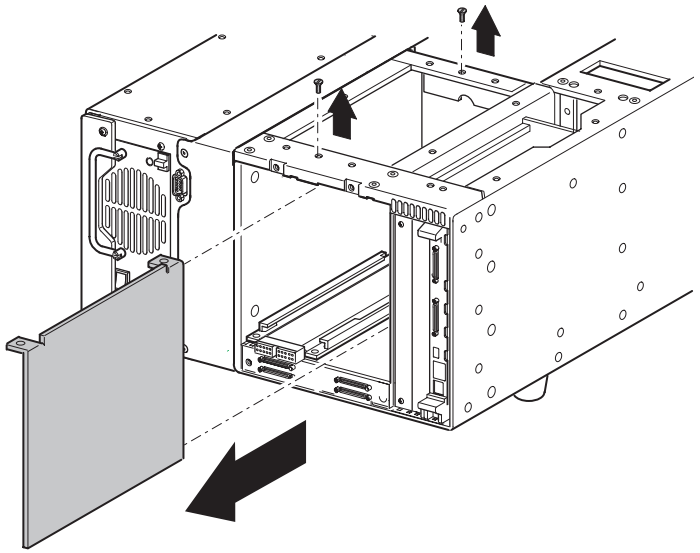


**Figure 55: Removing the tape drive shield**

To replace the tape drive shield:

1. Insert the tape drive shield into the tape drive bay (see Figure 55).
2. Secure the tape drive shield to the library chassis using the two previously removed flat-head screws (see Figure 55).
3. Replace the previously removed tape drive guide.
4. Replace the drive 0 and drive 1.
5. Replace the right rear cover.
6. Reconnect the power cord.
7. Turn the library on, if applicable.
8. Run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *HP StorageWorks Library and Tape Tools (L&TT)* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is a diagnostic tool that is designed to aid in the installation and maintenance of HP tape and magneto-optical storage products. *L&TT* includes several features designed for use by both HP storage customers and trained service personnel. The key features include:

- Diagnostic tools for tape and magneto-optical devices designed for simple troubleshooting
- Multiple options for retrieving and updating both the latest firmware and the most current version of *L&TT*

*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.

9. Restart the application software.

# Removing and Replacing the Shuttle Assembly

The shuttle assembly is mounted on a track at the bottom of the library chassis.

Before removing the shuttle assembly, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Park the shuttle assembly.
3. Open both magazine doors, and remove both magazines.
4. Remove the top front cover.

After completing step 1 through step 4 above, complete the following steps:

1. If the shuttle assembly is on the rotating track section, turn the track by hand so that the cartridge opening is to the left, with the pulley and gears to the right. Align the rotating and stationary track sections.
2. Operate the worm gear by hand to turn the rotating track section 90 degrees so that it is perpendicular to the stationary track section.
3. Remove the two screws from the shuttle assembly track sensor.
4. Remove the cable from the rotating track section motor.
5. Remove the motor cable from the rotating track section motor.
6. Remove the motor cable and track sensor cable from the cable clamps, and position them to the left of the robot base.
7. If necessary, remove the bar code reader. See "Removing and Replacing the Bar Code Reader" on page 140.
8. Remove the cables at J3 and J9 (Compaq libraries) or J2 and J5 (HP libraries) on the shuttle assembly board (see Figure 56 and Figure 57).

**Caution:** Pull connector J3/J2 by the connector body only. The wires used are small and can be easily damaged.

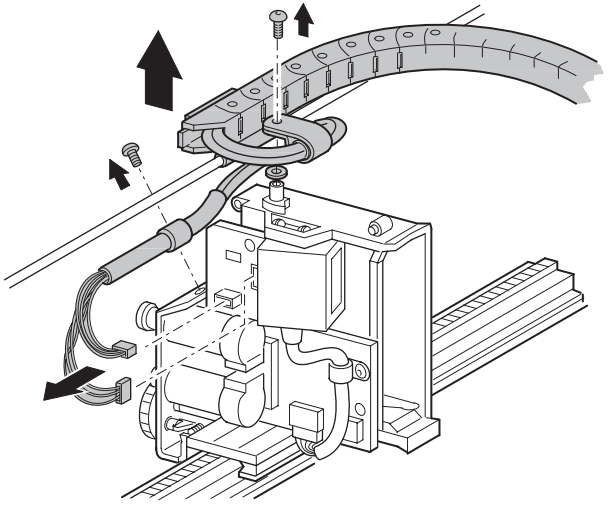


**Figure 56: Removing the shuttle assembly**

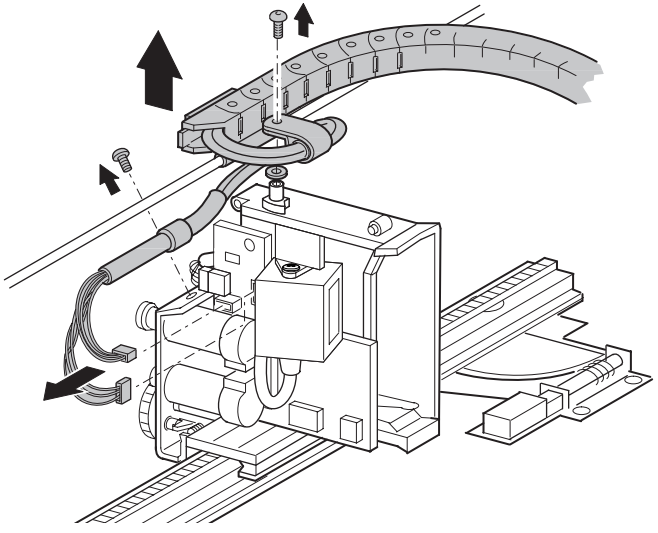


**Figure 57: Removing the shuttle assembly (LTO-compatible libraries)**

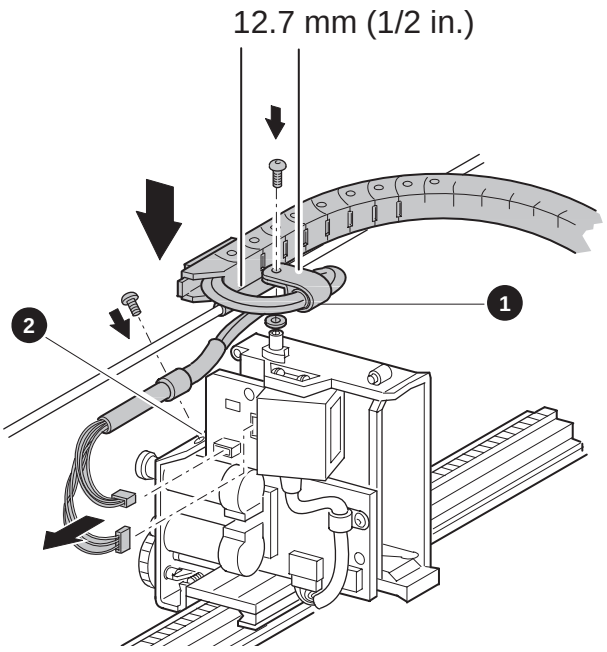
9. Remove the screw holding the cable clamp above the pulleys (see Figure 56).
10. Remove the retaining screw, cable clamp, and spacer where the flex cable/chain assembly pivots on top of the shuttle assembly (see Figure 56).
11. Carefully lift the flex cable/chain and cable support rod up and off the pivot point.
12. Remove the six self-locking hex nuts and washers that holds the robot assembly in the chassis bottom. Use the worm gear to move the rotating track section to access the nuts, if necessary.
13. Remove the shuttle assembly from the library.

To replace the shuttle assembly:

1. Position the shuttle assembly inside the library chassis with the stationary track section to the front of the library and the rotating track section to the rear.
2. Place the shuttle assembly base over the mounting standoffs.

**Caution:** Make sure that no cables or wires are caught under the shuttle assembly base.

3. Replace the six washers and self-locking hex nuts that hold the shuttle assembly in the chassis bottom. Torque to 28-33.6 cm/kg (5-6 in/lbs).
4. Lift the cable support rod and flex cable/chain pivot block up and onto the pivot point on the shuttle assembly. See Figure 58.
5. Where the cables exit the flex chain at the pivot point, bend the cables in a circle to the left (counter-clockwise) and back under the flex chain and cable support rod. Replace the cable clamp at the pivot point. Put the clamp on the cable with the flat side up and open side to the right. Replace the spacer, cable clamp, screw and washer on the pivot block, but do not tighten the screw at this time.




1. Cable tie
2. Cable clamp

**Figure 58: Installing flex chain on robot**

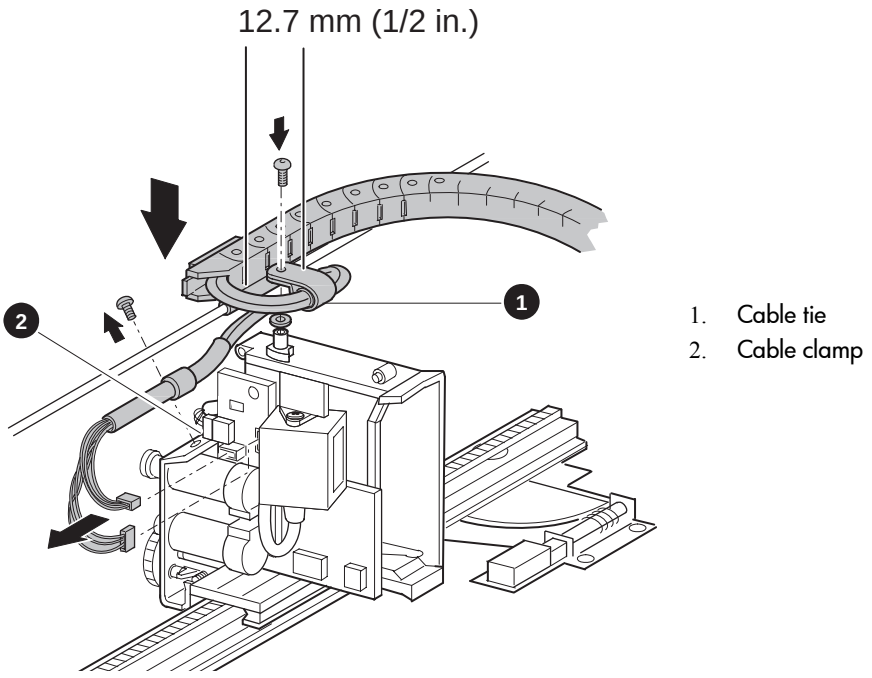



**Figure 59: Installing flex chain on robot (LTO-compatible libraries)**

6. Route the cables between the flex and the cable clamp to align the cable tie on the cables with the rear edge of the cable clamp. The shrink tubing will be inside the clamp. The cables should exit the cable clamp side-by-side.
7. Tighten the screw against the spacer. Be sure the spacer is inside the screw mounting holes of the clamp. The cable clamp should be able to rotate after tightening the screw.
8. Continue routing the cables counter-clockwise down the shuttle assembly board. The cables should remain parallel and not be twisted around each other. Replace the cables at J9 and J3.
9. Replace the cable clamp above the pulleys. The flat side should be down with the cables about the mounting screw and shrink tubing inside the clamp. Do not tighten the screw yet.
10. Align the end of the shrink tubing with the edge of the shuttle assembly board, and tighten the screw.
11. Replace the top front cover.

12. Reconnect the power cord.
13. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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14. Restart the application software.

# Removing and Replacing the Power Supply

The power supply is installed on the left side at the rear of the library in a quick-change receiver.

**WARNING:** Hazardous voltage is present in the cavity if the power cord is not removed.

**Caution:** The power supply is *not* hot pluggable. It is necessary to power down the library to replace it.

To remove a power supply:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Exit the application software.
3. Using the LCD touch display, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove AC power cords.

**WARNING:** Hazardous voltage is present in the power supply cavity if the power cord is not removed. If AC power cords are not removed during this procedures, serious bodily injury can occur.

4. Remove the mounting screws that secure the power supply locking bracket. (see Figure 60).

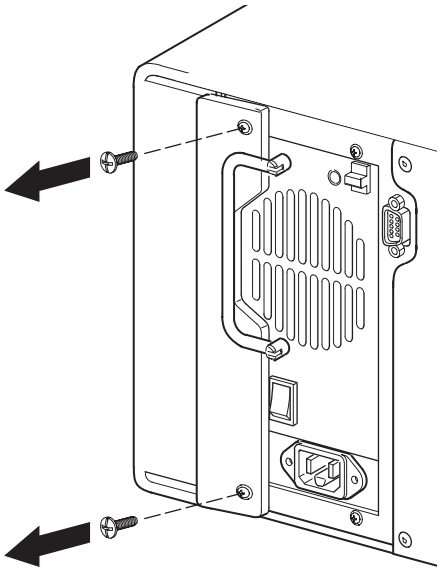

**Figure 60: Removing mounting screws**

5. Press down on the latch, and then use the handle to pull the power supply out of the receiver (see Figure 61).

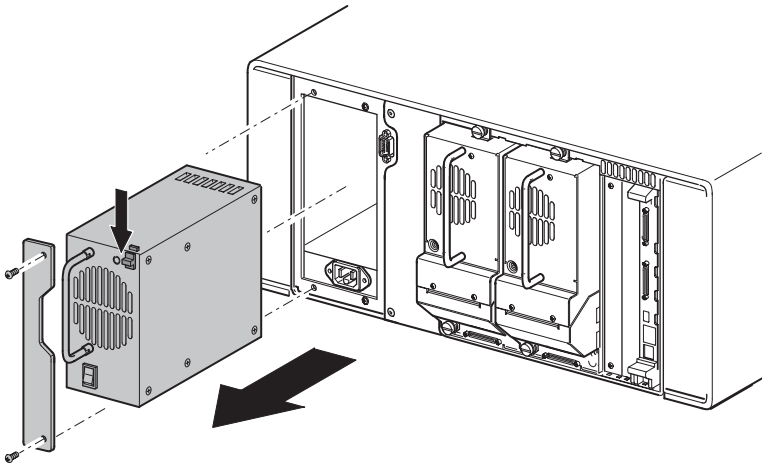

**Figure 61: Removing the power supply**

To replace the bracket and a power supply:

1. Position the power supply at the rear of the library with the latch at the top and the power switch at the bottom. (See Figure 61).

**Caution:** Ensure that the replacement power supply power switch is in the off position.

2. Push the power supply into the power supply receiver until the latch engages.

3. Secure the power supply locking bracket using the mounting screws (see Figure 62).

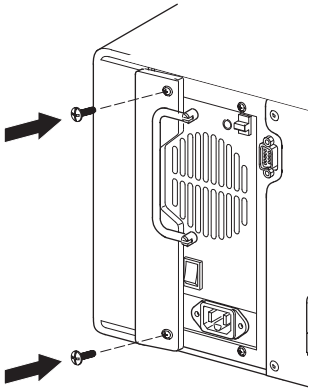

**Figure 62: Securing the power supply locking bracket**

4. Reconnect the power cord, and turn on the master power switch for both power supplies. If necessary, turn the library on by touching the LCD touch display.
5. Run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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6. If the host operating system requires a restart to discover SCSI devices, then reboot the host.
7. Restart the application software.

# Removing and Replacing the Power Supply Receiver

The power supply receiver is installed on the left side at the rear of the library. It houses the power supply and the power cord receptacles.

Before removing a power supply receiver, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Remove the left magazine.
3. Remove the left rear cover and top front cover.

After completing step 1 through step 3 above:

1. Be sure that the library is turned off and that the AC power cord has been removed.
2. Remove the bracket and power supply. See "Removing and Replacing the Power Supply" on page 129.

3. Work through the opening behind the right magazine track to remove the 22-pin main power harness connector. Remove the two 4-pin drive power connectors (see Figure 63).

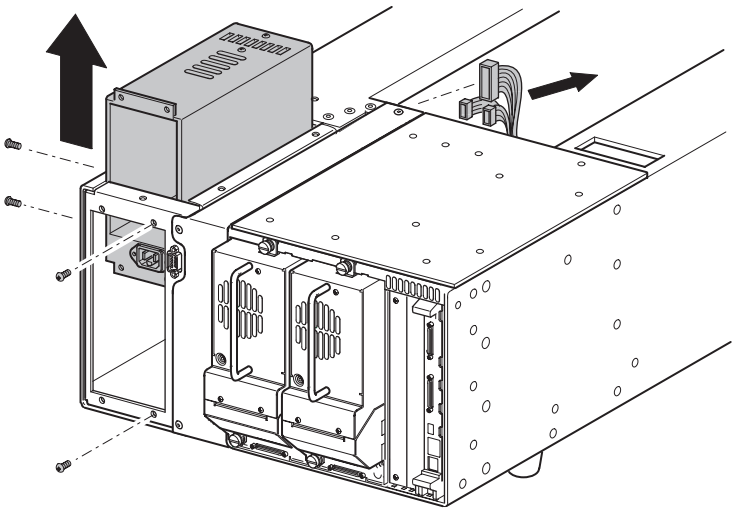

**Figure 63: Removing a power supply receiver**

4. On the outside of the library chassis, remove the two mounting screws (see Figure 63).
5. At the rear of the library, remove the two mounting screws while supporting the power supply receiver (see Figure 63).
6. Remove the power supply receiver through the opening in the top of the library.

To replace the power supply receiver:

1. Insert the power supply receiver into the opening in the top of the library with the power cord receptacle at the bottom facing the rear of the library.
2. At the rear of the library, install the two mounting screws on the right side of the power supply receiver bay (see Figure 63).
3. At the side of the library, install the two mounting screws (see Figure 63).
4. Working through the opening behind the right magazine track, replace the two 4-pin drive power connectors and the 22-pin main power harness connector (see Figure 63).
5. Replace the top front cover and left rear cover.

6. Replace the bracket and power supply.
7. Reconnect the power cord.
8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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9. Restart the application software.

# Removing and Replacing the Backplane Fan

The backplane fan is mounted on two long standoffs inside the library directly behind the left magazine.

Before removing the backplane fan, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Remove the left magazine.
3. Remove the top front cover and the right rear cover.

After completing step 1 through step 3 above:

1. Be sure that the library is turned off and that the AC power cord has been removed.
2. Disconnect the cable at J11 on the card cage/backplane assembly (see Figure 64).

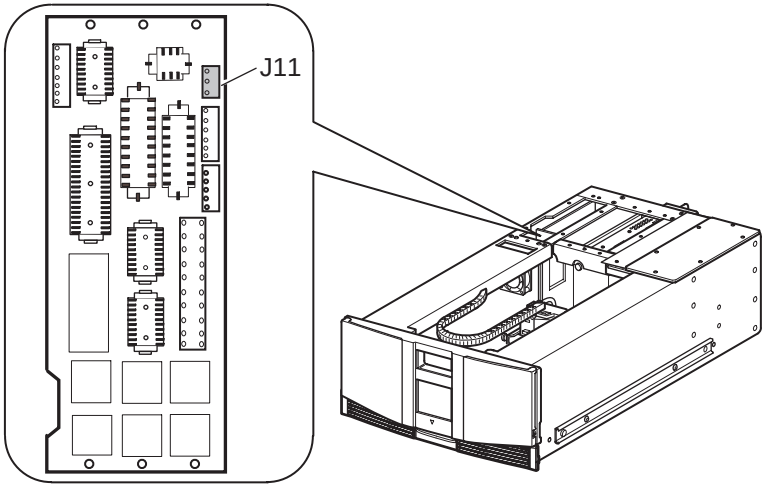


**Figure 64: Card cage/backplane assembly**

3. Remove the outside access plate, or if necessary to access J11, remove the drive 0 shoe assembly. See “Removing and Replacing a Tape Drive” on page 113.
4. Remove the screw from the card cage/backplane assembly connector access plate, and then lift the access plate out of the library (see Figure 65).

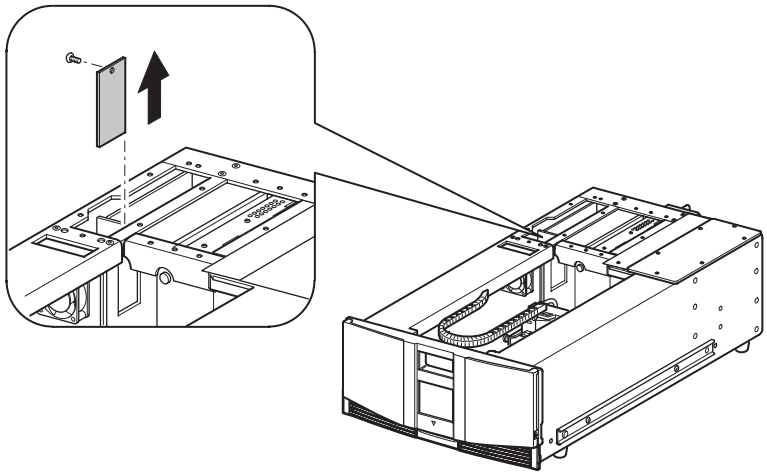

**Figure 65: Removing the card cage/backplane assembly access plate**

5. Remove the two screws that secure the backplane fan to the standoffs (see Figure 66).

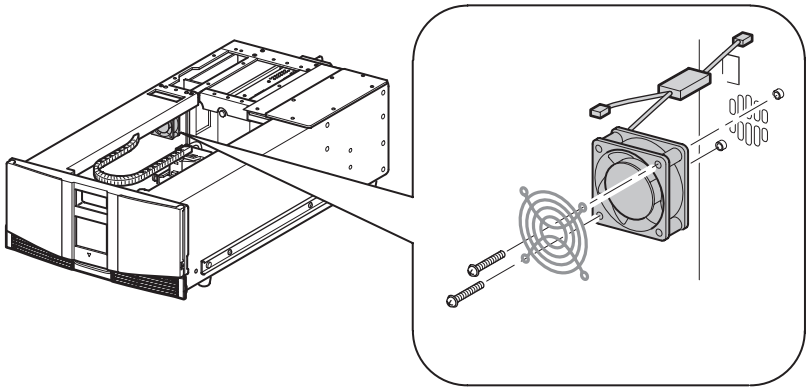

**Figure 66: Removing the backplane fan**

6. Pull the backplane fan straight off of the standoffs while guiding the fan cable out through the cable access hole (see Figure 66).
7. Remove the backplane fan from the library (see Figure 66).

To replace the backplane fan:

1. Position the backplane fan inside the left magazine area with the cable at the top left corner (see Figure 66).
2. Install the backplane fan over the two mounting standoffs while guiding the cable through the cable access hole into the card cage/backplane assembly area (see Figure 66).

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**Note:** The direction arrow of the fan should face toward the front of the library after the cooling kit is seated in the library. For opal-colored libraries, the arrow should face toward the back of the library.

---

3. Install the two screws that secure the backplane fan to the standoffs (see Figure 66).

4. Replace the cable at connector J11 on the card cage/backplane assembly (see Figure 66).
5. If removed, replace the card cage/backplane assembly connector access plate (see Figure 65).
6. If removed, replace the drive 0 shoe assembly.
7. Replace the top front cover and the right rear cover.
8. Reconnect the power cord.
9. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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10. Restart the application software.

# Removing and Replacing the Bar Code Reader

The bar code reader is mounted on the shuttle assembly. No other FRUs need to be removed to remove the bar code reader.

To remove the bar code reader:

1. Using the LCD touch display, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.
2. Remove the top front cover. See "Removing and Replacing the Library Covers" on page 45.
3. Depending on the library model:
   - Original: Remove the cable restraint screw at the lower front of the bar code reader. The cable clamp secures the bar code reader cable to the shuttle assembly board.
   - LTO-compatible: Remove the cable tie at the side of the bar code reader that secures the cable (see Figure 67).
4. Remove the cable on the shuttle assembly board:
   - Original: J5 (see Figure 67).
   - LTO-compatible: J10 (see Figure 68).

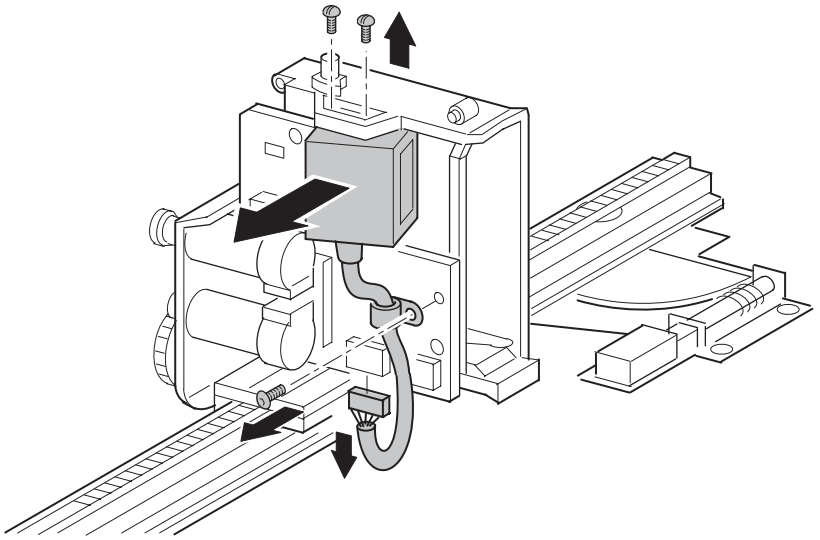

**Figure 67: Removing the bar code reader**

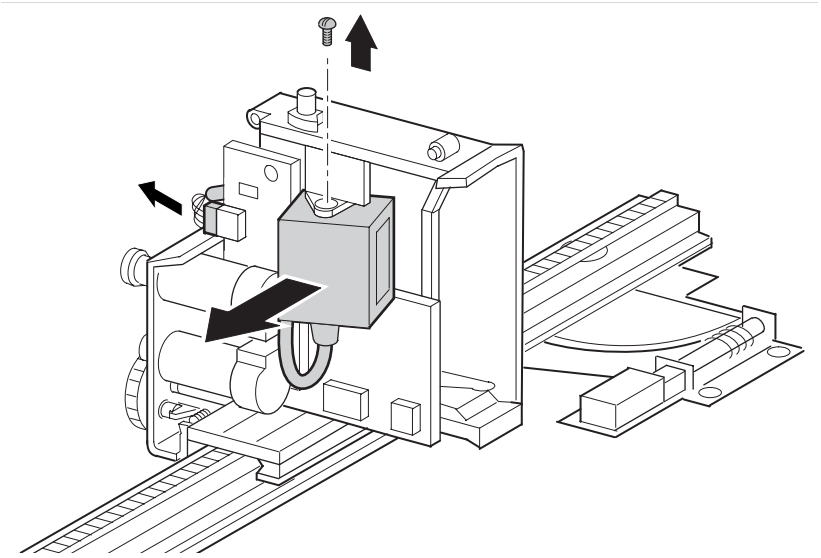

**Figure 68: Removing the bar code reader (LTO-compatible libraries)**

5. For the SDLT bar code readers, remove the two screws at the top that secure the bar code reader to the shuttle assembly (see Figure 67).
6. For LTO bar code readers, remove the one screw at the top that secure the bar code reader to the shuttle assembly (see Figure 68).
7. Remove the bar code reader from the shuttle assembly.

To replace the bar code reader:

1. Position the bar code reader in the opening on the board side of the shuttle assembly, with the lens pointing through the cartridge opening and the cable at the bottom. The bar code reader is mounted at an approximate 10-degree angle to the shuttle assembly body.
2. Replace the screw or screws at the top that secure the bar code reader to the shuttle assembly (see Figure 67 or Figure 68).
3. Replace the cable on the shuttle assembly board.
4. Depending on the library model:
   - Original: Place the bar code cable in the restraint, and replace the cable restraint screw at the lower front of the bar code reader so that the cable lies close to the board.
   - LTO-compatible: Replace the cable tie at the side of the bar code reader.

5. Replace the top front cover. See “Removing and Replacing the Library Covers” on page 45.
6. Reconnect the power cord.
7. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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8. Restart the application software.

# Removing and Replacing the Card Cage Fan

To remove the card cage fan:

1. Remove the right rear cover. See “Removing and Replacing the Library Covers” on page 45.
2. Release the fan cable from the two cable ties.
3. Remove the two screws securing the fan to the cover, and lift the fan off and away from the cover.

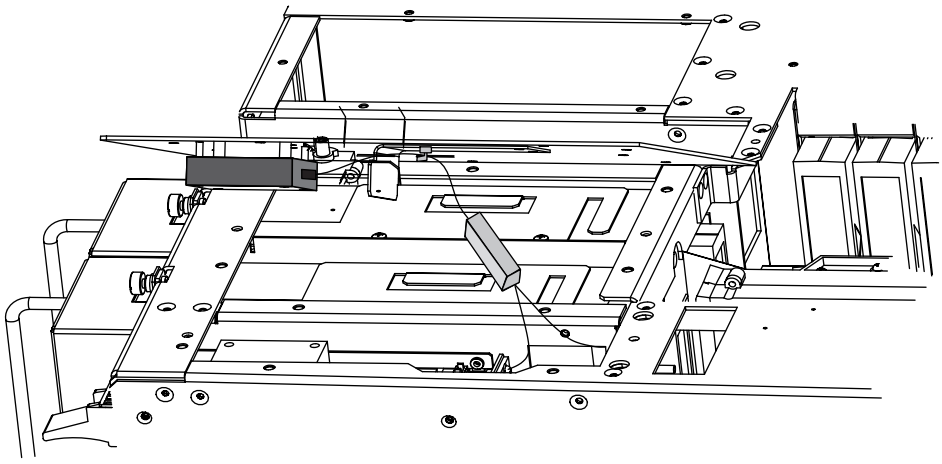


**Figure 69: Top cover card cage fan**

4. Replace the card cage fan by reversing these procedures.

# Replacing Four-Drive (10U) Model Electrical Components

5

This chapter provides procedures from removing and replacing MSL5000 and MSL6000 Series tape library electrical components for the following four-drive models:

- MSL5052
- MSL5060
- MSL6052
- MSL6060

---

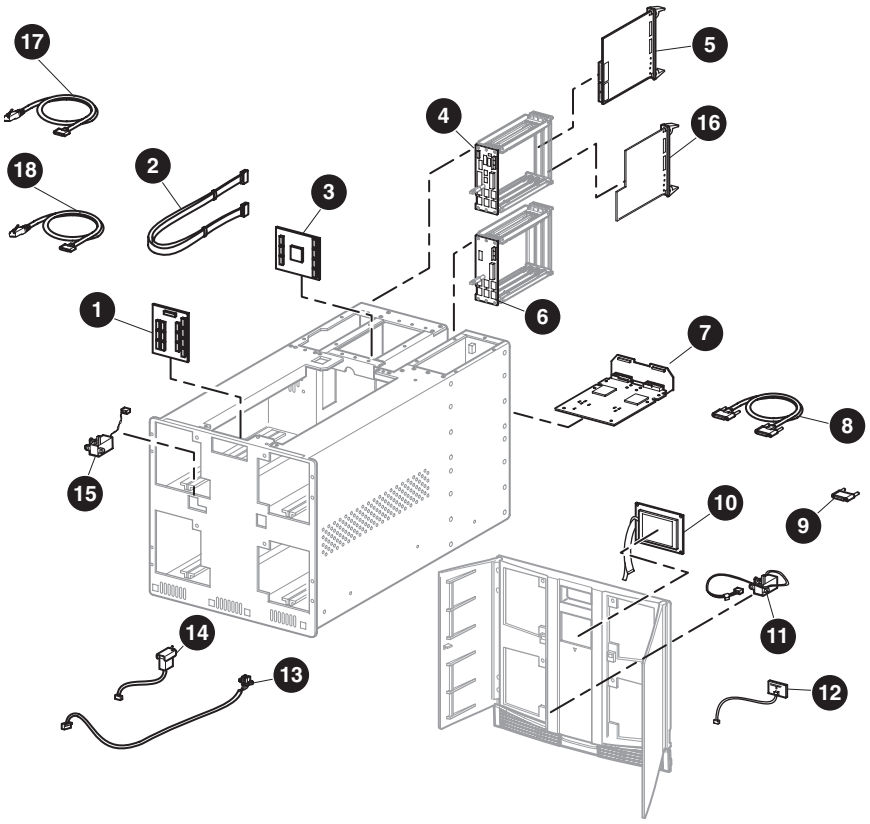
**Note:** See the Illustrated Parts Catalog on page 21 to verify spare part numbers when replacing electrical components for four-drive (10U) tape library models.

---

Procedures covered in this chapter include:


- Removing and Replacing the Front Panel, page 148
- Removing and Replacing the LCD Touch Display, page 152
- Removing and Replacing the Front Panel LED Board, page 154
- Removing and Replacing the Magazine Door Latch Solenoids, page 156
- Removing and Replacing the Control Panel Board (Auto Power On and Non-Auto Power On), page 158
- Removing and Replacing the Mail Slot Solenoid, page 162
- Removing and Replacing the Magazine Solenoids, page 165
- Removing and Replacing the Library Controller Board, page 168
- Removing and Replacing the Fibre Channel Thermal Unit, page 172
- Removing and Replacing the Fibre Channel Card, page 177
- Removing and Replacing the Upper Card Cage/Backplane Assembly, page 184

- Removing and Replacing the Lower Card Cage/Backplane Assembly, page 188
- Removing and Replacing a Very High Density I/O SCSI Board/ Library Board, page 192
- Removing and Replacing a Magazine Opto Sensor, page 195
- Removing and Replacing the Pass-Through Opto Sensor, page 202
- Removing and Replacing the Vertical Controller Board, page 206
- Removing and Replacing the Rotating Track Flex Cable, page 208
- Removing and Replacing the Shuttle Assembly Flex Cable, page 215




1. Control panel board, 10U, non-auto power on or auto power on
2. Flex cable kit
3. Vertical controller board
4. Backplane board
5. Library controller board
6. Backplane Expansion board
7. Ultra 2 SCSI library Hot-plug board/very high density I/O SCSI board
8. SCSI high density cable 0.5 m (1.64 ft)
9. High density SCSI terminator
10. LCD touch display with board
11. Solenoid latch set
12. Front panel LED board
13. Opto sensor cable
14. Magazine solenoid
15. Mail slot solenoid
16. Optional Fibre Channel card
17. Optional Fibre Channel cable
18. Library serial cable

**Figure 70: Electrical components for four-drive (10U) models**

# Removing and Replacing the Front Panel

The front panel assembly mounts on the front of the library chassis. It includes a replaceable LCD touch display, front panel LED board, and solenoids for the left and right magazine door lock mechanisms. The front panel must be removed to replace the LCD touch display, front panel LED board, and the front panel solenoids.

Before removing the front panel, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the magazine doors, and remove the two magazines.
3. Park the shuttle assembly.
4. Remove the top front cover.

After completing step 1 through step 4 above:

1. Remove the four screws and washers (two on each side) that secure the front panel to the left and right side of the chassis (see Figure 71).

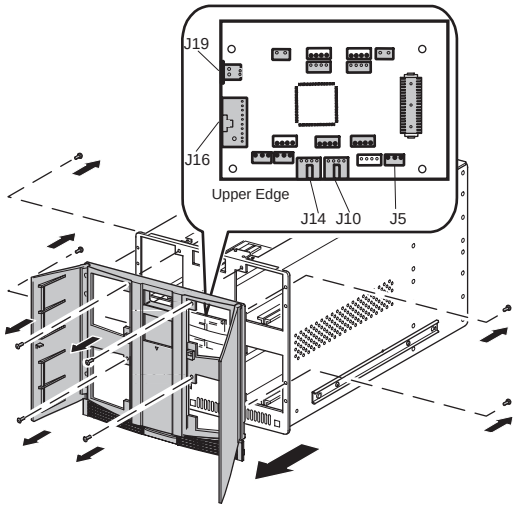



**Figure 71: Removing the front panel**

2. With the doors open, hold the front panel against the library chassis, and remove the four screws and washers that secure the front panel to the library chassis (see Figure 71).

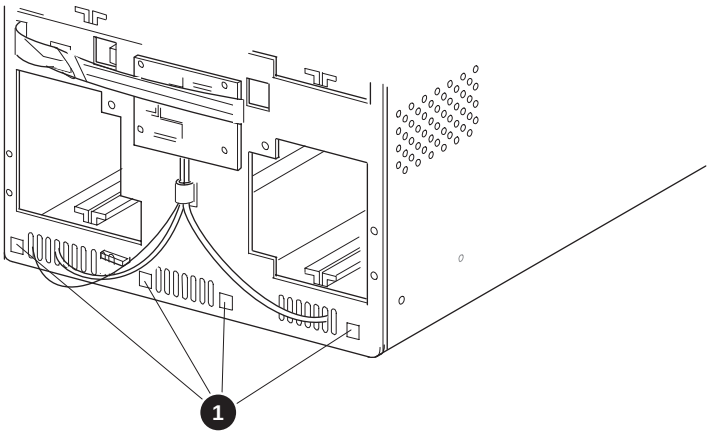
---

**Note:** As you remove the front mounting screws, support the front panel to avoid damaging the cables connected to the front door solenoids and the LCD touch display.

---

3. Lift the front panel up slightly, and carefully pivot the top of the front panel away from the library chassis approximately 5.08 cm (2 inches). Locate the control panel board at the bottom of the library chassis behind the front panel (see Figure 71).
4. While supporting the front panel, disconnect and label the cables J14 and J10 (left and right door solenoids) and J5 (LED). Press the cable release to disconnect cable J16 (display). Disconnect the zero insertion force cable at J19 (touch screen stiffener) by sliding the body of the connector up to release the flex cable. Remove the flex cable from the connector.

5. Lift up on the front panel so that the four alignment tabs that hold the panel at the bottom clear the chassis (see Figure 72).




1. Front panel tabs alignment holes

**Figure 72: Removing the front panel**

6. Lay the front panel on a padded, flat surface.

To replace the front panel:

1. Tilt the bottom of the front panel toward the chassis to allow for LCD touch display and door solenoid connections to be made to the board.
2. On the control panel board assembly located in between the chassis and the front panel, reconnect the cables at J14 and J10 (left and right solenoids), J16 (display), J19 (LCD touch display stiffener), and J5 (LED). Reconnect the zero insertion force cable at J19 by sliding the body of the connector up to insert the flex cable.
3. With the top of the front panel pivoted away from the chassis at a slight angle, position the four tabs at the bottom of the front panel in the library chassis openings. Slip the tabs over the library chassis.
4. Pivot the top of the front panel to rest against the library chassis.

**Caution:** If solenoids have been replaced, be sure the cables do not obstruct replacement of the front panel.

5. Replace the eight screws and washers that secure the front panel to the library chassis.

---

**Note:** Do not fully tighten the mounting screws until all eight have been reinstalled.

---

6. Replace the top front cover.
7. Reconnect the power cords.
8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *HP StorageWorks Library and Tape Tools (L&TT)* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is a diagnostic tool that is designed to aid in the installation and maintenance of HP tape and magneto-optical storage products. *L&TT* includes several features designed for use by both HP storage customers and trained service personnel. The key features include:

- Diagnostic tools for tape and magneto-optical devices designed for simple troubleshooting
- Multiple options for retrieving and updating both the latest firmware and the most current version of *L&TT*

*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.

---

9. Restart the application software.

# Removing and Replacing the LCD Touch Display

The LCD touch display is mounted on the inside of the front panel.

To remove the LCD touch display:

1. Remove the front panel. See “Removing and Replacing the Front Panel” on page 148.
2. Use a cushioning material to protect the finish of the front panel, and place the front panel face down on a flat work surface.
3. Remove the four screws (with insulating washers) that secure the LCD touch display to the front panel (see Figure 73).
4. Lift the LCD touch display up and away from the front panel.
5. Note the cable location, and then disconnect the cable.

