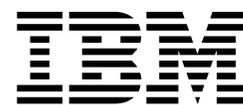


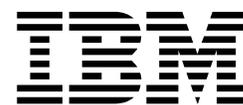
IBM TotalStorage  
Ultrium Scalable Tape Library 3583



# Maintenance Information



IBM TotalStorage  
Ultrium Scalable Tape Library 3583



# Maintenance Information

**Note!**

Before using this information and the product it supports, be sure to read the general information under "Notices" on page D-1.

To ensure that you have the latest publications, visit the web at

<http://www.ibm.com/storage/lto>

**Third Edition (May 2003)**

This edition applies to the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information*, SA37-0425-02, and to the subsequent releases and modifications until otherwise indicated in new editions. This edition replaces SA37-0425-01.

The revision character I found in this document identifies the information that has been added or changed.

A readers' comment form is provided at the back of this guide. Either mail the form or fax it to (520) 799-2230. If the form has been removed, address your comments about this guide to:

IBM Corporation  
Department GZW  
9000 South Rita Road  
Tucson, Arizona 85775-4401  
U.S.A.

© Copyright International Business Machines Corporation 2000, 2003. All rights reserved.

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

---

# Contents

<b>Figures</b> . . . . .	ix
<b>Tables</b> . . . . .	xiii
<b>Preface</b> . . . . .	xv
Intended Audience . . . . .	xv
Organization . . . . .	xv
Related Publications . . . . .	xvi
Getting Assistance . . . . .	xvi
<b>Chapter 1. Introduction</b> . . . . .	1-1
Description . . . . .	1-2
Server Attachment . . . . .	1-3
SCSI Interface . . . . .	1-3
Fibre Channel Attachment . . . . .	1-4
Tape Drives and Drive Sleds . . . . .	1-5
Ultrium 2 Tape Drives. . . . .	1-6
Ultrium 1 Tape Drives. . . . .	1-6
Speed Matching. . . . .	1-7
Channel Calibration . . . . .	1-7
Power Management . . . . .	1-7
Tape Cartridges . . . . .	1-7
Mixing Media in Drives . . . . .	1-8
Mixing Drive Types . . . . .	1-9
Functional Units. . . . .	1-9
Cartridge Storage . . . . .	1-9
I/O Station . . . . .	1-11
Library Control Hardware . . . . .	1-11
Robotic System . . . . .	1-11
RMU with TotalStorage Specialist . . . . .	1-12
SAN Data Gateway Module with TotalStorage Specialist . . . . .	1-12
Optional Features . . . . .	1-13
Feature License . . . . .	1-13
Multi-Path Architecture . . . . .	1-14
Library Sharing . . . . .	1-15
Example Configurations . . . . .	1-16
Using Multiple Logical Libraries . . . . .	1-17
Using Multiple Control Paths . . . . .	1-18
Specifications . . . . .	1-19
Product Environment . . . . .	1-20
Maintenance Plan . . . . .	1-20
Maintenance Start . . . . .	1-20
Preventive Maintenance . . . . .	1-20
Functional Diagram . . . . .	1-21
Functional Diagram for a Library With the Multi-Path Feature. . . . .	1-23
Functional Diagram for a Library Without the Multi-Path Feature . . . . .	1-24
<b>Chapter 2. Safety Instructions</b> . . . . .	2-1
Danger Notice . . . . .	2-2
Caution Notice . . . . .	2-2
Attention Notice . . . . .	2-4
Area of Application. . . . .	2-4
Laser Safety and Compliance. . . . .	2-4

Class I Laser Product . . . . .	2-4
3583 Library ac Grounding Inspection. . . . .	2-5
Guards . . . . .	2-6
Access to the Library . . . . .	2-6
Main Switch . . . . .	2-7
Before Working on Equipment . . . . .	2-7
Normal Operating Modes . . . . .	2-7
Emergency Operating Mode . . . . .	2-7
Before Restarting Equipment . . . . .	2-8
Working on Parts With Line Voltage Present . . . . .	2-8
Mechanical Maintenance . . . . .	2-9
Safety Check. . . . .	2-9
<b>Chapter 3. Panel . . . . .</b>	<b>3-1</b>
Overview . . . . .	3-2
Operator Panel . . . . .	3-2
I/O Station Status Area . . . . .	3-3
Library Status Area . . . . .	3-5
Drive Status Area . . . . .	3-5
Message Area . . . . .	3-7
Operator/CE Panel Menus . . . . .	3-7
Operator/CE Panel Flowcharts . . . . .	3-8
<b>Chapter 4. Start . . . . .</b>	<b>4-1</b>
Overview . . . . .	4-2
Maintenance Starting Point. . . . .	4-2
Library Service Approach . . . . .	4-2
Start Service . . . . .	4-3
Analyze Tape Library Power Problems . . . . .	4-5
Analyze RMU Problems. . . . .	4-6
Other Library Failures . . . . .	4-7
<b>Chapter 5. Fault Symptom Index . . . . .</b>	<b>5-1</b>
Overview . . . . .	5-2
Service Action Codes. . . . .	5-3
Drive Error Codes . . . . .	5-19
<b>Chapter 6. Locations . . . . .</b>	<b>6-1</b>
Tape Library Subsystem Overview . . . . .	6-2
Tape Library Front View . . . . .	6-3
Rear View of Tape Library with SCSI Attachment . . . . .	6-4
I Rear View of Tape Library with Native Fibre Channel Attachment . . . . .	6-5
Tape Library Serial Ports . . . . .	6-6
Y-Axis and Rotary-Axis Assembly . . . . .	6-7
Picker Assembly . . . . .	6-8
I/O Station (12 Slot) . . . . .	6-9
I/O Station (Single Slot) . . . . .	6-10
Main Controller PCBA . . . . .	6-11
Display Assembly. . . . .	6-12
Power Distribution PCBA (Type I) . . . . .	6-13
Power Distribution Board (Type II) . . . . .	6-14
Picker Control Board . . . . .	6-15
Host SCSI Interface Board . . . . .	6-16
I Serial Diagnostic Port Board. . . . .	6-17
DC Power Supply Assembly. . . . .	6-18
AC Input Power Module . . . . .	6-19

SAN Data Gateway Module (optional)	6-20
Remote Management Unit	6-21
<b>Chapter 7. Check, Adjust, Remove, and Replace</b>	<b>7-1</b>
Cartridge Removal from Picker Assembly	7-2
Tape Drive Sled	7-3
Picker Assembly	7-5
I Picker Carriage Arm Assembly (Picker Assembly and Control Board)	7-9
Rotary Axis Motor	7-12
Picker Control Board	7-14
Y-Axis Drive Belt	7-16
Y-Axis Flex Cable	7-22
Display Assembly Flex Cable	7-23
Main Controller to Power Distribution Cables (Power or Signal Interface)	7-25
Power Distribution to Drive Sled Cable	7-26
Y-Axis Motor Assembly	7-27
Y-Axis Drive Shaft Assembly	7-28
Storage Columns	7-29
Main Controller Board	7-30
I RMU Network Interface Cable	7-32
Remote Management Unit	7-35
SAN Data Gateway Module	7-37
I Accessory Bay Cable for the SAN Data Gateway Module	7-38
Host SCSI Interface Board	7-41
I Serial Diagnostic Port Board	7-42
Display Assembly	7-43
Power Distribution Board	7-45
12-Slot I/O Station	7-46
Single-Slot I/O Station	7-47
Power Supplies Check Procedure	7-48
Power	7-48
ac Input Power Module	7-48
dc Power Supply	7-49
Door Lock Assembly	7-53
Door Interlock Switch and Cable Assembly	7-54
Plastic Top Door	7-55
Plastic Lower Front Door Panel	7-56
Side Cover	7-57
Top Cover	7-58
<b>Chapter 8. Service Procedures</b>	<b>8-1</b>
Overview	8-2
Methods of Capturing Logs	8-2
I Capturing Logs by Using HyperTerminal	8-2
Updating Firmware	8-4
Updating All Firmware by Using the RMU	8-7
Updating Library and Drive Firmware by Using the SCSI Bus	8-8
Updating Drive Firmware by Using an FMR Tape	8-9
Updating Library Firmware by Using the Library's Serial Port	8-11
Reseating Cables	8-13
Observing Library Robotics	8-15
SCSI or Fibre Channel Wrap Test	8-16
I SAN Data Gateway Module Wrap Test	8-16
<b>Chapter 9. Messages</b>	<b>9-1</b>
Obtaining Tape Drive or Library Error Information at the Host	9-2

Obtaining Error Information From an RS/6000. . . . .	9-2
Obtaining Service Information Message from an AS/400 . . . . .	9-8
AS/400 System with RISC Processor . . . . .	9-8
Obtaining Error Information From a Sun System . . . . .	9-9
Obtaining Error Information From an HP-UX System . . . . .	9-9
<b>I Chapter 10. Sense . . . . .</b>	<b>10-1</b>
I Library Sense Data . . . . .	10-2
I Drive Sense Data. . . . .	10-6
<b>Chapter 11. Power . . . . .</b>	<b>11-1</b>
Overview . . . . .	11-2
ac and dc Power . . . . .	11-2
ac and dc Power Distribution . . . . .	11-3
I ac and dc Power Distribution for Type I Power Supply in a Library With the Multi-Path Feature	11-4
I ac and dc Power Distribution for Type I Power Supply in a Library Without the Multi-Path Feature	11-5
I ac and dc Power Distribution for Type II Power Supply in a Library With the Multi-Path Feature	11-6
I ac and dc Power Distribution for Type II Power Supply in a Library Without the Multi-Path Feature	11-7
<b>Chapter 12. Cable . . . . .</b>	<b>12-1</b>
Overview . . . . .	12-2
I Cable Diagram for Type I Power Distribution PCBA in a Library With the Multi-Path Feature . . . . .	12-3
I Cable Diagram for Type I Power Distribution PCBA in a Library Without the Multi-Path Feature	12-4
I Cable Diagram for Type II Power Distribution PCBA in a Library With the Multi-Path Feature . . . . .	12-5
I Cable Diagram with Type II Power Distribution PCBA in a Library Without the Multi-Path Feature	12-6
<b>Chapter 13. Install . . . . .</b>	<b>13-1</b>
<b>Chapter 14. Parts List . . . . .</b>	<b>14-1</b>
Other Available Parts . . . . .	14-4
Power Cords . . . . .	14-4
Power Cord Information . . . . .	14-5
<b>TapeAlert Flags . . . . .</b>	<b>A-1</b>
TapeAlert Flags Supported by the Drive . . . . .	A-1
Setting the Write-Protect Switch. . . . .	A-4
TapeAlert Flags Supported by the Library . . . . .	A-5
Resolving Problems . . . . .	A-6
Methods of Receiving Errors and Messages . . . . .	A-7
Using Host Sense Data . . . . .	A-8
Viewing the Drive Error Log . . . . .	A-9
Resolving Problems Reported to the Server . . . . .	A-9
Fixing SCSI Bus Errors . . . . .	A-9
I    Fixing Fibre Channel Errors . . . . .	A-11
Resolving Media-Related Problems . . . . .	A-14
Operating the Tape Drive . . . . .	A-15
Status Light. . . . .	A-16
Unload Button . . . . .	A-16
Single-Character Display . . . . .	A-16
Inserting a Tape Cartridge . . . . .	A-17
Removing a Tape Cartridge . . . . .	A-18
Cleaning the Drive Head . . . . .	A-18
Selecting a Diagnostic or Maintenance Function . . . . .	A-19
Repositioning or Reattaching a Leader Pin . . . . .	A-28
I    Repositioning a Leader Pin . . . . .	A-28
I    Reattaching a Leader Pin. . . . .	A-30

<b>Removing a Tape Cartridge</b> . . . . .	B-1
Resetting the Drive and Ejecting the Cartridge . . . . .	B-1
Manually Removing the Tape Cartridge . . . . .	B-2
Removing the Cartridge . . . . .	B-2
I    Fixing an Internal Jam . . . . .	B-5
<b>Element Addressing</b> . . . . .	C-1
All Operating Systems and Windows 200x with RSM Disabled . . . . .	C-2
Windows 200x with RSM Enabled . . . . .	C-5
<b>Notices</b> . . . . .	D-1
Trademarks . . . . .	D-2
Electronic Emission Notices . . . . .	D-3
Federal Communications Commission (FCC) Class A Statement . . . . .	D-3
European Union (EU) Electromagnetic Compatibility Directive . . . . .	D-3
Chinese Class A Electronic Emission Statement . . . . .	D-4
Taiwan Class A Electronic Emission Statement . . . . .	D-4
Japan VCCI Class A ITE Electronic Emission Statement . . . . .	D-4
Industry Canada Class A Emission Compliance Statement . . . . .	D-4
Avis de conformité à la réglementation d'Industrie Canada . . . . .	D-4
Germany Electromagnetic Compatibility Directive . . . . .	D-4
<b>Glossary</b> . . . . .	E-1
<b>Index</b> . . . . .	X-1



# Figures

1-1.	Ultrium Scalable Tape Library(Stand-alone configuration).	1-3
1-2.	Gigabit interface converter (GBIC) module with dust protector .	1-5
1-3.	Fibre Channel Ultrium 2 Tape Drive in the Ultrium Scalable Tape Library .	1-6
1-4.	SCSI Ultrium 1 Tape Drive in the Ultrium Scalable Tape Library .	1-6
1-5.	Examples of methods for mixing Ultrium drive types .	1-9
1-6.	Storage Column Configurations and Coordinate system .	1-10
1-7.	Examples of configurations for a Ultrium Scalable Tape Library .	1-16
1-8.	Functional diagram for a library with the Multi-Path feature .	1-23
1-9.	Functional diagram for a library without the Multi-Path feature Functional Diagram .	1-24
2-1.	AC Grounding Diagram (50 Hz and 60 Hz) .	2-5
2-2.	ac Power Module and dc Power Supplies locations. .	2-7
3-1.	Operator Panel .	3-2
3-2.	I/O Station Status Area .	3-3
3-3.	Library Status Area .	3-5
3-4.	Drive Status Area .	3-5
3-5.	Messages Area .	3-7
3-6.	Operator/CE Panel Flowchart. .	3-8
4-1.	Power Map .	4-5
4-2.	RMU Map .	4-6
5-1.	Error Log Dialog .	5-3
6-1.	Tape Library Overview (Standalone Model). .	6-2
6-2.	Front view of tape library with door opened. .	6-3
6-3.	Rear view of tape library with SCSI attachment .	6-4
6-4.	Rear view of tape library with native fibre channel attachment .	6-5
6-5.	Tape library serial ports .	6-6
6-6.	Y-Axis and Rotary-Axis Assembly .	6-7
6-7.	Picker Assembly .	6-8
6-8.	Rear View of the I/O Station .	6-9
6-9.	I/O Station (Single Slot) .	6-10
6-10.	Main controller PCBA .	6-11
6-11.	Operator panel assembly .	6-12
6-12.	Power distribution PCBA (Type I) .	6-13
6-13.	Power distribution PCBA (Type II). .	6-14
6-14.	Picker control board. .	6-15
6-15.	Host SCSI interface board for SCSI attachment .	6-16
6-16.	Serial diagnostic port board for native Fibre Channel attachment .	6-17
6-17.	DC Power Supply Assembly. .	6-18
6-18.	AC Power Input Module .	6-19
6-19.	SAN Data Gateway Module (optional) .	6-20
6-20.	RMU .	6-21
7-1.	Cartridge Removal from Picker Assembly .	7-2
7-2.	Cable Connections. .	7-3
7-3.	Tape Drive Sled Removal and Replacement .	7-4
7-4.	Flat Washer and Casting .	7-5
7-5.	Picker Assembly Removal and Replacement .	7-7
7-6.	Proper orientation of picker control PCBA to picker support ground wire connector .	7-8
7-7.	Top Cover Removal .	7-9
7-8.	Picker Carriage Arm Assembly Removal and Replacement .	7-10
7-9.	Location of ground strap .	7-11
7-10.	Rotary Axis Motor Removal and Replacement .	7-13
7-11.	Picker Control Board Removal and Replacement .	7-15
7-12.	Top Cover Removal .	7-16
7-13.	Y-Axis Drive Belt Removal and Replacement .	7-17

7-14.	Removing the belt clamps . . . . .	7-18
7-15.	Tensioning screw and Ny-lock nuts . . . . .	7-18
7-16.	Stud and Tension pulley . . . . .	7-19
7-17.	Installing Belt Clamps . . . . .	7-20
7-18.	Y-Axis Flex Cable Removal and Replacement . . . . .	7-22
7-19.	Display Assembly Flex Cable Removal and Replacement . . . . .	7-23
I 7-20.	Display Assembly Flex Cable Removal and Replacement . . . . .	7-24
7-21.	Main to Power Distribution Cables Removal and Replacement . . . . .	7-25
7-22.	Power Distribution to Drive Sled Cable Removal and Replacement . . . . .	7-26
7-23.	Y-Axis Motor Assembly Removal and Replacement . . . . .	7-27
7-24.	Y-Axis Drive Shaft Removal and Replacement . . . . .	7-28
7-25.	Storage Removal and Replacement . . . . .	7-29
7-26.	Main Board Removal and Replacement . . . . .	7-31
I 7-27.	Removing the Lower Fibre Channel Bracket Sub-Assembly . . . . .	7-32
I 7-28.	View of the RMU Bracket Sub-Assembly and RMU Interface Cable Connector . . . . .	7-33
I 7-29.	Sliding the Main Controller PCBA Out of the Guiding Tracks . . . . .	7-33
7-30.	RMU . . . . .	7-35
7-31.	RMU Jumpers . . . . .	7-36
7-32.	SAN Data Gateway Module . . . . .	7-37
I 7-33.	Removing the T8 Torx Screws that Secure the Fibre Channel Bracket Sub-Assembly . . . . .	7-38
I 7-34.	Disconnecting the accessory bay cable from the Fibre Channel bracket sub-assembly . . . . .	7-39
I 7-35.	Disconnecting the accessory bay cable from the power distribution PCBA . . . . .	7-40
7-36.	Host SCSI Interface Board Removal and Replacement . . . . .	7-41
I 7-37.	Serial Diagnostic Port Board Removal and Replacement . . . . .	7-42
7-38.	Display Assembly Removal and Replacement . . . . .	7-44
7-39.	Power Distribution Board Removal and Replacement . . . . .	7-45
7-40.	I/O Station Removal and Replacement . . . . .	7-46
7-41.	I/O Station, Single Slot. . . . .	7-47
7-42.	ac Input Module Removal and Replacement . . . . .	7-48
7-43.	Comparing dc Power Supplies . . . . .	7-50
7-44.	DC Power Supply Removal and Replacement . . . . .	7-52
7-45.	Door Lock Assembly, Remove/Replace . . . . .	7-53
7-46.	Door Interlock Switch Removal and Replacement . . . . .	7-54
7-47.	Plastic Top Door Removal and Replacement. . . . .	7-55
7-48.	Plastic Lower Front Door Panel Removal and Replacement . . . . .	7-56
7-49.	Side Cover Removal and Replacement. . . . .	7-57
7-50.	Top Cover Removal and Replacement . . . . .	7-58
8-1.	Drives Dialog. . . . .	8-5
8-2.	About Menu . . . . .	8-5
8-3.	Status page . . . . .	8-6
8-4.	RMU firmware page . . . . .	8-7
I 8-5.	Main Menu (initial screen) . . . . .	8-9
I 8-6.	Command Menu . . . . .	8-9
I 8-7.	Drives Submenu . . . . .	8-10
I 8-8.	Firmware Update Dialog . . . . .	8-10
I 8-9.	Select Drive Dialog . . . . .	8-10
I 8-10.	Firmware Update Starting Dialog . . . . .	8-11
8-11.	Cable Diagram. . . . .	8-14
8-12.	Top Cover Removal . . . . .	8-15
9-1.	AIX ERRPT Library Error Log Example . . . . .	9-3
9-2.	AIX ERRPT Drive Error Log Example. . . . .	9-4
9-3.	Example of Error Suggesting SCSI Bus Problem, Which Takes Down Entire Bus. . . . .	9-5
9-4.	SCSI Problem Points to Library Control Path as Possible Cause. . . . .	9-6
9-5.	AIX ERRPT Commands Error Log Example . . . . .	9-7
11-1.	ac Power Module and dc Power Supplies locations . . . . .	11-2
I 11-2.	ac and dc power distribution for Type I power supply in a library with the Multi-Path feature . . . . .	11-4

11-3.	ac and dc power distribution for Type I power supply in a library without the Multi-Path feature . . . . .	11-5
11-4.	ac and dc power distribution for Type II power supply in a library with the Multi-Path feature . . . . .	11-6
11-5.	ac and dc power distribution for Type II power supply in a library without the Multi-Path feature . . . . .	11-7
12-1.	Cable diagram for Type I power distribution PCBA in a library with the Multi-Path feature . . . . .	12-3
12-2.	Cable diagram for Type I Power Distribution PCBA in a library without the Multi-Path feature . . . . .	12-4
12-3.	Cable diagram for Type II Power Distribution PCBA in a library with the Multi-Path feature . . . . .	12-5
12-4.	Cable diagram with Type II Power Distribution PCBA in a library without the Multi-Path feature . . . . .	12-6
14-1.	Types of receptacles . . . . .	14-7
A-1.	Cartridge Write-Protect Switch . . . . .	A-4
A-2.	Front view of the Ultrium Tape Drive. . . . .	A-15
A-3.	Inserting a Cartridge into the Ultrium Tape Drive . . . . .	A-17
A-4.	Leader pin in the incorrect and correct positions . . . . .	A-28
A-5.	Placing the dislodged leader pin into the correct position . . . . .	A-29
A-6.	Rewinding the tape into the cartridge . . . . .	A-29
A-7.	Leader Pin Reattachment Kit . . . . .	A-30
A-8.	Attaching the leader pin attach tool to the cartridge . . . . .	A-31
A-9.	Winding the tape out of the cartridge . . . . .	A-32
A-10.	Removing the C-clip from the leader pin . . . . .	A-32
A-11.	Attaching the leader pin to the tape . . . . .	A-33
B-1.	Resetting the Tape Drive . . . . .	B-1
B-2.	Removing the Drive Sled . . . . .	B-3
B-3.	Determining whether the tape is broken . . . . .	B-3
B-4.	Removing the top cover of the drive . . . . .	B-6
B-5.	Rewinding the leader pin into the tape cartridge . . . . .	B-7
B-6.	Guiding the leader block into the home position . . . . .	B-8
B-7.	Rotating the loader motor gear until the leader block is fully inside the drive . . . . .	B-9
B-8.	Rotating the loader motor gear so that the leader block retracts . . . . .	B-10
B-9.	Rotating the loader motor gear until the cartridge ejects . . . . .	B-11
C-1.	Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station . . . . .	C-2
C-2.	Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station . . . . .	C-3
C-3.	Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots . . . . .	C-4
C-4.	Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station . . . . .	C-5
C-5.	Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station . . . . .	C-6
C-6.	Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots . . . . .	C-7



## Tables

1-1.	Compatible cartridges and drives . . . . .	1-8
1-2.	Ultrium Scalable Tape Library Configurations. . . . .	1-11
1-3.	Optional features and codes for the Ultrium Scalable Tape Library. . . . .	1-13
1-4.	Quantity of drives that are supported per adapter and operating system for iSeries and AS/400 servers . . . . .	1-18
1-5.	Specifications for the Ultrium Scalable Tape Library . . . . .	1-19
1-6.	Tape Library Major Functional Areas. . . . .	1-21
2-1.	Caution Notice Symbols. . . . .	2-2
2-2.	Examples of Symbol Use . . . . .	2-3
3-1.	I/O Station Icons . . . . .	3-4
3-2.	Library Status Area . . . . .	3-5
3-3.	Drive Status Icons . . . . .	3-6
4-1.	Start Service . . . . .	4-3
4-2.	Problem Analysis for Failures without Service Action Codes . . . . .	4-7
5-1.	Service Action Codes. . . . .	5-4
5-2.	Drive error codes. . . . .	5-19
7-1.	Interchange of Power Supplies with Library Power Architecture . . . . .	7-51
8-1.	Library Cables . . . . .	8-13
9-1.	AIX ERRPT Library Sense Data. . . . .	9-3
9-2.	AIX ERRPT Drive Sense Data . . . . .	9-4
10-1.	Sense Information Format . . . . .	10-2
10-2.	Sense Keys. . . . .	10-2
10-3.	Additional Sense Codes and Qualifiers (Bytes 12 and 13). . . . .	10-3
10-4.	LTO Tape Drive Sense Data. . . . .	10-6
14-1.	Parts List for Ultrium Scalable Tape Library . . . . .	14-1
14-2.	Other Available Parts . . . . .	14-4
14-3.	Power cord information . . . . .	14-5
A-1.	TapeAlert Flags Supported by the Ultrium Tape Drive . . . . .	A-1
A-2.	TapeAlert Flags Supported by the Tape Library . . . . .	A-5
A-3.	Troubleshooting Tips for the Ultrium Tape Drive . . . . .	A-6
A-4.	Methods of Receiving Errors and Messages for the Ultrium Tape Drive . . . . .	A-7
A-5.	Host Method of Recording Tape Drive Errors . . . . .	A-8
A-6.	Choosing the port for your topology and Fibre Channel connection . . . . .	A-11
A-7.	Meaning of Status Light Activity . . . . .	A-16
A-8.	Diagnostic and maintenance functions . . . . .	A-19



---

## Preface

This guide contains information and instructions necessary for the installation and service of the IBM TotalStorage Ultrium Scalable Tape Library 3583. Throughout this guide, references to the *tape library* or *library* will mean the IBM TotalStorage Ultrium Scalable Tape Library 3583.

---

## Intended Audience

This guide is intended for trained service personnel who install and repair the tape library.

---

## Organization

This guide contains the following information.

- Chapter 1, “Introduction”, on page 1-1 describes the contents of this guide, as well as provides a description of the tape library and its functions.
- Chapter 2, “Safety Instructions”, on page 2-1 gives general safety procedures.
- Chapter 3, “Panel”, on page 3-1 provides a description of the Operator/CE Panel and functions.
- Chapter 4, “Start”, on page 4-1 provides a starting point for all maintenance actions.
- Chapter 5, “Fault Symptom Index”, on page 5-1 provides all service actions for reported symptoms.
- Chapter 6, “Locations”, on page 6-1 provides information to locate major components in the library.
- Chapter 7, “Check, Adjust, Remove, and Replace”, on page 7-1 provides procedures for making checks, adjustments, removals and replacements of field replaceable units.
- Chapter 8, “Service Procedures”, on page 8-1 provides common service procedures for the library.
- | • Chapter 9, “Messages”, on page 9-1 gives information about obtaining tape drive error information at the host or from RS/6000®, AS/400®, Sun, and HP-UX systems.
- | • Chapter 10, “Sense”, on page 10-1 provides sense information about the tape library and the Ultrium Tape Drives.
- | • Chapter 11, “Power”, on page 11-1 provides power distribution diagram for the library.
- | • Chapter 12, “Cable”, on page 12-1 provides cable diagram for the library.
- | • Chapter 13, “Install”, on page 13-1 gives instructions for installing the tape library and other optional features.
- | • Chapter 14, “Parts List”, on page 14-1 lists FRU numbers for the parts in the library and provides power cord information for different countries (or regions).
- | • “TapeAlert Flags” on page A-1 lists TapeAlert flags that the tape library and the Ultrium Tape Drive support.
- | • “Removing a Tape Cartridge” on page B-1 provides information for removing a tape cartridge from an Ultrium Tape Drive.
- | • “Element Addressing” on page C-1 shows element addressing information for the drives and storage slots in the tape library.

---

## Related Publications

Refer to the following publications for additional information. To ensure that you have the latest publications, visit the web at <http://www.ibm.com/storage/1to> .

- | • *IBM TotalStorage Ultrium Scalable Tape Library 3583 SCSI Reference*, GA32-0453, provides supported SCSI commands and protocol governing the behavior of SCSI interface for the tape library.
- | • *IBM TotalStorage Ultrium Scalable Tape Library 3583 Quick Reference*, GX35-0557, illustrates how to install and operate the tape library.
- | • *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*, GA32-0411, provides information for installing and operating the tape library.
- | • *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*, GA32-0436, provides installation, operation, and service information for the SAN Data Gateway Module.
- | • *IBM Ultrium Device Driver Installation and User's Guide*, GA32-0430, provides instructions for attaching IBM-supported hardware to open-systems operating systems. It indicates what devices and levels of operating systems are supported. Also gives requirements for adapter cards, and tells how to configure hosts to use the device driver. All the above are with the Ultrium family of devices.
- | • *IBM Ultrium Device Driver Programming Reference* , GC-0483, supplies information to application owners who want to integrate their open-systems applications with IBM-supported Ultrium hardware. The reference contains information about the application programming interfaces (APIs) for each of the various supported operating-system environments.

---

## Getting Assistance

- | If this document does not help you solve your problem, contact your next level of support.

