Document 95900

TimberWolf 9730 Library

Product Manual

StorageTek

TimberWolf 9730 Library

Product Manual

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USA

URL: http://sts.stortek.com/sts/nid

Complete the following table in pencil (or make a copy) to record your 9730 configuration.

9730 Library Configuration Information

Serial Number: _____ **StorageTek Contact Number:** _____

Model: 10-cell ❑ 20-cell ❑ 30-cell ❑

Code Version: _____

Library SCSI ID: _____ **Configuration:** Single-ended ❑ Differential ❑

Number of Drives Installed: _____

Drive 0 SCSI ID: _____ Model–DLT4000 ❑ DLT7000 ❑ SDLT 220 ❑
Single-ended ❑ Differential ❑ HVD ❑
On bus ❑ Off bus ❑

Drive 1 SCSI ID: _____ Model–DLT4000 ❑ DLT7000 ❑ SDLT 220 ❑
Single-ended ❑ Differential ❑ HVD ❑
On bus ❑ Off bus ❑

Drive 2 SCSI ID: _____ Model–DLT4000 ❑ DLT7000 ❑ SDLT 220 ❑
Single-ended ❑ Differential ❑ HVD ❑
On bus ❑ Off bus ❑

Drive 3 SCSI ID: _____ Model–DLT4000 ❑ DLT7000 ❑ SDLT 220 ❑
Single-ended ❑ Differential ❑ HVD ❑
On bus ❑ Off bus ❑

Fast Load: Enabled ❑ Disabled ❑

Auto Clean: Enabled ❑ Disabled ❑

Removable Cart Magazine: Installed ❑ Not Installed ❑

SCSI Emulation: Normal ❑ Extended ❑

Summary of Changes

EC Number	Date	Edition	Change
53980	September 1999	First	Initial release.
111307	December 1999	Second	Refer to this edition for a description of the changes.
111611	February 2001	Third	Refer to this edition for a description of the changes.
111683	August 2001	Fourth	Updated to include SDLT 220 drive, removed DLT8000 information.

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Preface

This product manual explains the TimberWolf 9730 Library initial installation and preparation for first use, configuration, day-to-day operation, diagnostics, routine maintenance, and service procedures. ***Chapter 2 through Chapter 4 provide details of the required procedures to follow before first using the library.***

Organization

This Product Manual has six chapters and one appendix:

Chapter 1	"General Information" describes the basic configuration of the 9730 and its features and major components.
Chapter 2	"Installing the Library" describes unpacking and inspecting the library, and the basic installation procedures.
Chapter 3	"Handling Cartridge Tapes" describes the type of cartridge tapes used by the library, how to care for, label, and properly maintain them, and how to populate the library with tapes.
Chapter 4	"Getting Started" contains instructions for powering on the library, accessing library functions from the operator panel, and configuring the library before first use.
Chapter 5	"Maintaining the Library" contains trouble isolation procedures, library and drive utilities including diagnostic procedures, and procedures for loading microcode and other operations.
Chapter 6	"Servicing the Library" contains procedures for removing and replacing field replaceable units (FRUs) and customer replaceable units (CRUs).
Appendix A	"Specifications" contains library specifications.
Glossary	Defines new or special terms and abbreviations used in this manual.
Index	Assists in locating information in this manual.

A Reader's Comment Form at the back of the manual is for communicating suggestions or requests for change. We encourage and appreciate reader feedback.

Trademarks

StorageTek is a trademark of Storage Technology Corporation. Other features and terms used in this publication are for informational purposes only and might be trademarks of Storage Technology Corporation or other companies.

Alert Messages

This manual contains alert messages that must be read carefully and followed:

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

CAUTION:
Informs the user of conditions that might result in damage to hardware, corruption of data or application software, or long-term health hazard to people. A caution precedes the information to which it relates.

WARNING:
Alerts the user to conditions that might result in injury or death. A warning precedes the information to which it applies.

Conventions

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

Item	Example	Description of Convention
Acronyms	CSA	All uppercase
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)

Item	Example	Description of Convention
Jumper names	TERMPWR	All uppercase
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

Additional information is contained in the following publications.

Publication	Part Number
TimberWolf 9730 Library Illustrated Parts Catalog	309129201
TimberWolf 9730/7430/9738 SCSI Reference Manual	95727
Quantum DLT4000 Cartridge Subsystem Product Manual	313127601 (STK) 81-60043-0x (Quantum)
Quantum DLT7000 Tape Drive Product Manual	313134501 (STK) 81-60000-0x (Quantum)
Quantum Super DLTtape System SDLT 220 Product Manual	81-00000-0x (Quantum)

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 customer 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-Partners 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. 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.

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

e-Partners Site

StorageTek's e-Partners site, formerly known as the Partners Page or the Channels Site, is a Web site that provides information about products, services, customer support, upcoming events, training programs, and sales tools to support StorageTek's e-Partners. Access to this site, beyond the e-Partners Login page, is restricted. On the e-Partners Login page, current partners who do not have access can request a login ID and password and prospective partners can apply to become StorageTek resellers.

The URL for the e-Partners site is http://channels.stortek.com.

Hardcopy Publications

Contact a StorageTek sales or marketing representative to order additional paper copies of this publication or to order other StorageTek customer publications in paper format.

Safety and ESD

The following pages cover three topics that are *essential* to all service activity:

- Safety Precautions
- Electrostatic Discharge (ESD) Damage Prevention
- Rack safety and precautions

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 (ESD) 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 66ºC (150ºF) or below 4.5ºC (40ºF), 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.

Properly store the work surface and the other Field Service Grounding Kit items.

Rack Safety and Precautions

WARNING:
Possible personal injury:

- **The TimberWolf 9730 Library, when it contains 4 tape drives, weighs approximately 68 kg (149 lb). To install the library into a rack or to remove the library from a rack will require more than one person.**
- **Also consider the library's total weight when you are placing other equipment into the rack. To prevent an unbalanced situation, install the heaviest equipment on the bottom and the lightest equipment on the top. Failure to do so might cause the rack to become unstable and tip over.**

Observe the following safety precautions when you are installing the library into a rack:

- If the rack has front or rear doors, do *not* allow the doors to interfere with the library's ventilation. The rack's internal ambient temperature should not exceed the recommended operating temperature range of the library.
- Ensure that rack doors provide adequate clearance to the library.
- Ensure that the combination of the library with other equipment in the rack does not create an overcurrent condition, whether the equipment is connected directly to the branch circuit or to a power distribution strip.
- Ensure that all equipment in the rack has reliable earth ground, whether the equipment is connected directly to the branch circuit or to a power distribution strip.

  Note: The library relies on the ground pin of the power cord for its earth ground.

Notices

FCC Compliance Statement

The following is the compliance statement from the Federal Communications Commission:

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

Some of the cables used to connect peripherals must be shielded and grounded as described in the installation manual. Operation of this equipment with the required cables that are not shielded and correctly grounded may result in interference to radio and TV reception.

Changes or modifications not expressly approved by StorageTek could void the user's authority to operate the equipment.

■ Japanese Compliance Statement

The following is the compliance statement from Japan:

この装置は、クラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 VCCI-A

This equipment is in the Class A category information technology equipment based on the rules of Voluntary Control Council For Interference by Information Technology Equipment (VCCI). When used in a residential area, radio interference may be caused. In this case, user may be required to take appropriate corrective actions.

Consequently, when used in residential area or in an adjacent area thereto, radio interference may be caused to radios and TV receivers, etc. Read the instructions for correct handling.

■ Taiwan Warning Label Statement

The following is the warning label statement from Taiwan, R.O.C.:

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

Internal Code License Statement

The following is the Internal Code License Agreement from StorageTek:

NOTICE

INTERNAL CODE LICENSE

PLEASE READ THIS NOTICE CAREFULLY BEFORE INSTALLING AND OPERATION THIS EQUIPMENT. THIS NOTICE IS A LEGAL AGREEMENT BETWEEN YOU (EITHER AN INDIVIDUAL OR ENTITY), THE END USER, AND STORAGE TECHNOLOGY CORPORATION ("STORAGETEK"), THE MANUFACTURER OF THE EQUIPMENT. BY OPENING THE PACKAGE AND ACCEPTING AND USING ANY UNIT OF EQUIPMENT DESCRIBED IN THIS DOCUMENT, YOU AGREE TO BECOME BOUND BY THE TERMS OF THIS AGREEMENT. IF YOU DO NOT AGREE WITH THE TERMS OF THIS AGREEMENT, DO **NOT** OPEN THE PACKAGE AND USE THE EQUIPMENT. IF YOU DO NOT HAVE THE AUTHORITY TO BIND YOUR COMPANY, DO **NOT** OPEN THE PACKAGE AND USE THE EQUIPMENT. IF YOU HAVE ANY QUESTIONS, CONTACT THE AUTHORIZED STORAGETEK DISTRIBUTOR OR RESELLER FROM WHOM YOU ACQUIRED THIS EQUIPMENT. IF THE EQUIPMENT WAS OBTAINED BY YOU DIRECTLY FROM STORAGETEK, CONTACT YOUR STORAGETEK REPRESENTATIVE.

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   b. "Internal Code" is Microcode that (i) is an integral part of Equipment, (ii) is required by such Equipment to perform its data storage and retrieval functions, and (iii) executes below the user interface of such Equipment. Internal code does not include other Microcode or software, including data files, which may reside or execute in or be used by or in connection with such Equipment, including, without limitation, Maintenance Code.

   c. "Maintenance Code" is defined as Microcode and other software, including data files, which may reside or execute in or be used by or in connection with Equipment, and which detects, records, displays, and/or analyzes malfunctions in the Equipment.

   d. "Microcode" is defined as a set of instructions (software) that is either imbedded into or is to be loaded into the Equipment and executes below the external user interface of such Equipment. Microcode includes both Internal Code and Maintenance Code, and may be in magnetic or other storage media, integrated circuitry, or other media.

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General Information

1

The TimberWolf 9730 Library is a self-contained, fully automated 30-cartridge system for up to four digital linear tape (DLT) drives, or four Super DLT (SDLT) drives. The library is also available as fully upgradeable 10- or 20-cartridge models. It can be rack-mounted, set on a desktop, or placed on a pedestal. The 9730 uses a small computer system interface (SCSI) library command set and attaches directly to the SCSI bus.

Figure 1-1. 9730 Library Front View

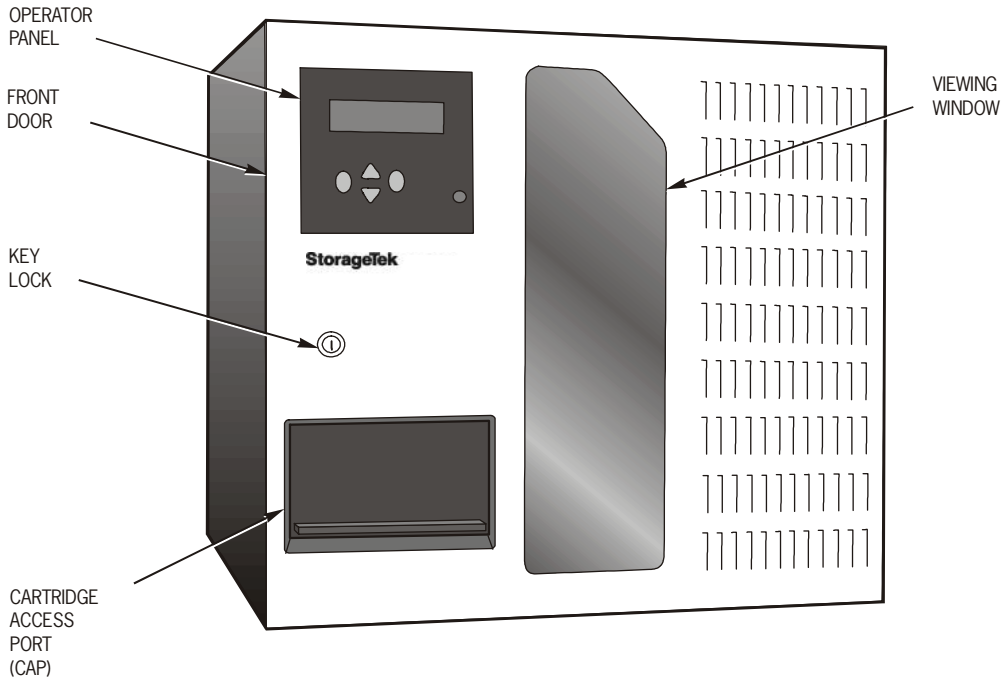


Figure 1-1 shows the front of the 9730 Library, featuring:

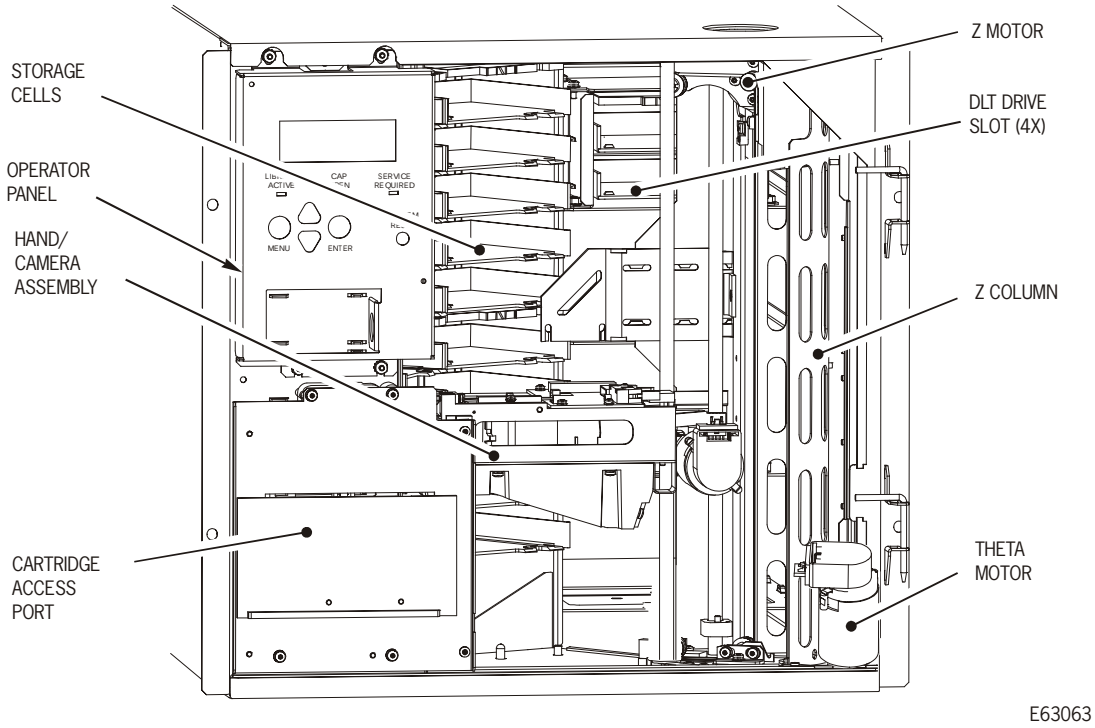
- A window for viewing library operation
- An operator panel for accessing library functions
- A cartridge access port (CAP) for manually loading tapes
- A lockable access door with safety interlock switch for ensuring security and safety

9730 Library Components

The major 9730 internal components, as shown in Figure 1-2, are:

- Robot assembly (includes hand/camera assembly)
- Electronics module (not shown)
- Cartridge access port (CAP)
- Storage cells for 30 cartridges (28 when four drives are installed)
- DLT and SDLT drives (not shown)
- Operator panel

Figure 1-2. 9730 Library Major Components



Robot

The robot moves cartridges to and from the storage cells, the CAP, and the tape drives when directed by the host (controlling) software. The robot's major components are a Z column assembly and a hand/camera assembly.

Hand/Camera Assembly

The hand/camera assembly picks cartridge tapes and moves them to and from tape drives, storage cells, and the CAP. The camera reads coded information on the storage cells and cartridge tapes for position location and library audits.

Z Column Assembly

The Z column assembly contains the mechanisms necessary to move the hand vertically and in horizontal rotation (theta). These movements allow the hand to move cartridge tapes to and from storage cells, the CAP, and the tape drives.

Theta Motor

The theta motor drives a belt that moves the Z column assembly (including the hand) in horizontal rotation to reach the storage cells and tape drives.

Z Motor

The Z motor drives a belt that moves the hand/camera assembly up and down to reach the storage cells and tape drives.

Electronics Module

The electronics module (EM) contains the controller card (CYC card), two fan assemblies, and a power supply. SCSI commands and microcode are downloaded and stored on the CYC card.

The EM contains 2 MB of dynamic RAM (DRAM), 128 kB of nonvolatile RAM (NVRAM), and 512 kB of flash programmable ROM (PROM). The CYC card contains a 32-bit microprocessor to control motion, the vision system, SCSI commands, and operator panel commands and display information.

Cartridge Access Port

The CAP permits adding or removing cartridge tapes from the library without interrupting normal library operations. Refer to Chapter 3, “Handling Cartridge Tapes,” for more information about the CAP.

Storage Cells

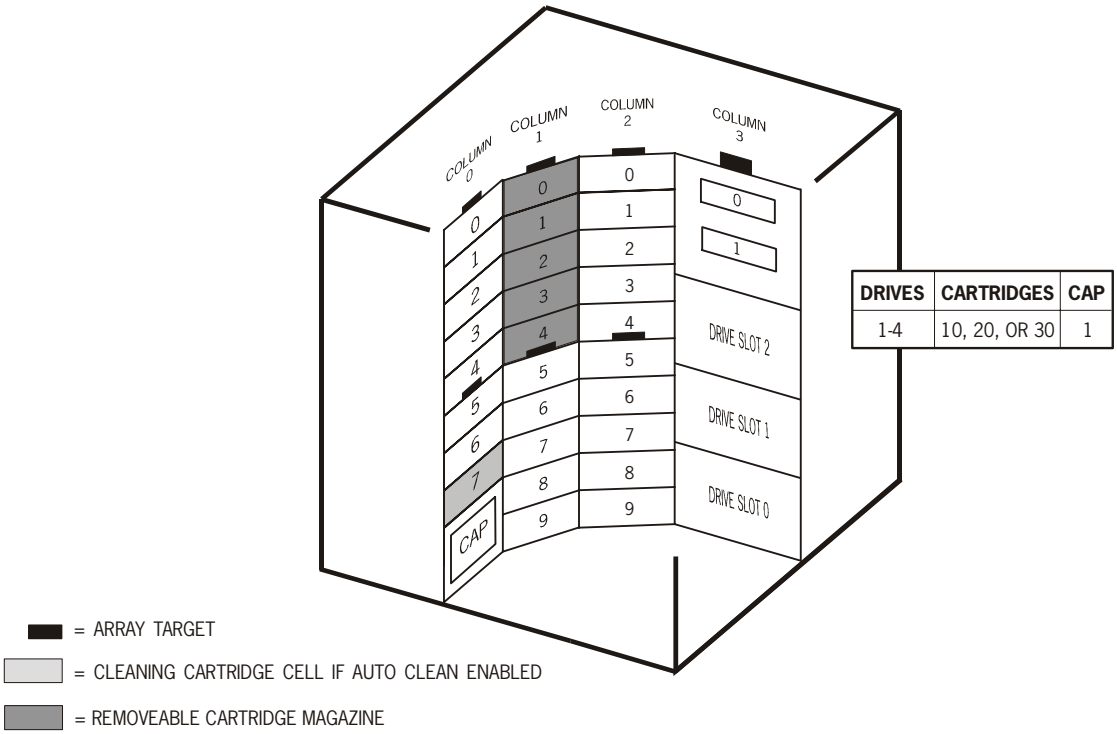
The 9730 contains storage cells for 30 DLTtape IV or Super DLTtape I cartridges. DLTtape III and IIIXT are also supported when using DLT4000 or DLT7000 drives.

Note: With four drives installed, 28 cartridges is the maximum.

The 10- and 20-cartridge models have physical cells for the same number of cartridges, but are limited by hardware and software to accessing only 10 or 20.

If Auto Clean is enabled, Column 0, Cell 7, cannot be used for a data cartridge, because a cleaning cartridge must be placed in that cell. Refer to Chapter 5, “Maintaining the Library,” for more information about Auto Clean.

Figure 1-3. Storage Cell Locations



NOTE:
If a drive is NOT installed in DRIVE SLOT 3, two additional storage cells should be installed.

C63064

Figure 1-3, shows the number of the storage cells in each of the three columns. The storage cell layout as a whole is called the "array," and the array targets are used for robotic calibration during initialization. The shaded area (Column 1, Cells 0 through 4) is the location of the removable cartridge magazine.

Removable Five-Cell Cartridge Magazine

A removable five-cell cartridge magazine is included with the TimberWolf 9730 Library. This can be easily taken out, loaded with batch jobs or special applications, and replaced in the library whenever it is required. Extra magazines can be purchased for additional, as-needed storage capacity. Chapter 3, "Handling Cartridge Tapes," diescribes the use of the cartridge magazine.

DLT and SDLT Drives

The 9730 Library can hold four DLT drives (DLT4000 or DLT7000 single-ended or differential) or four SDLT 220 Backward Read Compatible (BRC) drives. The drive slots are numbered 0 through 3 starting from the bottom. If a tape drive is

not installed in slot 3 (fourth from bottom), two cartridge storage cells must be present there or the library will not operate.

Note: Some host software might number the drive slots starting from 1.

Single-ended and differential drives cannot be mixed on the same SCSI bus when using the DLT4000 or DLT7000 drives.

CAUTION:
SDLT drives should not be mixed with DLT drives in the 9730 TimbwerWolf Library. StorageTek will not support mixing drive types in this library.

In the event of a library mechanical failure, or if desired for other reasons, cartridge tapes can be mounted into the tape drives manually, as described in "Mounting a Cartridge into a Drive" in Chapter 5, "Maintaining the Library." Refer to the appropriate DLT or SDLT drive documentation for other information about your drives.

Operator Panel

The library operator panel includes a display for viewing library and tape drive status. The operator panel also includes five function buttons and three LEDs. The function buttons allow access to all of the menus, status displays, machine diagnostics, and error information available for the library.

9730 Library Safety Features

The 9730 Library features a safety interlock switch that shuts off power to the robot if the front door is opened, preventing personal injury and/or damage to the library. Do not attempt to override the safety interlock switch.

Controlling Software

Controlling (host) software resides on the host operating system. Its function is to request tape read, write, and move operations of the library components. The software determines where the cartridge is located by tracking the volume serial number (VOLSER) and cell location during audits. The host software then allocates a tape drive to receive the cartridge for read/write operations. Refer to the documentation that accompanies your software for detailed information.

Figure 1-4. Rear View of the Library

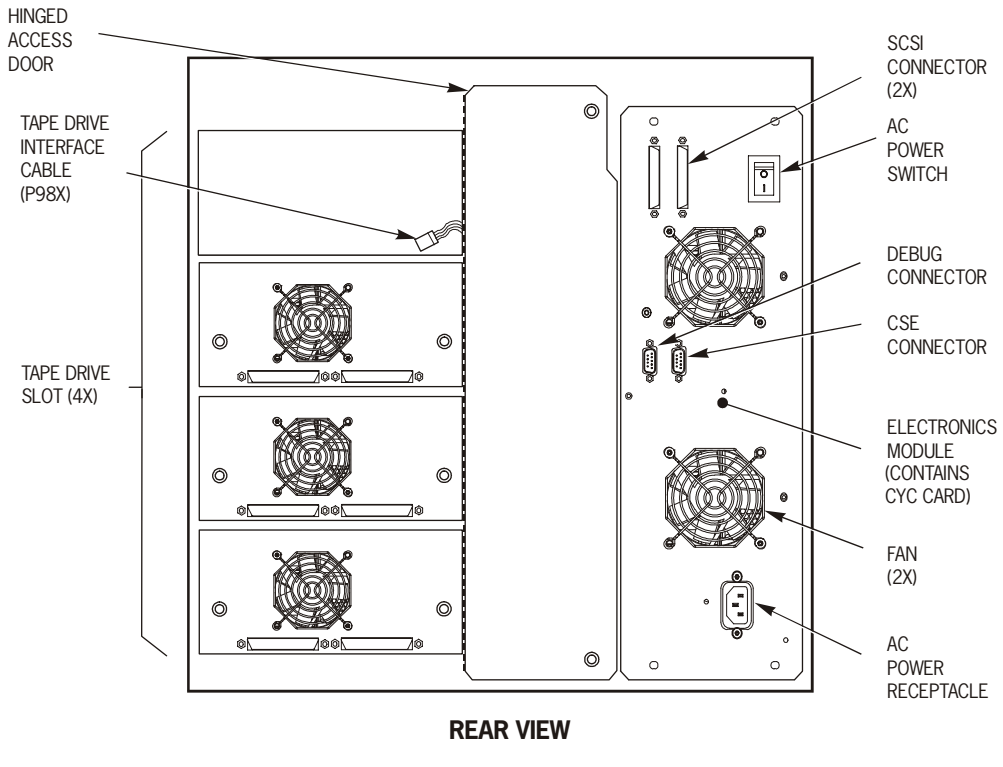


Figure 1-4 shows the rear of the 9730 Library with tape drive slots on the left, the hinged access door in the middle, and the electronics module (EM) on the right.

The power supplies for the tape drives and the AC power outlets for the supplies reside behind the hinged access door.

The EM holds the main processor (CYC card) and power supply for the library. On the rear face of the EM are an AC power switch, the AC power cord receptacle, two fans, two SCSI connectors, a debug connector for diagnostics (for trained technical personnel only), and a CSE connector for loading microcode.

Installing the Library

2

This chapter describes basic installation for the 9730 Library and DLT and SDLT drives. It may be helpful to check off the tasks in this list as you complete them.

Before using the library for the first time, you must also insert cartridge tapes (see Chapter 3, "Handling Cartridge Tapes") and configure it (see Chapter 4, "Getting Started"). Be sure to review the Safety and ESD information in "Safety and ESD" on page xviii before beginning.

- ❑ 1. **Prepare the Installation Location**
- ❑ 2. **Inspect the Library**
- ❑ 3. **Position the Library**
- ❑ 4. **Unpack the Library Interior**
- ❑ 5. **Configure the Electronics Module**
- ❑ 6. **Unpack and Inspect the Tape Drives**
- ❑ 7. **Configure the Tape Drives**
- ❑ 8. **Install the Tape Drives**
- ❑ 9. **Connect the External SCSI Cables**
- ❑ 10. **Connect the Library Power Cord**

In general, these procedures require the following knowledge and tools:

- Basic SCSI principles (bus termination; terminator power; addressing)
- SCSI cable plan for the installation
- SCSI addresses (IDs) already in use by the system
- Chosen SCSI IDs for the devices to be installed (library and tape drives)
- ESD grounding kit
- Screwdriver set
- Diagonal wire cutters
- Flashlight (optional)

Preparing the Installation Location

Complete the following steps to prepare the 9730 Library install location:

- ❑ Be sure the location is clean, dry, level, and ventilated.
- ❑ Allow the following clearances for the library:

Front	50.8 cm (20 in.)
Rear	20.5 cm (8 in.) operating minimum 61 cm (24 in.) minimum for servicing

- ❑ Review your SCSI cable plan and lay out the SCSI cable(s) at the library location.
- ❑ Be sure the location has adequate AC power.
- ❑ If you are installing the library in a rack, allow for the following library dimensions:

Height	445 mm (17.5 in.)
Width	480 mm (19 in.)
Depth	725 mm (28.5 in.)

Guidelines for a Rack

Follow these requirements for rack mounting (up to three libraries per rack):

Rack width	**S**tandard 483 mm (19 in.)
Rack height	1.727 m (68 in.)
Rack depth	762 mm (30 in.) (33 in. if there is a rear door)
Supportable equipment weight	318.3 kg (700 lb.)
Casters (four)	136.4 kg (300 lb.) capacity each
Front and/or rear door (if any)	Louvered for adequate ventilation
Top and bottom	Ventilated
Solid shelf or rails	To support each library (no slides)

A suitable shelf to fit a standard width rack of any depth is available from StorageTek. It includes a matching faceplate in the library color (STK platinum white). Order Part Number 3000599.

Inspecting the Library

After unpacking the library, use the following checklist to inspect it:

- ❑ Check the outside of the library for physical damage such as crushed corners or connectors, bent or scratched panels, or a broken window.
- ❑ Unlock and open the front door and check inside the library for broken or loose parts, using a flashlight if necessary.
- ❑ Verify that the serial number of the library on the rear panel matches the shipping invoice.
- ❑ Verify that the following cables and accessories are present:

  _____ SCSI cables (type and number optional)

  _____ SCSI terminators (optional)

  _____ SCSI adapters (optional)

  _____ AC power cord

  _____ Keys (front library door)

  _____ Manuals

  _____ Tapes and labels (type and number optional)
- ❑ Report any damaged, missing, or incorrect items to your sales rep.

Positioning the Library

Perform the following steps to position the library:

WARNING:
Possible physical injury: **The 9730 Library, with no tape drives, weighs approximately 50 kilograms (110 pounds). Lifting it requires two people.**

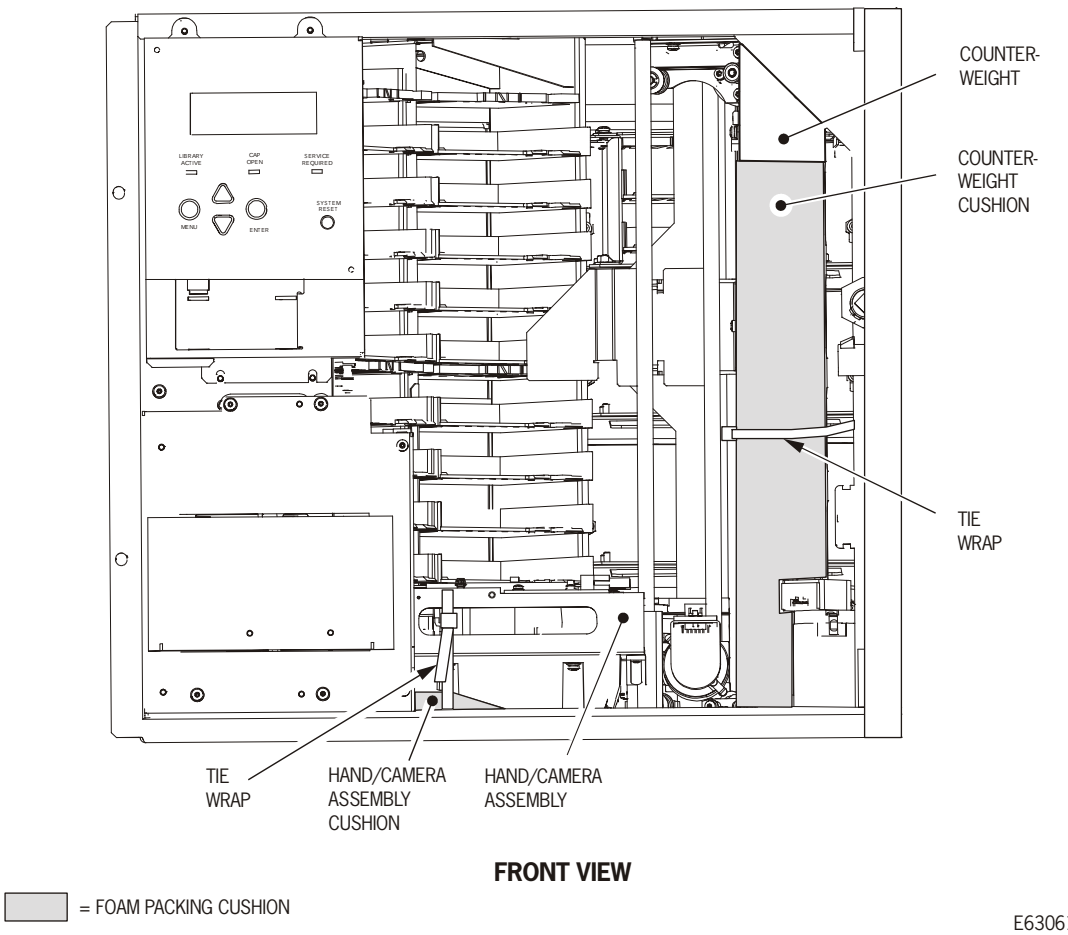
- ❑ Review the Safety Information at the front of this manual.
- ❑ Check the path from the pallet to the location, and clear obstructions.
- ❑ Lift the library from the pallet and put it in place.
- ❑ If a rack is used, screw the front flange of the library to the rack rails.

Unpacking the Library Interior

To unpack the interior of the library, perform the following steps:

- ❑ Locate the key (in the document package) and open the front door.
- ❑ Cut and discard the tie wraps that hold the hand assembly cushion, the counterweight cushion, and the removable magazine cushion, using a diagonal wire cutter. Figure 2-1 shows their locations.
- ❑ Remove the cushions from beneath the hand assembly and the counterweight.

Figure 2-1. Interior Packaging of the Library



Configuring the Electronics Module

The electronics module is equipped with the following options:

- Differential or single-ended alternative (default is differential)
- Terminator power (TERMPWR) ON or OFF (default is TERMPWR ON)

Perform the following steps to verify or change these settings if necessary. Refer to Figure 2-2 on page 2-6 for locations of jumpers and connectors.

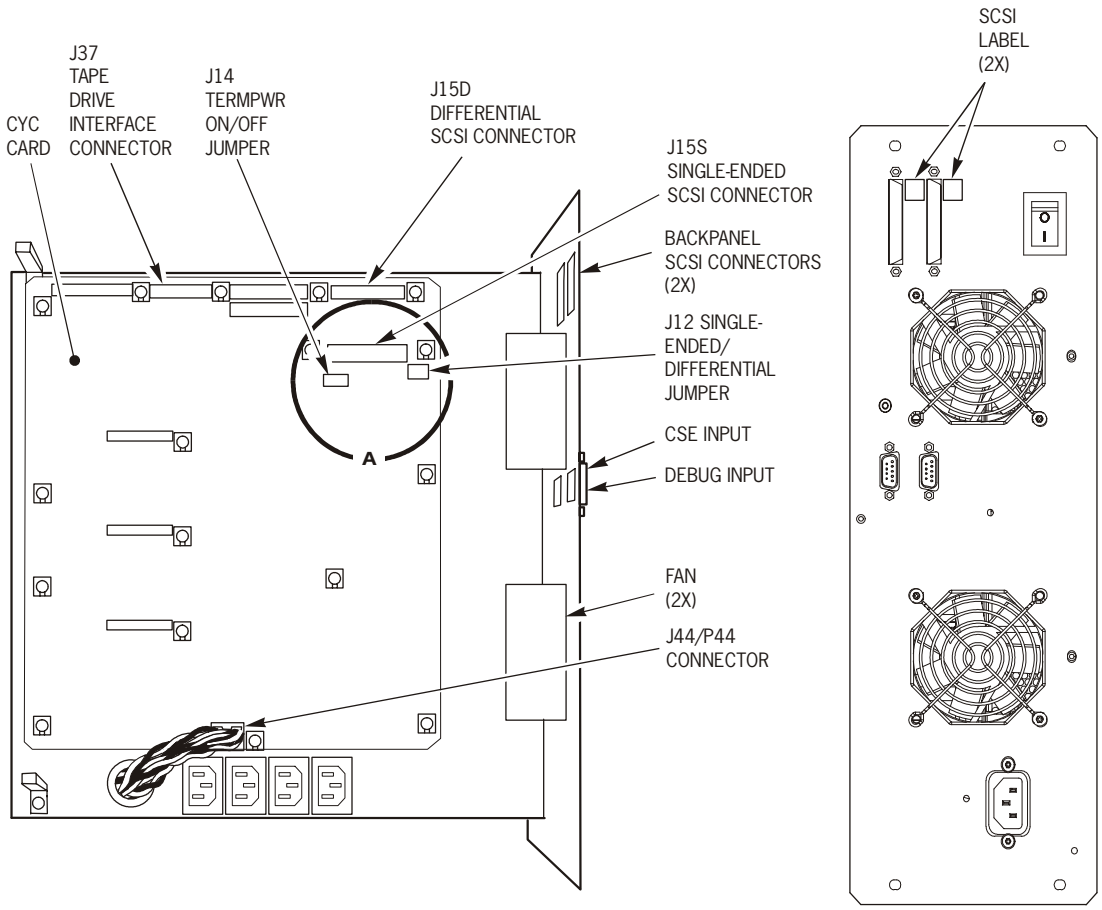
Note: "Bottom," "top," "left," and "right" in these steps refer to the component side of the CYC card, looking at it so the silkscreened words appear upright. Figure 2-2 shows the CYC card in this orientation.

1. Open the hinged access door on the rear of the library.
2. View the component side of the CYC card. Use a flashlight if necessary.
3. Verify the jumper position for the single-ended or differential alternative at connector J12 on the CYC card. The jumper connects the middle row of pins on J12 to one of the following rows:
   - **Differential:** Upper row (toward the top of the CYC card), to the left of the word "DIFF" silkscreened on the CYC card.
   - **Single-ended:** Lower row (below DIFF), to the left of the word "SING" silkscreened on the CYC card.
4. Verify that cables connect the two SCSI sockets on the back panel of the electronics module to one of the following connectors on the CYC card:
   - **Differential:** Connector J15D
   - **Single-ended:** Connector J15S
5. Verify that the two library SCSI ports are labeled correctly (or label them yourself) for single-ended or differential operation.
6. Verify the jumper position for TERMPWR at connector J14. The jumper connects the middle pin of J14 with the one of the following pins:
   - **TERMPWR off:** Left pin (toward the left of the CYC card), near the word "OFF" silkscreened on the CYC card.
   - **TERMPWR on:** Right pin (toward the right of the CYC card), near the word "ON" silkscreened on the CYC card.

   Note: To prevent degradation of performance, devices on both ends of the SCSI bus should supply TERMPWR. No more than three devices total should supply TERMPWR on the SCSI bus.
7. Close the hinged access door.

Note: The SCSI address (ID), an additional configuration option for the electronics module, is set from the operator panel after power on.

Figure 2-2. Electronics Module showing the CYC Card



Unpacking and Inspecting Tape Drives

CAUTION:
***Possible equipment damage:* A pivoting lever (load latch) protrudes forward from the front of the DLT drive. Do not move the load latch up and down unless the drive is powered on and the green "Operate Handle" LED on the drive face is lit (solid, not flashing).**

Unpack and inspect the tape drives:

- ❑ After unpacking the tape drives, check them for damage, such as bent, broken, or loose parts.
- ❑ Verify that model and serial numbers of the tape drives match the shipping invoice.
- ❑ Verify that necessary cables and accessories are present.
- ❑ Report any damaged, missing, or incorrect items to your salesperson or marketing representative.

Configuring Tape Drives

DLT drives are shipped with the following non-selectable configurations. Make sure you have received the correct configuration:

- **DLT4000** or **DLT7000** (manufacturer's model number). Verify this by checking the label, as shown in Figure 2-3 on page 2-8.
- **Differential** or **single-ended**. Verify this by checking the label as shown in Figure 2-3.

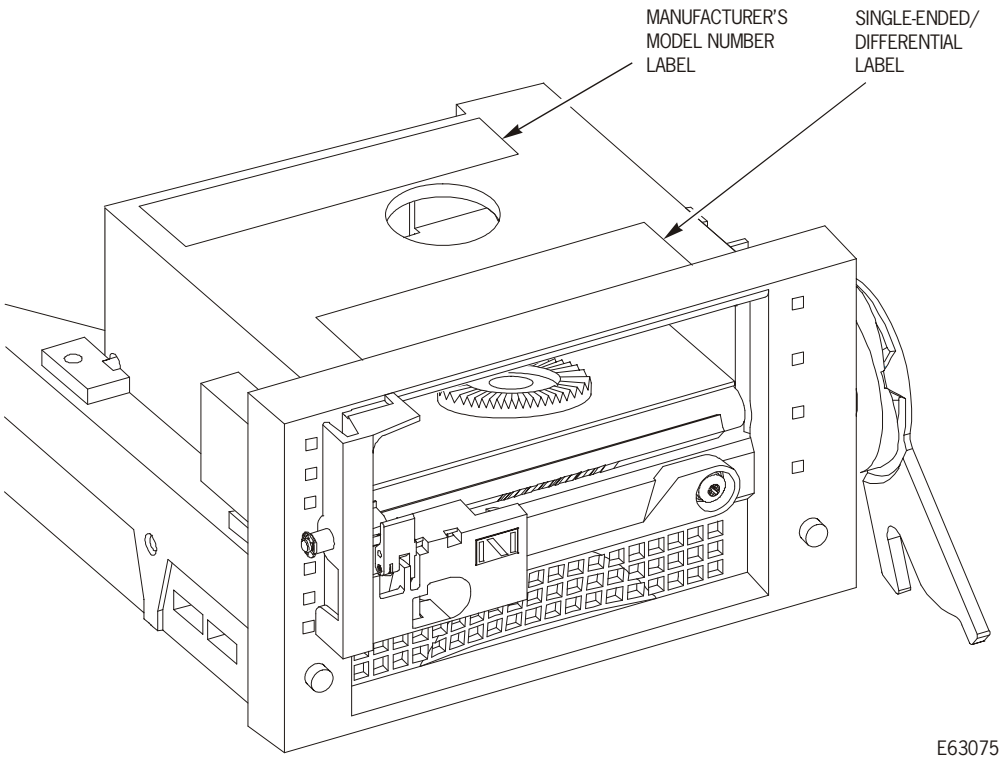
SDLT drives are shipped with the following non-selectable configurations.

- **SDLT 220 BRC** (manufacturer's model number).
- **HVD** only.