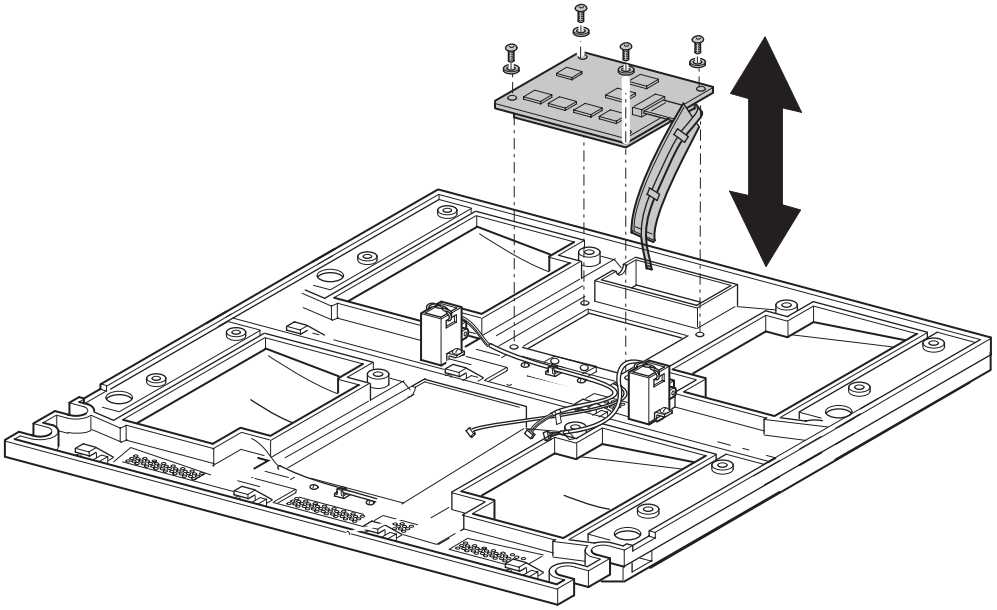


**Figure 73: Removing the LCD touch display**

To replace the LCD touch display:

1. Properly mount the magazine door lock solenoid wires.
   a. The wires from the right-hand magazine door lock solenoid that are to the left of the LCD touch display are routed with the blue wires above the mounting post, and the orange wires below the mounting post.
   b. The sleeved section of the cable is then routed on top of the control panel board for the library status LED.
2. Place the LCD touch display assembly on the mounting posts with the ribbon cable and flex cable to the right (see Figure 73).
3. Replace the four mounting screws and insulating washers, with the insulating washers between the mounting screw washer and the LCD touch display (see Figure 73).
4. Reconnect the cable that was disconnected in step 5 on page 152.
5. Replace the front panel.
6. Reconnect the power cords.
7. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

---

8. Restart the application software.

# Removing and Replacing the Front Panel LED Board

The front panel LED board is mounted inside the front panel. Before replacing it, you must remove the front panel LCD touch display assembly.

To remove the front panel LED board:

1. Remove the front panel. See “Removing and Replacing the Front Panel” on page 148.
2. Remove the LCD touch display assembly. See “Removing and Replacing the LCD Touch Display” on page 152.
3. Remove the two screws that mount the LED to the front panel (see Figure 74).

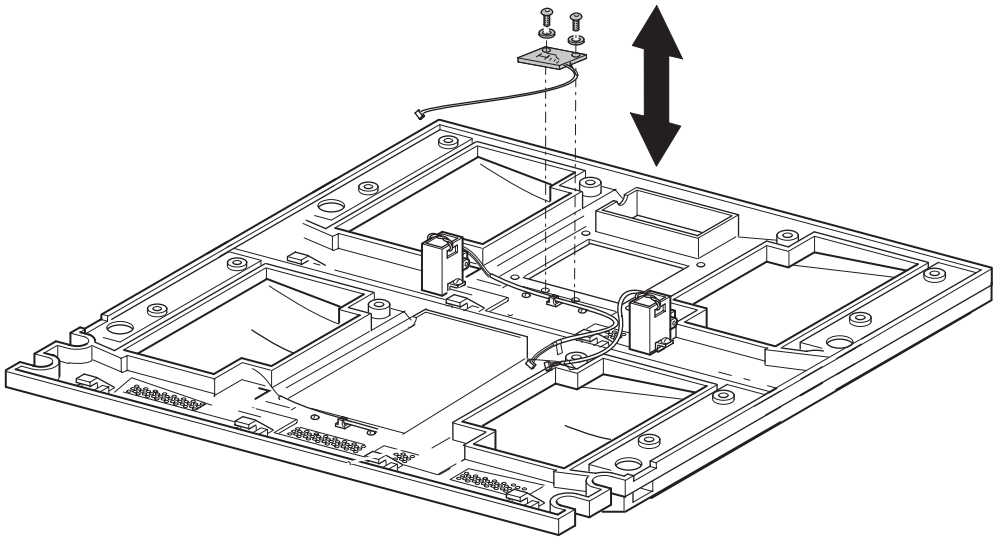


**Figure 74: Removing and replacing the front panel LED board**

4. Lift the LED up and away from the front panel.
5. Note the cable location, and then disconnect the cable (see Figure 74).

To replace the front panel LED board:

1. Position the front panel LED board on the mounting posts with the cable to the right.
2. Replace the two mounting screws. (See Figure 74).
3. Reconnect the cable that was disconnected in step 5 above.

4. Replace the LCD touch display assembly.
5. Replace the front panel.
6. Reconnect the power cords.
7. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

---

8. Restart the application software.

# Removing and Replacing the Magazine Door Latch Solenoids

The left and right magazine door latch solenoids are mounted on the inside of the front panel.

To remove the magazine door latch solenoids:

1. Remove the front panel. See “Removing and Replacing the Front Panel” on page 148.
2. Remove the two screws that mount the latch solenoids to the front panel (see Figure 75).

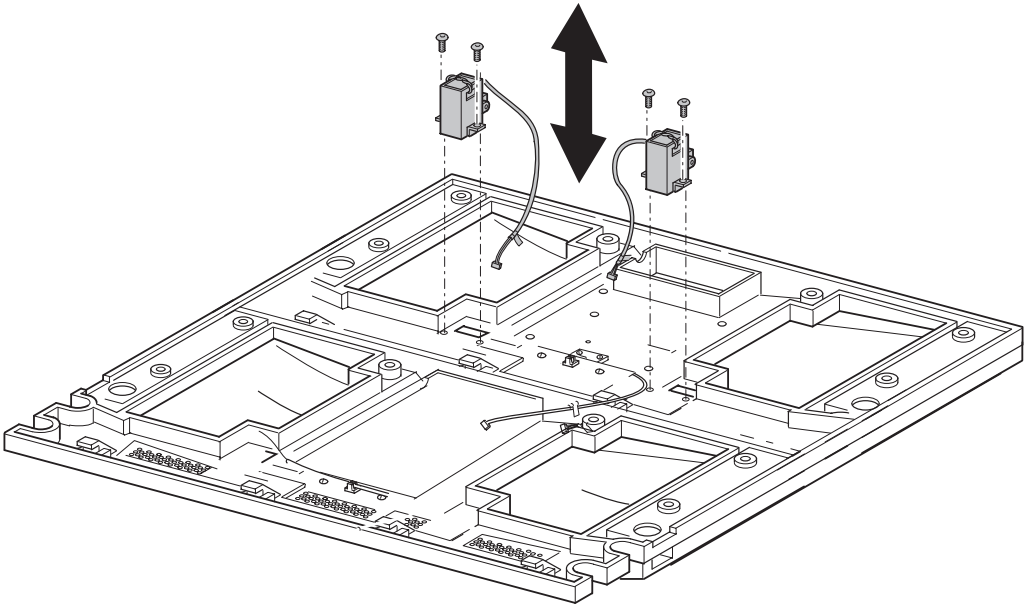


**Figure 75: Magazine door latch solenoids**

3. Lift the solenoids up and away from the front panel.
4. Note cable locations, and then disconnect the cables.

To replace the magazine door latch solenoids:

1. With the magazine door open, position each magazine door latch solenoid in the front panel, and loosely replace the two mounting screws (see Figure 75).

**Note:** The wires from the right magazine latch assembly to the left of the LCD touch display assembly need to be routed with the blue wires above the mounting post and the orange wires below the mounting post. The sleeved section of the cable is then routed on top of the board for the power-on LED display.

2. Loosen the screws that mount the solenoid body to the bracket, and gently push forward. Tighten the screws while applying pressure downward and to the left.

**Note:** This step may require some adjustment to latch the door properly.

3. Reconnect cables that were disconnected in step 4 on page 156.
4. Replace the front panel. See "Removing and Replacing the Front Panel" on page 148.
5. Reconnect the power cords.
6. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

7. Restart the application software.

# Removing and Replacing the Control Panel Board (Auto Power On and Non-Auto Power On)

The control panel board is mounted in the center of the library chassis directly behind the front panel.

**Note:** The control panel board is manufactured with either the Auto Power On or the non-Auto Power On option. Original MSL5000 Series tape libraries are shipped with the non-Auto Power On feature; however, the board can be upgraded with the Auto Power On feature. MSL6000 Series tape libraries are shipped with the Power On feature. Removal and replacement is the same for the control panel board with either feature.

If the control panel board includes the Auto Power On feature, the feature is enabled by default.

Before removing the control panel board, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the left magazine door, and remove the left magazines.
3. Park the shuttle assembly.

After completing step 1 through step 3 above:

1. Remove the front panel. See "Removing and Replacing the Front Panel" on page 148.
2. Verify that the cables at J14, J10, J16, J19, and J5 were removed during front panel removal.

3. Remove the four mounting screws and washers that secure the control panel board to the library chassis (see Figure 76).

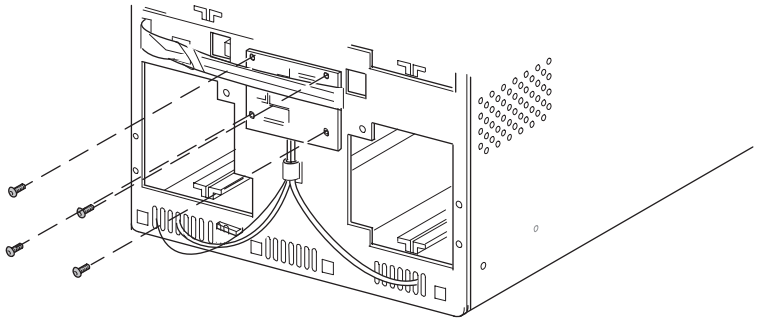


**Figure 76: Control panel board mounting screws**

4. Disconnect the cable at J9, and gently press in on the sides of the connector to remove the cable at J1.
5. Tilt the upper edge of the board forward, and disconnect the cables at:
   - J2 - Upper Magazine Solenoid
   - J3 - Lower-Left LTO Magazine Sensor
   - J4 - Lower-Right Magazine Opto Sensor
   - J6 - Lower-Left Magazine Opto Sensor
   - J7 - Lower-Right LTO Magazine Sensor
   - J8 - Upper-Left LTO Magazine Sensor
   - J11 - Lower Magazine Solenoid
   - J12 - Upper-Left Opto Sensor
   - J13 - Upper-Right LTO Magazine Sensor
   - J15 - Upper Mail Slot Lock (white wire)
   - J18- Lower Mail Slot Lock (white wire)

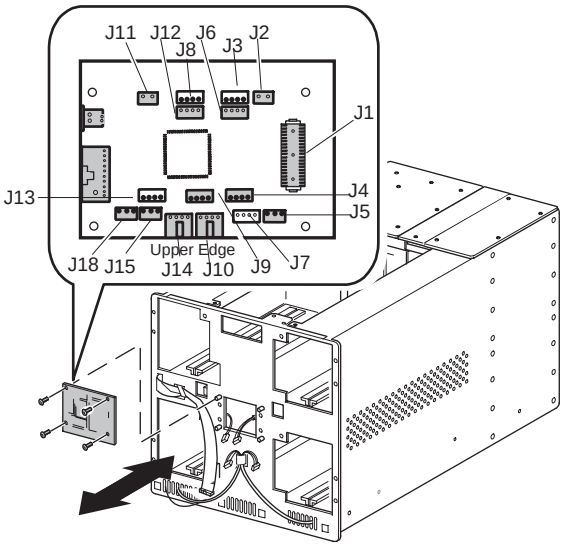



**Figure 77: Control panel board connectors**

6. Remove the control panel board from the chassis area.

To replace the control panel board:

1. Position the control panel board, and make the appropriate connections at the locations listed in step 5 above.
2. Make the appropriate reconnections at the J1 and J9 locations (see Figure 77).
3. Replace the four mounting screws and washers from the board (see Figure 76).

**Caution:** Be sure not to pinch any of the board cables when replacing the mounting screws.

4. Replace the front panel.
5. Reconnect the power cords.
6. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

7. Restart the application software.

# Removing and Replacing the Mail Slot Solenoid

The mail slot solenoid is mounted on the underside of the upper and lower left magazine track near the front of the library.

Before removing the mail slot solenoid, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the left magazine door, and remove the left magazines.
3. Park the shuttle assembly.
4. Remove the top front cover.

After completing step 1 through step 4 above:

1. Release the brake on the shuttle assembly, and move it toward the rear of the library.
2. From inside the library, remove the four screws securing the control panel board cover plate, and then remove the control panel board cover plate (see Figure 78).

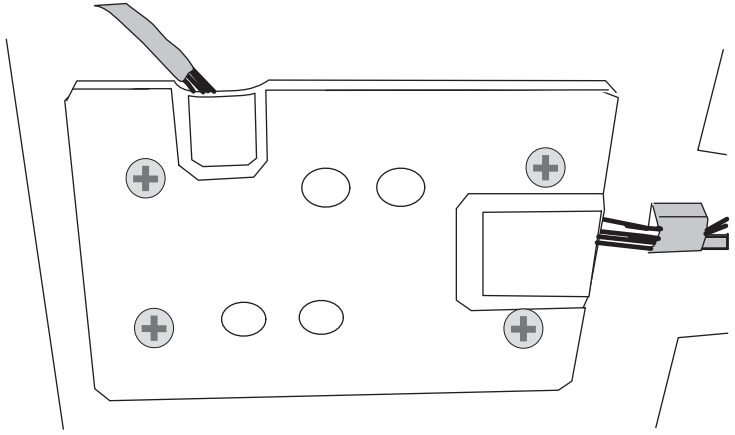


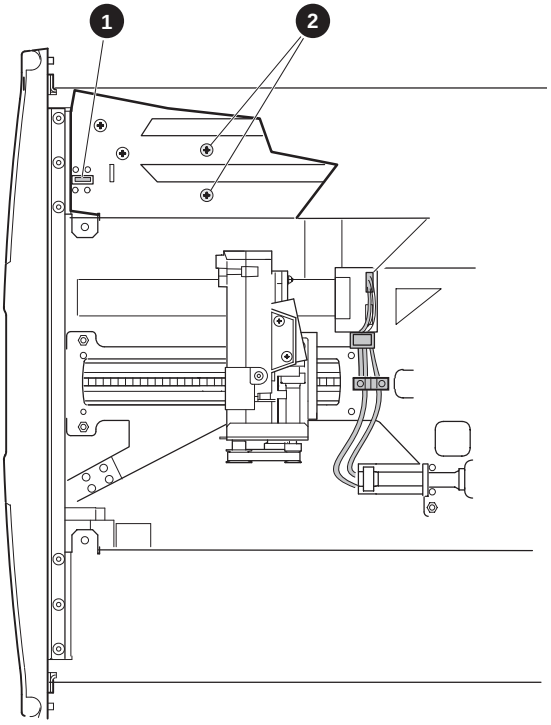
**Figure 78: Control panel board cover plate**

3. Disconnect the white cables at J15 (upper) and J18 (lower) locations, as needed, on the control panel board (see Figure 77).

**Note:** For easier cable accessibility the board may be removed from the mounts on the front side of the chassis. See "Removing and Replacing the Control Panel Board (Auto Power On and Non-Auto Power On)."

4. While supporting the solenoid assembly below the magazine track, remove the two mounting screws that face the center of the magazine track (see Figure 79).

**Note:** Use a stubby or right-angle screwdriver for this procedure.




1. Sleeve
2. Mounting screws

**Figure 79: Mail slot solenoid mounting screws**

5. Remove the solenoid assembly from beneath the magazine track.

To replace the mail slot solenoid:

1. Position the mail slot solenoid underneath the magazine track. The top of the tab should be in the black sleeve (see Figure 79).
2. Align the mounting holes, and install the two previously removed screws (see Figure 79).
3. Route the cable through the cable holder (upper) or through the library grill (lower), and reconnect the applicable cables at J15 (upper) and J18 (lower) locations, as needed, on the control panel board.

---

**Note:** Replace the control panel board if it was removed.

---

4. Replace the control panel board cover plate (see Figure 78).
5. Replace the front panel.
6. Replace the top front cover.
7. Reconnect the power cords.
8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

---

9. Restart the application software.

# Removing and Replacing the Magazine Solenoids

The magazine solenoid is mounted on the underside of the upper and lower left magazine track near the front of the library.

Before removing a magazine solenoid, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the left magazine door, and remove the left magazines.
3. Park the shuttle assembly.
4. Remove the top front cover.

After completing step 1 through step 4 above:

1. Release the brake on the shuttle assembly, and move it toward the rear of the library.
2. Remove the four screws securing the control panel board cover plate, and then remove the control panel board cover plate (see Figure 80).

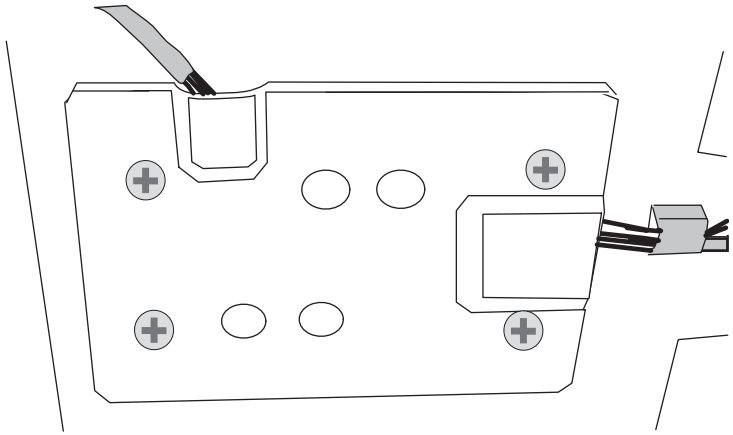


**Figure 80: Control panel board cover plate**

3. Disconnect the blue cables, as needed, at the applicable J2 (upper) and J11 (lower) locations, as needed, on the control panel board (see Figure 80).

**Note:** For easier cable accessibility, the board may be removed from the mounts on the front side of the chassis. See "Removing and Replacing the Control Panel Board (Auto Power On and Non-Auto Power On)" on page 158.

4. While supporting the solenoid assembly below the magazine track, remove the two mounting screws that face the center of the magazine track (see Figure 81).

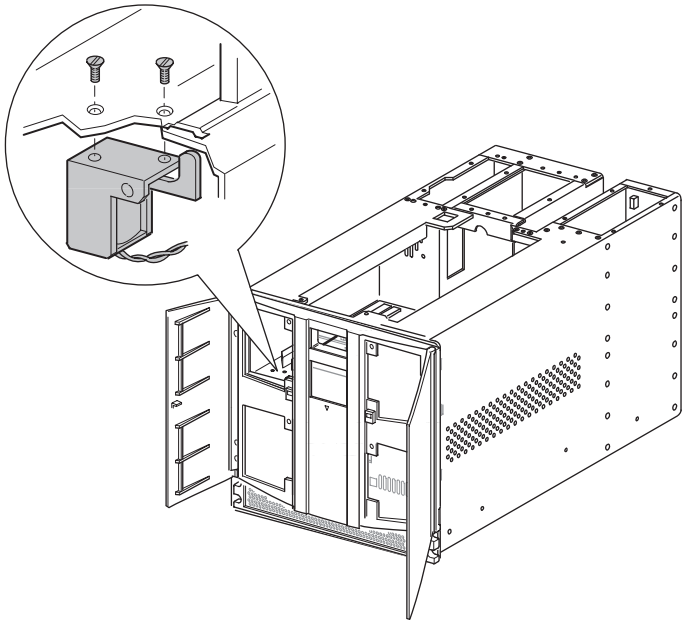


**Figure 81: Interlock solenoid mounting screws**

5. Remove the solenoid from beneath the magazine track.

To replace the magazine solenoid:

1. Position the magazine solenoid underneath the magazine track. The top of the tab should be in the slot (see Figure 81).
2. Align the mounting holes, and install the two previously removed flat-head screws (see Figure 81).

3. Route the cable through the cable holder (upper) or through the library grill (lower), and reconnect the needed cables at J2 (upper) and J11 (lower) locations, as applicable, on the control panel board.

---

**Note:** Replace the control panel board if it was removed.

---

4. Replace the control panel board cover plate (see Figure 80).
5. Replace the top front cover.
6. Reconnect the power cords.
7. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

---

8. Restart the application software.

# Removing and Replacing the Library Controller Board

The library controller board is installed in the card cage/backplane assembly on the right at the rear of the library.

**Note:** The library controller board must be installed in the right-most slot. It will not function in the other slots.

To remove the library controller board:

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

1. Exit the application software, and halt the operating system.
2. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.

3. Disconnect the SCSI interface cables, as needed, SCSI terminator, 10Base-T cable, and RS-232 cable (see Figure 82).

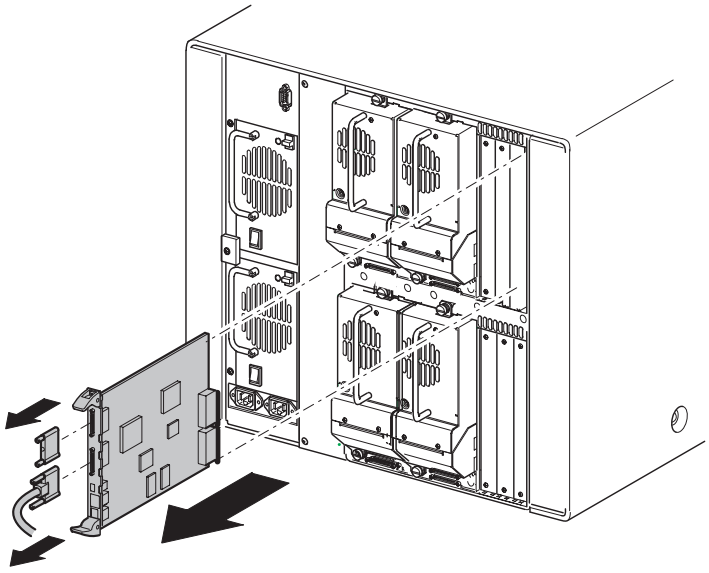


**Figure 82: Removing the library controller board**

4. Completely loosen the two captive hold-down screws on the ejector handles (see Figure 82).

5. Disconnect the library controller board by spreading the ejector handles (see Figure 83).

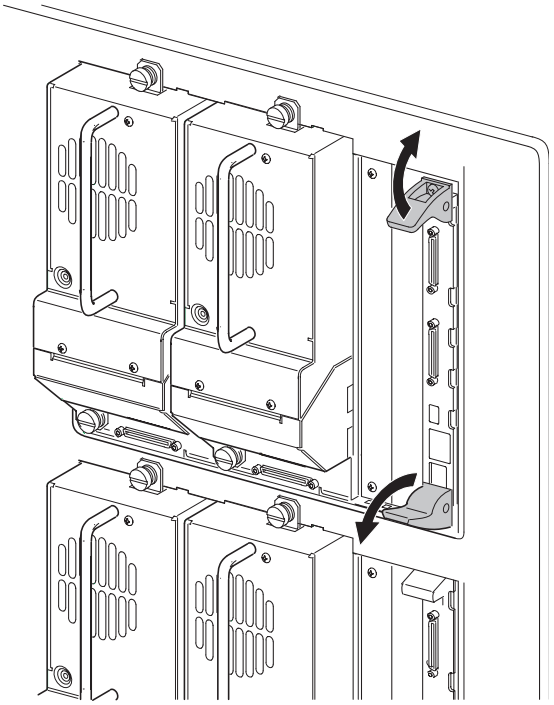


**Figure 83: Disconnecting the library controller board**

6. Pull the library controller board out of the card cage/backplane assembly.

To replace the library controller board:

1. Position the library controller board with the SCSI connectors toward the top, and then align the edges of the board with the slots in the card cage (see Figure 82).
2. Push the library controller board into the card cage until the ejector handles pivot toward each other (see Figure 83). Move the ejector handles toward each other to fully seat the board.
3. Tighten the two captive hold-down screws on the ejector handles (see Figure 82).
4. Reconnect the SCSI interface cable, SCSI terminator, 10Base-T cable, and RS-232 cable.

5. Reconnect the power cords.
6. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** An error code (`3031`) displays after the first power on with the new controller board. This is expected because the replacement controller board did not have this library's serial number stored in memory.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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7. Restart the application software.

# Removing and Replacing the Fibre Channel Thermal Unit

The Fibre Channel thermal unit ensures proper cooling of the Fibre Channel card by using enhanced airflow through the interior of the library.

**Caution:** Only tape libraries that are not dark gray required the installation of the Fibre Channel thermal unit. Failure to install the Fibre Channel thermal unit into libraries that are not dark gray could result in damage to the equipment or data loss.

**Caution:** This part should only be installed by an HP service representative to avoid damage to equipment or data loss.

**Caution:** This part is not hot pluggable. It is necessary to power down the library to replace this part.

To remove the Fibre Channel thermal unit, complete the following steps:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Using the LCD touch display, open the front left side door, and remove the left side tape cartridge magazine.
3. Using the LCD touch display, turn the library off. Turn off the master power switch for each power supply at the back of the library, and then remove the AC power cord.

**Note:** This process automatically moves the robot to the parked position. See "Parking the Shuttle Assembly for Service or Shipping" on page 41 for additional information on parking the shuttle assembly.

4. For rack mounted libraries, remove the library from the rack. For tabletop libraries, remove the outer cover. See the *HP StorageWorks MSL6000 Series Tape Library User Guide* for detailed instructions.
5. Remove the front cover, and set aside. Remove the right rear cover and discard. Be sure to keep the screws.
6. Remove the cooling baffle plate, and discard (See Figure 84).

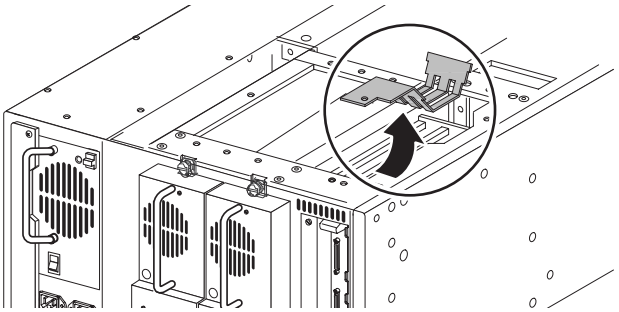


**Figure 84: Removing the cooling baffle plate**

7. Disconnect the card cage cooling fan cable from the card cage backplane (J11), and remove the fan and finger guard from the chassis (see Figure 85). Access to the fan mounting fasteners is through the area opened by removal of the left side magazine.

**Note:** This fan will not be reused.

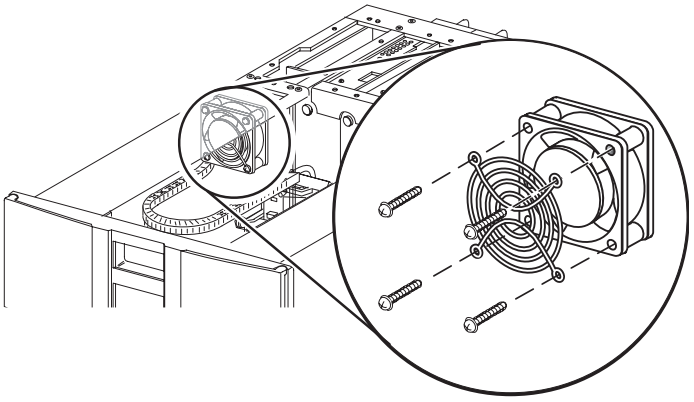
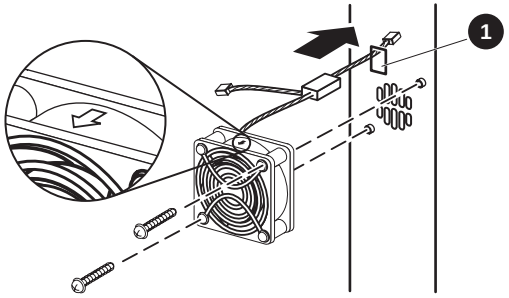


**Figure 85: Removing the fan and finger guard from chassis**

To replace the Fibre Channel thermal unit:

1. Using the replacement fan, thread the power cable with the Y connector through the access slot at the top of the chassis toward the backplane (see Figure 86).

**Caution:** Verify that the arrow at the top of the fan points toward the front of the library. This directs the airflow away from the card cage and toward the front of the library. Install the replacement card cage cooling fan and finger guard with two screws.




1. Access slot

**Figure 86: Threading power cable with Y connector**

2. Connect the card cage replacement fan 3-pin connector to the card cage backplane at the J11 location.
3. Position the outside edge of the thermal upgrade kit cover as shown, and lower it towards the unit. Connect the card cage fan's other cable to the fan on the thermal upgrade kit cover.
4. Make sure that the fan power cables do not bind between the cover and the top of the library chassis.

**Note:** As the cover is lowered, offset the rear edge of the cover approximately 2.54 cm (1-inch) in front of the rear edge of the library. This enables you to slide the cooling fan/baffle under the outer lip of the library.

5. When the cover lies flat on top of the unit, slide it back to align the mounting holes. Replace the 11 screws to secure the new right rear cover.

6. Replace the two screws to replace the top cover.
7. For rack mounted libraries, reinstall the library into the rack. For tabletop libraries, replace the outer cover. See the *HP StorageWorks MSL6000 Series Tape Libraries User Guide* for detailed instructions.
8. Replace the left side tape cartridge magazine, and close the door. Proceed to the Removing and Replacing the Fibre Channel Card section on page 177.

# Removing and Replacing the Fibre Channel Card

The Fibre Channel card is a SCSI-to-Fibre Channel card. The card allows libraries to be added to storage area networks (SAN). All the SCSI cables of the library and drives are connected to bridges that then can be connected to a fibre switch or hub.

---

**Note:** If you are replacing a card, save the configuration settings, if possible by using the FTP user interface.

ftp > **login > bin > get *.cfg <*path*><*filename*>.cfg**

Refer to the *HP StorageWorks Network Storage Router User Guide* for more information.

---

To remove the Fibre Channel card:

1. Using the LCD touch display, turn the library off. Turn off the master power switch for each power supply at the back of the library, and then remove the AC power cord.

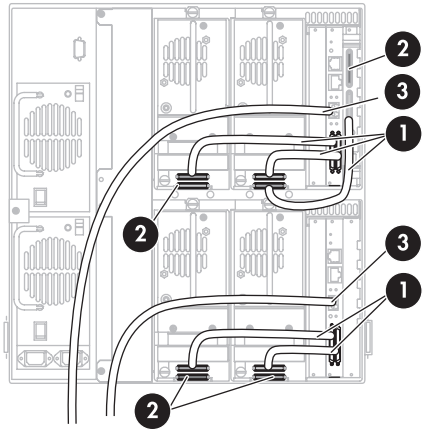
---

**Note:** This process automatically moves the robot to the parked position. See "Parking the Shuttle Assembly for Service or Shipping" on page 41 for additional information on parking the shuttle assembly.

---

2. Remove the SCSI interface cable, SCSI terminator, Ethernet cable (if present), and RS-232 cable (if present). See Figure 87.

**Note:** See Configuration Examples on page 367 for cabling examples using SDLT 600, LTO 2 (new) and LTO 3 tape drives.




1. SCSI cable
2. Terminator
3. Fibre cables

**Figure 87: Cable connections (four-drive, 10U, model)**

3. Remove the center option slot cover plate, if one is present (see Figure 88).

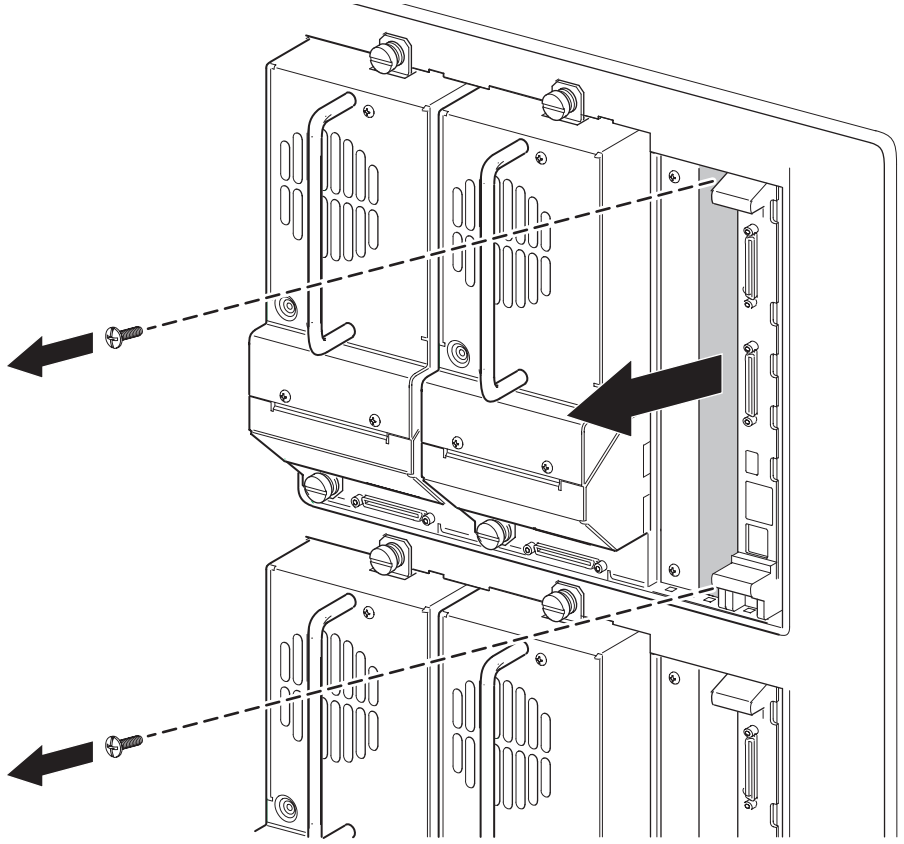


**Figure 88: Removing the option slot cover plate**

4. If you are replacing an existing Fibre Channel card, remove the existing Fibre Channel card.

**Caution:** To avoid damage to the library, ensure that the Fibre Channel cards are installed in the correct option slots. If you are installing one Fibre Channel card, place it in the middle slot next to the controller board. If you are installing two Fibre Channel cards, place the second one in the center slot on the bottom level of the library.

To replace the Fibre Channel card:

1. Carefully insert the Fibre Channel card into the upper (see Figure 89), and lower guide rails of the appropriate option slot with the SCSI connectors downward.

**Note:** You will feel some resistance when the Fibre Channel card begins to connect with the library backplane. Apply just enough force to seat the Fibre Channel card firmly to ensure proper connection by rotating the ejector handles inward.

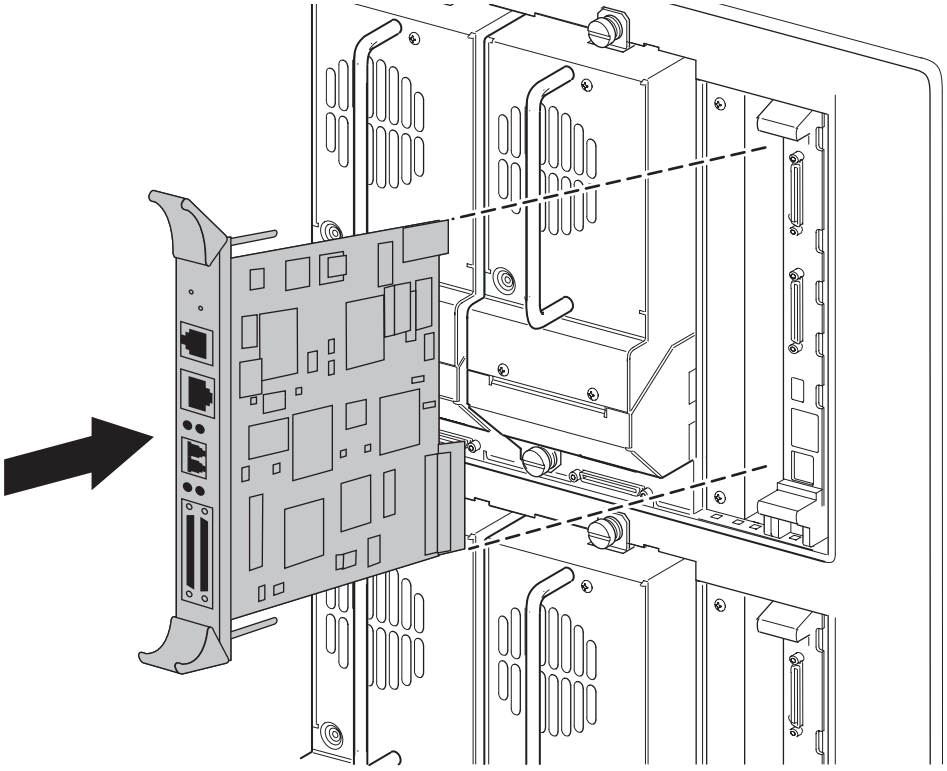


**Figure 89: Inserting the new Fibre Channel card**

2. Tighten the board captive screws (see Figure 90).

**Caution:** Libraries that are not dark gray require the installation of the Fibre Channel thermal unit. Failure to install the kit into libraries that are not dark gray could result in damage to the equipment or data loss. Refer to the "Removing and Replacing the Fibre Channel Thermal Unit" section on page 172 for more information.

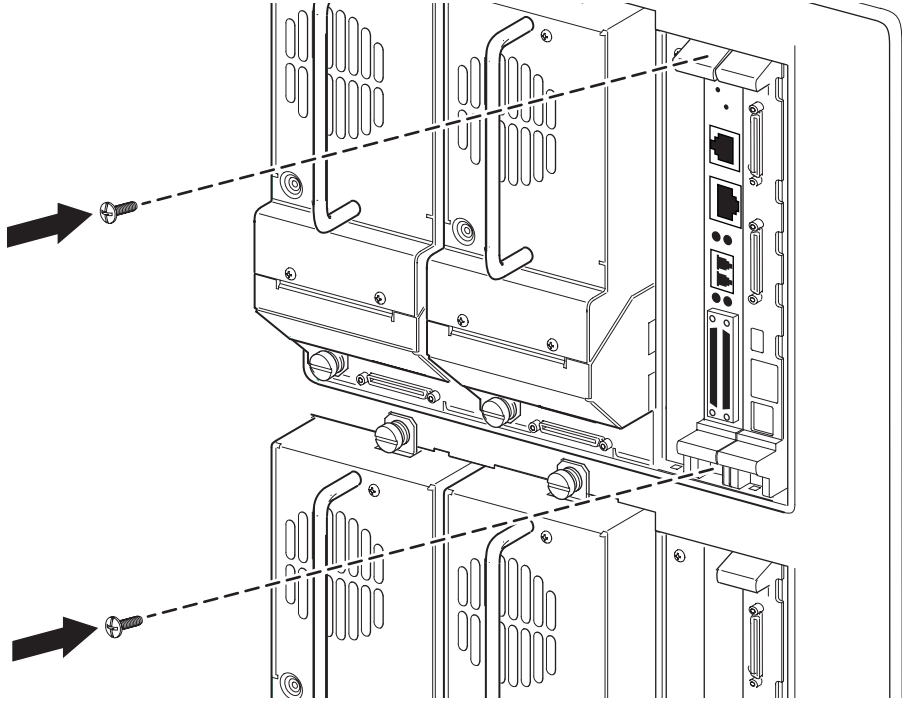


**Figure 90: Tightening board captive screws**

3. Reconnect the cables disconnected in step 2 on page 178. Connect the cables to the Fibre Channel card (see Figure 87).
4. Connect each power cord, and turn on the master power switch for the power supply. If necessary, turn the library on by touching the LCD touch display.
5. Configure the Fibre Channel card.

**Note:** Refer to the *HP StorageWorks Network Storage Router User Guide* for detailed procedures on configuring the Fibre Channel card.

a. Cable up the serial interface, and use your host application to communicate over the serial bus.

   The defaults are: 115200 Bits per second, 8 Data bits, No Parity, 1 Stop bit, and Xon/Xoff Flow Control.

b. Use the serial user interface to set the Ethernet configurations (DHCP, IP address, Subnet, and Gateway).

   Choose **Configuration > Ethernet and SNMP Configuration**.

c. Save Configuration.

   Choose **Configuration > Ethernet and SNMP Configuration**.

d. Reboot the Fibre Channel card.

   Choose **Main Menu**.

e. Document the Fibre Channel card IP address

   Choose **Configuration > Ethernet and SNMP Configuration**.

f. Enter the Visual User Interface by opening your web browser and entering the Fibre Channel card IP address.

   The defaults are: Logon-root Password-password.

g. Set the Real-Time Clock.

   Choose **System > Real-Time Clock**.

h. Set the Fibre Channel port Performance Mode (1GB or 2GB, depending on the hardware to which the Fibre Channel card is connected. The Fibre Channel card is not auto switching).

   Choose **Ports > FC Port**.

i. Assign Port 0 Device Map to the hosts that need to communicate with the library.

   Choose **Mapping**.

j. Choose **Port 0 Device Map**, and click **Edit/View**.

   Choose **Mapping**.

k. Set the Fill Map Priority to Bus/Target and Fill Map.

Choose **Mapping > Select Map > Edit/View**.

l. For SCSI Ultra 3 drives (for example, Ultrium 460), configure only one drive per SCSI bus. For SCSI Ultra 2 drives (for example, SDLT 220, SDLT 320, Ultrium 230 and all DLT drives) configure a maximum of 2 drives per SCSI bus.

Choose **Mapping > Select Map > Edit/View**.

m. Active Fabric (AF) should be the last LUN used on the map. Do not move AF to map LUN 0. (The device-specific LUN=0 is normal.

