

HP SureStore DLT Tape Library 4115e, 4115r, 4215e, 4215r Service Manual



HP Part No. C5150-90030

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English language support from other European countries:

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Elsewhere in the world:

Contact an authorized HP dealer/distributor or the nearest HP sales and service office.

Typographical Conventions

The following typographical conventions are used in this manual:

Italic Font - Italic font designates the title of a document and statements that need to be emphasized.

Typewriter Font - Typewriter font denotes commands to be typed on your keyboard or screen menu items to be selected.

Shaded Text - denotes information that is displayed in the display window of the jukebox.

Keys - indicates the key to press on the jukebox control panel.

WARNING

Warning calls attention to a procedure or practice which could result in personal injury if not correctly performed. Do not proceed beyond this symbol until you fully understand and meet the indicated conditions.

Caution

Caution calls attention to an operating procedure or practice which could result in damage to the product if not correctly performed. Do not proceed beyond this symbol until you fully understand and meet the indicated conditions.

Note

A note calls attention to information which can be helpful in understanding the operation of the product.

Printing History

New editions of this manual incorporate all material updated since the previous edition. The manual printing date and part number indicate the current edition. The printing date changes when a new edition is printed. (Minor corrections and updates incorporated at reprint do not cause this date to change.)

March 1997

Edition 1

Safety and Regulatory Information

This section contains important safety and regulatory information for the United States, Finland, Sweden, Germany, United Kingdom, European Union, and Japan.

Laser Safety

WARNING

Class II laser light is generated in this library. If operating the library with access panels removed or with less than three tape magazines installed and the interlocks disabled on an open front door, do not stare into the light from the bar code reader.

CDRH Regulations (USA Only)

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

Complies with 21 CFR Chapter 1 Subchapter J.

WARNING

Use of controls, adjustments or performing procedures other than those specified in this manual may result in hazardous laser radiation exposure.

Laser Class Information: A black on yellow label which reads, "Class 1 Laser Product" printed in English, French, German, Finnish, Japanese, and Spanish.

FCC Radio Frequency Interference Statement (USA Only)

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

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

EC Radio Frequency Interference Statement (Europe Only)

Warning: This is a class B product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

United Kingdom Telecommunications Act 1984

The digital linear tape libraries are approved under Approval Number NS/G/1234/J/100003 for indirect connection to Public Telecommunication Systems within the United Kingdom.

European Union (EU) Declaration of Conformity

DECLARATION OF CONFORMITY

according to ISO/IEC Guide 22 and EN 45014

Manufacturer's Name: Hewlett-Packard Co.

Manufacturer's Address: Storage Systems Division
700 71st Avenue
Greeley, CO 80634 USA

declares, that the product

Product Name: DLT Tape Library

Model Numbers: C5150x, C5151x, C5152x, C5153x
(Where x is any alpha except C with or without suffixes)

Product Options: All options

conforms to the following Product Specifications:

Safety: EN 60950: 1992 +A1 +A2:1993 +A3:1995 / IEC950 (1991)+A1+A2+A3
EN 60825-1 (1994) / IEC 825-1 (1993), Laser Class 1

EMC: EN 55022 (1994) / CISPR-22 (1993), Class B
EN 50082-1 (1992)
prEN 55024-2 (1992) / IEC 1000-4-2 (1995), 4kV CD, 8kV AD
prEN 55024-3 (1991) / IEC 1000-4-3 (1995), 3 V/m
prEN 55024-4 (1993) / IEC 801-4 (1988), 1 kV Peak Power Lines
0,5 kV Signal Lines
EN61000-3-2 (1995) / IEC 1000-3-2 (1995), Harmonics
EN61000-3-3(1995) / IEC 1000-3-3 (1994), Flicker

Supplementary Information:

The product herewith complies with the requirements of the Low Voltage Directive 93/68 EEC and the EMC Directive 89/336/EEC and carries the CE-marking accordingly. These products conform when tested with Hewlett-Packard Computers. Additional suffixes may be used to indicate variation in color or firmware.

Storage Systems Division April 1997

Greeley, Colorado USA

European Contact: Your local Hewlett-Packard Sales and Service Office or Hewlett-Packard GmbH, Department TRE, Herrenberger Straße 130, D-71304 Boblingen (FAX: +49-7031-14-3143)

Herstellerbescheinigung

Diese Information steht im Zusammenhang mit den Anforderungen der Maschinenlärn information sverordnung vom 18 Januar 1991.

Schalldruckpegel $L_p < 70 \text{ dB(A)}$

- am arbeitsplatz
- normaler betrieb
- nach ISO 7779:1988/EN 27779:1991 (Typprüfung)

English Translation of German Sound Emission Directive

This statement is provided to comply with the requirements of the German Sound Emission Directive, from 18 January 1991.

Sound pressure $L_p < 70 \text{ dB(A)}$

- at operator position
- normal operation
- according to ISO 7779: 1988/EN 27779: 1991 (type test)

Turvallisuusyhteenveto

Laserturvallisuus

LUOKAN 1 LASERLAITE

KLASS 1 LASER APPARAT

HP DLT 4115e/r 4215e/r Tape Library -nauhamuistiasemat ovat käyttäjän

kannalta turvallisia luokan 1 laserlaitteita. Nauhamuistiasemien sisälle asennettu lasersädetä käyttävä viivakoodinlukija ei normaalissa käytössä aiheuta vaaraa käyttäjälle.

Laitteiden turvallisuusluokka on määritetty standardin EN 60825-1 (1994) mukaisesti.

Laitteen turvallisuusluokka on määritetty standardin EN 60825 mukaisesti.

VAROITUS !

Laitteen käyttäminen muulla kuin käyttöohjeessa mainitulla tavalla saattaa altistaa käyttäjän turvallisuusluokan 1 ylittävälle lasersäteilylle.

VARNING !

Om apparaten används på annat sätt än i bruksanvisning specificerats, kan användaren utsättas för laserstrålning som överskrider gränsen för laserklass 1.

Huolto

HP DLT 4115e/r 4215e/r Tape Library -nauhamuistiasemien sisällä ei ole käyttäjän huollettavissa olevia kohteita. Laitteen saa avata ja huoltaa ainoastaan sen huoltamiseen koulutettu henkilö. Nauhamuistiaseman sisälle asennettua viivakoodinlukijaa ei tule avata eikä purkaa huoltotoimenpiteiden yhteydessä.

VARO !

Nauhamuistiaseman suojakotelon ollessa avattuna saatat altistua lasersäteilylle viivakoodinlukijan toimiessa. Älä tuijota säteeseen.

VARNING !

När skyddshöljet av magnetbandstationen är öppnad, kan användaren utsättas för laserstrålning då streckkodläsare är i funktion. Stirra ej in i strålen.

Tiedot viivakoodinlukijassa käytettävän laserdiodin säteilyominaisuuksista:

Aallonpituus	675 nm
Teho	0,5 mW
Turvallisuusluokka	Luokan 2 laser

English Translation - Finnish Regulatory Information

LASER SAFETY SUMMARY

LASER SAFETY

CLASS 1 LASER PRODUCT (The same text in Swedish)

HP DLT 4115e/r 4215e/r Tape Libraries are for user safety class 1 laser products. In normal use the laser barcode reader installed inside the tape library units doesn't cause any hazard to the user.

The laser safety class of the libraries was defined in accordance with the standard EN 60825-1 (1994). The safety class of the products was defined according to the standard EN 60825.

WARNING !

The use of the product otherwise than specified in the user's manual may expose the user to laser radiation exceeding safety class 1.

(THE SAME WARNING IN SWEDISH)

SERVICE

There are no user serviceable parts inside the HP DLT 4115e/r 4215e/r Tape Library units. The DLT units can be serviced only by qualified service personnel. The laser barcode reader installed inside the library units shall not be opened or disassembled during service.

WARNING !

If the enclosure of the tape library unit is opened, you may be exposed to laser radiation when the barcode reader is operating. Don't stare into the beam.

(THE SAME WARNING IN SWEDISH)

The information about the radiation characteristics of the laser diode used in the laser barcode reader:

Wavelength	675 nm
Power	0,5 mW
Laser safety class	Class 2 laser

Japanese VCCI Statement

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

English Translation of Japanese VCCI Statement

This equipment is in the 2nd Class category information technology equipment based on the rules of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). Although aimed for residential area operation, radio interference may be caused when used near a radio or TV receiver. Read the instructions for correct operation.

Contents

Product Information

Characteristics.....	1-3
DLT Drive Mechanism Characteristics.....	1-3
HP DLT Tape Library Characteristics.....	1-7
DLT Tape Characteristics.....	1-9
Environmental Characteristics.....	1-10
DLT Tape Library Product Certifications.....	1-13
Choosing Tape Cartridges.....	1-14
Product Support.....	1-15
Related Documents.....	1-16

Environmental/Installation/PM

Environmental Requirements.....	2-1
Primary Power/External Ground.....	2-1
Clearance Requirements.....	2-2
Location Requirements.....	2-3
Responsibilities.....	2-3
Checkout Procedure.....	2-4
Unpacking and Taking the Library Off the Pallet.....	2-5
Installing the Library into a Rack.....	2-6
Installation Overview.....	2-7
Installation Steps.....	2-9
Installing the Cosmetic Panels for the Standalone Library.....	2-15
Installation Overview.....	2-16
Installation Steps.....	2-17

Product Configuration and Operation

Identifying Rear and Control Panel Features.....	3-1
Setting Up the DLT Tape Library.....	3-5
Connecting the SCSI Cables to the Library	3-6
Connecting the Library as the Only Peripheral	3-7
Connecting the Library with Other Peripherals	3-10
Connecting Power	3-12
Operating the Library.....	3-13
Using the Control Panel	3-13
Understanding Display Window Messages.....	3-14
Loading Tape Cartridges Into the Library.....	3-18
Removing Tape Cartridges from the Library	3-23
Viewing Tape Cartridge Bar Code Labels.....	3-27
Entering the Administration Menu Password	3-28
Setting a New Administration Menu Password.....	3-29
Setting the SCSI IDs	3-31
Changing the Current SCSI Address Settings.....	3-32
Viewing the Current SCSI Address Settings.....	3-35
Cleaning the Library Tape Drives	3-37
Setting a Configuration Option	3-40
Moving or Shipping the Library	3-43
Moving the Library a Short Distance	3-43
Shipping the Library.....	3-45

Troubleshooting and Diagnostics

Understanding the Troubleshooting Process	4-1
Retrieving Performance Information	4-4
Recovering from Operation/Installation Errors	4-9
Recovering from Hardware Errors	4-15
Micro-Move Error Codes	4-30
Micro-Move IDs.....	4-32
Running an Internal Test.....	4-41
Cleaning a Tape Drive	4-48

Using the Cleaning Tape Cartridge	4-49
Cleaning Issues Relating to Tape Cartridges.....	4-52
Manually Ejecting Cartridges	4-55

Removal and Replacement

Contents	5-1
Procedures.....	5-1
Parts	5-2
Disassembly/Reassembly Procedures.....	5-3
Tools Required	5-3
Service Access	5-5
Removing the Library From the Rack for Service.....	5-12
5/12 Volt Power Supply.....	5-14
24-Volt Power Supply / Power Distribution Module	5-18
Removable Magazine Guide Assembly	5-21
Control Panel Assembly.....	5-25
Vertical-Path-Clear (Starwars) Cable	5-27
Replacing a Tape Drive - Power Off or Library Online	5-28
Bar Code Reader Assembly	5-35
Picker and/or Horizontal Encoder Strip	5-36
Translate Frame (Including the Picker).....	5-44
Vertical Encoder Strip	5-52
Vertical Drive Assembly	5-56
Controller PCA.....	5-59
Internal SCSI Cable.....	5-64
SCSI Repeater/Converter Interface PCA	5-70
Removal of a Tape Cartridge From a Drive During a Power-Off Condition ...	5-72
Removal of a Tape Cartridge From a Drive When Picker Eject is Unavailable	5-75
Reinitializing the Autochanger Controller PCA RAM After Service.....	5-76
Replaceable Parts.....	5-79
Recommended Service Kits	5-79
Miscellaneous	5-93

Theory of Operation

The SCSI Interface..... 6-2

 Single-Ended and Differential SCSI Interfaces..... 6-3

 SCSI Command Set — References 6-4

SCSI Command Execution to Mechanics..... 6-5

Library Assemblies 6-8

 The Library Controller PCA 6-8

 Power Supplies 6-14

 SCSI Repeater/Converter PCA..... 6-15

 Translate Frame 6-18

Error Reduction, Detection and Correction 6-19

 Multi-Level Error Detection..... 6-20

 Error Correction 6-21

Service Notes/IOSMs

(None at this printing)..... 7-1

Figures

Clearance Requirements	2-2
The Library Returns Suspect FRUs	4-2
Evaluating Suspect FRUs	4-3
Front Access Door with Key Inserted	5-5
Front Door / Bezel Area Mounting Screws	5-6
Connection for Door Open Sensor Cable	5-7
Components and Access Points on the Rear of the Library	5-9
Cosmetic Panels and Mounting Screws.....	5-11
Attaching the Lifting Handles to the Library	5-12
Removing the Library Rackmount Screws.....	5-13
Suspending the Translate Frame / Picker Assembly	5-14
12-Volt Cable Connections to the Controller PCA	5-15
Connections to the 12-Volt Power Supply	5-16
Rear Panel on the 24 V Module.....	5-18
Disconnecting Cables Before Removing 24 V Module	5-19
Cartridge Guide Frame Mounting Screws.....	5-21
Disconnecting the Camlock Linkage.....	5-22
Sliding the Removable Magazine Guide Assembly Out of the Chassis.....	5-23
Control Panel / Display Assembly Mounting Screws	5-25
Removing Cables From the Rear of the Control Panel Assembly	5-26
Path-Clear Sensors and Home Sensor Mounting.....	5-27
Drive Numbering	5-29
Removing the Fan Assembly From the Rear of the Drive	5-31
Drive Cabling and Mounting	5-31
Bar Code Reader Assembly and Interface Cable	5-35
Disconnecting the Picker Umbilical Cable.....	5-36
Detensioning and Removing Translate Rope	5-38
Translate Rope Stowed and Capture Bracket Spring Mounting Screws	5-39
Picker Capture Brackets - Operating Position	5-41
Rotating a Picker Capture Bracket Out	5-41
Rotating the Picker Assembly Out of the Translate Frame	5-42
Horizontal Encoder Strip Mounting	5-43

Suspending the Translate Frame / Picker Assembly	5-44
Vertical Encoder Strip Top Mount and Screw.....	5-45
Retaining Peg on the Bottom of the Vertical Encoder Strip.....	5-46
Disconnecting the Vertical Umbilical Cable	5-46
Disconnecting the Translate Frame From the Vertical Lift Bracket	5-47
Removing Tensioners From Each Side of the Translate Frame	5-48
Mounting the Tensioner While Holding the Translate Frame in Position.....	5-50
Confirming Proper Positioning of the Translate Frame.....	5-51
Vertical Encoder Strip Top Mount and Screw.....	5-52
Removing the Encoder Strip Tensioner Spring	5-53
Retaining Peg on the Bottom of the Vertical Encoder Strip.....	5-54
Vertical Drive Assembly Rope Coupler and Assembly Mounting Screws	5-56
The Rope and Pulley System	5-58
Suspending the Translate Frame / Picker Assembly	5-60
Controller PCA - Cover On	5-61
Controller PCA - Cover Off.....	5-62
Controller PCA Cabling.....	5-63
Removing the Lower RFI Panel	5-64
Removing the Drive Fan.....	5-65
Removing the Drive SCSI Cable - Right Drive Shown.....	5-66
Removing the SCSI Protector.....	5-67
Controller PCA - Cover On	5-68
Controller PCA - Cover Off.....	5-69
Routing of the Internal SCSI Cable	5-69
SCSI Interface Assembly - Rear Panel View	5-70
Cabling on the SCSI Repeater/Converter PCA	5-71
Drive Mounting Screws	5-73
Rewinding Tape Through the Access Hole	5-73
Opening the Tape Drive Door	5-74
Exploded View (1 of 4)	5-87
Exploded View (2 of 4)	5-88
Exploded View (3 of 4)	5-89
Exploded View (4 of 4)	5-90
Standalone Enclosure Components	5-91
Rope Cradle and Pulley Diagram	5-92
SCSI Command Translation for Library Operation	6-5

6 - Contents

Library Controller PCA Block Diagram..... 6-9

General Purpose LEDs on the Controller PCA6-12

Power Supplies and Poweron Sequence 6-14

SCSI Repeater/Converter PCA..... 6-16

Digital Linear Tape Media Block Format 6-20

Tables

DLT Tape Library Matrix	1-1
Native Tape Densities	1-14
SCSI Cable Length Limitations	3-6
SCSI Address Considerations	3-10
Default SCSI Address Settings	3-31
Configuration Choices	3-36
Information Logs	4-5
Operation Errors	4-9
Hardware Errors and Recovery Procedures	4-16
Micro-Move Error Codes	4-30
Micro-Move IDs	4-32
Tests Available from the Control Panel	4-43
Drive Cleaning Issues Relating to Tape Cartridges	4-53
Exchange Parts	5-80
Non-Exchange Parts	5-80
Common Resource Parts	5-93

Product Information

Table 1-1. DLT Tape Library Matrix

Model	Order Number	Description
4115r Rackmount	C5151F	DLT tape library with one DLT 4000 drive and capacity for up to 15 tape cartridges. Single-ended and differential SCSI interfaces. Rackmount hardware.
4215r Rackmount	C5153F	DLT tape library with two DLT 4000 drives and capacity for up to 15 tape cartridges. Single-ended and differential SCSI interfaces. Rackmount hardware.
4115e Standalone	C5150F	DLT tape library with one DLT 4000 drive and capacity for up to 15 tape cartridges. Single-ended and differential SCSI interfaces. Cosmetic panels for standalone configuration.

Table 1-1. DLT Tape Library Matrix

Model	Order Number	Description
4215e Standalone	C5152F	DLT tape library with two DLT 4000 drives and capacity for up to 15 tape cartridges. Single-ended and differential SCSI interfaces. Cosmetic panels for standalone configuration.
Rack Mount Kit	C5157F	Rack slides, hardware and instructions for rackmount installation.
Standalone Cosmetic Enclosure Kit	C5156F	Enclosure, hardware and instructions for standalone installation.
DLT 4000 Upgrade Kit	C5154F	One DLT 4000 Drive and associated hardware for installation into the C5151F.

1-2 Product Information

Characteristics

This section provides the physical and environmental characteristics/specifications for the DLT drive and libraries.

DLT Drive Mechanism Characteristics

DLT 4000 Drive

Performance

Sustained data transfer rate to tape	1.5 Mbytes/s (native) 3.0 Mbytes/s (compressed 2:1)
Peak transfer rate	10.0 Mbytes/s
Average access time	68 seconds
Tape speed	
(read/write)	98 ips
(search)	150 ips
(rewind)	70 seconds (average) 150 seconds (max.)
Loading time to BOT (for previously written tape)	48 seconds (max.)
Unloading time from BOT	17 seconds (max.)
Repositioning Time	1.3 seconds

DLT 4000 Drive

Interface

Data interface	8-bit SCSI-2, single-ended
Read-write head	Two channel, ferrite w/MIG
Encoding method	RLL 2,7
Recording format	128-track serial serpentine variable block (64 pairs) 256 tpi track density
Linear bit density	81,600 bpi/track
Formatted data capacity using standard 1,778 ft tape	20.0 Gbytes (native) 40.0 Gbytes (compressed 2:1)
Data compression algo- rithm	DLZ
Recorded data block size on tape	16,777,215 bytes (max.) 1 byte (min)
Nominal tape tension	3.0 +/- 1 oz (stationary) 4.7 +/- 1 oz (operating)

Reliability

Soft read error rate	1 error in 10^7 bytes maximum allowable
----------------------	--

DLT 4000 Drive

Soft write error rate	1 error in 10^6 bytes maximum allowable
Hard read error rate	1 error in 10^{17} bytes maximum allowable
Hard write error rate	read after write verified
Undetected error rate	1×10^{30} bits read
MTBF	80,000 hours

Power Specifications

Total power consumption	22 W (avg.) 33 W (max.)
5 volt supply	5.0 V +/- 5% (max.) @2.5 A (avg.), 3.0 A (max.)
12 volt supply	12.0 V +/- 5% @1 A (avg.), 3.1 A (max.)

DLT 4000 Drive

Physical Characteristics (Drive)

Form factor	5 1/4-inch full length with modified depth
Height	3.25-inch (w/o bezel)
Width	5.7-inch (behind bezel)
Depth	9.0-inch (measured from back of front bezel)
Weight (net)	6 lb, 7 oz

HP DLT Tape Library Characteristics

Performance

Average tape access	<14 seconds
Average tape exchange	28 seconds (mean time to eject tape from drive, robotically exchange tape from magazine and reload drive.)

Reliability

MTBF	100,000 hours
MSBF (robotics)	1 million swaps, guaranteed for life
Preventive maintenance	None required

Power Requirements

Total power consumption	140 W (typical) 150 W (maximum)
Line voltage	100 - 240 Vac
Line frequency	50 to 60 Hz

Interface	SCSI-2 (single-ended or differential, user selectable)
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Physical Characteristics (Library)

Rack-mount Library Product

Height	356 mm (14 in.)
Width	445 mm (17.5 in.)
Depth	737 mm (29 in.)
Weight	44 kg (97 lbs)

Rack-mount Product Shipping

Height	696 mm (27.5 in.)
Width	686 mm (27 in.)
Depth	1003 mm (39.5 in.)
Weight	60 kg (132 lbs)

Standalone Library Product

Height	387 mm (15.5 in.)
Width	483 mm (19 in.)
Depth	737 mm (29 in.)
Weight	55 kg (121 lbs)

Panel Kit Shipping

Height	178 mm (7 in.)
Width	686 mm (27 in.)
Depth	1,003 mm (39.5 in.)
Weight	14 kg (31 lbs)

DLT Tape Characteristics

	HP DLTtape III XT	HP DLTtape IV
Basic description	0.5 in. metal particle	0.5 in. metal particle
Formatted capacity	15 Gbytes (non-compressed)	20 Gbytes (non-compressed)
	30 Gbytes (2:1 compression)	40 Gbytes (2:1 compression)
Tape length	1,167 ft	1,778 ft
Cartridge dimensions	4.1 in. x 4.1 in. x 1.0 in.	4.1 in. x 4.1 in. x 1.0 in.
Shelf life	30 years (min.)	20 years (min.)
	@ 20 ° C, 40% RH (non-condensing)	@ 20 ° C, 40% RH (non-condensing)
Usage	500,000 passes (min.)	500,000 passes (min.)
	10,000 loads/unloads (min.)	10,000 loads/unloads (min.)

Environmental Characteristics

	Tape/Drive	Library
Temperature and Humidity		
Operating	10° to 40°C 20% to 80% RH	10° to 40° C 20% to 80% RH
Non-operating w/o tape	0° to 55°C 10% to 95% RH	-40° to 60° C 10% to 95% RH
Storage/Shipment	-40° to 70°C 10% to 95% RH	-30° to 60° C (<14 consecutive days)
Gradient		10° C per hour
Altitude		
Operating	0 to 30,000 ft	
Non-operating	0 to 50,000 ft	

	Tape/Drive	Library
Shock		
Operating	60 half-sine shock impulses of 5 g for 11 seconds in 3 axes	
Non-operating	half-sine, 55 g, 11 ms half-sine, 140 g, 2 ms half-sine, 15 g, 20 ms half-sine, 150 g, 3 ms half-sine, 40 g, 11.8 ms (all measured in 6 axes)	30 g /206 in./s (trape- zoidal wave)
Package shock Drop tests	42-inch packaged drive dropped on 6 sides, 3 edges and one corner	

Vibration

Operating random	5-500 Hz @ 1 g rms 10 minutes, 3 axes	0.21 g rms
Operating sine	0.25 g peak 10-300 Hz 0.1 g peak 300-500 Hz 10-500 - 10 Hz @ 1/4 octave/minute in 3 axes	
Non-operating random	5-500 Hz @ 2 g rms 60 minutes, 6 axes	2.1 g rms

	Tape/Drive	Library
Non-operating swept-sine	5-10 Hz @ 0.5 g peak 10-50 Hz @ 1 g peak 50-500 Hz @ 3 g peak 5-500 - 5 Hz @ 1/2 octave/minute in 6 axes	0.5 g rms (0 to peak, swept-sine wave)
Non-operating random packaged	2-200 Hz @ 1.5 g rms 6 axes, dwell = 30 minutes	
Non-operating swept-sine packaged	5-150 Hz @ 0.5 g peak 5-150-5 Hz @ 1/2 octave/minute, 6 axes with dwell at lowest natural resonance in each axes	

Acoustic Emissions

Read/write operation	4.3 Bels (max.) A - weighted	5.0 Bels
Tape loading operation	4.9 Bels (max.) A - weighted	

DLT Tape Library Product Certifications

Safety	EN60950/IEC 950
Electromagnetic emissions	EN55022/CISPR-22, Class B EN50082-1 EN55024-2/IEC 801-2, 4kV CD, 8kV AD EN55024-3/IEC 801-3, 3 V/m EN55024-4/IEC 801-4, 1kV Peak Power lines 0,5 kV Signal lines FCC 47 CFR Part 15 - Class “B” VCCI Level 1 EN61000-3-2/IEC 1000-3-2 EN61000-3-3/IEC 1000-3-3
Laser	EN60825 (1991)/IEC 825 (1984) +A1, Laser Class 1

Tape Cartridges

The two types of digital linear tape cartridges available to which the tape drive can read and write are:

- HP DLTtape IV Data Cartridge
- HP DLTtape III XT Data Cartridge

The tape densities available for each cartridge type are as follows:

Table 2-2. Native Tape Densities

Cartridge Type	Available Densities
HP DLTtape IV Data Cartridge	20.0 GBytes
HP DLTtape III XT Data Cartridge	15.0 GBytes

Note

For top performance, highest capacity, longest drive head life, and least amount of head cleaning, Hewlett-Packard recommends use of the HP DLTtape IV Data Cartridge.

Product Support

For information regarding time-and-materials billings, contact your local HP Sales Office. For other support policies for the digital linear tape library, see support policies in the *C5150F, C5151F, C5152F, C5153F Product Support Plan*.

This support plan can be found in the KDB (Knowledge Data Base) or on the HP WEB page at URL:

<http://msdfd.mayfield.hp.com>

Please note that this WEB location is only available to users connected to the HP internal network.

Information about DLT tape library support can also be found by calling the Response Center.

Related Documents

Document Name	Part No.	Edition/ Date
<i>HP DLT Tape Library 4115, 4215 User's Guide</i>	C5153-90000	Ed. 1, 5/97
<i>HP DLT Tape Library 4115 and 4215 Rackmount Kit Installation Instructions</i>	C5157-90000	Ed. 1, 5/97
<i>HP DLT Library 4115 and 4215 Cosmetic Panels Kit Installation Instructions</i>	C5156-90000	Ed. 1, 5/97
<i>Digital Linear Tape Drive and Library SCSI-2 Command Reference</i>	5960-7674	Ed. 1, 6/96

Environmental, Unpacking, and Installation

Environmental Requirements

For detailed site environmental information refer to the publication entitled, *CEO Site Preparation Handbook* (part number 5958-2370).

Note

The environmental requirements listed here apply when the library is *not* connected to a Hewlett-Packard system. When this device is connected to HP systems, the more stringent environmental specifications listed for any single HP device within the HP system are applicable and supersede these specifications.

This digital linear tape library is designed to operate with an ambient air temperature range of 10° to 40° C (50° to 104° F) with a rate of temperature change not to exceed 15° C (18° F) per hour.

Primary Power/External Ground

The power outlet must supply a voltage range of 100-127/200-240 Vac at 50 - 60 Hz. Also, check the earth (safety) ground of the outlet.

Clearance Requirements

Standalone Configuration

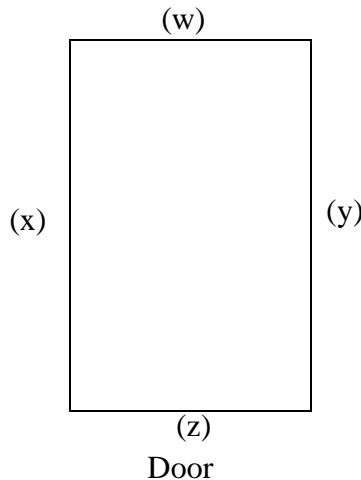


Figure 2-1. Clearance Requirements

Standalone configuration (refer to Figure 2-1 where the front is “z”) - free standing or against a wall/desk. Rear (w) requires 56 cm (22 in.) for cooling and service. Front (z) requires 86 cm (34 in.) for operator access. Sides (x) and (y) require 56 cm (22 in.) for removal of the external cover. If less space is allowed, the peripheral must be moved to an open area before servicing.

Rackmount configuration - Rear (w) requires adequate room to open the rear door of the rack for service access, usually 18-24 in. (45.7-61 cm) depending on the rack. The front requires 86 cm (34 in.) for operator access.

2-2 Environmental, Unpacking, and Installation

Location Requirements

Position the library away from sources of particulate contamination such as frequently-used doors and walkways, stacks of supplies that collect dust, and smoke-filled rooms. (It is recommended that the library be placed at least 30 inches off the floor to decrease dust contamination.)

Responsibilities

Customer site preparation/verification and installation are the customer's or reseller's responsibility. If the customer/reseller wants HP to perform the site preparation/verification and/or installation, this should be contracted on a time-and-materials basis.

For further information on time-and-materials billings, please contact your local HP Sales Office. For other support policies for the digital linear tape library, see the *C5150F, C5151F, C5152F, C5153F Product Support Plan*.

Installation and configuration information can be found in the host system's documentation, in the HP DLT Tape Library 4115, 4215 User's Guide, and in Chapter 3 of this manual.

Checkout Procedure

Check that all materials are included with the library (see the “Product Matrix” located in Chapter 1). If any items are missing, please contact the factory Order Processing Center with the following information:

- original order number or unit serial number
- receiving address

If the unit is damaged, it will be repaired or replaced. Billing of the charges depends on whether the damage was caused by the carrier or the factory packaging. The cause of damage will be determined by the field service representative.

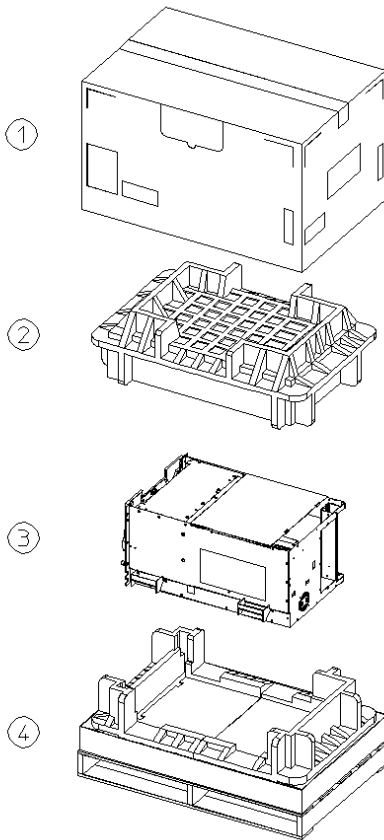
If the carrier refuses payment of damages, replacement/repair costs should be entered into the Field Engineering Support (F.E.S.) account.

Problems determined to be caused by factory packaging should be reported, in detail, to the factory so a warranty claim can be submitted.

Be sure to include the product number, purchase order number, and full serial number in any correspondence with Hewlett-Packard concerning the unit.

Unpacking and Taking the Library Off the Pallet

Using a floor jack or floor level cart, move the library to the chosen location. Remove the outer packaging by following the instructions printed on the carton.



Cut and remove the straps surrounding the outside box and slide the box up and off of the tape library as shown in (1).

Remove the foam cushion (2) from the top of the library and the plastic sheet (not shown).

Using two or more people, lift the library (3) by the handles, out of the packaging (4).

Save the packing material to use if reshipment is necessary at a later time.

Contents of the Accessories Kit

Item	Quantity	Part Number
• User's guide	• 1	• C5150-90000
• DLT Tape data sheet	• 1	• 5965-1389E
• DLT Type IV Tape (HP label)	• 1	• C5141F
• DLT Cleaning Tape (HP label)	• 1	• C5142A
• Power cord	• 1	• 8120-1378

Installing the Library into a Rack

Warning

The tape library weighs approximately 100 pounds (45 kilograms). Use the following safety precautions when installing the tape library:

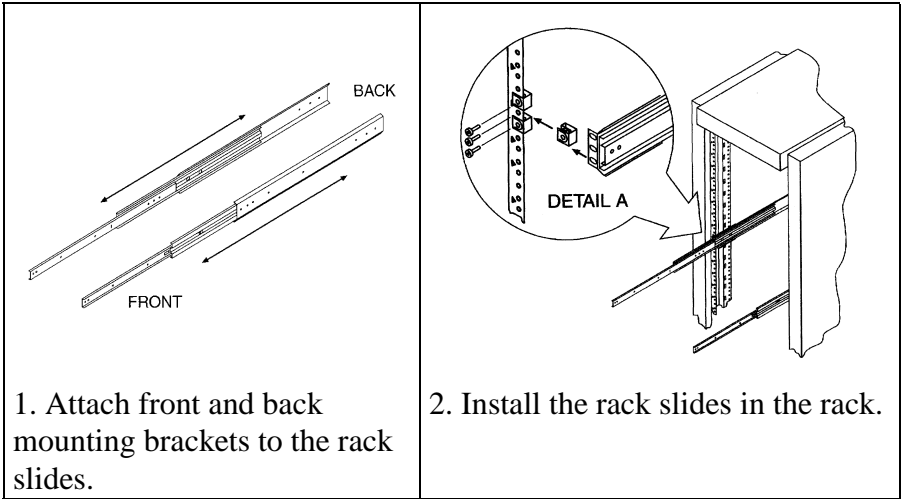
- Fully extend the cabinet's antitip feet.
- Install no higher than 4 feet (122 centimeters) in the rack.
- Use a minimum of two people to lift the library.

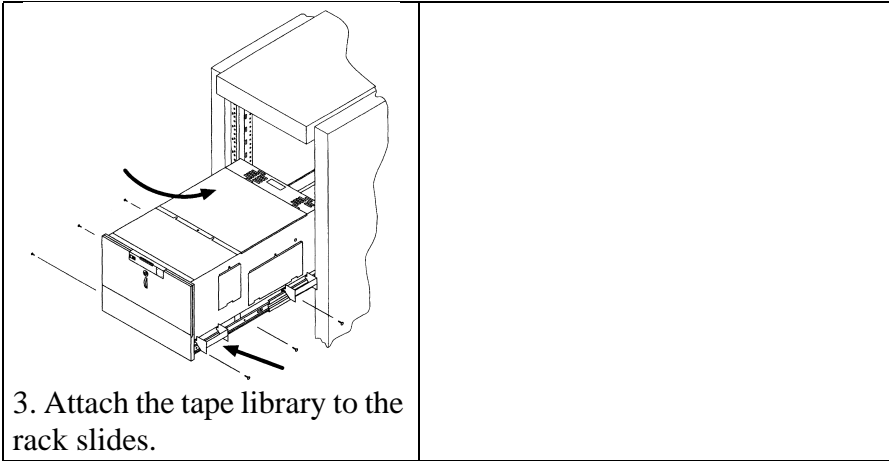
Note

The rack slides in this kit can be adjusted to fit any standard rack with a depth of 26 to 31 inches (66.04 to 78.75 centimeters).