The only configuration option the installer sets at this time is TERMPWR on or off. When shipped, the default on drives is TERMPWR on.

Note: SCSI address (ID), an additional configuration option for the tape drives, is set from the operator panel after power on.

Figure 2-3. Tape Drive Configuration Labels



Setting Terminator Power On or Off

CAUTION:
Possible loss of data or degradation of performance: **StorageTek recommends supplying terminator power (TERMPWR) from devices attached at both ends of the SCSI bus. Industry standards state that no more than three devices provide terminator power to the bus.**

❑ Verify whether the TERMPWR is on or off (enabled or disabled) for each tape drive. Figure 2-4 on page 2-9 shows the location of the TERMPWR jumper for the DLT4000 and DLT7000 drives. Figure 2-5 on page 2-10 shows the location of the TERMPWR jumper for SDLT drives.

TERMPWR On: Install the jumper on the pins shown in Figure 2-4.

TERMPWR Off: Remove the jumper from the pins shown in Figure 2-4. You may store the jumper by placing it on one pin only.

Figure 2-4. Location of TERMPWR Jumper for DLT Drives

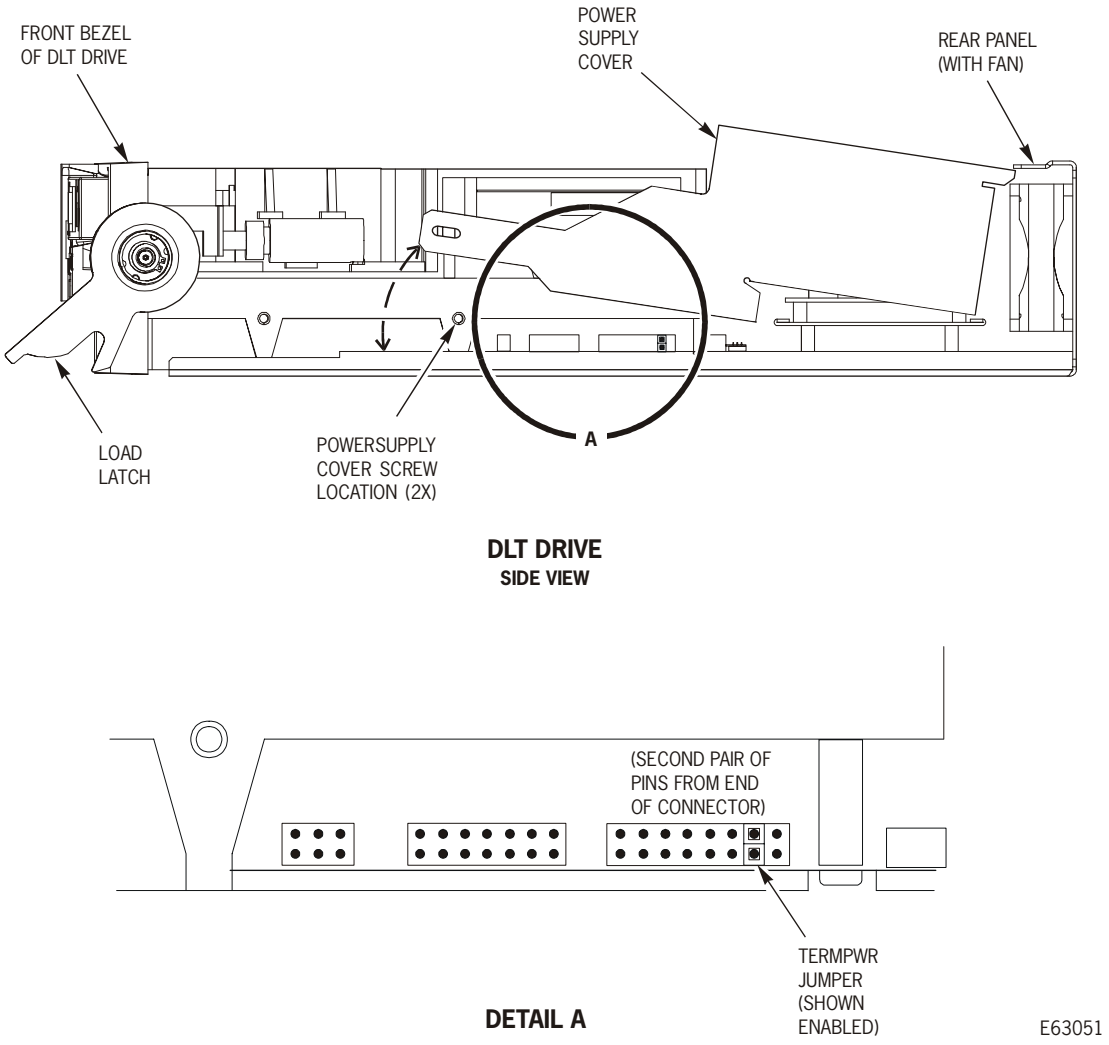
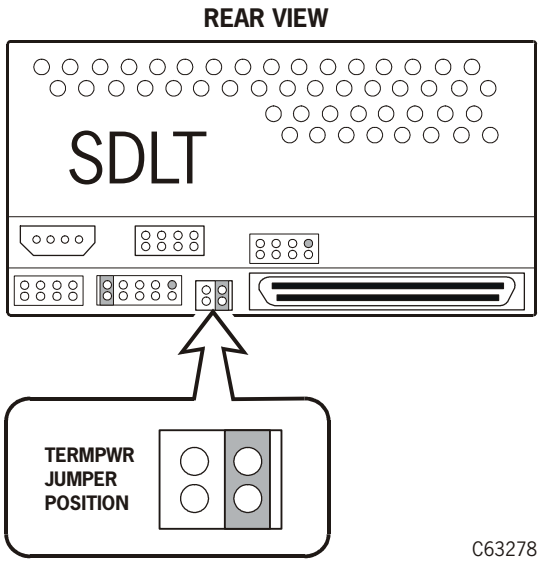


Figure 2-5. Location of TERMPWR Jumper for SDLT Drives



Installing Tape Drives

To install tape drives or add additional tape drives:

❑ Open the hinged access door on the rear of the library. Figure 1-4 on page 1-6 shows the components of the rear of the library.

CAUTION:
Possible equipment damage:

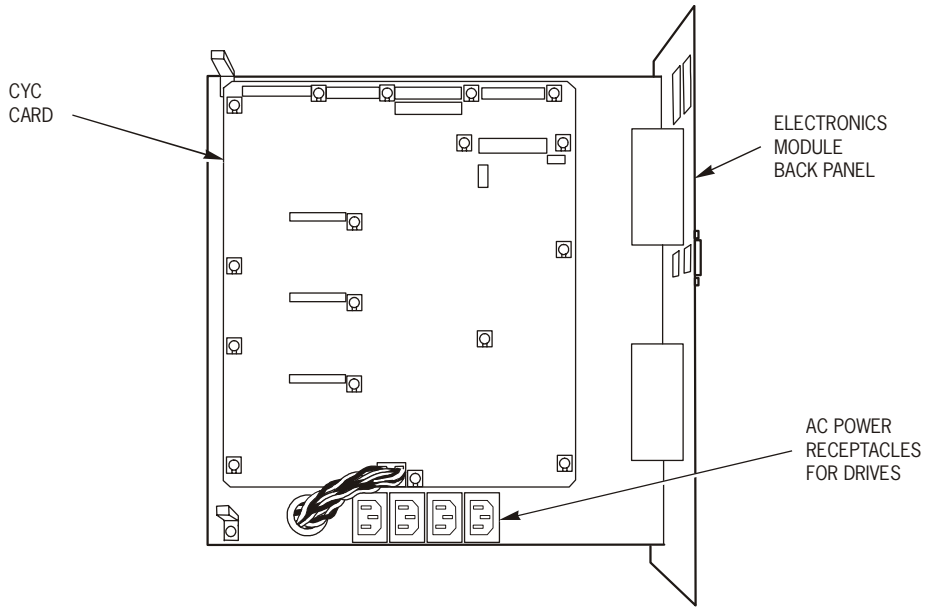
- **Make sure the tape drive interface cables, shown in Figure 2-6 on page 2-12, are out of the way.**
- **Do not move the load latch of a tape drive by hand without power to the drive and the green "Operate Handle" LED on the drive face ON (solid, not flashing). The latch is equipped with a breakaway feature to prevent damage. If the latch breaks away, return it to one of the positions shown in Figure 2-7 on page 2-13.**
- **Do not force a tape drive into a slot.**

❑ Slide each tape drive into its slot, working from bottom to top. Slot 0 is the bottom slot, Slot 3 is at the top.

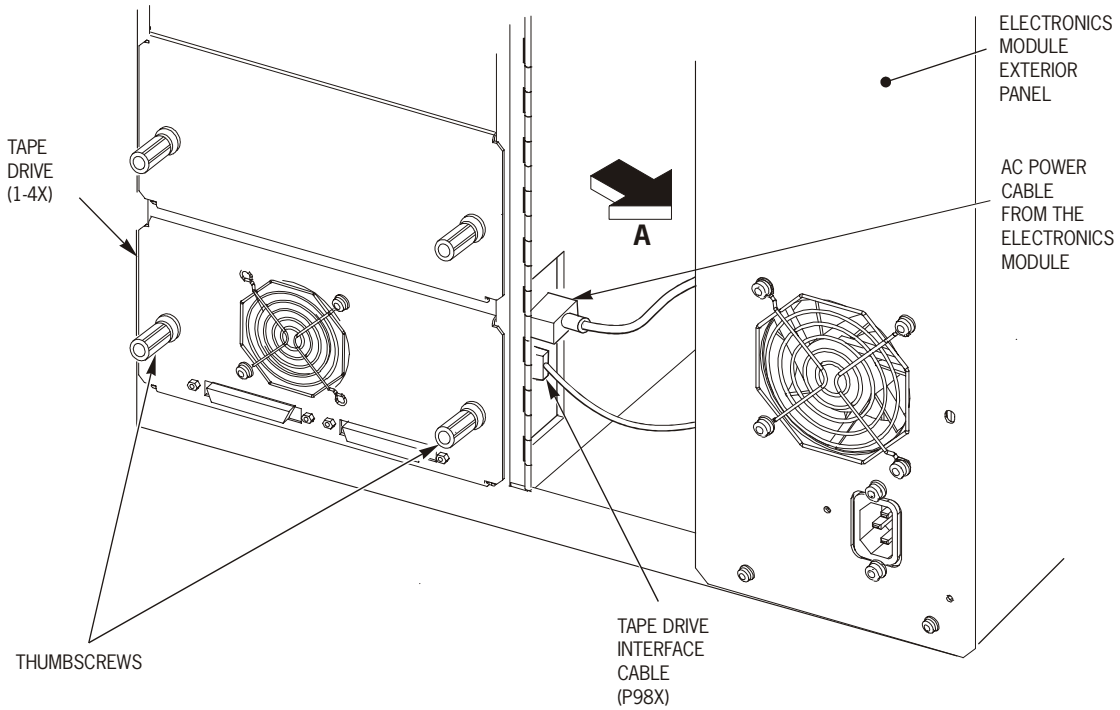
❑ Connect the tape drive interface cable (with connector P98x) to the tape drive interface connector on each tape drive.

❑ Connect a 430 mm (18 in.) internal AC power cable from the AC power connector of each tape drive to the electronics module.

Figure 2-6. Connections between the Electronics Module and the Tape Drives



VIEW A
ELECTRONICS MODULE



REAR VIEW

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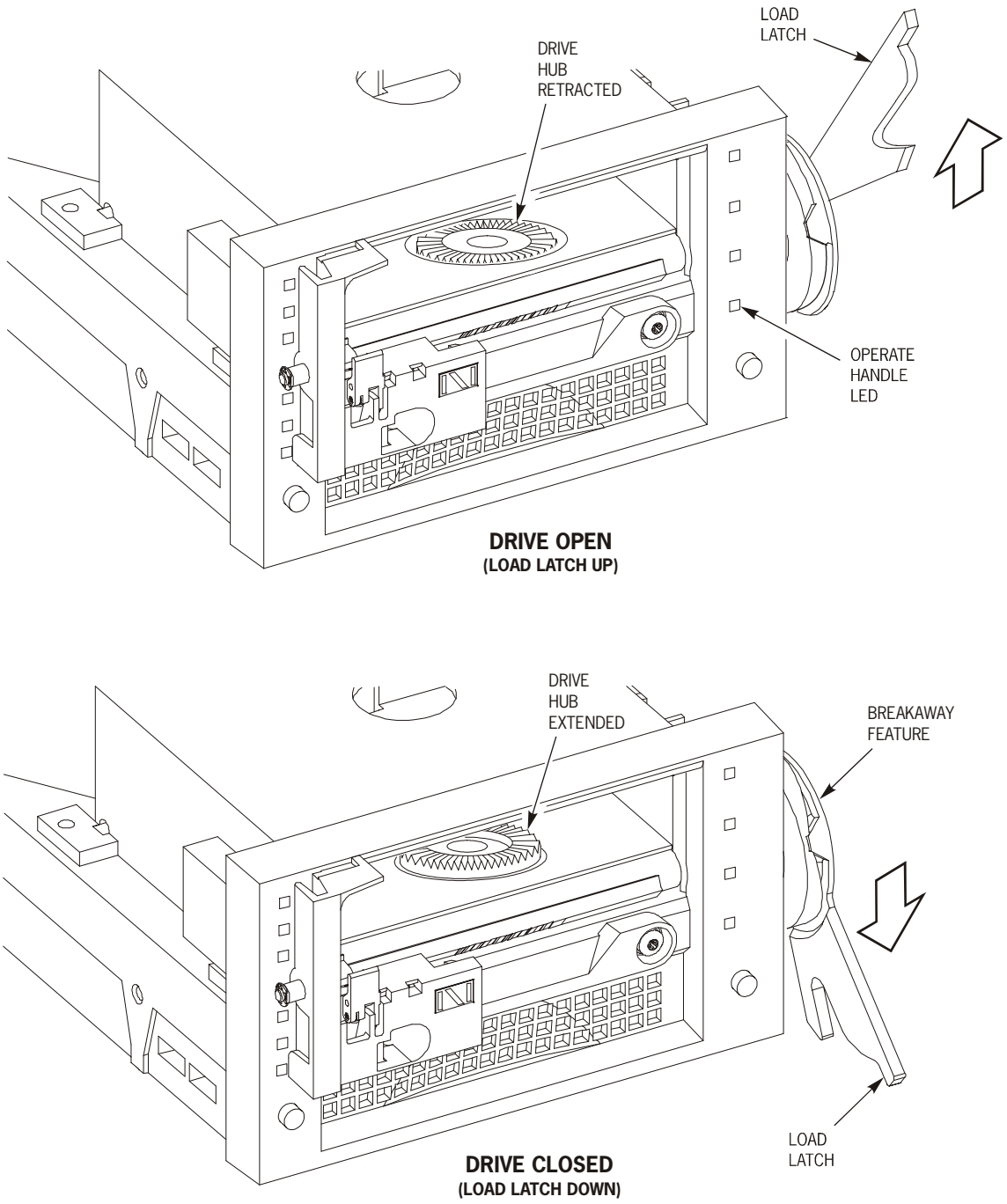
Figure 2-7. Load Latch Positions of the DLT Drive



NOTE:
For clarity, the drives are shown out of the library with no tapes loaded.

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Connecting External SCSI Cables

SCSI cabling will vary according to your desired system configuration. For differential systems, the maximum cable length, including daisy-chain cables, is 25 m (82 ft). For single-ended systems, the maximum cable length is 6 m (20 ft).

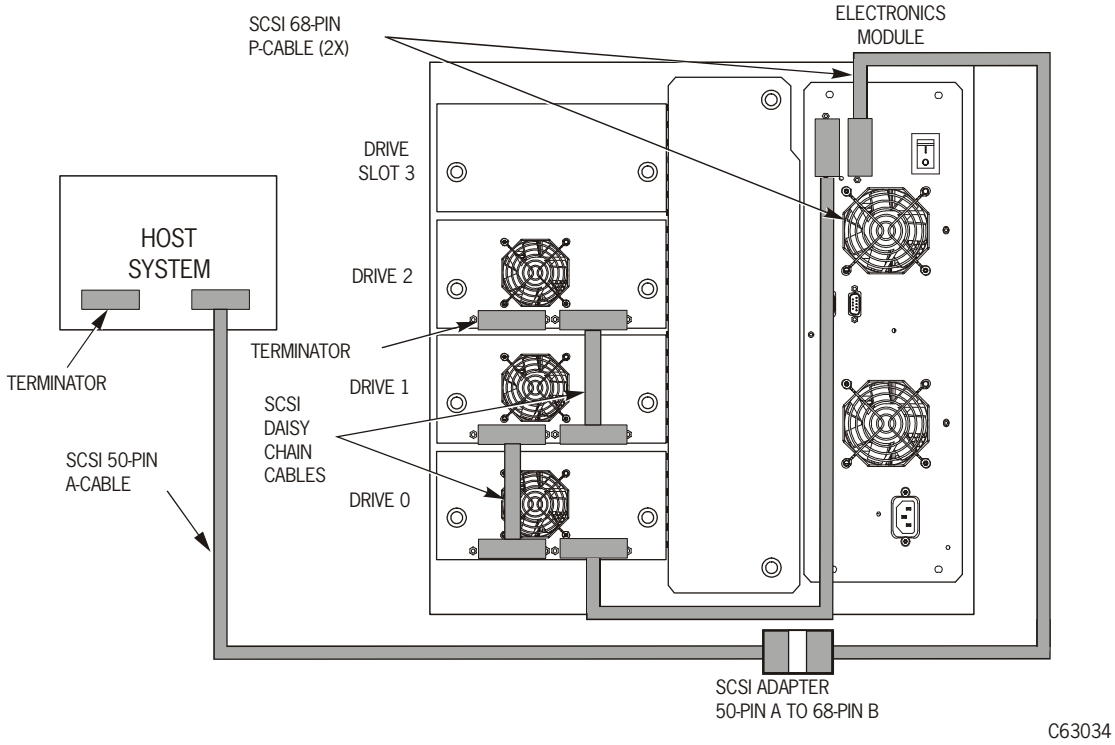
In the simplest system, you will daisy chain the library to the first tape drive, and then daisy-chain all the tape drives, terminating the last one in the chain, as shown in Figure 2-8 on page 2-15. Perform the following steps to connect the external SCSI cables:

- ❑ Be sure there is no activity on the SCSI bus. The host must be inactive.
- ❑ Connect a SCSI cable from the host system to the library electronics module.
- ❑ Connect a SCSI cable (PN 10083600) from the library electronics module to the lower SCSI port on Drive 0 (the bottom drive).
- ❑ Connect a drive daisy-chain cable (PN 10083599) from the upper SCSI port on Drive 0 to the lower SCSI port on Drive 1.
- ❑ Continue daisy chaining the remaining drives in the library.
- ❑ Install a terminator on the upper SCSI port of the last tape drive.

Figure 2-8 on page 2-15 shows an example of this cabling plan.

Note: If you are attaching to a 68-pin SCSI bus at the host, this is a direct connection. If you are attaching to a 50-pin SCSI bus, use an adapter (PN 10148010).

Figure 2-8. A Simple Cabling Plan



The SCSI cabling can be configured any number of ways depending on your requirements and your host system.

Connecting the Library Power Cord

Perform the following steps to connect the external AC power cord, referring to Figure 1-4 on page 1-6 for locations:

- ❑ Make sure the AC power switch is OFF (“O” on the power switch).
- ❑ Plug the AC power cord into the library AC power receptacle.
- ❑ Plug the AC power cord into the AC power source.

If you are using the International Power Cord (PN 10083241), attach an appropriate plug for the country of operation.

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Handling Cartridge Tapes

3

This chapter describes the type of cartridge tapes used by the 9730 Library, how to care for, label, and properly maintain them, and ***how to populate the library with tapes before using it***.

General Information

DLT (digital linear tape) drives use DLTtape IV cartridge tapes for data. DLTtape III and III XT cartridges are also supported, although they have less capacity.

SDLT drives use Super DLTtape I cartridge tapes for data. The BRC SDLT drives are able to READ only (not write) DLTtape IV media written by DLT4000 and DLT7000 tape drives. BRC SDLT tape drives require SDLT media for writing data.

Figure 3-1 on page 3-2 shows the parts of DLTtape and Super DLTtape cartridges.

Observe the following protocols when handling cartridge tapes:

- Keep cartridges clean.
- Inspect cartridges before each use.
- Never put a damaged cartridge into a drive or storage cell.
- Do not open cartridges or release the cartridge latch and pull out tape.
- Do not handle tape that is outside the cartridge.
- Do not expose the tape or cartridge to direct sunlight or moisture.
- Do not expose a recorded cartridge to magnetic fields.

Complete these basic tasks before using the library:

❑ 1. **Apply Cartridge Labels**

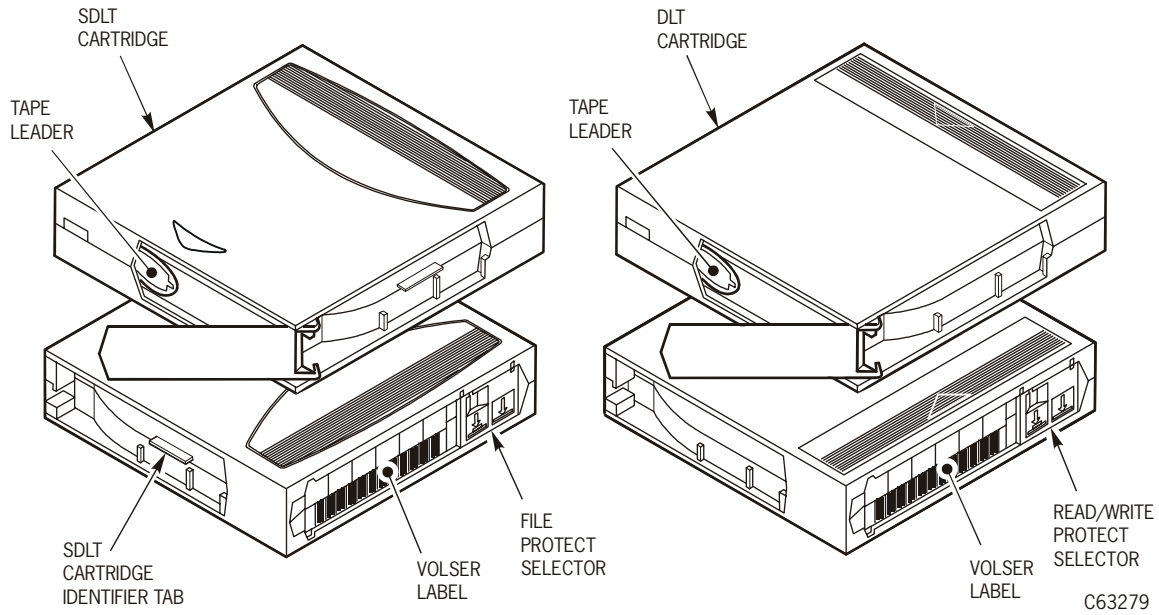
❑ 2. **Set Cartridge Write Protection**

❑ 3. **Populate the Library with Tapes**

Applying Cartridge Labels

Before inserting cartridges into the library in preparation for use, they must have the correct labels. If your cartridges were not ordered with labels applied, apply them yourself, as shown in Figure 3-1 on page 3-2.

Figure 3-1. DLTtape and Super DLTtape Cartridges



Data cartridges have a small letter next to the last number in the VOLSER indicating the type. Cleaning and diagnostic cartridges have a two or three letter prefix in the VOLSER. Correct labeling is:

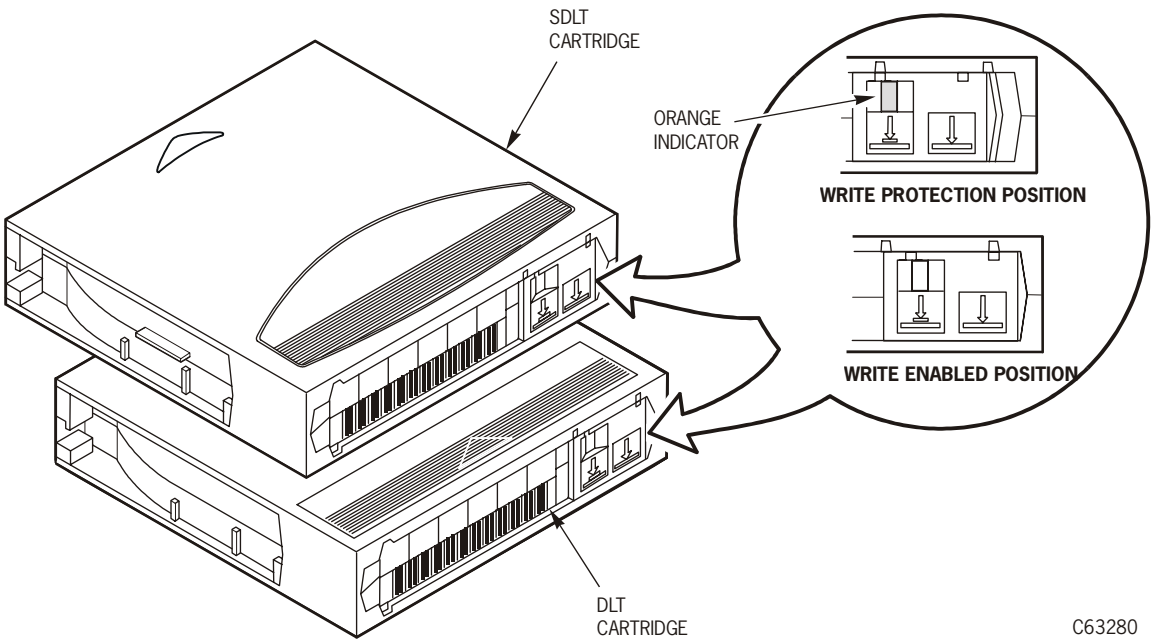
- **DLTtape IV** data cartridges should have a "**D**" label
- **DLTtape III** data cartridges should have a "**C**" label
- **DLTtape IIIXT** data cartridges should have an "**E**" label
- **Cleaning cartridges** should have a "**CLN**" label
- Cartridges used for **diagnostics** should have a "**DG**" label (one supplied with library). It should be applied to an empty (no data) data cartridge and used for diagnostic routines.

The operator is responsible for applying labels correctly, unless tapes were ordered with labels already applied. Insert labels into the recessed area, or peel away the backing for an adhesive application. Do not place labels anywhere but in the VOLSER area, and be sure the edges do not curl, to avoid misreading or sticking.

Setting Cartridge Write Protection

Before populating the library, be sure the write protect switches on the cartridges are set the way you want them. When set to *write-protected*, the drive can only read data from the tape and cannot write data to the tape. When set to *write-enabled,* the drive can read from and write data to the tape. Refer to Figure 3-2 for the location of the write protect switch.

Figure 3-2. Setting the Write-Protect Switch



Populating the Library with Tapes

You must populate the library with cartridge tapes before using it, although it is not necessary to place tapes in every available cell. Note that the removable magazine cannot be used in the 10-cell model.

If you have the **20-cell** model of the library, access is limited to 20 cells. *Use only the following cells:*

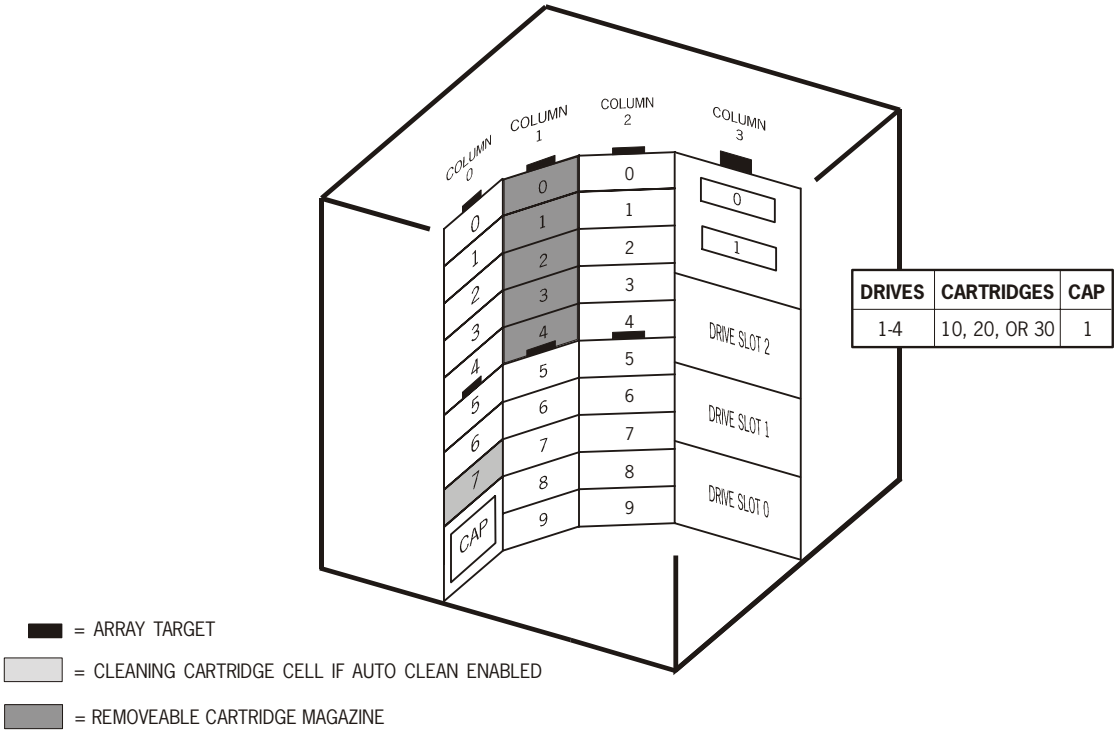
- **Column 0**, the eight-cell column above the cartridge access port
- **Column 1**, the ten-cell column adjacent to the CAP
- **Column 3**, the two cells in the cartridge slot at the top of the column

If you have the **10-cell** library model, *use only these cells:*

- **Column 0**, the eight-cell column above the cartridge access port
- **Column 3**, the two cells in the cartridge slot at the top of the column

Figure 3-3 on page 3-4 shows the location of the storage cells.

Figure 3-3. Location of Storage Cells



NOTE:
If a drive is NOT installed in DRIVE SLOT 3, two additional storage cells should be installed.

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With labels properly applied on cartridges, perform the following steps:

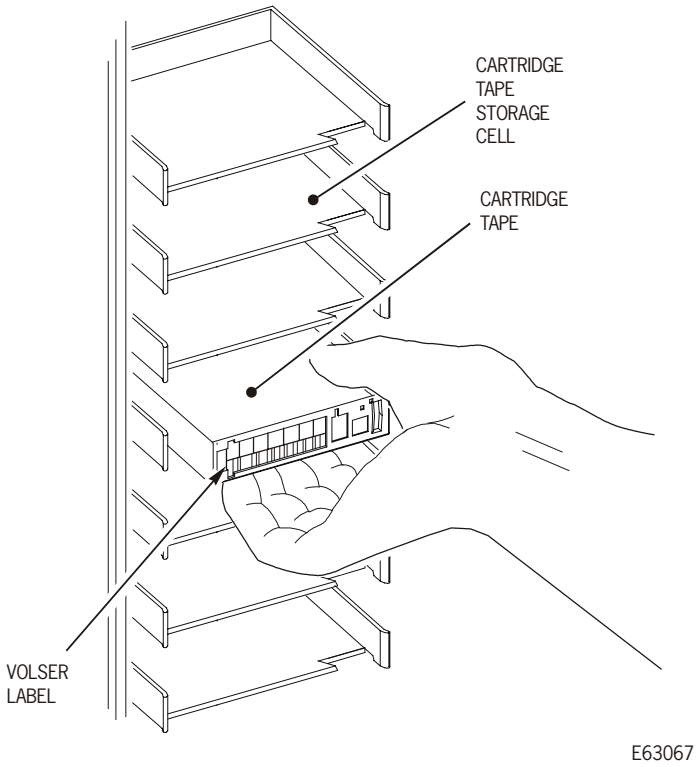
- ❑ Open the front door of the library.
- ❑ In the desired storage cells, insert cartridge tapes hubs down, with the VOLSER label facing out. Figure 3-4 on page 3-5 shows the correct orientation. Slide them in all the way until you feel the cartridge catch on the retainer.
- ❑ Close and lock the front door.

Note: If you are going to use the library's Auto Clean feature, be sure to insert a cleaning cartridge in Column 0, Cell 7. Then, while configuring the library, set Auto Clean ON (see page 4-7) and then set the Clean Limit, which is the maximum number of cleaning cartridge uses (see page 5-10).

With Auto Clean ON, the library displays an asterisk (*) in the upper right corner of the operator panel when the clean limit (as set by the

operator) has been reached. You then “Change the Cleaning Cartridge” (through the CAP) using the Drive Utilities menu (see page 5-10).

Figure 3-4. Orientation of Cartridge Tape

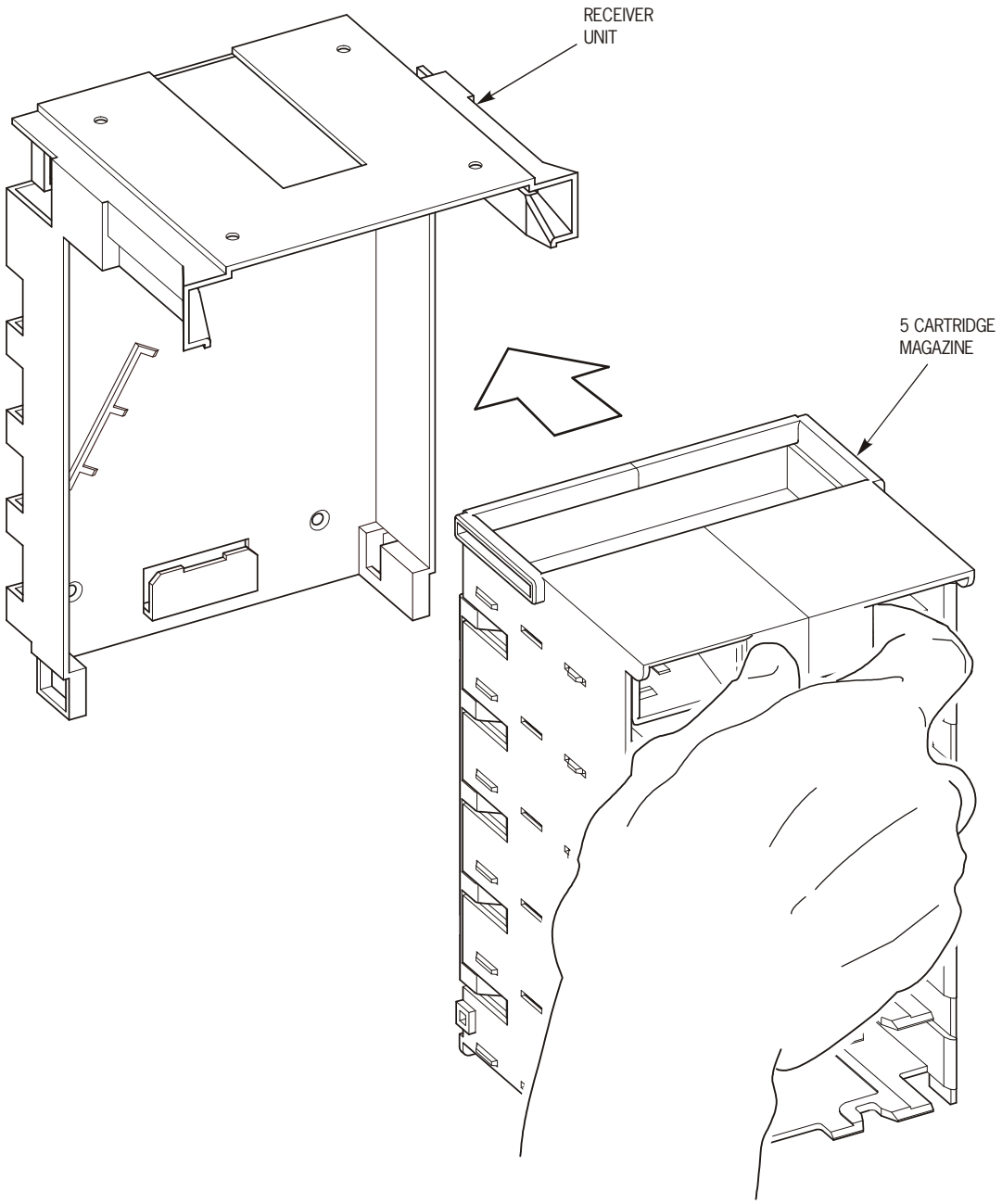


Using the Removable Cartridge Magazine

The five-cell cartridge magazine included in the 9730 Library can be loaded with batch jobs or special applications, and removed from or replaced in the library as needed.

Figure 3-5 on page 3-6 shows the magazine and its receiver unit separate from the library for clarity. To replace the magazine, grasp it as shown and place it straight back into the receiver unit until it seats itself. To remove the magazine, grasp it as shown, *lift it up*, and pull it straight out of the receiver unit.

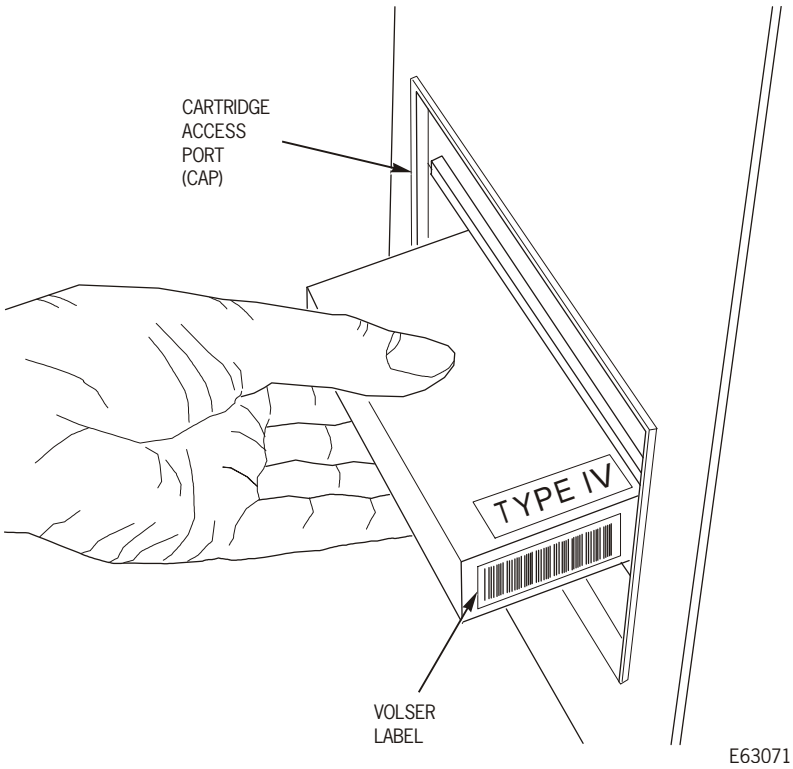
Figure 3-5. Replacing the Five-Cartridge Magazine



Inserting a Cartridge into the CAP

In general, while the 9730 Library is operating in automated mode, the robot mounts and dismounts cartridges to the tape drives automatically on request from the host software. Some manual operations might still be required on occasion, such as inserting or removing cartridges through the CAP.

Figure 3-6. Inserting a Cartridge through the CAP



The procedure for inserting cartridges through the CAP, shown in Figure 3-6, is the same for all types of cartridges. Depending on the operation, the library unlocks the CAP door automatically, or at the operator's command (by pressing ENTER when display reads "`Enter Unlocks CAP`.") When the CAP is unlocked, lift the door to insert the required cartridge.

Insert the cartridge right side up (hub on the bottom) with the VOLSER label to the right. Insert the cartridge all the way into the slot and then close the CAP door by lowering it until it locks.

Removing a Cartridge from the CAP

After the robot has placed a cartridge in the CAP, press ENTER to unlock the CAP door. Open the door, remove the cartridge, and close the door. A small lip in the CAP slot prevents cartridges from slipping out of place. When removing a cartridge, lift it slightly to clear the lip.

Maintaining Cartridge Tapes

It is important to keep your cartridge tapes in good condition. Observe the following tips.

A defective or dirty cartridge tape can damage a drive. If you suspect a problem with a cartridge, inspect it for these defects:

- Cracked or broken cartridge
- Broken cartridge access door
- Damaged file-protect selector
- Labels not firmly or neatly attached

Wipe all dust, dirt, and moisture from the cartridge with a lint-free cloth.

Use StorageTek Tape Cleaner Wipes, PN 4046289-01. These wipes contain isopropyl alcohol. Keep the solution from touching the tape.

CAUTION:
Possible tape damage: **Do not use acetone, trichloroethane, toluene, xylene, benzene, ketone, methylethyl ketone, methylene chloride, ethyldichloride, esters, ethyl acetate, or similar chemicals to clean cartridges.**

Follow these practices when storing cartridges:

- Leave cartridges in their protective wrapping. (When using a cartridge, remove its wrapping using the tear string, not sharp instruments.)
- Make sure the storage environment is clean and conditions are similar to the operating environment.
- Before using tapes, keep them in their operating environment for 24 hours.