Choose **Mapping > Select Map > Edit/View**.

n. Remove Gaps in the LUN sequence.

Choose **Mapping > Select Map > Edit/View**.

o. Reboot the Fibre Channel card.

Choose **Reboot**.

6. Complete the following substeps for direct connect (point-to-point) configurations:

a. Set Port Mode to `Auto Sense`.

Choose **Ports > FC Port**.

b. Set Hard AL_PA to `Enable`.

Choose **Ports > FC Port**.

c. Click **Set AL_PA** to select any available AL_PA. The only other used AL_PA should be the host bus adapter (HBA). Using a high number will help to avoid potential conflicts.

Choose **Ports > FC Port**.

d. Reboot the Fibre Channel card.

Choose **Reboot**.

# Removing and Replacing the Upper Card Cage/Backplane Assembly

The card cage/backplane assembly is located on the top right side at the rear of the library.

To remove the card cage/backplane assembly:

1. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
2. Exit the application software, and halt the operating system.
3. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
4. Remove the library controller board and any option cards installed in the card cage. See "Removing and Replacing the Library Controller Board" on page 168.
5. Remove the drive 0 and drive 1 shoe assemblies. See "Removing and Replacing a Tape Drive" on page 223.
6. Remove the top front cover and right rear cover. See "Removing and Replacing the Library Covers" on page 45.

7. Remove the screw from the inside card cage/backplane assembly connector access plate, and lift the plate out of the library (see Figure 91).

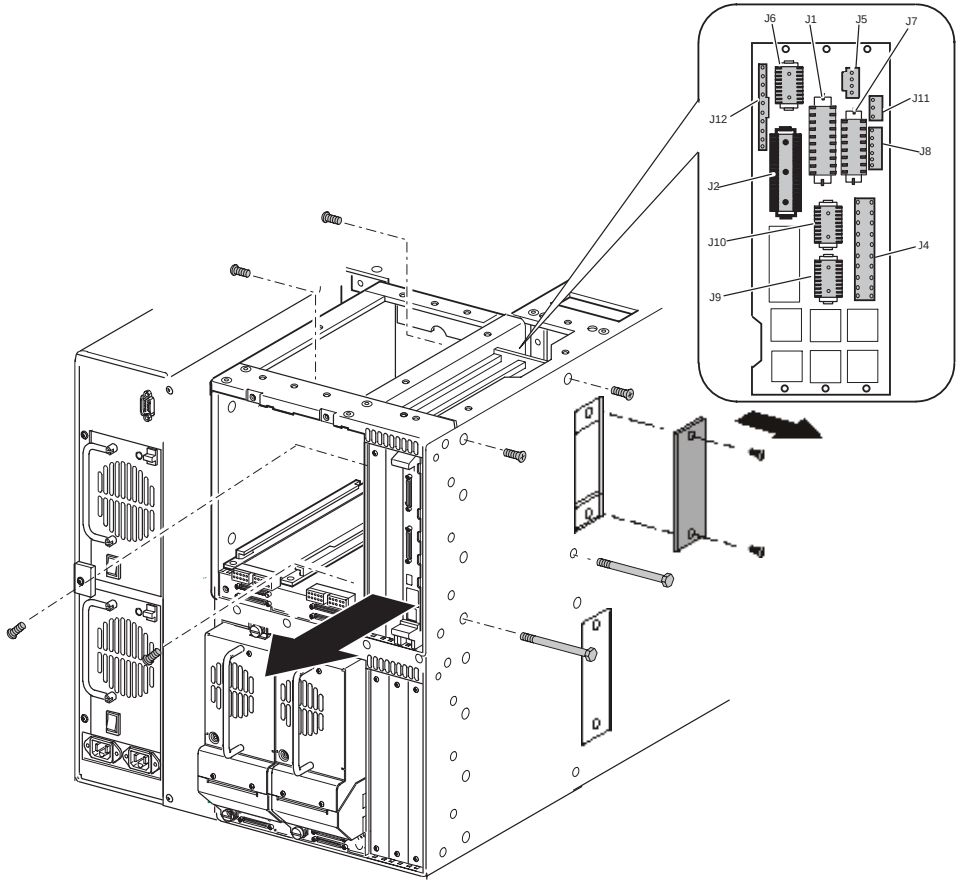



**Figure 91: Removing the card cage/backplane assembly**

8. Remove the two screws from the outside card cage/backplane assembly connector access plate, and remove it from the library (see Figure 91).
9. Remove the tape drive guides. See "Removing and Replacing the Tape Drive Guides" on page 233.

**Note:** This allows easier access to the card cage mounting screws.

10. Remove the upper tape drive shield. See "Removing and Replacing the Tape Drive Shields" on page 228.
11. Remove the cable access plate (two screws) from the side of the unit.
12. From outside the chassis, remove the two screws at the top of the card cage.
13. From inside the drive bay, remove two screws at the top of the card cage and one at the bottom rear of the card cage.
14. From outside the chassis, remove two through-bolts at the bottom of the card cage.
15. Remove the blank panels on the front of the card cage.
16. Remove the screw that secures the card cage/backplane assembly board stiffener to the chassis.
17. From inside the card cage, remove the grounding strip plate and spacer by removing the two screws located in tape drive bay 0.
18. Slide the card cage half-way out.
19. With the card cage loose and working from inside the drive bay, access the top, and remove the cables from J5, J6, J12, J2, J1, J7, J11, J8, J10, J9, and J4.
20. Slide the card cage out of the library.

To replace the card cage/backplane assembly:

1. Position the card cage at the rear of the library with connectors J6/J5 at the top and towards the front of the library.
2. Slide the card cage/backplane assembly about half way into the opening.
3. From inside the card cage, position the grounding strip plate with the spacer beneath it against the drive bay wall. The grounding strip contacts should be on the card cage side and toward the rear of the library. From inside the drive bay, replace the two mounting screws.
4. Slide the card cage the rest of the way in.

---

**Note:** Lift the cables toward the top of the unit so as not to trap any cables beneath the card cage.

---

5. With the card cage loose and working from inside the drive bay access and the top, connect the cables at J4, J9, J10, J8, J11, J7, J1, J2, J12, J6, and J5.

**Note:** For ease of installation, replace the cables moving from left to right and bottom to top of the back plane assembly.

6. Replace the one screw from the backplane board stiffener.
7. From outside the chassis, replace the two screws at the top of the card cage and the two through-bolts at the bottom of the card cage.
8. From inside the drive bay, replace the two screws at the top of the card cage and one at the bottom rear of the card cage.
9. Attach the cable access plates (two screws) on the side of the unit.
10. Replace the card cage/backplane connector access plate and mounting screw.
11. Replace the outside upper card cage/backplane connector access plate with the two screws.
12. Position the card cage shield near the backplane board, and slide it into position on top of the card cage. Replace the mounting screw.
13. Replace the top front cover and the right rear cover. See "Removing and Replacing the Library Covers" on page 45.
14. Replace the upper tape drive shield.
15. Replace the tape drive guides.
16. Replace the drive shoe assemblies.
17. Replace the library controller card.
18. Reconnect the power cords.
19. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

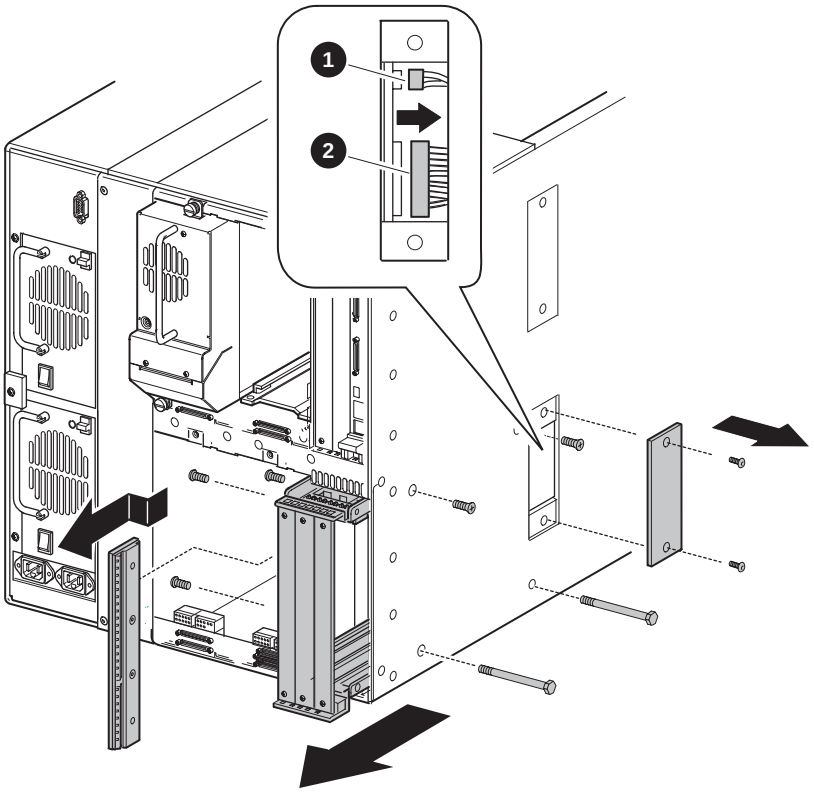
20. Restart the application software.

# Removing and Replacing the Lower Card Cage/Backplane Assembly

The lower card cage/backplane assembly is located on the lower-right side at the rear of the library.

To remove the lower card cage/backplane assembly:

1. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
2. If necessary, exit the application software, and halt the operating system.
3. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cord.
4. Remove the top front cover and right rear cover. See "Removing and Replacing the Library Covers" on page 45.
5. Remove tape drive 2 and tape drive 3. See "Removing and Replacing a Tape Drive" on page 223.
6. Remove the lower tape drive shield. See "Removing and Replacing the Tape Drive Shields" on page 228.
7. Remove the two screws from the lower-outside card cage/backplane connector access plate. Doing this provides better lighting into the card cage area (see Figure 92).




1. J11 cable connection (upper fan)
2. J4 cable connection (main power)

**Figure 92: Expansion card cage/backplane**

8. From outside the chassis, remove the two screws at the top of the card cage (see Figure 92).
9. From inside the drive bay, remove the two screws at the top of the card cage and one at the bottom rear of the card cage.
10. From outside the chassis, remove the two through-bolts at the bottom of the card cage (see Figure 92).
11. Remove the outside cover plates from the front of the card cage.
12. From inside the card cage, remove the screw from the backplane board stiffener.

13. From inside the card cage/backplane assembly, remove the grounding strip plate and spacer (the two screws located in tape drive bay 3).
14. Slide the lower card cage about halfway out, and remove the cable connection at J11 (see Figure 92).
15. Slide the lower card cage/backplane assembly out of the library.
16. Remove the connection at J4 (see Figure 92).

To replace the lower card cage/backplane assembly:

1. Reconnect the power cable to the expansion card cage/backplane at J4.
2. Slide the card cage/backplane assembly into the opening at the lower-rear of the library.

---

**Note:** Lift the cables toward the top of the unit to avoid trapping any cables beneath the card cage.

---

3. From inside the card cage/backplane assembly, position the grounding strip plate with the spacer beneath it against the tape drive bay wall. The grounding strip contacts should be on the card cage side and towards the rear of the library.
4. With the card cage loose inside the drive bay, connect the cable at J11.
5. Replace the screw that secures the backplane board stiffener.
6. Replace the blank cover plates in the card cage/backplane assembly.
7. From outside the chassis, loosely replace the two screws and the top and the two through-bolts at the bottom the of the card cage/backplane assembly.

---

**Note:** Tighten the top screws first.

---

8. From inside the tape drive bay, replace the two screws at the top of the card cage/backplane assembly.
9. Replace the card cage/backplane assembly connector access plate.
10. Replace the drive shoe assemblies.
11. Replace the lower tape drive shield.
12. Replace the library controller board.

13. Replace the top front cover and the right rear cover.
14. Reconnect the power cords.
15. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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16. Restart the application software.

# Removing and Replacing a Very High Density I/O SCSI Board/ Library Board

The very high density I/O SCSI and library board is located at the rear of the library directly under the tape drive bays. Use this procedure to replace the board.

To remove a high density I/O SCSI board/library board:

1. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
2. Exit the application software, and halt the operating system.
3. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
4. Remove any SCSI interface cables and SCSI terminators that are attached to the tape drive SCSI connectors.
5. Remove the appropriate drive shoe assemblies. See “Removing and Replacing a Tape Drive” on page 223.
6. Remove the right rear cover. See “Removing and Replacing the Library Covers” on page 45.
7. Remove the tape drive guides. See “Removing and Replacing the Tape Drive Guides” on page 233.
8. Remove the tape drive shield. See “Removing and Replacing the Tape Drive Shields” on page 228.

9. Remove eight jackscrews from the SCSI connectors.

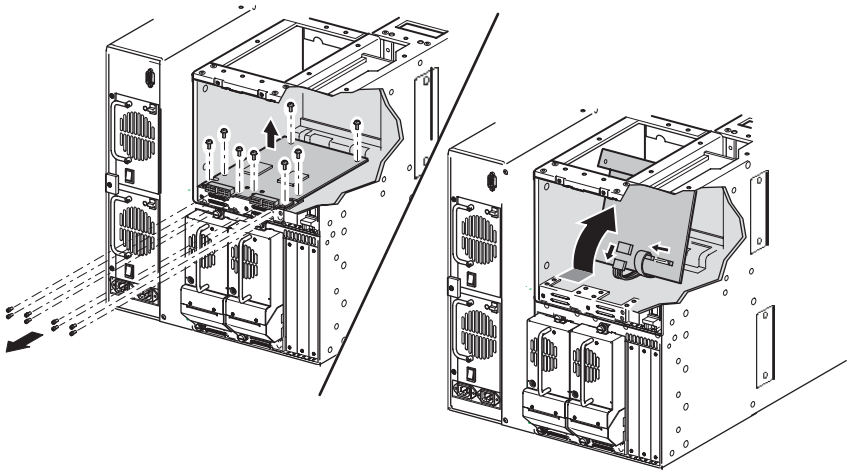

**Figure 93: Removing the I/O SCSI board**

10. Remove the six screws that secure the I/O SCSI board/library board assembly to the library chassis.
11. Slide the SCSI board/library board assembly toward the front of the library until it is possible to pivot the rear of it up (toward the front of the library). This allows access to the bottom of the library board.
12. Remove the cables at J3 and J4.
13. Remove the I/O SCSI board/library board assembly from the library.

To replace the I/O SCSI/library board:

1. Position the I/O SCSI board in the drive bays with the SCSI connectors to the rear of the library.
2. Pivot the rear of the board up and toward the front of the library to access the bottom of the board.
3. Replace the cables at J3 and J4.
4. Guide the I/O SCSI board/library board assembly into place, aligning it with the mounting holes.
5. Replace the eight jack screws that secure the I/O SCSI board/library board assembly to the library chassis.

6. Replace the six screws that mount the board to the chassis.
7. Replace the tape drive shield.
8. Replace the drive guides.
9. Replace the right rear cover.
10. Replace the appropriate drive shoe assemblies.
11. Replace the SCSI cables and SCSI terminators.
12. Reconnect the power cords.
13. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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14. Restart the application software.

# Removing and Replacing a Magazine Opto Sensor

Optical sensors are located at the rear of both the left and right magazine tracks.

**Note:** The appropriate left or right magazine must be removed prior to removing a magazine opto sensor.

## Removing an Upper Magazine Opto Sensor

To remove an upper magazine opto sensor, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Remove the appropriate magazine for the opto sensor to be replaced.
3. Remove the top front cover.

After completing step 1 through step 3 above:

1. Remove the front panel. See “Removing and Replacing the Front Panel” on page 148.
2. Remove the control panel cover plate.

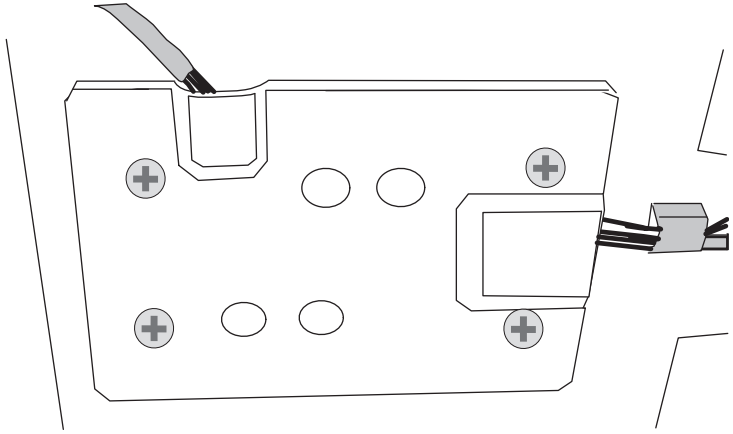

**Figure 94: Control panel board cover plate**

3. Locate the control panel board behind the front panel.
   a. Remove the white cable at J8 for the upper left LTO magazine opto sensor.
   b. Remove the black cable at J12 for the upper left SDLT/DLT magazine opto sensor.
   c. Remove the white cable at J13 for the upper right LTO magazine opto sensor.
   d. Remove the black cable at J9 for the upper right SDLT/DLT magazine opto sensor.

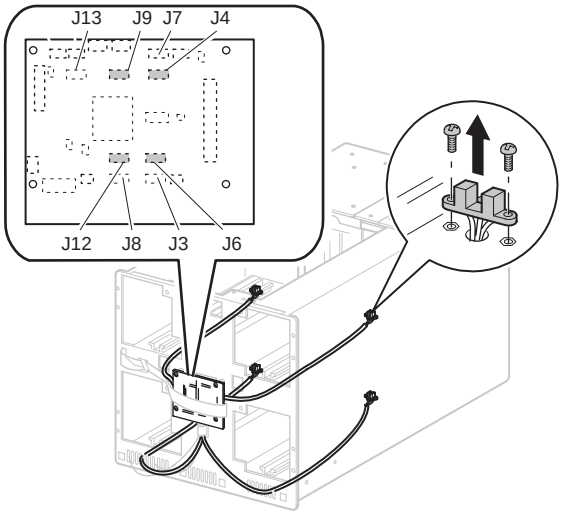


**Figure 95: Removing a magazine opto sensor**

4. Following the appropriate cable to the rear of the library, remove the cable clamps as required.
5. On the underside of the left magazine tray remove the large cable clamps and from the right magazine tray remove the sensor cable from the small cable clamps.
6. Remove the two screws that secure the magazine opto sensor to the track.
   - The two mounting holes at the front of the track are for the SDLT/DLT opto sensor.
   - The two mounting holes 0.3175 cm (1/8 inch) behind the SDLT/DLT mounting holes are for the LTO opto sensor.

**Note:** The upper left sensor is under the ribbon cable.

7. Lift the magazine opto sensor from the magazine track while guiding the cable through the opening in the magazine track.

To replace an upper magazine opto sensor:

**Note:** The right magazine opto sensor is 78.7 cm (31 inches) long.

1. Guide the connector end of the cable through the opening in the magazine track (see Figure 95).
2. Replace the two screws that secure the magazine opto sensor to the magazine track using the appropriate mounting holes.
3. Route the cable along the magazine tray bottom with the flex cable (upper left sensor only). Replace the cables, as applicable, in the two wide cable clamps (left side) or the two small cable clamps (right side) and continue routing, using cable clamps to the control panel board.
4. Replace the appropriate cable:
   a. Replace the white cable at J8 for the upper left LTO magazine opto sensor.
   b. Replace the black cable at J12 for the upper left SDLT/DLT magazine opto sensor.
   c. Replace the white cable at J13 for the upper right LTO magazine opto sensor.
   d. Replace the black cable at J9 for the upper right SDLT/DLT magazine opto sensor.
5. Replace the magazine for the sensor being replaced.
6. Replace the top front cover.
7. Reconnect the power cords.
8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

9. Restart the application software.

## Removing a Lower Magazine Opto Sensor

Before removing the lower magazine opto sensor, see the "Preparing for Service" chapter that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Remove the appropriate magazine for the opto sensor to be replaced.
3. Remove the top front cover.

After completing step 1 through step 3 above:

1. Remove the front panel. See "Removing and Replacing the Front Panel" on page 148.
2. Remove the control panel cover plate. (See Figure 94.)
3. Locate the control panel board behind the front panel.
   a. Remove the white cable at J3 for the lower left LTO magazine opto sensor.
   b. Remove the black cable at J4 for the lower left SDLT/DLT magazine opto sensor.
   c. Remove the white cable at J7 for the lower right LTO magazine opto sensor.
   d. Remove the black cable at J6 for the lower right SDLT/DLT magazine opto sensor.

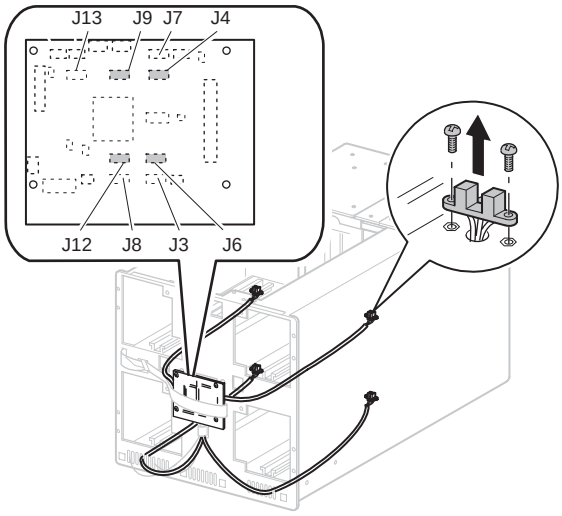


**Figure 96: Removing a magazine opto sensor**

4. Following the appropriate cable to the rear of the library, remove the cable clamps as required.
5. Remove the cable from the cable clamp below the control panel board, thread it through the front grill area and follow it to the rear of the library, removing the cable from the cable clamps.
6. Remove the two screws that secure the magazine opto sensor to the track.
   - The two mounting holes at the front of the track are for the SDLT/DLT opto sensor.
   - The two mounting holes 0.3175 cm (1/8 inch) behind the SDLT/DLT mounting holes are for the LTO opto sensor.
7. Lift the magazine opto sensor from the magazine track while guiding the cable through the opening in the magazine track (see Figure 96).

To replace a lower magazine opto sensor:

1. Guide the connector end of the cable through the opening in the magazine track (see Figure 96).
2. Replace the two screws that secure the magazine opto sensor to the magazine track using the appropriate mounting holes.

3. Route the cable along the magazine tray bottom replacing the two small cable clamps. Continue routing through the front grill area using cable clamps to the control panel board.
4. Replace the appropriate cable:
   a. Replace the white cable at J3 for the lower left LTO magazine opto sensor.
   b. Replace the black cable at J4 for the lower left SDLT/DLT magazine opto sensor.
   c. Replace the white cable at J7 for the lower right LTO magazine opto sensor.
   d. Replace the black cable at J6 for the lower right SDLT/DLT magazine opto sensor.
5. Replace the front panel.
6. Replace the magazine for the sensor being replaced.
7. Replace the top front cover.
8. Reconnect the power cords.
9. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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10. Restart the application software.

# Removing and Replacing the Pass-Through Opto Sensor

The pass-through opto sensor is mounted inside the chassis at the bottom of the pass-through opening.

**Note:** The pass-through opto sensor is included with the opto sensor cable set. Refer to Figure 3 for part number details.

Before removing the pass-through opto sensor, see the "Preparing for Service" that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Park the shuttle assembly.
3. Remove the outside cover and top front cover.

After completing step 1 through step 3 above:

1. Remove the drive 0 shoe assembly. See “Removing and Replacing a Tape Drive” on page 223.
2. Remove the screw from the card cage/back plane access plate, and lift it out of the library (see Figure 97).

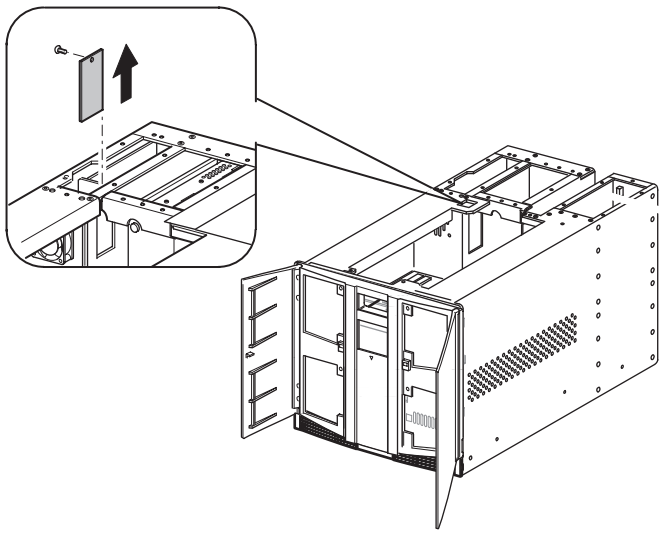

**Figure 97: Removing the card cage/backplane access plate**

3. Remove the two snap rivets that mount the pass-through opto sensor to the chassis (see Figure 98).

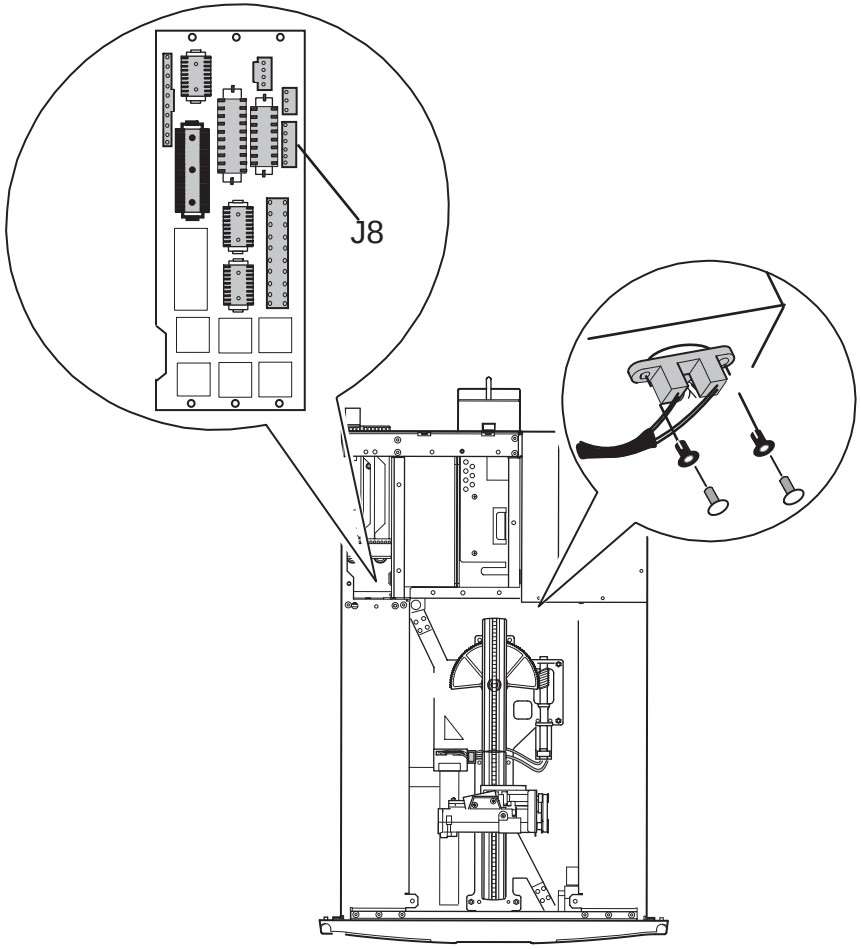


**Figure 98: Removing the pass-through opto sensor**

4. Remove the cable ties that secure the pass-through cable to the main wiring harness.
5. Disconnect the cable at J8 on the card cage/backplane board (see Figure 98).
6. Carefully work the cable through the opening under the card cage and into the main chassis area to remove the pass-through opto sensor.

To replace the pass-through opto sensor:

1. Position the pass-through opto sensor in the mounting hole with the cable routed along the main wiring harness to the left.
2. Replace the two snap rivets (see Figure 98).
3. Replace the cable ties in the locations they were removed from in step 6 of the removal instructions.
4. Carefully work the cable through the opening under the left magazine track and into the card cage/backplane area.
5. Feed the cable through, and reconnect it to J8 on the card cage/backplane board (see Figure 98).
6. Replace the card cage/backplane connector access plate, and replace the screw (see Figure 97).
7. Replace the drive shoe assembly.
8. Replace the outside cover and the top front cover.
9. Reconnect the power cords.
10. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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11. Restart the application software.

# Removing and Replacing the Vertical Controller Board

To remove the vertical controller board:

1. Using the LCD touch display, open the right magazine door, and remove the upper right magazine. If the library is not operational, see "Manually Opening the Magazine Doors" on page 38.
2. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
3. Remove the top front cover. See "Removing and Replacing the Library Covers" on page 45.
4. Remove the cables from the vertical controller board at locations J1, J2, and J3.

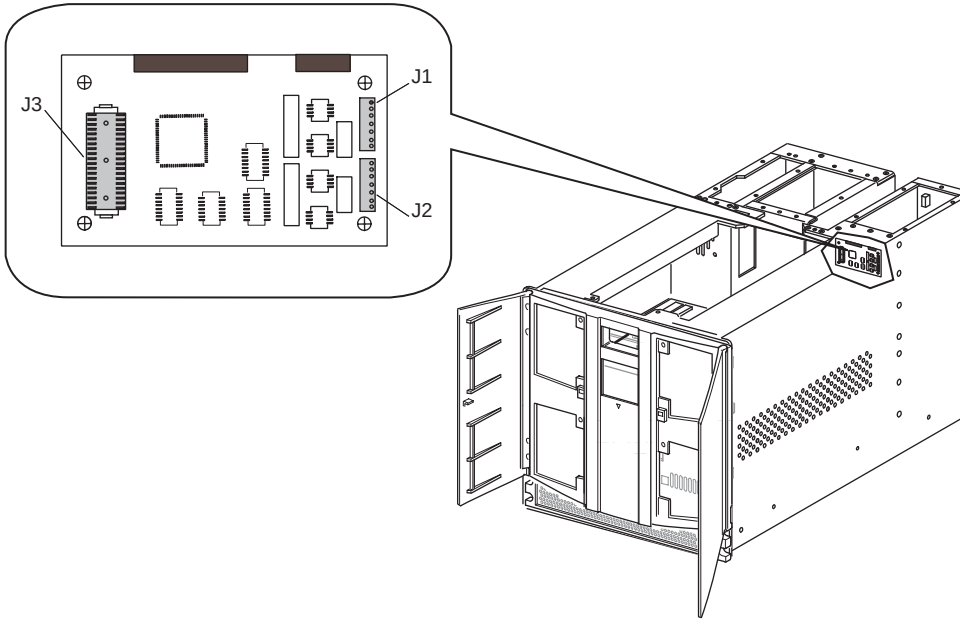


**Figure 99: Vertical controller board**

5. Remove the four mounting screws that secure the board to the library chassis.
6. Remove the vertical controller board from the library.

To replace the vertical controller board:

1. Place the vertical controller board in the library, and replace the four mounting screws.
2. Replace the cables at locations J1, J2, and J3.
3. Replace the top front cover.
4. Replace the upper right magazine, and then close the door.
5. Reconnect the power cords.
6. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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7. Restart the application software.

# Removing and Replacing the Rotating Track Flex Cable

The rotating track flex cable enables operation of the rotating track and opto sensor. There are several components that must be removed to install a replacement flex cable:

- Right rear cover
- Top front cover
- Lower left magazine
- Lower cooling fan
- Library front panel
- Magazine track
- Various cable connections and cable holders

To remove the rotating track flex cable:

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

1. Using the LCD touch display, open the left magazine door, and remove the upper and lower magazines. If the library is not operational, see "Manually Opening the Magazine Doors" on page 38.
2. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
3. Remove the top front cover and the right rear cover. See "Removing and Replacing the Library Covers" on page 45.
4. Remove the upper card cage access plate.

**Note:** This allows removal of the old flex cable and installation of the replacement.

5. Remove the lower card cage cooling fan from its mounting.

**Note:** Removal of the lower card cage cooling fan enables access to the rear mounting screws of the lower left magazine track.

a. Remove the two screws (outside of the unit to the right of the access plate) that secure the shuttle flex cable bracket. Slide the bracket down the flex cable to allow removal of the fan.

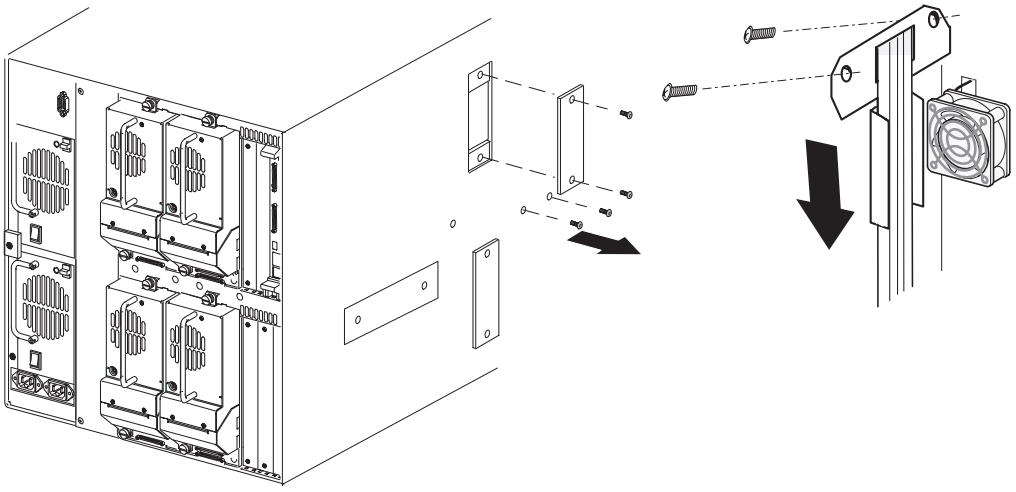

**Figure 100: Access plate flex cable bracket**

b. Remove the two screws that secure the finger guard and fan to the standoffs.

c. Remove the card cage fan from the mounting standoffs.

**Note:** The fan does not need to be removed from the library or disconnected from the card cage backplane. The fan can be temporarily secured out of the way by inserting a small tie wrap through one of the fan mounting holes and attaching it to the rear lead screw.

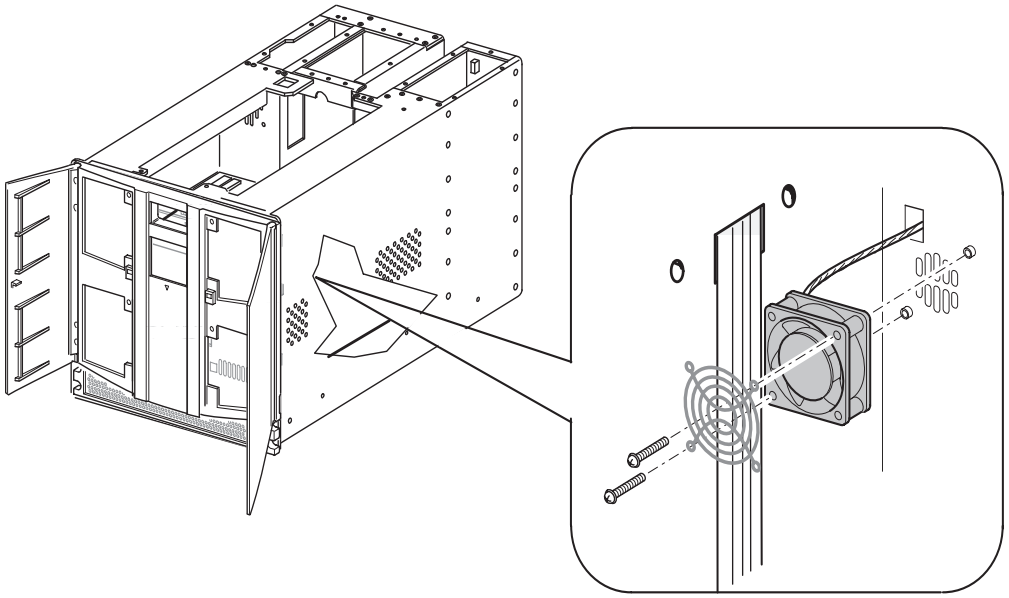

**Figure 101: Removing the fan from the standoffs**

6. Remove the library front panel. See "Removing and Replacing the Front Panel" on page 148.
7. Remove the lower left magazine track by removing the four screws (two front and two rear) that secure the lower left magazine track to the chassis, and remove it from the library.

---

**Note:** Removing the magazine track allows access to the flex cable and the inner wall of the library.

---

8. Remove the Teflon cable clamps that secure the rotating track flex cable to the library floor.
9. Disconnect the flex cable from J1 at the shuttle base.

10. Remove the 5.08-cm (2-inch) Kapton tape covering the flex cable.

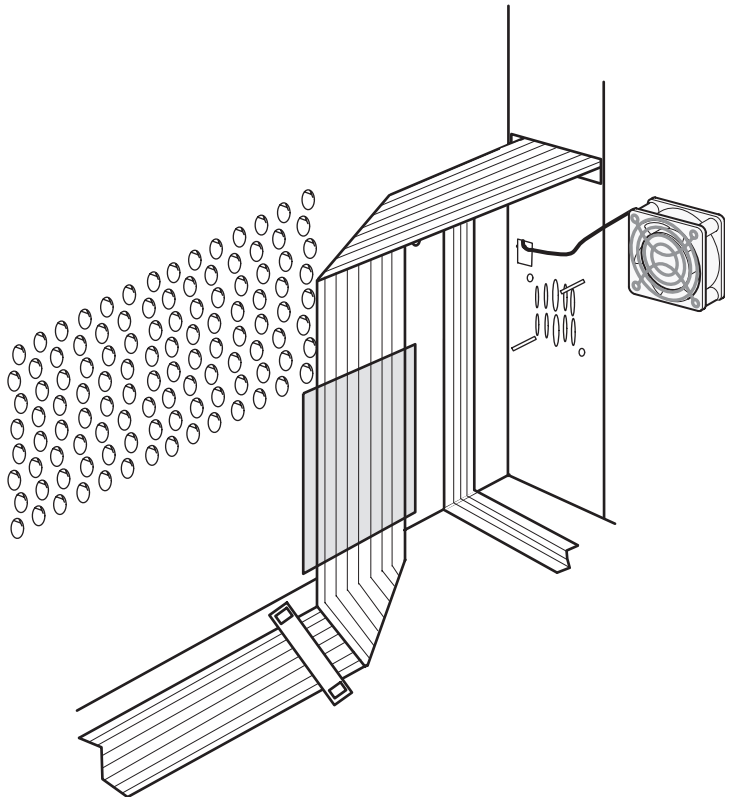

**Figure 102: Removing the flex cable**

11. Disconnect the flex cable from the J12 connector on the upper card cage/backplane board.

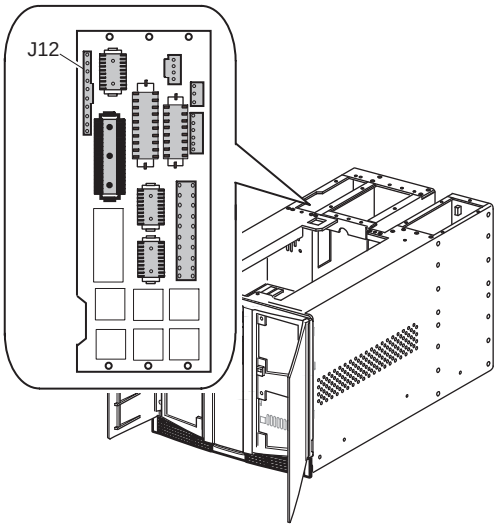


**Figure 103: Disconnecting flex cable at J12**

12. Thread the flex cable carefully down the backplane board (so as not to damage other connections) through the opening near the midpoint of the library chassis where the lower cooling fan is mounted, and remove it from the library.

To replace the rotating track flex cable:

1. Remove the tape used for shipping purposes from the folded areas of the replacement flex cable.
2. Thread the replacement cable through the opening near the midpoint of the library chassis where the lower card cage cooling fan is mounted.
3. Carefully work the flex cable up the backplane (by using the outside access plate), and reconnect it at the J12 connector on the upper card cage/backplane board.
4. Clean both the chassis wall and the area of the flex cable with isopropyl alcohol where the double-sided tape will be affixed to the flex cable and attached to the side of the library chassis.
5. Attach the double stick tape to the back side of the flex cable.

6. Align the angled portion of the flex cable to the fourth row of holes (as shown in Figure 102), and apply to the chassis wall.
7. Replace the 5.08-cm (2-inch) Kapton tape with the piece supplied (spare included) in the flex cable kit. Be sure to smooth the tape to ensure against air bubbles and lifted edges.

---

**Note:** The Kapton tape is designed to hold the flex cable against the library chassis and prevent snagging of the flex cable when the lower left magazine is inserted.