---

# Chapter 1. Introduction

Description . . . . .	1-2
Server Attachment . . . . .	1-3
SCSI Interface . . . . .	1-3
Fibre Channel Attachment . . . . .	1-4
Attaching by Using a Native Fibre Channel Connection . . . . .	1-5
Attaching by Using the SAN Data Gateway Module. . . . .	1-5
Tape Drives and Drive Sleds . . . . .	1-5
Ultrium 2 Tape Drives. . . . .	1-6
Ultrium 1 Tape Drives. . . . .	1-6
Speed Matching. . . . .	1-7
Channel Calibration . . . . .	1-7
Power Management . . . . .	1-7
Tape Cartridges . . . . .	1-7
Mixing Media in Drives . . . . .	1-8
Mixing Drive Types . . . . .	1-9
Functional Units. . . . .	1-9
Cartridge Storage . . . . .	1-9
Storage Slot Numbering . . . . .	1-10
I/O Station . . . . .	1-11
Library Control Hardware . . . . .	1-11
Robotic System . . . . .	1-11
RMU with TotalStorage Specialist. . . . .	1-12
SAN Data Gateway Module with TotalStorage Specialist . . . . .	1-12
Optional Features . . . . .	1-13
Feature License . . . . .	1-13
Multi-Path Architecture . . . . .	1-14
Library Sharing . . . . .	1-15
Example Configurations . . . . .	1-16
Using Multiple Logical Libraries . . . . .	1-17
Using Multiple Logical Libraries for Library Sharing . . . . .	1-17
Using Multiple Logical Libraries for Mixed Drive Types . . . . .	1-17
Using Multiple Control Paths . . . . .	1-18
Using Multiple Control Paths for iSeries and AS/400 Attachment . . . . .	1-18
Using Multiple Control Paths for Control Path Failover . . . . .	1-18
Specifications . . . . .	1-19
Product Environment . . . . .	1-20
Maintenance Plan . . . . .	1-20
Maintenance Start . . . . .	1-20
Preventive Maintenance . . . . .	1-20
Functional Diagram . . . . .	1-21
Functional Diagram for a Library With the Multi-Path Feature. . . . .	1-23
Functional Diagram for a Library Without the Multi-Path Feature . . . . .	1-24

---

## Description

The IBM® TotalStorage™ Ultrium Scalable Tape Library 3583 is a stand-alone or rack-mounted device that provides reliable, automated tape handling and storage for unattended mid-range systems and network servers. The library handles a wide range of data storage needs, including backup, archiving, software program distribution, automatic data migration between disk storage and tape, and disaster recovery. Cartridges can be mounted and dismounted on tape drives by using supporting software from the server (host) without operator intervention.

| The Ultrium Scalable Tape Library is installed with high-performance IBM LTO Ultrium Tape Drive technology that offers a native capacity of 200 GB (400 GB at 2:1 compression) with the new IBM TotalStorage LTO Ultrium 200 GB Data Cartridge. It also offers a native data rate of 35 MB/s (70 MB/s at 2:1 compression). Ultrium 2 Tape Drives can read and write Ultrium 1 Tape Drive data cartridges, and Ultrium 2 Tape Drives and cartridges can reside in the same library with Ultrium 1 Tape Drive data cartridges.

| Ultrium 2 Tape Drives can come with Low Voltage Differential (LVD) Ultra160 SCSI interfaces, High Voltage Differential (HVD) Ultra SCSI interfaces, or the new 2-Gb Fibre Channel interface with fabric attachment. Additional new features include native switched fabric Fibre Channel drive attachment, Multi-Path architecture, the ability to partition the library into three logical libraries, and an optional control path failover feature for AIX®.

The library is designed for easy expansion. It can accommodate from one to six tape drives and has cartridge storage configurations that hold 18, 36, 54, or 72 cartridges. This provides total capacities of 3.6 terabyte (TB), 7.2 TB, and 14.4 TB of native data. With 2:1 compression the largest model of tape library can store 28.8 TB of data. Any starting configuration can be upgraded to the maximum configuration of six drives and 72 cartridges. Upgrade features are modular units that are easy to install.

The library offers two input/output (I/O) station options: single-slot or 12-slot. The 12-slot I/O station is required to achieve the 72 cartridge maximum library configuration. With the 12-slot I/O station feature, the library can be configured as 72 storage slots, or 60 storage slots and 12 I/O slots.

All libraries come equipped with one modular dc power supply. A second redundant power supply feature is available.

| A Remote Management Unit (RMU) comes standard in every library. The RMU provides remote access to the library over a network. Library status can be sent to the network as Simple Network Management Protocol (SNMP) traps. An application called the TotalStorage Specialist enables network access to the library for more detailed status and control. The TotalStorage Specialist provides access to all library operator panel functions.

| The Storage Area Network (SAN) Data Gateway Module is another available library feature. The gateway provides the small computer system interface (SCSI) library with an avenue into a SAN infrastructure. With 2-Gigabit (Gbit) port speeds the library is compatible with 2-Gbit Fibre Channel components. It is also backward compatible with 1-Gbit Fibre Channel hardware.

Figure 1-1 shows an example of an Ultrium Scalable Tape Library with optional features.

- |          |   |           |                                      |
|----------|---|-----------|--------------------------------------|
| <b>1</b> | I/O Station (12 slot shown)                                 | <b>8</b>  | RMU                                  |
| <b>2</b> | Front Door  | <b>9</b>  | Casters                              |
| <b>3</b> | Door Lock   | <b>10</b> | Tape Drive Sled                      |
| <b>4</b> | Door Handle   | <b>11</b> | Filler Plate                         |
| <b>5</b> | Operator Panel  | <b>12</b> | AC Input Power Module                |
| <b>6</b> | Host Interface Board (SCSI) or Serial Diagnostic Port Board | <b>13</b> | DC Power Supply                      |
| <b>7</b> | SAN Data Gateway Module (optional)                          | <b>14</b> | Redundant dc Power Supply (optional) |

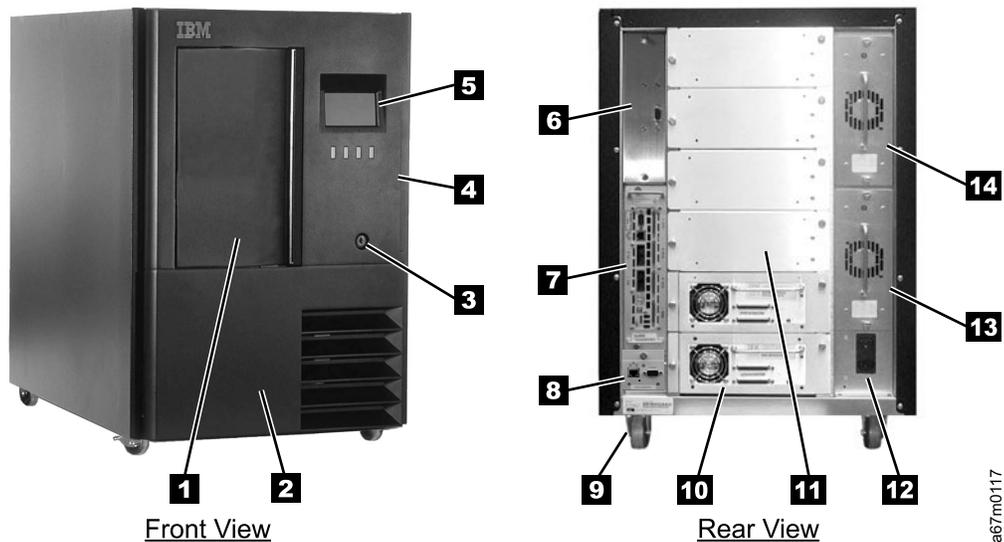


Figure 1-1. Ultrium Scalable Tape Library(Stand-alone configuration)

## Server Attachment

You can attach the Ultrium Scalable Tape Library to servers by using:

- SCSI interface (with or without a Multi-Path connection)
- Native Fibre Channel interface
- SAN Data Gateway Module interface

The sections that follow describe each type of interface.

### SCSI Interface

The Ultrium Scalable Tape Library operates as a set of SCSI-3 devices. For drives that use a SCSI interface, the following conditions apply:

- The Ultrium 2 Tape Drive can attach to a server through a Low Voltage Differential (LVD) Ultra160 SCSI interface or a High Voltage Differential (HVD) Ultra SCSI interface
- The Ultrium 1 Tape Drive can attach to a server through an LVD Ultra2 SCSI interface or an HVD Ultra SCSI interface

Each SCSI drive sled uses shielded, 68-pin connectors and can attach directly to a 2-byte-wide SCSI cable.

Any combination of up to two initiators (servers) and up to four targets (devices) is allowed on a single SCSI bus if the following conditions are met:

- | • The SCSI bus is terminated properly at each end
  - | • Cable restrictions and lengths are followed according to SCSI-3 standards
- | Under the SCSI-3 protocol, this type of attachment allows cable lengths of up to 25 m (81 ft) with the appropriate cable and terminator for HVD devices and up to 12 m (39 ft) for LVD devices.
- | You can attach the SCSI interface through a single path or multi-path connection.
- | **Important:** If you are using an AS/400 server and HVD drives, the AS/400 adapters are HVD SCSI and support only one initiator per bus. In addition, the medium changer and tape drives must be attached on the same SCSI bus. For these, and other tape drive performance reasons, a SCSI-configured tape library must be a single-drive, single-host configuration when attached to the AS/400.
- | For more information, see the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide*.

## Fibre Channel Attachment



Class I

**Attention:** This product contains an assembly that complies with the performance standards set by the U.S. Food and Drug Administration for a Class I Laser Product. This laser assembly is registered with the Department of Health and Human Services and is in compliance with IEC825.

- | To attach the library to a Fibre Channel interface, it must be equipped with the Multi-Path feature (feature code 1450 or 9450).
- | The 2-Gb interface is a 200-MB-per-second, full-duplex, serial-communications technology capable of interconnecting Ultrium Tape Drives that are separated by as much as 10 kilometers (7 miles).
- | Fibre Channel technology combines the best features of traditional input/output (I/O) interfaces (such as the throughput and reliability of SCSI and Programmed Control Interrupt) with the best features of networking interfaces (such as the connectivity and scalability of Ethernet and Token Ring). The technology offers a transport mechanism for delivering commands, and provides high performance by allowing processing to be done in the hardware.
- | You can establish Fibre Channel connections between Fibre Channel ports that reside in the Ultrium Scalable Tape Library, one or more servers, and the network interconnecting them. The network can consist of such elements as switches, hubs, bridges, and repeaters used in the interconnection.
- | The sections that follow describe ways to connect the library to a Fibre Channel server. For more information, see the section about using the Fibre Channel interface in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide*.

## Attaching by Using a Native Fibre Channel Connection

A library that supports native Fibre Channel attachment communicates with a server through an intermediary multi-path interface in one or more installed drives. In this type of connection, a host is connected directly to a drive rather than a library. Communication is accomplished as a host sends commands to and receives status or responses from one or more drives with multi-path interfaces.

Only Ultrium 2 Tape Drives support native Fibre Channel connections. Each drive has a single LC fiber connector located at the back.

## Attaching by Using the SAN Data Gateway Module

The gateway is the interface between the tape library and the SAN or Fibre Channel server. It provides Fibre Channel connectivity to the SCSI tape drives and SCSI medium changer in the library. Two Fibre Channel ports are available on the gateway. Each port is equipped with a gigabit interface converter (GBIC) module that lets you connect a fiber cable. The GBIC can transmit data at up to 2 Gbits per second by using a short-wave, multimode, subscriber connector (SC). Figure 1-2 shows the GBIC module.

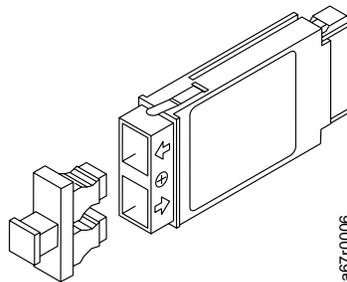


Figure 1-2. Gigabit interface converter (GBIC) module with dust protector

The gateway also has four LVD Ultra2 SCSI ports to which you can attach tape drives and the medium changer. To make the medium changer LVD connectors active, you must attach the gateway to the LVD connectors of the medium changer and you must set the configuration switch on the host interface board to the LVD setting (see “Host SCSI Interface Board” on page 6-16).

**Note:** The SAN Data Gateway Module supports only tape drives that use an LVD (SCSI) interface.

For a list of the supported adapters that you can use when connecting the Fibre Channel interface, visit the web at: <http://www.ibm.com/storage/lto>. Select LTO support, then Interoperability matrix and software (ISVs). Under Supported servers and operating systems, select IBM 3583 (Models) Tape Library.

---

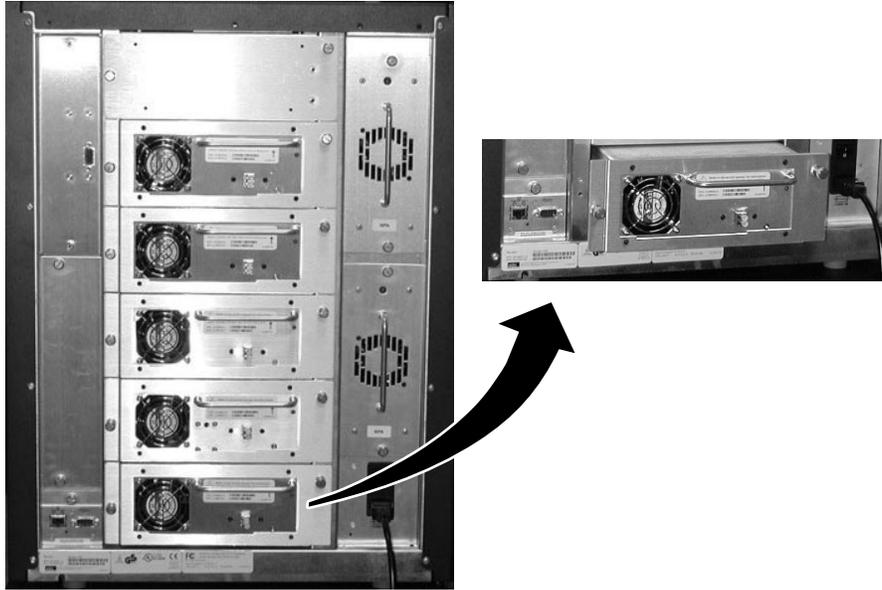
## Tape Drives and Drive Sleds

The Ultrium Scalable Tape Library supports the IBM Ultrium 2 Tape Drive and Ultrium 1 Tape Drive. Although the library can contain both LVD and HVD drives, both types of drives cannot reside on the same SCSI bus.

Each tape drive in the Ultrium Scalable Tape Library is packaged in a container called a drive sled. The drive sled is a field replaceable unit (FRU), and is designed for quick removal and replacement in the library. The sections that follow describe the different types of drives.

## Ultrium 2 Tape Drives

The IBM Ultrium 2 Tape Drive supports Fibre Channel, LVD Ultra160, or HVD Ultra SCSI interfaces. It features two HD68 connectors or one LC Fibre Channel connector. Figure 1-3 shows a Fibre Channel Ultrium 2 Tape Drive.



a67m0106

Figure 1-3. Fibre Channel Ultrium 2 Tape Drive in the Ultrium Scalable Tape Library

## Ultrium 1 Tape Drives

IBM Ultrium 1 Tape Drive supports LVD Ultra2 SCSI or HVD Ultra SCSI interfaces. It features two HD68 connectors. Figure 1-4 shows a SCSI Ultrium 1 Tape Drive.



a67l6207

Figure 1-4. SCSI Ultrium 1 Tape Drive in the Ultrium Scalable Tape Library. The tape drive is contained in a removable drive sled. The view is from the rear of the library.

## Speed Matching

To improve system performance, the Ultrium 2 Tape Drive uses a technique called *speed matching* to dynamically adjust its native (uncompressed) data rate to the slower data rate of a server.

## Channel Calibration

The Ultrium 2 Tape Drive's channel calibration feature customizes each read/write data channel for optimum performance. The customization enables compensation for variations in the recording channel transfer function, media characteristics, and read/write head characteristics.

## Power Management

The Ultrium 2 Tape Drive's power management function controls the drive's electronics so that part of them completely turn off when circuit functions are not needed for the drive's operation.

---

## Tape Cartridges

The library uses Ultrium Tape Cartridges that provide up to 200 GB native capacity and up to 400 GB with 2:1 hardware data compression. Supported cartridges include:

- IBM TotalStorage LTO Ultrium 200 GB Data Cartridge (Ultrium 2)
- IBM LTO Ultrium 100 GB Data Cartridge (Ultrium 1)
- IBM TotalStorage LTO Ultrium Cleaning Cartridge
- LTO Ultrium Cleaning Cartridge

Each tape cartridge in the library **must** have an external bar code label that is operator and machine readable to identify the volume serial number (volser). The external label contains up to eight characters for the volser. The first six positions can be uppercase A–Z, or numerics 0–9, and the last two positions are reserved. If a cartridge in a storage or I/O station slot does not contain a label, the bar code reader on the robotics will treat that slot as empty.

For information about the types of labels that are supported by the library, refer to the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.

The external bar code labels on the cartridges identify the cartridges to the tape library. The internal volser must be identical to external bar code label on the physical volume.

Certain restrictions apply to mixing media in drives and mixing drive types. The sections that follow describe those restrictions.

## Mixing Media in Drives

Not all cartridges that are supported by the Ultrium Scalable Tape Library are compatible with its drives. Table 1-1 gives a matrix of compatible cartridges and drives.

**Note:** When labeled according to proper IBM bar code label specifications, the last character of the cartridge's volume serial number (VOLSER) indicates the generation of the media. For example, a cartridge with a VOLSER of 000764L2 is an Ultrium 2 cartridge; a cartridge with a VOLSER of 003995L1 is an Ultrium 1 cartridge.

Table 1-1. Compatible cartridges and drives

Cartridges	Drives (see Notes 1 and 2)	
	Ultrium 2 Tape Drive	Ultrium 1 Tape Drive
Ultrium 2 Data Cartridge (xxxxxxL2)	Y	N (see Note 3)
Ultrium 1 Data Cartridge (xxxxxxL1)	Y	Y
IBM TotalStorage LTO Ultrium Cleaning Cartridge (universal, CLNUxxL1)	Y	Y (see Note 4)
LTO Ultrium Cleaning Cartridge (IBM only, CLNixxL1)	Y	Y

**Notes:**

- Y = supported.
- N = unsupported.
- The library rejects any command to move an Ultrium 2 data cartridge to an Ultrium 1 drive, and returns a sense key of 5 and an additional sense code/additional sense code qualifier of 30/00.
- Requires drive firmware level 25D4 or higher.

## Mixing Drive Types

The Ultrium Scalable Tape Library supports mixed Ultrium drive types in the same logical library. Some independent software vendors (ISVs) support mixed drive types within logical libraries; others do not. Some ISVs that support mixed drive types do so with restrictions. For details, have the customer contact the applicable ISV.

For situations where the ISV support does not exist or does not meet customer requirements, the Ultrium Scalable Tape Library provides another option to protect the customer's investment by partitioning the tape drives into separate logical libraries. The quantity and location of slots per partition are predetermined and set by using menus in the library (see the section about partitioning logical libraries in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*. For additional details, see "Multi-Path Architecture" on page 1-14.

Figure 1-5 shows examples of methods for mixing Ultrium drive types.

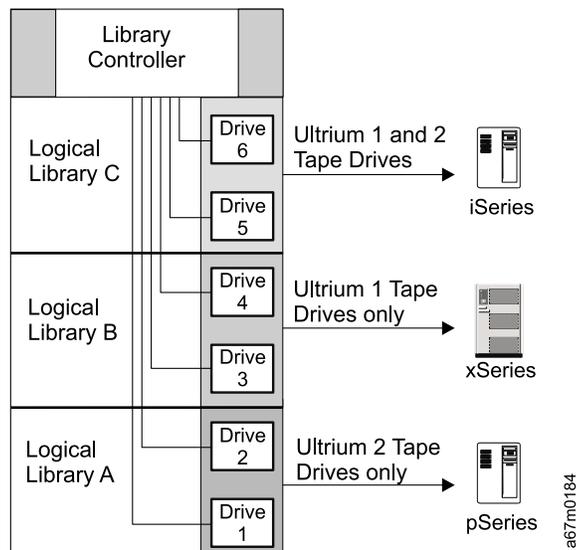


Figure 1-5. Examples of methods for mixing Ultrium drive types

## Functional Units

The Ultrium Scalable Tape Library consists of the following functional units:

- Tape drives in drive sleds
- Cartridge storage
- Tape cartridge
- I/O station
- Library control hardware
- Robotics system
- RMU with TotalStorage Specialist
- SAN Data Gateway Module with TotalStorage Specialist (optional)

Except for the tape drives and tape cartridges, which are discussed on pages 1-5 and 1-7, the sections that follow describe each functional unit.

## Cartridge Storage

The Ultrium Scalable Tape Library can have up to five columns. One column contains tape drives, and one to four columns contain cartridges. The columns are numbered 1 to 5 beginning with the I/O station column and continuing clockwise. Column 1 can be a single slot I/O station or a multiple slot I/O station.

Column 2 is a cartridge storage column and is standard in all libraries. Column 3 is the drive column. Columns 4 and 5 are optional cartridge storage columns which may also be installed depending on the configuration.

### Storage Slot Numbering

- | The I/O station and cartridge storage columns can have storage slot number designations. Each cartridge column has three magazines containing six storage slots. The magazines within each column are designated A to C from top to bottom. The slots within each magazine are numbered 1 to 6 from top to bottom. The drives within the drive column are designated 1 to 6 from bottom to top (see Figure 1-6).

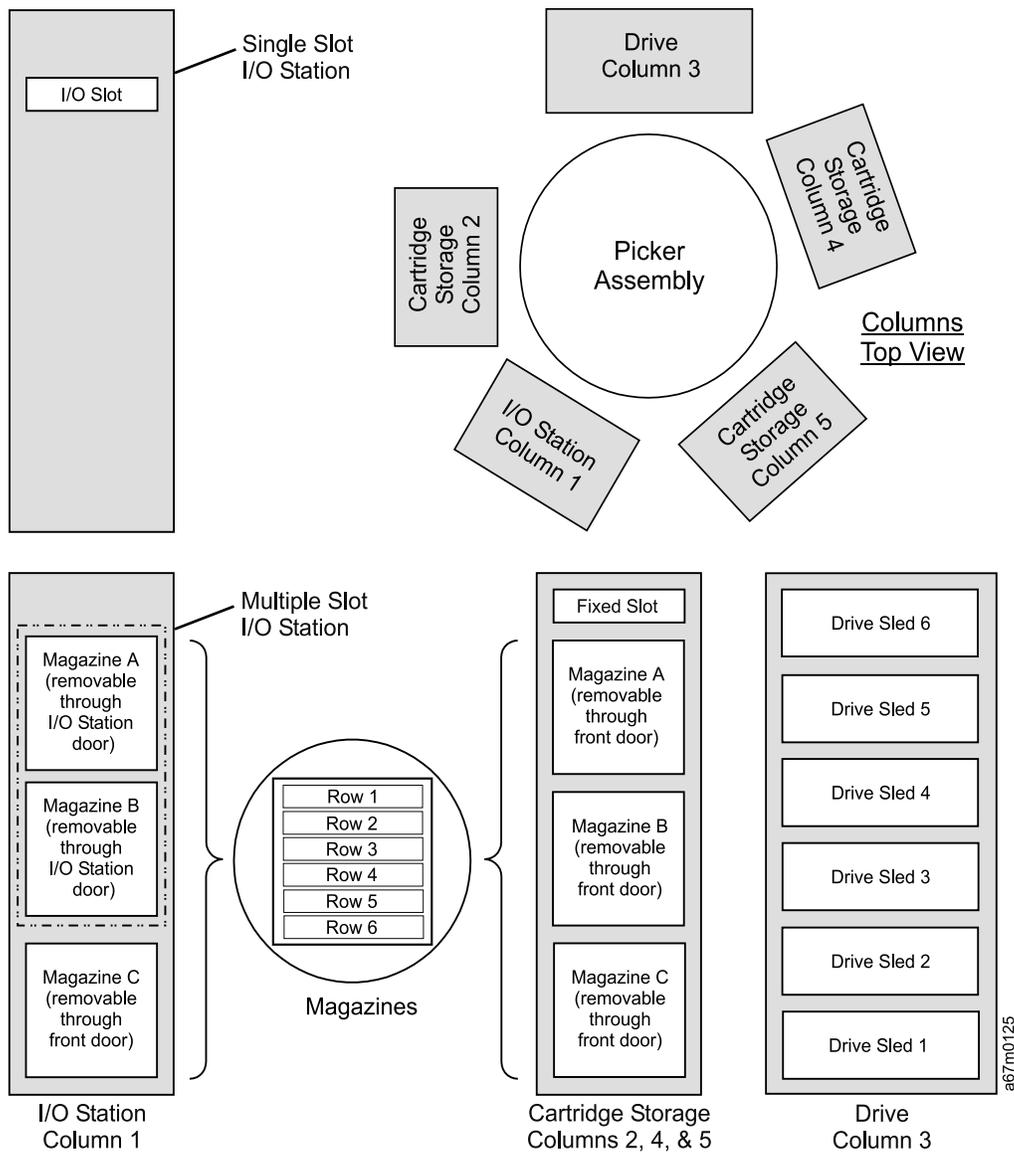


Figure 1-6. Storage Column Configurations and Coordinate system

To manipulate the media within the library, the host must reference each movement with source and target designations. This is done via element addressing, which specifies precisely which slots within the library are to be used. For information about element addressing, see “Element Addressing” on page C-1.

The total number of slots available per storage column is 19. However the host system only has access to 18. The fixed slot located at the top of storage columns 2, 4, and 5 is reserved for the cleaning cartridge when the autoclean function is enabled. The bar code reader cannot read the label on the cartridge if it is stored in the nonaddressable slot.

## I/O Station

This facility allows the insertion and ejection of cartridges without interrupting the normal operation of the library. There are two models of the I/O station:

- The single slot I/O station has a capacity of one cartridge. The cartridge can be inserted or ejected by opening the I/O station door.
- The 12-slot I/O station has a capacity of 12 LTO cartridges contained in two magazines. Magazines and cartridges can be inserted or removed by opening the I/O station door. There is also one fixed magazine that contains six LTO storage slots inside the front door, just below the I/O station door. The 12-slot I/O station can also be configured as 12 additional storage slots. The configuration determines the number of cartridges available for data storage. Table 1-2 presents all possible I/O, storage combinations.

Table 1-2. Ultrium Scalable Tape Library Configurations

Cartridge Storage Columns Installed	Single Slot I/O Station Installed	12 Slot I/O Station Installed	
		Configured as I/O	Configured as Storage
2	Storage Slots: 18 I/O Slots: 1	Storage Slots: 24 I/O Slots: 12	Storage Slots: 36 I/O Slots: 0
2, 4	Storage Slots: 36 I/O Slots: 1	Storage Slots: 42 I/O Slots: 12	Storage Slots: 54 I/O Slots: 0
2, 4, 5	Storage Slots: 54 I/O Slots: 1	Storage Slots: 60 I/O Slots: 12	Storage Slots: 72 I/O Slots: 0

## Library Control Hardware

The library control hardware controls all operations in the Ultrium Scalable Tape Library, including the interaction between the library and operators. The library firmware creates and maintains the tape library configuration, the physical location of the robotic system and the inventory of cartridges. The database will be kept in the flash memory of the library control hardware.

## Robotic System

The robotic system identifies and moves cartridges between the storage slots, tape drives and the I/O Station. The robotic system has:

- A picker assembly for mounting a cartridge gripper and the bar code reader.
- A cartridge gripper for picking and placing cartridges in storage slots, tape drives or the I/O Station.
- A bar code reader for reading the external labels on the cartridges. The bar code reader is used during the inventory process to locate and categorize all cartridges installed in the library. The bar code reader is also used during the teaching process. The bar code reader reads the fiducial labels to identify the types of storage magazines and tape drives installed in the library. Fiducial labels are bar code labels located on tape drives and storage magazines. Each label has a different value to identify various types of storage magazines or tape drives that may be installed in the library.

- A vertical (Y) axis drive for moving the picker assembly vertically in the library.
- A rotary (X) axis drive for moving the picker assembly between storage columns and drive columns.
- A reach (Z) axis drive for moving the gripper part of the picker assembly in a forward and backward motion.

## RMU with TotalStorage Specialist

The RMU provides remote access to the library over a network. You can attach the library to the network through a 10/100 Ethernet port on the RMU. Any host on the network can access the library if it has a Web browser installed. The RMU supports Microsoft® Internet Explorer version 4.0 and above, as well as Netscape Navigator versions 4.01, 4.5, and 4.7X. The RMU can access all available functions without a dedicated server or separate software. With the RMU and the TotalStorage Specialist you can perform many remote functions:

- Checking system status, library and drive conditions, and firmware levels
- Operating all library operator panel functions
- Updating firmware in the RMU, the library controller, and the tape drives
- Retrieving the library command and error logs and the RMU error log
- Configuring changes such as network, users, and date and time changes
- Accessing online tape library documentation

The RMU supports SNMP version 2.0 and can act as an SNMP server, responding to SNMP requests and generating SNMP traps. An internal library serial interface enables the RMU to acquire TapeAlert 3.0 compatibility information from the drives and to send this information to an SNMP server. In the event of a power loss, the RMU will detect the loss and generate an SNMP trap for notification.

## SAN Data Gateway Module with TotalStorage Specialist

The Storage Area Network (SAN) Data Gateway Module is a legacy hardware component that, when installed in the Ultrium Scalable Tape Library, serves as an interface between the library and a SAN or Fibre Channel server. When you install the gateway into the library, the gateway connects the SCSI devices in the library to the SAN or to a Fibre Channel server.