Getting Started

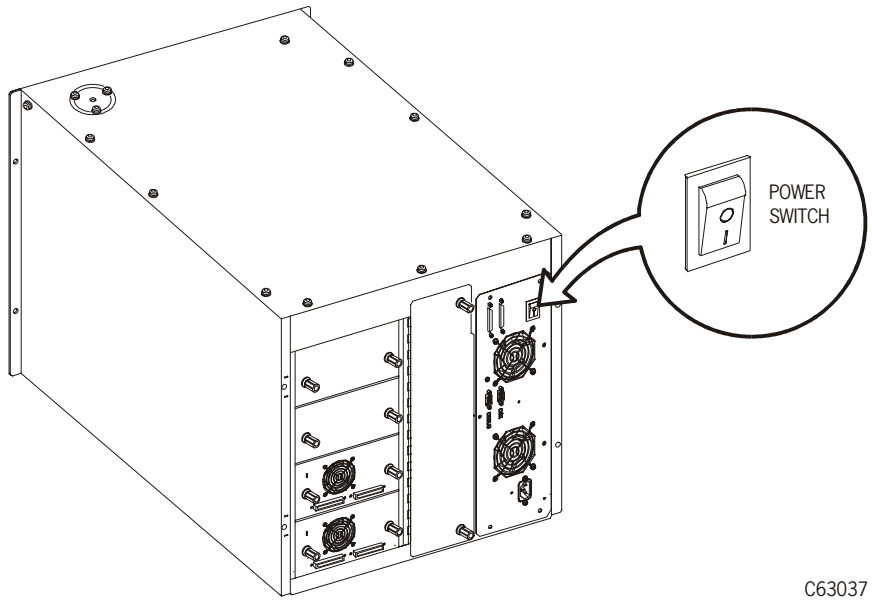
4

This chapter contains instructions for powering on the 9730 Library, accessing library functions from the operator panel, and configuring the library. ***You must configure the library before using it.***

Powering On the Library

The 9730 Library power switch is on the upper right rear of the unit, as shown in Figure 4-1. "|" is ON and "O" is OFF.

Figure 4-1. 9730 Library Rear View Showing Power Switch



When you power on or reset the library, it performs a complete diagnostic routine and a tape audit. If the front door is opened and closed while power is on, the library performs the same routines (except retargeting to cells). During these operations, the library displays its current activity on the operator panel display.

After the library completes its startup routine, the operator panel *Status Display* shows current library and drive status information. To go to the *Main* menu, press the MENU button.

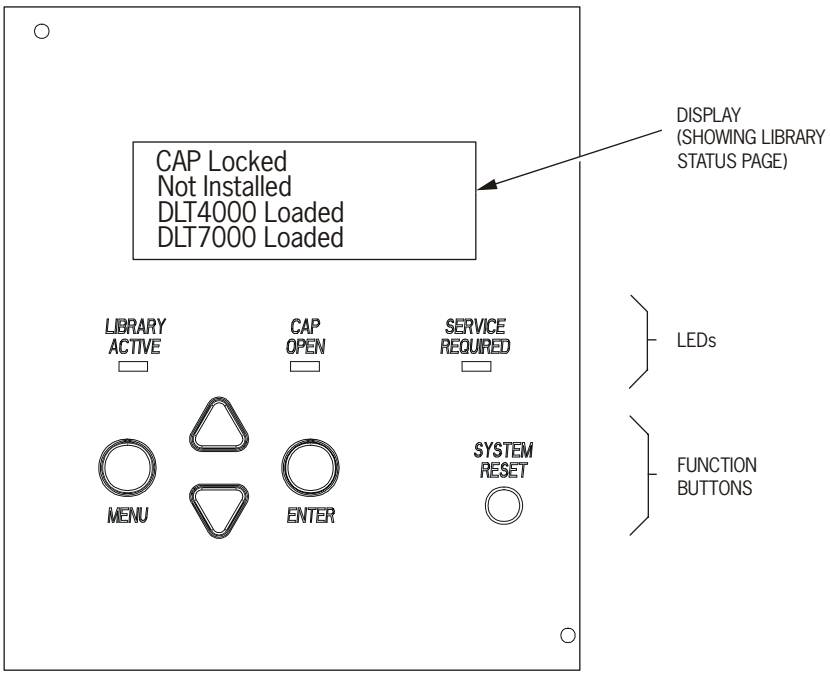
CAUTION:
As part of the startup/reboot routine, the display briefly (for about 10 seconds) shows software version numbers and the message "`MENU available`." *Do not* press MENU at this time. The functions available here, such as loading microcode, are for use by qualified service personnel only. The routine will automatically continue in a few seconds.

Using the Operator Panel

The operator panel includes a four-line, 20-character per line, backlit display for viewing library and tape drive status. The operator panel also includes five function buttons and three light-emitting diodes (LEDs). The function buttons allow access to all the menus, status displays, machine diagnostics, and error information available for the library.

Figure 4-2 shows the operator panel with a typical *Status Display* visible.

Figure 4-2. 9730 Library Operator Panel



Operator Panel Controls

The operator panel has five function buttons:

MENU The MENU button toggles the display between the *Main* menu and the *Status Display*. The MENU button calls up the previous (higher-level) menu if the machine displays one of the nested menus.

ENTER The ENTER button has two functions:

- - Selects the option indicated by the menu cursor (>).
- - Opens the cartridge access port (CAP) when enabled.

▲ ▼ The Up (▲) and Down (▼) arrow buttons control the menu cursor for scrolling among options.

SYSTEM RESET The recessed SYSTEM RESET button allows the operator to reset the library (stop machine operation and reinitialize the library) without affecting tape drive operation or erasing the current library configuration.

Operator Panel LEDs

The operator panel has three LEDs:

Library Active The green *Library Active* LED is lit during initialization, then flashes when the processor card is active.

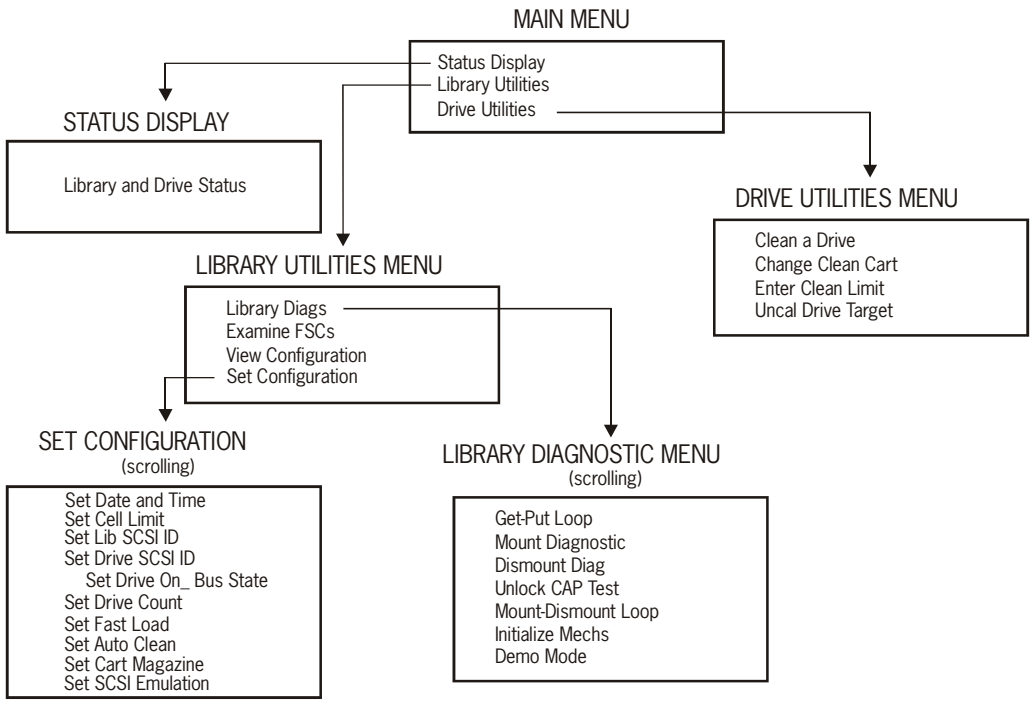
CAP Open The amber *CAP Open* LED is lit when the CAP door is unlocked and ready for access.

Service Required The red *Service Required* LED is lit when operator intervention is required before the machine can be used further. Check the *Status Display* for indication of the problem.

Menus and Displays

Figure 4-3 shows the hierarchy of menus.

Figure 4-3. Operator Panel Menu Flow Chart



To select an item, move the cursor using the up or down arrows until it points to the item, and press ENTER. To return to a higher-level menu, press MENU.

Main Menu

```
> Status Display
  Library Utilities
  Drive Utilities
```

Status Display Shows the current library and tape drive status.

Library Utilities Provides library diagnostics, error and configuration information, and sets library configuration. (Discussed in Chapter 5, “Maintaining the Library.”)

Drive Utilities Provides choices for cleaning the tape drives. (Discussed in Chapter 5, “Maintaining the Library.”)

Status Display

When the *Status Display* is visible, the first line (library status line) shows the state of the CAP. The three normal CAP states are:

CAP Locked, No Entry	The CAP cannot be used.
ENTER Unlocks CAP	The CAP can be unlocked by pressing ENTER.
CAP Unlocked	The CAP is ready to be opened and used.

The remaining three lines of the *Status Display* show information about the tape drives, including current operational status. The library displays the following possible messages for current drive operational status:

Unit Check	Hardware error condition reported, or drive handle not lowered
Ready	Drive is ready
Rewinding	Tape in the drive is rewinding
Loaded	A cartridge tape is loaded in the drive
Cleaning Req	The drive needs cleaning
Cleaning	The drive is being cleaned
Unloading	The library is removing a tape from the drive
Loading	The library is loading a tape into the drive
Unloaded	No cartridge tape is loaded in the drive
Not Talking	An installed drive is not communicating with the library
Not Installed	No tape drive is installed in the drive slot

A typical status display looks like the example below.

```
CAP Locked
Drive 2 Not Installed
Drive 1 Loaded
Drive 0 Unloaded
```

In this example, the message lines indicate:

(Line 1) The cartridge access port is locked.

(Line 2) Drive Slot 2 is empty (third slot from bottom in the library).

(Line 3) Drive Slot 1 (second from bottom) drive is loaded with a tape.

(Line 4) Drive Slot 0 (bottom) tape drive is not loaded with a tape.

Note: If the library contains four drives, you can see the status of the fourth drive by pressing the up arrow (▲) on the operator panel to scroll.

Configuring the Library

You must configure the library before using it for the first time. This is done using the operator panel. The parameters to be set are:

- Drive count
- SCSI ID for the library
- SCSI IDs for the tape drives
- Date and time
- On- or off-bus status for the tape drives
- Cell limit
- Fast load option
- Auto clean option
- Removable cartridge magazine feature
- SCSI emulation option

To configure the library:

1. Press MENU to display the *Main* menu.
2. On the *Main* menu, move the cursor to *Library Utilities* and press ENTER to display the *Library Utilities* menu.
3. On the *Library Utilities* menu, move the cursor to *Set Configuration* and press ENTER to display the *Set Configuration* menu.
4. Move the cursor to the item you want to configure and press ENTER. The operator panel displays detailed prompts to assist you.

Note: The following list presents the *Set Configuration* menu options in the order in which you should perform them when doing the initial configuration, rather than the order in which they appear on the menu. You may check off the items as you finish them.

1. Set Drive Count

Enter the number of tape drives installed in the library: Setting this first ensures that the library prompts you to set the SCSI IDs for all the drives present. When first set or later changed, the system prompts for reset before exiting *Set Configuration*.

2. Set Lib SCSI ID

Set the SCSI ID for the library (electronics module): Avoid using duplicate or reserved IDs. (When set or changed, the system prompts for reset before exiting.)

3. Set Drive SCSI ID

Set the SCSI ID for each tape drive: Avoid using duplicate or reserved IDs.

Set Drive On_Bus State: Inform the library whether or not a tape drive is on the same SCSI bus as the library.

4. Set Date and Time

Set Date and Time: Set the day, date, and time. This assists in diagnosing errors and fault symptom codes.

5. Set Cell Limit

Set the library to 10-, 20-, or 30-cell operation: This setting should match the hardware configuration of your library.

Note: Attempting to set a 10- or 20-cell library to 30-cell operation will not work unless you install the required hardware upgrade.

6. Set Fast Load

ENABLE or DISABLE the Fast Load option: Fast load enables the robot to proceed without waiting for load confirmation from a tape drive. ENABLED is recommended, unless your host software provider requires an exception.

7. Set Auto Clean

ENABLE or DISABLE the Auto Clean option: When enabled, a cleaning cartridge must be kept in Column 0, Cell 7 of the library. The library will automatically retrieve and insert the cleaning cartridge when required. When first set or later changed, the system prompts for reset before exiting *Set Configuration*. (Auto Clean is not supported by all third-party host software. Check with your software vendor to be sure.)

Note: If you enable Auto Clean, you must also enter the Clean Limit (maximum number of uses of the cleaning cartridge). Do this after you finish configuring the library, by using the Drive Utilities menu, as described on page 5-10.

The library counts how many times it has used the cleaning cartridge. When it is expired (based on the Clean Limit you set) the library displays an asterisk (*) in the top right corner of the operator panel. You can then change the cleaning cartridge, using the Drive Utilities menu described on page 5-10.

Note: Quantum does not support a cleaning tape for the SDLT 220 at this time. For more information on this topic, please visit www.quantum.com.

8. Set Cart Magazine

Indicate whether the removable magazine feature is INSTALLED or NOT INSTALLED.

Note: Configuring this feature as "installed" on a machine that does not have it will prevent the library from booting properly.

9. Set SCSI Emulation

Set NORMAL or EXTENDED emulation mode: Use the extended mode for host software packages that require the library to report the three additional conditions–CAP Open, Door Open, and Maintenance Mode.

10. Finishing the Configuration

When you are finished setting the listed parameters, press MENU. If this was the initial configuration or if you have later changed the Library SCSI ID, the Drive Count, or the Auto Clean option, the following message appears on the display:

New configuration requires mach reset. Push SYSTEM RESET.

Push SYSTEM RESET at this time. The library re-initializes and the operator panel shows the *Status Display*.

If you are not required to reset the library, continue to press MENU until you return to the *Status Display* or the *Main* menu.

The library is now ready to use.

Recording Library Data

When maintaining or servicing the library at a later date, it helps to have the configuration information recorded on paper. A table on page *ii* has been created for this purpose. Write down the values you set in the configuration procedure.

Give the library manuals and front door keys to the appropriate person.

Maintaining the Library

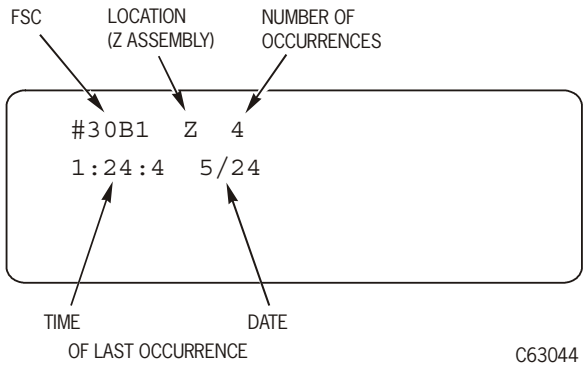
5

This chapter contains trouble isolation procedures (TIPs), explanations of library and drive utilities, and procedures for loading microcode and performing other occasionally necessary operations.

Examining FSCs

Most faults detected in the library result in a fault symptom code (FSC). If you have a problem and know the FSC, you can replace the suggested field replaceable units (FRUs) listed for that code.

The *Examine FSCs* menu option allows the operator to view the last 20 FSCs. An example of the FSC display is shown below.



To examine FSCs, select the *Library Utilities* menu on the operator panel, and then select *Examine FSCs*. Use the arrow buttons to scroll the lines of the display.

A listing of FSCs and their meanings is found on the microcode floppy that comes with the library, under the filename `FSC.DOS`. Use a word processing or text program to open this file.

Trouble Isolation Procedures

Sometimes a fault exists without any indication of an FSC, such as:

- A power problem
- A display problem
- An interface problem
- An intermittent or performance problem

The following TIPs are guidelines to help diagnose and fix these problems and others with no associated FSC.

Each TIP begins with a summary of symptoms and their possible causes, followed by step-by-step instructions to help isolate the problem. Always start with TIP 0000 to direct you to the correct procedure.

TIP 0000: START

The START TIP is the beginning point for all of the following 9730 Library TIPs. Whenever a problem occurs and no FSC is displayed, begin the trouble isolation process here to help isolate and fix the problem.

Problem	Conditions That Could Cause This Problem
You detect a failure, suspect a problem with the library or tape drives.	• You detect power problems in the library. • The operator panel shows no display. • The operating system does not recognize the library or tape drives. • You observe an abnormal condition with the library or tape drive.

1.	Do you have a power problem?	**Yes:**	Go to "TIP 1000: Power" on page 5-3.
		No:	Go to Step 2.
2.	Do you have a problem with the operator panel?	**Yes:**	Go to "TIP 2000: Operator Panel" on page 5-6.
		No:	Go to Step 3.
3.	Do you have a problem where the operating system cannot access the library or tape drives?	**Yes:**	Go to TIP "TIP 3000: SCSI Interface" on page 5-7.
		No:	Go to Step 4.
4.	If you are uncertain, run diagnostic tests on the library and the drives.	Refer to the explanations of "Library Utilities" on page 5-8 and "Drive Utilities" on page 5-10.	

TIP 1000: Power

TIP 1000 is the starting point for power problems in the 9730 Library.

Symptom Explantion	Conditions That Could Cause This Problem
You detect power problems in some part of the library.	• Switches, cables, or connections are faulty • Power supply (on the electronics module) is faulty • Tape drive power supply is faulty • Input power has problems

WARNING:
Possible physical injury: **Observe the precautions in "Safety and ESD" on page xviii when working with voltage in the 9730 Library, tape drives, and with input line voltage.**

1. Is there a problem with library power?	**Yes:**	Go to "TIP 1010: Library Power Problems" on page 5-4.
	No:	Go to Step 2.
2. Is there a problem with tape drive power?	**Yes:**	Go to "TIP 1020: Tape Drive" on page 5-5.
	No:	Go to Step 3.
3. Is there a display problem with operator panel power?	**Yes:**	Go to "TIP 2000: Operator Panel" on page 5-6.

TIP 1010: Library Power Problems

Use this TIP to troubleshoot and repair power problems with the library.

Symptom Explanation	Conditions That Could Cause This Problem
The library does not power on.	• Electronics module is faulty • Power cable connection is loose or faulty • Library power switch is faulty • Customer supplied power is missing

WARNING:
Possible physical injury: **Observe the precautions in "Safety and ESD" on page xviii when working with voltage in the 9730 Library, tape drives, and with input line voltage.**

1. Is the power switch on?	**Yes:**	Go to Step 2.
	No:	Turn on the power switch.
2. Is the power cord properly seated in the library and in the input?	**Yes:**	Go to Step 3.
	No:	Turn off the power switch. Reseat the AC power cord at the back of the library and at the AC wall outlet. Turn on the power switch.
3. Is the input power circuit breaker ON in the building or room?	**Yes:**	Go to Step 4.
	No:	Reset the circuit breaker.
4. Are the library fans turning?	**Yes:**	Go to Step 5.
	No:	Replace the electronics module.
5. Are there any displays or lit LEDS on the operator panel?	**Yes:**	Go to Step 6.
	No:	Replace the operator panel.
6. Place a service call.		

TIP 1020: Tape Drive

Use this TIP to troubleshoot and repair power problems with the tape drive.

Symptom Explanation	Conditions That Could Cause This Problem
A tape drive does not power on.	• Cable connection between the drive power supply and the tape drive is faulty • Drive power supply is defective • Electronics module power supply is faulty

WARNING:
Possible physical injury: **DO NOT TOUCH any components on the power supply located within the electronics module. Voltage could be present even though the library is powered off.**

1. Is only one of the drives not powered on?	**Yes:**	Go to Step 3.
	No:	Plug the drive power cable into a different drive power receptacle on the electronics module. If it works, but the power receptacle cannot be used for this drive, go to Step 4.
2. Are all drives powered off?	**Yes:**	Go to Step 3.
	No:	Turn off the library power switch. Reseat the AC power cable connector at the back of the library and in the AC wall outlet. Turn on the library power switch.
3. Is your input power circuit breaker in the correct position?	**Yes:**	Go to Step 4.
	No:	Reset the circuit breaker.
4. Is the electronics module working?	**Yes:**	Go to Step 5.
	No:	Replace the electronics module.
5. Place a service call.		

TIP 2000: Operator Panel

Use this TIP to troubleshoot and repair problems with the operator panel.

Symptom Explanation	Conditions That Could Cause This Problem
No display on the operator panel.	• Cable connections between the electronics module and the operator panel are faulty • Cable connections between the signal cable and the operator panel are faulty • Operator panel is defective • Electronics module is defective

WARNING:
Possible physical injury: **DO NOT TOUCH any components on the power supply located within the electronics module. Voltage could be present even if powered off.**

1. Is the power switch on?	**Yes:**	Go to Step 2.
	No:	Turn on the power switch.
2. Is the power cable properly seated in the library and at the power source?	**Yes:**	Go to Step 3.
	No:	Turn off the power switch. Reseat the AC power cable connector at the back of the library and at the AC power source. Turn on the power switch.
3. Is the input power circuit breaker on?	**Yes:**	Go to Step 4.
	No:	Reset the circuit breaker.
4. Are the library fans turning?	**Yes:**	Go to Step 5.
	No:	Replace the electronics module.
5. Are all of the connectors on the CYC card seated?	**Yes:**	Go to Step 6.
	No:	Seat the connectors.
6. Are any displays or LEDS showing on the operator panel?	**Yes:**	Go to Step 7.
	No:	Replace the operator panel.
7. Is the operator panel power connector properly seated at the operator panel?	**Yes:**	Go to Step 8.
	No:	Reseat the DC power connector at the operator panel.
8. Place a service call.		

TIP 3000: SCSI Interface

Use this TIP to troubleshoot and repair problems with the SCSI interface.

Symptom Explanation	Conditions That Could Cause This Problem
The operating system does not recognize the library or the tape drives.	• SCSI cables might be loose • SCSI terminators might be missing or loose • The SCSI terminator might not be at the end of the bus or more than two terminators might be present • The SCSI bus might be too long • The SCSI bus might have too many devices • Your system might not be configured to recognize the library or tape drive SCSI IDs

1. Are the SCSI cables properly connected?	**Yes:**	Go to Step 2.
	No:	Reseat the connectors.
2. Are there SCSI terminators at both ends of the bus?	**Yes:**	Go to Step 3.
	No:	Add SCSI terminators. Differential (PN 10148003) Single-ended (PN 10148002)
3. Are there more than two terminators present?	**Yes:**	Go to Step 4.
	No:	Remove extra terminators (the maximum is two).
4. Is the length of the SCSI bus within specification?	**Yes:**	Go to Step 5.
	No:	Connect a shorter SCSI cable.
5. Does the SCSI bus have more than the maximum permitted number of devices?	**Yes:**	Go to Step 6.
	No:	Check the library and drive configurations for valid IDs.
6. Is the system configured to recognize the tape drives?	**Yes:**	Go to Step 7.
	No:	Reset the tape drive SCSI IDs.
7. Is the system configured to recognize the library?	**Yes:**	Go to Step 8.
	No:	Reset the library SCSI ID.
8. Place a service call.		

Library Utilities

You can make the following selections from the *Library Utilities* menu to display diagnostic, error, and configuration options:

Library Diags	Accesses diagnostic routines for the library
Examine FSCs	Displays the last 20 fault symptom codes (discussed previously in this chapter)
View Configuration	Displays the current library configuration
Set Configuration	Accesses library configuration options (discussed in Chapter 4, "Getting Started")

Library Diagnostics

Running library diagnostic routines can help diagnose faults, which may then be recorded by the library as FSCs. You can select the following diagnostic routines from the *Library Diags* menu:

Get-Put Loop	Robot removes diagnostic tape from CAP, moves, returns tape to CAP
Mount Diagnostic	Robot mounts diagnostic tape to a specified drive
Dismount Diag	Robot dismounts diagnostic tape from a specified drive
Unlock CAP Test	Robot unlocks the CAP and prompts operator to open and close the CAP to complete the test
Mount-Dismnt Loop	Robot mounts and dismounts a tape to a drive
Initialize Mechs	Initializes the library and performs an audit
Demo Mode	Robot makes random moves (You must have at least one data cartridge in the library and at least one empty cell.)

CAUTION:
***Audit required*—Demo mode shuffles cartridges in the library, which invalidates the host's cartridge location information. After exiting Demo mode, instruct the host software to perform a re-audit to update the location of the tapes.**

Procedure for Running Diagnostics

To run any diagnostic routine, select the *Library Utilities* menu and then select *Library Diags*. Select the desired diagnostic routine using the arrow buttons, and press ENTER. Then follow the prompts displayed on the operator panel.

Note: When you first choose one of the diagnostic routines, the library prompts you to press ENTER to put the library in Maintenance mode. In Maintenance mode, the library goes offline to the host. Make sure all host activity has stopped before proceeding. (Consult your software documentation if necessary.)

If you want to continue, the display prompts you to insert a diagnostic cartridge, an ordinary data cartridge with a "DG" label attached. The label is required for diagnostic routines. One is supplied with the library. (The cartridge should be empty of data to avoid data loss.)

If you start these routines and do not have a diagnostic cartridge ready, you might need to reset the library by pressing SYSTEM RESET on the operator panel, or by opening and closing the front door, to exit Maintenance mode.

When the library is in Maintenance mode with a diagnostic tape inserted, it retains that tape, enabling you to run more than one diagnostic routine without leaving Maintenance mode. When you are finished, press MENU (once or several times, as required) to exit, retrieve the diagnostic tape, and return to a higher-level menu.

View Configuration

View Configuration displays the current library/drive configuration, such as:

```
Code Vers: x.x.xx
Cell Limit = 10 (20) (30)
SCSI ID = x
x Drives Installed
Fast Load - ON (OFF)
Auto Clean - ON (OFF)
Cart Magazine - YES (NO)
SCSI Emula - Norml
Drv 3 NOT Instald
Drv 2 NOT Instald
Drv 1 NOT Instald
Drv 0 SCSI ID - x
```

The operator panel displays only four lines. Use the arrow keys to scroll through the options.

Drive Utilities

You can select the following options for tape drive utilities from the *Drive Utilities* menu. Move the cursor to your choice using the arrow keys, and press ENTER. Then follow the prompts on the operator panel display.

Clean a Drive Allows the operator to manually insert a cleaning cartridge through the CAP and specify the drive to be cleaned. This is usually done in response to a Clean Me message on the operator display (when AutoClean is disabled).

Change Clean Cart When Auto Clean is enabled, use this selection to change the cleaning cartridge residing in the library.

Enter Clean Limit When Auto Clean is enabled, use this selection to set the maximum number of cleaning cartridge uses.

Uncal Drive Target Allows the operator to uncalibrate a drive target. The next time a tape mount operation is called for that drive, the library recalibrates the target automatically as, for example, when a drive has been physically removed and replaced while the library is operating (hot swapped-only for qualified service personnel).

Important Maintenance Procedures

This section describes procedures that might be required from time to time.

Loading Microcode

In order to reload or upgrade library microcode, the following items are required:

- DOS-based laptop computer ***or*** DOS-based laptop with SCSI board for SCSI download
- Adapter DB9 to RJ45 (PN 10410823) to laptop
- RJ45 8-conductor cable (PN 410828925)
- Adapter DB9 to RJ45 (PN 10402019) to CSE port on library
- 9730 microcode diskette

Procedure for Loading Microcode

1. With the computer attached to the CSE port, power on the library.
2. During boot, while the library display reads `<Menu> Available` (visible for about five seconds), press the MENU button on the operator panel.
3. The operator panel displays the choices

   ```
   >Functional reflash
    NVRAM test & init
   ```

   Select `Functional reflash` using the arrow buttons and press ENTER.

   The operator panel displays

   ```
   Connect CSE port?  connecting.............
   ```

4. Insert the microcode diskette into the PC.
   Type **`A:`** and press RETURN.
5. At the DOS prompt, type `Flash97.exe Release.PRM`

   The PC displays `Sending` and the library's operator panel displays `Receiving`.

   Next, the PC displays `Send Status: File transfer completed successfully.` The operator panel displays `Writing`.

CAUTION:
Do not power down or reset the library while in the writing mode.

6. When the library operator panel displays `Write OK - Push Reset`, push the SYSTEM RESET button on the operator panel to enable the new code version.

Cleaning Tape Drives

If your host software supports the Auto Clean option, you may choose to enable it and keep a cleaning cartridge in Column 0, Cell 7 of the library (see Figure 3-3 on page 3-4 for location). When a drive needs cleaning it notifies the library, when Auto Clean is enabled. The robot then automatically retrieves and mounts the cleaning cartridge for that operation.

Note: With Auto Clean enabled, the library keeps track of how many times it has used the cleaning cartridge. When a cleaning cartridge is expired (based on the maximum usage you set during configuration) the operator panel displays an asterisk in the top right corner.

If your software does not support Auto Clean, or you choose not to enable it, a drive that needs cleaning sends a "`Clean Me`" message to the operator panel. When you receive this message, choose *Clean a Drive* from the *Drive Utilities* menu and perform this procedure:

1. Select the *Drive Utilities* menu, then select *Clean a Drive*.
2. Select the number of the drive to be cleaned using the arrow buttons and press ENTER. The library unlocks the CAP.
3. Insert a cleaning cartridge into the CAP, close the CAP, and press ENTER. The display reads `Performing Operation`.
4. When the cleaning is finished, follow the prompts on the display to retrieve the cleaning cartridge and return to operation. When the cleaning cartridge has reached its maximum number of uses, it will not work anymore.Understanding Auto Clean

Remember several things when using the Auto Clean feature:

- You must set the maximum number of uses for the cleaning cartridge (see "Enter Clean Limit" on page 5-10). This limit remains in effect until changed.
- Monitor the operator panel for the expired cartridge indicator (*). When the cleaning cartridge is expired, replace it following the procedure "Change Clean Cart" on page 5-10. If you change the cartridge by opening the front door, the library will not clear the indicator.
- When first loading the library with tapes, be sure to place the cleaning cartridge in column 0 slot 7 (see "Location of Storage Cells" in Chapter 3, "Handling Cartridge Tapes"). After the initial placement, use the correct procedure (above) to replace it.
- Make sure the cartridge is labeled with the proper bar code as described in "Applying Cartridge Labels" in Chapter 3, "Handling Cartridge Tapes."

The library cannot recognize directly whether a cartridge tape is expired or not; it only counts down the number of times it has been accessed. The DLT drives, however, read usage information directly from the tape header. This may occasionally lead to a cleaning cartridge being expired and unusable by the drives while the library does not yet report it as such. Or, a cartridge may sometimes have more uses left even though the library reports it as expired.

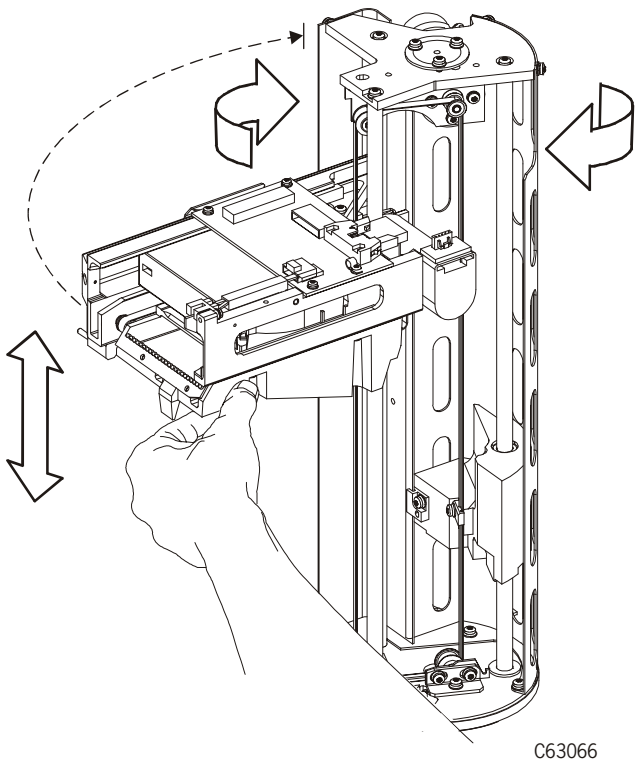
Note: Quantum does not support a cleaning tape for the SDLT 220 at this time. For more information on this topic, please visit www.quantum.com.

Moving the Hand/Camera Assembly

On occasion, you might need to manually operate the library. For example, if the hand/camera assembly fails, the operator can mount cartridge tapes to the DLT or SDLT drives by hand.

If the library robot becomes inoperative and you want to mount a tape into a drive, the hand/camera assembly might be in the way of the cartridge tape you want to reach, whether that tape is in a drive or a storage cell.

Figure 5-1. Moving the Hand/Camera Assembly



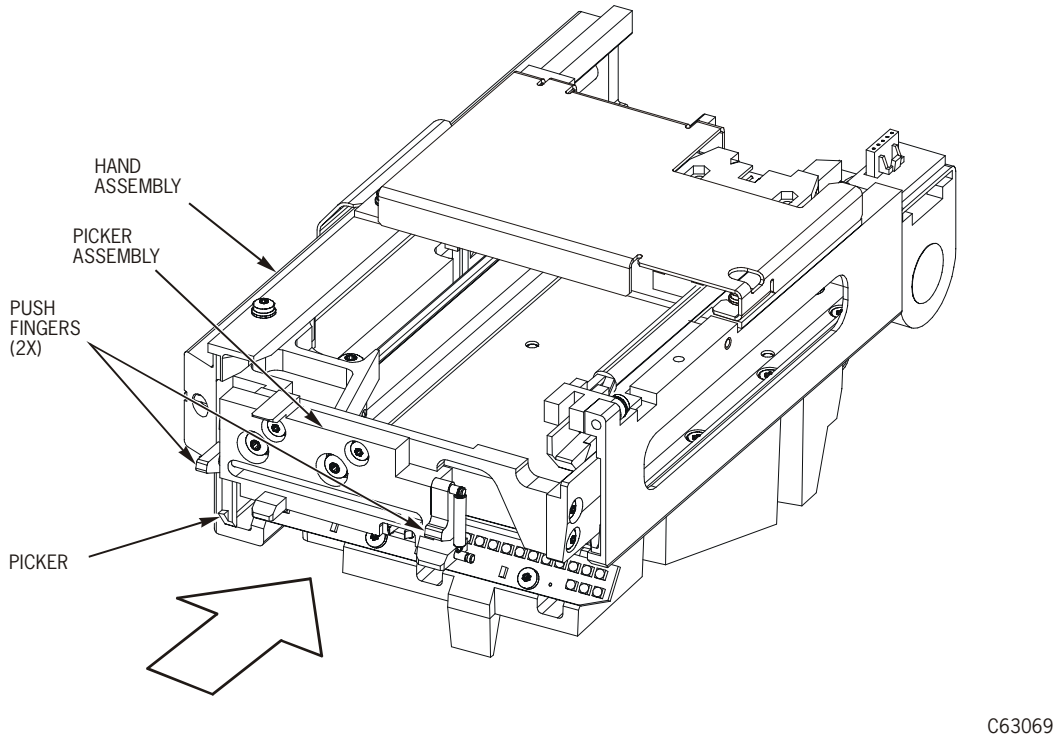
To move the hand/camera assembly to reach a cartridge or drive:

1. Unlock and open the front door. (Power to the robot is disconnected, although the tape drives will still be powered on and operable.)

CAUTION:
Make sure the picker assembly, shown in Figure 5-2 on page 5-14, is retracted before moving the hand, to prevent it from striking the storage cells. Push it back with your finger.

2. Grasp the hand and move it up, down, or horizontally (rotating), as shown in Figure 5-1, until you can access the cell or drive you want.

Figure 5-2. Retracting the Picker Assembly

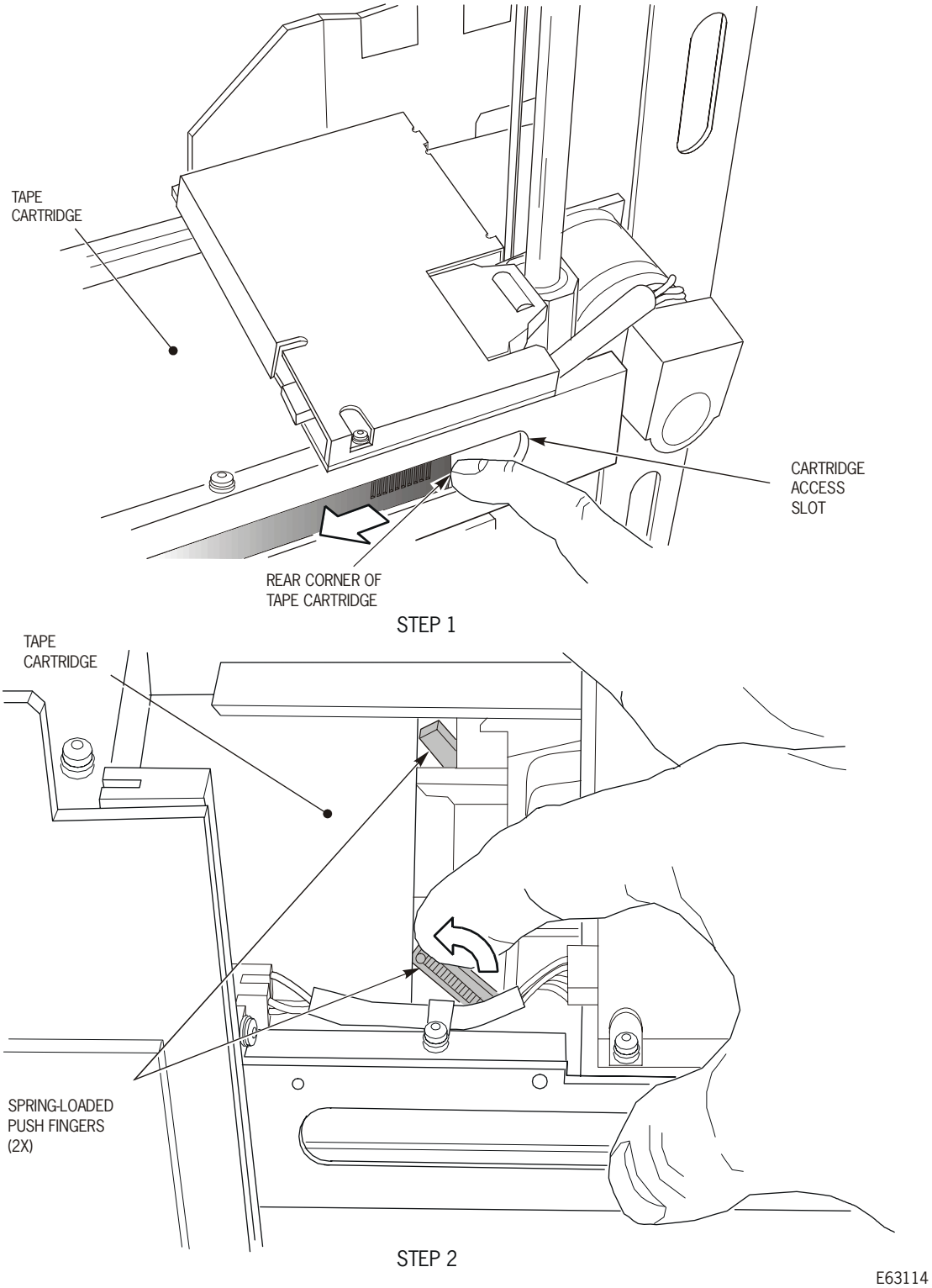


Removing a Cartridge from the Hand

If the library becomes inoperative with a cartridge in the hand, you can remove the cartridge:

1. Rotate the robot/hand until it is aligned with the CAP or any empty storage cell.
2. With your finger in the slot on the side of the hand (Step 1 of Figure 5-3 on page 5-15), push the cartridge towards the CAP or empty storage cell.
3. If the picker assembly is engaged with the cartridge, press the push finger forward 90 degrees (towards the cartridge) to disengage the picker (Step 2 of Figure 5-3).
4. Push the cartridge the rest of the way into the CAP or empty storage cell.
5. Rotate the hand until it is out of the way.
6. Remove the cartridge from the CAP or empty storage cell, if needed

Figure 5-3. Removing a Cartridge from the Hand



Mounting a Cartridge into a Drive

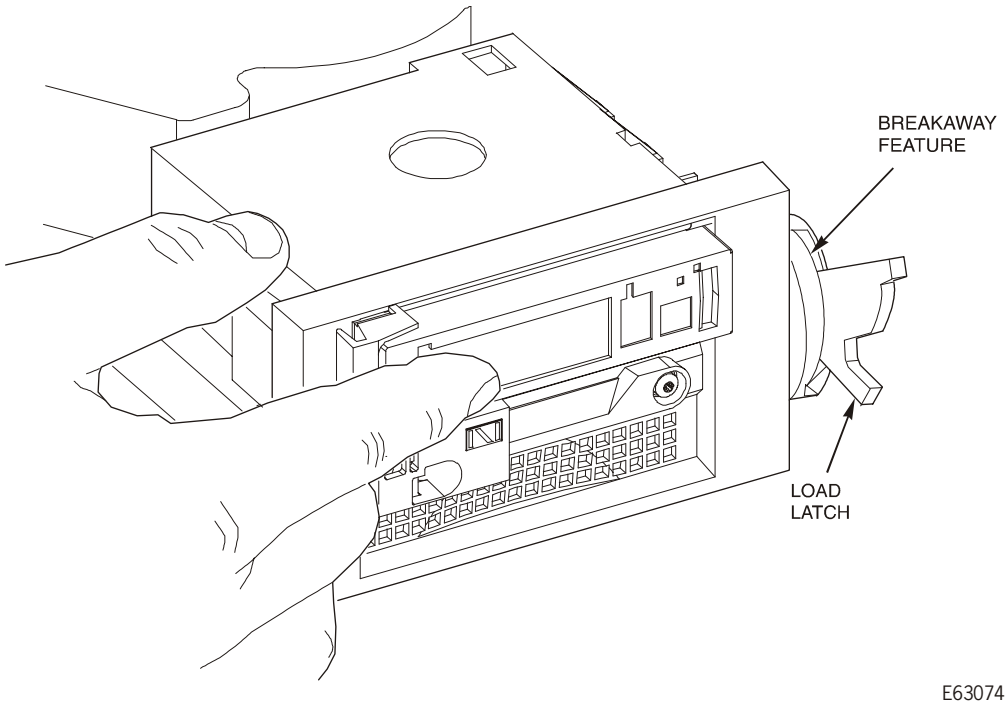
To manually mount a cartridge into a DLT drive, the load latch must be UP, which indicates the drive is open. The drive hub should be retracted when the load latch is up, allowing a cartridge to slide into the opening. Figure 2-7 on page 2-13 shows the front of a DLT drive with the load latch UP (drive open-unloaded position) and the load latch DOWN (drive closed-loaded position).

