Document 95897

L180 Tape Library

Service Manual

L180
Tape Library

Service Manual

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Summary of Changes

EC	Date	Edition	Description
111222	November 1999	First	Initial release.
111468	May 2000	Second	Refer to this edition for a description of the changes.
111640	February 2001	Third	Refer to this edition for a description of the changes.
111680	September 2001	Fourth	Refer to this edition for a description of the changes.
111721	March 2002	Fifth	Changes to this edition include: • Changed the title of Chapter 1: General Information to Introduction. • Combined the information, screen shots, and procedures in Chapter 2: Operator Panel with Chapter 3: Firmware Operation. Changed the title to Chapter 2: Configuration. • Moved the information in Chapter 4: Remote Setup to the Installation Manual PN 95896. • Deleted the Glossary. Refer to the Operator Guide for a list of terms and descriptions. • Updated removal and replacement procedures. • Updated the IBM LTO removal and replacement procedure to include Fibre Channel. • Updated LTO Fibre Channel procedure to include caution when closing the access door to avoid breaking the interface cable. • Added references for Super DLT. • Added references for the LTO CDs. • Combined physical, environmental, and UPS specifications with Appendix A: Theory.

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Preface

This manual describes how to service the L180 Tape Library and is intended primarily for StorageTek service representatives and authorized original equipment manufacturer (OEM) personnel. The service tasks that can be performed include:

- Loading microcode
- Using trouble isolation procedures (TIPs) to help diagnose problems
- Running diagnostic routines
- Replacing field replaceable units (FRUs)

Note: Refer to the specific tape drive publications for information about how to service the drives.

Organization

This manual contains the following information:

Chapter 1 "Introduction" contains an introduction for servicing the L180 Tape Library and the basic components in it.

Chapter 2 "Configuration" provides information about how to update the microcode and configure the library, tape drives, network, and other values.

Chapter 3 "Trouble Isolation Procedures" provides guidelines that help you diagnose and correct operational problems. Also included in this chapter is information about how to run diagnostic tests.

Chapter 4 "Removal and Replacement" provides procedures to remove and replace the field replaceable units (FRUs) within the library.

Appendix A "Theory of Operation" describes the components and operation of the tape library.

Index Assists in locating information in this manual.

Alert Messages

Alert messages call the reader's attention to information that is especially important or that has a unique relationship to the main text or graphic.

Note: A note provides additional information that is of special interest. A note might point out exceptions to rules or procedures. A note usually, but not always, follows the information to which it pertains.

CAUTION:
A caution informs the reader of conditions that might result in damage to hardware, corruption of data, corruption of application software, or long-term health problems in people. A caution always precedes the information to which it pertains.

WARNING:
A warning alerts the reader to conditions that might result in injury or death. A warning always precedes the information to which it pertains.

Conventions

Naming conventions found in this publication for the L180 Tape Library include L180, library, and tape library. Naming conventions for the various tape drives include drives or the specific name and model number for the tape drives, such as 9840 Tape Drive.

Typographical conventions highlight special words, phrases, and actions in this publication.

Item	Example	Description of Convention
Buttons	MENU	Sans serif font; capitalization follows label on product (usually all uppercase)
Commands	Mode Select	Initial cap
Document titles	*System Assurance Guide*	Italic font
Emphasis	*not* or *must*	Italic font
File names	`fsc.txt`	Monospace font
Hypertext links	Figure 2-1 on page 2-5	Blue (prints black in hardcopy publications)
Indicators	*Open*	Italic font; capitalization follows label on product (usually initial caps)
Jumper names	TERMPWR	All uppercase

Item	Example	Description of Convention
Keyboard keys	<Y> <Enter> or <Ctrl+Alt+Delete>	Sans serif font; capitalization follows label on product (usually initial caps); enclosed within angle brackets
Menu names	Configuration Menu	Capitalization follows label on product; usually title caps
Parameters and variables	Device = *xx*	Italic font
Path names	`c:/mydirectory`	Monospace font
Port or connector names	SER1	Capitalization follows label on product; otherwise, all uppercase
Positions for circuit breakers, jumpers, and switches	ON	Default font; capitalization follows label on product; otherwise, all uppercase
Screen text (including screen captures, screen messages, and user input)	`downloading`	Monospace font
Switch names	Power	Sans serif font; capitalization follows label on product
URLs	http://www.storagetek.com	Blue (prints black in hardcopy publications)

Related Publications

The following publications contains additional information about the L180 Tape Library:

L180 Tape Library Publications	Part Number
L700/L180 Interface Reference Manual	95869
Operator's Guide	95895
Installation Manual	95896
Illustrated Parts Catalog	95898
General Information Manual	MT9111
Ordering and Configuration Guide	MT9112

Power Supply Publications	Part Number
L180 and L700 Uninterruptible Power Supply Reference Manual	96047

The following publications contains additional information about the various tape drives supported in the L180 Tape Library:

9840/T9840 Tape Drive Publications	**Part Number**
Service Reference Manual	95740
User's Reference Manual	95739
Installation Manual	95879
Illustrated Parts Catalog	95866

DLT Tape Drive Publications	**Part Number**
DLT7000 Tape Drive Product Manual	StorageTek part: 313127701 Also available from Quantum
DLT8000 Tape System Product Manual	Available from Quantum 81-60118-0x
Super DLT 220 Product Manual	Available from Quantum 81-80000-0x

Ultrium Tape Drive Publications	**Part Number**
3580 IBM Ultrium Tape Drive Setup, Operator, and Service Guide	Available from IBM
User's Guide for the C7369 High Performance Ultrium Tape Drive	Available from Hewlett-Packard
Seagate Viper 200 LTO Tape Drive Product Manual	Available from Seagate

LTO Ultrium CDs Available from StorageTek	
HP's User's Guide for the C7369 High Performance Ultrium Tape Drive	100089901
3580 IBM Ultrium Tape Drive Setup, Operator, and Service Guide	100089701
Seagate Viper 200 LTO Tape Drive Product Manual	100089801

Additional Information

StorageTek offers several methods for you to obtain additional information. Please use one of these methods when you want to obtain the latest edition of this or any other StorageTek publication.

StorageTek's External Web Site

StorageTek's external Web site provides marketing, product, event, corporate, and service information. In addition, the external Web site serves as an entry point to the Customer Resource Center (CRC) and to the e-Partner site. The external Web site is accessible to anyone with a Web browser and an Internet connection.

The URL for the StorageTek external Web site is http://www.storagetek.com

Customer Resource Center

StorageTek's Customer Resource Center (CRC) is a Web site that enables members to resolve technical issues by searching code fixes and technical documentation. (This site encompasses the former Electronic Documentation Center.) CRC membership entitles you to other proactive services, such as HIPER subscriptions, technical tips, answers to frequently asked questions, and online product support contact information. Customers who have a current warranty or a current maintenance service agreement may apply for membership by clicking on the Request Password button on the CRC home page. StorageTek employees may enter the CRC through PowerPort.

The URL for the CRC is http://www.support.storagetek.com.

e-Partners Site

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StorageTek's Global Services Support Tools mission is to provide tools that aid in the sales and support of StorageTek's products and services, and to meet or exceed the defined requirements of Customers by delivering tools on time and to specifications. This is an internal Web site for StorageTek employees.

The URL for the Global Services Support Tools is http://wwssto.stortek.com

Documents on CD

Documents on CD (3106600xx) is a compact disc that contains portable document format (PDF) files of StorageTek's tape, library, OPENstorage disk, and StorageNet publications. Contact your local Customer Services Logistics Depot to order this CD and to get onto the distribution list for this CD. The *Documents on CD* is only for StorageTek employees.

Hardcopy Publications

You may order paper copies of publications listed on the CRC or included on the *Documents on CD*.

Service publications have *numeric* part numbers. To order paper copies of service publications, contact your local Customer Services Logistics Depot.

Marketing publications have *alphanumeric* part numbers. To order paper copies of marketing publications, do one of the following:

- Visit StorageTek's PowerPort and select alphabetical listings under "L" or select `Online Forms`. Then search for Literature Distribution. Follow the instructions on the Literature Distribution Web page.
- Send e-mail to DistrL@louisville.stortek.com.

Safety

The following provides information about topics that are *essential* to all service and maintenance activity:

- Your safety
- Preventing electrostatic discharge (ESD) damage to equipment

Safety Precautions

CAUTION:
***Potential injury:* On-the-job safety is important; therefore, observe the following safety precautions while you are engaging in any maintenance activity. Failing to follow these precautions could result in serious injury.**

Remove all conductive jewelry, such as watches and rings, before you service powered-on equipment.

- Avoid electrical shock. Be careful when you work near power connectors and supplies.
- Power-off the equipment that is being serviced before you remove a field replaceable unit (FRU) or other component. Remember that dangerous voltages could still be present in some areas even though power is off.
- Ground all test equipment and power tools.
- Lift objects properly; read the information in "Lifting Techniques" (see below).
- Do not remove, cut, or relocate any floor tiles indiscriminately. Before you manipulate floor tiles, be sure that you understand the customer's environment and receive the customer's approval. Remember, each situation is different.
- Enforce good housekeeping practices in the equipment area to help prevent fire and accidents.

Note: Important things to investigate and to be aware of include the use of Halon® gas, under-the-floor smoke detectors, and cables to other equipment installed nearby.

Lifting Techniques

Lifting, regardless of how much or how little, can create serious back stress. If you follow these guidelines, you can reduce the risk of back injury:

- Do not twist your body to pick up something or to put it down. Twisting puts extreme pressure on your back, especially when you lift or carry objects. Instead of twisting, make the task two separate moves; first lift, and then use your feet to turn your body.
- Plan the lift: first examine the object and then determine how it will be lifted and where it will be placed.
- Choose the appropriate lifting technique. Examine the weight, size, location, frequency, and direction of the lift. Plan to avoid awkward postures, and determine if material-handling aids are needed.
- Place your feet shoulder-width apart, and place one foot a little behind the other. Keep your back straight because even light loads can significantly increase pressure on your spine when you lean forward.
- Whenever you can, grip the load with your whole hand, and use two hands.
- Carry objects at elbow height and close to your body. The farther away you hold an object, the more force it puts on your lower back.
- Lift with your legs instead of your back. Leg muscles are some of the strongest in the body. When you squat and lift with your legs, you can lift more weight safely.
- Alternate lifting tasks with tasks that are less stressful to the same muscles. This technique ensures that your muscles have some recovery time.

Shoulder, Elbow, Wrist, and Hand Safety

Follow these guidelines to minimize the possibility of injury to your shoulders, elbows, wrists, and hands.

- Work within your safety zone—the area between shoulder level and knuckle level of your lowered hands. You face less chance of injury when you work or lift in this area.
- Keep your elbows bent to keep loads close to your body and to decrease the amount of force necessary to do the job. If you use this posture, you will put less weight and pressure on your shoulder.
- Be sure to keep your wrists straight. Avoid bending, extending, or twisting your wrists for long periods of time.

- Do not use a pinch grip to lift large or heavy loads because the way you lift also can affect the tendons in your hand. When you grasp an object between your thumb and fingers, you put a lot of tension on hand and wrist tendons. Use both hands—use one for a while, and then use the other—to give them rest.

Electrostatic Discharge Damage Prevention

Anyone who handles ESD-sensitive components must be aware of the damage that ESD can cause to electronic components and must take the proper precautions to prevent it. Also, anyone who performs maintenance on StorageTek equipment must complete an ESD-basics course.

CAUTION:
Potential damage to equipment: **Handle ESD-sensitive components *only* under ESD-protected conditions. To meet this requirement, always use the Field Service Grounding Kit (PN 4711) and always follow these ESD precautions and procedures when you are servicing StorageTek equipment or handling ESD-sensitive components.**

ESD Precautions

Always take the following general precautions when you work with ESD-sensitive components:

- Wear ESD protection whenever you install, remove, maintain, or repair StorageTek equipment.
- Keep ESD-sensitive printed-circuit components in their ESD-protective packages until you have taken all ESD-preventive steps and you are ready to install the component.
- Do not allow anyone to touch or handle an unprotected ESD-sensitive component unless that person has taken all ESD precautions.
- Reinstall all equipment covers and close all equipment doors after you have completed the work.
- If the grounding-kit work surface has been exposed to temperatures above 66°C (150°F) or below 4.5°C (40°F), acclimate the work surface to room temperature before you unroll it.
- Immediately place any component that you have removed into an ESD-protective package.
- Keep the grounding-kit work surface clean.

  Note: To clean the work surface, use a mild detergent and water, and make sure that the surface is completely dry before you use it.

- Periodically check the electrical resistance of the ground cord and the wrist-strap coil cord.

  Note: The ground cord should measure less than 1.2 MΩ, and the coil cord should measure between 0.8 and 1.2 MΩ. Repair or replace the cords if they no longer meet these requirements.

ESD-Protection Procedure

Remember that each customer environment is different. Address all the customer's concerns before you work on any equipment.

Prepare the Work Area

1. Before you service the equipment, unfold the grounding-kit work surface completely and place it on a convenient surface.
2. Attach one end of the ground cord to the work surface; secure the snap fastener.

   Note: You will attach the free end in a later step.

3. Slip on an ESD wrist strap. Make sure that the strap is comfortable and makes contact with the entire circumference of your wrist.
4. Snap one end of the coil cord to the wrist band.

Access the Equipment

5. Carefully open the doors to the equipment or remove the covers from the equipment. Do not touch any internal components.

   CAUTION:
   Be sure that you are properly grounded before you touch any internal components.

6. Attach the free end of the coil cord to the most appropriate place:

   a. If you are working on components from a small piece of equipment, attach the free end of the coil cord to the grounding-kit work surface. In addition, be sure that you touch an unpainted metal surface on the equipment before you touch an internal component.

   b. If you are working on components from a large piece of equipment, attach the free end of the coil cord to a grounding jack or to an unpainted metal surface inside the equipment.

Replace Components

7. Remove the defective component and place it on the work surface.
8. Remove the replacement component from its ESD-protective package, and install the component in the equipment.
9. Place the defective component in the ESD-protective package.

Clean Up

10. Disconnect the ground cords from the equipment.
11. Reinstall all equipment covers and close all equipment doors.
12. Disconnect the coil cord from your wrist, and, if necessary, disconnect the ground cord from the work surface.
13. Properly store the work surface and the other Field Service Grounding Kit items.

Tape Library Safety Features

Safety features are incorporated into the tape library. If the front door is opened, an electrical interlock removes power from the robot assembly.

Behind the front door, covers are placed over the MPC card, the AC power supply, and the DC power supply to prevent you from coming into contact with hazardous voltages and sensitive electronics.

CAUTION:
Confined Space: **While reaching inside the library, take care to avoid bumping your head or catching your clothing on protruding edges.**

Rack Safety and Precautions

WARNING:
Possible personal injury:

- **More than one person might be required to install equipment into the library's rack or to remove equipment from the library's rack.**
- **Personnel should take adequate precautions when they are moving a library that contains rack-installed equipment. The weight of some rack equipment might alter the height of the library's center of gravity. This condition might cause the library to tip during a move.**

CAUTION:
Potential equipment damage: **Do not exceed the maximum allowable weight (77.1 kg [170 lb]) and U-height (6U) for equipment in the rack area of this library.**

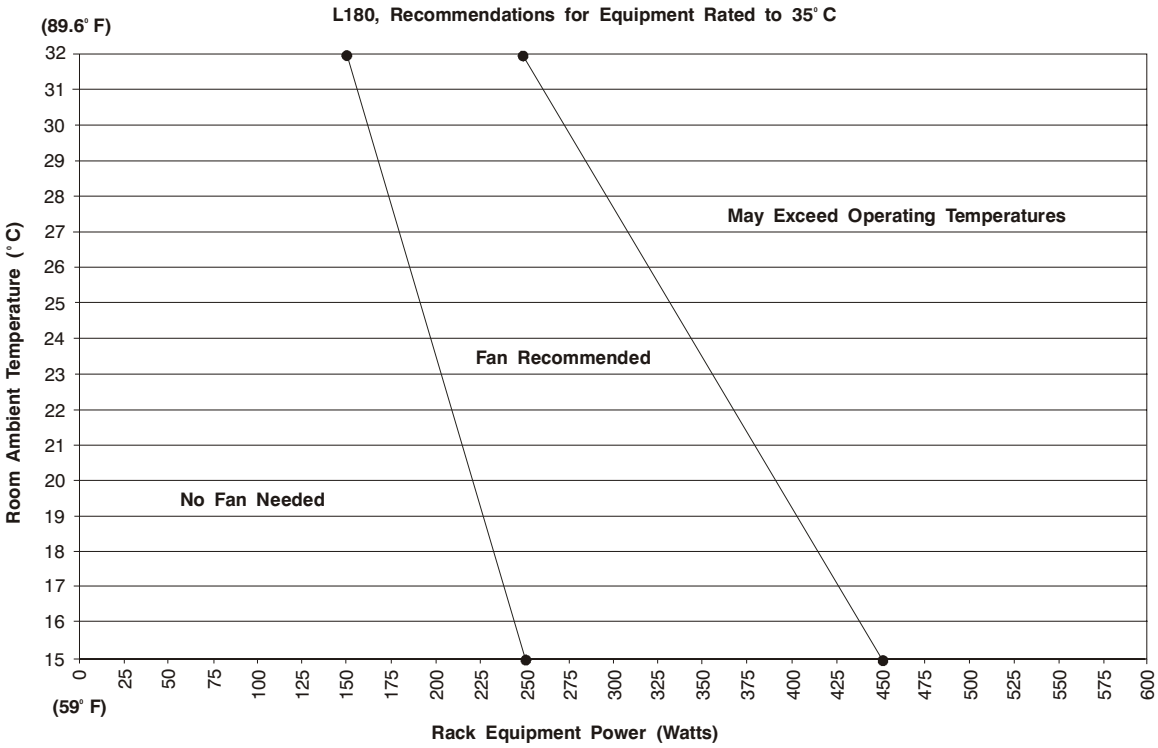
Observe the following safety and handling precautions when you are installing equipment into the library's rack:

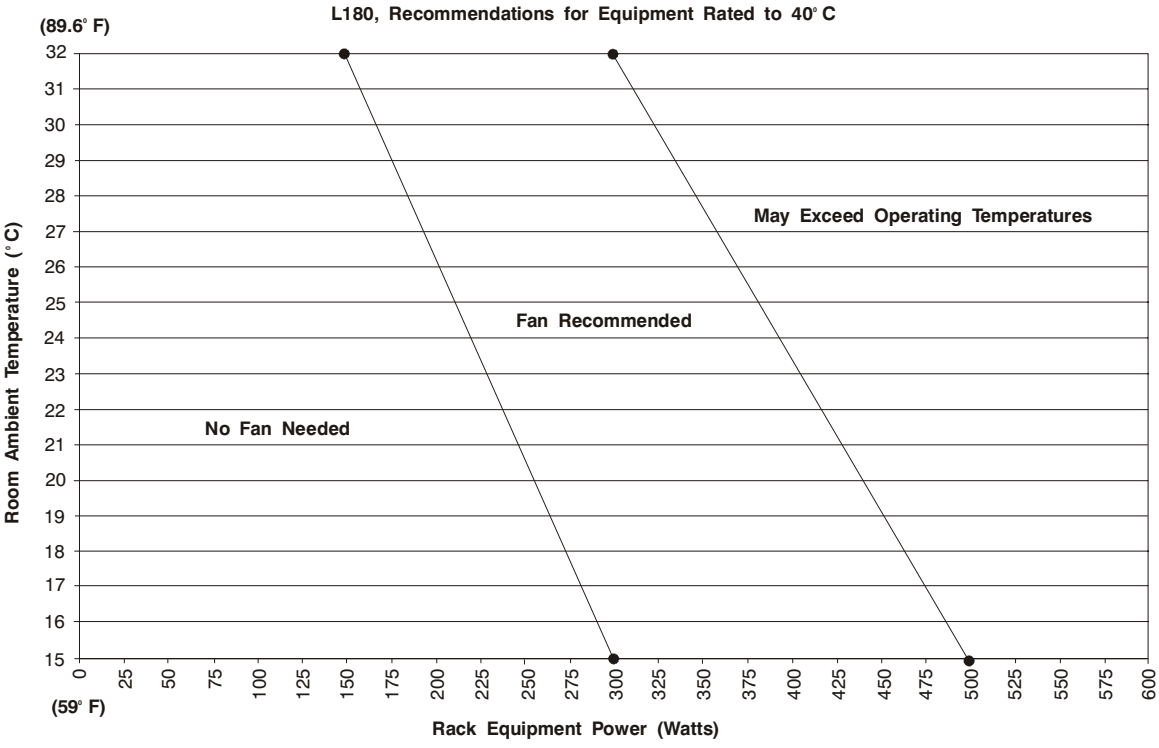
- Ensure that the equipment has UL listing (listing by Underwriters' Laboratories), CSA certification (certification by the Canadian Standards Association), and CE compliance (compliance with the European Council's directives and standards).
- Understand that the library does not supply power to the rack area. So ensure that the rack-installed equipment has an adequate power source.

  Note: If you remove power from the library by using the library's power switch, the rack-installed equipment will remain powered-on.

- Follow the manufacturer's guidelines to position, to support, and to fasten the equipment in the rack.
- Locate the equipment so that it does not block or hinder any ventilation openings in the library's rack area. For example, do not block library or drive exhaust areas, the electronic module exhaust area, perforated metal, or other similar ventilation.
- Locate the equipment so that the library doors adequately clear the equipment when you close them.
- Install the equipment from the bottom of the rack to the top of the rack; StorageTek recommends that you place the heaviest items near the bottom of the rack.
- Ensure that the equipment in the rack does not create an overcurrent condition, whether equipment is connected directly to the branch circuit or to a power distribution strip.
- Ensure that the equipment in the rack has reliable earth ground, whether equipment is connected directly to the branch circuit or to a power distribution strip.
- Ensure that any equipment that you install within the rack is adequately cooled. The library's internal ambient temperature should not exceed the recommended operating temperature. Base cooling considerations upon the power dissipation within the rack space as well as upon the ambient room conditions that are external to the library. You must provide cooling for moderate power dissipation within the rack space.

Note: The following figures outline the temperature recommendations for the L180 Tape Library:


L180, Recommendations for Equipment Rated to 35° C
(89.6° F)
Room Ambient Temperature (°C)
May Exceed Operating Temperatures
Fan Recommended
No Fan Needed
(59° F)
Rack Equipment Power (Watts)


L180, Recommendations for Equipment Rated to 40° C
(89.6° F)
Room Ambient Temperature (°C)
May Exceed Operating Temperatures
Fan Recommended
No Fan Needed
(59° F)
Rack Equipment Power (Watts)

Fiber Optic Safety

WARNING:
***Eye hazard*. Never look directly into a fiber-optic cable, a fiber-optic connector, or a laser transceiver module. Hazardous conditions might exist from laser power levels that are capable of causing injury to the eye.**

Be especially careful when using optical instruments with this equipment. Such instruments might increase the likelihood of eye injury.

The laser transceivers in fiber-optic equipment can pose dangers to personal safety. Ensure that anyone who works with this StorageTek equipment understands these dangers and follows safety procedures. Ensure that the optical ports of every laser transceiver module are terminated with an optical connector, a dust plug, or a cover.

Each fiber-optic interface in this StorageTek Fibre Channel equipment contains a laser transceiver that is a Class 1 Laser Product. Each laser transceiver has an output of less than 70 µW and a wavelength of 850 nm. StorageTek's Class 1 Laser Products comply with EN60825-1(+A-11) and with sections 21 CFR 1040.10 and 1040.11 of the Food and Drug Administration (FDA) regulations.

The following translations are for users in Finland and Sweden who wish to identify laser safety and classification:

CLASS 1 LASER
LUOKAN 1 LASERLAITE
KLASSE 1 LASER APPARAT

Laser Product Label

In accordance with safety regulations, a label on each StorageTek Fibre Channel product identifies the laser class of the product and the place and date of the manufacturer. The label appears on top of a Fibre Channel tape drive and near the Fibre Channel connectors on a Fibre Channel tape library. A copy of the label is shown here:

CLASS 1 LASER PRODUCT
LASER KLASSE 1
APPAREIL A LASER DE CLASSE 1
COMPLIES WITH 21 CFR 1040.10 AND 1040.11

Fiber-Optic Cable Handling

Observe these precautions when you handle fiber-optic cables:

- Do not coil the cable to less than 96 mm (3.75 in.) in diameter.
- Do not bend the cable to less than 12 mm (0.5 in.) in radius. StorageTek recommends that a cable's bend radius be no less than 20 times the diameter of the cable.
- Do not pull on the cables; carefully place them into position.
- Do not grasp the cables with pliers, grippers, or side cutters; do not attach pulling devices to the cables or connectors.
- Keep cables away from sharp edges or sharp protrusions that could cut or wear through the cable; make sure that cutouts in the equipment have protective edging.
- Protect the cable from extreme temperature conditions.

WARNING:
***Eye hazard*. Never look directly into a fiber-optic cable, a fiber-optic connector, or a laser transceiver module. Hazardous conditions might exist from laser power levels that are capable of causing injury to the eye.**

Be especially careful when using optical instruments with this equipment. Such instruments might increase the likelihood of eye injury.

- Install the connector's protective cover whenever the connector is not connected.

Fiber-Optic Cable Installation

Follow these guidelines when you install fiber-optic cables:

1. **Cable routing:**
   - **Raised floor:** You may install fiber-optic cables under a raised floor. Route them away from any obstruction, such as existing cables or other equipment.
   - **Cable tray or raceway:** Place the cables in position; do not pull them through the cable tray. Route the cables away from sharp corners, ceiling hangers, pipes, and construction activity.
   - **Vertical rise length:** Leave the cables on the shipping spool, and lower them from above; do not pull the cables up from below. Use proper cable ties to secure the cable.
   - **General:** Do not install fiber-optic cables on top of smoke detectors.

2. **Cable management:**

   - Leave at least 4.6 m (15 ft) of cable at each end for future growth.
   - Use strain reliefs to prevent the weight of the cable from damaging the connector.
   - Review all information in this manual and in any related manuals about safely handling fiber-optic cables.

WARNING:
***Eye hazard*. Never look directly into a fiber-optic cable, a fiber-optic connector, or a laser transceiver module. Hazardous conditions might exist from laser power levels that are capable of causing injury to the eye.**

Be especially careful when using optical instruments with this equipment. Such instruments might increase the likelihood of eye injury.

3. **Connector protection:**

   - Insert connectors carefully to prevent damage to the connector or fiber.
   - Leave the connector's protective cover in place until you are ready to make connections.
   - Replace the connector's protective cover when the connector is disconnected.
   - Clean the connector before making a connection. Make sure that there are no obstructions and that keyways are aligned.

Introduction

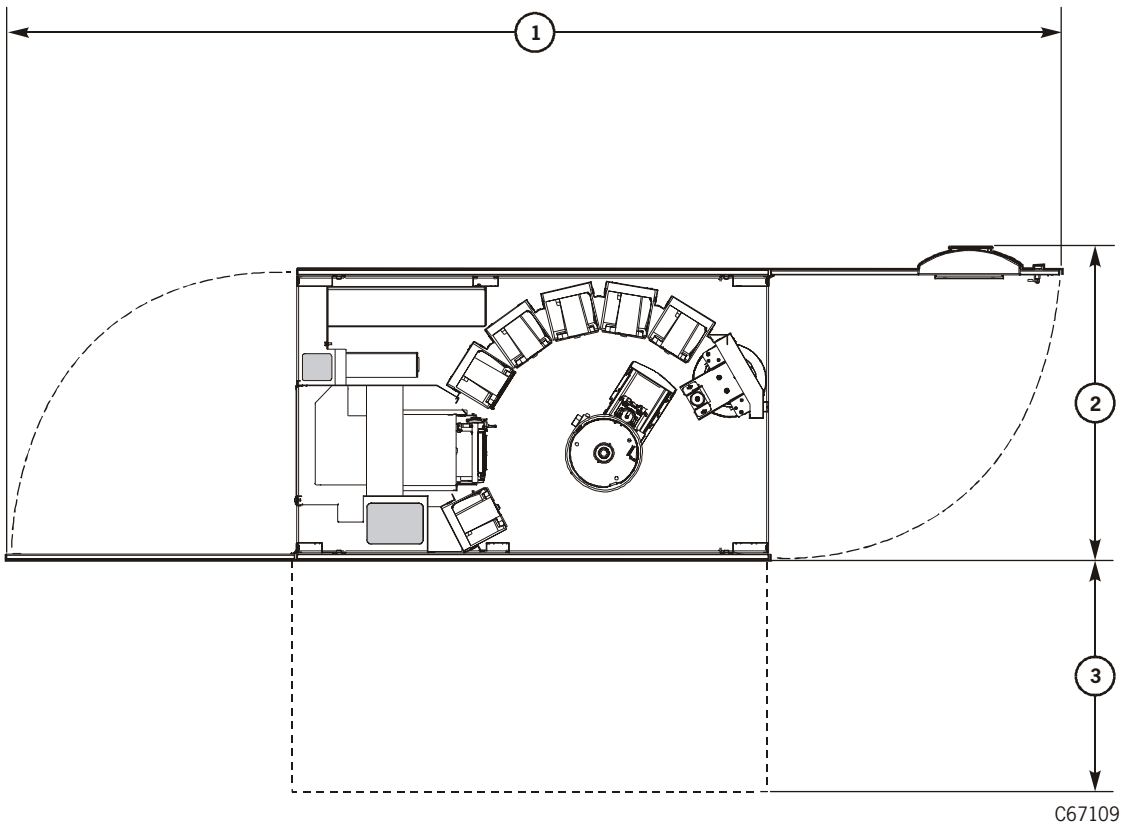
1

This chapter contains an introduction for servicing the L180 Tape Library and the basic components in it.

Service Clearances

Figure 1-1 shows the space requirements that you need to service the library.

Figure 1-1. Service Clearances (C67109)



1. 2.6 m (8.5 ft)
2. 0.8 m (2.6 ft)
3. At all times, make sure at least 51 mm (2 in.) exists on the right and left sides of the library for airflow.

Note: You might want to remove the left side cover when you replace the CAP motor and the theta motor for easier access. Allow a minimum of 1 m (3.3 ft) to remove the cover.

Power System

The library power system consists of:

- One or two AC power distribution units (PDUs)
- One or two DC power supplies that provide voltage to the library
- An *optional* uninterruptible power supply (Figure 1-2 on page 1-2)

AC Power Distribution Units

Each power distribution unit (PDU):

- Operates within 100 to 127 VAC or 200 to 240 VAC at 50/60 Hz
- Distributes AC voltage to a library DC power supply
- Protects the library from overcurrent by circuit breakers

In addition, the standard PDU supplies AC voltage to the drive column. A second, optional PDU can supply power for redundancy.

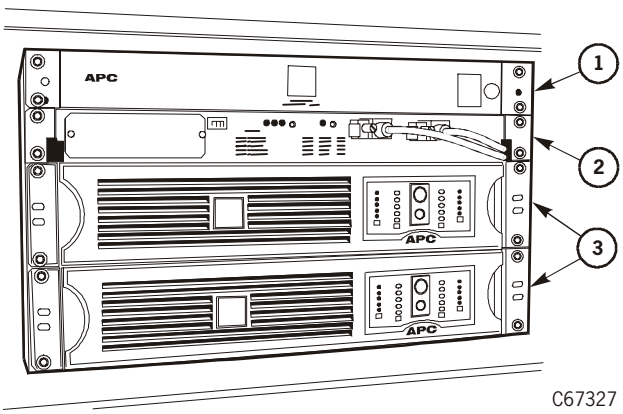
DC Power Supplies

If the library has two DC power supplies, one supply powers the library during normal operation. If a fault is detected, the second DC power supply assumes control, and the library posts the error to the FSC log.

Uninterruptible Power Supply

The uninterruptible power supply (UPS) is an *optional* feature from APC designed to prevent blackouts, brownouts, sags and surges in AC power. This UPS is located in the rack area above the operator panel.

Figure 1-2. Uninterruptible Power Supply (C67327)



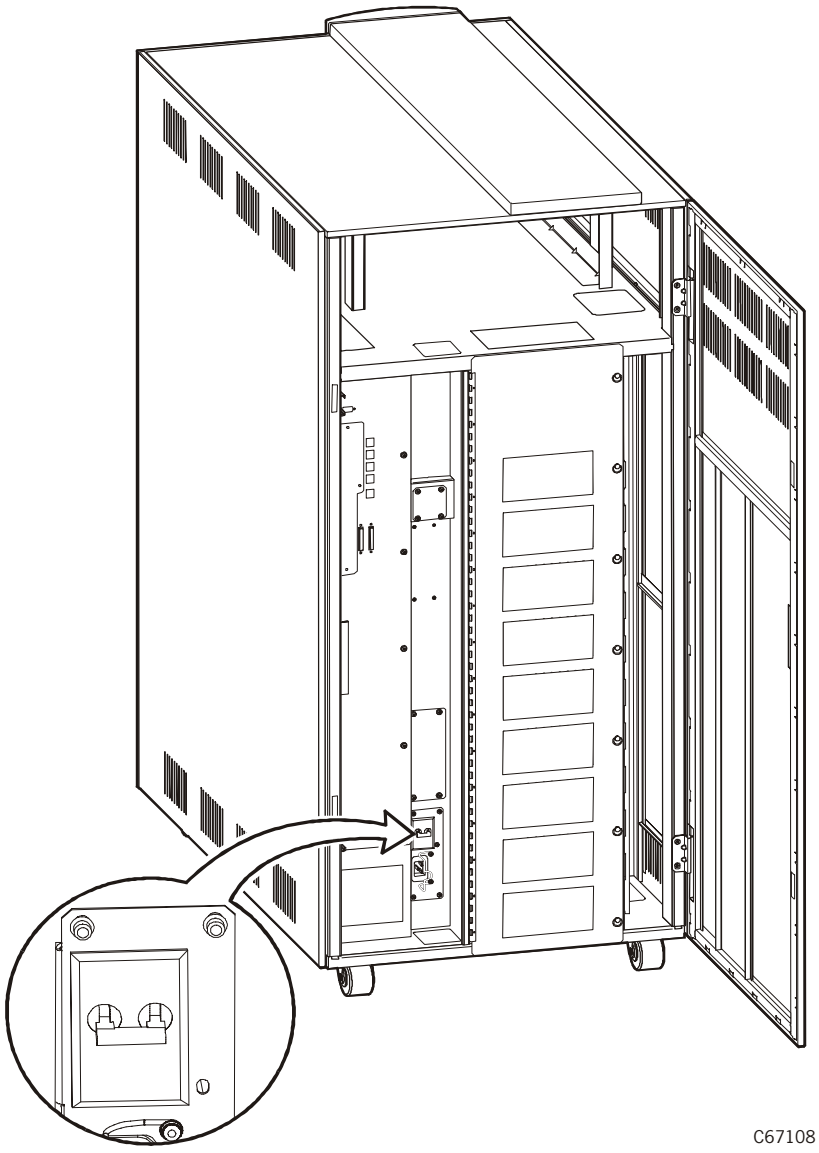
1. Power strip
2. Switch
3. Batteries

Power-On and Power-Off

To power-on or power-off the library:

1. Open the rear door by placing your fingers in the slot and pulling the door open. The door swings open to the right.
2. Find the power switch near the bottom of the library, shown in Figure 1-3.
3. Power-on the library by lifting up on the switch, or power-off the library by pressing down on the switch.

Figure 1-3. Library Power Switch Location (C67108)



Component Overview

The library is a fully automated cartridge storage and retrieval subsystem that consists of:

- A robot that moves cartridges among cells (Figure 1-4 on page 1-5)
- The cartridge access port (CAP) that contains two removable magazines; each magazine holds up to five cartridges (Figure 1-4 on page 1-5).
- Electronic module that controls the robotic operations and interfaces to the host operating systems (Figure 1-5 on page 1-6 and Figure 1-6 on page 1-7)
- Storage cells for the tape library are from 84 up to 174 cartridges, excluding the 10 CAP cells and (Figure 1-7 on page 1-8).
- Cartridges are stored in cell arrays that each hold six cartridges. The cell arrays are stacked in columns and the columns are arranged around the robot.

  Note: The top two cells in each column are reserved and not available.

- Six reserved cells (Figure 1-8 on page 1-9)

  - Row 0, the swap cell, is reserved for in-transit cartridges.
  - Rows 1 through 5 are reserved for cleaning and/or diagnostic cartridges.

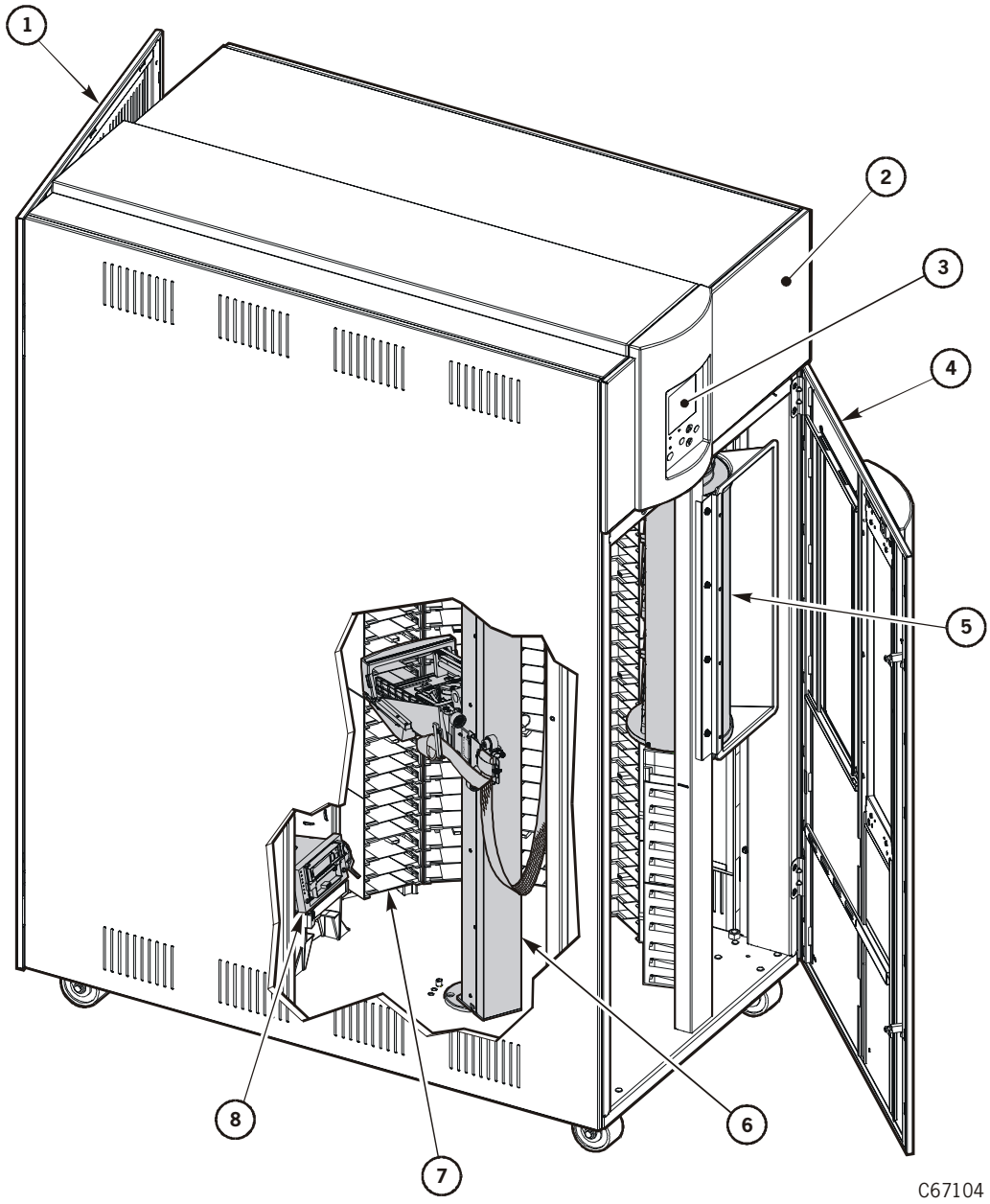
  Note: *Never put data cartridges in reserved cells.* If the customer *wants* the Auto Clean feature enabled, at least one reserved cell must contain a cleaning cartridge.

- Tape drives (Figure 1-9 on page 1-10), including:

  - One to 10 Digital Linear Tape (DLT) drives
  - One to 10 Super DLT (SDLT) drives
  - One to 10 Linear Tape-Open (LTO) Ultrium drives
  - One to six StorageTek 9840 Tape Drives
  - One to six StorageTek T9840 Tape Drives
  - A combination of these tape drives

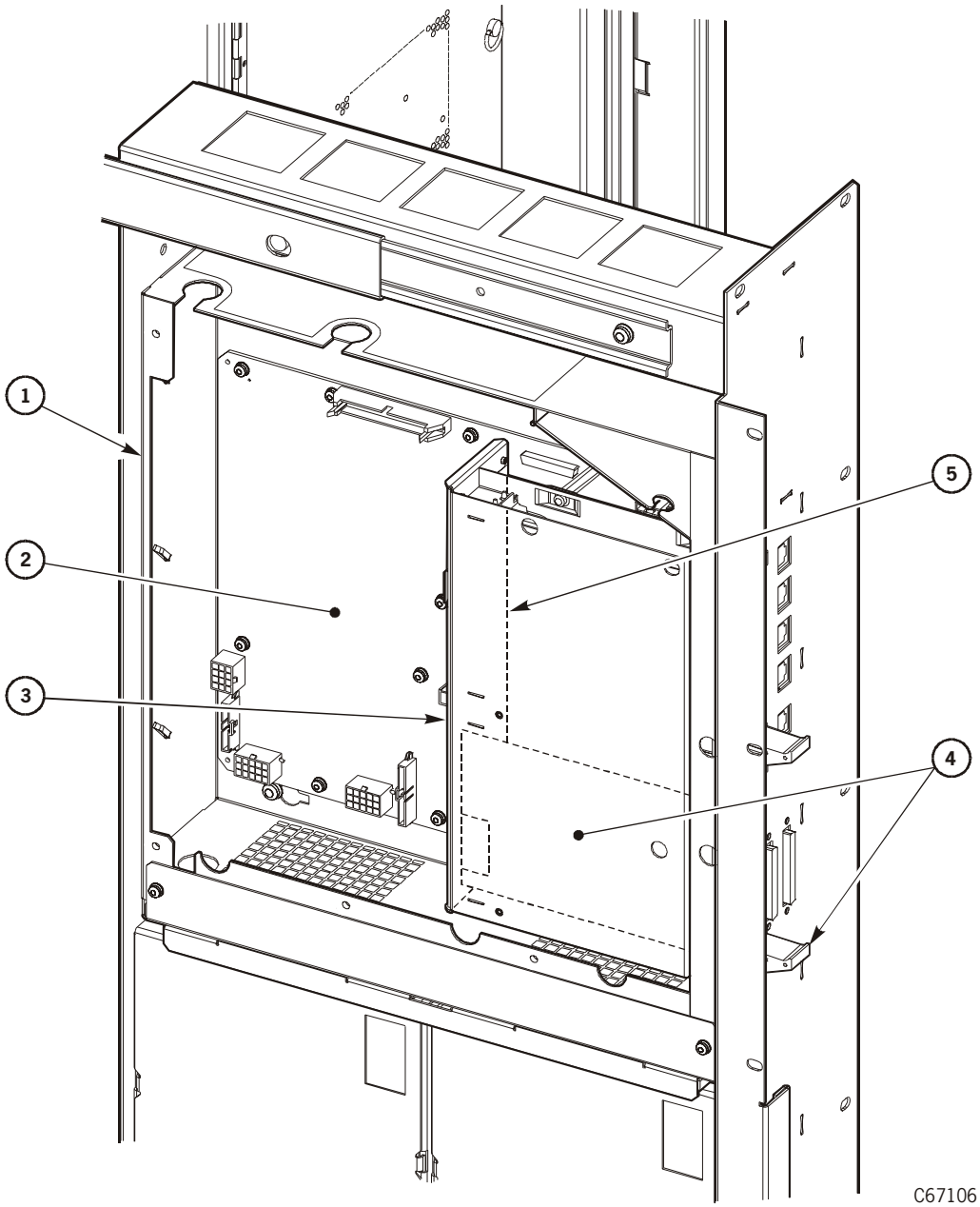
- Operator panel (Figure 1-10 on page 1-11).

Figure 1-4. Major Components (C67104)



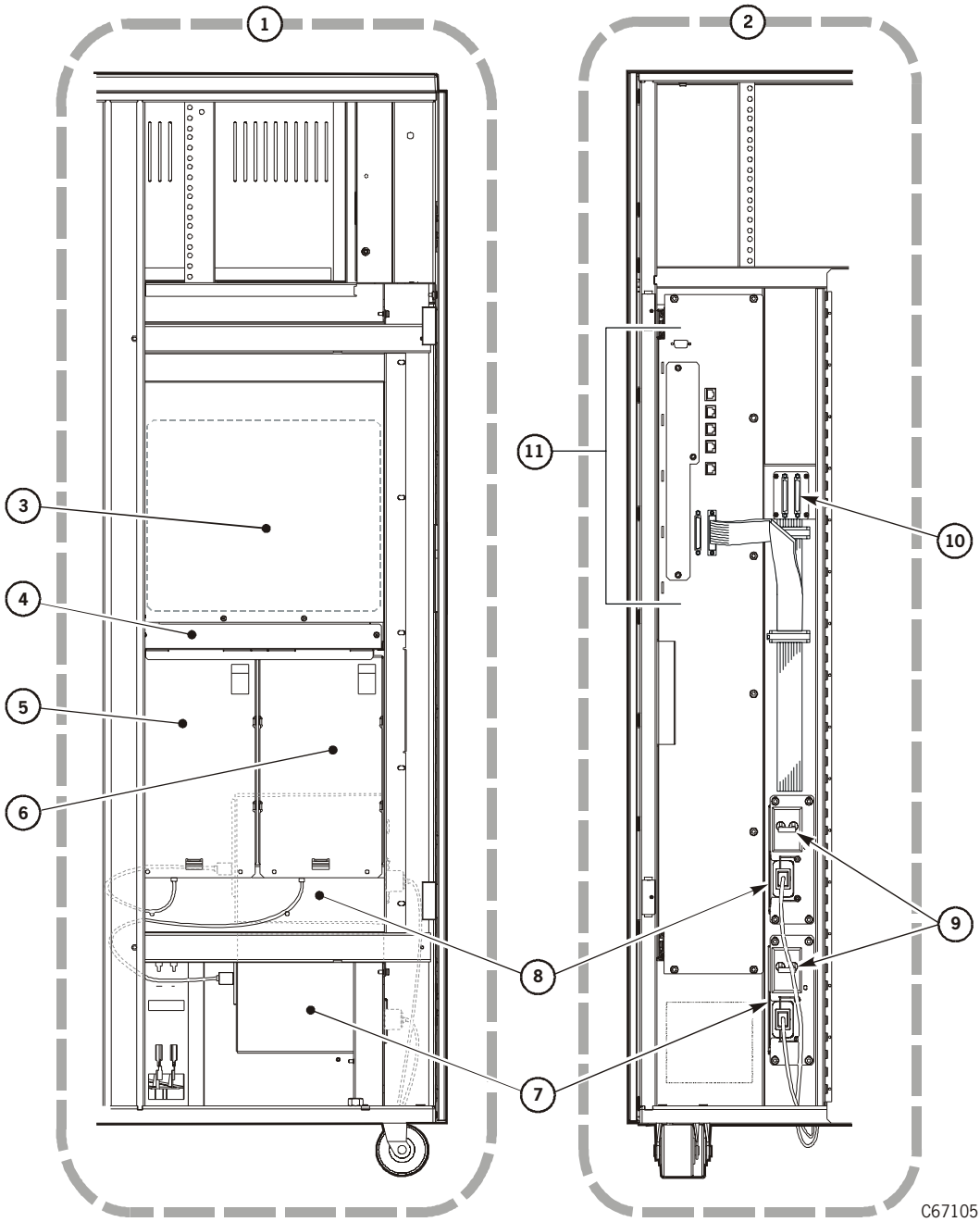
1. Rear door
2. Rack door
3. Operator panel
4. Front door
5. Cartridge access port (CAP)
6. Robotics
7. Arrays
8. Tape drives

Figure 1-5. Electronics Module Components (C67106)



1. Electronics Module
2. MPC card
3. CPCI card cage assembly
4. MPU or MPW card
5. MPV card

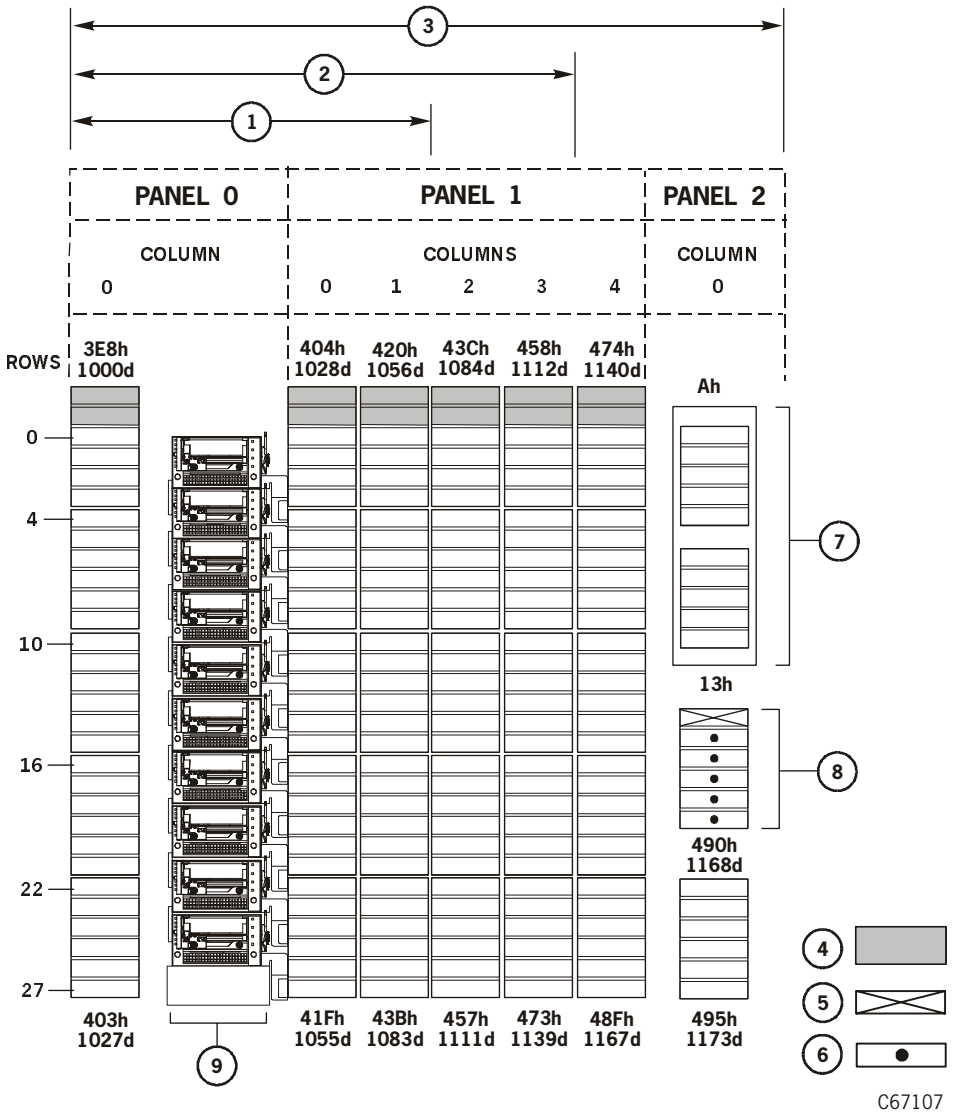
Figure 1-6. Electronic Compartment Components (C67105)



1. View from library side (cut away)
2. View from library rear
3. MPC card (enclosed)
4. Fan tray assembly
5. Standard DC power supply
6. Optional DC power supply
7. Main AC power distribution unit (PDU)
8. Optional AC PDU
9. Power switches (circuit breakers)
10. Library-to-client SCSI I/O connectors
11. Electronics module bulkhead

Storage Cells

Figure 1-7. Cell Locations (C67107)

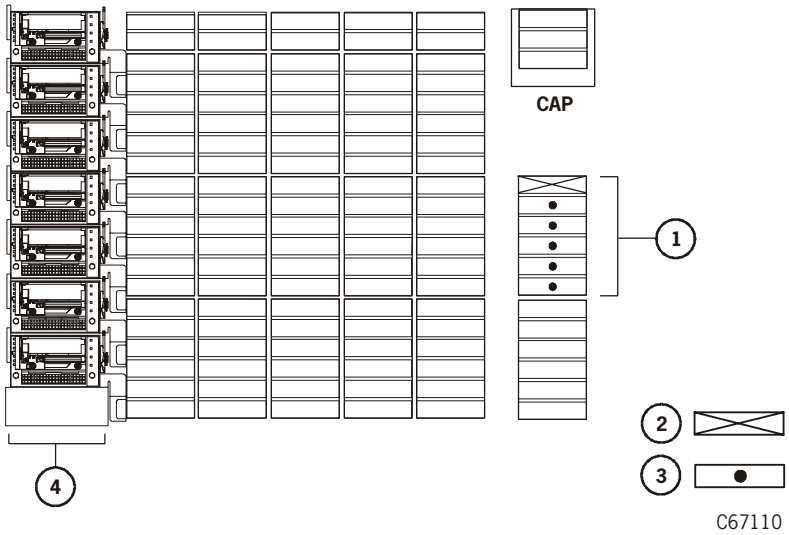


1. 84 storage cell configuration
2. Reserved cells for cleaning and diagnostic cartridges
3. Cartridge access port cells
4. Reserved cell array
5. Drive column
6. 140 storage cell configuration
7. 174 storage cell configuration
8. Blocked storage cells (no cartridges allowed)
9. Swap cell (leave empty)

Reserved Cells

The reserved cells are for the swap cell, diagnostic, and cleaning cartridges.

Figure 1-8. Reserved Cells (C67110)



1. Reserved cells location
2. Swap cell (leave empty)
3. Cells reserved for cleaning or diagnostic cartridges
4. Drive column

The top cell is the swap cell. It is reserved for in-transit cartridges. Do *not* insert any cartridges into this cell. This cell has two functions:

- It allows the robot to swap cartridges within the library.
- It is used in case the library loses power and the robot has a cartridge in the hand. When power is restored, the robot automatically inserts this cartridge into this cell as part of the initialization sequence.

To install diagnostic and cleaning cartridges:

1. Open the front door of the library.
2. Insert the cartridge into any of the five cells under the top cell, holding the cartridge so that the customer label is on top and the VOLSER can be read by the robot.