The gateway includes two Fibre Channel interfaces and four SCSI interfaces (interfaces are also known as ports). The Fibre Channel ports of the gateway connect to the SAN or to a Fibre Channel server. They provide two independent paths to the SCSI devices in the library. The SCSI ports of the gateway connect to the library's medium changer and tape drives.

A tape library that is attached to a SAN is available to all servers on the SAN. The gateway and all attached devices appear on the SAN or Fibre Channel server as a single Fibre Channel loop ID (LID), with each device addressable at a unique logical unit number (LUN) of that ID. The gateway's address assignments are persistent and will survive the power-up cycles of the library.

The gateway supports any of three available Fibre Channel topologies: point-to-point, arbitrated loop, or switched fabric. It also can function in a public or private loop environment.

- I By using its TotalStorage Specialist web application, the gateway supports remote management, configuration, and event notification over an Ethernet connection. It can log and analyze events, and runs periodic health checks for predictive failure analysis. These management, configuration, and remote notification capabilities are accessible by using the industry-standard SNMP protocol.

---

## Optional Features

Table 1-3 lists the optional features for the Ultrium Scalable Tape Library.

**Note:** Except for the redundant dc power supply and the Multi-Path feature, the customer is responsible for installing all optional features.

Table 1-3. Optional features and codes for the Ultrium Scalable Tape Library

Optional Feature	Feature Code
Ultrium 2 Tape Drive with 2-Gb Fibre Channel interface	8105
Ultrium 2 Tape Drive with High Voltage Differential (HVD) Ultra SCSI interface	8104
Ultrium 2 Tape Drive with Low Voltage Differential (LVD) Ultra160 SCSI interface	8103
Ultrium 1 Tape Drive with LVD Ultra2 SCSI interface	8003
Ultrium 1 Tape Drive with HVD Ultra SCSI interface	8004
SAN Data Gateway Module, LVD	8005
Rackmount kit	8006
18-slot tape storage column	8007
Redundant DC power supply	8008
12-slot I/O station	8012
6-cartridge magazine with cover	8013
Control path failover	1680
Multi-Path feature	9450 (if ordered with new library)
	1450 (if ordered to upgrade existing library)

---

## Feature License

The Ultrium Scalable Tape Library uses a feature license to enable the control path failover feature.

The feature license controls the setting of feature-enabled flags that are based on a user input key and the library's serial number that is stored in the library's vital product data (VPD). A unique key exists for each library based on an encryption of the chassis serial number and a feature code.

The feature-enabled flags are stored in the library's VPD and are preserved even when FRU components are replaced. FRU components that contain a serial number also include a flag that allows the serial number to be automatically updated in the field whenever the new part is installed. The serial number is then set to the value of the original component.

After you enable a feature, neither you (the service representative) nor the customer can disable it. The library's serial number can only be assigned at the factory.

The control path failover feature requires the Multi-Path feature.

---

## Multi-Path Architecture

The Ultrium Scalable Tape Library features the Storage Area Network (SAN)-ready Multi-Path Architecture, which allows homogeneous or heterogeneous open systems applications to share the library's robotics without middleware or a dedicated server (host) acting as a library manager. The SAN-ready Multi-Path Architecture makes sharing possible by letting you partition the library's storage slots and tape drives into logical libraries. Servers can then run separate applications for each logical library. This partitioning capability extends the potential centralization of storage that the SAN enables. Partitioning also provides investment protection for Ultrium 1 Tape Drive if your application does not support the mixing of Ultrium 1 and Ultrium 2 Tape Drives and media in the same logical library. The Multi-Path Architecture is compliant with the following attachment interfaces:

- Small Computer Systems Interface (SCSI)
- Fibre Channel

Whether partitioned or not, the Ultrium Scalable Tape Library is certified for SAN solutions (such as LAN-free backup).

The Multi-Path Architecture also lets you configure additional control paths for any one logical library. A control path is a logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library. Additional control paths reduce the possibility that failure in one control path will cause the entire library to be unavailable. Use of the control path failover feature further reduces that possibility (see "Using Multiple Control Paths for Control Path Failover" on page 1-18).

For details about configuring the library to share robotics, see "Library Sharing" on page 1-15.

---

## Library Sharing

The Ultrium Scalable Tape Library's default configuration allows a single application to operate the library through a single control path. Often, however, it is advantageous to be able to share a single library between heterogeneous (dissimilar) or homogeneous (similar) applications. Some applications (and some servers) do not allow for sharing a library between systems. With the Ultrium Scalable Tape Library, however, you can create configurations that enable the library to process commands from multiple heterogeneous applications (such as an IBM @server pSeries™ application and a Windows NT® application) and multiple homogeneous applications (for example, the same application run by several pSeries servers).

From the library's web interface or operator panel, you can perform the following actions:

- Configure the library so that it is partitioned into separate logical libraries that independently communicate with separate applications through separate control paths. This configuration (see example **1** in Figure 1-7 on page 1-16) requires no special capabilities from the server or application. (For more information, see “Using Multiple Logical Libraries” on page 1-17.)
- Configure any single logical library (including the entire physical library) so that it is shared by two or more servers that are running the same application. Depending on the capabilities of the server and application, there are several ways to set up this type of configuration. Three typical ways include:
  - Configuring one server (host) to communicate with the library through a single control path; all other servers send requests to that server through a network (see example **2** in Figure 1-7 on page 1-16). This configuration is used by Tivoli® Storage Manager (TSM).
  - Configuring all of the servers to communicate with the library through a single, common control path (see example **3** in Figure 1-7 on page 1-16). This configuration is used in high-availability environments such as IBM's High Availability Clustered Microprocessing (HACMP) and Microsoft's Systems Management Server (SMS) and Clustered Server Environments. Multi-initiator configurations are only supported by certain adapters and ISVs. Check with your ISV.
  - Configuring a single logical library to communicate with multiple servers through multiple control paths. This configuration (see example **4** in Figure 1-7 on page 1-16) requires that you add control paths (see “Using Multiple Control Paths” on page 1-18). It is used by Backup Recovery and Media Services (BRMS).

Your library configuration is not limited to the examples shown in “Example Configurations” on page 1-16. Many configurations are possible, and you can design them according to your business needs.

## Example Configurations

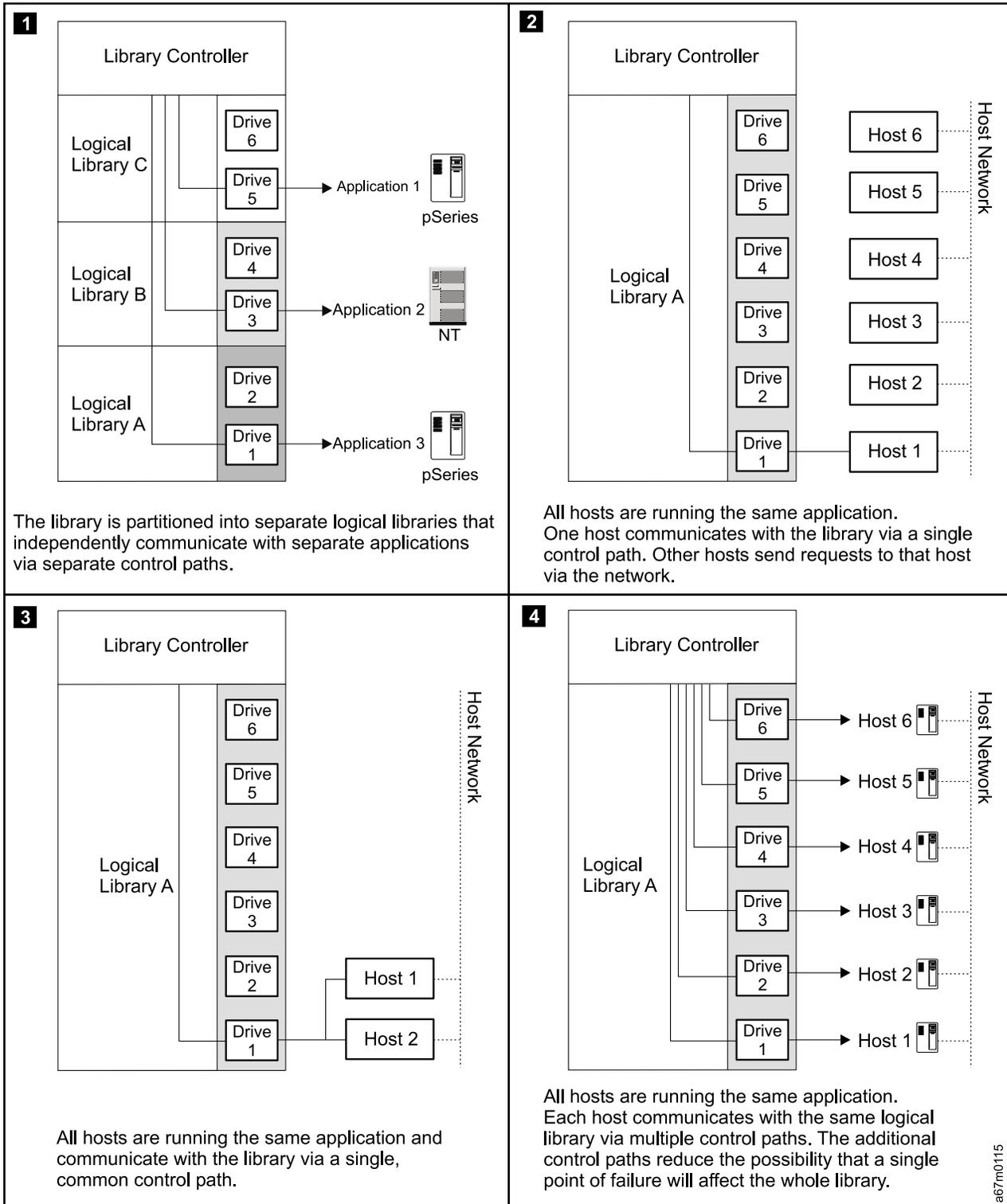


Figure 1-7. Examples of configurations for a Ultrium Scalable Tape Library. Lines from one or more drives to the library controller represent control paths.

## Using Multiple Logical Libraries

To maximize your investment, you can use multiple logical libraries to share the physical library between applications or to support mixed drive types for any application.

You can partition the Ultrium Scalable Tape Library into a maximum of three logical libraries. Each logical library consists of:

- Tape drives
- Storage slots
- Input/output (I/O) slots
- Cartridge accessor

Each logical library has its own control path (a logical path into the library through which a server sends standard SCSI Medium Changer commands to control the logical library). Each logical library control path is available to servers through logical unit number 1 (LUN 1) of the first drive that is defined within that logical library. A logical unit number is a number used by a server to identify a drive.

A logical library cannot share another logical library's tape drives and storage slots. However, it does share the I/O slots and the cartridge accessor on a first-come, first-served basis.

The sections that follow describe these uses for multiple logical libraries. To create or change multiple logical libraries within your library, refer to the section about partitioning logical libraries in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide*.

When automatic cleaning is enabled, any appropriate cleaning cartridge may be used to clean a drive in any configured logical library, even if the cartridge resides in a column for a different logical library. For additional details, see the sections about cleaning drives and enabling the autoclean function in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.

## Using Multiple Logical Libraries for Library Sharing

Multiple logical libraries are an effective way for the Ultrium Scalable Tape Library to simultaneously back up and restore data from heterogeneous applications. For example, you can partition the library so that it processes commands from Application 1 (about Department X) in Logical Library A, commands from Application 2 (about Department Y) in Logical Library B, and commands from Application 3 (about Department Z) in Logical Library C. In this configuration, the storage slots and drives in each logical library are dedicated to that library and are not shared among other libraries. Commands issued by the applications travel to the library through three unique control paths. Thus, the data processing for Department X is confined to the storage slots and drives in Logical Library A, processing for Department Y is confined to the storage slots and drives in Logical Library B, and so forth.

## Using Multiple Logical Libraries for Mixed Drive Types

For applications that cannot support Ultrium 1 and Ultrium 2 drives and media in the same logical library, you can partition multiple logical libraries to keep the drives and media separate. By partitioning the physical library into one or more logical libraries, you ensure investment protection for any one Ultrium 1 Tape Drive.

**Note:** The AS/400 and iSeries™ servers require that you separate unlike drives into separate logical libraries.

## Using Multiple Control Paths

In addition to creating multiple logical libraries, you can also configure any logical library to have more than one control path. When you configure additional control paths, additional library sharing configurations and availability options are made possible. Access to the logical library is on a first-come, first-served basis and each control path for a logical library can accept commands while the library is in use by another control path. By default, a logical library can communicate with the server only through the first LUN-1-enabled drive that is installed in the partition.

**Note:** Microsoft Windows® 2000 Removable Storage Manager (RSM) does not support multiple control paths within a logical library. IBM recommends that you disable RSM to use this feature.

To add or remove additional control paths, refer to the appropriate section in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide*. For a particular logical library, you can enable as many control paths as there are drives in that logical library.

The sections that follow describe two potential uses for multiple control paths.

### Using Multiple Control Paths for iSeries and AS/400 Attachment

The use of control paths for the iSeries and AS/400 servers is unique. In general, every iSeries adapter must “see” the control path that is associated with the drives to which it is connected. Table 1-4 lists the quantity of drives that are supported by a particular adapter and operating system (OS/400® 5.1 or OS/400 5.2).

Table 1-4. Quantity of drives that are supported per adapter and operating system for iSeries and AS/400 servers

Type of Adapter	Quantity of Ultrium 2 Tape Drives		Quantity of Ultrium 1 Tape Drives	
	OS/400 5.1	OS/400 5.2	OS/400 5.1	OS/400 5.2
HVD	1 to 6	1 to 6	1	1
LVD	1 to 6	1 to 6	N/A	N/A
Fibre Channel	1 to 6	1 to 6	1 to 6	1 to 6
<b>Note:</b> N/A = not applicable				

### Using Multiple Control Paths for Control Path Failover

Command failures and timeouts are costly. Customers want their libraries to run smoothly and efficiently. To ensure continued processing, the Ultrium Scalable Tape Library offers an optional control path failover feature that enables the host device driver to resend the command to an alternate control path for the same logical library. With control path failover installed, the alternate control path can include another HBA, SAN, or library control path drive. The device driver initiates error recovery and continues the operation on the alternate control path without interrupting the application. Only AIX hosts are currently supported for this feature.

The control path failover feature can be enabled at the factory, or it can be ordered later and installed by the customer. To order the feature, the customer can call an IBM Sales Representative.

**Note:** The control path failover feature is activated by a license key.

For more information about using the control path failover feature, see the *IBM Ultrium Device Drivers Installation and User's Guide*.

## Specifications

Table 1-5 lists the specifications for the Ultrium Scalable Tape Library.

Table 1-5. Specifications for the Ultrium Scalable Tape Library

Specification	Measurement		
<b>Physical Specifications</b>			
Width	44.1 cm (17.4 in.) rack unit		
	48.1 cm (18.9 in.) stand alone unit		
Depth	73.5 cm (28.9 in.)		
Height	68.5 cm (27.0 in.) (with casters)		
Weight (6 drives and 72 cartridges)	65.8 kg (145 lb) (minimum configuration, no cartridges)		
	101.6 kg (224 lb) (maximum configuration, no cartridges)		
	118.4 kg (261 lb) (maximum configuration, with cartridges)		
Height of library in rack	14 EIA units		
<b>Power Specifications</b>			
Voltage	100 to 240 Vac, 50 to 60 Hz		
Current for 100 Vac	7.0 A		
Current for 240 Vac	3.5 A		
Maximum electrical power	0.840 kVA		
Inrush current	45 A at 120 Vac, 90 A at 208 Vac		
<b>Other Specifications</b>			
Maximum altitude	2500 m (8202 ft) for operating and storage		
<b>Environmental Specifications</b>			
Environmental Factor	Operating (see Note)	Storage	Shipping
Drive temperature	10 to 38°C (50 to 100°F)	-40 to 60°C (-40 to 140°F)	-40 to 60°C (-40 to 140°F)
Heat output	542 W (483 Cal/Hr)	Not applicable	Not applicable
Relative humidity	20 to 80%	10 to 90%	10 to 90%
Maximum wet bulb temperature	26°C (79°F)	Noncondensing	Noncondensing
<p><b>Note:</b> The operating environment of the library must not conflict with the media storage requirements (see the section about media storage requirements in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>. The library may be capable of operating at elevated temperatures for an extended period of time, the temperature could shorten the useful life of media that is stored in the library. If media is stored in the library for more than 10 hours, the storage temperature requirements for media should be met. It should be assumed that media stored in the library will be 2 degrees above ambient temperature when the library is powered on.</p>			

---

## Product Environment

The tape library is designed to operate in a general business environment.

The library meets the acoustical requirements for general business area category 2D. Category 2D states that the library should be installed a minimum of 4 m (13 ft.) from a permanent work station.

To allow for service access, install the library a minimum of 0.9 m (3 ft.) from all obstacles.

The library is a precision computer peripheral. To ensure maximum longevity of your library, place the library away from dust, dirt, and airborne particulates:

- Keep the library away from high-traffic areas, especially if the floor is carpeted. Carpeting harbors dust and people walking on the carpet can cause the carpet fibers and the dust to become airborne.
- Keep the library out of computer-printer rooms because of toner and paper dust. Additionally, do not store paper supplies next to the library.
- Keep the library away from moving air caused by doorways, open windows, fans, and air conditioners.

Ensure that the machine covers are always kept closed to minimize any contamination from airborne particles.

---

## Maintenance Plan

The tape library consists of two hardware subsystems, the library and the tape drives. The tape drive is packaged in a common drive sled and each drive sled is a FRU. When a drive failure occurs, the drive sled is removed and returned to IBM for repair. The tape library maintenance package supports the library and the library interfaces with the tape drives.

## Maintenance Start

Start all maintenance activity for the tape library and the integrated subsystem using the **START** section in this manual. A symptom to action table is provided to quickly determine which procedure to use for the reported problem. You are also shown how to prepare the library for service. Subsystem problem determination information is included to help determine the failing components. For hardware failures, the Field Engineer will be directed to one of the following procedures to continue with maintenance activity:

- The START procedure in this manual
- The Tape Drive Supplemental Maintenance Package if available.

## Preventive Maintenance

There is no Preventive Maintenance required on the library at this time. Service Action Code “**FB**” is reserved for future expansion should there be a requirement for Preventative Maintenance.

## Functional Diagram

The diagrams on pages 1-23 and 1-24 show the major functional areas of a library with and without the Multi-Path feature. The items enclosed in boxes are FRUs. Table 1-6 describes each functional area.

Table 1-6. Tape Library Major Functional Areas

FRU/Sub-Assembly	Description
Host Interface Board (SCSI)	High voltage differential (HVD) and low voltage differential (LVD) SCSI adapter board. This board is connected to the main controller board on one side and the SCSI host system on the other side. Also contains a serial interface into the library.
Serial Diagnostic Port Board	An adapter board connected to the main controller board and used as a serial interface to the library.
*Main Controller Board	Library control board, this board contains microprocessor, memory, motion control, digital input and output (DI/DO), serial ports, real time clock and interface to other boards in the library.
*Display Assembly	Operator panel assembly which contains all switches and interfaces to a message display to allow operator/CE to communicate with the library. This assembly also controls the operations of the I/O Station, the door interlock system, and ambient temperature sensor.
Power Distribution Board	Connector board which receives ac input from the ac power module. It distributes ac to dc power supplies and tape drive sleds. It also distributes dc voltages to the library and drives. The power distribution board also contains the servo controller for the Y-axis.  There are two versions of the power distribution board: Type I is used with its companion dc power supply in older libraries Type II contains a dc-to-dc converter that generates +5 Vdc from 12 Vdc and is used in current production libraries. It requires a companion dc power supply.
Picker Control Board	This board communicates with the main controller board and controls the rotary axis, gripper assembly and bar code reader.
Picker Assembly	This assembly contains motor, sensors and mechanical components to move the picker in the rotary axis and pick the cartridge.
Picker Carriage Arm Assembly	This assembly contains the picker assembly and the picker control board.
Bar Code Reader	Used in reading the bar code label on each cartridge as well as fiducial labels located throughout the library. It is also used in teaching and inventory of the library subsystem, <b>the bar code reader is not a separate FRU but a part of the picker assembly.</b>
Y-Axis Motor and Belt	Motor assembly to move the picker in vertical directions.
dc Power Supplies	There are two types of dc power supplies: <ul style="list-style-type: none"> <li>Type I produces both 12 Vdc and +5 Vdc power and must be used with its companion power distribution PCBA. This power supply is used in an older library.</li> <li>Type II only produces +12 Vdc and must be used with its companion power distribution PCBA. This power supply is used in the current production libraries.</li> </ul>
I/O Station	This assembly allows the operator to insert and eject cartridges without interrupting the operation of the library. Contains motor, sensors and storage slots.

Table 1-6. Tape Library Major Functional Areas (continued)

FRU/Sub-Assembly	Description
ac Input Power Module	This assembly is connected to the customer's ac power source and distributes ac to all major subassemblies within each tape library module (dc power supplies, drives). It also contains a switch that controls the input ac and has replaceable fuses for protection.
Tape Drive Sled	Individual tape drive, dc power supply and drive control board packaged in one assembly.
Storage Area Network (SAN) Data Gateway Module (SANDGM)	The SANDGM allows the library and its drives to connect to a Fibre Channel server.
*Remote Management Unit (RMU)	Unit that is connected to the Main Controller Board and used for remote management of the library.
<b>Note:</b> * = Locations where vital product data (VPD) is stored in the library.	

# Functional Diagram for a Library With the Multi-Path Feature

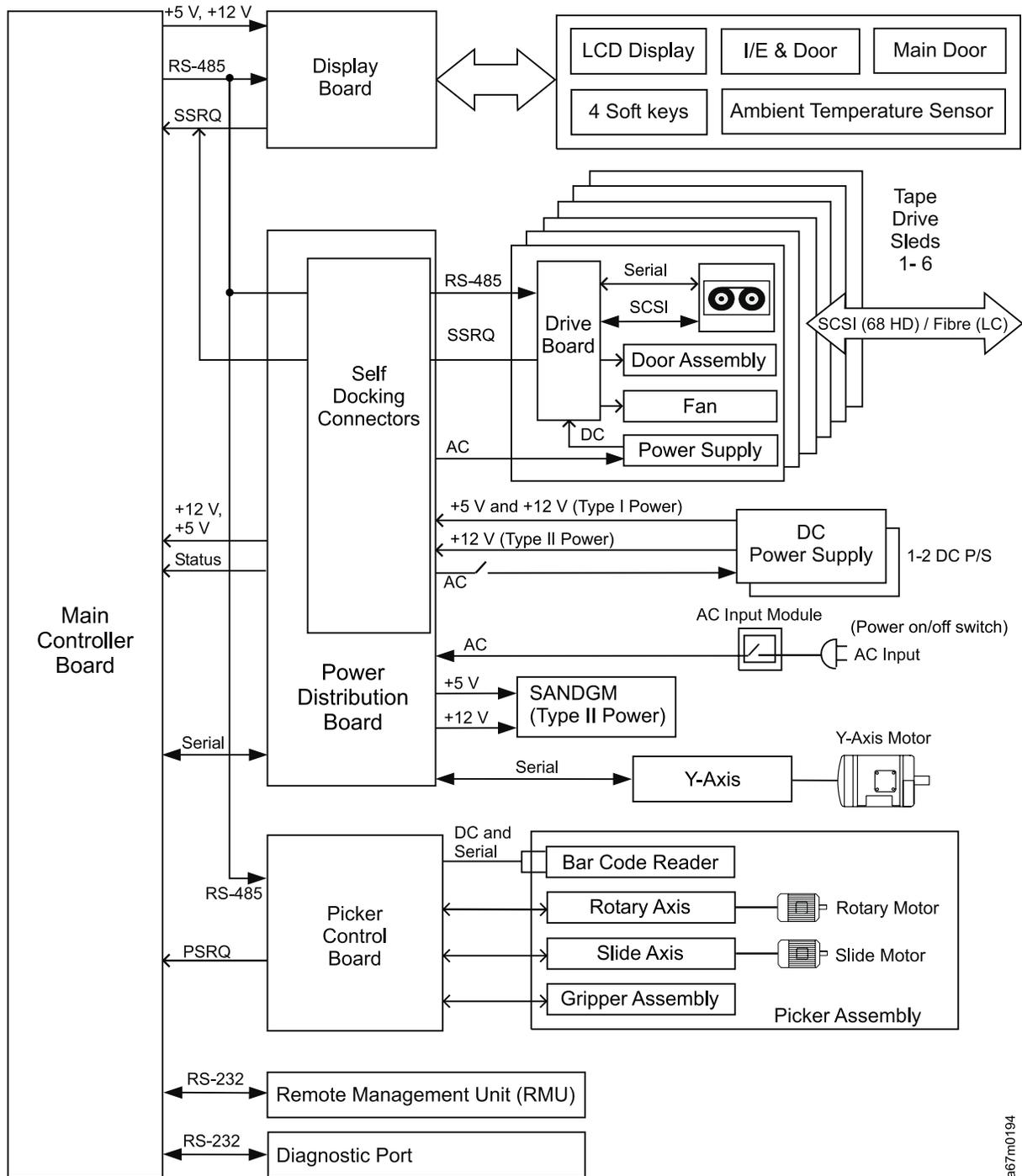


Figure 1-8. Functional diagram for a library with the Multi-Path feature

a67m0194

# Functional Diagram for a Library Without the Multi-Path Feature

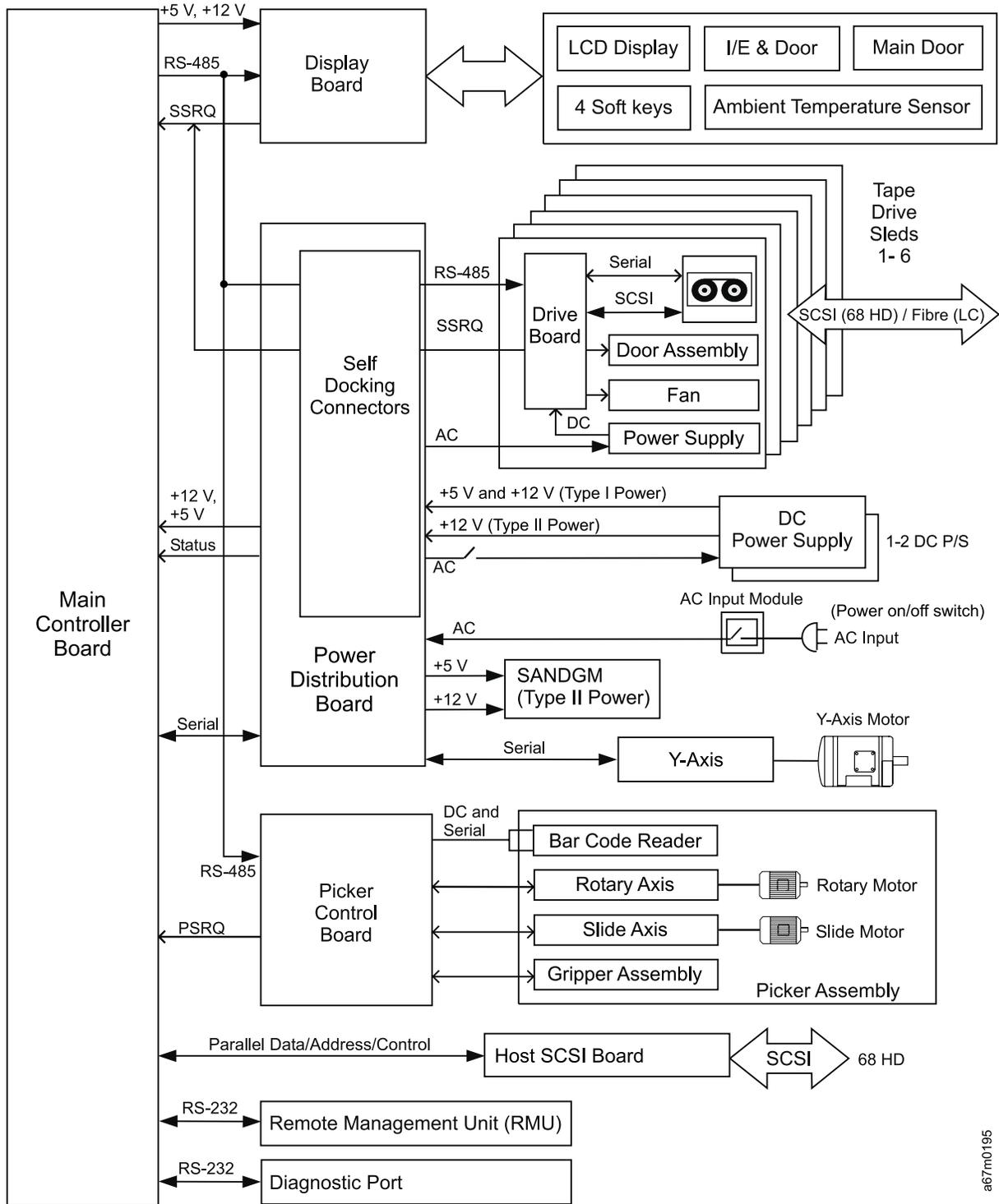


Figure 1-9. Functional diagram for a library without the Multi-Path feature Functional Diagram

---

## Chapter 2. Safety Instructions

Danger Notice . . . . .	2-2
Caution Notice . . . . .	2-2
Attention Notice . . . . .	2-4
Area of Application. . . . .	2-4
Laser Safety and Compliance. . . . .	2-4
Class I Laser Product. . . . .	2-4
3583 Library ac Grounding Inspection. . . . .	2-5
Guards . . . . .	2-6
Access to the Library . . . . .	2-6
Main Switch . . . . .	2-7
Before Working on Equipment . . . . .	2-7
Normal Operating Modes . . . . .	2-7
Emergency Operating Mode . . . . .	2-7
Before Restarting Equipment . . . . .	2-8
Working on Parts With Line Voltage Present . . . . .	2-8
Mechanical Maintenance . . . . .	2-9
Safety Check. . . . .	2-9

**Note:** In addition to the safety instructions in this guide, local and professional safety rules apply.

When using this product, observe the danger, caution, and attention notices contained in this guide. The notices are accompanied by symbols that represent the severity of the safety condition.