Note: Move the load latch only when the drive is powered on and the green *Operate Handle* LED on the drive face lit (solid-not flashing). The latch has a breakaway feature to prevent damage. If it breaks away, return it to one of the positions shown in Figure 2-7.

To mount a cartridge:

1. With the drive open (load latch up), insert the cartridge right side up (writing on top) with the VOLSER label facing out.
2. Push the cartridge fully into the drive until the drive latches onto the tape.
3. Lower the load latch.

Figure 5-4. Mounting a Cartridge into a Drive



Dismounting a Cartridge from a Drive

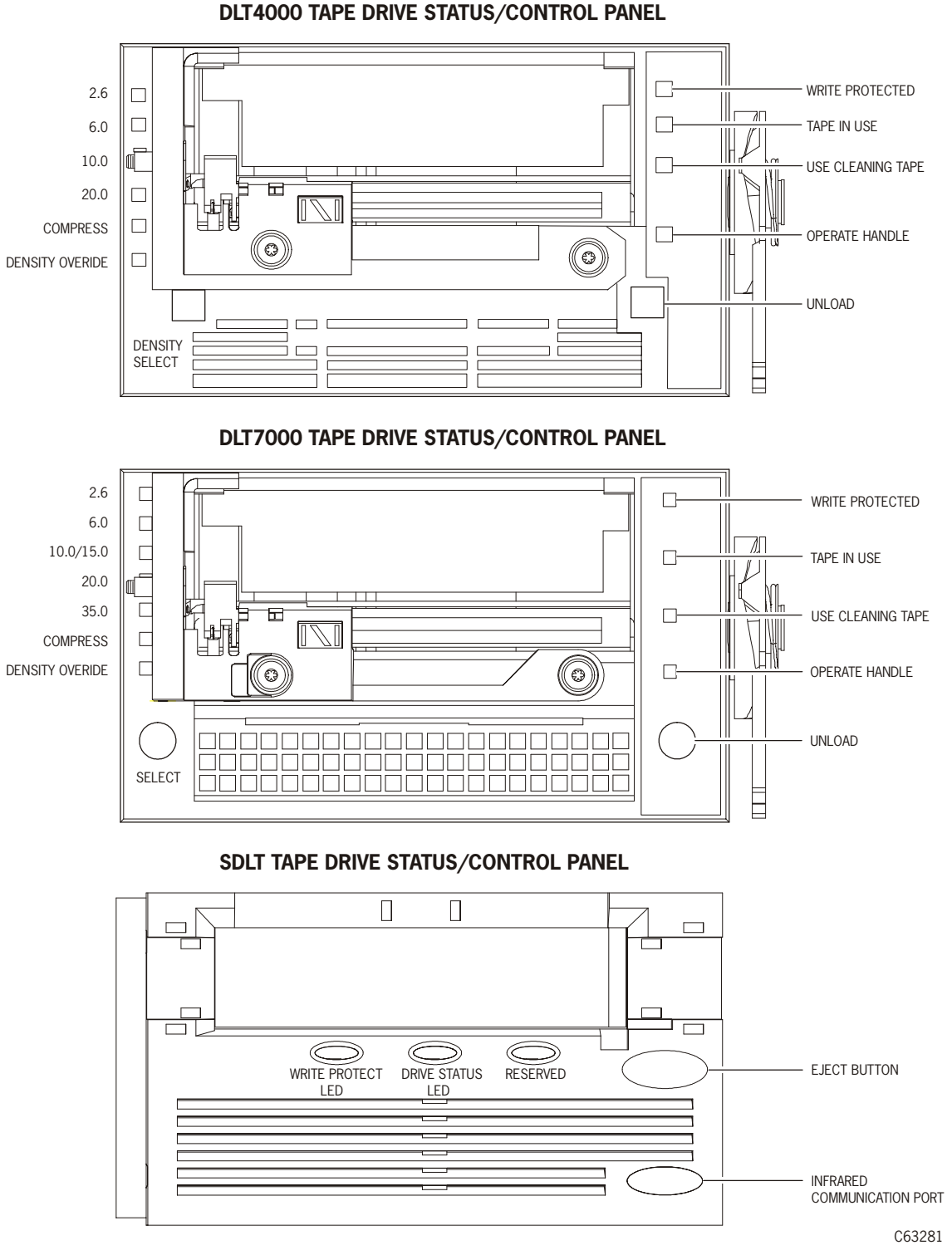
To dismount a cartridge from a drive:

1. Press the Unload/Eject button on the face of the tape drive and wait for the *Operate Handle* light to come on. (Figure 5-5 on page 5-18 shows the LEDs and the Unload/Eject button on the DLT4000, DLT7000, and SDLT drives.)
2. Lift the load latch. The tape will eject.

   Note: It is normal to experience a 2-3 second delay before the tape ejects. If this occurs, it does not necessarily indicate a sticky mechanism.

3. Remove the cartridge.

Figure 5-5. DLT and SDLT Drive Faceplates



Servicing the Library

6

This chapter contains procedures for removing and replacing the customer replaceable units (CRUs) and field replaceable units (FRUs) in the 9730 Library.

Preparation

If you are replacing a CRU or FRU because of a fault symptom code (FSC), run diagnostic tests to make sure you can duplicate the problem. You can find information about FSCs and diagnostic tests in Chapter 5, "Maintaining the Library." After you have replaced the unit, run the diagnostic tests again to make sure the problem has been fixed.

Review these steps *before* attempting to remove and replace FRUs:

1. **Read and follow the safety and electrostatic discharge (ESD) and rack-mount precautions included at the beginning of this manual.**
2. Read each procedure completely before starting, to familiarize yourself with the warnings and steps involved with the procedure.
3. End all jobs being performed by the library and place the tape drives offline before removing power. Removing power without placing the drives offline could result in loss of data or damage to the cartridge tape.

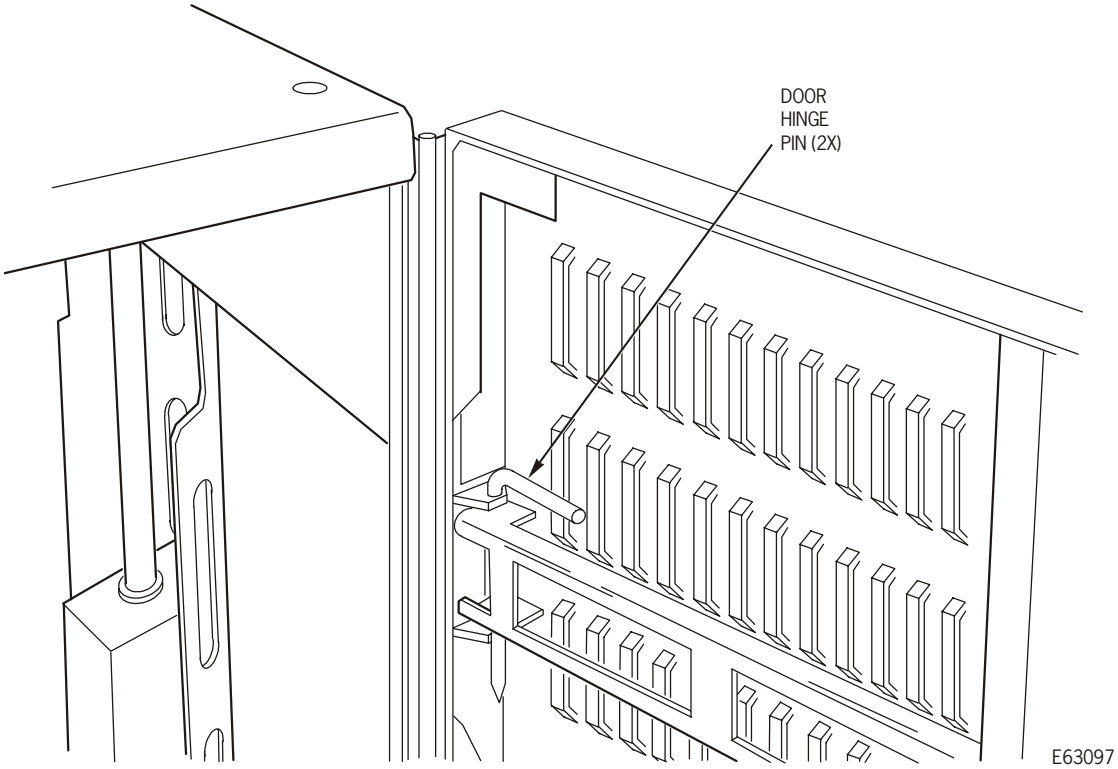
CAUTION:
Possible equipment problems: **Observe these SCSI bus precautions when disconnecting the SCSI cables from the 9730 Library and tape drives.**

- **Before disconnecting the external SCSI cables, make sure there is no activity on the SCSI bus. The host must be quiesced; do not connect to a hot bus.**
- **Any third-party software must be quiesced (halted).**

Removing the Front Door

You might need to remove the library front door to service the robot and the arrays. The tape drives and the electronics module are serviced from the rear.

Figure 6-1. Removing the Library Front Door



To open and remove the front door:

1. Place the library offline.
2. Unlock the front door with the key provided.
3. Remove the door by pulling out the two hinge pins and lifting the door up and away from the library.

Note: Set the door aside out of the way, taking care not to break off the key.

To replace and close the front door:

1. Align the door with the hinges.
2. Install the two hinge pins.
3. Close the door. The safety interlock engages.

Required Tools

The following tools are required for some removal/replacement procedures and must be provided by the customer:

- Flashlight
- Torx screwdriver
- Flat-head screwdriver
- Wire clipper

Customer Replaceable Units (CRUs)

CRUs are designed to be removed/replaced by an individual with minimal technical experience. Follow all precautions and instructions.

Table 6-1. CRU Locations and Functions

Units	Locations	Functions	Pages
DLT drive tray assembly	Left rear of the library	Holds tape drive and its power supply.	page 6-12
Electronics module	Right rear of the library	Houses the power supply, CYC card, fan assemblies	page 6-17
Hand/camera assembly	Attaches to the bearing block on the Z column	Mounts and dismounts cartridge tapes from storage cells and tape drives.	page 6-31

Field Replaceable Units (FRUs)

FRUs are to be removed/replaced only by technically trained service personnel.

Table 6-2. FRU Locations and Functions

Units	Locations	Functions	Pages
CYC card	Part of the electronics module (EM)	Microprocessor that monitors and controls all functions of the 9730 library.	page 6-5
CYO card (operator panel assembly)	Front of the library, above the CAP	Displays library and drive statuses. Used for configuring the system, running diagnostics, and examining errors.	page 6-7
Fans (2)	Part of the electronics module	Cool the library electronics. (Tape drives have their own fans.)	page 6-26

Table 6-2. FRU Locations and Functions (Continued)

Units	Locations	Functions	Pages
Hand/flex cable	Routed from the hand through the library to the CYC card.	Carries functional information from the CYC card to the hand.	page 6-42
Operator panel cable	Routed along the side of the library from the operator panel to the CYC card.	Carries functional information between CYC card and operator panel (CYO card).	page 6-60
DLT Tape drive	On the drive tray assembly	Holds cartridges for read/write operations.	page 6-67
SDLT Tape drive	On the drive tray assembly	Holds cartridges for read/write operations.	page 6-74
Theta motor assembly	Inside library, in the lower right corner.	Provides power for theta movement of the robot.	page 6-79
Z and Theta flex cable assembly	Routed from the Z and Theta motors through the library to the CYC card.	Carries functional information from the CYC card to the Z and Theta motor.	page 6-87
Z motor	Inside the front of the library, at the top of the Z column	Provides power for vertical movement of the robot.	page 6-103

CYC Card

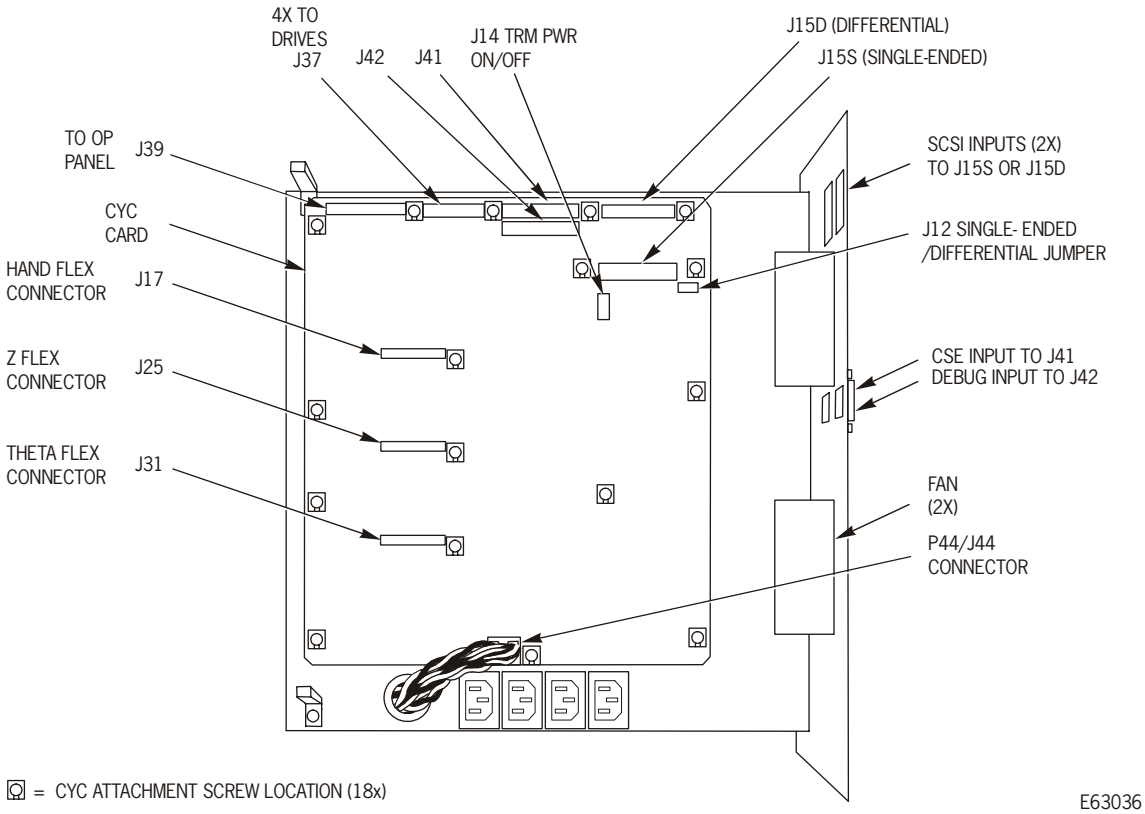
The CYC card FRU is mounted within the electronics module. The electronics module is inside the library and is accessed from the right rear side.

You must remove the electronics module to service the CYC card.

Tools required:

- ESD grounding kit
- Torx driver with a T-10 and T-15 bit
- Note paper and a pen or pencil to record configuration information

Figure 6-2. CYC Card Shown Removed from Library



Removal

1. Try to view the library configuration information by accessing *Library Utilities* from the operator panel and selecting *View Configuration*. (Or see the configuration that should have been recorded in the table on page *ii* of this manual.)
2. Manually log all of the configuration information, including library SCSI ID, tape drive SCSI IDs, and the rest. This data will be used to reconfigure the library later.
3. Remove the electronics module following the procedures beginning on page 6-17.
4. Disconnect cables J41, J42, J44, and J15S or D from their connectors. Refer to Figure 6-2 on page 6-5 for connector locations.
5. Remove the 18 screws attaching the CYC card to the standoffs on the electronics module chassis using a Torx driver with a T-10 bit.

Replacement

1. Remove the new CYC card from its packaging.
2. Align the card with the 18 standoffs on the electronics module chassis.
3. Install the 18 screws attaching the CYC card to the EM chassis using a Torx driver with a T-10 bit.
4. Connect cables J41, J42, J44, and J15S or D to their connectors. Refer to Figure 6-2 on page 6-5 for connector locations.
5. Replace the electronics module following the procedure beginning on page 6-23.
6. Reconfigure the library using the values you obtained in step 1. of the removal procedure above. Refer to Chapter 4, “Getting Started,” for instructions on configuring the library.

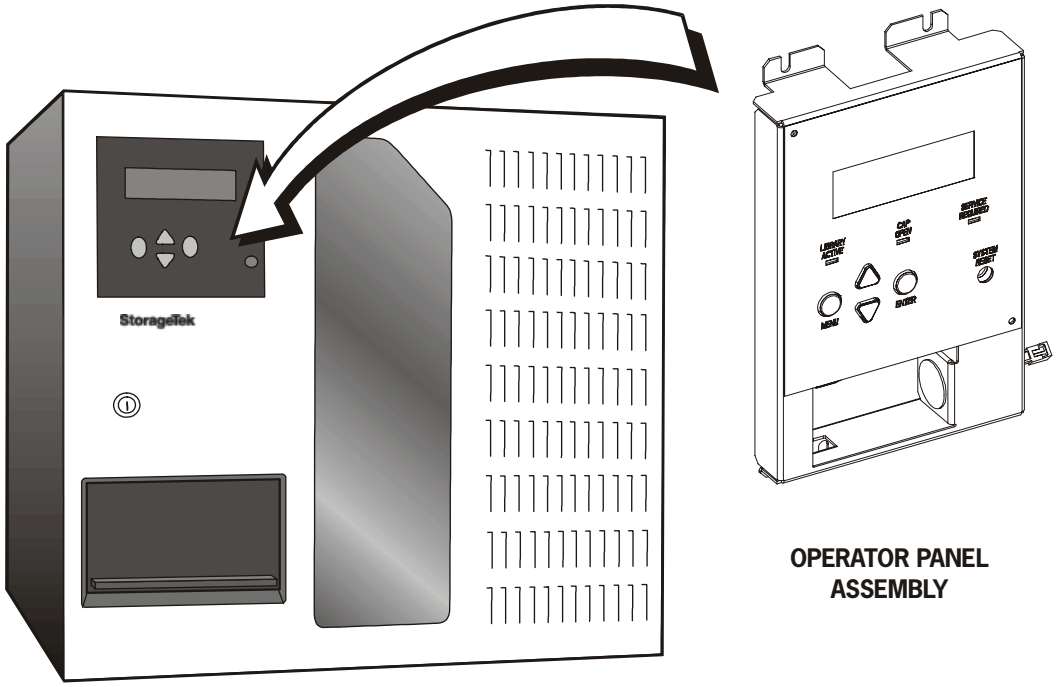
CYO Card

The CYO card FRU is behind the operator panel. The operator panel is on the front of the library, to the left of the window and above the cartridge access port. You must remove the operator panel to access the CYO card and the magnetic sensor switch.

Tools required:

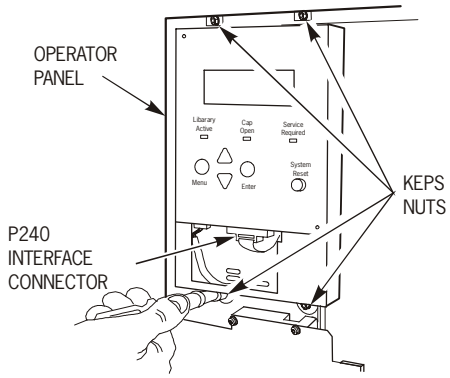
- ESD grounding kit
- 5/16" Keps nut driver
- Torx driver with a T-10 and a T-15 bit.
- Key to the library front door

Figure 6-3. Operator Panel

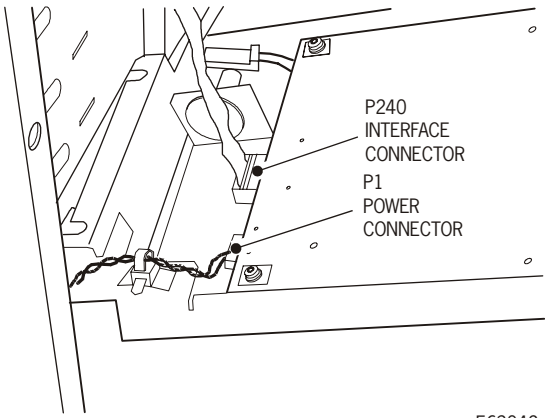


Removal

1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Power off the library and unlock and open the library front door.
3. Taking care not to drop the Keps nuts, *remove* the two bottom nuts on the operator panel, and *loosen* the two top nuts.
4. Pull the bottom of the op panel forward to disengage the top two flanges., and allow the panel cover to tilt forward to provide access to its rear.

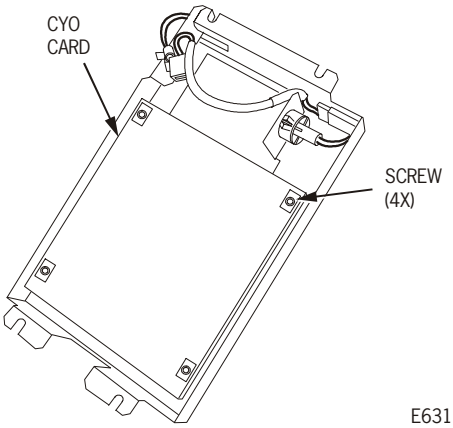


5. Disconnect the P240 connector on the ribbon cable.
6. Disconnect P1, the power cable.



CYO Card Removal

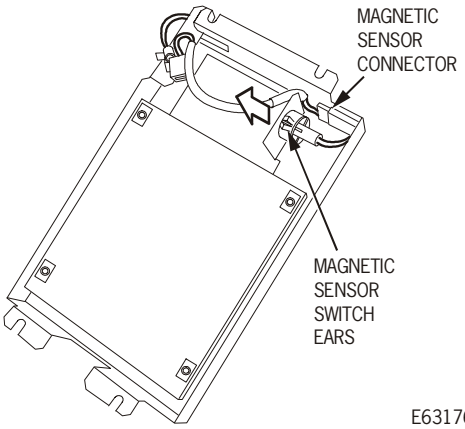
7. Remove the four CYO card screws using a Torx driver with a T-10 bit.
8. Lift out the CYO card.



E63175

Magnetic Sensor Removal

9. Disconnect the magnetic sensor connector.
10. Squeeze the ears on the magnetic sensor switch and push it through the switch cutout as shown.

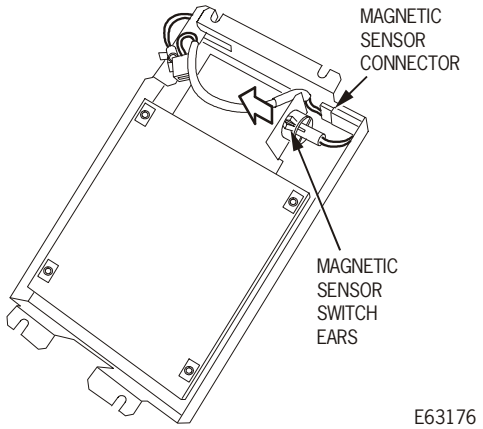


E63176

Replacement

Magnetic Sensor Replacement

1. Push the magnetic sensor switch through the cutout as shown.
2. Connect the magnetic sensor connector.

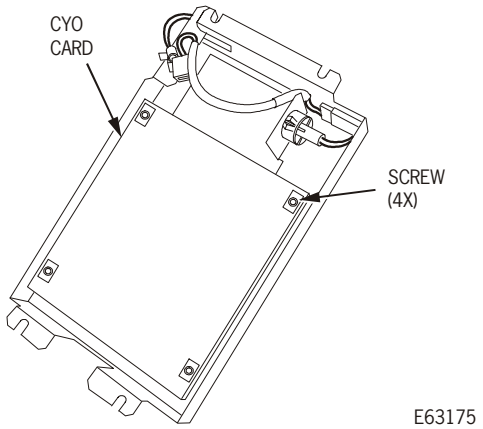


CYO Card Replacement

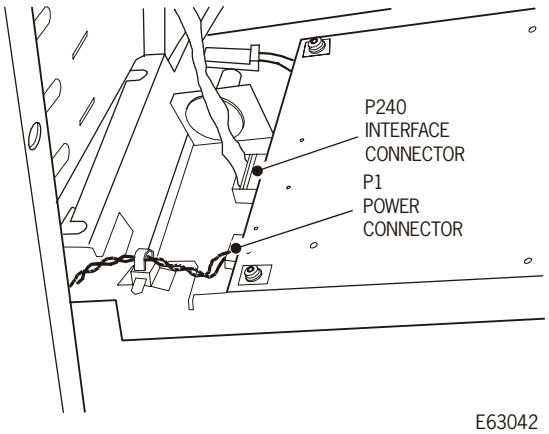
3. Align the four screw holes in the CYO card with holes in the operator panel enclosure.

Note: Make sure the trace side of the card is facing you and the component side is down. The operator panel display must align with the cutout in the enclosure.

4. Install the four CYO card screws using a Torx driver with a T-10 bit.



5. Connect P1, the power cable.
6. Connect the P240 connector on the ribbon cable.

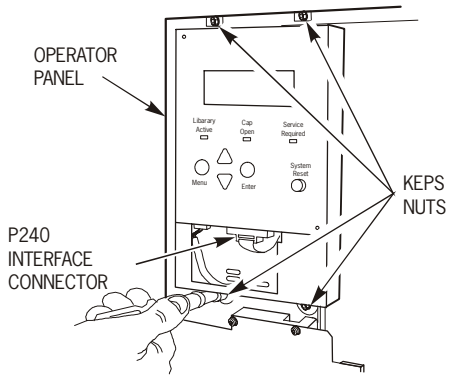


E63042

7. Align the op panel cover flanges with the top two screw holes on the library frame.

CAUTION:
***Possible cable damage:* Do not pinch the cables when replacing the panel cover.**

8. Align the two bottom holes on the op panel cover with the library frame.
9. Tighten the two top Keps nuts and install the two bottom Keps nuts.
10. Carefully close the library door to check for alignment, and adjust the mounting Keps nuts as necessary for alignment.
11. Proceed to "Checkout Procedures" on page 6-108.



E63041

DLT and SDLT Drive Tray Assembly

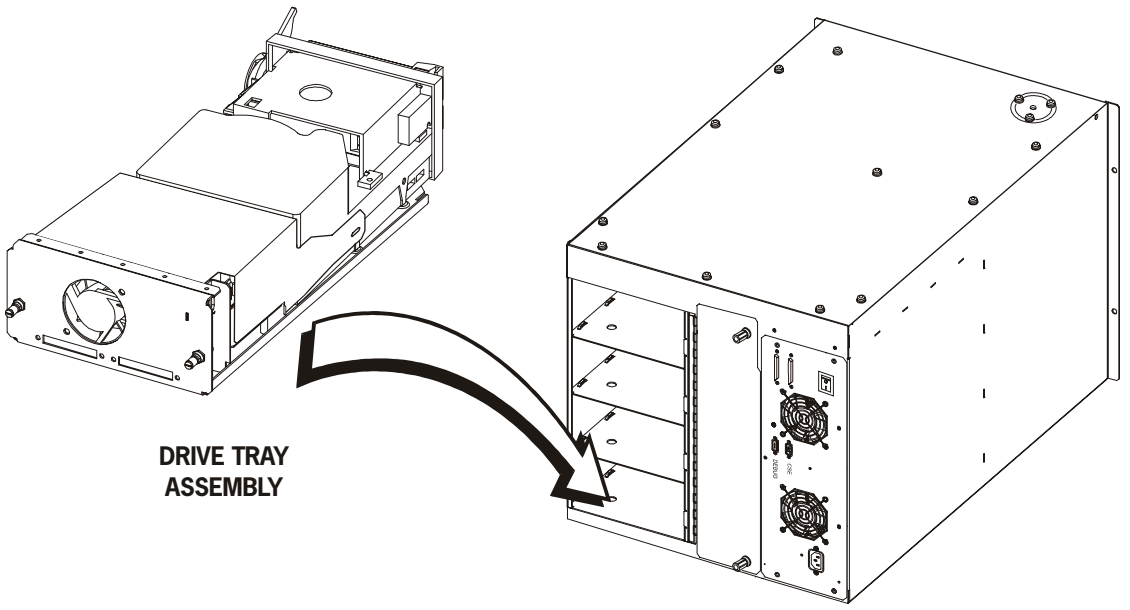
The DLT and SDLT drive tray assembly FRUs are located in the tape drive slots at the left rear of the library. This assembly is also a CRU.

Tape drives are hot swappable; they can be removed and replaced without powering off the library or interrupting its operations. Hot swapping should only be performed by trained technicians.

Tools required:

- ESD grounding kit
- Torx driver with a T-15 bit
- Flat-blade screwdriver

Figure 6-4. DLT Drive Tray Assembly



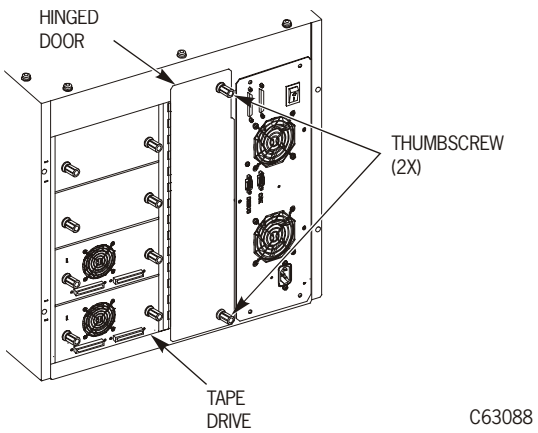
WARNING:
Possible physical injury: **Do not apply power to the drive tray assembly when it is not installed in the library.**

Removal

CAUTION:
Possible data loss or performance degradation:

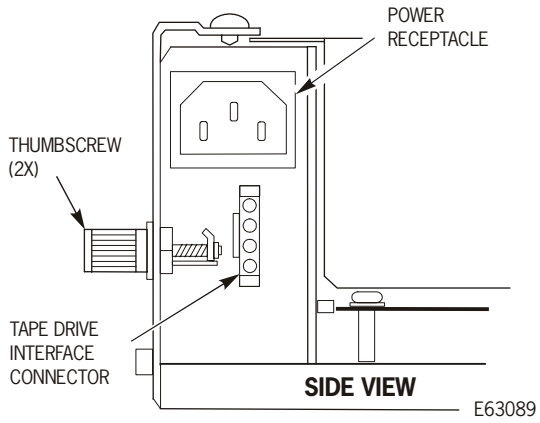
- **If drives are daisy chained, do not disconnect them from the bus without stopping all data processing on the channel.**
- **Before disconnecting external SCSI cables, make sure there is no activity on the SCSI bus. The host must be quiesced; do not disconnect a hot bus.**
- **Any third-party software must be quiesced.**
- **All signals must be terminated at each end of the SCSI bus. Do not mix single-ended and differential terminators.**

1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Loosen the thumbscrews from the hinged rear door and open the door.

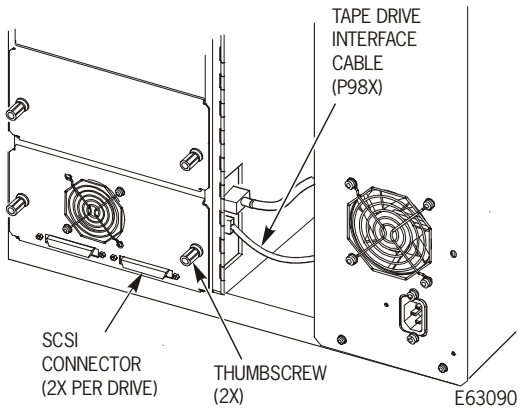


3. Disconnect the power cable from the tape drive.

CAUTION:
Possible equipment damage: **Disconnect the tape drive interface cable, as described in the next step, *before* removing the tape drive. Make sure the cable is out of the tape drive bay by removing it from the rectangular hole (along with connectors P980–P983) to prevent the cable from being damaged.**



4. Disconnect the tape drive interface cable from the tape drive. Note the orientation; the markings on the connector face toward the rear.
5. Disconnect the SCSI cable connectors and/or terminator from the rear of the drive. Save the terminator, if any.
6. Loosen the thumbscrews at the rear of the tape drive assembly and, using both hands, remove the assembly from the slot and place it on a flat, stable surface.



Replacement

1. Unpack the new assembly and inspect it for damage such as bent, broken, or loose parts.
2. Verify that the tape drive model and serial numbers match those on the shipping invoice. Labels on top of the drive show either DLT4000 or DLT7000 (single-ended or differential), or SDLT.
3. Verify that any required cables are present.
4. Report any damaged, missing, or incorrect items to the phone number on the invoice.

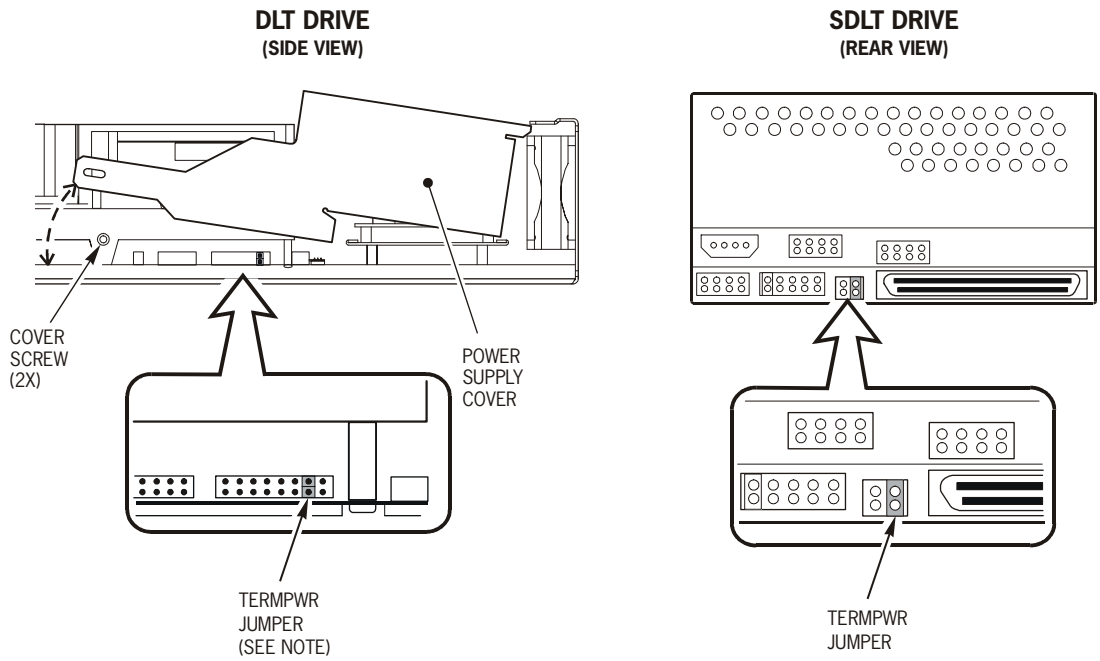
WARNING:
Possible physical injury: **Do not apply power to the drive tray assembly when it is not installed in the library.**

5. To check terminator power (TERMPWR), remove the two power supply cover screws using a Torx driver with a T-15 bit, and lift the cover (pulling forward slightly) enough to see the jumpers. For safety, do not remove the cover completely.

Note: TERMPWR settings for the SDLT can be found on the back of the drive.

6. Set TERMPWR ON or OFF (enabled or disabled) on the new drive to match the drive you are replacing. The figure shows the right side of the tape drive (as you face its front).
   - Install the jumper on the pins as shown to set TERMPWR ON.
   - Remove the jumper from the pins to set TERMPWR OFF. (You can store the jumper by placing it on one pin only.)
7. Return the power supply cover to its previous position and reinstall the two screws holding it in place.

Figure 6-5. DLT and SDLT TERMPWR Jumper Locations



NOTE:
Install the DLT drive term power jumper on the second pair of pins from the right end of the connector (as shown).

E63265

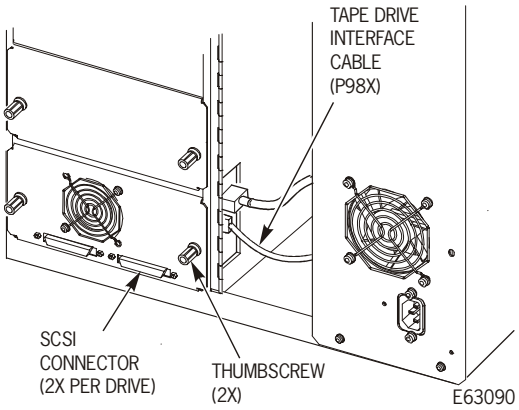
CAUTION:
Possible equipment damage: **When sliding the drive into its bay, make sure the drive interface cable is out of the way. Do not force the tape drive assembly into the slot.**

8. Slide the drive tray into its slot, being careful not to catch or crush any cables.
9. Tighten the two thumbscrews on the back of the drive assembly.

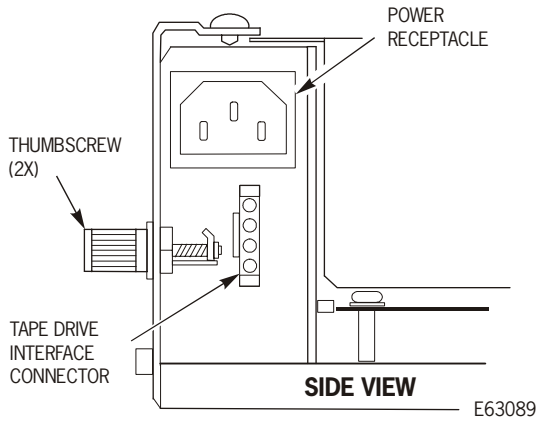
CAUTION:
Possible data loss or performance degradation:

- **Before connecting the external SCSI cables, make sure there is no activity on the SCSI bus. Do not connect to a hot bus.**
- **Any third party software must be quiesced.**
- **All signals must be terminated at each end of the SCSI bus. Do not mix single-ended and differential terminators.**

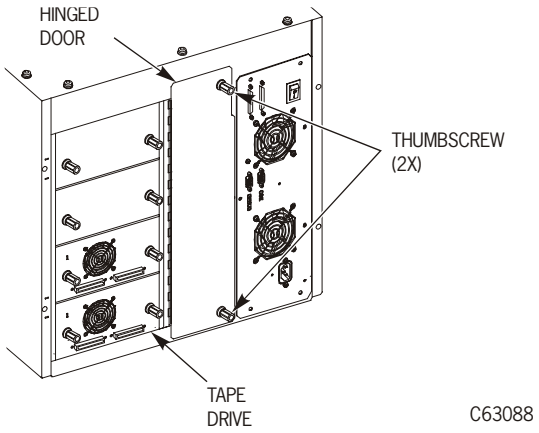
10. Connect the SCSI cables and/or terminator to the connectors on the rear of the drive.
11. Connect the tape drive interface cable to the tape drive interface connector on the drive. Note that the P980–P983 markings should face the rear of the tape drive when inserting.



12. Connect the tape drive power cable to the tape drive.



13. Close the hinged door at the rear of the library.
14. Tighten the thumbscrews holding the hinged door closed.
15. Make sure all cables are installed and connectors are tight.
16. Proceed to "Checkout Procedures" on page 6-108.