Tools Required	Kit Contents
<ul style="list-style-type: none"> • Phillips screwdriver (included in rackmount kit) • 1/2-inch open-end wrench 	<ul style="list-style-type: none"> • 1 pair of rack slides • 4 mounting brackets • 1 strain relief bracket • 8 8-32 keps nuts • 16 10-32 clip nuts • 4 cable ties • 4 nuts with lockwashers (8-32) • 14 small (8-32) screws • 2 bezel spacers • 1 6-32x3/8 pan phillip screw, with internal lockwasher • 18 10-32x5/8 pan slotted phillip screws

Installation Overview

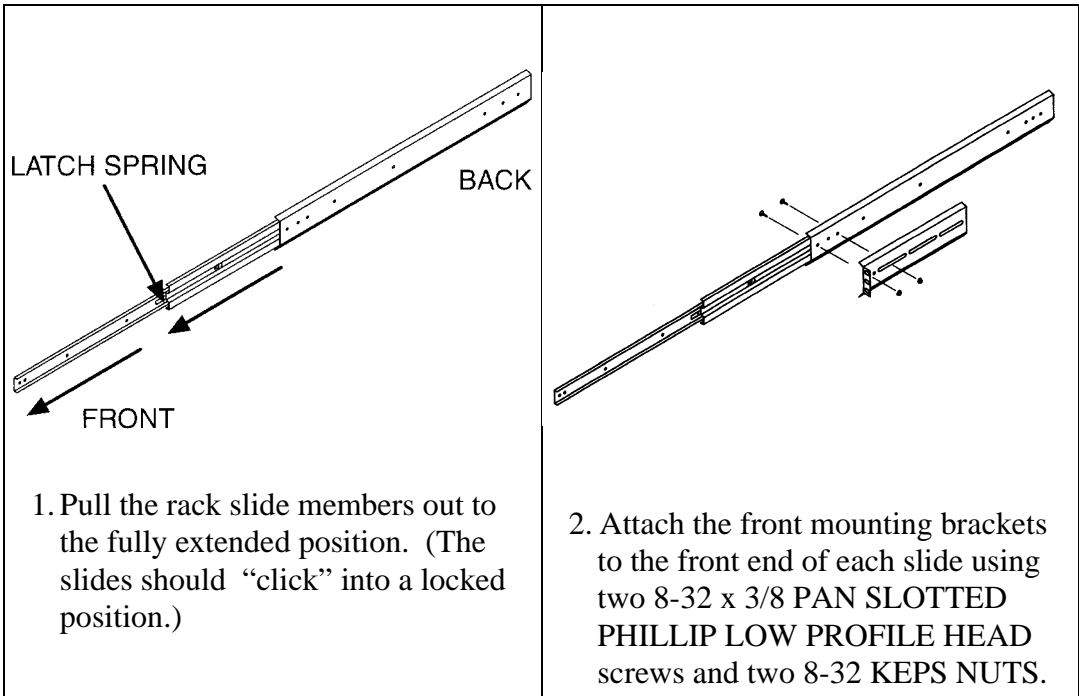


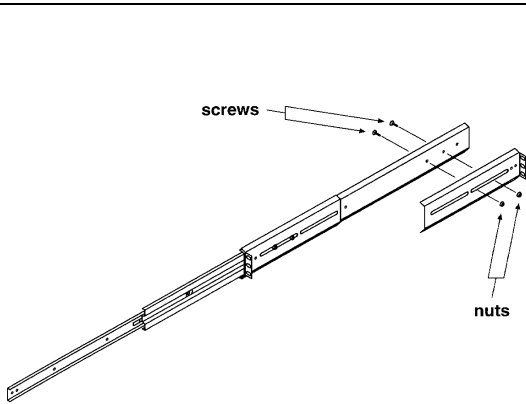


Installation Steps

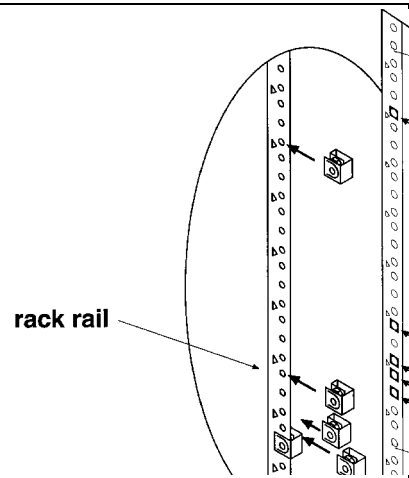
Warning

Lower the rack's leveler feet using a 1/2-inch open-end wrench, and extend the rack's anti-tip feet before proceeding with these installation steps. Failure to do so could result in personal injury and/or damage to the tape library.

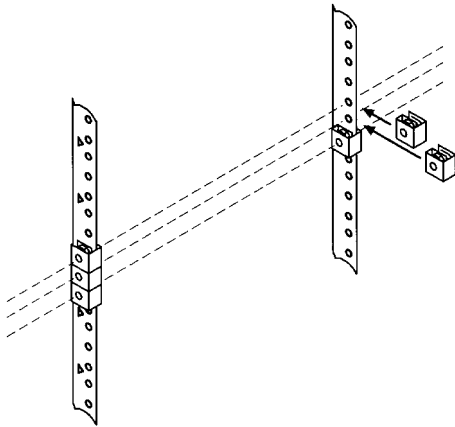




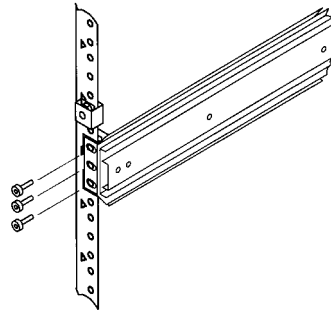
3. Attach the rear mounting brackets to the back side of each slide using two 8-32 x 3/8 PAN SLOTTED PHILLIP LOW PROFILE HEAD screws and two 8-32 KEPS NUTS. **Do not tighten these screws.**



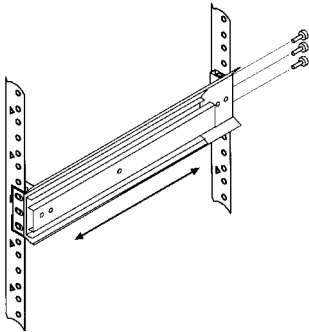
4. Using the template in the rackmount kit, determine the space required for the tape library on the **rack's front rails** and attach four clip nuts to each rail as indicated.



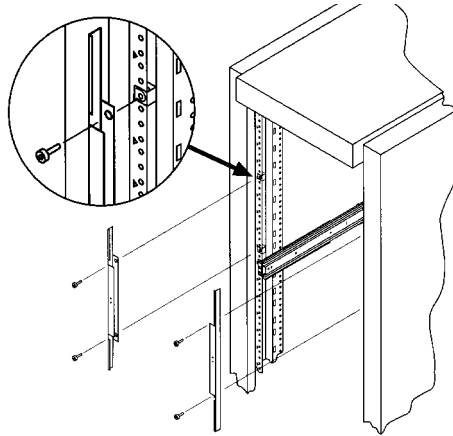
5. Attach three clip nuts to each of the back rails so that the slides will be level when attached to the rails. (This may mean having to count the holes on the front and back rails to ensure that the slides will be level.)



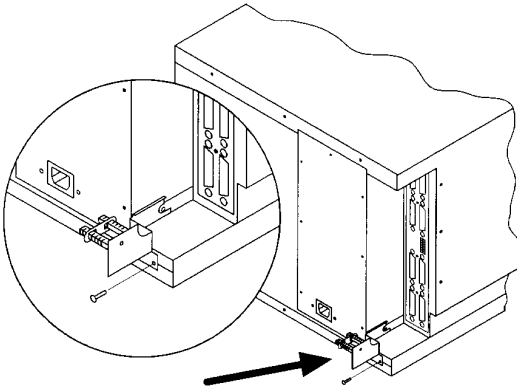
6. Return the slides to their compressed position and attach the front of the slide assembly to the clip nuts on the front rails using three 10-32 x 5/8 PAN SLOTTED PHILLIP screws. **Push the slides as far as possible toward the outside of the rack and then tighten the screws.** (The clip nuts shown above were added previously in Step 4.)



7. Adjust the rear mounting brackets to fit lengthwise in the rack and secure each slide assembly to the rear clip nuts using three 10-32 x 5/8 PAN SLOTTED PHILLIP screws. Tighten screws added in Steps 3, 6 and 7.



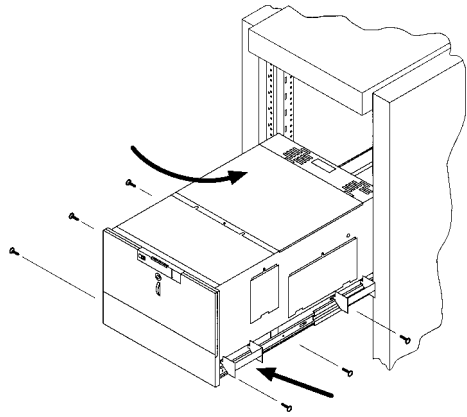
8. Extend the slides fully, make sure they are parallel, and then recompress the slides.
9. Connect the two bezel spacers to the front rails using two 10-32 x 5/8 PAN SLOTTED PHILLIP screws. The screws attach to the two clip nuts on the front rails above the slides.



10. Attach the cable strain relief bracket to the library rear panel below the SCSI connectors (see illustration above) using one 6-32 x 3/8 PAN PHILLIP, WITH INTERNAL LOCKWASHER screw

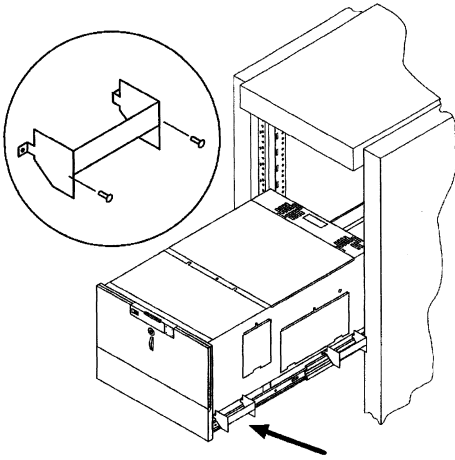
11. Remove the keys from the library handle.

Warning: Before doing Step 12 the rack's antitip feet must be extended! Also, two people are needed to lift the tape library



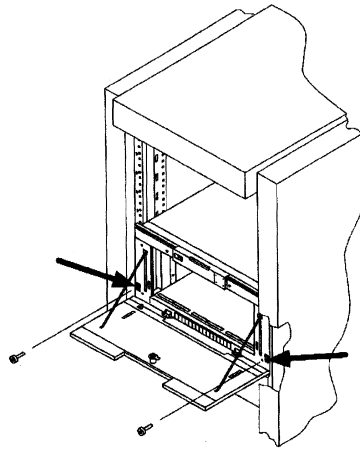
12. Lift the library onto the slides and back slightly into the rack using the side handles. **Make sure the handles sit securely on the slides** and that the front holes in the library line up with the second hole from the front on the slides.

13. Attach the library to each slide using three 8-32 x 3/8 PAN SLOTTED PHILLIP LOW PROFILE HEAD screws.



14. Remove the installation handles by removing two screws on each handle. Keep the screws and handles in case the library needs to be reshipped in the future.

15. Release the slide latch springs push the tape library into the rack.



16. Open the front access door and secure the library to the rack using two large screws. (The rectangular holes in the door should line up with the clip nuts added in Step 4.)

Installing the Cosmetic Panels for the Standalone Library

Tools Required

- Phillips magnetized screwdriver
- 9/64 Allen wrench

Kit Contents

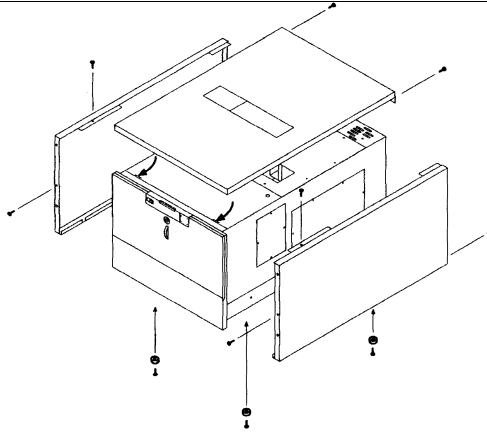
Note

There is only one FRU part number for this kit (panels may not be ordered separately). If there is a problem with the kit, order kit C5150-60x90 (listed as FRU 90, Table 5-2, Chapter 5).

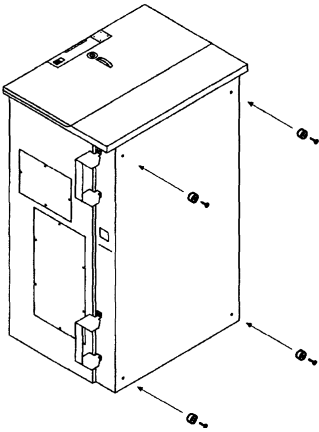
- 4 feet , part number 0403-1048
- 2 side cosmetic panels, reorder new kit, part number C5150-60090
- 1 top cosmetic panel, reorder new kit, part number C5150-60090
- 1 replacement chassis panel, reorder new kit, part number C5150-60090
- 6 10-32 screws, part number 2680-0107
- 6 6-32 screws, part number 2380-0119

Installation Overview

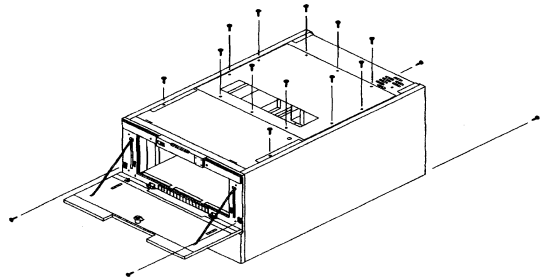
1. Add feet to the bottom of the library.
2. Remove the installation handles.
3. Replace the top access panel on the chassis.
4. Attach the side cosmetic panels.
5. Attach the top cosmetic panel.



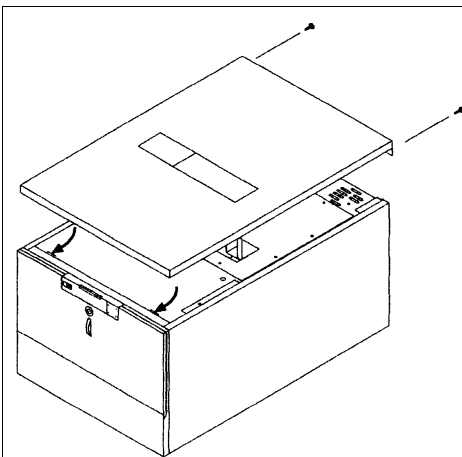
Installation Steps



1. Carefully lift the library back onto its back panel using the installation handles.
2. Attach four feet to the bottom of the library using the four 10-32 screws.
3. Return the library to its upright position
4. Remove the four screws securing the installation handles to the library using a 9/64 Allen wrench. Save the handles for future use.



5. Remove the access door on the top of the chassis and replace it with the new chassis access panel using the screws just removed.
6. Unlock the front access door and attach the two side panels through the front panel using two 10-32 screws.
7. Attach the side panels at the top and back using four 6-32 screws.



8. Attach the top panel by sliding the panel hooks into the slots at the front of the chassis. Secure the panel at the back using two 6-32 screws.

Product Configuration and Operation

Identifying Rear and Control Panel Features

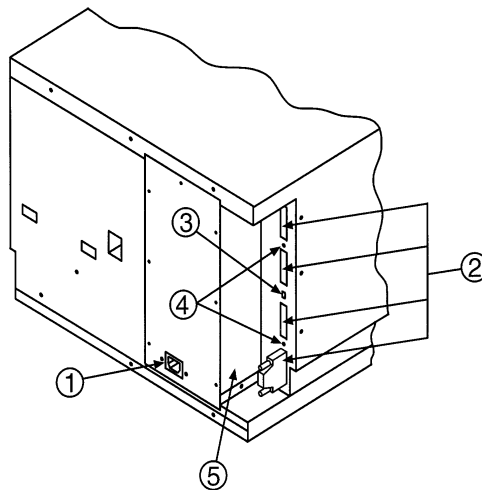


Figure 3-1. Rear Panel

The numbers on the next page correspond to the numbers in Figure 3-1.

- | | |
|-------------------------------------|--|
| 1) Power Port | Used to connect the power cord to the library. |
| 2) SCSI Ports | Used for attaching SCSI cable(s) from the library to the host computer. You must select either the single-ended or the differential pair of connectors (see item 3 in this list), and both SCSI connectors selected must be used. One connector must have a SCSI cable connected, and the other must have either a SCSI terminator connected to it, or it can be used to daisy-chain to another SCSI peripheral. |
| 3) SCSI
Interface
Mode Switch | Used to select either a single-ended or differential SCSI interface. |
| 4) Active Bus
Indicator | Lit when the SCSI bus is active. |
| 5) Serial
Number
Label | Needed when a service call is made. |

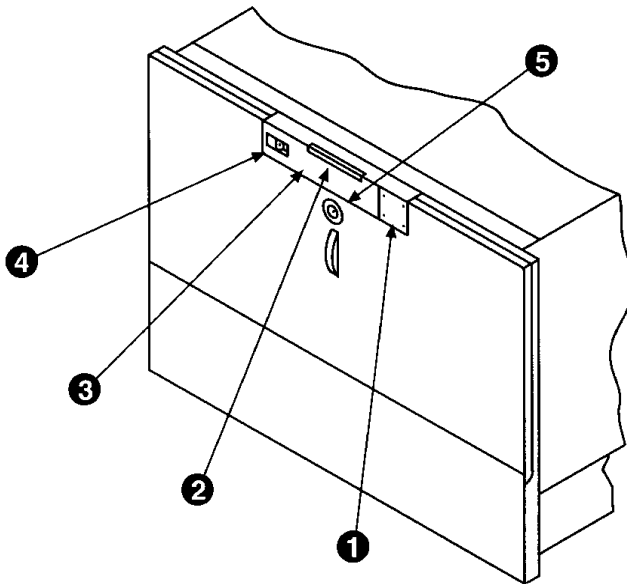


Figure 3-2. Control Panel

The numbers below correspond to the numbers in Figure 3-2.

- | | |
|-------------------------|---|
| 1) Control Panel | Press to perform the following operations:
"CANCEL" cancels the current operation or choice.
"PREV" scrolls the display choice backward by one.
When held continuously the choices scroll fast.
"NEXT" scrolls the display choice forward by one.
When held continuously the choices scroll fast.
"ENTER" selects the displayed option. |
| 2) Activity Light | Lit differently to indicate the following:
Steady Green - power is on
Flashing Green - a tape cartridge is being accessed
Amber - fault indicator |
| 3) 16-Character Display | Displays information about the current operation or drive status information (see "Understanding Display Window Messages" on page 3-14). |
| 4) Power Switch | Switches power to the unit on and off. |
| 5) Door Latch | Used to lock/unlock door for access to tape cartridge caddies. |

Note

The library runs in reduced power mode if it has not been used for 30 minutes.

Note

The library menus available using the control panel are shown in Figure 3-5.

Setting Up the DLT Tape Library

Note

Before you connect the digital linear tape library to the host, verify that it is supported by the host.

Note

The tape library must be installed in the rack prior to using the instructions in this guide. Rack mounting instructions are included in the rack slide kit and in Chapter 2 of this manual.

To set up the library, you will need the following:

- rack slide kit and a 19-inch rack with eight EIA (electronics industries association) standard units of space available (Rack slide installation instructions included in the kit. Refer to Chapter 2, “Installing the Library into a Rack”)

-OR-

- cosmetic panels kit (Installation instructions included in the kit. Refer to Chapter 2, “Installing the Cosmetic Panels for the Standalone Library.”)

-AND-

- power cord (included in the accessories kit)
- SCSI cable
- instructions from this chapter

Connecting the SCSI Cables to the Library

The library connects to the host computer with high-density SCSI interface cable, and may be configured to use either a single-ended or a differential SCSI interface. Select the SCSI interface type using the SCSI interface switch on the rear panel of the library (see “Rear Panel” on page 3-1).

The total allowable length of the SCSI cable depends on which interface type you select. Refer to the following table for allowable SCSI cable lengths.

Table 3-1. SCSI Cable Length Limitations

Interface Type	Allowable Cable Length
Single-Ended FAST SCSI (host transfers data faster than 5 Mbytes/second)	3 meters
Single-Ended SCSI (host transfers data no faster than 5 Mbytes/second)	6 meters
Differential SCSI	25 meters

Note

Because of FAST handshaking the single-ended FAST SCSI is limited to 3 meters.

A 50-pin high-density SCSI cable must be used if the single-ended SCSI mode is used; a 68-pin high-density SCSI cable must be used if the differential SCSI mode is used. See the end of Chapter 5, in “Miscellaneous” for part numbers for SCSI cables.

Caution

Make sure all peripheral devices connected to the host computer have been properly shut down. If the host computer is connected to a network, check with the system administrator before switching off power.

The tape library can be the only peripheral attached to the host computer, or as one of a number of peripherals connected to the host. Refer to one of the following sections to connect the tape library to the host:

- Connecting the Library as the Only Peripheral
- Connecting the Library with Other Peripherals

Connecting the Library as the Only Peripheral

Note

For the best tape library performance, Hewlett-Packard recommends connecting only one library on a SCSI bus.

Caution

Make sure all peripheral devices connected to the host computer have been properly shut down. If the host computer is connected to a network, be sure to check with the system administrator before switching off power.

Refer to Figure 3-1 for the locations of the following switches and connectors.

1. Switch off power to the host computer before you connect the library.
2. Select the SCSI interface mode (single-ended or differential) using the SCSI interface selection switch on the library rear panel.

3. Plug one end of the SCSI cable into one of the SCSI ports on the library rear panel. Make sure that you select the set of SCSI connectors that matches your interface switch setting selected in Step 2.
4. Plug a SCSI terminator into the unused SCSI connector of the SCSI port set being used (see Figure 3-3).

Note

A terminator must be used if no other SCSI devices are connected to the SCSI bus. Both single-ended and differential SCSI terminators are shipped with the library. Select the terminator that matches your interface switch setting selected in Step 2.

5. Plug the other end of the SCSI cable into a SCSI port on the host computer.

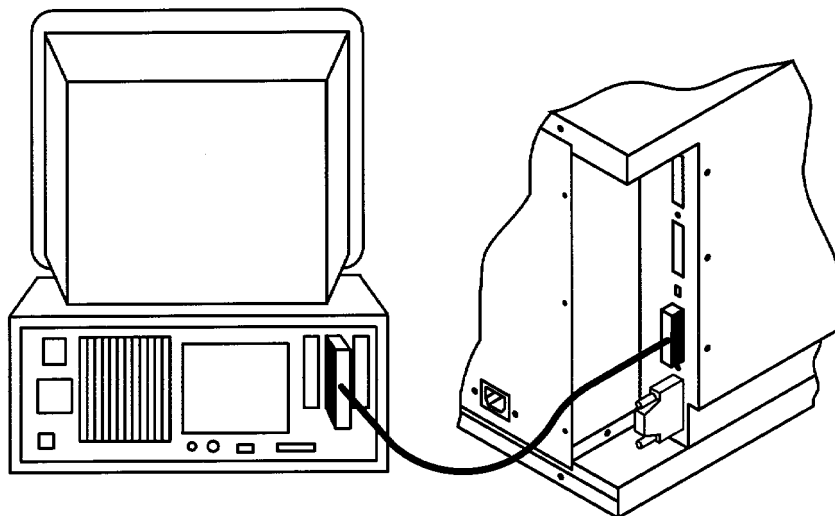


Figure 3-3. Connecting the Library as the Only Peripheral

Note

Instructions for powering on the library are given in the section, "Connecting Power," in this chapter.

Instructions for setting SCSI IDs, configuration options, and for operating the tape library are given later in this chapter.

Connecting the Library with Other Peripherals

Note

For the best tape library performance, Hewlett-Packard recommends connecting only one library on a SCSI bus.

Caution

Make sure that all peripheral devices connected to the host computer have been properly shut down. If the host computer is connected to a network, be sure to check with the system administrator before switching off power.

When connecting the tape library with other peripherals, refer to the following table for the number of SCSI addresses available:

Table 3-2. SCSI Address Considerations

No. of Drives	SCSI Addresses Available ^a
1	5 SCSI addresses are available for connecting other devices
2	4 SCSI addresses are available on the bus for other devices

a. The library takes one SCSI address and each drive takes a SCSI address.

Refer to Figure 3-1 for the locations of the following switches and connectors.

1. Switch off power to the host computer before you connect the library.
2. Select the SCSI interface mode (single-ended or differential to match your host's interface card) using the SCSI interface selection switch on the library rear panel.

3. Plug one end of the SCSI cable into one of the SCSI ports on the library rear panel (see Figure 3-4). Make sure that you select the set of SCSI connectors that matches your interface switch setting selected in Step 2.
4. Plug the other end of the SCSI cable into the SCSI port of another peripheral device (see Figure 3-4).
5. Plug a terminator into the last SCSI device connected to the system.

Note

You can connect the library to any peripheral device along a chain of peripherals, as long as you plug a terminator into the last device in the chain. Both single-ended and differential SCSI terminators are shipped with the library. Make sure that you select the terminator that matches your interface switch setting selected in Step 2.

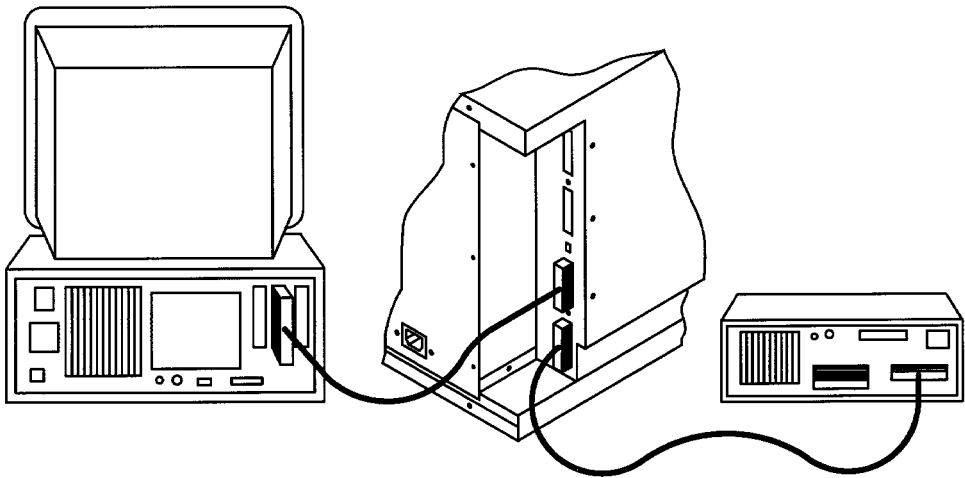


Figure 3-4. Connecting the Library with Other Peripherals

Note

Instructions for powering on the library are given in the section, "Connecting Power," in this chapter.

Instructions for setting SCSI IDs, configuration options, and for operating the tape library are also given in this chapter.

Connecting Power

1. Find the power cord that was shipped with the library.
2. Make sure the power switch on the library is switched off. (The power switch is on the library control panel.)
3. Plug the socket end of the power cord into the power port on the library rear panel (see Figure 3-1).
4. Plug the other end of the power cord into a three-hole grounded outlet.
5. Turn on the power switch.
6. Initially **SELF TEST** and **NOT READY**, and then **NOT READY** and **INVENTORY CHECK** alternately appear in the display window on the library. Once the poweron test completes (approximately 1.5 minutes), the drive status information appears in the display window. (See "Understanding Display Window Messages" in this chapter.)

Note

If the drive status information does not display, the poweron test was not successful and **DEVICE FAILED** displays. See "Troubleshooting," Chapter 4, for troubleshooting procedures.

Operating the Library

This section gives information on the following topics:

- using the control panel
- interpreting messages which appear on the display window
- loading tape cartridges into the library
- removing tape cartridges from the library
- entering the administration menu password
- setting a new administration menu password
- setting the SCSI IDs
- choosing configuration options

Using the Control Panel

Note

The control panel options, **NEXT** , **PREV** , **CANCEL** , and **ENTER** are represented as "buttons" in this manual, indicating a key press.

The control panel is used to select tasks you want the library to perform. When you press a control panel choice, the message in the display window changes. See the next section for a list of messages. You can hold down the **NEXT** or **PREV** choice to scroll the display faster.

Each time you press the **NEXT** or **PREV** choice, a task option appears. (If you see an "*" as part of the message, it indicates there is a menu beneath that option, which you can access by pressing **ENTER** on the control panel.

To display additional options, press **NEXT** or **PREV** .)

Note

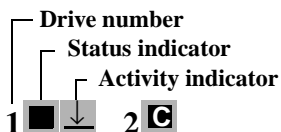
You can get back to the drive status indicators (ready status) at any time by pressing **CANCEL** . (You may have to press **CANCEL** more than once in some cases.)

Understanding Display Window Messages

The display window shows the menu options you can select. To select an option press **ENTER** . A description and instructions for using and setting options are in the following sections.

Drive Status Indicators (Displayed when the library is in the "ready" state.)

Example:



Note: The library may have one or two drives, depending on the model number.

In the above example, Drive 1 has a cartridge inserted and data is being written to the tape, and Drive 2 needs to be cleaned.

The following indicators provide drive status information for the drive number preceding the symbol.

Status indicators:



- The drive needs to be cleaned.



- The tape cartridge in the drive is write-protected.



- The drive is empty.



- The drive is full.

- (Blank) The drive is offline or is not included in your library model number.

Activity Indicators: (activity light flashes during the following operations)



- The drive is being cleaned.



- Information is being written to the tape in the drive.



- Information is being read from the tape in the drive



- The tape in the drive is being searched backward.



- The tape in the drive is being searched forward.

First Level Messages (displayed by pressing **PREV** or **NEXT** while the library is in the "ready" state)



- Select to allow the front access door to be unlocked.



- Select to view the bar code labels on each tape cartridge by slot number.



- Select to access second-level options. (You must enter a security code to access the second-level options.)

Second Level Messages (accessed from **ADMIN ***)

Before you can access the following control panel options, you must enter a security code. A default code of 000-000-000 is set at the factory, but you will want to change this code to prevent library access by unauthorized personnel. (See "Setting a New Administration Menu Password" in this chapter.)

INFO * - Select to retrieve performance information stored in the library.

TEST * - Select to run internal library tests.

CONFIG * - (Configurations) Select to customize the way the library functions.

CLEAN DRIVES * - Select to display the drive numbers you wish to clean.

OVERRIDE DOOR - Select, if necessary, to unlock the front access door if certain circumstances (such as the drives being full or a security option being set) prevent the "RELEASE DOOR" option from unlocking the door.

SCSI IDs * - Select to set the SCSI addresses for the library controller and the library drive mechanisms.

ONLINE REPAIR * - Select to deactivate a drive for replacement.

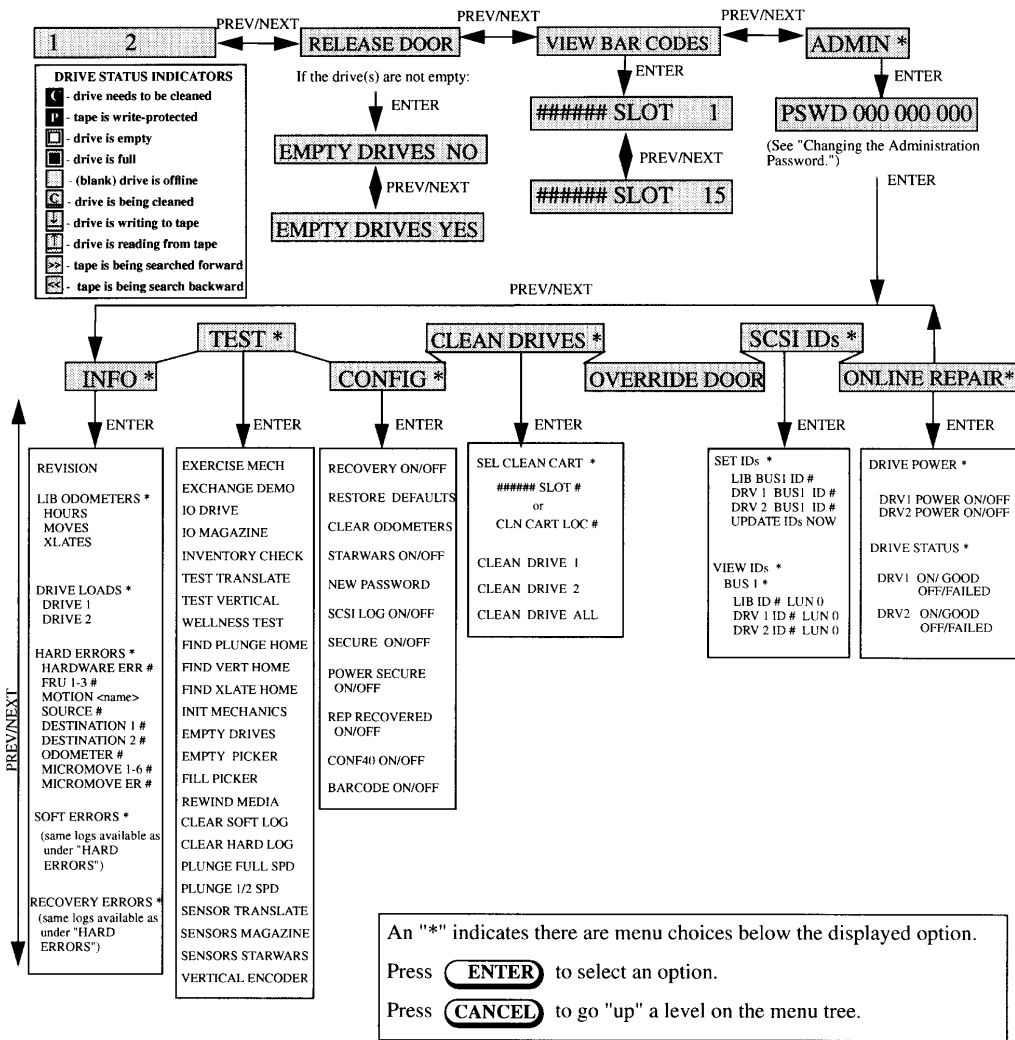
Note

An "*" indicates there are multiple selections available for that operation.

When a menu selection is flashing, press **ENTER** to select the option, or press **PREV** or **NEXT** to display other available options.

In Figure 3-5, you can display the selections listed in boxes below the shaded options by pressing **ENTER** when that option is displayed. Press **PREV** or **NEXT** to scroll through the list. To perform the displayed operation, press **ENTER**.

Figure 3-5. Tape Library Display Menu Tree



Loading Tape Cartridges Into the Library

Tapes are loaded into a removable magazine which is then inserted into the library through the front access door. The tape library is designed to hold three 5-slot magazines. To load tapes into the library, do the following:

Note

Some software packages control the insertion and removal of cartridges. If you are using a software package to manage files in the library, check the software documentation before proceeding with these steps.

Note

Be sure to label all cartridges before inserting them into the magazine. Refer to Chapter 2 of the User's Guide for labeling recommendations.

The bar codes and storage slot locations will be stored into library memory when the door is closed and the "Inventory Check" test is automatically run.

Note

To prevent cartridges from sliding out of the bulk load magazines when inserting them into the library, avoid the following:

- Do not use excessive force when inserting the magazines into the library. This can cause the magazine "latching" mechanisms to fail.
- Do not insert magazines into the library when the library power is turned off. During normal library operation, the cartridge release button on top of the magazine is pushed down by a special mechanism inside the library. This "unlocks" the cartridges, allowing them to be inserted and removed from the storage slots as needed. When the control panel RELEASE DOOR option is enabled, the button on top of the magazine is released, which "relocks" the cartridges into the magazine slots. During a power failure, however, this button is not released, and cartridges can slide out of their storage slots if a magazine is inserted or removed from the library. (If no magazines are in a library, the special mechanism defaults to the position that keeps cartridges locked into the magazine storage slot.)

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Verify that all drives in the library are empty. Refer to the note below.
 - ☐ is displayed after the drive number if the drives are empty
 - ☒ is displayed after the drive number if the drives are full
3. Press **NEXT** or **PREV** until **RELEASE DOOR** appears in the display window.
4. Press **ENTER** . **DOOR RELEASED** displays. (See the note below. If an error message displays, see Table 4-2, "Operation Errors".)

Note

The tape drive(s) must be empty before the access door can be released. If the drive(s) are not empty, **EMPTY DRIVES NO** displays. Press **NEXT** or **PREV** until **EMPTY DRIVES YES** displays and then press **ENTER**.

Some security configurations may prevent the access door from being released. If a security option is enabled **SECURITY ENABLED** displays or if the drives contain cartridges, **DRIVES FULL** and **CAN'T OPEN DOOR** display after the **RELEASE DOOR** option is chosen.

In some situations it may be necessary to override a security option and open the access door. In this case, use the **OVERRIDE DOOR** option under the **ADMIN *** menu (see Figure 3-5).

5. Unlock the access door using the key that is included in the accessories kit.
6. Open the access door by pulling the top of the door outward. (Refer to Figure 3-6.)