---

8. Connect the flex cable at the J1 connector on the shuttle base (see Figure 104).

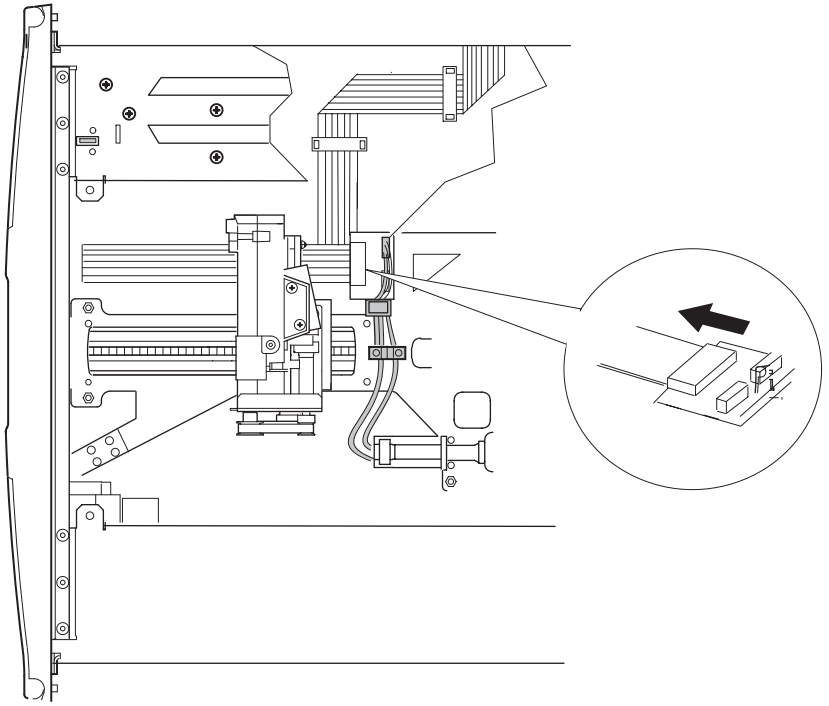

**Figure 104: Disconnecting flex cable at J1**

9. Replace the two teflon cable holders that secure the flex cable to the library floor.

10. Loosely install the four screws (two front and two rear) that secure the lower left magazine track to the chassis.
11. Tighten the magazine track screws at the front panel first and then the two screws at the rear of the track.
12. Replace the front panel.
13. Replace the lower card cage cooling fan:
    a. Slide the fan over the two mounting standoffs while guiding the excess cable through the cable access hole in the card cage backplane area.
    b. Install the two screws that secure the fan to the standoffs.
    c. Slide the bracket up the shuttle assembly flex cable, and align it to the mounting holes. Replace the two screws that secure the flex cable bracket. Ensure that the flex cable is within in the bracket.
14. Slide the lower left magazine onto the magazine track, ensuring that the magazine does not snag the Kapton tape.
15. Replace the top front cover and the right rear cover.
16. Reconnect the power cords.
17. Turn the library on, and run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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18. Restart the application software.

# Removing and Replacing the Shuttle Assembly Flex Cable

The flex cable enables operation of the shuttle assembly robotics. The following components must be removed to allow removal and installation of the flex cable:

- Outer cover (tabletop model)
- Top front cover
- Lower left magazine
- Various cable connections and cable holders

Before removing the flex cable, see the "Preparing for Service" that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the left magazine door, and remove the two magazines.
3. Park the shuttle assembly.
4. Remove the outside cover and the top front cover.

After completing step 1 through step 4 above:

1. Disconnect the connections of the flex cable from the J9 and J3 locations of the board on the robot shuttle.

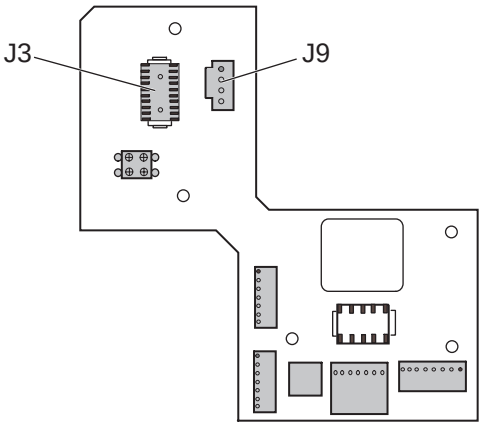


**Figure 105: Shuttle board**

2. Remove the spool attachment screw from the shuttle.
3. Remove the flex cable from the spool and re-install the spool on the robot shuttle, being careful not to move the spool clocker (metal piece under the spool) out of position.
4. Remove the flex cable from the flex cable carrier and guide.

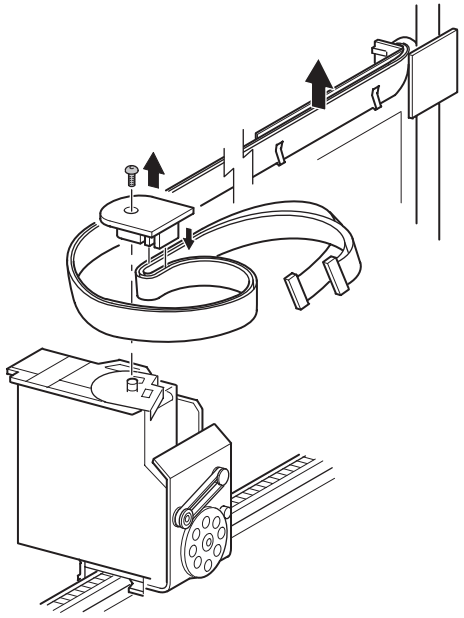

**Figure 106: Removing the flex cable, carrier, and clip**

5. Remove the upper card cage access plate to allow removal of the old flex cable and installation of the replacement.

6. Remove the two screws (outside of the unit to the right of the access plate) that secure the flex cable bracket.

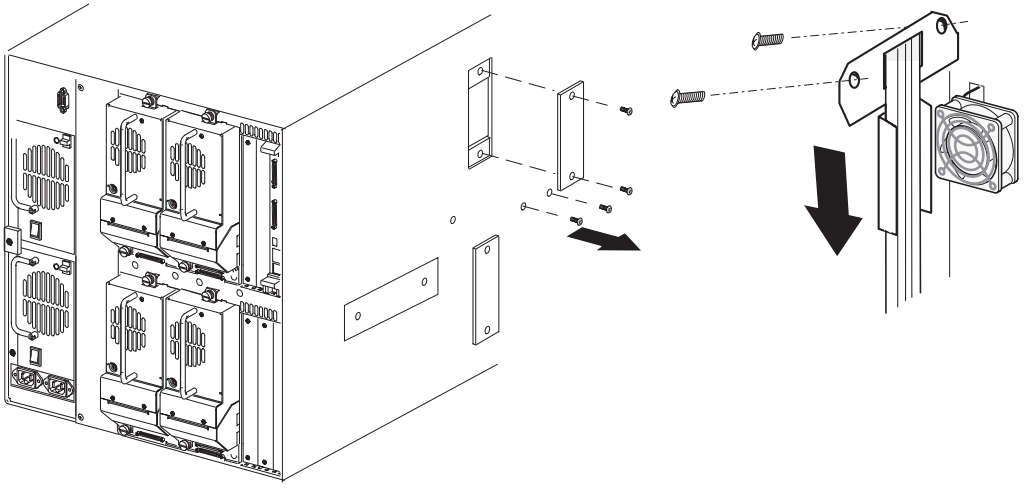

**Figure 107: Access plate flex cable bracket**

7. Disconnect the flex cable cables from the J6 and J5 connections at the upper card cage/backplane board.
8. Remove the spool attachment screw from the shuttle.
9. Thread the flex cable carefully down the backplane board (so as not to damage other connections) through the opening near the midpoint of the library chassis where the lower cooling fan is mounted, and remove it from the library.

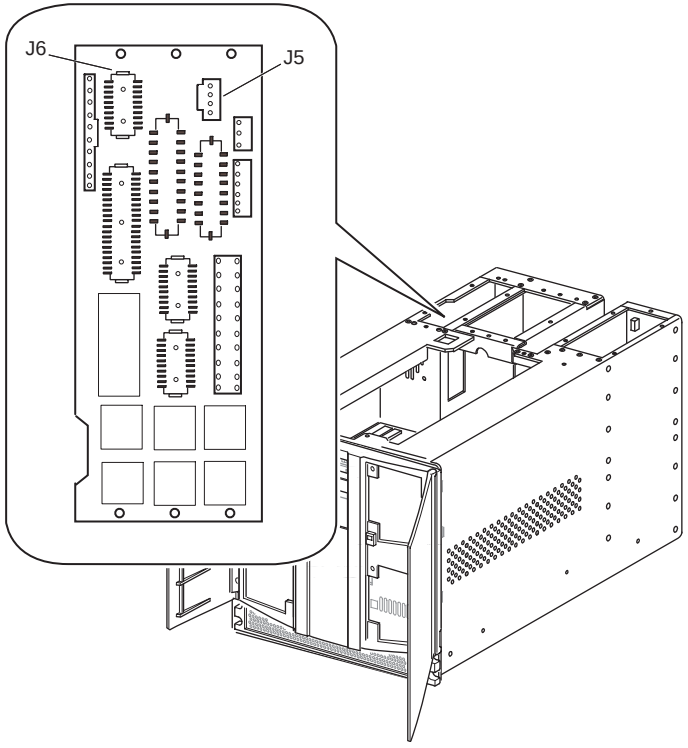


**Figure 108: Shuttle assembly flex cable connections**

To replace the shuttle assembly flex cable:

1. Remove the tape used for shipping purposes from the folded areas of the replacement flex cable/chain assembly .
2. Thread the end of the replacement flex cable/chain assembly, which has no polycarbonate stiffener, through the opening near the midpoint of the library chassis where the lower cooling fan is mounted.
3. Carefully work the flex cable/chain assembly up the backplane (using the side access plate), and reconnect it at the J5 and J6 connectors on the upper card cage/backplane board.
4. Slide the bracket up the shuttle assembly flex cable, and align to the mounting holes. Replace the two screws that secure the shuttle assembly flex cable bracket. Ensure that the shuttle assembly flex cable is within the bracket.

5. Attach the shuttle assembly flex cable to the shuttle assembly flex cable carrier and guide making sure the folds are in the correct position.
6. Remove the spool attachment screw from the shuttle.
7. Mount the shuttle assembly flex cable (sliding the stiffener into the spool as shown) to the spool, and re-install the spool to the robot shuttle, being careful not to move the spool clocker (metal piece under the spool) out of position.
8. Replace the connections of the shuttle assembly flex cable from the J9 and J3 locations of the board on the robot shuttle.
9. Slide the lower left magazine onto the magazine track.
10. Replace the top from cover.
11. Reconnect the power cords.
12. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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13. Restart the application software.

# Replacing Four-Drive (10U) Model Mechanical Parts

6

This chapter provides procedures from removing and replacing mechanical components for the following four-drive model MSL5000 and MSL6000 Series tape libraries:

- MSL5052
- MSL5060
- MSL6052
- MSL6060

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**Note:** See the Illustrated Parts Catalog on page 21 to verify spare part numbers when replacing mechanical parts for four-drive (10U) tape library models.

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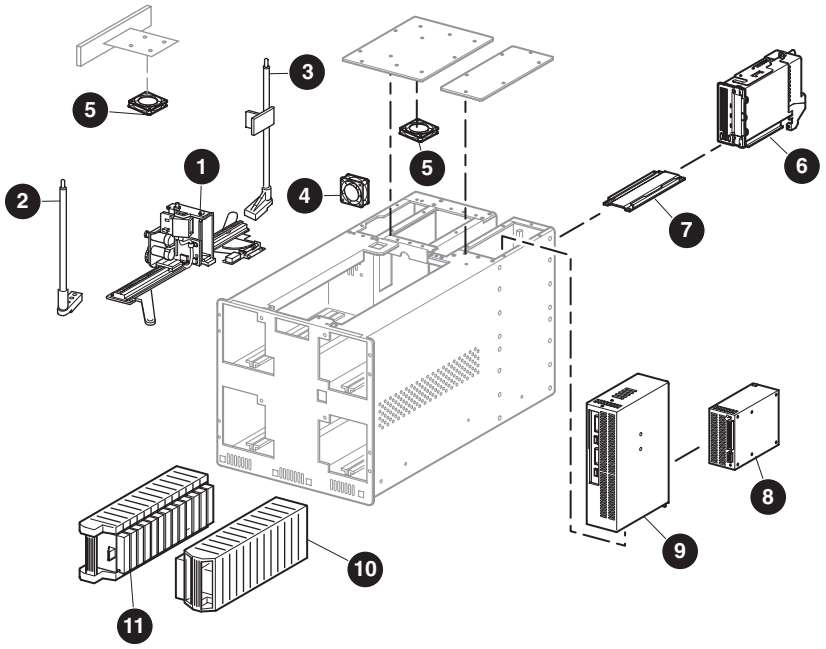
Procedures covered in this chapter include:


- Removing and Replacing a Tape Drive, page 223
- Removing and Replacing the Tape Drive Shields, page 228
- Removing and Replacing the Tape Drive Guides, page 233
- Removing and Replacing the Brackets and Power Supplies, page 235
- Removing and Replacing the Power Supply Receiver, page 240
- Removing and Replacing the Card Cage Fan, page 243
- Removing and Replacing the Backplane Fan, page 244
- Removing and Replacing the Lower Card Cage Fan Bracket Assembly, page 244
- Removing and Replacing the Shuttle Assembly Robotics, page 254
- Removing and Replacing the Bar Code Reader, page 254
- Removing and Replacing the Front Vertical Axis Assembly, page 264

- Removing and Replacing the Rear Vertical Axis Assembly, page 268




1. Robot with bar code reader
2. Front screw rail
3. Rear screw rail
4. 18CFM backplane fan (w/Y cable)
5. Card cage fan
6. Tape drive
7. Drive guide
8. Power supply
9. Power supply receiver with board
10. Right magazine
11. Left magazine

**Figure 109: Mechanical components for four-drive (10U) models**

# Removing and Replacing a Tape Drive

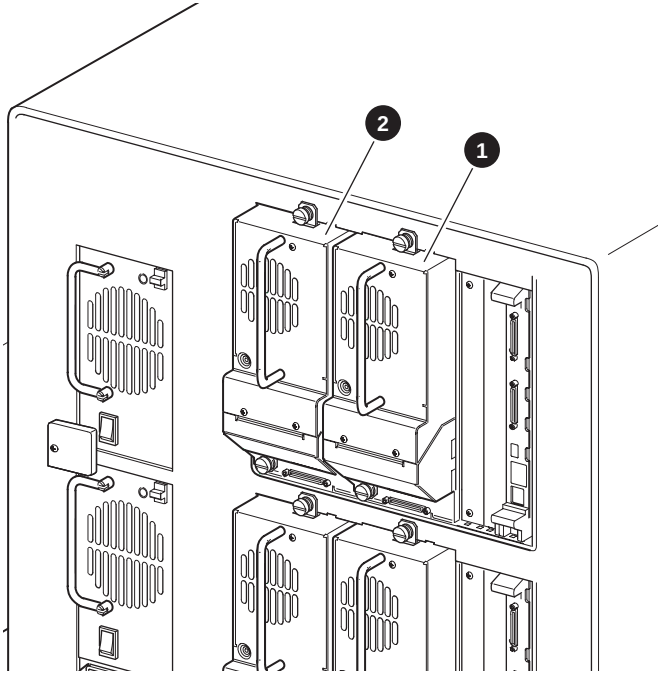
Tape drives are mounted at the rear of the library. The SCSI connectors for the tape drives are part of the drive module and do not offer hot-plug capability when the tape drive is removed.

**Caution:** This part is not hot-pluggable. Before you install the tape drive, you must take the library off line using the library LCD touch screen.

To remove a tape drive:

1. Unload any tape cartridge in the tape drive to be removed using application software or the LCD touch display.

**Note:** The following procedures are the same when removing and replacing SDLT600, LTO2 (new) and LTO3 tape drives even though illustrations are not up-to-date.




1. Drive 0
2. Drive 1

**Figure 110: Drive shoe assembly with tape cartridge**

2. Using the LCD touch display, deactivate the tape drive to be removed by selecting **Menu** > **Maintenance** > **Replace Drive** > **Deactivate Drive *n***. The screen changes to indicate that Drive *n* can be removed.
3. Make sure that the LED on the tape drive to removed is off.
4. Loosen the two captive thumbscrews at the top center and lower left of the drive (see Figure 111).

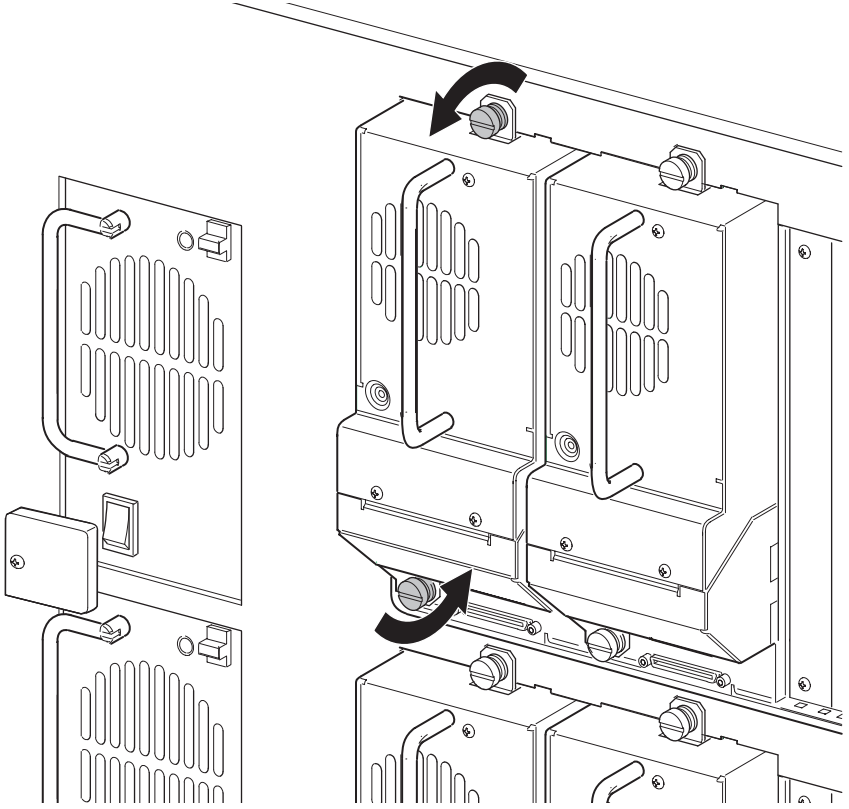


**Figure 111: Loosening captive thumbscrews**

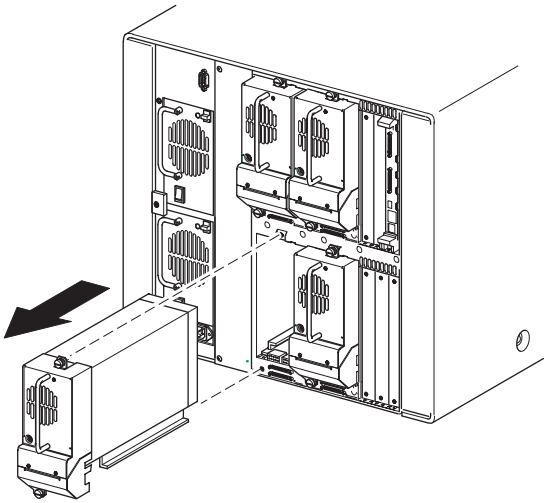


**Figure 112: Removing a tape drive**

5. Pull straight back on the tape drive handle to remove it from the library.

**Note:** Some effort is required to overcome the initial resistance of unplugging the drive shoe assembly from the receiver.

To replace a tape drive:

**Note:** If you are upgrading to a new drive technology, use *L&TT* to upgrade the library firmware before installing the new 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 contacts.
2. Slowly insert the new tape drive into the mounting bay, and align the connectors on the library.

**Caution:** Push on the tape drive handle and the bottom portion of the tape drive until it is seated. Damage to the connector pins and drive communication errors may occur if this procedure is not followed.

3. Fully support the drive shoe assembly while starting it into the receiver being careful not to damage the tape drive load handle.
4. Push the drive shoe assembly slowly into the receiver until the drive shoe assembly seats itself against the back of the library.
5. Tighten the two captive thumbscrews.
6. If adding an additional drive, configure the library for the new tape drive. Refer to the *HP StorageWorks MSL6000 Series Tape Libraries User Guide*.

**Note:** If you are adding an additional tape drive to your library, or if you are upgrading an existing drive, be sure to use supported cabling configurations. See the *HP StorageWorks MSL6000 Series Tape Libraries User Guide*.

**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.

# Removing and Replacing the Tape Drive Shields

The tape drive shields are installed between the drive 0 and drive 1 and drive 2 and drive 3 shoe assemblies.

**Note:** The tape drive must be removed prior to removing the tape drive shield.

## Upper Tape Drive Shield

To remove the upper tape drive shield:

1. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
2. If necessary, exit the application software, and halt the operating system.
3. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
4. Remove the right rear cover. See "Removing and Replacing the Library Covers" on page 45.
5. Remove the applicable shoe assemblies. See "Removing and Replacing a Tape Drive" on page 223.
6. Remove one of the tape drive guides. See "Removing and Replacing the Tape Drive Guides" on page 233.
7. Remove the two screws that secure the tape drive shield to the library chassis.
8. Gently push the bottom of the shield to the right.

**Note:** This allows the top to clear the chassis lip.

9. Pull the tape drive shield out and away from the tape drive bay (see Figure 113).

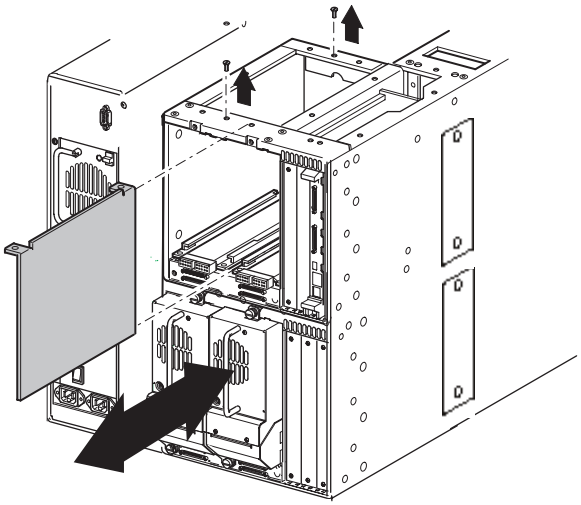


**Figure 113: Removing the upper tape drive shield**

To replace the upper tape drive shield:

1. Insert the tape drive shield into the tape drive bay.
2. Secure the tape drive shield to the library chassis using the two previously removed screws.
3. Replace the previously removed tape drive guides. See “Removing and Replacing the Tape Drive Guides” on page 233.
4. Replace the drive shoe assemblies. See “Removing and Replacing a Tape Drive” on page 223.
5. Replace the right rear cover. See “Removing and Replacing the Library Covers” on page 45.
6. Reconnect the power cords. Turn the library on, and then restart the application software.

## Lower Tape Drive Shield

To remove the lower tape drive shield:

1. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
2. If necessary, exit the application software, and halt the operating system.
3. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
4. Remove the top front cover. See “Removing and Replacing the Library Covers” on page 45.
5. Remove the applicable shoe assemblies. See “Removing and Replacing a Tape Drive” on page 223.
6. Remove both of the tape drive guides. See “Removing and Replacing the Tape Drive Guides” on page 233.
7. Remove the two screws that secure the tape drive shield to the library chassis.

8. Inside the chassis between the upper and lower drive bays, remove the shield inner mounting screw. (See Figure 114.)

**Note:** On some units it may be necessary to remove the two screws that secure the power cable wire harness cover plate to permit access to the lower tape drive shield inner mounting screw.

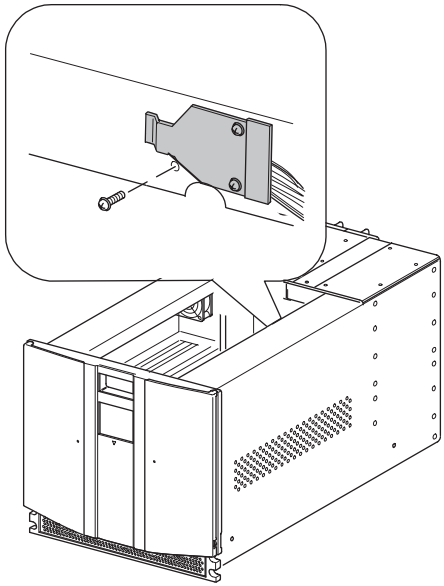


**Figure 114: Removing the shield inner mounting screw**

9. Pull the tape drive shield out and away from the tape drive bay (see Figure 115).

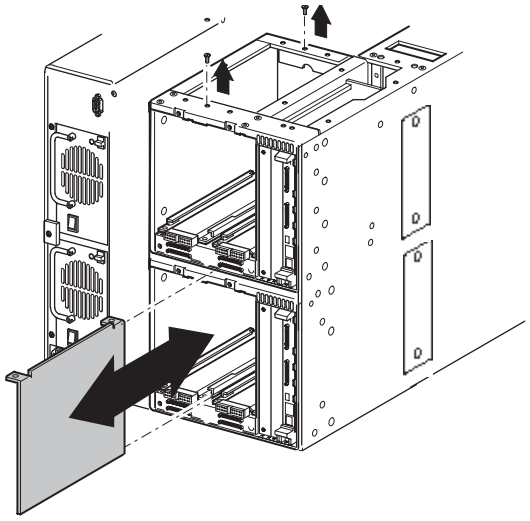


**Figure 115: Removing the lower tape drive shield**

To replace the tape drive shield:

1. Insert the tape drive shield into the tape drive bay.
2. Secure the tape drive shield to the library chassis using the two previously removed screws.

---

**Note:** If the lower tape drive guide was removed, replace the power cable wire harness cover plate located inside the chassis between the drive bays.

---

3. Replace the previously removed tape drive guides. See "Removing and Replacing the Tape Drive Guides" on page 233.
4. Replace the drive shoe assemblies. See "Removing and Replacing a Tape Drive" on page 223.
5. Reconnect the power cords. Turn the library on, and then restart the application software.

# Removing and Replacing the Tape Drive Guides

A tape drive guide is installed at the bottom of each tape drive bay. This procedure can be used to remove and replace any tape drive guide.

**Note:** The appropriate drive shoe assembly must be removed prior to removing a tape drive guide.

To remove a tape drive guide:

1. If the library is operational, remove any tape cartridges in the tape drives using the LCD touch display or application software.
2. If necessary, exit the application software, and halt the operating system.
3. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
4. Remove the appropriate drive shoe assembly. See "Removing and Replacing a Tape Drive" on page 223.
5. Remove the right rear cover. See "Removing and Replacing the Library Covers" on page 45.

6. Remove the four screws that secure the tape drive guide in the library chassis (see Figure 116).

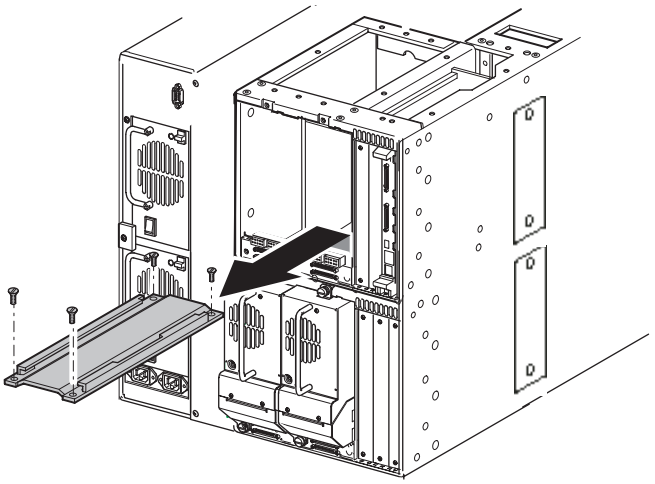


**Figure 116: Removing a tape drive guide**

7. Remove the tape drive guide from the library.

To replace a tape drive guide:

1. Position the tape drive guide in the tape drive bay with the two straight-sided holes facing the rear of the library (see Figure 116).
2. Replace the four flat-head screws that secure the tape drive guide in the library chassis (see Figure 116).
3. Replace the right rear cover. See “Removing and Replacing the Library Covers” on page 45.
4. Replace the appropriate drive shoe assembly. See “Removing and Replacing a Tape Drive” on page 223.
5. Reconnect the power cords. Turn the library on, and then restart the application software.

# Removing and Replacing the Brackets and Power Supplies

Four-drive models of the MSL5000 and MSL6000 Series tape libraries are equipped with dual-redundant power supplies. The power supplies are installed stacked on top of each other on the left side at the rear of the library in a quick-change receiver. The dual-redundant power supplies and receiver are designed so that if one power supply fails the other assumes the flow of power immediately.

**WARNING:** Hazardous voltage is present in the cavity if the power cord is not removed.

**Note:** Power supplies are not hot pluggable. It is necessary to power down the library to replace them.

To remove a power supply:

1. See the "Preparing for Service" chapter that starts on page 31 to review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Exit the application software.
3. Using the LCD touch display, turn the library off. Turn off the master power switch at the rear of the library on each power supply, and then remove AC power cords.

**Note:** For four-drive models, the left plug connects to the bottom power supply, and the right plug connects to the top power supply.

4. Remove the mounting screws securing the power supply locking bracket (see Figure 117).

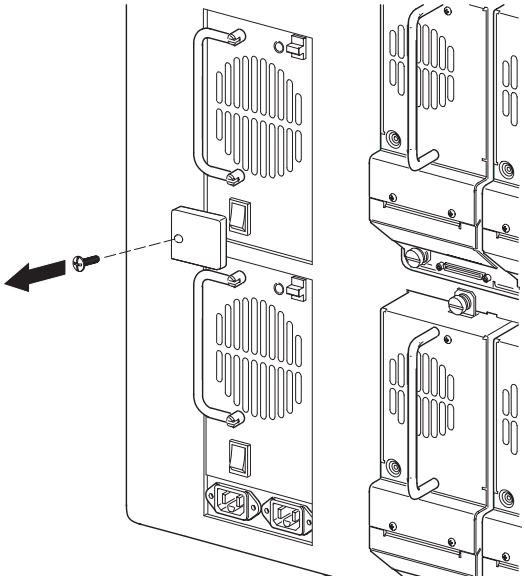


**Figure 117: Removing mounting screws**

5. Push down on the latch, and then use the handle to pull the power supply out of the receiver (see Figure 118).

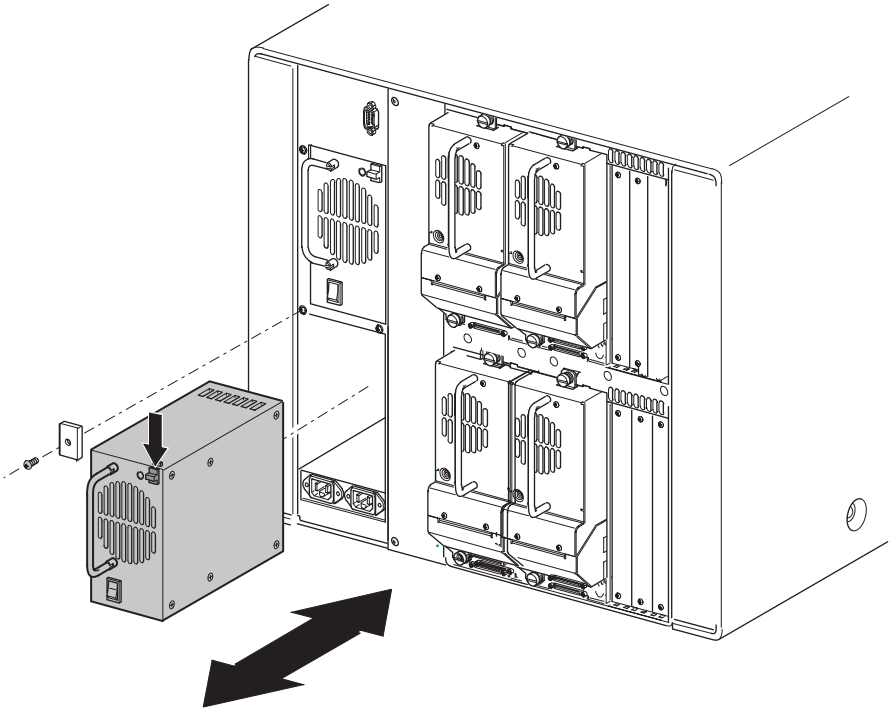


**Figure 118: Removing and replacing the power supply**

To replace a bracket and a power supply:

1. Position the power supply at the rear of the library with the latch at the top and the power switch at the bottom. (See Figure 118).

**Note:** Ensure that the replacement power supply power switch is in the off position.

2. Push the power supply into the power supply receiver until the latch engages.

3. Secure the power supply locking bracket using the mounting screws (see Figure 119).

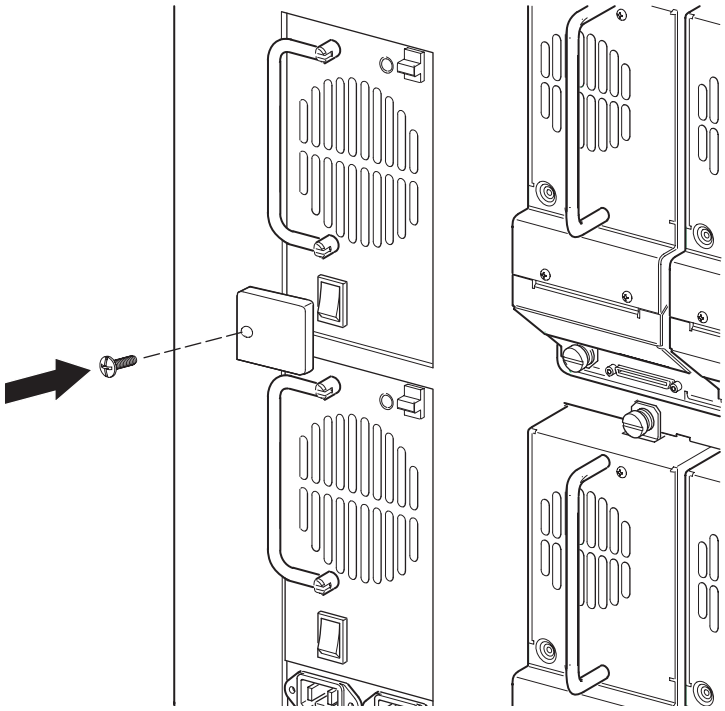


**Figure 119: Securing power supply locking bracket**

4. Reconnect the power cords, and turn on the master power switch for both power supplies. If necessary, turn the library on by touching LCD touch display.

5. Run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *HP StorageWorks Library and Tape Tools (L&TT)* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is a diagnostic tool that is designed to aid in the installation and maintenance of HP tape and magneto-optical storage products. *L&TT* includes several features designed for use by both HP storage customers and trained service personnel. The key features include:

- Diagnostic tools for tape and magneto-optical devices designed for simple troubleshooting
- Multiple options for retrieving and updating both the latest firmware and the most current version of *L&TT*

6. *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.

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7. If the host operating system requires a restart to discover SCSI devices, then reboot the host.
8. Restart the application software.

# Removing and Replacing the Power Supply Receiver

Power supply receivers are installed on the left side at the rear of the library and house power supplies and the power cord receptacles.

Before removing a power supply receiver, see Chapter 2, "Preparing for Service" that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the magazine doors, and remove the two right magazines.
3. Remove the left rear cover and the top front cover.

After completing step 1 through step 3 above:

1. Remove the bracket and power supply. See "Removing and Replacing the Brackets and Power Supplies" on page 235.
2. Remove drive shoe assemblies 1 and 3. See "Removing and Replacing a Tape Drive" on page 223.

**Note:** This allows access to the PTM/blank cover mounting screws. On older models, it may be necessary to remove the PTM cover to access the receiver screws.

3. Remove the five screws (three outer and two inner) connecting the PTM blank to the chassis.

**Note:** For multiple library systems with a PTM installed, the entire PTM must be removed. Refer to the *HP StorageWorks Pass-Through Mechanism Reference Guide*.

4. Working through the opening behind the right magazine track, press the release latch to remove the two 22-pin main power harness connectors.

**Note:** Remove the connector closest to the drive bays first.

5. Remove the four 4-pin drive power connectors.

**Note:** There are five pin receptacles. The bottom four receptacles are used.

6. At the back of the library, remove the five mounting screws while supporting the receiver.
7. Remove the receiver through the top of the library being careful to move the wires from the PTM interface connector out of the way.

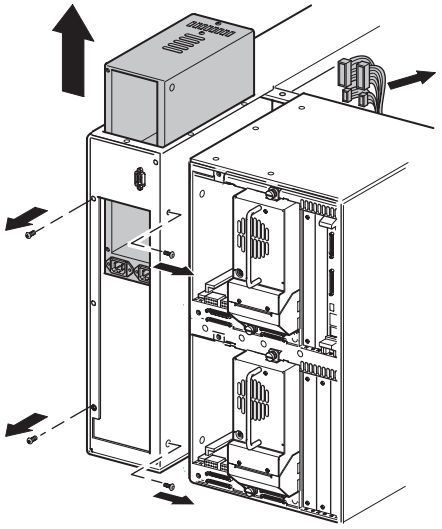

**Figure 120: Removing the power supply receiver**

To replace a power supply receiver:

1. Insert the power supply receiver into the opening in the top of the library with the power cord receptacle at the bottom facing the rear of the library being careful to keep the cables from the PTM interface connector out of the way.

**Note:** Be sure the cables from the PTM interface connector are on top of the power supply receiver after it has been placed into the library chassis.

2. At the rear of the library, install the five mounting screws on the rear of the power supply receiver bay (see Figure 120).
3. At the side of the library, install the two mounting screws (see Figure 120).
4. Working through the opening behind the right magazine track, replace the four 4-pin drive power connectors and the two 22-pin main power harness connectors (see Figure 120).
5. Replace the top front cover and left rear cover.
6. Replace the bracket and power supply.
7. Reconnect the power cords.
8. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

9. Restart the application software.

# Removing and Replacing the Card Cage Fan

To remove the card cage fan:

1. Remove the right rear cover. See “Removing and Replacing the Library Covers” on page 45.
2. Release the fan cable from the two cable ties.
3. Remove the two screws securing the fan to the cover, and lift the fan off and away from the cover.

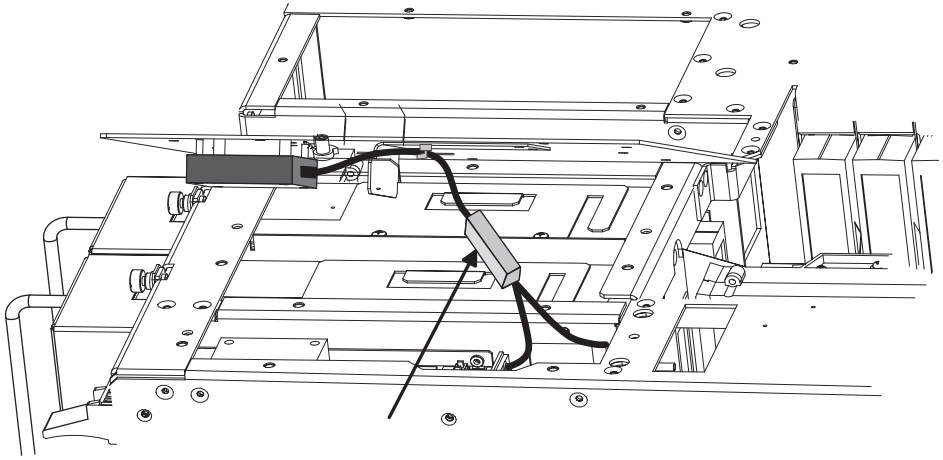

**Figure 121: Top cover card cage fan**

4. Replace the card cage fan by reversing these procedures.

# Removing and Replacing the Backplane Fan

The backplane fans are mounted on two long standoffs inside the library directly behind the left magazines.

Before removing the backplane fans, see Chapter 2, "Preparing for Service," that starts on page 31 to:

1. Review all warnings.

**WARNING:** Before removing or replacing this component, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

2. Open the magazine doors, and remove the two left magazines.
3. Remove the right rear cover and the top front cover.
4. Proceed to "Upper Backplane Fan Removal and Replacement" below or "Lower Backplane Fan Removal and Replacement" on page 248.

# Upper Backplane Fan Removal and Replacement

**Note:** For easier access to the J11 cable connection, remove the drive 0 shoe assembly. See "Removing and Replacing a Tape Drive" on page 223.