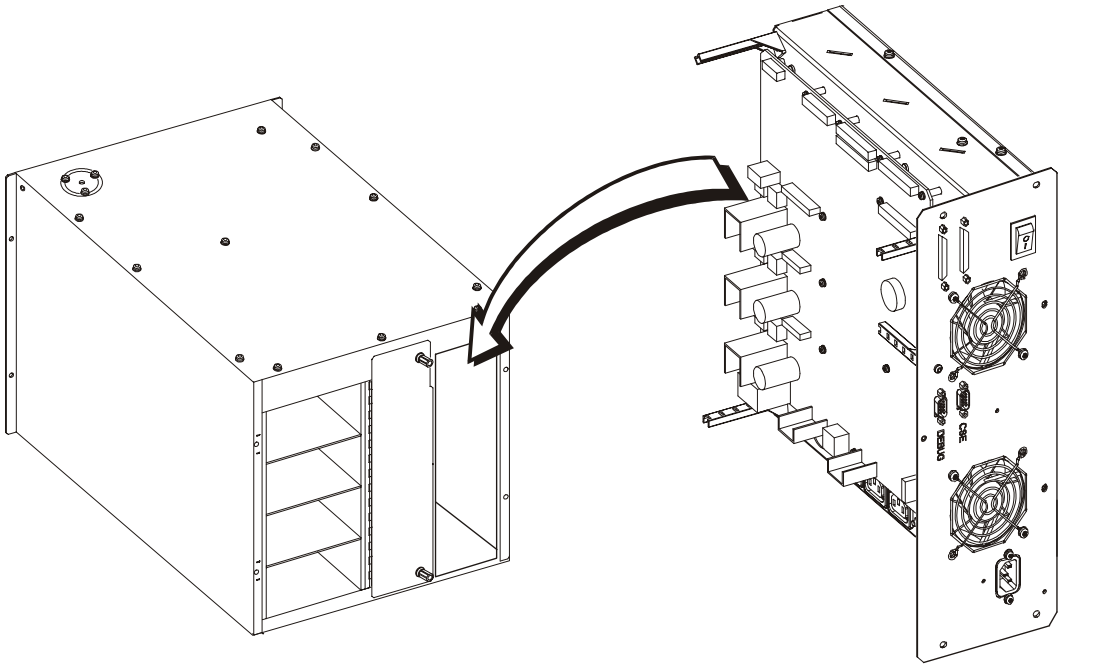
Electronics Module

The electronics module (EM) FRU is inside the library on the right rear side as you face the rear of the library. The EM is also a CRU

Tools required:

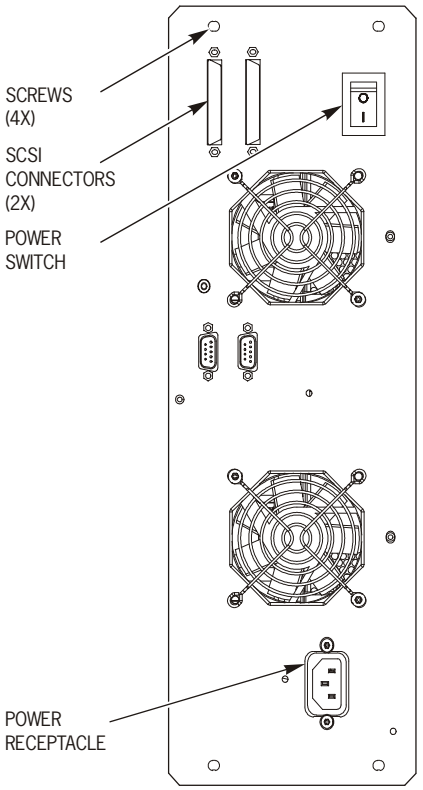
- ESD grounding kit
- Torx driver and T-15 bit
- Flashlight
- Note paper and a pen or pencil to record configuration information

Figure 6-6. Electronics Module



Removal

1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Try to view the library configuration information by accessing *Library Utilities* from the operator panel. Then select *View Configuration*. (Or see this information, which should have been recorded in the table on page ii of this manual.)
3. Write down all of the configuration information, including library SCSI ID, tape drive SCSI IDs, and the rest. This data will be used to reconfigure the library later.
4. Power off the library and disconnect the power cord.
5. Disconnect the SCSI cables from the back of the electronics module.
6. Remove the four screws at the corners of the EM module, using Torx driver with T-15 bit.



C63002

7. Loosen the thumbscrews on the hinged access door at the rear of the library and open the door.

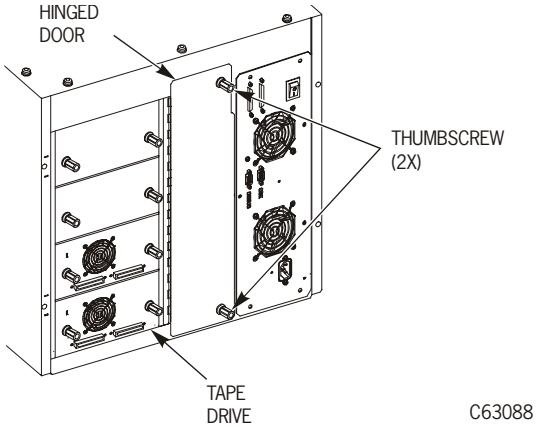
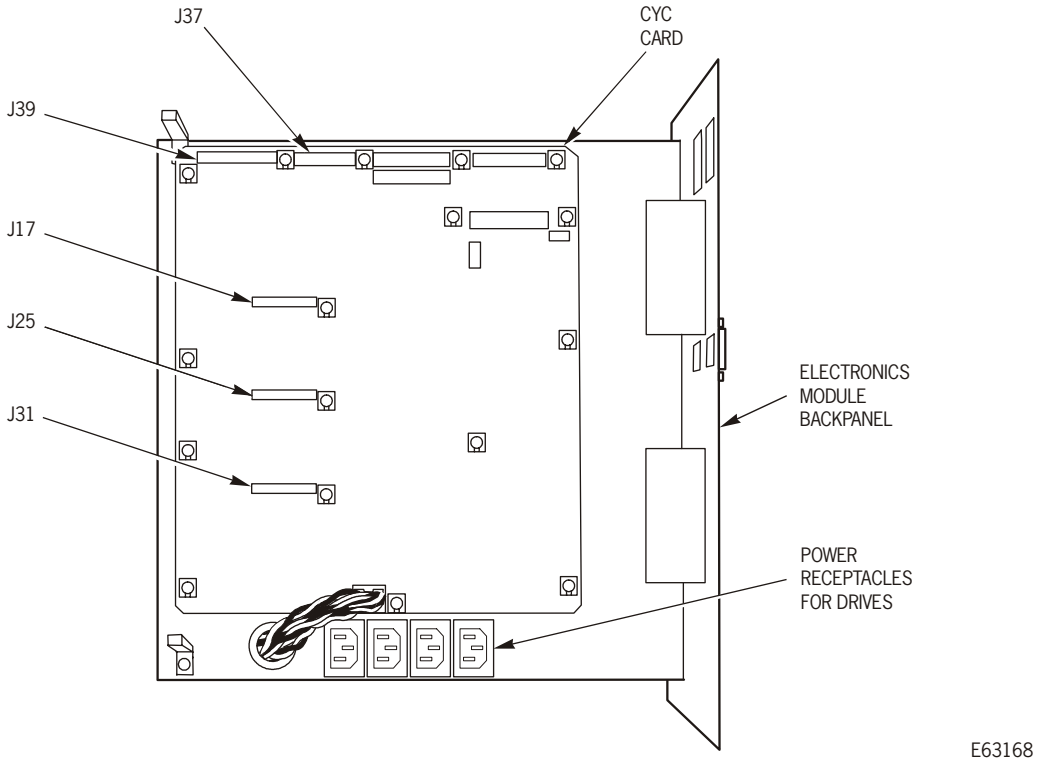


Figure 6-7. Electronics Module (and CYC card) Showing Cable Locations



8. Reaching into the access door, disconnect J17, J25, J31, and J39 cables from their connectors on the CYC card. (The CYC card is the large controller card mounted to the electronics module.) Use a flashlight to see, if necessary.

   Note: The connectors are different and are therefore removed differently. For example, connector J37 requires that you loosen its thumbscrews before you can remove it. Some connectors require you to pinch tabs together or push tabs apart.

9. Disconnect the tape drive power cables from the electronics module power receptacles.

CAUTION:
Possible equipment damage: **Failure to disconnect all the cables described above will cause cable damage and possibly card connector damage when you slide out the electronics module. When the cables are disconnected, take care not to snag them on the electronics module when you slide it out.**

WARNING:
Possible physical injury: **Do not apply power to the electronics module assembly when it is not installed in the library.**

10. Slide the electronics module out of the library, verifying that all cables are disconnected.

11. Place the damaged electronics module on a flat, stable surface.

Replacement

WARNING:
Possible physical injury! **DO NOT apply power to the electronics module assembly when it is not installed in the library.**

1. Verify that the jumper position and cable connections for the single-ended or differential alternative at connector J12 on the new CYC card match those of the CYC card you are replacing. The jumper connects the middle row of pins on J12 to one of the following rows: (See Detail A of Figure 6-8 on page 6-24.)

   - **Differential:** Upper row (toward the top of the CYC card), to the left of the word "DIFF" silkscreened on the CYC card.
   - **Single-ended:** Lower row (below DIFF), to the left of the word "SING" silkscreened on the CYC card.

2. Verify that cables connect the two SCSI connectors on the back panel of the electronics module to one of the following connectors on the CYC card:

   - **Differential:** Connector J15D
   - **Single-ended:** Connector J15S

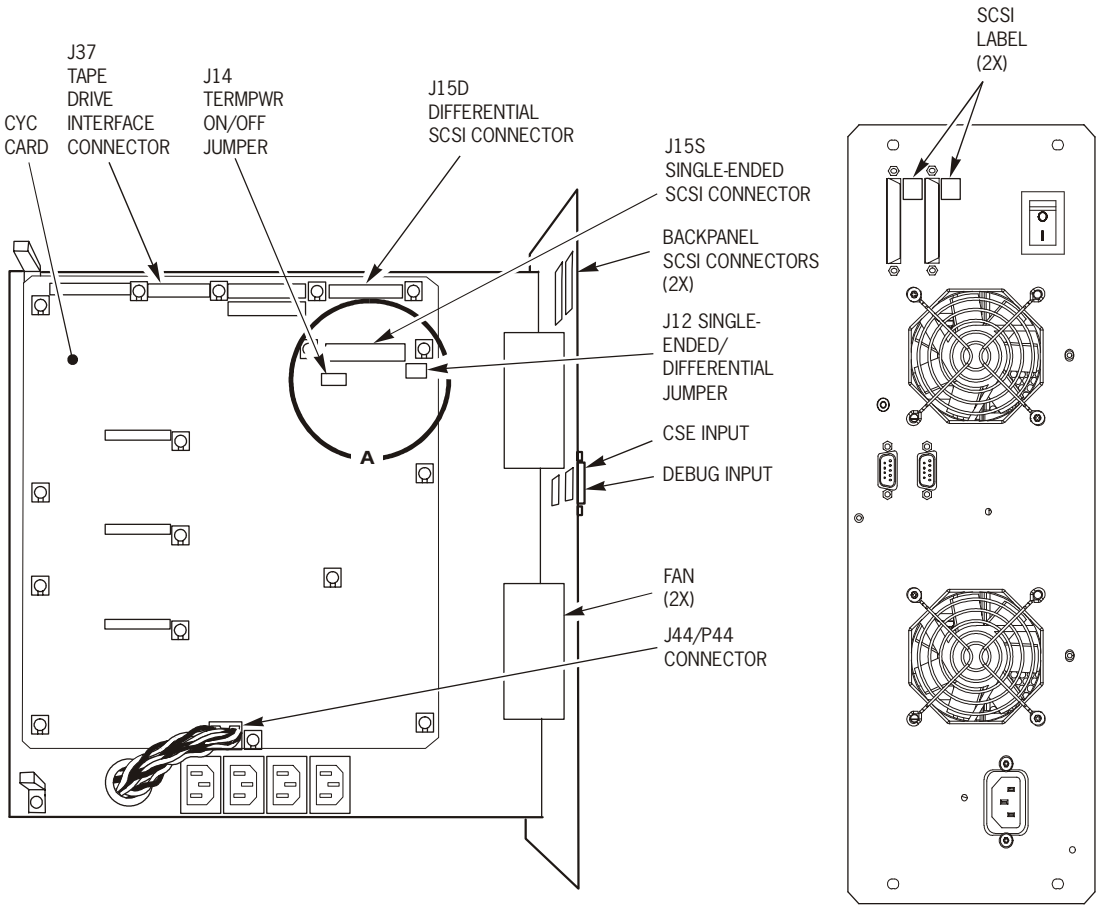
   Make sure the jumper and cables in items 1 and 2 agree. Both should be set the same.

3. Set the jumper position for TERMPWR at connector J14 to match the position on the card being replaced. The jumper connects the middle pin of J14 with one of the following pins: (See Detail A of Figure 6-8 on page 6-24.)

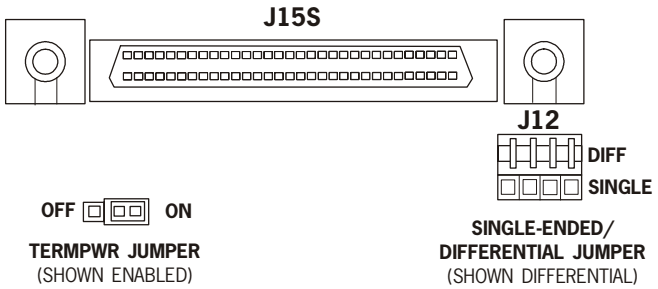
   - **TERMPWR off:** Left pin (toward the left of the CYC card), near the word OFF silkscreened on the CYC card.
   - **TERMPWR on:** Right pin (toward the right of the CYC card), near the word "ON" silkscreened on the CYC card.

Note: **"**Bottom," "top," "left," and "right" in Step 3. refers to directions on the CYC card on the component side with the silkscreened words appearing normally.

Figure 6-8. EM Shown Removed from Library



ELECTRONICS MODULE



DETAIL A

E63035

4. Slide the electronics module into the library.
5. Connect the correct cables to the J31, J25, J17, J37, and J39 connectors on the CYC card.
6. Connect the drive power plugs to the electronics module.
7. Install the four screws to the corners of the electronics module using a Torx driver with a T-15 bit.
8. Connect the SCSI cables to the electronics module.
9. Close the hinged access door and tighten the thumbscrews.
10. Connect the AC power cable to the electronics module and power on the library, observing the front panel to see that power comes on to the library and tape drives.

Note: The library must now be reconfigured.

11. Reconfigure the library using the information you obtained before removing the EM. Refer to Chapter 4, "Getting Started," for instructions on configuring the library.
12. Proceed to "Checkout Procedures" on page 6-108.

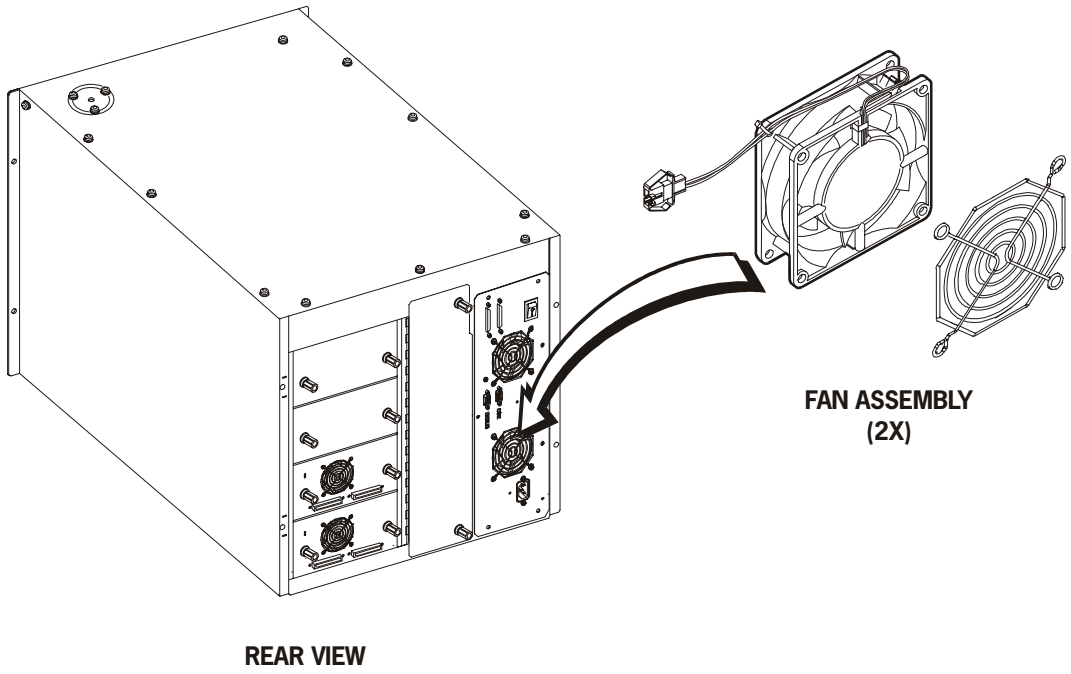
Fans

The fan FRUs are mounted to the backplate of the electronics module. You must remove the electronics module to access the fan assembly.

Tools required:

- ESD grounding kit
- Torx driver and T-15 bit
- Wire cutter

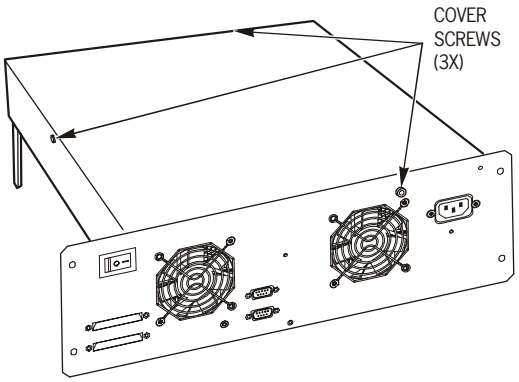
Figure 6-9. Fans



Removal

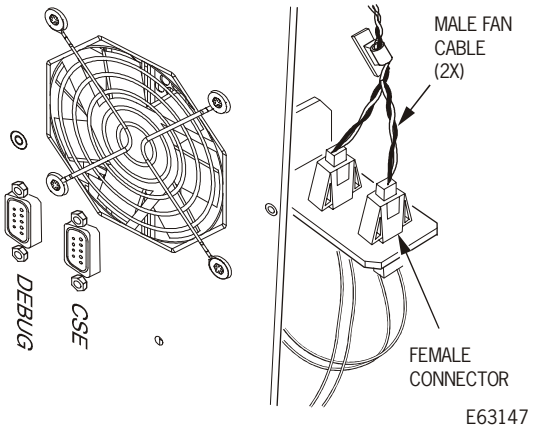
1. Remove the electronics module (EM) following the procedures beginning on page 6-17. Place the electronics module on a flat, stable surface.
2. Remove the three cover screws from the EM using a Torx driver with a T-15 bit.
3. Remove the cover from the electronics module.

WARNING:
Possible physical injury! **DO NOT TOUCH any components on the electronics module. Voltage could be present even though the library is powered off.**

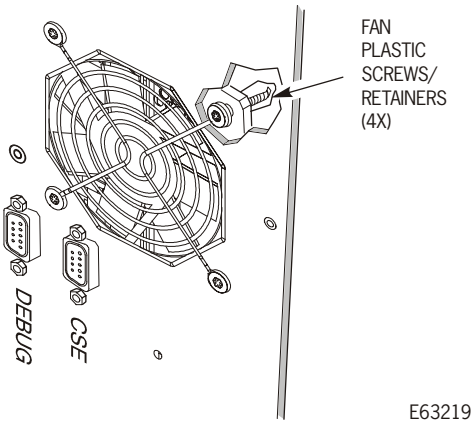


E63160

4. Cut the cable tie securing the two fan cables together, if any.
5. Disconnect the fan cable connector by pinching the connector tab and pulling up.
6. Remove the fan connector from the sheet metal cutout by pinching the two outer edges of the female connector together and pushing it down through the sheet metal connector cutout.

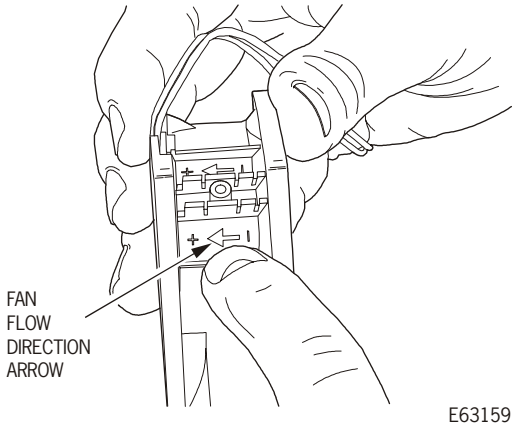


7. From behind the electronics module face plate, use a wire cutter to cut off the four plastic screws with their plastic retainers holding on the fan and finger guard and discard them.



Replacement

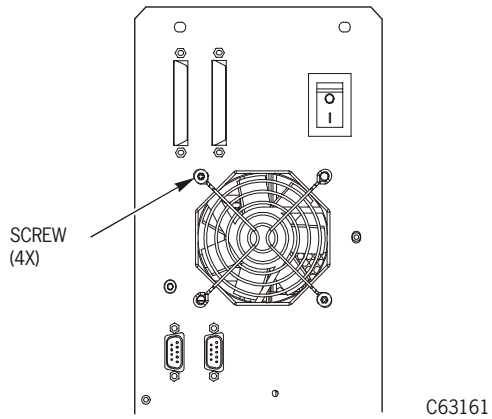
1. Note the directional flow arrow on the fan.
2. Place the fan in the cutout with the direction arrow facing to the outside of the EM.



E63159

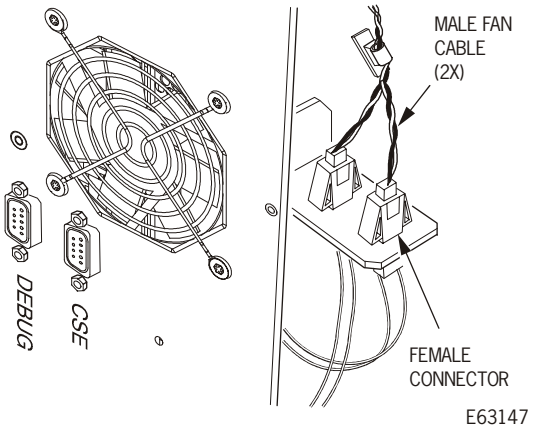
3. Install the four plastic inserts together with the plastic screws, by pushing them through the fan finger guards, through the fan assembly holes, and into the fan assembly.

Note: Make sure the raised area of the finger guard faces to the outside of the EM.



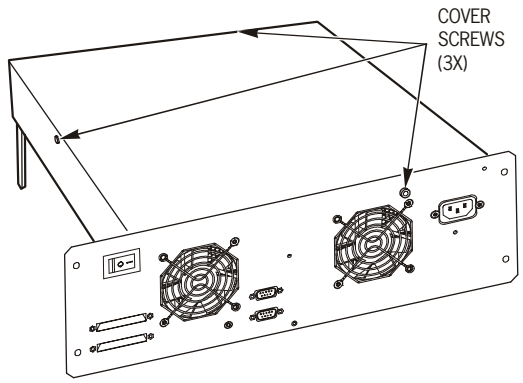
C63161

4. Install the fan connector into the sheet metal cutout by pinching the two outer edges of the female connector together and pushing it up and through the cutout.
5. Attach the fan power connector and replace the cable tie securing the cables together.



E63147

6. Replace the EM cover and its three cover screws using a Torx driver with a T-15 bit.



E63160

7. Replace the electronics module following the procedure beginning on page 6-23.

Hand/Camera Assembly

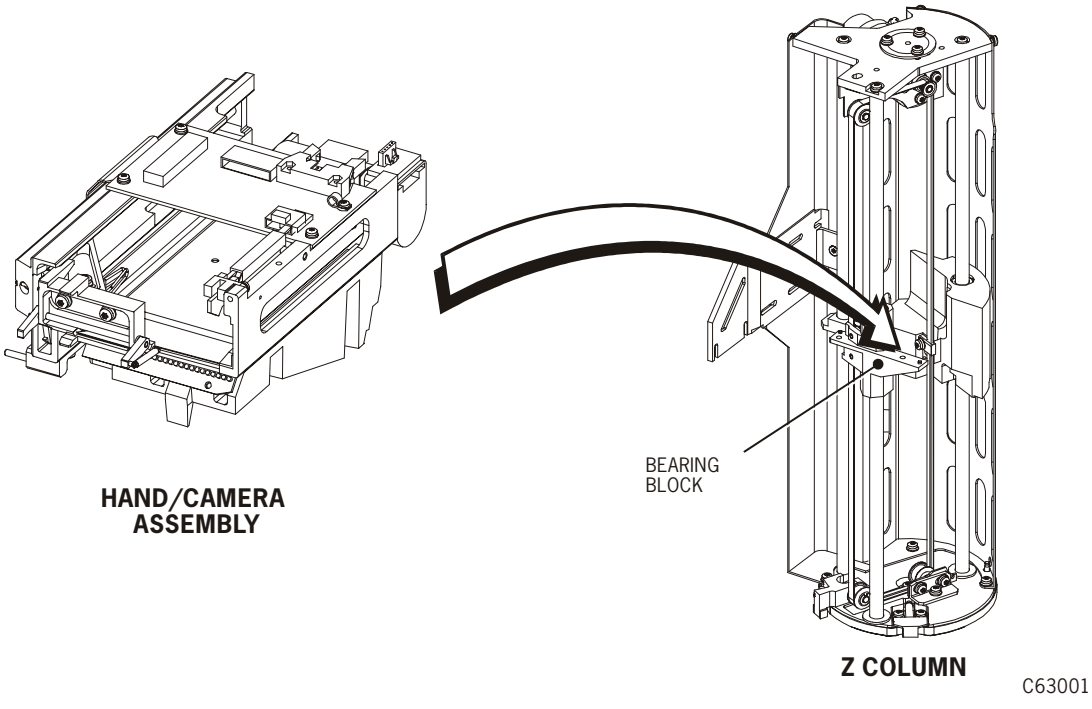
The hand/camera assembly FRU mounts to the bearing block on the Z column. This assembly is also a CRU.

Removing and replacing the hand/camera assembly requires access through the library front door.

The tools required are:

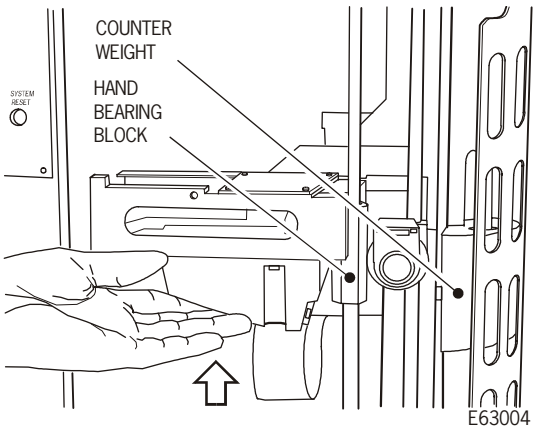
- ESD wrist strap
- Torx driver and a T-10 and T-15 bit
- Standard eight inch flat-blade screwdriver (optional)
- Key to the library front door

Figure 6-10. Hand/Camera Assembly

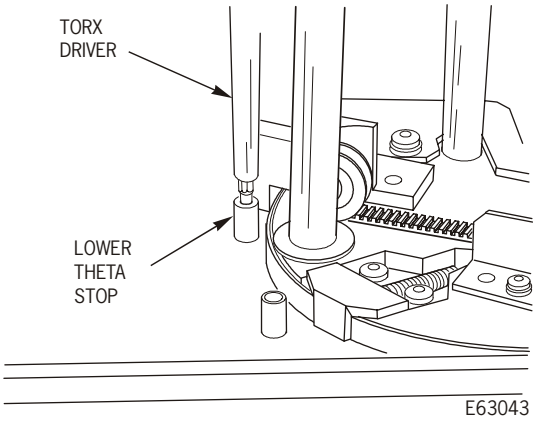


Removal

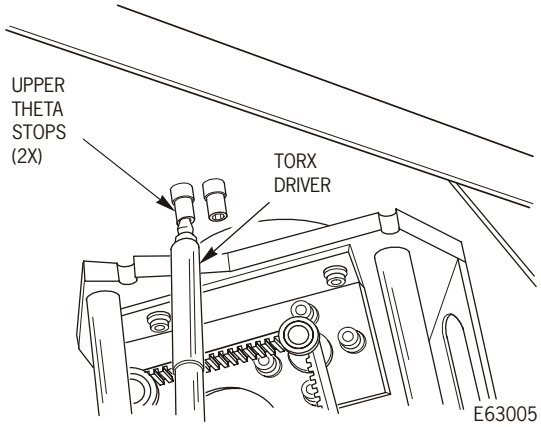
1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Power off the library. Make sure all system activity is stopped before proceeding.
3. Unlock and open the library front door.
4. Carefully raise the hand/camera assembly with your hand, as shown in the figure, to the middle of the Z column assembly.



5. Remove the lower theta stop from the floor of the library using a Torx driver and a T-15 bit.

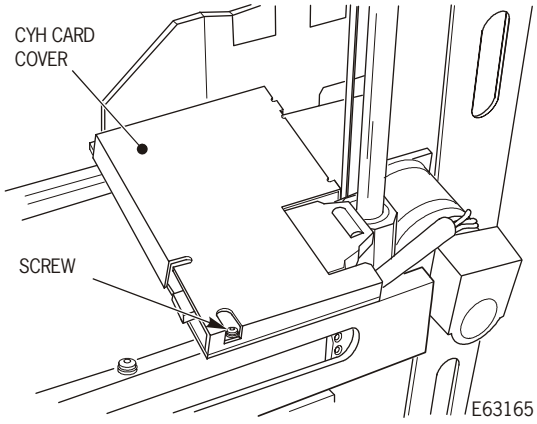


6. Remove both upper theta stops from the ceiling of the library using a Torx driver with a T-15 bit.
7. Rotate the robot counterclockwise so that the hand extends beyond the front opening of the library. This allows more convenient access to the cable connectors on the CYH card (on the hand).

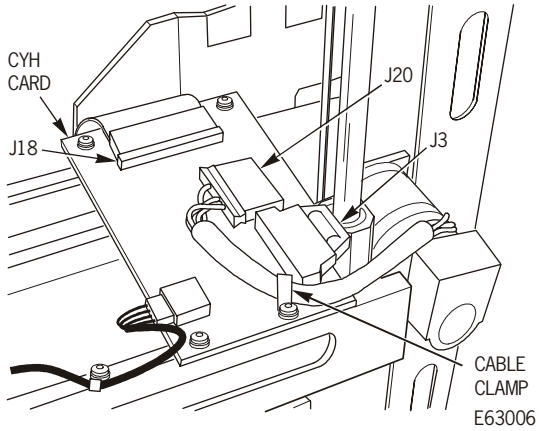


8. Remove the screw holding the CYH card cover using a Torx driver.
9. Move the cover horizontally until it is disengaged from the CYH card, and remove the cover.

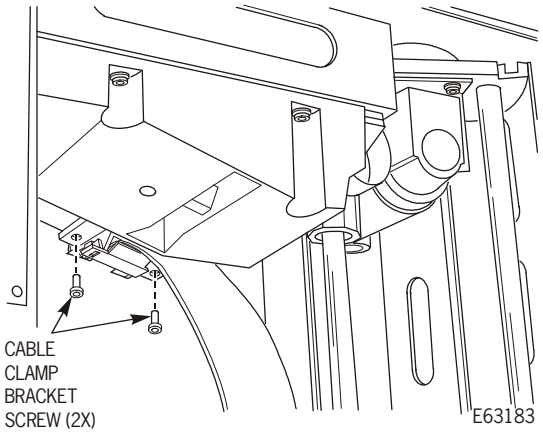
Note: Carefully observe the orientation of the card cover when removing it, because correct positioning of the cover on replacement is critical.



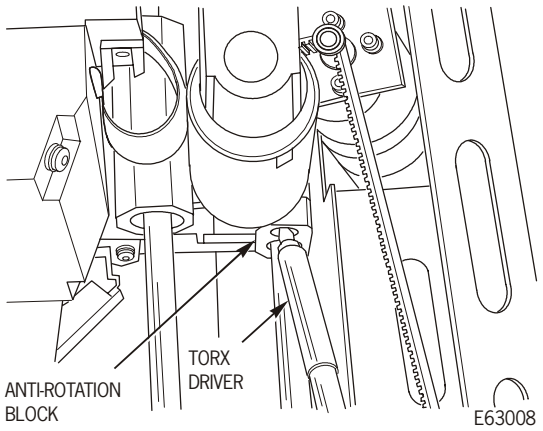
10. Flip up one side of the cable clamp located under the hand and release the cable. (Note the routing of the cables for replacement.)
11. Disconnect cables from the J3, J20, and J18 connectors on the CYH card.
12. Rotate the robot clockwise so the hand is inside the library, and carefully raise the hand to the top of the Z column assembly.



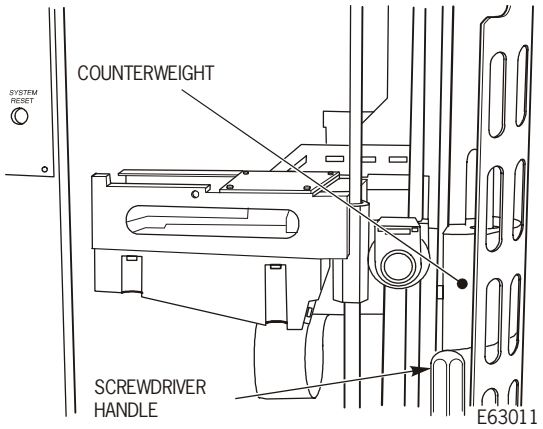
13. Remove the two screws securing the flex cable clamp bracket to the bottom of the hand using a Torx driver with a T-10 bit.
14. Lay the cable on the library floor. Make sure it does not interfere with Z column motion.



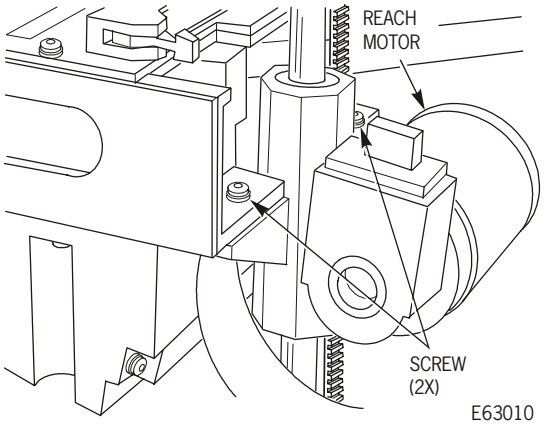
15. Remove the screw securing the anti-rotation block (under the hand) using a Torx driver with a T-15 bit.
16. Slide the anti-rotation block down to the base of the Z column.
17. Carefully lower the hand/camera assembly to the bottom of the Z column.



18. Prop up the counterweight by placing a standard eight inch flat-blade screwdriver between the counterweight and the base of the robot. (optional)

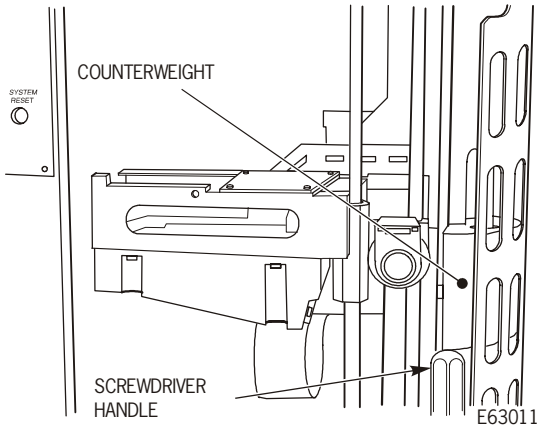


19. Supporting the hand assembly with your left hand, remove the two screws securing the hand/camera assembly to the bearing block (on the end of the hand assembly near the reach motor) using a Torx driver with a T-15 bit.
20. Carefully lift and remove the hand by rotating it so the card side (top) of the hand faces the front of the library, making sure the hand motor clears the Z column and the Z belt.
21. Pull the hand/camera assembly out through the front opening of the library.

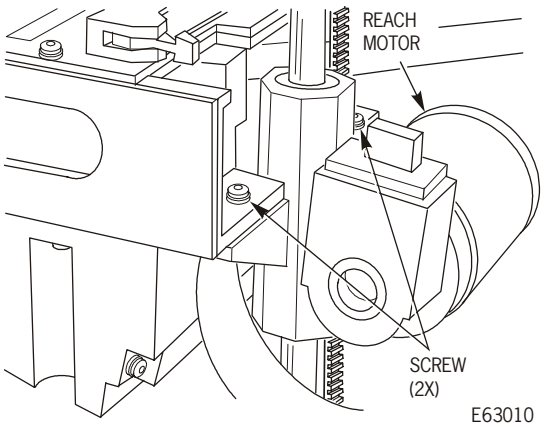


Replacement

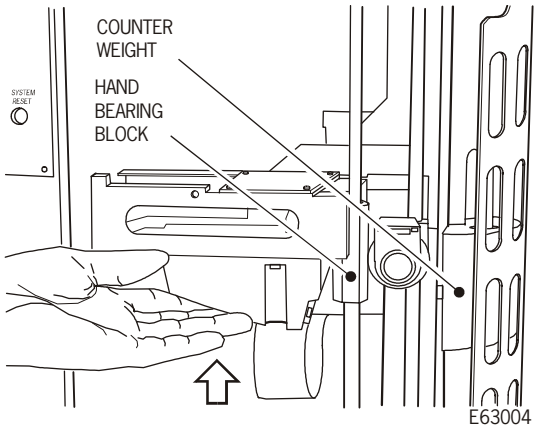
1. Holding the assembly with your left hand, rotate it so the card side (top) faces the front of the library, making sure the hand motor clears the Z column and the Z belt.
2. Rotate the assembly until it clears the Z column and the Z belt and align it with the two screw holes on the bearing block using the locator pins on the bearing block.



3. Install the two screws securing the hand/camera assembly to the bearing block (on the end of the hand assembly near the reach motor) using a Torx driver with a T-15 bit. Do not overtighten.
4. Remove the screwdriver propping up the counterweight, if used.

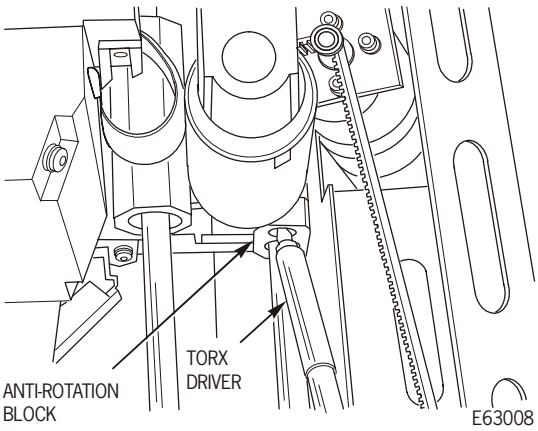


5. Carefully raise the hand/camera assembly to the top of the Z column.

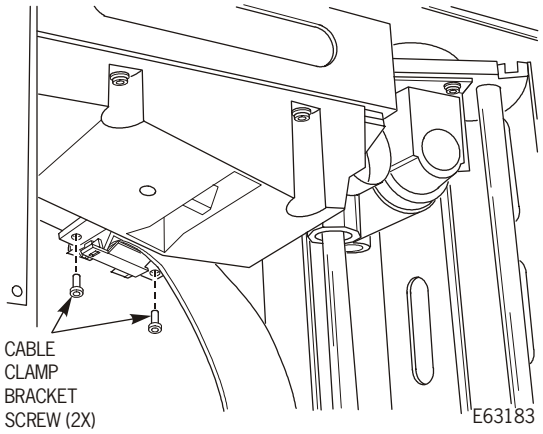


6. Slide the anti-rotation block up the Z column and align it to the locating pins on the hand assembly.

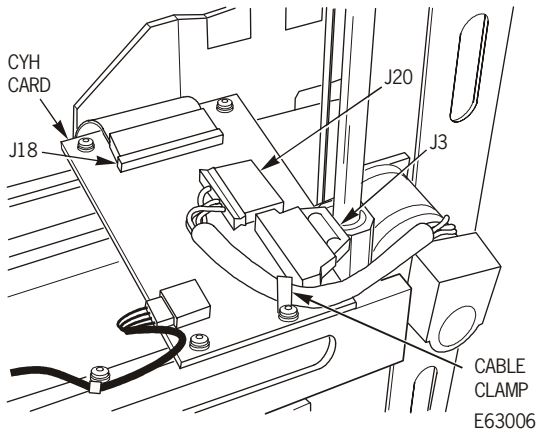
7. Install the screw securing the anti-rotation block (under the hand) using a Torx driver with a T-15 bit.



8. Install the two screws securing the flex cable clamp bracket to the bottom of the hand using a Torx driver with a T-10 bit. Make sure the flex cable is not twisted.
9. Carefully raise and lower the hand/camera assembly to be sure the hand flex cable has full range of movement to the top and bottom of the Z column.

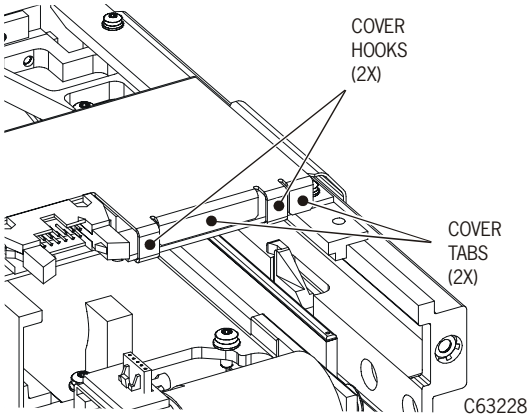


10. Connect the J3, J20, and J18 cables to the connectors on the CYH card, and secure the J20 cable under the clamp by flipping the clamp over the cable.
11. Rotate the robot so the hand is inside the library.



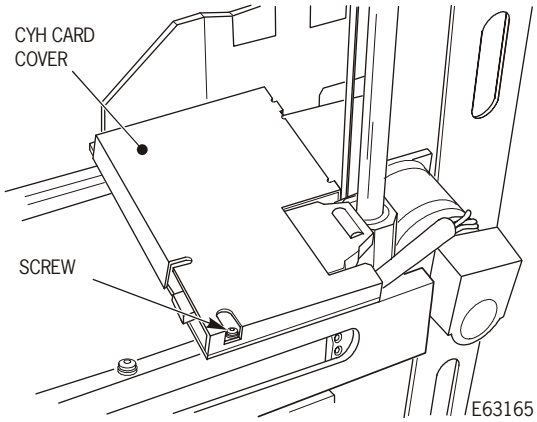
12. Replace the CYH card cover over the CYH card.