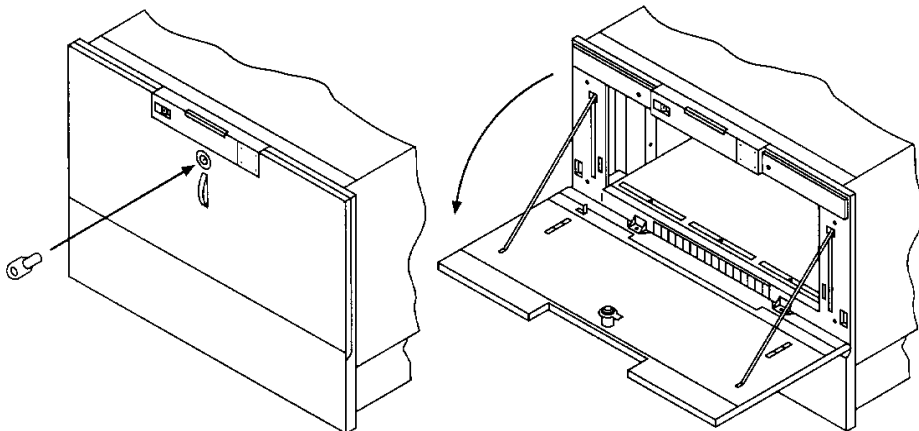


Figure 3-6. Opening the Front Access Door

7. Insert up to five tape cartridges into a magazine so that the tape brand name printed on the top of the cartridge is facing up and the tape label is facing out towards you (see Figure 3-7). The tapes should "click" into place.

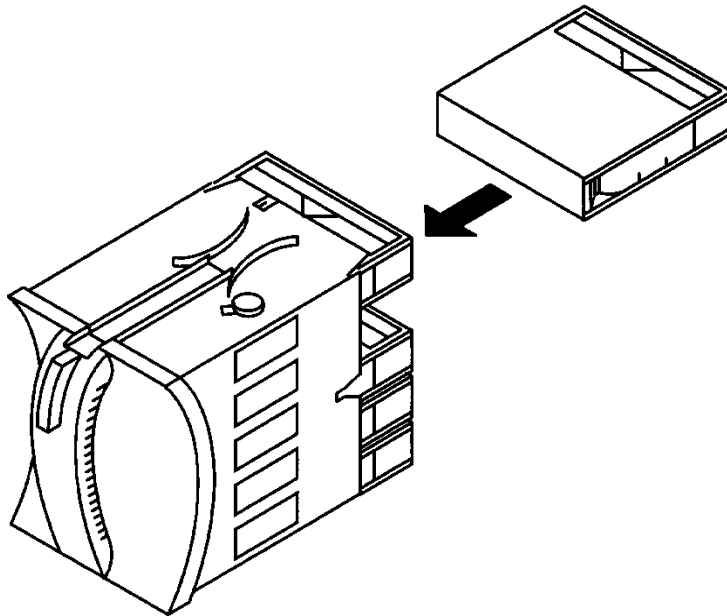


Figure 3-7. Loading Tape Cartridges into the Magazine

8. Insert the removable magazine so it lines up with the arrow on the label inside the library, the handle is facing out toward the front of the library, and the tapes are facing toward the inside of the tape library (see Figure 3-8). The magazine should "click" into place.
9. Shut and lock the access door. Make sure the door is shut completely or the library will fail the "Inventory Check" test, which automatically runs when the access door is closed.

Note

The library "Inventory Check" test runs when the access door is closed. The "Inventory Check" test inventories the tape bar code labels and storage slot locations, and stores them in library memory. This process takes approximately one minute.

Warning

Class II laser light is generated in this library. If operating the library with less than three tape magazines installed and the interlocks disabled on an open front door, do not stare into the light from the bar code reader.

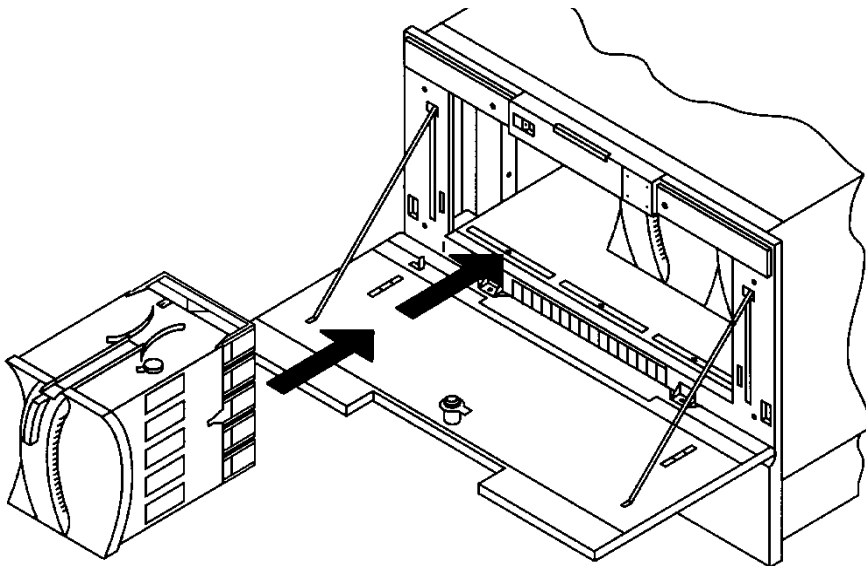


Figure 3-8. Inserting a Magazine Through the Front Access Door

Removing Tape Cartridges from the Library

Tapes are loaded into a magazine which is then inserted into the library through the front access door. The tape library is designed to hold three 5-slot caddies. Follow these steps to remove caddies from the library:

Note

Some software packages control tape cartridge insertion and deletion. If you are using a software package to manage files in the library, check the software documentation before proceeding with these steps.

Note

The tape drive(s) must be empty before the access door can be released. If the drive(s) are not empty, **EMPTY DRIVES NO** displays. Press **NEXT** or **PREV** until **EMPTY DRIVES YES** displays and then press **ENTER**.

Some security configurations may prevent the access door from being released. If a security option is enabled **SECURITY ENABLED** displays or if the drives contain cartridges, **DRIVES FULL** and **CAN'T OPEN DOOR** display after the **RELEASE DOOR** option is chosen.

In some situations it may be necessary to override a security option and open the access door. To open the access door when a security option prevents the door from being released, use the **OVERRIDE DOOR** option under the **ADMIN *** menu (see Figure 3-5).

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.

2. Verify that all drives in the library are empty. Refer to the note above.
☐ is displayed after the drive number if the drives are empty
☒ is displayed after the drive number if the drives are full
3. Press **NEXT** or **PREV** until **RELEASE DOOR** appears in the display window.
4. Press **ENTER**. **DOOR RELEASED** displays. (See the note on the following page. If an error message displays, see Chapter 4, “Troubleshooting and Diagnostics.”)
5. Unlock the access door using the key that is included in the accessories kit.
6. Open the access door by pulling the top of the door outward. (Refer to Figure 3-9). Do not let the door fall open.

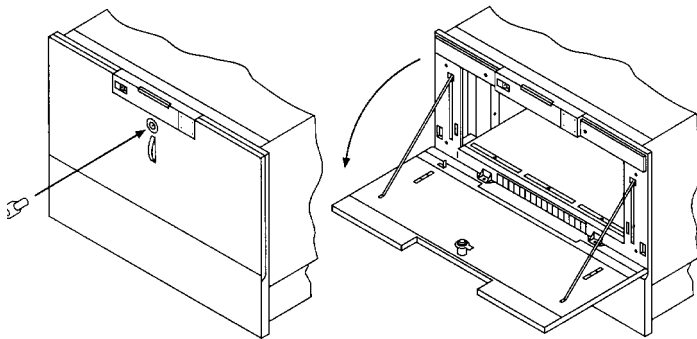


Figure 3-9. Opening the Front Access Door

7. Remove the desired magazine by pushing the button at the top of the

magazine handle (see detail in Figure 3-10) and pulling out the magazine.

8. Remove tapes from the magazine (if needed) by pressing the green button on top of the magazine and pulling out the tape.
9. Shut and lock the access door. Make sure the door is shut completely or the library will fail the “Inventory Check” test, which automatically runs when the access door is closed.

Note

The library inventory check test runs when the access door is closed so that an inventory of tape bar code labels and storage slot locations can be stored into library memory. This process takes approximately one minute.

Warning

Class II laser light is generated in this library. If operating the library with less than three tape magazines installed and the interlocks disabled on an open front door, do not stare into the light from the bar code reader.

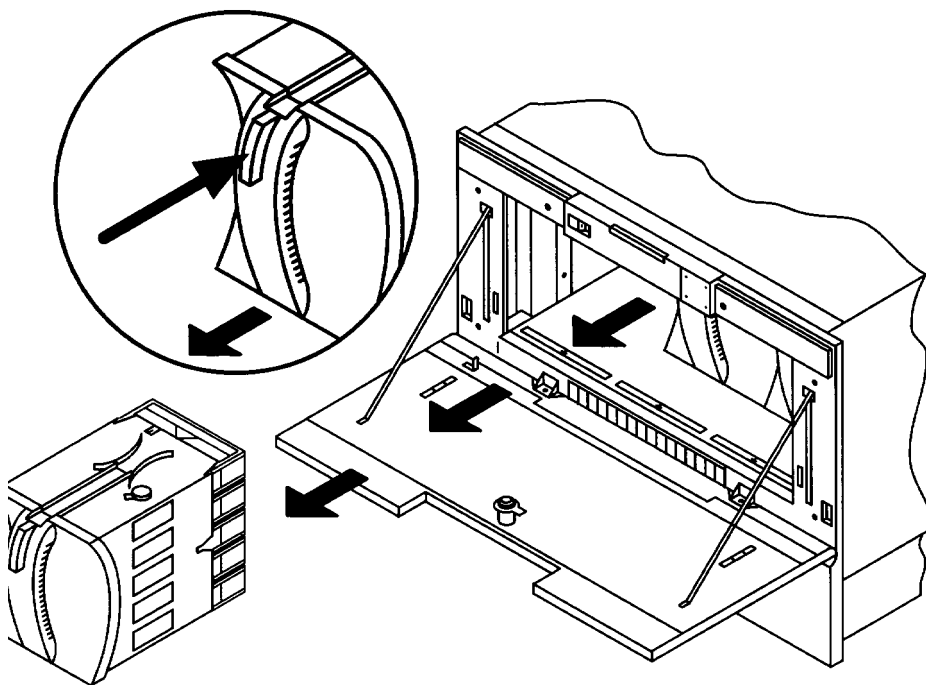


Figure 3-10. Removing a Magazine Through the Front Access Door

Viewing Tape Cartridge Bar Code Labels

Bar code label information can be viewed for each tape cartridge in the library using the control panel. Bar code information is displayed sequentially by storage slot number. To view bar code information, do the following steps:

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **VIEW BAR CODES** appears in the display window and then press **ENTER**.

SLOT # displays. ("#####" represents the bar code information, and "#" represents the first storage slot that contains a bar coded tape cartridge.

Note

If there are no bar coded tape cartridges in the library,

LIBRARY EMPTY displays briefly and then

VIEW BAR CODES displays. Press **CANCEL** to return to the drive status indicators ("ready" state).

3. Press **NEXT** or **PREV** to scroll through the storage slot locations that contain bar coded tape cartridges.
4. Press **CANCEL** twice to return to the drive status indicators ("ready" state).

Entering the Administration Menu Password

A numeric password is required to access options beneath **ADMIN *** menu of the library (see Figure 3-5). A three-part default password of 000-000-000 is set at the factory.

Note

See “Inputting Security Code” in the “Operation Errors,” Table 4-2 for instructions to set the customer’s password to the default password set at the factory.

Follow these steps to enter the current password. Follow the steps in the next section, "Setting a New Administration Menu Password" to change the password.

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window.
3. Press **ENTER**. **PSWD 000 000 000** displays and the first set of zeros is flashing.
4. Press **ENTER** to accept this number if no password has been set, or press **NEXT** or **PREV** until the number you have set is displayed. Press **ENTER**. The middle set of zeros is now flashing.
5. Press **ENTER** to accept this number if no password has been set, or press **NEXT** or **PREV** until the number you have set is displayed. Press **ENTER**. The last set of zeros is now flashing.
6. Press **ENTER** to accept this number if no password has been set, or press **NEXT** or **PREV** until the number you have set is displayed. Press

ENTER . **INFO *** displays.

To access options under the **ADMIN *** menu press **PREV** or **NEXT** until the desired option is displayed, and then press **ENTER**.

Setting a New Administration Menu Password



Note

See “Inputting Security Code” in the “Operation Errors,” Table 4-2 for instructions to set the customer’s password to the default password set at the factory.

1. Follow the steps on the previous page to enter the existing or factory-set password.
2. **INFO *** displays. Press **NEXT** until **CONFIG *** displays, and then press **ENTER**.
3. Press **NEXT** or **PREV** until **NEW PASSWORD** displays and then press **ENTER**.
4. **NEW 000 000 000** displays and the first set of zeros is flashing. Press **NEXT** or **PREV** until the new number you wish to assign to the first part of the password is displayed and then press **ENTER**. The second set of zeros is flashing.
5. Press **NEXT** or **PREV** until the new number you wish to assign to the second part of the password is displayed and then press **ENTER**. The last set of zeros is flashing.

6. Press **NEXT** or **PREV** until the new number you wish to assign to the third part of the password is displayed and then press **ENTER**.
7. **PASSWORD CHANGED** displays. Press **CANCEL** three times to return to the drive status ("ready" state).

Note

The new password can be saved to flash ROM by power cycling the library. This allows the password to be recovered if the library is powered off for more than ten days.

Caution

Do not switch off power to the library until you are sure the SCSI bus is inactive. Removing power from a SCSI peripheral when the bus is active can result in data loss and/or indeterminate bus states. (Check the host system manuals for information about checking the SCSI bus status.) If the computer is connected to a LAN, be sure to check with the system administrator before shutting off power to the library.

Setting the SCSI IDs



There are two options available when **SCSI ID'S *** is chosen:

- **SET IDs *** allows you to assign individual SCSI IDs to each drive in the library and to the library controller.
- **VIEW IDs *** allows you to see the current drive and library controller settings.

To set individual SCSI IDs, see the next section, "Changing the Current SCSI Address Settings."

To view the current SCSI address settings, see "Viewing the Current SCSI Address Settings" in this chapter.

Table 3-3. Default SCSI Address Settings

Device	SCSI ID
LIB ID	6
DRV 1 ID	5
DRV 2 ID *	4

* may or may not be included in some models

If you are already using any of these IDs for the computer or another SCSI peripheral device, follow the instructions in "Changing the Current SCSI Address Settings" to change the controller or the drive ID. To view the current SCSI address settings, see "Viewing the Current SCSI Address Settings" in this chapter.

Changing the Current SCSI Address Settings



A SCSI address is required for the library controller and for each tape drive inside the library. The default address settings are shown in Figure 3-3. To view the current SCSI address settings see the next section, "Viewing the Current SCSI Address Settings".

To change the current SCSI address settings, do the following steps:

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window and then press **ENTER**.

Note

A three-part numerical password is required to access any options beneath **ADMIN ***. Instructions for entering this password are given in the section, "Entering the Administration Menu Password". The factory default password is 000-000-000.

3. Press **NEXT** until **SCSI IDs *** displays, and then press **ENTER**.
SET IDs * displays.

4. Press **ENTER**.

LIB BUS1 ID # or **DRV# BUS1 ID #** displays. (LIB BUS1 ID # stands for the current SCSI ID of the library controller, and DRV # BUS1 ID # is the current SCSI ID setting for the displayed drive number. The library controller and all drives in the library are on a single SCSI bus — BUS1.)

5. Press **NEXT** until the setting you wish to change is displayed, and then press **ENTER**. The # (current SCSI address setting) is flashing.
6. Press **NEXT** or **PREV** until the address you want displays and then press **ENTER**.
7. Press **NEXT** until **UPDATE IDs NOW** displays, and then press **ENTER**.
8. **IDs SAVED** displays briefly, and then one of the following messages displays:
 - If the new settings do not conflict with other SCSI IDs on the bus, **SCSI IDs *** displays.
 - If the new settings conflict with other IDs on the SCSI bus, **CONFLICT-ABORTED** displays briefly and then **SET IDs *** displays. Any changes entered are lost, and you must repeat the previous steps to set a new address.
9. Press **CANCEL** three times to return to the drive status ("ready" state).

Note

After you change an address, the computer may need to be rebooted for the new SCSI IDs to be recognized.

The new settings can be saved to flash ROM by power cycling the library. This allows the settings to be recovered if the library is powered off for more than ten days.

Caution

Do not switch off power to the library until the SCSI bus is inactive. Removing power from a SCSI peripheral when the bus is active can result in data loss and/or indeterminate bus states. (Check the host system manuals for information about checking the SCSI bus status.) If the computer is connected to a LAN, be sure to check with the system administrator before shutting off power to the library.

Viewing the Current SCSI Address Settings



1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window and then press **ENTER**.

Note

A three-part numerical password is required to access any options beneath **ADMIN ***. Instructions for entering this password are given in the section, "Entering the Administration Menu Password" in this chapter. The factory default password is 000-000-000.

3. Press **NEXT** until **SCSI IDs *** displays, and then press **ENTER**.
4. **SET IDs *** displays. Press **NEXT** until **VIEW IDs *** displays, and then press **ENTER**.
5. **BUS 1 *** displays. Press **ENTER**. (The library controller and all drives in the library are on a single SCSI bus — BUS1.)
6. **LIB ID # LUN 0** or **DRV# ID # LUN 0** displays. (LIB ID # stands for the current SCSI ID of the library controller, and DRV# ID # is the current SCSI ID setting for the displayed drive number. LUN is the logical unit number and will always be "0".)

Press **NEXT** or **PREV** to scroll through the current SCSI address settings.

7. Press **CANCEL** until the next operation you wish to perform is displayed, or until the drive status indicators (library "ready" state) are displayed.

Cleaning the Library Tape Drives



Note

Cleaning the digital linear tape drives requires the use of a special digital linear tape cleaning cartridge. (Typically, cleaning cartridges are light yellow and data cartridges are black, brown, or white. See the end of Chapter 5 for a list of supplies.)

The drive mechanisms do not require scheduled cleanings and should only be cleaned if a **C** status indicator is displayed after the drive number. (See "Understanding Display Window Messages" at the beginning of this chapter.)

If a cleaning cartridge is not stored inside the tape library, it must be inserted into a library storage slot prior to doing these steps. (See "Loading Tape Cartridges Into the Library" in this chapter.)

If the cleaning cartridge needs to be replaced,

REPLACE CLEANING is displayed.

The host software may manage tape drive cleaning.

To clean one or more of the tape drives:

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window and then

press **ENTER** . **INFO *** displays.

Note

A three-part numerical password is required to access any options beneath **ADMIN ***. Instructions for entering this password are given in the section, "Entering the Administration Menu Password" in this chapter. The factory default password is 000-000-000.

3. Press **NEXT** until **CLEAN DRIVES *** displays, and then press **ENTER** .

- If the library power has been turned off or the access door has been opened since you last selected a cleaning cartridge location , **SEL CLEAN CART *** displays. Press **ENTER** .
- If the library power has not been turned off or the access door has not been opened since you last selected a cleaning cartridge location, **CLN CART LOC #** displays. (# is flashing and is the cleaning cartridge storage slot location last selected.) If the storage slot location is correct, press **ENTER** and go to Step 4. If you wish to select a different storage slot location, press **NEXT** or **PREV** until the correct storage slot location is displayed, press **ENTER** , and go to Step 4.

SLOT # displays (where "#####" is a bar code number or is blank if bar codes are not being used, and "#" is a storage slot location and is flashing). Press **ENTER** to select the displayed storage slot location or press **NEXT** or **PREV** to select a different storage slot location, and then press **ENTER** .

4. **CLEAN DRIVE 1** displays and the "1" is flashing. Press **NEXT** or **PREV** until the drive number you wish to clean displays and then press **ENTER** .

If you wish to clean both drives, press **NEXT** or **PREV** until **CLEAN DRIVE ALL** displays and then press **ENTER**.

Note

If the drives are not empty, a **DRIVE FULL** message will be displayed, and the drives must be emptied before they can be cleaned.

If the slot location chosen in Step 4 did not contain a cleaning cartridge, **NOT CLEAN CART** displays briefly and then **CLEAN FAIL #** displays. Press **CANCEL** twice to return to the "ready" state. Check the bulk load magazines in the library to locate the cleaning cartridge. If no cleaning cartridge is present, insert one into an available slot.

CLEANING DRV # displays (# is the number of the drive being cleaned). When the drive has been cleaned, **CLEANED DRV #** displays briefly, and then **CLEAN DRIVES *** is again displayed.

Note

If the host system software controls drive cleaning, the drive status indicator, **C**, is displayed after the drive number(s) being cleaned and the activity indicator flashes until the drive(s) are clean.

Note

Cleaning takes approximately five minutes per drive.

5. Press **CANCEL** until the next operation you wish to perform is displayed, or until the drive status indicators (library "ready" state) are displayed.

Setting a Configuration Option



1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window and then press **ENTER**.

Note

A three-part numerical password is required to access any options beneath **ADMIN ***. Instructions for entering this password are given in the section, "Entering the Administration Menu Password" in this chapter. The factory has set a default library password of 000-000-000.

3. **INFO *** displays. Press **NEXT** until **CONFIG *** displays, and then press **ENTER**.
4. Press **NEXT** or **PREV** until the name of the configuration you wish to set displays and then press **ENTER**. If the configuration has multiple settings, the current setting will flash. Otherwise, the configuration option will be set and a confirmation message will display. (Configuration options are described on the following pages.)
5. If the current configuration setting is flashing, press **NEXT** or **PREV** until the desired setting is displayed, and then press **ENTER**. **OPTION SAVED** displays.
6. Press **CANCEL** to return to the drive status ("ready" state).

Descriptions of the available configurations are on the following pages.

Table 3-4. Configuration Choices

Config Name	Description
RECOVERY ON/OFF	Toggles between ON and OFF. If the configuration is set to ON, the library attempts to recover from errors; if the configuration is set to OFF the library immediately stops moving if an error condition occurs. The default configuration is RECOVERY ON, and recovery should remain ON under normal conditions.
RESTORE DEFAULTS	Sets all library configurations back to their default settings.
CLEAR ODOMETERS	Sets all library odometers back to zero.
STARWARS ON/OFF	Should be set to ON during normal operation. Toggles between ON and OFF. If the configuration is set to ON, the library runs with the vertical sensors enabled; if the configuration is set to OFF, the library runs with the vertical sensors disabled.
NEW PASSWORD	Allows you to change the numerical password required to access the options under the ADMIN * menu on the library control panel. These options include configurations, tests, and information logs. To change the security code, see "Setting a New Administration Menu Password" in this chapter.
SCSI LOG ON/ OFF	Should be set to OFF during normal operation. Toggles between ON and OFF. Tracks internal SCSI states and saves the information to a log.

Config Name	Description
SECURE ON/ OFF	Toggles between ON and OFF. If the configuration is set to ON, tape magazines cannot be loaded or removed. If the configuration is set to OFF, the library operates in its default state, which allows cartridges to be loaded and removed.
POWER SECURE ON/ OFF	Toggles between ON and OFF. When set to ON, the SECURE ON/OFF configuration setting is retained in the event of a power outage. If this configuration is set to OFF, the library returns to its default setting of POWER SECURE OFF when power is returned after being shut off.
REP RECOVERED ON/OFF	Toggles between ON and OFF. When set to ON, recovered errors are reported; when set to OFF, the recovered errors are not reported.
CONF40 ON/ OFF	Toggles between ON and OFF. Selects Inquiry Mode. ON selects standard inquiry mode; OFF selects downloadable inquiry mode. Default is OFF.
BARCODE ON/ OFF	Toggles between ON and OFF. When set to ON the bar codes and slot locations are stored into library memory when the front access door is closed and the "Inventory Check" test is automatically run. When set to OFF, the bar codes are not recorded when the "Inventory Check" test is run.

Moving or Shipping the Library

Refer to the following two sections if you want to move or ship the library. If the library must be moved a short distance, such as to another office or to another floor in the building, see "Moving the Library a Short Distance." If the library must be shipped to another location, see "Shipping the Library."

Moving the Library a Short Distance

1. Unmount (unreserve) any tape cartridges in the library if necessary. See your computer operating system documentation, or software application documentation for instructions on how to unmount tape cartridges.

Caution

Do not switch off power to the library until the SCSI bus is inactive. Removing power from a SCSI peripheral when the bus is active can result in data loss and/or indeterminate bus states. (Check the host system manuals for information about checking the SCSI bus status.) If the computer is connected to a LAN, be sure to check with the system administrator before shutting off power to the library.

2. Verify that all drives in the library are empty.



is displayed after the drive number if the drives are empty



is displayed after the drive number if the drives are full

If the drives are full, empty them before shipping the library. To empty the drives, refer to the host system software documentation or use the library menu.

3. Switch off the power to the library using the power switch on the library control panel.
4. Remove the power cord and the SCSI cable connections from the rear panel

of the library (see Figure 3-3).

5. If the unit is installed in a rack:

Warning

Do not pull the library out of the rack to its fully extended position unless the antitip feet on the bottom of the rack have been positioned correctly.

The tape library weighs approximately 100 pounds (45 kilograms). Pulling the library out of the rack without the rack's antitip feet extended could result in personal injury and/or damage to the tape library if the rack tips over.

- a. Extend the antitip feet on the rack.
- b. Slide the library out of the rack so that it is in the fully extended position.

Warning

Do not attempt to remove the tape library from the rack by yourself.

The tape library weighs approximately 100 pounds (45 kilograms); therefore, to avoid personal injury and possible damage to the library, a minimum of two people are needed to remove the library from the rack.

- c. Remove the library from the rack as follows:
 1. Reattach the handles to the side of library using two 1/4-inch hex screws. Make sure the handle flanges are sitting on top of the slides. (The handles should have been saved with the original shipping materials. If you no longer have the handles, call your service representative for assistance in getting replacement handles.)
 2. Remove the three 8-32 screws on each side of the tape library that secure the library to the rack slides.

3. With a person on each side of the library, lift the library off the rack slides and onto a cart.
6. Roll the library to its new destination.
7. If the unit is to be installed in a rack, reinstall the library into the rack using the rack mount kit instructions, "Installing the Library Into a Rack," in Chapter 2.
8. Reconnect the power cord and SCSI cables.
9. Connect the library to the host.
10. Configure the library to the host. (Refer to the host system manuals for configuration information not covered in this chapter.)

Shipping the Library

Follow these instructions to ship the library. If the product packing materials have been misplaced, order replacement packing materials, C1164F to safely pack the product for shipping.

1. Unmount (unreserve) any tape cartridges in the library if necessary. See the computer operating system, or software application documentation for instructions on how to unmount tape cartridges.
2. Remove the tape caddies from the library. Tapes should be labeled, but be careful not to allow the tapes to be ejected from their slots. See "Removing Tape Cartridges from the Library" in this chapter for information on removing cartridges.

Caution

Do not switch off power to the library until the SCSI bus is inactive.

Removing power from a SCSI peripheral when the bus is active can result in data loss and/or indeterminate bus states. (Check the host system manuals for information about checking the SCSI bus status.) If the computer is connected to a LAN, be sure to check with the system administrator before shutting off power to the library.

3. Switch off the power switch on the library control panel.

Warning

Do not pull the library out of the rack to its fully extended position unless the antitip feet on the bottom of the rack have been positioned correctly.

The tape library weighs approximately 100 pounds (45 kilograms). Pulling the library out of the rack without the rack's antitip feet extended could result in personal injury and/or damage to the tape library if the rack tips over.

4. Remove the power cord and the SCSI cable connections from the library rear panel (see Figure 3-3).
5. If the unit is installed in a rack,
 - a. Extend the antitip feet on the rack.

- b. Slide the library out of the rack so that it is in the fully extended position.

Warning

Do not attempt to remove the tape library from the rack by yourself.

The tape library weighs approximately 100 pounds (45 kilograms); therefore, to avoid personal injury and possible damage to the library, a minimum of two people are needed to remove the library from the rack.

- c. Remove the library from the rack as follows:
1. Reattach the handles to the side of library using two 1/4-inch hex screws. Make sure the handle flanges are sitting on top of the slides. (The handles should have been saved with the original shipping materials. If you no longer have the handles, call your service representative for assistance in getting replacement handles.)
 2. Remove the three 8-32 screws on each side of the tape library that secure the library to the rack slides.
 3. With a person on each side of the library, lift the library off the rack slides and onto a cart or tabletop.
6. Repackage the library in the same materials and ship it in the same manner in which it was received. (See the caution note below.)

Caution

The tape library can be seriously damaged if it is not shipped using appropriate shipping materials.

Note

If the packing materials are misplaced, order product number C1164F to obtain replacement packing materials.

Troubleshooting and Diagnostics

Understanding the Troubleshooting Process

When there are errors in library movements, two main approaches are available to get information and to run exerciser tests. The approach usually depends on whether the error encountered was a **hard** error or whether it was a **soft** (intermittent, recoverable) error.

- Troubleshooting Using the Control Panel and Observation - This method is usually used in situations where you have a hard error.
- Troubleshooting Through the SCSI Bus - This method is used in situations where you have a intermittent, recoverable error.

Obtaining Information for Troubleshooting

Error information is available through both control panel. It can also be obtained by using an external diagnostic tool through the SCSI bus.

By knowing how the library operates and using the summarized information from the control panel display, there is enough information to troubleshoot many problems that result in a **hard** error.

In most instances, running internal tests and reading error logs in the control panel display will be enough to troubleshoot problems in the library.

The Library Automatically Lists the First “Possible Causes”

At poweron, and after every failed move, the library automatically runs an initialization sequence that comprehensively tests the library. If a hard failure occurs, a list of *possible* Field Replacable Units (FRUs) that may have been at fault is returned.

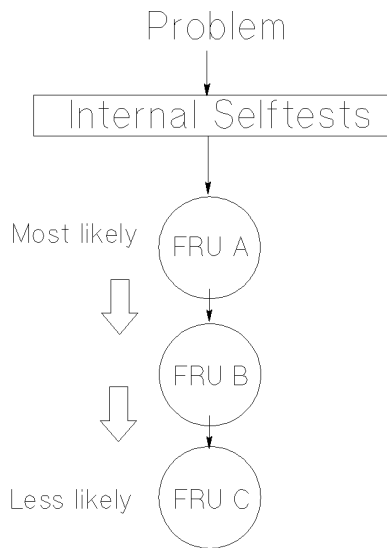


Figure 4-1. The library returns suspect FRUs

Note

This test sequence returns possible failed FRUs only if there has been a **hard failure**. The test sequence will NOT find a failure from which a recovery was made.

4-2 Troubleshooting and Diagnostics

How “Possible Causes” Should be Evaluated

Similar to treating symptoms rather than the real problem, the suspect FRUs given by the FRU isolation procedure may actually mask the root cause of the problem.

The hard move error that caused the library to run the FRU isolation test may have only been a **PRODUCT** of the actual problem. Blindly and repeatedly replacing the suspect FRU(s) may not reliably solve a problem.

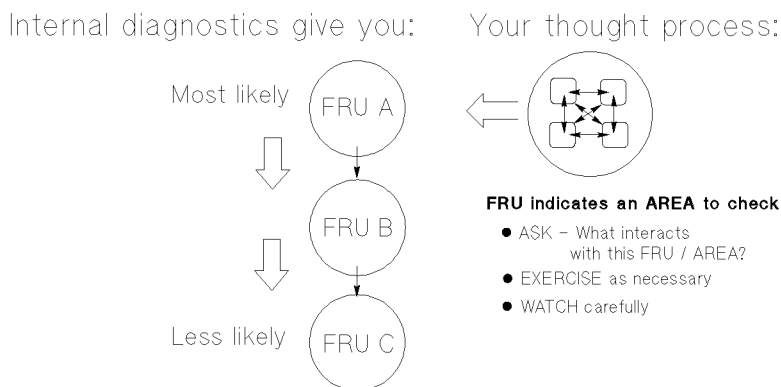


Figure 4-2. Evaluating suspect FRUs

If you consider the suspect FRU as a **POINTER** to the problem area rather than the problem itself, a visual inspection, with perhaps some cable and connector wiggling, should reveal the real problem.

A good visual inspection requires an understanding of how the library acts under normal operation. To understand what the library does in normal operation, run the various movements available from the control panel and watch it closely. Reading the descriptions in the Micro-move ID table in this chapter will also help you understand the small moves that comprise library operation.

Retrieving Performance Information

To access an information log:

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window and then press **ENTER**.

Note

A three-part security code is required to access options beneath ADMIN. This code may be 000-000-000 as set in the factory or another code chosen by the customer after installation.

3. **INFO *** displays. Press **ENTER**.
4. Press **NEXT** until the name of the log you wish to access displays and then press **ENTER**. (An “*” indicates that there are more choices beneath the displayed choice.)
5. Press **CANCEL** to return to the drive status (“ready state”).

Descriptions of the available information logs are on the following pages.

4-4 Troubleshooting and Diagnostics

Table 4-1. Information Logs

Log Name	Description
REVISION	Displays the library's firmware version number.
LIB ODOMETERS *	Press (ENTER) to select the odometer logs described in the next few rows.
HOURS	Displays the number of operation hours (time during which the power was on). Note that some of the time may have been spent in power reduction mode.
MOVES	Displays the total number of moves and move attempts by the cartridge transport mechanism.
XLATES	Displays the total number of cartridge transport mechanism horizontal moves.
DRIVE LOADS *	Press (ENTER) to select the logs described in the next few rows.
DRIVE 1	Displays the number of tape cartridge loads for drive number 1.
DRIVE 2	Displays the number of tape cartridge loads for drive number 2. (Model dependent)

Table 4-1. Information Logs


Log Name	Description
HARD ERRORS *	Log of unrecoverable errors, commands that did not successfully complete. Returns either "NO HARD ENTRIES" or "ENTRY #", which refers to the order of the errors, 1 being the most recent. (There may be multiple hard error numbers.) Press ENTER to view the log for the currently displayed error, or press NEXT to select the next error. (The log entries are described in the rows following "RECOVERY ERROR" in this table.)
SOFT ERRORS *	Log of recovered errors, commands successfully completed. Returns either "NO SOFT ENTRIES" or "ENTRY #". (There may be multiple soft error numbers.) Press ENTER to view the log for the currently displayed error, or press NEXT to select the next error. (The log entries are described in the rows following "RECOVERY ERROR" in this table.)
RECOVERY ERRORS *	Log of errors during most recent move. Returns either "NO RECOV ENTRIES" or the number of recovery errors. Press ENTER to view the log for the currently displayed error, or press NEXT to select the next error. (The log entries are described in the following rows.)
*HARDWARE ERR#	This error number indicates the cause of the failure.

Table 4-1. Information Logs

Log Name	Description
*FRU 1 #	The field replaceable unit most likely to be at fault.
*FRU 2 #	The field replaceable unit second most likely to be at fault.
*FRU 3 #	The field replaceable unit third most likely to be at fault.
MOTION <name>	<name> indicates one of the following types of movements taking place in the library at the time of the failure: <ul style="list-style-type: none">• EXCHANGE• MOVE• POSITION• INIT ELEM• REZERO• DIAGNOSTIC• RESTORE
SOURCE #	The element number to which the source refers. (This information is valid for MOVE, EXCHANGE, and POSITION movements only.)
DESTINATION 1 #	The element to which the first destination refers. (This information is valid for MOVE and EXCHANGE movements only.)
DESTINATION 2 #	The element to which the second destination refers. (This information is valid for the EXCHANGE movement only.)

Table 4-1. Information Logs

Log Name	Description
ODOMETER #	The move number in which the error occurred.
*MICROMOVE 1 #	The first library Micro-move for the original move command issued prior to the failure.
*MICROMOVE 2 #	The second library Micro-move for the original move command issued prior to the failure.
*MICROMOVE 3 #	The third library Micro-move for the original move command issued prior to the failure.
*MICROMOVE 4 #	The fourth library Micro-move for the original move command issued prior to the failure.
*MICROMOVE 5 #	The fifth library Micro-move for the original move command issued prior to the failure.
*MICROMOVE 6 #	The last library Micro-move for the original move command issued prior to the failure.
*MICROMOVE ER #	The actual Micro-move error that occurred.

*  can be pressed when an error number is displayed to receive further information.