1. Remove the screw from the card cage/backplane connector access plate, and lift it out of the library.

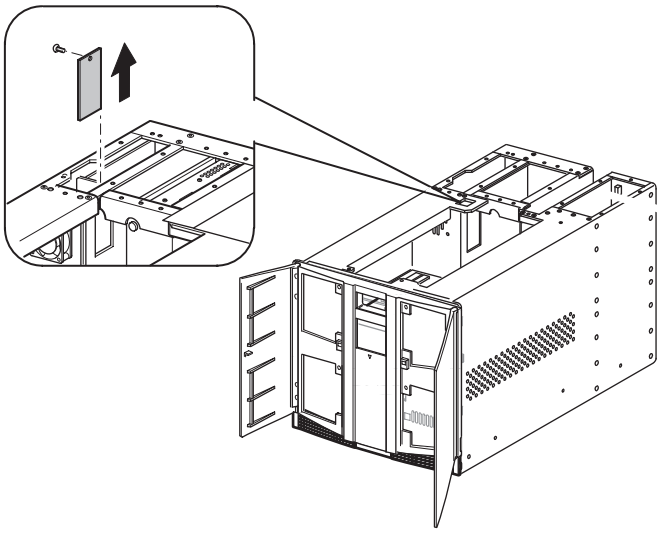

**Figure 122: Removing the card cage/backplane connector access plate**

2. Disconnect the cable at J11 on the backplane board (see Figure 123).

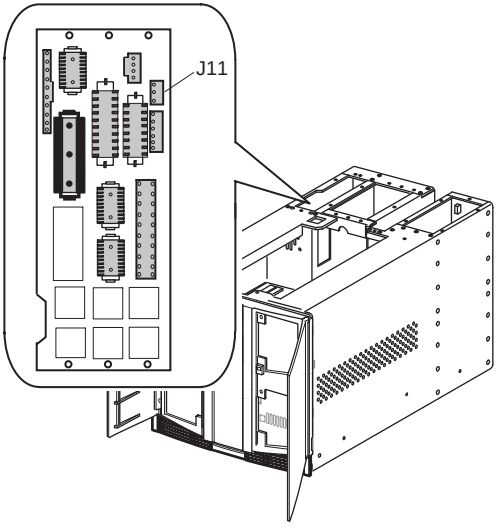


**Figure 123: Card cage/backplane assembly**

3. Remove the two screws and washers that secure the finger guard and fan to the standoffs.

4. Pull the fan straight off of the standoffs while guiding the fan cable out through the cable access hole (see Figure 124).

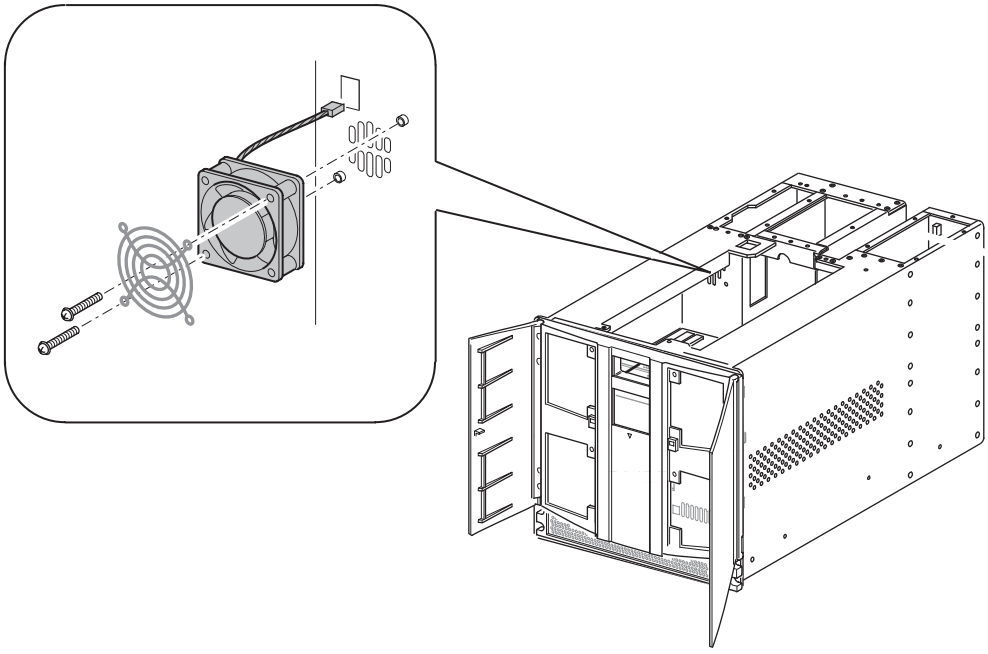

**Figure 124: Removing the upper backplane fan**

5. Remove the backplane fan from the library.

To replace the upper backplane fan:

1. Position the backplane fan inside the upper left magazine area with the cable at the top left corner.
2. Place the fan over the two mounting standoffs.
3. Guide the fan cable through the cable access hole to the card cage backplane.
4. Install the two screws and washers that secure the backplane fan to the standoffs.
5. Replace the cable at connector J11 on the card cage/backplane assembly board.
6. If removed, replace the card cage/backplane assembly connector access plate.
7. If removed, replace the drive 0 shoe assembly.

8. Replace the top front cover and the right rear cover.
9. Reconnect the power cords.
10. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

---

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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11. Restart the application software.

## Lower Backplane Fan Removal and Replacement

1. Remove the lower outside access plate (two screws) located at the lower left of the right side of the chassis. This panel accesses the backplane expansion board.
2. Disconnect the cable at J11 on the backplane expansion board.

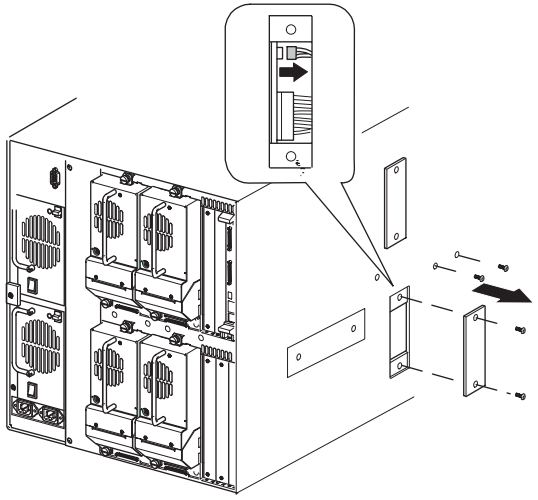

**Figure 125: Backplane expansion board**

3. Remove the two screws (outside of the unit to the right of the access plate) that secure the flex cable bracket.

4. From inside the chassis slide the bracket down the flex cable to allow removal of the fan (see Figure 126).
5. Remove the two screws and washers that secure the finger guard and fan to the standoffs.

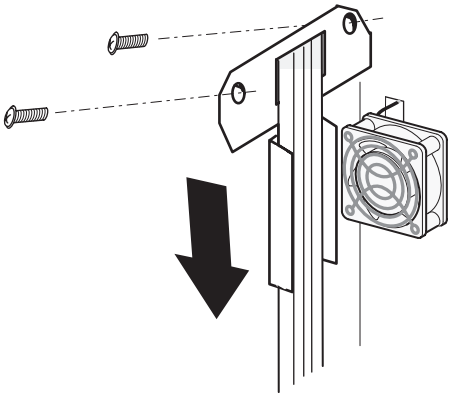

**Figure 126: Removing the flex cable bracket**

6. Disconnect the fan cable from the Y-connector.
7. Remove the backplane fan from the library.

To replace the lower backplane fan:

1. Position the lower backplane fan inside the lower-left magazine area with the cable at the top left corner.
2. Install the lower backplane fan over the two mounting standoffs while guiding the cable through the cable access hole into the lower card cage/backplane assembly area.
3. Install the two screws and washers that secure the backplane fan to the standoffs.
4. Slide the bracket up the flex cable, and align to the mounting holes. Replace the two screws that secure the flex cable bracket. Ensure that the flex cable is within the bracket.
5. Reconnect the cable at connector J11 on the backplane expansion board.
6. Replace the card cage/backplane connector backplane access plate.
7. If removed, replace the drive 0 shoe assembly.
8. Replace the top front cover and the right rear cover.

9. Reconnect the power cords.
10. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

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**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

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11. Restart the application software.

# Removing and Replacing the Lower Card Cage Fan Bracket Assembly

A cooling fan is attached to a bracket that is inserted within the lower card cage on newer library models. The downward airflow enhances cooling of optional expansion cards (when installed). The lower card cage cooling fan and the fan on the bracket assembly (optional) are connected through a splitter, with power coming through the J11 connector on the backplane expansion board.

To remove the lower card cage fan bracket assembly:

1. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
2. Facing the rear of the library, remove the two screws from the fan bracket assembly located at the lower left of the right side of the chassis (see Figure 127).

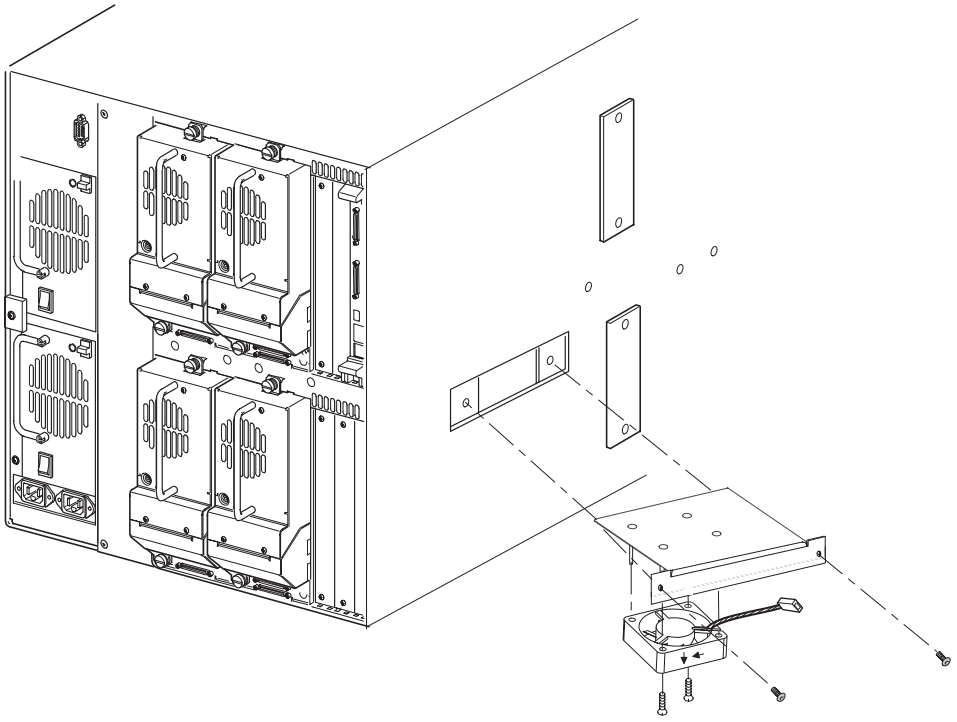

**Figure 127: Removing the lower card cage fan bracket**

3. Carefully slide the fan bracket assembly partially out of the chassis.
4. Disconnect the cable for the cooling fan at the splitter. (see Figure 127).
5. Remove the lower card cage fan bracket assembly completely from the library.
6. Remove the two screws that secure the fan to the bracket assembly.

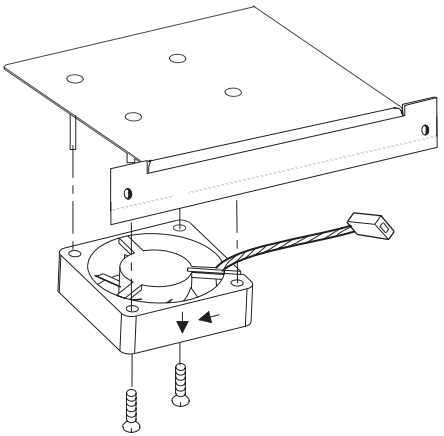

**Figure 128: Lower card cage bracket assembly**

7. Slide the fan off of the bracket assembly.
8. Retain the fan bracket for installation of the replacement fan.

To replace the lower card cage fan bracket assembly:

1. Slide the fan onto the bracket assembly, ensuring that fan airflow is directed downward into the expansion card cage area (see Figure 127).
2. Install the two screws that secure the replacement fan to the bracket assembly.
3. Position the fan bracket assembly slightly into the chassis access, and connect the power cable to the fan cable.
4. Slide the fan bracket assembly the rest of the way into the chassis, and install the two screws to secure it to the chassis.
5. Reconnect the power cords.
6. Turn the library on, and then run the appropriate diagnostic software to verify that all components operate properly.

**Note:** You may use the *L&TT* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

7. Restart the application software.

# Removing and Replacing the Shuttle Assembly Robotics

The shuttle assembly robot is mounted on a track at the bottom of the library chassis. The robot track sensor must be removed from its mounting standoffs to remove the shuttle assembly. The bar code reader must also be removed and installed on the replacement robotic assembly.

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**Note:** Before completing removal and replacement of the shuttle assembly robotics, you must perform the vertical axis alignment procedures in Appendix A, "Vertical Axis Alignment," that starts on page 361.

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To remove the shuttle assembly:

1. Using the LCD touch display, open both magazine doors, and remove the upper and lower magazines. If the library is not operational, see "Manually Opening the Magazine Doors" on page 38.
2. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cord.
3. Remove the top front cover. See "Removing and Replacing the Library Covers" on page 45.

4. Press down on the release latch to remove the connections of the flex cable from J9 and J3 locations of the board on the robot shuttle (see Figure 129).

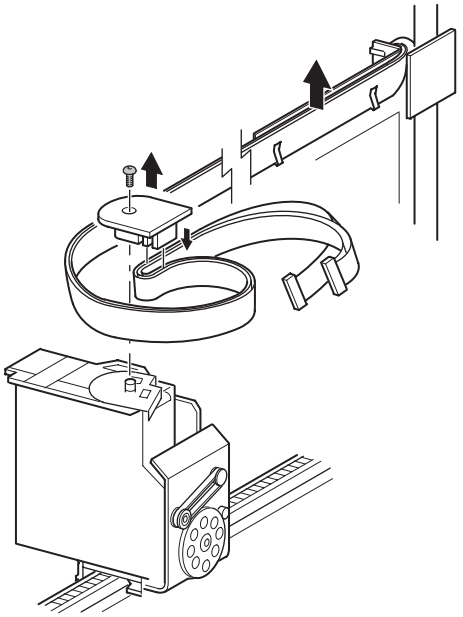

**Figure 129: Removing the spool/flex cable from carrier and guide**

5. Remove the spool attachment screw from the shuttle.
6. Remove the flex cable from the spool, and reinstall spool to robot shuttle, being careful not to move the spool clocker (metal piece under the spool) out of position.
7. Remove the flex cable from the flex cable carrier and guide.
8. Store the flex cable in the left magazine bay with it hanging through the left magazine door.

9. Manually rotate the robot track by turning the motor/track coupler approximately 90 degrees to allow for removal of the robot shuttle (see Figure 130).

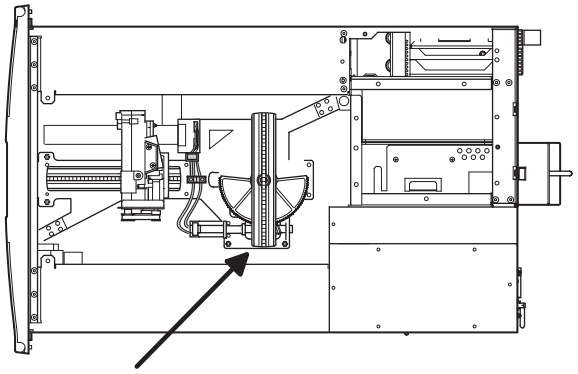

**Figure 130: Rotating the track**

10. Depress the shuttle brake lever on the bottom of the shuttle, and remove the robot shuttle from the track.

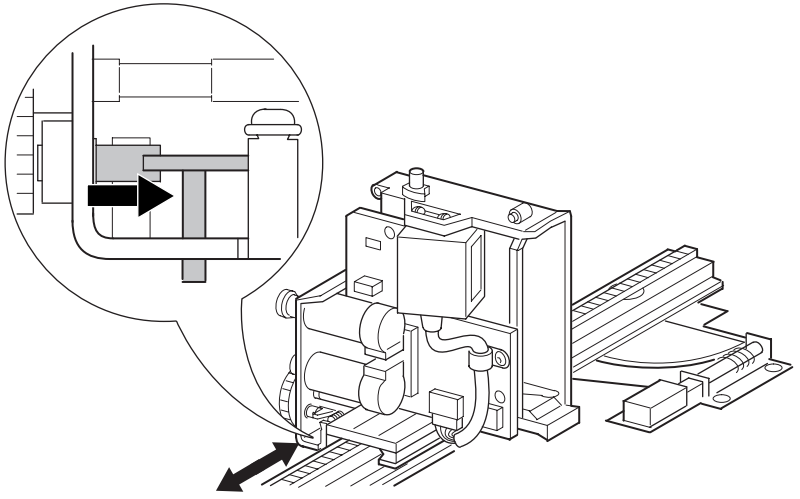

**Figure 131: Shuttle brake release**

11. Remove the rotating track motor power cable from the robotics board.

12. Remove the shuttle assembly track sensor. See “Removing and Replacing the Shuttle Assembly” on page 123.
13. Remove the four screws and washers that secure the rear vertical axis screw rail from the robotics base (see Figure 132).
14. Remove and retain the screw rail clamp.
15. Manually rotate the pulley at the top of the rear vertical axis screw rail clockwise, raise the shuttle base approximately 1.27 cm (0.5 inches), and then gently press the base plate down next to the screw rail nut to release it from the alignment pins.
16. Swing the vertical axis screw rail foot counter-clockwise to the rear of the library. The alignment pins on the robotics base should now be visible.
17. Remove the four screws that secure the front vertical axis screw rail to the robotics base (see Figure 132).
18. Manually rotate the flex coupling at the top of the front vertical axis screw rail at the Z-axis motor coupler clockwise, and then raise the foot of the screw rail to relieve pressure on the robotics base.
19. Swing the front vertical axis screw rail foot clockwise to the front of the library. There are no alignment pins.

20. Carefully lift the robotics base from the chassis (see Figure 132).

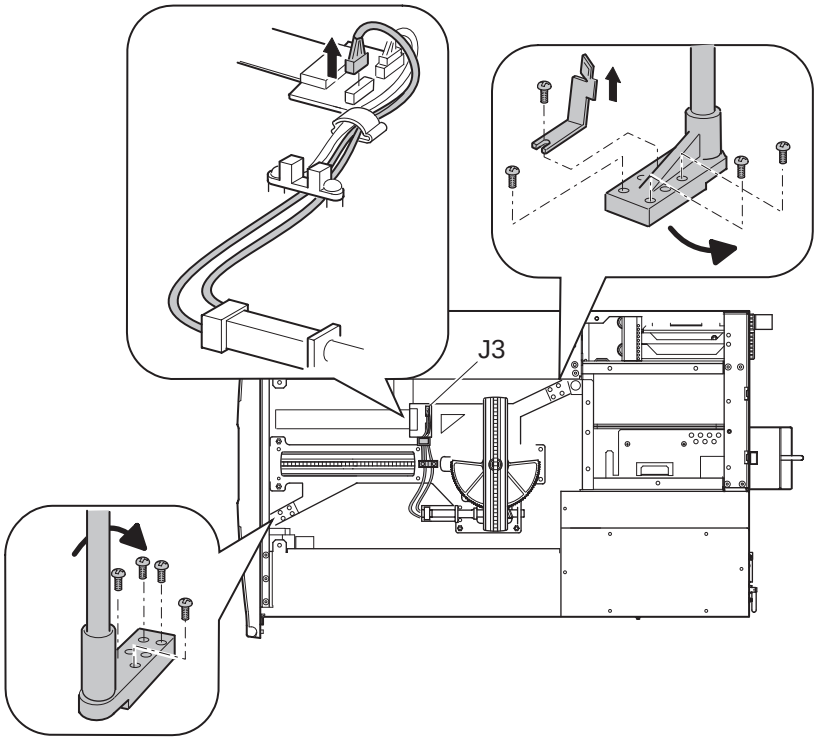


**Figure 132: Removing the robotics base**

21. If present, remove the bar code reader from the robotics base. See "Removing and Replacing the Bar Code Reader" on page 261.

To replace the shuttle assembly:

1. Carefully place the robotics base into the chassis (see Figure 132).
2. Swing the front vertical axis screw rail foot counter-clockwise, and align the installation holes with the robot track base (see Figure 132).
3. Manually rotate the front vertical screw rail counter-clockwise at the Z-axis motor coupler until a slight pressure is felt on the robotics base.
4. Replace (finger tighten and loosen one turn) the four screws that secure the front vertical axis screw rail to the robotics base (see Figure 132).

**Note:** These screws must remain loose until the Vertical Axis Alignment procedure in Appendix A (which starts on page 361) is performed.

5. Swing the rear vertical axis screw rail foot clockwise, and align it over the robot track base (see Figure 132).
6. Manually rotate the rear vertical screw rail clockwise to align the pins on the robotics base.
7. Replace (finger tighten and loosen one turn) the four screws that secure the rear vertical axis screw rail to the robotics base (see Figure 132).
8. Replace the flex cable carrier clamp (see Figure 132).
9. Connect the rotating track motor power cable to the robotics board (see Figure 132).
10. Depress the shuttle brake lever on the bottom of the shuttle, place the shuttle on the edge of the track, and slide it towards the front of the unit.
11. Manually rotate the robot track by turning the motor/track coupler approximately 90 degrees, and align with the stationary track.
12. Replace the shuttle assembly track sensor. See "Removing and Replacing the Shuttle Assembly" on page 123.
13. Attach the flex cable to the flex cable clip guide and carrier.

**Caution:** Make sure that the flex cable is not twisted.

14. Remove the spool from the shuttle assembly, and then attach the flex cable. Ensure that the strain relief is in the proper position.

**Note:** When attaching the flex cable clip to the side of the flex cable guide, slide the top portion in first and then the bottom portion.

15. Connect the flex cable connections J3 and J9 on the shuttle assembly board.
16. Perform a friction test as described in Appendix A, "Vertical Axis Alignment," that starts on page 361.

If necessary, replace the bar code reader following the instructions in “Removing and Replacing the Bar Code Reader” on page 261.

17. Replace the top front cover. See “Removing and Replacing the Library Covers” on page 45.
18. Replace the upper-left and lower magazines, and close the doors.
19. Reconnect the power cords. Turn the library on, and then restart the application software.

# Removing and Replacing the Bar Code Reader

The bar code reader is mounted on the shuttle assembly. No other FRUs need to be removed to remove the bar code reader.

To remove the bar code reader:

1. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
2. Remove the top front cover. See "Removing and Replacing the Library Covers" on page 45.
3. Depending on the library model:
   - Original: Remove the cable restraint screw at the lower front of the bar code reader. The cable clamp secures the bar code reader cable to the shuttle assembly board.
   - LTO-compatible: Remove the cable tie at the side of the bar code reader that secures the cable as shown in the graphic to the right.
4. Remove the cable on the shuttle assembly board:
   - Original: J5 (see Figure 133).
   - LTO-compatible: J10 (See Figure 134).

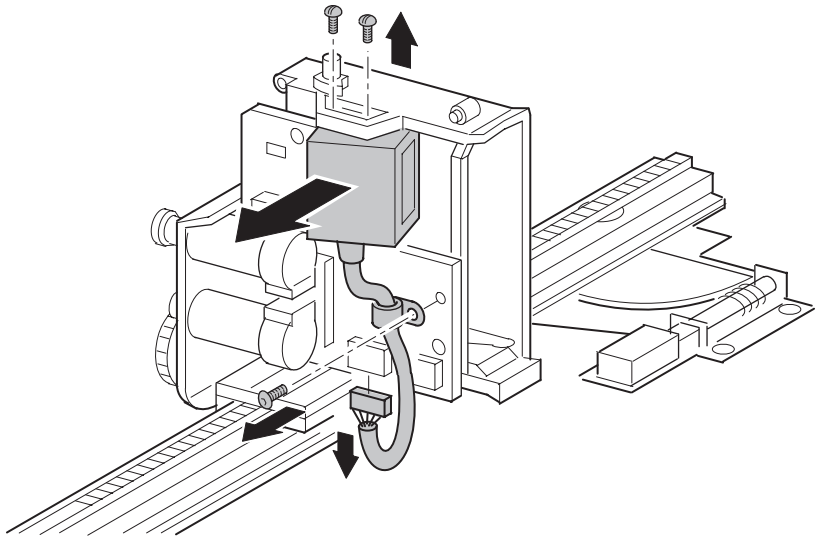

**Figure 133: Removing the bar code reader**

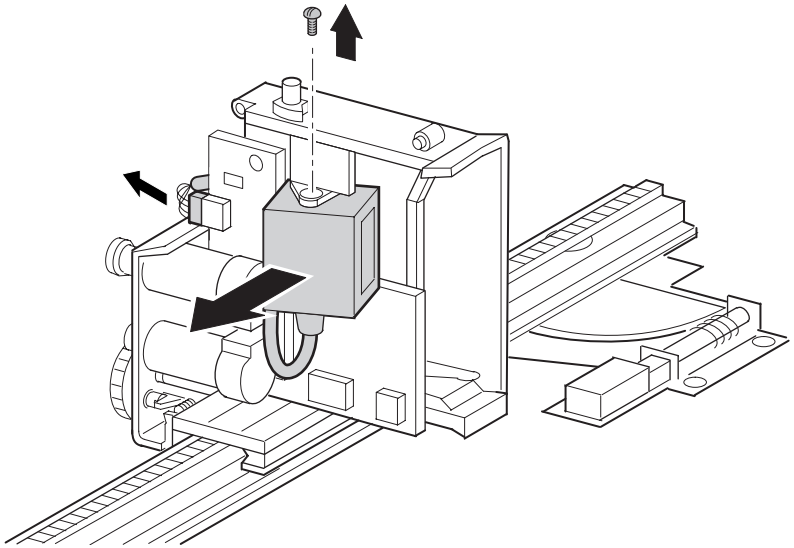

**Figure 134: Removing the bar code reader (LTO-compatible)**

5. Remove the screws or screws at the top that secures the bar code reader to the shuttle assembly (see Figure 133 or Figure 134).
6. Remove the bar code reader from the shuttle assembly.

To replace the bar code reader:

1. Position the bar code reader in the opening on the board side of the shuttle assembly, with the lens pointing through the cartridge opening, with the cable at the bottom. The bar code reader is mounted at a 10-degree angle to the shuttle assembly body.
2. Replace the screw or screws at the top that secure the bar code reader to the shuttle assembly (see Figure 133 or Figure 134).
3. Replace the cable on the shuttle assembly board.
4. Depending on the library model:
   - Original: Place the bar code cable in the restraint, and replace the cable restraint screw at the lower front of the bar code reader so that the cable lies close to the board.
   - LTO-compatible: Replace the cable tie at the side of the bar code reader.
5. Replace the top front cover. See “Removing and Replacing the Library Covers” on page 45.

6. Reconnect the power cords. Turn the library on, and then restart the application software.

# Removing and Replacing the Front Vertical Axis Assembly

**Note:** Before completing the front vertical axis assembly removal and replacement procedures you must align it using the procedures in Appendix A, "Vertical Axis Alignment," that starts on page 361.

To remove the front vertical axis assembly (screw rail):

1. Using the LCD touch display, open both magazine doors, and remove the upper and lower magazines. If the library is not operational, see "Manually Opening the Magazine Doors" on page 38.
2. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
3. Remove the top front cover. See "Removing and Replacing the Library Covers" on page 45.
4. Manually rotate the robot track by turning the motor/track coupler approximately 90 degrees to allow for removal of the robot shuttle.

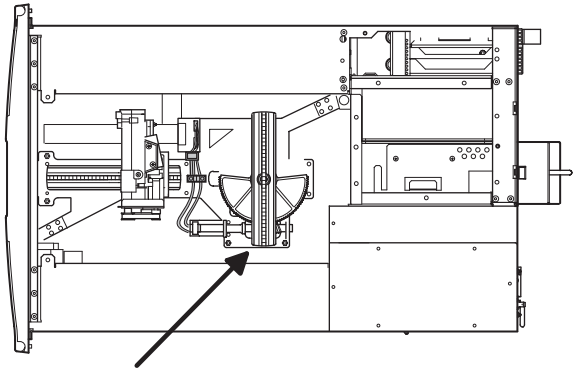

**Figure 135: Rotating the track**

5. Depress the shuttle brake lever on the bottom of the shuttle, and slide the robot shuttle on the track towards the rear of the unit (see Figure 136). This step allows for easier vertical axis removal.

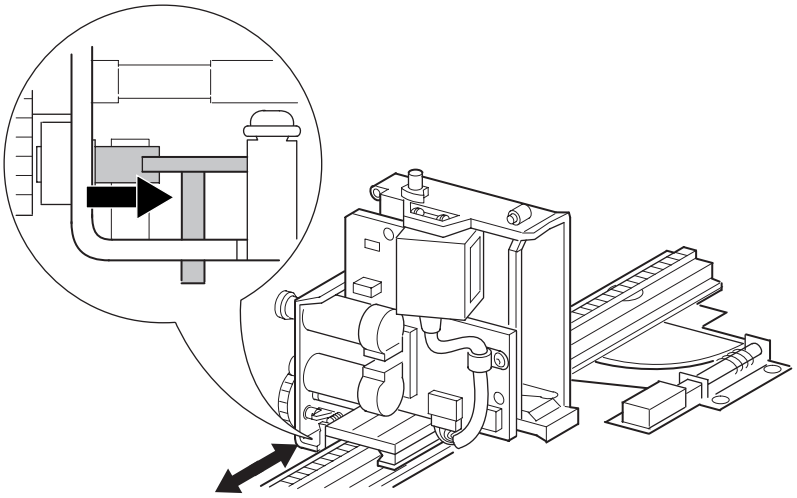

**Figure 136: Shuttle brake release**

6. Remove the two front screws located immediately below the vertical axis drive motor (see Figure 137).

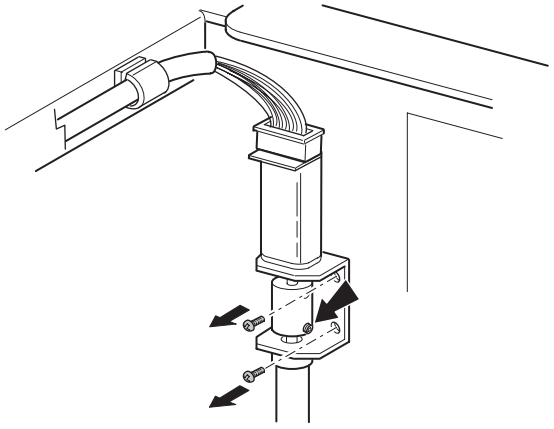

**Figure 137: Front vertical axis assembly screws**

7. Tilt the assembly inward, and remove the 7-pin connector from the front vertical axis drive motor (see Figure 138).

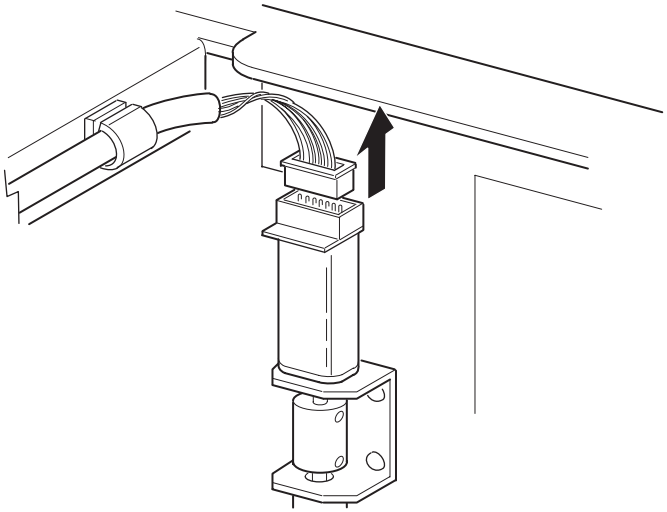

**Figure 138: Front vertical axis motor cable**

8. Remove the four screws that secure the front vertical axis assembly to the robotics base (see Figure 139).

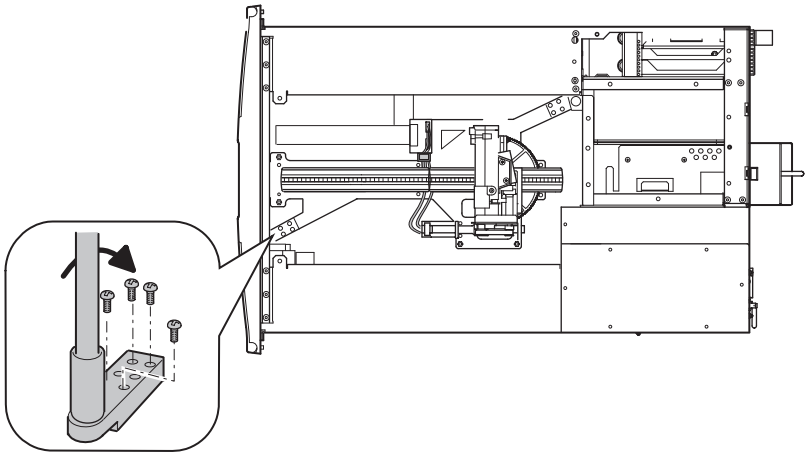

**Figure 139: Front vertical axis screws**

9. Manually rotate the front screw rail clockwise at the front flex shaft coupling, and then raise the foot of the screw rail to relieve pressure on the robotics base.
10. Swing the front screw rail foot clockwise to the front of the library.
11. Lift axis assembly upwards to remove from chassis.

To replace the front vertical axis assembly:

1. Install the assembled front vertical axis assembly into the bottom screw rail bracket.
2. Replace the 7-pin connector on the front vertical axis drive motor.
3. Install the two front rail screw bracket screws. (See Figure 137.)
4. Loosen the lower set screw on the flex coupling, push the screw rail down to seat it snugly, and tighten the set screw.
5. Swing the front vertical axis screw rail foot counter-clockwise, and then align the installation holes with the robot track base.
6. Manually rotate the flex coupler front vertical screw rail counter-clockwise at the Z-axis motor coupler until slight pressure is felt on the robotics base.
7. Replace (finger tighten and loosen one turn) the four screws that secure the front vertical axis rail to the robotics base.

---

**Note:** This assembly remains loose until aligned using the vertical axis alignment procedure in Appendix A that starts on page 361.

---

8. Depress the shuttle brake lever on the bottom of the shuttle, and slide it toward the front of the unit on the track.
9. Power up the library, and perform the friction test as described in Appendix A, "Vertical Axis Alignment," that starts on page 361.
10. Replace the top front cover. See "Removing and Replacing the Library Covers" on page 45.
11. Replace the upper-left and lower-left magazines, and then close the door.

# Removing and Replacing the Rear Vertical Axis Assembly

**Note:** After removing and replacing the rear vertical axis assembly, you must align it using the procedures in Appendix A, "Vertical Axis Alignment," that starts on page 361.

To remove the rear vertical axis assembly (screw rail):

1. Using the LCD touch display, open the left magazine door, and remove the upper and lower magazines. If the library is not operational, see "Manually Opening the Magazine Doors" on page 38.
2. Using the LCD touch display, turn the library off. Turn off the master power switches on the power supplies, which are located at the rear of the library, and then remove the AC power cords.
3. Remove the top front cover and the right rear cover. See "Removing and Replacing the Library Covers" on page 45.
4. Remove the flex cable from the flex cable carrier and guide, and retain the lower clip for reinstallation (see Figure 140).

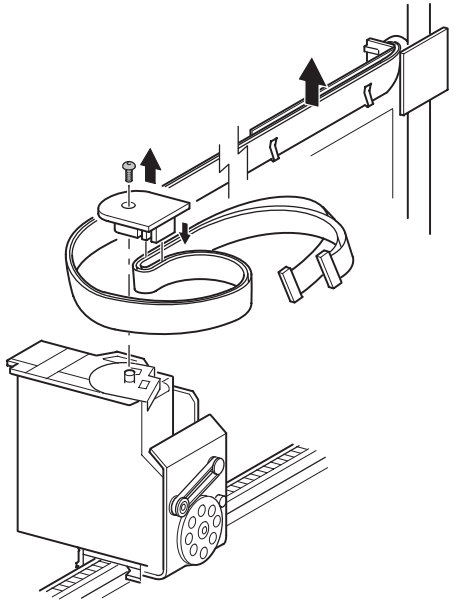

**Figure 140: Removing the flex cable**

5. Store the flex cable in the left magazine bay.
6. Remove the two upper mounting screws.
7. Tilt the unit inward, and cut the cable tie from the drive motor.
8. Remove the 7-pin connector from the rear vertical axis drive motor (see Figure 141).

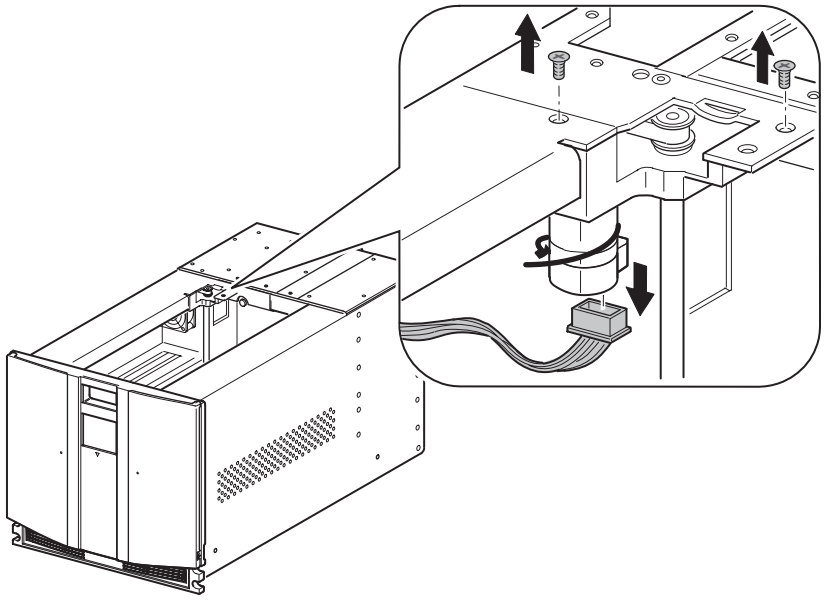

**Figure 141: Motor cable**

9. Remove the four screws that secure the rear vertical axis screw rail to the robotics base (see Figure 142).

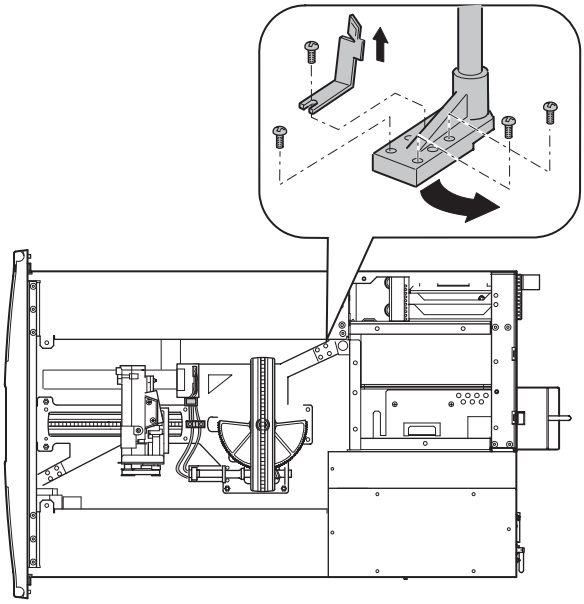

**Figure 142: Rear vertical axis screws removed**

10. Remove and retain the rear screw rail bracket.
11. Manually rotate the rear vertical axis screw rail clockwise at the Z-axis motor belt assembly, and then raise the foot of the screw rail approximately 1.27 cm (0.5 inches) to clear the alignment pins on the robotics base.
12. Swing the vertical axis screw rail foot counter-clockwise to the rear of the library. The alignment pins on the robotics base should now be visible.

13. Remove the two rear vertical axis assembly top mounting screws (see Figure 143).

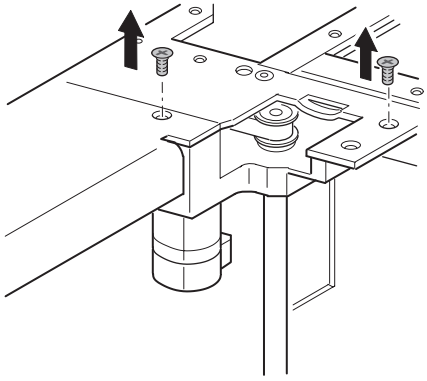

**Figure 143: Rear vertical axis assembly mounting screw locations**

14. Remove the rear vertical axis assembly from the chassis.

To replace the rear vertical axis motor:

1. Insert the bottom portion of the rear vertical axis assembly into the rail screw bracket.
2. Replace the 7-pin connector to the rear vertical axis drive motor.
3. Align the vertical axis assembly with the two mounting holes.
4. Insert the two screws into the mounting holes and tighten.
5. Install new cable tie to cable and motor. From the rear of the vertical axis drive motor, route the cable.
6. Swing the rear vertical axis screw rail foot clockwise, and then align it over the robot track base and alignment pins (see Figure 142).
7. Manually rotate the rear screw rail clockwise to align the pins on the robotics base. Rotate until a slight pressure is felt on the robotics base.
8. Replace the screw rail bracket (see Figure 142).
9. Replace (finger tighten and loosen one turn) the four screws that secure the rear vertical axis screw rail to the robotics base (see Figure 142).