Note: Hook the two cover hooks on the back side of the cover *underneath the card*. The longer cover tab between the two hooks rests *on top of the card*. The short cover tab at the end rests *off the card and on top of the hand*.

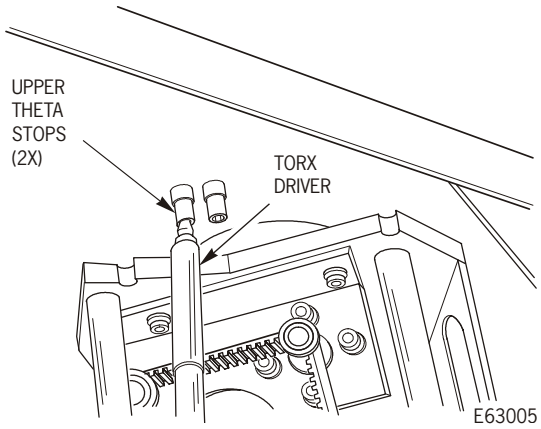


13. Replace the screw holding the CYH card cover using a Torx driver.

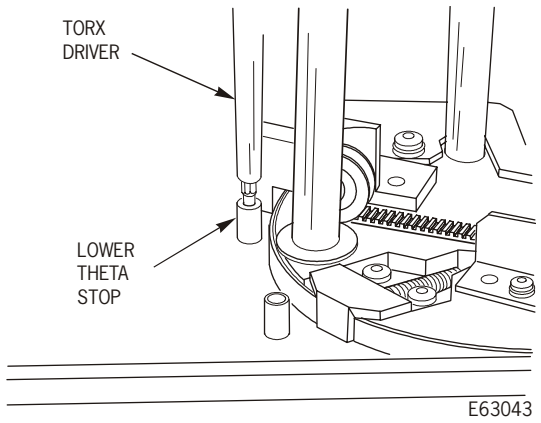
Note: The front edge of the card cover fits *over the edge* of the card. It should not rest on top of the card. Be sure the cartridge present sensor cable is tucked under the cover.



14. Install the two upper theta stops to the ceiling of the library using a Torx driver with a T-15 bit.



15. Install the lower theta stop to the floor of the library using a Torx driver with a T-15 bit.



16. Make sure the reach mechanism on the hand assembly is fully retracted by pushing the cartridge picker into the hand assembly.

17. Proceed to "Checkout Procedures" on page 6-108.

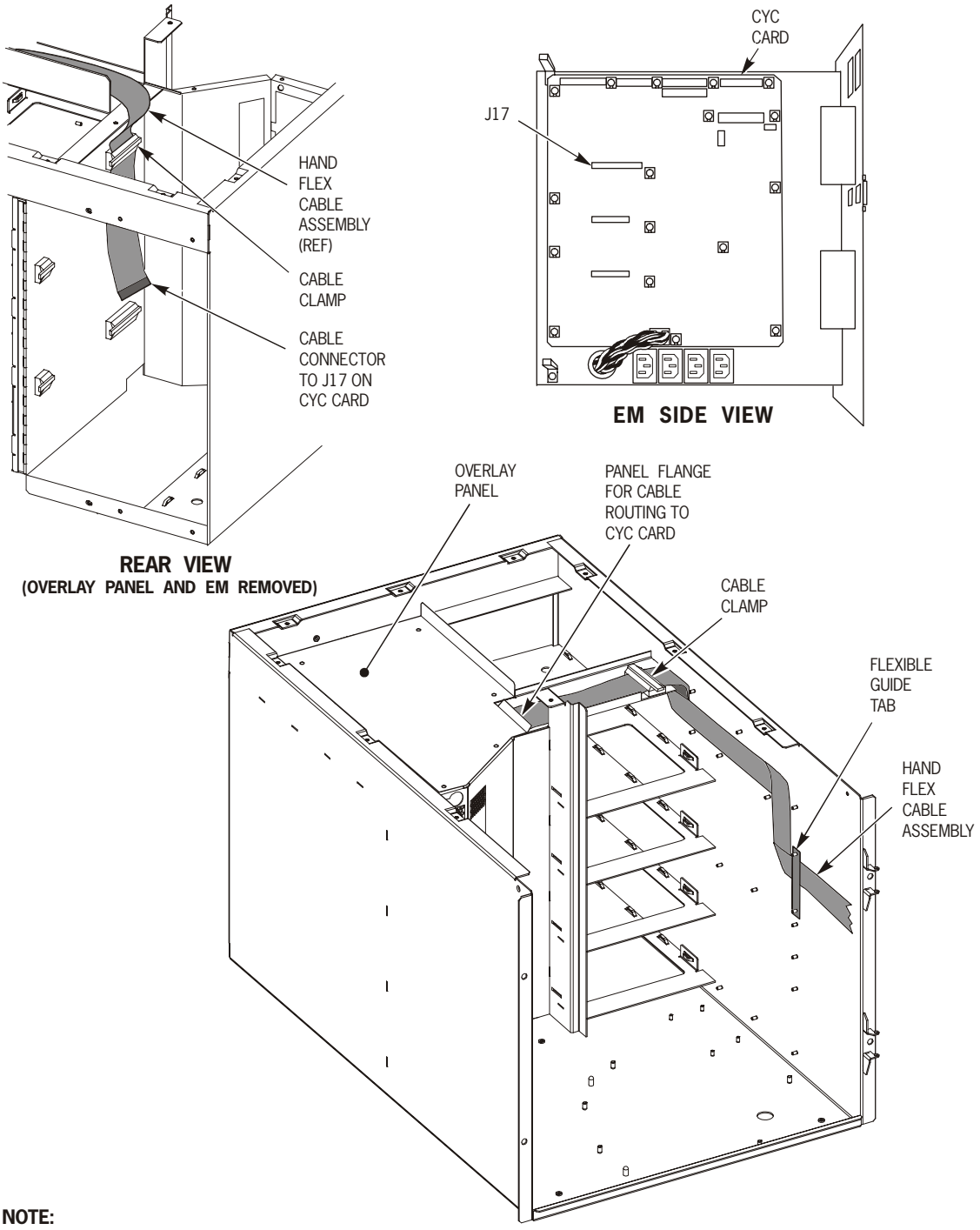
Hand Flex Cable Assembly

The hand flex cable FRU is routed from the electronics module, along the right side of the library to the hand. To replace this cable you must remove the tray containing two storage cells at the top of the drive slots, or remove the fourth tape drive (at the top) if there is one installed.

Tools required:

- ESD grounding kit
- Torx driver w/ T-10 and T-15 bit
- 3/16 in. hex nut driver
- Flat-blade screwdriver
- Electrical or masking tape
- Flashlight
- Key to unlock front door

Figure 6-11. Hand/Flex Cable Routing



NOTE:
Some components are omitted for clarity.

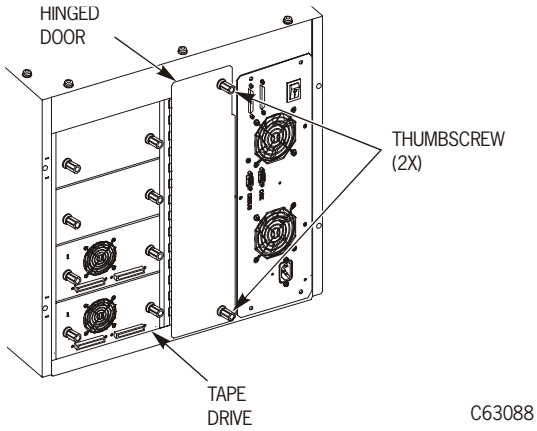
C63007

Removal

1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Power off the library, disconnect the power cord, and open the library front door.

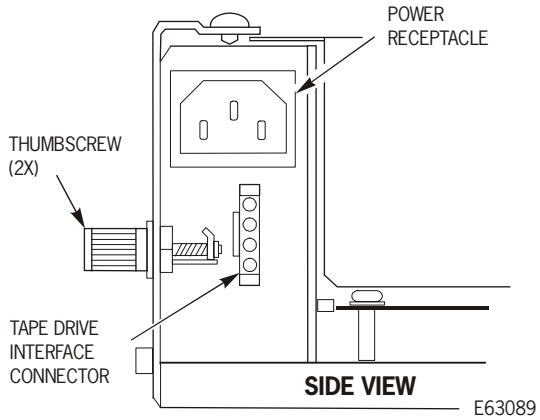
WARNING:
Possible physical injury: **High voltage! Do not touch any components on the power supply located within the electronics module or on the drive trays. Voltage could be present even though the unit is powered off.**

3. Loosen the thumbscrews on the hinged access door and open the door.



4. If your library has a tape drive in Slot 3 at the top, disconnect its power cable.

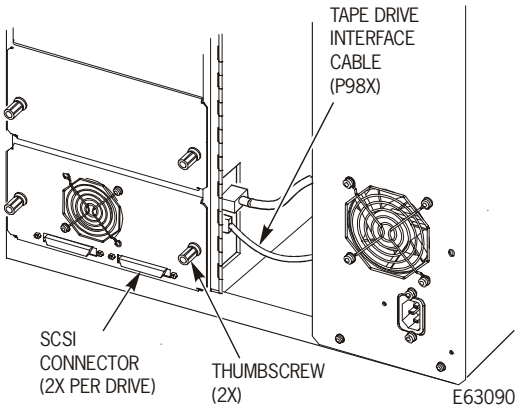
Note: If your library has additional cells instead of a tape drive in Slot 3 (top) go to Step 6.



5. Still working on the top drive, disconnect the tape drive interface cable. (The figure shows the bottom drive as an example.)

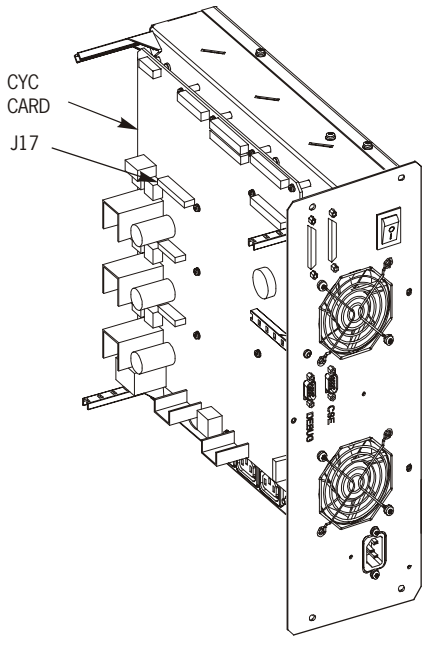
CAUTION:
Possible equipment damage: **Remove the tape drive interface cable from the rectangular hole in the library chassis, to prevent damage when backing out the drive.**

6. Loosen the thumbscrews at the rear of the tape drive or cell tray (in slot #3 at the top) and back it out a few inches. It is not necessary to remove it.

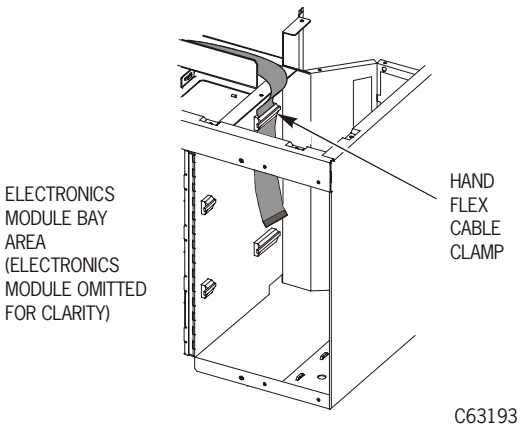


7. Working through the hinged door at the back of the library, disconnect the hand flex cable connector from J17 on the CYC card. Use a flashlight to see if necessary.

Note: The electronics module is shown removed from the library for clarity.

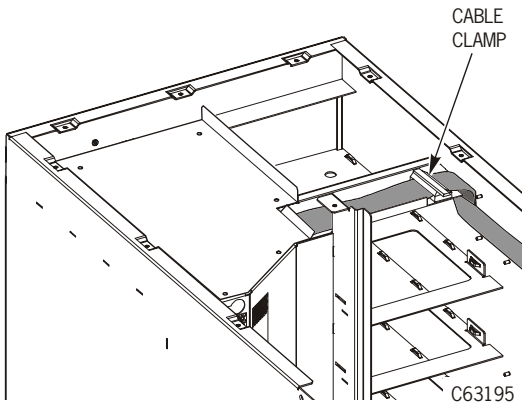


8. Open the hand flex cable clamp at the top left corner of the electronics module bay.

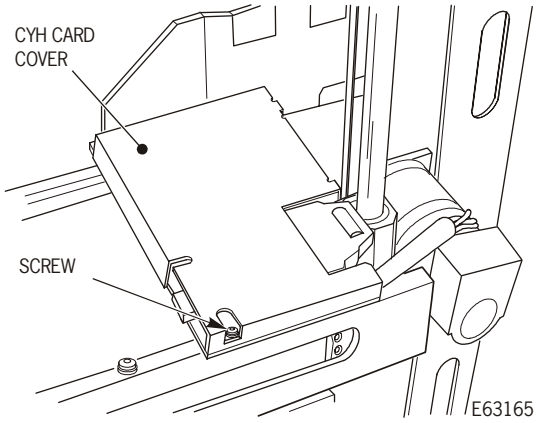


9. Move to the front of the library and open the flex cable clamp over Slot 3 (at the top).

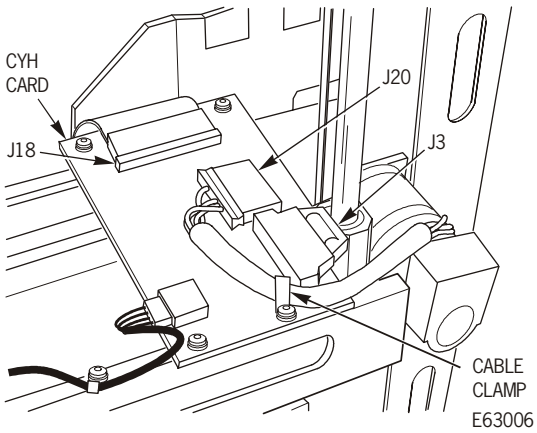
Note: Use a flat-blade screwdriver if necessary.



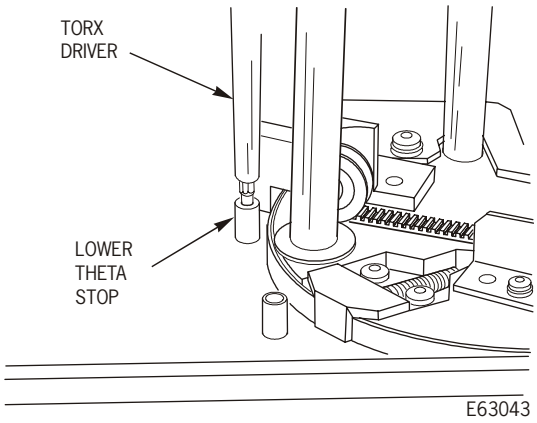
10. Remove the screw holding the CYH card cover using a Torx driver.
11. Move the cover until it is disengaged from the CYH card, and remove the cover.



12. Disconnect the hand flex cable connector from J18 on the CYH card on the hand.

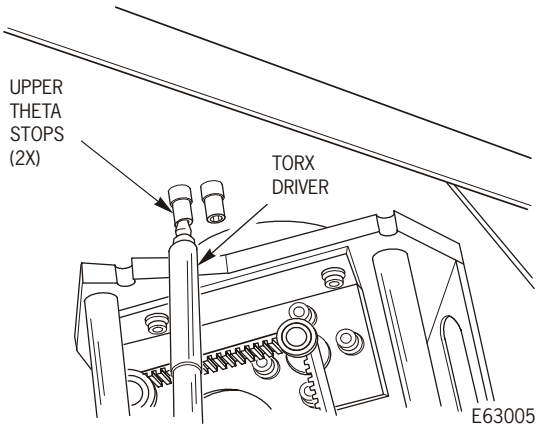


13. Remove the lower theta stop from the floor of the library using a Torx driver with a T-15 bit.

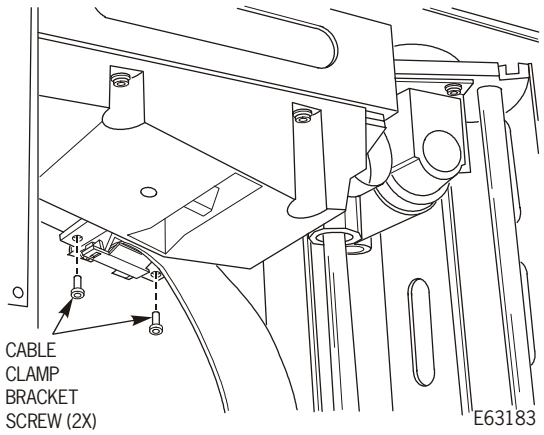


14. Remove both upper theta stops from the ceiling of the library using a Torx driver with a T-15 bit.

15. Rotate the robot counterclockwise so the hand extends beyond the front opening of the library. This allows more convenient access to the cable connectors on the CYH card.

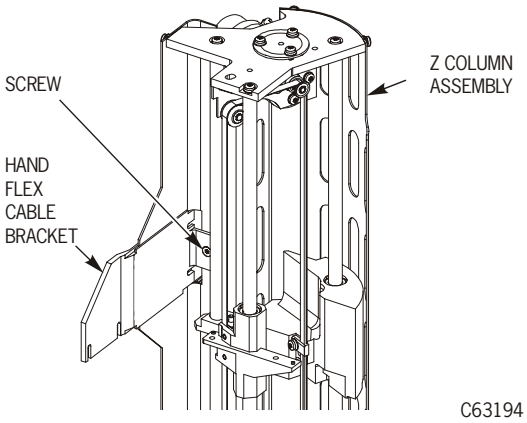


16. Remove the two screws securing the flex cable clamp bracket to the bottom of the hand using a Torx driver with a T-10 bit.

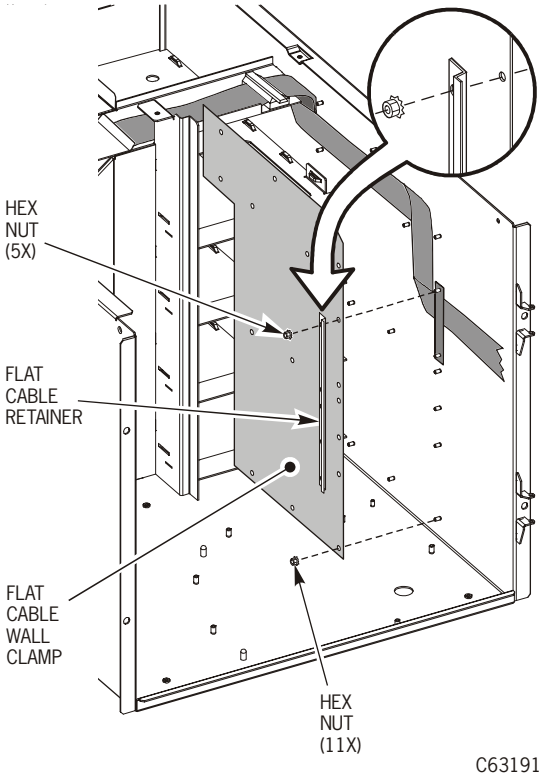


17. Remove the screw mounting the hand flex cable bracket to the Z column using a Torx driver with a T-10 bit.

Note: For clarity, the robot and flex cable bracket are shown removed from the library and without the hand.



18. Remove the five nuts with captive star washers from the flat cable retainer securing the flat cable wall clamp to the right side (as you face the front of the library) of the library using a 3/16 in. nut driver. Note the flat cable retainer location for installation. Note also the tape position on the interior right side of the unit.
19. Remove the remaining 11 hex nuts with captive star washers from the flat cable retainer at the right side of the library (as you face the front of the library) using a 3/16 in. nut driver.
20. Remove the flat cable wall clamp from the library.
21. Carefully remove the hand flex cable from the library.

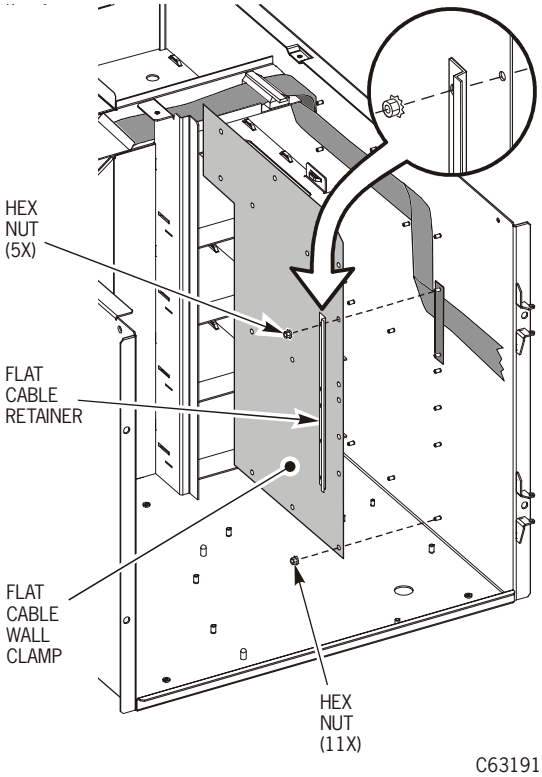


Replacement

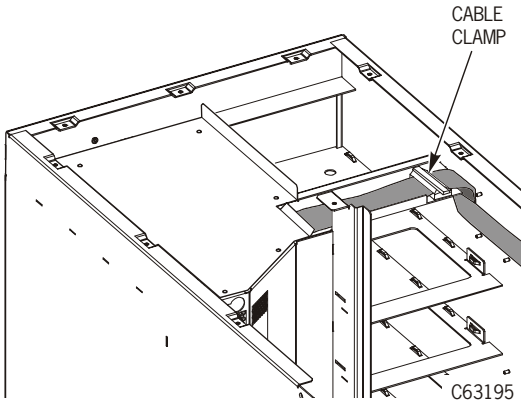
1. Working from the front of the library, route the new hand flex cable over the top of Slot 3, through the flange opening and down into the electronics module bay. Use the holes in the flexible guide tab to properly align the tab over the studs along the interior right side of the unit. Refer to Figure 6-11 on page 6-43 for cable routing.

Note: Make sure the end of the cable with the bracket and the folds is at the front of the library.

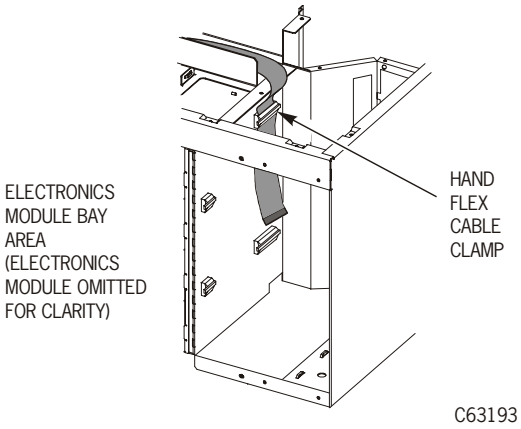
2. Tape the flex cable to the right side of the library. Make sure the flex cable is not twisted.



3. Route the flex cable through the cable clamp above drive Slot 3.

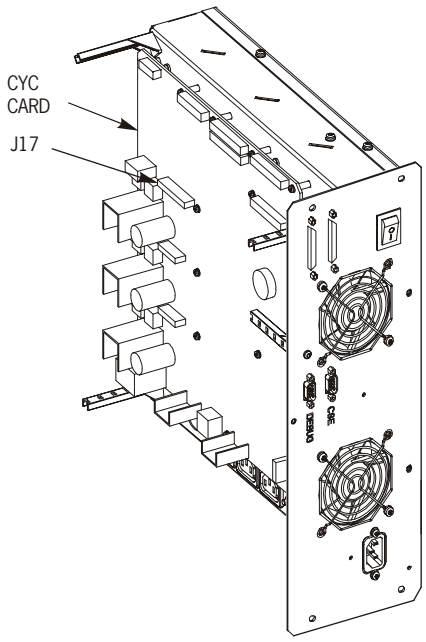


4. Route the flex cable through the cable clamps in the electronics module bay (left side, one horizontal clamp and one vertical).
5. Close the clamp over drive Slot 3.
6. Close the clamps in the electronics module bay.

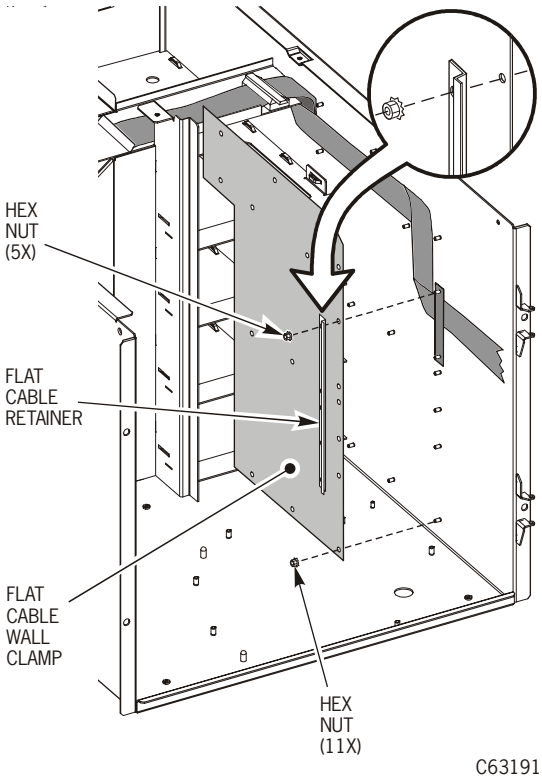


7. Connect the flex cable connector J17 on the CYC card. Use a flashlight to locate this receptacle if necessary.

Note: The electronics module is shown removed from the library for clarity.

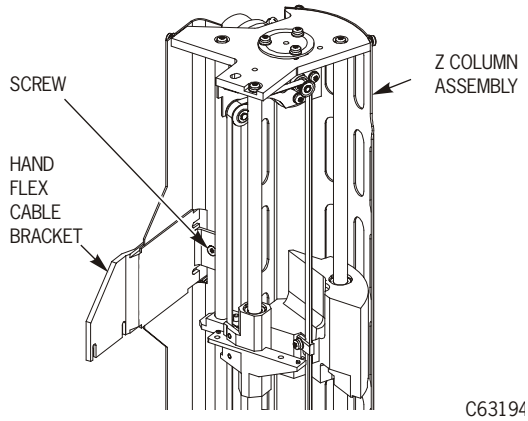


8. Place the flat cable wall clamp over the flex cable and align the holes with the screws on the side of the library.
9. Install the 11 hex nuts with captive star washers in the flat cable wall clamp using a 3/16 in. nut driver as shown.
10. Align the flat cable retainer with the five screws on the side of the library, covering the flat cable wall clamp.
11. Install the five hex nuts with captive star washers in the flat cable retainer using a 3/16 in. nut driver.

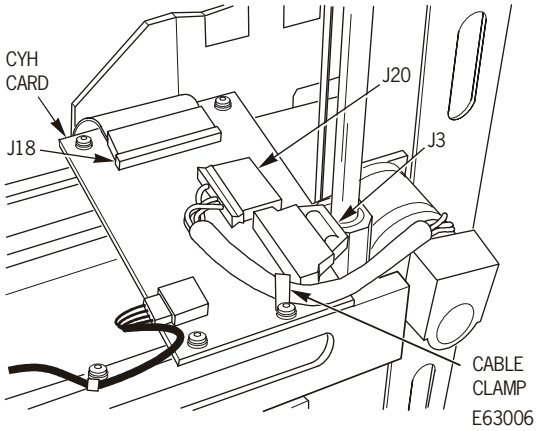


12. Install the screw to mount the hand flex cable bracket to the Z column using a Torx driver with a T-10 bit.

Note: The robot is shown removed from the library for clarity.

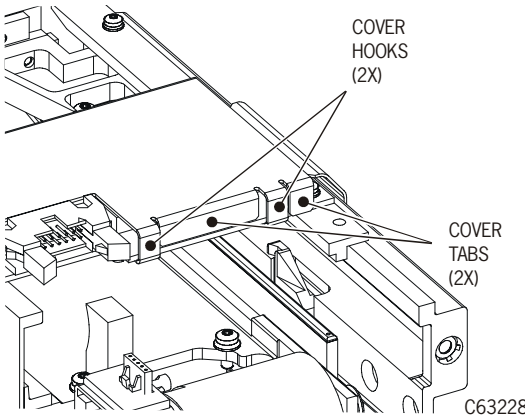


13. Connect the hand flex cable connector to J18 on the CYH card.



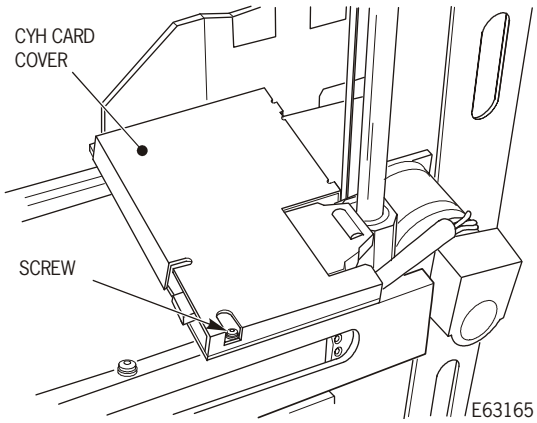
14. Replace the CYH card cover over the CYH card.

Note: Hook the two cover hooks on the back side of the cover *underneath the card*. The longer cover tab between the two hooks rests *on top of the card*. The short cover tab at the end rests *off the card and on top of the hand*.

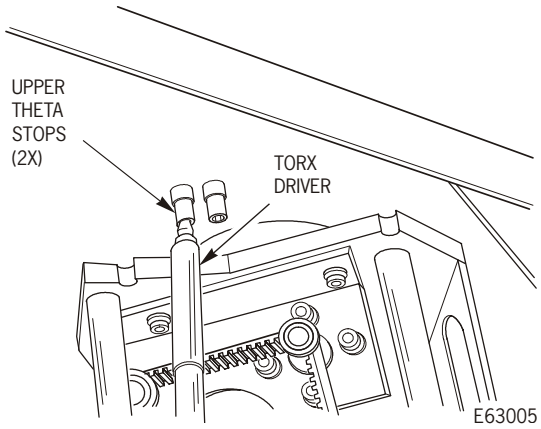


15. Replace the screw holding the CYH card cover using a Torx driver.

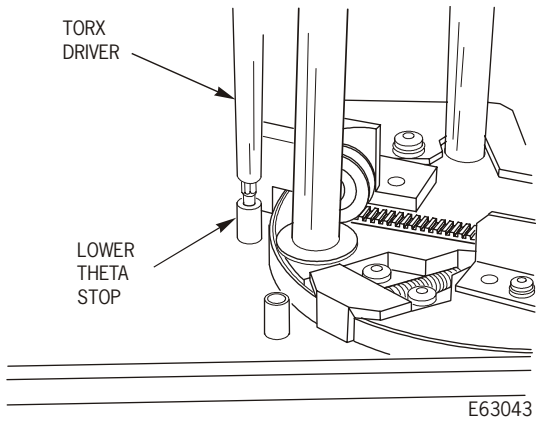
Note: The front of the card cover fits *over the edge* of the card. It should not rest on top of the card. Make sure the cartridge present sensor cable is tucked under the cover.



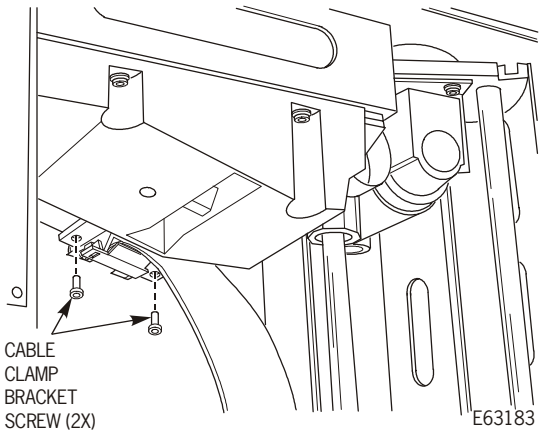
16. Rotate the hand into position inside the library and install the two upper theta stops to the ceiling of the library using a Torx driver with a T-15 bit.



17. Install the lower theta stop to the floor of the library using a Torx driver with a T-15 bit.

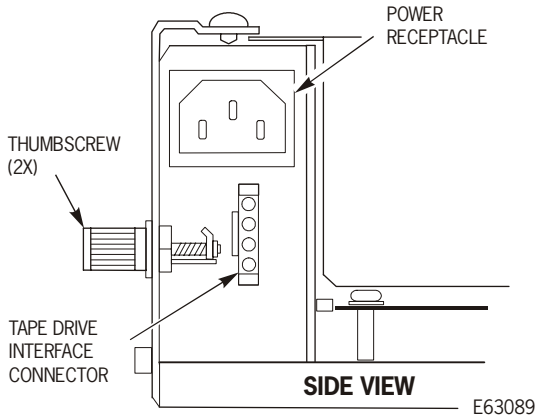


18. Install the two screws to secure the flex cable clamp bracket to the bottom of the hand using a Torx driver with a T-10 bit. Make sure that the flex cable is not twisted.

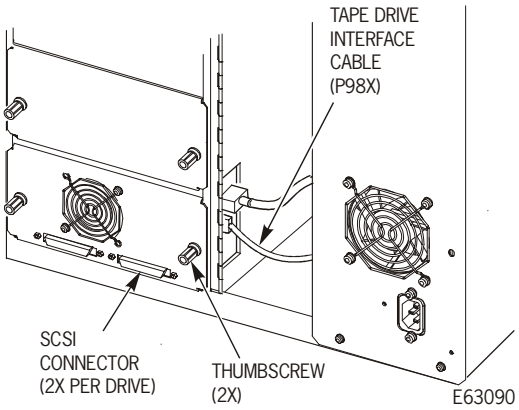


19. Slide the tape drive or cell tray back into Slot 3 (the top slot), being careful not to catch or crush any cables. Tighten the thumbscrews at the back the tray.

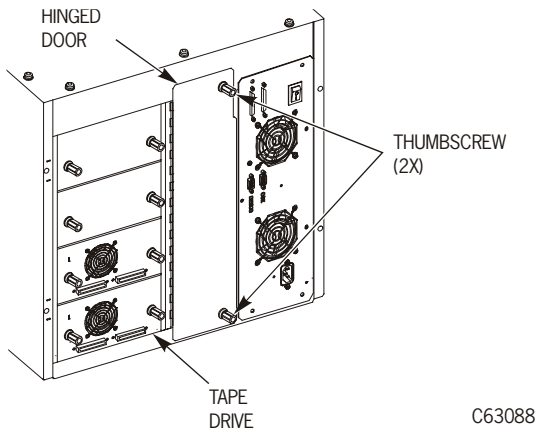
20. If there is a tape drive in Slot 3, reconnect the drive power cable to the drive.



21. Connect the tape drive interface cable to the tape drive interface connector on the drive. Note that the markings on the connector should face the rear of the tape drive.



22. Close the hinged door at the rear of the library and tighten the thumbscrews.
23. Connect the AC power cable to the electronics module and power on the library.
24. Observe the front panel to ensure that power comes on to the library and tape drives.
25. Proceed to "Checkout Procedures" on page 6-108.



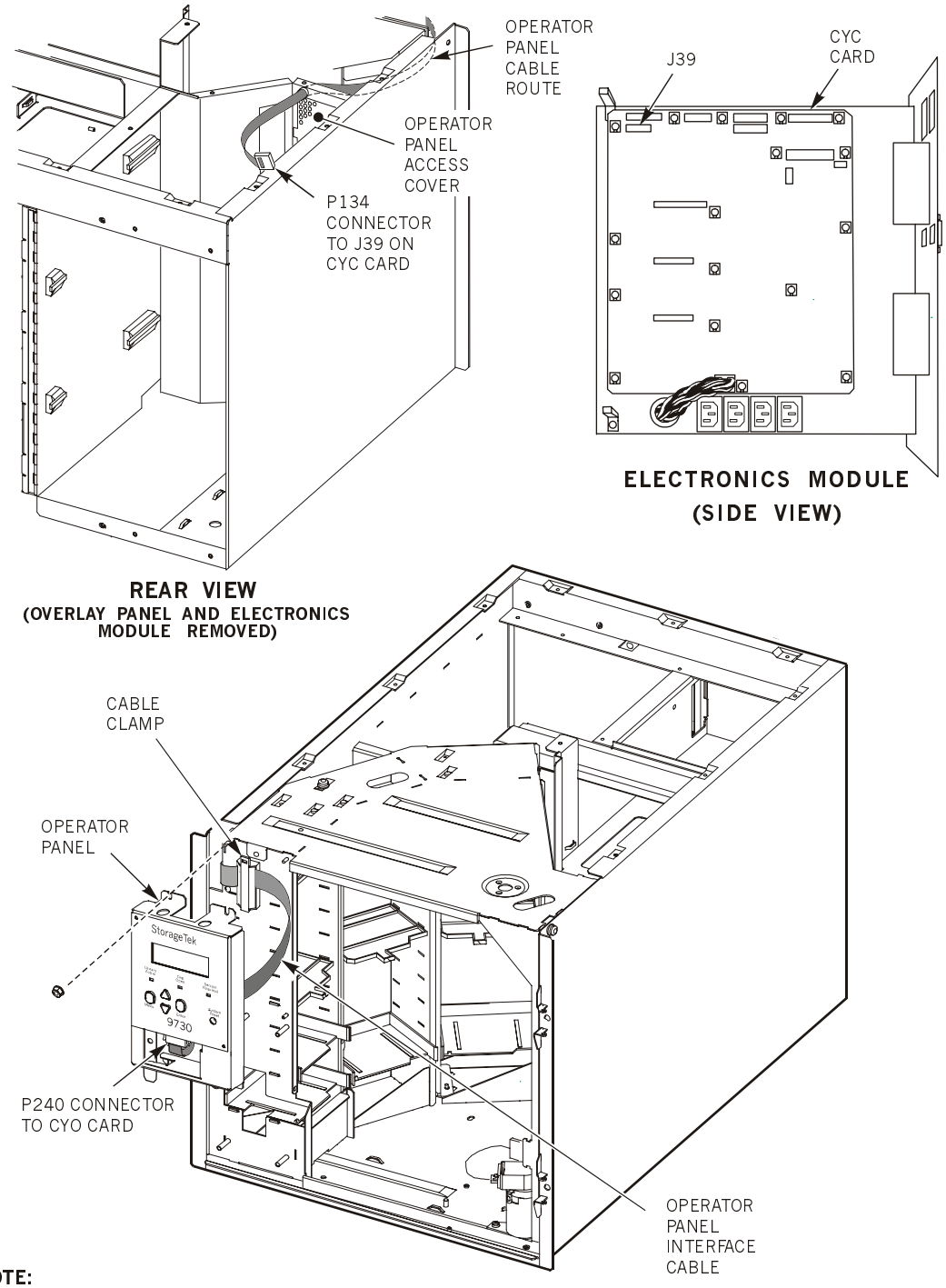
Operator Panel Cable

The operator panel cable FRU is routed from the CYO card (behind the operator panel) along the left side of the library (as you face the front of the library) underneath the top. It connects to J37 on the CYC card. To replace this cable you must remove the operator panel and the top of the library.

Tools required:

- ESD grounding kit
- Torx driver and T-15 and T-10 bits
- Flashlight
- Key to unlock front door

Figure 6-12. Operator Panel Cable Routing



NOTE:
Some Components are Omitted for Clarity.

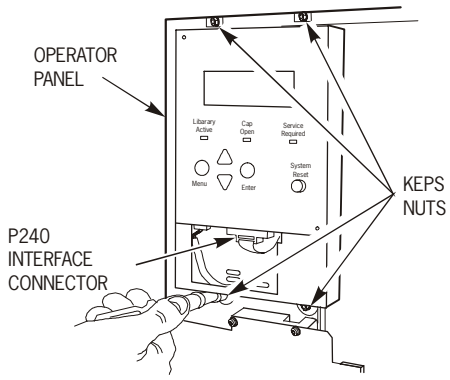
C63198

Removal

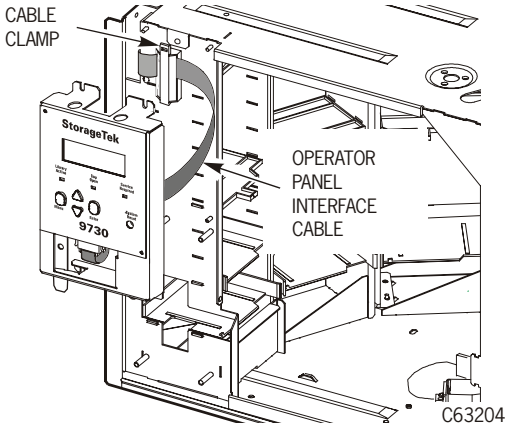
1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Power off the library, disconnect the power cord, and open the library front door.
3. Disconnect the SCSI connectors from the back of the electronics module.
4. Remove the electronics module following the procedures beginning on page 6-17. Place the electronics module on a flat, stable surface.
5. Remove the 11 screws on top and the one on on the front right side of the library top panel. Remove the top. (This step is optional. It may be possible to thread the cable through without taking off the top.)

Note: Do not unscrew the three screws in the circular cutout of the top panel. These hold the Z column in place.

6. Disconnect the P240 interface cable connector from the CYO card.
7. *Remove* the two bottom Keps nuts on the operator panel and *loosen* the two top nuts.
8. Pull the bottom of the operator panel forward to disengage the two top flanges.