Recovering from Operation/Installation Errors

Caution

DO NOT CYCLE POWER during any troubleshooting until you are sure the system SCSI bus is INACTIVE and will REMAIN INACTIVE.

Removing power while the bus is active can cause data loss and/or indeterminate bus states. Check the host system reference manuals for information on checking the status of the SCSI bus.

Table 4-2. Operation Errors

Task	Problem/ Symptom	What to do
Communicating host<-->library	Can't get the host to recognize the library.	<ul style="list-style-type: none">•Verify that the library is supported on the host operating system.•Verify that the library was installed and configured as described in the users guide and the appropriate host system manuals.•Check the SCSI connections.•Check the SCSI interface address as it relates to the device files.

Table 4-2. Operation Errors

Task	Problem/ Symptom	What to do
Changing the drive address	Changed drive address but new address is not recognized.	After changing an address, the library power and/or the host system power may need to be cycled for the new address to be recognized. (Refer to the host system documentation for information on setting peripheral addresses and shutting down the host system.)
Inputting security code	Security code forgotten or misplaced.	<ul style="list-style-type: none">•First, try the default security code (000-000-000).•If the security code is not set to the default, use DOWNLD(2 or later) to download a new copy of the firmware into the unit. This clears NVRAM and sets the security code to the default code. <p>The customer may now set a new password. (See “Setting a New Administration Menu Password” in Chapter 3.)</p>
Powering on	The tape library won't power on.	<ul style="list-style-type: none">•Make sure the power cord connections are tight.•Make sure the power switch is ON (next to the control panel).•Make sure the power outlet is operating.•Replace the power cord with a known good one.•Replace the power supply module.

Table 4-2. Operation Errors

Task	Problem/ Symptom	What to do
Power fail	Poweron selftest fails.	<ul style="list-style-type: none"> •Press ENTER and record the error message. •Cycle the power. Observe the poweron test result. If the unit continues to fail, use the error code to begin troubleshooting.
	Just the library power fails.	When power returns, unmount and remount all tape volumes.
	Library power fails while a tape is in the drive.	The tape drive does not automatically eject a cartridge if a power failure occurs. The cartridge cannot be removed when a power failure occurs without potential risk to the tape. In the event of a power failure, power must be restored and the drive must complete the eject sequence. Use the Empty Drive test from the control panel.
	Host computer power fails and the library stays on.	After the host reboots, file system check (<i>fsck or equivalent</i>) any write-mounted tape volumes.
	Both the host system and library power fail.	After the host reboots, file system check (<i>fsck or equivalent</i>) any write-mounted tape volumes.

Table 4-2. Operation Errors

Task	Problem/ Symptom	What to do
Reading the control panel display window	No display messages appear; no power evident.	<ul style="list-style-type: none">•Check that the power cord is connected.•Check AC input.•Check the control panel cable connections.•Power cycle the library.•Replace the power cable with a known good one.•Replace the power supply.
	No display messages appear, power is on.	<ul style="list-style-type: none">•Replace the library controller PCA.•Replace the control panel PCA.

Table 4-2. Operation Errors

Task	Problem/ Symptom	What to do
	An error message is received after bulk loading tape cartridges.	<ul style="list-style-type: none">• Verify that cartridges are inserted into the magazine in the correct orientation. (See "Loading Tape Cartridges Into the Library" in Chapter 3.)• Verify that you are using the correct tape type. (See "Choosing Tape Cartridges" in Chapter 2.)• If the light bar on the display panel is amber, cycle power to the library and try to load the magazine again when the drive numbers and status indicators are displayed. (See the caution note at the end of this table.)• If you get a RESERVED message, a security option has been set that prevents cartridges from being loaded into or removed from the library. (See "Setting a Configuration Option" in Chapter 3.)• If you get a TRANSPORT FULL message, the cartridge transport mechanism already contains a tape cartridge. Refer to the host documentation to remove the cartridge from the transport.

Table 4-2. Operation Errors

Task	Problem/ Symptom	What to do
Reading/ writing tapes	Can't write to the tape.	<ul style="list-style-type: none">• Check the file system access permissions.• Check the write-protect tab on the tape cartridge to assure write-enabled status.• Make sure the tape was initialized, labeled, and inventoried (or equivalent, depending on operating system).• Check that the tape file system was mounted correctly.• Refer to the “Cleaning a Tape Drive” section in this chapter.
Running a test	Started a test and need to stop the test.	<ul style="list-style-type: none">• Press CANCEL. The current test loop continues until it is finished; then the test stops.

Caution

Do not press the library power switch until you have shut down the peripherals connected to your computer by SCSI cables. Pressing the power button when the SCSI system is active can cause data loss and/or problems with the SCSI interface.

Recovering from Hardware Errors

When a hardware failure occurs, **DEVICE FAILED** is displayed on the control panel. If a failure occurs while you are running a test, **TEST FAILED** is displayed. When you press **ENTER**, the library displays information about the hardware failure that is held in the error log. When you press **ENTER** during a message such as ERR 01, the library displays a verbal description of the message.

When looking at hardware errors in the error logs accessible through the control panel, there are a list of codes following the hardware error (the most general error description). Micro-move error codes follow the hardware error, which applies the hardware error to the last move(s) to diagnose the problem. Micro-move IDs follow the Micro-move errors. These indicate the specific part of the move which occurred just before the error. All these error codes help to isolate when and how the error occurred. These error codes are listed on the following pages.

Note that the library firmware can detect broken components such as a dead motor, but if failures are due to marginal or random problems, the failing component may induce errors in other components. For example, if any portion of the electronics becomes intermittent or if friction increases on a part, different components of the library may appear to fail at varied points as the library runs its firmware. This results in many different error codes.

Refer to Table 5-1, “Exchange Parts” and Table 5-2, “Non-Exchange Parts”, for FRU numbers and descriptions.

In Table 4-3 below, the bulleted recovery procedures are usually, but not always sequential. In each instance where replacing hardware is recommended, it is assumed that the unit will be tested to determine if the problem has been resolved before the hardware listed next in the list is replaced.

WARNING

Class II laser light is generated in this library. If operating the library with access panels removed or with less than three tape magazines installed and the interlocks disabled on an open front door, do not stare into the light from the bar code reader.

Laser light warning labels are located adjacent to the side access panels and the top access panel.

Table 4-3. Hardware Errors and Recovery Procedures

Error Code (hex.)	Recovery Procedures
01 ROM checksum error	01 thru 07 are controller tests. These errors are only possible on powerup. If you get these errors, replace the controller PCA.
02 Register error	See error 01.
03 Microprocessor error	See error 01.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
04 Controlled area of RAM checksum error	See error 01.
05 RAM test error	See error 01.
06 SCSI chip error	See error 01.
07 Library controller chip error	See error 01.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
1E Translate motor error	<p>Cannot sense or translate the picker . Translate frame (umbilical cable, motor, encoder)--</p> <ul style="list-style-type: none">• If doesn't move at all, problem is likely the umbilical cable.• If it moves a little but can't reach the side, cables are good, but the motor is bad. Replace the translate frame or encoder.• Make sure encoder strip is inside sensor.• Make sure encoder strip is not damaged.• Moved to the side, but does not sense the move occurred. Encoder is likely the problem.• Change the controller PCA.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
1F Vertical motor error	<p>Occurs when trying to sense if the carriage assembly moves vertically. If the carriage assembly moves vertically, and a failure occurs, the encoder strip is not being read. If the carriage assembly doesn't move -- it probably is the controller, motor leads, motor, or 24-volt power supply.</p> <ul style="list-style-type: none">• Make sure the encoder strip is inside sensor, or not damaged.• Make sure the motor leads are connected to the vertical motor and the controller board.• Check the cable from the sensor to the translate umbilical cable under the translate frame.• Change the vertical motor.• Change the 24-volt power supply.• Change the controller PCA.
20 Plunge motor error	<ul style="list-style-type: none">• Check the plunge motor leads.• Change the controller PCA.• Change the translate frame assembly.
2D Door is open	<p>Securely shut the front door.</p>

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
2E Magazine 1 Sensor error	Magazine 1 not seated properly or magazine cable failure.
2F Magazine 2 Sensor error	Magazine 2 not seated properly or magazine cable failure.
30 Magazine 3 Sensor error	Magazine 3 not seated properly or magazine cable failure.
32 Invalid test number	User error.
33 Invalid configuration	User error. One cause could be that there are not enough cartridges in the library. Cartridge may be in the picker or tape drive.
34 Need to inventory	Run the Inventory Check test. Refer to “Running an Internal Check” later in this chapter.
35 Exercise test failed	Press ENTER to see what hardware codes were set or run Exercise test again, watch where it fails.
36 Elements reserved	User error. The host probably has the library elements reserved. Check host system manual to unreserve.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
3C Move to	<p>Vertical motion failed in the middle of a move or exchange.</p> <ul style="list-style-type: none">• Look at the Micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display). Also check the Source and Destination entries in the error log to verify what move was in process.• Make sure the encoder strip is inside the sensor, or not damaged.• Make sure the motor leads are connected to the vertical motor.• Check that the cable from the sensor is connected through the translate frame to the translate frame umbilical cable.• Replace the 24-volt power module.• Replace the controller PCA.
3E Translate	<ul style="list-style-type: none">• Change the picker.• Check the translate encoder. Replace if damaged.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
3F Put magazine in	<p>Failed plunging cartridge into a magazine.</p> <ul style="list-style-type: none">• Look at the Micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display).• Look at the picker and vertical encoder strip to make sure that vertical positioning seems to be correct.• Replace the picker.
40 Get magazine out	<p>Failed extracting a cartridge from a magazine.</p> <ul style="list-style-type: none">• Look at the Micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display).• Replace the picker.
41 Test magazine	<p>Failed testing the magazine portion during an Inventory Check.</p> <ul style="list-style-type: none">• Look at the Micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display).• Replace the picker.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
42 Put drive in	<ul style="list-style-type: none">• Look at the Micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display).• Remove top panel and run the Wellness Test, Drive I/O test, and Exercise Mechanics test. Note where the problem occurs.• If indicates the drive, change the drive.• If it indicates a picker error, change the translate frame assembly.
43 Get drive out	<ul style="list-style-type: none">• Look at the Micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display).• Remove rear panel and run the Wellness Test, Drive I/O test, and Exercise Mechanics tests. Note where the problem occurs.• If test results indicate a drive error, change the drive.• If test results indicate a picker error, change the translate frame assembly.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
44 Test drive	<ul style="list-style-type: none">• Look at the Micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display).• Remove top panel and run the Wellness Test, Drive I/O test, and Exercise Mechanics test. Note where the problem occurs.• If test results indicate a drive error, change the drive.• If test results indicate a picker error, change the translate frame assembly.
4A Test picker	<p>This may appear when testing for a cartridge in the picker during an Inventory Check.</p> <ul style="list-style-type: none">• Replace the picker.
4C Restore picker	<ul style="list-style-type: none">• Check for loose cables.• Replace the picker.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
4D Find translate home	<p>Cannot translate the picker and/or sense that it has moved.</p> <p>Run FIND XLATE HOME test from the control panel:</p> <ul style="list-style-type: none">• If the picker does not move, check the connections on the umbilical cable. If the connections are good and the picker still does not move, change the umbilical cable.• If the picker moves a little but does not reach the side of the frame, the translate motor on the translate frame is probably defective. Change the translate frame assembly.• If the picker moves properly to the side, the translate encoder is probably defective. Change the translate encoder (the horizontal encoder located on the translate frame).

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
4E Find vertical home	<p>Because a motor test is performed before a find vertical home is attempted, the vertical motor is assumed to be minimally functional.</p> <ul style="list-style-type: none">• Verify that the vertical path is physically clear.• Make sure that the cartridges are fully in their slots. Some cartridges have sticky doors.• Replace the translate encoder strip if the translate frame assembly is moving to the wrong place.• Change the vertical drive assembly (probably a marginal error) if translate frame assembly is not moving at all.
4F Find plunge home	<p>The plunge motor can be moved. (Therefore, the motor and umbilical cable are probably not the error source.)</p> <ul style="list-style-type: none">• Change the translate frame assembly.
51 Clear magazine path	<ul style="list-style-type: none">• Check that the path from the picker to the magazine is clear.• Check that the vertical path is clear.• Test the vertical path sensor operation.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
52 Clear drive path	<ul style="list-style-type: none"> • Check that the path from the picker to the drive is clear. • Check that the vertical path is clear. • Test the vertical path sensor operation.
5C Wait plunge	Change the translate frame assembly.
5D Wait vertical	<p>Vertical motion failed in the middle of a move or exchange.</p> <ul style="list-style-type: none"> • Look at the micro-move error of the failure in the error log (under INFO *, and Hardware Error in the control panel display). Also check the Source and Destination entries in the error log to verify what move was in process. • Make sure the vertical encoder strip is inside the sensor. • Make sure the motor leads are connected to the vertical motor. • Check that the cable from the sensor is connected through the translate frame to the umbilical cable for the picker. • Replace the 24-volt power supply. • Replace the controller PCA.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
5E Powerfail clear path	<ul style="list-style-type: none">• Check that all paths are clear.• Test the vertical path sensor operation.
5F Powerfail restore cartridges	<p>A cartridge was physically moved after powerfail and before powerfail recovery.</p> <ul style="list-style-type: none">• Replace cartridges that have been moved manually after a powerfail.
60 Repeater Controller	<ul style="list-style-type: none">• Check cables between the controller PCA and the SCSI repeater/converter PCA.• Check the external cables and terminator. Make sure to connect the correct cables and terminator for the single-ended/differential SCSI interface respectively.• Verify that the SCSI interface mode switch is set correctly.• Change the SCSI repeater/converter PCA.• Change the controller PCA.• Change the internal SCSI cable.

Table 4-3. Hardware Errors and Recovery Procedures (Cont.)

Error Code (hex.)	Recovery Procedures
61 External SCSI cables	<ul style="list-style-type: none">• Check for correct terminator (single-ended or differential) for the type of SCSI interface chosen.• Check that single-ended/differential slide switch is selecting desired interface.• Change the external SCSI cable. Make sure to connect the correct cables and terminator for the single-ended/differential SCSI interface respectively.• Change the SCSI repeater/converter PCA.• Change the controller PCA.

Micro-Move Error Codes

Micro-move errors are reported through bytes 50-55 in the additional sense bytes of the Request Sense Command (03H) and the Log Sense Command (4DH) with page code 33H.

Table 4-4. Micro-Move Error Codes

Error Code (Hex.)	Description
00	No error
01	Vertical over voltage exceeded limit set by firmware
02	Vertical over force exceeded limit set by firmware
03	Vertical servo error
04	Vertical timeout
05	Vertical open path
06	Vertical closed path
0A	Plunge over voltage exceeded limit set by firmware
0B	Plunge over force exceeded limit set by firmware
0C	Plunge servo error
0D	Plunge timeout
0E	Plunge open path
0F	Plunge closed path
14	Translate over voltage error
15	Translate over force error
16	Translate servo error
17	No vertical overforce
18	No plunge overforce

Table 4-4. Micro-Move Error Codes

Error Code (Hex.)	Description
19	No translate overforce
1A	Vertical servo loop open
1B	Plunge servo loop open
1C	Translate servo loop open
1E	No load complete
1F	Unexpected load complete
20	Unexpected cartridge in drive
21	No cartridge in drive
22	Drive put in accept failed
23	Drive get out accept failed
24	Drive eject failed
25	Drive insert failed
26	Drive eject retry
27	Drive insert retry
28	Clear drive path
29	Drive signal (not used)
2A	Drive not connected
2B	Magazine sensor failed
32	Magazine put in saturate failed
33	Magazine get out saturate failed
34	Magazine put in accept failed
35	Magazine get out accept failed

Table 4-4. Micro-Move Error Codes

Error Code (Hex.)	Description
36	Magazine measure failed
37	Test magazine failed
38	Return magazine failed
39	Clear magazine path
41	Recovery did not clear vertical path
51	Failed to finish a translate
52	Extra force needed to translate
6B	Vertical distance difference detected after error recovery

Micro-Move IDs

Table 4-5. Micro-Move IDs

ID (hex.)	Description
1	Move translate frame up. (Quickly.)
2	Move translate frame down. (Quickly.)
3	Move translate frame up slowly, looking for resistance. Used in vertical find home sequence.
4	Move translate frame down slowly, looking for resistance. Used in vertical find home sequence.

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
5	Move a small amount upward, to relieve tension in the servos. Used after finding “home” in the vertical find home sequence.
8	Move translate frame up to the top of the library, checking for a clear path. Used in the vertical find home sequence.
9	Move translate frame to the bottom of the library, checking for a clear path. Used in the vertical find home sequence.
13	Move slowly upward. Used in the plunge find home sequence. Also used in power fail recovery to move the picker off of a cartridge that may have been between the picker and the magazines when the power failed and the picker settled.
14	Move slowly downward. Used in the plunge find home sequence.
15	Move vertically to restore the picker to the position it had before an error (and error recovery), occurred. Only called in error recovery.
16	Move up. Used in the motor test during powerup.
17	Move down. Used in the motor test during powerup.
1C	Move translate frame up to open the drive latch.
1D	Move translate frame down to close the drive latch. (First part of move.)
1E	Move translate frame down to close the drive latch. (Second part of move.)
33	Translate slowly to the right of the library (when facing front door). Used to find translate home.

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
34	Translate slowly away from the right of the library (when facing front door). Used to find translate home.
35	Translate picker toward the right of the library (when facing front door).
36	Translate picker away from the right of the library (when facing front door).
38	Translate slowly to the right of the library (when facing front door). Used to calibrate translate position.
67	Move a short distance back from the plunge position where an overforce shutdown error occurred. Relaxes the tension.
68	Retract the plunge assembly on the picker all the way back to find “home” in the plunge axis.
6B	Plunge toward magazine to get cartridge.
6C	First time plunge into magazine (first “get”). Feels for resistance to learn the distance to the cartridge when it is seated.
6D	Retraction to pull the cartridge out of the magazine springs.
6E	Retraction to pull the cartridge out of the magazine into the picker.
6F	First part of a two-step move to put a cartridge into a magazine. Puts the cartridge nearly all the way in. Next part of move is Micro-move 70.

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
70	Second part of a two-step move to put a cartridge into a magazine. Continues movement of Micro-move 6F and puts the cartridge in the rest of the way (the distance learned in Micro-move 6C).
71	First time plunge into a magazine (first “put”). Feels for resistance to learn the distance to the cartridge when it is seated.
72	Retract picker after putting cartridge into a magazine. Picker is retracted just far enough that the thumb is clear of the picker vertical path.
75	First part of a two-step plunge move to put a cartridge into a drive. Cartridge is inserted to a point where it is at the end of the picker.
76	First time “put” plunge into a drive (done slowly). Feels for resistance to learn the distance to the cartridge when it is seated.
77	First time “get” plunge into a drive (done slowly). Feels for resistance to learn the distance to the cartridge when it is seated.
78	Fast “put” plunge into a drive (distance has been previously learned).
79	Retract picker plunge assembly after putting cartridge into drive. Assembly is retracted just far enough so that the thumb is clear of the picker vertical path.
7C	Move picker thumb close to drive front bezel to prepare for calibration.
7D	Move picker thumb to touch drive front bezel and calibrate distance.
7E	Log ID (no motion). Logs that picker is in position in front of drive, waiting for the drive to eject the cartridge.

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
7F	Plunge forward to get cartridge from the drive. Thumb wraps over the indentation on the cartridge.
80	Retract a small amount or take up the slack between the picker thumb and the cartridge indentation.
81	Retract cartridge from drive partially into the picker.
82	Retract cartridge from drive fully into the picker.
83	Move picker thumb close to drive latch to prepare for opening.
84	Move picker thumb to open drive latch.
85	Move picker thumb away from drive front bezel after calibration.
87	Short plunge out to test for a cartridge in the picker. If a cartridge is in the picker, the path clear beam will be interrupted. Used in an ISTAT.
88	Short plunge out to test for a cartridge in a magazine when the picker contains a cartridge. If resistance is felt, this is interpreted as a cartridge in the magazine. Used in an ISTAT.
89	Retract picker plunge assembly into the picker after executing Micro-move 88. Used in an ISTAT.
8A	Short plunge to test for a cartridge in a drive when the picker contains a cartridge. If resistance is felt, this is interpreted as a cartridge in the drive. Used in an ISTAT.
8B	Plunge out. Used in error recovery. Attempts to push a cartridge out of the vertical picker path and into a magazine.

4-36 Troubleshooting and Diagnostics

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
8C	Retract thumb back into the picker. Used in error recovery. Attempts to pull a cartridge out of the vertical picker path and into the picker. Either this Micro-move or Micro-move 8D is used, depending on position of the picker at the start of recovery.
8D	Retract thumb back into the picker. Used in error recovery. Attempts to pull a cartridge out of the vertical picker path and into the picker. Either this Micro-move or Micro-move 8C is used, depending on the position of the picker at the start of recovery.
8E	Retract picker thumb and enable picker finger to be splayed.
A2	Move picker thumb close to drive latch to prepare for closing.
A3	Move picker thumb to feel drive latch to verify closing.
A4	Plunge out. Attempts to clear the vertical picker path during drive error recovery.
A5	Plunge picker. Attempts to clear the vertical picker path during drive error recovery.
A6	Retract picker. Attempts to clear the vertical picker path during drive error recovery.
A7	Move picker thumb towards drive bezel to attempt to clear fingers after an error has occurred.
A8	Move to a position where the picker thumb sensor can be read. Used in the find plunge home recalibration.

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
AF	First of two moves to move the thumb to the magazine during an ISTAT when no cartridge is in the picker. Next move is Micro-move B0.
B0	Second of two moves to move the thumb to the magazine during an ISTAT when no cartridge is in the picker. Slow move to check for an overforce (cartridge in the magazine slot).
B1	Retract picker plunge assembly back into the picker to a point where the thumb can unsplay. Used during an ISTAT, with no cartridge in the picker, when the thumb is splayed and must be unsplayed.
B2	Retract picker plunge assembly into the picker to a point just short of where the thumb would be released and unsplayed. Used during an ISTAT, with no cartridge in the picker, when the thumb is splayed and must be kept splayed.
B3	Retract picker plunge assembly back far enough to release the thumb and let it go to an unsplayed position. Used during an ISTAT, when the thumb is being returned to an unsplayed position after contacting, getting, and replacing the first cartridge.
B4	Retract picker plunge assembly into the picker to a point just short of where the thumb would be released and unsplayed. Used during an ISTAT, when the thumb is being retained in the splayed position after contacting, getting, and replacing the first cartridge.
B5	Retract picker plunge assembly far enough to get the thumb out of the vertical picker path. Used during an ISTAT, no cartridge in the picker, and no cartridge was contacted in the first magazine.

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
B6	Pull picker plunge assembly fully back to be unsplayed during a “put.” Enable the picker to replace the cartridge it picked up during an ISTAT.
B7	Retract picker thumb and enable picker finger to be unsplayed.
B8	Second of two moves that put a cartridge back into the magazine after the cartridge is detected during an ISTAT. Moves the cartridge fully into the magazine.
B9	Second of two moves to test for the presence of a cartridge in a magazine during an ISTAT when there is a cartridge in the picker. Slow move to check for an overforce (cartridge in the magazine slot). Follows Micro-move BA.
BA	First of two moves to test for the presence of a cartridge in a magazine during an ISTAT when there is a cartridge in the picker. Fast plunge that places the end of the cartridge in the picker close to the magazine. Followed by Micro-move B9.
BB	Testing for media in picker. After the physical force check.
BC	Retract picker plunge assembly after detecting a cartridge in the drive. Used in an ISTAT when there is a cartridge in the picker.
BD	Retract picker plunge assembly to a point just short of where the thumb would be released from its splayed position. Used if thumb is splayed after checking magazines in an ISTAT.
BE	Retract picker plunge assembly after inserting a cartridge into a drive.

Table 4-5. Micro-Move IDs (Cont.)

ID (hex.)	Description
BF	Quickly retract the picker plunge assembly if an error occurred while inserting a cartridge into a drive.
C0	Retract picker plunge assembly to a point where the thumb is released and go to an unsplayed position. Used in an ISTAT.
C8	Plunge thumb out close to the end of the picker to get ready to retrieve a cartridge. Done at the same time as vertical moves and in-transit translates.
D7	Retract thumb to a point just inside the picker. Used to clear the vertical picker path during error recovery.
E7	On powerup, testing for motion in one direction on the plunge motor.
E8	On powerup, testing for motion in the plunge motor. Opposite direction than in Micro-move E7.
E9	Plunge out to clear the picker vertical path. Used when path is blocked during powerup.
EA	Picker plunge assembly retraction to clear the picker vertical path. Used when path is blocked during powerup.

Running an Internal Test

WARNING

Class II laser light is generated in this library. If operating the library with access panels removed or with less than three tape magazines installed and the interlocks disabled on an open front door, do not stare into the light from the bar code reader.

Laser light warning labels are located adjacent to the side access panels and the top access panel.

Caution

Some diagnostic tests, such as EXCHANGE DEMO, can corrupt the file system if a test is not properly completed. (Tape cartridges can be placed in unexpected locations.)

Note

There are tests that can only be run through the SCSI interface. Refer to *Digital Linear Tape Drive and Library SCSI-2 Command Reference*, part number 5960-7674, for information about these tests.

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window and then

press **ENTER** .

Note

A three-part numerical password is required to access any options beneath **ADMIN ***. Instructions for entering this password are given in the section, “Entering the Administration Menu Password” in Chapter 3.

3. **INFO *** displays. Press **NEXT** or **PREV** until **TEST *** displays, and then press **ENTER** .
4. Press **NEXT** until the name of the test you wish to run displays and then press **ENTER** .
5. **NUM LOOPS 1** displays, where the 1 is flashing. Press **NEXT** until the number of test loops you wish to run displays, then press **ENTER** .

Note

You may press **CANCEL** at any time to abort a test. The last test cycle will complete before **CANCEL** takes effect.

TEST CANCEL - WAIT displays.

Descriptions of the internal tests available from the control panel are on the following pages. (Tests are listed alphabetically according to function.)

WARNING

Class II laser light is generated in this library. If operating the library with access panels removed or with less than three tape magazines installed and the interlocks disabled on an open front door, do not stare into the light from the bar code reader.

Laser light warning labels are located adjacent to the side access panels and the top access panel.


Table 4-6. Tests Available from the Control Panel

Test Name	Description
EXERCISE MECH	Runs the VERTICAL TEST, TRANSLATE TEST, IO MAGAZINE, and IO DRIVE tests. Each test is run one time per test loop.
EXCHANGE DEMO	Do not run this test if the library contains tape cartridges with actual file system data on them. This test moves randomly-chosen cartridges to random storage slot locations. This test displays FAIL if there are no cartridges in the library or if all storage slots are full. For best results, the library should contain as many cartridges as there are drives, plus two additional cartridges. The picker must be empty.

Test Name	Description
IO DRIVE	Makes a combination of moves with a PASS/FAIL result. If the drives are empty, a tape cartridge is moved from a randomly-chosen full slot to a randomly-chosen drive. If the drives are full, a tape cartridge is moved from a randomly-chosen drive to a randomly-chosen storage slot. It then moves the cartridge back to its original location. This test displays FAIL if there are no cartridges in the library or if all storage slots are full. The drives and picker must be empty.
IO MAGAZINE	Makes a combination of moves with a PASS/FAIL result. It moves a tape cartridge from a randomly-chosen full slot to a randomly-chosen empty slot. It then moves the tape back to its original storage slot. This test displays FAIL if there are no cartridges in the library or if all storage slots are full. The drives and picker must be empty.
INVENTORY CHECK	Functions the same as the SCSI Initialize Element Status command. This test physically scans the entire unit to determine which storage slots contain tape cartridges and if the drives contain cartridges. NOTE: This test will appear as "ISTAT TEST" in all control panel error messages.
TEST TRANSLATE	Translates from side to side. No tape cartridges are required.
TEST VERTICAL	Moves the tape translate frame up and down the full length of the translate assembly rail. Returns PASS/FAIL. No tape cartridges are required.

Test Name	Description
WELLNESS TEST	Checks out the general capability of the library. Requires one loaded tape cartridge; drives and picker must be empty. Runs INIT MECHANICS and EXERCISE MECH. Each test is run one time per test loop.
FIND PLUNGE HOME	Runs mechanism recalibration, determines the reference points in the picker travel path, and tests the picker. This test assumes that the mechanics and servo system are functional. No tape cartridges are required.
FIND VERT HOME	Recalibrates the vertical position and verifies that the vertical path is clear. No tape cartridges are required.
FIND XLATE HOME	Calibrates the translate position. No tape cartridges are required.
INIT MECHANICS	Runs the FIND PLUNGE HOME, FIND VERTICAL HOME, FIND XLATE HOME, and INIT ELEM STATUS tests. Each test is run one time per test loop.
EMPTY DRIVES	Do not run this test if the library contains tape cartridges with actual file system data on them. Moves cartridges out of the drive mechanisms and returns them to their home storage slot locations if the locations are known, otherwise the cartridges are placed into the first available empty storage slot.
EMPTY PICKER	Do not run this test if the library contains tape cartridges with actual file system data on them. Moves a tape cartridge from the picker to its home storage slot location if that location is known, otherwise the cartridge is placed into the first available empty storage slot.

Test Name	Description
FILL PICKER	Do not run this test if the library contains tape cartridges with actual file system data on them. Moves a tape cartridge into the picker from the first storage slot containing a cartridge.
REWIND MEDIA	Do not run this test if the library contains tape cartridges with actual file system data on them. Rewinds the tape in the drive(s) and opens the solenoid in the drive handle, which allows the tape to be removed from the drive.
CLEAR SOFT LOG	Sets the soft error log to zero.
CLEAR HARD LOG	Sets the hard error log to zero.
PLUNGE FULL SPD	Allows the cartridge transport mechanics to run at full speed. This setting should always be used under normal library operation.
PLUNGE 1/2 SPD	Allows the cartridge transport mechanics to run at half speed.
SENSOR TRANSLATE	Tests the horizontal path that the translate frame assembly follows when moving from one stack of tape cartridges to another. Displays ON or OFF. If OFF displays, the path is blocked. (This display is automatically updated if the sensor status changes.) Requires use of one tape cartridge.
SENSORS MAGAZINE	The display shows M1 1 M2 1 M3 1 . Each “1” indicates that the magazine is in place. If a “0” is displayed, the magazine has not been inserted into the library. (This display is automatically updated if the sensor status changes.)

Test Name	Description
SENSORS STARWARS	<p>The display shows .</p> <p>Each “0” indicates one of the paths that the cartridge transport mechanism follows in front of each stack of tape cartridges. If the path is clear, a “0” is displayed; if the path is blocked (because of a cartridge that is not inserted fully into its storage slot for example), an “*” will be displayed. (This display is automatically updated if the sensor status changes.)</p>
VERTICAL ENCODER	<p>Moves the cartridge transport mechanism down, moves it back up a short distance, and then moves it back down. The last time the translate frame is moved down the number of encoder counts is verified. Returns PASS/FAIL. No tape cartridges are required.</p>

Cleaning a Tape Drive

Caution

Every effort should be made to instruct the customer of the importance of placing the libraries at locations that do not have a high concentration of airborne dust.

A failure to read a tape may result from:

- hardware failure
- contamination of the tape surface
- contamination of the drive objective lens

In a service situation where contaminated tapes may be a problem, ensure first that failures are not caused by another, perhaps hardware failure.

On an otherwise working drive, check to see that the most current firmware code level is being used and/or that all applicable service notes have been applied.

The following are recommendations for preventing contamination of tapes and the tape drive:

- Place the library away from high traffic areas.
- Do not leave a tape in the drive for extended periods of time if possible.
- Do not use the library in “dirty” environments.

Using the Cleaning Tape Cartridge

Note

Cleaning the digital linear tape drives requires the use of a special digital linear tape cleaning cartridge. (Typically, cleaning cartridges are light yellow and data cartridges are brown or white. See the end of Chapter 5, in “Miscellaneous” for a list of supplies.)

The drive mechanisms do not require scheduled cleanings and should only be cleaned if a **C** status indicator is displayed after the drive number. (See “Understanding Display Window Messages” in Chapter 3.)

If a cleaning cartridge is not stored inside the tape library, it must be inserted into a library storage slot prior to doing these steps. (See "Loading Tape Cartridges Into the Library" in Chapter 3.)

If the cleaning cartridge needs to be replaced,
REPLACE CLEANING is displayed.

The host system may manage tape drive cleaning.

To clean one or more of the tape drives:

1. Verify that the drive numbers and status indicators are displayed. If they are not displayed, press **CANCEL** until they display.
2. Press **NEXT** until **ADMIN *** appears in the display window and then press **ENTER**.

INFO * displays.

Note

A three-part numerical password is required to access any options beneath **ADMIN ***. Instructions for entering this password are given in the section, "Entering the Administration Menu Password" in Chapter 3. The default setting is 000-000-000.

3. Press **NEXT** until **CLEAN DRIVES *** displays, and then press **ENTER**.
 - If the library power has been turned off or the access door has been opened since you last selected a cleaning cartridge location , **SEL CLEAN CART *** displays. Press **ENTER**.
 - If the library power has not been turned off or the access door has not been opened since you last selected a cleaning cartridge location, **CLN CART LOC *** displays. (# is flashing and is the cleaning cartridge storage slot location last selected.) If the storage slot location is correct, press **ENTER** and go to Step 4; if you wish to select a different storage slot location, press **NEXT** or **PREV**.

SLOT # displays (where "#####" is a barcode number or is blank if barcodes are not being used, and "#" is a storage slot location and is flashing). Press **ENTER** to select the displayed storage slot location or press **NEXT** or **PREV** to select a different storage slot location, and then press **ENTER**.
4. **CLEAN DRIVE 1** displays and the "1" is flashing. Press **NEXT** or **PREV** until the drive number you wish to clean displays and then press **ENTER**.

If you wish to clean both drives, press **NEXT** or **PREV** until **CLEAN DRIVE ALL** displays and then press **ENTER**.

Note

If the drives are not empty, a **DRIVE FULL** message will be displayed, and the drives must be emptied before they can be cleaned.

If the slot location chosen in Step 4 did not contain a cleaning cartridge, **NOT CLEAN CART** displays briefly and then **CLEAN FAIL #** displays. Press **CANCEL** twice to return to the "ready" state. Check the magazines in the library to locate the cleaning cartridge. If no cleaning cartridge is present, insert one into an available slot.

CLEANING DRV # displays (# is the number of the drive being cleaned). When the drive has been cleaned, **CLEANED DRV #** displays briefly, and then **CLEAN DRIVES *** is again displayed.

Note

If the host system software controls drive cleaning, the drive status indicator, **C**, is displayed after the drive number(s) being cleaned and the activity indicator flashes until the drive(s) are clean.

Note

Cleaning takes approximately five minutes per drive.

5. Press **CANCEL** until the next operation you wish to perform is displayed, or until the drive status indicators (library "ready" state) are displayed.

Cleaning Issues Relating to Tape Cartridges

The tape inside the tape cartridge cannot be cleaned; however, there are issues relating to tape cartridge use that affect drive cleaning.

Note

The tape drives do not require scheduled cleaning maintenance. Excessive use of the cleaning cartridge can cause unnecessary wear on the drive head.

Note

After 20 cleaning cycles, the cleaning cartridge must be replaced. (See Chapter 5, “Miscellaneous” for cleaning cartridge ordering information.)

Table 4-7 lists special circumstances that can cause a drive cleaning message, **C**, to be displayed when a tape cartridge may be at fault.

Table 4-7. Drive Cleaning Issues Relating to Tape Cartridges

If this happens ...	It means ...	And you need to do this
A new data tape cartridge is used and a drive cleaning message is received.	Debris from the tape manufacturing process was deposited on the drive head.	<p>Clean the drive using the tape library cleaning procedure in the previous section.</p> <p>If the message is displayed again within a short amount of time, return the cartridge for warranty replacement.</p>
An older, frequently-used data tape cartridge is loaded and a drive cleaning message is received.	Dust from frequent tape loads and unloads has most likely built up on the tape cartridge and was deposited on the drive head.	<p>Clean the <i>outside</i> of the tape cartridge using a damp cloth.</p> <p>Clean the tape drive using the tape drive cleaning procedure that precedes this section.</p>

Table 4-7. Drive Cleaning Issues Relating to Tape Cartridges

If this happens ...	It means ...	And you need to do this
An older, frequently-used tape causes a cleaning message to be displayed for the second time.	The tape is most likely damaged. (Damaged cartridges can cause unnecessary use of the cleaning cartridge.)	<ol style="list-style-type: none">1. Verify the tape is readable by clearing the error message. (Select the “ONLINE REPAIR” option from the control panel, and turn off power to the drive containing the tape, and then turn the drive power on again. See “Replacing a Tape Drive” in Chapter 5.)2. Try reading the tape again. <p>If the tape can be read, back up data from the damaged cartridge to another tape cartridge and discard the damaged one.</p>

Manually Ejecting Cartridges

Caution

There is a risk of damaging the tape if an attempt is made to remove the tape cartridge manually. If the tape is damaged, data loss could result.