---

**Note:** This assembly remains loose until aligned using the vertical axis alignment procedure in Appendix A that starts on page 361.

---

10. Attach the flex cable to the flex cable guide and carrier with the flex cable bracket (see Figure 141).

**Note:** Make sure that the flex cable is not twisted.

11. Replace the upper-left and lower-left magazines, and then close the door.
12. Power up the library, and perform the friction test as described in Appendix A, "Vertical Axis Alignment," that starts on page 361.
13. Replace the top front cover and the right rear cover. See "Removing and Replacing the Library Covers" on page 45.

# Diagnostic Tools

7

This chapter describes software and firmware diagnostic tools available for an HP StorageWorks MSL5000 and MSL6000 Series libraries. The sections in this chapter include:


- Power-On Self-Test (POST), page 274
- POST Error Messages, page 275
- Platform Problems, page 276
- Error Recovery, page 277
- Fault Symptom Codes (FSCs), page 279
- Diagnostic Support Tools, page 314
- Running Library Diagnostic Tests, page 315


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**Note:** You may use the *HP StorageWorks Library and Tape Tools (L&TT)* diagnostic utility to perform diagnostic functions for both the MSL5000 and MSL6000 Series tape libraries. *L&TT* is a diagnostic tool that is designed to aid in the installation and maintenance of HP tape and magneto-optical storage products. *L&TT* includes several features designed for use by both HP storage customers and trained service personnel. The key features include:

- Diagnostic tools for tape and magneto-optical devices designed for simple troubleshooting
- Multiple options for retrieving and updating both the latest firmware and the most current version of *L&TT*

*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.

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# Power-On Self-Test (POST)

The POST is a series of diagnostic tests that run automatically when the library is turned on. POST checks the following assemblies to ensure that the library is functioning properly:

- System ROM
- Library controller
- Tape drives
- Power supplies
- Shuttle assembly

# POST Error Messages

If POST detects an error in the library, an error condition is indicated by a message on the LCD touch display. If an error code appears on the LCD touch display during POST or after restarting the library, follow the instructions in Table 8 on page 279.

The recommended action column in Table 8 on page 279 lists the steps necessary to correct each respective problem. After completing each step, run the Diagnostics software to verify whether the error condition has been corrected. If the error message reappears, perform the next step, and then run the diagnostics program again. Follow this procedure until the diagnostics software no longer detects an error condition.

---

**Note:** Each library is supplied with an RS-232 diagnostic cable and the *MSLUtil* diagnostic utility.

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# Platform Problems

An incorrect installation or configuration can cause platform problems. In this case, the library appears to be operating normally, but no data can be interchanged, or performance is poor. You also might or might not get an error code on the LCD touch display. To identify an error caused by this type of problem, check your installation and configuration setup. See Chapter 2, "Installation," in the *HP StorageWorks MSL6000 Series Tape Libraries User Guide* for information on how to correctly install, and configure the library.

General drive errors usually result from a miscommunication between a library processor and a tape drive processor, drive and tape interaction issues, or a mechanical malfunction within the library. Both platform problems and general tape drive errors display an error message and a Fault Symptom Code (FSC) on the LCD touch display. Use an FSC to report errors to your service provider, or in some cases, to determine a recovery procedure.

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

Your application software may need to be reconfigured or, in some cases, reinstalled after you have installed additional drives or slots into the library. Changing the number of magazines, number of reserved slots, or changing between DLT and Ultrium magazines will also require changes to the software. Some application software may require the purchase of add-on components and licenses when you increase the number of storage slots or drives. Contact your application software provider for more information on add-on components or if you install new storage slot drives that are not recognized by your application software.

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**Note:** The library numbers drives and slots beginning with 0. Your software application may number these items beginning with 1. Be aware of this difference in numbering when troubleshooting the library.

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# Error Recovery

Figure 144 outlines the recommended steps for error recovery. Follow this chart in all cases.

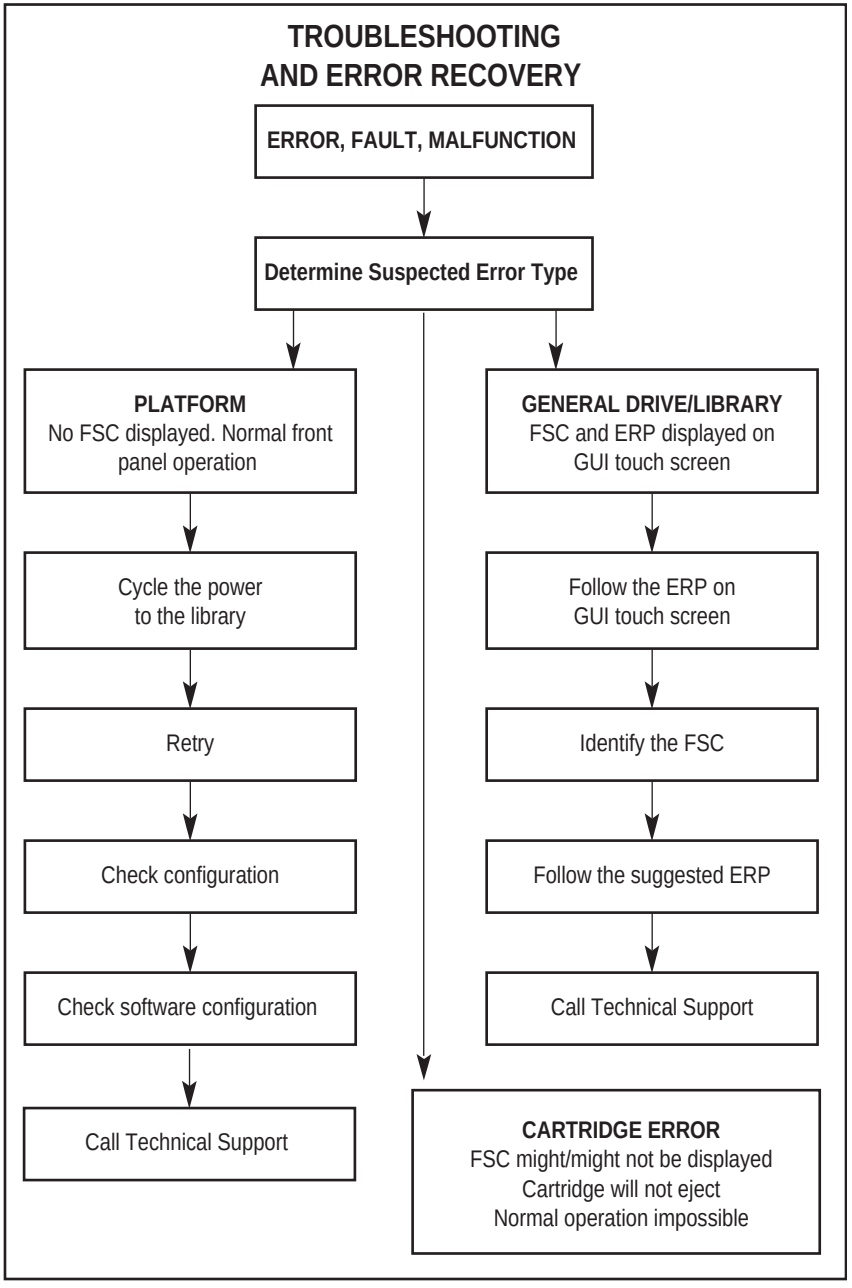



**Figure 144: Troubleshooting and error recovery flow chart**

# Fault Symptom Codes (FSCs)

FSCs that appear on the LCD touch display are described in Table 8.

**Table 8: Fault Symptom Codes**

| FSC | Message | ERP |
|---|---|---|
| 0306 | Novram Update Error<br>(The firmware update failed.) | • Press the **Enter** button to reboot.<br>• Attempt firmware upgrade. |
| 0501 | Barcode Not Active Error<br>(The hardware could not detect a bar code reader.) | • Turn off power to the library and inspect connectors and cables. |
| 0901 | OS Catastrophic Error | • Press the **Enter** button to reboot. |
| 0902 | OS Task Exit Error<br>(TCP/IP data error) | • Cycle power to the library or reboot using the GUI touch screen.<br>• Check the ethernet connections on the router for the master to slave(s) communication. |
| 0A01 | Invalid Ethernet (MAC) Address<br>(The library's ethernet (MAC) address stored in the non-volatile configuration is not valid. The last three octets are either 0:0:0, or 255:255:255.) | • Cycle power to the library or reboot using the GUI touch screen.<br>• Check IP address. |
| 0A02 | Invalid IP subnet Mask (255.255.255.255)<br>(The ethernet subnet mask stored in the nonvolatile configuration is not valid - 255.255.255) | • Invalid user initiated operation. Set parameters correctly and try again.<br>• Ensure configuration options are set correctly. |
| 1001 | SCSI Firmware Error<br>(Internal SCSI task processing error. Unexpected state or hardware status.) | • Turn off power to the library and inspect connectors and cables.<br>• Check the SCSI cable connections to make sure they are secured.<br>• Make sure the library controller board has SCSI termination. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 1002 | SCSI FIFO Empty<br>(The SCSI controller data FIFO is empty but should contain more data bytes.) | • Turn off power to the library and inspect connectors and cables.<br>• Check the SCSI cable connections to make sure they are secured.<br>• Make sure the library controller board has SCSI termination. |
| 1003 | SCSI FIFO Error<br>(The SCSI controller data FIFO should be empty but still contains data bytes.) | • Turn off power to the library and inspect connectors and cables.<br>• Check the SCSI cable connections to make sure they are secured.<br>• Make sure the library controller board has SCSI termination. |
| 1004 | SCSI Gross Error<br>(The SCSI controller detected a gross error condition. Invalid SCSI bus phase or DMA error.) | • Turn off power to the library and inspect connectors and cables.<br>• Ensure SCSI options are set correctly.<br>• Check the SCSI cable connections to make sure they are secured.<br>• Make sure the library controller board has SCSI termination.<br>• Check host SCSI cable and connections. |
| 1005 | Illegal SCSI Cnt Cmd<br>(Either an invalid command was sent to the SCSI controller, or the controller was not in the correct mode.) | • Turn off power to the library and inspect connectors and cables.<br>• Check that application is certified to work with your library and has up-to-date patches.<br>• Ensure SCSI options are set correctly.<br>• Check the SCSI cable connections to make sure they are secured.<br>• Make sure the library controller board has SCSI termination.<br>• Check host SCSI cable and connections. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 1007 | SCSI Invalid Element<br>(Internal SCSI task processing error. Invalid element type was detected.) | • Turn off power to the library and inspect connectors and cables.<br>• Check host SCSI cable and connections. |
| 1008 | SCSI No Pending Int. | • Turn off power to the library and inspect connectors and cables. |
| 1009 | SCSI Invalid Int.<br>(The SCSI controller posted an invalid interrupt status.) | • Turn off power to the library and inspect connectors and cables.<br>• Check host SCSI cable and connections. |
| 2004 | Loader Not Ready<br>(Failed to fetch, stow, scan, move, pass through, or loader detected invalid command and aborted.) | • Cycle power to the library or reboot using the GUI touch screen. |
| 2009 | Door Open (status only)<br>(Door is forced open or door sensor failed.) | • Invalid user initiated operation. Select parameters correctly and try again.<br>• Make sure door(s) are closed.<br>• Press the **Enter** button to clear the message. |
| 200C | Cart Inaccessible<br>(For an SDLT drive, indicates the tape is not in the unloaded state. For an Ultrium drive, indicates the tape is not ejected. Cartridge in drive is not accessible from changer.) | • Invalid user initiated operation. Select parameters correctly and try again.<br>• Ensure drive is powered on.<br>• Ensure the drive shows good status through the drive status window.<br>• Check the tape cartridge used in the last operation for damage.<br>• Reactivate drive using control panel maintenance menu and reseat drive. |
| 200D | Drive In Error<br>(A general drive error detected by control task) | • Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window.<br>• Reseat drive. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 200E | No Magazine<br>(Cannot move from changer. Element not installed.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Select parameters correctly and try again.<br>• Check for magazine.<br>• Replace magazine. |
| 200F | Removal Prevented<br>(Receive medium prevent removal from drive for a fetch.) | • Attempt to unload drive from software. If fails, power off unit, disconnect from SCSI bus, and retry operation.<br>• Invalid host initiated operation. Check that application is certified to work with your library and has up-to-date patches.<br>• Invalid user initiated operation. Select parameters correctly and try again.<br>• Check for firmware tape in drive.<br>• Check for cleaning tape in drive.<br>• Press the **Enter** button to clear the message. |
| 2010 | Ctl. Firmware Error<br>(Internal task processing error. Unexpected event. SMX send or receive error.) | • Cycle power to the library or reboot using the GUI touch screen.<br>• Upgrade firmware if a newer revision exists. |
| 2030 | Drive Timeout Error | • Check if the drive shows good status through the drive status window.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Reseat drive. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 2080 | Drive Code Update Command Error<br>(Update code from SCSI or from tape failed.) | • Make sure that the firmware is the correct file for this product.<br>• Check if the drive shows good status through the drive status window.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Attempt firmware upgrade again. |
| 2081 | Move Command Failure<br>(Move command from or to drive slot failed. Detected by control task.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Load/unload a cartridge to the drive to verify. |
| 2090 | Open Mail Slot Fault<br>(Door open sensor time-out detected when open door.) | • Press the **Ente**r button to clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Run sensor test.<br>• Make sure door(s) are closed. |
| 2091 | Open Left Door Fault<br>(Door open sensor time-out detected when open door.) | • Press the **Ente**r button to clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Run sensor test.<br>• Make sure door(s) are closed. |
| 2092 | Open Right Door Fault<br>(Door open sensor time-out detected when open door.) | • Press the **Ente**r button to clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Run sensor test.<br>• Make sure door(s) are closed. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 2093 | Open Doors Fault<br>(Door open sensor time-out detected when open door.) | • Press the **Ente**r button to clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Run sensor test.<br>• Make sure door(s) are closed. |
| 20a0 | No IP Address Found<br>(SMC router failed to get an IP address.) | • Press the **Ente**r button to clear the message.<br>• Ensure network configuration options are set correctly.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 20a1 | No IP Address Mode Fault<br>(SMC router failed to detect static or IP address mode.) | • Press the **Ente**r button to clear the message.<br>• Ensure network configuration options are set correctly.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 20b0 | Unknown Exchange For The Async message<br>(Unexpected exchange detected when process messages.) | • Press the **Ente**r button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. Wait 30 seconds to power up again. |
| 20c0 | Drive In Error<br>(Control failed to set SCSI ID.) | • Press the **Enter** button to clear the message.<br>• Ensure the drive shows good status through the drive status window.<br>• Check SCSI ID settings.<br>• Cycle power to the library or reboot using the GUI touch screen. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 20c1 | Drive In Error<br>(Control failed on installed drive.) | • Press the **Enter** button to clear the message.<br>• Ensure the drive shows good status through the drive status window.<br>• Check SCSI ID settings.<br>• Check cabling.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 3000 | Motor Fault Condition<br>(One of the robot motors has been disabled and could not be re-enabled.) | • Press the **Ente**r button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 3002 | Picker Tach Errors<br>(Picker tachometer errors were detected when checking slots.) | • Press the **Ente**r button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 3011 | Bin Fetch Failure<br>(Loader failed to fetch a cartridge from a bin.) | • Press the **Enter** button to reboot.<br>• Ensure cartridges are fully inserted in the magazine(s).<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Run the cartridge cycle diagnostic to verify.<br>• Check the tape cartridge used in the last operation for damage. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3013 | Drive Fetch Failure<br>(Loader failed to fetch a cartridge from a drive.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 3015 | Drive Timeout Failure<br>(Loader detects unload command time-out.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3016 | Drive Status Failure | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 3017 | Drive In Flux Timeout<br>(Time-out waiting for drive to clear the full status.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3018 | Drive Load Retry Failed<br>(SLTO drive fail to load, detected in drive task.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used int he last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 3019 | Drive Open Door Failed | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used int he last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 301A | Drive Close Door Failed | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 301B | Drive Communication Error<br>(Intertask send, receive failed.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 301C | Drive Get General Status Fail<br>(Drive communication failed.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat the drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 301D | Drive Get Status 3 Fail | • Press the **Enter** button to clear the message.<br>• Contact support. |
| 3020 | Undefined Config<br>(In loader, unexpected configuration, not a 5U or 10U model. In diagnostics, invalid source or destination.) | • Press the **Enter** button to clear the message.<br>• Contact support. |
| 3030 | Orphan Cartridge not stowed<br>(The loader could not successfully stow an orphan cartridge to a bin.) | • Unload magazine, remove a tape, replace the magazine, and retry the operation. |
| 3031 | Chassis S/N Mismatch. Previous S/N retained<br>(The serial number scanned from the bar code label does not match the value stored in non-volatile memory.) | • Press the **Enter** button to clear the message.<br>• No action is required. This error is expected when replacing the controller board. If controller board was not replace, then contact support. |
| 3032 | Chassis S/N Character count is not correct<br>(A valid serial number bar code label could not b read.) | • Press the **Enter** button to clear the message.<br>• Contact support. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3033 | Chassis S/N did not scan<br>(A valid serial number bar code label could not be read.) | • Press the **Enter** button to clear the message.<br>• Contact support. |
| 3034 | Chassis S/N save operation failed<br>(The serial number scanned from the bar code label could not be saved to non-volatile memory.) | • Press the **Enter** button to clear the message.<br>• Contact support. |
| 3040 | Motor Firmware Error<br>(The loader task detected an unexpected status and could not recover.) | • Press the **Enter** button to reboot.<br>• Turn off power to the library and inspect connectors and cables. |
| 3041 | Loader Received Invalid Command<br>(The loader task received an unexpected command and could not recover.) | • Press the **Enter** button to reboot.<br>• Turn off power to the library and inspect connectors and cables. |
| 3042 | Motor Firmware Error<br>(The loader task detected an unexpected status and could not recover.) | • Press the **Enter** button to reboot.<br>• Turn off power to the library and inspect connectors and cables. |
| 3050 | Missing Magazine<br>(In diag, no magazine installed for diag to run.) | • Press the **Enter** button to clear the message.<br>• Insert magazine.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 3051 | No Cartridges In Library<br>(No cartridge available for diag to run.) | • Press the **Enter** button to clear the message.<br>• Insert cartridge.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 3052 | Too Many Cartridges<br>(Unable to run cartridge or drive cycle because loader is full with cartridges.) | • Press the **Enter** button to clear the message.<br>• Remove a tape from the library.<br>• Invalid user initiated operation. Set parameters correctly and try again. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3054 | Need 1 Drive Minimum<br>(No available drive to run diag.) | • Install or activate a drive.<br>• Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 3057 | Invalid Magazine Type<br>(Unsupported magazine type detected.) | • Upgrade firmware if a newer revision exists.<br>• Press the **Enter** button to clear the message.<br>• Check magazine type.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 3058 | Magazine Type Change Not Handled<br>(Unsupported magazine type detected.) | • Upgrade firmware if a newer revision exists.<br>• Press the **Enter** button to clear the message.<br>• Check drive type.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 3059 | Drive Type Not Supported<br>(Unsupported magazine type detected.) | • Upgrade firmware if a newer revision exists.<br>• Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 305B | Diag Fetch, Drive not loaded<br>(Diag: no cartridge present for fetch.) | • Press the **Enter** button to clear the message.<br>• Load a cartridge in the drive and retry the operation.<br>• Invalid user initiated operation. Set parameters correctly and try again. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 305D | Diag Timeout waiting for drive empty, ready<br>(Fetch, time-out waiting for drive unload.) | • Press the **Enter** button to reboot.<br>• Invalid user initiated operation. Set parameters correctly and try again.<br>• Ensure the drive shows good status through the drive status window.<br>• Check the tape cartridge used in the last operation for damage. |
| 305F | Invalid bin number<br>(Invalid bin number detected in diag.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 3060 | Zone Sequence Error<br>(Robot did not find sensor on power-up.) | • Cycle power to the library or reboot using the GUI touch screen. |
| 3074 | Drive 0 Eject Failed<br>(Eject command time-out.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3075 | Drive 1 Eject Failed<br>(Eject command time-out.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 3076 | Drive 2 Eject Failed<br>(Eject command time-out.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3077 | Drive 3 Eject Fail<br>(Eject command time-out.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 3078 | Diag get drive 0 status failed<br>(Failed to get drive status, communication error.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3079 | Diag get drive 1 status failed<br>(Failed to get drive status, communication error.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 307A | Diag get drive 2 status failed<br>(Failed to get drive status, communication error.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 307B | Diag get drive 3 status failed<br>(Failed to get drive status, communication error.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Deactivate the drive using the GUI control panel maintenance menu.<br>• Reseat drive.<br>• Check cabling.<br>• Load/unload a cartridge to the drive to verify.<br>• Check the tape cartridge used in the last operation for damage.<br>• Run the cartridge cycle diagnostic to verify. |
| 3082 | Drive Stow Failed, Media Returned to Source | • Press the **Enter** button to clear the message.<br>• Use only media approved for the drive type.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 3083 | Drive Stow Failed, Media Remains in Drive | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again.<br>• Ensure cartridges are in magazines. |
| 3084 | UnSupported Drive For Requested Operation<br>(Unsupported drive type.) | • Make sure the media type used is compatible with the drive.<br>• Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 308F | No Retry On Fetch/Stow<br>(The loader retried an operation and retries were disabled.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again.<br>• Ensure configuration options are set correctly. |
| 3100 | Picker Jammed<br>(The picker jammed during a bin stow operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3102 | Picker Jammed 2<br>(The picker jammed during a bin stow operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3103 | Picker Jammed 3<br>(The picker jammed during a bin stow operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3104 | Picker Jammed 4<br>(The picker jammed during a bin stow operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3105 | Picker Jammed 5<br>(The picker jammed during a bin stow operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3106 | Picker Jammed 6<br>(The picker jammed during a bin stow operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3107 | Picker Jammed 7<br>(The picker jammed during a pass-through fetch operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s).<br>• Check pass-through alignment. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3108 | Picker Jammed 8<br>(The picker jammed during a pass-through fetch operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s).<br>• Check pass-through alignment. |
| 310B | Picker Jammed 11<br>(The picker jammed during a drive fetch operation.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 310F | Picker Jammed on Stow<br>(The picker jammed on a stow operation.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3111 | Picker Retries Exceeded 1<br>(Picker retries exceeded during a pass-through fetch operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Check pass-through alignment. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3113 | Picker Retries Exceeded 3<br>(Picker retries exceeded during a bin stow operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3115 | Picker Retraction Error<br>(Picker did not retract during a bin check operation.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 3200 | Shuttle Jammed<br>(Shuttle could not reach target location.) | • Press the **Enter** button to reboot.<br>• Check pass-through mechanism alignment.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 3300 | Rotary Jammed<br>(Rotary track could not reach target location.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Ensure cartridges are fully inserted in the magazine(s). |
| 3301 | Shuttle on Wrong Side Of The Rotary<br>(Zone indicators show that the shuttle is backwards on the rotary track during power-up initialization.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 3400 | Pass-through Elevator Jammed<br>(Pass-through shuttle could not reach target location.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Check pass-through alignment. |
| 3500 | Vertical Elevator Jammed<br>(Vertical elevator could not reach target location. 10U libraries only). | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines). |
| 5011 | All Slots Empty<br>(There are no cartridges installed in any of the reserved cleaning slots.) | • Press the **Enter** button to clear the message.<br>• Insert cleaning cartridge in reserved cleaning slot.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 5014 | Drive Already Loaded<br>(Cleaning operation failed because the drive already has a cartridge inserted.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again.<br>• If the tape in the drive is not in use, unload the drive and retry the cleaning operation. |
| 5015 | Expired Clean'g Cart<br>(Cleaning operation failed due to an expired cleaning cartridge.) | • Press the **Enter** button to clear the message.<br>• Remove expired cleaning cartridge from library and discard. Replace with new cleaning cartridge. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 5016 | Not a Clean'g Cart<br>(Cleaning operation failed because the loaded cartridge is not a cleaning cartridge.) | • Press the **Enter** button to clear the message.<br>• Make sure tape in reserved slot is a cleaning cartridge.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 5035 | Drive Timeout Error<br>(Cleaning operation failed because the drive timed out.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again.<br>• Ensure the drive shows good status through the drive status window. |
| 503B | Move Command Fail<br>(A front panel move operation failed.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 503C | Clean Operation Timeout<br>(Cleaning operation failed because the drive timed out.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again.<br>• Ensure the drive shows good status through the drive status window. |
| 503D | Drive Status Fail<br>(Cleaning operation failed because the library could not retrieve drive status.) | • Press the **Enter** button to clear the message.<br>• Invalid user initiated operation. Set parameters correctly and try again.<br>• Ensure the drive shows good status through the drive status window. |
| 7001 | Command response from unexpected source | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7002 | Control command execution failed | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 7003 | Control response not matched to a known command | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7004 | Loader response not matched to a known command | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7005 | Drive response not matched to a known command | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7006 | Flash response not matched to a known command | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7007 | Drive index on Update Status message was invalid | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7008 | The Drive response was not as expected | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7009 | The opcode for a WORD message was unknown | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 700A | The opcode for a DWORD message was unknown | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 700B | The button causing library to go offline was unknown<br>(A command to take the library off-line was completed successfully, but the GUI button that initiated the action could not be identified.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 700C | Destination Xchg was Null | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 700D | Sending of a cmd failed | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 700E | Deactivating a drive that is not attached<br>(The control task indicates that a request to deactivate a drive failed because the drive is not attached.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window.<br>• Reseat the drive.<br>• Check cabling. |
| 700F | Deactivation of a drive failed<br>(The control task indicates that a request to deactivate a drive failed. Reason unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window<br>• Reseat the drive.<br>• Check cabling. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 7010 | Drive removal failed<br>(The drive task indicates that a request to power-down a drive failed. Reason unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7012 | Drive is Active failed<br>(The drive task indicates that a request to determine if a drive is executing a host command failed. Reason unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7013 | Control Com Unidentified<br>(During a hot swap, a command response from the control task could not be associated with any outstanding command.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7014 | Drive status update failed<br>(The drive task indicates that a request to determine the current state of a drive failed. Reason unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7015 | Loader command execution failed<br>(The loader task indicates that a command has failed to complete successfully.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7016 | Sequential command execution failed<br>(The sequential task indicates that a command has failed to complete successfully.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 7017 | Destination Xchg for msg. was Null<br>(Attempted to send a message to a task, but the argument exchange pointer was NULL.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7018 | Bad src mod in peg msg<br>(A message was received from a remote module, but the module number was out of range.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 7019 | Peg message wrapping a Null msg. ptr.<br>(A peg message has a pointer to NULL.) | • Press the **Enter** button clear the message.<br>• Cycle power to the router.<br>• Cycle power to all libraries in a stack, or reboot using the GUI touch screen. |
| 701A | Xchg conversion failed<br>(Attempted to determine the module number containing the task that is returning a command response failed.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| 701B | Invalid L-drive number to convert<br>(Attempted to send a command to a drive, but the logical drive number is out of range.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 701C | Invalid P-drive number to convert<br>(Attempted to send a command to a drive, but the physical drive number is out of range.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library.<br>• Ensure the drive shows good status through the drive status window. |
| 701D | Invalid mod number to convert<br>(Attempted to send a command to a drive in a remote module, but the module number is out of range.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 701E | Unknown drive type<br>(Attempted to show detailed drive status of a drive whose type is unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 701F | The SCSI response was not expected<br>(The command response from the SCSI task in a remote module was unexpected.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7020 | The Flash response was not expected<br>(The command response from the Flash task in a remote module was unexpected.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7021 | SCSI response not matched to a known command<br>(A command response was received from a SCSI task, but the original command opcode could not be determined.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7022 | Unexpected state after NonVolConfig cmd<br>(After successfully completing a NonVolConfigPut command, the current state of the save operation was unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 7023 | Unexpected state after SCSI mode cmd<br>(After successfully completing a SCSIUpdateMode Parameters command, the current state of the save operation was unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 7024 | Unexpected state after SCSI init cmd<br>(After successfully completing a SCSIInitCommand, the current state of the save operation was unknown.) | • Press the **Enter** button clear the message.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Ensure the drive shows good status through the drive status window. |
| 8001 | Cartridge reject recovery failed | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Check the tape cartridge used in the last operation for damage. |
| 8002 | Drive Fan stalled<br>(The fan in the drive hot-swap shoe is either not installed or has stalled.) | • Press the **Enter** button to clear the message.<br>• Look for a drive with an amber LED (rear of library) to determine which drive has the fan issue. If the drive is not in use, take it off-line to prevent it from overheating. If currently in use, end the operation immediately, and take the drive off-line. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 8003 | Drive load did not complete<br>(The drive failed to successfully load a tape.) | • Press the **Enter** button to reboot.<br>• Ensure the drive shows good status through the drive status window.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Check the tape cartridge used in the last operation for damage. |
| 8004 | Invalid drive was installed<br>(One or more installed drives are of a type either unknown or not supported in the current library personality.) | • Press the **Enter** button to clear the message.<br>• Update the firmware if a newer revision exists.<br>• Invalid user initiated operation. Set parameters correctly and try again. |
| 9001 | Orphan cartridge recovery failed<br>(The master module could not successfully return an orphan cartridge to a slot location.) | • Make sure there is one empty slot in a magazine in the master module.<br>• Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen.<br>• Check pass-through alignment.<br>• Ensure that there are no obstructions inside the library (all cartridges are in magazines).<br>• Check the tape cartridge used in the last operation for damage. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| 9003 | Master pass-thru opto failed.<br>(The master module opto sensor was not detected during the power-up Pass-Through module inventory.) | • Press the **Enter** button to reboot.<br>• Run the sensor test, checking appropriate sensor.<br>• Determine if the pass-through may have been plugged or unplugged while power was on to the library.<br>• Reinitialize or power-cycle the master it is connected to. Ensure the pass-through is functioning by observing whether or not the pass-through car moves to either end of the pass-through smoothly. |
| A001 | SMX send error<br>(An attempt to place a message on a task's exchange generated a kernel error.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| A002 | SMX receive error<br>(An attempt to receive a message from a task's exchange generated a kernel error.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| A003 | Comm free list empty<br>(An attempt to acquire a message from the free pool failed because the pool is empty.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| A004 | Invalid comm. put attempt<br>(An attempt to place a message on a task's exchange failed.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| A005 | Invalid comm. get attempt<br>(An attempt to receive a message from a task's exchange failed.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| A006 | Comm initialization error<br>(The Comm manager could not be initialized at power-up because system is out of memory.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| A007 | Put of a NULL comm. | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| A008 | Msg contains no comm.<br>(A message obtained from the pool did not contain a Comm block.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| A009 | Comm return address is unknown<br>(An attempt to return a command response to the originating task failed because the originator could not be determined.) | • Press the **Enter** button to reboot.<br>• Cycle power to the library or reboot using the GUI touch screen. |
| F001 | Bad Image CRC<br>(The uploaded firmware image has a bad CRC and is probably corrupted.) | • Press the **Enter** button to clear the message.<br>• Make sure the firmware file is complete and correct. If having difficulty uploading firmware via FTP, telnet, the web management interface, or TSMC, try using HP StorageWorks Library and Tape Tools (see page 314). |
| F002 | Flash erase sector failed<br>(One of the flash memory sectors could not be programmed.) | • Press the **Enter** button to clear the message. |
| F003 | Flash program sector failed<br>(One of the flash memory sectors could not be erased.) | • Press the **Enter** button to clear the message. |
| F004 | Bad flash CRC<br>(The firmware image programmed into flash memory has a bad CRC and is probably corrupted.) | • Press the **Enter** button to clear the message.<br>• Make sure the firmware file is complete and correct. If having difficulty uploading firmware via FTP, telnet, the web management interface, or LTT, try using HP StorageWorks Library and Tape Tools (see page 314). |

**Table 8: Fault Symptom Codes (Continued)**

| FSC | Message | ERP |
|---|---|---|
| F005 | Flash exit error<br>(Internal flash task error.) | • Press the **Enter** button to clear the message. |
| F006 | Incompatible image<br>(The uploaded firmware image is not compatible with the library hardware, and is possibly an older firmware version.) | • Press the **Enter** button to clear the message.<br>• Make sure the firmware file is complete and correct. If having difficulty uploading firmware via FTP, telnet, the web management interface, or LTT, try using HP StorageWorks Library and Tape Tools (see page 314). |
| F402 | Buffer allocation failed<br>(The flash task could not allocate a buffer area to hold the firmware image to be uploaded.) | • Press the **Enter** button to clear the message. |

If an error message appears that is not included in Table 8, write down the fault code number, and follow the troubleshooting procedure shown in Figure 144 on page 278.

# Diagnostic Support Tools

This section describes diagnostic tools available to help troubleshoot and maintain your tape library.

## HP StorageWorks Library and Tape Tools

To provide continued service to our customers, HP provides *L&TT* software application. *L&TT* is a diagnostic tool that is designed to aid in the installation and maintenance of both HP tape devices and tape libraries. *L&TT* includes several features designed for use by both HP storage customers and trained service personnel. The key features include:

- Diagnostic tools for tape drive and tape automation devices designed for simple troubleshooting and for verifying installations.
- Multiple options for retrieving and updating both the latest firmware for library and drives, and the most current version of *L&TT*.
- Comprehensive reports to assist authorized service providers in troubleshooting.

For optimal performance, HP recommends that you update your system periodically with the latest device firmware.

*L&TT* can be download at no cost from the following HP website at: http://www.hp.com/support/tapetools

## MSLUtil

The library ships with an RS232 diagnostic cable and a diskette containing the *MSLUtil* diagnostic utility. After following the recommended steps from the ERP to resolve any issues, use this utility to verify whether error conditions have been corrected. Follow this procedure until the diagnostics software no longer detects an error condition.

# Running Library Diagnostic Tests

Use the following procedure to run internal tests of library functions. Table 9 describes these tests.

1. From the LCD touch display **Status** window, choose **Menu**.
2. Under the **Utilities**, select **Diagnostics**.
3. Select the test you want to run.

**Note:** Available tests are dependent on the library model and specified user level.

**Table 9: Library Diagnostic Tests**

| Test | Description |
|---|---|
| Cartridge Cycle | Cycles cartridges continuously and randomly in bins and mail slots, displaying on the control panel a count of the type of cycle. Press the **Start** button to begin the test and the **Stop** button end to end the test. |
| Drive Cycle | Cycles cartridges continuously and randomly in bins, mail slots, and drives, displaying a count of the type of cycle on the control panel. Press the **Start** button to begin the test and the **Stop** button to end the test. |
| Bar Code Cycle | Scans all bar codes continuously, listing those read and the number of times a full library scan has been done. Press the **Start** button to begin the test and the **Stop** button to end the test. |
| Inventory | Physically scans the entire library to determine which slots and drives contain tapes and reads all barcode labels. |
| Sensor Test | Tests all affected sensors and lists their status. |
| Vertical Calibration *(available in four-drive models only)* | Calibrates the vertical lifters to correct limits. This test is typically used when vertical lifters are replaced. |
| View Error Log | Allows access to the error log to view posted errors. |

**Table 9: Library Diagnostic Tests**

| Test | Description |
|---|---|
| Touch Screen Calibrate | Allows resetting of calibration values when the screen brightness is not uniform. |
| Tachometer Diagnostic | This is a factory-only diagnostic used to measure tachometer motor function limits. |
| Friction Diagnostic | This is a factory-only diagnostic used to measure friction in the motors for acceptable limits. |

# Connectors, Switches, and LED Indicators

8

This chapter provides information regarding the following components inside the MSL5000 and MSL6000 Series tape libraries:

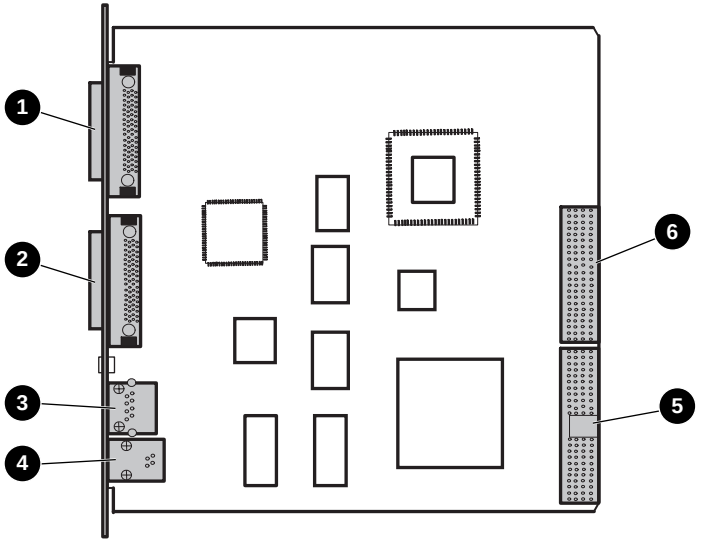

- Connectors, page 318
- Power Supply Switches, page 335
- LED Indicators, page 337


**Note:** Illustrations in this chapter do not reflect changes to tape drives or power supplies.

# Connectors

## MSL5026/MSL5030/MSL6026/MSL6030 (Old LTO2 models)- Two-drive (5U) Model

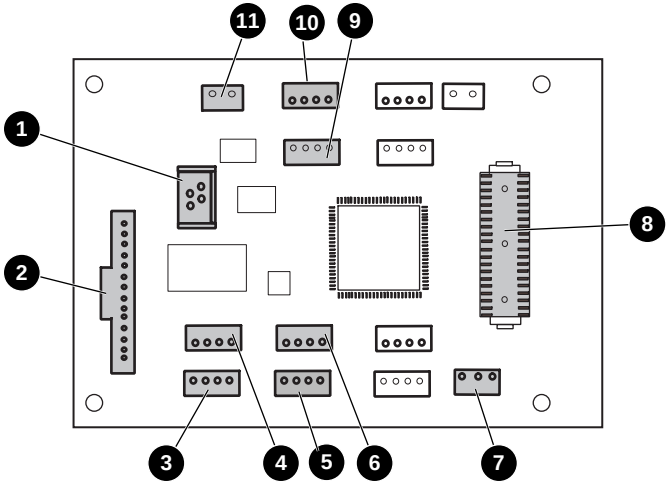
### Library Controller Board




1. J1 - VHDCI library SCSI
2. J3 - VHDCI library SCSI
3. J5 - 10Base-T ethernet port
4. J6 - RS232 serial port
5. J8 - Card cage/backplane
6. J4 - Card cage/backplane

**Figure 145: Library controller board**

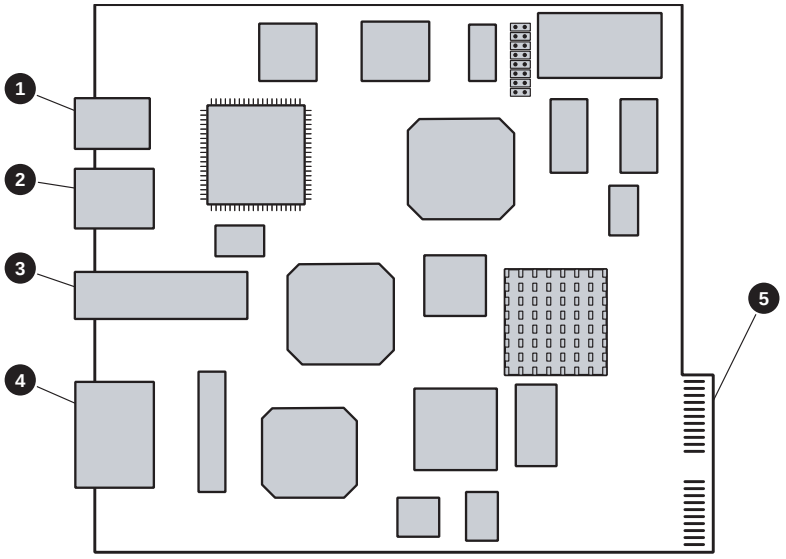
## Control Panel Board




1. J15 - Touchscreen
2. J16 - LCD
3. J14 - Right magazine door solenoid
4. J13 - Left magazine door solenoid
5. J11 - Right LTO magazine opto sensor
6. J9 - Right DLT/SDLT magazine opto sensor
7. J3 - LED
8. J1 - Controller board
9. J10 - Left DLT/SDLT magazine opto sensor
- J8 - Left LTO magazine opto sensor
q J12 - Magazine interlock solenoid