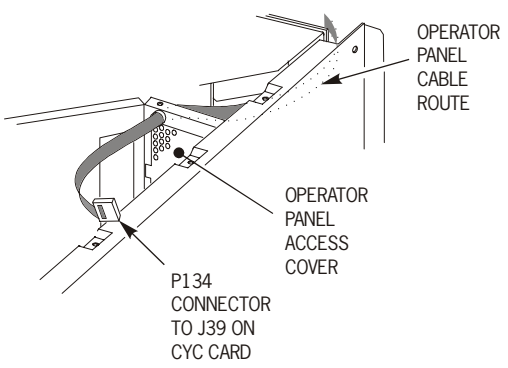


9. Open the operator panel interface cable clamp.
10. Gently remove the operator panel interface cable from the library.



Replacement

1. Thread the new ribbon cable through the operator panel cable route, then through the grommetted access hole and into the electronics module bay.



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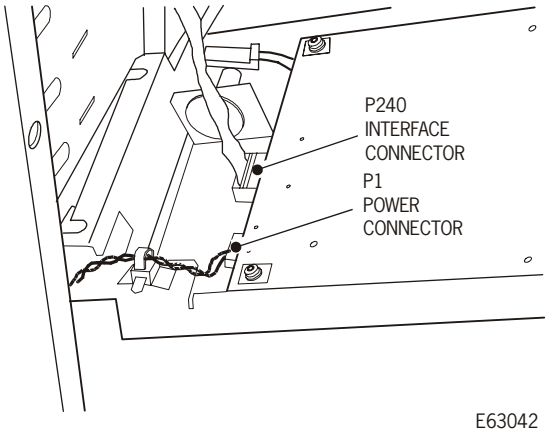
2. Replace the electronics module following the procedure beginning on page 6-23.
3. Close the hinged door at the rear of the library and tighten the thumbscrews.
4. At the front of the library, connect the P240 interface cable connector to the CYO card.



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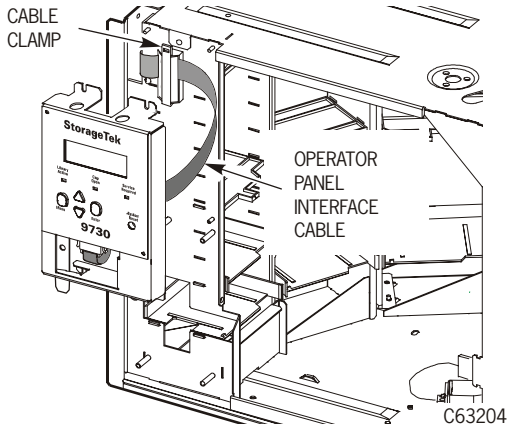
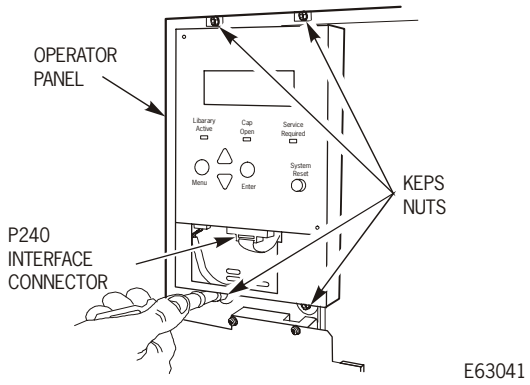
5. Thread the interface cable through the cable clamp and close it.



6. Align the operator panel cover flanges with the top two screw holes on the library frame.
7. Align the two bottom holes on the operator panel cover with the library frame.
8. Tighten the top and bottom Keps nuts.
9. Carefully close the library door to check for alignment, and adjust the Keps nuts as necessary.



10. Replace the library top panel and reinstall the 11 screws on top and the one on the right front side.
11. Replace the electronics module following the procedure beginning on page 6-23.
12. Reconnect the SCSI connectors to the back of the electronics module. Close the library front door.
13. Connect the AC power cable to the electronics module and power on the library.
14. Observe the front panel to ensure that power comes on to the library and tape drives.
15. Proceed to "Checkout Procedures" on page 6-108.

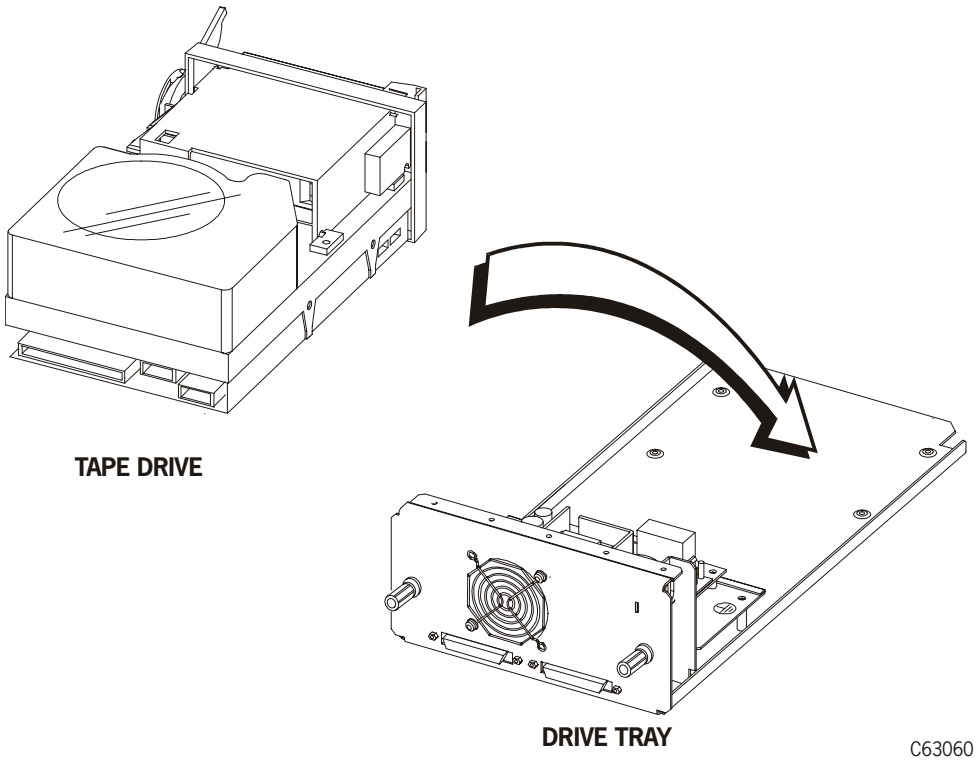
DLT Tape Drive

The tape drive FRUs are mounted on the drive tray assemblies.

Tools required:

- ESD grounding kit
- Torx driver and T-15 bit
- Flat-blade screwdriver
- Flashlight

Figure 6-13. DLT Tape Drive

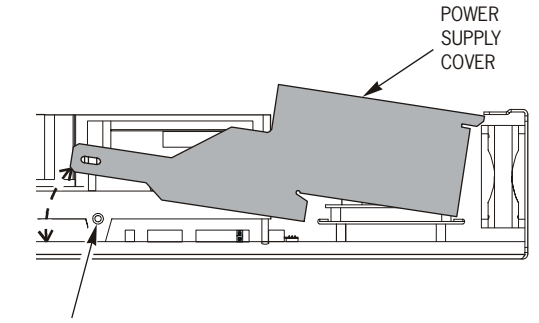


Removal

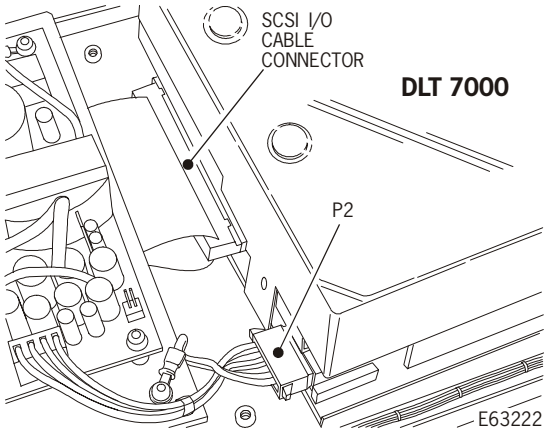
1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Follow the DLT and SDLT drive tray assembly removal procedure on page 6-12.

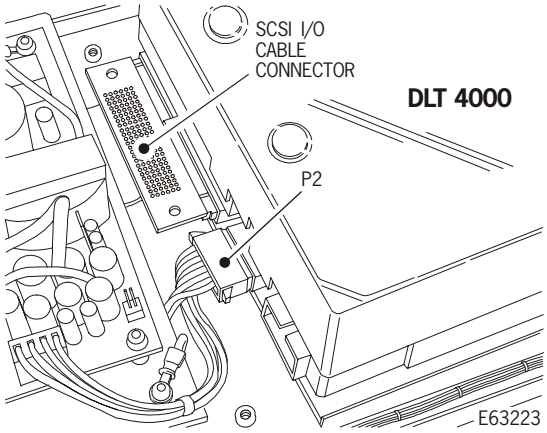
WARNING:
Possible physical injury! **High Voltage! Do not touch any components on the power supply located within the electronics module or on the drive trays. Voltage could be present even though the unit is powered off.**

3. Remove the power supply cover by removing the screw on each side of the cover using a Torx driver with a T-15 bit, lifting the attachment arms and sliding the cover forward.



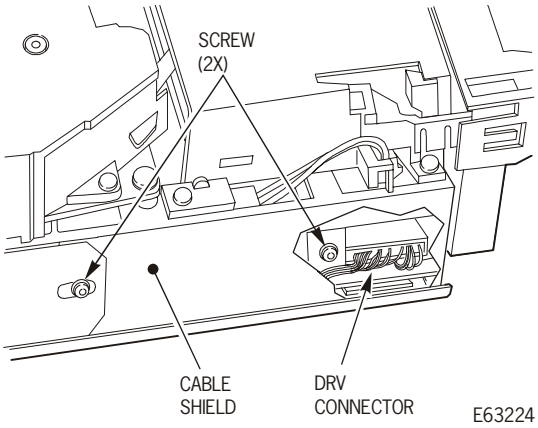
4. Disconnect the SCSI I/O and P2 power cables located at the rear of the tape drive.



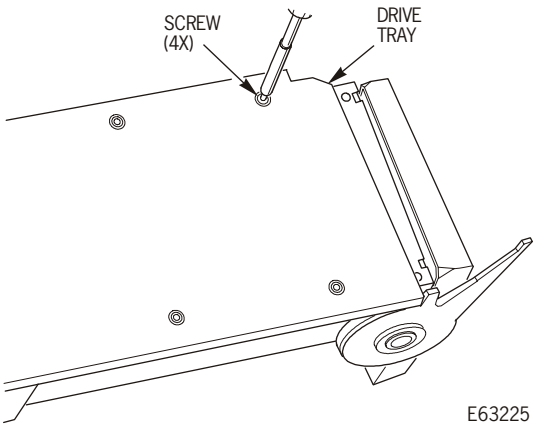


5. Remove the two screws attaching the cable shield to the side of the drive tray using a Torx driver with a T-15 bit, and remove the shield.
6. Carefully pry up its retention tabs and unplug the DRV connector from its receptacle.

CAUTION:
Possible equipment damage: **Be careful not to pull hard on the cable itself or you might damage the connector.**

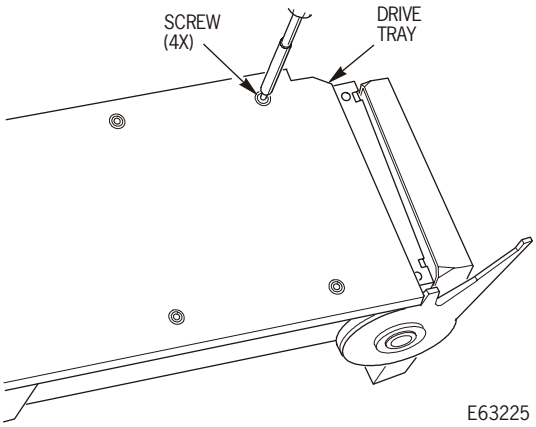


7. Gently turn the drive tray over to access the flat-head screws on the bottom.
8. Remove the four flat-head screws securing the tape drive to the tray using a Torx driver with a T-10 bit.

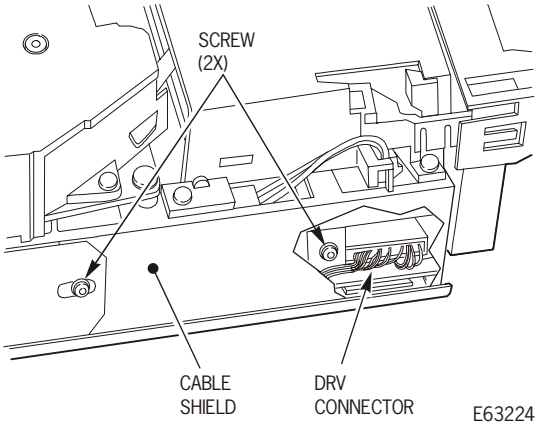


Replacement

1. Carefully turn over the drive and tray so the bottom is facing up, line up the four screw holes on the drive to the holes in the drive tray, and install the four flat-head screws to secure the drive to the tray.

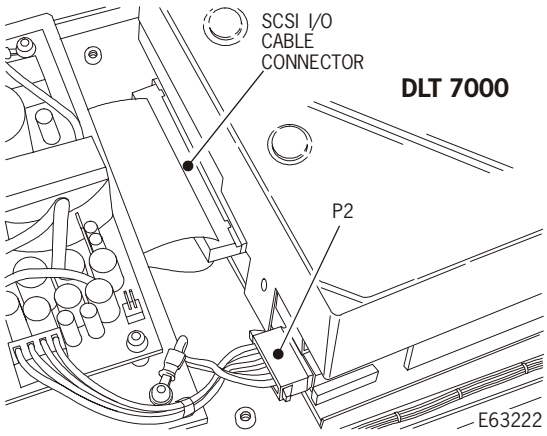


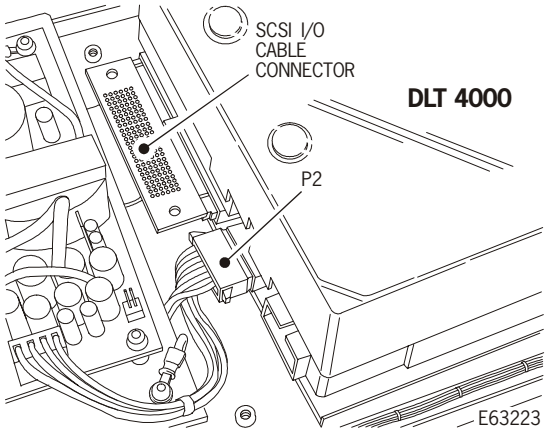
2. Turn the drive right side up, and plug the DRV connector into its receptacle.
3. Replace the cable shield (cable inside) and insert the two screws holding it to the side of the drive tray using a Torx driver with a T-15 bit. (Wait to insert the rearward screw until replacing the power supply cover in Step 6.)



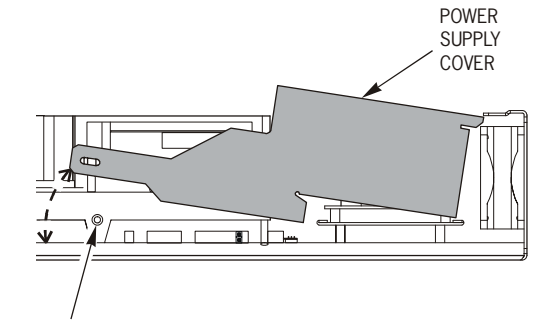
4. Connect the SCSI I/O and P2 power cables at the rear of the tape drive.

CAUTION:
Possible equipment damage: **Make sure to install the P2 cable into the correct connector plug on the DLT4000 drive, as shown. Installing it in the wrong plug might result in drive failure.**





5. Set terminator power on the new tape drive to match the old drive. (See "DLT and SDLT Drive Tray Assembly" on page 6-12.)
6. Replace the power supply cover by sliding the rear end under its retaining lip and lowering the front end to align with the screw holes.
7. Replace the screw on each side of the cover.



8. Replace the drive tray assembly following the procedure beginning on page 6-15.
9. Proceed to the "Checkout Procedures" on page 6-108.

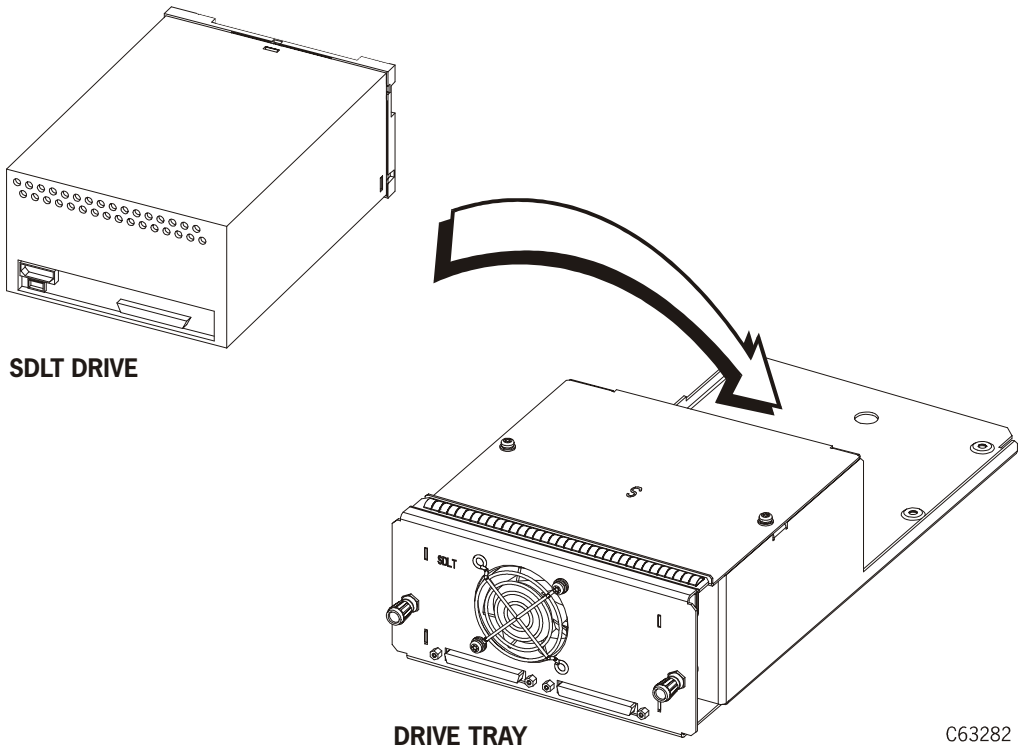
SDLT Tape Drive

The tape drive FRUs are mounted on the drive tray assemblies.

Tools required:

- ESD grounding kit
- Torx driver and T-15 bit
- Flat-blade screwdriver
- Flashlight

Figure 6-14. SDLT Tape Drive

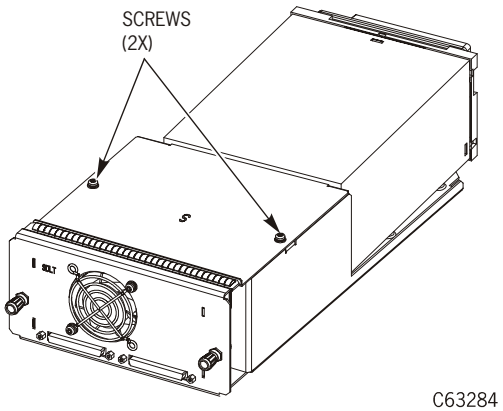


Removal

1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Follow the DLT and SDLT drive tray assembly removal procedure on page 6-12.

WARNING:
Possible physical injury! **High Voltage! Do not touch any components on the power supply located on the drive trays. Voltage could be present even though the unit is powered off.**

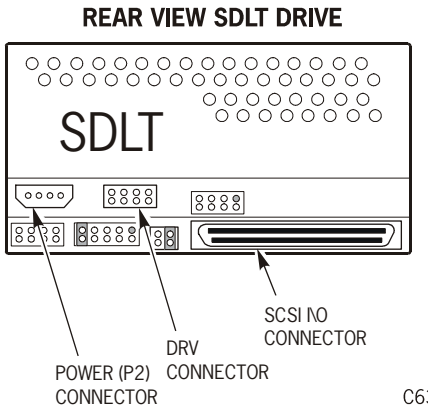
3. Remove the power supply cover by removing the two screws on top of the cover using a Torx driver with a T-15 bit. Lift the cover straight up to remove.



C63284

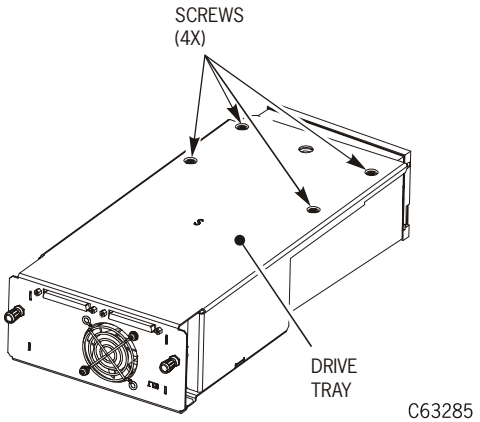
4. Disconnect the SCSI I/O and P2 power cables located at the rear of the tape drive.
5. Unplug the DRV connector from its receptacle.

CAUTION:
Possible equipment damage: **Be careful not to pull hard on the cable itself or you might damage the connector.**



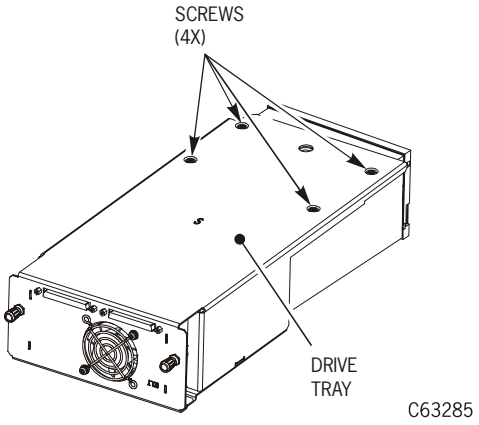
C63283

6. Gently turn the drive tray over to access the flat-head screws on the bottom.
7. Remove the four flat-head screws securing the tape drive to the tray using a Torx driver with a T-15 bit.



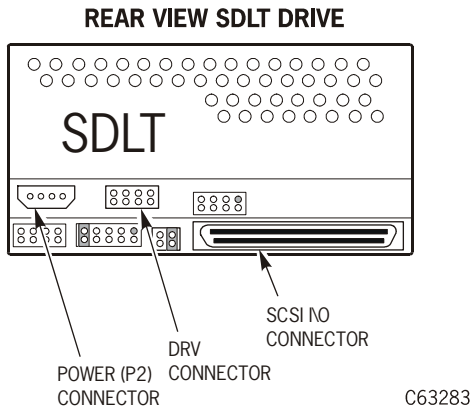
Replacement

1. Carefully turn over the drive and tray so the bottom is facing up, line up the four screw holes on the drive to the holes in the drive tray, and install the four flat-head screws to secure the drive to the tray.

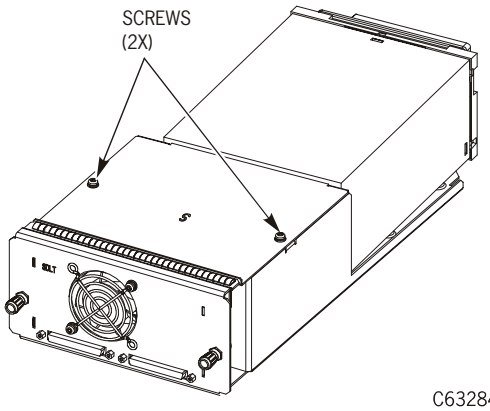


2. Turn the drive right side up, and plug the DRV connector into its receptacle.

3. Connect the SCSI I/O and P2 power cables at the rear of the tape drive.



4. Set terminator power on the new tape drive to match the old drive. (See "DLT and SDLT Drive Tray Assembly" on page 6-12.)
5. Replace the power supply cover by alligning the two screw holes on top of the drive.
6. Replace the screw on each side of the cover.



C63284

7. Replace the drive tray assembly following the procedure beginning on page 6-15.
8. Proceed to the "Checkout Procedures" on page 6-108.

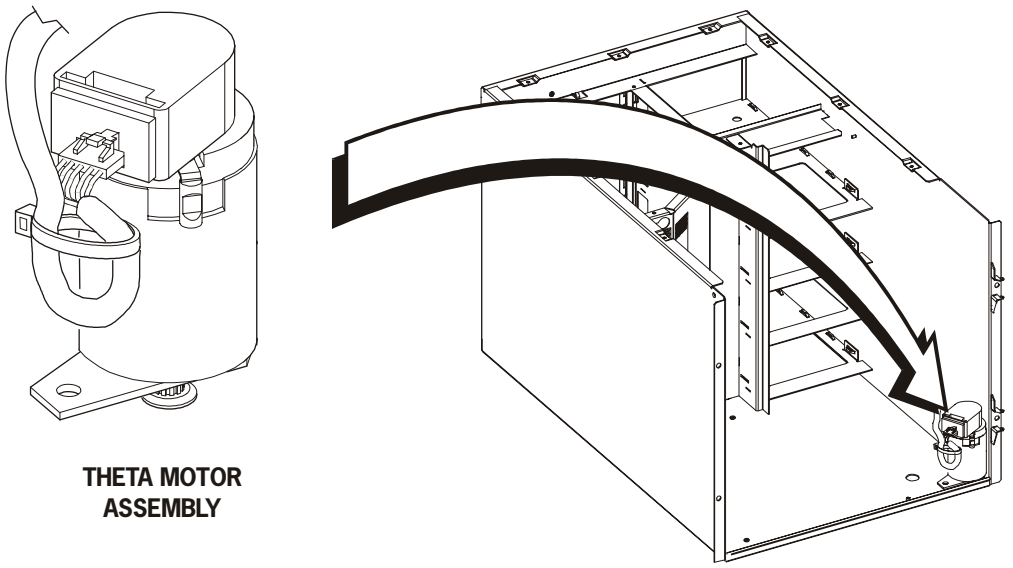
Theta Motor

The theta motor FRU is at the bottom right corner of the library, inside the front door. The theta motor cables, but not the mounting bracket, are part of the FRU.

Tools required:

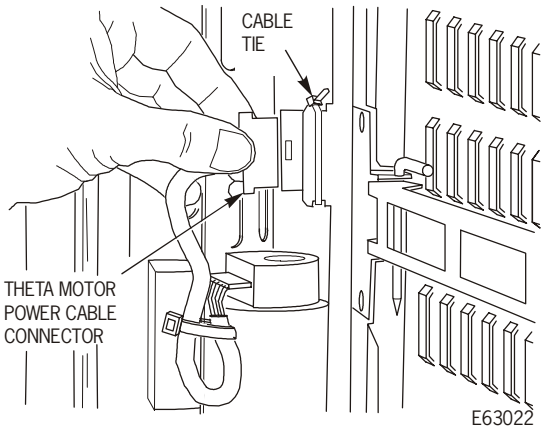
- ESD grounding kit
- Torx driver and T-15 bit
- Diagonal wire cutters
- Key to the library front door

Figure 6-15. Theta Motor

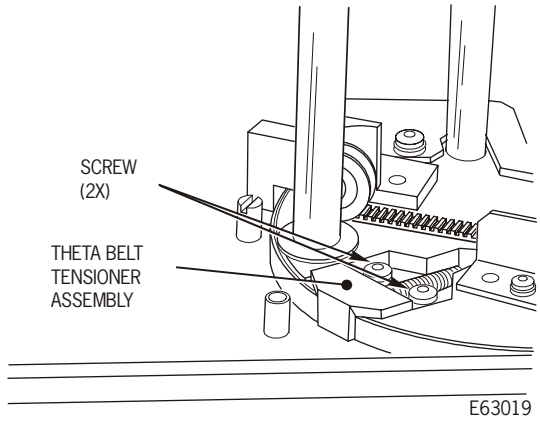


Removal

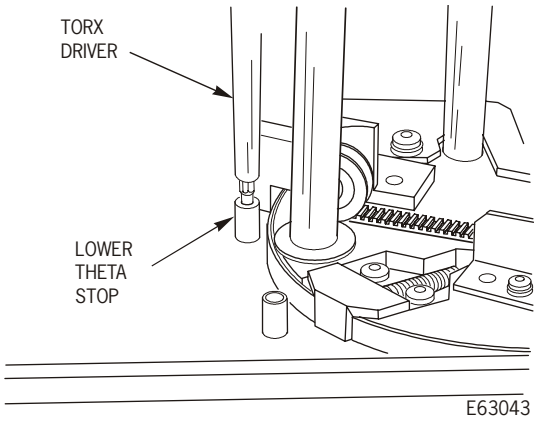
1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Power off the library and remove the library front door if desired.
3. Disconnect the theta motor power cable connector from the library.



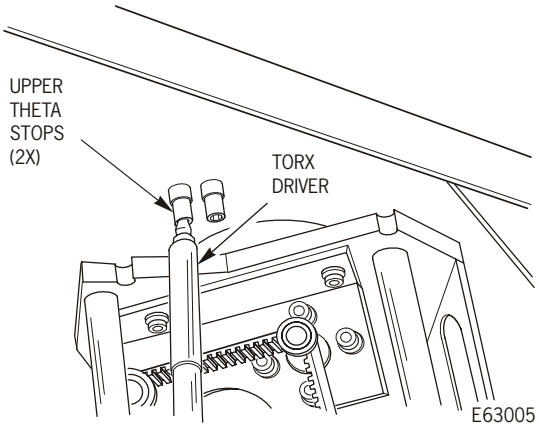
4. Remove the two screws on top of the theta belt tensioner assembly using a Torx driver with a T-15 bit.
5. Remove the theta belt tensioner assembly (including the spring, which slips over a hook), noting the position of the belt for replacement.



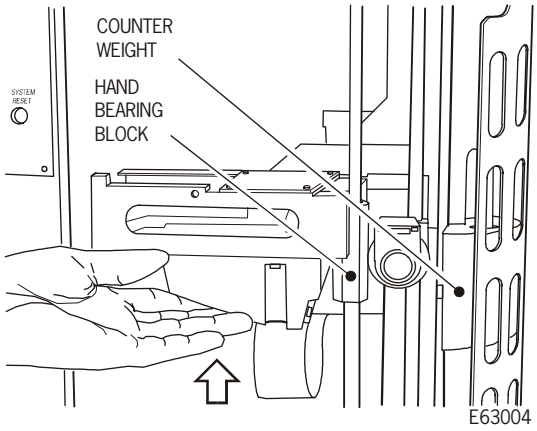
6. Remove the lower theta stop from the library floor using a Torx driver with a T-15 bit.



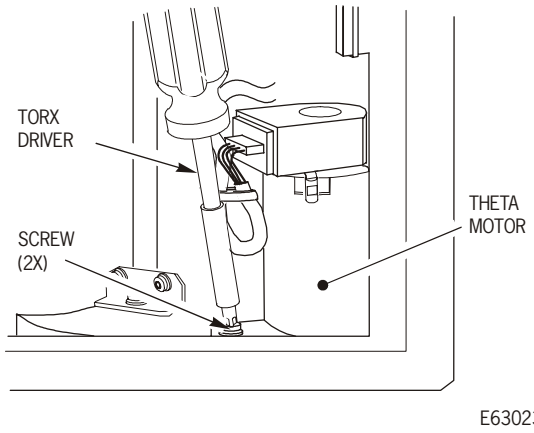
7. Remove the upper theta stops from the library ceiling using a Torx driver with a T-15 bit.



8. Carefully move the hand to the top of the Z column.
9. Rotate the robot so that the hand extends beyond the front opening of the library. This allows access to the screw at the right rear of the theta motor mount.

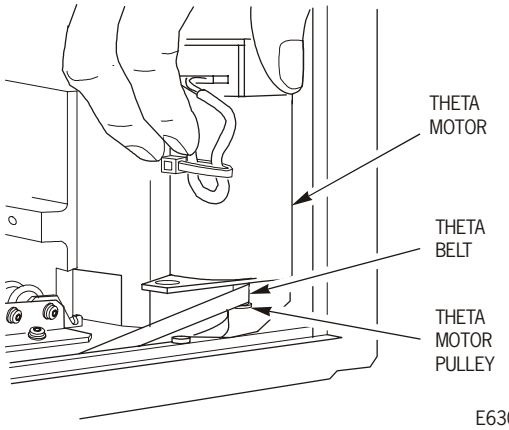


10. Remove the two screws from the theta motor mounting bracket (on the floor of the library) using a Torx driver with a T-15 bit, being careful not to damage the theta motor power cable.



11. Lift the motor up and toward the robot so that the theta motor pulley clears the theta belt.

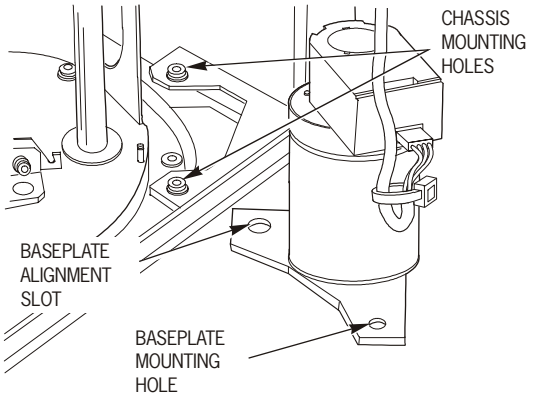
12. Remove the two screws holding the mounting bracket (baseplate) to the theta motor, noting the orientation of the bracket (slotted alignment hole goes towards back of library).



E63068

Replacement

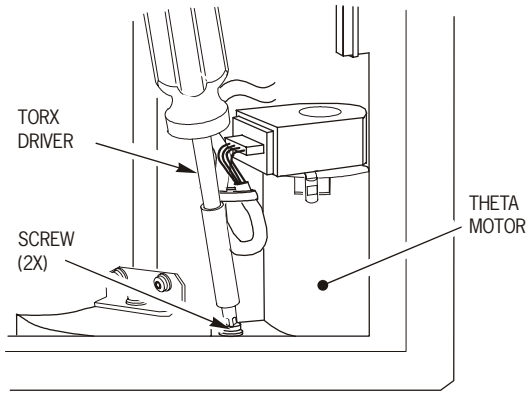
1. Bundle the theta motor power cable using a tie wrap, to match the original cable.
2. Attach the mounting bracket (baseplate) to the bottom of the new theta motor, using the two screws taken from the original. Note the orientation of the alignment slot and mounting hole relative to the cable outlet on the motor.
3. Place the motor in the library so the theta belt loops around the motor pulley, and match the alignment slot and mounting hole on the baseplate with the chassis mounting holes.



E63024

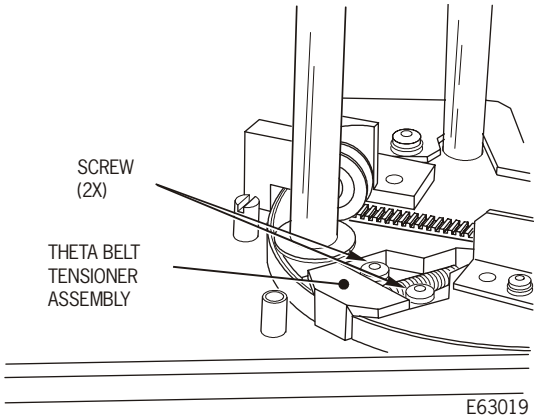
4. Loop the theta motor belt around the theta motor pulley. Make sure it moves freely.
5. Aligning the front of the theta motor mounting bracket flush with the front edge of the chassis, replace the mounting screws using a Torx driver with a T-15 bit, being careful not to damage the theta motor power cable.

Note: Use short screws (PN 10206213). Longer screws might cause the mechanism to bind.

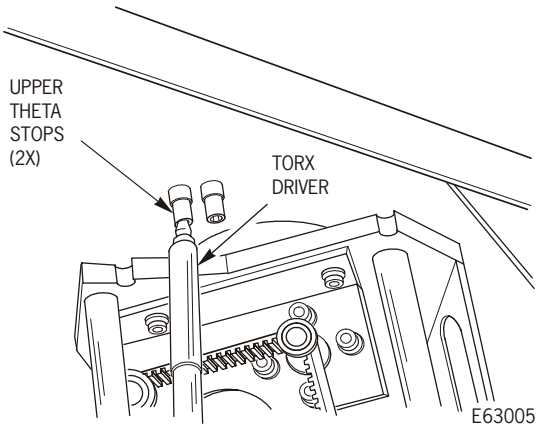


E63023

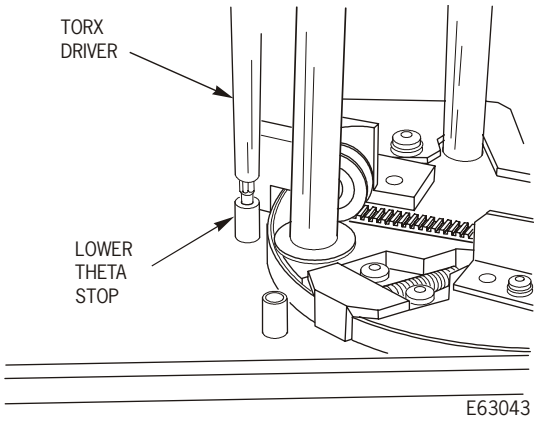
6. Reinstall the tensioner spring, reposition the theta belt tensioner, and reinstall the two screws using a Torx driver and T-15 bit. Align the theta belt flush with the base plate of the Z column.
7. Test for free movement of the belt tensioner and spring by pressing on the belt retention flange on the tensioner.



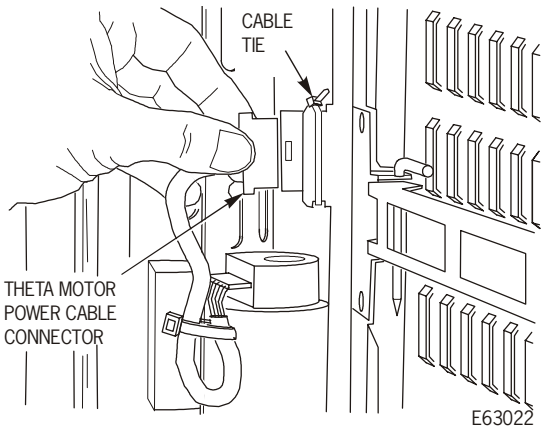
8. Install both theta stops to the ceiling of the library using a Torx driver with a T-15 bit.



9. Install the lower theta stop to the floor of the library using a Torx driver with a T-15 bit.



10. Connect the theta motor power cable connector.
11. Proceed to "Checkout Procedures" on page 6-108.



Z and Theta Flex Cable Assembly

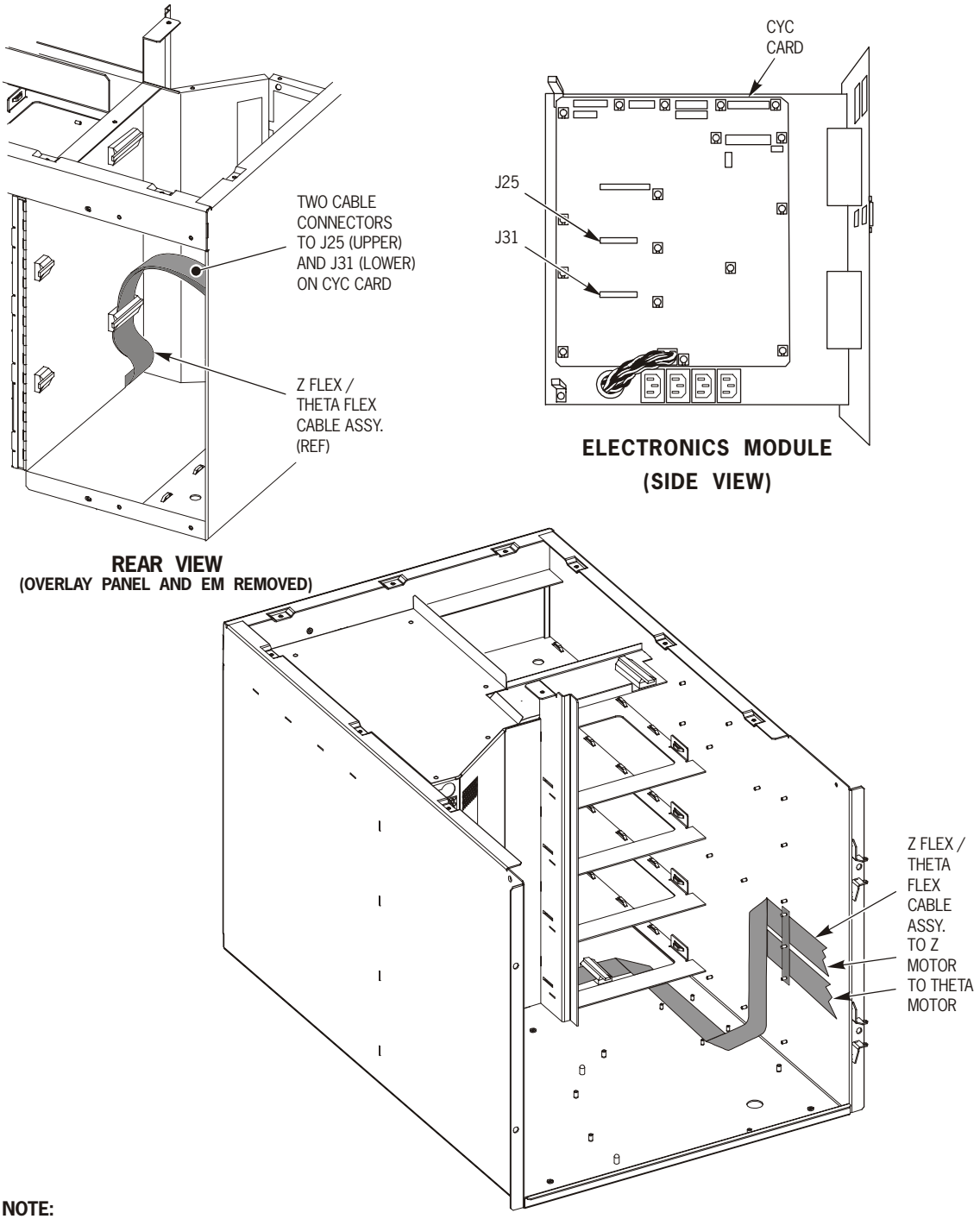
The Z and theta flex cable FRU is an assembly. If you want to replace either, you must replace both. The assembly is routed from the theta motor and the Z motor along the right side of the library (as you face the front of the library), beneath Drive 0 (the bottom drive) and to the CYC card.