You may have to manually eject a tape cartridge from a drive because of an autochanger failure or a power failure.

If a tape cartridge **MUST** be retrieved from a drive before power can be restored after a power failure, or before an autochanger tape eject failure can be corrected, refer to “Removal of a Tape Cartridge From a Drive During a Power-off Condition” in Chapter 5 for the proper procedures.

Removal and Replacement

Procedures

Service Access to the Library Chassis:

Front Access Door Area	5-5
Rear Panel Area	5-8
Top and Sides.....	5-9
Removing the Library From the Rack for Service	5-12

Removal and Replacement Procedures:

5/12 V Power Supply.....	5-14
24 V Power Supply / Power Distribution Module	5-18
Removable Magazine Guide Assembly.....	5-21
Control Panel Assembly	5-25
Vertical-Path-Clear (Starwars) Cable	5-27
Tape Drive - Library Power Off or Library Online	5-28
Bar Code Reader Assembly.....	5-35
Picker and/or Horizontal Encoder Strip	5-36
Translate Frame (Including the Picker)	5-44
Vertical Encoder Strip.....	5-52
Vertical Drive Assembly.....	5-56
Controller PCA	5-59
Internal SCSI Cable	5-64
SCSI Repeater/Converter Interface PCA.....	5-70
Removal of a Tape Cartridge From a Drive	
During a Power-Off Condition	5-72

Removal of a Tape Cartridge From a Drive
 When Eject is Unavailable..... 5-75
Reinitializing the Library Controller PCA RAM After Service 5-76

Parts

Replaceable Parts 5-79
Miscellaneous 5-93

Disassembly/Reassembly Procedures

Tools Required

The following tools are needed for assembly/disassembly of the library:

- Torx® driver with the following bits: T-10, T-15, T-15W, T-20
- needle-nosed pliers
- Pozidriv® magnetized screwdriver
- 11/16 wrench or nut driver (for ground wire in 24-volt module)

Caution

ESD Precautions

This tape library contains very sensitive electrical components. It is **EXTREMELY IMPORTANT** that you follow the proper procedures for preventing ESD (Electrostatic Discharge). Use wrist-grounding straps, anti-static mats, and anti-static work stations when removing and replacing the major assemblies.

Failure to follow proper procedures could lead to intermittent failures and/or premature hard failures in the disk controller and mechanism.

Warning

Disconnect the power cord before servicing any electronics.

Warning

If the library is mounted higher than four feet in a rack, the library must be removed from the rack for service.

See “Removing the Library From the Rack for Service” on pg. 5-11.

Caution

Do not switch off power to the library until you are sure the SCSI bus is inactive. Switching off the library when the SCSI bus is active can cause data loss and/or indeterminate bus states.

When servicing the library, be sure that tape cartridges are not moved from their original slot locations. If you need to remove the cartridges, record their SLOT LOCATIONS so they can be replaced to their ORIGINAL positions. Failure to follow this practice results in a serious loss of file system integrity.

Service Access

Front Access Door Area

1. *After the SCSI bus is inactive* (see caution note on page 5-4), remove the power.
 - a. Press the power switch on the left side of the control panel to the OFF position.
 - b. Remove the AC power cable.

Rackmount configurations may require opening a rear door to access the AC power cable.

2. Unlock and open the front access door.

Use the key and turn the front access door lock clockwise 90 degrees. Let the door rotate down until it rests on its support straps.



Figure 5-1. Front Access Door with Key Inserted

3. Remove the 6 T-15 screws that mount the front access door / bezel assembly. See Figure 5-2.

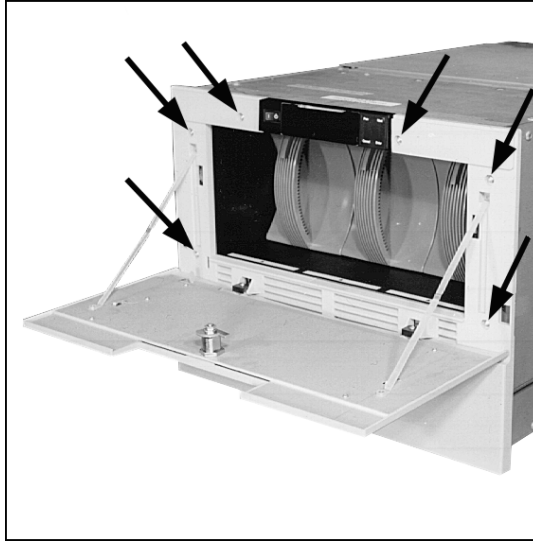


Figure 5-2. Front Door / Bezel Area Mounting Screws

4. Tilt the front access door / bezel assembly forward, and disconnect the door open sensor cable from the lower RFI panel (see Figure 5-3). Remove the access door / bezel assembly.

5-6 Removal and Replacement

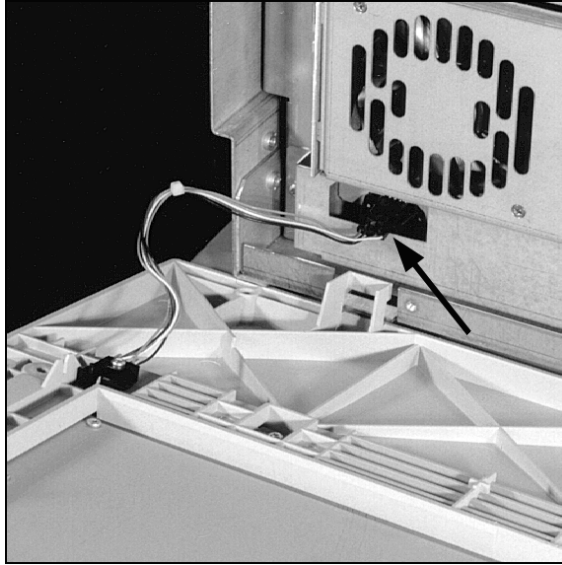


Figure 5-3. Connection for Door Open Sensor Cable

Warning

If doing the optional next step for rackmounted libraries, extend the antitip feet to prevent a rack from tipping forward when the library is pulled out on its slide rails.

5. (If top and side access is required)

- (Rackmount) - Remove the two screws holding the library to the rack and pull the library out on its rackmount rails until it “clicks.” The rack mounting screws are the lowest screws on each side of the front of the bezel as shown in Figure 5-2.
- (Standalone) - Refer to the “Top and Sides” section which follows the “Rear Panel Area” instructions.

Rear Panel Area

Note

If the library is in a rackmount configuration, you may have to open a rear door on the rack to access the rear of the library.

Caution

Before removing power, see the caution note on pg. 5-4.

1. Remove power.
 - a. Press the power switch on the left side of the control panel to the OFF position.
 - b. Remove the AC power cable plug from the receptacle on the rear panel.
2. Access the component desired.

From the rear panel area you can access the following: (see Figure 5-4)

- AC power connection and 12 V power supply cabling clips and controller PCA connections (after 24-volt module is removed) (1)
- External SCSI interface, and SCSI repeater / converter PCA (2)
- 24 Volt / power distribution module (behind plate) (3)

5-8 Removal and Replacement

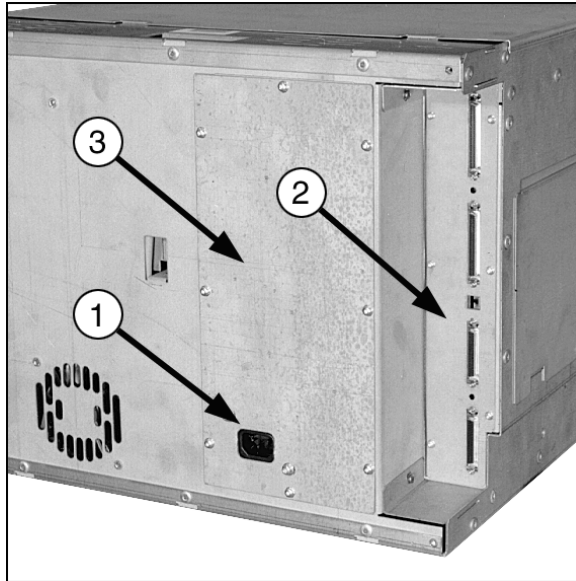


Figure 5-4. Components and Access Points on the Rear of the Library

Top and Sides

Note

If the library is in a rackmount configuration, you must be able to pull the library out on its slides to access the top panel.

- If rackmounted, refer to the previous procedure, “Front Access Door Area” and complete optional Step 5 (releasing the library from its mount on the rack and pulling the library out on its slides). Then continue with Step 3 below.
- If a standalone configuration, start with Step 2 below.

Caution

Before removing power, see the caution note on page 5-4.

1. *Rackmount configuration* - See note above about rackmount configuration. Then go to Step 3.
2. *Standalone configuration* -
 - a. Remove power (if not previously done).
 - Press the power switch on the left side of the control panel to OFF.
 - Remove the AC power cable plug from the receptacle on the rear panel.
 - b. Remove cosmetic panels as needed.
 - To access the rear of the chassis - no panels have to be removed.
 - To access the top of the chassis - Remove the two 6-32 screws on the rear of the top enclosure panel.

Lift the rear of the top cosmetic panel and slide the panel back a little to pull the tabs on the front edge of the panel out of the slots on the front of the chassis.
 - To access the sides of the chassis (the top cosmetic panel must be removed first - see above) - Remove the side panel(s) as desired.

Remove the 6-32 screw on the lower edge of the rear of the side panel.

5-10 Removal and Replacement

Remove the two 6-32 screws on the top edge of the panel

Remove the single 10-32 screw through the front panel.

3. (*Rackmount and standalone configurations*) -Once the chassis has been exposed, and depending on what you intend to service, remove the ten T-15 screws on the top access panel and/or the T-15 screws on the side access panels (five on the left panel and six on the right panel -- as you face the front of the library).

Remove the chassis panels as required by the procedure you are doing.

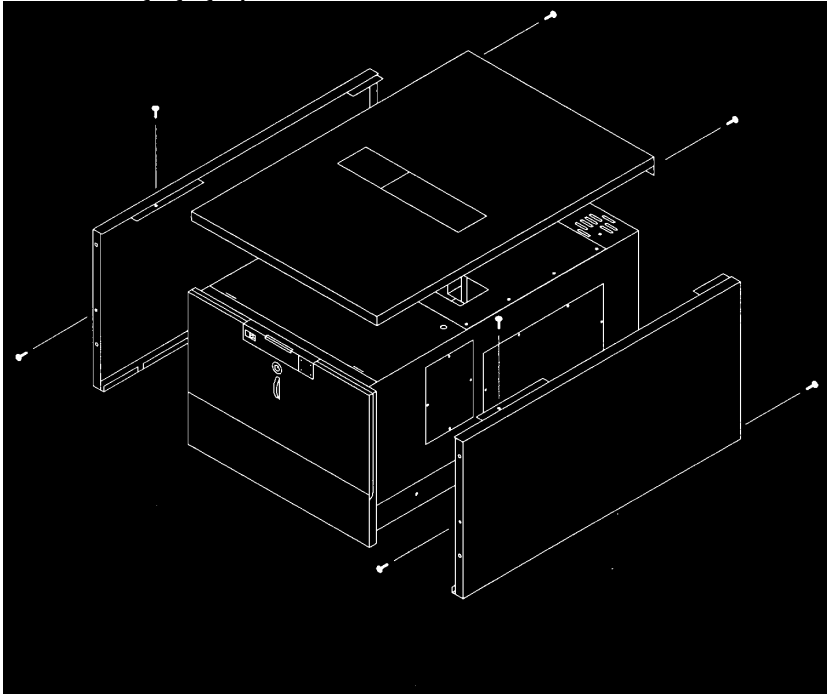


Figure 5-5. Cosmetic Panels and Mounting Screws

Removing the Library From the Rack for Service

1. Locate the four lifting handles for the library. (The installation instructions request that the customer save the handles after installing the library in a rack).
2. Do all steps in accessing the “Front Access Door Area”, (page 5-5) including Step 5, removing the library rack mounting screws and pulling the library out on its rackmount rails.

Warning

Remember: Extend the antitip feet during the next steps.

3. Attach the four lifting handles (two on each side). See Figure 5-6.

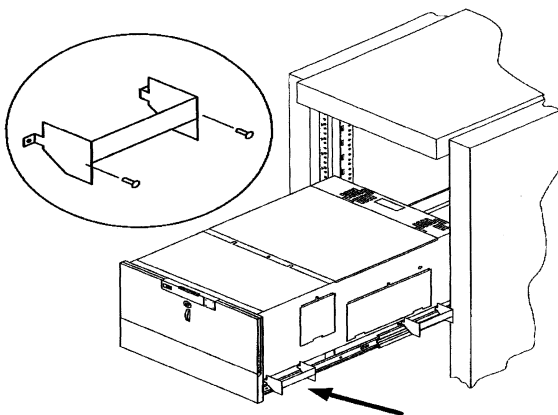


Figure 5-6. Attaching the Lifting Handles to the Library

4. Remove the three 8-32 x 3/8 Phillips screws holding the library chassis to the rails on each side. See Figure 5-7.

5-12 Removal and Replacement

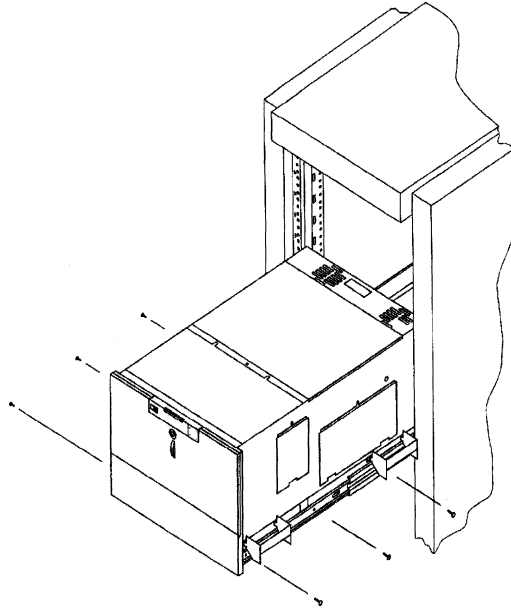


Figure 5-7. Removing the Library Rackmount Screws

5/12 Volt Power Supply

1. Use the “Rear Panel Area,” “Front Access Door Area,” and “Top and Sides” instructions on pages 5-5 to 5-11 to access the library.
2. Remove the 24-volt power distribution module on the rear panel. (This module is removed to gain access to the cable clamps that hold the bundles coming from the 5/12 V supply.)

Refer to the procedure “24 Volt /Power Distribution Module” on page 5-19. .

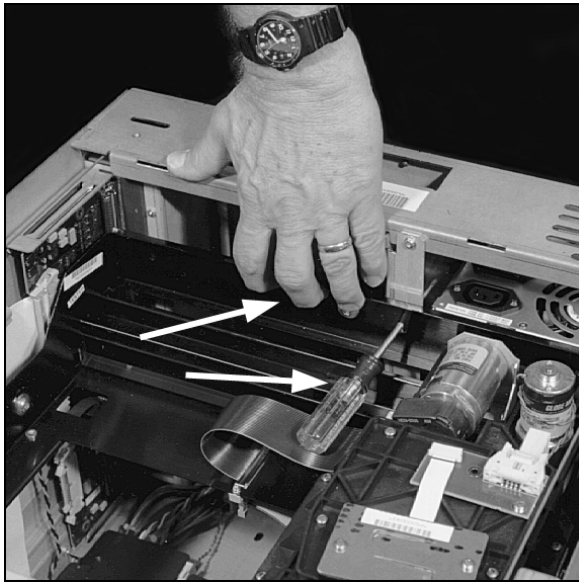


Figure 5-8. Suspending the Translate Frame / Picker Assembly

3. **Holding the translate frame by its rear crossmember**, raise the frame up near the top of the chassis.

To hold the translate frame up out of the way, insert a small screwdriver or similar tool through the rear crossmember on the frame and into one of the two holes in the vertical lift assembly.

5-14 Removal and Replacement

4. Remove the controller PCA cover.
5. Disconnect the SCSI cable at the SCSI repeater/converter PCA. (It is not necessary to remove the SCSI cable protector for this procedure.)
6. Remove the cover on the controller PCA.

Gently pull up on the controller cover near each of the plastic standoffs; a section at a time.

Pull the cover through the translate frame (or out through a side access panel, if desired).

7. (See Figure 5-9) Reach through the rear opening made by the 24-volt module just removed and open the power supply cable clip on the rear chassis wall (1) and the two clips on the chassis bottom (2) and (3).
8. Disconnect the 14- and 12-wire connectors from the edge of the controller PCA. See Figure 5-9 (4) and (5).

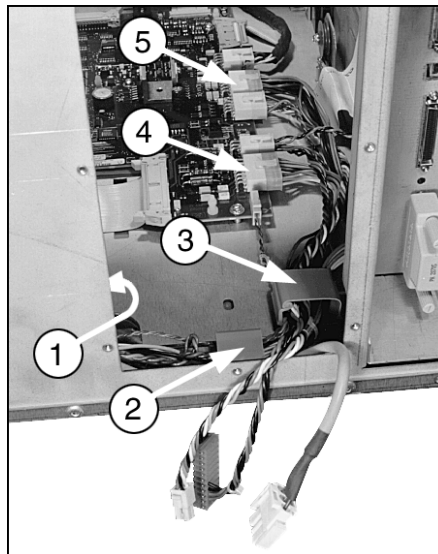


Figure 5-9. 12-Volt Cable Connections to the Controller PCA

9. Remove the tool you are using to hold the translate frame at the top of the chassis and lower the chassis to the bottom.
10. Remove the two T-15 screws at the top of the power supply.

Hold the power supply so that it does not fall forward when the screws are removed.

11. Rotate the power supply out far enough to remove the AC input cord on the top of the power supply. Then rotate the power supply out farther and lift it out of the chassis.

Note that the cables from the power supply pass BELOW the center standoff bracket for the vertical lift assembly. You will have to replace the cables along that same route during reassembly.

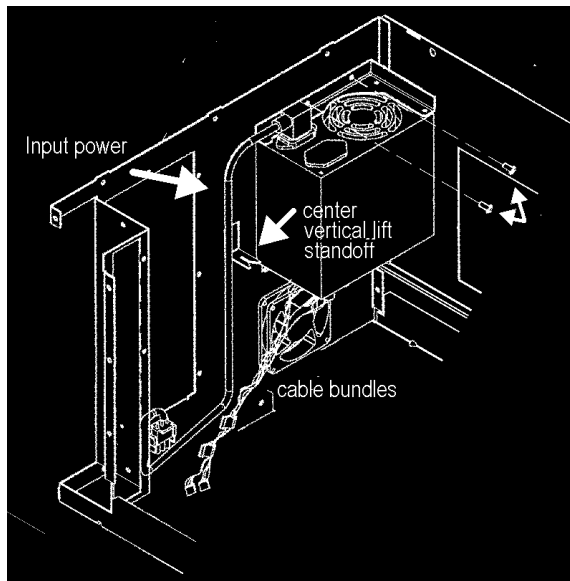


Figure 5-10. Connections to the 12-Volt Power Supply

Reassembly Recommendations:

5-16 Removal and Replacement

Through the top access panel —

1. *Place the bottom of the replacement power supply on the tabs on the rear chassis wall.*

(From the top) Thread the cable bundles that come out of the bottom of the power supply behind the vertical lift. Make sure both cable bundles go BELOW the vertical lift standoff in the middle of the vertical lift assembly.

2. *Place the AC power cord along the left side of the power supply and plug this cord into its receptacle on the top of the power supply before rotating the power supply against the rear of the chassis.*
3. *Insert and tighten the two T-15 screws that mount the top of the power supply.*
4. *Holding the translate frame by its rear crossmember, raise the frame up near the top of the chassis.*

Insert a small screwdriver or similar tool through the rear crossmember on the frame and into one of the two holes in the vertical lift assembly.

5. *Route the cable bundles from the bottom of the power supply through the clamp on the rear wall of the chassis and the two clamps on the bottom of the chassis. Close the clamps.*
6. *Connect the cable bundles to the controller PCA (12- and 14-pin power connectors).*
7. *Reinstall the controller PCA cover by placing the cover over the standoffs and pressing down.*
8. *Reinstall the 24 V module.*

Refer to the reassembly recommendations at the end of the procedure, “24 V / Power Distribution Module.”

24-Volt Power Supply / Power Distribution Module

1. Remove the power cable from the power receptacle on the rear of the library.
2. Remove the two T-15 screws from either side of the power receptacle on the module cover panel. See Figure 5-11, (1).
3. Remove the eight T-15 screws on the module cover panel and remove the panel. See Figure 5-11, (2).

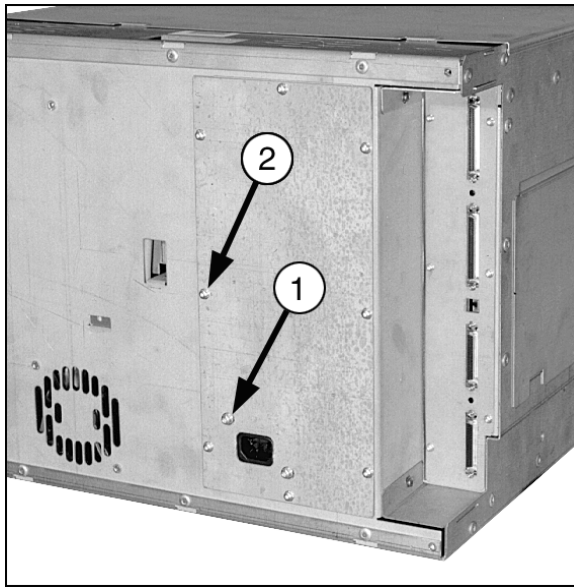


Figure 5-11. Rear Panel on the 24 V Module

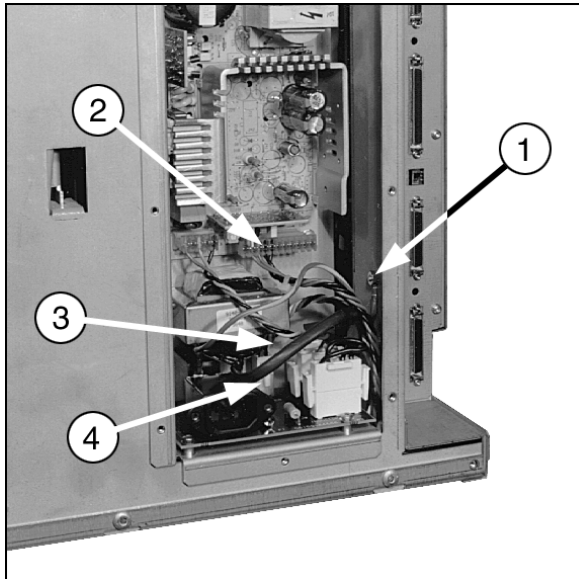


Figure 5-12. Disconnecting Cables Before Removing 24 V Module

4. (See Figure 5-12.) Remove the 11/16-inch nut holding the ground wire to the side of the module enclosure (on the inside wall of the module). See Figure 5-12 (1).
5. Disconnect the 11-pin 24 V power cable (2), 5/12 V power supply cable (3), and the 4-pin autochanger control cable (4).

(The 5/12 V power supply cable (3) is the cable nearest the rear of the module shelf and the 4-pin autochanger control cable (4) is beside this cable at the rear of the shelf.)

6. Remove the module from the chassis.

Reassembly Recommendations:

When placing the replacement module into the chassis, keep the three cables you removed in Step 5 out of the chassis. Move the module assembly close to the chassis and connect these cables first.

When the three cables are connected, rotated the module into the chassis.

Removable Magazine Guide Assembly

1. Do all steps in removing the “Control Panel Assembly” on page 5-25.

This exposes the removable magazine guide assembly for removal.

2. Open the small access panels near the front of the chassis on each side.
3. Remove the cartridge guide frame. (See Figure 5-13.)
 - a. (Inside the small access holes on each side) - Remove the two screws on each side of the chassis that hold the side of the cartridge guide frame. See Figure 5-13 (side screws are indicated on one side only).
 - b. (Through the small holes across the top of the chassis) - Remove the four screws that hold the top of the cartridge guide frame.
 - c. Pull the cartridge guide frame out of the chassis.

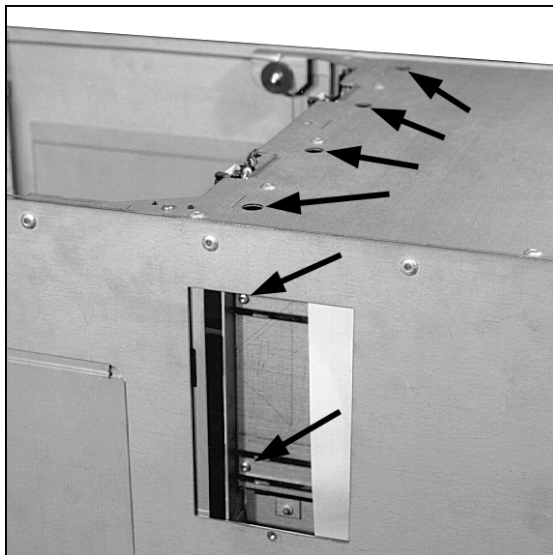


Figure 5-13. Cartridge Guide Frame Mounting Screws

4. Remove the T-15 screw in the pivot point of the camlock linkage. (See Figure 5-14)
5. Pull the horizontal pivot arm to the right and remove the T-15 screw holding the vertical camlock link to the end of the horizontal pivot link.

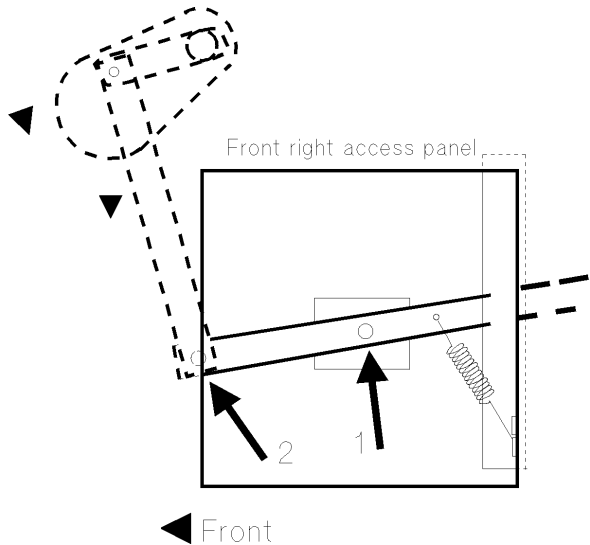


Figure 5-14. Disconnecting the Camlock Linkage

5-22 Removal and Replacement

6. Remove the removable magazine guide assembly.

While holding the magazine guide assembly from the front of the chassis, move the assembly a little to the right and then rotate the left side of the assembly down toward the drives. Rotating the left side of the assembly down makes it possible to rotate the camlock link (Figure 5-15 (1)) up and over the right side panel.

Pull the assembly out of the front of the chassis.

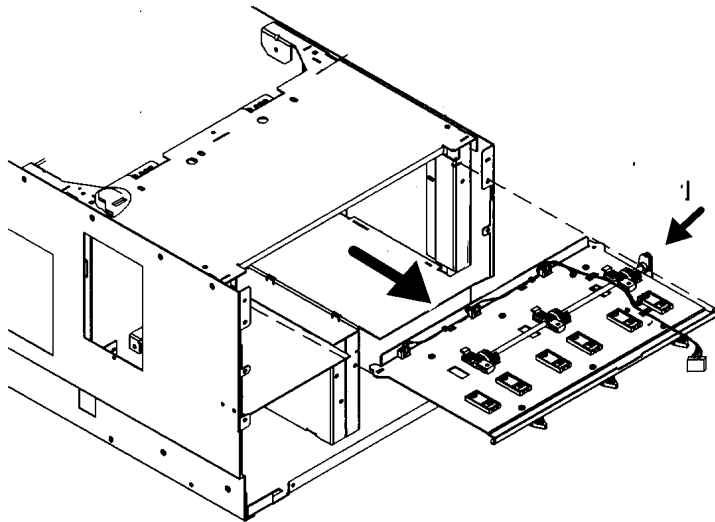


Figure 5-15. Sliding the Removable Magazine Guide Assembly Out of the Chassis

Reassembly Recommendations:

1. *Put the replacement magazine guide assembly into the chassis.*
 - a. *Rotate the left side of the assembly down and hold the camlock linkage*

arm up level with the assembly.

- b. As you put the assembly into the chassis, move it toward the right and guide the camlock assembly linkage over the side panel so that it can hang down in the space between the two right walls of the chassis, in the vicinity of the rest of the linkage.*
 - c. Bring the left side of the guide assembly up level and insert the assembly into the slot near the top of the chassis.*
 - d. Slide the guide assembly into the chassis.*
- 2. Insert the cartridge guide frame into the chassis and insert the 6 T-15 screws to mount it. (There are two screws on each side and four screws across the top.)*
 - 3. Reinstall the control panel / display assembly.*
 - 4. Reinstall the front access door / bezel assembly*

5-24 Removal and Replacement

Control Panel Assembly

1. Use the “Front Access Door Area” instructions on page 5-5 to access the library.
2. Remove the two T-15 screws on either end of the control panel / display assembly.

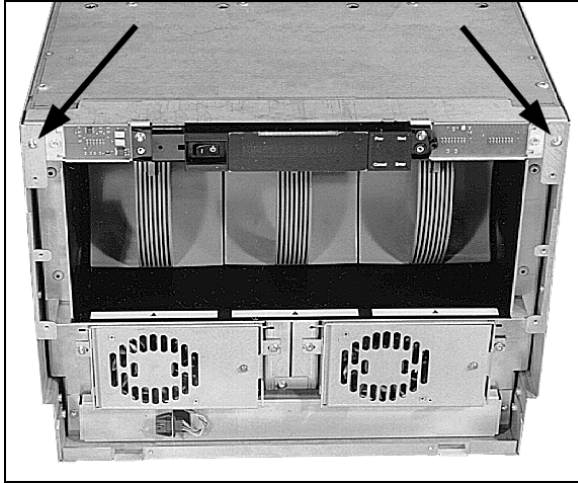


Figure 5-16. Control Panel / Display Assembly Mounting Screws

3. Remove the cables from the rear of the control panel / display assembly channel.
 - a. Pull the control panel up and out of its mounting channel a small amount and rotate it forward to expose the cabling inside the channel.
 - b. (See Figure 5-17). Remove the path-clear / home sensor cable connection (1), the connection to the front door interlock solenoid (2), the power connector (3), the connection to removable magazine / home sensors (4), and the front panel ribbon cable (5).

4. Remove the control panel assembly.

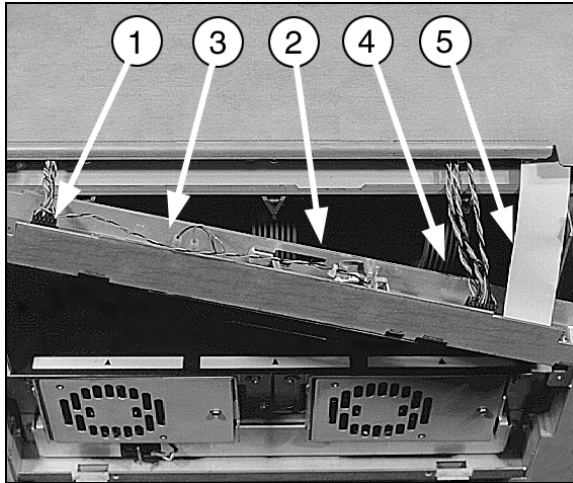


Figure 5-17. Removing Cables From the Rear of the Control Panel Assembly

Vertical-Path-Clear (Starwars) Cable

1. Use the “Front Access Door Area,” and “Top and Sides” instructions on pages 5-5 to 5-11 to access the library.
2. Remove the T-15 screw on the home sensor. See Figure 5-18 (1).
3. Remove the T-15 screw holding each path-clear sensor. See Figure 5-18(2).

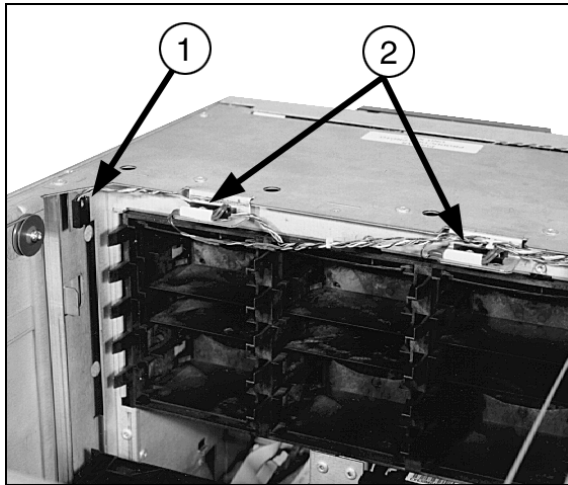


Figure 5-18. Path-Clear Sensors and Home Sensor Mounting

4. Remove the two T-15 screws on either end of the control panel / display assembly.
5. Disconnect the path-clear / home sensor cable from the rear of the control panel / display assembly channel.

(See Figure 5-17) Pull the control panel up and out of its mounting channel a small amount and rotate it forward far enough to remove the path-clear / home sensor cable (1) and the connection to the door open solenoid (2) from the rear of the left side of the channel.

6. Pull the vertical-path-clear cable out towards the front of the chassis.

Replacing a Tape Drive - Power Off or Library Online

Note

The procedure for replacing a drive in a library that is powered off or a library that is online are almost identical.

Any differences in the two procedures will be noted.

Note

If possible, record all logs before starting this procedure.

The final step in this procedure is to reset values in the controller PCA NVRAM. Previous history will be erased.

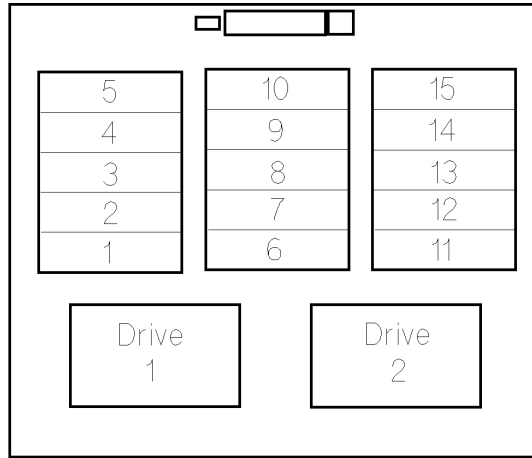
This log information should be kept with the autochanger for future service use.

Note

Be sure that the replacement DLT drive is a proper drive for the model library you are servicing.

Bytes 41 and 42 of the Vendor Unique Inquiry data should be “OF” and “03” hexadecimal which means “OML Type 3.” Also library drives have a “lip” on the tape door (drives for standalone use do not).

1. Use the “Front Access Door Area” instructions on page 5-5 to access the library.



Outside – looking at front

Figure 5-19. Drive Numbering

1. (*If online*) - There may be a tape in the failed drive — rewind the tape, if possible.
 - a. Either check with the system administrator to find out which drive has been placed offline by the application, or enter the ONLINE REPAIR * menu under DRIVE POWER to confirm which drive is “OFF.”
 - b. Enter the ONLINE REPAIR * menu, select DRV(x) POWER (where “x” is the failed drive; “1” or “2”), use PREV or NEXT to toggle the drive power to “ON.”
 - c. Apply power to the drive. Enter the “TEST” menu, and select TAPE REWIND.
 - d. When the tape is rewound, enter the ONLINE REPAIR * menu, select

DRV(x) POWER (where “x” is the failed drive; “1” or “2”), use PREV or NEXT to toggle the drive power to “OFF.”