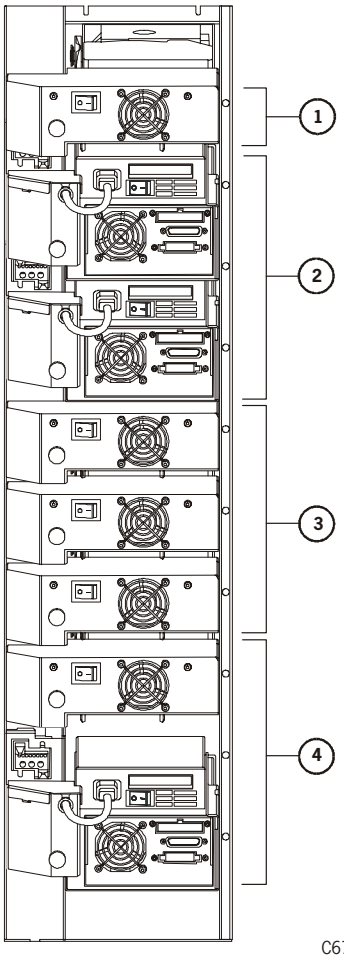
Tape Drives

Table 1-1 lists the number of each type of drive when mixing drives:

Table 1-1. Mixed Drive Combinations

9840/T9840	DLT or LTO
0	10
1	8
2	7
3	5
4	4
5	2
6	1

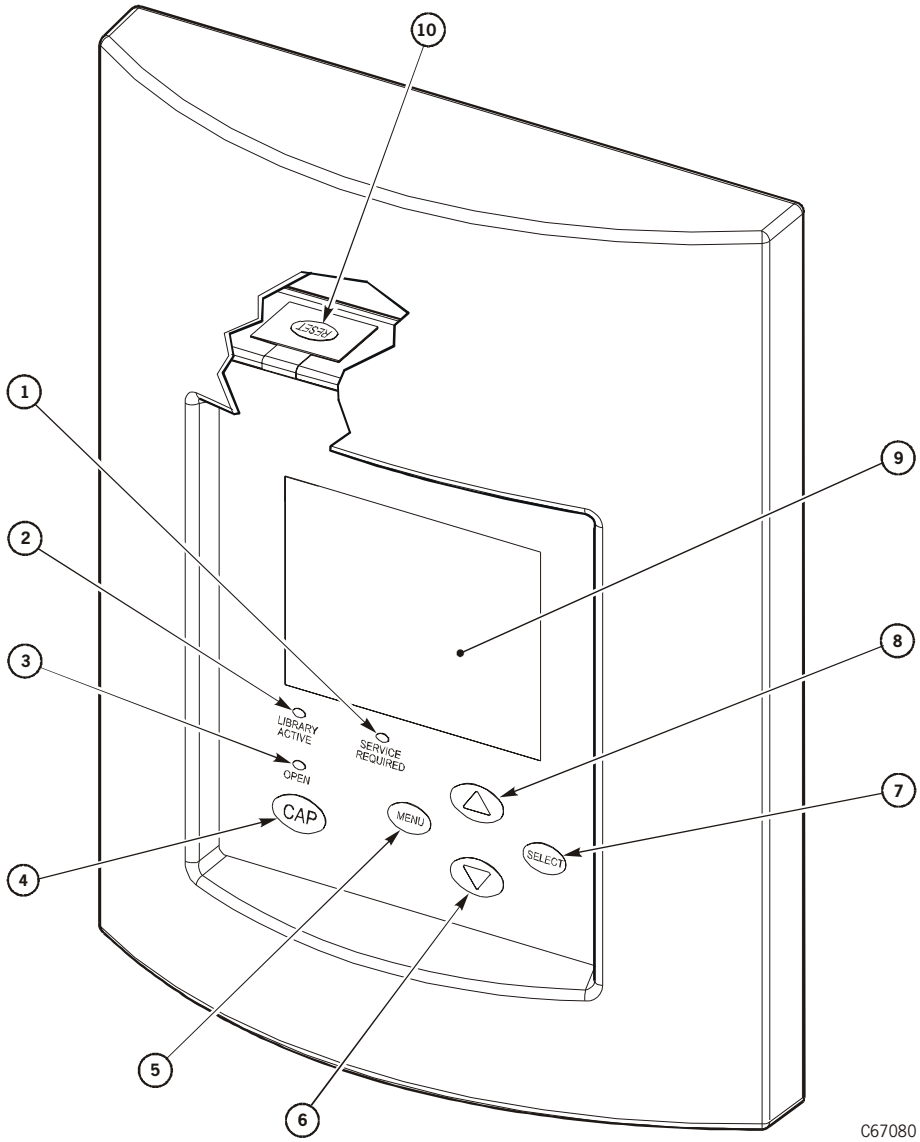
Figure 1-9. Tape Drives (C67052)



1. DLT or Ultrium drive *only* in the top-most slot
2. Two 9840/T9840 drives (shown): space equivalent to three DLT or Ultrium drives
3. Three DLT drives (shown) or three Ultrium drives: space equivalent to two 9840/T9840 drives
4. Mixed 9840 and DLT drives (shown), or three DLT drives, or three Ultrium drives, or two 9840 drives

Operator Panel

Figure 1-10. Operator Panel Display, Buttons, and Indicators (C67080)



1. *Service Required* indicator is steadily red when human intervention is required.
2. *Library Active* indicator flashes green when the library is operational.
3. *Open* indicator is steadily amber when the CAP door is open.
4. CAP button opens and closes the CAP.
5. MENU button
6. Arrow down button moves the cursor down and decrements a value highlighted on the screen.
7. SELECT button selects an item, saves the currently highlighted value, and moves the cursor.
8. Arrow up button moves the cursor up and increments a value highlighted on the screen.
9. Graphic display screen shows current information and errors, and allows you to input from menus.
10. RESET button starts an initial program load (IPL).

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Configuration

2

This chapter provides information about how to update the microcode and configure the library, tape drives, and network.

- **Firmware** is the instructions or data that has been written into read-only-memory (ROMs, PROMs and EPROMs).
- **Microcode** is the instructions that directly control a microprocessor. A single machine-language instruction typically translates into several microcode instructions.

Updating the Microcode

Library microcode is factory-installed on all new machines and resides within a Flash PROM on the MPC card.

- For new installations, a diskette with current microcode is provided.
- For upgrades you can download microcode from the multi-platform support web site at http://mpss.stortek.com.

  This Web site lists the Automated Tape Solutions Library/Drive Matrix along with the product list (tape drives and libraries), current microcode level, download file, and release notes.

You must have a personal computer and the following to download the microcode to the MPC card:

- An RJ45 cable (PN 4108289xx)
- An RJ45—DB9 adapter (PN 10410823) or diagnostic cable (PN 24100134)

Starting with microcode edition 2.20, there are now two methods to download microcode to the library:

- The DOS method that requires approximately 20 minutes.
- The Hyperterminal method that requires only 6 minutes.

Note: The Hyperterminal method is the *preferred* method because it requires less time to download and it will be the only method available for future libraries.

DOS Method

Note: This download method takes about 20 minutes to complete.

To download the microcode using the DOS method:

1. Connect the PC to the CSE port on the MPC card.
2. Open a DOS window on your PC.
3. Create a directory on the C drive (`mk dir`).
4. Insert the diskette into the personal computer.
5. Change to the directory on the diskette drive (`cd` directory name).
6. Copy the `flash97.exe` program *and* the `release.prm` to the directory you created on the C drive (`copy flash.exe` and `copy release.prm c:/`directory name.
7. From the directory on your personal computer, type in:

   ```
   flash97 release.prm
   ```

CAUTION:
***Equipment Damage*: Do not attempt to do perform any operations on the personal computer or library until the operator panel displays `DOWNLOAD COMPLETE`. Damage to the MPC processor card may occur if you do not wait for the process to complete.**

8. When prompted, enter the port number being used on the personal computer (generally port 1) and press <Enter> or <Return>.

   After several seconds, the personal computer will display and update the number of bytes being sent. The download takes about 20 minutes.

   The L180 operator panel will display `DOWNLOADING`.

   After the personal computer displays `FILE TRANSFER COMPLETED SUCCESSFULLY`, the operator panel will display `DOWNLOAD COMPLETE`. *Wait for this sequence to complete.*

9. To activate the microcode, press the `RESET` button on the operator panel.

Hyperterminal Method

It is best to read through this procedure first before attempting it since there is a *two minute time limit* after Step 7.

To use this method, the library must be fully initialized and the access door must be closed.

Note: This method is *only* valid with microcode version 2.20 and higher.

To download the microcode:

1. Copy the `release.prm` to the directory you created on the C drive (`copy release.prm c:/`directory name)
2. Attach your PC to the command line interface (CLI) port.
3. From your PC:
   a. For older machines, go to Start →Programs →Accessories →Hyperterminal and open a Hyperterminal session.
   b. For WIN2000 machines, go to Start →Programs →Accessories →Communications →Hyperterminal and open a Hyperterminal session.
4. Within the `File Properties`, configure the connection as follows:

Table 2-1. Hyperterminal Connection

Older PCs	WIN2000 PCs
Baud rate = 38,400	Baud rate = 38,400
Data bits = 8	Data bits = 8
Parity bit = None	Parity bit = None
Stop bit = 1	Stop bit = 1
Direct to comm flow = none	Hardware flow control = on

5. Click on OK.
6. In the Hyperterminal window, click on ENTER.

   The `CLI>` prompt will appear.
7. Type in: `download` and press the [Enter] key.

   A message will appear stating that you have ***two minutes*** to begin sending the new microcode version.
8. At the top of the window, find the TRANSFER button and point to SEND FILE.

   A box will appear, allowing you to browse to the file location of the microcode you copied in step 1.

9. Double click on release.prm.

   The SEND FILE box will appear, showing the pathname and the protocol chosen. Protocol should be set to Z-MODEM.

10. Click on SEND.

    The status window for the transfer will appear.

11. *Wait* for the following prompt: Reboot 'yes'?

    Respond with 'yes' to reboot the machine and activate the microcode. (Or you may power cycle or IPL the library to activate the microcode.)

    If you do not reboot, power cycle, or IPL the library to activate the new microcode, the old version will remain active. When the next reboot, power cycle, or IPL occurs, the new microcode will become active.

    When the reboot is complete, verify that the version is correctly listed on the operator panel.

Configuration Overview

Configuration data consists of client connection, library capacity, panel types, along with the number and types of tape drives. The library and its associated drives must be configured:

- During installation
- When the MPC card is replaced
- When a drive is added to or removed from the library

Before starting the configuration procedure:

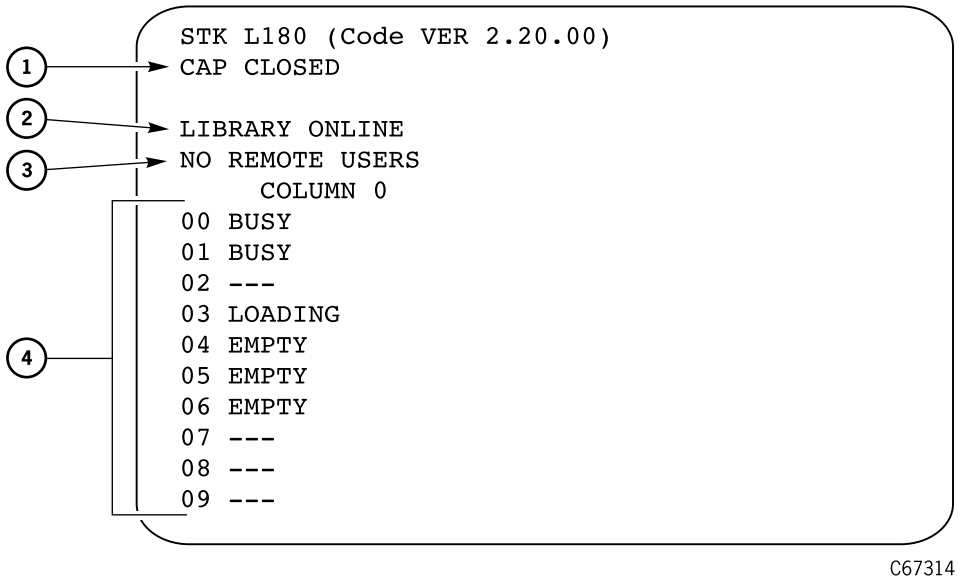
1. Read the information in this chapter.
2. Determine your choices and write your configuration information into Table 2-2 and Table 2-3 on page 2-7.
3. Make a copy of this information and keep it for future reference.

Initial Status

The first screen to appear on the operator panel after an IPL is the initial status screen. This is an information only screen and displays information.

Figure 2-1 is an example of the initial status screen:

Figure 2-1. Initial Status Screen (C67314)



1. CAP status message
2. Library status message
3. Remote users status message
4. Drive status message

Main Menu

4. Push the MENU button on the operator panel, to see the Main Menu.

   Figure 2-2 is an example of the main menu:

Figure 2-2. Main Menu

```
MAIN MENU:

ESC LOG
CAP CONTENTS
DRIVE INFO
CLEANING INFO
DIAGNOSTICS
VERSION INFO
CONFIGURATION
```

Configuration Menu

The Main Configuration Menu lets you select the various configuration menus (library, drive, network) and to the panel display controls. This menu also routes you to screens that let you view the library personality and input a password for a Web interface product.

5. Select the configuration menu for the device you want to configure.

   Figure 2-3 shows an example of the main configuration screen.

Figure 2-3. Configuration Menu

```
MAIN CONFIGURATION MENU

LIBRARY CONFIG
DRIVE CONFIG
NETWORK CONFIG
PERSONALITY MODULE
WEB PASSWORD
DISPLAY INFO
```

CAUTION:
Possible loss of data: **Make sure the library and associated drives are offline to the system before making configuration entries.**

Table 2-2. Library Configurations

Configuration Option	Selection
Auto Clean enabled or disabled	
9840 Cleaning cartridge warning count	
DLT Cleaning cartridge warning count	
LTO Cleaning cartridge warning count	
Date and time	
Fast Load enabled or disabled	
IP address	
Library capacity	Automatically configured during IPL
Library name	
Library SCSI ID	
Library Worldwide ID	Not configurable: pre-set at the factory
Network gateway address	
Port 0 Address (library)	
Port 0 Worldwide ID (library)	Not configurable: pre-set at the factory
Subnet netmask address	
Web password	

Table 2-3. Tape Drive Configurations

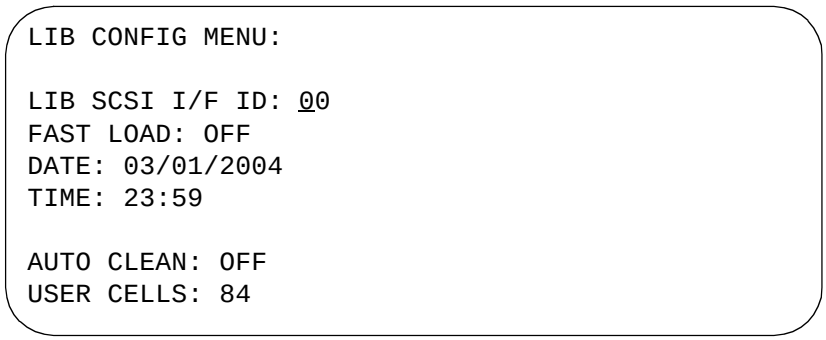
Drive #	Drive Type	Interface Type	SCSI ID	On or Off Bus
1.		F/C ❑ SCSI ❑		
2.		F/C ❑ SCSI ❑		
3.		F/C ❑ SCSI ❑		
4.		F/C ❑ SCSI ❑		
5.		F/C ❑ SCSI ❑		
6.		F/C ❑ SCSI ❑		
7.		F/C ❑ SCSI ❑		
8.		F/C ❑ SCSI ❑		
9.		F/C ❑ SCSI ❑		
10.		F/C ❑ SCSI ❑		

Library Information

The Library Configuration Menu lets you modify the library's configuration. From this menu, you may access editing menus for setting the library's interface identifier, Fast Load status, date and time.

Figure 2-4 shows an example of the library configuration screen.

Figure 2-4. Library Configuration Menu



Note: The sequence of this configuration assumes that you will make all entries at one time. Each item is saved as it is changed, except for the library's SCSI ID or Fibre Channel Port 0 address.

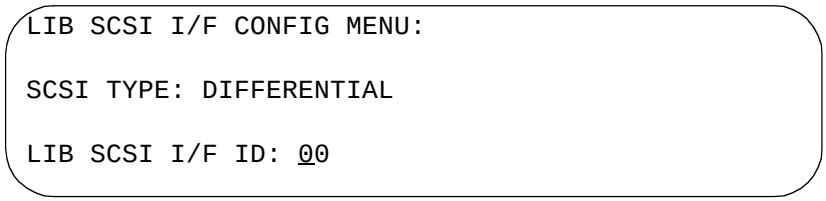
To save a revised library SCSI ID or Fibre Channel address, you must reset the library by pressing the RESET button.

Setting the Library SCSI ID

The Lib SCSI I/F Config Menu lets you view the library's SCSI type (differential or single-ended) and access an edit menu for the library's SCSI ID.

Figure 2-5 shows an example of the library SCSI interface screen.

Figure 2-5. Library SCSI Interface Configuration Menu



If the control path for the library is SCSI, you must set a SCSI ID for the library at the operator panel.

Note: When configuring the library to a UNIX workstation, it is recommended that you use a dedicated SCSI client bus adapter:

- For wide SCSI adapters, you may assign any target from 0–14.
- For narrow SCSI adapters, you may assign any target from 0–6.

If you choose to use the embedded system bus on the SPARC station, available targets are 6, 5, 2, or 0, because the remaining targets are reserved for Sun peripherals.

For IBM RISC System/6000 machines, available targets on the embedded system bus are 6, 5, 3, or 2.

To set this value:

1. From the online status screen, press the MENU button. The Main Menu will display.
2. Press the down arrow button until the cursor underscores CONFIGURATION.
3. Press the SELECT button. The Main Configuration Menu will appear. The cursor will line up with LIBRARY CONFIG.
4. Press the SELECT button. The Lib Config Menu will appear. The cursor will line up with LIB SCSI I/F CONFIG.
5. Press the SELECT button. The Lib SCSI I/F Config Menu will appear. (This menu also displays the type of SCSI interface: differential or single-ended.)
6. Press the arrow buttons until the cursor underscores SCSI ID.
7. Press the SELECT button. The Set Lib SCSI ID Menu will appear.
8. Use the up and down arrow buttons to change the ID.
9. When the ID is correct, press the SELECT button to save the changes. Press the MENU button to abort.
   - If the library SCSI ID is the only configuration value you wish to set at this time, press the RESET button.
   - If you wish to set other configuration values before you reset the library, continue with the next section.

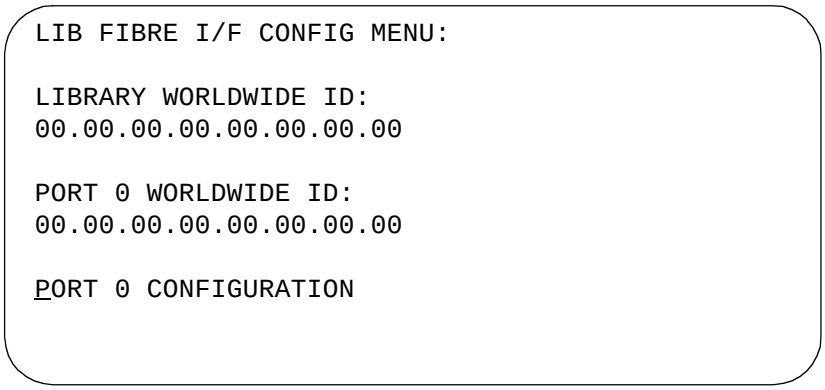
Setting the Library Fibre Channel Port 0 Address

If the control path for the library is Fibre Channel, you must set the Library's Fibre Channel Port 0 address.

The Lib Fibre I/F Config Menu lets you view the library's worldwide ID and Port 0 Worldwide ID. This menu also lets you access an edit menu for the library's Port 0 address.

Figure 2-6 shows an example of the library Fibre Channel interface screen.

Figure 2-6. Library Fibre Channel Interface Configuration Menu



To set this value:

1. From the online status screen, press the MENU button. The Main Menu will display.
2. Press the down arrow button until the cursor underscores CONFIGURATION.
3. Press the SELECT button. The Main Configuration Menu will appear. The cursor will line up with LIBRARY CONFIG.
4. Press the SELECT button. The Lib Config Menu will appear. The cursor will line up with LIB FIBRE I/F CONFIG.
5. Press the SELECT button. The Lib Fibre I/F Config Menu will appear. (This menu also displays the library's worldwide ID (the node ID) and the Port 0 worldwide ID (the port ID). These two IDs are set at the factory and cannot be changed. Each ID is 64 bits and uses the IEEE registered format.) The cursor will line up with PORT 0 CONFIGURATION.
6. Press the SELECT button. The Fibre Port 0 Configuration menu will appear.

   Note: Consult the system administrator before selecting the library's Port 0 addressing option.

If you want to have your network's software set the library Port 0 address, you must set the hard address option to DISABLED by:

a. Pressing the arrow buttons until the cursor underscores AUTO ADDRESS.

b. Pressing the SELECT button. The Port Hard Address Edit Menu will appear.

c. Using the up and down arrow buttons to select DISABLED.

d. Pressing the SELECT button to save the selected option.

Note: The default for the hard address option is DISABLED.

7. If you want to set the library Port 0 address, you must set the HARD ADDRESS option to ENABLED (see Step 7) and enter a port address by:

e. Selecting ADDRESS from the Fibre Port 0 Configuration menu. The Port Address menu will appear.

f. Using the up and down arrow buttons to select a digit for each field in the three-field address. Permissible addresses are 001 through 125.

g. Pressing the SELECT button to save the address.

- If the library Fibre Channel Port 0 address is the only configuration value you wish to set at this time, press the RESET button.
- If you wish to set other configuration values before you reset the library, continue with the next section.

Enabling/Disabling Fast Load

The Fast Load feature adjusts the robot's timing during cartridge load operations:

- With the Fast Load feature *enabled*, the robot will mount a cartridge into a drive and then immediately perform its next task, not waiting for the drive to complete its loading cycle.
- With the Fast Load feature *disabled*, the robot will wait at the drive location until the tape is fully loaded before beginning its next task.

Note: Some client software does not support the Fast Load feature. Consult the systems administrator before enabling this feature.

To set this value:

1. At the Lib Config Menu, press the arrow button until the cursor underscores FAST LOAD.
2. Press the SELECT button. An editing screen appears.
3. Use the up and down arrow buttons to select either ON or OFF.

4. When the screen displays your desired setting, press the SELECT button to save the changes. Press the MENU button to abort.

   - If you have already changed the library's SCSI ID or Port 0 address and are planning to exit the Main Configuration Menu at this time, you must press the RESET button.
   - If you wish to set other configuration values, continue with the next section.
   - If you have not changed the library's SCSI ID or Port 0 address and are not setting other configuration values, press the MENU button until you exit all menus.

Setting the Date

The library saves the current date in non-volatile memory.

To set this value:

1. At the Lib Config Menu, press an arrow button until the cursor underscores DATE.
2. Press the SELECT button. An editing screen appears.
3. On the editing screen:
   a. Use the up and down arrow buttons to select a value for each portion (field) of the date.
   b. Use the SELECT button to move right to the next field.
   c. Use the MENU button to move left to the previous field.
4. When the screen displays your desired setting, press the SELECT button from the right-most field to save the changes. Press the MENU button to abort.

   - If you have already changed the library's SCSI ID or Port 0 address and are planning to exit the Main Configuration Menu at this time, you must press the RESET button.
   - If you wish to set other configuration values, continue with the next section.
   - If you have not changed the library's SCSI ID or Port 0 address and are not setting other configuration values, press the MENU button until you exit all menus.

Setting the Time

The library saves the current time in non-volatile memory.

To set this value:

1. Press the arrow button until the cursor underscores TIME.
2. Press the SELECT button. An editing screen appears.
   a. Use the up and down arrows to select a value for each field of the time.
   b. Use the SELECT button to move right to the next field.
   c. Use the MENU button to move left to the previous field.
3. When the screen displays your desired setting, press the SELECT button from the right-most field to save the changes. Press the MENU button to abort.
   - If you have already changed the library's SCSI ID or Port 0 address and are planning to exit the Main Configuration Menu at this time, you must press the RESET button.
   - If you wish to set other configuration values, continue with the next section.
   - If you have not changed the library's SCSI ID or Port 0 address and are not setting other configuration values, press the MENU button until you exit all menus.

Drive Configuration

The Drive Configuration Menu lets you modify portions of each drive's configuration. For each drive, the menu displays the drive position, drive type, and, if the drive path is SCSI, the drive's SCSI ID and the drive's SCSI bus relationship with the library. If the drive path is Fibre Channel, the menu displays FIBRE I/F after the drive type.

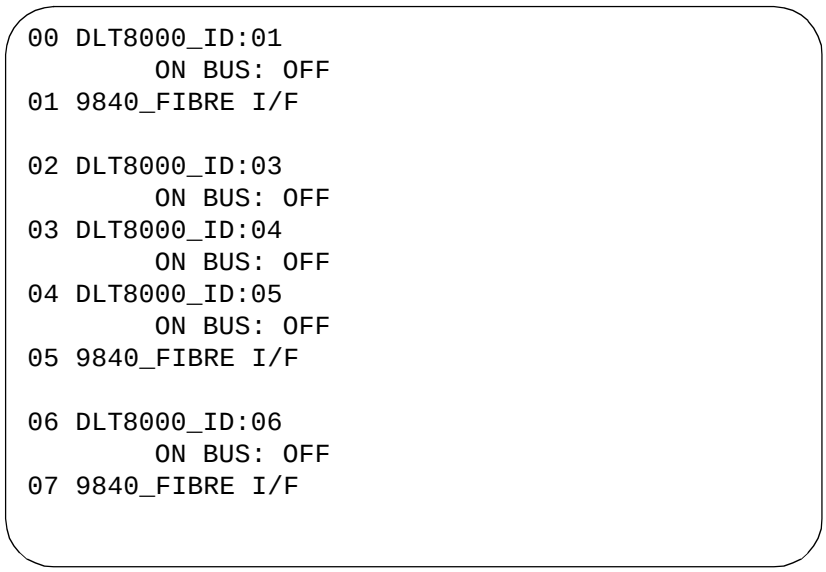
Sub-menus let you change the SCSI ID and indicate whether the drive is on the same SCSI bus as the library or off the SCSI bus.

Notes: These statements apply to this menu:

1. The cursor position is saved on all screens that list the library's drives.
2. The panel displays 16 lines of data per menu. If you library contains more than seven drives, you must use the down arrow button to scroll to drives 08 and 09.

Figure 2-7 shows an example of the drive configuration screen.

Figure 2-7. Drive Configuration Menu



Drive Entries ~ SCSI Drives Only

These notes apply to configuring a 9840 or T9840 Tape Drive:

- To configure a 9840 or T9840 Tape Drive's SCSI ID and bus status from the library's operator panel, the drive must have version 1.24 or later. Check the drive's version, from the Main Menu.
- Configuring a 9840 or T9840 Tape Drive might involve more than setting the drive's SCSI ID and bus status. Refer to the *9840/T9840/T9940 Tape Drive Service Reference Manual* for more information about the tape drive configuration options and instructions.

Two entries at the library operator panel complete the configuration choices for each SCSI drive installed in the library:

- SCSI ID
- Bus status (on or off bus)

Note: "On bus" means that the drive is on the same SCSI bus as the library. "Off bus" means that the drive is *not* on the same SCSI bus

You set the drive SCSI IDs and bus status choices from the drive configuration menu. You can enter both values for each drive at the same time.

To set this value:

1. Press an arrow button until the cursor underscores `DRIVE CONFIG`.
2. Press the `SELECT` button. The screen will list all installed drives, and the cursor will align with the first drive on the list.

   The format of the drive information appears in the following example:

   ```
   00 DLT8000 ID:__
              ON BUS: ON
   ```

   The first two digits are the drive's logical number, that is, the number that the library has assigned the drive. The library sets this number during its automatic configuration sequence (at power-on or reset). It is an internal number *only* and is shown for information only. The uppermost drive within the column is designated as "0," the next is "1," and so forth

   Next in the example is the drive type (DLT 8000 in this example). To the right of the drive type is the SCSI ID. On the next line is the drive's bus status.

Drive Entries ~ LTO Drives

LTO drives display as:

- IBM LTO for the IBM Ultrium drives
- SGT LTO for the Seagate Ultrium drives
- HP LTO for the Hewlett-Packard Ultrium drives

These statements explain how drive information might appear on the menu:

- If the drive is a Fibre Channel drive, the menu will display FIBRE I/F instead of the SCSI ID.
- If the menu displays INVALID instead of the SCSI ID for a drive, you must set the drive's SCSI ID to a valid address.

To set this value:

1. Use the arrow buttons to scroll to the drive you wish to change and press the SELECT button. The Set Drive SCSI ID Menu will appear.

Note: The operator panel displays only 16 lines per menu. If the library contains more than seven drives, you must use the down arrow button to scroll to drives 08 and 09.

2. Use the up and down arrow buttons to change the ID.
3. When the ID is correct, press SELECT to save your changes. A message screen will appear to indicate that the library is saving the new ID. Then the drive configuration menu will re-appear.

   These statements explain how the drive configuration might look after it reappears:

   - The cursor position is the same as it was in Step 3.
   - The new SCSI ID for the tape drive might not appear right away.

4. Press the arrow down button to get to the drive's second line of information (which is the drive's bus status field).
5. Press the SELECT button. The Set Drive SCSI Bus Menu will appear.
6. Use the up and down arrow buttons to change the bus status to ON or OFF.
7. When your choice is highlighted, press the SELECT button to save the changes. Press the MENU button to abort, the drive configuration screen will reappear.
8. Continue these steps until all drives are configured.

Drive Entries (LTO Fibre Channel Only)

You may either set a hard Fibre Channel address of 0 for LTO drives or allow the address to be set automatically, through arbitration.

Note: Before you enter an LTO Fibre Channel address to 0, you must first set the drive's Fibre Channel hard address option to *enabled*.

If you configure the drive for soft addressing, you allow the network to configure the address. To do this, you must set the Fibre Channel hard address option to *disabled*. The default for this option is *disabled*.

To set this value:

1. Press the arrow buttons to scroll to the drive you wish to configure and press the SELECT button. The screen will allow you to select hard addressing to `enabled` or `disabled`.
2. Press the up and down arrow buttons to line up with your choice. Press SELECT and:
   - If you select `enabled`, the hard address will be set to 0
   - If you select `disabled`, the address will arbitrate through the channel.
3. Press the SELECT button to save the changes. Press the MENU button to abort.
4. If you wish to set other configuration values, continue with the next section.
   - If you have already changed the library's SCSI ID or Port 0 address and are planning to exit the Main Configuration Menu at this time, you must press the RESET button.
   - If you wish to set other configuration values, continue with the next section.
   - If you have not changed the library's SCSI ID or Port 0 address and are not setting other configuration values, press the MENU button until you exit all menus.

Drive Entries ~ 9840/T9840B

To configure a 9840/T9840B drive:

1. The drive must have firmware version 1.24 or higher. Check the drive's firmware version, by selecting `DRIVE INFO` from the Main Menu.
2. Configuring a 9840/T9840B/T9940 drive might involve more than setting the drive's SCSI ID and bus status.

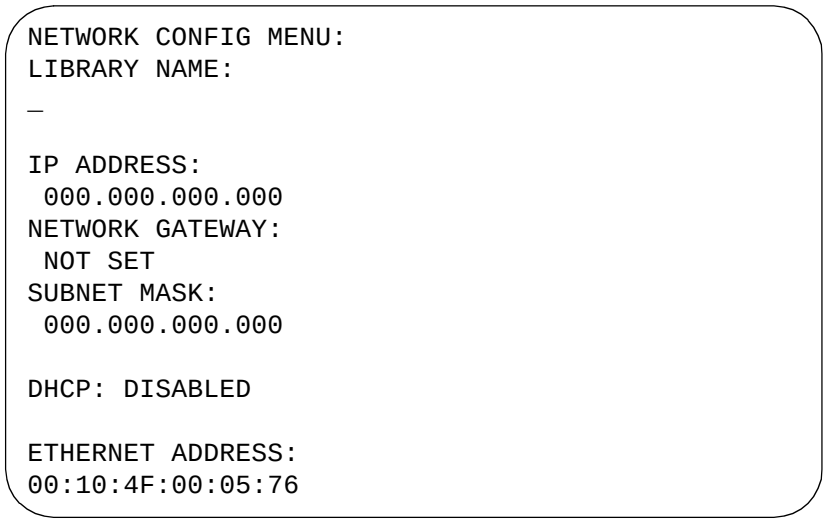
   Refer to the *9840/T9840B/T9940 Tape Drive Service Reference Manual* for information about 9840/T9840B/T9940 drive configuration options and instructions.

Network Configuration

The Network Config Menu lets you modify the library's network configuration and view the library's Ethernet address.

Figure 2-8 shows an example of the network configuration screen.

Figure 2-8. Network Configuration Menu



Four entries complete the library's network configuration:

- Library name
- IP address
- Network gateway
- Subnet mask

You also can view the library's Ethernet address.

Note: You might need to consult the systems administrator for some information.

Viewing the Ethernet Address

Note: The library's Ethernet address is pre-set at the factory. You cannot change it.

To view the Ethernet address:

1. At the Main Configuration Menu, press the arrow down button to line up the cursor with NETWORK CONFIG.
2. Press the SELECT button. The Network Config Menu will appear.
3. The library's Ethernet address appears at the bottom of the screen.

Setting the Library Name

The system administrator might assign the library a name. The name is mapped to the IP address but does not affect operation.

To set this value:

1. At the Network Config Menu, press an arrow button until the cursor underscores LIBRARY NAME.
2. Press the SELECT button. An editing screen appears.
3. On the editing screen:
   a. Use the up and down arrow buttons to select a value for each character (field) in the name.
   b. Use the SELECT button to move right to the next field.
   c. Use the MENU button to move left to the previous field.

Note: Do not enter a library name longer than 30 characters.

4. When the screen displays your desired setting, press the SELECT button twice to save the changes. Press the MENU button to abort.

Setting the IP Address

The system administrator might assign the library an IP address, which makes the library accessible through a network.

Note: To use the Horizon L Series Library Monitor, you must set the library's IP address at the operator panel.

To set the IP address:

1. At the Network Config Menu, press an arrow button until the cursor underscores IP ADDRESS.
2. Press the SELECT button. An editing screen appears.
3. On the editing screen:
   a. Use the up and down arrow buttons to select a value for each digit (field) in the address.
   b. Use the SELECT button to move right to the next field.
   c. Use the MENU button to move left to the previous field.
4. When the screen displays your desired setting, press the SELECT button from the right-most field to save the changes. Press the MENU button to abort.

Setting the Network Gateway Address

Note: Entering this address is optional. It serves to indicate the gateway connection between subnets, but it is applicable only when such a connection exists and is necessary to library operation.

Consult the systems administrator for additional information.

To set the network gateway address:

1. At the Network Config Menu, press an arrow button until the cursor underscores NETWORK GATEWAY.
2. Press the SELECT button. An editing screen appears.
3. On the editing screen:
   a. Use the up and down arrow buttons to select a value for each digit (field) in the address.
   b. Use the SELECT button to move right to the next field.
   c. Use the MENU button to move left to the previous field.
4. When the screen displays your desired setting, press the SELECT button from the right-most field to save the changes. Press the MENU button to abort.

Setting the Subnet Mask Address

The system administrator might assign the library a subnet mask address if one is required. This address makes the library accessible through a subnet on a large network.

To set the subnet mask address:

1. At the Network Config Menu, press an arrow button until the cursor underscores SUBNET MASK.
2. Press the SELECT button. An editing screen appears.
3. On the editing screen:
   a. Use the up and down arrow buttons to select a value for each digit (field) in the address.
   b. Use the SELECT button to move right to the next field.
   c. Use the MENU button to move left to the previous field.
4. When the screen displays your desired setting, press the SELECT button from the right-most field to save the changes. Press the MENU button to abort.

- If you have already changed the library's SCSI ID or Port 0 address and are planning to exit the Main Configuration Menu at this time, you must press the RESET button.
- If you wish to set other configuration values, continue with the next section.
- If you have not changed the library's SCSI ID or Port 0 address and are not setting other configuration values, press the MENU button until you exit all menus.

Installing a Personality Module

If you are planning to use the Horizon L Series Library Monitor, install its personality module and other components according to the documentation included in the monitor shipping package. Consult this documentation for instructions about how to set required configuration data.

Setting the Web Password

If your library has StorageTek's L-Series Library Administrator installed, you must set a web password at the operator panel. For instructions on how to set this value, see the documentation that shipped with the software.

If you need to reset the password:

1. Connect to the command line interface (CLI)
2. Enter password reset
3. Enter *1* to reset the password to horizon

Screen Characteristics

You also can change the operator panel's screen characteristics from the main configuration menu. The screen characteristics are saved in non-volatile memory.

To change the contrast and backlight (or brightness) of the operator panel screens:

1. At the Main Configuration Menu, press an arrow button until the cursor underscores DISPLAY INFO.
2. Press the SELECT button. The Display Info Menu will appear.
3. Use the arrow buttons to line up with the desired screen characteristic: CONTRAST or BACKLIGHT. An editing screen will appear.
4. On the editing screen, use the up and down arrow buttons to change the count value.

Note: To reset the screen characteristics to the default values, line up the cursor with RESTORE DEFAULTS and press the SELECT button.

5. When the value is correct, press the SELECT button to save the changes. Press the MENU button to abort.

Cleaning Cartridge Warning Count

The Cleaning Info Menu provides information about the library's cleaning cartridges, lets you change the warning count for each type of cleaning cartridge, as well as import and export cleaning cartridges from the library.

This menu also lets you check the number of times a cleaning cartridge has been used.

Figure 2-9 shows an example of the cleaning information screen.

Figure 2-9. Cleaning Information Menu

```
CLEANING INFO

NUM CLEAN CARTRIDGES: 00

DLT WARN COUNT: 000
9840 WARN COUNT: 000
HP LTO WARN COUNT: 000
IBM LTO WARN COUNT: 000
SGT LTO WARN COUNT: 000

EXPORT CARTRIDGES
IMPORT CARTRIDGES

CLEAN CARTIDGE INFO
```

Cleaning cartridges have a limited life span. After multiple uses, a cleaning cartridge must be replaced and disposed of.

If you have enabled the Auto Clean feature, you can use the operator panel to set the maximum number of times a cleaning cartridge can be used (or the "warning count").

- For DLT drives, the product manual specifies that you can use a DLT cleaning cartridge a maximum of 20 times.
- For 9840 cartridges, refer to the *9840/T9840 Tape Drive User's Reference Manual*.
- For Ultrium cartridges, refer to the specific manufacturer's documentation.

Note: The Auto Clean feature is automatically enabled if you insert even one cleaning cartridge into the reserved cell area and then reset the library.

You set the cleaning cartridge warning count from the Cleaning Info menu.

To set this value:

1. From the status screen, press the MENU button. The Main Menu will appear.
2. Press the arrow button until the cursor underscores CLEANING INFO.
3. Press the SELECT button. The Cleaning Info menu will appear. This menu displays the number of cleaning cartridges in the reserved area.
4. Using an arrow button, line up the cursor with the appropriate drive's WARNING COUNT.
5. Press the SELECT button for your choice. An editing screen will appear.
6. The editing screen displays the current setting for the cartridge warning count. It displays the maximum recommended warning count below the current setting. On this screen, use the up and down arrow buttons to change the count value.
7. When the value is correct, press the SELECT button to save the changes. Press the MENU button to abort.
8. When you are finished, press the MENU button twice to return to the library status screen.

L-Series Library Admin Entries

The L-Series Library Admin is an optional Web-based interface to the library. Before you can use the interface to monitor the library or alter the library's configuration, you must enter two values at the operator panel:

- The library's IP address
- The library's Web password

For instructions on how to make these entries, see the documentation included in the monitor shipping package. For instructions on using the interface to alter the library's configuration or monitor library activity, access the online help files for the monitor.

Configuration Verification

When you have completed all configuration entries, the operator panel will notify you if you made a change that requires you to press the RESET button.

When the library becomes ready, go through the configuration screens to verify that all information is complete.

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Trouble Isolation Procedures

3

This chapter provides information about trouble isolation procedures (TIPs). TIPs are guidelines that help you diagnose and correct operational problems that do not result in the library displaying a fault symptom code (FSC).

Examples of failures that might not post an FSC are:

- "TIP 0000: START" on page 3-2
- "TIP 1000: AC Power Problems" on page 3-3
- "TIP 1010: UPS Power Problems" on page 3-5, also see:
  - Table 3-1 on page 3-6 for more information or suggestions
- "TIP 2000: DC Power Problems" on page 3-8
- "TIP 3000: Operator Panel" on page 3-10
- "TIP 4000: Interface" on page 3-11
- "TIP 5000: Tape Drives" on page 3-13, also see
  - Table 3-2 on page 3-16 for drive messages and
  - Table 3-3 on page 3-17 for more information or suggestions

Each TIP is designed to help you isolate these problems. The Start TIP is the beginning point for all other TIPs.

CAUTION:
Possible loss of data: **Make sure the operator has placed the library and drives offline before troubleshooting library faults.**

See Chapter 4, "Removal and Replacement," to replace the faulty field replaceable units (FRUs).

This chapter also includes information about how to run diagnostic tests. See "Diagnostic Tests" on page 3-19.

TIP 0000: START

Use this TIP to help determine the type of problem you are having and which TIP to use to help isolate the problem.

Problem	Conditions That Could Cause This Problem
A problem is detected, but no FSC is displayed	• Defective AC power component • Defective DC power component • Defective operator panel • Defective or incorrect interface cable or terminator • Defective MPC card • Defective tape drive

1.	Do you have an AC power problem?	**Yes:**	Go to "TIP 1000: AC Power Problems" on page 3-3.
		No:	Go to step 2.
2.	Do you have an DC power problem?	**Yes:**	Go to "TIP 2000: DC Power Problems" on page 3-8.
		No:	Go to step 3.
3.	Do you have an operator panel problem	**Yes:**	Go to "TIP 3000: Operator Panel" on page 3-10.
		No:	Go to step 4.
4.	Do you have a problem where the operating system cannot access the library?	**Yes:**	Go to "TIP 4000: Interface" on page 3-11.
		No:	Go to step 5.
5.	Do you have a problem with a tape drive?	**Yes:**	Go to "TIP 5000: Tape Drives" on page 3-13.
		No:	Go to step 6.
6.	If you are uncertain, run diagnostic tests on the library.	See "Diagnostic Tests" in Chapter 3, "Trouble Isolation Procedures" for additional information.	

TIP 1000: AC Power Problems

Use this TIP to troubleshoot AC power problems.

WARNING:
Make sure you follow the procedures in "Safety" on page xxi.

Problem	Conditions That Could Cause This Problem
The PDU breaker trips.	• Defective AC PDU • Defective power cable • Incorrect power source • Defective tape drive

1. Open the rear door. 2. Is the power cord seated properly?	**Yes:** **No:**	Go to step 3. Reseat the power cord.
3. Power off all the tape drives. 4. Lift the PDU breaker. Does it trip?	**Yes:** **No:**	Go to step 5. Power on drives, one at a time, to see which drive causes the breaker to trip. Replace the defective drive. Go to "TIP 5000: Tape Drives" on page 3-13.
5. Disconnect the power cable from the customer receptacle. At the male pins on the power connector, use a volt/ohmmeter (set to *ohms*) to check between the following male pins on the power cable: • 1 phase pin to GND = open • 2nd phase pin to GND = open • 1 phase to 2nd phase = <1 MΩ • GND pin to frame = short Are the measurements correct?	**Yes:** **No:**	Go to step 9. Go to step 6.

6. Loosen the screws on the cable strain relief for the AC PDU. 7. Remove the power cable from the bottom of the PDU. 8. Use an ohmmeter to check the continuity of all three wires in the power cable. Is there continuity?	**Yes:** Go to step 9. **No:** Replace the cable.
9. Plug the power cord back into the customer's outlet. Leave the library end of the cord unplugged.	

WARNING:
***Electrocution hazard:* Take the necessary safety measures when measuring line voltage in the next procedure.**

WARNUNG: Bevor Sie die Netzspannung wie nachstehend beschrieben messen, treffen Sie die entsprechenden Sicherheitsmaßnahmen.

Avertissement:
***Danger d'électrocution:* Avant de mesurer la tension de secteur à l'étape suivante, prendre les mesures de sécurité requises.**

10. Switch your volt/ohmmeter to *AC volts* and measure the line voltage at the cable. • Nominal voltage for North America is 100 to120 VAC. • Nominal voltage for international is 200 to 240 VAC. Is the line voltage correct?	**Yes:** Go to step 11. **No:** Notify the customer about this potential problem.
11. Place the cable into the bottom of the AC PDU. Lift the breaker. Does the breaker still trip?	**Yes:** Replace the AC PDU.

TIP 1010: UPS Power Problems

Use this TIP to troubleshoot power problems with the uninterruptible power supply (UPS). This UPS is an optional feature that was designed to help prevent blackouts, brownouts, sags and surges in AC power to the library.

See "Uninterruptible Power Supply" on page A-6 for a wiring diagram and more information about the UPS.

Notes:

If power fails, the UPS will supply power to the equipment connected to the power strip until the batteries are exhausted. While running on battery power, periodic beeps will sound.

- Press the TEST/ALARM DISABLE button to turn off this alarm.
- A continuous beep will sound *two* minutes before the UPS will shutdown.

WARNING:
Make sure you follow the procedures in "Safety" on page xxi.

Problem	Conditions That Could Cause This Problem
No power to the library.	• Defective UPS, switch, or power strip • Defective AC PDU • Defective power cable • Disconnected power source

1. Did the customer site lose power?	**Yes:**	Go to step 2.
	No:	Go to step 4.
2. Did the UPS activate?	**Yes:**	Go to step 3
	No:	Go to step 4.
3. Check the Replace Battery light. Is the LED on?	**Yes:**	See Table 3-1 on page 3-6 for information about the problem and possible cause.
	No:	Go to step 4.
4. Isolate the power problem between the library and the UPS.	Refer to the *L180 and L700 Uninterruptible Power Supply Reference Manual* for more information and fault isolation of the UPS. See Table 3-1 on page 3-6 to help isolate the problem with the UPS. See "TIP 1000: AC Power Problems" on page 3-3 for information about the library.	

Troubleshooting the Uninterruptible Power Supply

Table 3-1 lists some possible problems that may occur and solutions:

Table 3-1. Troubleshooting the Uninterruptible Power Supply

Problem and Possible Cause	Solution
UPS will not turn on.	
• ON button not pushed.	Press the ON button once to power on the UPS and other equipment.
• UPS not connected to AC power supply.	Make sure the power cable from the UPS to the customer's input power is securely connected at both ends.
• UPS input circuit breaker tripped.	Reduce the load on the UPS by unplugging equipment and reset the circuit breaker (on back of the UPS) until you isolate the device causing the problem (or the UPS).
• Very low or no utility voltage.	Check the AC power supply to the UPS with a table lamp. If the light is very dim, check the input voltage.
• Battery not connected properly.	Check the battery connections.
UPS will not turn off.	
• Internal UPS fault.	Do not attempt to use the UPS. Unplug the UPS and contact your service representative immediately.
UPS operates on battery although normal line voltage exists.	
• UPS's input circuit breaker tripped.	Reduce the load on the UPS by unplugging equipment and reset the circuit breaker (on back of the UPS) until you isolate the device causing the problem (or the UPS).
• Very high, low, or distorted line voltage. **Note:** Inexpensive generators can distort the voltage.	• Move the UPS to a different outlet on a different circuit. • Test the input voltage with the Utility Voltage display. If acceptable to the load, reduce the UPS's sensitivity (refer to the *L180 and L700 Uninterruptible Power Supply Reference Manual* for more information).
UPS beeps occasionally.	
• Normal UPS operation.	None. The UPS is protecting the load.

Problem and Possible Cause	Solution
UPS does not provide expected backup time.	
• The UPS's battery is weak because of a recent power outage or is near the end of its service life.	Charge the battery. Batteries require recharging after extended outages. The batteries wear faster when in service more often and when operated at higher temperatures. If the battery is near the end of its service life, consider contacting your service representative to replace the battery.
• The UPS is overloaded.	Check the UPS load display and unplug any less needed equipment (such as printers).
Front panel indicators flash sequentially.	
• The UPS has been shutdown by remote control.	None. The UPS will restart automatically when power is restored.
All indicators are lit and the UPS emits a constant beeping sound.	
• Internal UPS fault.	Do not use the UPS. Turn the UPS off and contact your service representative immediately.
All indicators are off and the UPS is plugged into the power source.	
• The UPS has shutdown and the battery is discharged from an extended outage.	None. The UPS will return to normal operation when power is restored and the battery has a sufficient charge.
The Replace Battery light is on.	
• Weak batteries.	Allow the batteries to recharge for at least four hours. If the problem persists after recharging, contact your service representative to replace the batteries.
• Replacement batteries not connected properly.	Check or reconnect the battery connections.

TIP 2000: DC Power Problems

Use this TIP to troubleshoot DC power problems.

WARNING:
Make sure you follow the procedures in "Safety" on page xxi.

Problem	Conditions That Could Cause This Problem
The PDU breaker is UP, but the library will not power on.	• Defective DC power supply • Defective operator panel (MPO card) • Defective cable from MPC card to MPO card • Defective MPC card • Defective component within the library causing the DC power supply to shut down.

1. Open the right front door and the right side door. 2. Is the AC PDU breaker up?	**Yes:**	Go to step 4.
	No:	Turn on PDU breaker. Go to step 3.
3. Does the breaker trip?	**Yes:**	Go to "TIP 1000: AC Power Problems" on page 3-3.
	No:	Go to step 4.
4. Look at the small viewing window on the DC power supply. Is the green LED lit?	**Yes:**	Go to step 6.
	No:	Turn off the breaker. Unplug J570 (or J571) on the MPC card. Go to step 5.
5. Plug J570/571 into the MPC card. a. Turn on the breaker. b. Look at the small viewing window on the DC power supply. c. Is the green LED lit?	**Yes:**	A cable or component has caused the machine to shut down the power. 1. Turn off the breaker. 2. Unplug the connectors (except J570/571) from the MPC card. 3. Plug an MPC connector into the MPC card. 4. Turn on the breaker and see if the green LED is on. 5. Repeat steps 1–4 until you find the connector that causes the LED to turn off. **Note:** If a connector causes the LED to turn off, find the component that the connector supplies and replace that component.

	Refer to Figure A-5 on page A-17 for an illustration and a list of the connectors for the MPC card. **No:** Go to step 6.
6. Are the MPC card fans and the two fans in the drive area working?	**Yes:** Go to step 7. **No:** +43 VDC is missing. Replace the DC power supply.
7. Is the operator panel lit?	**Yes:** Go to step 8. **No:** Replace in this order: 1. Operator card (MPO). 2. Operator panel cable to MPC card, J28.
8. Open the left front access door and check the hand LEDs. Are they lit?	**Yes:** Go to step 9. **No:** Possible hand problem. Replace the hand.
9. If the machine still does not power on....	Replace the MPC card.

TIP 3000: Operator Panel

Use this TIP to troubleshoot operator panel or display problems.

WARNING:
Make sure you follow the procedures in "Safety" on page xxi.

Problem	Conditions That Could Cause This Problem
The operator panel has no display, or the panel does not function correctly.	• Defective AC PDU • Defective DC power supply • Defective operator panel (MPO card). • Defective cable or connection between MPC card to MPO (operator panel) card • Defective MPC card

1. Have the customer place the library and tape drives offline. 2. Open the rear door 3. Is the PDU breaker on?	**Yes:**	Go to step 5.
	No:	Lift the breaker. Go to step 4.
4. Does the breaker trip?	**Yes:**	Go to "TIP 1000: AC Power Problems" on page 3-3.
	No:	Go to step 5.
5. Is the operator panel lit?	**Yes:**	Go to step 6.
	No:	Go to "TIP 2000: DC Power Problems" on page 3-8.
6. Open the front door and check the hand indicators. Are they lit?	**Yes:**	Go to step 7.
	No:	Go to "TIP 2000: DC Power Problems" on page 3-8.
7. Use the panel buttons to enter a test or move to a different screen. Does the panel work?	**No:**	Replace in this order, checking for operation after each step: 1. The MPO (operator panel) card 2. The cable from the MPC card to the operator panel 3. The MPC card

TIP 4000: Interface

Use this TIP if the operating system does not recognize the library.

WARNING:
Make sure you follow the procedures in "Safety" on page xxi.

Note: In the following procedure, to determine if the SCSI connectors are the correct length and type, see "External Interfaces" in Appendix A, "Theory of Operation."

CAUTION:
The single-ended and differential alternatives are not compatible and cannot be mixed on the same SCSI bus.

Note: You can use the Lib SCSI I/F Config menu from the operator panel to check the valid SCSI bus connections. The screen that displays the SCSI ID of the library should display either single-ended or differential.

If the screen displays Invalid, you have mixed single-ended devices with differential devices somewhere on the bus. Correct the bus connection, then use the menu to verify the bus connection.

Problem	Conditions That Could Cause This Problem
The operating system cannot access the library.	• System not working or incorrectly configured • Incorrect library configuration • Loose or incorrect cable connection at the system or at the library • Defective MPC card

1. Is the library the only system component not operating correctly? 2. Have the customer place the library and drives offline. 3. Open the front door.	**Yes:**	Go to step 4.
	No:	Notify the system administrator.
4. Check the library configuration to make sure it matches the system requirements. Is the library correctly configured?	**Yes:**	Go to step 5.
	No:	Correctly configure the library.

5. Check the library interface cable connection at the library electronics module bulkhead. Is the cable the correct type and is the connection good?	**Yes:**	Go to step 6.
	No:	Re-seat the cable connector or correct the cable type.
6. If the control path is SCSI, is a SCSI terminator at the library electronics module bulkhead?	**Yes:**	Go to step 7.
	No:	Install the correct terminator: • Differential PN 10148003 • Single-ended PN 10148002
7. Check the library bulkhead-to-MPC card cable connection. Is the cable the correct type and is the connection good?	**Yes:**	Go to step 7.
	No:	Re-seat the cable connector or correct the cable type.
8. Check the cable connection at the client. Is the cable the correct type and is the connection good?	**Yes:**	Go to step 9.
	No:	Re-seat the cable connector or correct the cable type.
9. Check the SCSI terminator at the client. Is the terminator turned on?	**Yes:**	Go to step 10.
	No:	Turn it on.
10. Is the length of the SCSI bus correct for its operation type?	**Yes:**	Go to step 11.
	No:	Connect the correct length of cable.
11. Does the SCSI bus have more than the maximum number of devices allowed?	**Yes:**	Check with the system administrator to correct the number of devices on this bus.
	No:	Go to step 12.
12. Check all connections at the MPC card. Are the connections correct? See Figure A-5 on page A-17.	**Yes:**	Go to step 13.
	No:	Reseat the connectors.
13. Replace the MPC card. **Note:** Make sure you reconfigure the new MPC card. Does this fix the problem?	**Yes:**	Return the equipment to the customer.
	No:	The problem may be due to: • Defective SCSI or Fibre Channel cable • Intermittent DC power problem Replace the cables one at a time. If this does not fix the problem, replace the DC power supply.

TIP 5000: Tape Drives

See Table 3-3 on page 3-17 for a list of potential problems and possible causes.

The following procedure describes the isolation of a faulty tape drive and its replacement while the library and other drives are online. This procedure is called a *hot swap* of the tape drive.

Note: Before starting, read through the procedure to become familiar with the tasks both you and the operator must perform.

You can use the Drive Status menu from the operator panel to check the drive's status. Typically, drive failures are reported in this menu as:

- Not connected
- Unknown drive
- Not communicating
- Not functional
- Not loadable

Problem	Conditions That Could Cause This Problem
The client system: • Cannot access a drive • Marks the drive unavailable • Detects an unrecoverable error in the drive	• The drive has lost power • A poor or missing SCSI/fiber bus connection • A defective SCSI/fiber cable • A damaged tape • A faulty drive

1. Have the operator place the drive offline. 2. Open the front door. 3. At the operator panel, check the drive's status. See Table 3-2 on page 3-16 for a list of messages. Does the panel display: • `Not communicating` • `Not functional`	**Yes:** Go to step 4. **No:** Go to step 6.
4. Is the drive firmly seated into its connector?	**Yes:** Go to step 5. **No:** Firmly seat the drive into the connector. Go to step 5.

5. Is the drive AC switch in the ON (|) position?	**Yes:**	Go to step 6.
	No:	Set the switch on. If the drive still fails to function, go to step 10.
6. At the operator panel, consult the drive's status (see list on page 3-13). Does the panel display: • `Unknown drive?`	**Yes:**	Check the drive type to be sure it matches the system requirements. This can be checked in the Lib Config menu and the Lib SCSI I/F Config menu on the operator panel.
	No:	Go to step 7.
7. At the operator panel, consult the drive's status (see list on page 3-13). Does the panel display: • `Not connected?`	**Yes:**	The drive's Tape Transport Interface (TTI) connector is not firmly connected or the AC switch may be off. See steps 4 and 5.
	No:	Go to step 9.
8. Check the host-to-drive cable connection at the library bulkhead (SCSI) or fiber component *and* at the drive. Is the cable the correct type and the connection good?	**Yes:**	Go to step 10.
	No:	If the cable is: • Incorrect type—schedule time to replace cable. • Incorrectly connected or the connector is damaged—schedule time to replace the cable.
9. If possible, obtain the tape that was mounted on the drive at the time of the error. Have the operator make another drive offline and use a system diagnostic test with this tape on that drive. Was an error encountered?	**Yes:**	Have the operator remove the tape from the system pool.
	No:	Go to step 10 Drive Replacement

10. Drive Replacement:

CAUTION:
***System interruption:* To avoid a system interruption, be sure to carefully follow the steps below when replacing the drive.**

a. Place the drive in a convenient position near the defective drive's position.

b. Have the operator quiesce the system's SCSI bus or Fibre Channel connection.

c. Replace the drive:

1. For DLT drives, follow the procedure in "DLT Tape Drive" on page 4-99 to replace the drive.

2. For IBM Ultrium drives, follow the procedure in "IBM Ultrium Tape Drive" on page 4-117.

3. For HP Ultrium drives, follow the procedure in "HP Ultrium Tape Drive" on page 4-124.

4. For Seagate Ultrium drives, follow the procedure in "Seagate Ultrium Tape Drive" on page 4-130.

CAUTION:
***Special information for 9840 drives:* Consult the *9840/T9840/T9940 Tape Drive Service Reference Manual* for drive configuration options. The library will automatically assign the same address to the replacement drive. However, you may need to configure other information for the drive before performing the swap.**

5. For 9840 drives, follow the directions in the *9840/T9840/T9940 Tape Drive Service Reference Manual* above to replace the drive.

11. Recovery Information:

Drive, library, and system recovery from the hot swap procedure is explained below.

Once the drive is replaced:

- A SCSI Bus Reset command is *not* asserted during the operation.
- The library will sense that a new drive is installed.
- Library communications with the drive are automatically resumed.
- The SCSI ID of the drive is automatically assigned the same ID of the drive that was replaced—no reconfiguration or library re-boot is required.
- The drive type, serial number, and microcode version is also automatically updated.
- The drive handle is cycled (DLT only).
- The drive is automatically available to the library.
- Some system intervention may still be required to make the drive available to the system.