Read and carefully observe the hazard alert information in this guide and in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.

---

## Danger Notice

A danger notice calls attention to a situation that is potentially lethal or extremely hazardous to people. A lightning bolt symbol always accompanies a danger notice to represent a dangerous electrical condition. A sample danger notice follows:



### DANGER

**An electrical outlet that is not correctly wired could place hazardous voltage on metal parts of the system or the products that attach to the system. It is the customer's responsibility to ensure that the outlet is correctly wired and grounded to prevent an electrical shock. (72XXD201)**

---

## Caution Notice

A caution notice calls attention to a situation that is potentially hazardous to people because of some existing condition. A caution notice can be accompanied by one of several symbols shown in Table 2-1:

Table 2-1. Caution Notice Symbols

If the symbol is...	It means....
	A hazardous electrical condition with less severity than electrical danger.
	A generally hazardous condition not represented by other safety symbols.
	A hazardous condition due to mechanical movement in or around the product.
 > 18 kg (40 lb)	A hazardous condition due to the weight of the unit. Weight symbols are accompanied by an approximation of the product's weight.

Sample caution notices (See Table 2-2):

Table 2-2. Examples of Symbol Use



**CAUTION:**  
The controller card contains a lithium battery. To avoid possible explosion, do not burn, exchange, or charge the battery. Discard the controller card as instructed by local regulations for lithium batteries. (RSFTC228)

---



**CAUTION:**  
Do not attempt to use the handle on the module to lift the entire device (module and enclosure) as a unit. First remove the module; then, use two hands to lift the enclosure. (72XXC356)

---



> 18 kg  
(40 lb)

**CAUTION:**  
The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes specially trained persons with a lifting device to safely lift this part or unit. (RSFTC206)

---



**CAUTION:**  
Use care when servicing the autochanger assembly.

---

## Attention Notice

An attention notice indicates the possibility of damage to a program, device, or server, or to data. An exclamation point symbol may accompany an Attention notice, but is not required. Sample attention notices follow:



**Attention:** If you use a power screwdriver to perform this procedure it could destroy the tape.

**Attention:** Do not operate the Tape Library in a poor air-quality environment. If your environment contains an excessive amount of particulates, contact your service representative for more information.

---

## Area of Application

The information in this document applies to the entire Tape Library. Additional safety instructions for components used in the equipment are not invalidated by these instructions.

**Note:** Other manufacturers' documentation forms an integral part of the Tape Library documentation.

This *manual* is intended for training personnel for service work and maintenance work. Therefore, the hazard alert messages apply only to maintenance of the equipment. Knowledge of safety rules for work on electronic and mechanical systems is required. Only trained specialists (maintenance trained) are allowed to maintain and repair the Tape Library.

---

## Laser Safety and Compliance

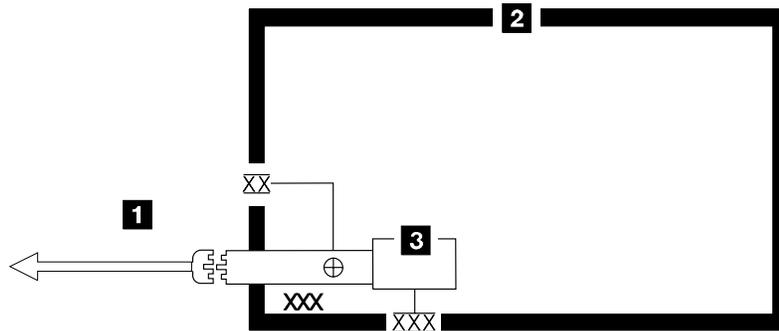
Before using the Tape Library, review the following laser safety information.

### Class I Laser Product

The Tape Library may contain a laser assembly that complies with the performance standards set by the U.S. Food and Drug Administration for a Class I laser product. Class I laser products do not emit hazardous laser radiation. The library has the necessary protective housing and scanning safeguards to ensure that laser radiation is inaccessible during operation or is within Class I limits. External safety agencies have reviewed the library and have obtained approvals to the latest standards as they apply.

## 3583 Library ac Grounding Inspection

1. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
2. Disconnect all cables.
3. See Figure 2-1. Disconnect the power cord **1** from its source.
4. Check that no voltage exists between the housing on the power source and building ground.
5. Check that resistance is less than 0.1 ohm from the building ground to the power supply enclosure **3**.
6. Inspect the power cable **1** for visible cracks, wear, or damage.
7. Check that the resistance between the power cable ground and the library frame **2** is less than 0.1 ohm.
8. Inspect the power supply enclosure covers **3** to ensure all screws are installed and tight.



Legend:

- XX External tooth lock washer  
Green/yellow ground wire terminated to chassis or ground
- ⊕ Green/yellow ground wire terminated with slip-on spade terminal
- XXX Redundant ground path to frame
- XXX External tooth lock washer

A1400040

Figure 2-1. AC Grounding Diagram (50 Hz and 60 Hz)

---

## Guards

The Tape Library system is equipped with the following guards:

- Access Control
- Main Switch

## Access to the Library

The Tape Library is completely enclosed in a housing. The only access is provided by the monitored guard door. The interlock is active when the Main Switch is switched ON.

The housing around the Tape Library serves as a separating guard. It separates the danger area of the Tape Library system from the normal working area.

The danger area of the Tape Library system is the area in which persons could be injured because of hazardous movements of the handling unit.

Hazardous movements can be:

- Expected movements
- Unexpected movements

The guard door can be opened from the outside only with a key. An authorized person is responsible for this key.

### **CAUTION:**

**In the Tape Library, movements of components can cause serious injury. Access to this area is, therefore, restricted to authorized persons. Persons who are not trained in the use of the system should enter the Library only under supervision.**

## Main Switch

Before working inside the Tape Library or working with electrical components, ensure that the Main Switch **1** in Figure 2-2 is OFF.

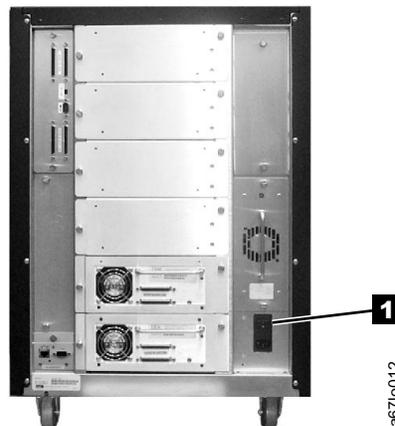


Figure 2-2. ac Power Module and dc Power Supplies locations

---

## Before Working on Equipment

Before beginning work, become familiar with the location of the:

- Main Switch
- Power source connection

**Note:** Bridging of door guards is not advisable.

**Attention:** Never put door guards out of operation other than as instructed by supervision.

All drive units and all hazardous voltages are switched OFF.

Proceed with extreme caution if the system cannot be switched off at the main switch because of required work (for example, functional checks).

## Normal Operating Modes

In normal operation, the host controls the Tape Library.

## Emergency Operating Mode

Emergency operations are meant for:

- Manual inserts and retrievals of media
- Manual operation of the drives

---

## Before Restarting Equipment

Movement of components inside the library can cause serious injury. Before starting the Tape Library, ensure that the library door is closed.

## Working on Parts With Line Voltage Present

### Caution Statements:

1. **Contact with live electrical parts can cause severe or fatal burns and internal injury as the consequence of electrical shock. After contact with live parts, persons often cannot break loose from the part by themselves.**
2. **Components being worked on must only have voltage present when this is specifically required.**
3. **Before working on other electrical components, switch OFF power with the Main switch.**
4. **Never assume a circuit is without power - always test for power off with a meter.**

Work on live parts of the equipment must be authorized by supervision.

When performing such work, observe the following:

- Accident prevention rules
- Perform the following:
  - Use only suitable tools and measuring devices in good working condition.
  - Check the measuring devices for correct adjustment of measuring ranges.
  - Work with one hand only. This can prevent injury to internal organs in case of electrical shock.
  - Avoid contact with conducting floors (especially metal) or equipment parts. If necessary, cover the working area with suitable protective rubber mats.

---

## Mechanical Maintenance

Observe the following:

- Location of the escape routes and emergency exits - keep these free of obstacles
- Keep dismantled machine components and other parts safe and inaccessible for unauthorized persons
- Keep the equipment clean during work; clean up carefully afterward

Before and after work, remove and reinstall all safety provisions installed for maintenance, such as:

- Covers
- Hazard alert messages
- Warning signs
- Grounding wires

Clothing must be in agreement with the safety rules. Clothing:

- Must not have metal fasteners
- Should be close-fitting so that it cannot be caught in moving machine parts
- Button up or roll up the sleeves.
- Place the ends of a scarf into the clothing.
- For long hair, use a protection that fully covers it.
- Take off watch, rings, and jewelry.

Wear safety glasses when:

- Using a hammer
- Using an electric drill
- Working on springs, and retaining rings.
- Soldering, working on cables
- Cleaning with chemical agents
- All work that endangers the eyes

When handling heavy components, wear safety shoes.

**Refrain from any action that could endanger persons or that could damage installations or equipment.**

## Safety Check

Check all guards every six months:

- Door interlocks
- Tape Library access



---

## Chapter 3. Panel

Overview . . . . .	3-2
Operator Panel . . . . .	3-2
I/O Station Status Area . . . . .	3-3
Library Status Area . . . . .	3-5
Drive Status Area . . . . .	3-5
Message Area . . . . .	3-7
Operator/CE Panel Menus . . . . .	3-7
Operator/CE Panel Flowcharts . . . . .	3-8

---

## Overview

The Operator panel provides a menu driven operator and service interface via an assembly consisting of a message display and push button switches. Displays include operator and service menus, library and drive status, activities and error conditions. English is the only language supported.

**Note:** This chapter is designed to provide reader with:

- An overview of the Operator Panel
- Information on how to navigate through the Operator Panel Menus
- An overview of all menu functions.

Refer to Tape Library Operator Guide for complete descriptions of all functions available. Make sure you have the proper level of Operator Guide to use with Firmware installed.

---

## Operator Panel

The operator Panel provides an interactive path between Operator and the Tape Library. See Figure 3-1 for an illustration of the Operator Panel. Visual indications and push-buttons **6** enable the Operator to control the Tape Library.

The Tape Library Operator Panel is divided into five areas: I/O Station status **1**, library status **2**, messages **3**, drive status **4**, and softkeys **5**.

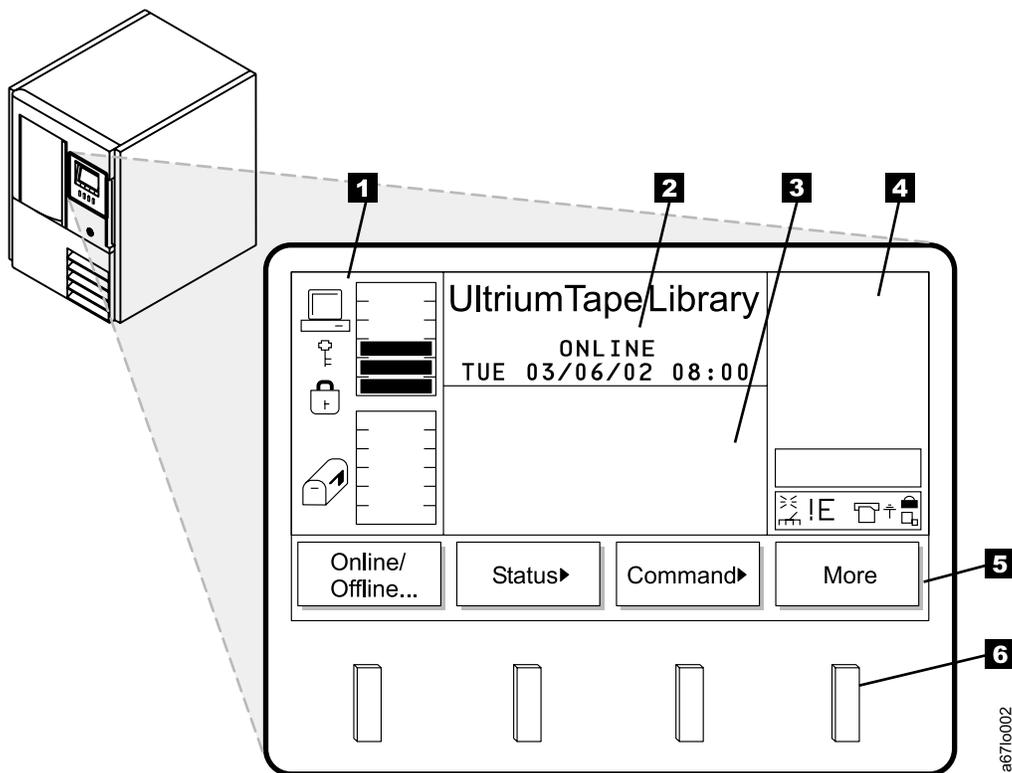


Figure 3-1. Operator Panel

## I/O Station Status Area

The I/O Station status area provides constant information about the I/O Station. See **1** in Figure 3-2.

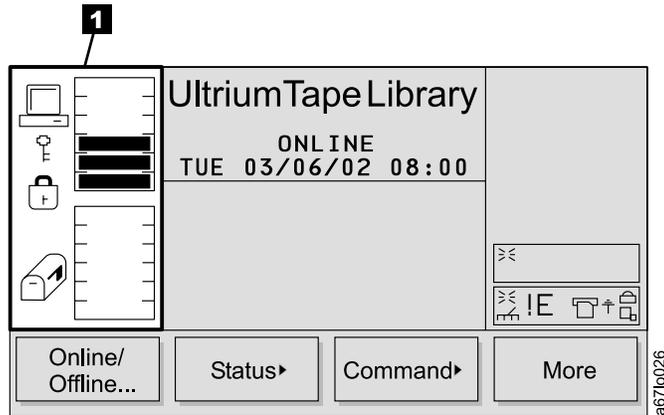
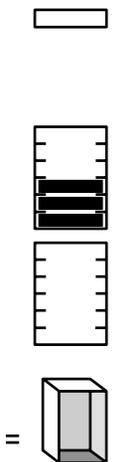


Figure 3-2. I/O Station Status Area

Table 3-1 on page 3-4 provides a description of the icons shown in the I/O Station status area.

Figure 3-2 on page 3-3 provides an illustration of the icons shown in the I/O Station status area.

Table 3-1. I/O Station Icons

Icon	Description
	<p>This icon is displayed on screen if the host has issued a <b>PREVENT/ALLOW MEDIUM REMOVAL</b> SCSI command and locked the I/O Station.</p>
  	<p>This icon is displayed on screen if the I/O Station is locked. The I/O Station can be locked by the following conditions.</p> <ul style="list-style-type: none"> <li>• The host issues a <b>PREVENT/ALLOW MEDIUM REMOVAL</b> SCSI command and locks the I/O Station</li> <li>• The Tape Library is accessing an I/O Station slot.</li> <li>• The I/O Station has been configured as all storage.</li> </ul> <p>This icon is displayed if the I/O Station is unlocked.</p>
	<p>These icons are displayed on screen for the six I/O Station states.</p> <p>State 1: The I/O Station door is closed. Any cartridge in the I/O Station has previously been inventoried.</p> <p>State 2: The I/O Station door is partially open. Any cartridge in the I/O Station has previously been inventoried.</p> <p>State 3: The I/O Station door is fully open. Any cartridge in the I/O Station has previously been inventoried. For an import operation, a cartridge can be inserted.</p> <p>State 4: The I/O Station door is closed. A cartridge has been exported and not yet removed.</p> <p>State 5: The I/O Station door is partially open. A cartridge has been exported and not yet removed.</p> <p>State 6: The I/O Station door is fully open. A cartridge has been exported and not yet removed. While in this state, an exported cartridge can be removed.</p>
	<p>These icons are displayed on screen to show the possible configurations of the I/O station.</p> <p>Type 1: A single slot I/O Station icon (available on the standard I/O station).</p> <p>Type 2: An I/O Station icon showing cartridges as indicated by the blackened out slots. A total of 12 slots are available (only available on the optional multiple I/O station feature).</p> <p>Type 3: A continuous storage icon. A total of 12 slots are available (only available on the optional multiple I/O station feature).</p>

## Library Status Area

The library status area displays the current location, activity or state of the library. See **1** in Figure 3-3.

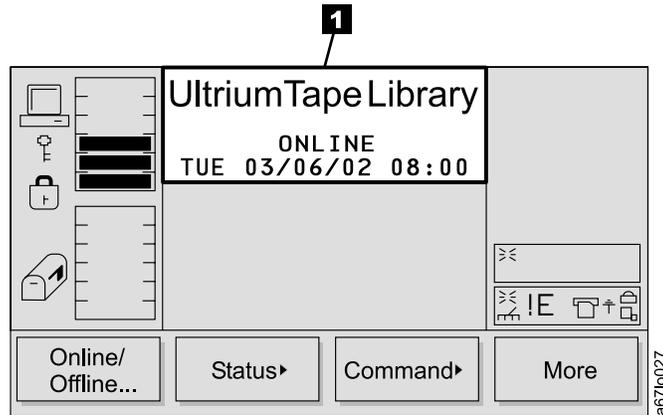


Figure 3-3. Library Status Area

Table 3-2 describes the text displayed in the library status area.

Table 3-2. Library Status Area

Text	Definition
OFFLINE	The media changer equipment is in an Offline state.
ONLINE	The media changer equipment is in an Online state.
Status or Attention Message	The library reports status or messages to solicit operator intervention.

## Drive Status Area

The drive status area provides constant information about the drives. See **1** in Figure 3-4.

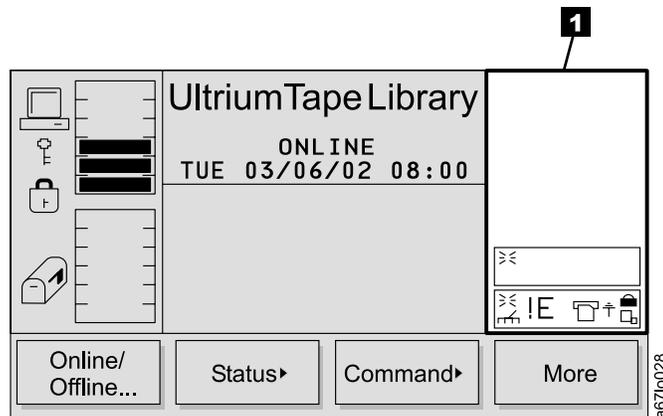


Figure 3-4. Drive Status Area

Table 3-3 on page 3-6 provides a description of the icons shown in the drive status area.

Figure 3-4 on page 3-5 provides an illustration of the icons shown in the drive status area.

Table 3-3. Drive Status Icons

Status	Icon	Description
Drive Present		A tape drive is present but does not contain a cartridge.
Power On		If power is applied to the tape drive, the Power On icon is displayed.
Cleaning Required		If the tape drive cleaning is required, the Cleaning Required icon is displayed.
Error Code		If a drive error occurs, an error code displays. See Table 5-2 on page 5-19 for a list of drive error codes. "n" represents the character displayed, it can be:  0 – 9, or A, B, E, F, o, c, b, d, h or C.
Compression On		If the tape drive is compressing data on tape, the Compression On icon is displayed.
Write Protect		If the tape is write protected, the Write Protect icon is displayed.
Tape Activity		A tape drive is loading a cartridge.
		A tape drive has a cartridge loaded.
		A tape drive is rewinding a cartridge.
		A tape drive is unloading a cartridge.
		A tape drive has unloaded a cartridge.
		A tape drive is reading data from a cartridge.
		A tape drive is writing data to a cartridge.
		A tape drive is erasing data from a cartridge.
		A tape drive is locating data on a cartridge.

## Message Area

The message area displays six lines of text, graphics representations, or a combination of both. See **1** in Figure 3-5. Each text line can be up to twenty characters long. These lines communicate interactive dialogs, special messages, alerts, error codes and library configurations.

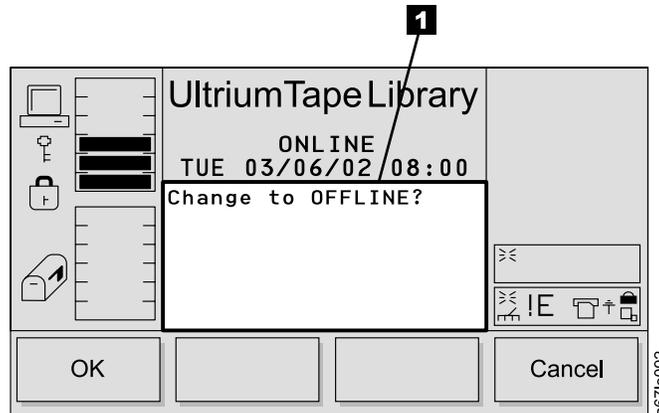


Figure 3-5. Messages Area

## Operator/CE Panel Menus

Operator/CE panel allows information to be passed from Library to the Operator/CE and back to Library. Operator and CE communicates with Library via menus presented on the message display.

All menus are available to both Operator and CE.

All menus and respective options are grouped according to function. Special characters follow some respective options. The special characters following the softkey menu titles are described below.

- A keyword leading to another menu is followed by a black arrow. Example: **Move▶**
- A keyword leading to a dialog box is followed with three closely spaced dots. Example: **Move Media ...**
- A keyword leading to an immediate action has no suffix.
- Most fields on the menus, submenus, dialogs and screens are read only. The fields which are writable are in reverse video. Example: **ON**

# Operator/CE Panel Flowcharts

Following diagram shows all menus and functions available via the Operator/CE panel.

**Note:** The information menus do not dynamically update. To view changes, re-select the menu which was changed.

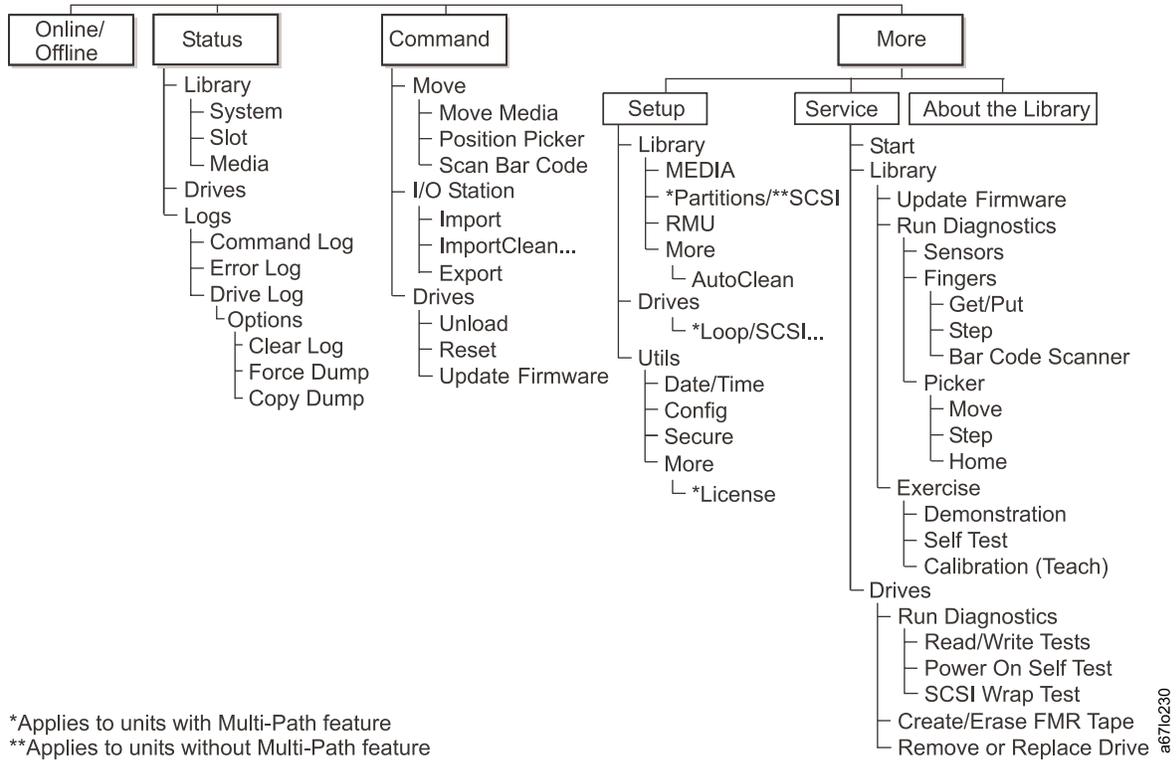


Figure 3-6. Operator/CE Panel Flowchart

---

## Chapter 4. Start

Overview . . . . .	4-2
Maintenance Starting Point. . . . .	4-2
Library Service Approach . . . . .	4-2
Start Service . . . . .	4-3
Analyze Tape Library Power Problems . . . . .	4-5
Analyze RMU Problems. . . . .	4-6
Other Library Failures . . . . .	4-7

---

## Overview

All service actions should begin with the START Section (this section). This chapter provides procedures and pointers to other sections of this book to be used by the Field Engineer for all service actions.

---

## Maintenance Starting Point

### Library Service Approach

If you are here because of a suspected problem with the Storage Area Network (SAN) Data Gateway Module go to *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* to complete this service action.

**Note:** Some problems may be difficult to isolate between the gateway module and library SCSI host interface board. This is especially true for SCSI bus problems. The following procedure is an aid in determining which FRU is at fault.

1. See the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* introduction chapter, LED indicators to verify the LEDs on the gateway are in the correct state. If LED indicators are in the correct state then proceed with step 2. If LED indicators are not in correct state proceed with MAP section of *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*.
2. If a particular SCSI port or target devices on a particular SCSI port are not functioning do the following:
  - a. Go to the SCSI MAP in MAP section of *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* and proceed as directed. If you do not find a problem return here to step 2b.
  - b. Proceed with the Start section here. The 3583 library diagnostics contain a SCSI wrap test for the tape drives only. The library SCSI host interface board is not tested.

Begin all other service actions here. Start at the top of each table. Locate the reason you are here in the left column and perform the action in the right column.

#### Maintenance Hints:

1. If a problem is fixed by replugging of a cable or card, enter a specific comment in the field tracking system.
2. If the problem is intermittent and will not fail, replacement of the FRU Group may be appropriate. Based on the severity of the problem and customer input, determine the correct action to take.

#### Recommended maintenance procedure steps:

1. **Use** Table 4-1 on page 4-3 to determine the service action to perform. The symptoms and actions are listed in order of priority.
2. **Follow** the recommended service procedure until a list of possible FRUs is recommended for the problem.
3. **Review** the FRU list, **ensure** that all associated Boards and cables are properly seated, and **inspect** mechanical assemblies for obvious damage before ordering or replacing FRUs.
4. **Replace** recommended FRUs in the order specified. If a FRU does not correct the problem, reinsert the original FRU and return the new FRU to stock.
5. **Verify** that the library is functioning correctly.
6. **Return** the library to customer use.

## Start Service

Use the following table to start your service call.