Note

(If online) - Opening the front access door in the next step places the library into a state in which reads and writes *may continue* to the drive in use, however the picker will not respond to movement commands.

2. *(If online)* - If the library is in use, enter the ADMIN * level and select DOOR OVERRIDE.
3. Open the front access door / bezel assembly.
 - a. Use the key and turn the front panel lock clockwise approximately 90 degrees. Pull the front door down and let it rest on its straps.
 - b. Remove the 6 T-15 screws that mount the front bezel.
 - c. Tilt the front panel bezel assembly forward, and disconnect the door open sensor cable.
4. *(The following steps apply to both power off and online drive replacement)* - Remove the single T-15 screw on the right side of the drive fan assembly.

5-30 Removal and Replacement

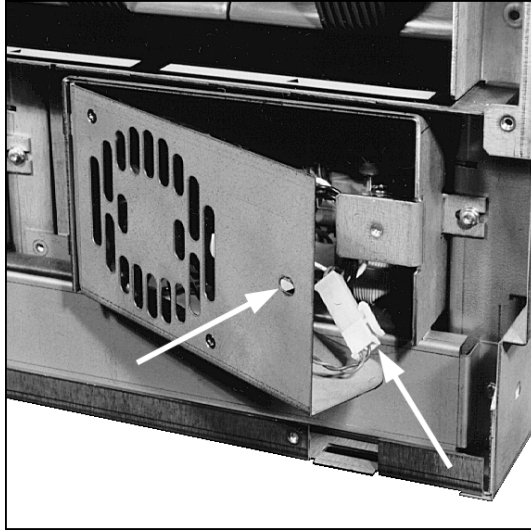


Figure 5-20. Removing the Fan Assembly From the Rear of the Drive

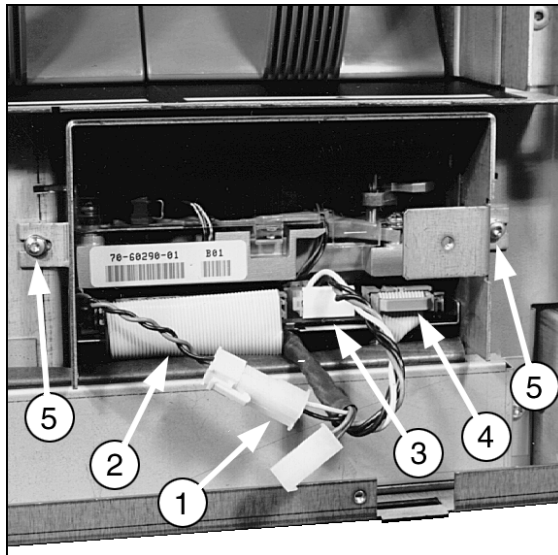


Figure 5-21. Drive Cabling and Mounting

5. Rotate the fan assembly off the rear of the drive enclosure a small distance and disconnect the fan power cable. Remove the rear fan assembly.
6. (See Figure 5-21) Disconnect the cables for drive door solenoid (1), SCSI bus (2), drive power (3) and drive interface (4)
7. Remove the two T-15 screws (with cone washers) on each side of the drive mount assembly (one on each side). See Figure 5-21, (5).
8. Pull the drive out of the front of the chassis.
9. If there is a tape in the drive, check to see if it was completely rewound.
 - a. If the tape was completely rewound, refer to Steps 4 and 5 and the figure associated with that step in “Removal of a Tape Cartridge from a Drive During a Power-Off Condition” (later in this chapter) to remove the tape cartridge.
 - b. If the tape was NOT completely rewound, continue with a manual rewind described in Steps 2 through 6 in “Removal of a Tape Cartridge from a Drive During a Power-Off Condition” later in this chapter.
10. *If a tape was removed from the failed drive*, give this tape to the customer. (Each customer’s storage application program handles this situation differently.)
11. Slide the replacement drive into the chassis. As you are sliding the drive in, wiggle the front of the drive up and down a little to make sure that the slots on the side of the enclosure slide over the tabs on the walls of the drive slot.
12. Update drive firmware (optional).
 - a. (Requires a *service* SCSI cable supplied by the CE) - Connect the service SCSI cable and drive power cable to the rear of the drive. (The service SCSI cable is part of the recommended CE service kit for this product.)

5-32 Removal and Replacement

- b. Enter the ONLINE REPAIR * menu and select DRV(x) POWER “ON” for the replacement drive. (Where “x” is “1” or “2” drive.).

Note

Code for the drives is obtained from:

- (within the HP intranet) - anonymous ftp site hpgrsg.
- (outside of HP intranet) - HP Tape Storage BBS. 970-635-0650 (when dialing in USA)

- c. Use your PC tool to download firmware. (Use a utility such as HP’s DOWNLD2 [or later] or the DLTTOOLS.EXE from Quantum Corporation.
- d. Enter the ONLINE REPAIR * menu and select DRV(x) POWER “OFF” for the replacement drive.

Reassembly Recommendations:

1. *Slide the drive into the chassis. As you are sliding the drive in, wiggle the front of the drive up and down a little to make sure that the slots on the side of the enclosure slide over the tabs on the walls of the drive slot.*
2. *Insert and tighten the two T-15 screws (with cone washer) on each side of the drive mount assembly.*
3. *Connect the cables for drive power, SCSI bus, drive interface, and drive door solenoid cable.*
4. *Place the fan assembly near the rear of the drive enclosure. Connect the fan power cable.*
5. *Push the solenoid power cable under the bottom of the right side of the*

drive.

6. *Place the tabs on the left side of the fan assembly into the slots in the drive enclosure. Connect the fan power cable.*

Caution

Ensure that no cables are pinched as you close the fan cover.

7. *As you swing the fan assembly onto the rear of the drive, put the fan power cable behind the fan cover mounting bracket on the right side of the enclosure. This ensures that the cable will not be pinched.*

Insert and tighten the single screw on the right side of the fan assembly.

8. *Replace the front bezel.*
 - a. *Place the front door / bezel assembly close to the front of the library chassis and connect the door open sensor cable to the connector on the lower RFI panel.*
 - b. *Mount the front door / bezel assembly to the front of the chassis with 6 T-15 screws.*
 - c. *Close the front door and turn the key lock 90 degrees clockwise to lock the door.*
9. *(If doing an online drive replacement) - From the control panel, enter the ONLINE REPAIR * menu, select DRV(x) POWER (where “x” is the drive just replaced, and use PREV or NEXT to toggle the drive power to ON.*

5-34 Removal and Replacement

Bar Code Reader Assembly

1. Use the “Top and Sides” instructions on page 5-9 to access the library.
2. Disconnect the bar code interface cable from the PCA on the top rear of the bar code assembly mount (the lower right arrow on Figure 5-22).

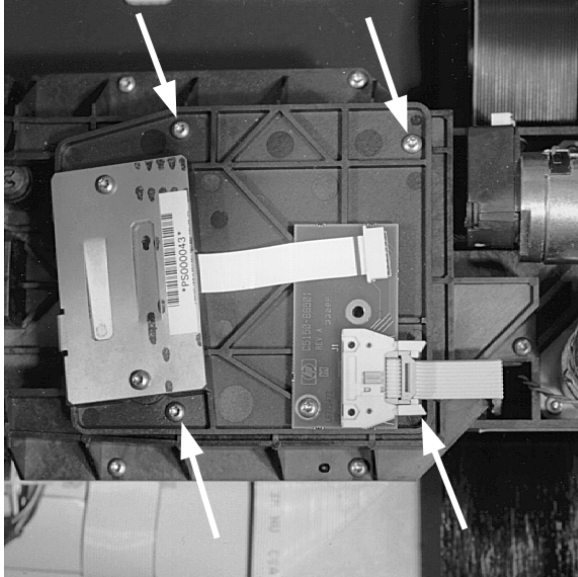


Figure 5-22. Bar Code Reader Assembly and Interface Cable

3. Remove the four T-15 screws holding the bar code assembly mount plate to the top of the picker. Remove the assembly.

Picker and/or Horizontal Encoder Strip

1. Use the “Top and Sides” instructions on page 5-9 to access the library.
2. Disconnect the picker umbilical cable.

Reach under the picker and pull on the tab attached to the cable connector.

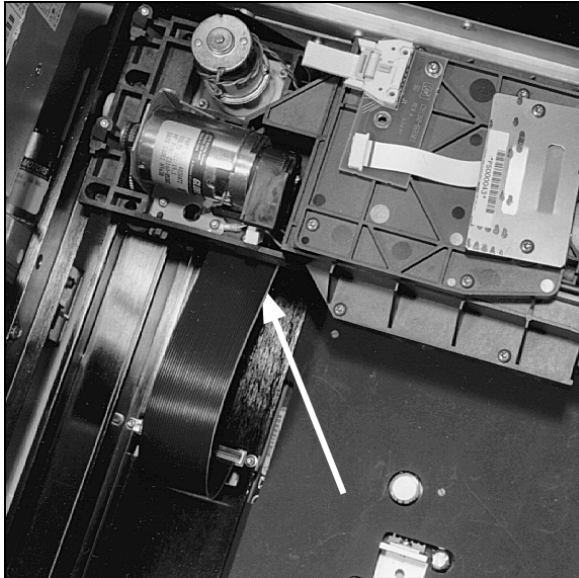


Figure 5-23. Disconnecting the Picker Umbilical Cable

Caution

When manually pulling the translate frame up or pushing it down, push and pull **ONLY** by the *center of rear of the frame* (side nearest the vertical lift assembly).

Applying pressure to any other location on the translate frame may bend the assembly and cause errors during operation.

3. Raise the translate frame up and hold it into position with a screwdriver (or similar small tool) in the lower hole on the face of the vertical drive assembly.

Pulling the translate frame up allows you to access the lower edges of the translate frame through the side panels.

4. Push the translate cable tensioner plug in towards the translate frame to release tension on the picker translate rope (Figure 5-24 (1)). (This plug is on the power supply side of the translate frame). At the same time pull the opposite end of the translate rope out of its slot in the other side of the translate frame (Figure 5-24 (2)).
5. Place the end of the rope just removed from the translate frame into the rope holder (notch) on the side of the picker to prevent that rope end from being pulled completely off the horizontal motor pulley. The location of this notch is indicated by the center arrow on Figure 5-24.

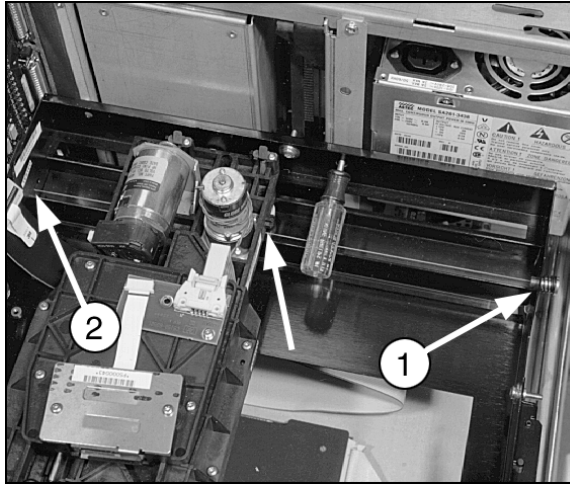


Figure 5-24. Detensioning and Removing Translate Rope

6. Slide the spring on the tensioner (released in Step 4) away from the end of the tensioner plug and remove the end of the tensioner rope from the plug.
7. Place this end of the rope into the rope holder on the side of the picker. Figure 5-25 shows the ropes stowed on each side of the picker.

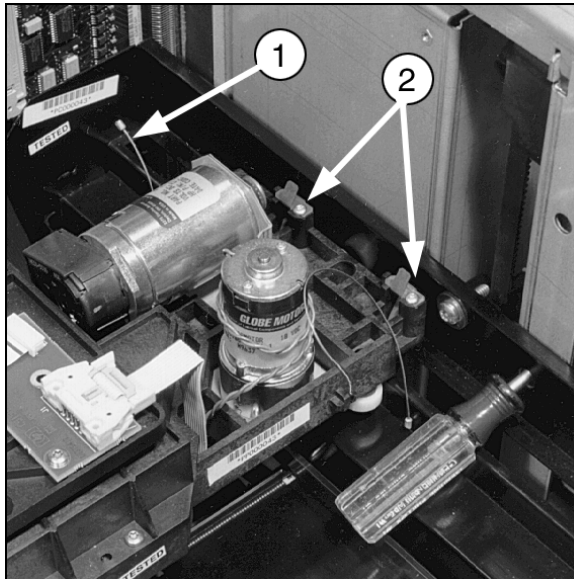


Figure 5-25. Translate Rope Stowed and Capture Bracket Spring Mounting Screws

8. Remove the two T-10 sheet metal screws that hold the two capture springs down. See the two arrows at the rear of the picker in Figure 5-25 (2).
9. Pull the capture spring holders up and out of the picker.

Caution

When manually pulling the translate frame up or pushing it down, push and pull **ONLY** by the *center of rear of the frame* (side nearest the vertical lift assembly)

Applying pressure to any other location on the translate frame may bend the assembly and cause errors during operation.

10. Raise the translate frame and picker up to near the top of the chassis, where you can access its underside.

Insert a small screwdriver or similar small tool through the translate frame hole into one of the holes in the vertical lift assembly to hold the translate frame in position.

11. Release the picker from the translate frame by removing the capture brackets on the rear, underside of the picker (see Figures 5-26 and 5-27).
 - a. To make room to rotate the capture brackets away from the translate frame, move the picker so that the rear of the picker is opposite the space between the vertical drive assembly and the 24-volt power supply / power distribution module.
 - b. Rotate the capture brackets 90 degrees and pull them down and out (see Figure 5-27).

5-40 Removal and Replacement

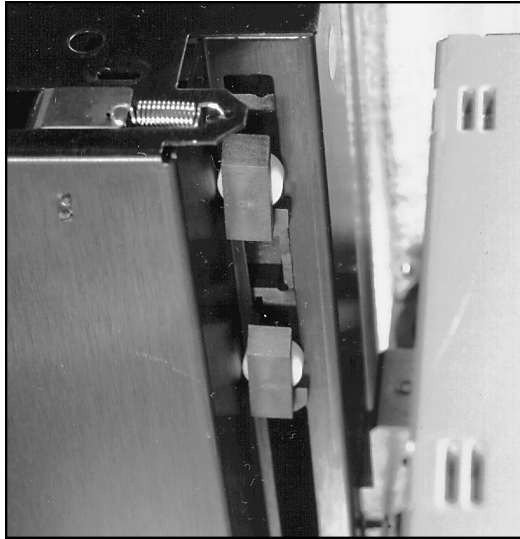


Figure 5-26. Picker Capture Brackets - Operating Position

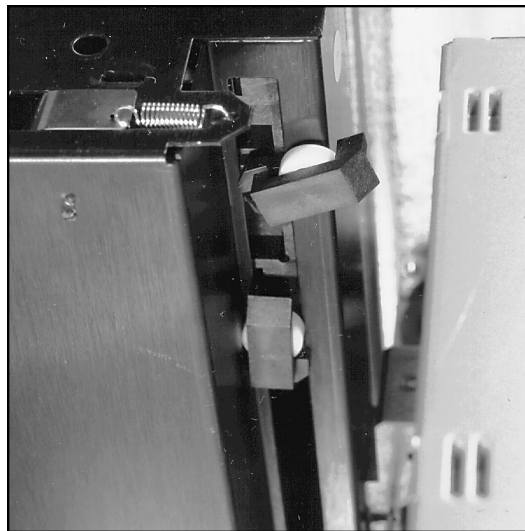


Figure 5-27. Rotating a Picker Capture Bracket Out



Figure 5-28. Rotating the Picker Assembly Out of the Translate Frame

Caution

Use care in the next step to prevent damage to the horizontal encoder strip.

12. Tilt up the rear end of the picker and lift the picker up and away from the rear of the translate frame.

Warning

Take care when working close to the horizontal encoder strip. Its edges are sharp.

13. *(If removing the encoder strip from the translate frame)* - If you are using the upper translate frame suspension hole to hold the frame in position, lower the frame to the second hole from the top and reinsert your holding tool.
14. Unhook the spring that holds the end of the strip to the lower outside of the translate frame. Remove the strip. (See Figure 5-29.)

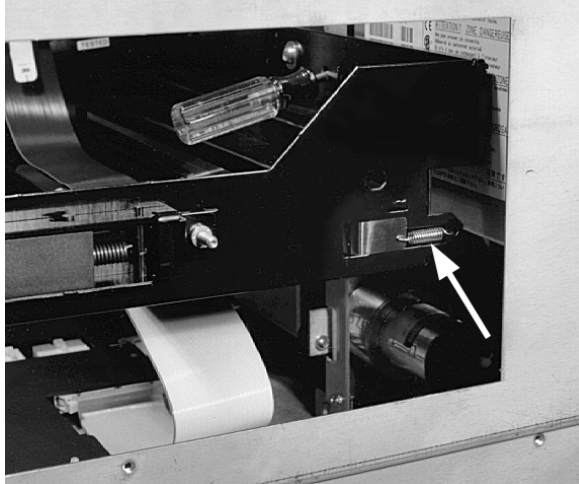


Figure 5-29. Horizontal Encoder Strip Mounting

Reassembly Recommendations:

Connect the picker umbilical cable to the underside of the picker as you are putting the picker back into the translate frame. It is easier to find the receptacle under the picker if you are able to rotate the picker to view the umbilical connector.

Translate Frame (Including the Picker)

1. Use the “Top and Sides” instructions on page 5-9 to access the top and right side of the library.
2. Raise the translate frame and picker up to near the top of the chassis, where you can access the underside of the frame.

Insert a small screwdriver or similar tool through the translate frame hole into one of the holes in the vertical lift assembly to hold the translate frame in position.

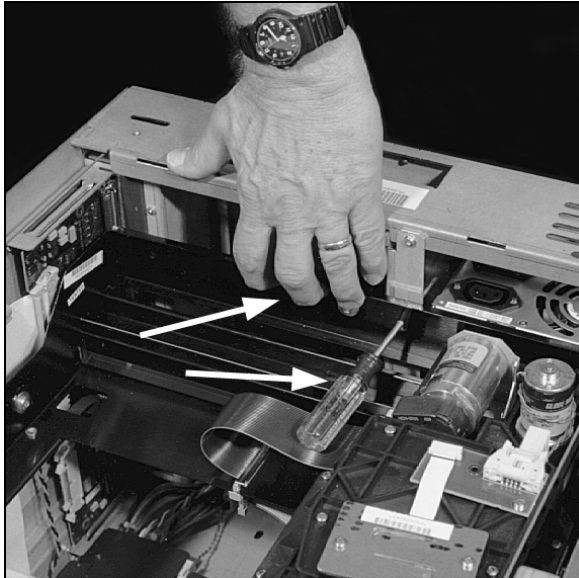


Figure 5-30. Suspending the Translate Frame / Picker Assembly

WARNING

Take care when handling the vertical encoder strip. Its edges are sharp.

3. Remove the T-15 screw holding the top mount of the vertical encoder strip (see Figure 5-31).

While holding the encoder strip by the mount, lightly tug upward on the strip a few times. This should cause the strip to fall off the holding peg inside the lower strip mount. Figure 5-32 shows the inside of the lower encoder strip mount.

Carefully pull the encoder strip up and out of the chassis.

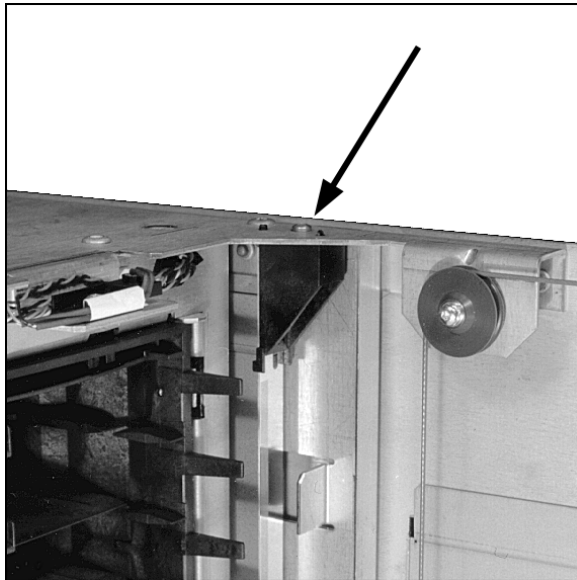


Figure 5-31. Vertical Encoder Strip Top Mount and Screw

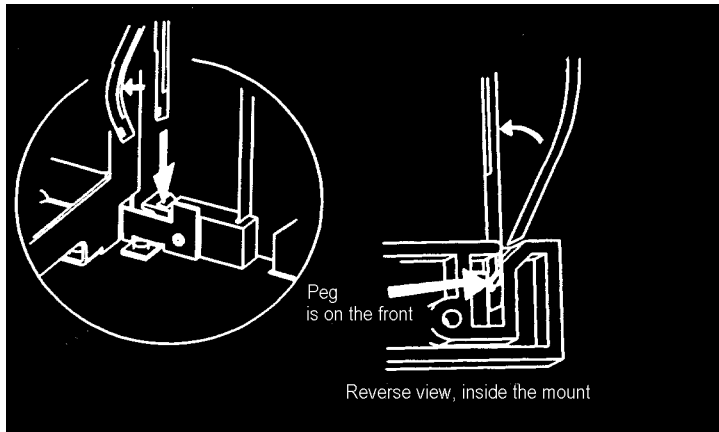


Figure 5-32. Retaining Peg on the Bottom of the Vertical Encoder Strip

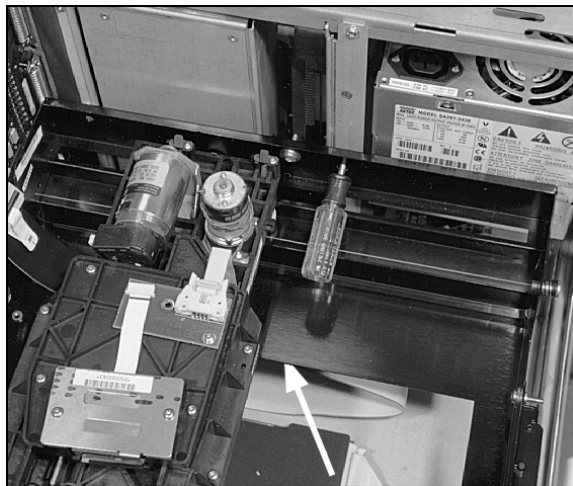


Figure 5-33. Disconnecting the Vertical Umbilical Cable

4. Disconnect the umbilical cable on the underside of the frame.

5-46 Removal and Replacement

5. Remove the tool you are using to hold the translate frame up and let the translate frame descend to the bottom of the chassis.
6. Remove the T-25 screw attaching the rear of the translate frame to the bracket on the vertical drive belt.

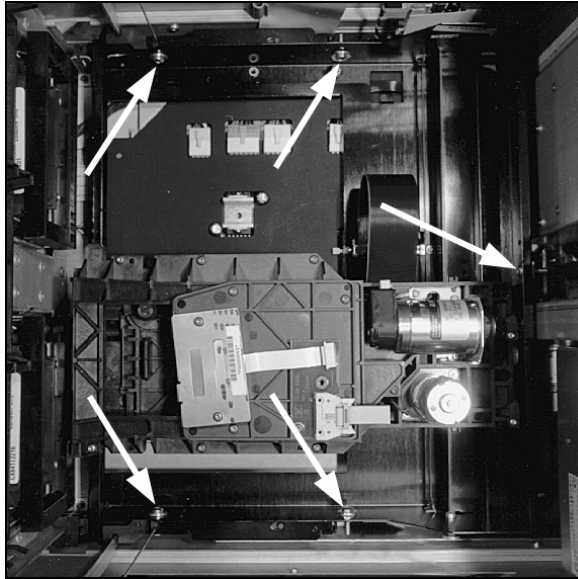


Figure 5-34. Disconnecting the Translate Frame From the Vertical Lift Bracket

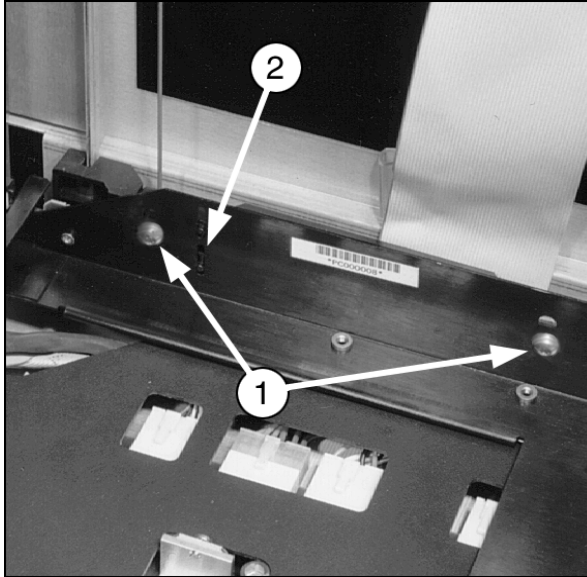


Figure 5-35. Removing Tensioners From Each Side of the Translate Frame

7. Remove the two rope tensioners from each side of the frame.
 - a. Remove two T-25 long screws per rope tensioner.

Each rope tensioner has two positioning pegs which position and seat each rope tensioner properly on the translate frame. After removing the screws on a tensioner, pull the tensioner free of the frame.
 - b. Grip the vertical drive belt and pull it so that you move the tensioners up toward the top of the chassis and out of your way.
8. Carefully lift the translate frame out of the chassis.

5-48 Removal and Replacement

Reassembly Recommendations:

Note

It is important to install the translate frame properly.

If the frame is not mounted correctly on the ropes, errors will be caused that will prevent the library from operating.

Make sure you do Steps 6 to 11 in these reassembly recommendations.

1. *Mount the ropes in the vertical lift assembly rope coupler.*
2. *Place the frame back in the chassis . It will rest on the three support points underneath.*
3. *Pull the belt down on the vertical lift assembly until the bottom of the mounting bracket contacts the cover over the drive pulley. (You can tell that it is in contact with the pulley cover when the bracket tilts away from the translate frame when you try to pull in down any farther.)*
4. *Mount the tensioners on each side of the translate frame.*

Make sure both pins are through the slots in the frame

5. *Insert and tighten the T-25 screw that mounts the vertical lift assembly bracket to the rear crossmember of the translate frame.*

Do not apply any pressure right or left as you tighten the screw. The screw should mount the bracket to the frame just as it lays.

6. *Mount the tensioners.*

Make sure the pins near the screw are coming through the frame without binding and also that the rear pin can be moved slightly and is not binding.

7. *While tightening the mounting screw in the tensioner, push down on the corner of the frame to make sure that the corner is definitely on its hard stop.*



Figure 5-36. Mounting the Tensioner While Holding the Translate Frame in Position

8. *Insert the rear screw into the tensioner and tighten. Make sure the pin on the rear of the tensioner stays in its slot.*
9. *Insert the tensioner mounting screw in the other tensioner and tighten.*
10. *As in Step 7, make sure that the pins in the tensioner (near the screw) and the rear pin on the tensioner are through the frame and nothing is binding. Tighten this tensioner's mounting screw and push down on the corner of the frame hold the frame to its hard stop.*
11. *Insert and tighten the rear screws in the tensioner. Make sure the rear pin is*

5-50 Removal and Replacement

through the frame.

12. *To check that the translate frame is mounted on the cables definitely at the bottom of the chassis, center the picker in the frame and push down lightly but quickly and listen for any small “click” that indicates that the frame was even slightly off the hard stops when you pushed down.*



Figure 5-37. Confirming Proper Positioning of the Translate Frame

Vertical Encoder Strip

1. Use the “Top and Sides” instructions on page 5-9 to access the library through the top and right side.
2. Remove the T-15 screw holding the top mount of the vertical encoder strip.

While holding the encoder strip by the mount, lightly tug upward on the strip a few times. This should cause the strip to fall off the holding peg inside the lower strip mount (on the floor of the chassis).

Carefully pull the encoder strip up and out of the chassis.

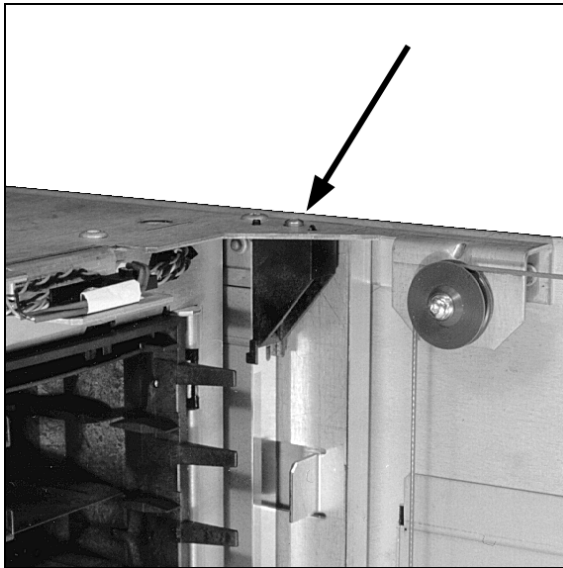


Figure 5-38. Vertical Encoder Strip Top Mount and Screw

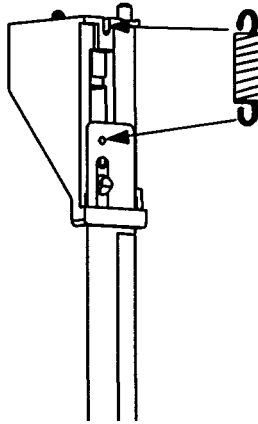


Figure 5-39. Removing the Encoder Strip Tensioner Spring

3. Remove the tensioner spring on the top of the encoder strip.
4. Slide the strip down and out of the top mount. Carefully pull the strip up through the sensor on the corner of the translate frame and pull the strip out of the chassis.

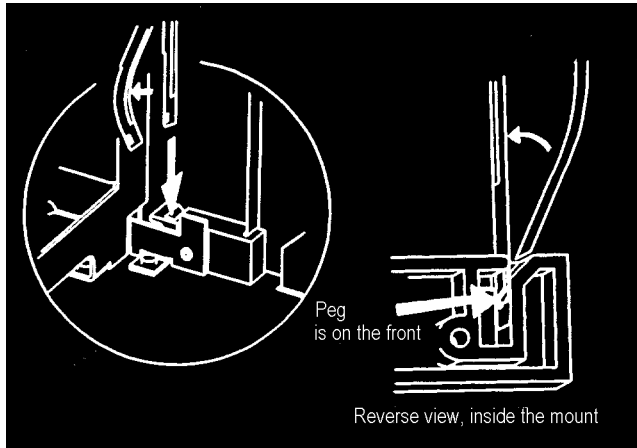


Figure 5-40. Retaining Peg on the Bottom of the Vertical Encoder Strip

WARNING

Take care when working in the area of the vertical encoder strip. Its edges are sharp.

Caution

The encoder strip is easily damaged. Take care when routing the encoder strip through the translate frame sensor.

Reassembly:

- 1. Insert the strip into the slot on the top mount. The slotted area of the strip must be facing toward the center of the library (area on the strip that looks gray).*

5-54 Removal and Replacement

2. *Attach the tensioner spring to the top of the strip and to the spring holder.*
3. *Bring the strip down, feeding it through the sensor PCA on the translate frame.*
4. *Route the encoder strip into the bottom mount and hook it onto the retaining peg.*

Vertical Drive Assembly

1. Use the “Top and Sides” instructions on page 5-9 to access the library.
2. Remove the translate frame (including the picker).

Refer to removing the “Translate Frame (Including the Picker)” earlier in this chapter.

3. Remove the 24-volt module.

Refer to removing the “24-Volt Power Supply / Power Distribution Module” in this chapter.

4. Remove the T-10 screw on the rope coupler cover to expose the ropes (see Figure 5-41 (1)). Pull the ropes out of the coupler.

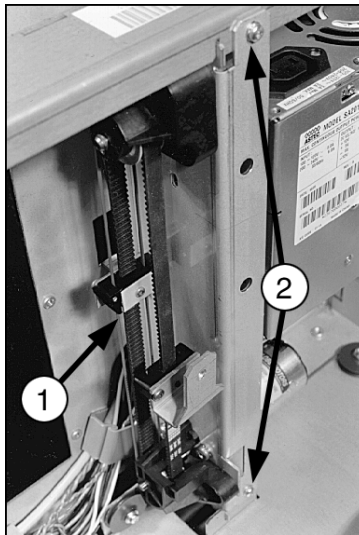


Figure 5-41. Vertical Drive Assembly Rope Coupler and Assembly Mounting Screws

5. Remove the two T-15 screws (with cone washer) that mount the vertical drive assembly to the rear of the chassis.
6. Lift the assembly out of the chassis.

Reassembly:

1. *Position the new vertical drive assembly against the rear wall of the chassis. Note the guide slot bracket on the rear wall that guides the assembly into position. Make sure the cable bundles from the power supply are **BETWEEN** the vertical drive assembly and the rear wall of the chassis.*
2. *Insert and tighten the two T-15 screws that mount the top and bottom of the assembly to the chassis.*
3. *Make sure the translate frame is resting on the bottom of the chassis.*
4. *Remove the small plate on the rope coupler.*
5. *Pull the coupler on the vertical drive assembly belt to a position where the balls on the two translate frame support ropes can be inserted into the coupler.*
6. *Reattach the small plate on the coupler to secure the ropes into the coupler.*
7. *Reinstall the translate frame.*

Refer to the reassembly instructions in “Translate Frame (Including the Picker)” earlier in this chapter.

8. *Bring the translate frame into position and attach the bracket between the vertical drive belt and the rear of the translate frame.*

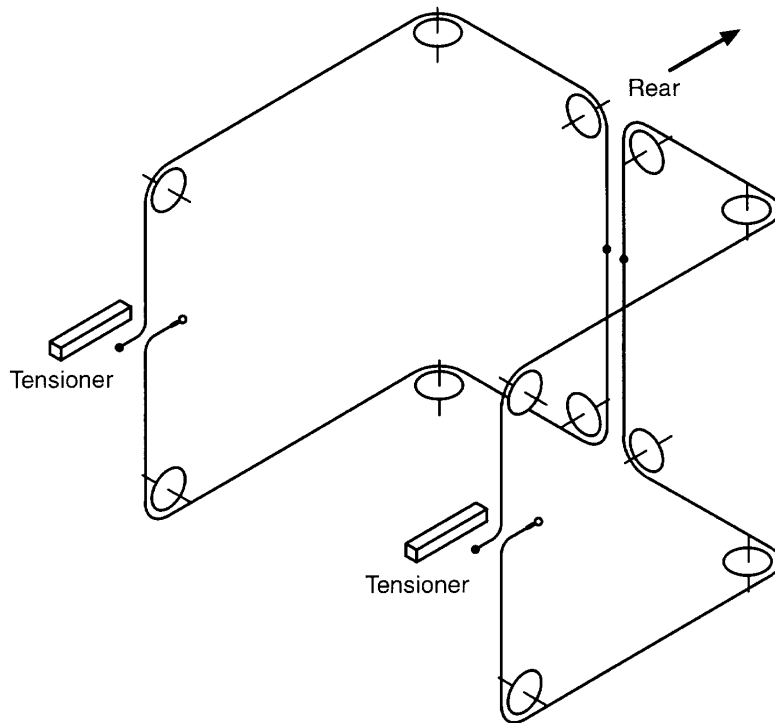


Figure 5-42. The Rope and Pulley System

Controller PCA

Note

If possible, record all logs before starting this procedure.

The final step in this procedure is to reset values in the controller PCA NVRAM. Previous history will be erased.

This log information should be kept with the autochanger for future service use.

1. Use the “Top and Sides” instructions on page 5-9 to access the top of the library.

Caution

When manually pulling the translate frame up or pushing it down, push and pull **ONLY** by the *center of rear of the frame* (side nearest the vertical lift assembly)

Applying pressure to any other location on the translate frame may bend the assembly and cause errors during operation.

2. Lift the translate frame to the top of the chassis and insert a screwdriver through the rear crossmember to hold the frame in position.