**Figure 146: Control panel board**

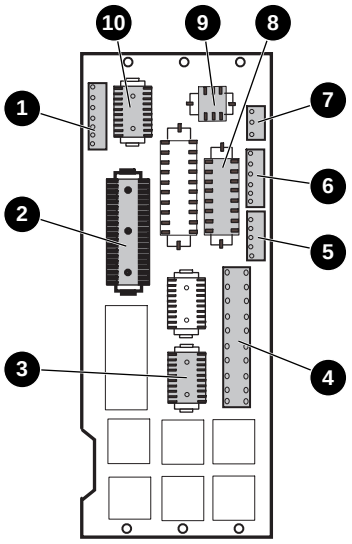
## Fibre Channel Card




1. Serial RJ-11 connector
2. Ethernet RJ-45 connector
3. Fibre Channel port
4. SCSI VHDCI connectors
5. Card cage/backplane connector

**Figure 147: Fibre Channel Card**

## Card Cage/Backplane Assembly

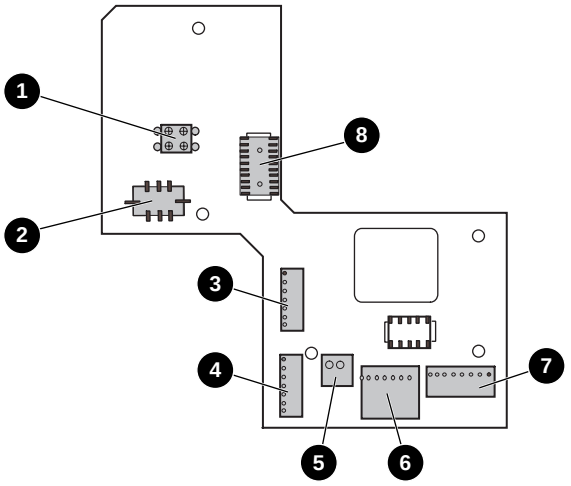



1. J12 - Track rotate motor
2. J2 - Control panel
3. J9 - Drive transmit/receive
4. J4 - Power supplies
5. J5 - Track rotate home sensor
6. J8 - PTM sensor
7. J11 - Card cage fan
8. J7 - PTM motor
9. J3 - Shuttle assembly power

\- J6 - Shuttle assembly

**Figure 148: Card cage/backplane assembly**

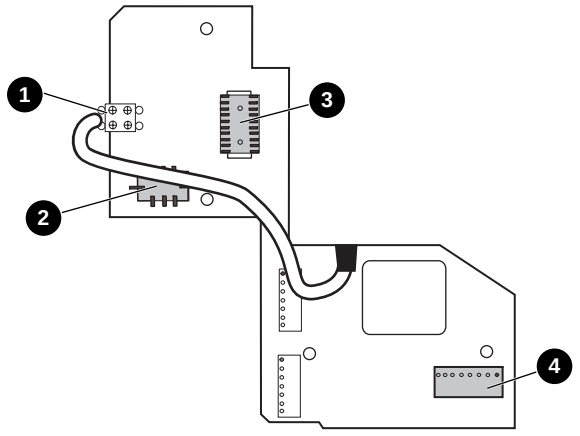
## Shuttle Assembly Board




1. J8 - Cartridge sensor
2. J9 - Shuttle power
3. J7 - Picker motor
4. J6 - Shuttle motor
5. J2 - Parking brake solenoid
6. J5 - Bar code reader
7. J1 - Track zone sensor
8. J3 - Shuttle control

**Figure 149: Shuttle assembly board**

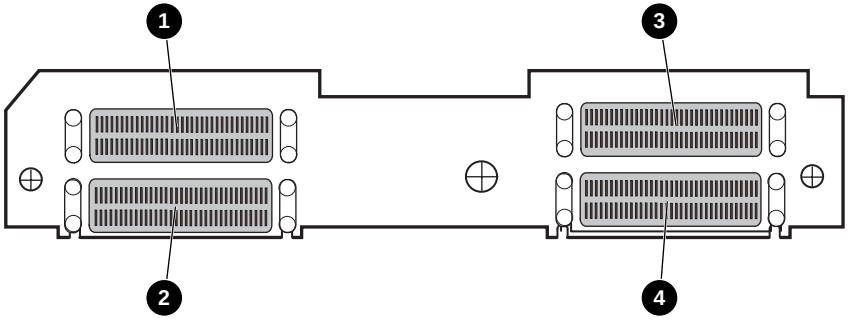
## Shuttle Assembly Board (LTO-compatible)




1. J10 - Bar code reader
2. J2 - Main power
3. J5 - Flex signal (robot)
4. J1 - Track zone sensor

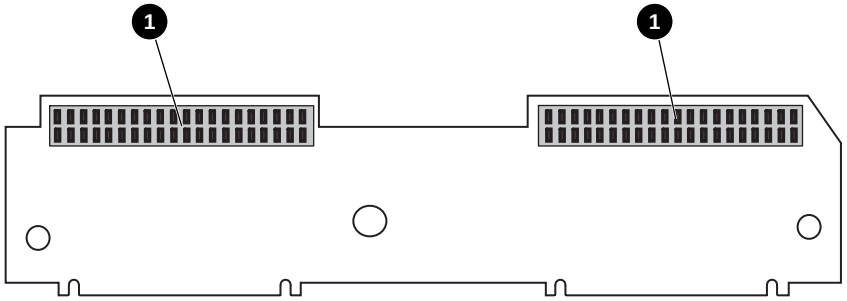
**Figure 150: Shuttle assembly board (LTO-compatible)**

## Very High Density I/O SCSI Board




1. J2 - Drive 1 SCSI data
2. J1 - Drive 1 SCSI data
3. J4 - Drive 0 SCSI data
4. J5 - Drive 0 SCSI data

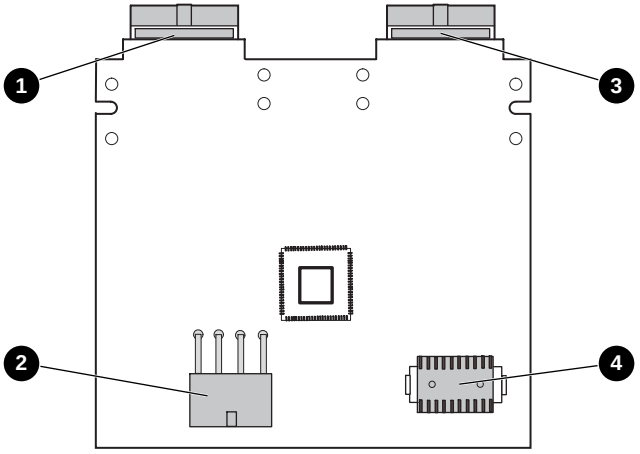
**Figure 151: I/O SCSI board (bottom side)**




1. J6 - Drive 0 to I/O SCSI Board
2. J3 - Drive 1 I/O SCSI Board

**Figure 152: I/O SCSI board (top side)**

## Library Board

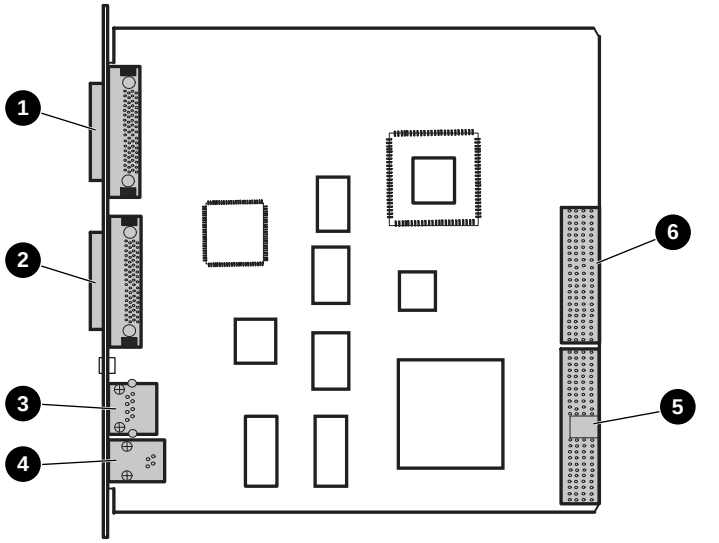



1. J2 - Drive 1
2. J4 - Power
3. J1 - Drive 0
4. J3 - Drive control

**Figure 153: Library board**

# MSL5052/MSL5060/MSL6060 - Four-Drive (10U) Models

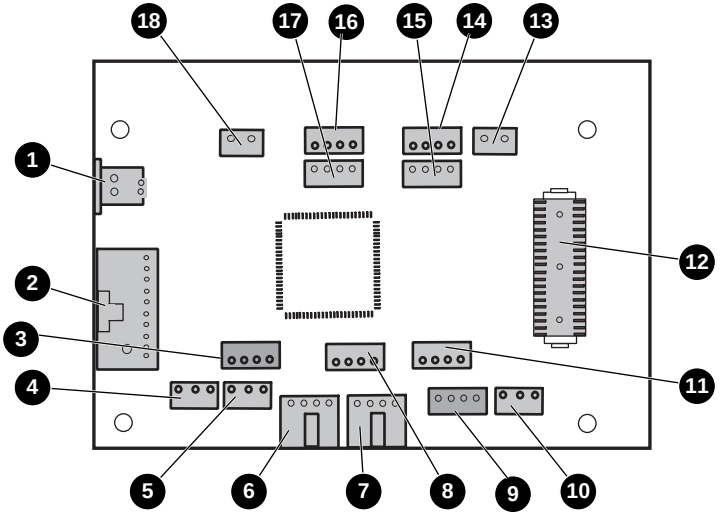
## Library Controller Board




1. J1 - VHDCI library SCSI
2. J3 - VHDCI library SCSI
3. J5 - 10Base-T ethernet port
4. J6 - RS232 port
5. J8 - Card cage/backplane
6. J4 - Card cage/backplane

**Figure 154: Library controller board**

## Control Panel Board

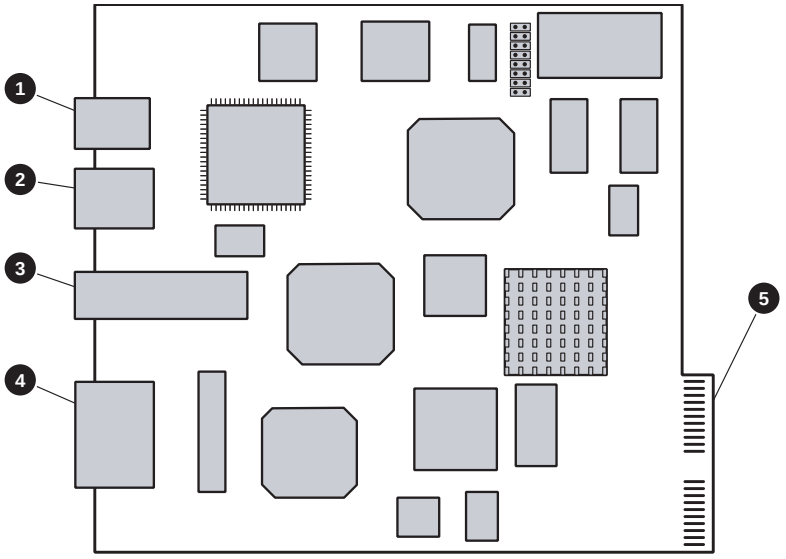



1. J19 - Touchscreen
2. J16 - LCD
3. J13 - Upper right LTO magazine opto sensor
4. J18 - Lower mail slot lock
5. J15 - Upper mail slot lock
6. J14 - Left door solenoid
7. J10 - Right door solenoid
8. J9 - Upper right DLT/SDLT magazine opto sensor
9. J7 - Lower right LTO magazine opto sensor
- J5 - Front panel LED

q J4 - Lower right DLT/SDLT magazine opto sensor
w J1 - Touchscreen serial port interface
e J2 - Upper magazine/mail slot interlock
r J3 - Lower left LTO magazine opto sensor
t J3 - Lower left LTO magazine opto sensor
y J8 - Upper left LTO magazine opto sensor
u J12 - Upper left DLT/SDLT magazine opto Sensor
i J11 - Lower magazine/mail slot interlock

**Figure 155: Control panel board**

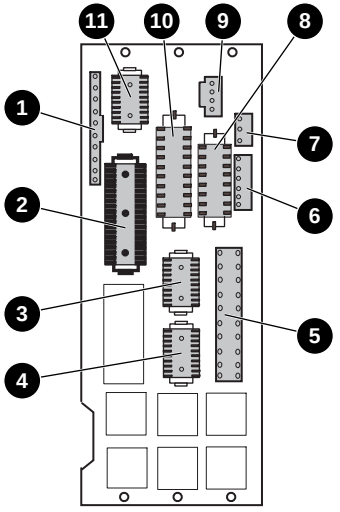
## Fibre Channel Card




1. Serial RJ-11 connector
2. Ethernet RJ-45 connector
3. Fibre Channel port
4. SCSI VHDCI connectors
5. Card cage/backplane connector

**Figure 156: Fibre Channel card**

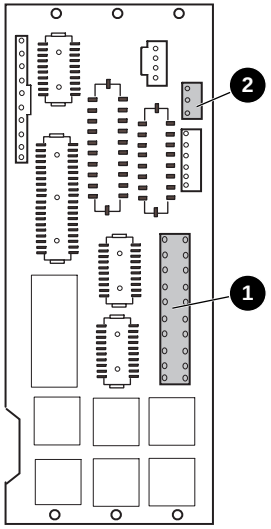
## Card Cage/Backplane Board




1. J12 - Rotating track opto sensor
2. J2 - Touchscreen
3. J10 - Drives 0/1 serial port interface
4. J9 - Drives 2/3 serial port interface
5. J4 - Main power
6. J8 - PTM opto sensor
7. J11 - Upper fan
8. J7 - Power serial port interface
9. J5 - Robotics serial port interface power
- J1 - Vertical axis serial port interface
q J6 - Robotics serial port interface

**Figure 157: Card cage/backplane board**

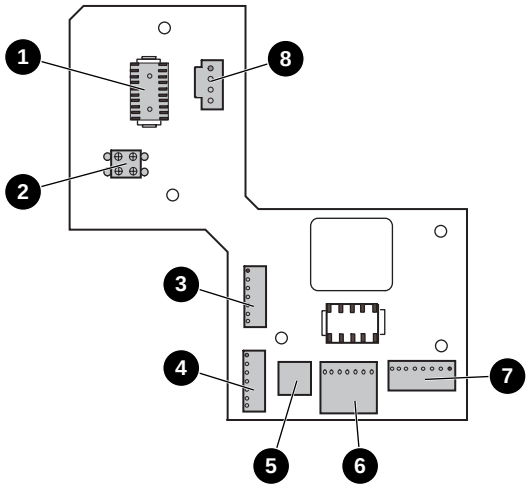
## Card Cage/Backplane Expansion Board




1. J4 - Main power
2. J11 - Lower fan

**Figure 158: Backplane expansion board**

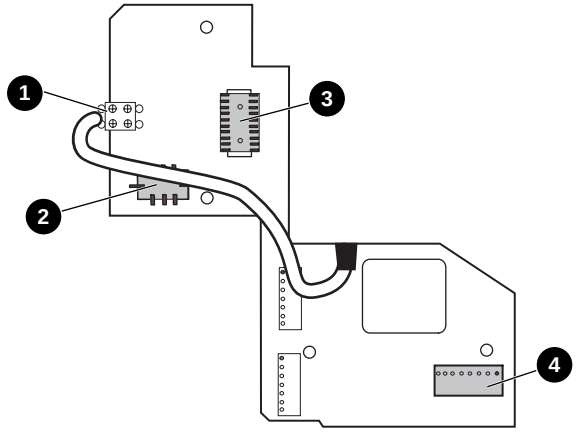
## Shuttle Assembly Board




1. J3 - Flex signal
2. J8 - Cartridge sensor
3. J7 - Picker motor
4. J6 - Shuttle motor
5. J2 - Shuttle parking brake
6. J5 - Bar code reader
7. J1 - Track zone sensor
8. J9 - Main power

**Figure 159: Shuttle assembly board**

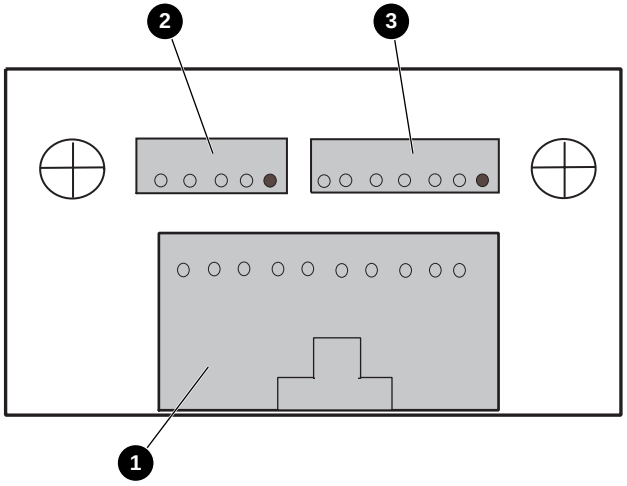
## Shuttle Assembly Board (LTO-compatible)




1. J10 - Bar code reader
2. J2 - Main power
3. J5 - Flex signal (robot)
4. J1 - Track zone sensor

**Figure 160: Shuttle assembly board (LTO-compatible)**

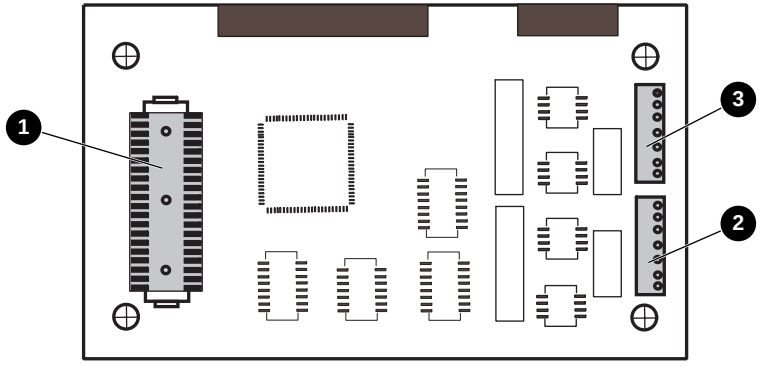
## Mono Track Interface Board




1. J1 - Rotating track opto
2. J2 - Track rotation
3. J3 - Rotate home opto sensor

**Figure 161: Mono track interface board**

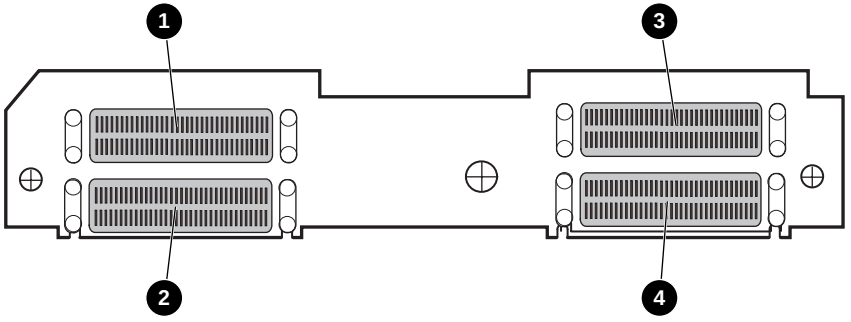
## Vertical Axis Assembly Board




1. J2 - Forward vertical axis assembly
2. J3 - Aft vertical axis assembly
3. J1 - Power

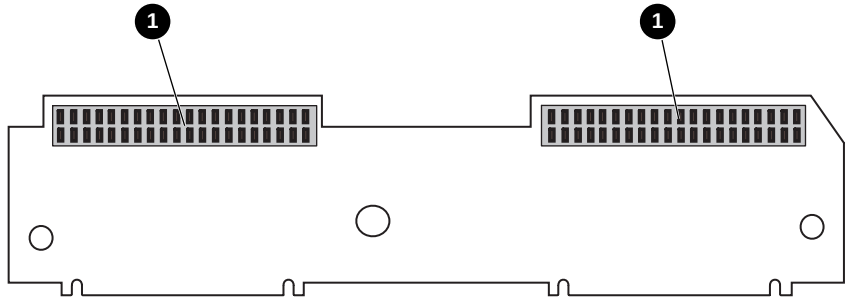
**Figure 162: Vertical axis assembly board**

## Upper and Lower Very High Density I/O SCSI Boards




1. J2 - Drive 1 or 3 SCSI data
2. J1 - Drive 1 or 3 SCSI data
3. J4 - Drive 0 or 2 SCSI data
4. J5 - Drive 0 or 2 SCSI data

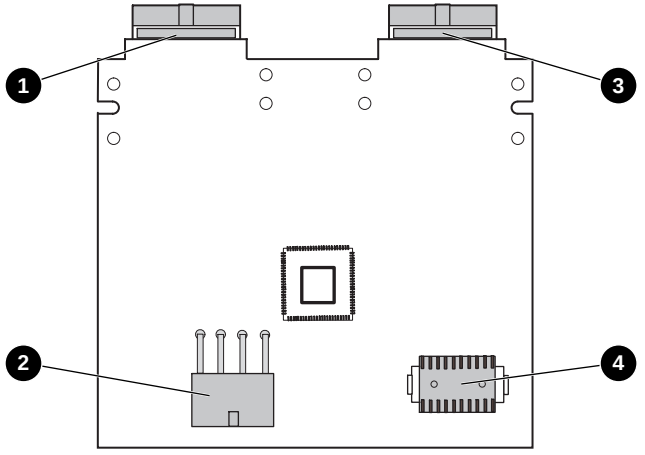
**Figure 163: I/O SCSI board (bottom side)**




1. J6 - Drive 0 or 2 to I/O SCSI board
2. J3 - Drive 1 or 3 to I/O SCSI board

**Figure 164: I/O SCSI board (top side)**

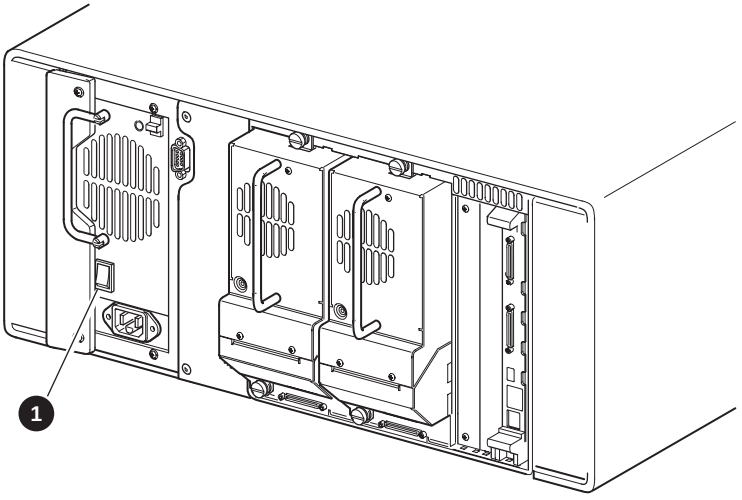
## Library Board




1. J2 - Drive 1
2. J4 - Power
3. J1 - Drive 0
4. J3 - Drive control

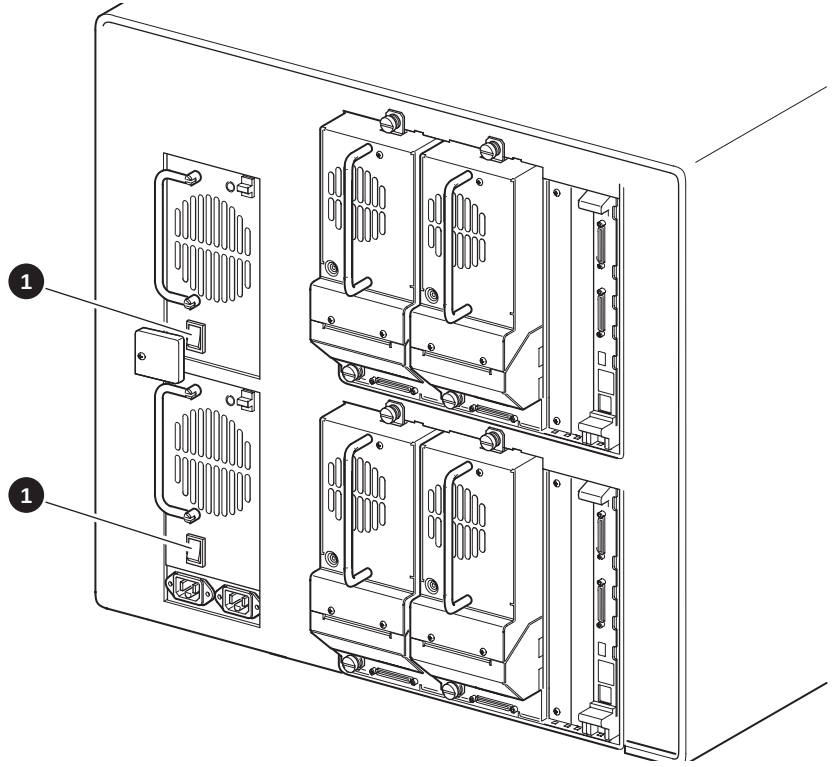
**Figure 165: Library board**

# Power Supply Switches




1. Power on/off switch

**Figure 166: Master power on and off switch on a two-drive (5U) power supply**




1. Power on/off switch (top)
2. Power on/off switch (bottom)

**Figure 167: Master power on and off switches on four-drive (10U) power supplies**

# LED Indicators

## Power-on LED Indicators on Power Supplies

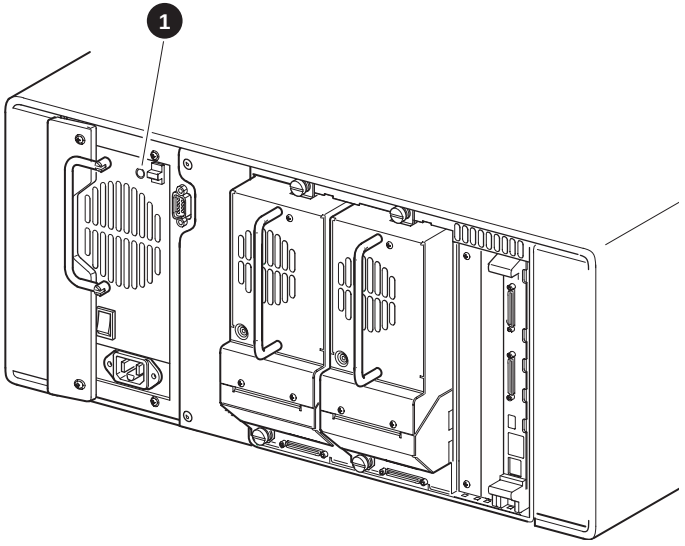



**Figure 168: Power-on LED indicator on a two-drive (5U) power supply**

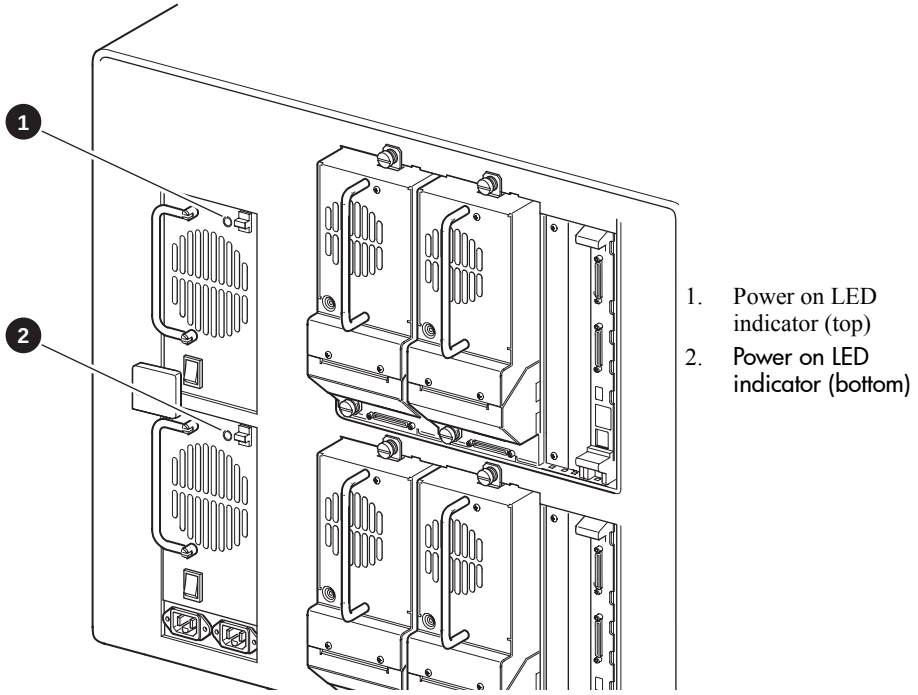
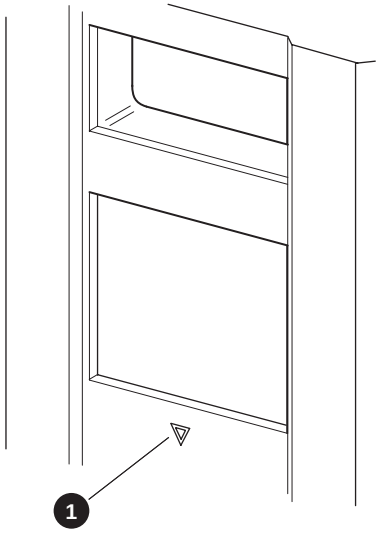



**Figure 169: Power-on LED indicators on four-drive (10U) power supplies**

# Library Status LED Indicator




1. Library status LED indicator

**Figure 170: Library status LED indicator**

Table 10 explains what the different LED displays indicate on the Library status LED indicator.

**Table 10: Library Status LED Activity Descriptions**

| LED Color | LED Activity | Activity Description |
|---|---|---|
| Green | Solid | • The library is on-line and ready. |
| Green | Flashing | • The library is off-line.<br>• The library is performing an operation. |
| Amber | Solid | • The library is in a fault state as detailed by the error message on the LCD touch display.<br>• The library is powered off and in a standby mode. |
| Amber | Blinking | • The library is in the process of powering up.<br>• The library is waiting for power supply to be turned on. |

# Applying the New Box-Swap Strategy to MSL6030 Models

# 9

This chapter provides information you will need when removing and replacing Field Replaceable Units (FRUs) for LTO Ultrium-based Two-Drive (5U) MSL6030 Tape Library models.

This chapter covers the following topics:

- Identifying Field Replaceable Units (FRUs)
- Removing and Replacing the Tape Library
- Removing and Replacing a Tape Drive
- Removing and Replacing a Magazine
- Removing and Replacing the Fibre Channel Card

---

**Note:** This chapter provides only service information for box-swap MSL6030 library models. See Replacing Two-Drive (5U) Model Electrical Components on page 51 and Replacing Two-Drive (5U) Model Mechanical Parts on page 95 for additional information about replacing parts and components for existing two-drive (5U) tape libraries.

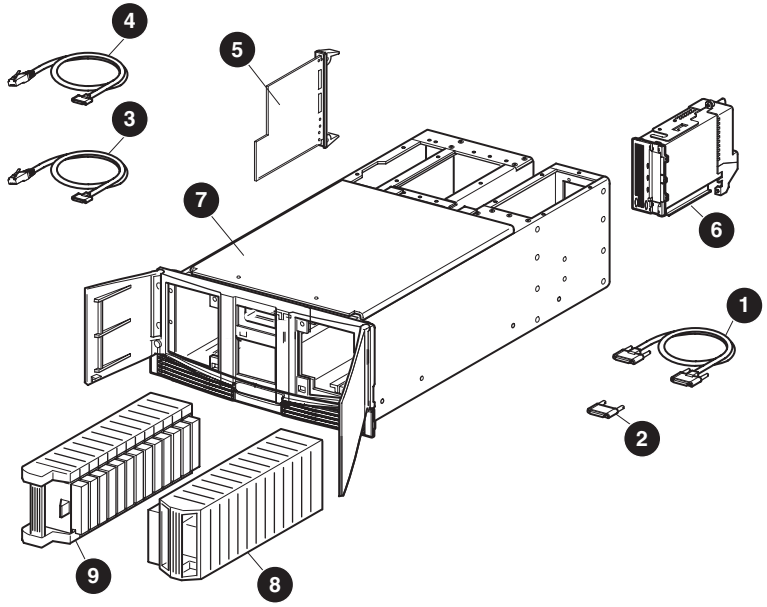
---

**WARNING:** Before replacing any electrical or mechanical spare parts or components for two-drive (5U) MSL6030 models (Figure 171), verify the correct SKU is listed in Table 11.

---

**Table 11: SKUs for Two-Drive (5U) MSL6030 Models**

| SKU | Description | Drive Technology |
|---|---|---|
| AD597A | HP MSL6030 0 Drive Library | LTO 2 |
| AD598A | HP MSL6030 1 Ult 460 Dr Library | LTO 2 |
| AD599A | HP MSL6030 2 Ult 460 Dr Library | LTO 2 |
| AD600A | HP MSL6030 1 Ult 460 Dr FC Library | LTO 2 |
| AD601A | HP MSL6030 2 Ult 460 Dr FC Library | LTO 2 |
| AD606A | HP MSL6030 1 Ult 960 Dr Library | LTO 3 |
| AD607A | HP MSL6030 2 Ult 960 Dr Library | LTO 3 |
| AD608A | HP MSL6030 1 Ult 960 Dr FC Library | LTO 3 |
| AD609A | HP MSL6030 2 Ult 960 Dr FC Library | LTO 3 |




1. SCSI very high density cable, 0.5 m (1.64 ft)
2. Very high density SCSI terminator (LVD)
3. Library serial cable - RJ11-089
4. Fibre Channel serial cable
5. Fibre Channel card Ultra3 SCSI (optional)
6. Tape drive (LTO3 or LTO2)
7. MSL6000 Chassis
8. Right Magazine (LTO compatible)
9. Left Magazine (LTO compatible)

**Figure 171: FRUs for the MSL6030 Tape Library Models**

**Note:** FRUs for LTO2 and LTO3 tape drives do not offer hot-plug capability.

# Identifying Field Replaceable Units

The MSL6030 Two-Drive (5U) Tape Library utilizes fewer FRUs than legacy MSL5000 and MSL6000 Series libraries. Instead of repairing numerous parts in the field, including drives, magazines, HP unique controllers, cables, and terminators, limited FRUs are available for removal and replacement. If a supported FRU does not make the tape library operational, the unit should be returned to the factory for replacement. This is known as the box-swap strategy.

Only FRUs on the following list should be replaced:

**Table 12: Part Numbers for MSL6030 Field Replaceable Units**

| Spare Part Number | Description | Backward Compatible |
|---|---|---|
| 390302-001 | Tape Drive - LTO3 (no hot-plug) | Yes |
| 390834-001 | Tape Drive - LTO2 (no hot-plug) | Yes |
| 390304-001 | MSL6000 Chassis | No |
| 390307-001 | Right Magazine - LTO | Yes |
| 390308-001 | Left Magazine - LTO | Yes |
| 320101-001 | Fibre Channel Card Ultra3 SCSI (optional) | Yes |
| 231687-002 | Very High Density SCSI Cable .5M (male to male) | Yes |
| 231683-001 | Veriy High Density SCSI Terminator (LVD) | Yes |
| 252850-001 | Library Serial Cable RJ11-DB9 | Yes |
| 300576-001 | Fibre Channel Serial Cable | Yes |

# Removing and Replacing the Tape Library

To remove the library for replacement:

1. See the Preparing for Service on page 31 to review all warnings.
2. Exit the application software from the host touch screen on the front of the library.

3. Open the doors at the front of the library using the GUI touch screen and loosen the retaining screws that secure the front panel.
4. Remove both tape magazines from the front of the tape library.
5. Disconnect all SCSI cables and terminators from each SCSI target on the rear of the library.
6. Using the GUI touch screen, turn the library off. Turn off the master power switch on the power supply at the rear of the library, and then remove the AC power cord.

WARNING! Before continuing the removal and replacement of the tape library, disconnect power from the library to avoid equipment damage and personal injury as a result of electrical shock.

7. Remove tape drives from the rear of the library.
8. Remove option cards from the rear of the library if present.
9. Using two people, lift the library out of the rack and select a flat, sturdy, and level location to place it.
10. Use replacement packaging or original packing materials (if available) to repackage the library for shipping.

To replace the library:

1. Unpack the library near the empty rack at a location that is flat, sturdy, and level.

   NOTE: Save the packing material for use in moving and shipping the library in the future.

2. Using two people, lift the library and visually align the inner and intermediate slide rails with the library.
3. Carefully insert the library's inner slide rails into the extended intermediate slide rails.
4. Slide the library into the rack enclosures until the rail locks are engaged.
5. Level the rear of the library and fully tighten the rear rail screws.
6. Remove the tape securing the library doors in place at the front of the library.
7. Remove and discard the pull-tabs used to block the latch mechanism when closing the doors.
8. Secure the front panel to the rack enclosure using the retaining screws and then close the doors.

9. Install tape drive and option cards at the rear of the library.
10. Install the magazines at the front of the library. See Removing and Replacing Magazines on page 350.
11. Connect each tape drive and library controller at the rear of the library to a separate SCSI target.

    NOTE: See the HP StorageWorks MSL6000 Series Tape Library Setting up Your Library poster for detailed set up and connection guidelines. The set up poster can be downloaded from http://www.hp.com/support

12. Connect the power cord and turn on the master power switch for the power supply.

**Note:** If the library fails to power up, turn the library on by touching the GUI touch screen on the front of the library.

13. After you install and configure the library, refer to the HP StorageWorks MSL6000 Series Tape Library for more information on setting the mailslot, SCSI IDs, library IP address, and changing the default password and configuring the application software.

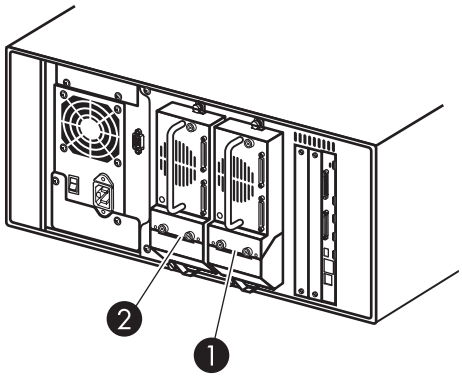
## Removing and Replacing a Tape Drive

**Note:** This part is not hot-pluggable. Before installing the drive, you must take it off line using the library GUI touch screen.

Tape drives are mounted at the rear of the library. The library must remain offline until the replacement tape drive has been installed.

To remove a drive:

1. Using your application software or the library GUI touch screen, unload any tape cartridge from the drive you want to remove.




1. Drive 0
2. Drive 1

**Figure 172: Drive shoe assembly with tape cartridge**

2. Using the GUI touch screen, deactivate the tape drive to be removed by choosing **Menu** > **Maintenance** > **Replace Drive** > **Deactivate Drive** *n*. The screen changes to indicate that Drive *n* can be removed.
3. Make sure that the LED on that tape drive is off.
4. Remove the cabling and terminators from the tape drive.
5. Loosen the two captive thumbscrews at the top center and lower left of the tape drive (see Figure 173).