Table 4-1. Start Service

If ...	Perform this Action
<p><b>A dc power indicator is NOT on.</b> The indicator for the power supply is located on the dc power supply assembly <b>2</b> (see Figure 6-17 on page 6-18). <b>Check power</b> before proceeding with any library maintenance (refer to “Power Supplies Check Procedure” on page 7-48).</p>	<p>Go to procedure “Analyze Tape Library Power Problems” on page 4-5.</p>
<p><b>Library subsystem power problem -</b> (includes library and tape drives).</p>	<p>Go to procedure “Analyze Tape Library Power Problems” on page 4-5.</p>
<p><b>Library does not respond to commands from a SCSI host.</b></p>	<ol style="list-style-type: none"> <li>1. Ensure the SCSI type is configured properly (LVD or HVD).</li> <li>2. Ensure the Tape Library SCSI ID is set properly.</li> <li>3. Ensure the SCSI bus is properly terminated and the correct terminator is being used.</li> <li>4. Verify correct SCSI cable is in use.</li> <li>5. Go to “Host SCSI Interface Board” on page 7-41 to replace board.</li> <li>6. Go to “Main Controller Board” on page 7-30 to replace the main controller board.</li> </ol>
<p><b>Library does not respond to commands from a Fibre Channel host.</b></p>	<ol style="list-style-type: none"> <li>1. Ensure that only LVD drives are installed and the LVD switch is set on the host interface board (see “Host SCSI Interface Board” on page 6-16).</li> <li>2. Ensure the SCSI bus is properly terminated.</li> <li>3. Go to the <i>IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide</i> to identify problems in the gateway.</li> <li>4. Go to “Host SCSI Interface Board” on page 7-41 to replace board.</li> <li>5. Go to “Main Controller Board” on page 7-30 to replace the main controller board.</li> </ol>
<p><b>The Library firmware does not complete the boot-up process and appears hung.</b> Failure of the main menu to appear on the Operator panel after one minute indicates that the boot-up process is not completing.</p>	<ol style="list-style-type: none"> <li>1. Power off the library and wait at least one minute before power on to recover the problem.</li> <li>2. Go to procedure “Reseating Cables” on page 8-13.</li> <li>3. Go to procedure “Main Controller Board” on page 7-30 to replace the main controller board.</li> </ol>
<p><b>The Library firmware does not complete the teaching process and appears hung with a message Teaching Column 5 displayed on the Operator panel.</b></p>	<ol style="list-style-type: none"> <li>1. Ensure that columns 2, 4, and 5 are installed in the library and each column has a correct fiducial label installed.</li> <li>2. Go to “Picker Assembly” on page 7-5 to replace the picker assembly.</li> <li>3. Go to “Picker Control Board” on page 7-14 to replace the picker control PCBA.</li> </ol>
<p><b>Picker Home Failure message on the Operator panel.</b></p>	<ol style="list-style-type: none"> <li>1. Power off the library and ensure that the front door and the door of the I/O station are securely closed. Power on to recover the problem.</li> <li>2. Go to “Picker Assembly” on page 7-5 to replace the picker assembly.</li> <li>3. Go to “Picker Control Board” on page 7-14 to replace the picker control PCBA.</li> </ol>
<p><b>Service Action Code (SAC) message from the Operator panel or from the Host.</b></p>	<ol style="list-style-type: none"> <li>1. Prepare library for service.</li> <li>2. Using the SAC just obtained start at Table 5-1 on page 5-4 locate the SAC and perform the actions in the order recommended.</li> <li>3. Run start option from the Operator panel to retrieve the SAC (Main Menu →Service →Start)</li> </ol>

Table 4-1. Start Service (continued)

If ...	Perform this Action
<b>Excessive retries on one section of magazine or the cartridges are not fully inserted in the storage slots.</b>	<ol style="list-style-type: none"> <li>1. Prepare library for service.</li> <li>2. Run Get/Put diagnostic from the Operator panel (&gt;Main Menu —&gt;Service —&gt;Library —&gt;Diags —&gt;Finger —&gt;Get/Put) to verify excessive retries. The gripper should get and put cartridge cleanly into storage slot. If gripper bumps into an upper or lower cartridge during this operation, retries are considered excessive. Note the storage slot where this happens then replace the storage magazine.</li> </ol>
<b>Customer reported that not all cartridges are being seen by the library</b>	<ol style="list-style-type: none"> <li>1. Prepare library for service.</li> <li>2. Check that the correct cartridge labels are applied on the cartridges. See the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i></li> <li>3. Replace the Picker Assembly (see “Picker Assembly” on page 7-5).</li> <li>4. Replace the Picker Control PCBA (see “Replacing the Picker Control Board” on page 7-14).</li> </ol>
<b>Library Problem - No Error Message</b> (includes visual symptoms or noise from the picker)	<ol style="list-style-type: none"> <li>1. Prepare library for service.</li> <li>2. Go to procedure “Other Library Failures” on page 4-7 to analyze the problem.</li> </ol>
<b>Drive sense data from host error logs is collected</b>	Go to procedure Chapter 10, “Sense”, on page 10-1.
<b>Install the Tape Library</b>	Go to procedure Chapter 13, “Install”, on page 13-1.
<b>Update Library Microcode</b>	Go to procedure “Updating Firmware” on page 8-4.
<b>Retrieving Error log, Trace Data and Command Log</b>	Go to procedure “Methods of Capturing Logs” on page 8-2.

# Analyze Tape Library Power Problems

Make sure the ac Power Cord is plugged in and the dc Power Modules are installed properly. Power Up the Library, observe the Library Operator Panel Display and the dc Power Modules' LEDs before proceeding.

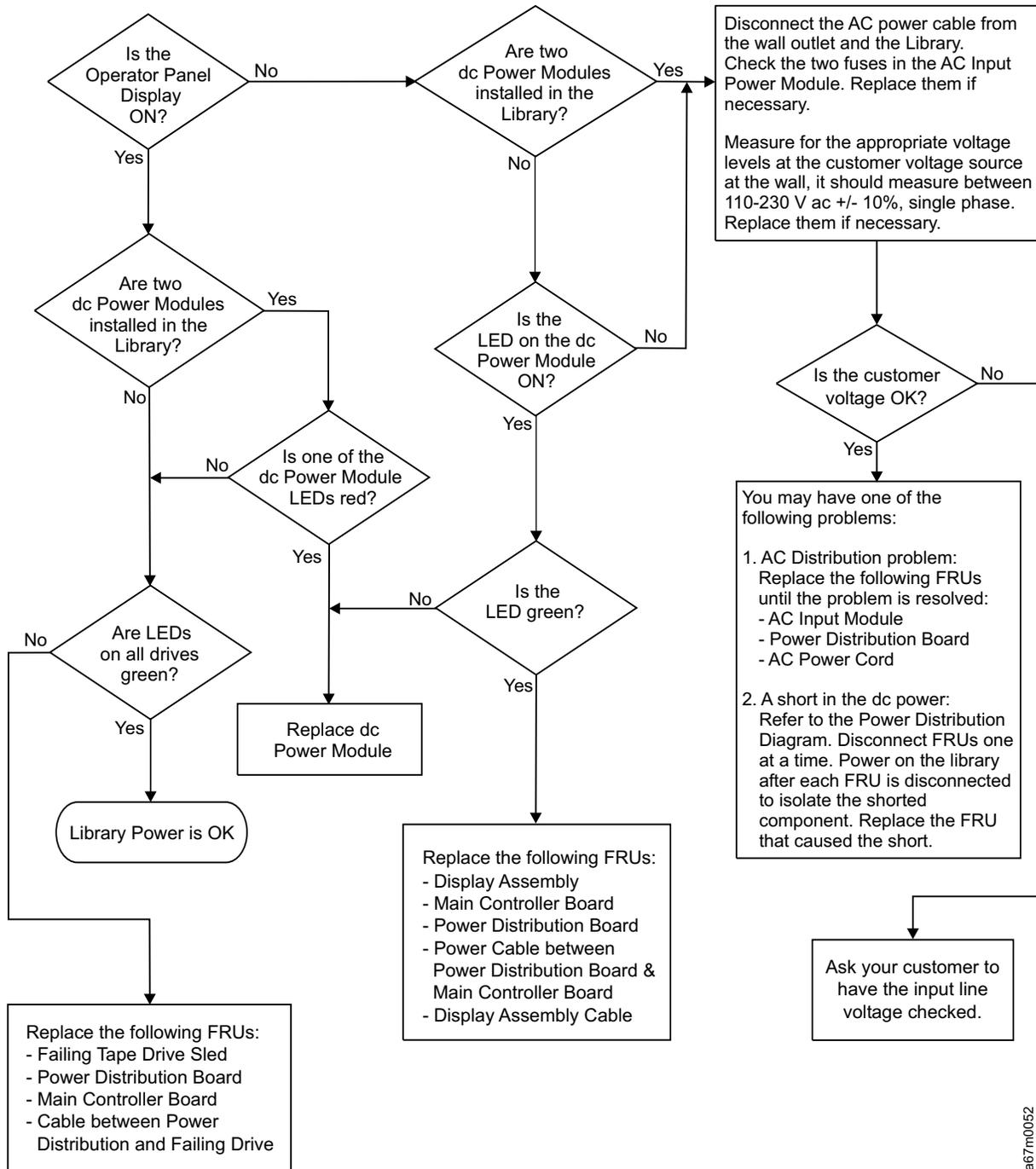


Figure 4-1. Power Map

a67m0052

# Analyze RMU Problems

Use Figure 4-2 to help resolve these problems with the RMU:

- SAC A0 00
- Failure to start an Ethernet session from attached PC
- Unexpected LED activity

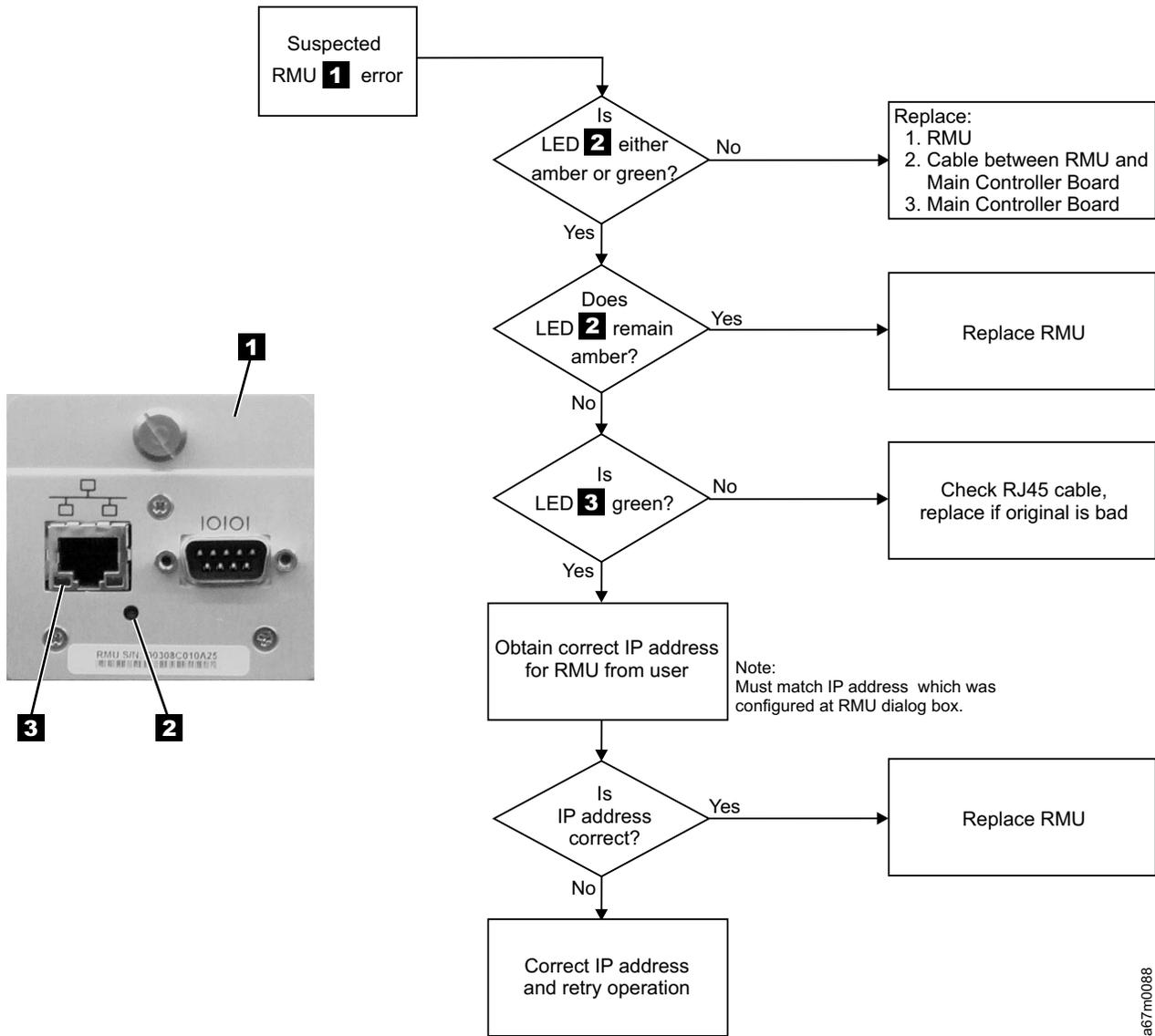


Figure 4-2. RMU Map

a67m0088

## Other Library Failures

Use the following table to perform problem analysis for Library failures that appear as Visual, Audible, or other Symptoms without Service Action Codes (SACs).

Table 4-2. Problem Analysis for Failures without Service Action Codes

Symptom	Possible Causes	Actions or FRUs	Reference Information on Page
Bearing noise or squeak from Y-axis	Defective bearing	Replace: casting supporting picker assembly Y-axis belt picker assembly Y-axis motor	7-5 7-16 7-5 7-27
Binding Y-axis	Defective bearing	Replace: casting supporting picker assembly Y-axis belt picker assembly Y-axis motor	7-5 7-16 7-5 7-27
Rotary axis vibration (oscillation) when stopping or stopped	Servo problem	Replace: picker control board rotary axis motor	7-14 7-12
Fuse or fuses blown on ac input module.	Shorted component or heavy load on circuit	Replace the fuse and power-on the library. If the fuse continues to blow, examine the power diagrams and isolate the failing component by unplugging cables in the fuse circuit until the failing FRU is determined.	11-4 11-5 11-6 11-7
I/O station problem	I/O station mechanical or electronic failure	Replace: I/O station assembly display assembly main controller board	7-46 7-43 7-30
Operator panel display incorrect operation	Operator panel electronic failure	Replace: display assembly main controller board Operator panel cable	7-43 7-30
Operator panel switches incorrect operation	Operator panel electronic failure	Replace: display assembly main controller board Operator panel cable	7-43 7-30
Operator panel No indicators are working	+5 V dc voltage missing from Operator panel	Replace: dc power supply assembly main controller board display assembly display assembly cable	7-49 7-30 7-23



---

## Chapter 5. Fault Symptom Index

Overview . . . . .	5-2
Service Action Codes. . . . .	5-3
Drive Error Codes . . . . .	5-19

---

## Overview

The following are definitions for acronyms and the acronyms used in this chapter:

1. Remote Management Unit will be referred to as RMU.
2. Service Action Code will be referred to as SAC.
3. Power-On-Self-Test will be referred to as POST.

When a failure occurs, the Tape Library firmware performs error recovery and error reporting. If the failure requires a service call, a two-byte SAC is generated and presented on the Operator/CE panel. This SAC is the result of the Tape Library firmware analyzing all pertinent information available at the time of failure which include sense data, the operation in progress, error and threshold data and any data returned from diagnostic routines invoked by the firmware to isolate the failure.

**Prior to performing the suggested actions for each SAC, it is recommended that you retrieve the Command and Error logs in case you need further assistance from Product Support to resolve the problem. To retrieve logs, see “Methods of Capturing Logs” on page 8-2.**

## Service Action Codes

Table 5-1 on page 5-4 lists the SACs, the error description and the actions that can be performed in addition to the FRUs that can be replaced. Each SAC consists of two bytes “nn xx”:

- “nn”: SAC.
- “xx”: SAC modifier. This byte identifies the processor that reports the error:
  - “00” = Main Controller
  - “10” = Picker Controller
  - “20” = Display Controller
  - “3x” = Drive Sled Controller (“x” = Drive ID (1 to 6)).
  - “40” = Host Interface Controller (SCSI)
  - “50” = RMU Controller

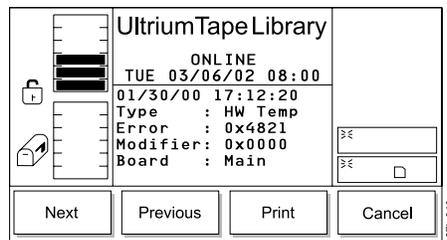
**Note:** For most SACs, the modifier is extra information, thus the value is not important; however, a small number of SACs will use this modifier to further refine the actions to be performed. The SACs requiring the modifier value are documented so that the suggested actions are grouped depending on the value of the modifier.

The table also lists the FRU names and a reference column which points to the page containing the location of the FRU or the procedure on how to perform the suggested action.

**Actions associated with each SAC are listed in their order of probability. Always perform the actions in the order listed, starting with the top action and continue down the list until the problem is resolved.**

| Press the button below the **Main Menu (initial screen)** → **Status** → **Logs** → **Error Log** softkeys. The Error Log Dialog displays (see Figure 5-1).

| **Note:** The error code that displays in the Error Log Dialog is for Engineering use only; it is not the Service Action Code (SAC).



| Figure 5-1. Error Log Dialog

**Note:** When an action calls for observation of the library Robotics you must remove library top cover, see “Observing Library Robotics” on page 8-15.

Table 5-1. Service Action Codes

SAC	Type of Error	Perform these actions	See Page
01 xx	Type 1 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
02 xx	Type 2 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
03 xx	Type 3 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
04 xx	Type 4 Software	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
05 xx	Permanent operating system error	Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
		Contact next level of support.	
10 xx	Bar code reader communications failed.	Clean the bar code reader with a lint free cloth. Retry the failing operation (this could be inventory, scan, teach, or any other operation where bar code reader is involved).	6-8
		Power off and on the tape library to recover from the error. Use the Main Switch to perform this action, wait at least one minute between power off and on.	
		Replace picker assembly.	7-5
		Replace picker control board.	7-14
11 xx	Bar code reader communication is OK, Data received from bar code reader is bad.	Clean the bar code reader with a lint free cloth. Retry the failing operation (this could be inventory, scan, teach, or any other operation where bar code reader is involved).	6-8
		Replace picker assembly.	7-5
		Replace picker control board.	7-14
12 00	Bar code reader communication is OK, bar code reader reports data is bad.	Replace picker assembly.	7-5
13 xx	Cannot read bar code label or label is bad.	Check Cartridge labels to ensure that they meet specifications and installed properly and not damaged or dirty, the slots in question are displayed with the SAC.	
		Ensure that scan beam is not obstructed.	
		Clean the bar code reader with a lint free cloth. Retry the failing operation (this could be inventory, scan, teach, or any other operation where bar code reader is involved).	6-8
		Power off and on the tape library to recover from the error. Use the main power switch to perform this action, wait at least one minute between power off and on.	
		Replace picker assembly.	7-5

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
14 xx	The system detects Serial Number is missing from its NVRAM.	Record and reenter System Serial Number (Using serial cable and HyperTerminal, enter "setser" command from HyperTerminal prompt.	7-30
15 XX	An intermittent scanning error was detected. During Demo, the library performs inventory after each complete demo cycle and detects a mismatch between the number of cartridges scanned and its previous database.	Note the number of cartridges installed in the library and use the operator panel to compare this information with the number of cartridges reported by the library. Examine the cartridges that are installed but not reported by the library for proper cartridge labels and replace labels if necessary. Note that if a whole column of cartridges is missing, the column fiducial label can be defective. In this case, the whole storage column must be replaced.	7-29
		If all labels are correct, clear the SAC and retry the Demo program.	
		If the problem remains, replace the Picker Assembly.	7-5
20 00	Serial port connection failures.	Replace main controller board.	7-30
		Replace the host interface board (SCSI).	7-41
		Replace serial port cable between host system and host interface board (SCSI).	
		Problem is in host system.	
21 xx	NVRAM failures.	Check Library configuration and reenter all data (SCSI ID, Time/Date, Library Serial Number, and any other valid data).	
		Power off and on the tape library a few times to see if the same error condition reappears. Use the Main Switch to perform this action, wait at least one minute between power off and on. <b>Note:</b> If the error reappears after a number of power on/off cycles, replace library main controller board.	7-30
22 00	Fail to communicate with Operator panel.	Reseat cable between main controller and display assembly.	8-13
		Replace cable between main controller and display assembly.	7-43
		Replace main controller board.	7-30
		Replace display assembly.	7-43
23 00	An unexpected interrupt is received.	Replace main controller board.	7-30
		Replace picker control board.	7-14
30 00	A fatal error is detected in SCSI Port.	Verify the SCSI bus connection to Library is properly terminated and powered.	
		Verify that the Library SCSI is properly configured by using the Operator panel (Main Menu →More →Setup →Library →SCSI).	
		Replace main controller board.	7-30
		Replace host interface board (SCSI).	7-41

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
31 00	<b>A fatal error is detected in SCSI Port.</b>	Verify SCSI bus connected to Library Port is properly terminated and powered.	
		Verify Library SCSI Port is properly configured by using Operator panel (Main Menu →More →Setup →Library →SCSI).	
		Replace main controller board.	7-30
		Replace host interface board (SCSI).	7-41
32 00	<b>Wrong SCSI bus connection detected. A single-ended SCSI bus is connected to Library set up in Differential mode.</b>	Verify Host SCSI bus is same type as Library host interface board (SCSI).	
		Verify LVD-HVD switch is set correctly on Library host interface board (SCSI).	6-16
33 00	<b>Wrong SCSI bus connection detected. A single-ended SCSI bus is connected to Library set up in Differential mode.</b>	Verify Host SCSI bus is same type as Library host interface board (SCSI).	
		Verify LVD-HVD switch is set correctly on Library host interface board (SCSI).	7-41
34 00	<b>A general SCSI failure is detected.</b>	Verify that the SCSI host is working properly.	
35 00	<b>A fatal SCSI error is detected.</b>	Verify SCSI connected to Library is properly terminated and powered.	
		Verify Library SCSI is properly configured (if applicable) by using Operator panel (Main Menu →More →Setup →Library →SCSI).	
		Replace Library main controller board.	7-30
		Replace the host interface board (SCSI).	7-41
38 xx	<b>The RMU cannot communicate with the Dynamic Host Configuration Protocol (DHCP) server.</b>	Ensure the network cable is properly connected to the RMU and verify that the RMU is set up to work in DHCP mode (Main Menu →Setup →Library →RMU).	
		Verify that the DHCP server is properly set up and configured. Test to see if the DHCP server can ping the RMU.	4-6
		Replace the RMU.	7-35
39 xx	<b>An external network error was detected by the RMU</b>	Ensure the network cable is properly connected to the RMU.	4-6
		Verify that the network the RMU is connected to is working properly.	4-6
		Replace the RMU.	7-35
40 xx	<b>The Library detects that Servo power is missing.</b>	Replace dc power supply.	7-49
		Replace power distribution board.	7-45

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
42 xx	<b>An invalid library configuration was detected: The I/O station storage column is missing or drive modules are not installed in the allowable configurations.</b>	Ensure all tape drive modules are properly installed (refer to the instructions in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i> . Drive sled 1 must be installed at the bottom slot of drive column. If you have a library with the Multi-Path feature, see the section about partitioning in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i> . Additional drive sleds must be installed consecutively one above the other with no gaps.	
		Ensure I/O station column (column 1) is installed and fiducial label is properly installed. Ensure the fiducial label is not damaged. Fiducial label is present on both standard I/O and 12 slot I/O station.	
		Ensure the picker assembly flex cable is properly connected and seated at the picker control board. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	8-13
		<p>Verify that the bar code reader is working properly:</p> <ul style="list-style-type: none"> <li>• With the library offline, open the door, observe a cartridge to be tested. Write down the cartridge label number and column/slot location. Close the door. The library will immediately perform an inventory of all the cartridges in the library.</li> <li>• When the inventory has completed, at the Operator panel, press Command—&gt;Move—&gt;Move Media. When asked to Select Target, enter the cartridge column/slot location you wrote down earlier. The library should respond back with a message stating that the target address already has a cartridge in it. It will also display data such as: Target:xxx (representing the column/slot address) and the bar code label number of the cartridge in that slot address.</li> </ul> <p>If bar code reader is working properly, the value of scanned bar code will be displayed on the Operator panel. If diagnostic failed, replace:</p> <ul style="list-style-type: none"> <li>– Picker assembly</li> <li>– Picker Control PCBA</li> </ul>	7-5
43 xx	<b>An unknown library configuration is detected, the bar code reader reads a fiducial label where none is expected.</b>	Ensure that the firmware level in the tape library supports the hardware installed.	
		If you are unable to determine the defective part, perform a serial trace (see “Capturing Serial Logs” on page 8-4).	8-4
		Check for a dirty, damaged, missing or wrong fiducial label located on storage columns, magazines, or tape drive sleds in the library, and replace the part that is defective.	

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
44 xx	<b>An unknown fiducial label is detected during a teach operation.</b>	Ensure that the firmware level in the tape library supports the hardware installed.	
		If you are unable to determine the defective part, perform a serial trace (see “Capturing Serial Logs” on page 8-4).	8-4
		Check for a dirty, damaged, missing or wrong fiducial label located on storage columns, magazines, or tape drive sleds in the library, and replace the part that is defective.	
46 xx	<b>A failure was detected during the scanning of fiducial or cartridge labels. This failure can be caused by a number of things. Perform the following actions to recover from the failure.</b>	This error can be caused by a dirty bar code reader (dust or fingerprints). Clean the bar code reader window with a lint free cloth and retry the operation.	6-8
		This error can be caused by a dirty, damaged or missing fiducial label on the magazine. To isolate the problem magazine, perform one of the following procedures: <ul style="list-style-type: none"> <li>Note the number of magazines installed in the library (each magazine should have at least one cartridge in it) and use the Operator panel to compare this information with the number of magazines reported by the library. If the library is equipped with a 12 slot I/O station, the icons representing the magazines in the I/O station column are displayed in the I/O station area.</li> <li>Remove one magazine at a time and retry the operation until the problem is resolved (Main Menu →Status →Library →System or Slot). Replace the failing magazine if found.</li> </ul>	
		This error can be caused by a dirty, damaged or incorrect cartridge bar code label. To isolate the problem cartridge, try one of the following procedures: <ul style="list-style-type: none"> <li>Note the number of cartridges installed in the library and use the Operator panel to compare this information with the number of cartridges reported by the library.</li> <li>Remove a few cartridges at a time and retry the operation until the problem is resolved (Main Menu →Status →Library →System or Slot). Replace the bar code label on the cartridge.</li> </ul>	
		This error can also be caused by hardware failures: <ul style="list-style-type: none"> <li>Ensure the picker assembly flex cable connector is properly seated on the picker control board.</li> <li>Inspect the picker flex cable for any obvious damage. Rotate the picker assembly to maximum counter clockwise (grip fingers facing the drive column) and inspect the area of the cable loop that is near the rotary motor encoder. If the Picker flex cable does not contain enough slack in this loop, the encoder on the Rotary axis motor can rub on the cable and cause damage. If the picker flex cable is damaged, replace the picker assembly.</li> </ul>	8-13  7-5

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
50 00	<b>A cartridge is not properly seated in the storage slot.</b>	Ensure the cartridge in question is properly installed in its storage slot. Slots are displayed with the SAC. Run start option from Operator panel to retrieve this information (Main Menu →More →Service →Start).	
		Ensure Cartridge label meets specifications, is installed properly and not damaged or dirty.	
		Reteach library using Operator panel (Main Menu →More →Service →Library →Teach).	
60 xx	<b>Cannot complete lock/unlock I/O station commands.</b>	Open the library front door to check for any mechanical binding by manually moving plastic lever attached to gear of motor on the I/O station assembly.	
		Run lock diagnostics from the Operator panel to see if there is any mechanical bindings (Main Menu →More →Service →Library →Diags →Sensors).	
		Replace the I/O station assembly	7-46
		Replace display assembly.	7-43
61 00	<b>The I/O station closed sensor error threshold is exceeded.</b>	Replace I/O station assembly.	7-46
70 xx	<b>Failures detected in picker assembly grip finger open operation.</b>	Ensure the picker assembly flex cable is properly connected and seated at the picker control board. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	8-13
		Run Grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> <li>• If diagnostic failed: replace the picker assembly.</li> <li>• If diagnostic passed, you may have an intermittent problem. Retry diagnostic several times and if appropriate replace the picker assembly.</li> </ul>	7-5
		Replace picker control board.	7-14
71 xx	<b>Failures detected in picker assembly grip finger close operation.</b>	Ensure the picker assembly flex cable is properly connected and seated at the picker control board. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	8-13
		Run grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> <li>• If diagnostic failed: replace the picker assembly.</li> <li>• If diagnostic passed, you may have an intermittent problem. Retry diagnostic several times and if appropriate replace the picker assembly.</li> </ul>	7-5
		Replace picker control board.	7-14

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
72 xx	Get command was issued but sensor indicated a cartridge is already present in picker assembly.	<p>Look into picker assembly to see if a cartridge is present.</p> <p>If a cartridge is found:</p> <ul style="list-style-type: none"> <li>Recover the cartridge, place it in any empty slot, close the door and retry failing operation.</li> <li>Perform actions in SAC "02 00".</li> </ul> <p>If a cartridge is <b>not</b> found in the picker assembly:</p> <p>Perform the actions in SAC "73 xx".</p>	
73 xx	Failures detected in picker assembly finger open/close operations.	<p>Ensure the picker assembly flex cable is properly connected and seated at the picker control PCBA. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.</p>	8-13
		<p>Run Grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close):</p> <ul style="list-style-type: none"> <li>If diagnostic failed: replace picker assembly.</li> <li>If diagnostic passed, retry it several times. If it fails during successive retries or if intermittent failures continue to occur during normal operations, replace the picker assembly.</li> </ul>	7-5
		<p>Check cartridge for physical damage.</p>	
		<p>Check for a stuck cartridge in a tape drive or storage slot. Replace the tape drive or magazine. Close the door and retry the failed operation.</p>	7-3
		<p>Replace picker control PCBA.</p>	7-14
74 00	Get command was issued but the sensor indicated source location is empty.	<p>Error can be caused by a cartridge not fully inserted in storage slot above failing slot. Check to see if this condition exists, if so, push the cartridge into its slot. Reinventory the Library (Main Menu →Commands →Inventory).</p>	
		<p>Error may be caused by picker not getting to its intended target due to a defective Y-Axis belt. Locate the picker and compare its coordinates with the failing slot's coordinates posted with this SAC. Adjust or replace the Y-Axis belt if they do not match.</p>	7-16
		<p>Look into location (slot or drive) and see if a cartridge is present.</p> <p>If a cartridge is found: Perform the actions in SAC "73 xx".</p> <p>If a cartridge is <b>not</b> found in this location: Perform the actions in SAC "02 xx".</p>	
75 00	A failure is detected in the picker assembly.	<p>Replace picker assembly.</p>	7-5
		<p>Replace picker control board</p>	7-14
76 00	A teach failure is caused by the picker assembly out of alignment condition.	<p>Make sure Y-axis drive belt is properly installed and tensioned.</p>	Step 18 on page 7-20