Drive Status Messages

Table 3-2 summarizes drive status messages that might appear on the initial status screen:

Table 3-2. Drive Status Messages

Status Message	Explanation
INIT REQUIRED	You must initialize this drive.
NOT CONNECTED	This drive is not connected to the library.
UNKNOWN DRIVE	The library does not recognize the type of drive in this location.
NOT COMMUNICATE	This drive is not communicating with the library. (This drive might be powered off.)
NOT FUNCTIONAL	This drive is not operating properly.
EMPTY	No cartridge is loaded in this drive.
CARTRIDGE IN	This drive contains a cartridge, but it is not loaded into the drive.
CLEAN NEEDED	This drive requires cleaning. This message appears only if the drive is empty.
CLEAN FAILED	The attempt to clean this drive failed. This message appears only if the drive is empty.
LOADING	The drive is loading a cartridge.
REWOUND	The cartridge in this drive has been rewound.
UNLOADING	The drive is unloading a cartridge.
LOADED	A cartridge is loaded in this drive.
REWINDING	The cartridge in this drive is being rewound.
BUSY	This drive is performing a read or write operation.
CLEANING	The drive is being cleaned.

These messages might also appear on the Drive Information Menu and the Drive Diagnostics menu.

Potential Problems and Causes

Table 3-3 lists some potential problems with possible causes to help you determine problems with the tape drives:

Table 3-3. Potential Problems and Possible Causes

Problem	Possible Causes
Tapes not getting unloaded	• Bad drive • Max physical not set • Microcode • Operator induced problem • Bad or dirty hand
Slow throughput on drive	• Bad drive • SCSI bus problem • `st.conf` file not set correctly • Bad tapes • System problems
Read/Write errors on drives	• Bad tapes • Bad drives • `st.conf` file not set correctly • Bad bridge (if on a network)
Clean me light is on	• You clean the drive and light comes back on. What is the light really telling you? Possible read/write errors • Bad tapes or drive is getting ready to fail
Intermittent popped leader	• Bad drive • Bad leader • Bad tape in tape rotation
Drive is down	• Backup software downs the drive • Bad drive • Bad driver • SCSI problems
Library audits ok but ejects different tapes every time as unreadable	• Lens dirty • Bad hand (intermittent) • Bad bar codes
All lights on right front of DLT	• Popped leader • Bad drive
All lights on both sides on DLT	• Bad power supply • Bad drive
Drive makes a sound and the operator complains of intermittent SCSI bus errors (drive not communicating).	• 5V on DLT power supply low • Bad drive

Problem	Possible Causes
Drive makes a flip sound. All lights on right front of drive. Software says a tape is loaded and drive is in use. But no tape is in the drive.	• Popped leader
Operating system reports tape in the drive. It may or may not give a bar code. Customers verify that the drive is empty.	This is a buffer hang condition. The hardware and software are out of sync. • Re-IPL the drive. Try again. • Re-IPL the library. Unload all drives from the operating systems first. Try again. • Restart application. Try again. • Re-IPL the host
Customer reports drive keeps going down.	Watch the amount of time it takes the software to down the drive. - If it is a short time it is an operating system problem. - If it is a very long time it can be a drive mapping problem • Bad drive • Control path has a problem
Customer reports that he sees 7 or 15 drives on a bus. But there is only one drive.	• Wrong address. You have set the drive address to the same as the host bus adapter (HBA). This is usually ID 7.

Diagnostic Tests

Diagnostic tests simulate online library operation. These tests must be run only when the target mechanisms are *offline*.

For example, if the test exercises only the robot and does not affect any drives (as in the Get-Put diagnostic test), only the library must be offline. If, however, you want to mount a cartridge to a drive (Mount-Dismount diagnostic test), both the library *and* drive must be offline.

The Get-Put Loop and Mount-Dismount diagnostic tests are used to check library and drive operation.

Diagnostics Menu

The Main Diagnostics Menu lets you perform these functions:

- **Drive-related functions:**
  - Clean Drive: Enables you to clean tape drives manually
  - Mount: Inserts a test cartridge into a drive
  - Dismount: Removes a test cartridge from a drive
  - Run Drive Check: Determines if the DLT 8000, 9840, or T9840 Tape drive is functioning
  - Mount-Dismount Loop: Inserts a test cartridge into and removes it from a drive. (You may designate the number of times the library goes through the loop.)
- **Get-Put Loop:** Gets a test cartridge and puts it in another location. (You may designate the number of times the library goes through the loop.)
- **Demo Mode:** Simulates library operation

Figure 3-1 shows an example of a diagnostic screen.

Figure 3-1. Main Diagnostics Menu

```
MAIN DIAGNOSTICS MENU:

DRIVE DIAGNOSTICS
GET/PUT LOOP
DEMO MODE
```

Get-Put Loop Diagnostic Test

The Get-Put Loop diagnostic test verifies that the robot can move from cell-to-cell, using a diagnostic cartridge. The robot:

- Retrieves (gets) the diagnostic cartridge from the reserved cell
- Moves the hand and cartridge laterally and vertically
- Inserts (puts) the cartridge back into the reserved cell

To run the Get-Put Loop diagnostic test:

1. Make sure the library is offline.
2. Make sure the front door is closed and the library menu is displayed.
3. Make sure a diagnostic cartridge is in the reserved area.
4. From the status screen, press the MENU button.
5. Use the down arrow button to move the cursor next to DIAGNOSTICS.
6. Press the SELECT button. The diagnostics screen appears.
7. Use the down arrow button to move the cursor next to GET-PUT Loop.
8. Press the SELECT button. The get-put loop screen appears.
9. Follow the screen directions to set the number of times you want the test to run.
10. Press the SELECT button.
11. You will be prompted to confirm that you want the library in Maintenance Mode (offline) before beginning the test (ARE YOU SURE?). Press the SELECT button.
12. When this diagnostic test has completed, press the MENU button to return to the DIAGNOSTICS menu.

Mount-Dismount Loop Diagnostic Test

The Mount-Dismount Loop diagnostic test verifies that the robot can mount and dismount a cartridge to a drive. The robot:

- Retrieves a diagnostic cartridge
- Mounts the cartridge into a drive

When the drive unloads the cartridge, the robot:

- Retrieves the cartridge
- Inserts it back into its reserved cell.

To run the Mount-Dismount diagnostic test:

1. Make sure both the library *and* target drive are offline.
2. Make sure the front door is closed and the library menu is displayed.
3. Make sure a diagnostic cartridge is in the reserved area.
4. From the status screen, press the MENU button. The main menu appears.
5. Use the down arrow button to move the cursor next to DIAGNOSTICS.
6. Press the SELECT button. The diagnostics screen appears.
7. Use the down arrow button to move the cursor next to DRIVE DIAGNOSTICS.
8. Press the SELECT button. The list of available drives appears.
9. Use the arrow button to move the cursor to the drive you want to mount.
10. Press the SELECT button. The list of drive diagnostic tests appears.
11. Use the arrow button to move the cursor to MOUNT/DISMOUNT LOOP.
12. Press the SELECT button.
13. You will be prompted to confirm that you want the library in Maintenance Mode (offline) before beginning the test (ARE YOU SURE?). Press the SELECT button.
14. When this diagnostic test has completed, press the MENU button to return to the DIAGNOSTICS menu.

Other Diagnostic Tests

You might want to run all diagnostic tests. Descriptions of other tests that are available are listed below.

Clean Drive This routine will mount and dismount a specified cleaning cartridge to a drive. This routine does *not* require the library to be offline. *Make sure you show the operator how to run this test.* Refer to the *L180 Tape Library Operator's Guide*, PN 95895.

Mount This test will mount a diagnostic cartridge to a selected drive.

Dismount This test will dismount a diagnostic cartridge from a selected drive.

Run Drive Check This test will determine whether the specified drive is functioning. At the time of publication, the only drives that support this test are the DLT 8000 and the 9840. (The 9840 must be running code version 1.28 or later.)

CAUTION:
When DEMO MODE completes, you must IPL (reset) the library to re-audit the library. You must then notify the customer to update the client cartridge database.

Demo Mode This test will start a Get-Put Loop with customer cartridges to simulate machine operation. See the caution below.

Placing the Library Online

When you are ready to return the library to operation:

1. Have the operator enter the system command to place all drives online.
2. Have the operator enter the command to place the library online.
3. Have the operator enter the command to load the audit data to client memory.

Removal and Replacement

4

This chapter provides the procedures to remove and replace the field replaceable units (FRUs) within the L180 Tape Library which includes:

- "AC Power Distribution Unit" on page 4-5
- "DC Power Supply Assembly" on page 4-9
- "Operator Panel" on page 4-15
- "Cartridge Access Port Motor" on page 4-20
- "Hand-Camera Assembly" on page 4-29
- "Fan Tray Assembly" on page 4-35
- "MPC Card" on page 4-39
- "MPU Card" on page 4-49
- "MPW Card" on page 4-53
- "MPV Card" on page 4-56
- "Theta Motor" on page 4-65
- "Z Motor" on page 4-76
- "Z Flex Cable" on page 4-84
- "Library SCSI Cable" on page 4-90
- "Drive SCSI Y Cable" on page 4-95
- "DLT Tape Drive" on page 4-99
- "Super DLT" on page 4-106
- "DLT Drive Power Supply" on page 4-111
- "IBM Ultrium Tape Drive" on page 4-117
- "HP Ultrium Tape Drive" on page 4-124
- "Seagate Ultrium Tape Drive" on page 4-130
- "Restoring Operation" on page 4-136

Note: To replace the 9840 Tape Drives, refer to the *9840/T9840/T9940 Tape Drive Service Reference Manual,* for instructions.

Service Tools

You will need a standard service tool kit for most procedures. You may also need the following items listed in Table 4-1:

Table 4-1. Equipment and Tools List

Equipment/Tool	Part Number
Standard service tool kit	4019
Supplemental tool kit	24100094
ESD grounding kit	4711
Front door key	3102933xx
Cap motor spring hook	4656

An optional detached maintenance device, such as a laptop computer, is required to:

- Load microcode
- Access the fault symptom code (FSC) directory
- Connect for remote maintenance through a modem or external cable

Many screws require Torx screwdriver bits:

- 6-32 requires a Torx T-15 bit
- 6-32 flathead requires a Torx T-10 bit
- 10-32 requires a Torx T-25 bit
- 1/4-20 requires a Torx T-30 bit
- 4-40 pan head requires a Torx T-10 bit
- 4-40 flathead requires a Torx T-09 bit

Before Beginning

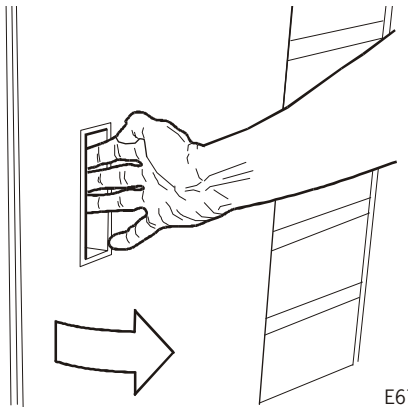
- Read the safety and ESD instructions in "Safety" on page xxi.
- If removing and replacing Fibre Channel components, read the information in "Fiber Optic Safety" on page xxviii.
- Perform the following steps before accessing a FRU in the library.

CAUTION:
Possible injury to person: **While reaching inside the library, take care to avoid bumping your head or catching your clothing on protruding edges.**

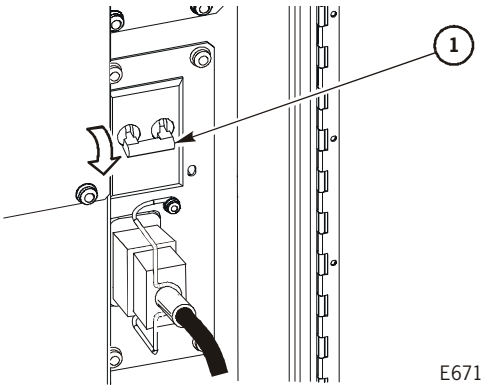
1. Make sure the customer has ended all jobs the robot is performing.

   Note: If you are replacing a drive, make sure the customer has ended all jobs to that drive.

2. Open the library rear door by pulling gently on the finger slot.

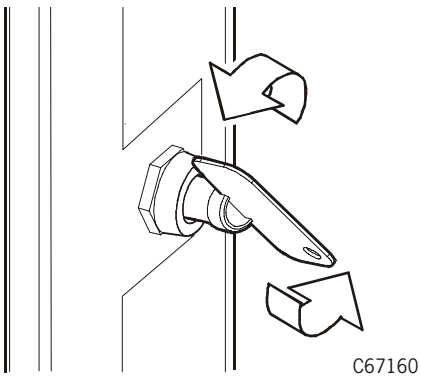


3. Remove power from the library by pressing down on the power switch on the bottom left area of the library.

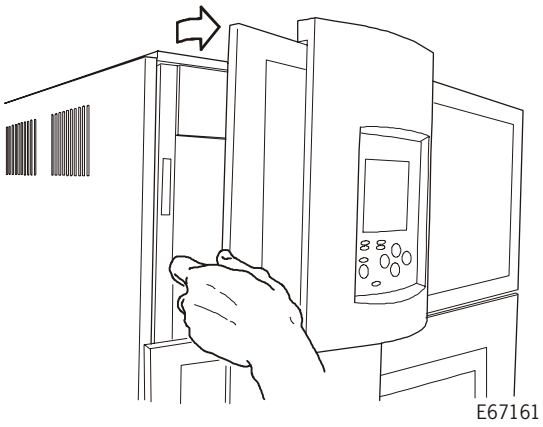


1. Power switch

- If you are replacing robotic or CAP FRUs:
  O pen the library front door by unlocking the top and bottom latches with the door key.



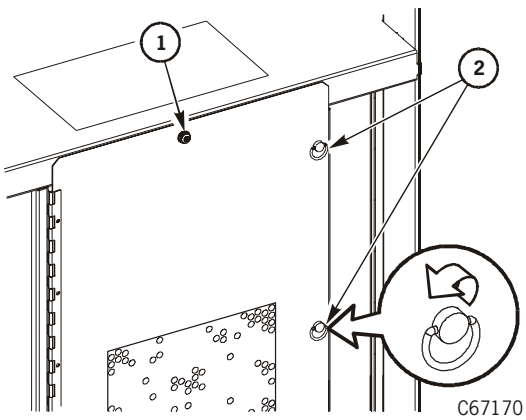
- If you are replacing the operator panel or rack installed components:
  Open the rack door by pulling gently on the left side of the door.



- If you are replacing the other FRUs:
  Open the rear door by pulling gently on the finger slot as shown in step 2.
- If you are replacing the theta motor, tape drive, or drive SCSI Y cable:
  Open the drive access door by:

  a. Pushing in and turning the snap rings to release them.

  a. Opening the door.



1. Screw (2)
2. Snap rings (7)

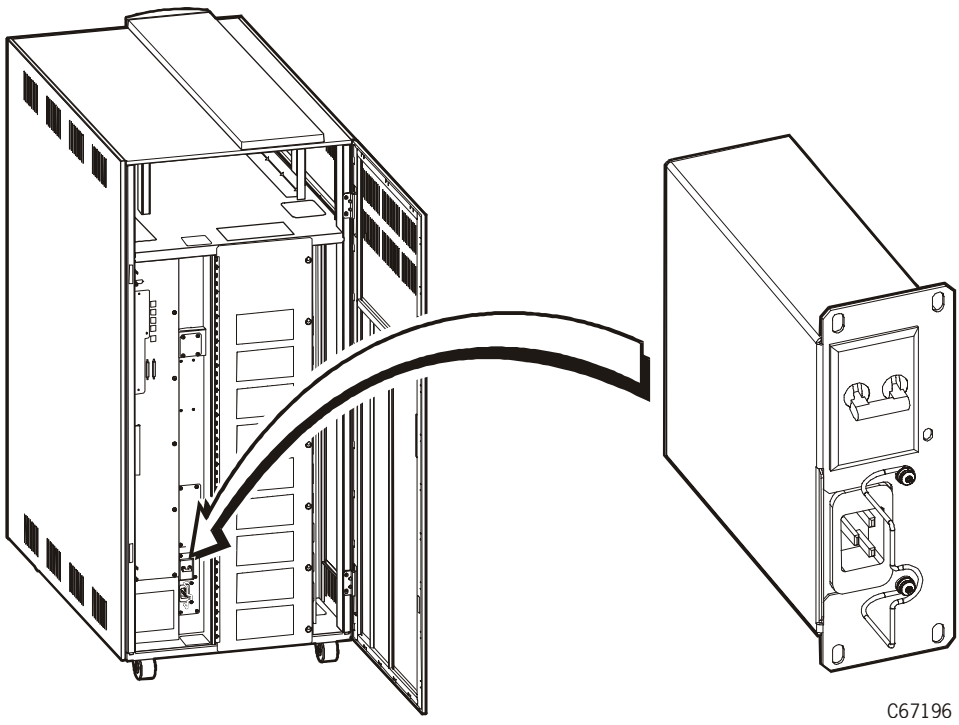
AC Power Distribution Unit

The AC power distribution unit (PDU) is behind the rear door, bottom middle section.

Use Figure 4-1 and the following procedure to replace the AC power distribution unit.

Note: If the library has two AC PDUs, this field replaceable unit may be removed and replaced while the library is powered on.

Figure 4-1. AC Power Distribution Unit (C67196)



Note: See "TIP 1010: UPS Power Problems" on page 3-5 for information about how to troubleshoot AC power problems with an uninterruptible power supply (UPS) installed.

Contact an your service representative for problems with the UPS.

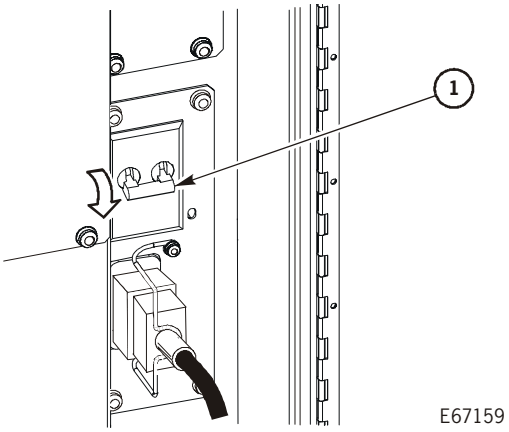
Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Remove power from the library by pressing down on the power switch.

WARNING:
Electrocution hazard: **Make sure you press down on the power switch before removing the PDU.**

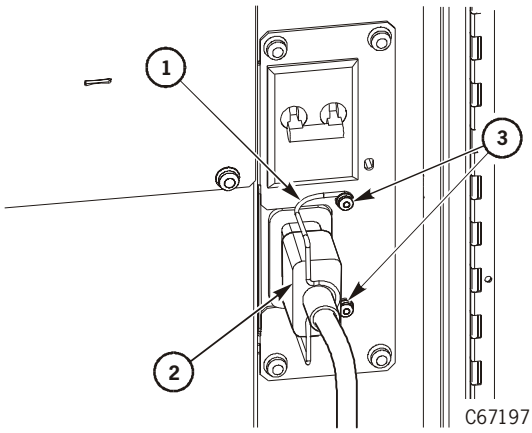
WARNUNG: ***Lebensgefährliche Spannung!*** **Bevor Sie den Netzstrom-Verteiler herausnehmen, kippen Sie den Netzschalter nach unten.**

Avertissement:
Danger d'électrocution: **Appuyer sur le commutateur avant de retirer l'unité de distribution de l'énergie (PDU).**



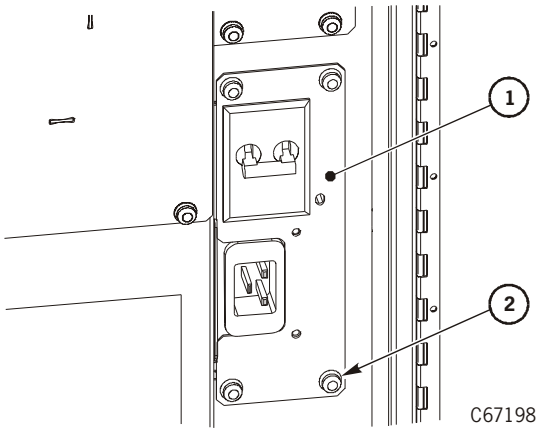
1. Power switch

3. Use a T-15 Torx bit to remove the two screws holding the strain relief in place.
4. Remove the strain relief from the power cable.
5. Disconnect the external power cable.



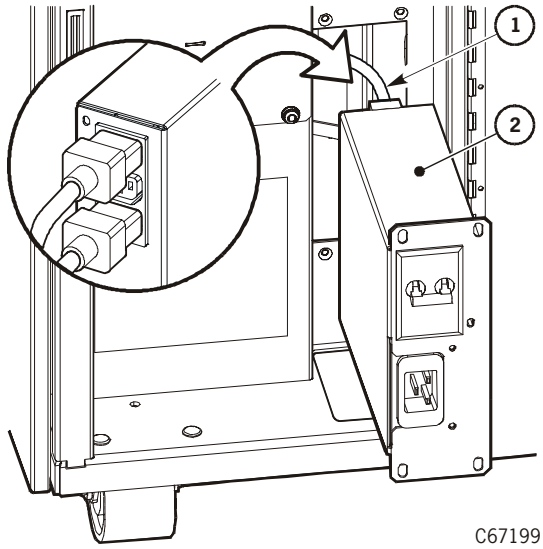
1. Strain relief
2. External power cable
3. Screws

6. Use a T-25 Torx bit to remove the four screws that attach the PDU to the frame.



1. PDU
2. Screw (4)

7. Pull the PDU straight out until you can disconnect the interior cables from the rear of the PDU.

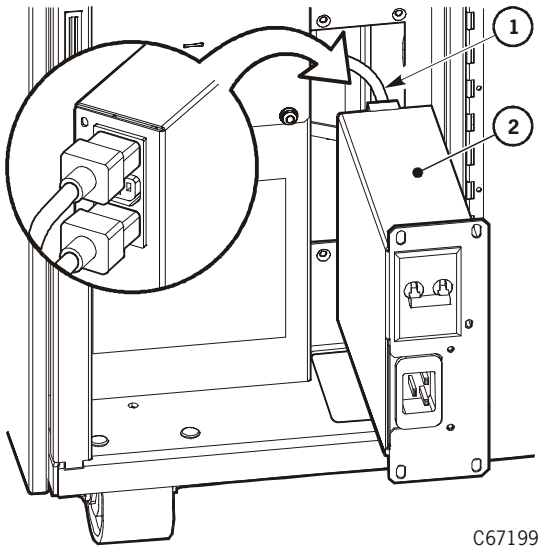


1. Interior cable (2)
2. PDU

8. Remove the PDU.

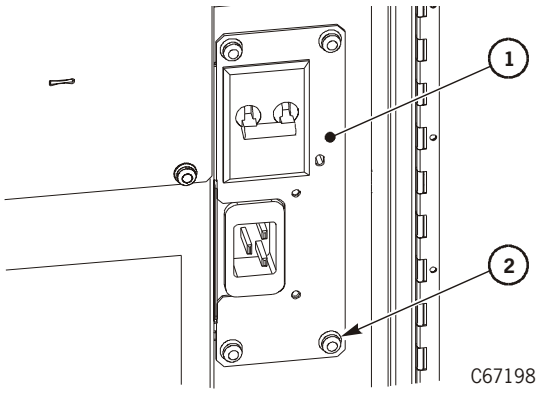
Replacement

1. Connect the interior cables and
2. Push the PDU straight into the library frame.



1. Interior cable (2)
2. PDU

3. Use the four screws to reattach the PDU to the plate.



1. PDU
2. Screw (4)

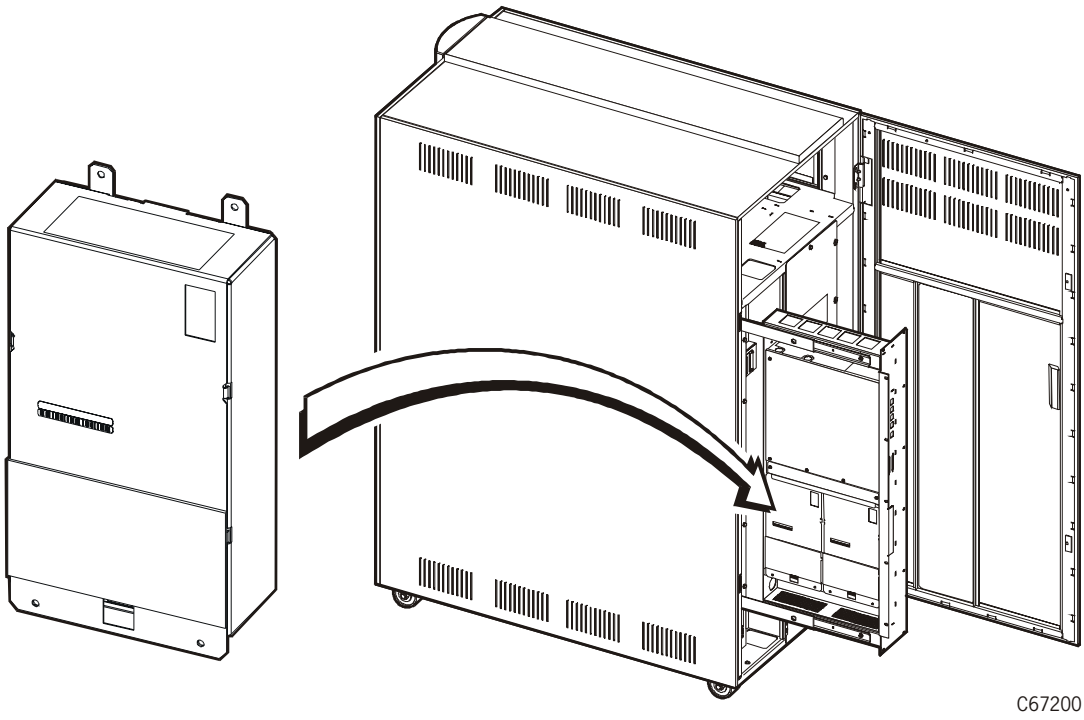
4. Reconnect the external power cable
5. Attach the strain relief with two screws.
6. Go to "Restoring Operation" on page 4-136.

DC Power Supply Assembly

The DC power supply assembly is under the electronics module.

Use Figure 4-2 and the following procedure to replace the DC power supply.

Figure 4-2. DC Power Supply Assembly (C67200)



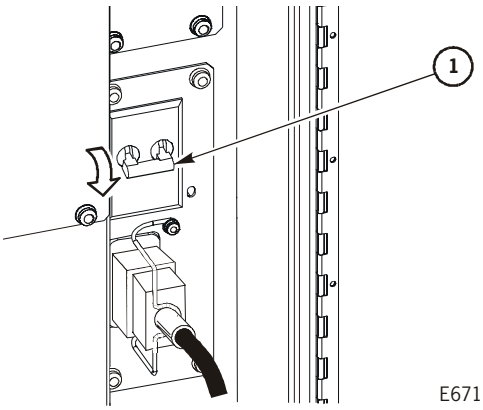
Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Remove power from the library by pressing down on the power switch.

WARNING:
***Electrocution hazard*: Make sure you press down on the power switch before removing the DC power supply assembly.**

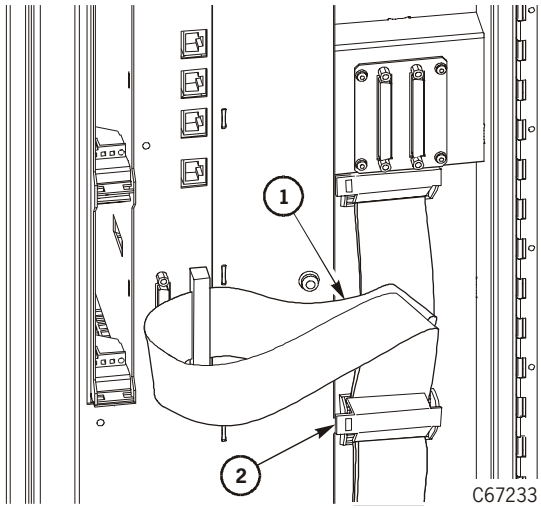
WARNUNG: *Lebensgefährliche Spannung!* Bevor Sie die Gleichstrom-Versorgungseinheit herausnehmen, kippen Sie den Netzschalter nach unten.

Avertissement:
***Danger d'électrocution:* Appuyer sur le commutateur avant de retirer le bloc d'alimentation en courant continu.**



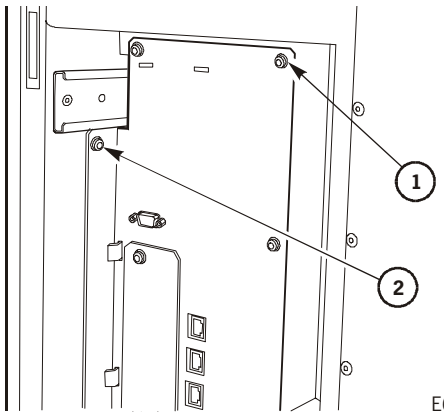
1. Power switch

3. If the library has a SCSI configuration, open the lower cable clamp and release the library SCSI Y cable.



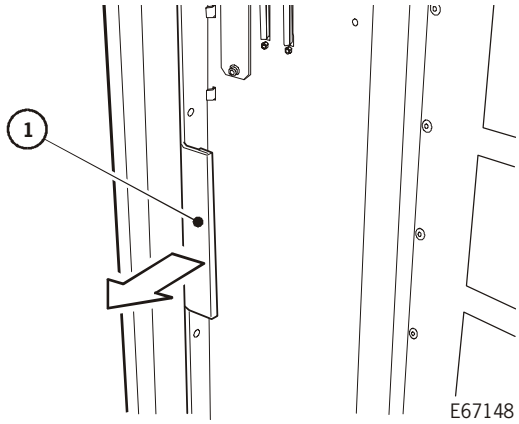
1. SCSI Y cable
2. Lower cable clamp

4. Use a T-25 Torx bit to remove the 13 screws (eight on the front of the cover and five along the left side of the cover).



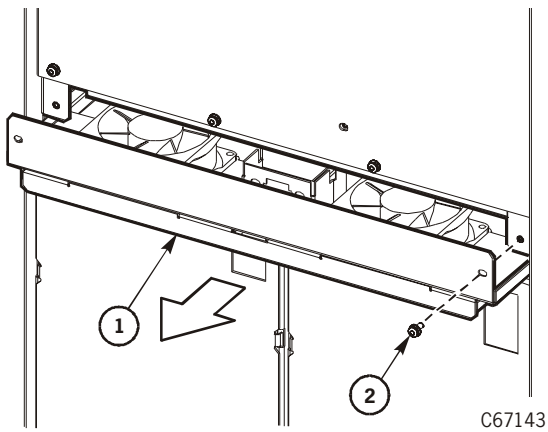
1. Front cover screw (8)
2. Left side screw (5)

5. Use the handle to gently pull out the compartment until the buttons in the top and bottom slides snap into place.



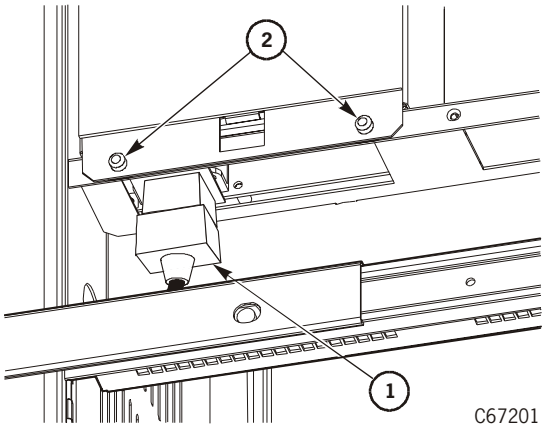
1. Handle

6. Use a T-15 Torx bit to remove the two fan tray screws.
7. Pull the fan tray assembly out from the frame.



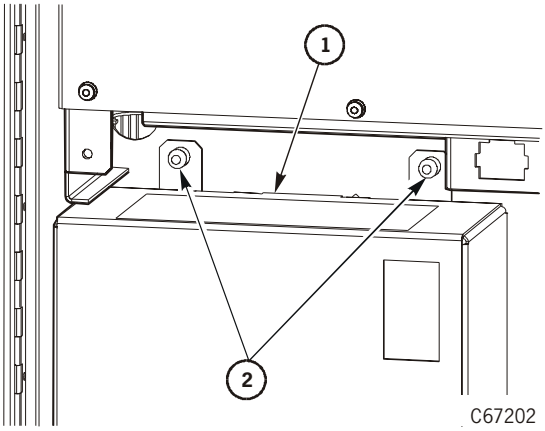
1. Fan tray assembly
2. Screw (2)

8. Disconnect the AC input power cable at the bottom of the DC power supply.
9. Use a T-15 Torx bit to remove the two bottom screws from the power supply.



1. Power cable
2. Screws

10. Use a T-20 Torx bit to remove the two top screws from the power supply.

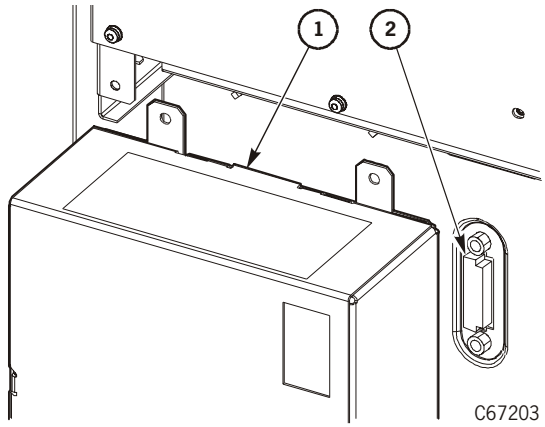


1. Power supply
2. Screws

11. Pull the power supply straight out to disengage it from the drawer plug.

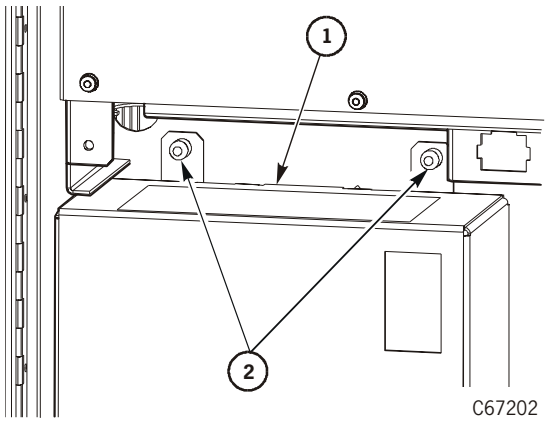
Replacement

1. Push the power supply straight in to engage it into the drawer plug.



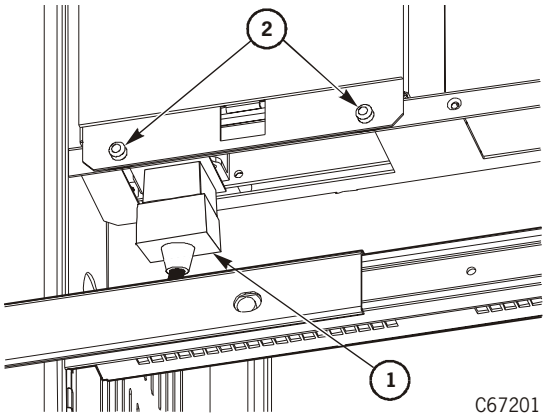
1. Power supply
2. Drawer plug

2. Install the two top screws.



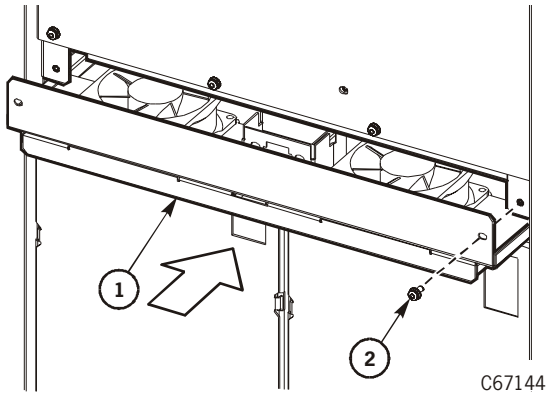
1. Power supply
2. Screws

3. Install the two bottom screws.
4. Connect the power cable into the bottom of the DC power supply.



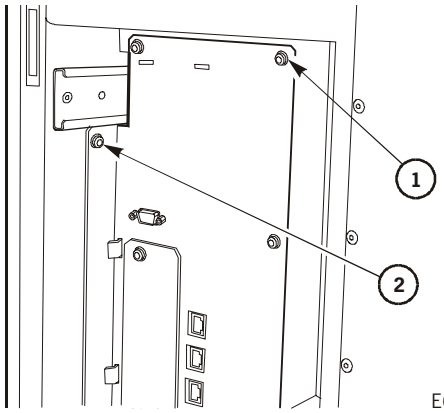
1. Power cable
2. Screws

5. Push the fan tray assembly into the frame and install the two fan tray screws.



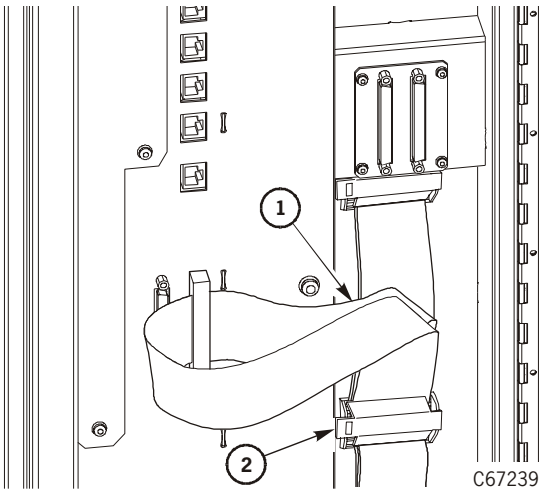
1. Fan tray assembly
2. Screw (2)

6. Install the 13 screws (eight on the front cover and five along the left side of the cover).



1. Front cover screw (8)
2. Left side screw (5)

7. If the library has a SCSI configuration, place the SCSI Y cable loop in the lower cable clamp and close the clamp.



1. SCSI Y cable
2. Lower cable clamp

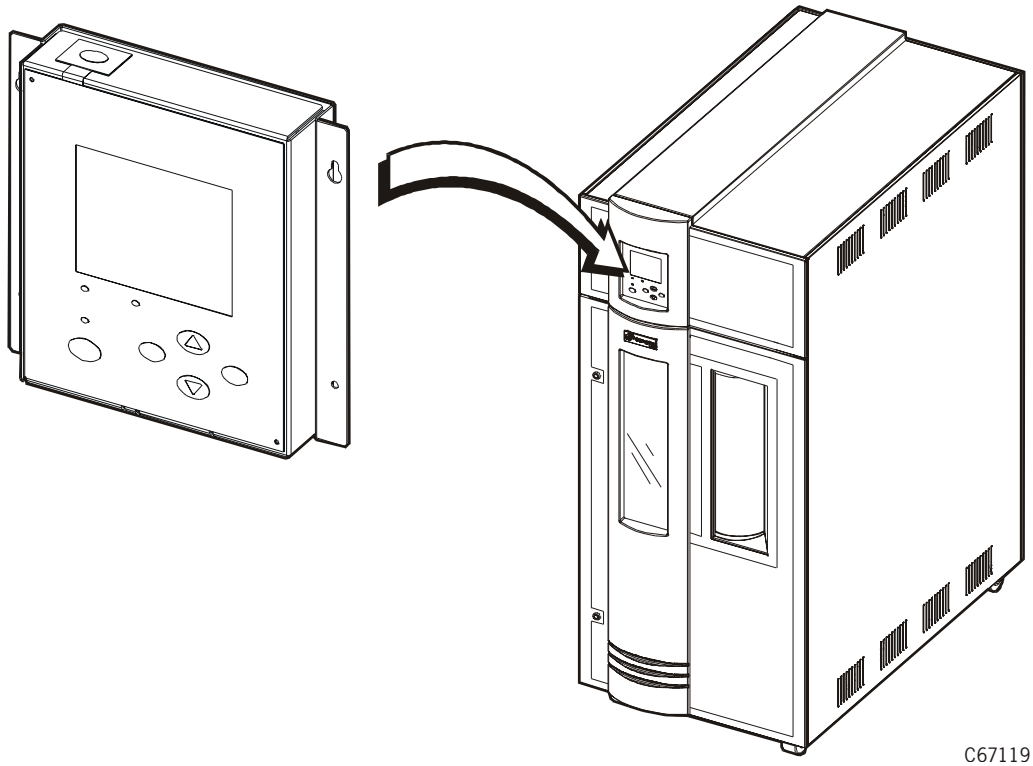
8. Go to "Restoring Operation" on page 4-136.

Operator Panel

The operator panel is recessed behind the rack door on the front of the library.

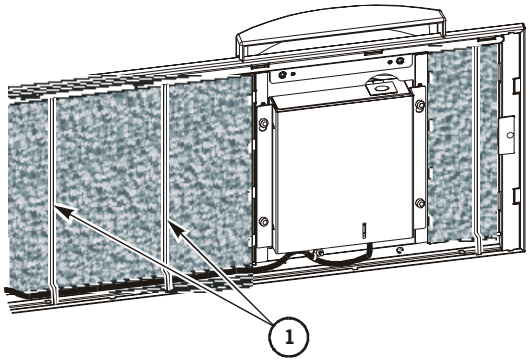
Use Figure 4-3 and the following procedure to replace the operator panel.

Figure 4-3. Operator Panel (C67119)



Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Remove the two left foam retainer wires from the slots on the rack door frame.

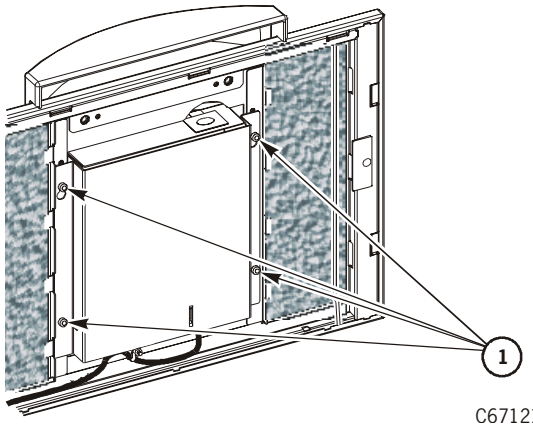


C67120

1. Wires

CAUTION:
Possible equipment damage: **Grasp the operator panel before removing the fourth screw.**

3. Use a T-15 Torx bit to remove the two bottom screws that attach the operator panel to the door.
4. Loosen the two top screws.

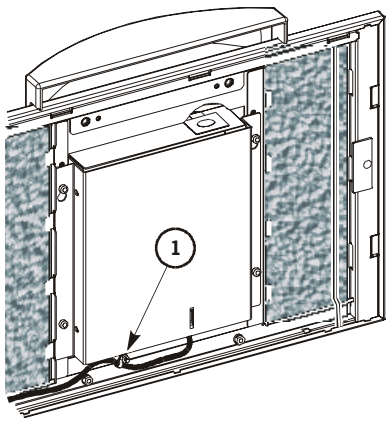


C67121

1. Screws

5. Use a nut driver to remove the cable clamp nut from under the operator panel.

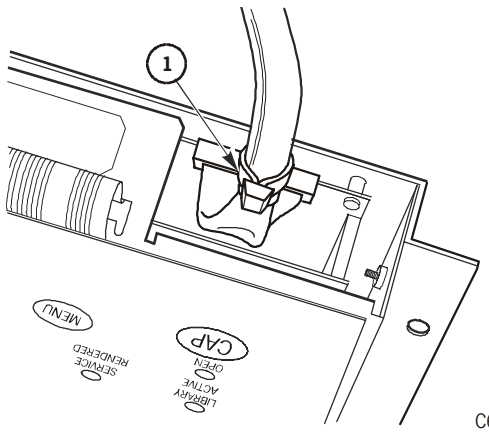
1. Nut



C67122

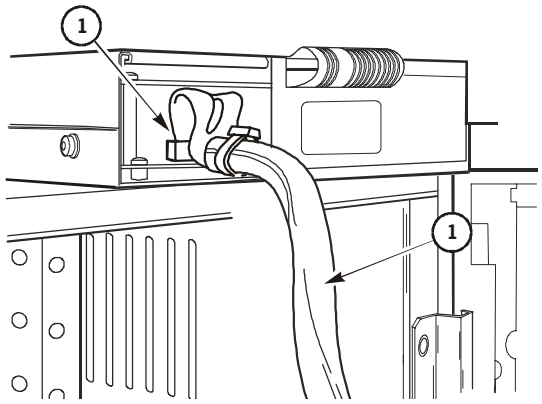
6. Use a T-15 Torx bit to remove the two top screws that attach the operator panel to the door.
7. Lift and remove the operator panel.
8. Cut the tie wrap at the bottom of the operator panel.

1. Tie wrap



C67123

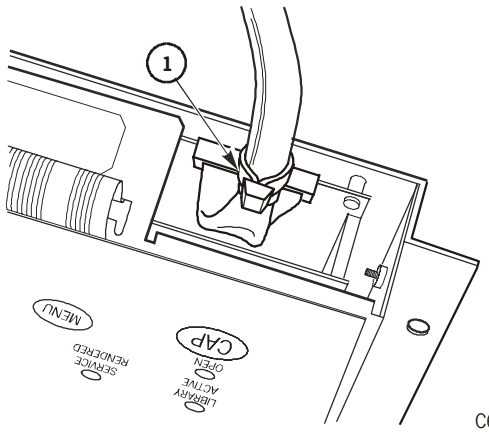
9. Remove the connector from within the operator panel housing.



1. Connector
2. Cable

Replacement

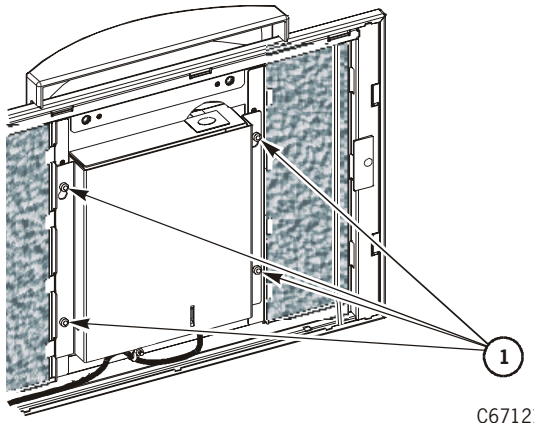
1. Connect the cable to the MPO interconnect cable.
2. Secure the cable in place with a tie wrap.



1. Tie wrap

3. Use a Torx bit to install the bottom two screws that attach the operator panel to the door.

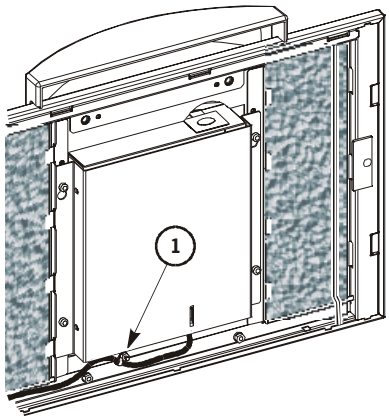
1. Screws



C67121

4. Install the cable clamp nut under the operator panel.

1. Nut

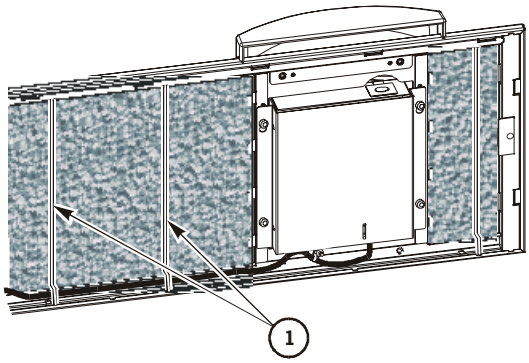


C67122

5. Insert the operator panel into the frame and secure the top two screws.

6. Install the two left foam retainer wires into the slots.

1. Wires



C67120

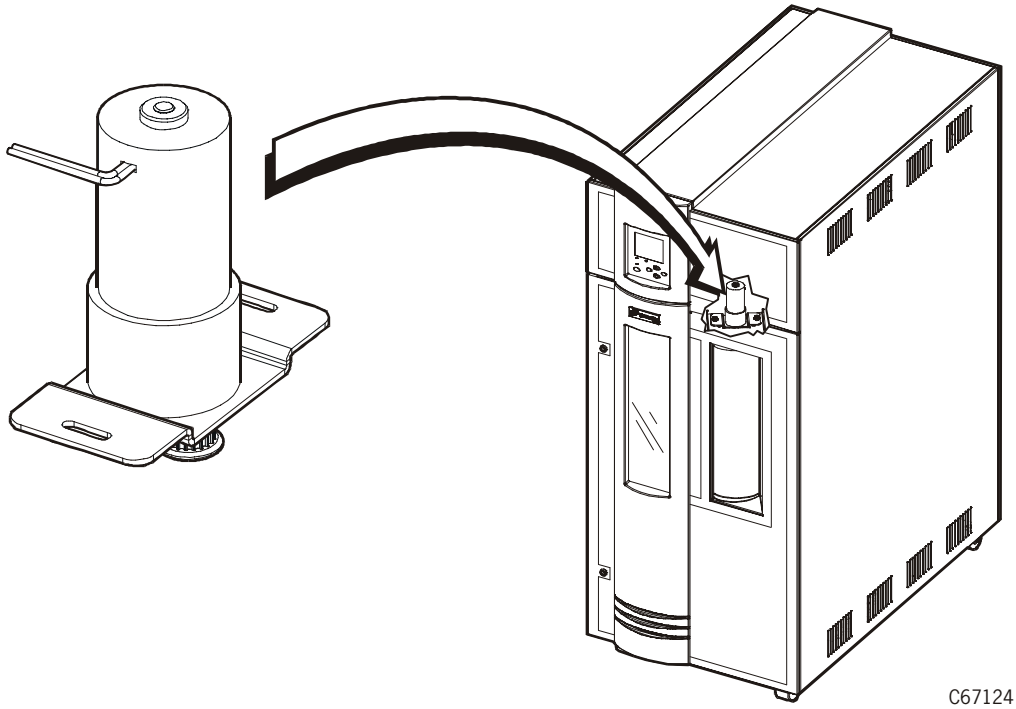
7. Go to "Restoring Operation" on page 4-136.

Cartridge Access Port Motor

The cartridge access port (CAP) motor is behind the front door, on top of the cartridge access port.

Use Figure 4-4 and the following procedure to replace the cartridge access port motor.

Figure 4-4. Cartridge Access Port Motor (C67124)



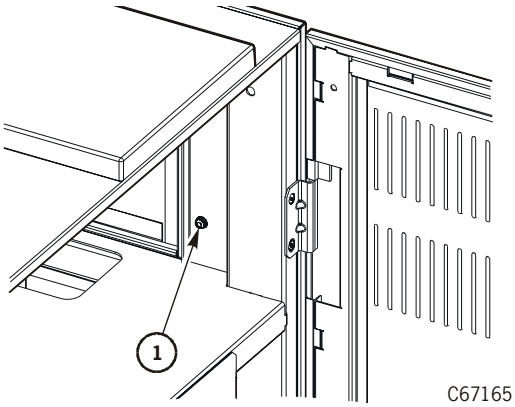
Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Remove power from the library by pressing down on the power switch.

CAUTION:
Possible injury to person: **The side cover is heavy and awkward. StorageTek advises that two people remove the cover. Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

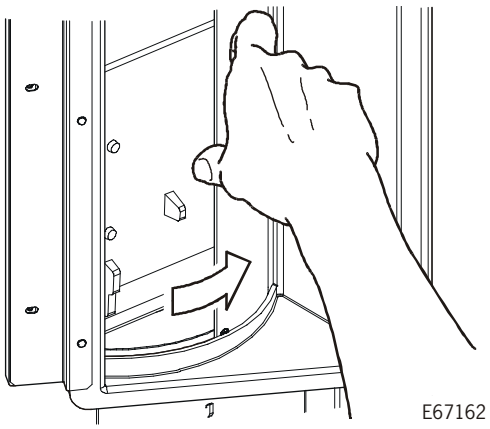
3. Open the rear door, and use a T-20 Torx bit to remove the screw that attaches the side cover to the top of the frame.
4. Lift the side cover off of the mushrooms on the frame, and set the cover aside.

Note: The side cover is removed to provide easier access to the motor.



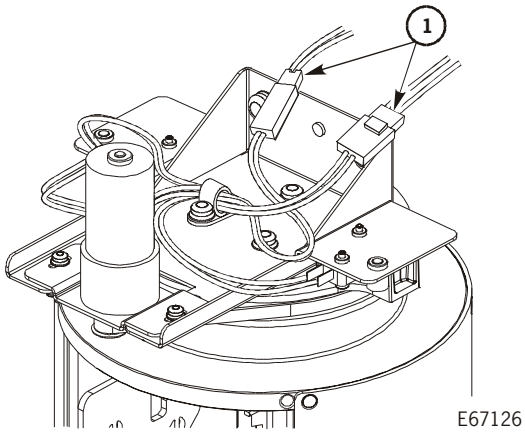
1. Side cover screw

5. Manually open the CAP door so that you can access the magazines.



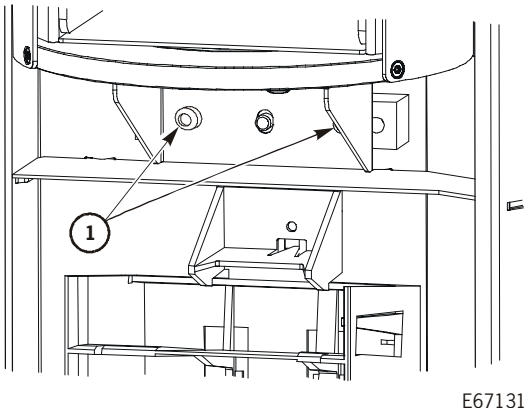
6. Remove the magazines.
7. Close the CAP door.

8. Disconnect the two plugs at the top of the CAP.



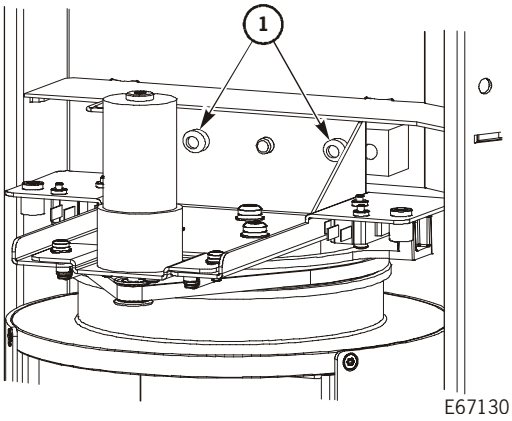
1. CAP plugs

9. If necessary, raise the hand so that you can access the bottom screws.
10. Use a T-30 Torx bit to remove the two bottom screws securing the CAP to the frame.



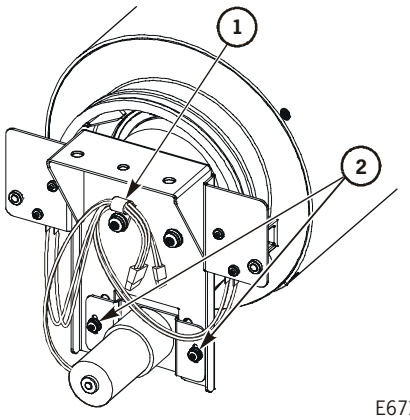
1. Bottom screws

11. Use a T-30 Torx bit to remove the two top screws securing the CAP to the frame.



1. Top screws

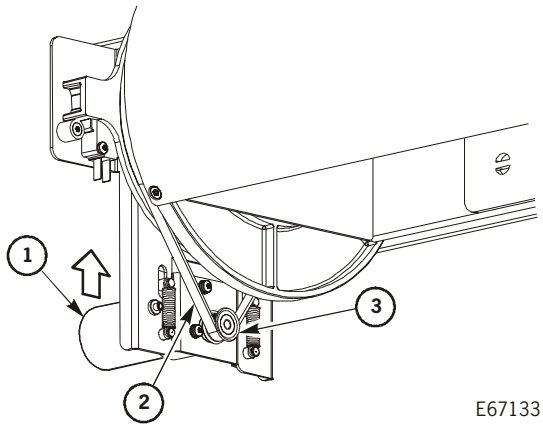
12. Grasp the CAP by the magazine shelf, and pull the CAP off of the top and bottom alignment pins.
13. Lay the flat side of the CAP on the corner of a flat surface.
14. Use a T-25 Torx bit to remove the cable clamp screw.
15. Open the clamp and remove the CAP motor cable
16. Use a T-15 Torx bit to loosen the two screws that attach the motor to the bracket.



E67132

1. Cable clamp screw
2. Motor screws

17. Slide the motor up to release the tension on the belt.
18. Slip the belt off of the pulley.

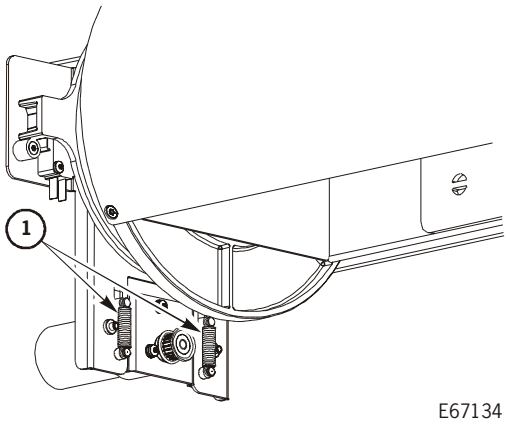


E67133

1. CAP motor
2. Belt
3. Pulley

19. Using a spring hook or needle-nose pliers, remove the two CAP motor springs from the CAP motor.

1. CAP motor springs



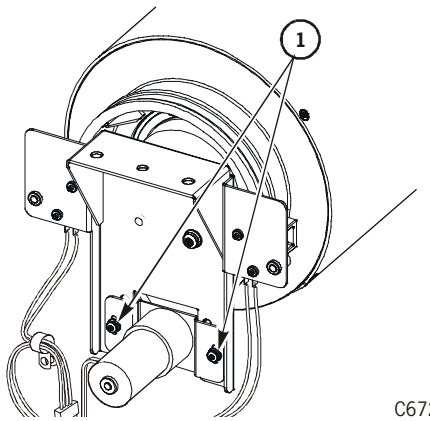
E67134

20. Use a T-15 Torx bit to remove the two screws that attach the motor to the bracket.
21. Remove the CAP motor.

Replacement

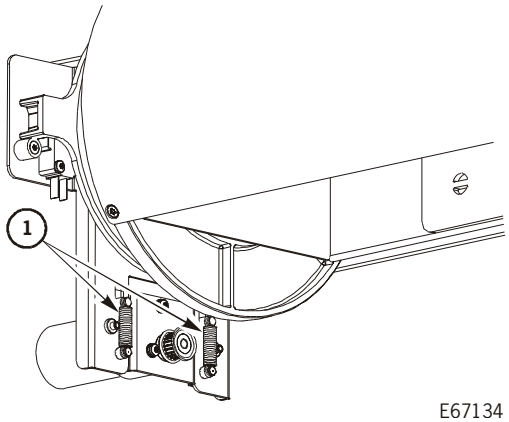
1. Install the two screws loosely to secure the motor to the bracket.