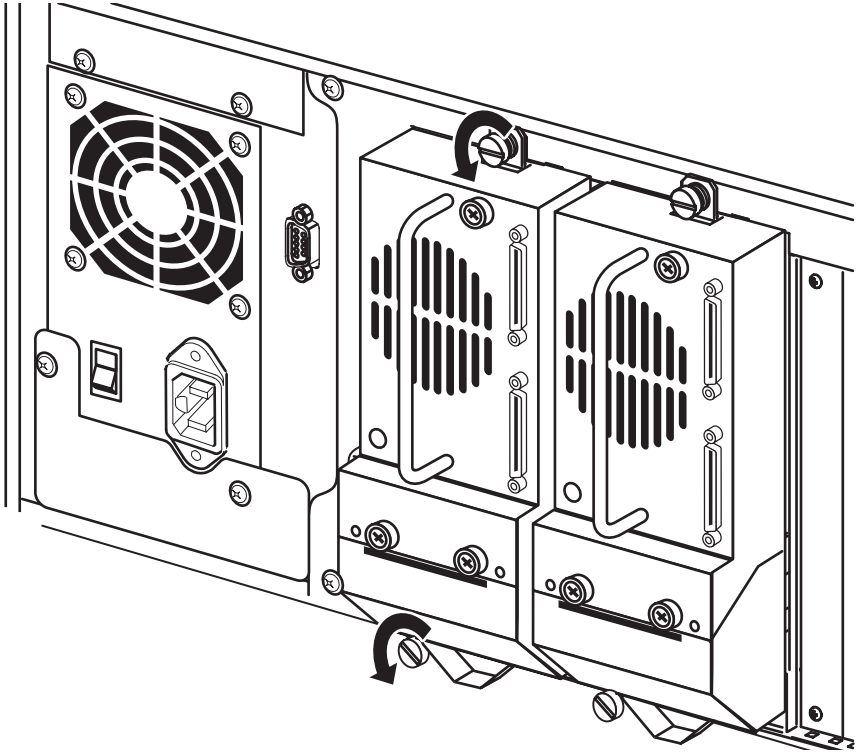


**Figure 173: Loosening captive thumbscrews**

6. Pull straight back on the tape drive handle to remove it from the library. (see Figure 174)

---

**Note:** Some effort is required to overcome the initial resistance of unplugging the drive from the receiver.

---

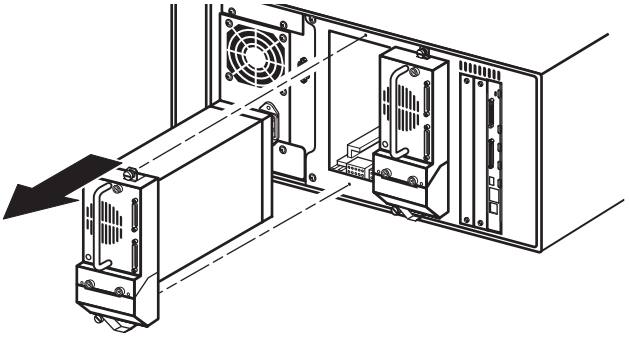


**Figure 174: Removing a tape drive**

To replace a tape drive:

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**Note:** If you are upgrading to a new drive technology, use *L&TT* to upgrade the library firmware before installing the new tape drive. *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

---

1. Before installing the new drive, inspect the connectors on the tape drive. Ensure that the connectors are intact, are free of any foreign objects, and have no cracks or deformed contacts.
2. Slowly insert the new tape drive into the mounting bay while you align the connectors on the tape drive with the connectors on the library.

   NOTE: For optimum performance, Ultrium 960 and 460 drives should be configured with one drive per bus.

3. Tighten the two captive thumbscrews on the top and bottom of the tape drive.
4. Connect cables on the tape drive to the library. If you are adding a new tape drive to your library, or if you are upgrading an existing drive, be sure to use supported cabling configurations.

---

**Note:** See Appendix B Configuration Examples on page 367or refer to the *HP StorageWorks MSL6000 Series Tape Libraries User Guide* for more information. The user guide can be downloaded from http://www.hp.com/support.

---

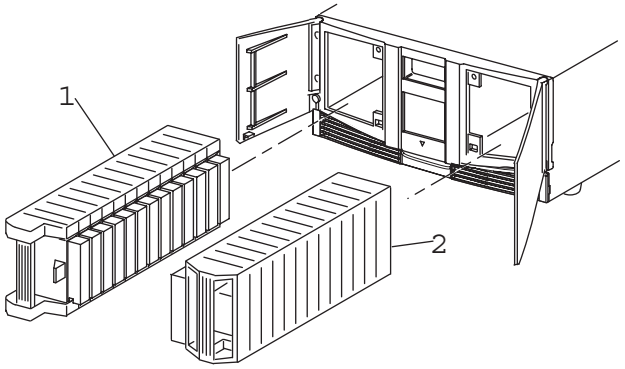
5. Use *L&TT* to upgrade the drive to the latest firmware.

**Note:** *L&TT* is available for download at the following HP website at no cost: http://www.hp.com/support/tapetools.

**Note:** You may need to reconfigure your software application. Drive serial numbers might be used for configuration and to assign drives to the library.

## Removing and Replacing Magazines

MSL Series tape libraries contain two removable tape cartridge magazines that are accessible through the front doors (see Figure 175).




1. Left Magazine(s), with integrated mail slot
2. Right Magazine(s)

**Figure 175: Library magazines**

Looking from the front of the library, the left tape magazine includes a mail slot, which is accessible when that magazine door is open. When this mail slot pivots forward, you can insert or remove a single tape without having to unlock, remove, and reinventory the magazine. If a full tape cartridge magazine is required, the library can be reconfigured to recognize each mail slot as a standard data slot. The right tape magazine contains fixed cartridge slots (no mail slot feature), so it retains its full capacity at all times.

**Note:** The slots and mail slots are numbered beginning with 0: the first slot is Slot 0, the second is Slot 1, etc. LTO magazine maximum capacity is 30 slots.

To remove a magazine:

1. Go to the front panel GUI touch screen.
2. Select magazine access to automatically open doors.
3. Select the magazine to be replaced from the following: right, left, or both.
4. Remove magazines from library.

To replace the magazine:

1. Move the tape media from the old magazine to the replacement magazine.
2. Reinsert the magazine into the library.
3. Close library doors.

**Note:** The library will do a reinventory of the magazine(s) once the library doors are closed.

## Removing and Replacing the Fibre Channel Card

The Fibre Channel card is a SCSI-to-Fibre Channel card. The card allows libraries to be added to storage area networks (SAN). All the SCSI cables of the library and drives are connected to bridges that then can be connected to a fibre switch or hub.

**Note:** If you are replacing a card, save the configuration settings, if possible by using the FTP user interface.

ftp > **login > bin > get *.cfg <*path*><*filename*>.cfg**

Refer to the *HP StorageWorks Network Storage Router User Guide* for more information.

To remove the Fibre Channel card:

1. Using the LCD touch display, turn the library off. Turn off the master power switch of the power supply at the back of the library, and then remove the AC power cord.

NOTE: This process automatically moves the robot to the parked position. See "Parking the Shuttle Assembly for Service or Shipping" on page 41 for additional information on parking the shuttle assembly.

2. Remove the SCSI interface cable and Ethernet cable (if present). See Figure 176.

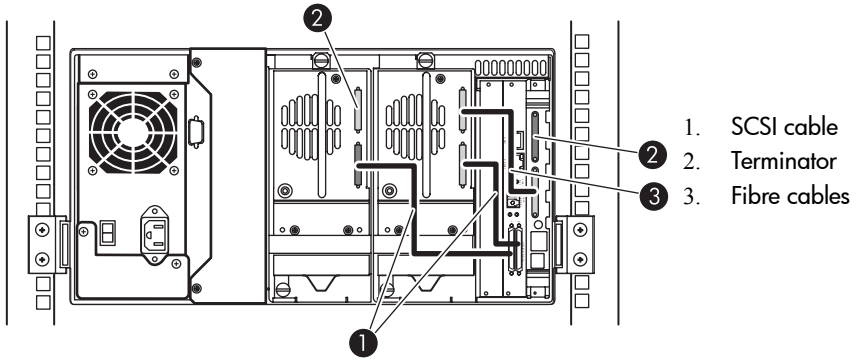



**Figure 176: Cable connections (two-drive, 5U, model)**

3. If you are replacing an existing Fibre Channel card, remove the existing Fibre Channel card.

**Caution:** To avoid damage to the library, ensure that the Fibre Channel cards are installed in the correct option slots. If you are installing one Fibre Channel card, place it in the middle slot next to the controller board.

To replace the Fibre Channel card:

1. Carefully insert the Fibre Channel card into the upper (see Figure 177), and lower guide rails of the appropriate option slot with the SCSI connectors downward.

   NOTE: You will feel some resistance when the Fibre Channel card begins to connect with the library backplane. Apply just enough force to seat the Fibre Channel card firmly to ensure proper connection by rotating the ejector handles inward.

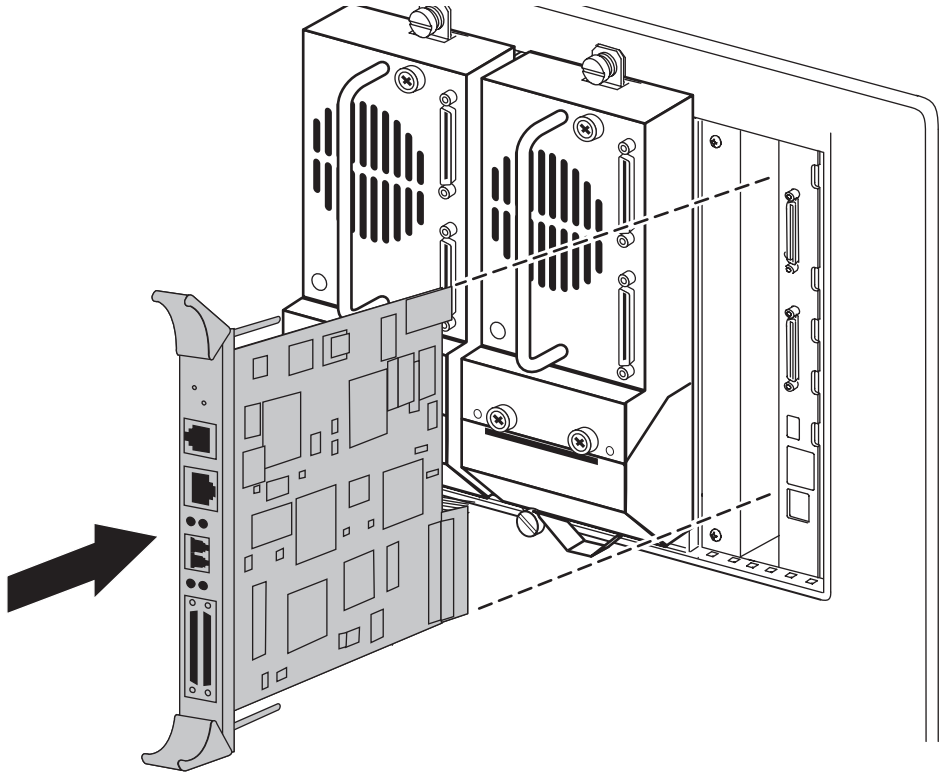


**Figure 177: Inserting the new Fibre Channel card**

2. Tighten the board captive screws (see Figure 178).

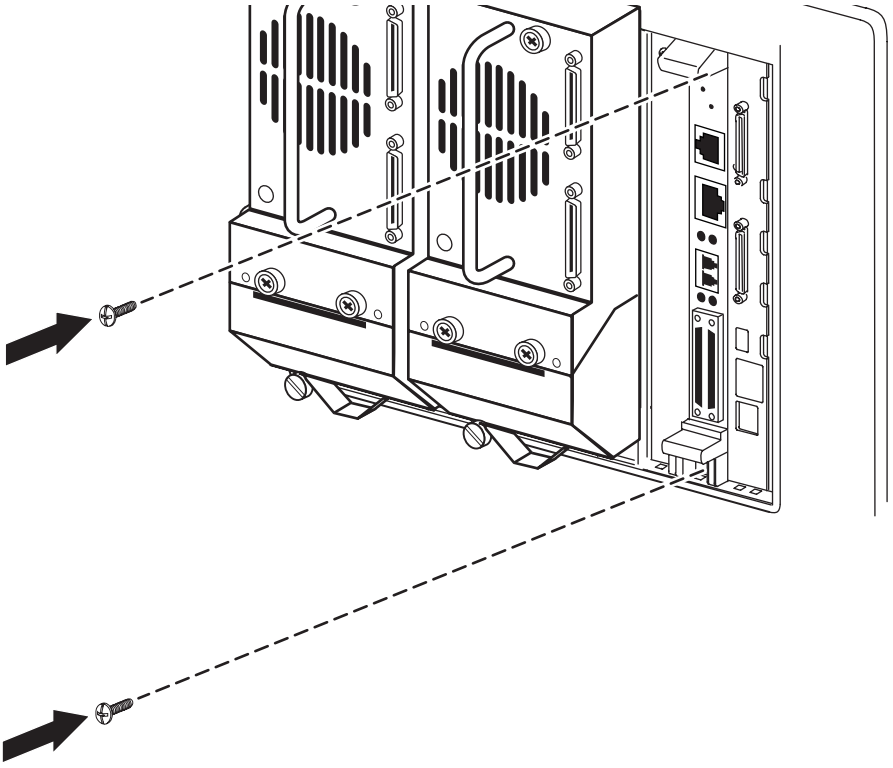


**Figure 178: Tightening board captive screws**

3. Reconnect the cables disconnected in step 2 on page 352. Connect the cables to the Fibre Channel card (see Figure 176).
4. Connect each power cord, and then turn on the master power switch for the power supply. If necessary, turn the library on by touching the LCD touch display.
5. Configure the Fibre Channel card.

   NOTE: Refer to the ***HP StorageWorks Network Storage Router User Guide*** for detailed procedures on configuring the Fibre Channel card.

   a. Cable up the serial interface, and use your host application to communicate over the serial bus.

      The defaults are: 115200 Bits per second, 8 Data bits, No Parity, 1 Stop bit, and Xon/Xoff Flow Control.

b. Use the serial user interface to set the Ethernet configurations (DHCP, IP address, Subnet, and Gateway).

   Choose Configuration > Ethernet and SNMP Configuration.

c. Save Configuration.

   Choose Configuration > Ethernet and SNMP Configuration.

d. Reboot the Fibre Channel card.

   Choose **Main Menu**.

e. Document the Fibre Channel card IP address

   Choose **Configuration > Ethernet and SNMP Configuration**.

f. Enter the Visual User Interface by opening your web browser and entering the Fibre Channel card IP address.

   The defaults are: Logon-root Password-password.

g. Set the Real-Time Clock.

   Choose **System > Real-Time Clock**.

h. Set the Fibre Channel port Performance Mode (1GB or 2GB, depending on the hardware to which the Fibre Channel card is connected. The Fibre Channel card is not auto switching).

   Choose **Ports > FC Port**.

i. Assign Port 0 Device Map to the hosts that need to communicate with the library.

   Choose **Mapping**.

j. Choose **Port 0 Device Map**, and click **Edit/View**.

   Choose **Mapping**.

k. Set the Fill Map Priority to Bus/Target and Fill Map.

   Choose **Mapping > Select Map > Edit/View**.

l. For SCSI Ultra 3 drives (for example, Ultrium 960 and Ultrium 460), configure only one drive per SCSI bus.

   Choose **Mapping > Select Map > Edit/View**.

m. Active Fabric (AF) should be the last LUN used on the map. Do not move AF to map LUN 0. (The device-specific LUN=0 is normal.

   Choose **Mapping > Select Map > Edit/View**.

n. Remove Gaps in the LUN sequence.

Choose **Mapping > Select Map > Edit/View**.

o. Reboot the Fibre Channel card.

Choose **Reboot**.

6. Complete the following substeps for direct connect (point-to-point) configurations:

a. Set Port Mode to `Auto Sense`.

Choose **Ports > FC Port**.

b. Set Hard AL_PA to `Enable`.

Choose **Ports > FC Port**.

c. Click **Set AL_PA** to select any available AL_PA. The only other used AL_PA should be the host bus adapter (HBA). Using a high number will help to avoid potential conflicts.

Choose **Ports > FC Port**.

d. Reboot the Fibre Channel card.

Choose **Reboot**.

# Vertical Axis Alignment

A

You must perform the vertical axis alignment procedure after removing and replacing the shuttle assembly robotics, front vertical axis, or rear vertical axis assemblies.

After performing the removal and replacement procedures outlined in the Replacing Two-Drive (5U) Model Electrical Components chapter on page 49:

1. Connect the power cords to the power supply receptacles.
2. Turn on the power switches located on the power supplies.
3. Press anywhere on the LCD touch display to view the **Initialization** screen.

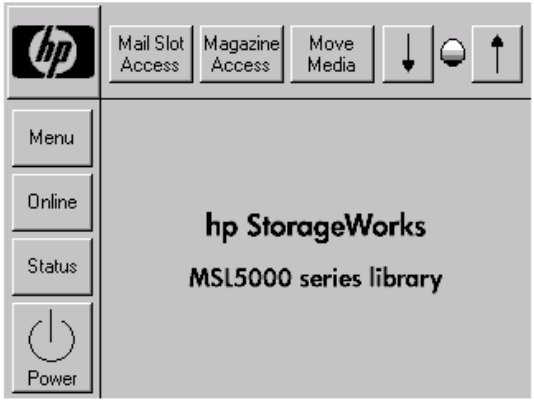



**Figure 179: Initialization screen (for the MSL5000 Series library)**

**Note:** The **Initialization** screen displays the appropriately for the library series in use.

4. Press **Menu**.

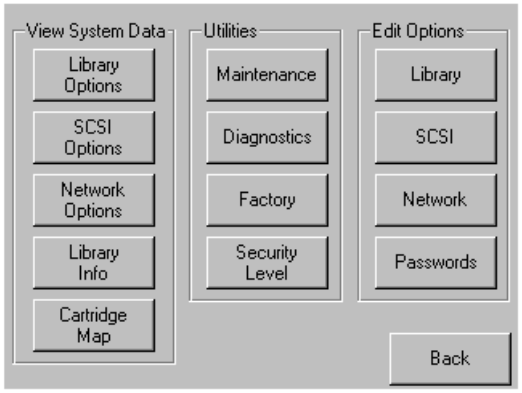



**Figure 180: Menu options**

5. Press **Diagnostics**.

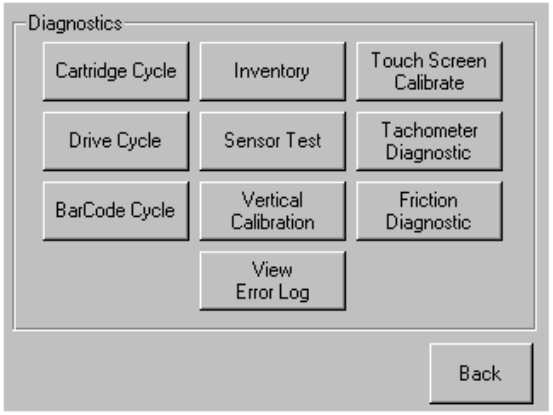



**Figure 181: Diagnostics options**

6. Press **Vertical Calibration**.

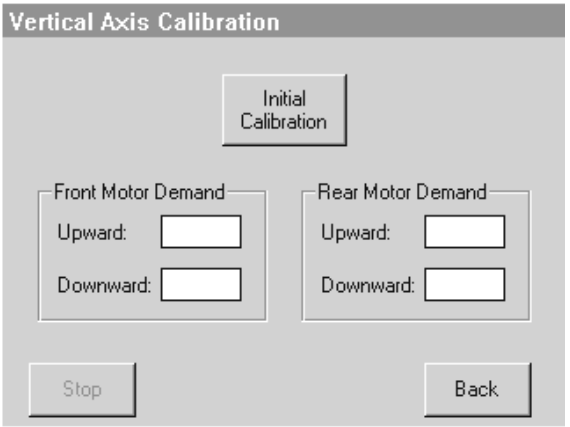



**Figure 182: Vertical Axis Calibration window**

7. Press **Initial Calibration**.

---

**Note:** After pressing **Initial Calibration**, the library runs for ten cycles and the **Upward** and **Downward** windows will display demand results as each cycle is completed. At the completion of this phase of the test, the **Front and Rear Motor Demand** boxes display demand averages, and the **Initial Calibration** LCD touch display button changes to **Final Calibration**. The robotics assembly will also be positioned halfway to the upper magazine track (allows easier access to tighten the screw rail foot screws).

---

8. Hand-tighten the 4 mounting screws of each screw rail in the sequence shown. For the rear vertical axis assembly, seat the flex cable carrier clamp against the screw rail when tightening screw labeled 4.

9. Torque tighten the 4 mounting screws of each screw rail in the sequence shown. For the rear vertical axis assembly, seat the flex cable carrier clamp against the screw rail when tightening screw labeled 4.

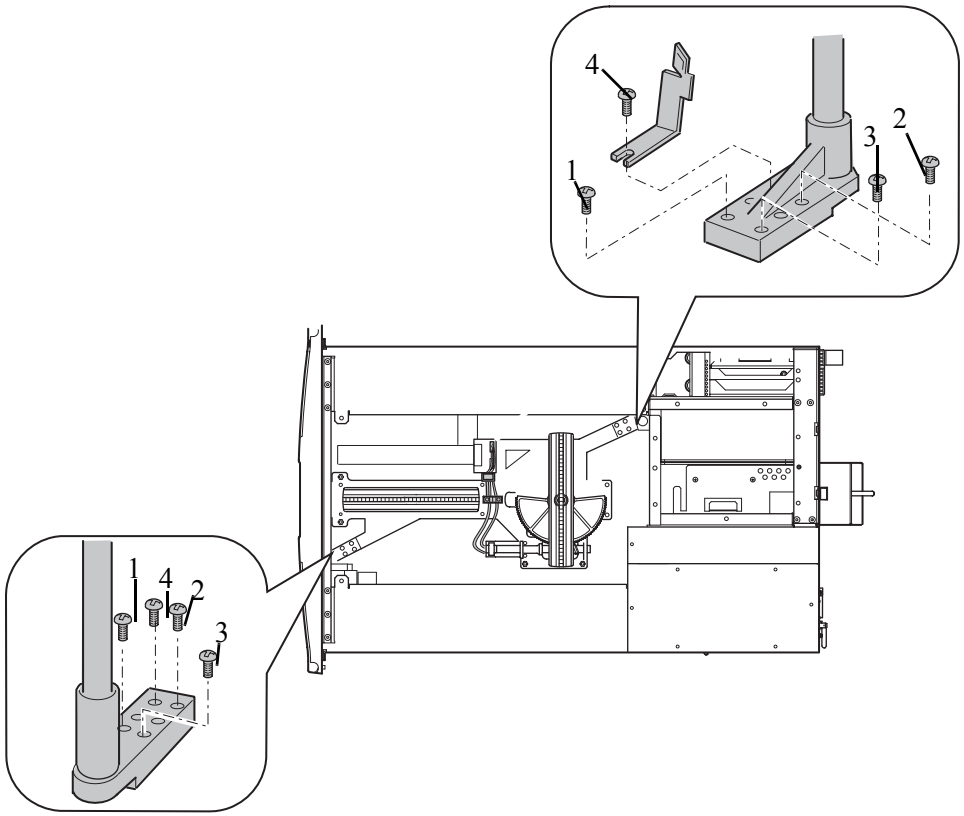



**Figure 183: Mounting screw sequence**

10. Press **Final Calibration.**

---

**Note:** After pressing **Initial Calibration**, the library runs for ten cycles and the **Upward** and **Downward** windows will display demand results as each cycle is completed. At the completion of this phase of the test, the **Front and Rear Motor Demand** boxes display demand averages, and the **Initial Calibration** LCD touch display button changes to **Final Calibration**.

---

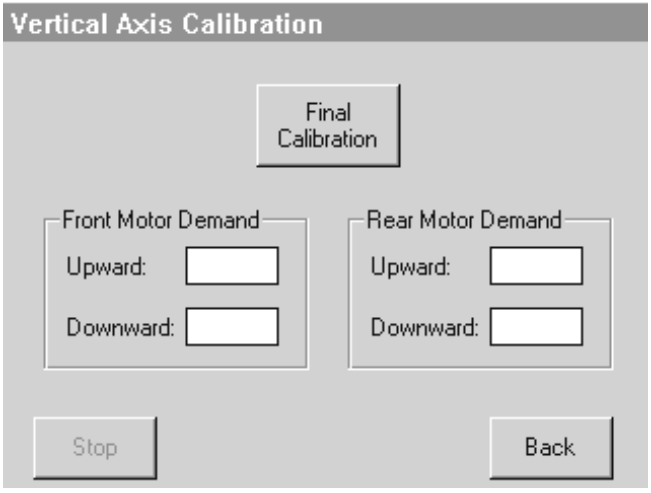



**Figure 184: Final Calibration window**

11. Verify that the Front and Rear Motor Demand results are less than 100 in all display boxes.

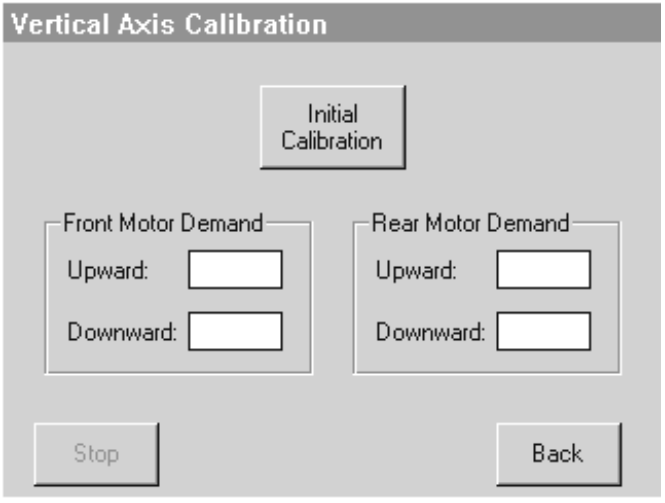



**Figure 185: Initial Calibration window**

**Note:** If the motor demand results are above 100, repeat the alignment procedure (first loosen the screw rail foot screws as described in the R & R procedure before repeating the calibration test). If correct values are not attained after several calibration attempts contact Technical Support.

12. Press **Back** three times.
13. Replace the magazines.
14. Press **Power**, and then **OK** to power down the unit.

**Figure 186: Main screen**

15. Return to the applicable Vertical Axis procedure.

# Configuration Examples

# B

This appendix illustrates potential SCSI cabling configurations using SDLT 600, LTO 2 (new) and LTO 3 tape drives.

---

**Note:** For a more comprehensive set of SCSI cabling configurations, go to http://www.hp.com/support.

---

# SCSI Cable Configurations

Use the following guidelines when configuring your SCSI cables:

- Use the highest quality SCSI cables.

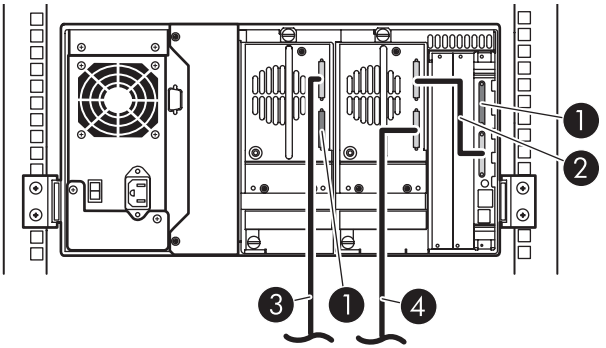
**Note:** Bus errors caused by excessive length or poor quality cables can significantly degrade performance and reliability.

- Each of the tape drives in the library, and the library controller constitute a separate SCSI target. When any two or more devices are connected to the same SCSI bus, each separate SCSI device must be assigned a unique SCSI ID.
- SCSI IDs are set at the factory. Use the GUI touch screen to change any of the factory defaults.
- To connect a library to a host, the host must have at least one Wide LVD controller and the appropriate driver software.

**Note:** The Single-Ended SCSI interface has a lower performance than LVD SCSI, and also has shorter cable requirements.

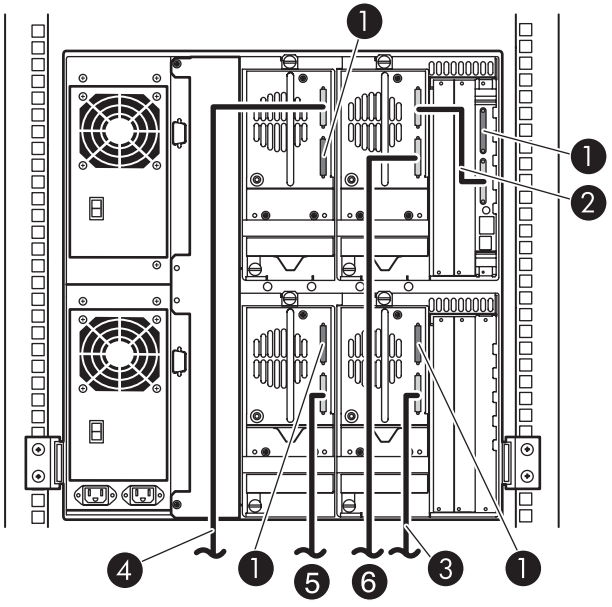
- For optimal performance, do not attach more than two drives per SCSI bus.

# Configuration Examples



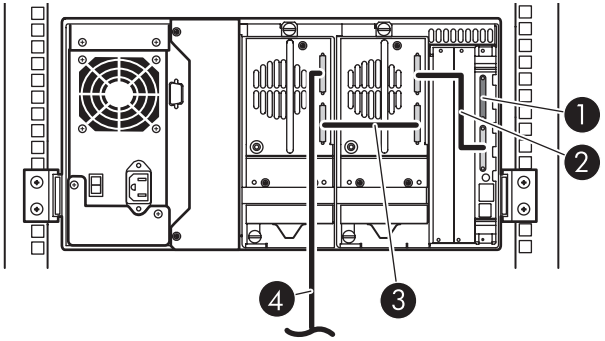

1. SCSI Terminator
2. 0.5 m cable (to library controller card)
3. Host cable (Bus 1, to host system)
4. Host cable (Bus 0, to host system)

**Figure 187: MSL6030/MSL6026, 2 hosts/2 drives**




1. SCSI Terminator
2. 0.5 m cable (to library controller card)
3. Host cable (Bus 1, to host system)
4. Host cable (Bus 3, to host system)
5. Host cable (Bus 2, to host system)
6. Host cable (Bus 0, to host system)

**Figure 188: Single MSL6060/MSL6052, 4 hosts/4 drives**



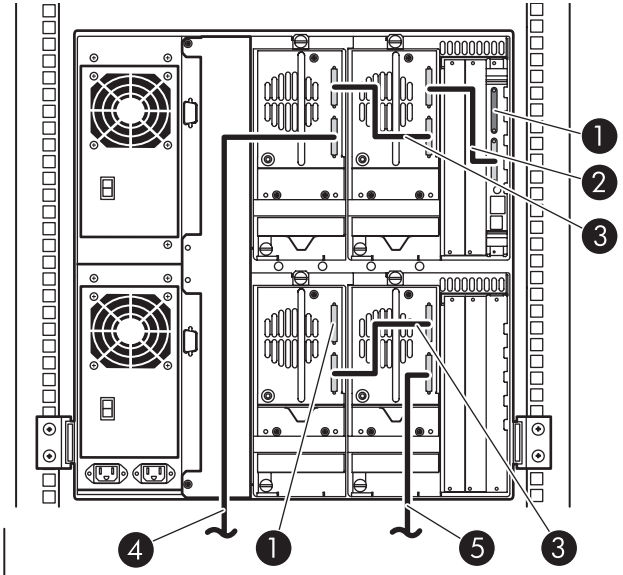

1. SCSI Terminator
2. 0.5 m cable (to library controller card)
3. 0.5 m cable
4. Host cable (Bus 0, to host system)

**Figure 189: Single MSL6030/MSL6026, 1 host/2 drives**

---

**Note:** The configuration shown in Figure 189 is not recommended for Ultrium 460 or 960 tape drives, due to performance downgrade.

---




1. SCSI Terminator
2. 0.5 m cable (to library controller card)
3. 0.5 m cable
4. Host cable (Bus 0, to host system)
5. Host cable (Bus 1, to host system)

**Figure 190: MSL6060/MSL6052, 2 hosts/4 drives**

**Note:** The configuration shown in Figure 190 is not recommended for Ultrium 460 or 960 tape drives, due to performance downgrade.

# glossary

This glossary defines terms used in this guide or related to this product and is not a comprehensive glossary of computer terms.

**10Base-T**
An IEEE specification that requires the use of unshielded twisted pair wiring and a speed of 10Mbps for networking purposes.

**AL_PA**
Arbitrated Loop Physical Address. A 1-byte value used to identify a port in an arbitrated loop topology.

**American National Standards Institute**
*See* **ANSI**.

**ANSI**
American National Standards Institute. A voluntary organization that originates standards for the computer industry.

**arbitrated loop**
A Fibre Channel topology consisting of a ring of ports, where the transmit output of one port is attached to the receive input of the next. Each port has a unique loop address, and it communicates to other ports on the loop by arbitrating for the loop access. Loop addresses are assigned through cooperative port intercommunication during loop initialization, which occurs any time the device configuration on the loop is physically changed.

**backplane**
The storage system electronic printed circuit board into which storage system devices can be plugged.

**bandwidth**
The measure of the capacity of a communications channel. Analog telephone lines measure capacity in hertz, the difference in the highest and lowest frequency of the channel. Digital channels measure bandwidth in bits per second.

### bay
The physical location of an element, such as a drive, I/O module, EMU, power supply, and so forth, in an enclosure.

### blower
An airflow device used to extract heat outside of a device.

*See also* **fan**.

### board
A printed circuit assembly (PCA). Also called a card or adapter.

### bulk load
A method of loading magazine slots with tapes. Usually refers to the initial loading of the library.

### bus
- A collection of wires through which data is transmitted from one part of a computer to another.
- In networking, a central cable that connects all devices on a local area network (LAN).

### byte
Binary term. A unit of storage capable of holding a single character. A byte is equal to 8 bits.

### calibration
A routine that is run immediately after a tape cartridge is loaded. The routine determines if the tape is blank or written, compatible with the drive, and capable of being written and read.

### cartridge
The plastic housing around a cartridge tape. A plastic leader block is attached to the tape for automatic threading when loaded in a transport. The spine of the cartridge contains a label listing the volume identification number.

### catalog
The inventory of all tape cartridge storage locations in the tape library.

### cell
The slot in the tape library that is used to store a tape cartridge.

### device
In its physical form, a magnetic or optical disk drive, magnetic tape drive, or CD-ROM drive that can be attached to a SCSI bus. A device provides a host with large amounts of addressable storage capacity.

### diagnostic tests
A procedure that is carried out through software or hardware programs used to troubleshoot and run offline checks of tape and tape library operability.

### disk
A storage device that uses rotating, magnetic media to store data.

### DLT
Digital Linear Tape. A family of tape devices and media technologies. DLT technology is used mainly for secondary storage in mid-size to large networks. Like Single-Channel Linear Recording (SLR) drives, DLT drives employ linear serpentine recording rather than the helical scan recording style of Digital Audio Tape (DAT). DLT tape has a width of 0.5 inch compared to the 0.315-inch width of SLR tapes.

### drive
The device that the library uses to record data onto tapes.

### drive cleaning
A library feature that uses a cleaning tape to clean a tape drive.

### drive module
The entire assembly that houses the drive, including the metal housing and connectors.

### dual-redundancy
A configuration consisting of a primary device and a backup device. If the primary device fails, the backup device assumes control of the failing device.

### electrostatic discharge
*See* **ESD**.

### enclosure
A specific unit which can accept insertion of storage devices such as disk enclosures, controller enclosures, and so forth.

### ESD
Electrostatic Discharge. The release of static electricity from one conductor to another.

### event
A significant library occurrence (such as drive errors, online/offline transitions, drive cleanings, and other information) that is listed in an automated log.

### fabric
A switched interconnect methodology that supports high-speed data routing in Fibre Channel networks.

### fan
An airflow element mounted in a storage system used to cool storage system components.

*See also* **blower**.

### FC
Fibre Channel. A serial data transfer architecture standardized by ANSI. It was designed for mass storage devices and other peripheral devices (such as workstations, supercomputers, mainframes, data storage devices, and so forth) that require very high bandwidth.

### FC-AL
*See* arbitrated loop.

### Fibre Channel
*See* **FC**.

### front panel display
An LCD that is equipped with soft keys and mounted on the front of the library. The front panel display controls all library functions.

### FRU
Field Replacement Unit. A device that users can replace without using special tools or techniques.

### GB
Gigabyte/Gigabytes. A unit of measurement defining either:

- A data transfer rate

  *See also* **GBps**

- A storage or memory capacity of 1,073,741,824 ($2^{30}$) bytes

### GBps
Gigabytes per second. A measurement of the rate at which the transfer of bytes of data occurs. A GBps is a transfer rate of 1,000,000,000 ($10^9$) bits per second.

*See also* **GB**.

### GUI
Graphical user interface. A computer program that allows a user to communicate with a computer system through a display system that uses symbols, visual metaphors, and pointing devices.

### HBA
Host bus adapter. A circuit board residing in the host system that handles requests to and from the host system and the library. Also called a host interface card.

### host
One or more computers that generate and communicate data to the library.

### host bus adapter
*See* **HBA**.

### host interface card
*See* **HBA**.

### hot pluggable
An HP term used to describe a method of device replacement in which the system remains operational (and does not interrupt data transfer) during device removal and reinstallation. Also called, hot swappable.

### hot-swappable
*See* **hot pluggable**.

### hub
A device that provides a multiple-port loop interconnect system to implement a Fibre Channel arbitrated loop using a distinct physical configuration.

### IEEE
Institute of Electrical and Electronics Engineers. An electronics organization that establishes standards commonly shared by the electronics industry.

### I/O
Input/output. The process by which a computer system moves data (and reads and writes data) through its main memory and an external device or interface such as a storage device, display monitory, or printer.

### K
Kilo. A scientific notation denoting a multiplier of one thousand (1,000).

### KB
kilobyte. A unit of measurement defining either storage or memory capacity.

- For storage, a KB is a capacity of 1,000 ($10^3$) bytes of data.
- For memory, a KB is a capacity of 1,024 ($2^{10}$) bytes of data.

### LAN
Local area network. A computer network (consisting typically of workstations and personal computers) that encompasses a small area, such as a single building or group of buildings. A LAN allows its users to communicate with other user on the network and access data and devices on the network of computers, as well as printers and other devices.

### LCD
Liquid crystal display. A display that consists of segments of liquid crystals whose reflectivity varies according to the voltage applied to them.

### LED
Light emitting diode. An electronic optical device that lights up when electricity is passed to it.

### library
A data storage system that stores electronic data on tape media. Depending on the model, the library can use multiple drive modules.

### light emitting diode
*See* **LED**.

### linear serpentine recording
A tape recording technique that writes the data in linear tracks parallel to the edge of the tape and reverses direction when it reaches either end of the tape to write a new track. Linear serpentine recording allows for faster access to data than a drive that reads and writes in only one direction.

### local area network
*See* **LAN**.

### LTO
Linear Tape-Open. A technology that creates tape devices and media based on common specification, licensing, and compliance standards and allows tape device users to use tape products and media from various sources.

### magazine
A slotted container that resides in the tape drawers and provides individual slots for multiple tape cartridges for storage purposes.

### magazine access
A tape loading or unloading process that involves opening a tape drawer and exchanging one or more magazines.

### MB
Megabyte/Megabytes. A term defining either of the following:

- A data transfer rate

  *See also* **MBps.**
- A measure of either storage or memory capacity of 1,048,576 ($2^{20}$) bytes.

### MBps
Megabytes per second. A measure of bandwidth or data transfers occurring at a rate of 1,000,000 ($10^6$) bytes per second.

### media format
A hiearchal structure written on a tape (such as 36 tracks).

### node
- An addressable entity connected to an I/O bus or network.
- The point at which one or more functional units connect transmission lines.

### offline
A library and drive state that indicates that the library is active and available for functional use.

### online
A library and drive state that indicates that the library it is not active and not available for functional use.

### robot
An electro-mechanical device used to load and move cartridges.

### SCSI
Small Computer System Interface. An American National Standards Institute (ANSI) interface that defines the physical and electrical parameters of a parallel I/O bus used to connect computers and a maximum of 16 bus elements.

### SDLT
Super Data Linear Tape. A DLT tape technology that allows for multigeneration, general-purpose tape storage for enterprise-class servers and Windows NT, Windows 2000, NetWare, OpenVMS, and UNIX operating systems.

### Small Computer System Interface
*See* **SCSI**.

### switch
- A network infrastructure component to which nodes attach.
- A device that provides an interconnect to allow a port to have full communication bandwidth with any other port while other communications are occurring.

### tape
A magnetically-coated strip of plastic on which data is encoded.

### tape drive
A storage device that writes data sequentially in the order in which it is delivered and reads data in the order in which it is stored on the media.

### tape library
- A collection of files.
- A robotic device that loads and unloads tapes from one or more drives.

### TB
Terabyte/Terabytes. A term defining either:
- A data transfer rate

  *See also* **TBps**.
- A measure of either storage or memory capacity of 1,099,511,627,776 ($2^{40}$) bytes.

### TBps
Terabytes per second. A data transfer rate of 1,000,000,000,000 ($10^{12}$) bytes per second.

### Tbyte
An abbreviation for terabyte.

### throughput
The number of I/O requests satisfied per unit of time. Expressed in I/O requests per second (where a request is an application request to a storage system to perform a read or write operation).

### transfer rate
- The speed at which data my be exchanged with the central processor, typically expressed in MBps.
- The speed of data transfer, typically expressed in MBps. The transfer rate depends upon both the bus speed and width.

### Ultra SCSI
A SCSI enhancement that results in doubling the FAST SCSI data throughput speeds to 20 MBps for an 8-bit bus and 40 MBps for a 16-bit bus.

### Ultrium
A high-capacity implementation of the LTO technology that uses a single-reel design with 1/2-inch tape and uses a scalable format, the latest of which is generation 2.

### unit
A container made accessible to a host. A unit may be created from a single disk drive or tape drive.

### VHDCI
Very High Density Cable Interconnect. A 68-pin interface required for UltraSCSI connections.

*See also* **UltraSCSI**.

### Very High Density Cable Interconnect
*See* **VHDCI**.

### volume
A magnetic tape cartridge.

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