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
77 xx	<b>Failures detected in the picker assembly during a reach axis retract operation.</b>	Ensure the picker assembly flex cable is properly connected and seated at the picker control PCBA. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	8-13
		Check for failure to retrieve a cartridge from a magazine. Replace the magazine, close the door, and retry the failed operation.	
		Check the cartridge for physical damage.	
		Replace picker assembly.	7-5
		This failure can be the result of the drive not ejecting the cartridge properly so that the picker can retrieve it. Check the drive for proper cartridge ejection (the cartridge must be easily retrieved without any force); replace the drive if necessary.	7-3
		Replace picker control PCBA.	7-14
78 xx	<b>A put command was issued but sensor indicated the cartridge is not present in picker assembly.</b>	Look into the picker assembly and see if a cartridge is present. If a cartridge is found: Perform the actions in SAC "73 xx". If a cartridge is <b>not</b> found in the picker assembly: Perform the actions in SAC "02 xx".	
79 xx	<b>Failures detected in putting a cartridge into a tape drive.</b>	Check the tape drive to ensure it's properly seated, powered on and working properly.	
		Replace picker assembly.	7-5
		Replace picker control board.	7-14
7A xx	<b>Failures detected in picker assembly during a reach axis retract (to home position) operation.</b>	Ensure the picker assembly flex cable is properly connected and seated at the picker control PCBA. If not routed properly, this cable can pop out of its connector when the picker flex cable cover is installed.	8-13
		Check for the failure to retrieve a cartridge from a magazine. Verify that all magazines in the library are stamped on the back with <b>REVB</b> . Replace all magazines that are not <b>REVB</b> , close the door, and retry the failed operation.	
		Check the cartridge for physical damage.	
		Replace picker assembly.	7-5
		This failure can be the result of the drive not ejecting the cartridge properly so that the picker can retrieve it. Check the drive for proper cartridge ejection (the cartridge must be easily retrieved without any force); replace the drive if necessary.	7-3
		Replace picker control PCBA.	7-14

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
7C xx	Failures detected in picker assembly during a reach axis extend operation.	Check for obstruction in the slot. Obstruction can be: <ul style="list-style-type: none"> <li>An unlabeled cartridge</li> <li>A cartridge in the slot during a put operation</li> <li>The slot wall in the magazine is too tight</li> <li>A tape drive failure that prevents the cartridge from being inserted properly</li> </ul> Remove obstruction or replace the magazine or drive, close door and retry the failing operation.	
		Perform the actions in SAC "7A xx".	
7D xx	Failure detected while getting a cartridge from a tape drive.	Check the Tape drive to see if a cartridge is present. If a cartridge is found in the tape drive: Remove cartridge from the tape drive, power drive off then on and retry the operation. If a cartridge is <b>not</b> found in the tape drive: Perform actions in SAC "02 xx".	
7E xx	Failure detected while pushing a cartridge into a tape drive feed slot.	Check the cartridge for any physical damage.	
		Replace the failing tape drive sled.	7-3
80 xx	Failures detected in the rotary-axis servo system.	Inspect gearing between the rotary axis motor and picker assembly. Replace following FRUs in the order shown:	
		Replace rotary axis motor.	7-12
		Replace picker assembly.	7-5
		Replace picker control board.	7-14
81 xx	Failures detected in the Y-axis servo system (can be the result of SAC 7A XX).	Check Y-axis for any binds by moving it up and down. The binding can be between picker assembly and Y-shaft. If any binds exist, replace appropriate FRU.	
		Replace Y-axis motor assembly.	7-27
		Replace power distribution board.	7-45
		Replace Y-axis drive belt.	7-16
82 xx	An unexpected motion control condition was received.	If the SAC modifier "xx" is: <b>00</b> - Replace power distribution board. <b>10</b> - Replace picker control board and picker assembly.	7-45 7-14 7-5
		Replace signal cable between main controller board and power distribution board.	7-25
		Replace power cable between main controller board and power distribution board.	7-25
83 xx	Locate fiducial command failed with no target found. This failure is most likely to occur during initial installation of library subsystem.	Ensure all fiducial labels are present and within specification.	
		Clean all teach fiducial labels.	



Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
8A xx	The returned sense indicated that a motion command completed sooner than expected.	If "xx" = "00" - Check the Y-axis for any bindings, binding can be caused by an object (like a cartridge) that prevents the Y-axis from homing and reaching its target correctly.  If a bind is found, remove the bind and retry the operation.  If a bind is not found, replace the Y-axis motor assembly.	7-27
		If "xx" = "10" - Check rotary axis for any bindings, binding can be caused by an object (like a cartridge) that prevents the rotary axis from homing and reaching its target correctly:  If a bind is found, remove the bind and retry the operation.  If a bind is not found, replace the rotary axis motor, then picker assembly.	7-12 7-5
8B xx	Servo failures detected but the axis is not known.	Replace picker assembly.	7-5
		Replace picker control PCBA.	7-14
		Replace power distribution PCBA.	7-45
		Replace rotary-axis motor.	7-12
90 00	A down level main controller board was detected by the Library firmware when a new board is required for this library configuration to operate.	Update the library firmware.	8-4
91 00	A down level picker control board was detected by the library firmware when a new board is required for this library configuration to operate.	Update the firmware.	8-4
92 xx	A down level board was detected by library firmware when a new board is required for this library configuration to operate.	Update the firmware.	8-4
93 xx	A failure was detected in drive communication hardware within the library: library cannot communicate with one or more drives (note the physical location of the failing drive, this information is presented with the SAC).	If the accompanying message indicated that the library cannot communicate with one specific tape drive: <ul style="list-style-type: none"> <li>• Make sure the tape drive in question is properly installed in its drive slot.</li> <li>• Replace failing tape drive sled.</li> <li>• Replace cable between power distribution board and the failing drive.</li> <li>• Replace power distribution board.</li> </ul>	7-3 7-26 7-45
		If the library cannot communicate with multiple drives: <ul style="list-style-type: none"> <li>• Replace the power distribution board.</li> <li>• Replace library main controller board</li> <li>• Replace cable between power distribution board and the failing drive.</li> </ul>	7-45 7-30 7-26

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
94 xx	<p>Communication was previously established between library and tape drive but the library detected communication is no longer present or the drive status is not as expected.</p> <p>Note: Coordinates of the failing tape drive sled is posted on Operator panel but if this information was reset by the Operator, it can be retrieved by going to the error log and refer to the error modifier "xxxx", this value will show the failing drive</p>	<p>If SAC modifier "xx" = "00":</p> <ul style="list-style-type: none"> <li>• Make sure that the failing tape drive sled is properly installed and powered on.</li> <li>• See if there is a cartridge in the failing tape drive preventing the drive from becoming ready. If cartridge is present eject the cartridge, retry the operation replacing the tape drive sled if appropriate.</li> <li>• Replace the power distribution board.</li> <li>• Replace cable between failing tape drive and power distribution board.</li> </ul>	<p>7-3</p> <p>7-45</p> <p>7-26</p>
		<p>If the SAC modifier "xx" = "3x" (where x equals 1 through 6), replace tape drive sled identified by SAC modifier.</p>	<p>7-3</p>
95 xx	<p>Picker assembly delivered a cartridge to a tape drive but the drive does not confirm tape loading status. The "xx" part of the SAC identifies the drive.</p>	<p>If another tape drive is available, retry the operation by loading the same cartridge into that tape drive:</p> <ul style="list-style-type: none"> <li>• If the operation failed, inspect the cartridge for damage and replace it.</li> <li>• If the operation is successful, verify that the original failing tape drive is failing by loading another cartridge into that drive. Replace the drive if this operation failed.</li> </ul>	<p>7-3</p>
98 xx	<p>The firmware installed on the tape drive is not supported by the Library. The "xx" part of the SAC identifies the drive.</p>	<p>Update the drive firmware with the latest level.</p>	<p>8-4</p>
A0 xx	<p>Communication is not established between the main controller and the RMU.</p>	<p>Ensure RMU is properly installed in the library.</p>	<p>4-6</p>
		<p>Reseat cable between main controller board and RMU.</p>	<p>8-13</p>
		<p>Replace RMU.</p>	<p>7-35</p>
		<p>Replace main controller board.</p>	<p>7-30</p>

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
A1 xx	<b>A generic communication error was detected between the main controller board and one of the auxiliary controller boards in the library. Use the SAC modifier “xx” and follow the appropriate actions below.</b>	If the SAC modifier “xx” = “00”: <ul style="list-style-type: none"> <li>• Reseat cable between main Controller and picker controller board.</li> <li>• Replace picker control board.</li> <li>• Replace library main controller board.</li> <li>• Replace the display assembly.</li> </ul>	8-13 7-14 7-30 7-43
		If the SAC modifier “xx” = “10”: <ul style="list-style-type: none"> <li>• Reseat cable between main Controller and picker controller board.</li> <li>• Replace picker control board.</li> </ul>	8-13 7-14
		If the SAC modifier “xx” = “20”: <ul style="list-style-type: none"> <li>• Reseat Cable between main control and display control board.</li> <li>• Replace display control board.</li> </ul>	8-13 7-43
		If the SAC modifier “xx” = “3x”: <ul style="list-style-type: none"> <li>• Reseat serial communication cable between main control and power distribution board.</li> <li>• Replace drive sled x.</li> </ul>	8-13 7-3
		If the SAC modifier “xx” = “40”: <ul style="list-style-type: none"> <li>• Replace host interface board (SCSI).</li> </ul>	7-41
		If the SAC modifier “xx” = “50”: <ul style="list-style-type: none"> <li>• Replace RMU.</li> </ul>	7-35
		Replace main control board.	7-30
A2 xx	<b>Communication was initially established but is now lost between the main controller board and the picker control board.</b>	Reseat the cable between main Controller and picker control boards.	8-13
		Replace the picker assembly.	7-5
		Replace the picker control board.	7-14
		Replace Library main controller board.	7-30
A3 xx	<b>Communication was initially established but is now lost between the main controller board and the display control board.</b>	Reseat the cable between main Controller and display control boards.	8-13
		Replace the display assembly.	7-43
		Replace the main controller board.	7-30
D0 xx	<b>Library detected that one of the dc power supplies has failed, this error condition only occurs in libraries equipped with the dual dc power supplies feature.</b>	Observe LEDs located on each dc power supply. The LED should be either green or red. Red LED indicates power supply had failed. Replace failing power supply.	7-49
D1 xx	<b>Library detected ac input to one bank of the dc power supplies is missing. This error condition only occurs in libraries equipped with the dual dc power supplies feature.</b>	Observe the LEDs located on each dc power supply. The LED should be either green of red. Red LED indicates the power supply had failed. Replace the failing power supply.	7-49
		Replace the power distribution board.	7-45

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
D2 xx	Library detected a fan has failed in one of the dc power supplies or in one of the tape drives.	If the SAC modifier xx = 00: <ul style="list-style-type: none"> <li>• If the library has only one dc power supply, replace it.</li> <li>• If the library has 2 dc power supplies, the failing supply displays a red LED. Observe the LED on the power supplies and replace the failing one.</li> </ul>	7-51
		If the SAC modifier xx = 3x, replace the drive that is identified by the modifier x where x equals drive 1 through 6 (as shown in "Storage Slot Numbering" on page 1-10).	7-51
E0 xx	A cartridge is stuck in picker assembly, Operator intervention is required to remove cartridge from the grip fingers.	Perform procedure "Cartridge Removal from Picker Assembly" on page 7-2.	
E1 00	I/O station door is not fully closed, Operator intervention is required to close the door.	Close the door on the I/O station.	
E2 xx	Front door is not fully closed. Operator intervention is required to close the door.	Close the front door.	
		If the SAC code is intermittent, replace the door switch.	7-54
E3 00	Wrong SCSI bus connection is detected. A single-ended SCSI device is connected to library configured in differential mode.	Check library configuration to ensure all devices on the library SCSI port have the same SCSI type.	
		If problem is not corrected, perform the actions in SAC "30 00".	
E4 00	Wrong SCSI bus connection is detected. A single-ended SCSI device is connected to library configured in differential mode.	Check library configuration to ensure that all devices on the library SCSI port have the same SCSI type.	
		If the problem is not corrected, perform actions in SAC "31 00".	
E5 00	SCSI bus connected to library is not properly terminated.	Ensure that both ends of the SCSI bus connected to library are properly terminated. A terminator is shipped with each library SCSI adapter card.	
		If the problem is not corrected, perform the actions in SAC "30 00".	
E6 00	SCSI bus connected to library is not properly terminated.	Ensure that both ends of the SCSI bus connected to library Port are properly terminated. A terminator is shipped with each library SCSI adapter card.	
		If the problem is not corrected, perform the actions in SAC "31 00".	

Table 5-1. Service Action Codes (continued)

SAC	Type of Error	Perform these actions	See Page
E7 xx	Picker assembly detected a cartridge is not present in the grip fingers. Cartridge may not be seated properly in grip fingers or the get operation is not successful. Locate the cartridge in question:	If cartridge is not properly seated in the grip fingers, remove the cartridge. Insert cartridge in any empty slot and retry the operation.	
		If cartridge is not in the Picker but located in its original slot, see if the cartridge is seated too tightly in the slot. If cartridge is seated too tight in the slot replace the magazine, reinventory and retry the operation.	
		Run grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> <li>• If the diagnostic failed: replace the picker assembly.</li> <li>• If the diagnostic passed, you may have an intermittent problem. Retry the diagnostic several times and replace the picker assembly if appropriate.</li> </ul>	7-5
E8 xx	During a move to put cartridge after a successful get command, the picker assembly detected the cartridge is no longer present in the grip fingers. Locate cartridge in question:	If a cartridge is found: Recover cartridge, reinventory Library and retry the operation.	
		If a cartridge is not found, run grip finger diagnostics (Main Menu →More →Service →Library →Diags →Fingers →Step →Open/Close): <ul style="list-style-type: none"> <li>• If diagnostic failed: replace the picker assembly.</li> <li>• If diagnostic passed, you may have an intermittent problem. Retry diagnostic several times and replace the picker assembly if appropriate.</li> </ul>	7-5
EA 00	Failures were detected while running the diagnostic loop test from main controller board to all sensors on the I/O station assembly.	Replace Library main controller board.	7-30
		Replace display control board.	7-43
		Replace the I/O station assembly	7-46
		Replace the Display Cable.	7-23
F0 00	Failures were detected while running diagnostic loop test from main controller board to the picker control board.	Replace library main controller board.	7-30
		Replace picker control board.	7-14
		Replace Y-axis flex cable.	7-22
F1 00	Failures were detected while running diagnostic loop test from main controller board to the display control board.	Replace library main control board.	7-30
		Replace display control board.	7-43
		Replace the display panel cable.	7-43
F7 00	Failures detected in the main controller board during POST.	Replace Library main controller board.	7-30
F8 00	Failures detected in the picker control board during POST.	Replace library picker control board.	7-14
F9 00	Failures detected in the display control board during POST.	Replace display control board.	7-43
FA 00	Failures detected in the SCSI host interface board (SCSI) during POST.	Replace host interface board (SCSI).	7-41
FB 00	Invalid SAC (Preventive Maintenance)	<ul style="list-style-type: none"> <li>• Press OK on library Operator panel to clear SAC.</li> <li>• Ensure library firmware is at latest level.</li> </ul>	8-11

## Drive Error Codes

Errors and informational messages that pertain to the tape drive are shown in the drive status area of the operator panel. Table 5-2 describes the codes that display.

**Note:** In this table, *enclosure* refers to the Ultrium Scalable Tape Library.

**Attention:** If the tape drive detects a permanent error and displays an error code other than 0, it automatically performs a drive dump. If you force a drive dump, the existing dump will be overwritten and data will be lost. After you force a drive dump, do not turn off the power to the tape drive or library, or you may lose the dump data.

Table 5-2. Drive error codes

Code	Cause and Action
0	<p>No error occurred and no action is required. This code displays:</p> <ul style="list-style-type: none"> <li>• When power is cycled (turned off, then on) to the tape drive.</li> <li>• When diagnostics have finished running and no error occurred.</li> </ul> <p><b>Note:</b> The single-character display is blank during normal operation of the tape drive.</p>
1	<p>Cooling problem. The tape drive detected that the recommended operating temperature was exceeded. Perform the following action:</p> <ol style="list-style-type: none"> <li>1. If a fan is present in the enclosure, ensure that it is rotating and is quiet. If not, replace the fan (for instructions about replacing the fan, see your enclosure's documentation).</li> <li>2. Remove any blockage that prevents air from flowing freely through the tape drive.</li> <li>3. Ensure that the operating temperature and airflow is within the specified range (see "Specifications" on page 1-19).</li> <li>4. If the operating temperature is within the specified range and the problem persists, replace the tape drive.</li> </ol> <p>The error code clears when you power-off the tape drive or place it in maintenance mode.</p>
2	<p>Power problem. The tape drive detected that the externally supplied power is either approaching the specified voltage limits (the drive is still operating) or is outside the specified voltage limits (the drive is not operating). Perform the following action:</p> <ol style="list-style-type: none"> <li>1. Ensure that the power connector is properly seated.</li> <li>2. Ensure that the proper dc voltages are being applied within the tolerances allowed (see "Specifications" on page 1-19).</li> <li>3. If the proper voltages are being applied but the problem persists, replace the tape drive.</li> </ol> <p>The error code clears when you power-off the tape drive or place it in maintenance mode.</p>

Table 5-2. Drive error codes (continued)

Code	Cause and Action
3	<p>Firmware problem. The tape drive determined that a firmware error occurred. Perform the following action:</p> <ol style="list-style-type: none"> <li>1. Collect a drive dump from one of the following:           <p><b>Note:</b> Do not force a new dump; the tape drive has already created one.</p> <ul style="list-style-type: none"> <li>• Server's SCSI or Fibre Channel interface by using a device driver utility or system tool. To obtain a dump, determine whether your server is installed with a utility that can read files from the server's memory. If it is, use that utility to obtain the dump. For information about using IBM's utility programs to obtain drive dumps, see the <i>IBM Ultrium Device Drivers Installation and User's Guide</i>. To determine where to send a file that contains a drive dump to be analyzed, contact your Support Center.</li> <li>• Ultrium Tape Drives (to copy a drive dump, refer to the section about copying a drive dump in the library's operator guide).</li> </ul> </li> <li>2. Power the tape drive off and on, then retry the operation that produced the error.</li> <li>3. If the problem persists, download new firmware and retry the operation.</li> <li>4. If the problem persists, send the drive dump that you collected in step 1 to your Support Center.</li> </ol> <p>The error code clears when you power-off the tape drive or place it in maintenance mode.</p>
4	<p>Firmware or tape drive problem. The tape drive determined that a firmware or tape drive hardware failure occurred. Perform the following action:</p> <ol style="list-style-type: none"> <li>1. Collect a drive dump from one of the following:           <p><b>Note:</b> Do not force a new dump; one already exists.</p> <ul style="list-style-type: none"> <li>• Server's SCSI or Fibre Channel interface by using a device driver utility or system tool. To obtain a dump, determine whether your server is installed with a utility that can read files from the server's memory. If it is, use that utility to obtain the dump. For information about using IBM's utility programs to obtain drive dumps, see the <i>IBM Ultrium Device Drivers Installation and User's Guide</i>. To determine where to send a file that contains a drive dump to be analyzed, contact your Support Center.</li> <li>• Ultrium Tape Drives (to copy a drive dump, refer to the section about copying a drive dump in the library's operator guide).</li> </ul> </li> <li>2. Power the tape drive off and on, then retry the operation that produced the error. The error code clears when you power-off the tape drive or place it in maintenance mode.</li> <li>3. If the problem persists, download new firmware and retry the operation; if new firmware is not available, replace the tape drive.</li> </ol>
5	<p>Tape drive hardware problem. The drive determined that a tape path or read/write error occurred. To prevent damage to the drive or tape, the drive will not allow you to insert a cartridge if the current cartridge was successfully ejected. The error code may clear when you cycle power to the tape drive or place it in maintenance mode. If the problem persists, replace the tape drive.</p>

Table 5-2. Drive error codes (continued)

Code	Cause and Action
6	<p>Tape drive or media error. The drive determined that an error occurred, but it cannot isolate the error to faulty hardware or to the tape cartridge. Perform the following action:</p> <p><b><u>For Problems with Writing Data:</u></b></p> <p>If the problem occurred while the drive was writing data to the tape, and if you know the volume serial number (located on the cartridge label) of the tape cartridge loaded in the drive when the problem occurred, retry the operation with a different cartridge:</p> <ul style="list-style-type: none"> <li>• If the operation succeeds, the original cartridge was defective. Copy data from the defective cartridge and discard it.</li> <li>• If the operation fails and another drive is available, insert the cartridge into the other drive and retry the operation. <ul style="list-style-type: none"> <li>– If the operation fails, discard the defective cartridge.</li> <li>– If the operation succeeds, insert a scratch cartridge into the first drive and run drive diagnostics (refer to the appropriate section in the library's operator guide). <ul style="list-style-type: none"> <li>- If the diagnostics fail, replace the drive.</li> <li>- If the diagnostics succeed, the error was temporary.</li> </ul> </li> </ul> </li> <li>• If the operation fails and another drive is not available, insert a scratch cartridge into the drive and run the tape drive diagnostics (refer to the appropriate section in the library's operator guide). <ul style="list-style-type: none"> <li>– If the diagnostics fail, replace the drive.</li> <li>– If the diagnostics succeed, discard the cartridge.</li> </ul> </li> </ul> <p>If the problem occurs with multiple tape cartridges or if you do not know the tape cartridge's volume serial number, run the tape drive diagnostics (refer to the appropriate section in the library's operator guide):</p> <ul style="list-style-type: none"> <li>• If the diagnostics fail, replace the tape drive.</li> <li>• If the diagnostics succeed, run the Head Read/Write test (refer to the appropriate section in the library's operator guide). <ul style="list-style-type: none"> <li>– If the Test Head diagnostic fails, replace the tape drive.</li> <li>– If the Test Head diagnostic succeeds, replace the cartridges that caused the problem.</li> </ul> </li> </ul> <p>The error code clears when you remove the tape cartridge or place the drive in maintenance mode.</p> <p><b><u>For Problems with Reading Data:</u></b></p> <p>If the problem occurred while the drive was reading data from the tape, and if you know the volume serial number of the tape cartridge, perform one of the following procedures:</p> <ul style="list-style-type: none"> <li>• If another drive is available, insert the cartridge into the other drive and retry the operation: <ul style="list-style-type: none"> <li>– If the operation fails, discard the defective cartridge.</li> <li>– If the operation succeeds, insert a scratch cartridge into the first drive and run the tape drive diagnostics (refer to the appropriate section in the library's operator guide): <ul style="list-style-type: none"> <li>- If the diagnostics fail, replace the drive.</li> <li>- If the diagnostics succeed, the error was temporary.</li> </ul> </li> </ul> </li> <li>• If another drive is not available, insert a scratch cartridge into the drive and run the tape drive diagnostics (refer to the appropriate section in the library's operator guide): <ul style="list-style-type: none"> <li>– If the diagnostics fail, replace the drive.</li> <li>– If the diagnostics succeed, discard the cartridge.</li> </ul> </li> </ul> <p>If the problem occurs with multiple tape cartridges or if you do not know the tape cartridge's volume serial number, run the tape drive diagnostics (refer to the appropriate section in the library's operator guide):</p> <ul style="list-style-type: none"> <li>• If the diagnostics fail, replace the tape drive.</li> <li>• If the diagnostics succeed, run the Head Read/Write test (refer to the appropriate section in the library's operator guide): <ul style="list-style-type: none"> <li>– If the Test Head diagnostic fails, replace the tape drive.</li> <li>– If the Test Head diagnostic succeeds, replace the cartridges that caused the problem.</li> </ul> </li> </ul> <p>The error code clears when you remove the tape cartridge or place the drive in maintenance mode.</p>

Table 5-2. Drive error codes (continued)

Code	Cause and Action
7	<p>A high probability of media error. The tape drive determined that an error occurred because of a faulty tape cartridge, and expired cleaning cartridge, or the insertion of an FMR cartridge as a data cartridge.</p> <ul style="list-style-type: none"> <li>• Try another tape cartridge. If the problem occurs with multiple tape cartridges, see “Resolving Media-Related Problems” on page A-14.</li> <li>• Dispose of the current cleaning cartridge and insert a new cleaning cartridge.</li> <li>• If the FMR cartridge is no longer needed, go to to the section about erasing an FMR tape in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Maintenance Information</i>.</li> </ul> <p>The error code clears when you remove the tape cartridge or place the drive in maintenance mode.</p>
8	<p><b>For SCSI drive:</b></p> <p>Tape drive or SCSI bus failure. The tape drive determined that a failure occurred in the tape drive’s hardware or in the SCSI bus. See “Fixing SCSI Bus Errors” on page A-9. The error code clears 10 seconds after the drive detected the error or when you place the drive in maintenance mode.</p> <p><b>For Fibre Channel drive:</b></p> <p>Tape drive or Fibre Channel failure. The tape drive determined that a failure occurred in the tape drive’s hardware or in the Fibre Channel. It detects light through the fiber cable but cannot perform data communication properly. The length of the cable between the devices should not exceed 500 m (1640 ft). See “Fixing Fibre Channel Errors” on page A-11. The error code clears when the drive detects light and can communicate, or when you place the drive in maintenance mode.</p>
9	<p>Tape drive or LDI (RS-422) error. The tape drive determined that a failure occurred in the tape drive hardware or in the LDI (RS-422) connection.</p> <ul style="list-style-type: none"> <li>• Power cycle the drive. If the power-on self test is successful, the problem is resolved.</li> <li>• If the problem persists, replace the tape drive sled (see “Tape Drive Sled” on page 7-3).</li> <li>• If the problem persists after replacing the drive, the problem is with the cable between the drive sled and the power distribution board, the power distribution board itself, or the main board.</li> </ul> <p>The error code clears when you place the drive in maintenance mode.</p>
o, c, b, or h	<p>No error or message assigned. There may be a problem with the single-character display. Turn the power off, then on and determine whether all segments on the single-character display are lit. If so, you may have a down-level version of both your library’s firmware and documentation (the documentation may not describe all of the available error codes). Refer to the latest version of the firmware or documentation.</p>
A	<p>Tape drive hardware problem. The tape drive determined that a problem occurred which degraded the operation of the tape drive, but it did not restrict continued use. If the problem persists, replace the tape drive. The drive is usable, though the single-character display continues to indicate an error and the status light flashes amber.</p> <p>The error code may clear when you cycle power to the tape drive or place it in maintenance mode.</p>
B	<p>No error or message is assigned. See error code 8 in this table.</p>
C	<p>The tape drive needs to be cleaned. Clean the tape drive. See the section about cleaning drives in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>.</p> <p>The error code clears when you clean the tape drive or place it in maintenance mode.</p>
d	<p>Fibre Channel AL_PA conflict. More than one device has the same address. Each device must have its own unique AL_PA address. See the section about setting Loop IDs in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>.</p>
D	<p>No error or message assigned. See error code 0 in this table.</p>

Table 5-2. Drive error codes (continued)

Code	Cause and Action
E	<p>Informational message. The tape drive's Fibre Channel port has been placed offline by another device or by an operator. This code is set when the Offline command is received from another device on the Fibre Channel interface. Determine why the device at the other end of the Fibre Channel (the server, switch, or other device) placed the drive offline.</p> <p>The drive is placed online when it receives the Online command from the Fibre Channel interface.</p> <p>After a reset, the drive comes online.</p>
F	<p>The tape drive determined that no light is being received over the Fibre Channel. See "Fixing Fibre Channel Errors" on page A-11.</p> <p>The error code clears when the drive detects light or when you place the drive in maintenance mode.</p>



## Chapter 6. Locations

	Tape Library Subsystem Overview . . . . .	6-2
	Tape Library Front View . . . . .	6-3
	Rear View of Tape Library with SCSI Attachment . . . . .	6-4
	Rear View of Tape Library with Native Fibre Channel Attachment . . . . .	6-5
	Tape Library Serial Ports . . . . .	6-6
	Y-Axis and Rotary-Axis Assembly . . . . .	6-7
	Picker Assembly . . . . .	6-8
	I/O Station (12 Slot) . . . . .	6-9
	I/O Station (Single Slot) . . . . .	6-10
	Main Controller PCBA . . . . .	6-11
	Display Assembly. . . . .	6-12
	Power Distribution PCBA (Type I) . . . . .	6-13
	Power Distribution Board (Type II) . . . . .	6-14
	Picker Control Board . . . . .	6-15
	Host SCSI Interface Board . . . . .	6-16
	Serial Diagnostic Port Board. . . . .	6-17
	DC Power Supply Assembly. . . . .	6-18
	AC Input Power Module . . . . .	6-19
	SAN Data Gateway Module (optional) . . . . .	6-20
	Remote Management Unit . . . . .	6-21

## Tape Library Subsystem Overview



Figure 6-1. Tape Library Overview (Standalone Model)