1. CAP motor screws



C67228

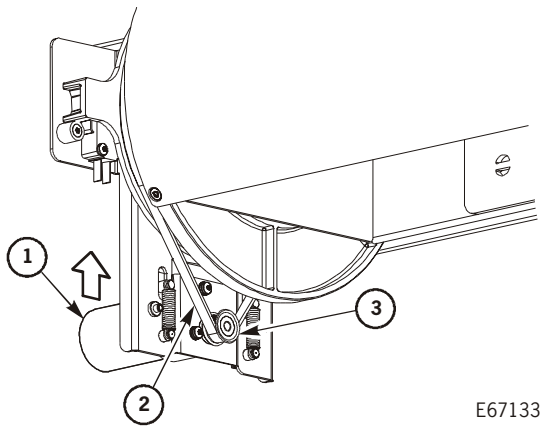
2. Attach the two springs to the CAP motor.



E67134

1. CAP motor springs

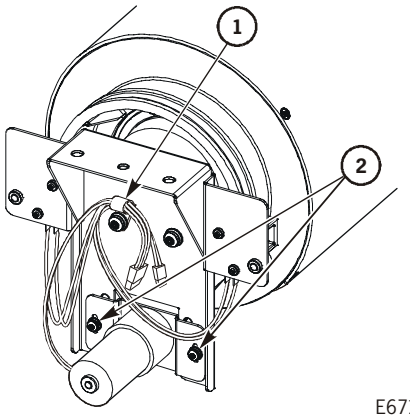
3. Place the CAP belt over the motor pulley, and make sure the belt is in the groove.



E67133

1. CAP motor
2. Belt
3. Pulley

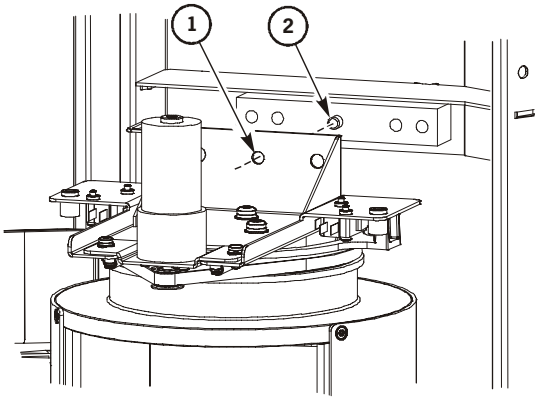
4. Use a T-15 Torx bit to tighten the two screws that attach the motor to the bracket.
5. Open the cable clamp and insert the CAP motor cable.
6. Use a T-25 Torx bit to install the cable clamp screw.



E67132

1. Cable clamp screw
2. Motor screws

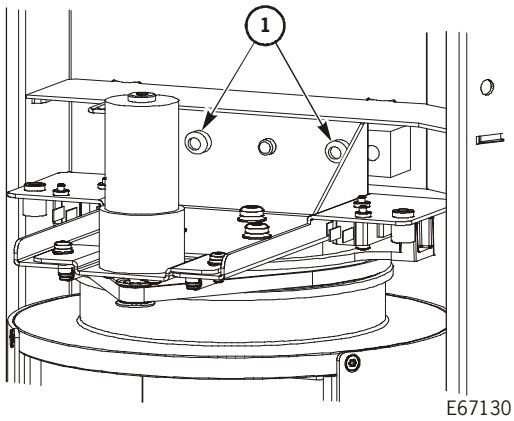
7. Place the slots in the CAP bracket over the alignment pins on the mounting blocks.



E67135

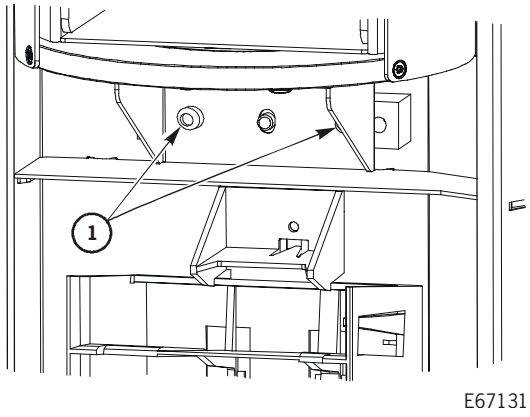
1. Slot in CAP bracket
2. CAP alignment pin

8. Use a T-30 Torx bit to install the two top screws securing the CAP to the frame.



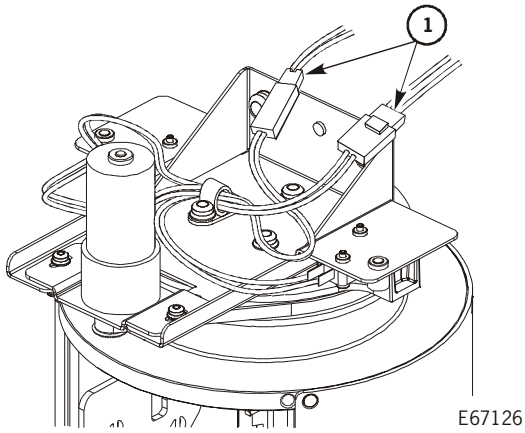
1. Top screws

9. Use a T-30 Torx bit to install the two bottom screws securing the CAP to the frame.



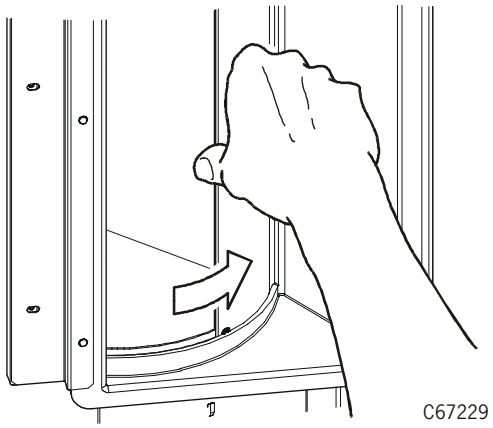
1. Bottom screws

10. Connect the two plugs at the top of the CAP.



1. CAP plugs

11. Manually open the CAP door.



12. Install the magazines.

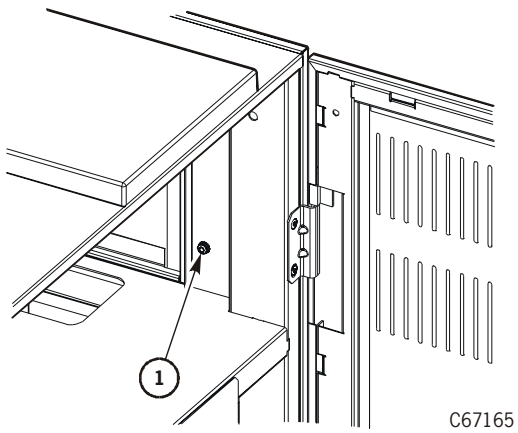
13. Close the CAP door.

CAUTION:
Possible injury to person: **The side cover is heavy and awkward. StorageTek advises that two people replace the cover. Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

14. Place the side cover onto the mushrooms on the frame.

15. Use a T-20 Torx bit to install the screw that attaches the side cover to the top of the frame.

1. Side cover screw



16. Go to "Restoring Operation" on page 4-136.

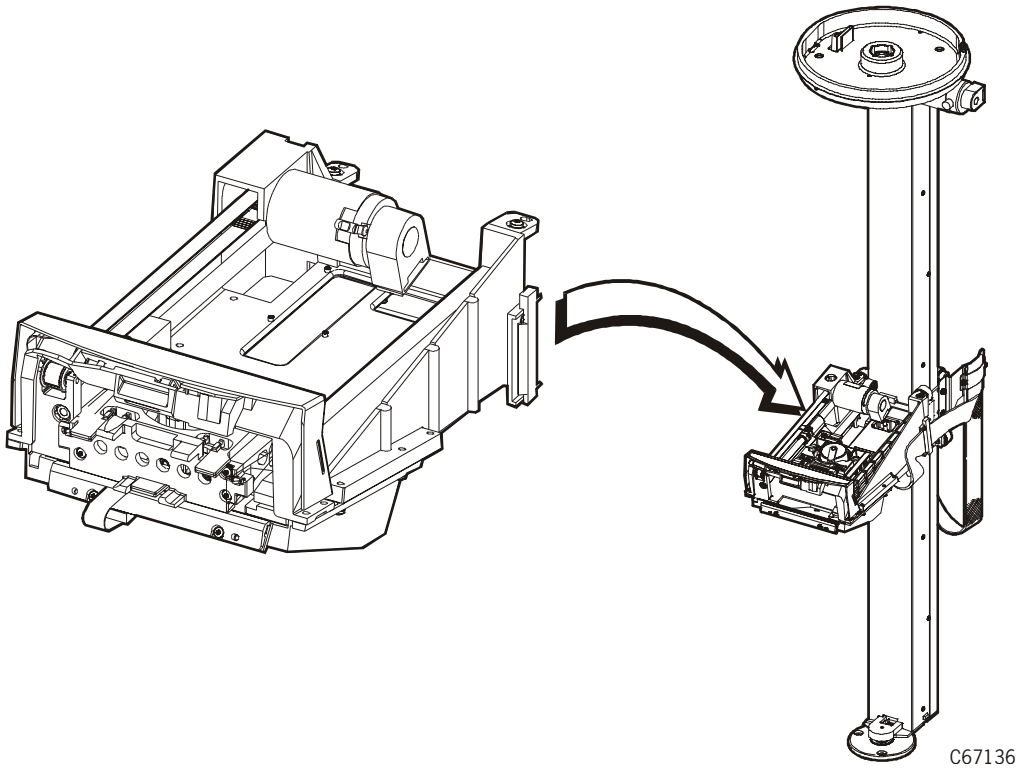
Hand-Camera Assembly

The hand-camera assembly is on the Z column behind the front door.

Use Figure 4-5 and the following procedure to replace the hand-camera assembly.

Note: After August 2000, StorageTek began offering a High Extra Force Hand assembly for use with Ultrium drives and cartridges. This hand assembly is available through conversion bill number 101376.

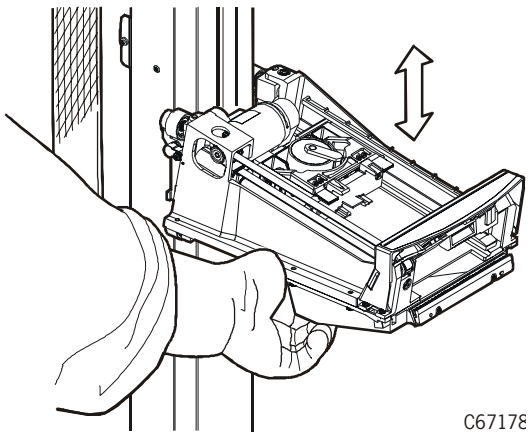
Figure 4-5. Hand-camera Assembly (C67136)



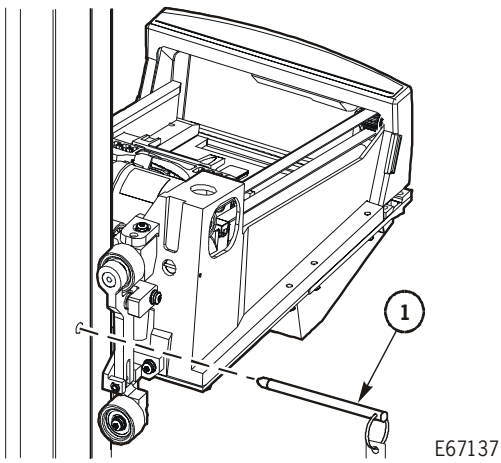
Removal

CAUTION:
Possible equipment damage: **You will need one of the shipping pins that were removed during installation. Ask the customer for the pin. If the pin is not available, hold the Z belt when removing the hand-camera assembly. Once the hand has been removed, the Z carriage will be pulled to the top of the column and could be damaged.**

1. Review the information under "Before Beginning" on page 4-2.
2. Remove power from the library by pressing down on the power switch.
3. Rotate the Z column until the hand is on the right side of the column.
4. Carefully raise the Z carriage until the shipping pin holes are aligned.



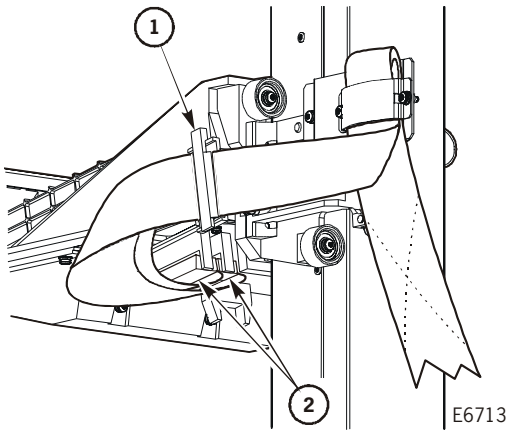
5. Insert the shipping pin through the Z column into the Z carriage.



6. Rotate the Z column until the hand is accessible from the left side of the Z column.
7. Open the cable clamp on the left side of the hand-camera assembly.

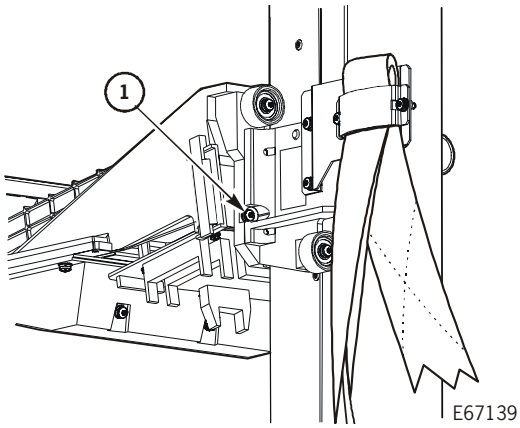
CAUTION:
Possible equipment damage: **Pay attention to which jack each cable attaches. Connecting the cables incorrectly can seriously damage the hand components. The inside cable is shorter and must connect to the closer jack.**

8. Disconnect the two cable connectors P194A/B from the bottom of the hand-camera assembly by pressing the tabs on the cables.



1. Cable clamp
2. P194A/B connectors

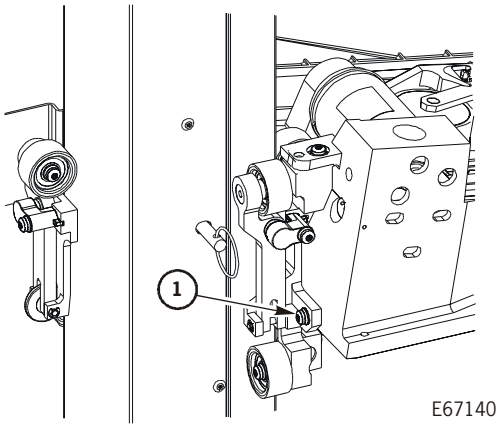
9. Use a T-15 Torx bit to remove the bottom screw that attaches the hand-camera assembly to the Z carriage.



1. Bottom screw

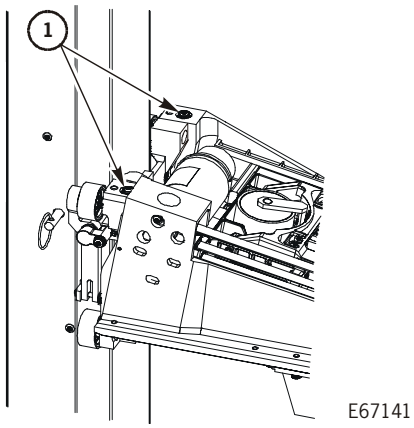
10. Rotate the Z column clockwise until the remaining bottom screw is accessible.
11. Use a T-15 Torx bit to remove the remaining bottom screw.

1. Bottom screw



12. Rotate the Z column clockwise.
13. Use a T-15 Torx bit to remove the two top screws.
14. Hold the carriage assembly with one hand, and gently lift the hand-camera assembly off of the two alignment pins on the Z carriage.

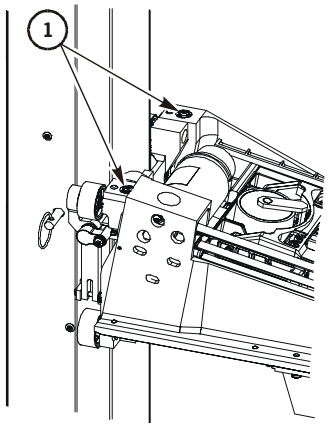
1. Top screws



Replacement

1. Align holes on the hand-camera assembly with the alignment pins on the Z carriage.
2. Attach the hand-camera assembly with the two top screws.

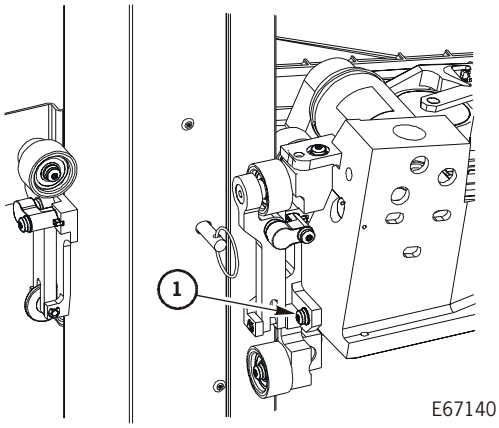
1. Top screws



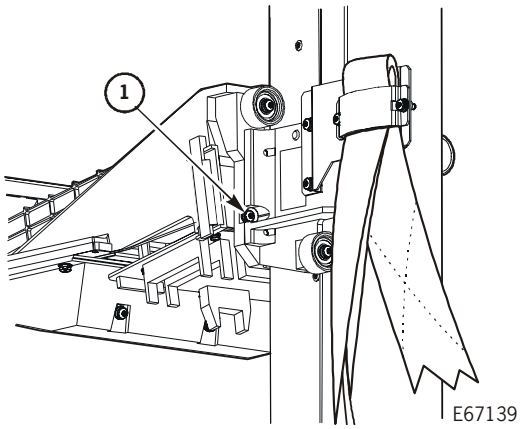
CAUTION:
Possible equipment damage: **Make sure the gripper mechanism is fully retracted. If it is left extended and you manually move the robot, the gripper mechanism will strike a storage cell.**

3. Push the gripper mechanism back into the hand until the mechanism is fully retracted.
4. Rotate the Z column counterclockwise until the bottom right screw hole is accessible and install a screw.

1. Bottom screw



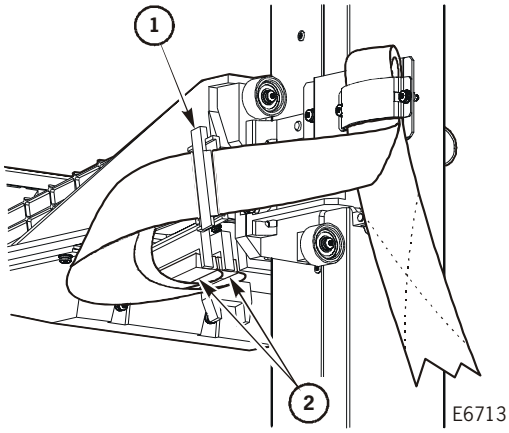
5. Rotate the Z column counterclockwise as far as possible and install the other bottom screw.



1. Bottom screw

CAUTION:
***Possible equipment damage:* Pay attention to which jack each cable attaches. Connecting the cables incorrectly can seriously damage the hand components. The inside cable is shorter and must connect to the closer jack.**

6. Connect the P194A/B connectors to the card on the bottom of the hand-camera assembly.
7. Close the cable clamp.



1. Cable clamp
2. P194A/B connectors

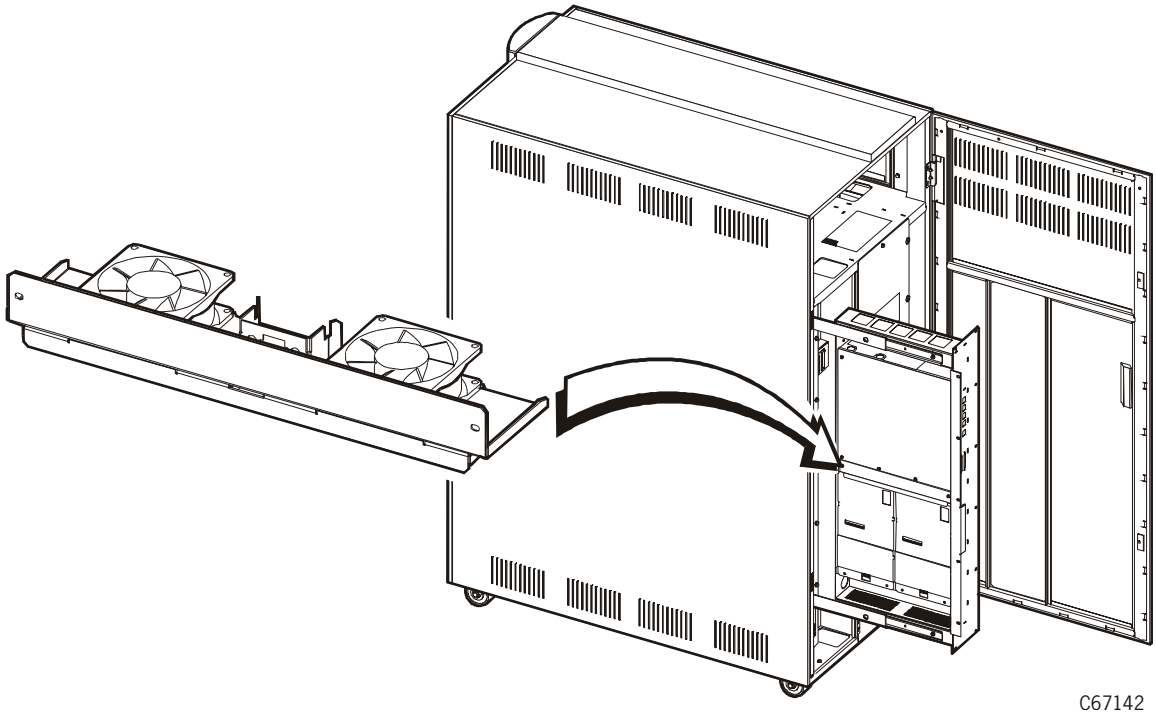
8. Rotate the Z column and *remove the shipping pin*.
9. Go to "Restoring Operation" on page 4-136.

Fan Tray Assembly

The fan tray assembly is behind the rear door, under the electronics module. If either fan fails, replace the entire assembly (two fans and the tray).

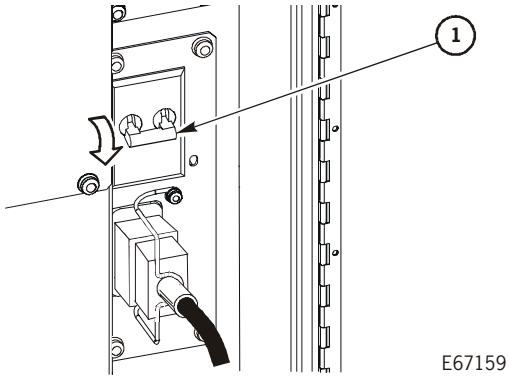
Use Figure 4-6 and the following procedure to replace the fan tray assembly.

Figure 4-6. Fan Tray Assembly (C67142)



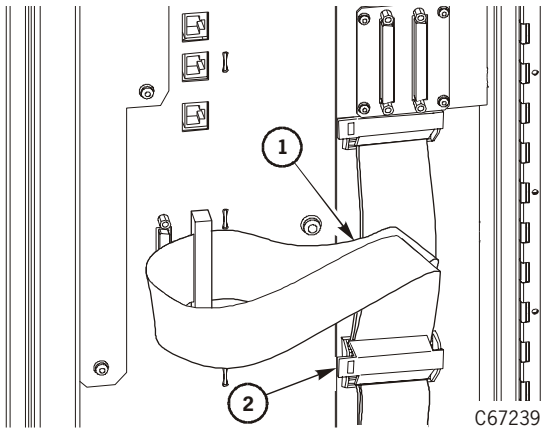
Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.



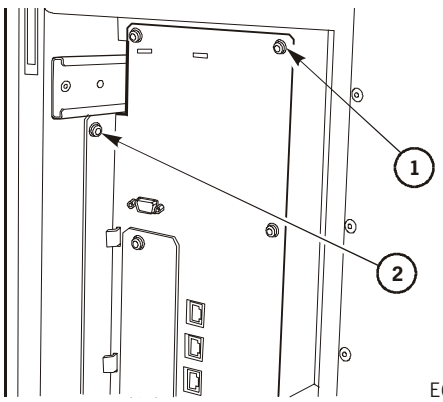
1. Power switch

3. If the library has a SCSI configuration, open the lower cable clamp and release the library SCSI Y cable.



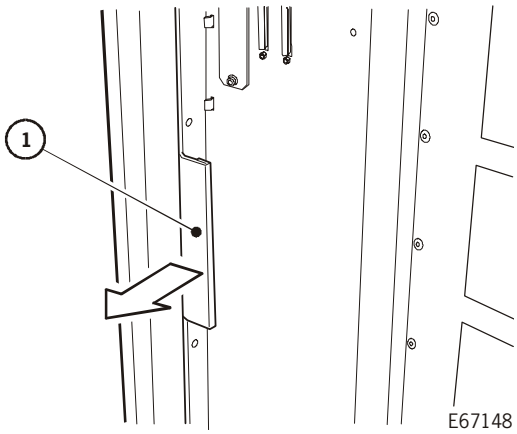
1. SCSI Y cable
2. Lower cable clamp

4. Using a T-25 Torx bit, remove the 13 screws (8 on the front cover and 5 along the side).

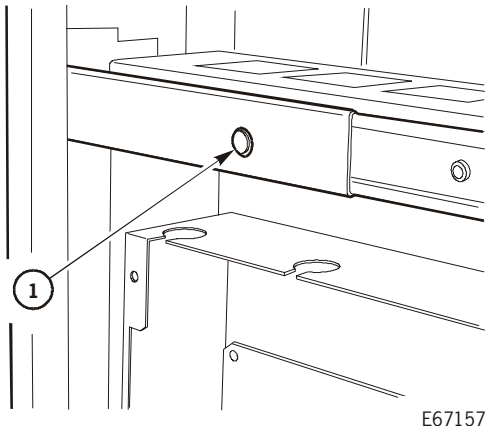


1. Front cover screw (8)
2. Left side screw (5)

5. Use the handle to gently pull the compartment completely out until the buttons in the top and bottom slides lock into place.

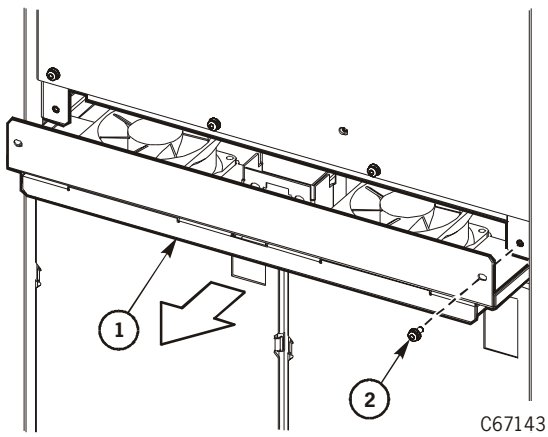


1. Handle



1. Button (2)

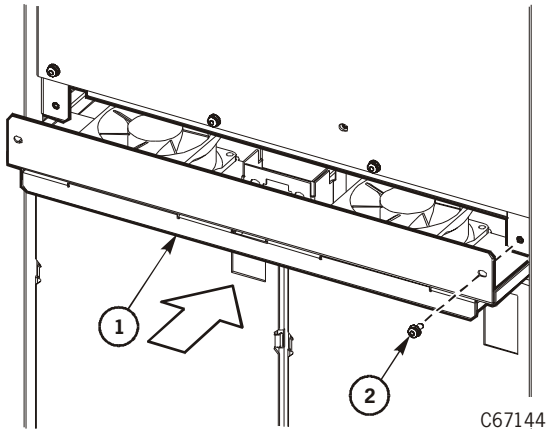
6. Use a T-15 Torx bit to remove the two fan tray screws.
7. Pull the fan tray assembly out from the frame.



1. Fan tray assembly
2. Screw (2)

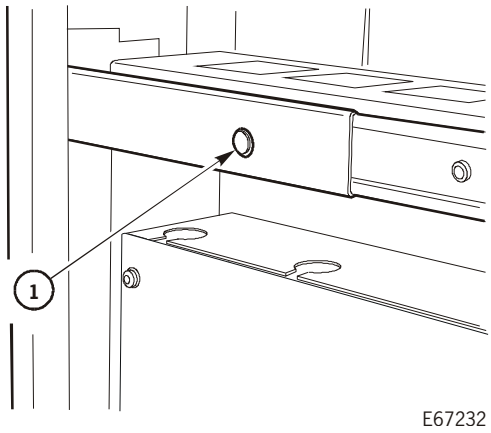
Replacement

1. Slide the new fan tray assembly into the frame and install the two fan tray screws.



1. Fan tray assembly
2. Screw (2)

2. Power on the library by lifting up the power switch.
   Listen to make sure the fans are operating, then power off the library.
3. Press in the top and bottom buttons and gently push in the compartment.



1. Button (2)

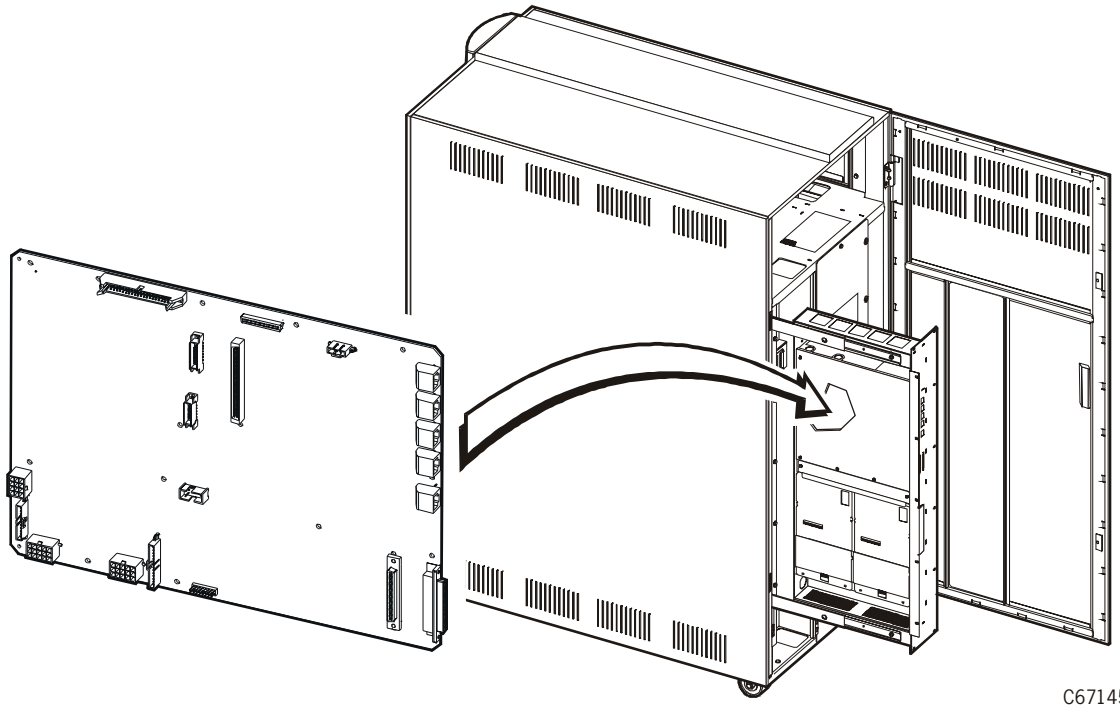
4. Reinstall the 13 screws (8 on the front cover and 5 along the left side).
5. If the library has a SCSI configuration, replace the SCSI Y cable loop in the lower cable clamp and close the clamp.
6. Go to "Restoring Operation" on page 4-136.

MPC Card

The MPC card is behind the rear door and inside the electronics module.

Use Figure 4-7 and the following procedure to replace the MPC card.

Figure 4-7. MPC Card (C67145)



Note: Depending on your library's configuration, you might need to remove MPV card assembly (CPCI module) from the old MPC card and install it onto the new MPC card.

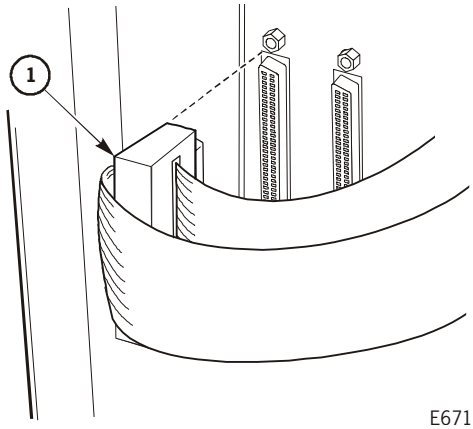
See "MPV Card" on page 4-56 to remove and replace this assembly.

Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.

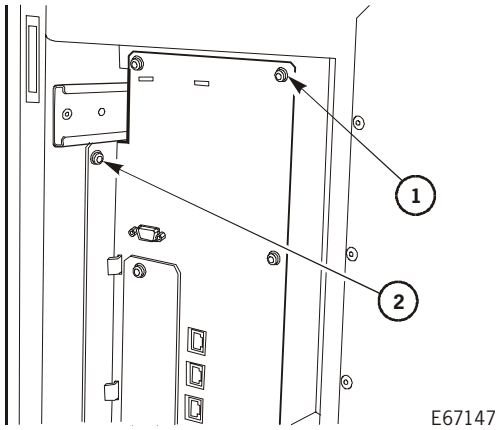
   If the library has a SCSI configuration, make a note of whether the SCSI cable connects to the single-ended or differential connector on the side of the electronics compartment or whether it connects to the MPW card.
3. Remove the SCSI cable from the connector. Make sure that you note to which connector the cable was originally connected.

Note: Depending on your library's configuration, you might need to remove MPV card assembly (CPCI module) from the old MPC card and install it onto the new MPC card. See "MPV Card" on page 4-56 to remove and replace this assembly.



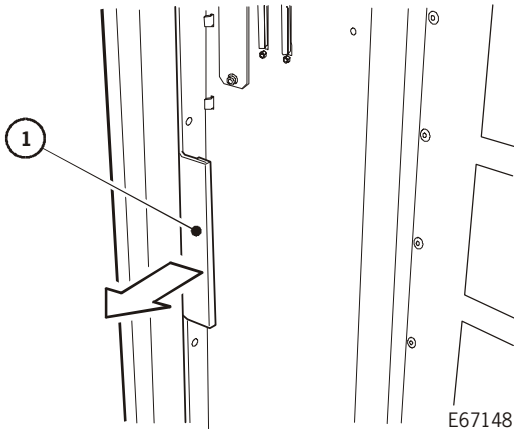
1. SCSI cable

4. Use a T-25 Torx bit to remove the 13 screws (eight on the front of the cover and five along the left side of the cover).



1. Front cover screw (8)
2. Left side screw (5)

5. Use the handle to gently pull out the compartment until the buttons in the top and bottom slides snap into place.

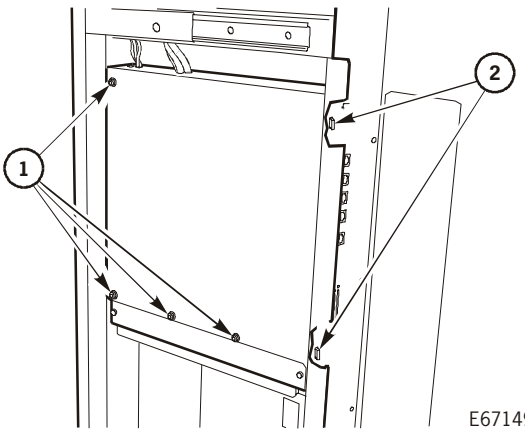


1. Handle

6. Use a T-15 Torx bit to remove four screws from the front of the electronics module cover.

   Note: The cover in older model libraries has six screws: four on the back and two on the sides.

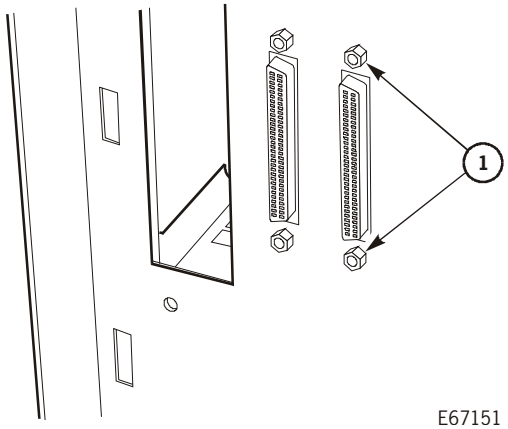
7. Pull the left side of the cover toward you until you can slip the tabs along the right side of the cover out of the slots.



1. Cover screws
2. Tabs (5)

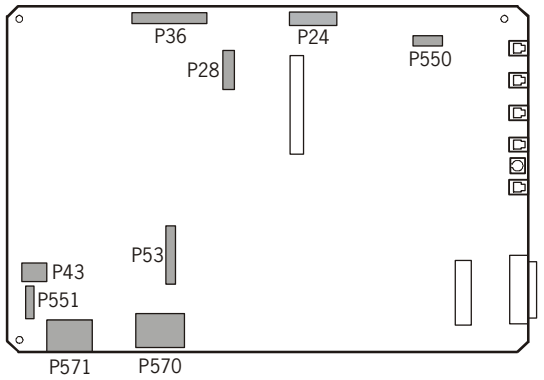
8. Use a 3/16 nut driver to remove the four SCSI jack screws, and remove the SCSI connectors. (This is done to make room to remove the card.)

1. SCSI jack screws (4)



E67151

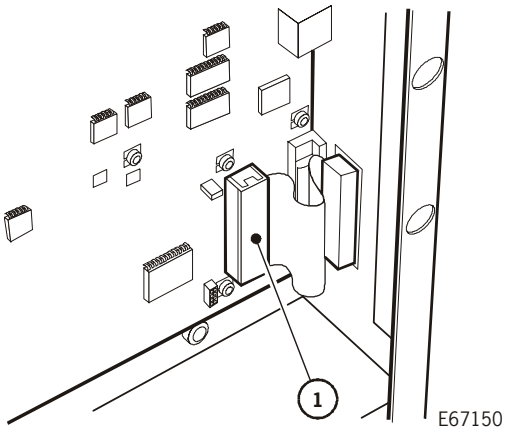
9. Disconnect P43, P551, P571, P570, P53, P550 (if applicable), P24, P28, and P36.



E67152

CAUTION:
Possible equipment damage: **Grasp the cable housing, not the cable itself.**

10. Remove the SCSI jumper cable from the lower right section of the MPC card.

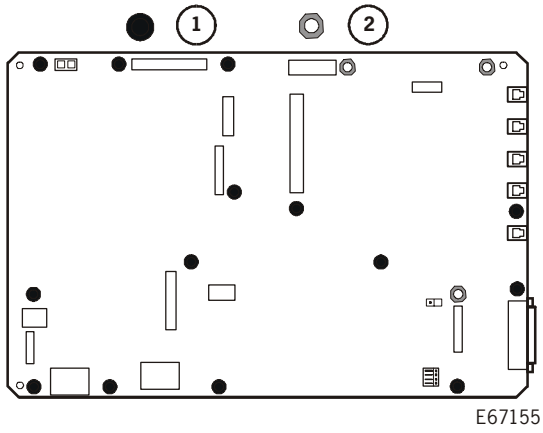


1. SCSI jumper cable

CAUTION:
Possible equipment damage: **Make sure the screws do not fall into the fan assembly.**

11. Use a T-10 Torx bit to remove the 14 screws from the card.

12. Use a 1/4-in. nut driver to remove the three standoffs from the card.



1. Screw (14)
2. Standoff (3)

CAUTION:
Possible equipment damage: **Be careful not to damage the cables when you remove the card.**

13. Tilt the right side of the card into the slot until the left side is free.

14. Tilt the left side of the card toward you and remove it.

Replacement

CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

1. Remove the MPC card from the anti-static bag.
2. Make sure the SCSI jumpers on the new card are set in the same position as those on the old card.

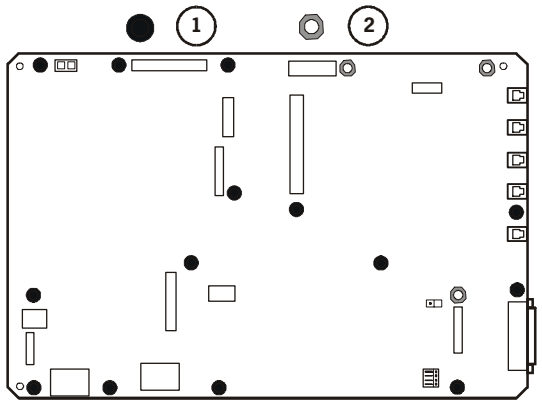
CAUTION:
Possible equipment damage: **Be careful not to damage the cables when you install the card.**

3. Tilt the right side of the card into the slot to clear the cables on the left side, then push the left side of the card back and insert the differential SCSI connector into the rear slot.

CAUTION:
Possible equipment damage: **Make sure the screws do not fall into the fan assembly.**

4. Hold the card while you install the three standoffs.
5. Install the 14 screws into the card.

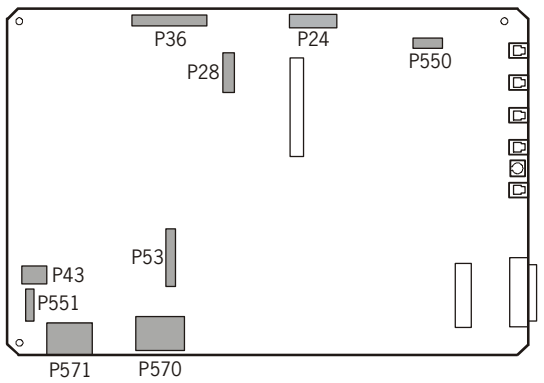
   Note: Do not overtighten the standoffs or screws.



E67155

1. Screw (14)
2. Standoff (3)

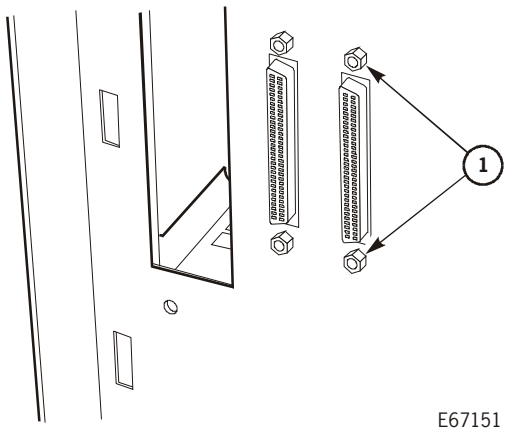
6. Connect P43, P551, P571, P570, P53, P550 (if applicable), P24, P28, and P36.



E67152

7. Install the four SCSI jack screws.

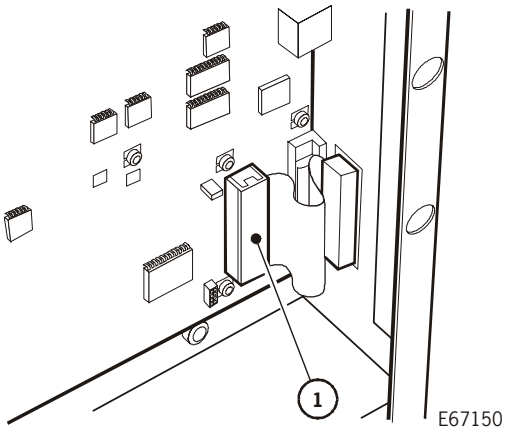
1. SCSI jack screws (4)



E67151

CAUTION:
Possible equipment damage: **Grasp the cable housing, not the cable itself.**

8. Install the SCSI jumper cable into the lower right section of the MPC card.



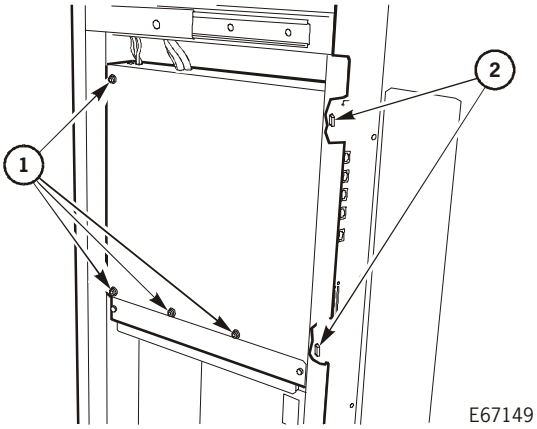
1. SCSI jumper cable

9. If you removed any other cards, install them, using the instructions in this chapter.

10. Tilt the electronics module cover, and slip the tabs into the slots.

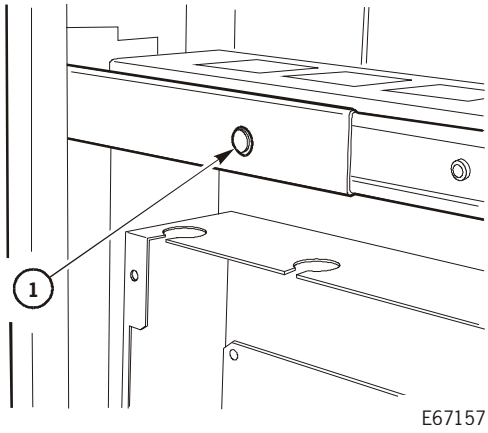
11. Attach the cover with the four screws.

Note: The cover in older model libraries has six screws: four on the back and two on the sides.



1. Cover screws
2. Tabs (5)

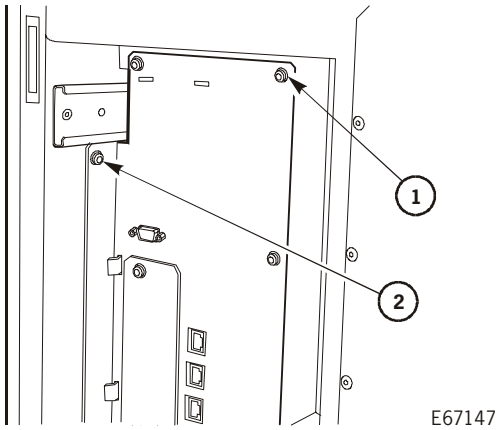
12. Pressing the top and bottom buttons in, use the handle to gently push in the compartment.



1. Button (2)

13. Install the 13 screws (eight on the front of the cover and five along the left side of the cover).

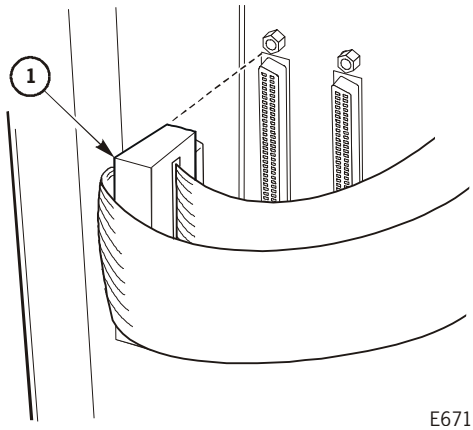
Note: Depending on your library's configuration, you might need to remove MPV card assembly (CPCI module) from the old MPC card and install it onto the new MPC card. See "MPV Card" on page 4-56 to remove and replace this assembly.



1. Front cover screw (8)
2. Left side screw (5)

14. If the library has a SCSI configuration, reconnect the SCSI connector.

1. SCSI cable



15. Configure the library. See Chapter 2, "Configuration" for specific information.

CAUTION:
***Configuration Error:* You must perform the steps below to ensure correct configuration of the library**

- Microcode version lower than 2.0:
  a. Connect the MPK card (cable) to the MPC card at P/J550.
  b. Load the microcode.
  c. Configure the tape library.

  Note: Re-set the network IP address and password.
- If you did not remove an MPK card, but the customer requires a vendor ID:
  a. Load the required microcode that supports a vendor ID.
  b. Load the vendor flash file.
  c. Configure the tape library.

16. Go to "Restoring Operation" on page 4-136.

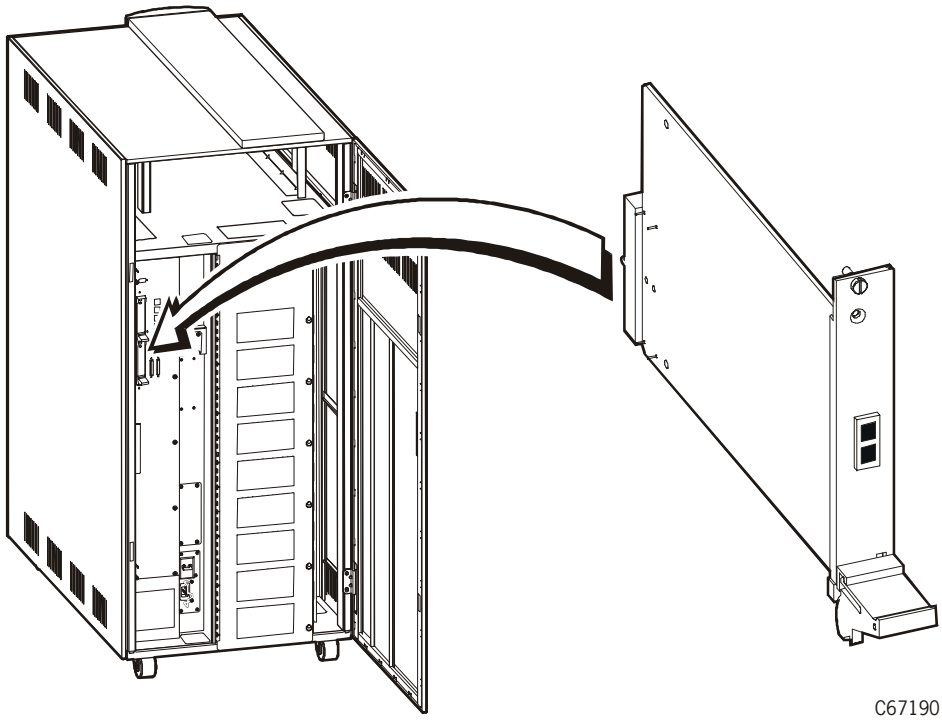
MPU Card

The MPU card attaches to the MPV card (CPCI module). The MPU card is attached to the side of the CPCI module and connected to the MPC card in the electronics module. The MPU card can be accessed from the front of the electronics compartment.

Use Figure 4-8 and the following procedure to replace the MPU card.

Note: The MPU card contains a Class 1 laser product. Class 1 laser products do not require any special safety precautions. See "Fiber Optic Safety" on page xxviii for compliance and other information.

Figure 4-8. MPU Card (C67190)



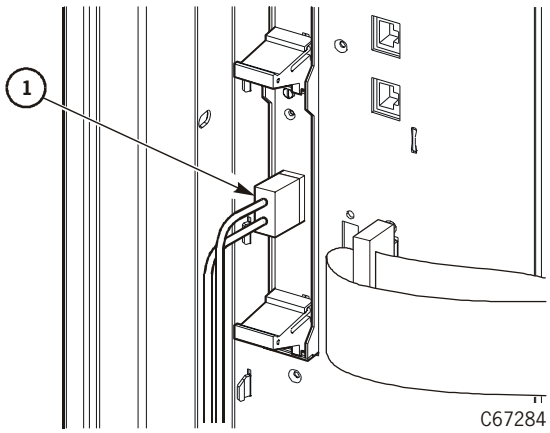
Removal

WARNING:
***Eye hazard*. Never look directly into a fiber-optic cable, a fiber-optic connector, or a laser transceiver module. Hazardous conditions might exist from laser power levels that are capable of causing injury to the eye.**

Be especially careful when using optical instruments with this equipment. Such instruments might increase the likelihood of eye injury.

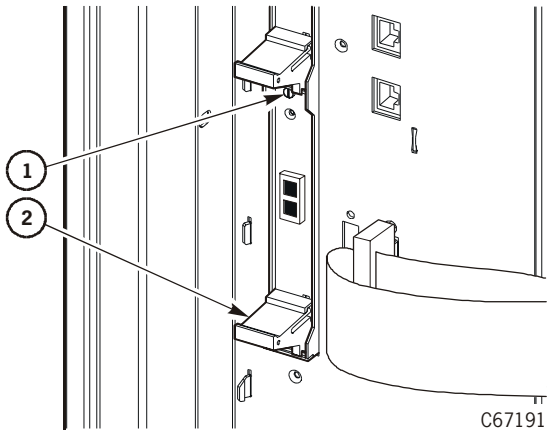
CAUTION:
***Potential damage to equipment:* Be sure that you follow the directions for handling fiber-optic cables in "Fiber Optic Safety" on page xxviii and "Fiber-Optic Cable Handling" on page xxix before you begin the following procedure.**

1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.
3. Disconnect the fiber cable from the MPU card.



1. Fiber optic cable

4. Use a flat-bladed screwdriver to loosen the captive screw at the top of the MPU card cover plate.
5. Push down the latch handle.
6. Pull the MPU card out of the CPCI module.



1. Captive screw
2. Latch handle

Replacement

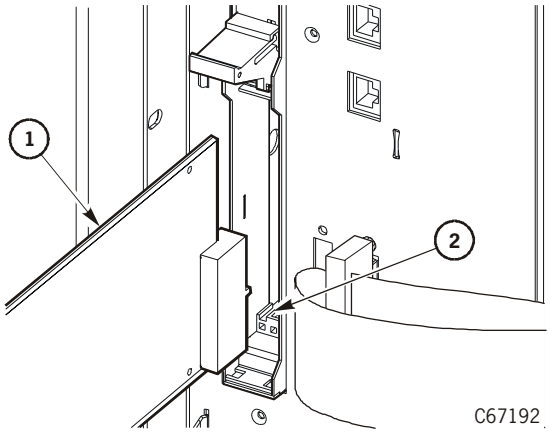
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

1. Remove the MPU card from the anti-static bag.

CAUTION:
Fiber-optic safety: **See "Safety" on page xxi for fiber-optic compliance information and safety precautions.**

2. Hold the card so that the card connector aligns with the MPV card connector (circuit side out, components facing the MPC card).

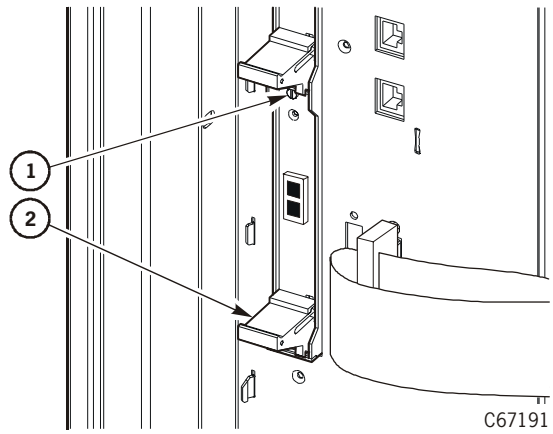
3. Slide the MPU card into the groove in the rail in the *lower slot*, and gently push it in until it mates with the MPV card connector.



1. MPU card
2. Groove in rail

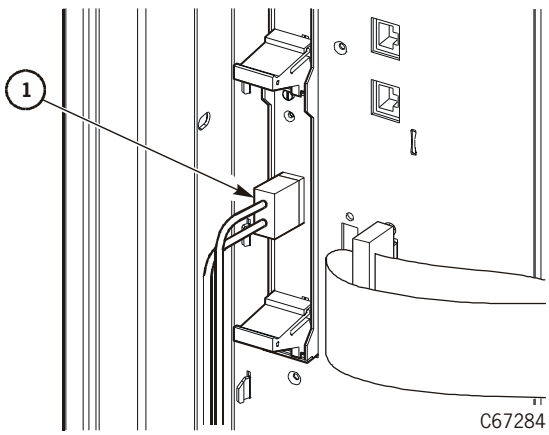
4. Make sure the latch handle engages.