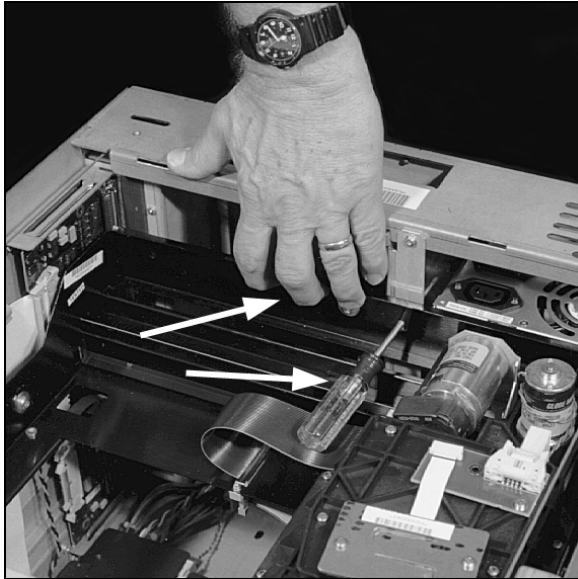


Figure 5-43. Suspending the Translate Frame / Picker Assembly

3. Gently pull the SCSI cable protector off its plastic standoffs.
4. Disconnect the SCSI cable at the SCSI repeater/converter PCA.
5. Remove the cover on the controller PCA.
 - a. Gently pull up on the controller cover near each of the plastic standoffs; a section at a time.
 - b. Pull the cover through the translate frame (or out through a side access panel, if desired).

5-60 Removal and Replacement

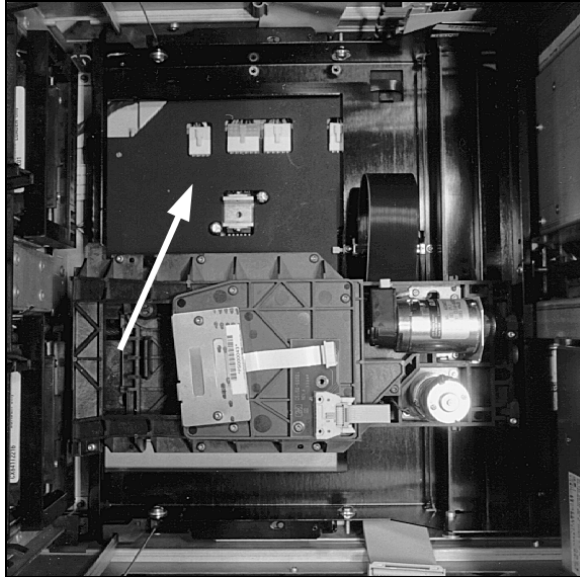


Figure 5-44. Controller PCA - Cover On

6. Remove all cables from the autochanger controller PCA.
7. Remove the nine T-15 screws (with cone washer) that mount the PCA to the chassis. (The nine screws are indicated by the single arrow in Figure 5-45.)
8. Pull the PCA out through the translate frame.

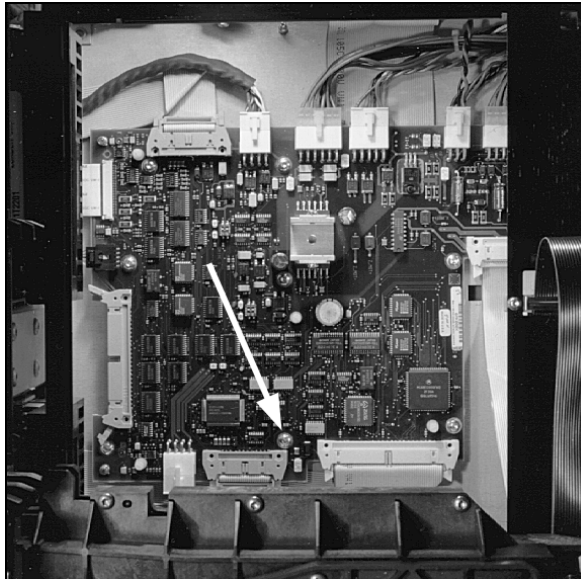


Figure 5-45. Controller PCA - Cover Off

Reassembly:

1. *Place the replacement autochanger controller PCA into position in the chassis.*

Put the alignment holes in the corners of the PCA over the alignment pins on the chassis bottom as shown.

2. *Insert and tighten the nine T-15 screws to mount the PCA.*
3. *Connect all cables as shown.*

5-62 Removal and Replacement

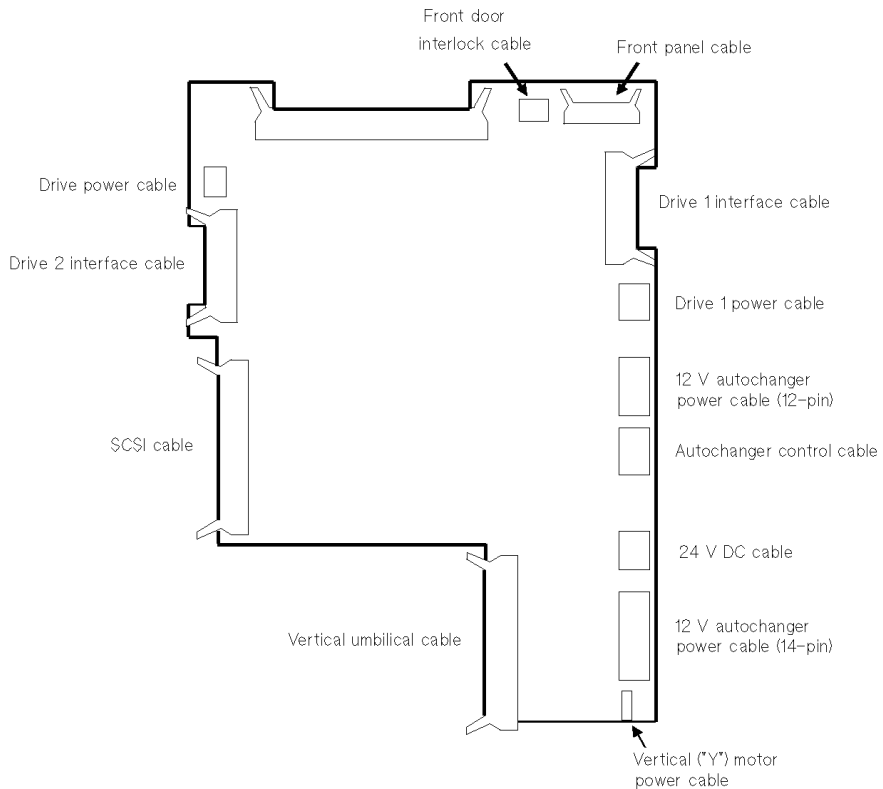


Figure 5-46. Controller PCA Cabling

4. Snap the cover onto the PCA.

Place the PCA on top of all the plastic standoffs but press the cover into position on each standoff individually. The cover will “snap” when it passes over the standoff.

Internal SCSI Cable

1. Use the “Front Access Door Area,” and “Top and Sides” instructions on pages 5-5 to 5-11 to access the library.
2. Remove the three T-15 screws from the middle (top) and from either end of the lower RFI panel (below the drives).

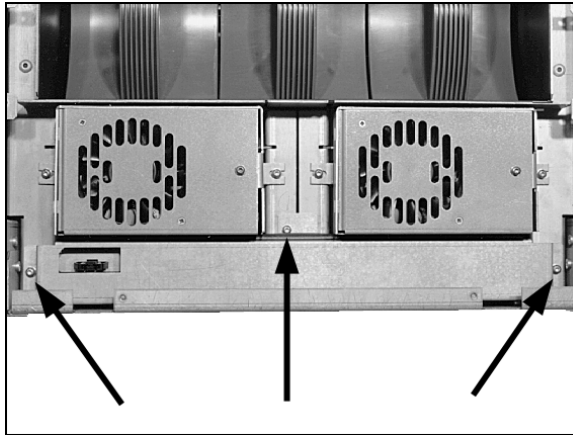


Figure 5-47. Removing the Lower RFI Panel

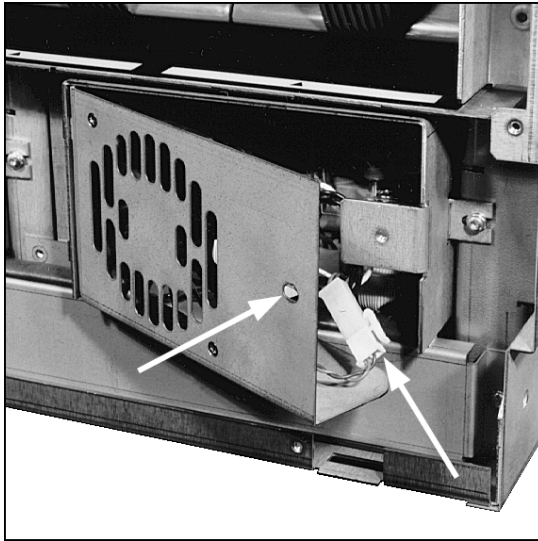


Figure 5-48. Removing the Drive Fan

3. Remove the fan assembly from the rear of each drive; disconnecting the fan power cable as you do so.

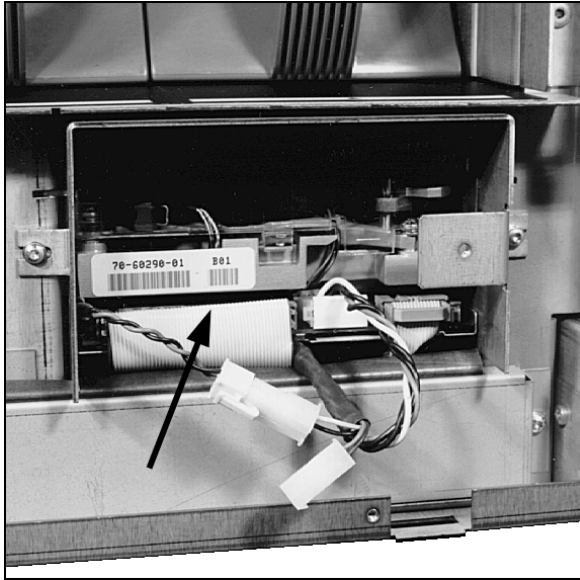


Figure 5-49. Removing the Drive SCSI Cable - Right Drive Shown

4. Disconnect the SCSI cable from both drives.

The SCSI cable is a single cable that connects first to the drive on the right (looking at the front of the library), which is Drive 2. The cable continues from Drive 2 over to the left and connect to Drive 1. The cable ends with a terminator.

5. Gently pull the SCSI cable protector off its plastic standoffs (see Figure 5-50 (1)).

5-66 Removal and Replacement

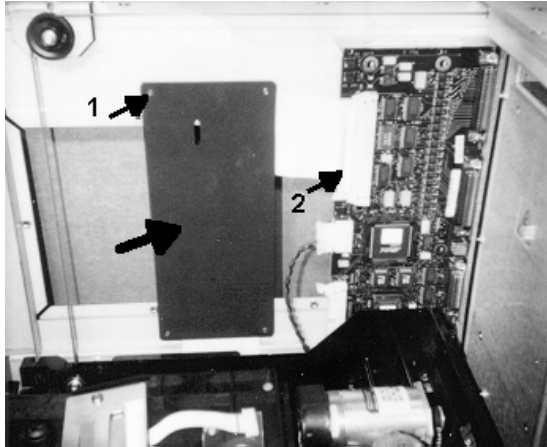


Figure 5-50. Removing the SCSI Protector

6. Disconnect the SCSI cable at the SCSI repeater/converter PCA (see Figure 5-50 (2)).
7. Remove the cover on the controller PCA (see Figure 5-51).
 - a. Gently pull up on the controller cover near each of the plastic standoffs; a section at a time.
 - b. Pull the cover through the translate frame (or out through a side access panel, if desired).

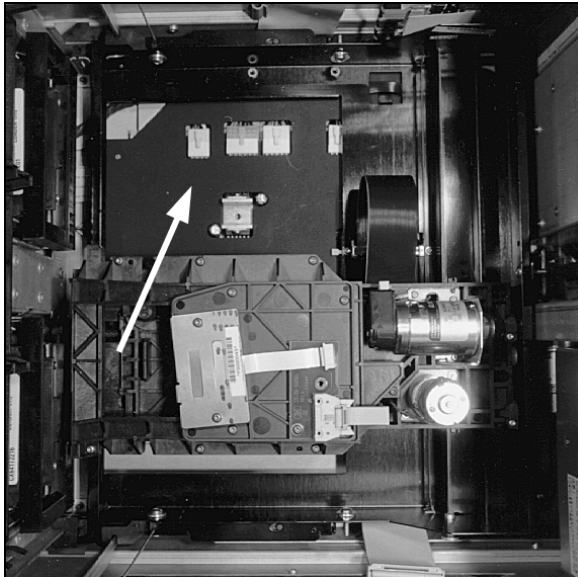


Figure 5-51. Controller PCA - Cover On

8. Remove all cables from the autochanger controller PCA.
9. Remove the nine T-15 screws (with cone washer) that mount the PCA to the chassis. (The nine screws are indicated by the single arrow in Figure 5-52.)
10. Gently pull up on the SCSI cable protector that lays across the SCSI cable on the floor of the chassis. Remove the protector.
11. Pull the PCA out through the translate frame.
12. Pull the SCSI cable out of the chassis.

5-68 Removal and Replacement

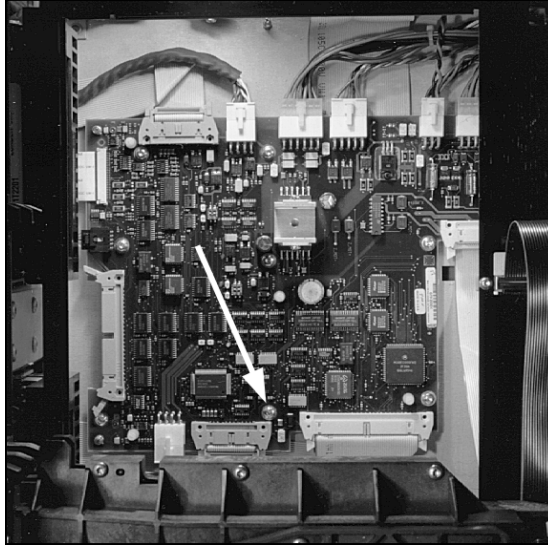


Figure 5-52. Controller PCA - Cover Off

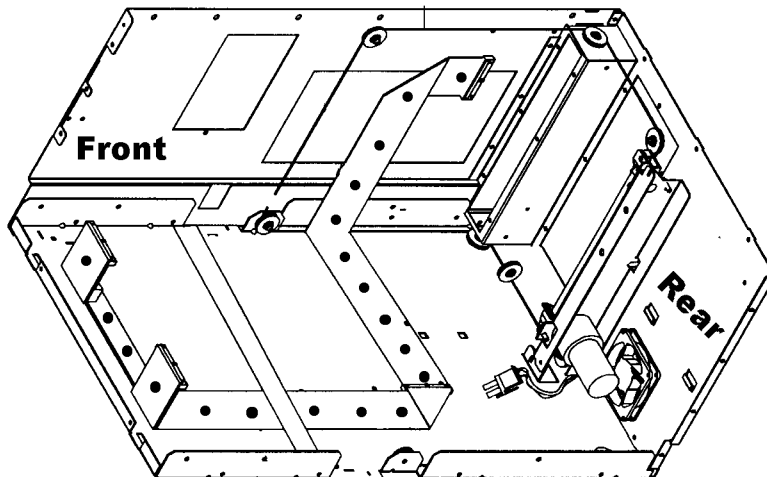


Figure 5-53. Routing of the Internal SCSI Cable

SCSI Repeater/Converter Interface PCA

1. Use the “Rear Panel Area,” “Front Access Door Area,” and “Top and Sides” instructions on pages 5-5 to 5-11 to access the library.
1. Remove the power and SCSI external cable(s) from their connectors on the rear interface panel.

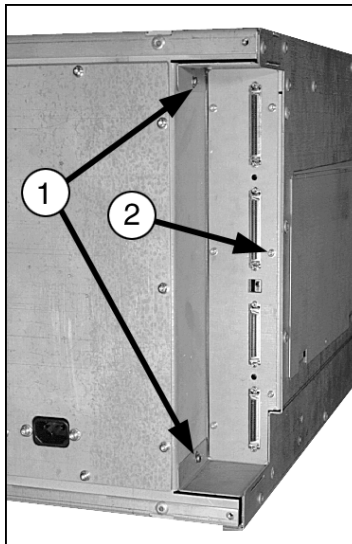


Figure 5-54. SCSI Interface Assembly - Rear Panel View

2. Remove the T-15 screw on both the upper and lower pulley covers and remove the covers. See Figure 5-54 (1).
3. Remove the six T-10 screws that mount the interface assembly to the rear panel. See Figure 5-54 (2).
4. Slide the interface assembly (frame and PCA) out through the rear of the chassis.

5-70 Removal and Replacement

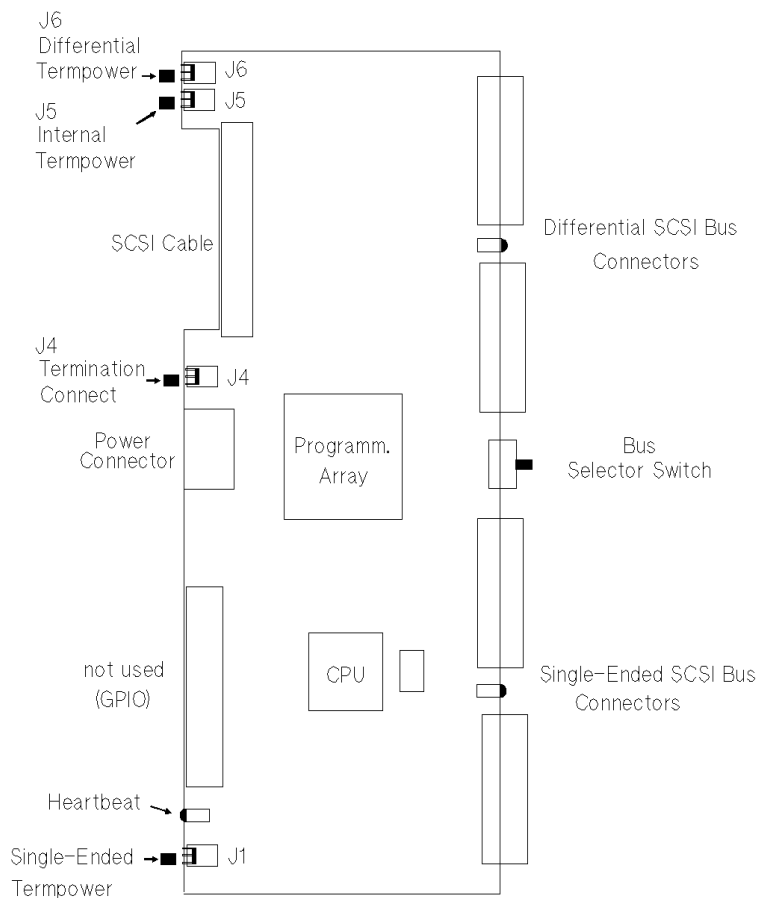


Figure 5-55. Cabling on the SCSI Repeater/Converter PCA

Removal of a Tape Cartridge From a Drive During a Power-Off Condition

Caution

It is strongly recommended that manual ejection of a tape cartridge is not attempted. The tape may be damaged.

Note

The tape drive does not automatically eject a cartridge if a power failure occurs. Normally, power must be restored before a tape can be ejected. If a tape cartridge is manually ejected, there is a strong possibility that the tape may be damaged.

If you **MUST** remove a tape cartridge while the power is off, the procedure is to remove the drive from its mounting in the chassis, rewind the tape very carefully, and *only then* manually eject the cartridge from the drive.

1. Use the “Front Access Door” and “Top and Sides” instructions on pages 5-5 to 5-11 to access the library.
2. Remove the tape drive from the library.

Access and remove the drive by doing Steps 1 to 8 in “Replacing a Tape Drive - Library Power Off or Library Online” earlier in this chapter.
3. Remove the four T-10 mounting screws on the drive enclosure (two on each side) and remove the drive. (See Figure 5-56.)

5-72 Removal and Replacement

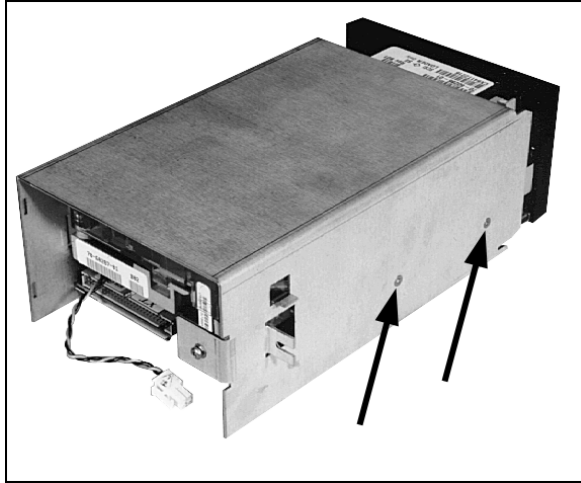


Figure 5-56. Drive Mounting Screws

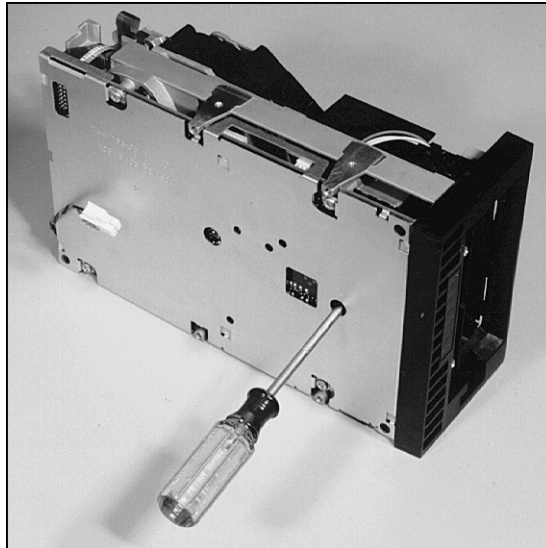


Figure 5-57. Rewinding Tape Through the Access Hole

4. Use a small Phillips screwdriver to rewind the tape in a counterclockwise direction (when facing the bottom of the drive). See Figure 5-57 for the location of the rewind hole.
5. When the tape is fully rewound (check to see that no tape is dangling from the cartridge), push in on the spring-loaded solenoid release located on the right front of the drive and, at the same time, slowly lift the handle beneath the tape cartridge door (see arrow on Figure 5-58).

The tape cartridge will eject from the drive.

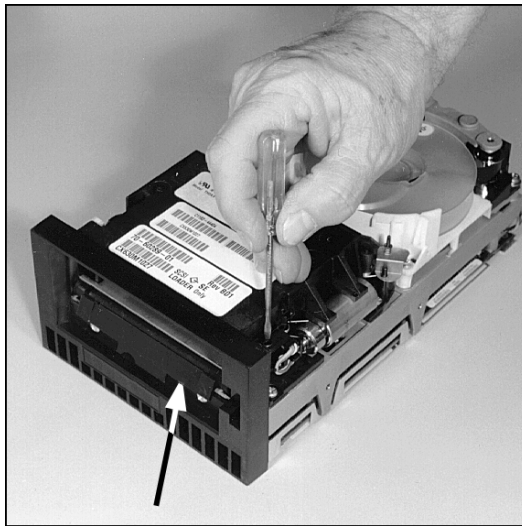


Figure 5-58. Opening the Tape Drive Door

6. Remount the drive into the drive enclosure with the four T-10 screws.
7. Refer to the reassembly steps at the end of “Replacing a Tape Drive - Library Power Off” earlier in this chapter.

5-74 Removal and Replacement

Removal of a Tape Cartridge From a Drive When Picker Eject is Unavailable

1. Enter the “TEST” menu, and select TAPE REWIND.

When the tape is rewound, enter the ONLINE REPAIR * menu and select DRV(x) POWER OFF

2. Use the “Front Access Door Area” instructions on page 5-5 to access the library.
3. Remove the tape drive from the library.

Access and remove the drive by doing Steps 1 to 8 in “Replacing a Tape Drive - Library Power Off or Library Online” earlier in this chapter.

Note

Executing a “Tape Rewind” should have completely rewound the tape in the cartridge. If the tape has not completely rewound, go to “Removing a Tape Cartridge From a Drive in a Power-Off Condition” (preceding procedure) and do steps 2 through the end of that procedure.

4. Manually eject the tape. See Figure 5-58.
 - a. Push in on the spring-loaded solenoid release located on the right front of the drive and, at the same time, slowly lift the handle beneath the tape cartridge door (shown by the arrow).

The tape cartridge will eject from the drive.

Reassembly Recommendations:

Refer to the reassembly instructions after “Replacing a Tape Drive - Power Off or Library Online” earlier in this chapter.

Reinitializing the Autochanger Controller PCA RAM After Service

All the RAM on the autochanger controller PCA is kept alive through a charged capacitor, and is, therefore, relatively non-volatile. If this RAM is backed up to flash EEPROM after any changes, the values are held permanently. If not backed up to flash EEPROM, the information is lost after approximately 10 to 60 days.

Most of the RAM is initialized to known values at powerup. Variables that are not changed are customer configurations, autochanger logs, autochanger odometers, element status variables, and variables that help the autochanger recover from power failures. These variables are set by the “Set Defaults” and “Clear Odometers” configurations.

NVRAM must be reinitialized after the following:

- replacing the autochanger controller PCA
- replacing a drive mechanism
- adding a second drive

NVRAM is initialized by selecting and executing both the “Set Defaults” and “Clear Odometers” configurations on the control panel.

Also, *THE LIBRARY SHOULD BE POWER CYCLED* after setting these configurations so that an automatic execution of ISTAT will occur. This re-establishes which slots are full and which are empty.

Variables set When “Set Defaults” is Run

- SCSI address of the autochanger
- Configurable options set to system defaults (ROM-dependent):
 - sets REP RECOVERED ON - the setting on this option chooses whether the autochanger should report recovered errors. REP RECOVERED ON and REP RECOVERED OFF are the choices.
 - sets RECOVERY ON - the setting on this option chooses whether the autochanger should automatically initialize element status when cartridges are found in unexpected places (ROM-dependent). RECOVERY ON and RECOVERY OFF are the choices.
- Drive status variables:
 - the reported SCSI address of the drive is set to system defaults
 - the source location of the disk in the drive is cleared
- Power fail variables
 - the existence of a move in progress is set to FALSE
 - the state of the last move is cleared
- Security variables
 - “Unit Reserved” is cleared
 - “Prevent Media Removal” for each SCSI ID is cleared
- Element Status variables
 - the exception bits are cleared
 - the element reservations are cleared
 - flags that an ISTAT is needed (to re-establish the empty/full status of all storage slots)
- Autochanger Logs

- Soft Error Log is cleared
- Hard Error Log is cleared
- Recovery Error Log is cleared
- Password
 - Password is set to 000-000-000

Variables set by When “Clear Odometers” is Run

- move odometer is set to zero
- translate odometer is set to zero
- number of poweron hours is set to zero
- number of loads to each drive is set to zero

Replaceable Parts

Recommended Service Kits

The initial recommended service kit for the library includes the exchange parts list and the non-exchange parts list for stocking at a field-level office.

Note

This document is not necessarily revised as each part number is revised.

In the parts lists that follow, an “x” is placed in “*service*” part numbers (parts orderable from Support Materials Organization) to designate that this digit increments when the part is revised. This digit usually starts at “0” and increments to “9.”

Support Materials Organization (SMO) will stock the most current part.

Table 5-1. Exchange Parts

FRU No.	Part Number	Description
1	C5150-69x01	autochanger controller PCA
2	C5150-69x02	tape drive assembly (includes enclosure, cooling fan) (drive enclosure available separately, C5150-60x47 -- cooling fan available separately, C5150-60x48)
8	C5150-69x08	SCSI single-ended/differential repeater/converter PCA

Table 5-2. Non-Exchange Parts

FRU No.	Part Number	Description
12	C5150-60x12	bar code reader assembly
22	C5150-60x22	control panel / display assembly (includes mounting channel, display PCA, power switch, key pad and cover, front door lock solenoid) (power switch available separately, C5150-60x80 -- front door lock solenoid available separately, C5150-60x44)

5-80 Removal and Replacement

Table 5-2. Non-Exchange Parts (Continued)

FRU No.	Part Number	Description
23	C5150-60x23	vertical drive assembly - motor, belt, channel mount
24	C5150-60x24	tape cartridge guide
25	C5150-60x25	idler pulley kit (one pulley)
26	C5150-60x26	tape cartridge removable magazine assembly
27	C5150-60x27	picker assembly (includes translate rope) (translate rope available separately, C5150-60x35)
30	C5150-60x30	vertical encoder strip
32	C5150-60x32	power supply (5/12V, 200W)
33	C5150-60x33	24 V power module (includes 24 V supply, 24 V power supply cable) (24 V power supply cable available separately, C5150-60x56)
34	C5150-60x34	slave rope
35	C1160-60x35	translate rope (included in picker assembly, C5150-60x27)
37	C5150-60x37	tensioner assembly
38	C1192-60x38	translate encoder strip

Table 5-2. Non-Exchange Parts (Continued)

FRU No.	Part Number	Description
39	C1160-60x39	top vertical encoder mount (includes spring)
40	C1192-60x40	translate frame (includes mount guide / sliders) (mount guide / slider available separately in C1192-60x42)
41	C5150-60x41	vertical umbilical cable
42	C1192-60x42	mount guide / slider (included in translate frame assembly, C1192-60x40)
43	C1192-60x43	picker (horizontal) umbilical cable
44	C5150-60x44	front access door interlock solenoid assembly (included in control panel / display assembly, C5150-60x22)
46	C1160-60x46	capture roller assembly (includes translate rope keeper and rope tensioner spring)
47	C5150-60x47	drive mount enclosure (included in drive assembly, C5150-60x02)
48	C5150-60x48	drive cooling fan assembly included in drive assembly, C5150-69x02)

Table 5-2. Non-Exchange Parts (Continued)

FRU No.	Part Number	Description
49	C5150-60049	tape cartridge magazine guide assembly (includes magazine sensor cable) (magazine sensor cable available separately, C5150-60x51)
50	C5150-60x50	front panel interlock cable
51	C1192-60x51	tape cartridge removable magazine sensor cable
52	C5150-60x52	24 V power cable (24 V module to controller PCA)
54	C1192-60x54	drive and drive fan power cable
55	C5150-60x55	12 V power cable (AC wiring PCA [in 24 V module] to 5/12 V supply)
56	C5150-60x56	24 V power cable (included in 24 V module, C5150-60x33)
57	C5150-60x57	vertical path-clear (starwars) sensor cable with receivers and picker position sensor
58	C5150-60x58	bar code reader patch cable
61	C5150-60x61	autochanger controller cable
62	C5150--60x62	Drive 1 drive interface cable
63	C5150-60x63	Drive 2 drive interface cable

Table 5-2. Non-Exchange Parts (Continued)

FRU No.	Part Number	Description
65	C5150-60x65	control panel cable (ribbon)
71	C1192-60x71	internal SCSI cable
72	C5150-60x72	autochanger controller PCA cover
73	C5150-60x73	picker access cover panel
74	C5150-60x74	magazine access cover panel
75	C5150-60x75	top access panel (no window)
76	C5150-60x76	AC / 24 V cover panel
77	C5150-60x77	installation handles (4) and screws
79	C5150-60x79	rackmount slide kit
80	C5150-60x80	power switch and cable (included in control panel / display assembly, C5150-60x22)
81	C5150-60x81	front access door / bezel assembly (includes front door lock mechanism and front door open sensor cable) (front door lock mechanism available separately, C5150-60x82 -- front door open sensor cable available separately, C1700-60x30)
82	C5150-60x82	door lock assembly with two keys
85	C5150-60x85	top access panel with window

Table 5-2. Non-Exchange Parts (Continued)

FRU No.	Part Number	Description
90	C5150-60x90	standalone enclosure kit (top and side cosmetic panels, feet, screws, instructions)
A	C5150-00610	upper pulley cover
B	C5150-00609	lower pulley cover
C	C5150-41203	lower vertical encoder strip mount
D	C5150-00606	drive RFI shield
E	C5150-20601	vertical SCSI cable shield
F	C5150-40603	SCSI cable shield, horizontal, under controller PCA
G	C5150-60x82	front door lock mechanism (includes two keys, and pawl) (included in front access door / bezel assembly, C5150-60x81)
H	C1700-60x30	front access door open sensor cable (included in front access door / bezel assembly, C5150-60x81)
	C5150-82700	SCSI host adapter
	2360-0589	screw (6-19 x .5)
	1400-0611	hairpin cable clamp (small)
	1400-2194	ESDI power cable clip
	2220-0020	screw, (4-40 x .312 with square cone washer)

Table 5-2. Non-Exchange Parts (Continued)

FRU No.	Part Number	Description
	2260-0009	nut, hex with lock
	2360-0462	screw, (6-32 x .25, sq cone)
	2360-0473	screw, (6-32 x 1, sq cone)
	2360-0522	screw, (6-32 x .438, sq cone)
	2360-0523	screw, flathead (6-32 x .25)
	2360-0546	screw (6-32 x .25)
	0515-2489	shoulder screw
	2420-0001	nut, hex (6-32)
	2680-0321	screw, 10-24 with washer
	1250-2548	single-ended SCSI terminator

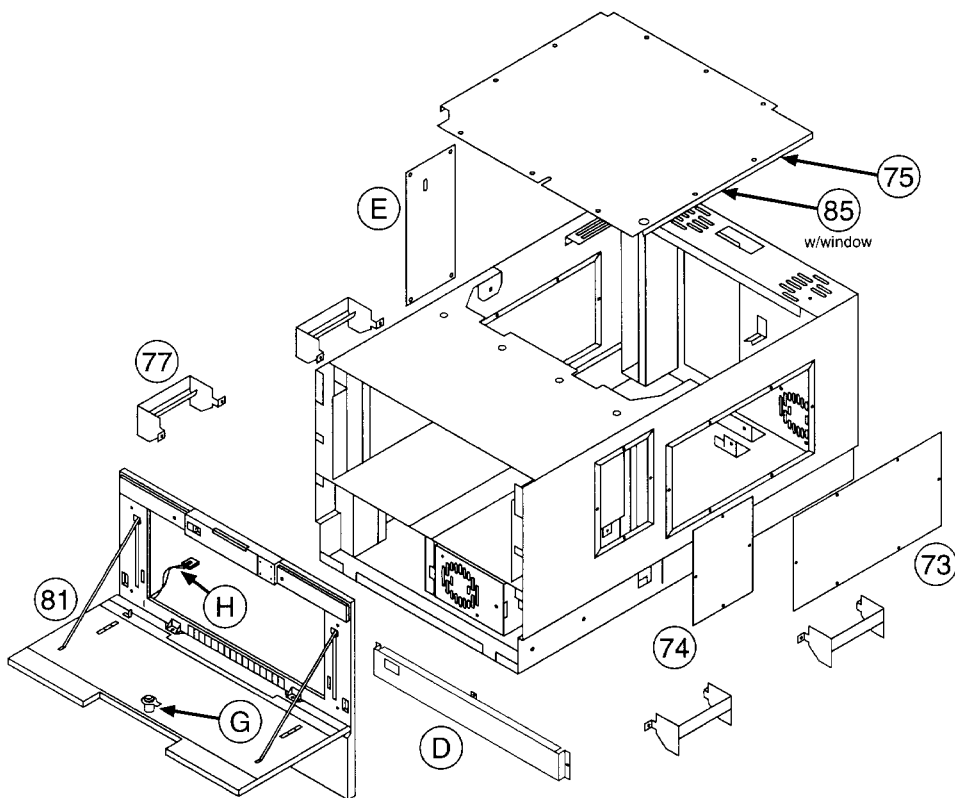


Figure 5-59. Exploded View (1 of 4)