- 1** Operator/CE Panel Display
- 2** Front Door
- 3** Door Lock

- 4** Louvre (Air Vent)
- 5** I/O Station
- 6** Casters

a67m0003

## Tape Library Front View

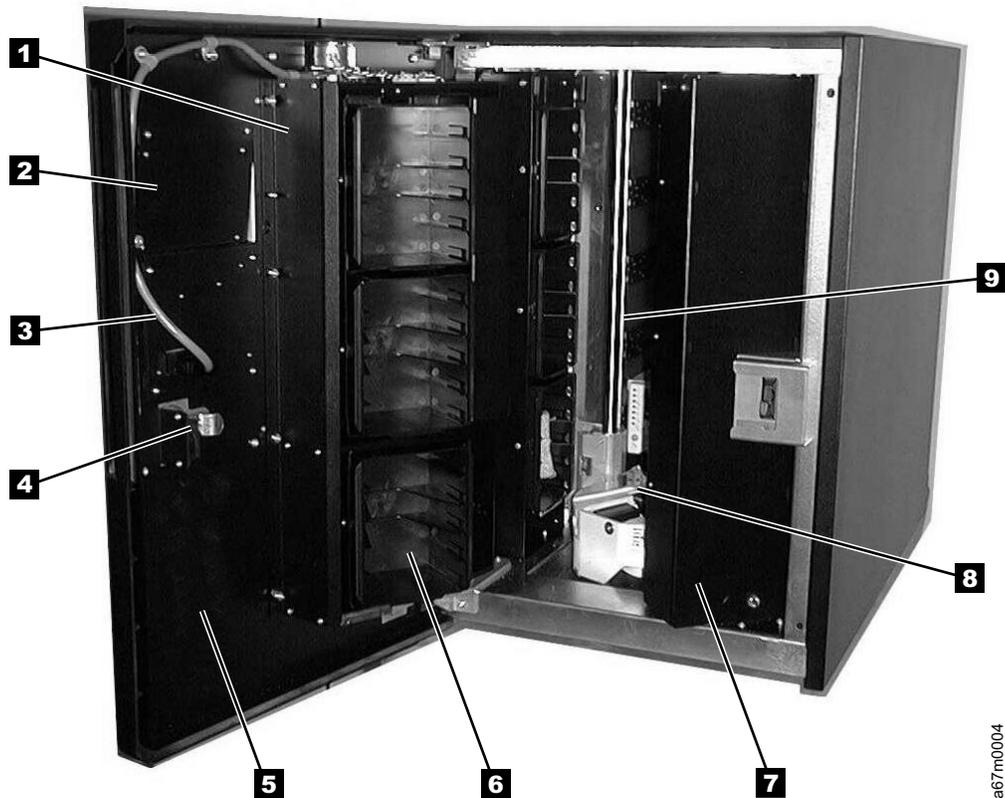


Figure 6-2. Front view of tape library with door opened

- |          |                              |          |                      |
|----------|------------------------------|----------|----------------------|
| <b>1</b> | I/O Station                  | <b>6</b> | I/O Station Column 1 |
| <b>2</b> | Operator/CE Panel Assembly   | <b>7</b> | Storage Column 5     |
| <b>3</b> | I/O Station Cable Harness    | <b>8</b> | Picker Assembly      |
| <b>4</b> | Door Lock & Interlock Switch | <b>9</b> | Y-Axis Drive Shaft   |
| <b>5</b> | Front Panel (Lower)          |          |                      |

a67m0004

## Rear View of Tape Library with SCSI Attachment

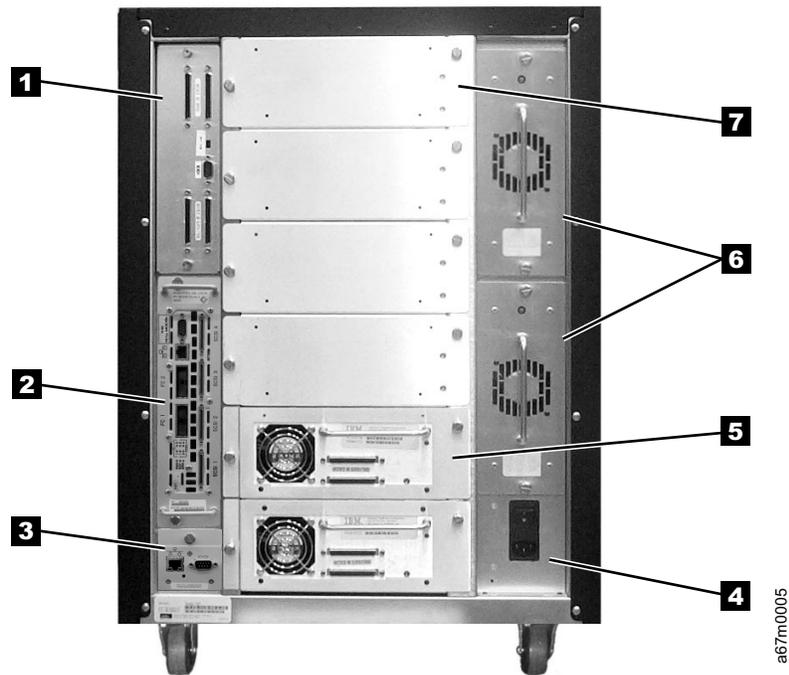


Figure 6-3. Rear view of tape library with SCSI attachment. The drive contains Ultrium 1 Tape Drives.

- |          |                                    |          |   |
|----------|------------------------------------|----------|---|
| <b>1</b> | Host Interface Board (SCSI)        | <b>5</b> | Tape Drive Sled and Ultrium 1 Tape Drive    |
| <b>2</b> | SAN Data Gateway Module (optional) | <b>6</b> | DC Power Supply & Redundant dc Power Supply |
| <b>3</b> | RMU                                | <b>7</b> | Filler Panel                                |
| <b>4</b> | AC Input Power Module              |          |   |

## Rear View of Tape Library with Native Fibre Channel Attachment

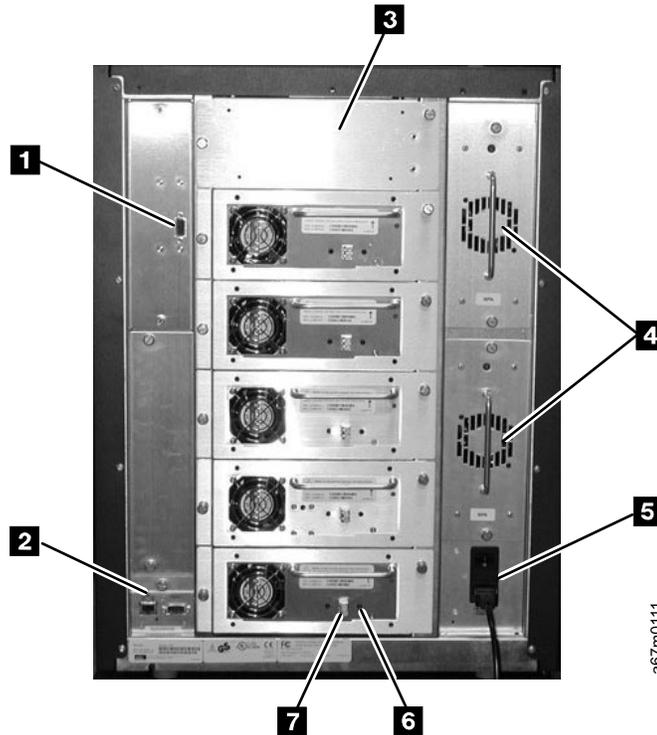


Figure 6-4. Rear view of tape library with native fibre channel attachment. The drive contains Ultrium 2 Tape Drives.

- |   |   |   |  |
|---|---|---|--|
| 1 | Serial Diagnostic Port Board                | 5 | Ac Input Power Module                    |
| 2 | Remote Management Unit                      | 6 | Tape Drive Sled and Ultrium 2 Tape Drive |
| 3 | Filler Panel                                | 7 | LC Connector                             |
| 4 | DC Power Supply & Redundant dc Power Supply |   |  |

## Tape Library Serial Ports

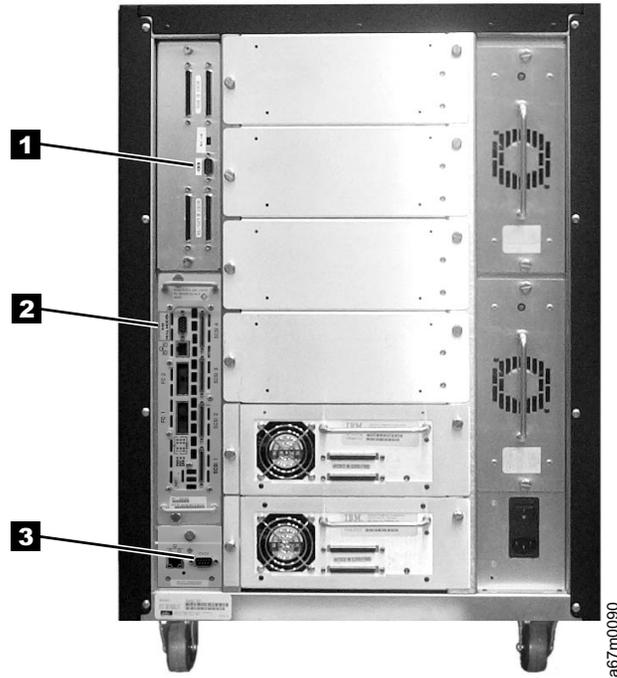


Figure 6-5. Tape library serial ports

- 1** Host Interface Board (SCSI) Serial Port, use only straight through serial cable.
- 2** SAN Data Gateway Module Serial Port with orange Null Modem label, use only Null Modem cable.
- 3** RMU Serial Port, use only straight through serial cable.

## Y-Axis and Rotary-Axis Assembly

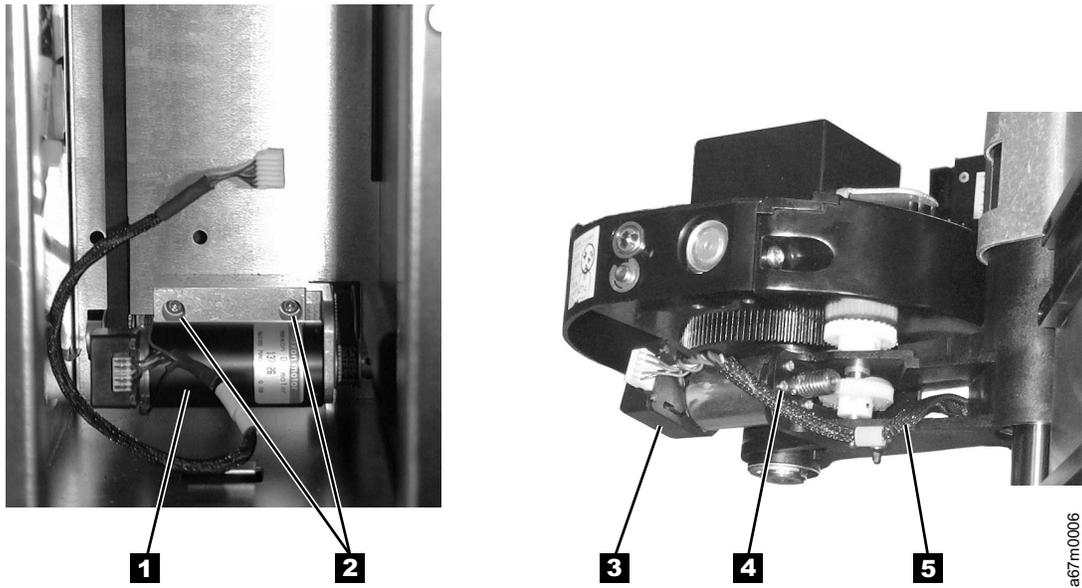


Figure 6-6. Y-Axis and Rotary-Axis Assembly

- 1** Y–Axis Motor Assembly
- 2** Y–Axis Motor Assembly Mounting Screws
- 3** Rotary Axis Motor Assembly

- 4** Rotary Axis Motor Mounting Screw (1 of 4)
- 5** Rotary Axis Cable Harness

## Picker Assembly

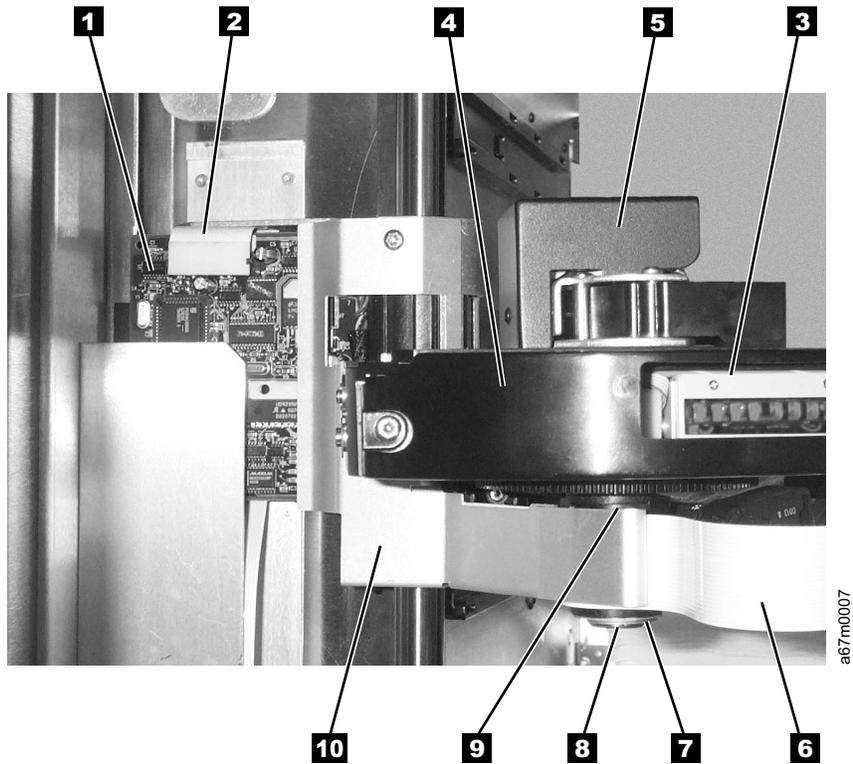


Figure 6-7. Picker Assembly

- |          |                                  |           |                         |
|----------|----------------------------------|-----------|-------------------------|
| <b>1</b> | Picker Control Board             | <b>6</b>  | Picker Flex Cable       |
| <b>2</b> | Y-Axis Flex Cable                | <b>7</b>  | E-clip & Washer         |
| <b>3</b> | Bar Code Reader Scan Beam Window | <b>8</b>  | Picker Shaft            |
| <b>4</b> | Bar Code Reader Cover            | <b>9</b>  | Top Washer              |
| <b>5</b> | Picker Assembly                  | <b>10</b> | Picker Flex Cable Cover |

---

## I/O Station (12 Slot)

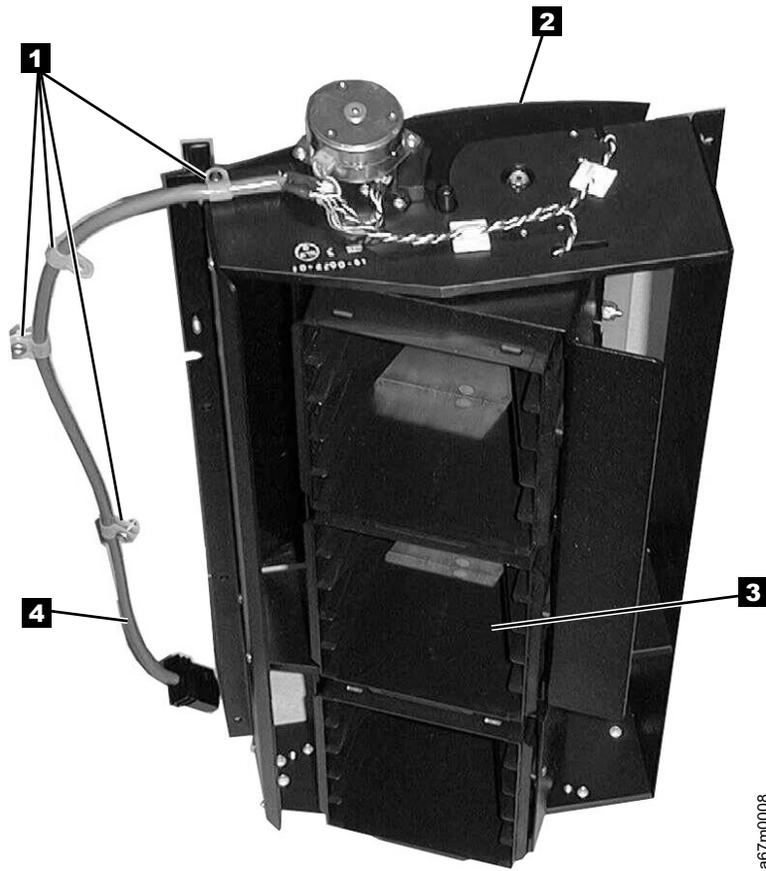


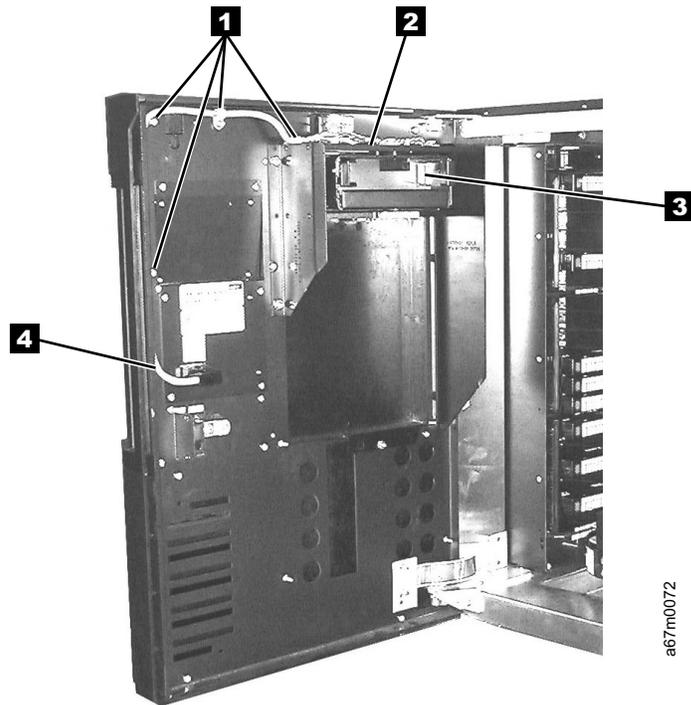
Figure 6-8. Rear View of the I/O Station

- 1** Cable Clamps
- 2** I/O Station Door

- 3** Storage Magazine
- 4** Cable Harness

---

## I/O Station (Single Slot)



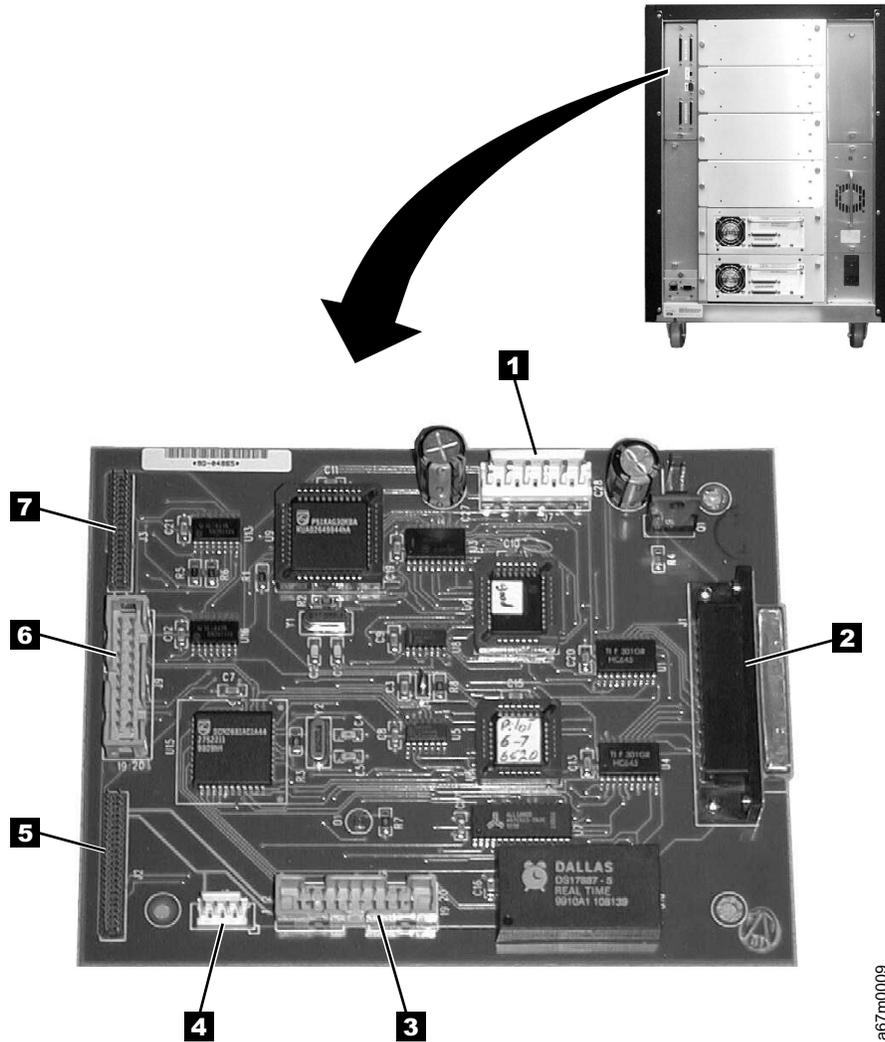
a67m0072

Figure 6-9. I/O Station (Single Slot)

- 1** Cable Clamps
- 2** I/O Station Door

- 3** Storage Magazine Cable Harness
- 4** Cable Harness

# Main Controller PCBA



a67m0009

Figure 6-10. Main controller PCBA. The board supports both SCSI and native Fibre Channel attachment.

- |          |  |          |   |
|----------|--|----------|---|
| <b>1</b> | Power Distribution Board Cable Connector (Power) | <b>5</b> | Picker Control Board Cable Connector              |
| <b>2</b> | Host Interface Board (SCSI) Cable Connector      | <b>6</b> | Power Distribution Board Cable Connector (Signal) |
| <b>3</b> | RMU  | <b>7</b> | Display Control Board Cable Connector             |
| <b>4</b> | Unused   |          |   |

## Display Assembly

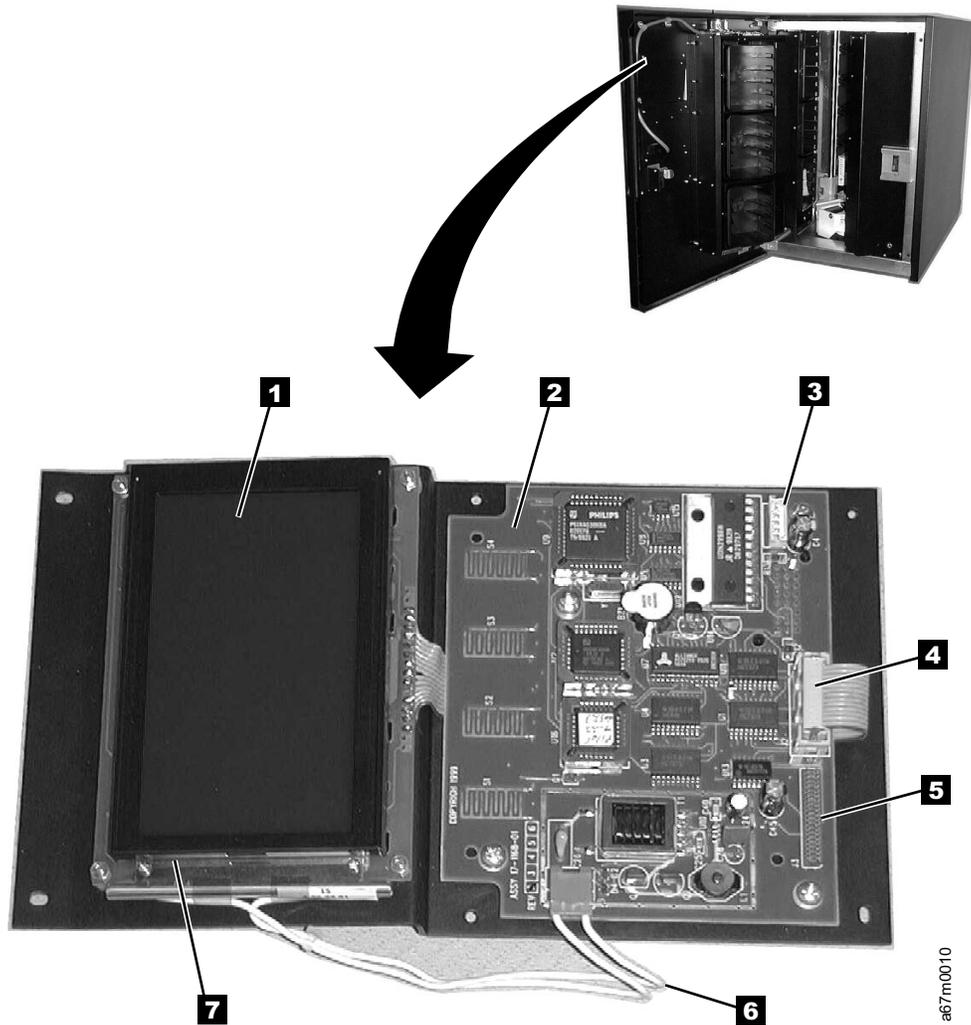


Figure 6-11. Operator panel assembly. The assembly supports both SCSI and native Fibre Channel attachment.