5. Tighten the captive screw.



1. Captive screw
2. Latch handle

6. Connect the fiber cable to the MPU card. Go to "Restoring Operation" on page 4-136



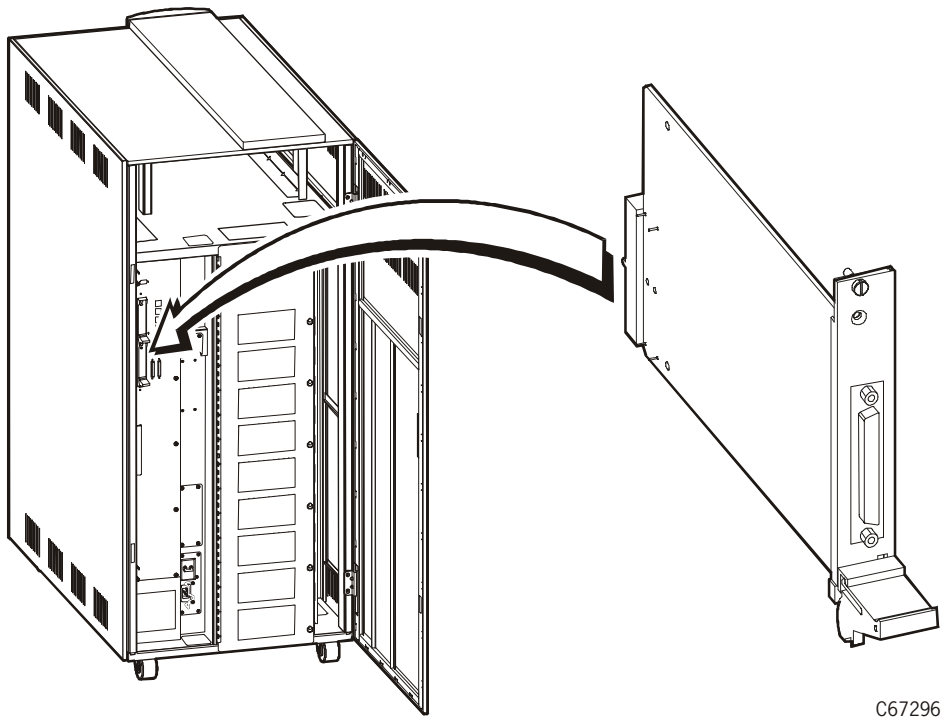
1. Fiber cable

MPW Card

The MPW card, which attaches to the MPV card (CPCI module), allows the customer to connect the library to a Low-Voltage Differential (LVD) SCSI bus. The MPW card is attaches to the side of the CPCI module and connects to the MPC card in the electronics module. The MPW card can be accessed from the front of the electronics compartment.

Use Figure 4-9 and the following procedure to replace the MPW card.

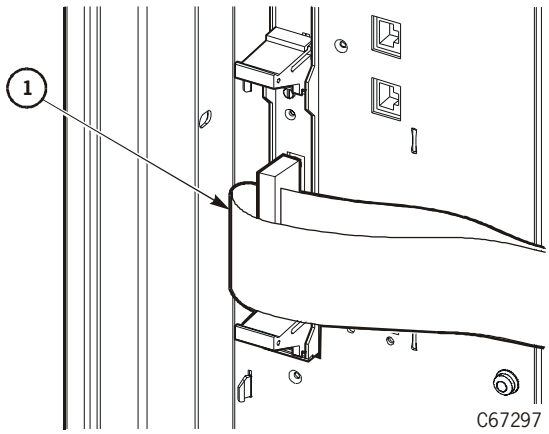
Figure 4-9. MPW Card (C67296)



Removal

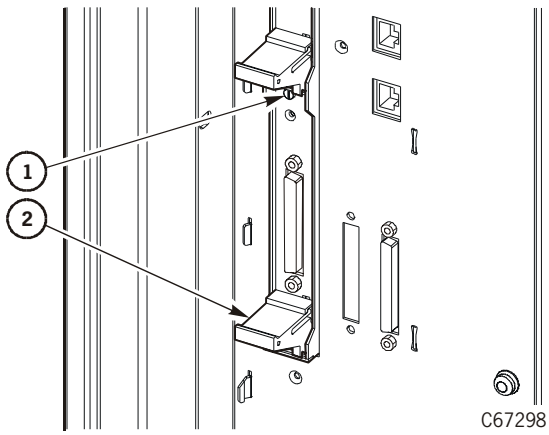
1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.
3. Disconnect the library's SCSI cable from the MPW card.

   Note: If the library is the last device on the SCSI bus, you might also have to disconnect the pass-through terminator.



1. SCSI cable

4. Use a flat-bladed screwdriver to loosen the captive screw at the top of the MPW card cover plate.
5. Push down the latch handle.
6. Pull the MPW card out of the CPCI module.

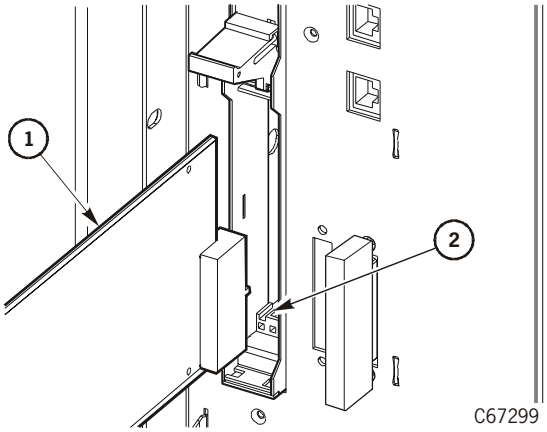


1. Captive screw
2. Latch handle

Replacement

CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

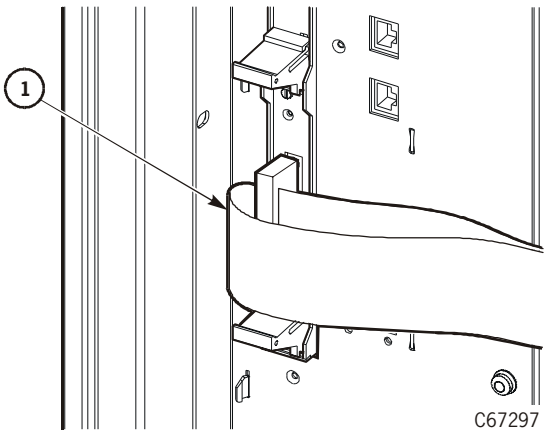
1. Remove the MPW card from the anti-static bag.
2. Hold the card so that the card connector aligns with the MPV card connector.
3. Slide the MPW card into the groove in the rail in the *lower slot*, and gently push it in until it connects with the MPV card connector.



1. MPW card
2. Groove in rail

4. Make sure the latch handle engages.
5. Tighten the captive screws.
6. Connect the library's SCSI cable to the MPW card.

If the library is the last device on the SCSI bus, you might also have to connect the terminator.



1. SCSI cable

7. Go to "Restoring Operation" on page 4-136.

MPV Card

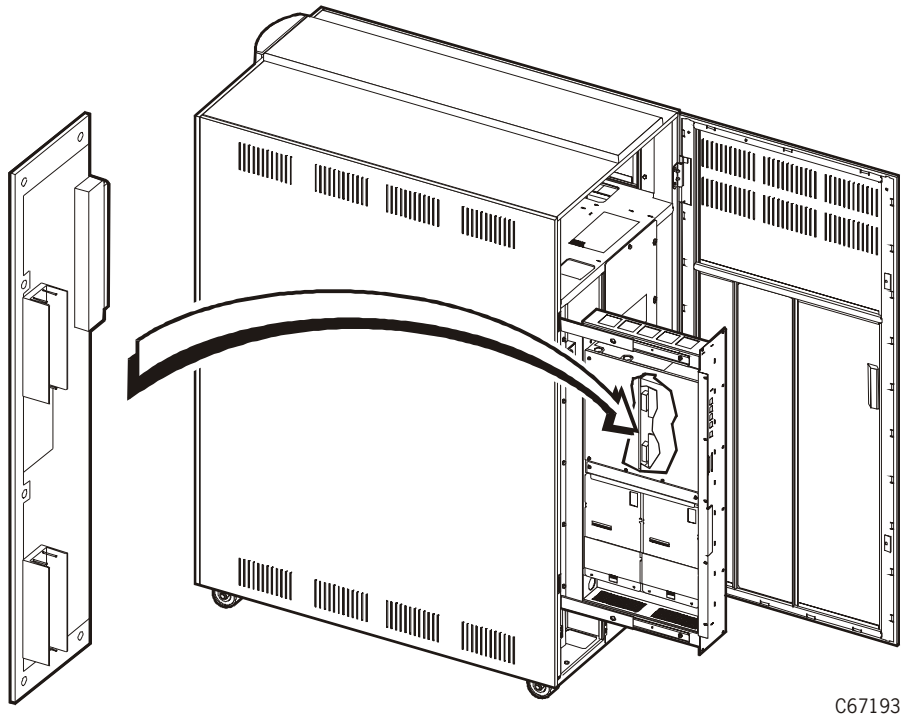
The MPV card is attached to the side of the CPCI card cage and connected to the MPC card in the electronics module.

During the procedure, you will remove the MPU card or MPW card and place it on the new MPV card.

Use Figure 4-10 and the following procedure to replace the MPV card.

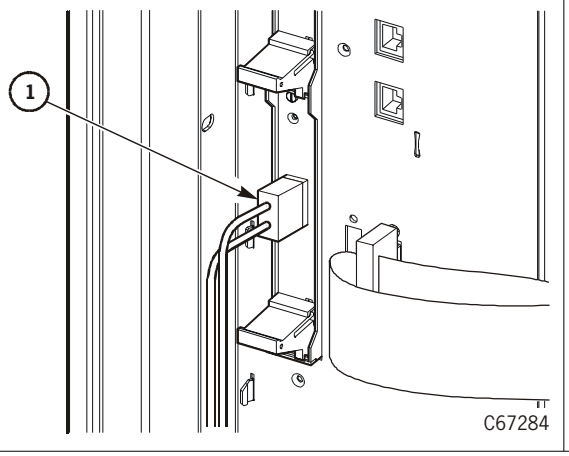
Note: An MPU card might be attached to the MPV card. The MPU card contains a Class 1 laser product. See "Safety" on page xxi for compliance information and safety precautions.

Figure 4-10. MPV (CPCI) Card (C67193)

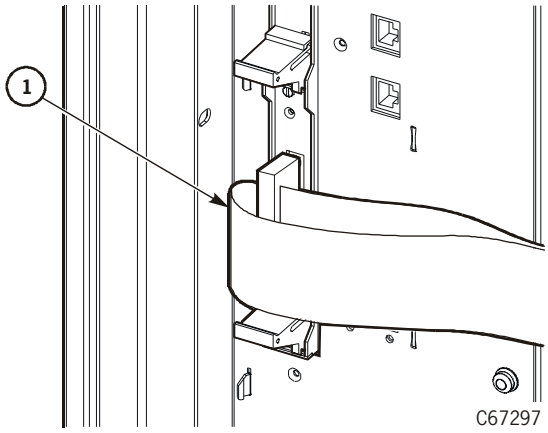


Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.
3. Disconnect the fiber optic cable from the MPU card or remove the library's SCSI cable from the MPW card.



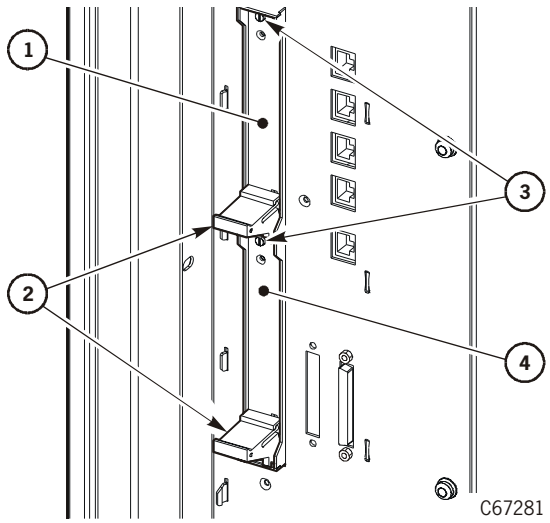
1. Fiber optic cable



1. SCSI cable

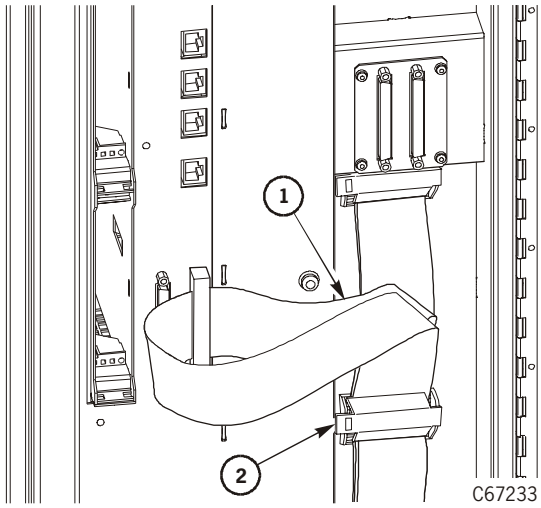
CAUTION:
***Possible ESD damage*: Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

4. Use a flat-bladed screwdriver to loosen the captive screw at the top of the MPU card or MPW card cover plate.
5. Push down on the latch handle at the bottom of the card and the vacancy plate.



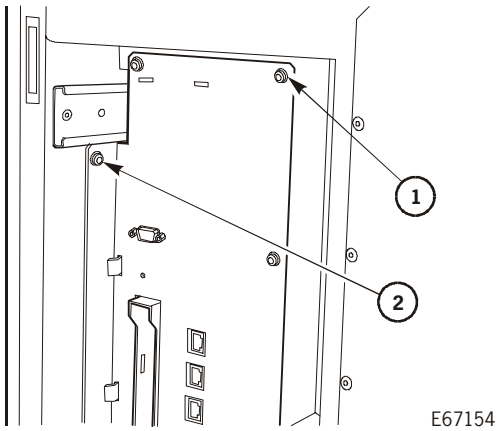
1. Vacancy plate
2. Latch handles
3. Captive screws
4. MPU card or MPW card

6. Pull the MPU or MPW card out of the CPCI module and place it into an anti-static bag. This card is not part of the FRU and will be reinstalled onto the new MPV card.
7. If necessary, open the lower cable clamp and release the library SCSI cable.



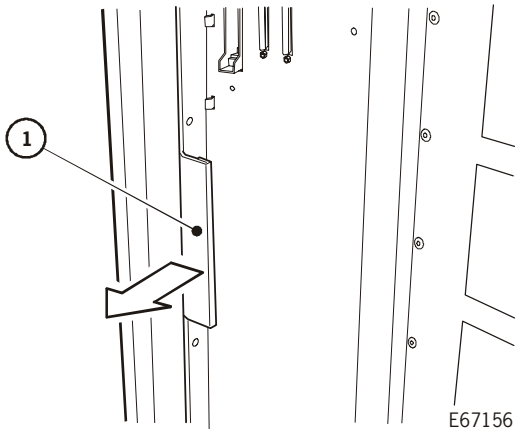
1. SCSI cable
2. Lower cable clamp

8. Use a T-25 Torx bit to remove the 13 screws (eight on the front and five along the left side of the EM compartment).



1. Front screw (8)
2. Left side screw (5)

9. Use the handle to gently pull out the compartment until the buttons in the top and bottom slides snap into place.

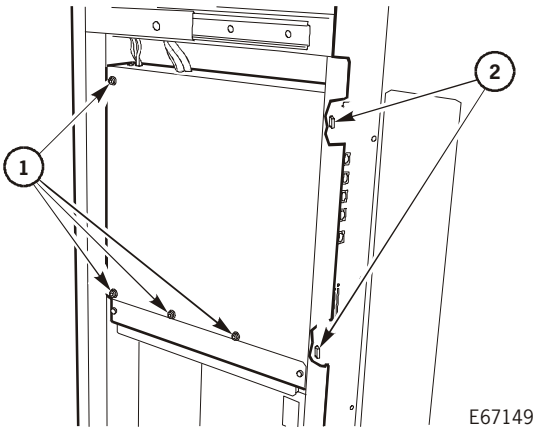


1. Handle

10. Use a T-15 Torx bit to remove the four screws from the front of the electronics module cover.

Note: The cover in older model libraries has six screws: four on the back and two on the sides.

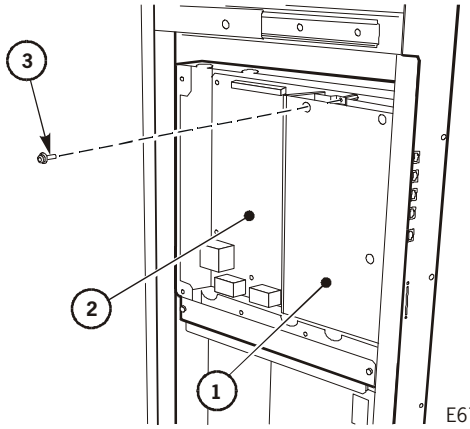
11. Pull the left side of the cover toward you until you can slip the tabs along the right side of the cover out of the slots.



1. Cover screws
2. Tabs (5)

CAUTION:
Possible equipment damage: **Use a magnetized Torx bit to remove the screws. Do not let the screws fall into the fans or power supply.**

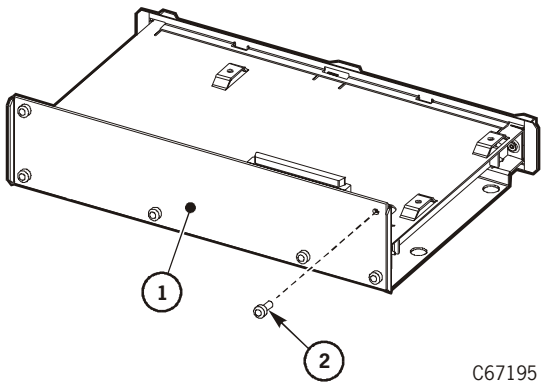
12. Use a T-10 Torx bit to remove the three CPCI module mounting screws from the MPC card standoffs. These screws go through the three cutouts in the cover.



1. CPCI module
2. MPC card
3. Screw (3)

CAUTION:
Possible equipment damage: **Pull the CPCI module straight out, being careful not to damage the connector to the MPC card.**

13. Grasping the left side of the CPCI module, gently pull the MPV card from the MPC card.
14. Place the CPCI module on a flat surface.
15. Use a T-10 Torx bit to remove the six mounting screws that attach the MPV card to the CPCI module, and remove the card.

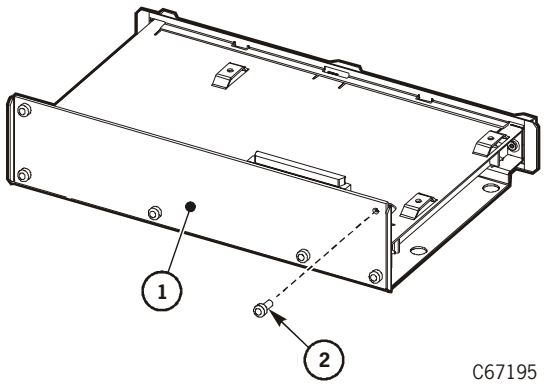


1. MPV card
2. Screw (6)

Replacement

CAUTION:
***Possible ESD damage*: Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

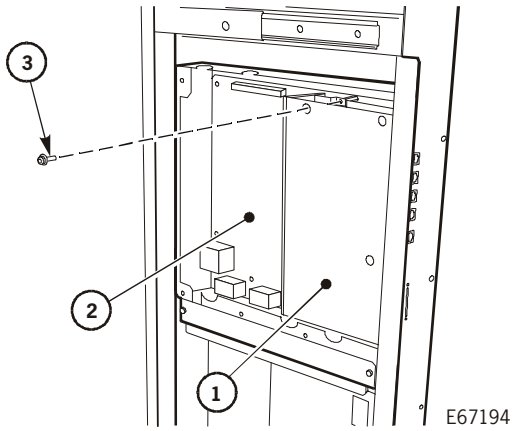
1. Remove the MPV card from the anti-static bag.
2. Install the MPV card to the CPCI module with the six mounting screws.



1. MPV card
2. Screw (6)

CAUTION:
***Possible equipment damage:* Push the MPV card straight in, being careful not to damage the connector to the MPC card.**

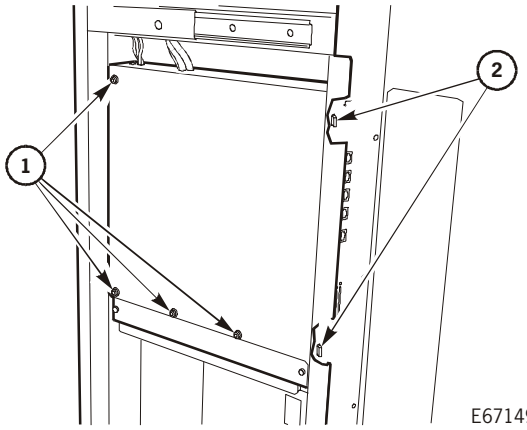
3. Install the CPCI module and the MPV card by gently mating the MPV card and the MPC card connectors.
4. Install the three mounting screws through the three cutouts in the cover and into the MPC card standoffs.



1. CPCI module
2. MPC card
3. Screw (3)

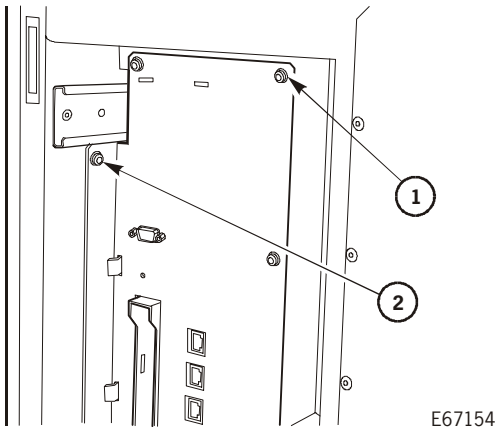
5. Tilt the electronics module cover, and slip the tabs into the slots.
6. Attach the cover with the four screws.

Note: The cover in older model libraries has six screws: four on the back and two on the sides.



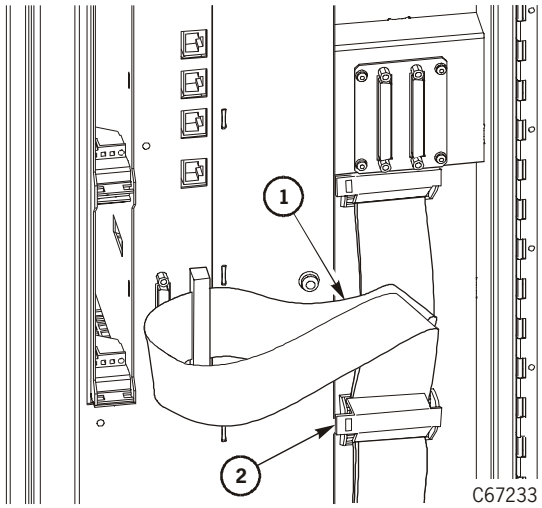
1. Cover screws
2. Tabs (5)

7. Pressing the top and bottom buttons in, use the handle to gently push in the compartment.
8. Install the 13 screws (eight on the front and five along the left side of the EM compartment).



1. Front screw (8)
2. Left side screw (5)

9. If necessary, place the SCSI cable loop in the lower cable clamp and close the clamp.



1. SCSI cable
2. Lower cable clamp

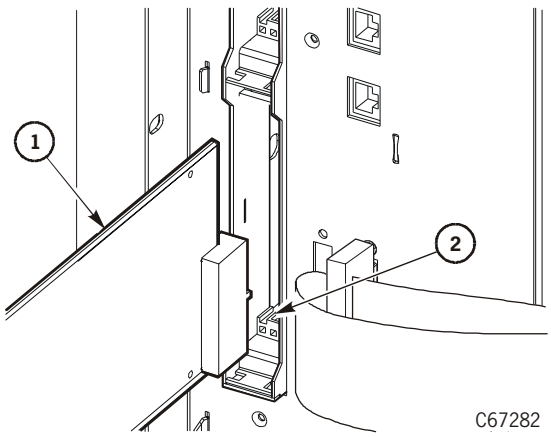
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

10. Remove the MPU or MPW card from the anti-static bag.

11. Hold the card so that the card connector aligns with the MPV card connector (circuit side out, components facing the MPC card).

CAUTION:
Fibre safety: **See "Fiber Optic Safety" on page xxviii for compliance information and safety precautions.**

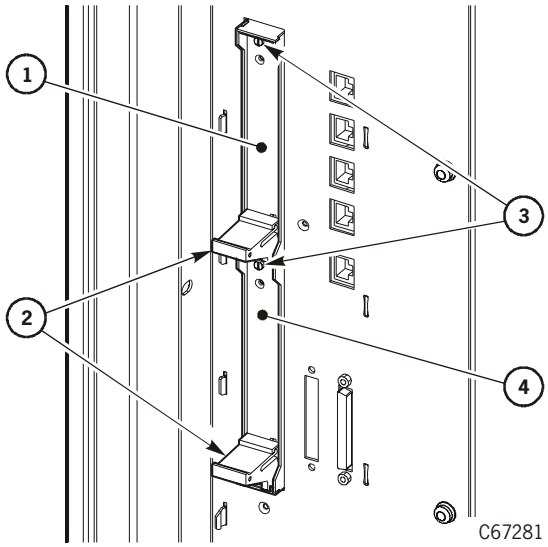
12. Slide the MPU or MPW card into the groove in the rail in the *lower slot*, and gently push it in until it mates with the MPV card connector.



1. MPU or MPW card
2. Groove in rail

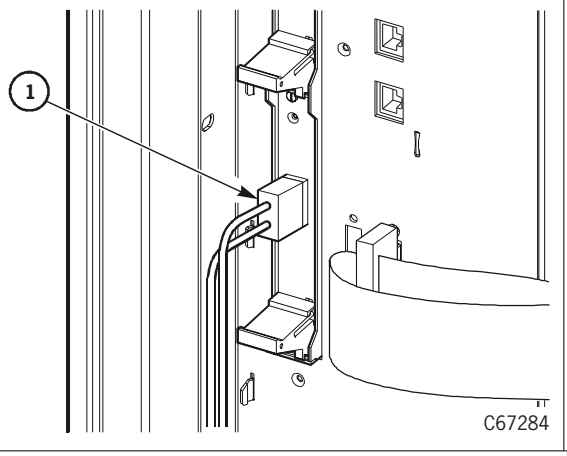
13. Make sure the card latch handle engages.

14. Tighten the captive screw.

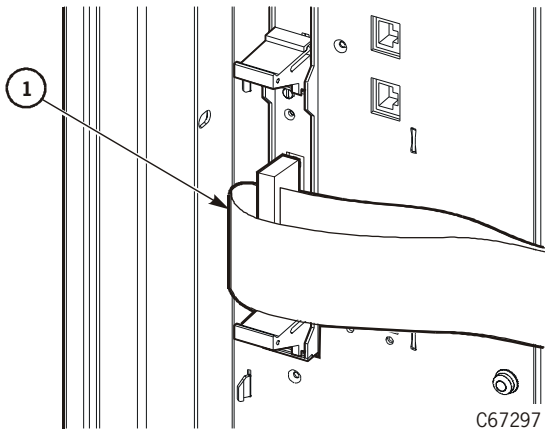


1. Vacancy plate
2. Latch handles
3. Captive screws
4. MPU or MPW card

1. Fiber optic cable



1. SCSI cable



15. Reconnect the fiber optic or SCSI cable.

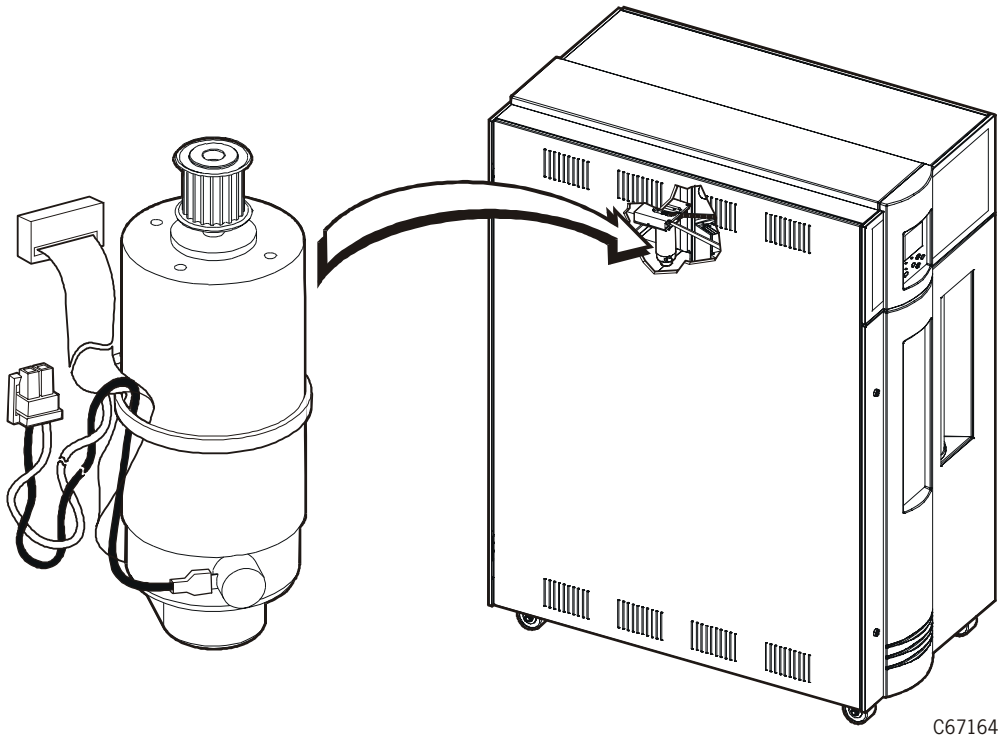
16. Go to "Restoring Operation" on page 4-136.

Theta Motor

The theta motor is behind the top of the robot.

Use Figure 4-11 and the following procedure to replace the theta motor.

Figure 4-11. Theta Motor (C67164)

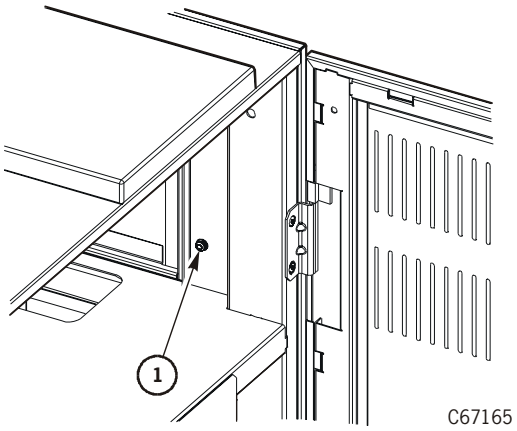


Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.

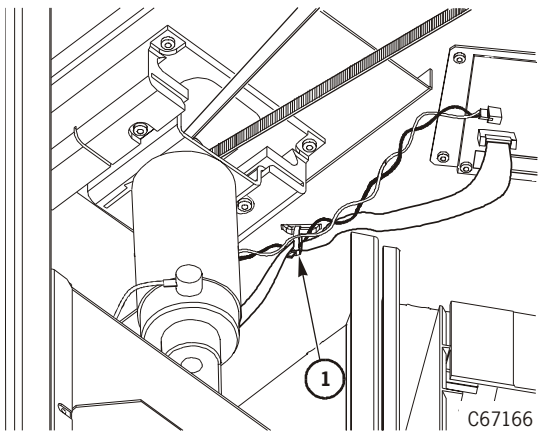
CAUTION:
Possible injury to person: **The side cover is heavy and awkward. StorageTek advises that two people remove the cover. Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

3. Open the rear door, and use a T-20 Torx bit to remove the screw that attaches the side cover to the top of the frame.
4. Lift the side cover off of the mushrooms on the frame, and set the cover aside.



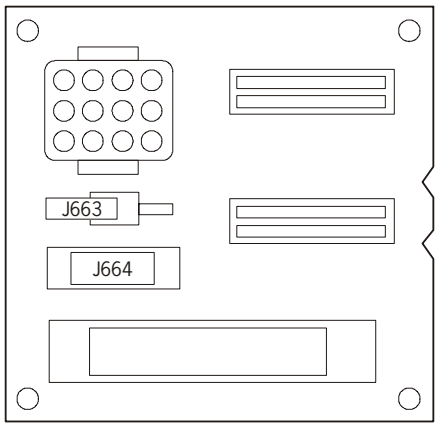
1. Side cover screw

5. Cut the tie wrap that holds the theta motor cables to the roof.

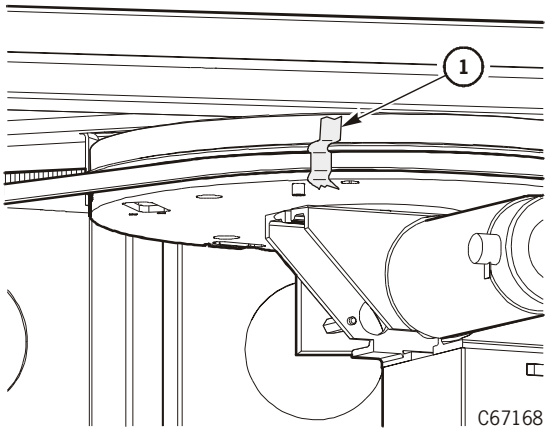


1. Tie wrap

6. Disconnect P663 and P664 from the PRY card.



7. As you face the Z column, rotate the Z column until the hand is pointing to the rear left corner of the library.
8. Use tape to secure the theta belt to the theta pulley at both places where it leaves the pulley.

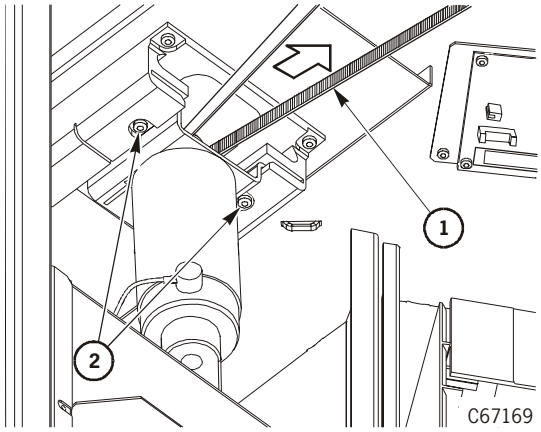


1. Tape

CAUTION:
Possible equipment damage: **Do not remove the two screws described below or you will release the springs in the motor bracket.**

9. Two screws clamp the theta belt tensioner. Use a T-25 Torx bit to loosen the screws two turns.

10. Move the motor assembly toward you and remove the belt from the pulley.

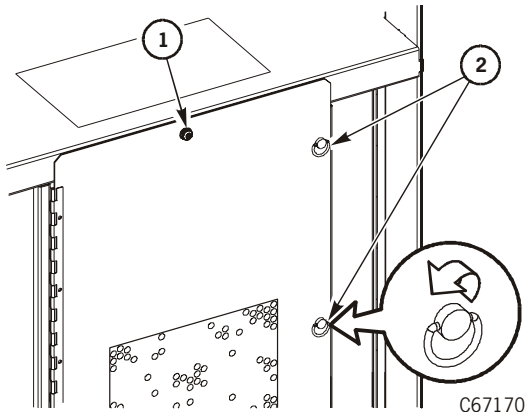


1. Belt
2. Screws

11. Let the motor assembly retract.

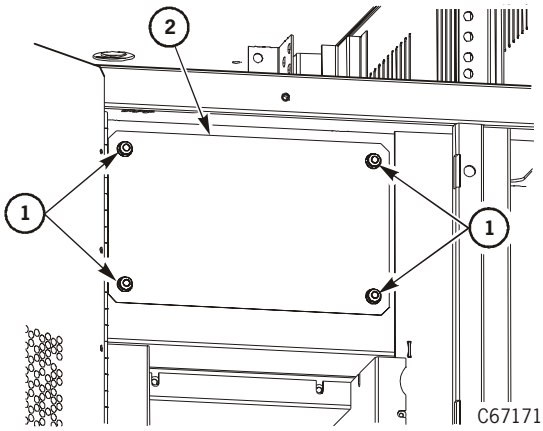
    There are three screws that attach the motor assembly to the roof.

12. To access the rear theta motor screw, open the drive access door by removing the two screws and releasing the seven snap rings.



1. Screw (2)
2. Snap rings (7)

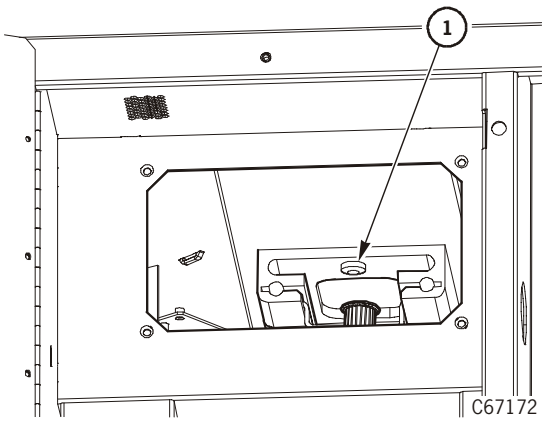
13. Remove the four screws that attach the cover plate to the bulkhead above the drives.
14. Remove the cover.



1. Screws
2. Cover plate

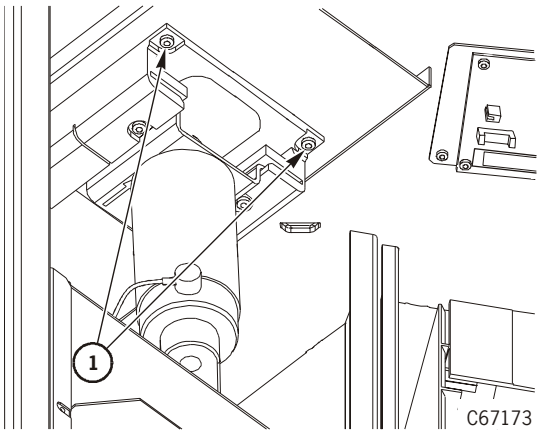
Note: The rear screw is hard to access. Use a short nut driver or a ratchet driver with a 1/4 in. bit, or a short screwdriver.

15. Reaching through the rear access hole, use a T-25 Torx bit to remove only the rear screw.



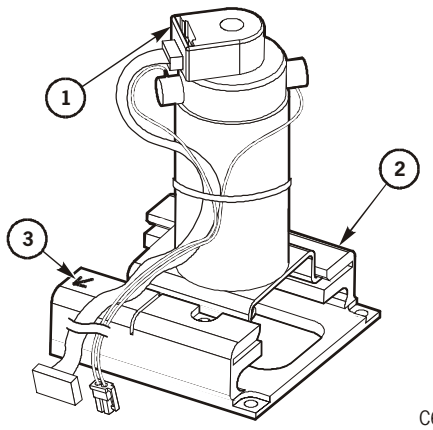
1. Rear screw

16. From the side of the library, grasp the motor assembly and remove the two forward screws.



1. Screws

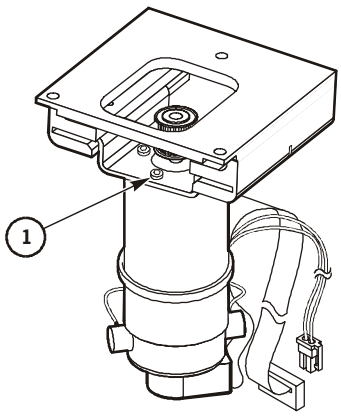
17. Place the motor assembly top-side down on a work surface.
18. Note the orientation of the encoder relative to the bracket and base.
19. Mark it with a marker or tape. This will enable you to properly install it during replacement so that the wires can be routed easily.



1. Encoder
2. Marker
3. Base

20. Lay the encoder on a cushioned surface.
21. Use a T-15 Torx bit to remove the four screws that attach the motor to the bracket.

1. Screw (4)



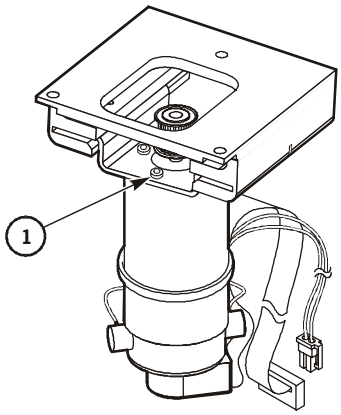
C67175

22. Remove the motor.

Replacement

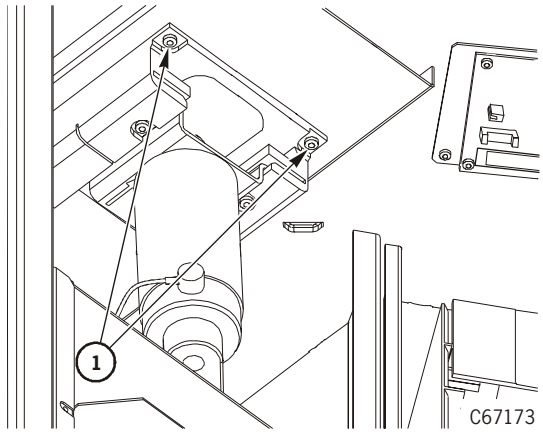
1. Noting the orientation of the encoder, attach the motor to the bracket with the four screws.

1. Screw (4)

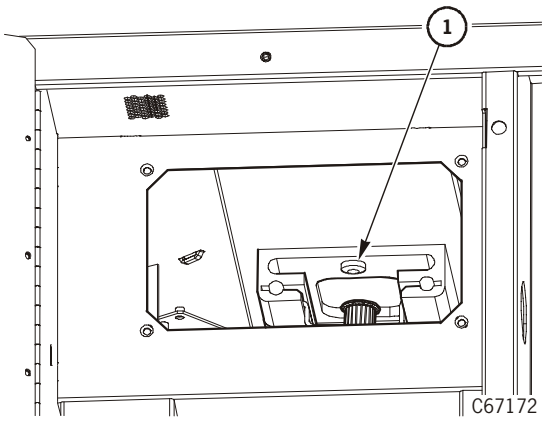


C67175

2. Attach the motor assembly to the roof with three screws.

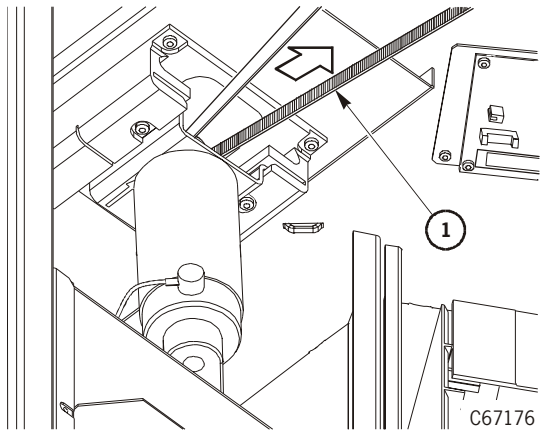


1. Front screws



1. Rear screw

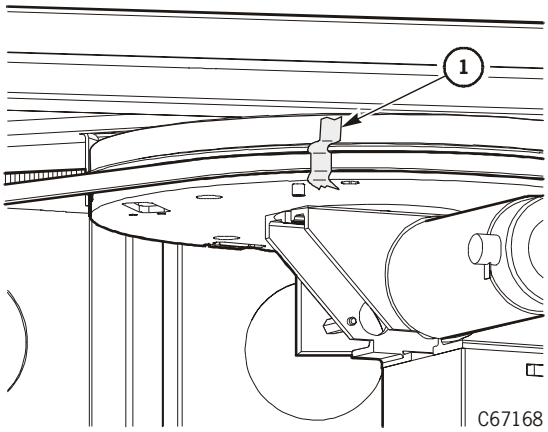
3. Move the motor assembly toward you, and place the belt over the pulley.



1. Belt

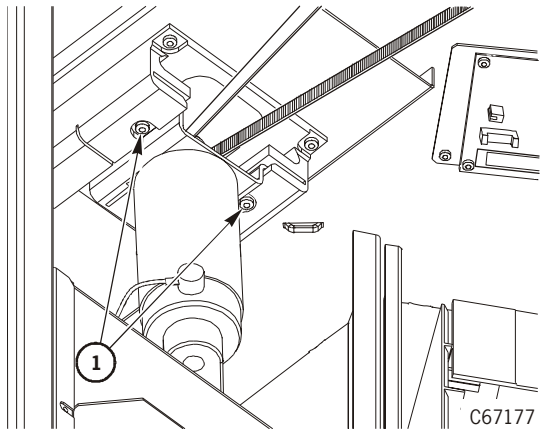
4. Remove the tape securing the belt to the theta pulley.
5. Make sure the belt is properly positioned along the top and bottom tracks of the theta pulley. If necessary, position the belt correctly.

1. Tape

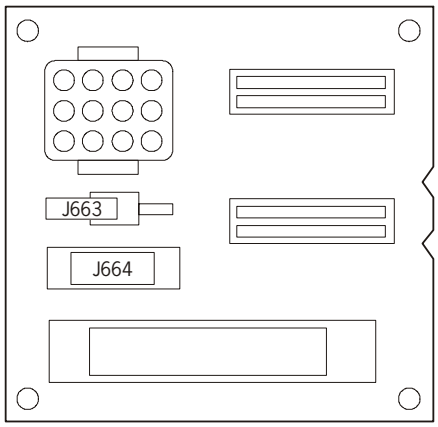


6. Rotate the Z column, checking for free movement.
7. Tighten the two screws until the motor assembly is rigid.

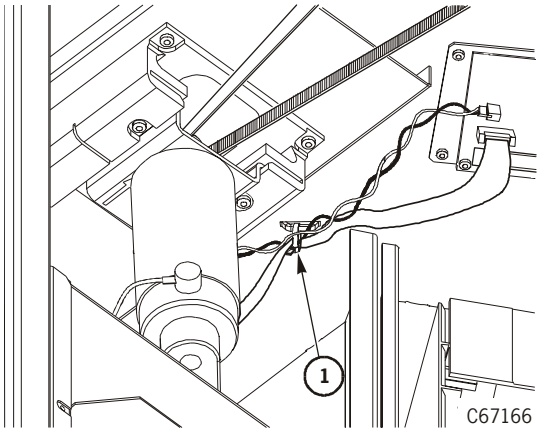
1. Screws



8. Connect P663 and P664 to the PRY card.



9. Use a tie wrap to secure the PRY card cables to the roof.

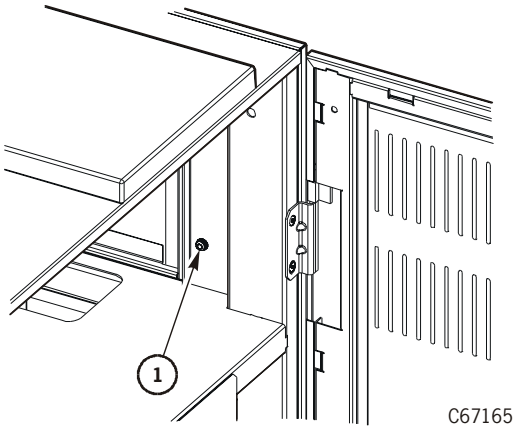


1. Tie wrap

CAUTION:
Possible injury to person: **The side cover is heavy and awkward. StorageTek advises that two people replace the cover. Use the proper lifting techniques described in** **"Lifting Techniques" on page xxii****.**

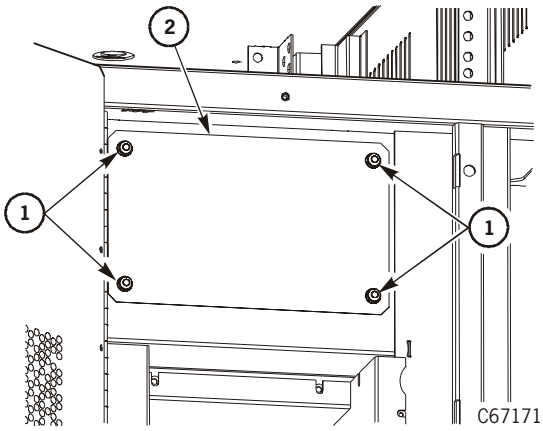
10. Place the side cover onto the mushrooms on the frame.

11. Use a Torx bit to install the screw that attaches the side cover to the top of the frame.



1. Side cover screw

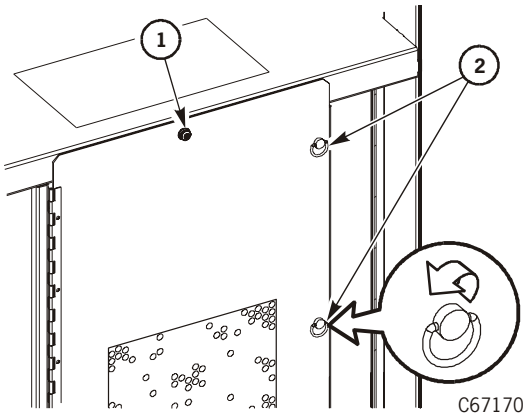
12. Attach the bulkhead cover plate with four screws.



1. Screws
2. Cover plate

13. Close the drive access door, and engage the seven snap rings.

14. Install the two screws



1. Screw (2)
2. Snap rings (7)

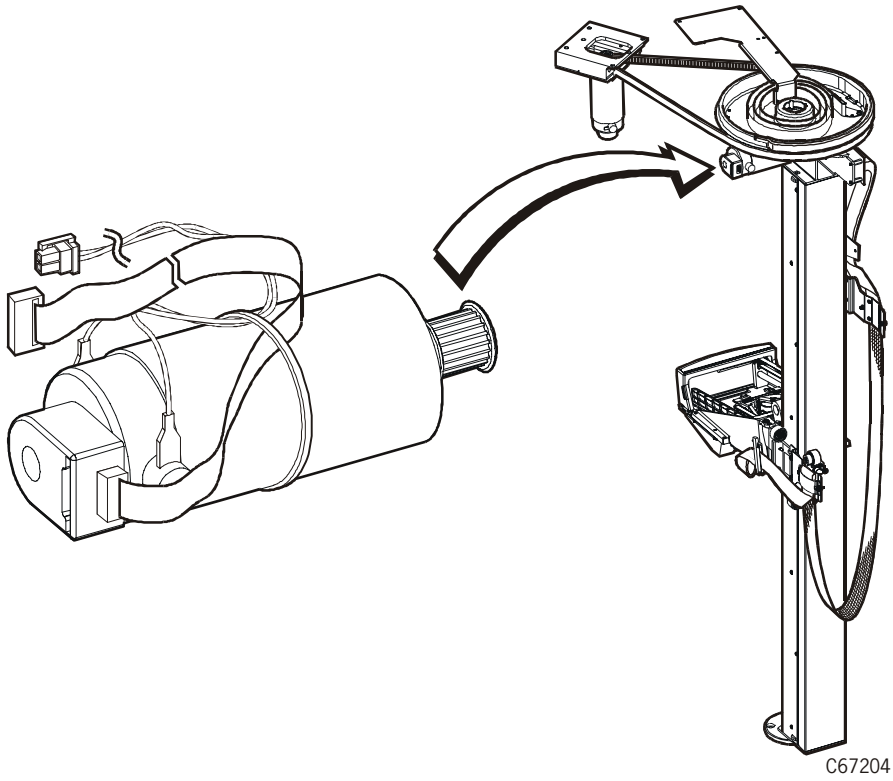
15. Go to "Restoring Operation" on page 4-136.

Z Motor

The Z motor is on the side of the Z column.

Use Figure 4-12 and the following procedure to replace the Z motor.

Figure 4-12. Z Motor (C67204)

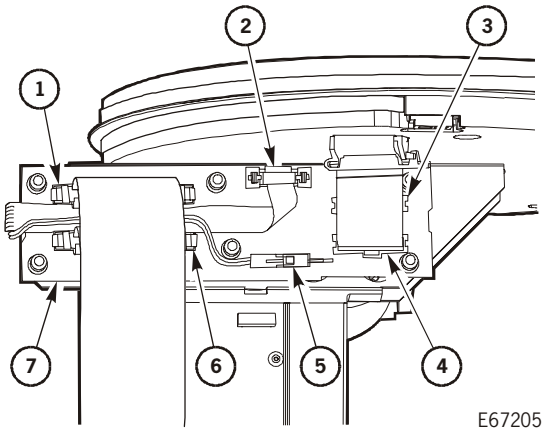


Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.

CAUTION:
Possible equipment damage: **Pay attention to which jack each cable attaches. Connecting the cables incorrectly can seriously damage the hand components.**

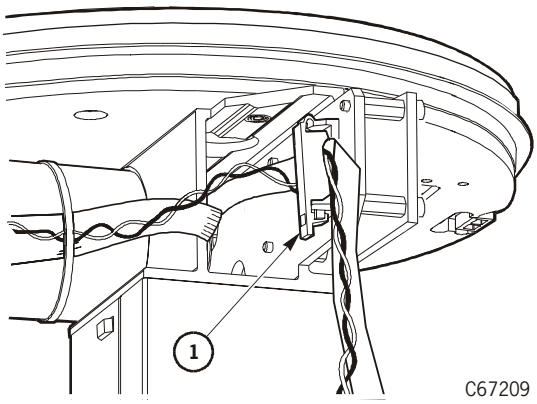
3. Disconnect the cables from the PRX card.



1. P193B
2. P671
3. P675
4. P676
5. P670
6. P193A
7. PRX card

Note: Do not disconnect the cables from the motor. They are part of the FRU.

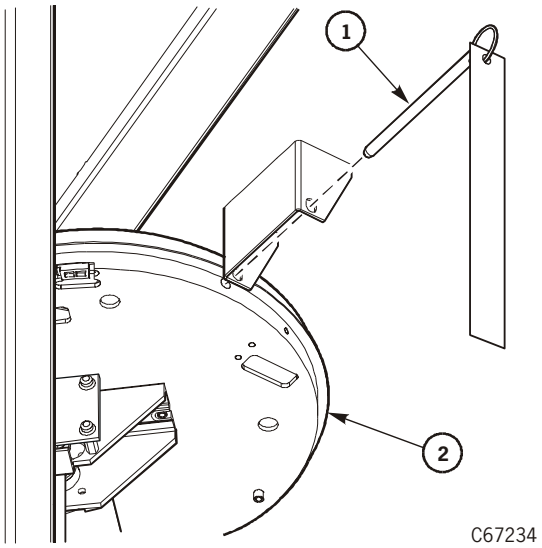
4. Open the cable clamp on the rear of the PRX card bracket and release the motor cables.



1. Cable clamp

5. Ask the customer for two shipping pins.

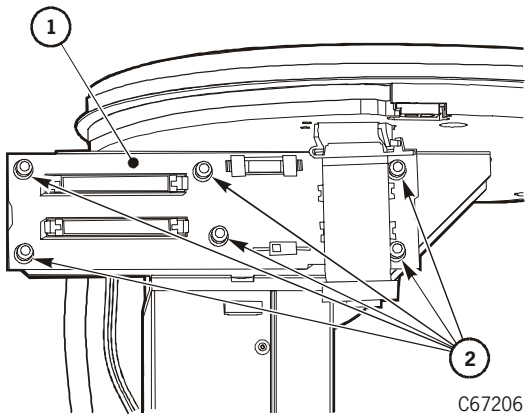
6. Insert one shipping pin through the holes in the ceiling bracket and into the theta pulley.



1. Shipping pin
2. Theta pulley

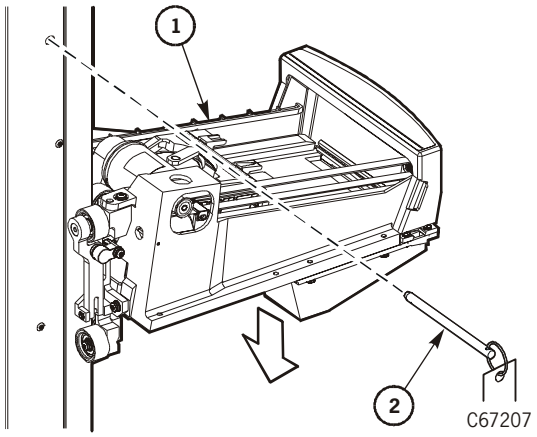
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

7. Use a T-15 Torx bit to remove the six screws that attach the PRX card.
8. Remove the card, and place it into an anti-static bag.



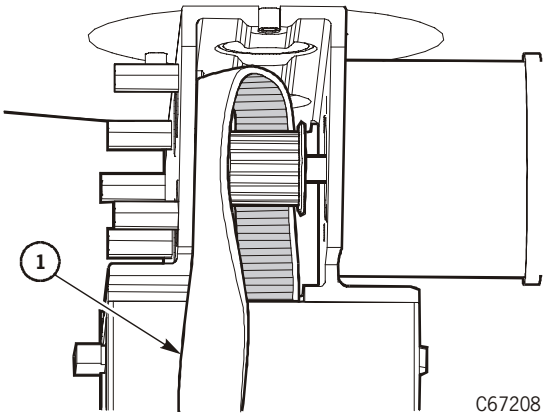
1. PRX card
2. Screws

9. Lower the hand-camera assembly past the shipping pin hole in the Z column, and insert the other shipping pin.
10. Slowly raise the Z carriage until the counterweight rests on the shipping pin.



1. Hand-camera assembly
2. Shipping pin

11. Raise the hand-camera assembly enough to create slack in the Z belt.
12. Carefully raise the belt off of the pulley, and set it on the Z column.