You must slide out the bottom tape drive to replace this FRU, but you do *not* need to remove the Z column.

Tools required:

- ESD grounding kit
- Torx driver and T-15 bit
- 3/16 in. hex nut driver
- Angled wire cutters
- Flashlight

Figure 6-16. Z and Theta Flex Cable Assembly Routing

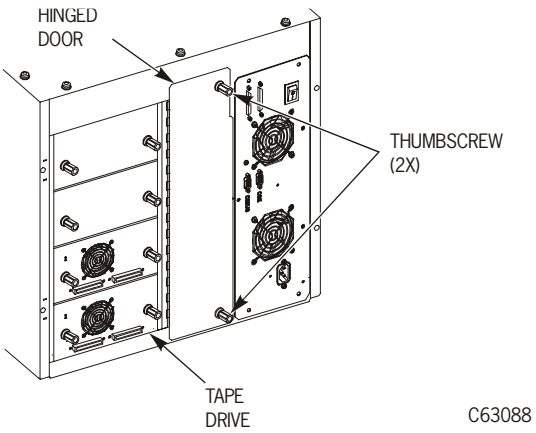


NOTE:
Some components are omitted for clarity.

C63196

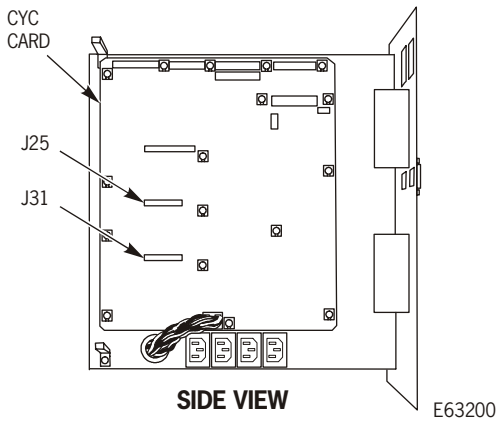
Removal

1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Power off the library, disconnect the power cord, and open the library front door.
3. At the library rear, loosen the thumbscrews on the hinged access door and open it.

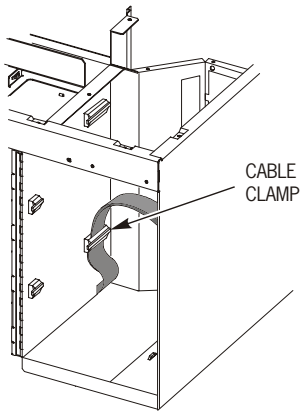


4. Back out the bottom tape drive to expose the cable assembly, following the procedure in "DLT and SDLT Drive Tray Assembly" on page 6-12.
5. Disconnect J25 and J31 from the CYC card in the electronics module bay. Use a flashlight to locate these connectors if necessary.

Note: The electronics module is shown removed for clarity.

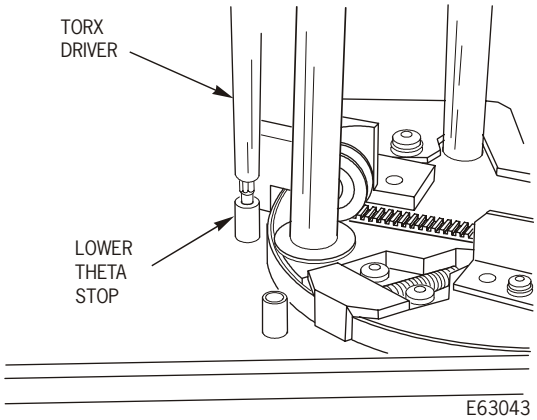


6. Open the flex cable clamps at the bottom left corner of the electronics module housing.
7. Move to the front of the library.



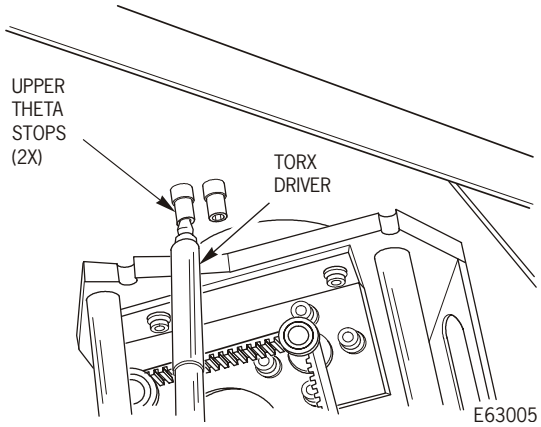
C63201

8. Remove the lower theta stop from the library floor using a Torx driver with a T-15 bit.



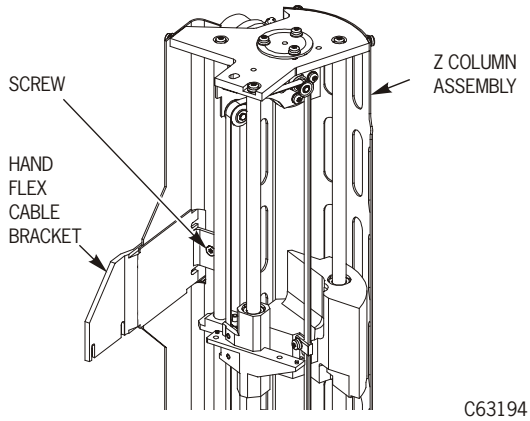
E63043

9. Remove both theta stops from the library ceiling using a Torx driver with a T-15 bit.
10. Rotate the robot counterclockwise so that the hand extends beyond the front opening of the library. This allows more convenient access to the cable connectors.

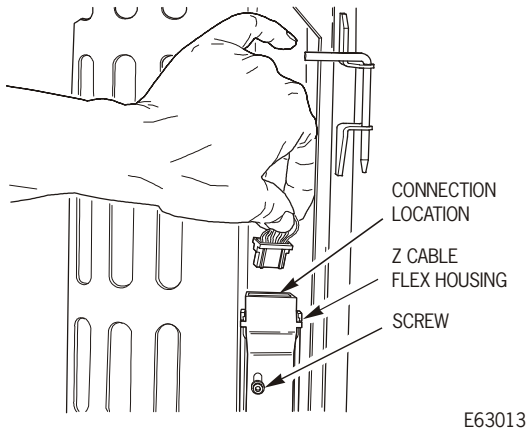


11. Remove the screw mounting the hand flex cable bracket to the Z column using a Torx driver with a T-10 bit.

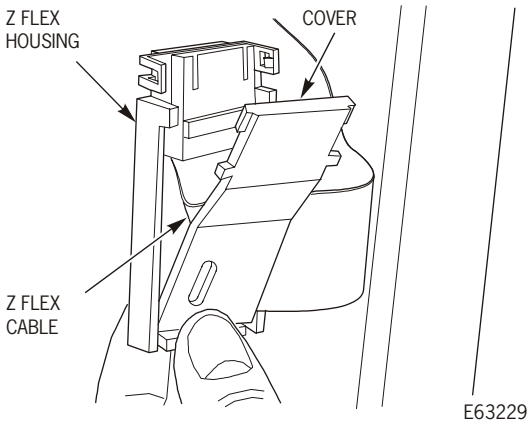
Note: The Z column is shown removed from the library and without the hand, for clarity.



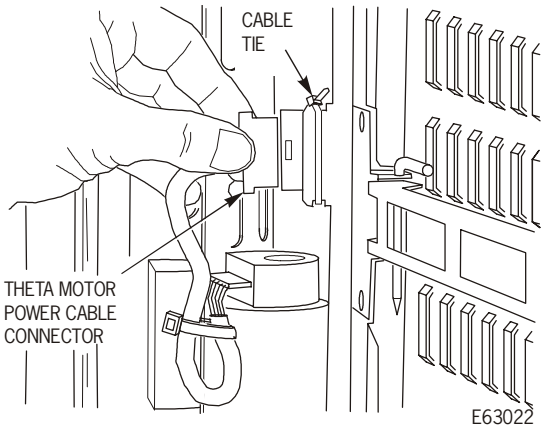
12. Disconnect the Z motor cable connector from the Z motor cable.
13. Rotate the robot clockwise as far as it will go. Remove the screw that secures the Z cable flex housing to the Z column assembly. Remove the Z cable flex housing.



14. Open the cover on the Z cable flex housing to remove the cable within.

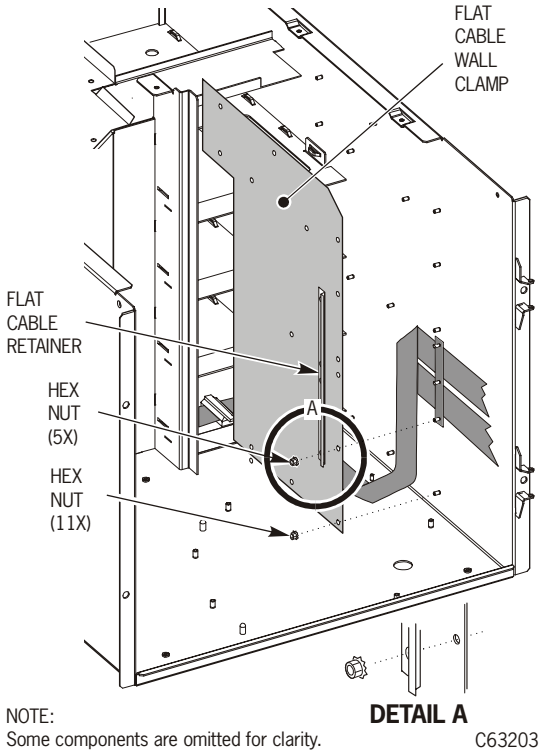


15. Disconnect the theta motor cable connector from the theta motor.
16. Cut the cable tie using angled wire cutters to allow the cable to be removed.
17. Remove the cable from the frame.

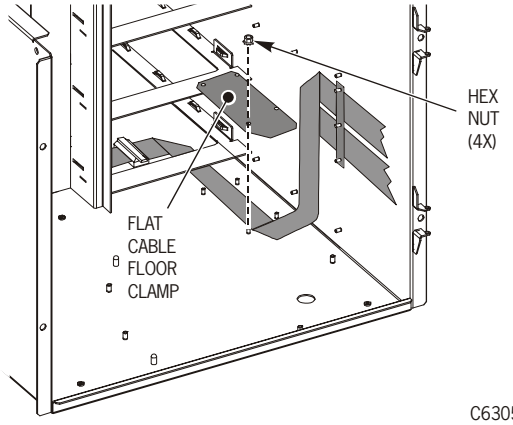


18. Remove the five nuts with captive star washers from the flat cable retainer securing the flat cable wall clamp to the side of the library using a 3/16 in. nut driver. Note the flat cable retainer location for installation. Note also the tape position on the interior right side of the unit (as you face the front of the library).

19. Remove the remaining 11 hex nuts with captive star washers from the flat cable wall clamp at the right side of the library (as you face the front of the library) using a 3/16 in. nut driver.

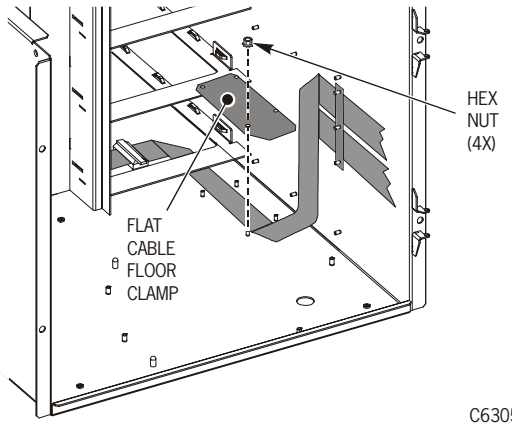


20. Remove the four nuts with captive star washers from the flat cable floor clamp on the floor of the library using a 3/16 in. nut driver.
21. Carefully remove the Z/theta flex cable from the library.

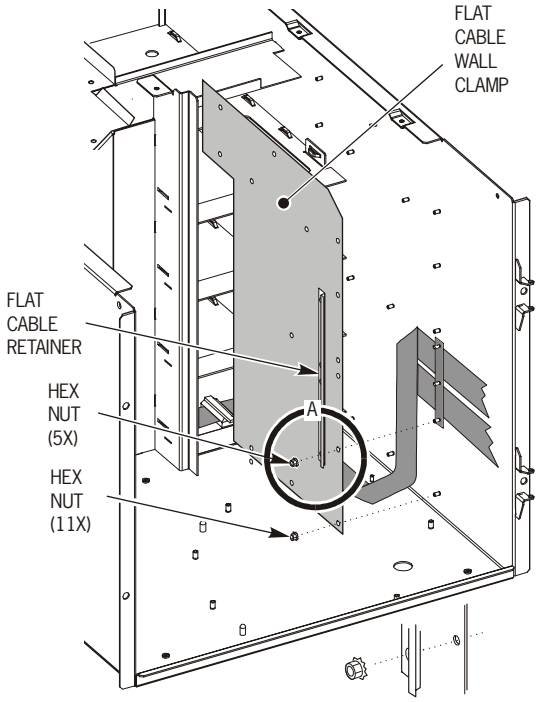


Replacement

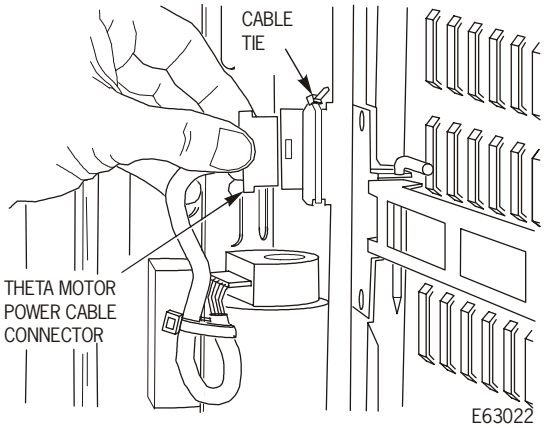
1. Working from the front of the library, route the new Z/theta flex cable along the floor of the library, through the cable clamp below the bottom drive slot and into the electronics module bay.
2. Close the clamp under the bottom drive slot.
3. Install the four nuts with captive star washers to the flat cable floor clamp on the floor of the library using a 3/16 in. nut driver.



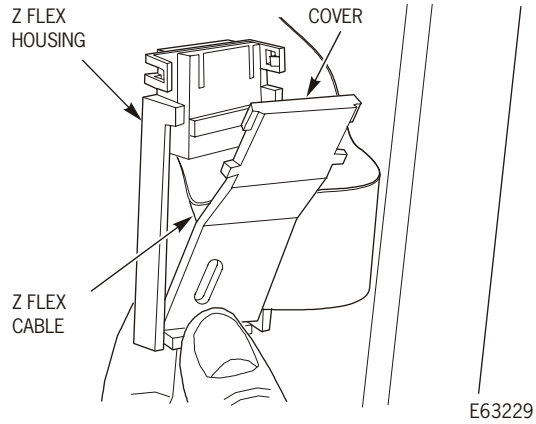
4. Tape the flex cable to the right side of the library interior as shown.
5. Install the remaining 11 hex nuts with captive star washers to the flat cable wall clamp at the right side (as you face the front) of the library using a 3/16 in. nut driver.
6. Install the five nuts with captive star washers to the flat cable retainer securing the flat cable wall clamp to the side of the library using a 3/16 in. nut driver.



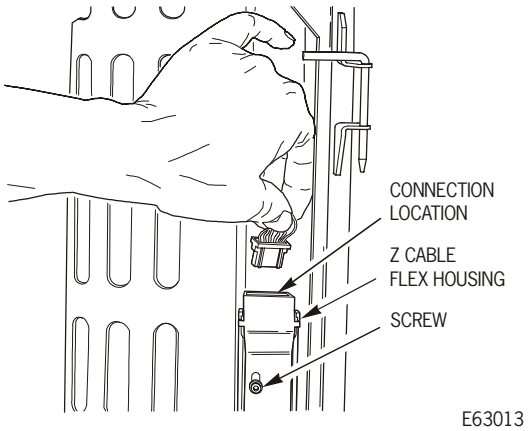
7. Attach the flex cable to the bracket using a tie wrap as shown.
8. Connect the theta motor cable connector to the theta motor.



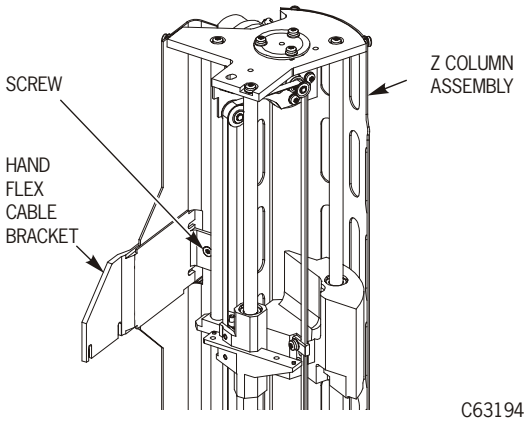
9. Insert the cable into the theta flex cable bracket as shown.



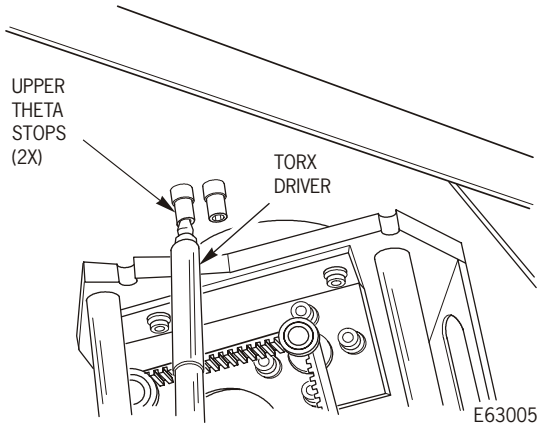
10. Rotate the robot clockwise as far as it will go.
11. Install the screw to secure the Z cable flex housing to the Z column assembly.



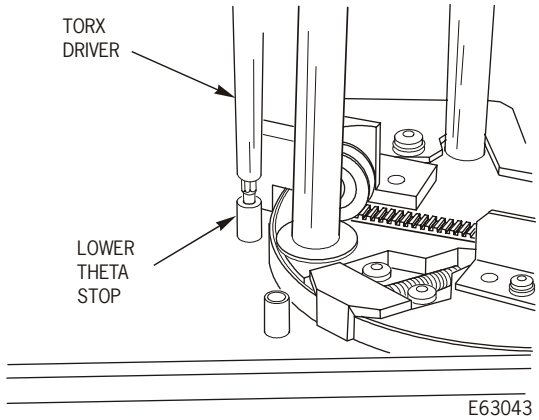
12. Install the screw to mount the hand flex cable bracket to the Z column using a Torx driver with a T-10 bit.



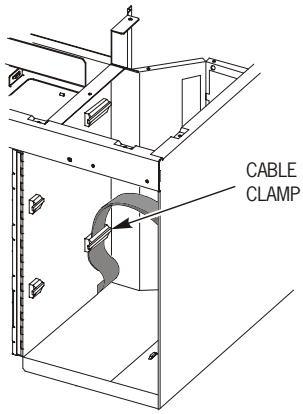
13. Install the two upper theta stops to the library ceiling using a Torx driver with a T-15 bit.



14. Install the lower theta stop to the library floor using a Torx driver with a T-15 bit.



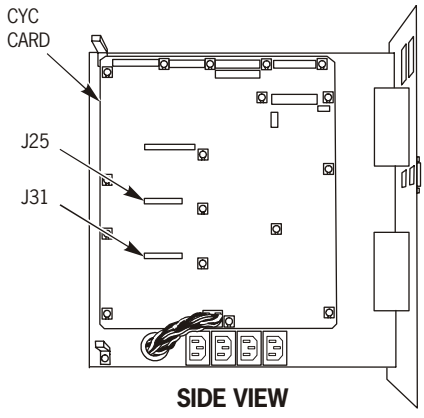
15. Move to the rear of the library.
16. Route the flex cable through the cable clamps at the bottom left (as you face the rear of the library) of the electronics module bay.
17. Close the clamps.



C63201

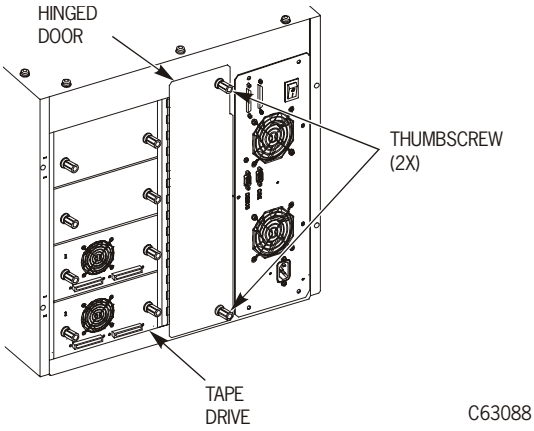
18. Connect the flex cable connectors to J25 and J31 on the CYC card. Use a flashlight to locate these connectors if necessary.

Note: The electronics module is shown removed from the library for clarity.



E63200

19. Slide Drive 0 (the bottom tape drive.) back into its slot, following the procedure on page 6-15.
20. Close the hinged door at the rear of the library and tighten the thumbscrews.
21. Proceed to "Checkout Procedures" on page 6-108.



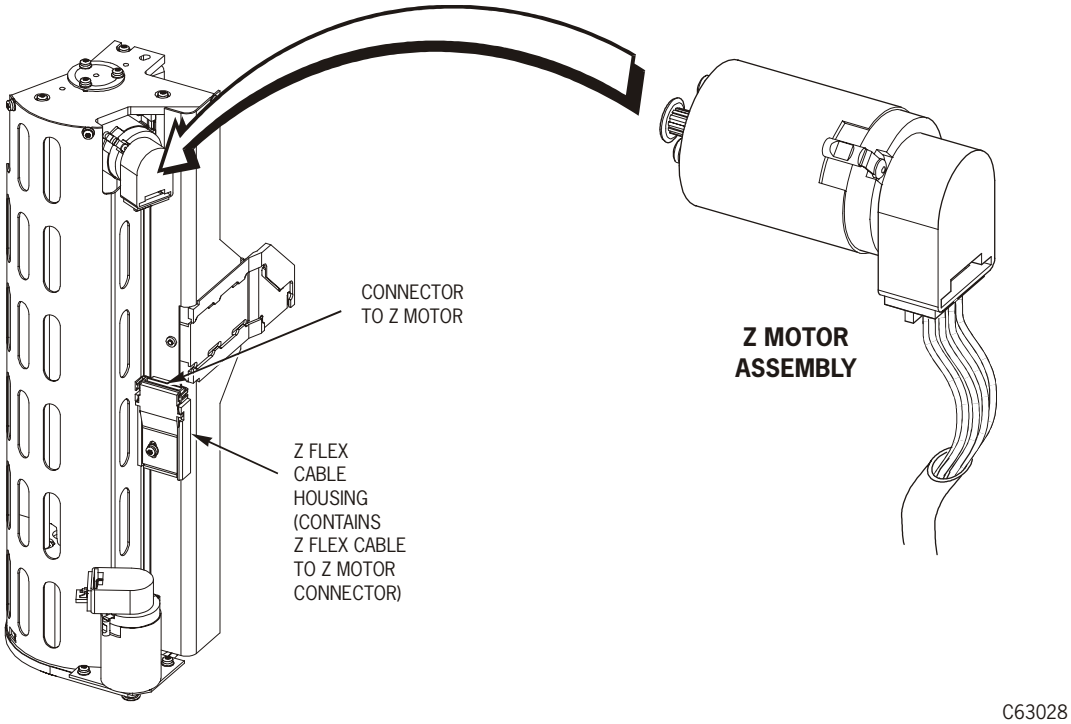
Z Motor

The Z motor FRU is at the top of the Z column and is attached by four screws to the Z motor bracket. The Z motor cable is part of the FRU.

Tools required:

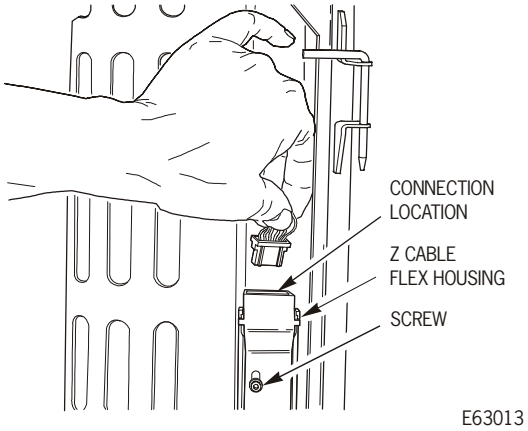
- ESD grounding kit
- Torx driver and T-15 bit
- Torque screwdriver capable of applying 10 in-lb. with a T-15 bit
- Key to the library front door

Figure 6-17. Z Motor



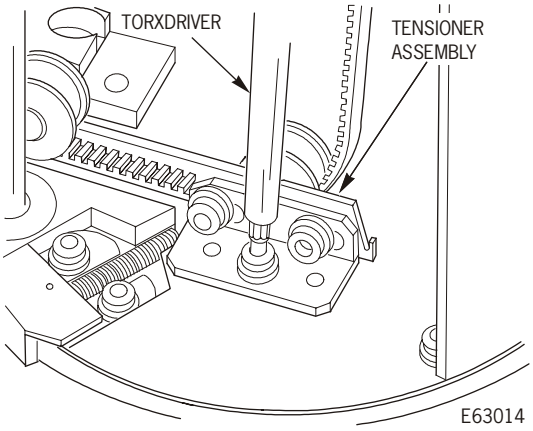
Removal

1. Review the information in "Preparation" on page 6-1 before starting this procedure.
2. Power off the library and remove the library front door, if desired.
3. Rotate the robot to give clear access to the Z cable connector.
4. Disconnect the Z motor cable.

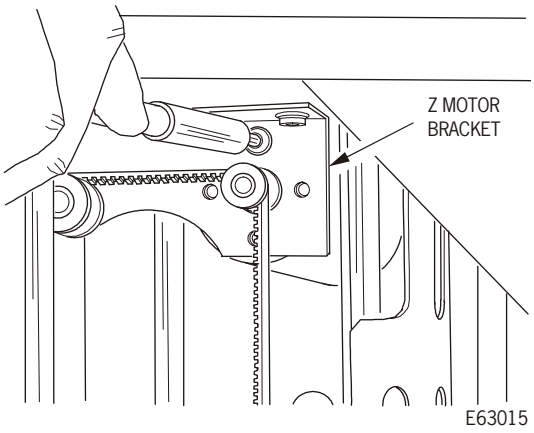


5. Loosen or remove the Z belt tensioner assembly located at the base of the Z column with a Torx driver with a T-15 bit to remove the screw holding it to the Z column baseplate.

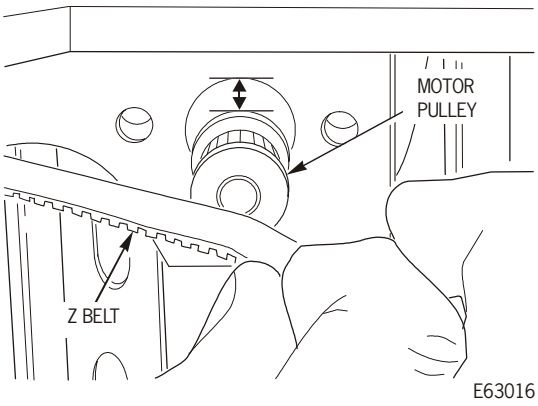
Note: Do not change the tensioner setting by loosening the two tensioner adjustment screws, so you can replace the tensioner with the same belt tension as before.



6. Remove the four screws holding the Z motor to the Z motor bracket using a Torx driver with a T-15 bit. Remove the top screw last.
7. Remove the top screw, holding the Z motor from behind, being careful not to damage the Z motor cables.

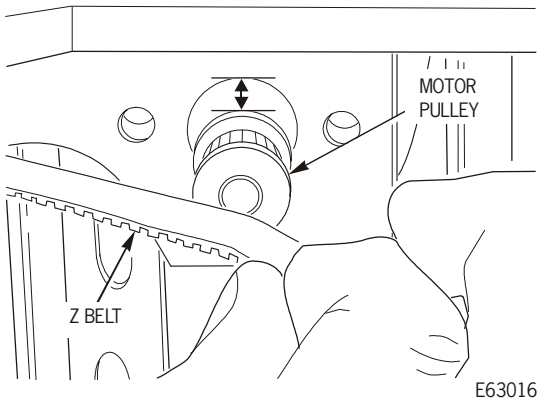


8. Slide the motor to the bottom of the cutout and lift the belt from the motor shaft while holding the Z motor from behind.
9. Remove the motor by pushing the shaft through the cutout in the Z motor bracket.

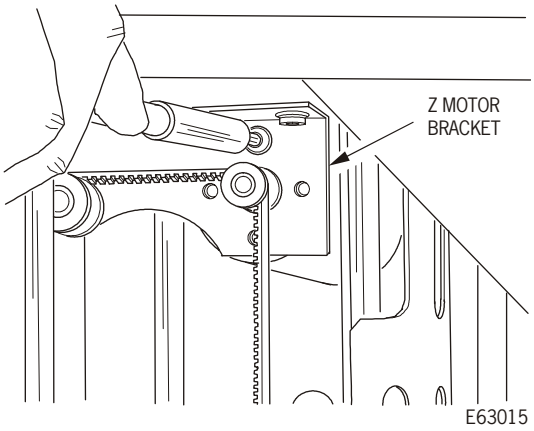


Replacement

1. Insert the Z motor pulley through the cutout in the Z motor bracket so the end of the pulley faces the front of the library.
2. Rest the pulley on the bottom of the cutout. The Z motor cable connector hangs toward the floor of the library.
3. Place the Z belt over the Z motor shaft, and slide the motor up to align the holes.

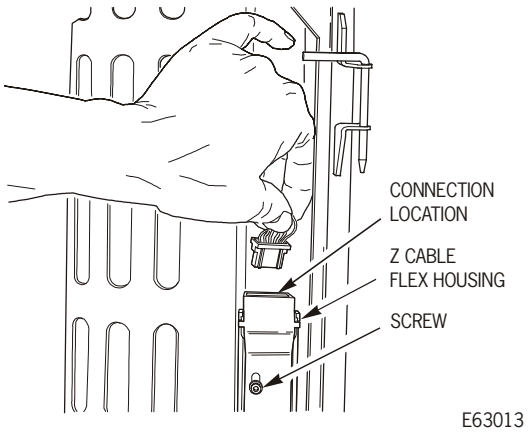


4. Install the four screws holding the Z motor to the Z motor bracket using a Torx driver with a T-15 bit.



5. Connect the Z motor cable.

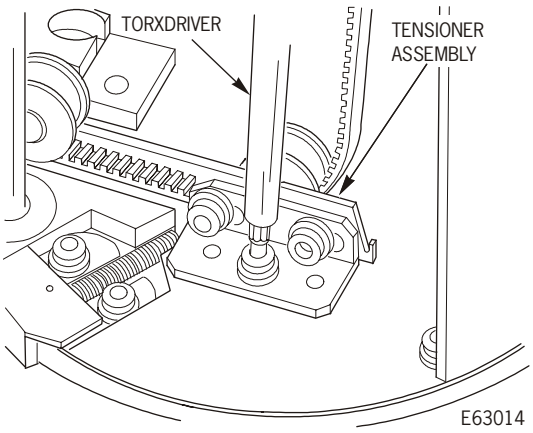
Note: Be sure that the cable is routed directly to the connector and not through the ribbon cable near the connector.



6. Replace or tighten the Z belt tensioner assembly at the base of the Z column with a Torx driver and T-15 bit.

Note: Do not change the tensioner setting by loosening the two tensioner adjustment screws, so you can replace the tensioner with the same belt tension as before.

7. Proceed to the "Checkout Procedures" on page 6-108.



Checkout Procedures

To make sure it is safe to resume library operation:

1. Make sure all cards are installed and properly seated.
2. Make sure all cables are installed and connectors are tight.
3. Visually check the library for loose parts, connectors, and tools.
4. Make sure the reach mechanism on the hand assembly is fully retracted by pushing the cartridge picker into the hand assembly.
5. Close and lock the library doors.
6. Connect the power cord to the library at the rear of the electronics module.
7. Power on the library.
8. Run diagnostic tests to be sure the fault is corrected. (Refer to Chapter 5, "Maintaining the Library.")
9. Complete any necessary paperwork.
10. Return any parts that are required for warranty or other service credits.

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Specifications

A

The following specifications apply to the library and to tape media. Specifications include physical, electrical, and environmental information.

Table A-1. Physical Specifications

Item	Measurement
Width	483 mm (19 in.)
Height	445 mm (17.5 in.)
Depth	726 mm (28.6 in.)
Rear clearance, library to any wall or other cabinet	205 mm (8 in.)
Front clearance, library to any wall or other cabinet	508 mm (20 in.)
Minimum rear clearance required to remove/replace the electronics module or the tape drives	610 mm (24 in.)
Weight with no drives	50 kg (110 lb)
Weight with four drives	68 kg (149 lb)

Table A-2. Power Specifications

Item	Measurement
Input voltage	90–264 VAC, single phase
Frequency	47–63 Hz
Maximum power consumption (library)	1.0 A at 120 V *or* 0.5 A at 240 V
Note: See DLT and SDLT drive documentation for drive specifications.	

Table A-3. Functional Data

Item	Measurement or Comments
Media	DLTtape IV and Super DLTtape I (III and IIIXT supported)
Number of cells	10, 20, or 30 (28 with four tape drives)
Number of tape drives	Up to four DLT4000, DLT7000, or SDLT 220
Average cartridge access time	Six seconds
Audit time	Less than one minute
Robotics control	SCSI-2 media changer command set, single-ended or differential (selectable in field)
Cartridge access port	Single cartridge capacity
Bar code reader	Standard
Serviceability	Key components are customer-serviceable. Drives are hot-swappable (with independent SCSI interface)

Table A-4. Data Capacity and Throughput

Library Capacity	Uncompressed	Compressed (2:1)
DLT4000 (30 Cells, DLTtape IV)	600 GB	1.2 TB
DLT7000 (30 Cells, DLTtape IV)	1.05 TB	2.1 TB
SDLT 220 (30 Cells, Super DLTtape I)	3.3 TB	6.6 TB

Table A-5. Reliability

Item	Measurement
Mean exchanges between failures (MEBF)	1,000,000
Mean time to repair (MTTR)	Less than 30 minutes

Table A-6. Environmental Specifications

Item	Measurement		
	Operating	**Storage**	**Transit**
Temperature	+15 to +32°C (+59 to +90°F)	+10 to +40°C (+50 to +104°F)	-40 to +60°C (-40 to +140°F)
Humidity	20 to 80%	10 to 95%	10 to 95%
Wet bulb (max, non-condensing)	+29.2°C (+84.5°F)	+35°C (+95°F)	+35°C (+95°F)
Altitude	-76 to 3,048 m (-250 to 10,000 ft)		

Table A-7. Agency Certifications

Category	Certification
Safety	CSA standard CAN/CSA-C22.2 no. 950-M93
	UL standard 1950, Third Edition
	EN60950
Emissions	FCC #47, Part 15, Subpart B, Class A
	EMC Framework AS/NZS 3598: 1995 (Australia, N.Z.)
	VCCI Class A (Japan)
	European Union CE EN55022 Class A emissions standards
	Canadian EMC Law; ICES-003
	BCIQ EMC Law CNS 13438 (Taiwan)
	Korean EMC Law
Immunity	European Union CE EN50082-1 immunity standards

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Glossary

This glossary defines abbreviations and new or special terms in this publication.

Some of the definitions are taken from the *IBM Dictionary of Computing*. The letters in the parentheses that follow some definitions indicate the source of the definition:

(IBM) *The IBM Dictionary of Computing*, copyright 1994 by IBM.

(T) Draft international standards committee drafts, and working papers being developed by the ISO/IEC/JTC1/SC1.

A

A Ampere.

AC Alternating Current.

audit An operation to catalog or record the physical location of a cartridge tape in an automated library.

auto clean A feature of an automated library that allows a cleaning cartridge to automatically clean a tape drive when the drive requires cleaning. The auto clean function must also be supported by the host software.

C

C Centigrade

cartridge magazine A removable module for cartridge tapes that is placed in the library by the operator as needed for specific jobs.

cartridge tape A composite of the plastic housing and the magnetic tape.

controlling host software The logical interface between the host operating system and the library components.

cm Centimeter.

D

diagnostic tape An empty cartridge tape (no data or code) with a "DG" label, which is used for diagnostic routines.

differential A SCSI bus alternative that provides better signal quality with less crosstalk and noise but requires more power to drive the signal. The maximum cable length is 25 m (82 ft.).

dismount To remove a cartridge from a tape drive.

Drive Utilities menu A portion of the menu in smaller libraries offering drive utility selections.

E

electronics module (EM) Part of a library or device that houses the controller and interface functions, the fan assemblies, and the power supplies.

F

F Fahrenheit

fast load A mode of library operation permitting the robot to retrieve another tape before receiving load confirmation from a tape drive.

fault symptom code (FSC) A four-character hexadecimal code generated in response to a subsystem error to help isolate failures within the device.

FCC *See* Federal Communications Commission.

Federal Communications Commission (FCC) A board of commissioners appointed by the President under the Communications Act of 1934 with the power to regulate all interstate and foreign communications by wire and radio originating in the United States. (IBM)

field replaceable unit (FRU) A library component that can be replaced on site.

FRU *See* field replaceable unit.

H

hand-camera assembly A part of the library robot whose function is grasping cartridge tapes and moving them between storage cells and tape drives. The camera reads cartridge volume serial numbers during library audits and normal operation.

host controlling software The logical interface between the host operating system and the library components.

I

initialization routine A startup-diagnostic routine performed automatically by the library when it is powered on or reset. See also wake-up diagnostic tests.

interlock switch A switch that disconnects power to the library when the front door is opened.

L

LED *See* light-emitting diode.

Library Diagnostic menu A portion of the menu on smaller libraries that offer library diagnostic selections.

Library Utilities menu A portion of the menu for smaller libraries that offers library utility selections.

M

m *See* meter.

Main menu The top-level menu on an operator panel display.

MB/s *See* megabytes per second.

megabytes per second (MB/s or MB/sec) A measurement that usually describes the speed of data transfer.

menu A list of options displayed to the user by a data processing system from which the user can select an action to initiate. (T)

meter (m) A metric measurement of length equal to 1.0936 yards, 3.2808 feet, or 39.3696 inches. (IBM)

mm *See* millimeter.

millimeter (mm) A unit of measure equal to one thousandth of a meter or 0.04 in.

millisecond (ms) One thousandth of a second. (IBM)

mount To place a cartridge tape in a drive or transport and make it accessible to the host system.

mV Millivolt or one one-thousandth of a volt.

O

operator control panel A functional unit that contains switches used to control all or part of a computer and possibly the indicators giving information about its functioning. (T) *See also* operator panel.

operator panel The user interface for libraries or drives. *Synonymous with* operator control panel.

operator panel controls The buttons, such as MENU, ENTER, SYSTEM RESET, and the up and down arrows, on the operator panels of StorageTek libraries.

operator panel LEDs The indicators, such as Library Active, CAP Open, and Service Required, on the operator panels of StorageTek libraries.

P

picker mechanism The specially designed mechanism that latches onto cartridge tapes and pulls them into the robot hand.

push fingers Two levers on the picker mechanism that push the cartridge into a storage cell.

R

robot An electromechanical device that moves cartridge tapes between storage cells and tape drives.

S

safety interlock switch A switch that disconnects power to the library when the front door is opened.

SCSI *See* small computer systems interface.

SCSI device A host adapter or control unit attached to the SCSI bus. *Synonymous with* target.

Set Configuration menu A portion of the menu on smaller libraries that offers library and drive configuration selections.

single-ended AA SCSI bus alternative, it is an inexpensive bus requiring less power than the differential alternative. The maximum cable length is 6 m (20 ft.).

small computer systems interface (SCSI) A local interface operating over a wide range of transfer rates using a common command set for all devices attached to the interface. It connects host computer systems to a variety of peripheral devices.

startup routine An initialization and diagnostic routine that the library performs automatically when it is powered on or reset. See also wake-up diagnostic tests.

status display A screen on the operator panel on smaller libraries showing library and drive status.

storage cells The slots where cartridge tapes are kept in the library.

T

target A SCSI device that performs an input/output operation requested by the initiator.

V

VOLSER *See* volume serial number.

volume serial number An alphanumeric label that the host software uses to identify a volume. It attaches to the spine of a cartridge and is both human- and machine-readable.

W

write-enabled A setting on cartridge tapes that allows data to be written on the tape.

write-protected A setting on cartridge tapes that prevents data form being written on the tape. Reading data is still possible.

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