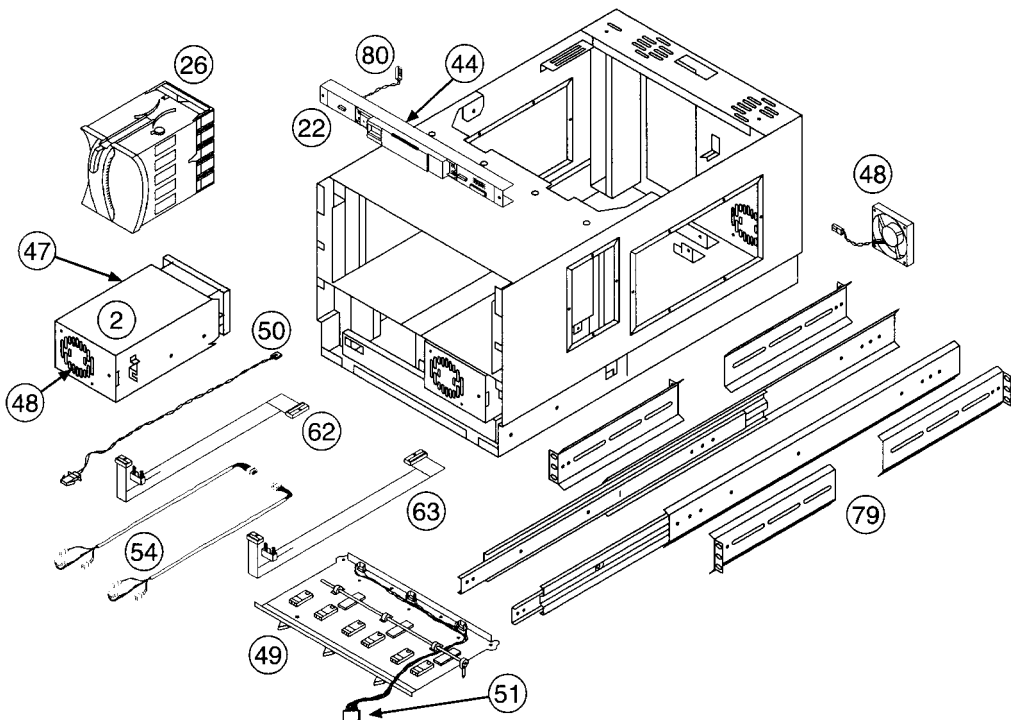


Figure 5-60. Exploded View (2 of 4)



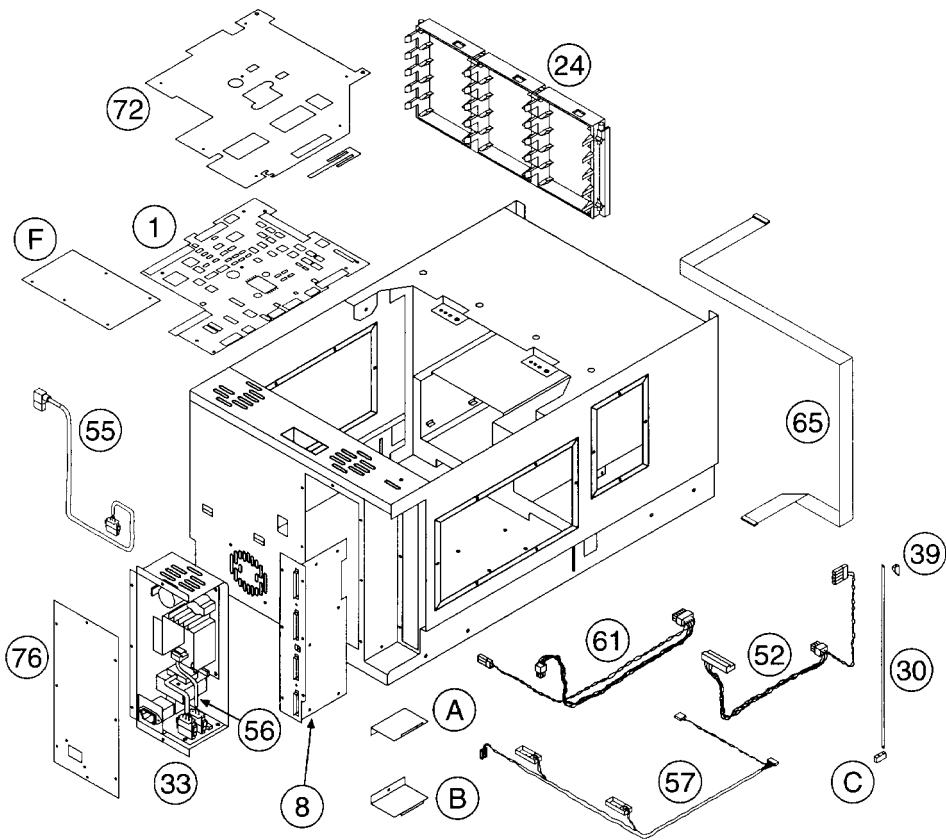


Figure 5-62. Exploded View (4 of 4)

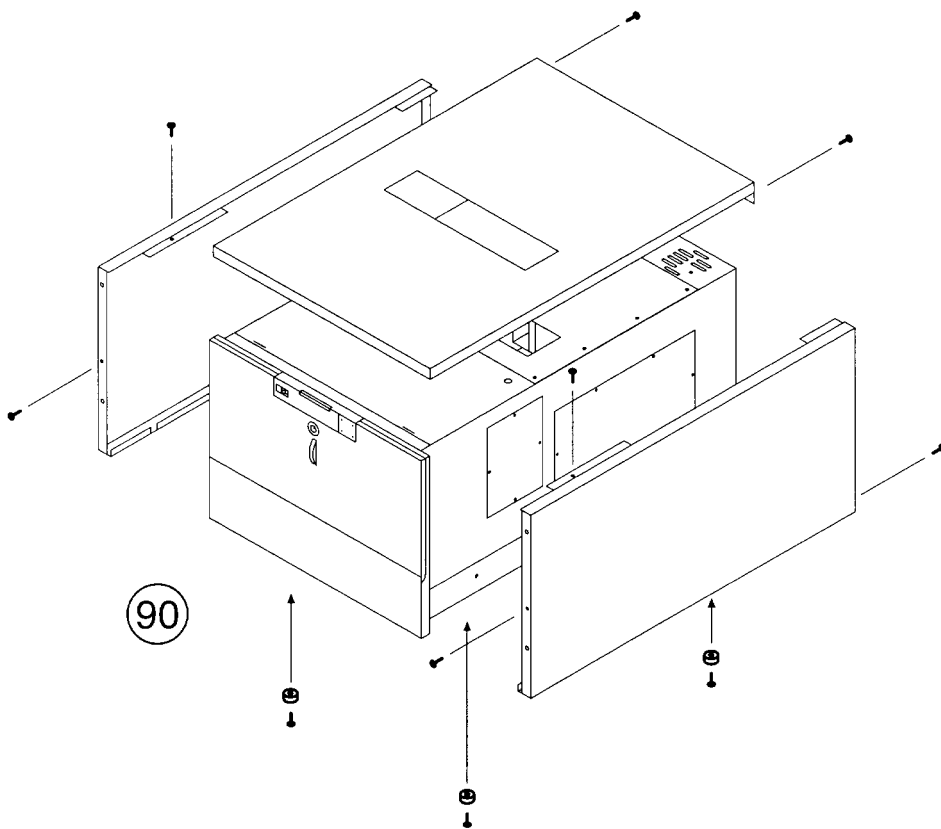


Figure 5-63. Standalone Enclosure Components

Miscellaneous

While no special tools are required to service this product, there are some commonly used items that may be stocked and available as an area resource.

Table 5-3. Common Resource Parts

Item	HP Part Number
Single-Ended SCSI Cables	
1 m (3.3 ft) cable ; high density with thumb screws (50 pin) to low-density with bail lock (50 pin), m-to-m	K2296
1.5 m (4.9 ft) cable ; high density with thumb screws (50 pin) to low-density with bail lock (50 pin), m-to-m	K2297
0.5 (1.6 ft) cable ; high density with thumb screws (50 pin) to high-density with thumb screws (50 pin), m-to-m	C2955A
1 m (3.3 ft) cable ; high density with thumb screws (50 pin) to high-density with thumb screws (50 pin), m-to-m	C2908A
1.5 m (4.9 ft) cable ; high density with thumb screws (50 pin) to high-density with thumb screws (50 pin), m-to-m	C2956A
2 m (6.5 ft) cable ; high density with thumb screws (50 pin) to high-density with thumb screws (50 pin), m-to-m	C2957A
5 m (16.5 ft) cable ; high density with thumb screws (50 pin) to high-density with thumb screws (50 pin), m-to-m	C2958A

Table 5-3. Common Resource Parts (Continued)

Item	HP Part Number
Differential SCSI Cables	
.9 m (2.9 ft) cable ; fast and wide high density with thumb screws (68 pin) to high-density with thumb screws (68 pin),	C2911A
2.5 m (8.2 ft) cable ; fast/wide high density with thumb screws (68 pin) to high-density with thumb screws (68 pin),	C2924A
10 m (32.8 ft) cable ; fast/wide high density with thumb screws (68 pin) to high-density with thumb screws (68 pin),	C2925A
2 m (6.5 ft) cable ; fast/wide high density with thumb screws (68 pin) to high-density with thumb screws (50 pin),	C2906A
5 m (16.5 ft) cable ; fast/wide high density with thumb screws (68 pin) to high-density with thumb screws (50 pin),	C2907A
Terminators	
Single-ended SCSI terminator, 50-pin, high-density, active	1250-2548
Differential SCSI terminator, 68-pin, high-density	C2905A

Table 5-3. Common Resource Parts (Continued)

Item	HP Part Number
Bulk Load Magazines	
Bulk Magazine	C5149F
Bulk magazine, with 5 cartridges	C5148F
Tape Cartridges	
HP DLTtape IV Data Cartridge - 20 Gbyte native capacity	C5141F
HP DLTtape III XT Data Cartridge - 15 Gbyte native capacity	C5141A
Cleaning tape	
Bar code labels are NOT AVAILABLE through Hewlett-Packard, but may be ordered through other companies (sample labels are shipped in the accessories kit). When the customer orders bar code labels, make sure they meet the following specifications:	NA
<p>Message: 6-character (2 alpha, 4 numeric)</p> <p>Dimensions: 2.2" x .82"</p> <p>Symbology: code 39 without check digit</p> <p>Start/Stop Characters: */*</p> <p>Narrow Bar: 0.014"</p> <p>Ratio: 2.5:1</p> <p>Print Quality: ANSI Grade "A"</p>	

Theory of Operation

This chapter discusses the following aspects of the library and digital linear tape drive theory of operation:

- SCSI interface
- SCSI command execution to mechanics
- library assemblies
 - library controller PCA
 - front panel PCA
 - power supplies
 - SCSI repeater/converter PCA
 - translate frame
- error reduction, detection and correction

The SCSI Interface

As defined by ANSI (American National Standards Institute), SCSI allows up to eight devices on the bus in any combination of computers and peripherals. The devices can communicate with one another without control from a host computer.

Another powerful feature is the ability of SCSI to perform arbitration. SCSI allows the host to initiate transactions, then break communication with a device, do something else, and re-establish communication when the device is ready.

Finally, SCSI is capable of high data transfer rates. The single-ended FAST SCSI handshaking allows the host to transfer data at 10 Mbytes/second. Synchronous data transfer rates may be as fast as 4 Mbytes/second, and asynchronous rates up to 1.5 Mbytes/second, limited only by the capabilities of the computer and peripheral.

Caution

DO NOT CYCLE POWER during any troubleshooting until you are sure the system SCSI bus is **INACTIVE** and will **REMAIN INACTIVE**.

Removing power while the bus is active can cause data loss and/or indeterminate bus states. Check the host system reference manuals for information on checking the status of the SCSI bus.

Single-Ended and Differential SCSI Interfaces

The SCSI interface on this library accepts either single-ended or differential SCSI buses. Internally, the library is single-ended. (Each SCSI bus type, single-ended or differential, must be configured separately using the SCSI interface switch for that SCSI card.) A single-ended external connection is repeated onto the appropriate library bus. A differential external connection is converted into the internal single-ended bus (and also repeated).

Single-ended FAST SCSI handshaking allows a maximum external bus length of 3 meters. Because the single-ended interface is repeated onto the internal bus, maximum external bus length remains at the maximum SCSI single-ended bus length of 6 meters. The differential bus is also repeated as it is converted and the maximum differential SCSI external bus available is 25 meters.

A single-ended SCSI interface may be preferable when peripherals are physically close to the host and short SCSI cables are adequate to connect (or daisy-chain) them. An example of an appropriate use of a single-ended SCSI interface is when a host and several peripherals are daisy-chained and located in an upright cabinet with 1-meter cables connecting them.

A differential SCSI interface is used when up to 25 meters of SCSI cabling is needed, and the peripherals need to be physically located farther apart than the single-ended SCSI interface allows. An example of an appropriate use of a differential SCSI interface is when a peripheral must be located in a different location than the host system for security reasons or for user convenience.

SCSI Command Set — References

Note

Detailed descriptions of the SCSI-2 commands and their functionality with DLT products can be found in the following documents:

- American National Standards Institute (ANSI) document titled, *Small Computer System Interface - 2 (SCSI-2)*, revision 10H which is dated September, 1991. Copies of this publication can be obtained by writing to: Global Engineering Documents, 2805 McGaw, Irvine, CA 92714, or call: (800) 854-7179 or (714) 261-1455. Please refer to document X3.131-SCSI-2.
- Digital Linear Tape Drive and Library SCSI-2 Command Reference*. This document can be obtained by ordering part number 5960-7674 from the Sales Response Center.

SCSI Command Execution to Mechanics

The mechanism code of the library accepts high-level SCSI commands from the interface, translates these commands into servo code for the library, executes the command, and reports status.

When a SCSI command is received, it is translated into a series of smaller sub-moves in the servo code of the library and executed.

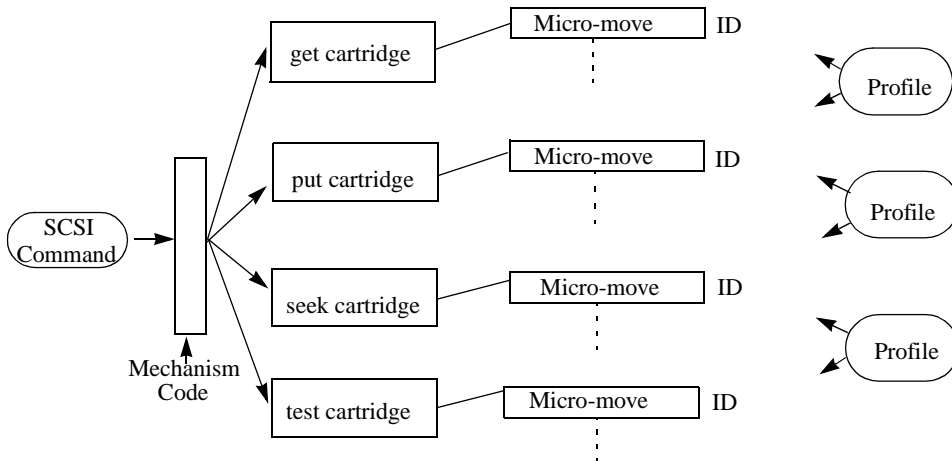


Figure 6-1. SCSI Command Translation for Library Operation

Examples of high-level SCSI-2 commands are:

- Move Medium -- move a cartridge from element A to element B.
- Exchange Medium -- move a cartridge from element B to element C and from element A to element B.
- Position to Element -- position the transport at a target element.
- Initialize Element Status -- test for the presence of a cartridge at a target element, and determine the bar code, if present.

The commands are translated into a series of moves which are *basic library functions*. Each called function (listed below) is then broken into submoves called micro-moves. In this library, the basic library functions include:

- get cartridge -- gets the cartridge with the picker finger from the magazine or drives.
- put cartridge -- puts the cartridge with the picker finger into the magazine or drives.
- seek cartridge -- positions the translate frame to a specific vertical position.
- test cartridge -- runs inventory test to see if a cartridge is present.

For example, "Move element 33 to element 2" is transformed into the following sequence of library functions:

1. Determine that element 33 is a storage slot and element 2 is a drive.
2. Move the picker to the front of the storage element.
3. Get the cartridge from the storage element.
4. Move the picker to the front of the disk insertion slot on the drive element.

6-6 Theory of Operation

5. Put the cartridge into the drive element.

Each of the basic library functions are divided into a series of smaller movements called "micro-moves." There are two *types* of micro-moves:

- position move -- move the driving motors a given distance at peak speed.
- saturation move -- same as a position move except that a known force is expected within a given distance; however, motion is halted when the force exceeds a specified threshold or no force is present within a specified distance.

Position moves are used for high-speed, unobstructed movements of a known distance. Saturation moves are used in low-speed, *adaptive* movements of variable distance.

Basic library functions consist of one or more combinations of position or saturation type micro-moves. Each function has a tailored set of these submoves to insure that the basic library function will be gentle.

Each micro-move within a specific function has a unique set of stability, performance, error recovery, force, and reliability criteria. Therefore, each micro-move is assigned a unique identification code (ID) which is used to determine how the move should be performed.

Library Assemblies

The following library assemblies are discussed in this section:

- Controller PCA
- Power Supplies
- SCSI Repeater/Converter PCA
- Translate Frame

The Library Controller PCA

The library controller PCA contains the following major components:

- microprocessor
- library ASIC
- NCR 53C80 Chip (SCSI bus control)
- flash EEPROM
- RAM
- SCSI interface

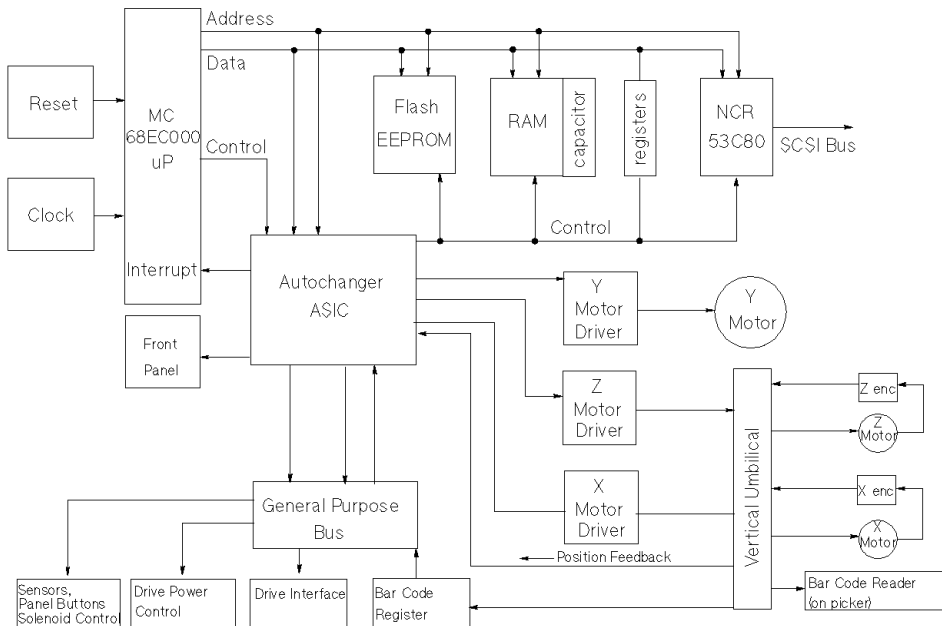


Figure 6-2. Library Controller PCA Block Diagram

The MICROPROCESSOR is a Motorola MC68EC000 running at 12.288 MHz. This microprocessor controls all processes on the controller PCA such as servos, SCSI interface, drive interface, and commands to the control panel.

Associated with the microprocessor is clocking circuitry, RAM with standby power supplied by a capacitor, and ROM.

The library APPLICATION-SPECIFIC INTEGRATED CIRCUIT (ASIC) provides the processor interface, programmable features, and motion control circuitry.

The processor interface functions are: decoding the processor's address space,

and generating select and strobe signals to give the processor access to the flash EEPROM, RAM, the SCSI controller, internal registers, I/O ports, and optional external registers. Also, the processor interface function of the chip includes the handling of internally- and externally-generated interrupt sources.

The programmable features section of the chip provides a control panel display state machine and firmware-configurable feature and general-purpose ports.

The servo system section of the chip provides servo timers, three motor control pulse-width modulators, and three quadrature encoder channels.

The General Purpose Bus is controlled by the ASIC. This bus provides access to registers located on other PCAs and is primarily used for the drive interface. Drive interface signals EJECT and BUSY are handled through this bus.

The ASIC is also the interface between the processor and the motors. The ASIC monitors the position encoders and uses that information to increment or decrement counters on the chip. The ASIC also provides pulse width modulation (PWM) output signals to drive the motor circuitry. The servo is run with firmware, by the microprocessor.

All SCSI signals are handled by the NCR 53C80 chip under control of the MC68EC000 processor and the library ASIC chip. Bus termination of the internal SCSI bus is accomplished with an inline terminator on the end of the SCSI cable near the last drive.

FLASH EEPROM. The controller firmware resides in two flash EEPROMs. These flash EEPROMs allow new firmware versions to be downloaded to the controller in the field. A boot section is always present to allow new downloads. The boot cannot be overwritten in the field.

RAM. The two RAM chips are special, low-power CMOS static RAMs. A standby capacitor on the PCA takes over powering these chips if main power is lost. The chips remain in standby mode (for a minimum of 10 days, typically 90 days), providing a non-volatile memory storage capability when the unit is powered off.

6-10 Theory of Operation

The X,Y, and Z MOTOR CONTROL DRIVERS take the pulse-width modulated signals from the motor control chip and change them into power signals for the translate, vertical, and plunge motors.

Motor position is returned through the vertical umbilical cable. The translate calibration position is determined by a photomicrosensor. The plunge motor position is determined by an optical encoder mounted on the motor itself. The vertical position is determined by an optical strip encoder located on the translate frame.

The CONTROL PANEL INTERFACE provides a serial data interface and power for the display.

The controller board also supplies power to the tape drives, enabling online drive replacement functionality if the host application software supports this capability.

LEDs on the PCA indicate drive status (one set per drive). For example, during online drive replacement, these LEDs indicate the condition of the drive. (The yellow LED in the middle of the PCA flashes and the green LED is off when drive 1 is faulty, the yellow LED is on solid and the green LED is off when the drive replacement has begun, the yellow LED is off and the green LED is on solid when the drive status is normal.)

The controller PCA distributes 5/12-volt power to the tape drives, the eject solenoids, and power to the drive bracket cooling fans. Power is supplied to the drives through an 8-pin connector. The 8-pin connector supplies power to the drives, the solenoid, and the cooling fan in the drive enclosure. In online drive replacement, drive power is removed under software control by the library controller PCA.

12-volts of power is also distributed to each drive for operation of the drive removal (cartridge eject) solenoid. The solenoid is driven to 12 volts to activate the solenoid and goes to 0 volts when off.

The power for control of the door is also distributed though the controller PCA.

A pulse-width-modulated control voltage goes to the solenoid to lock access to the door and to maintain the lock. This signal is programmable in 16 steps that go from 0 to 11.25 volts in .75-volt increments. The 11.25-volt signal is used to forcefully activate the solenoid. The voltage is then backed off to 4 volts to hold the solenoid in position. The solenoid is turned off at 0 volts.

The signals from the bar code reader are sent via the translate frame umbilical cable to the RS-232 receiver on the controller PCA.

Controller PCA Power-On Diagnostic LED Indications

Two LEDs on the controller PCA display information about the controller PCA at power-on (see Figure 6-3). One LED is green; the other is yellow.

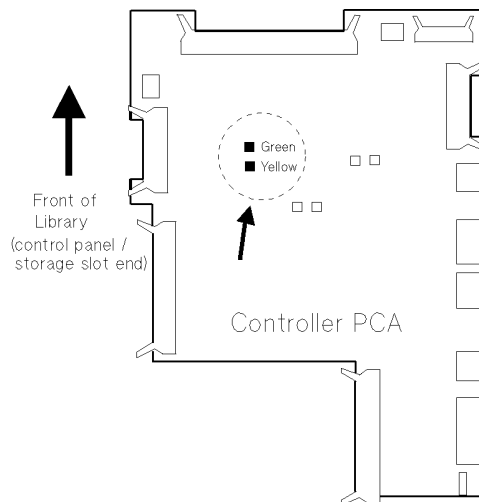


Figure 6-3. General Purpose LEDs on the Controller PCA

When power is applied to the library, both LEDs flash on/off briefly at the initial power-on surge. After the surge, the following indications are available:

- If the green LED flashes three times, and then remains ON — the PCA is good and only boot code is present.

6-12 Theory of Operation

The control panel display will show **I NEED CODE** for two seconds followed by the boot code version for two seconds (ex. **1.00 BOOT CODE**), and then display **I NEED CODE** steadily. (To see the boot code version again, the library must be power cycled.)

- If the green LED lights for three seconds, goes out for three seconds, and then comes back on steady — the PCA is good and both boot code and main code are loaded.
- If the green LED lights for three seconds, goes out, and then the yellow LED flashes a number of times, a controller PCA error has occurred. The number of times the yellow LED flashes corresponds to the controller PCA error code number (1 - 7) described in the “Hardware Errors and Recovery Procedures” table in Chapter 4. (For service, correcting these errors in the field is not possible; service action consists of changing the controller PCA.)

After the yellow light flashes the number of times corresponding to the error code, both the yellow LED and green LED are placed on steady to indicate that an error condition is present.

Note

The power on LED indications occur within 6 seconds of power-on if *all* drives are installed in the library. If *any* drive is not installed, this power-on diagnostic sequence is delayed to give the missing drive time to identify itself. If a drive interrogation must time out, the diagnostic sequence takes approximately 40 seconds.

The yellow LED will flash the number of the **FIRST** error that occurs — and it will flash this number of times only **ONCE**. To redisplay the error code, the library must be power cycled again.

Power Supplies

There are two power supplies, both autoranging.

One supplies +5 volts at 22 amperes and +12 volts at 8 amperes. This supply powers the drives and the library logic. The other supply provides +24 volts at 4.5 amperes. This supply powers the motors.

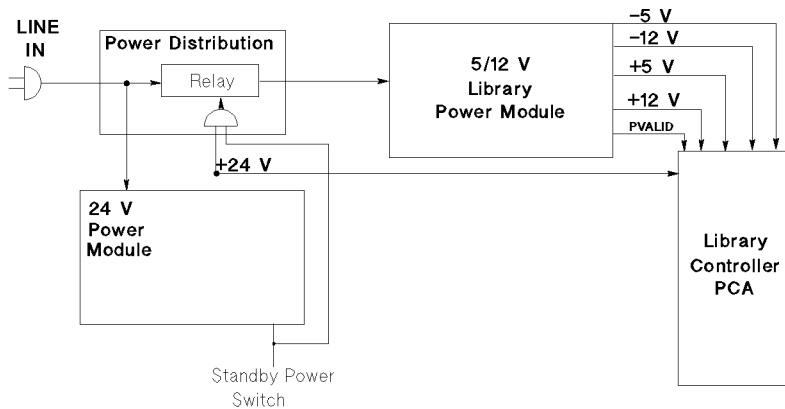


Figure 6-4. Power Supplies and Poweron Sequence

Line power is connected through the power distribution PCA. Line power is direct to the 24-volt power supply. When the 24-volt power supply comes up and is good, AND if the power standby switch on the front panel is in the ON position, the output of the 24-volt power supply is enabled to the relays, allowing line power to be applied to the 5/12-volt power supply for the library.

SCSI Repeater/Converter PCA

Internally, the library has a single-ended SCSI bus. Through a repeater/converter PCA, it can connect to either a single-ended or a differential external bus.

See the diagram on the next page:

The differential and single-ended connectors are on the right side of Figure 6-5, and the single-ended bus connection to the library is on the left side of the diagram. A slider switch between the two external connectors selects which type of input will be accepted.

Four jumpers select the configuration for termination alternatives (listed from top to bottom on the left side of Figure 6-4):

- J6 - enable/disable differential host TERMPOWER. PINS 1 and 2 jumpered together allows the PCA to provide TERMPOWER to the differential external [host] SCSI bus (default).
- J5 - enable/disable internal bus TERMPOWER. PINS 1 and 2 jumpered together allows the PCA to provide TERMPOWER to the internal SCSI bus (default).
- J4 - bus terminator configuration. PINS 1 and 2 jumpered together enable bus termination (default). When enabled, active termination is supplied for the internal bus at this PCA; termination at the other end of the SCSI cable is by a clamp terminator attached to the SCSI cable near the Drive 1 connection.
- J1 - enable/disable single-ended host TERMPOWER. PINS 1 and 2 jumpered together allows the PCA to provide TERMPOWER to the single-ended external [host] bus (default).

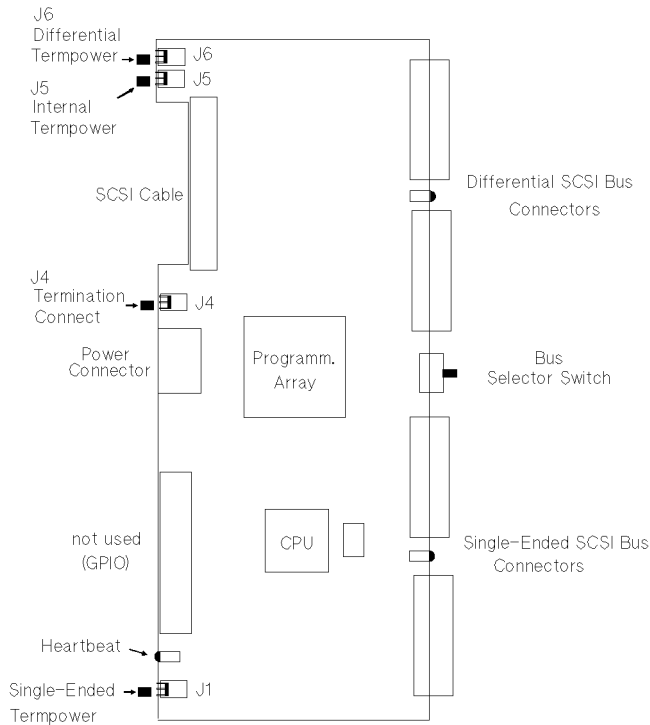


Figure 6-5. SCSI Repeater/Converter PCA

The two large components on the PCA are the field-programmable gate array and the microprocessor.

The microprocessor is an 80C52 that has flash-programmable memory on board. (There are no boot ROMs on this PCA.) The chip can be reprogrammed; however, it must be taken off of the PCA to do so.

The Field-Programmable Gate Array cannot be reprogrammed.

6-16 Theory of Operation

A “heartbeat” LED is located on the left, near the bottom edge of the board. This LED will continuously flash at a slow rate when power is on. If the LED is either on steady, or off, this indicates a problem with the PCA.

In repeater mode, this PCA looks transparent on the bus and passes all SCSI transactions through. The interface type may also be converted from single-ended to differential depending on the interface mode switch setting. This switch is located on the top of the PCA.

An LED, visible through the mounting bracket, is located between the interface connectors. These LEDs light to show which interface has been selected. If the wrong interface type is connected to the interface connector on this PCA, the LED will continuously and rapidly flash to alert the user to this error. No damage is caused to the chips on the PCA by having connectors in the wrong position.

During powerup, the position of the interface selector switch is checked to see which external bus is active and if the proper bus type is on the selected interface port.

If the differential bus is active, the DIFFSENSE signal on the SCSI bus is checked. If this signal is LOW, it means that a single-ended bus has erroneously been connected to the differential connector. The bus is immediately made inactive, to protect the chips.

In addition to checking the position of the interface select switch on powerup, the controller is informed of any change to this switch during normal operation. If the switch position is changed, a BUS RESET signal is sent to the library on the internal SCSI bus. This will cause a “Unit Attention” condition to be reported to the host.

Note

It is important to provide proper termination on whichever external SCSI bus (single-ended or differential) that is in use. If the SCSI bus is not being daisy-chained to another peripheral (and terminated there) the unused connector on the PCA must have a terminator attached.

Note

Single-ended and differential SCSI terminators are different.

Note

The unused ports may have external cables/terminators connected to them.

Translate Frame

The translate frame assembly consists of a frame which moves the picker, and a picker which holds, inserts, and removes cartridges from drives and storage slots.

The picker in this library is capable of holding one tape cartridge. SCSI commands, such as Read Element Status and Mode Sense, report back a single element address for the transport element. In this library, the single element address is 0.

6-18 Theory of Operation

Error Reduction, Detection and Correction

Error reduction and correction is achieved through several digital linear tape technology characteristics:

- Durability

The digital linear tape technology features linear recording, low tape tension and minimal contact between the read/write heads and the tape. These features result in a durable technology, minimizing wear on the drives and the tape.

- Data Recovery

Digital linear tape technology implements a multi-layer data integrity methodology to provide complete subsystem data protection. During write operations, digital linear tape technology protects data as it is brought into the drive from the bus, while it is in the controller, and as it is written to tape. During read operations, digital linear tape technology also protects data from the time it is read from tape until it goes out over the bus.

- Tape Block Format

The format of the digital linear tape supports data integrity. The DLT data “entity” is 20 blocks: 16 data blocks of data and 4 blocks of error-correction coding (ECC). A data block, which is 4 Kbytes long, incorporates user data, cyclic redundancy check (CRC), error detection code (EDC), indexes and a control field. The CRC, EDC, and ECC codes contribute directly to error detection and correction. The indexes are used for data compression and the control field contains physical and logical information about the block.

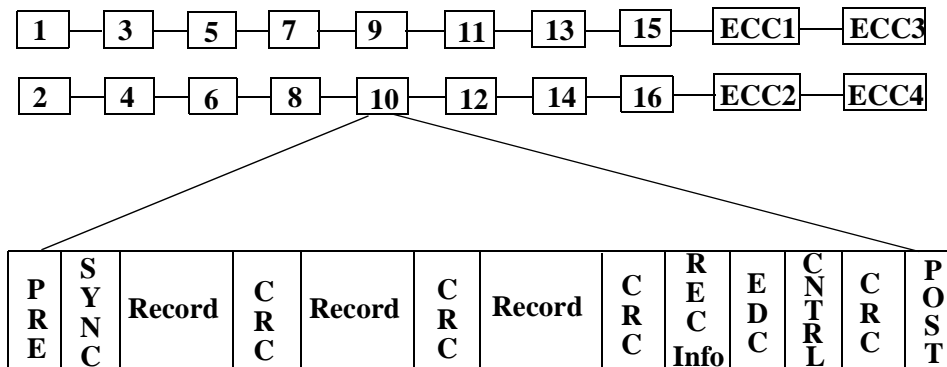


Figure 6-6. Digital Linear Tape Media Block Format

Multi-Level Error Detection

Multiple techniques are combined in the digital linear tape drive to maximize error detection. A CRC-64 error detection code, an EDC-16, a CRC-16 and other detection methods combine forces to provide an undetected error rate of 1×10^{-27} .

Digital Linear Tape error detection is interwoven throughout all controller and read/write operations:

- The SCSI bus brings user data into the drive and the controller calculates a CRC-16 code and appends it to the end of each record. This code provides record-level error detection.
- At the end of each 4-Kbyte data block, the drive calculates an EDC-16 code

6-20 Theory of Operation

on the data and indexes. During a write operation, this detection code is used to find errors in the block while the data is still in the controller and after it is written to tape. During read operations it detects errors as data is brought from the tape into the controller.

- Parity checking provides additional data protection in the controller memory.
- As each data block is written from the controller to tape, the controller calculates a CRC-64 code on the entire block, including user data, indexes and control field. This code is used to detect any errors that may occur during the write operation. For read operations, the CRC-64 detects errors as data is brought into the controller from tape.
- Digital linear tape technology provides additional protection by duplicating the control field information on both tracks being written. To ensure data integrity, the control fields are compared byte-for-byte, during read operations.
- A read operation is performed after each block is written to tape (while the data is still in the controller) to ensure the integrity of data as it is written to tape. The drive recalculates the error detection codes from the data read and compares the codes against those still in the controller memory. The controller checks the CRC-64 first, followed by the EDC-16, to ensure that no errors have occurred. After checking these codes, the controller verifies that it is reading the correct block by comparing a random tag stored in the block being read with the tape saved in the controller. During read operations, the drive performs similar checks and compares the control fields on the two tracks, byte-by-byte, to ensure data integrity.

Error Correction

During write operations, if an error is detected by the read after write, the drive rewrites the data block further down the tape until the read-after-write check validates that the block is correct. An ECC code is calculated on the data.

During read operations, if an error occurs, the drive recovers data using this same ECC code. The drive can recover up to four 4-Kbyte blocks of data within a 20-block entity. Four consecutive blocks translates to two inches of DLT tape, suggesting that even if up to two consecutive inches of tape are damaged on a single track, the drive can recover the data. The drive even attempts to recover from an error involving more than four blocks in a 20-block entity, by using an adaptive retry algorithm which rereads the entity multiple times while stepping the read head.

Service Notes / IOSMs

No service notes or IOSMs were published as of print date of this manual.