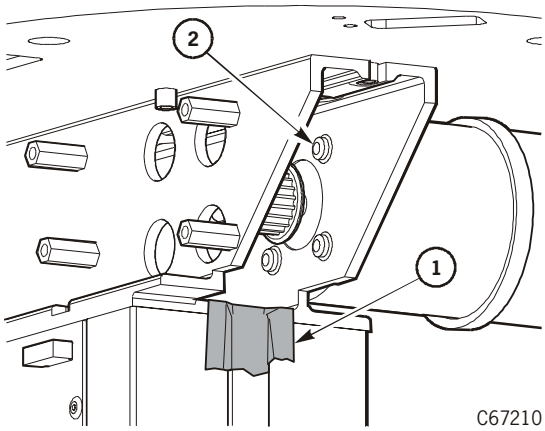


1. Belt

CAUTION:
Possible equipment damage: **Place a piece of tape over the hole in the Z column to prevent screws from falling into the counterweight wheels. This situation could cause a servo error. Use a magnetic screwdriver to remove the screws in the following step.**

13. Note the orientation of the motor. The encoder cables run along the right side of the motor.
14. Use a T-15 Torx bit to remove the four screws that attach the motor to the top of the Z column bracket.

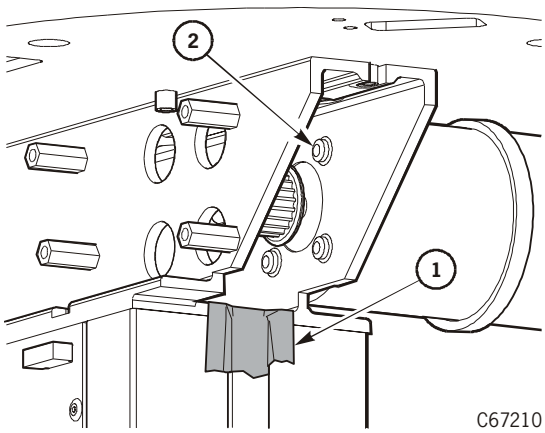
15. Remove the motor.



1. Tape
2. Screw (4)

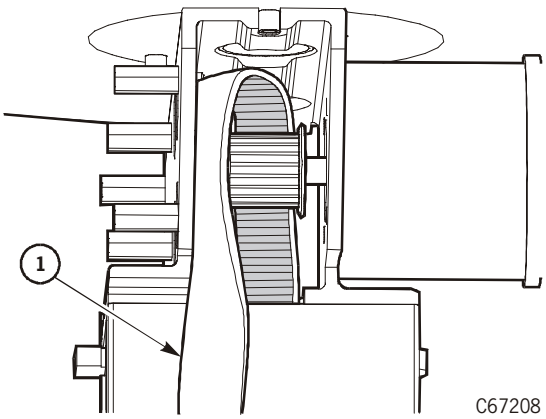
Replacement

1. Hold the motor so that the encoder cables run along the right side of the motor.
2. Use the four screws to attach the motor to the bracket.
3. Remove the piece of tape from over the hole in the Z column.



1. Tape
2. Screw (4)

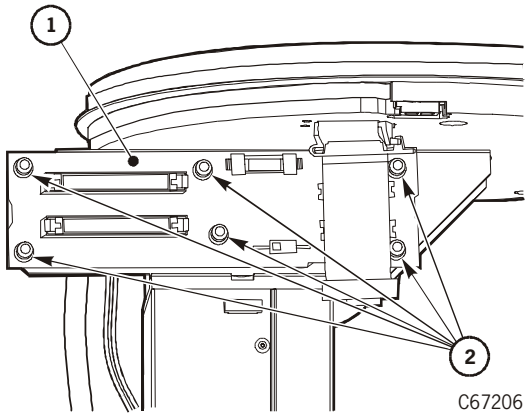
4. Carefully place the Z belt onto the pulley.



1. Belt

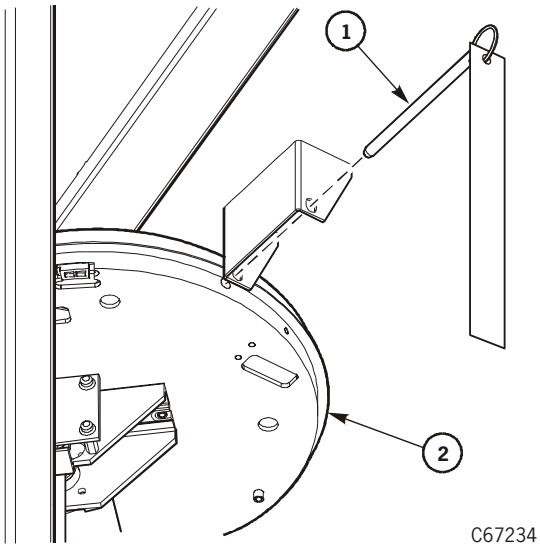
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

5. Attach the PRX card with six screws.



1. PRX card
2. Screws

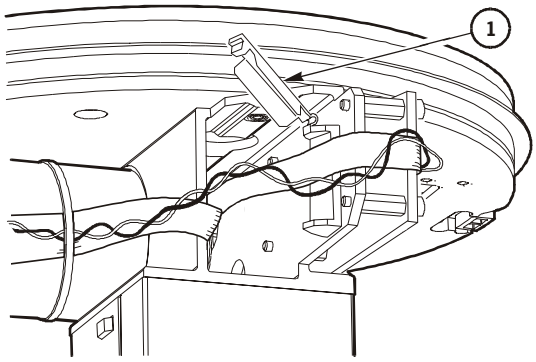
6. Remove the shipping pin from the theta pulley.



1. Shipping pin
2. Theta pulley

7. Rotate the Z column.

8. Route the motor cables along the recessed area between the PRX card bracket and the motor bracket and through the cable clamp.

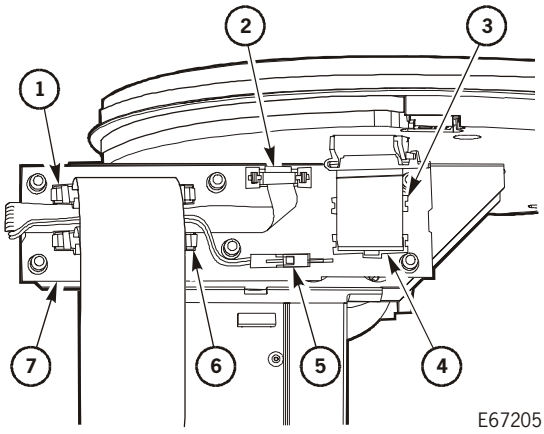


1. Cable clamp

CAUTION:
Possible equipment damage: **Pay attention to which jack each cable attaches. Connecting the cables incorrectly can seriously damage the Z mechanism components.**

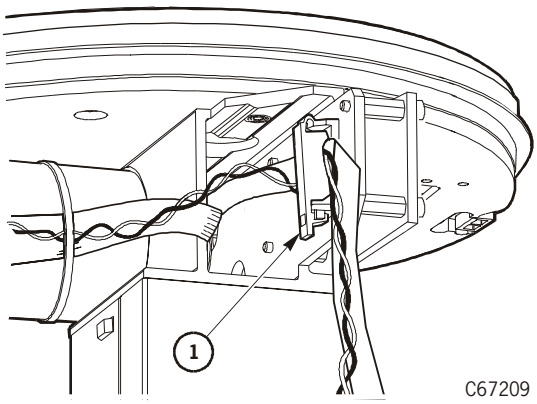
9. Continue routing the cables between P193A/B on the PRX card.

10. Connect the cables.



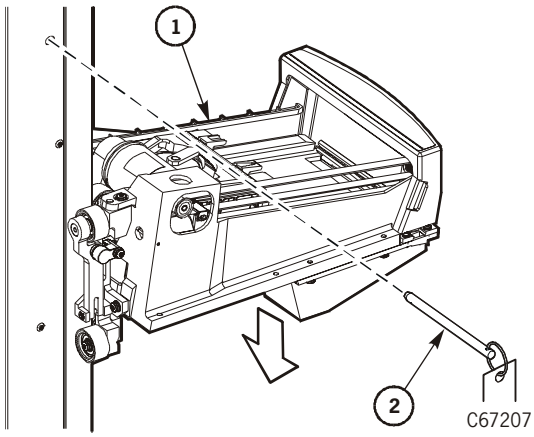
1. P193B
2. P671
3. P675
4. P676
5. P670
6. P193A
7. PRX card

11. Fasten the cable clamp.



1. Cable clamp

12. Lower the Z carriage and remove the shipping pin from the Z column.



1. Hand-camera assembly
2. Shipping pin

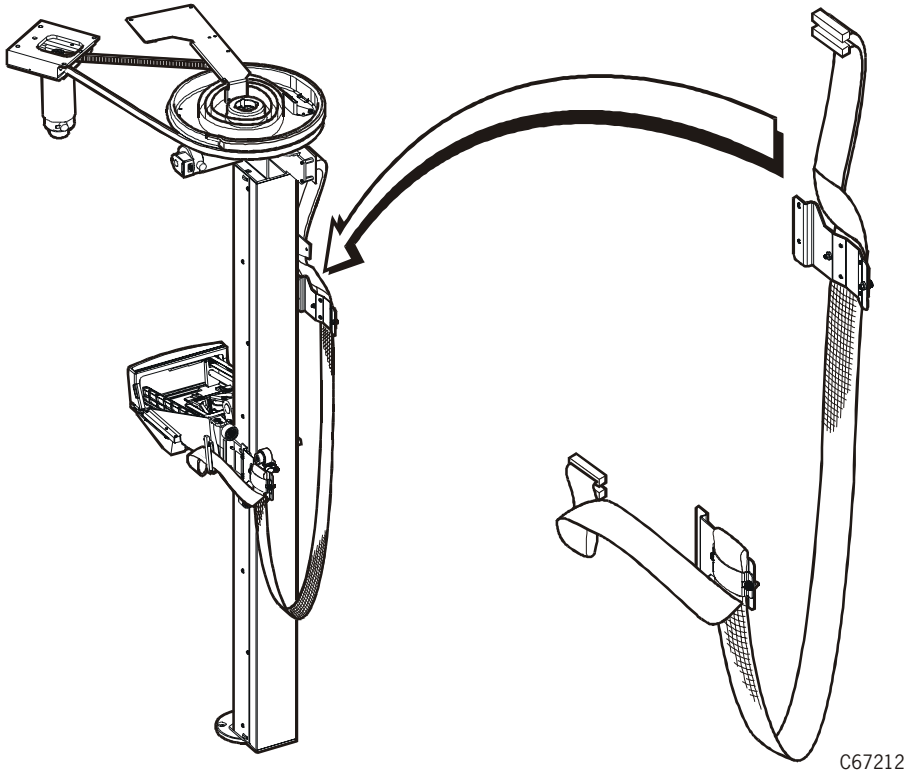
13. Go to "Restoring Operation" on page 4-136.

Z Flex Cable

The Z flex cable runs along the Z column between the Z carriage and the PRX card at the top of the Z column.

Use Figure 4-13 and the following procedure to replace the flex cable.

Figure 4-13. Z Flex Cable (C67212)

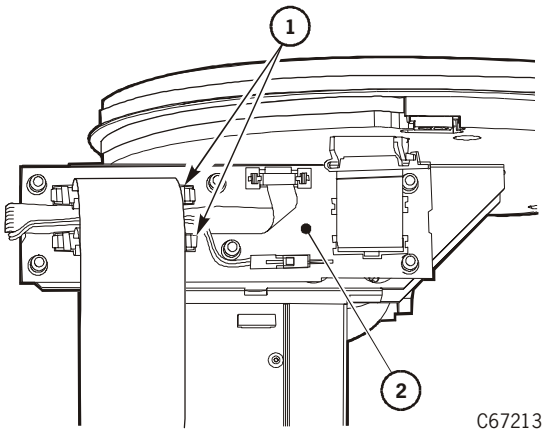


Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Power off the library by pressing down on the power switch.
3. Rotate the Z column until the PRX card is facing you.

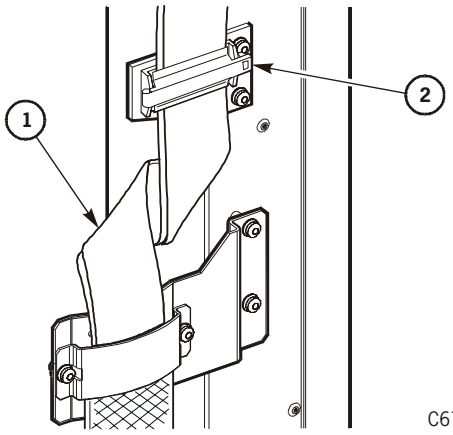
CAUTION:
***Possible equipment damage:* Pay attention to which jack each cable attaches. Connecting the cables incorrectly can seriously damage the Z mechanism components.**

4. Disconnect the two cable connectors P193A/B from the PRX card at the top of the Z column by pressing the tabs on the cables.



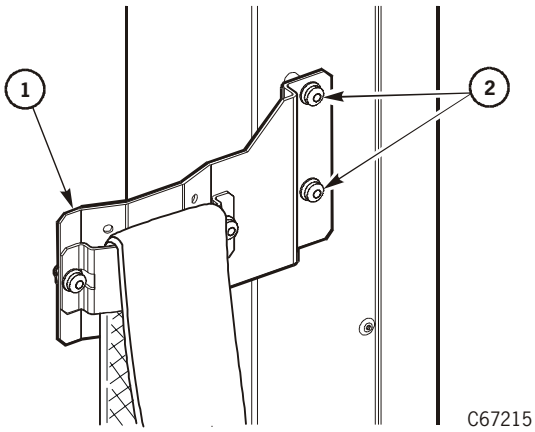
1. Cable connectors
2. PRX card

5. Note the fold in the cables; then open the cable clamp and release the cables.



1. Cable fold
2. Cable clamp

6. Use a T-15 Torx bit to remove the two screws that attach the Z flex cable bracket to the Z column.

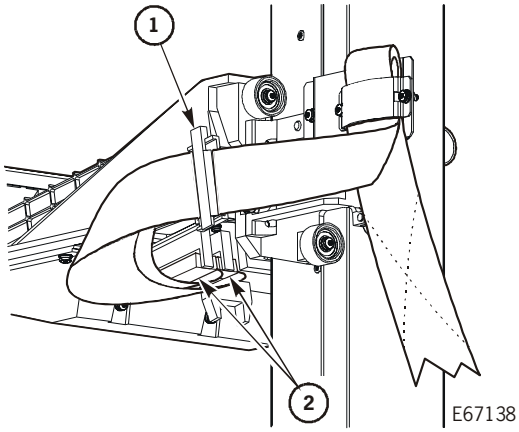


1. Cable bracket
2. Screws

7. Rotate the Z column counterclockwise until the Z flex cable side of the hand-camera assembly is accessible.

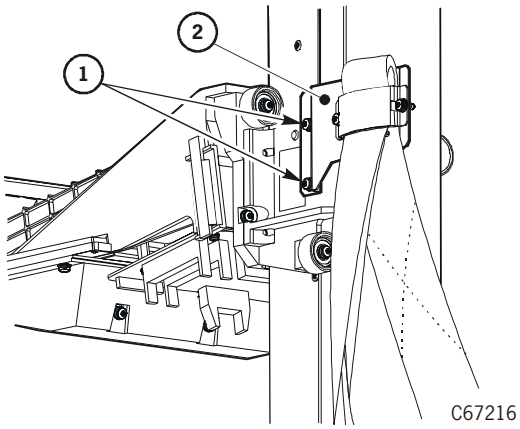
CAUTION:
Possible equipment damage: **Pay attention to which jack each cable attaches. Connecting the cables incorrectly can seriously damage the hand components. The inside cable is shorter and must connect to the closer jack.**

8. Open the cable clamp.
9. Disconnect P194A/B from the bottom of the hand-camera assembly.



1. Cable clamp
2. P194A/B

10. Use a T-15 Torx bit to remove the two screws that attach the Z flex cable bracket to the Z carriage.

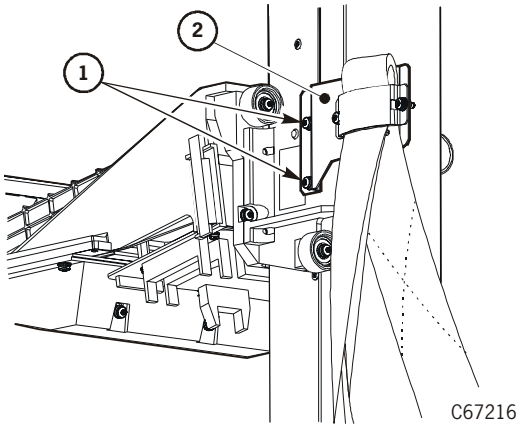


1. Screws
2. Bracket

Replacement

CAUTION:
Possible equipment damage: **Do not twist the new cable. Twisting could damage the stiffener in the cable assembly.**

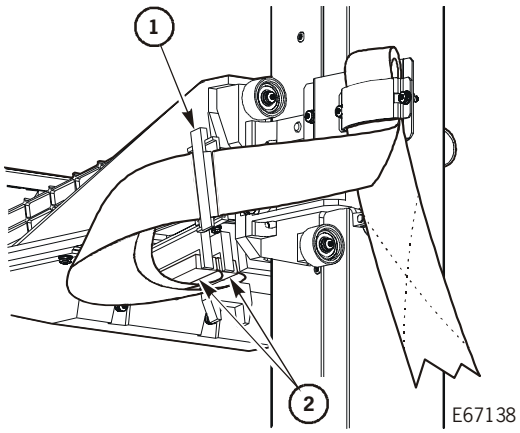
1. Attach the Z flex cable bracket to the Z carriage with two screws.



1. Screws
2. Bracket

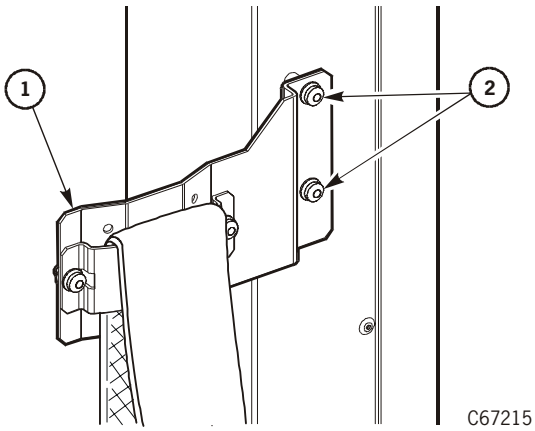
CAUTION:
Possible equipment damage: **Pay attention to which jack each cable attaches. Connecting the cables incorrectly can seriously damage the hand components. The inside cable is shorter and must connect to the closer jack.**

2. Connect P194A/B to the bottom of the hand-camera assembly.
3. Close the cable clamp.



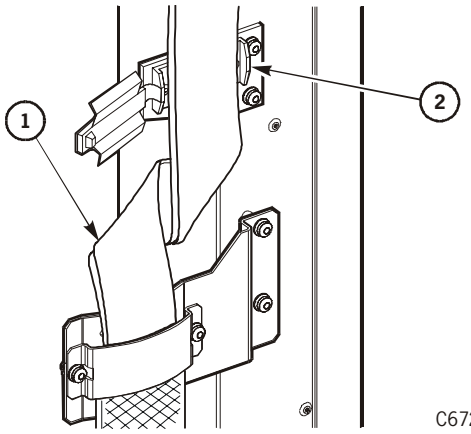
1. Cable clamp
2. P194A/B

4. Rotate the Z column clockwise until the other side of the Z column is accessible.
5. Attach the Z flex cable bracket to the Z column with two screws.



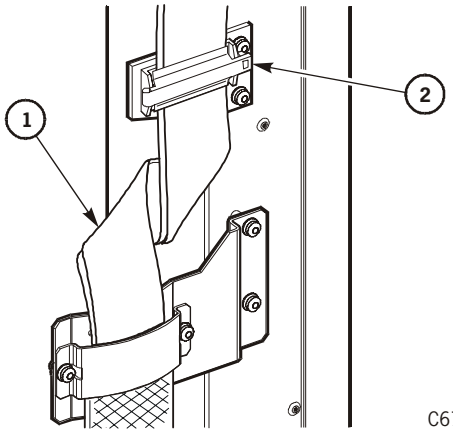
1. Cable bracket
2. Screws

6. Carefully fold the Z flex cables and route the Z flex cables through the cable clamp.



1. Cable fold
2. Cable clamp

7. Connect the two cable connectors P193A/B to the PRX card at the top of the Z column.
8. Close the cable clamp.



1. Cable fold
2. Cable clamp

9. Move the Z carriage along the Z column to make sure the flex cable moves freely.
10. Go to "Restoring Operation" on page 4-136.

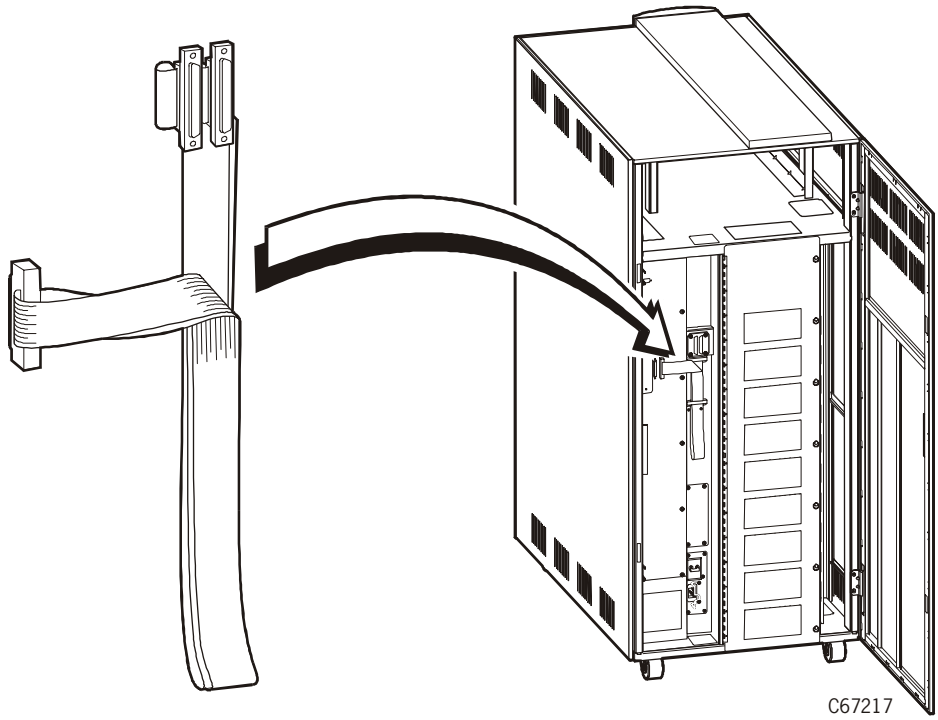
Library SCSI Cable

The cable is on the electronic compartment.

Note: If the library contains an MPW card and the library is the last device on the LVD SCSI bus, then the library's SCSI cable is likely not a Y cable but a single cable. However, the removal and replacement of the single cable is similar to the removal and replacement of the Y cable.

Use Figure 4-14 and the following procedure to replace the cable.

Figure 4-14. Library SCSI Y Cable (C67217)



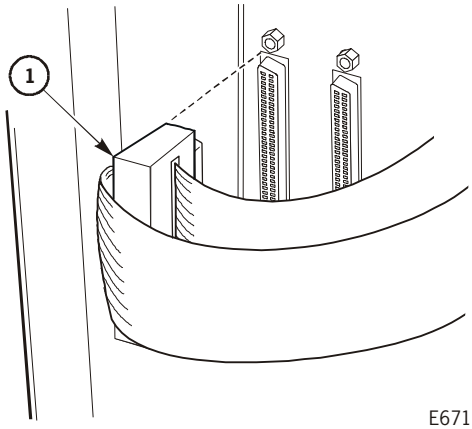
Preparation

Observe these precautions before beginning:

1. If the drives are daisy-chained with the library, stop all data processing on the channel before disconnecting them.
2. Make sure there is no activity on the SCSI bus before disconnecting the external SCSI cables; do not disconnect cables from an active (hot) bus.
3. Make sure any third-party software is quiesced.
4. Make sure all signals are terminated at each end of the SCSI bus. Also, do not mix single-ended and differential terminators.

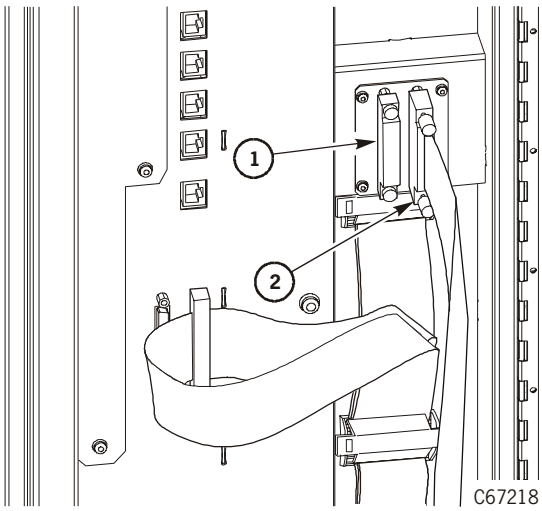
Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Note whether the cable is connected to the single-ended or differential connector; then disconnect the cable from the electronics module.



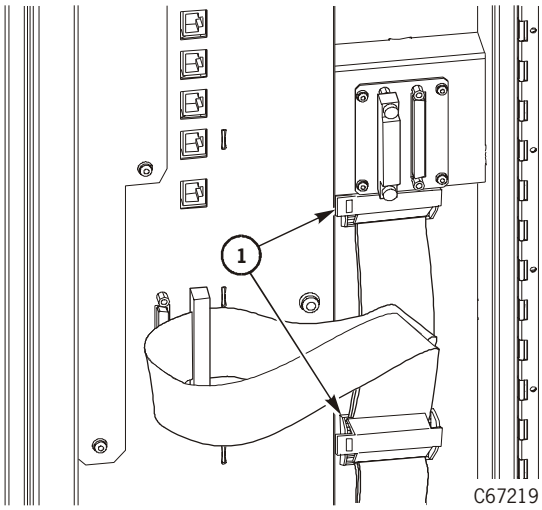
1. SCSI Y cable

3. Remove the terminator.
4. Disconnect the client cables from the dual end of the cable.



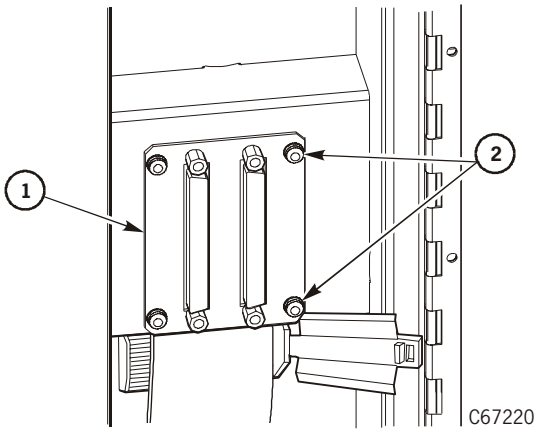
1. Terminator
2. Cable

5. Release the two cable clamps.



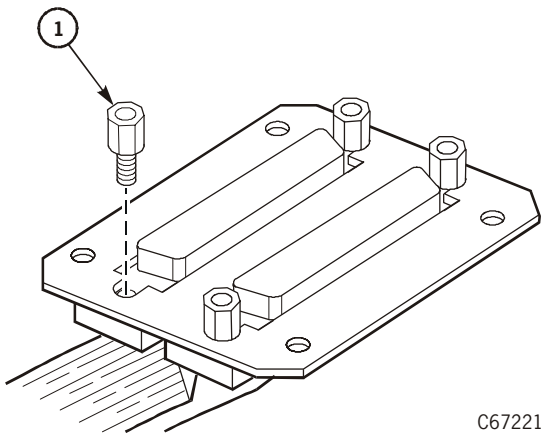
1. Cable clamps

6. Remove the four screws that attach the SCSI interface plate to the chassis.



1. Plate
2. Screws (4)

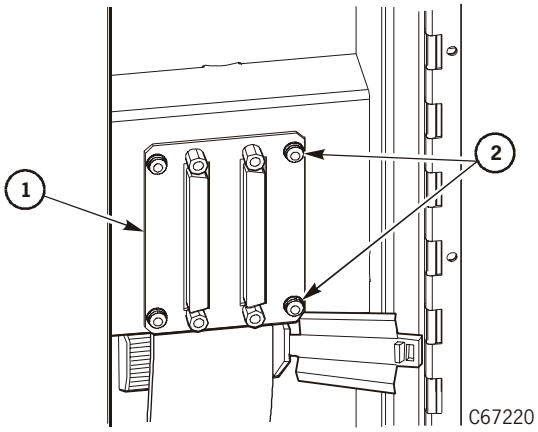
7. Use a 3/16 nut driver to remove the jack screws.



1. Screws (4)

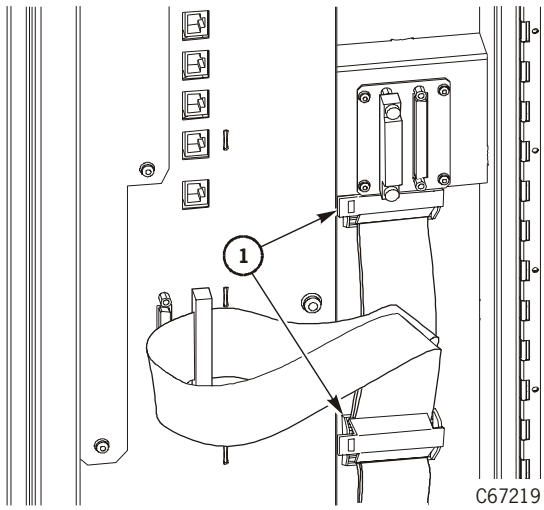
Replacement

1. Insert the connectors into the slots in the SCSI interface plate and attach the connectors with the jack screws.
2. Use four screws to attach the SCSI interface plate to the chassis.



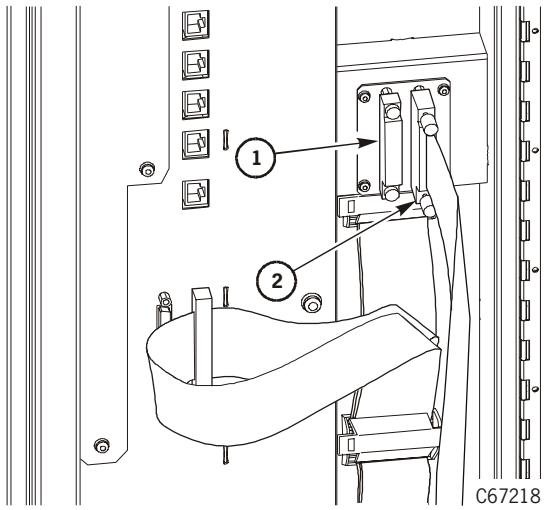
1. Plate
2. Screws (4)

3. Route the cable through the two cable clamps.
4. Close the cable clamps.



1. Cable clamps

5. Connect the client cables to the dual end of the cable.
6. Install the terminator.



1. Terminator
2. Cable

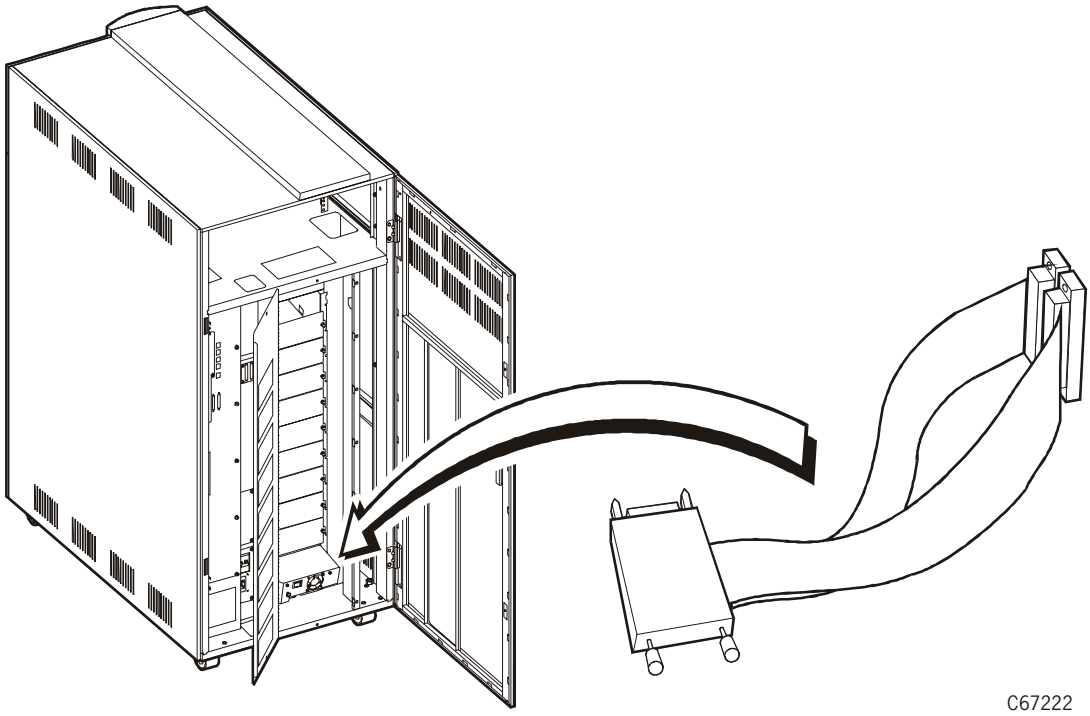
7. Connect the cable to the electronics module.
8. Go to "Restoring Operation" on page 4-136.

Drive SCSI Y Cable

The cable is behind the drive access door.

Use Figure 4-15 and the following procedure to replace the cable.

Figure 4-15. Drive SCSI Y Cable (C67222)



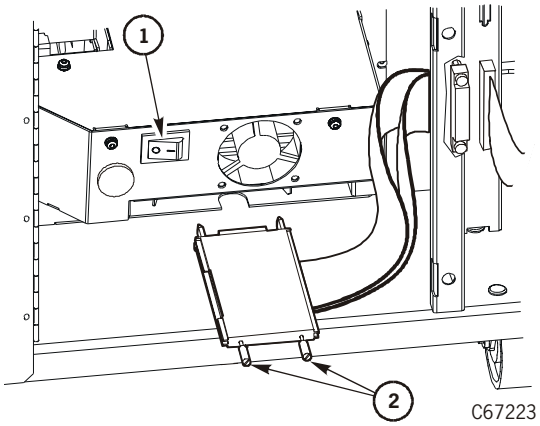
Drive Preparation

Observe these precautions before beginning:

1. If the drives are daisy-chained, stop all data processing in the channel before disconnecting them.
2. Make sure there is no activity on the SCSI bus before disconnecting the external SCSI cables. The client must be quiesced; do not disconnect a hot bus.
3. Make sure any third-party software is quiesced.
4. Make sure all signals are terminated at each end of the SCSI bus. Also, do not mix single-ended and differential terminators.

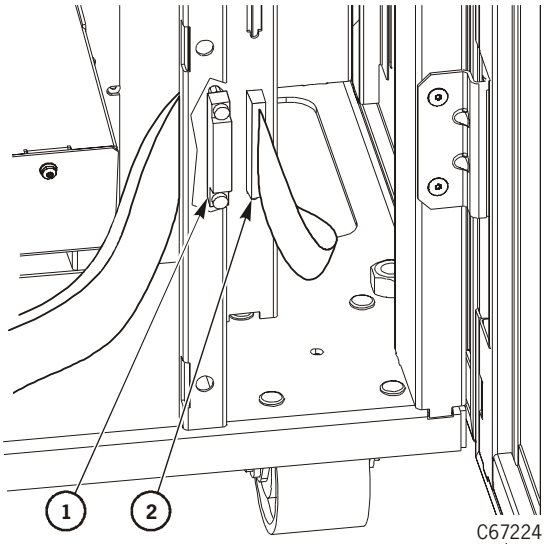
Removal

1. Review the information under "Before Beginning" on page 4-2.
2. Open the drive door.
3. Power off the drive by pressing the power switch to the OFF (O) position.
4. Disconnect the SCSI Y cable from the rear of the drive.



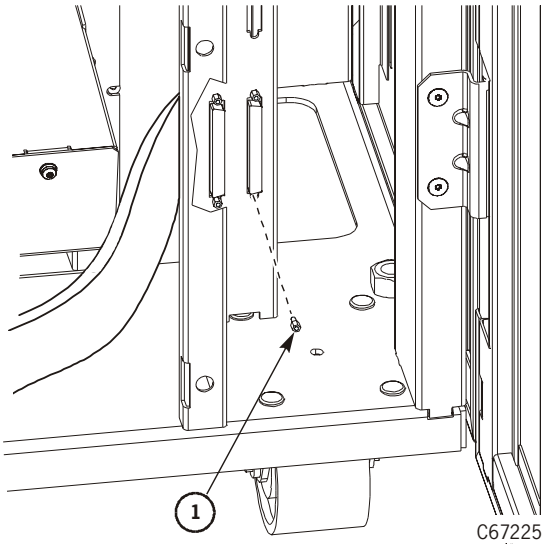
1. Power switch
2. Cable

5. Disconnect the client cable and terminator (or serial cable) from the frame.



1. Terminator
2. Client cable

6. Use a 3/16 nut driver to remove the jack screws.

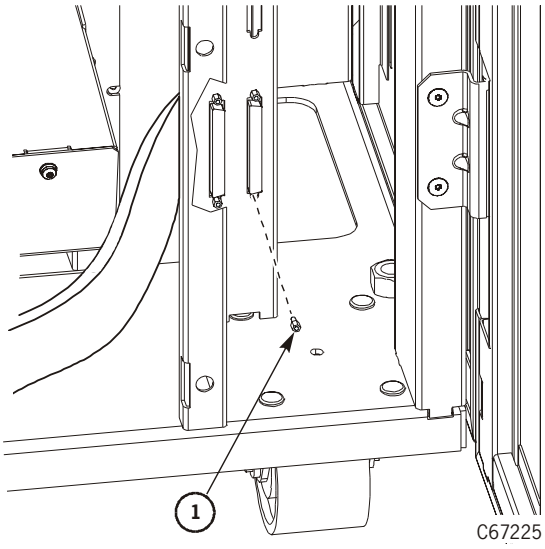


1. Screws (2)

7. Push the jack through the slot.
8. Pull the cable out of the frame.

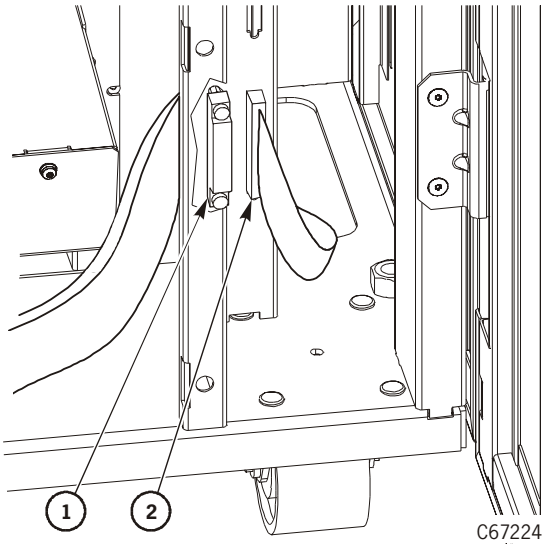
Replacement

1. Push the connectors through the slots and attach the connectors with the jack screws.



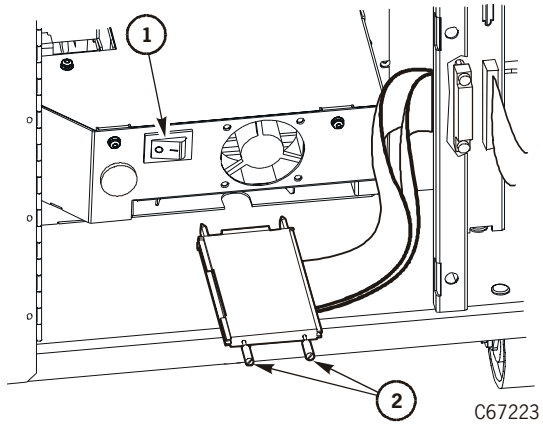
1. Screws (2)

2. Connect the client cables and terminator (or serial cable) to the frame.



1. Terminator
2. Client cable

3. Connect the cable to the rear of the drive.
4. Power on the drive by pressing the power switch to the ON (|) position.



1. Power switch
2. Cable

5. Close the drive access door.
6. Push in and turn the snap rings.
7. Install the two screws.
8. Go to "Restoring Operation" on page 4-136.

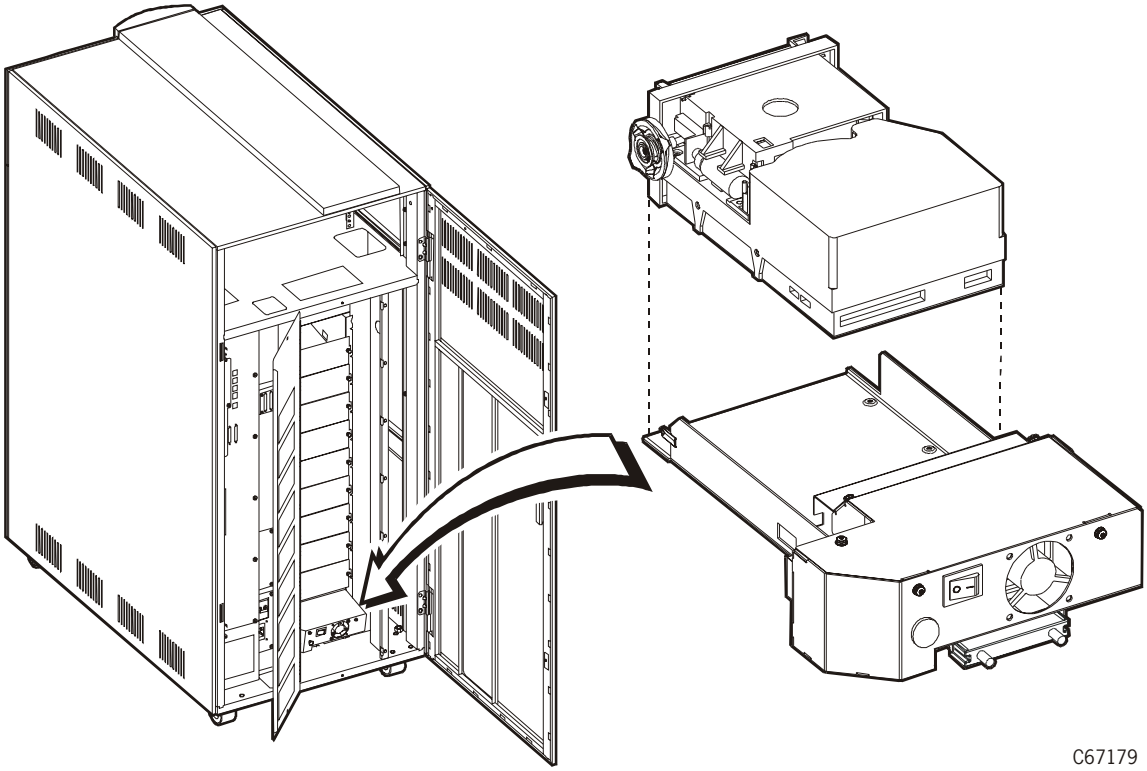
DLT Tape Drive

The drive is behind the drive access door. The drive access door is behind the library rear door.

Use Figure 4-16 and the following procedure to replace the drive.

Note: See "Super DLT" on page 4-106 for instructions to remove and replace a Super DLT drive.

Figure 4-16. DLT Drive (C67179)



Drive Preparation

Observe these precautions before beginning:

1. If the drives are daisy-chained, stop all data processing in the channel before disconnecting them.
2. Make sure there is no activity on the SCSI bus before disconnecting the external SCSI cables. The client must be quiesced; do not disconnect a hot bus.
3. Make sure any third-party software is quiesced.
4. Make sure all signals are terminated at each end of the SCSI bus. Also, do not mix single-ended and differential terminators.

Removal

WARNING:
Electrocution hazard. **Do not touch any components on the power supply located within the electronics module or on the drive trays. Live voltage could be present even though the unit is powered off.**
Do not apply power to the drive tray assembly when it is not installed in the library.

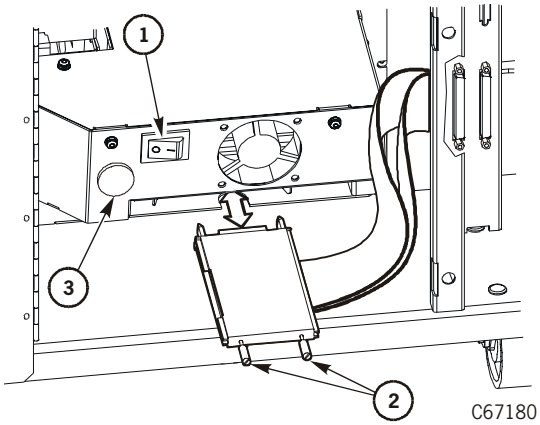
WARNUNG:
Stromschlaggefahr! **Berühren Sie auf keinen Fall die Bestandteile des Netzteils im Elektronikmodul oder an den Laufwerksschächten, da das Gerät auch nach dem Abschalten unter Spannung stehen kann.**
Schleißen Sie den Laufwerksschacht nicht an das Stromnetz an, solange er nicht im Bandarchiv installiert ist.

AVERTISSEMENT:
Danger d'électrocution**: Ne toucher aucun élément du bloc d'alimentation situé à l'intérieur du module électronique ou sur les porte-lecteurs. Ces éléments pourraient être sous tension, même lorsque l'appareil est hors tension.**
Ne remettez pas l'ensemble de porte-lecteurs sous tension s'il n'est pas installé dans la bibliothèque.

1. Review the information in "Before Beginning" on page 4-2 about tape drives.
2. Power off the drive by pressing the power switch.

CAUTION:
***Possible equipment damage:* Place the SCSI Y cable in an area where it will not interfere with the drive removal or replacement.**

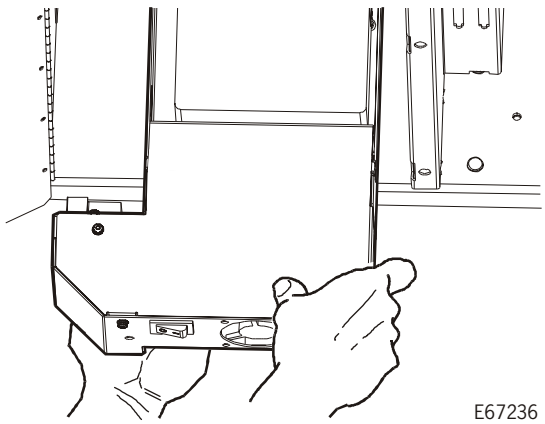
3. Carefully remove the SCSI Y cable from the rear of the drive by unscrewing the two SCSI cable screw locks.
4. Loosen the thumbscrew on the left side of the DLT drive.



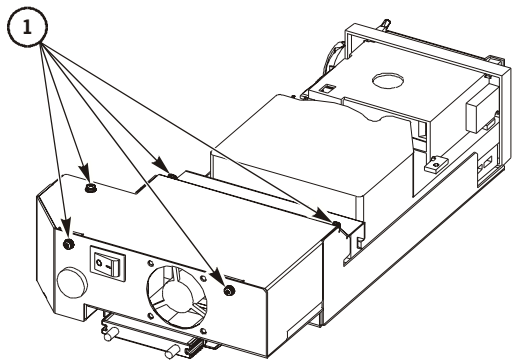
1. Power switch
2. Screw locks
3. Thumbscrew

CAUTION:
***Possible injury to person:* The DLT drive tray weighs 27 kg (12 lb). Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

5. Grip the rear of the drive and, while pulling it toward you, place your other hand under the drive tray for support.
6. Using both hands, remove the drive tray assembly from the slot, and place it on a flat, stable surface.



7. Use a T-15 Torx bit to remove the five mounting screws from the cover.
8. Lift off the cover.

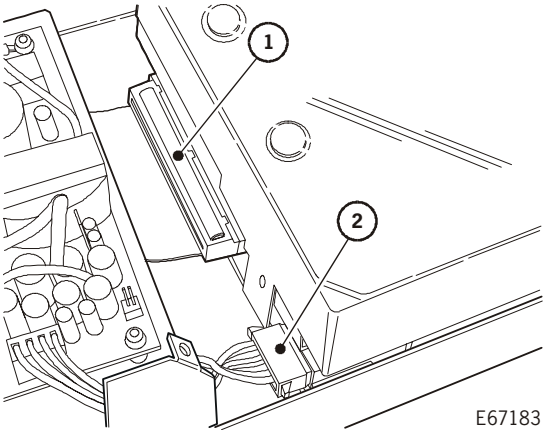


E67182

1. Cover screws

CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

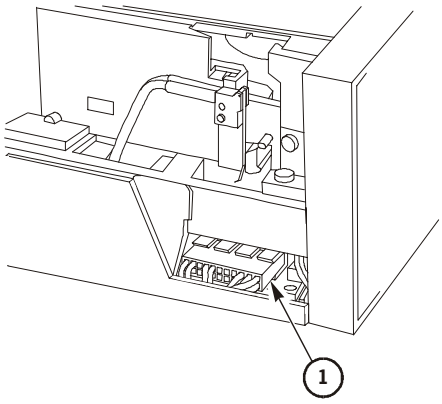
9. Remove the SCSI cable and the P2 connector from the drive.



E67183

1. P2 connector
2. SCSI cable

10. Remove the DRV connector from the drive.

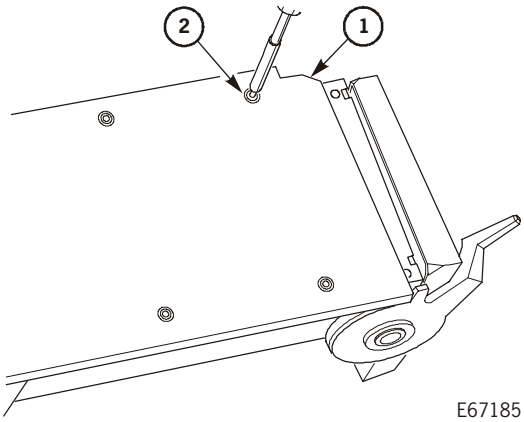


E67184

1. DRV connector

11. Turn the drive tray over to access the four screws on the bottom of the drive tray. Use a Torx T-10 bit to remove the four drive screws.

12. Lift and remove the drive tray.

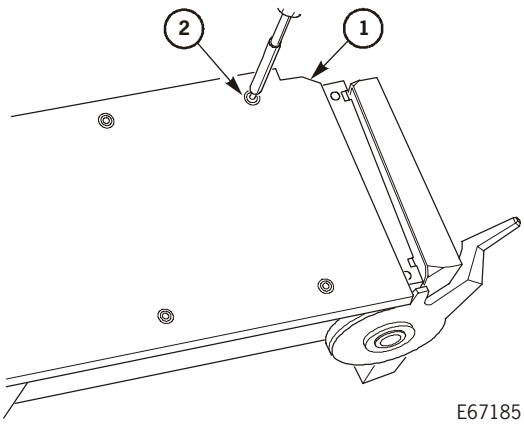


E67185

1. Drive tray
2. Screw (4)

Replacement

1. Set the drive on a work surface, making sure the DRV cable is away from the drive so that it does not get pinched.
2. Slide the drive tray over the drive so the SCSI and P2 cables do not get pinched.
3. Use a Torx T-10 bit to install the four screws on the bottom of the drive tray.

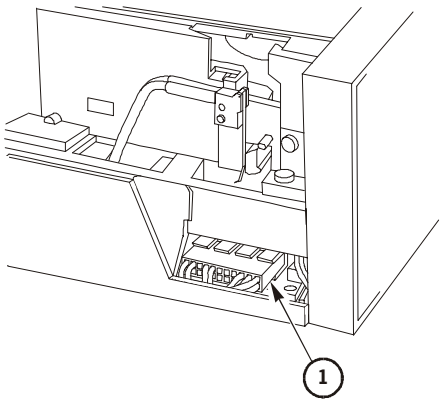


E67185

1. Drive tray
2. Screws (4)

CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

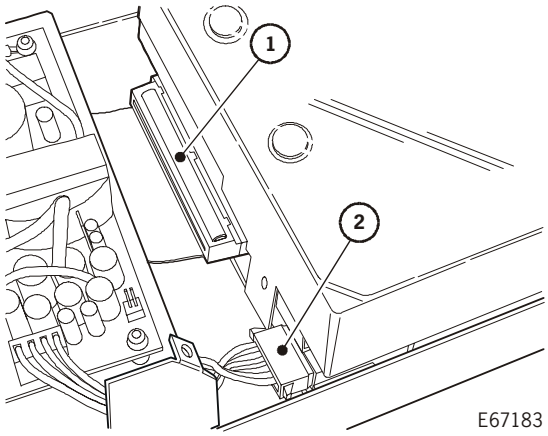
4. Turn the drive tray over and connect the DRV connector to the drive, threading the cable along the channel beside the drive.



E67184

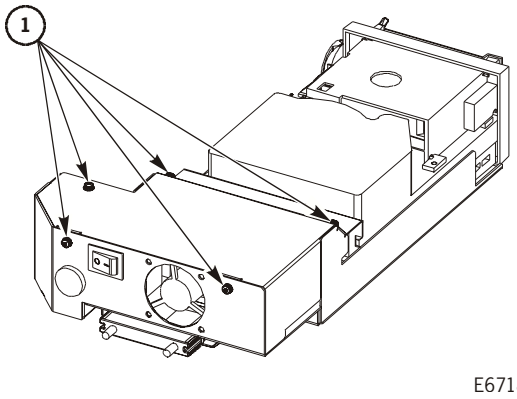
1. DRV connector

5. Connect the SCSI cable and the P2 connector to the drive.



1. P2 connector
2. SCSI cable

6. Use a Torx T-15 bit to install the five cover screws.



1. Cover screws

CAUTION:
***Possible equipment damage:* When sliding the drive into its slot, make sure the drive SCSI cable is out of the way. Do not force the drive into the slot.**

7. Slide the drive into its slot, being careful not to catch or crush any cables.
8. Tighten the thumbscrew on the left side of the DLT drive.
9. Use the two SCSI cable screw locks to install the SCSI drive cable to the rear of the drive.
10. Turn on the drive power by placing the switch to the ON (|) position.
11. Close the drive access door.
12. Push in and turn the snap rings.
13. Install the two screws.
14. Go to "Restoring Operation" on page 4-136.

Super DLT

WARNING:
Electrocution hazard. **Do not touch any components on the power supply located within the electronics module or on the drive trays. Live voltage could be present even though the unit is powered off.**
Do not apply power to the drive tray assembly when it is not installed in the library.

WARNUNG:
Stromschlaggefahr! **Berühren Sie auf keinen Fall die Bestandteile des Netzteils im Elektronikmodul oder an den Laufwerksschächten, da das Gerät auch nach dem Abschalten unter Spannung stehen kann.**
Schleißen Sie den Laufwerksschacht nicht an das Stromnetz an, solange er nicht im Bandarchiv installiert ist.

AVERTISSEMENT:
Danger d'électrocution: **Ne toucher aucun élément du bloc d'alimentation situé à l'intérieur du module électronique ou sur les porte-lecteurs. Ces éléments pourraient être sous tension, même lorsque l'appareil est hors tension.**

Ne remettez pas l'ensemble de porte-lecteurs sous tension s'il n'est pas installé dans la bibliothèque.

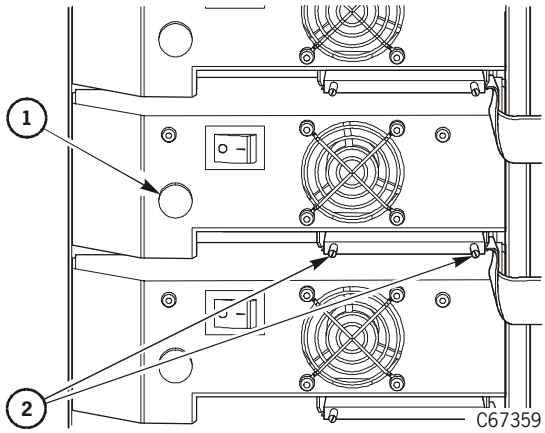
Observe these precautions before beginning:

1. If the drives are daisy-chained, stop all data processing in the channel before disconnecting them.
2. Make sure there is no activity on the SCSI bus before disconnecting the external SCSI cables. The host must be quiesced; do not disconnect a hot bus.
3. Make sure any third-party software is quiesced.
4. Make sure all signals are terminated at each end of the SCSI bus.

Note: Do not mix terminator types.

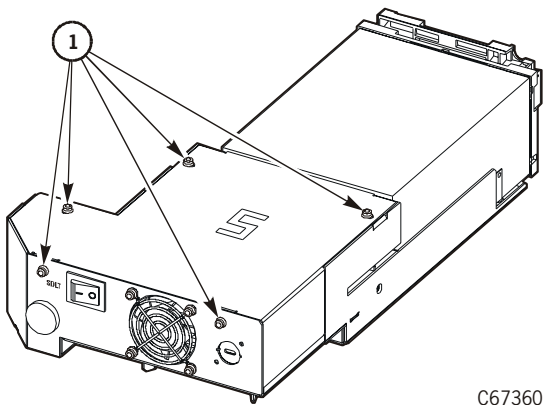
Removal

1. Review the information in "Before Beginning" on page 4-2 about tape drives.
2. Open the right side door of the tape library.
3. Turn off the power to the drive by placing the switch in the off (O) position.
4. Carefully remove the SCSI cable from the rear of the drive by unscrewing the two SCSI cable screw locks.
5. Loosen the thumbscrew on the left side of the drive.



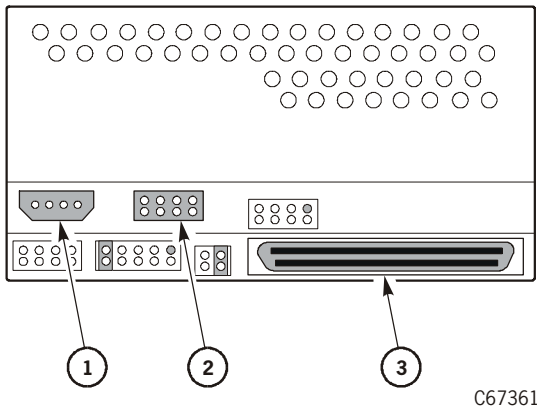
1. Thumbscrew
2. SCSI cable screw locks

6. Grip the rear of the drive and, while pulling it toward you, place your other hand under the drive tray for support.
7. Using both hands, remove the drive tray assembly from the slot, and place it on a flat, stable surface.
8. Using a Torx T-15 driver, remove the five power supply cover screws.



1. Power supply cover screws

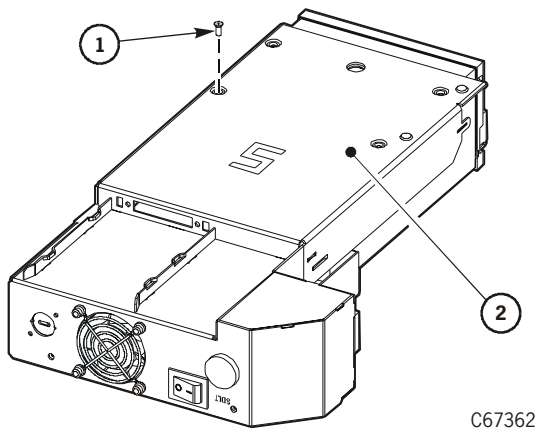
9. Remove the power connector, TTI cable, and SCSI cable from the drive.



1. Power connector
2. TTI cable
3. SCSI cable

10. Turn the drive tray over to access the four screws on the bottom of the drive tray. Using a Torx T-10 driver, remove the four drive screws.

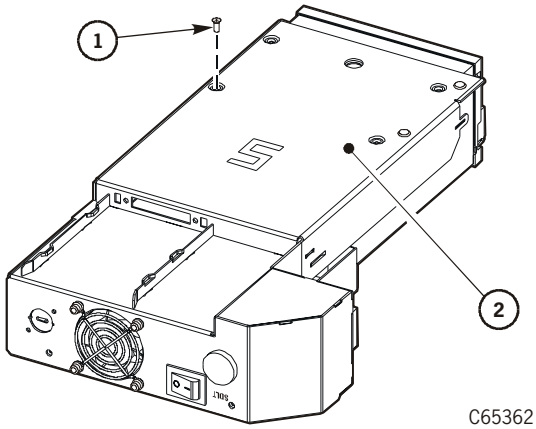
11. Lift and remove the drive tray.



1. Drive tray screw (4X)
2. Drive tray bottom

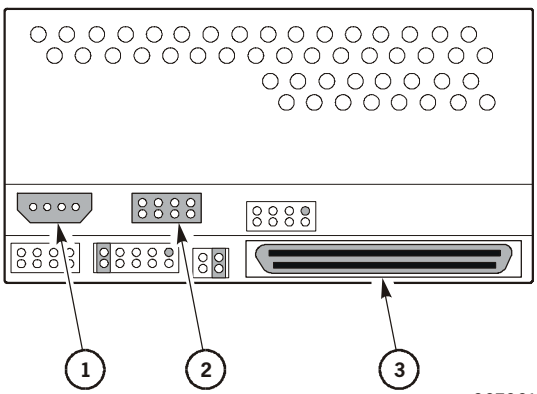
SDLT Replacement

1. Set the drive on a flat work surface
2. Slide the drive tray over the drive.
3. Using a Torx T-10 driver, attach the four screws on the bottom of the drive tray.



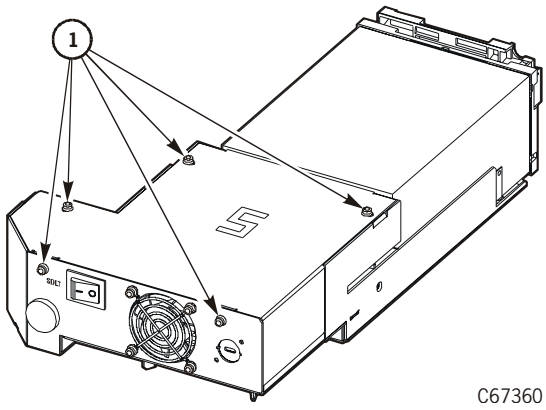
1. Drive tray screw (4X)

4. Attach the power connector, TTI cable, and SCSI cable to the drive.



1. Power connector
2. TTI cable
3. SCSI cable

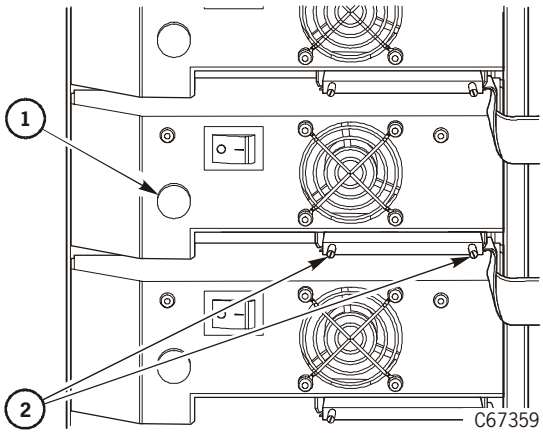
5. Using a Torx T-15 driver, attach the five power supply cover screws.



1. Power supply screws

CAUTION:
Possible equipment damage: **When sliding the tape drive into its slot, make sure the drive SCSI cable is out of the way. Do not force the drive into the slot.**

6. Slide the drive into its slot, being careful not to catch or crush any cables.
7. Tighten the thumbscrew on the left side of the drive.
8. Connect the SCSI cable screw locks to the SCSI connector on the rear of the drive.
9. Turn on the drive power by placing the switch to the on (|) position.
10. Close the right side door of the library.



1. Thumbscrew
2. SCSI cable screw locks

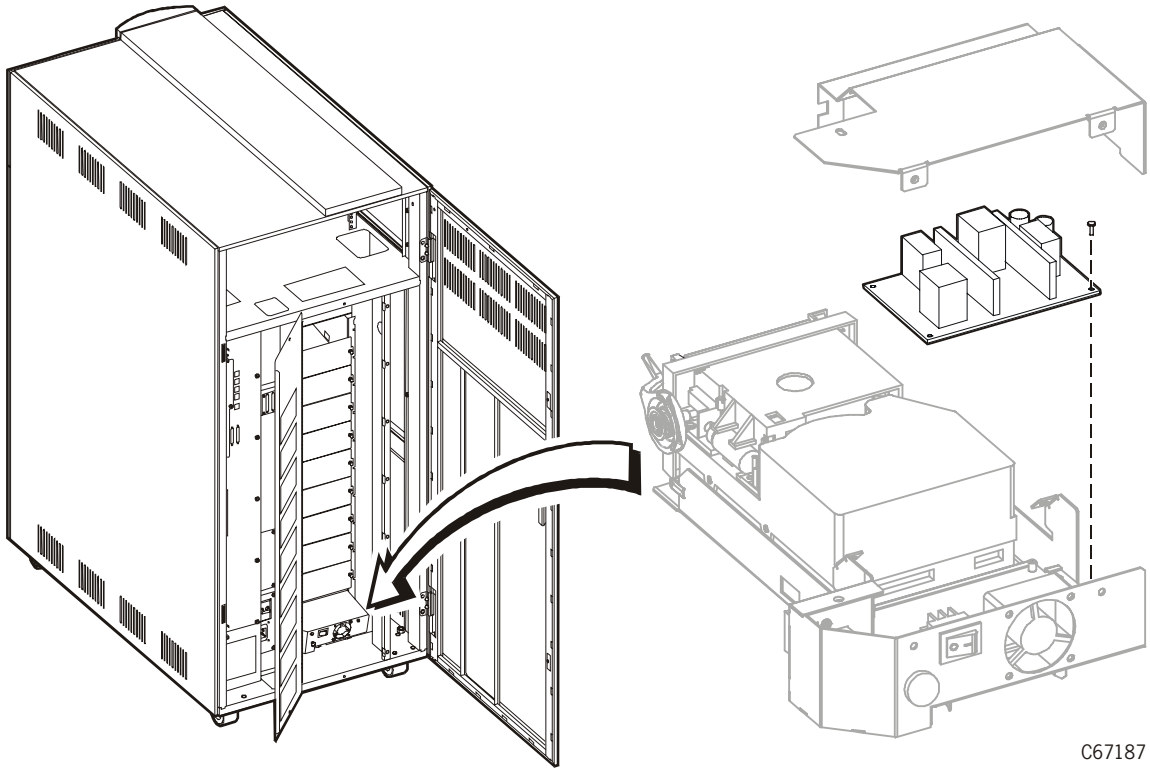
11. Return the system to operation. See "Restoring Operation" on page 4-136.

DLT Drive Power Supply

The power supply is inside the drive tray.

Use Figure 4-17 and the following procedure to replace the power supply.

Figure 4-17. DLT Power Supply (C67187)

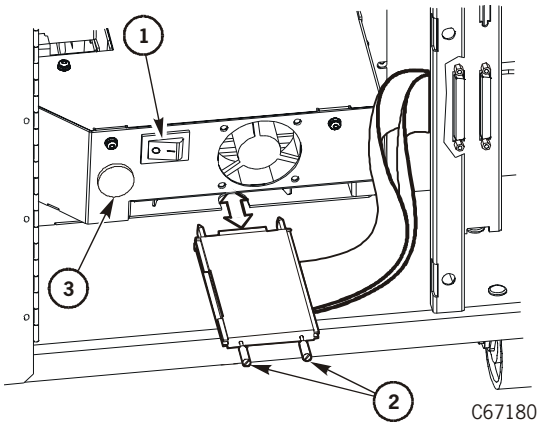


Removal

1. Review the information under "Before Beginning" on page 4-2 about tape drives.
2. Power off the drive by pressing the power switch.

CAUTION:
Possible equipment damage: **Place the SCSI Y cable in an area where it will not interfere with the drive removal or replacement.**

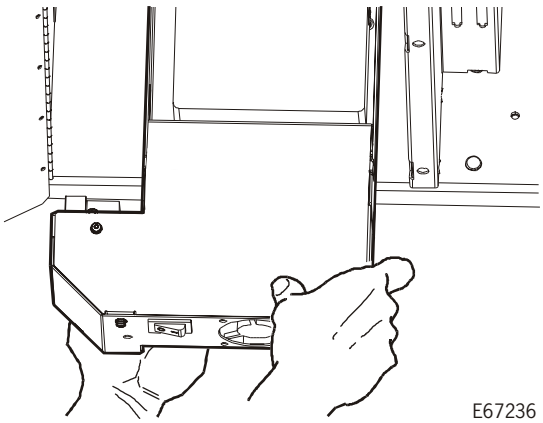
3. Carefully remove the SCSI Y cable from the rear of the drive by unscrewing the two SCSI cable screw locks.
4. Loosen the thumbscrew on the left side of the drive.



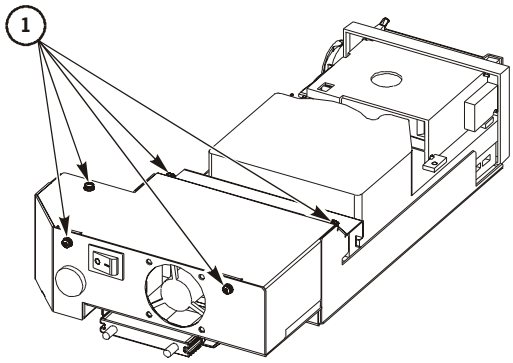
1. Power switch
2. Screw locks
3. Thumbscrew

CAUTION:
Possible injury to person: **A typical drive tray weighs 27 kg (12 lb). Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

5. Pull the drive tray out from the frame.



6. Use a T-15 Torx bit to remove the five mounting screws from the cover.
7. Lift off the cover.



1. Cover screws

E67182

WARNING:
Electrocution hazard: **Do not touch any components on the power supply located within the electronics module or on the drive trays. Live voltage could be present even though the unit is powered off. Do not apply power to the drive tray assembly when it is not installed in the library.**

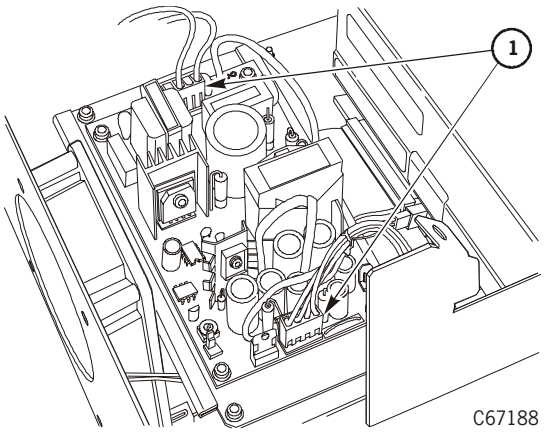
WARNUNG:
Stromschlaggefahr! **Berühren Sie auf keinen Fall die Bestandteile des Netzteils im Elektronikmodul oder an den Laufwerksschächten, da das Gerät auch nach dem Abschalten unter Spannung stehen kann. Schleißen Sie den Laufwerksschacht nicht an das Stromnetz an, solange er nicht im Bandarchiv installiert ist.**

AVERTISSEMENT:
Danger d'électrocution**: Ne toucher aucun élément du bloc d'alimentation situé à l'intérieur du module électronique ou sur les porte-lecteurs. Ces éléments pourraient être sous tension, même lorsque l'appareil est hors tension.**
Ne remettez pas l'ensemble de porte-lecteurs sous tension s'il n'est pas installé dans la bibliothèque.

CAUTION:
Burn hazard: **If the drive has been active, the power supply may be hot. Wait for the power supply to cool before touching it.**

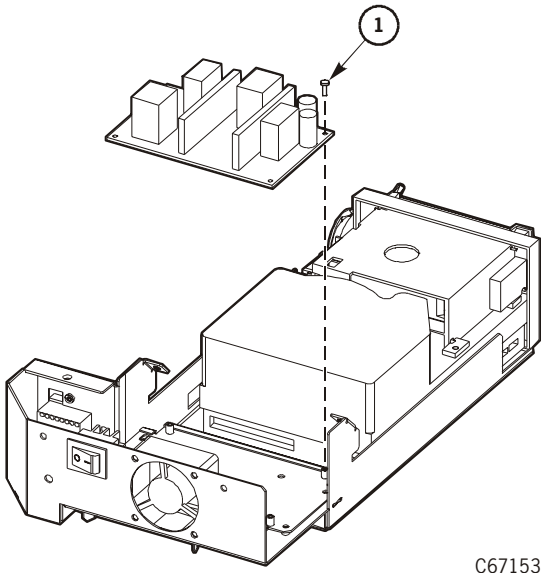
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

8. Disconnect the two power connectors from the power supply card.



1. Power connectors

9. Use a T-15 bit to remove the four screws that attach the power supply to the plate.
10. Lift the power supply off of the standoffs.

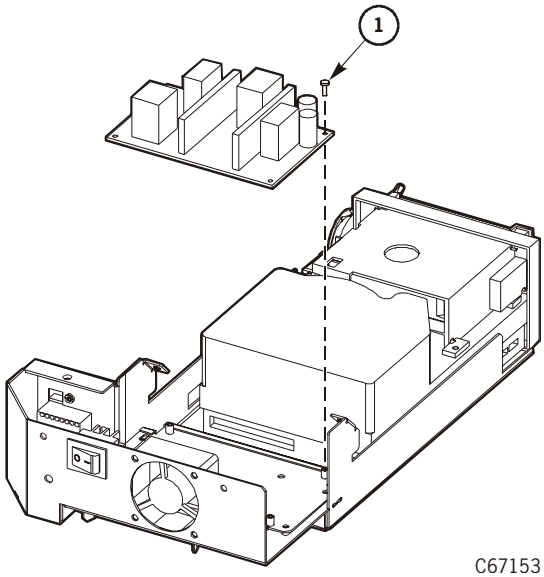


1. Screw (4)

Replacement

1. Place the power supply onto the standoffs, and install the four screws.
2. Make sure the green ground wire is placed under the appropriate screw.

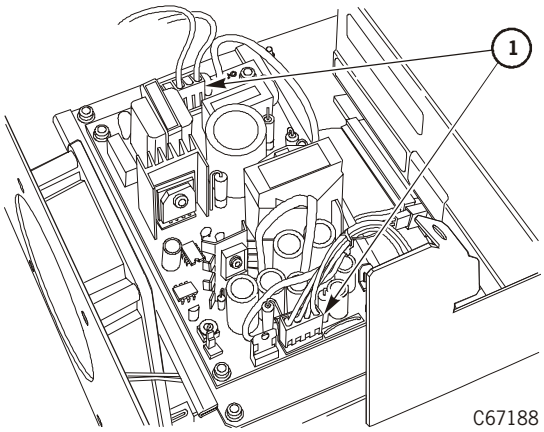
1. Screw (4)



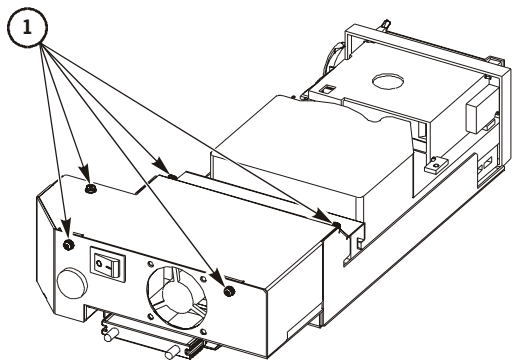
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

3. Connect the two power connectors to the power supply card.

1. Power connectors



4. Use a Torx T-15 bit to install the five cover screws.

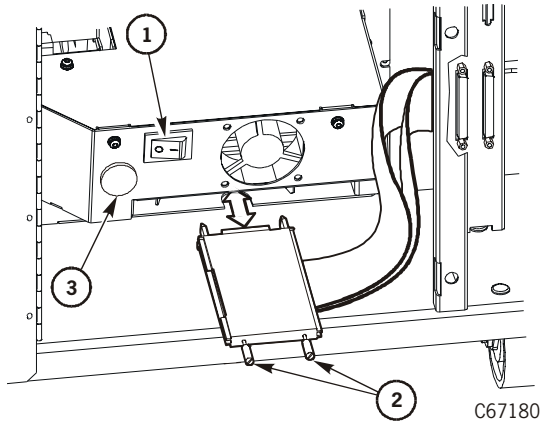


E67182

1. Cover screws

CAUTION:
***Possible equipment damage:* When sliding the drive into its slot, make sure the drive SCSI cable is out of the way. Do not force the drive into the slot.**

5. Slide the drive into its slot, being careful not to catch or crush any cables.
6. Tighten the thumbscrew on the left side of the DLT drive.
7. Connect the SCSI cable screw locks to the SCSI connector on the rear of the drive.
8. Power on the drive by pressing the power switch to the ON (|) position).



C67180

1. Power switch
2. Screw locks
3. Thumbscrew

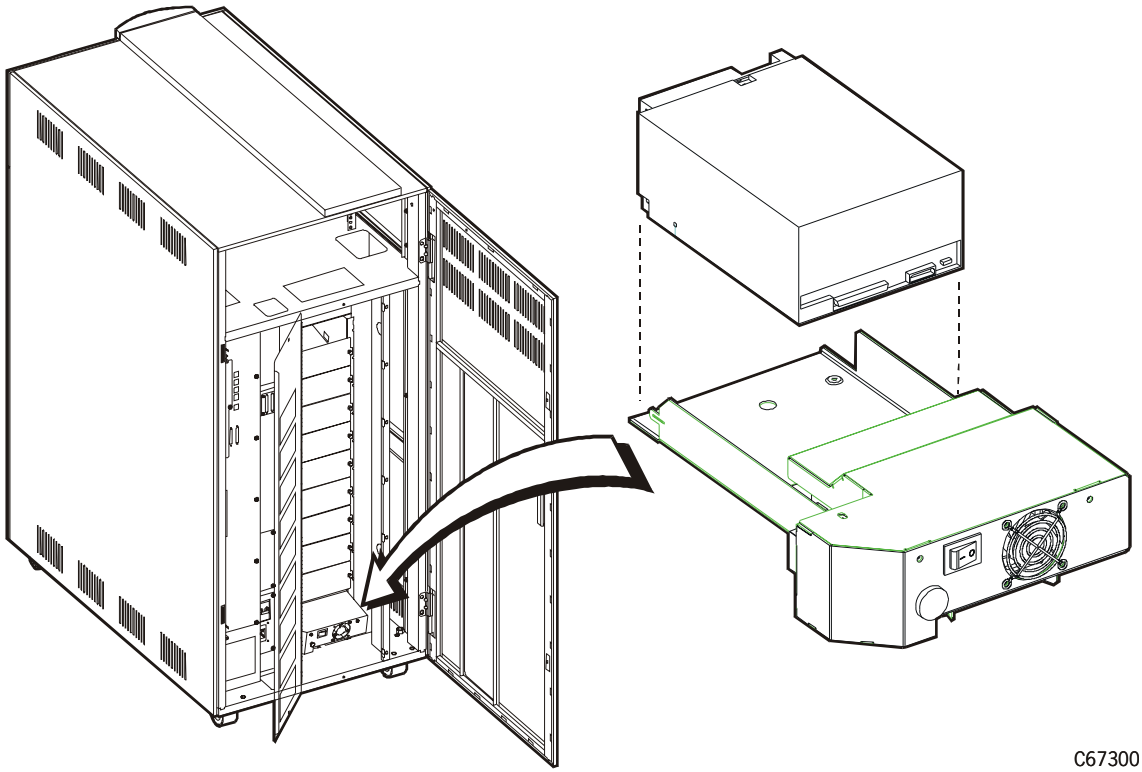
9. Close the drive access door.
10. Push in and turn the snap rings.
11. Install the two screws.
12. Go to "Restoring Operation" on page 4-136.

IBM Ultrium Tape Drive

The tape drive is behind the drive access door. The drive access door is behind the library rear door.

Use Figure 4-18 and the following procedure to replace the drive.

Figure 4-18. IBM Ultrium Drive (C67300)



Drive Preparation

Observe these precautions before beginning:

1. If the drives are daisy-chained, stop all data processing in the channel before disconnecting them.
2. Make sure there is no activity on the SCSI bus before disconnecting the external SCSI cables, do not disconnect an active (hot) bus.
3. Make sure any third-party software is quiesced.
4. Make sure all signals are terminated at each end of the SCSI bus.
5. Do not mix single-ended and differential terminators.

Removal

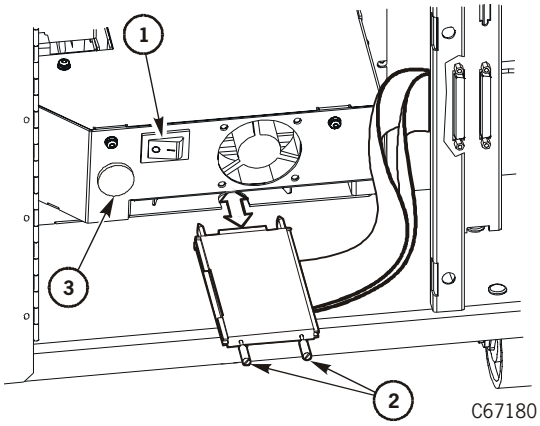
WARNING:
Electrocution hazard. **Do not touch any components on the power supply located within the electronics module or on the drive trays. Live voltage could be present even though the unit is powered off.**
Do not apply power to the drive tray assembly when it is not installed in the library.

WARNUNG:
Stromschlaggefahr! **Berühren Sie auf keinen Fall die Bestandteile des Netzteils im Elektronikmodul oder an den Laufwerksschächten, da das Gerät auch nach dem Abschalten unter Spannung stehen kann.**
Schleißen Sie den Laufwerksschacht nicht an das Stromnetz an, solange er nicht im Bandarchiv installiert ist.

AVERTISSEMENT:
Danger d'électrocution**: Ne toucher aucun élément du bloc d'alimentation situé à l'intérieur du module électronique ou sur les porte-lecteurs. Ces éléments pourraient être sous tension, même lorsque l'appareil est hors tension.**
Ne remettez pas l'ensemble de porte-lecteurs sous tension s'il n'est pas installé dans la bibliothèque.

---

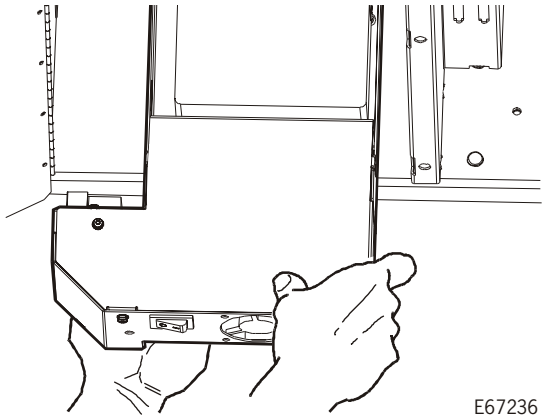
1. Review the information in "Before Beginning" on page 4-2 about tape drives.
2. Power off the drive by pressing the power switch.
3. Disconnect the interface cable (Fibre Channel or SCSI Y cable) from the rear of the drive.
4. Loosen the thumbscrew on the left side of the IBM Ultrium drive.



1. Power switch
2. Screw locks for the SCSI Y cable
3. Thumbscrew

CAUTION:
Possible injury to person: **The IBM Ultrium drive tray assembly weighs 5.8 kg (12.8 lb). Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

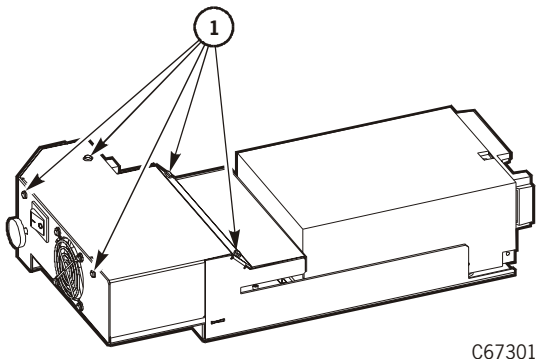
5. Grip the rear of the drive and, while pulling it toward you, place your other hand under the drive tray for support.
6. Using both hands, remove the drive tray assembly from the slot, and place it on a flat, stable surface.


E67236

7. Use a T-15 Torx bit to remove the five mounting screws from the cover.
8. Lift off the cover.

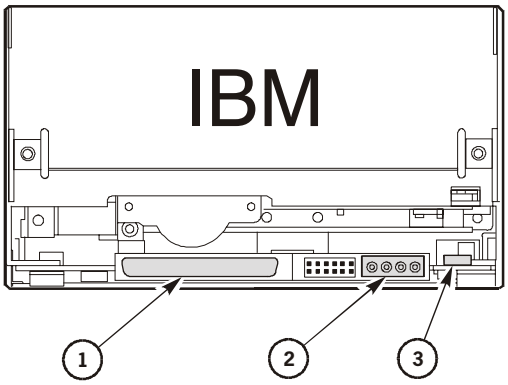
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

1. Cover screws



C67301

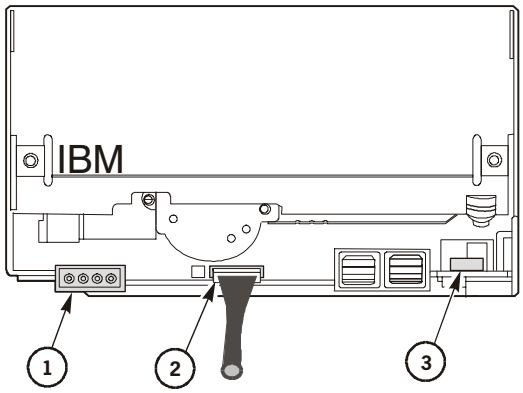
9. Remove the interface cable, TTI cable, and the power cable from the drive.



C67302

SCSI Interface

1. SCSI cable connection
2. Power cable connection
3. TTI cable connection



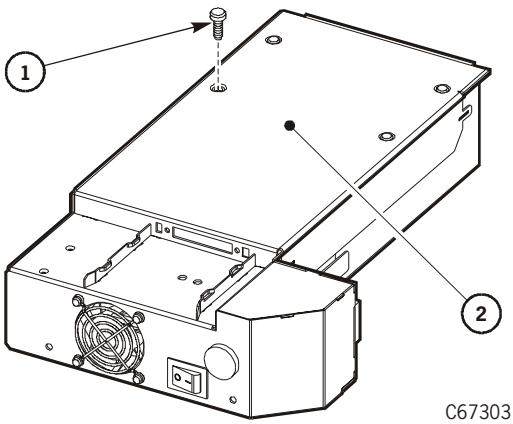
C67363

Fibre Channel Interface

1. Power
2. Fibre Channel terminator
3. TTI cable connection

10. Turn the drive tray over to access the four screws on the bottom of the drive tray. Use a Torx T-10 bit to remove the four drive screws.

11. Lift and remove the drive tray.

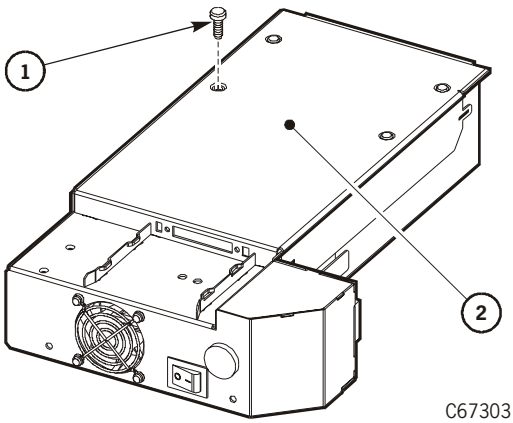


C67303

1. Screw (4)
2. Drive tray

Replacement

1. Set the drive on a work surface, making sure the cables away from the drive so that they does not get pinched.
2. Slide the drive tray over the drive so that the cables do not get pinched.
3. Ensure that the DIPs on the bottom of the new IBM Ultrium drive are set to SCSI address 15h. (Refer to the drive's documentation.)
4. Use a Torx T-10 bit to install the four screws on the bottom of the drive tray.

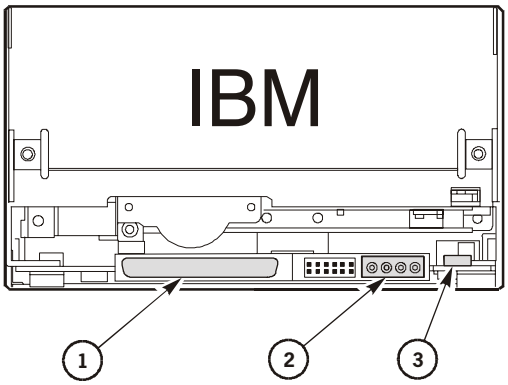


1. Screws (4)
2. Drive tray

CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

5. Reconnect the interface cable, TTI cable, and the power cable to the drive.

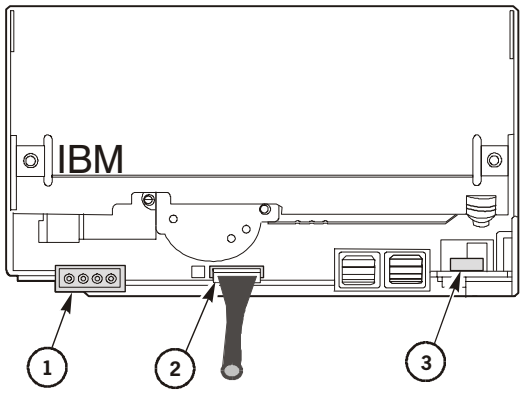
Note: If the drive has a SCSI interface, ensure that the jumper that enables TERMPWR for the drive is in place if the removed drive had the jumper. The pins and jumper are next to the power cable connection on the rear of the drive.



C67302

SCSI Interface

1. SCSI cable connection
2. Power cable connection
3. TTI cable connection

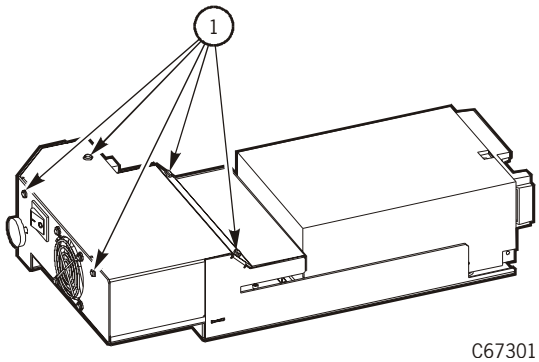


C67363

Fibre Channel Interface

1. Power
2. Fibre Channel terminator
3. TTI cable connection

6. Use a Torx T-15 bit to install the five cover screws.



C67301

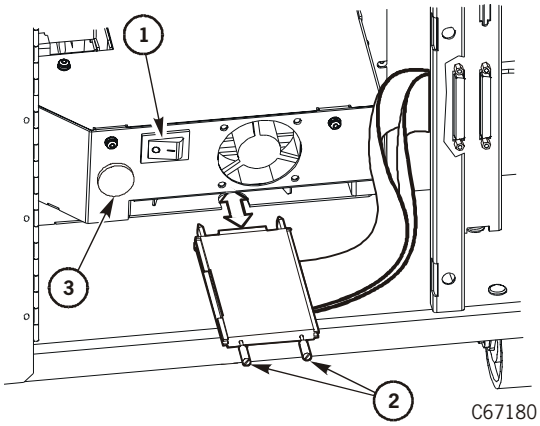
1. Cover screws

CAUTION:
Possible equipment damage: **When sliding the drive into its slot, make sure the drive SCSI cable is out of the way. Do not force the drive into the slot.**

7. Slide the drive into its slot, being careful not to catch or crush any cables.
8. Tighten the thumbscrew on the left side of the IBM Ultrium drive.
9. Reconnect the interface cable (Fibre Channel or SCSI Y cable) to the rear of the drive.

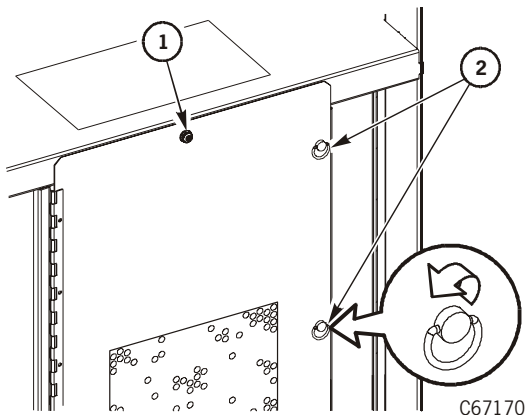
CAUTION:
Possible equipment damage: **Make sure the clip is on the Fibre Channel cable to avoid damage when you close the drive access door.**

10. Turn on the drive power by placing the switch to the ON (|) position.



1. Power switch
2. Screw locks
3. Thumbscrew

11. Close the drive access door (be careful not to break the Fibre Channel interface cable).
12. Push in and turn the snap rings and install the two screws.



1. Screw (2)
2. Snap rings (7)

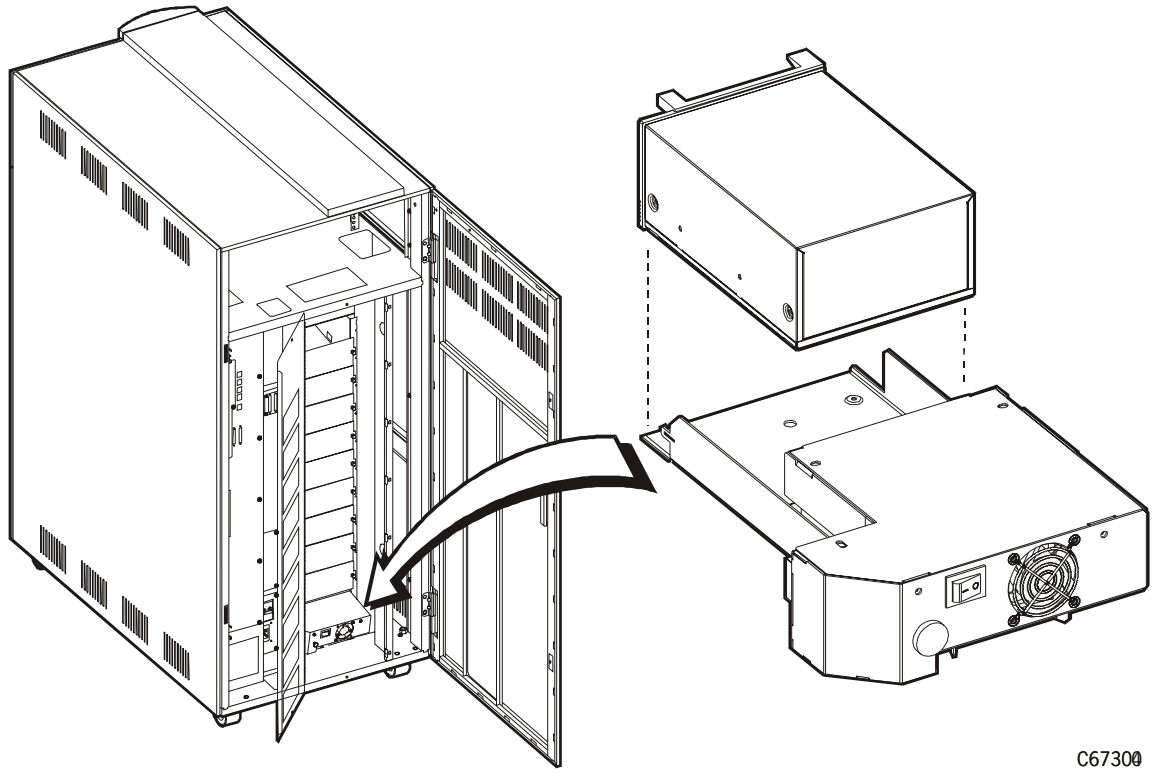
13. Go to "Restoring Operation" on page 4-136.

HP Ultrium Tape Drive

The tape drive is behind the drive access door. The drive access door is behind the library rear door.

Use Figure 4-19 and the following procedure to replace the drive.

Figure 4-19. HP Ultrium Drive (C67304)



Drive Preparation

Observe these precautions before beginning:

1. If the drives are daisy-chained, stop all data processing in the channel before disconnecting them.
2. Make sure there is no activity on the SCSI bus before disconnecting the external SCSI cables, do not disconnect an active (hot) bus.
3. Make sure any third-party software is quiesced.
4. Make sure all signals are terminated at each end of the SCSI bus.
5. Do not mix single-ended and differential terminators.

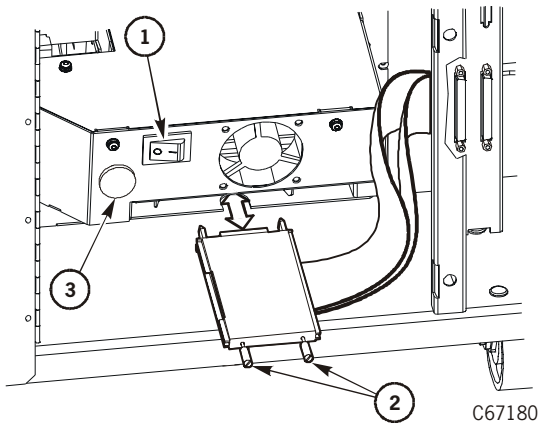
Removal

WARNING:
Electrocution hazard. **Do not touch any components on the power supply located within the electronics module or on the drive trays. Live voltage could be present even though the unit is powered off.**
Do not apply power to the drive tray assembly when it is not installed in the library.

WARNUNG:
Stromschlaggefahr! **Berühren Sie auf keinen Fall die Bestandteile des Netzteils im Elektronikmodul oder an den Laufwerksschächten, da das Gerät auch nach dem Abschalten unter Spannung stehen kann.**
Schleißen Sie den Laufwerksschacht nicht an das Stromnetz an, solange er nicht im Bandarchiv installiert ist.

AVERTISSEMENT:
Danger d'électrocution**: Ne toucher aucun élément du bloc d'alimentation situé à l'intérieur du module électronique ou sur les porte-lecteurs. Ces éléments pourraient être sous tension, même lorsque l'appareil est hors tension.**
Ne remettez pas l'ensemble de porte-lecteurs sous tension s'il n'est pas installé dans la bibliothèque.

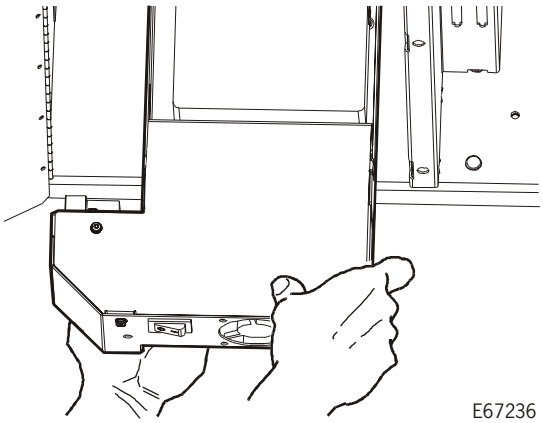
1. Review the information in "Before Beginning" on page 4-2 about tape drives.
2. Power off the drive by pressing the power switch.
3. Carefully remove the SCSI Y cable from the rear of the drive by unscrewing the two SCSI cable screw locks.
4. Loosen the thumbscrew on the left side of the HP Ultrium drive tray.



1. Power switch
2. Screw locks
3. Thumbscrew

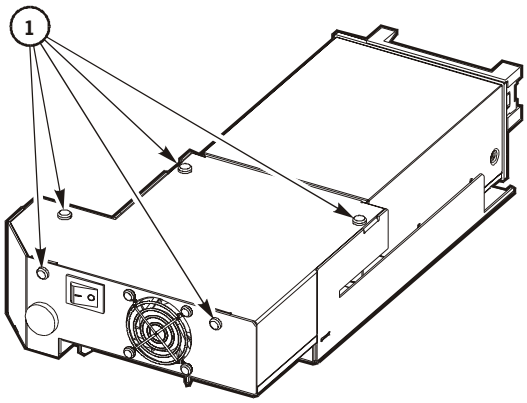
CAUTION:
Possible injury to person: **The HP Ultrium drive tray assembly weighs 5.0 kg (11 lb). Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

5. Grip the rear of the drive and, while pulling it toward you, place your other hand under the drive tray for support.
6. Using both hands, remove the drive tray assembly from the slot, and place it on a flat, stable surface.



E67236

7. Use a T-15 Torx bit to remove the five mounting screws from the cover.
8. Lift off the cover.



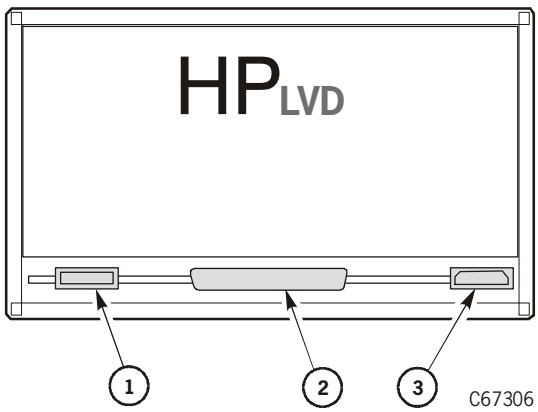
C67305

1. Cover screws

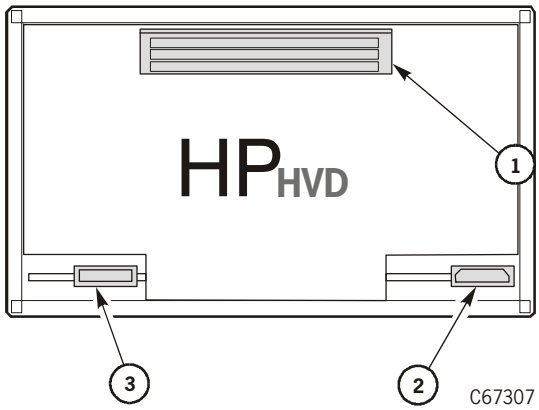
CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

9. Remove the SCSI cable, TTI cable, and the power cable from the drive. If the drive is an HVD drive, also remove the power cable from the converter card.

   - On LVD versions, the SCSI cable connects directly to the drive.
   - On HVD versions, the SCSI cable connects to the LVD-to-HVD converter.



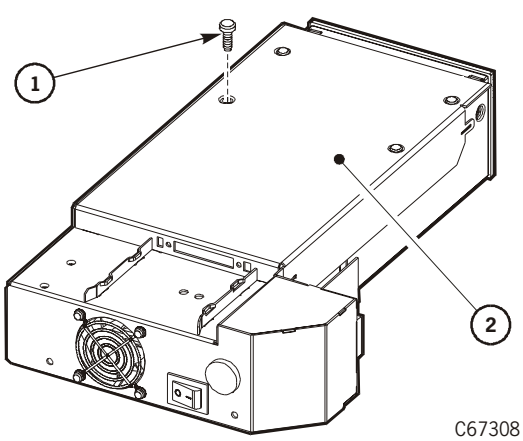
1. TTI cable connection
2. SCSI cable connection
3. Power cable connection



1. SCSI cable connection
2. Power cable connection
3. TTI cable connection

10. Turn the drive tray over and remove the four drive screws using a Torx T-10 bit.

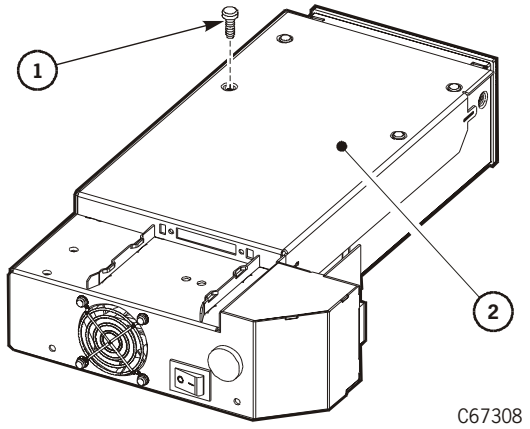
11. Lift and remove the drive tray.



1. Screw (4)
2. Drive tray

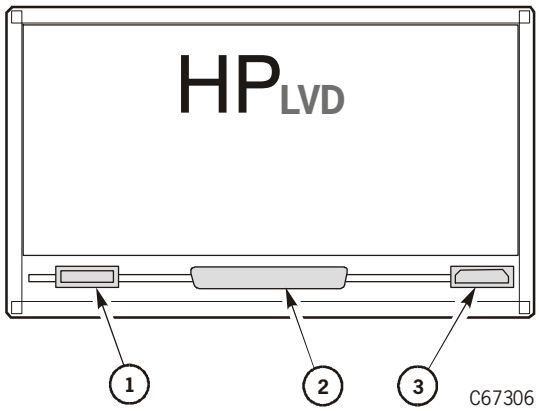
Replacement

1. Set the drive on a work surface, making sure the cables away from the drive so that they do not get pinched.
2. Use a Torx T-10 bit to install the four screws on the bottom of the drive tray.

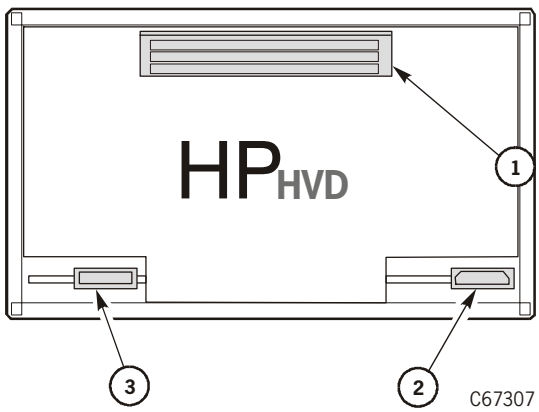


1. Screw (4)
2. Drive tray

3. Connect the SCSI cable, TTI cable, and the power cable to the drive. If the drive is an HVD drive, also remove the power cable from the converter card.

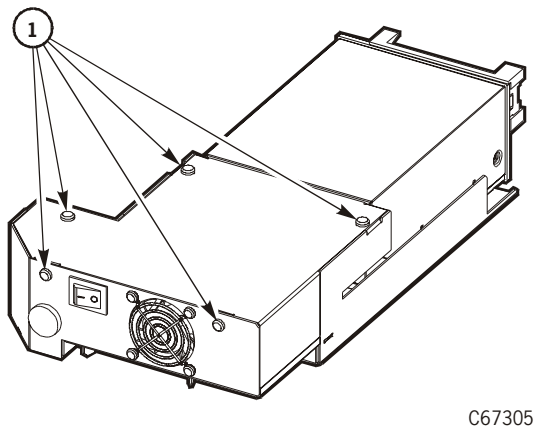


1. SCSI cable connection
2. Power cable connection
3. TTI cable connection



1. SCSI cable connection
2. Power cable connection
3. TTI cable connection

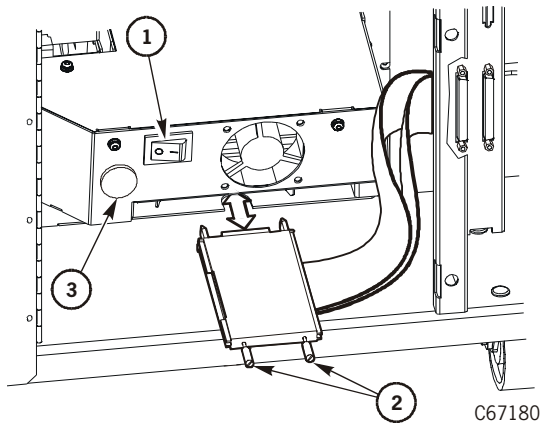
4. Use a Torx T-15 bit to install the five cover screws.



1. Cover screws

CAUTION:
Possible equipment damage: **When sliding the drive into its slot, make sure the drive SCSI cable is out of the way. Do not force the drive into the slot.**

5. Slide the drive into its slot, being careful not to catch or crush any cables.
6. Tighten the thumbscrew on the left side of the HP Ultrium drive tray.
7. Use the two SCSI cable screw locks to install the SCSI drive cable to the rear of the drive.
8. Turn on the drive power by placing the switch to the ON (|) position.



1. Power switch
2. Screw locks
3. Thumbscrew

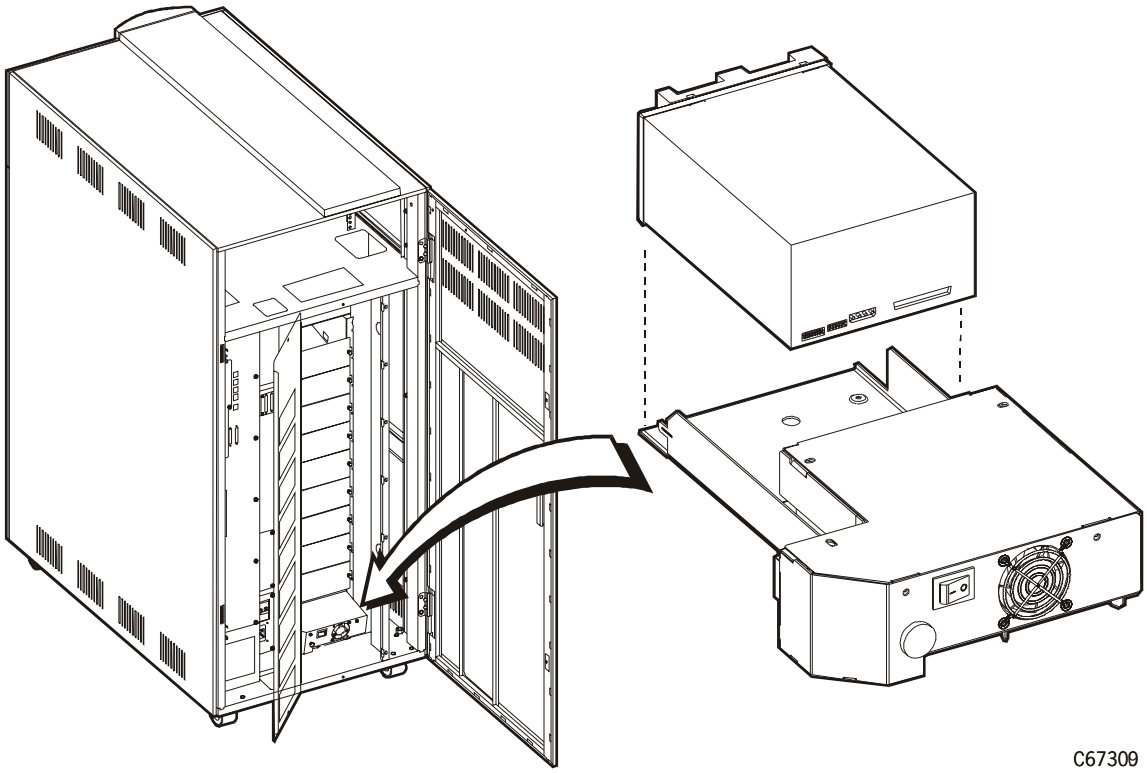
9. Close the drive access door.
10. Push in and turn the snap rings.
11. Install the two screws.
12. Go to "Restoring Operation" on page 4-136.

Seagate Ultrium Tape Drive

The tape drive is behind the drive access door. The drive access door is behind the library rear door.

Use Figure 4-20 and the following procedure to replace the drive.

Figure 4-20. Seagate Ultrium Drive (C67309)



Drive Preparation

Observe these precautions before beginning:

1. If the drives are daisy-chained, stop all data processing in the channel before disconnecting them.
2. Make sure there is no activity on the SCSI bus before disconnecting the external SCSI cables, do not disconnect an active (hot) bus.
3. Make sure any third-party software is quiesced.
4. Make sure all signals are terminated at each end of the SCSI bus.
5. Do not mix single-ended and differential terminators.

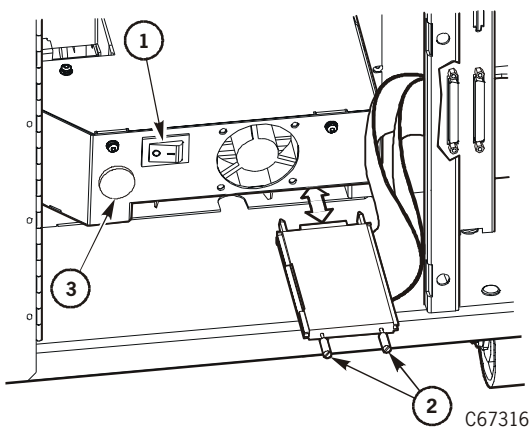
Removal

WARNING:
Electrocution hazard. **Do not touch any components on the power supply located within the electronics module or on the drive trays. Live voltage could be present even though the unit is powered off.**
Do not apply power to the drive tray assembly when it is not installed in the library.

WARNUNG:
Stromschlaggefahr! **Berühren Sie auf keinen Fall die Bestandteile des Netzteils im Elektronikmodul oder an den Laufwerksschächten, da das Gerät auch nach dem Abschalten unter Spannung stehen kann.**
Schleißen Sie den Laufwerksschacht nicht an das Stromnetz an, solange er nicht im Bandarchiv installiert ist.

AVERTISSEMENT:
Danger d'électrocution**: Ne toucher aucun élément du bloc d'alimentation situé à l'intérieur du module électronique ou sur les porte-lecteurs. Ces éléments pourraient être sous tension, même lorsque l'appareil est hors tension.**
Ne remettez pas l'ensemble de porte-lecteurs sous tension s'il n'est pas installé dans la bibliothèque.

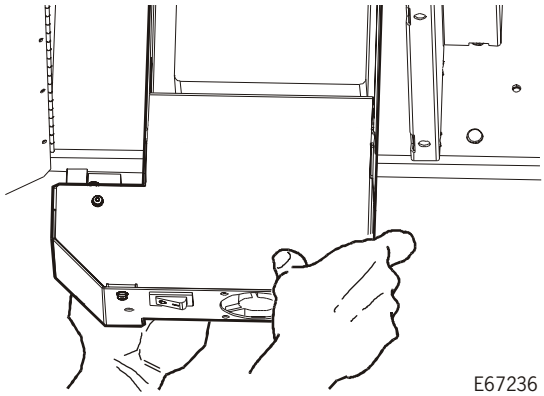
1. Review the information in "Before Beginning" on page 4-2 about tape drives.
2. Power off the drive by pressing the power switch.
3. Carefully remove the SCSI Y cable from the rear of the drive by unscrewing the two SCSI cable screw locks.
4. Loosen the thumbscrew on the left side of the Seagate Ultrium drive tray.



1. Power switch
2. Screw locks
3. Thumbscrew

CAUTION:
Possible injury to person: **The Seagate Ultrium drive tray assembly weighs 5.5 kg (12 lb). Use the proper lifting techniques described in "Lifting Techniques" on page xxii.**

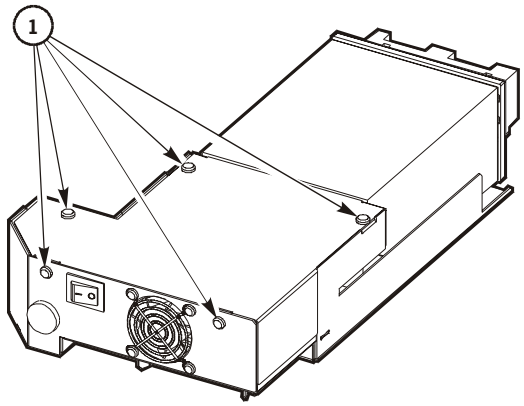
5. Grip the rear of the drive and, while pulling it toward you, place your other hand under the drive tray for support.
6. Using both hands, remove the drive tray assembly from the slot, and place it on a flat, stable surface.



E67236

7. Use a T-15 Torx bit to remove the five mounting screws from the cover.
8. Lift off the cover.

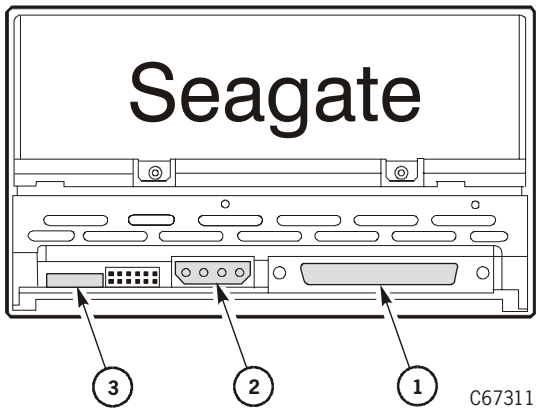
1. Cover screws



C67310

CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

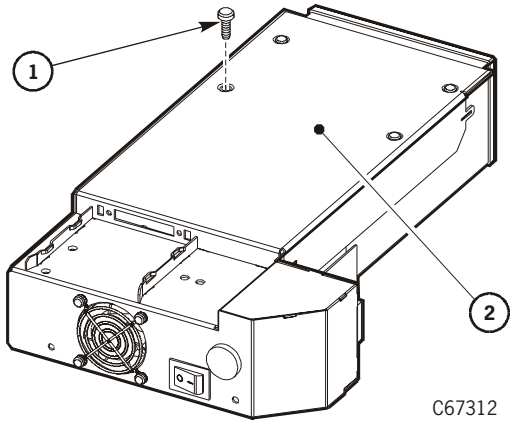
9. Remove the SCSI cable, TTI cable, and the power cable from the drive.



1. SCSI cable
2. Power cable
3. TTI cable

10. Turn the drive tray over to access the four screws on the bottom of the drive tray. Use a Torx T-10 bit to remove the four drive screws.

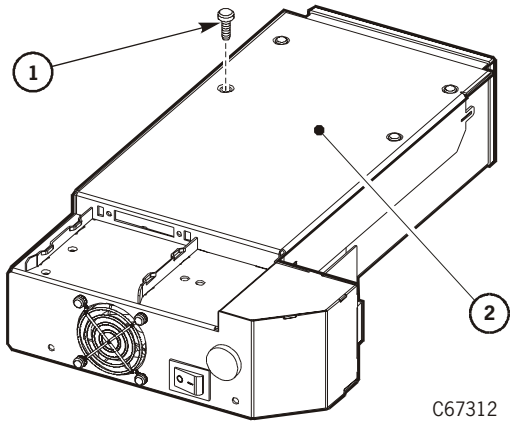
11. Lift and remove the drive tray.



1. Screw (4)
2. Drive tray)

Replacement

1. Set the drive on a work surface, making sure the cables away from the drive so that they does not get pinched.
2. Slide the drive tray over the drive so that the cables do not get pinched.
3. Use a Torx T-10 bit to install the four screws on the bottom of the drive tray.

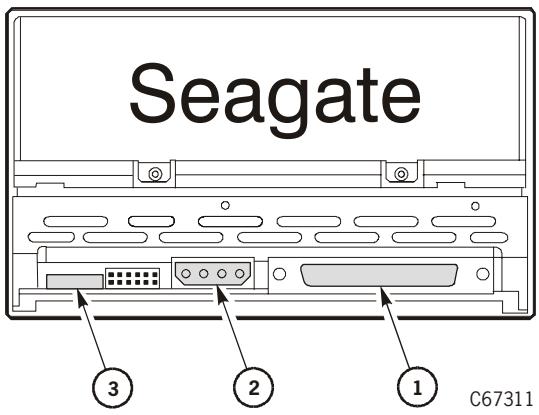


1. Screw (4)
2. Drive tray

CAUTION:
Possible ESD damage: **Follow the ESD precautions outlined in "Electrostatic Discharge Damage Prevention" on page xxiii.**

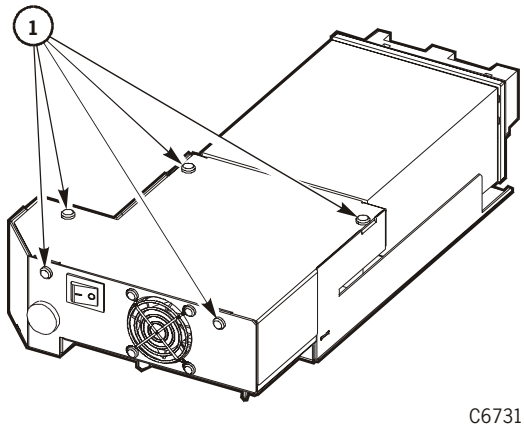
4. Connect the SCSI cable, TTI cable, and the power cable to the drive.

Note: Ensure that the jumper that enables TERMPWR for the drive is in place. The pins and jumper are next to the power cable connection on the rear of the drive. Refer to the *L180 Tape Library Installation Manual,* PN 95896, for details. (You do not have to be concerned about the jumpers that set the SCSI address. Those settings will be ignored.)



1. SCSI cable connection
2. Power cable connection
3. TTI cable connection

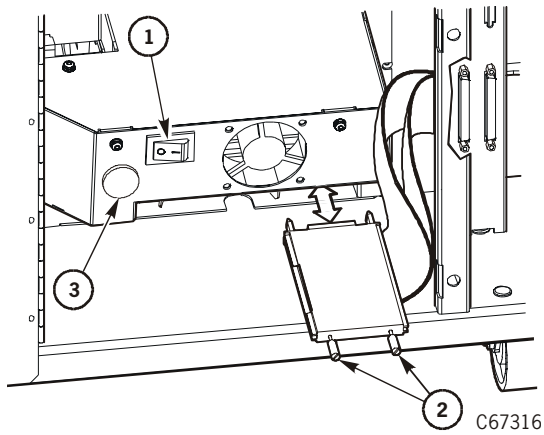
5. Use a Torx T-15 bit to install the five cover screws.



1. Cover screws

CAUTION:
Possible equipment damage: **When sliding the drive into its slot, make sure the drive SCSI cable is out of the way. Do not force the drive into the slot.**

6. Slide the drive into its slot, being careful not to catch or crush any cables.
7. Tighten the thumbscrew on the left side of the Seagate Ultrium drive.
8. Use the two SCSI cable screw locks to install the SCSI drive cable to the rear of the drive.
9. Turn on the drive power by placing the switch to the ON (|) position.



1. Power switch
2. Screw locks
3. Thumbscrew

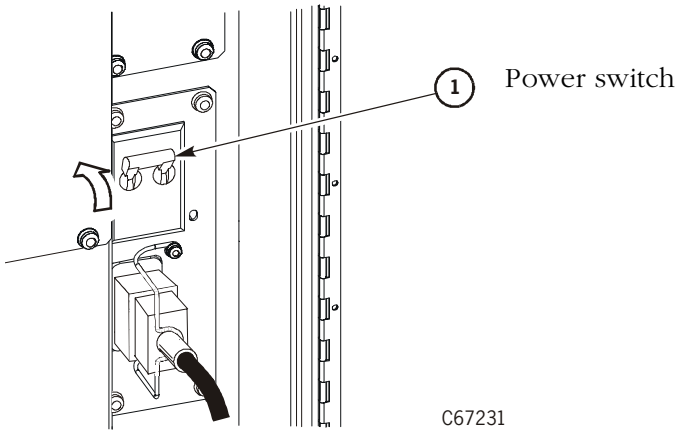
10. Close the drive access door.
11. Push in and turn the snap rings.
12. Install the two screws.
13. Go to "Restoring Operation" on page 4-136.

Restoring Operation

Perform the applicable steps to make sure the library is ready for operation:

Table 4-2. Checklist

❑	Make sure all cards are installed and properly seated.
❑	Make sure all cables are installed and connectors are tight.
❑	Make sure all cable strain reliefs are secure.
❑	Look in the library for any loose parts, connectors, or tools.
❑	Make sure the hand reach mechanism is fully retracted.
❑	Close and lock the doors.
❑	Re-apply power to the library.



❑	Run diagnostic tests. See "Diagnostic Tests" on page 3-19 for more information.
❑	Inform the customer that the library is ready for use.

Theory of Operation

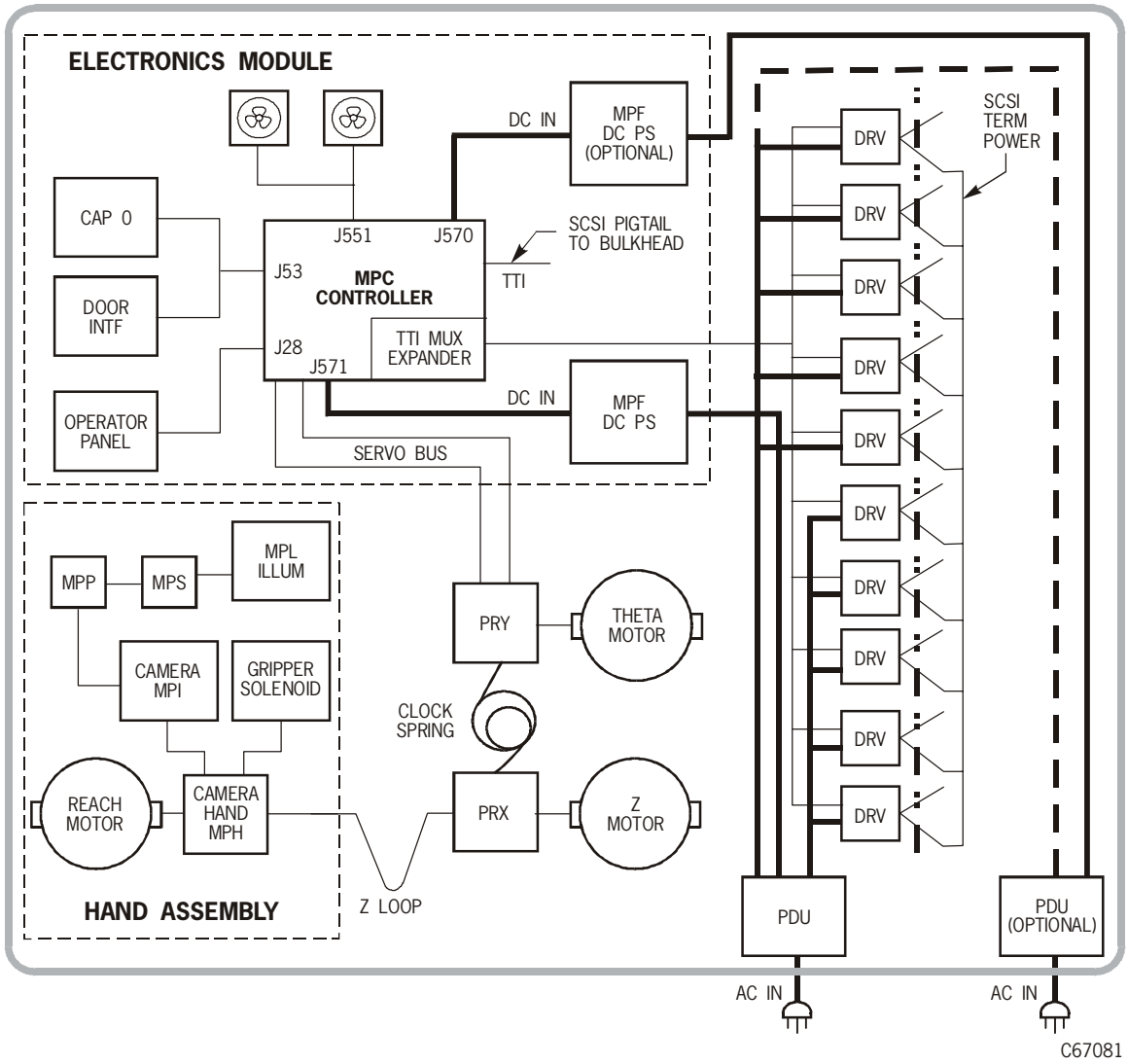
A

This appendix provides information about the components and operation of the L180 Tape Library.

Note: Refer to your drive publications for information about the tape drives.

Figure A-1 shows a block diagram of the L180 Tape Library:

Figure A-1. Library Block Diagram (C67081)



Power System

The tape library contains one standard AC power distribution unit (PDU) and one standard DC power supply.

Notes:

- The customer can order an optional AC PDU and an optional DC power supply for redundancy.
- The customer can also order an uninterruptible power supply as an optional feature for the library. See "Uninterruptible Power Supply" on page A-6 for more information.

The standard AC PDU, behind the rear door, distributes AC line voltage to the tape library and the tape drive column.

If the standard PDU fails and no optional PDU is installed, the library and all drives lose power. The MPC card posts an error to the FSC log.

If either PDU fails in a dual PDU configuration, and each PDU is cabled to half of the installed drives, the operating PDU supplies power to its half of the installed drives and to the library. The MPC card posts an error to the FSC log.

The MPC card contains a +5 V sense circuit that monitors the +5 VDC on the MPC card. If +5 VDC is out of established ranges, the MPC card sends a shut down request to the MPF card, and DC power is shut down. If an optional DC supply is present, it will automatically assume control of tape library power.

Table A-1 lists library DC power supply specifications.

Table A-1. DC Power Supply Specifications

Input voltage range Output voltage	100 to 254 VAC 43 VDC, ±15 VDC, and +5 VDC
Power consumption	120 W (library only)
Maximum heat output	410 Btu/hr (library only)

The tape library DC power supply (MPF card) converts AC input voltage from the AC PDU into:

- **+43 VDC** for library servo motors and reach motor on the hand
- **±15 VDC** power for the operational amplifiers on the MPC card
- **+5 VDC** for cards and CAP door motor

Power Specifications

Table A-2 lists library power specifications.

Table A-2. Library Power Specifications

Power cable	**U.S. and Canada:** 100 to 127 VAC UL/CSA power cable **International:** 200 to 240 VAC HAR power cable
Input voltage range	100 to 127 VAC / 200 to 240 VAC
Input current	Library: 1.0 A at 120 VAC (0.5 A at 240 VAC)
Power configuration (3 wire)	**U.S. and Canada:** Single-phase 100 to 127 VAC, 50/60 Hz, 15 A Service **International:** Single-phase 200 to 240 VAC, 50/60 Hz, 10 A Service
Power consumption	Library only: 120 W
Heat output	Library only: 410 Btu/hr (maximum)
Note: For information about the tape drives, see: • DLT 7000, DLT 8000, SDLT: Refer to the DLT manuals. • 9840: Refer to the 9840/T9840 manuals. • Ultrium: Refer to the specific manufacturer's manual.	

Power Cables

For each library, the customer must order the power cable and supply the correct receptacle.

Table A-3 on page A-4 lists the StorageTek part number for the cable and plug type as determined by:

- Input voltage (first column)
- Country (second column) where the library is to be installed
- Which type of drive is installed in the library (remaining columns)

Note: If the library configuration contains a mixture of drive types, the customer must order the part number listed in the far right column.

Table A-3. Library Power Cables

Input Voltage	Country	If the Library Contains...	
		Only 9840 Drives, Newer DLT Drives, Ultrium Drives, Mixture of Newer DLT, Ultrium and 9840 Drives	**Older DLT Drives (those with a non-PFC power supply)**
100 – 127 VAC 15 A	U.S./Canada	Nema 5–15P 10083634	Nema 5–15P 10083634
	Japan	JIS 8303 10083649	JIS 8303 10083649
200 – 240 VAC 10 or 15 A	Australia	AS 3112 10083650	Locking[1] IEC 60309 10083635
	Europe[2]	CEE 7/7 10083646	Locking IEC 60309 10083635
	Italy	CEI.23 10083651	Locking IEC 60309 10083635
	South Africa	BS 546 or BS 1363 10083655	Locking IEC 60309 10083635
	South Korea	KS 8305 10083656	Locking IEC 60309 10083635
	United Kingdom	BS 1363 10083653	Locking[1.] IEC 60309 10083635
	U.S./ Canada	NEMA 6–15 10083644	Locking IEC 60309 410573502 *or* NEMA L6–15P 10083645

Notes:

1. Use locking plugs for DLTs or DLTs mixed with 9840/T9840s.
2. Europe includes Germany, Norway, Sweden, Denmark, Finland, the Netherlands, Belgium, France, and Switzerland.

Power Considerations

In the library, some combinations of input voltage and current, drive type, and plug type limit the number of drives that can be installed. See the following paragraphs for details.

At 120 to 127 VAC

You may install the maximum number of drives in the library if the power source at the site is 120 to 127 VAC:

- 10 DLT drives (with or without Power Factor Correction [PFC])
- 10 LTO Ultrium drives
- Six 9840/T9840s and one DLT or one Ultrium drive

You may do so even if the library is connected to a single AC circuit.

At 200 to 240 VAC

Table A-4 on page A-5 lists the maximum number of drives that you may install in the library if it is connected to a single 220 VAC circuit.

Table A-4. Maximum Number of Drives on a Single 220 VAC Circuit

Factor	220 VAC[1]			
Current Capacity	10 or 15A (International)		15 A or 20 A	
Phase	Single Phase		Two Phase	
Power Cord Rating	10 or 15A (International)		15 A	
Plug Style	Non-locking	Locking[2]	Non-locking	Locking[2]
Maximum Number of Drives				
9840/T9840	6	6	6	6
Ultrium	10	10	10	10
DLT w/non-PFC	5	10	5	10
DLT w/PFC [3]	10	10	10	10

Notes:

1. Numbers in this table include library robotic requirements.
2. You must use a locking plug on the library when it contains a non-PFC DLT drive.
3. PFC power supplies have less leakage current and lower peak current demand on the AC input.

Uninterruptible Power Supply

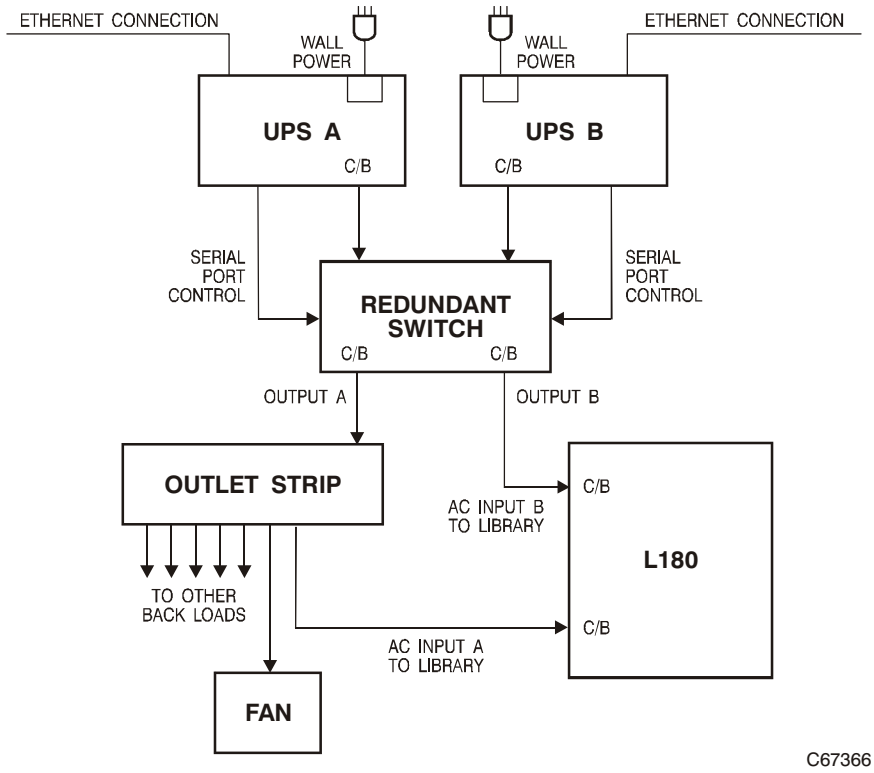
The uninterruptible power supply (UPS) is an optional feature designed to prevent blackouts, brownouts, sags and surges in AC power. This UPS also filters out small fluctuations and disturbances in AC line voltage.

The UPS comes with a power strip that allows you to connect up to eight additional components to the UPS. If power fails, the UPS will supply power to the equipment connected to the power strip until the batteries are exhausted. While running on battery power, periodic beeps will sound.

- Press the TEST/ALARM DISABLE button to turn off this alarm.
- A continuous beep will sound *two* minutes before the UPS will shutdown.

Figure A-2 shows the cable diagram for the UPS and the library:

Figure A-2. UPS Cable Diagram (C65293)



Notes:

- The UPS requires additional cooling if installed in the library. This cooling fan is also an optional feature for the library. See "Optional Cooling Fans" on page A-9 for more information.
- Refer to the *L180 and L700 Uninterruptible Power Supply Reference Manual* for more information.

Table A-5 lists the UPS specifications:

Table A-5. UPS Specifications

Acceptable input voltage	0 to 160 VAC
Frequency	47 to 63 Hz
Output voltage	103 to 132 VAC
Input protection	Circuit breaker
Protection	Overcurrent and short circuit Shutdown on overload
Volt-amps **Watts** **Amps** **Btu/hr**	1400 VA 950 W 12 A 171 Btu
Height **Width** **Depth**	21.6 cm (8.5 in.) 17 cm (6.7 in.) 44 cm (17.3 in.)
Weight	28.6 kg (63 lbs)
Battery life	3 to 6 years
Recharge time	2 to 5 hours
Replacement battery	RBC 24 cartridge (APC model number)

Table A-6 lists the typical runtime for the UPS:

Table A-6. UPS Typical Runtime

Load (Watts)	Volt Ampere	Time
65	100	4 hr 10 min
130	200	2 hr 16 min
195	300	1 hr 28 min
260	400	1 hr 3 min
325	500	47 min
390	600	36 min
455	700	28 min
520	800	23 min
585	900	18 min
650	1000	15 min
780	1200	11 min
910	1400	8 min

Drive Column Power

There are two drive-column power-cable configurations for the library:

- Single power cable
- Two power cables

Drive Column—Single Power Cable

If the library's drive column has only one power cable, then all of the tape drives will be on a single circuit. If you install an optional power system in this type of library configuration, the optional PDU will supply redundant power to the library robotics *only*.

Drive Column—Two Power Cables

Newer machines incorporate *two* power cables into the drive column. This enables more power configurations for the customer.

You can configure these newer models so that half of the drives are connected to one PDU, and the other half of the drives are connected to the other.

Note: When installing drives in a library that has two PDUs and a two-power-cable drive column, connect each PDU to a separate branch circuit.

Drive Column Power Connections

If the library has *one* power cable running from the drive column, the plug for the column is connected at the rear of the standard PDU.

If there are *two* power cables running from the drive column, the plug labeled *PWR1* denotes the lower half of the drive column; *PWR2* denotes the upper half of the column. You may cross-couple the power plugs at the rear of the PDUs.

Note: StorageTek advises you to label which drives are connected to each PDU.

All motors return tachometer pulses to the MPC card. The MPC card monitors the tachometer ranges (determined during the tape library initialization process) for proper positioning. If the processor detects that a motor is out of range, the MPC card generates a servo power interrupt (SPI), disconnecting drive current to that motor.

The SPI prevents a robotic servo runaway condition. As a built-in safety feature, an SPI is generated if the tape library front door is opened when the tape library is operating.

In the dual power supply configuration, you can replace the defective power components—DC power supply, the AC PDU, or both—while the other power supply and PDU are operating.

Cooling

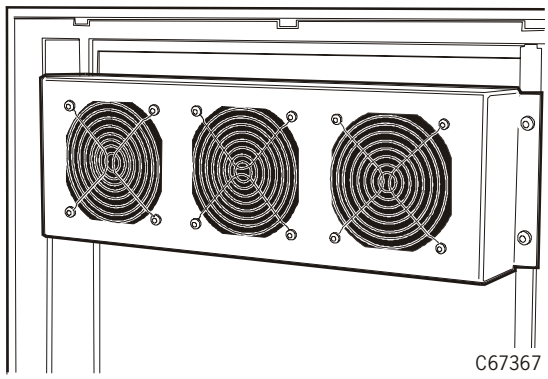
Two +43 VDC fans cool the DC power supplies. The fans are in a tray under the electronics module.

The fans are monitored by the MPC microprocessor. If a fan fails, a Hall-effect sensor detects the lack of motion in the fan blades, and an FSC is posted to the FSC log. The machine may be configured to simultaneously notify the service representative (through an email message) of the failure.

Cooling for the rack area is required if equipment is installed in this section of the library.

Optional Cooling Fans

Optional cooling fans are available if the UPS or other equipment is installed in the rack space of the library. These fans install on the rear door of the library and are replaced as a single unit.



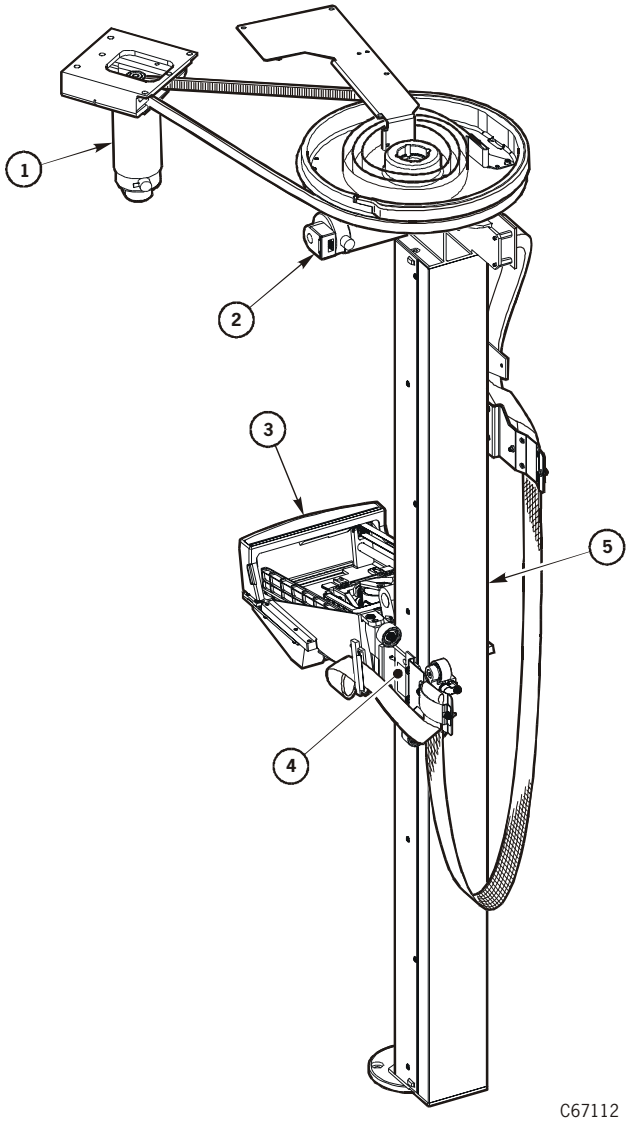
Robot

Figure A-3 shows the robot for the L180 library. The robot is located behind the front door and consists of:

- Theta assembly for lateral movement
- Z assembly for vertical movement
- Hand-camera assembly to mount and dismount cartridges

Most of the robot components are mounted on the Z column. The robot moves cartridges from the storage cells by rotating the Z column, moving the hand up and down the Z column, and reaching into a storage cell to grip a cartridge.

Figure A-3. Robotic Components (C67112)



1. Theta Motor
2. Z motor
3. Hand camera assembly
4. Z carriage
5. Z column

Theta Assembly

The theta assembly is composed of the +43 V theta motor, the PRY card, and the theta drive belt. The theta assembly, under microprocessor control by the MPC card, moves the hand laterally within the library. A closed-loop servo feedback configuration controls theta positioning.

During initialization, the MPC card applies voltage to the theta motor to obtain the motor's range of motion. The MPC card tracks the position of the motor by reading the lines etched on the motor tachometer disk into microprocessor memory.

The starting point for these counts begins at the first theta crash stop and ends at the second crash stop. All subsequent positioning of the motor is based on these reference points. The size of the library (model 180-80, model 180-140, or model 180-180) is determined at the end of initialization, based on the total number of line counts.

Accurate positioning of the theta motor is achieved by first applying +43 V power to the motor (coarse positioning). When the position of the destination cell is near, +43 V power is turned off and the ±15 V operational amplifiers on the MPC card are energized.

The MPC card locks the motor disk at the determined tachometer line by alternately energizing the two voltages until the line position is fixed (fine positioning). The final position is set when zero voltage is detected at the tachometer line. This zero potential is held by +15 V on one side of the tachometer line and -15 V on the other side of the line.

When the MPC card requires the motor to move to a new destination, the operational amplifiers are turned off, +43 V is gated to the motor, and the tachometer disk begins to turn until the new, coarse position is found. Fine positioning is then done by the ±15 V operational amplifiers.

If the motor fails to lock into correct position, the MPC card posts an FSC to the operator panel and the FSC log of the library.

Z Assembly

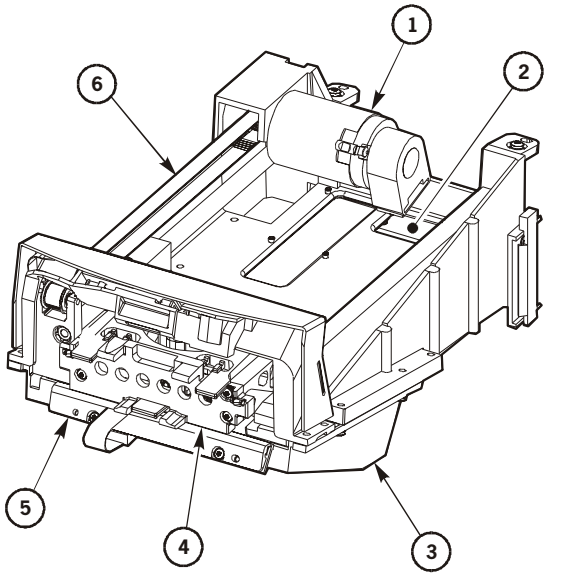
The Z assembly is composed of the +43 V Z motor, the PRX card, and the Z drive belt. The Z assembly, under MPC card microprocessor control, moves the hand vertically within the library. Like the theta, a closed-loop servo feedback configuration controls Z positioning.

The operation of the Z assembly is virtually the same as the theta operation described above. The only difference between the two operations is that the Z motor uses the PRX card to interface with the MPC card. The Z motor and the theta motor are identical.

Hand-Camera Assembly

Figure A-4 shows the hand-camera assembly components.

Figure A-4. Hand-Camera Assembly Components (C67113)



1. Reach motor)
2. MPH card
3. Camera and MPI card
4. Reach and gripper mechanisms
5. MPL card (see note)
6. Drive belt

Note: The MPL, MPP, and MPS cards are linked on the MPZ flexible cable assembly.

Under control of the MPC card, the hand-camera assembly removes cartridges from a cell, CAP, or drive (called a get operation), and places cartridges into a storage cell, the CAP, or a drive (called a put operation). Hand signals to and from the MPC card are routed through the flexible cable connectors (at P/J 801 and 802) on the Z column.

When robotic initialization begins, the first command from the MPC card is to retract the reach mechanism. The retract command precedes any motion by the theta assembly or Z assembly. This ensures that the reach mechanism is not extended before robotic motion begins, thereby preventing damage to cartridges or to the reach mechanism.

The vision system, composed of the MPL illumination card and camera, is initialized at the calibration label at the bottom of the drive column, Panel 0. The camera reads the label image. The MPH card checks the readability of the bar code. The image and the bar code are then compared to the information that is stored in the MPC card memory.

After the vision system is verified, the hand extension and hand-to-camera calibrations are done. The hand is extended below the calibration block, and the gripper and hand extension are validated.

If any hand failure occurs, the MPC card posts an FSC to the operator panel and the FSC log of the library.

Initial Program Load Sequence

An initial program load (IPL) occurs when the library powers on or the RESET button is pushed. The following headings describe this sequence:

Functional Microcode Loading

After the processor and associated hardware are determined to be operational, the functional microcode becomes active in processor memory. Control is turned over to the embedded microcode, and the initialization process begins for the robotic mechanisms.

Initialization Process

The MPC card directs the initialization process, which consists of:

- Robotic mechanism initialization and calibration
- Vision calibration
- Hand-camera assembly testing
- Audit of cartridges within the library
- Drive targeting and check for “in flux” condition on DLT drives
- Audit of reserve cells
- Load handle cycling for DLT drives

Mechanism Initialization and Calibration

Robotic mechanism parameters are loaded into processor memory, and calibration routines are executed. Monitored in this sequence are:

- Reach safe position: The reach mechanism fully retracts and the reach safe sensor *must* be detected before any theta or Z motion is initiated. This prevents possible damage to the hand-camera assembly or a cartridge.
- Z motor calibration: The Z assembly moves from end-stop to end-stop. The distance and time for this motion is compared against the assembly parameters within the microcode.
- Theta motor calibration: The theta assembly moves from theta stop to theta stop. The distance and time for this motion is compared against the assembly parameters within the microcode.

  Besides the front theta stop, a second theta stop exists for the 84-cartridge, 140-cartridge, or 174-cartridge configuration.

Vision Calibration

After the robotic motors are calibrated, the robot moves to the vision calibration decal (below the drives at Column 0, Panel 0). Thresholds for the line scan camera are:

- Target—readability and accuracy of the image for locating array positions
- Bar code—readability and accuracy of bar code information

Note: The camera is operational:

- During initialization
- During audit
- When cartridges are entered into a CAP

During normal operation, the camera is turned off and cartridges are located by referencing the volume serial number (VOLSER) and cell location within the MPC card memory.

Hand-Camera Assembly Testing

The hand-camera assembly is calibrated and tested near the vision calibration decal. The proximity sensor is aimed at the decal to see if the sensor indicator turns on. The assembly is then moved away from the decal to see if the indicator turns off. The gripper mechanism is extended to test for proper operation.

Audit of Library

The next step for initialization is the audit of the library.

When the theta assembly, Z assembly, and hand-camera assembly complete their initialization and calibration routines, the MPC card begins an audit of the library cells. The theta assembly and Z assembly position the hand at the arrays in a column, the camera reads the VOLSERs of the cartridges, and the VOLSERs and array positions of the tapes are transferred into MPC memory.

CAUTION:
Client software determines how unlabeled, unreadable cartridges or cartridges placed upside down in the CAP are handled.

Entering unlabeled and unreadable cartridges into the library should be discouraged, because problems will arise every time the library audits the cartridges.

Entering a cartridge upside down could result in damage to the hand-camera assembly and drive.

During the audit process:

- Cartridges within drives are not audited.
- The client software determines how unlabeled, unreadable cartridges are handled.
- Whenever an audit is performed, the customer must request a client software update of the audit results. This must be done to maintain identical audit information between the library and client.
- Cartridge VOLSERs are read by the camera *only* during an audit or a CAP entry. When the audit or CAP entry is completed, cartridge movement is done strictly by reference to MPC memory.

An audit begins when:

- You power on the library
- You open and close the front door
- A system request to audit is entered at the client console

Drive Targeting

In the next step of the initialization process, the robot moves to each drive and calculates the position of the drive's target. This ensures accurate and quick loading of cartridges during machine operation. For DLT drives, the load handles are checked for in flux conditions. Any handles found to be in flux will be lowered by the MPC card.

Audit of Reserved Cells

After drive targeting, the robot audits the six cells of the reserved area, below the cartridge access port (CAP). This area is explained below. If the library contains no DLT drives, this is the final initialization step.

Load Handling Cycling

If DLT drives are present, and the load handles need to be cycled, all handles are raised to the loading position. This is the final initialization step.

Cards

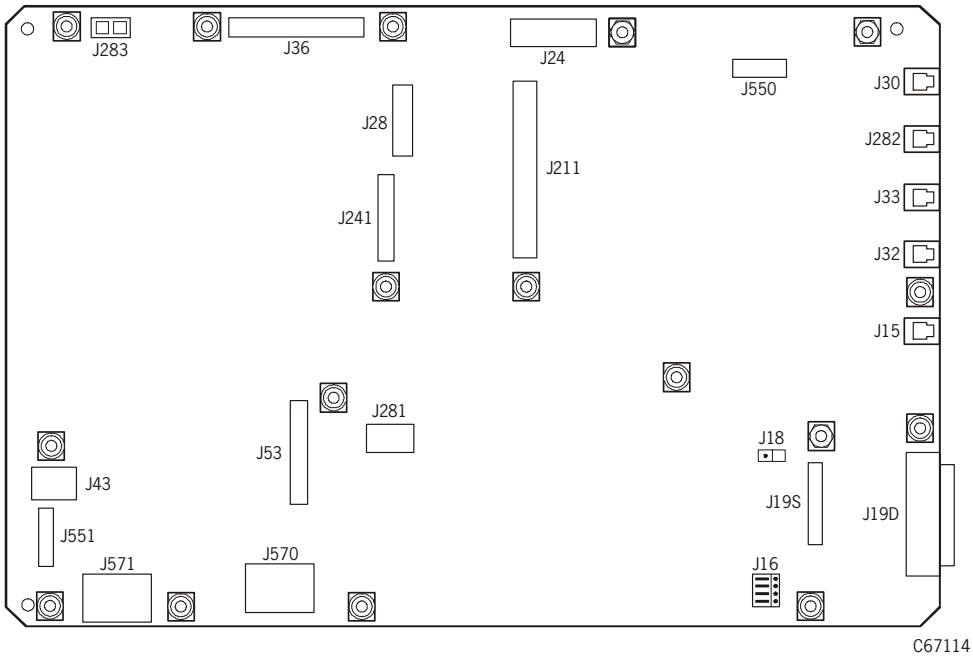
Table A-7 lists the library cards, their functions, and their locations.

Figure A-5 on page A-17 shows the MPC card and connectors.

Table A-7. Cards Functions and Locations

Card	Function	Location
MPC	Maintains robot, servo, vision control. Provides serial port interfaces for control and debug operations. Supplies +5 V to MPO card. Monitors motor positions. Stores configuration data. Maintains audit database. Gates +43 V to theta motor and Z motor. Provides ±15 V to operational amplifiers and to camera.	Electronics module
MPF	Converts AC input voltage from the AC PDU into +43 VDC for library servo motors and the reach motor on the hand, ±15 V for the operational amplifiers on the MPC card, and +5 V for cards and CAP door motor.	DC power supply
MPH	Contains vision circuitry. Interfaces between camera and MPC card. Supplies +5 V to theta and Z tachometers.	Hand-camera assembly
MPI	Adds camera pixels.	Camera
MPK	Stores feature and upgrade configuration information.	Between MPC card and electronics compartment
MPL	Provides indicator light source.	Hand-camera assembly
MPO	Interfaces between MPC and display.	Operator panel
MPP	Indicates if cartridge is in current cell (proximity sensor)	Hand
MPS	Indicates the hand can be safely moved after gripper operation (hand reach safe sensor).	Hand
MPU	Allows MPC card to communicate with Fibre Channel.	Side of MPV card
MPV	Operates as compact peripheral component interconnect (CPCI) backplane for Fibre Channel interface.	MPC card
MPW	Allows the MPC card to communicate with a LVD SCSI bus.	Side of MPV card
PRX	Interfaces between theta cable and Z flex cable.	Top of Z column
PRY	Interfaces between theta cable and MPC card.	Z column pulley assembly
Note:	When using the MPW card, you must place the library at the end of the SCSI bus and use a single, shielded cable.	

Figure A-5. MPC Card and Connectors (C67114)



Connector	Function
J283	Not used
J36	Servo signal lines
J24	Tape transport interface (TTI) for drives
J550	Connection to personality module MPK card.
J30	CSE port, modem, or dumb terminal (RS423) for downloading microcode
J282	Not used
J33	Client serial Port 1 (RS423) for diagnostic tests and service information
J32	Client serial Port 2 (RS423) (not used)
J15	Ethernet connector (TCP/IP)
J19D	SCSI differential
J19S	SCSI single-ended
J16	Single-ended or differential selection jumpers
J18	Terminating power jumper
J211	Connector for CPCI (MPV) expansion card
J28	Operator panel
J241	Not used
J281	Engineering use only
J53	CAP and door
J570	DC power in from second MPF (DC power) supply
J571	DC power in from first MPF (DC power) supply
J551	DC fans
J43	Servo power to robot and hand

External Interfaces

The library supports these standard interfaces:

- A multi-initiator small computer system interface (SCSI) connection
- A Fibre Channel connection (requires feature code IF01)

In addition, the SCSI connection can be converted to Fibre Channel through a converter network.

Thus users can interface with the library through:

- A direct connection to a SCSI client (LVD or HVD)
- An indirect connection to a SCSI client (LVD or HVD)
- A Fibre Channel connection to a Fibre Channel arbitrated loop
- A 10baseT Ethernet connection that they access through a Web browser with the Horizon L Series Library Monitor (optional)

SCSI to Client Connections

Two scenarios are possible for SCSI connections between a library and client.

SCSI Client Direct Connections

For client-to-library (direct) SCSI connections, a server connects to the drives and library through a multi-initiator SCSI bus. The library may have a control path that is separate from the data path to/from the drives (the drives are then off bus), or the control path may be daisy-chained to the data path (the drives are then on bus). The connection from the server to the library and/or drives is a SCSI Type-3, 68-pin cable.

SCSI Client Indirect Connections

An indirect connection to the library occurs when the library connects to a client through a network.

An example of an indirect connection would be:

- A library connected to a UNIX server
- The server connected to an Ethernet LAN network
- A cable connected between the Ethernet LAN and the client

A SCSI Type-3 68-pin cable connects the server to the library. The server may have its own control-side path or may be daisy-chained to a shared data bus with one or more drives.

Note: If the customer is using Automated Cartridge System Library Software (ACSLS), its level must be Version 5.3.2 or higher.

SCSI HVD or LVD Considerations

With the advent of Ultrium tape drives, customers now have choices as to the type of SCSI interface on which they wish to operate: High Voltage Differential (HVD) or Low Voltage Differential (LVD). As shown in Table A-8, the HVD interface allows longer cable lengths, but throughput is lower than LVD; the LVD interface restricts cable lengths but provides faster throughput.

As a service representative you must ensure that you understand these cabling requirements as well as:

- How LVD Ultrium drives are different internally from HVD Ultrium drives
- How the library (that is, the control path) is converted to LVD operation
- What the Host Bus Adapter (HBA) requirements are
- What the consequences for mixing SCSI types on a bus are

SCSI Cables

The library and drives support *only* SCSI Type-3 connectors. If you use SCSI Type 1 or 2 cable connectors, you must order a SCSI-1- or SCSI-2-to-SCSI-3 adapter so that components can connect properly.

Note: If you are connecting the library or drives to an LVD SCSI bus, the cable can be no longer than 12 m (39.4 ft).

Table A-8 lists additional restrictions for SCSI connections that you should keep in mind.

Table A-8. SCSI Cable Restrictions

Application	Length Restriction
Single-Ended (Library only)	Stub length: 0.1 m (4 in.) 5 to 10 MHz data transfer rate: 3 m (10 ft) 1 to 5 MHz data transfer rate: 6 m (20 ft)
High Voltage Differential (HVD)	Stub length: 0.2 m (10 in.) 1 to 10 MHz data transfer rate: 25 m (82 ft)
Low Voltage Differential (LVD)	Stub length: 0.1 m (3.9 in.) Generation 1 (108 GB/hr) data transfer rate: 12 m (39.4 ft)

LVD Ultrium Drives

The native operation for both the IBM Ultrium drives and the HP Ultrium drive is the LVD interface. For either drive to operate as HVD, the plant must install converter cards (Rancho and Paralan respectively) on their drive trays. There is no converter card for HVD operation on Seagate Ultrium drives; their model number dictates the type of operation.

When installing an Ultrium drive in the library, you must match the cable types and terminators with the bus type.

Library LVD Operation

StorageTek allows the library to be converted to LVD operation through an extra interface card—the MPW card—that attaches to the MPC card. The MPW card fits into Slot 0 on the electronics module bulkhead. The customer orders the MPW card and card cage with library feature code LV02.

SCSI Bus Precautions

Use caution when connecting the LVD or HVD interfaces. Table A-9 lists potential equipment damage or bus-disabling situations that may arise if the two types are intermixed.

CAUTION:
Potential equipment damage: **The single-ended, LVD, and HVD SCSI alternatives are not compatible and cannot be mixed on the same SCSI bus.**

Table A-9. SCSI Device/Bus Types: Precautions

If you plug this device type ...	into a Single-ended (SE) Bus Type ...	into an LVD Bus Type ...	into an HVD Bus Type ...
Single-ended (SE) device	No effect. This is a proper connection.	The entire bus will run in SE mode (with all SE restrictions).	The HVD bus will be *disabled*.
LVD device	The LVD device will run in SE mode.	No effect. This is a proper connection.	The LVD device will be *disabled (potential damage to the device)*.
HVD	The HVD device will be *disabled*.	The LVD bus and all LVD devices will be *disabled (potential damage to LVD devices)*	No effect. This is a proper connection.

Fibre Channel

The library supports the following topologies with a single N_Port attachment:

- Arbitrated loop—private loop
- Arbitrated loop—public loop

The arbitrated loop provides:

- Multiple connections for devices that share a single loop
- Point-to-point connections during communications

In a Fibre Channel arbitrated loop, as with SCSI, devices must arbitrate and win the connection before communications can begin. After a device is powered on and initialized on the loop, it must arbitrate and win to be able to communicate with other devices on the loop.

Private Arbitrated Loop

If the arbitrated loop is not attached to a Fibre Channel fabric, it is a private loop. A private arbitrated loop can connect up to 126 N-type ports, and:

- Only point-to-point communication is possible between one initiator and one target at any time. (Other links on the loop act as repeaters.)
- Both initiator and target must reside within the same loop.

While the library supports this Fibre Channel topology, StorageTek does not recommend it. Its best implementation includes a Fibre Channel hub.

Public Arbitrated Loop

If the Fibre Channel arbitrated loop contains at least one F-type (F=Fabric) port and is attached to a Fibre Channel fabric, it is a public loop. A public loop can contain up to 126 N-type ports and one F-type port. If the fabric connects to another arbitrated loop, then an initiator on one public loop might be able to communicate with a target on another.

Fibre Channel Cable Considerations

Table A-10 lists the cable and connector specifications for the library:

Table A-10. Fibre Channel Cables and Connectors

Distance		FC-0 Code	Cable	Type	Connector
Meters	Feet				
2 to 300	6.5 to 985	100-M6-SN-I	62.5 µm Multimode	Shortwave laser without OFC	Keyed Duplex SC
2 to 500	6.5 to 1640	100-M5-SN-I	50 µm Multimode	Shortwave laser without OFC	Keyed Duplex SC

HBA Requirements

CAUTION:
Mismatching SCSI operation types: **The host bus adapters (HBAs) in the customer's server must match the library's SCSI bus type. If the interface to the library is HVD, then the customer's server must contain an HVD-compatible HBA. Likewise, if the interface to the library is LVD, then the server must contain an LVD-compatible HBA.**

The server that the SCSI bus attaches to must have a compatible HBA. If the interface to the library is HVD, the customer's server must contain an HVD-compatible HBA. Likewise, if the interface to the library is LVD, then the server must contain an LVD-compatible HBA.

The following table compares device requirements—library, drives, and server—for LVD and HVD operation:

Table A-11. HVD and LVD Device Requirements

Low Voltage Differential	High Voltage Differential
Library – MPW card attached to MPC card	Library – None
IBM Ultrium – None[2]	HP Ultrium – Rancho converter[2]
HP Ultrium – None[2.]	HP Ultrium – Paralan converter[2]
Seagate Ultrium – Set by model number	Seagate Ultrium – Set by model number[2]
Host Server – LVD Host Bus Adapter	Host Server – HVD Host Bus Adapter

L-Series Library Admin

The L-Series Library Admin is an optional web-based interface to the library. This interface lets a library's users configure, operate, and monitor the library through a workstation or PC that is running a Netscape or Microsoft browser. This interface must first be enabled and configured on the library. Installation and configuration instructions appear in the documentation that ships with the software components.

Internal Interfaces

The MPC card monitors all interfaces to the library. These interfaces are:

- Client to CAP
- Library-to-HVD or Single-ended SCSI client
- Library-to-LVD SCSI client
- Library-to-drives
- Library-to-Fibre Channel
- Library-to-Personality Module and Horizon L Series Library Monitor
- Library-to-operator panel
- Library-to-SER1 port
- Library-to-CSE port

Client-to-CAP

Cartridges are imported into and exported from the cartridge access port (CAP). Each CAP has two magazines. The top magazine is numbered one, the bottom magazine is numbered two. Each cell location in a CAP is assigned an element number.

There is no restriction on how cartridges are placed into a magazine or CAP. When the CAP door is closed, the robot will audit all CAP cell locations for cartridges.

When exporting cartridges, however, the robot will place the target cartridge into the lowest available element number first.

Library-to-HVD or Single-Ended SCSI Client

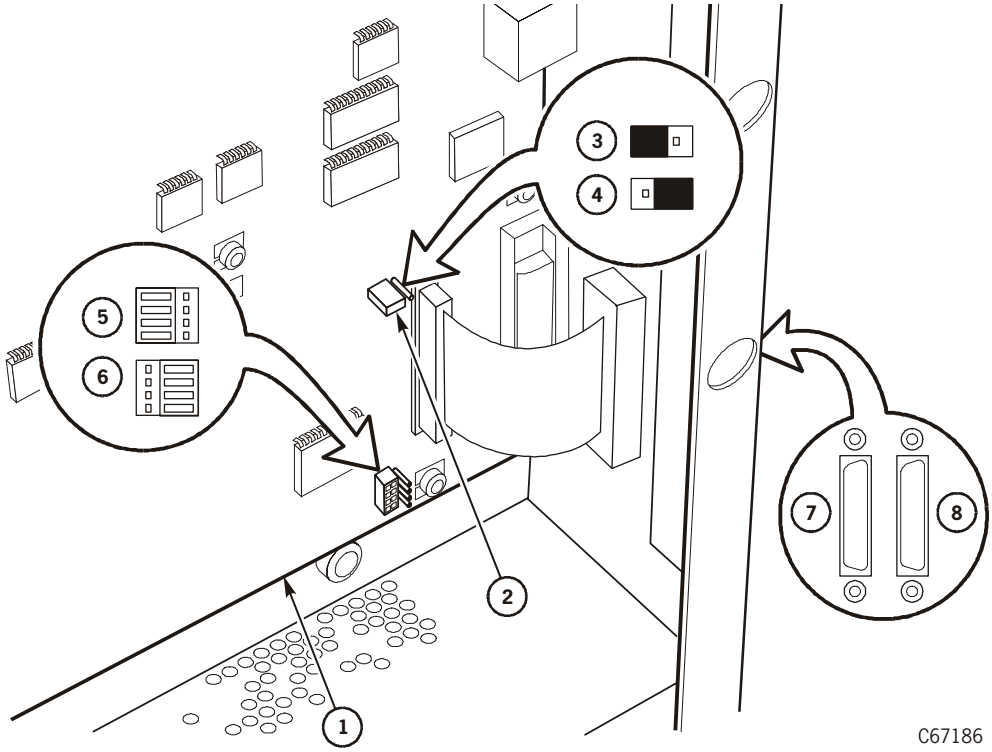
The MPC card is jumpered at the factory for SCSI differential operations at J16. If SCSI single-ended operation is desired, the jumper is moved, and the SCSI cable from the MPC card to the bulkhead is repositioned at the MPC card single-ended connector.

Both SCSI operations require 68-pin connectors. Terminating power is supplied at J18. This is set at the factory to supply terminating power at the library end of the bus, but may be moved for customers who do not want terminating power at that library end of the bus.

The jumpers for operation type and terminating power are shown in Figure A-6 on page A-24.

The MPC card has two client serial ports (J32 and J33). Both the CSE port and the SER1 port are supported as a command line interface port.

Figure A-6. Terminating Power and Operation Jumpers (C67186)



1. MPC card
2. Terminating power jumper (J18)
3. Terminating power on position
4. Terminating power off position
5. Differential operation setting (J16)
6. Single-ended operation setting (J16)
7. Single-ended connection (front)
8. Differential connection (rear)

Library-to-LVD SCSI Client

Library LVD SCSI operation is directed through the MPW card, which is connected to the MPV card. The MPW card slides into the lower slot of the compact peripheral component interconnect (CPCI) assembly, which contains the MPV card. The MPV card, which operates as the CPCI backplane for the LVD SCSI interface, attaches to the MPC at J211.

Library-to-Drives

The connection between the library MPC card and drives is a four-pin, RS422 interface. The connector for the drives is contained within the quick-disconnect connector for the drive tray. The cable for these lines runs from the drive connector to the MPC card at P/J24.

Library-to-Fibre Channel

Library Fibre Channel operation is directed through the MPU card, which is connected to the MPV card. The MPU card slides into the lower slot of the compact peripheral component interconnect (CPCI) assembly, which contains the MPV card. This lower slot is designated Port 0 by the microcode and is the default location that currently must be used.

The MPV card, which operates as the CPCI backplane for the Fibre Channel interface, attaches to the MPC at J211. The client path for fiber operation is: Client › Fibre Channel Component › MPU › MPV › MPC.

Note: The MPU card is attached to the MPV card. The MPU card contains a Class 1 laser product that complies with sections 21CFR 1040.10 and 1040.11 of the Food and Drug Administration (FDA) regulations. Class 1 laser products do not require any special safety precautions.

L-Series Library Admin

The MPK card, above right of the MPC card, contains an EEPROM that:

- Identifies the machine for a specific vendor (if required). When installed, the operator panel will display that vendor's name.
- Enables the L-Series Library Admin

If the MPK card is present and the MPC card must be replaced, you must re-connect the MPK card to the new MPC card. The vendor information and the Horizon L Series Library Monitor will remain effective. *However*, the customer's password and IP address *must* be re-entered during configuration.

Library-to-Operator Panel

The operator panel communicates tape library status, configuration, diagnostic sequences, and FSC information. The operator panel provides buttons for running diagnostics and examining the 20 most recent tape library FSCs.

Library-to-SER1 Port

The SER1 port provides a command line interface to the MPC card, allowing you to clear (purge) the FSC log and run diagnostic tests through a laptop. This interface is through an RJ45 connection.

Note: The baud rate for the SER1 port is 38,400.

CAUTION:
System Interruption: **Be sure that the library and drives are offline before using this interface. It is a direct, command line interface and will take the library offline without posting a warning message.**

Library-to-CSE Port

The CSE port also provides a command line interface to the MPC card, allowing you to clear (purge) the FSC log and run diagnostic tests through a laptop. In addition, you may use this interface to download microcode to the library. This interface is through an RJ45 connection.

Note: The baud rate for the CSE port is 38,400.

CAUTION:
System Interruption: **Be sure that the library and drives are offline before using this interface. It is a direct, command line interface and will take the library offline without posting a warning message.**

Other Interfaces

The library features three additional interfaces:

- An operator panel that communicates library status, configuration, diagnostic sequences, and fault symptom code (FSC) information. The operator panel provides menus for running diagnostic tests and for examining the 20 most recent library FSCs. The FSC information will help you troubleshoot should a component fail.
- A SER1 port that communicates the same operator panel information (in the previous paragraph) to a remote laptop device or through a serial modem connection. This interface is through an RJ45 connection. You may run diagnostic tests on the library through this port; however, please note that the library will go offline (that is, stop communicating with the client) without warning once the tests begin. This connection operates at 38400 bps.
- A CSE port that includes the same functionality as the SER1 port but also lets you download microcode to the library. This connection currently operates at 38,400 bps while running `Flash 97.exe`.

Specifications

The following tables list the physical and environmental specifications for the L180 Tape Library:

Table A-12 lists physical specifications.

Table A-12. Library Physical Specifications, with Covers

L180	**No Drives**
Height[1]	1.66 m (65 in.)
Width[1]	0.72 m (28 in.)
Depth [1]	1.25 m (49 in.)
Weight[2] (including covers but without cartridges)	274.4 kg (605 lb)
Notes: 1. Add 152 mm (6 in.) for top clearance and 51 mm (2 in.) on each side for cooling. 2. Each DLT cartridge weighs 223 g (7.85 oz) Each 9840 cartridge weighs 262 g (9.17 oz) Each Ultrium cartridge weighs 281 g (9.92 oz)	

Table A-13 lists the environmental consideration for the library.

Table A-13. Library Environmental Specifications

Temperature	
Operating	15° to 32°C (59° to 90°F)
Storage	10° to 40°C (50° to 104°F)
Shipping	-40° to 60°C (-40° to 140°F)
Relative Humidity	
Operating	20% to 80% (noncondensing)
Storage	10% to 95% (noncondensing)
Shipping	10% to 95% (noncondensing)
Wet Bulb Maximum	
Operating	29.2°C (84.5°F)
Storage	35°C (95°F)
Shipping	35°C (95°F)
Altitude	
Operating	0 to 3.05 km (0 to 10,000 ft)
Storage	0 to 3.05 km (0 to 10,000 ft)
Shipping	0 to 15.24 km (0 to 50,000 ft)

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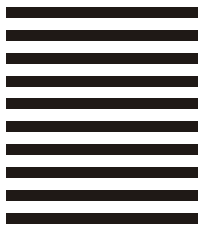

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