- |          |  |          |                                       |
|----------|--|----------|---------------------------------------|
| <b>1</b> | LCD Assembly                             | <b>5</b> | Cable Connector to Main Control Board |
| <b>2</b> | Display Control Board                    | <b>6</b> | Power Cable to Display Back Light     |
| <b>3</b> | Cable Connector to Door Interlock Switch | <b>7</b> | Display Back Light                    |
| <b>4</b> | Cable to LCD Display Assembly            |          |                                       |

# Power Distribution PCBA (Type I)

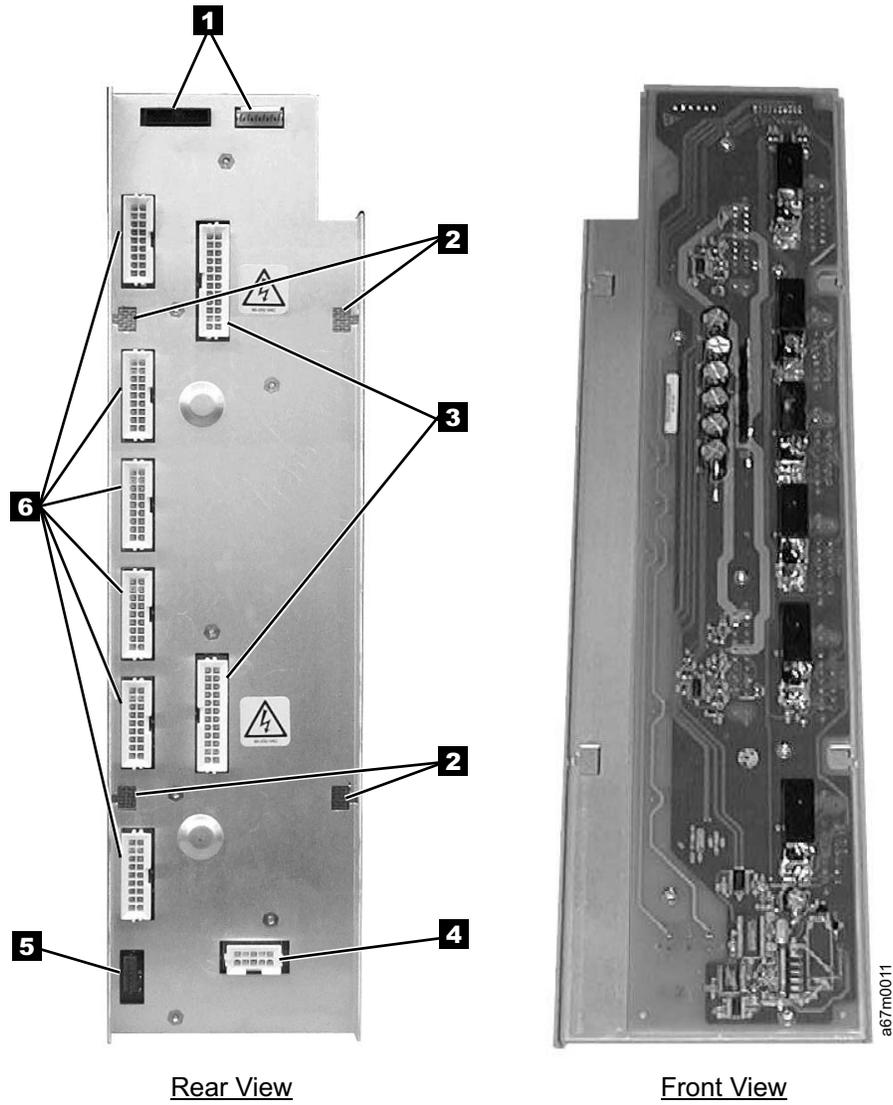


Figure 6-12. Power distribution PCBA (Type I)

- 1** Cable Connectors to Main Control Board
- 2** Mounting Holes
- 3** Cable Connectors to dc Power Supplies

- 4** Cable Connector to ac Input Power Module
- 5** Cable Connector to Y–Axis Motor Assembly
- 6** Cable Connectors to Drive Modules (Maximum six)

## Power Distribution Board (Type II)

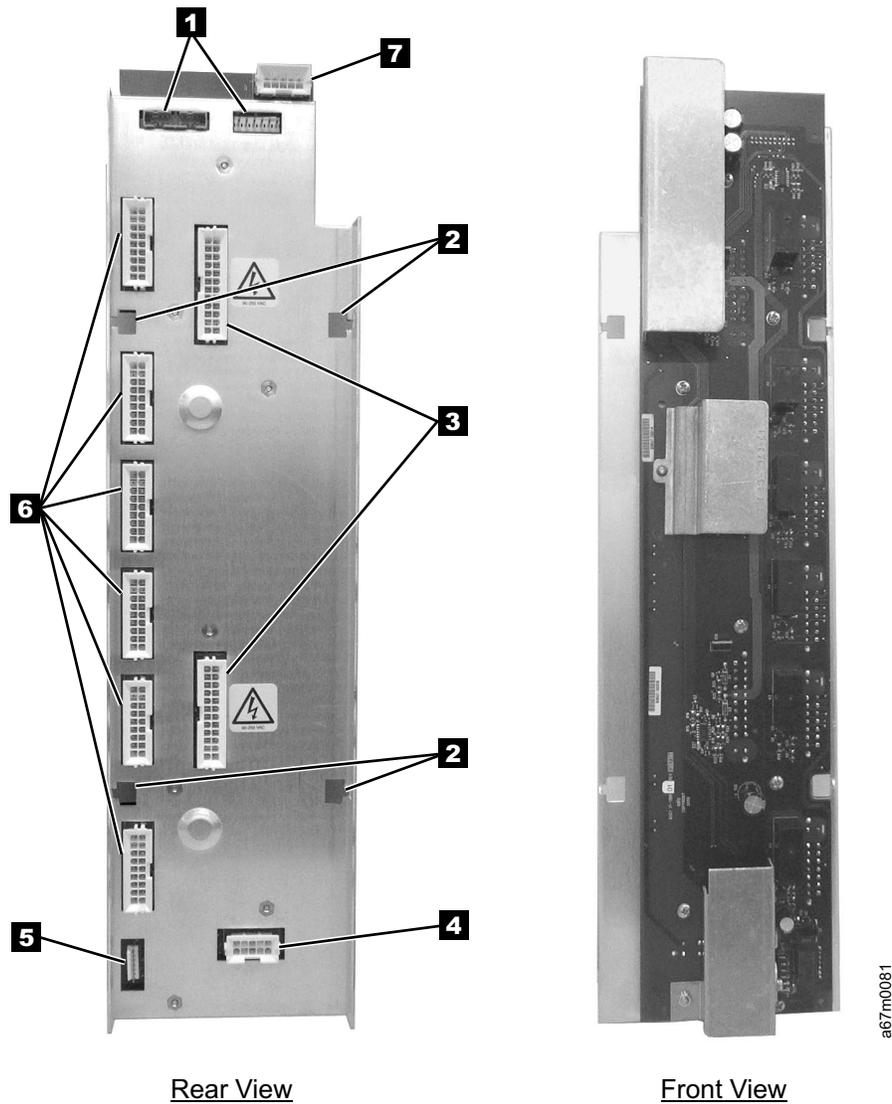
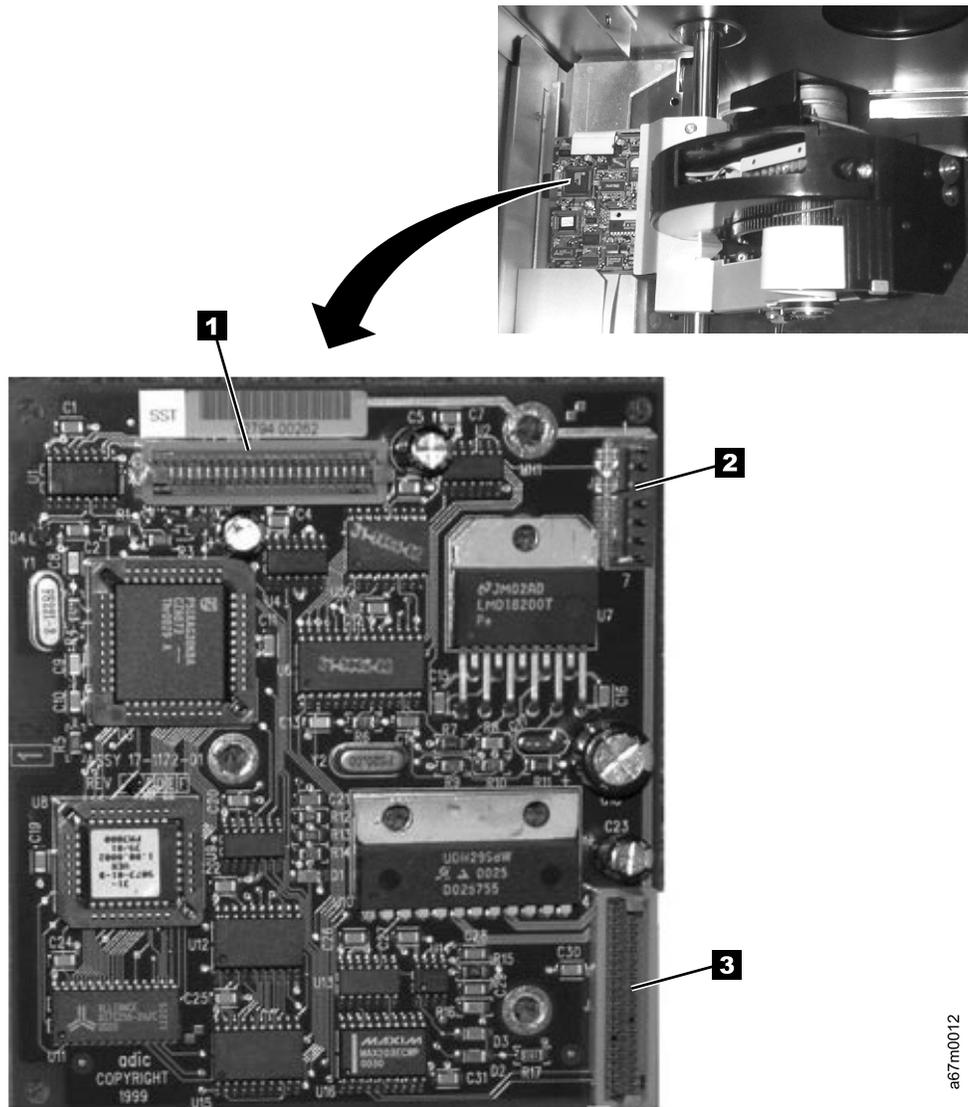


Figure 6-13. Power distribution PCBA (Type II)

- |  |  |
|--|--|
| <p><b>1</b> Cable Connectors to Main Control Board</p> <p><b>2</b> Mounting Holes</p> <p><b>3</b> Cable Connectors to dc Power Supplies</p> <p><b>4</b> Cable Connector to ac Input Power Module</p> | <p><b>5</b> Cable Connector to Y–Axis Motor Assembly</p> <p><b>6</b> Cable Connectors to Drive Modules (Maximum six)</p> <p><b>7</b> SAN Data Gateway Module Power Connector</p> |
|--|--|

! **Note:** Includes sticker for new power architecture (NPA).

## Picker Control Board



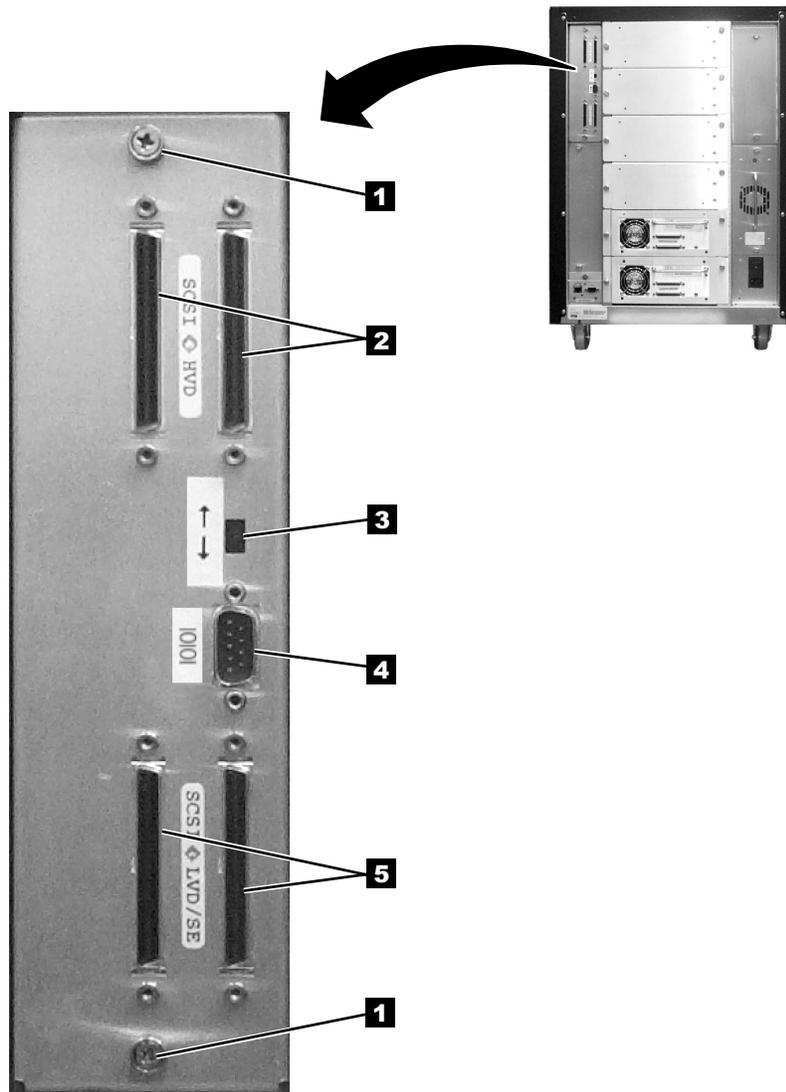
a67m0012

Figure 6-14. Picker control board

- 1** Y–Axis Flex Cable Connector
- 2** Rotary Axis Motor Cable Connector

- 3** Picker Assembly Flex Cable Connector

# Host SCSI Interface Board

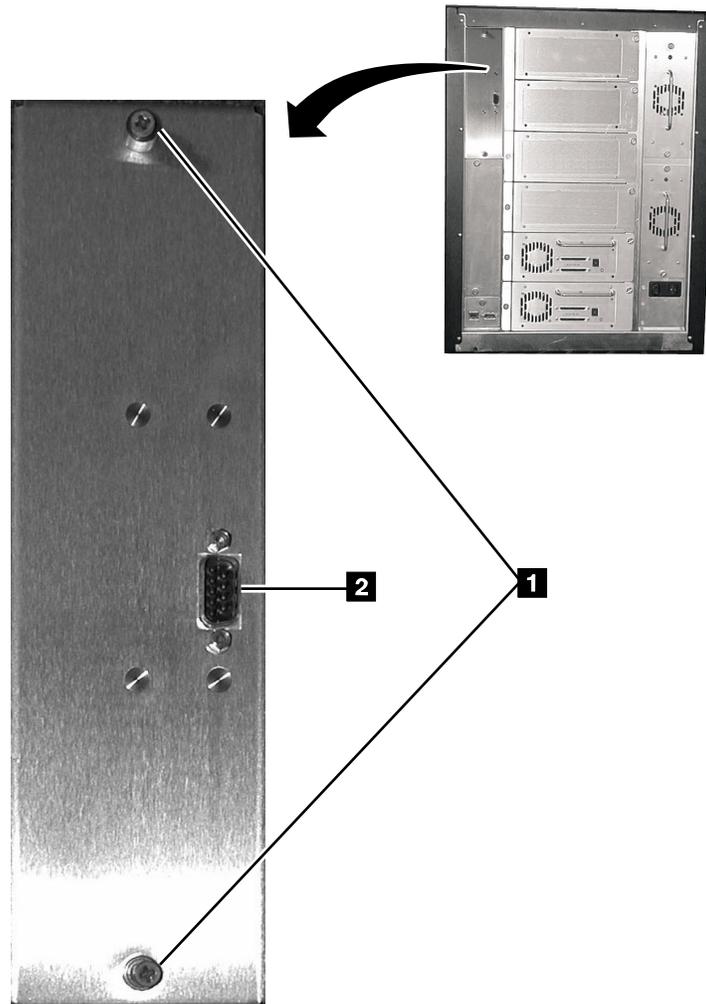


a67m0051

Figure 6-15. Host SCSI interface board for SCSI attachment

- |          |                           |          |                           |
|----------|---------------------------|----------|---------------------------|
| <b>1</b> | Mounting Screws (Captive) | <b>4</b> | Serial Port Connector     |
| <b>2</b> | HVD SCSI Cable Connectors | <b>5</b> | LVD SCSI Cable Connectors |
| <b>3</b> | LVD — HVD Selector Switch |          |                           |

## Serial Diagnostic Port Board



a67m0123

Figure 6-16. Serial diagnostic port board for native Fibre Channel attachment

**1** Mounting Screws (Captive)

**2** Library Serial Port Connector

# DC Power Supply Assembly

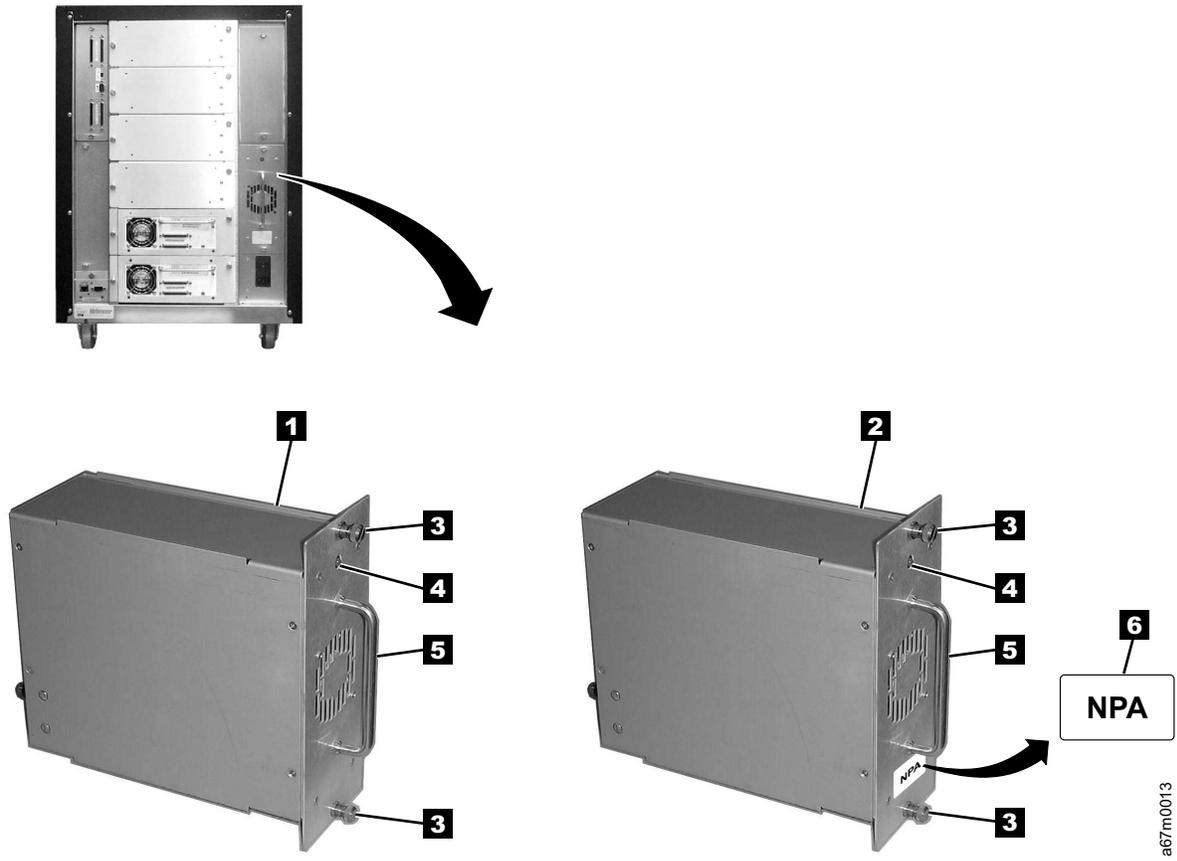


Figure 6-17. DC Power Supply Assembly

- |  |  |
|--|--|
| <p><b>1</b> DC Power Supply (old)</p> <p><b>2</b> DC Power Supply (new, required for Fibre Channel support)</p> <p><b>3</b> Thumbscrews (Mounting)</p> | <p><b>4</b> Power Supply LED (Green = Good) (Red = Fail)</p> <p><b>5</b> Handle</p> <p><b>6</b> NPA Label (new power architecture)</p> |
|--|--|

a67m0013

# AC Input Power Module

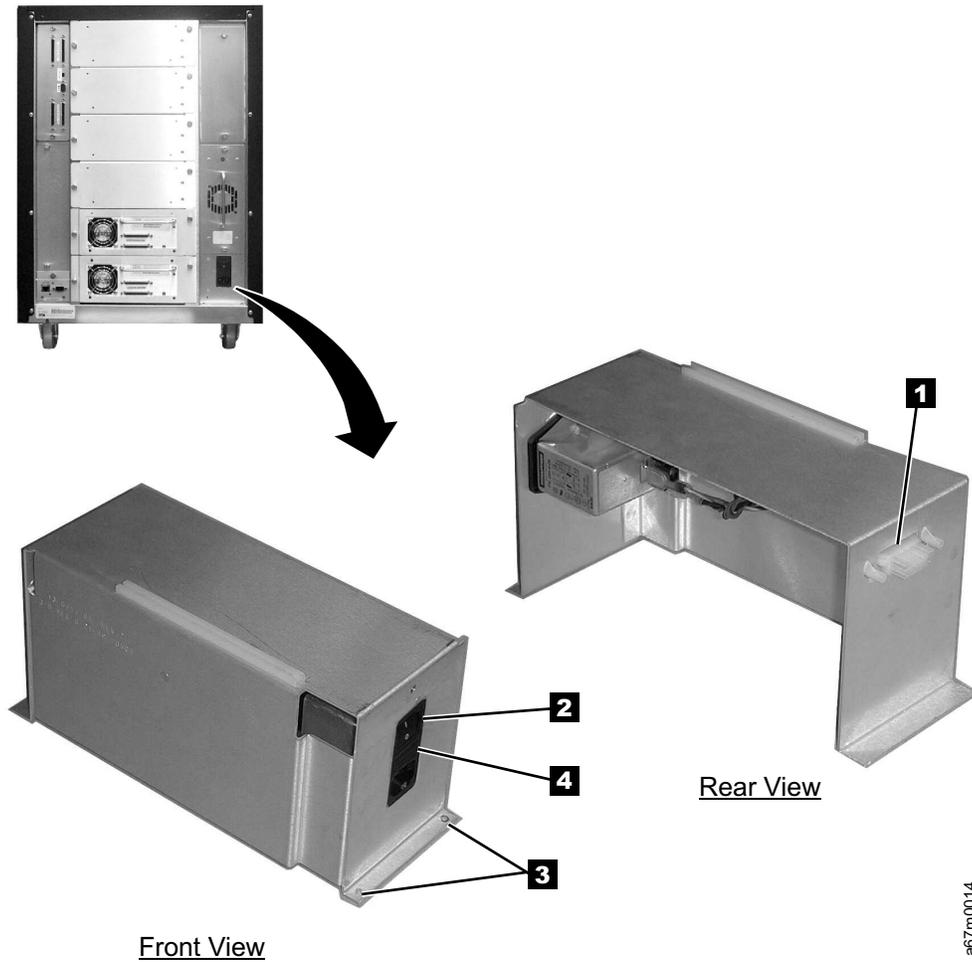


Figure 6-18. AC Power Input Module

- |          |  |          |                |
|----------|--|----------|----------------|
| <b>1</b> | AC Power Connector to Power Distribution Board | <b>3</b> | Mounting Holes |
| <b>2</b> | Main ac Power Switch                           | <b>4</b> | Fuse Holder    |

a67m0014

## SAN Data Gateway Module (optional)

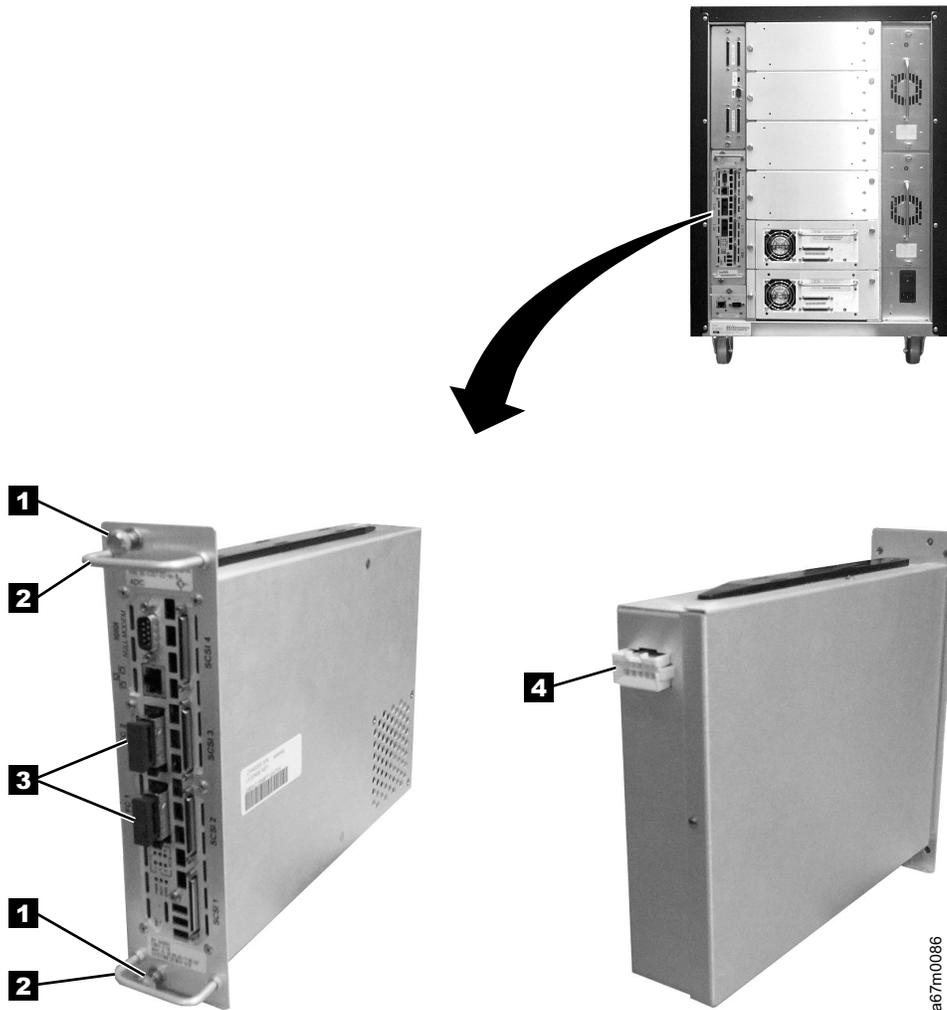
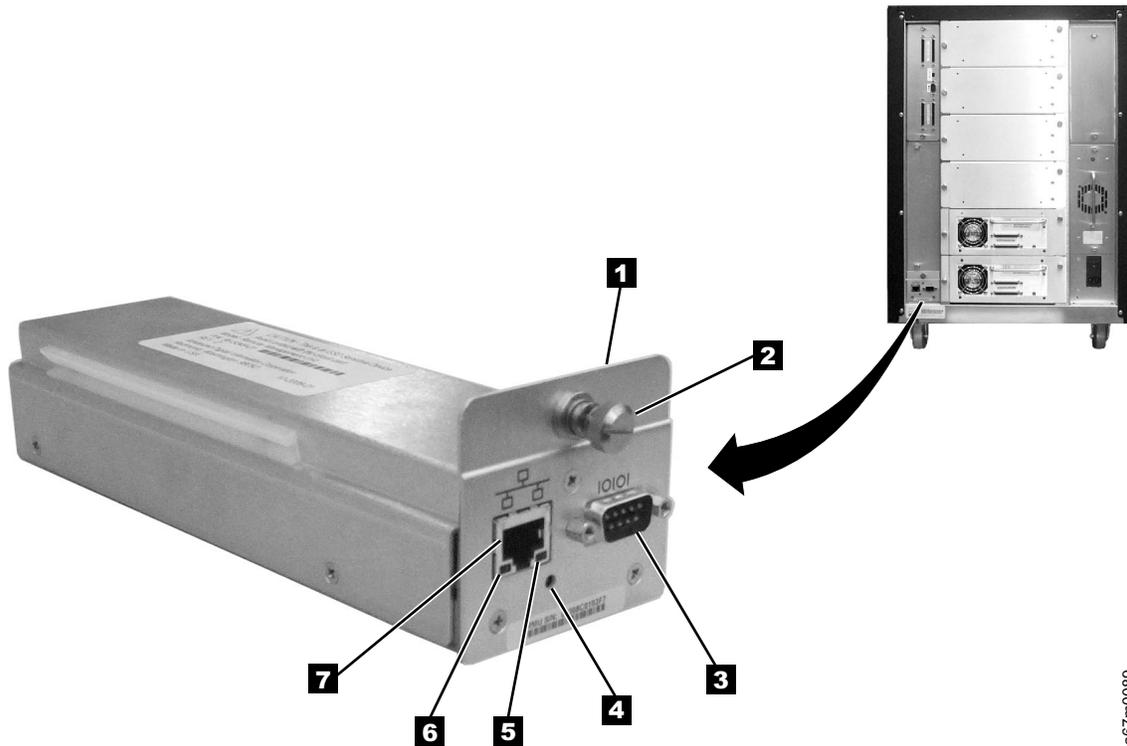


Figure 6-19. SAN Data Gateway Module (optional)

**1** Thumbscrew  
**2** Handle

**3** 2 Gbit GBIC  
**4** Connector to Power Distribution Board

# Remote Management Unit



a67m0089

Figure 6-20. RMU

- |          |             |          |                           |
|----------|-------------|----------|---------------------------|
| <b>1</b> | RMU         | <b>5</b> | Speed LED (yellow)        |
| <b>2</b> | Thumbscrew  | <b>6</b> | Ethernet Link LED (green) |
| <b>3</b> | Serial Port | <b>7</b> | Ethernet Port             |
| <b>4</b> | Status LED  |          |                           |
- Red = Power On/Failure  
Yellow = Booting  
Green = Initialized  
Flashing Green = Active



## Chapter 7. Check, Adjust, Remove, and Replace

Cartridge Removal from Picker Assembly . . . . .	7-2
Tape Drive Sled . . . . .	7-3
Picker Assembly . . . . .	7-5
I Picker Carriage Arm Assembly (Picker Assembly and Control Board) . . . . .	7-9
Rotary Axis Motor . . . . .	7-12
Picker Control Board . . . . .	7-14
Y-Axis Drive Belt . . . . .	7-16
Y-Axis Flex Cable. . . . .	7-22
Display Assembly Flex Cable . . . . .	7-23
Main Controller to Power Distribution Cables (Power or Signal Interface) . . . . .	7-25
Power Distribution to Drive Sled Cable . . . . .	7-26
Y-Axis Motor Assembly. . . . .	7-27
Y-Axis Drive Shaft Assembly. . . . .	7-28
Storage Columns . . . . .	7-29
Main Controller Board . . . . .	7-30
I RMU Network Interface Cable . . . . .	7-32
Remote Management Unit . . . . .	7-35
SAN Data Gateway Module . . . . .	7-37
I Accessory Bay Cable for the SAN Data Gateway Module . . . . .	7-38
Host SCSI Interface Board . . . . .	7-41
I Serial Diagnostic Port Board. . . . .	7-42
Display Assembly. . . . .	7-43
Power Distribution Board . . . . .	7-45
12-Slot I/O Station . . . . .	7-46
Single-Slot I/O Station . . . . .	7-47
Power Supplies Check Procedure. . . . .	7-48
Power . . . . .	7-48
ac Input Power Module . . . . .	7-48
dc Power Supply . . . . .	7-49
Door Lock Assembly . . . . .	7-53
Door Interlock Switch and Cable Assembly . . . . .	7-54
Plastic Top Door . . . . .	7-55
Plastic Lower Front Door Panel . . . . .	7-56
Side Cover . . . . .	7-57
Top Cover . . . . .	7-58

This section contains step by step procedures to adjust, remove and replace all Tape Library field replaceable units (FRUs).

---

## Cartridge Removal from Picker Assembly

See Figure 7-1.

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Tape Library.
4. The grip fingers are spring-loaded. Open them by applying pressure to the back of one of the fingers **1** as seen in Figure 7-1. Remove the cartridge when the fingers are open.
5. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 7-42 on page 7-48.
6. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

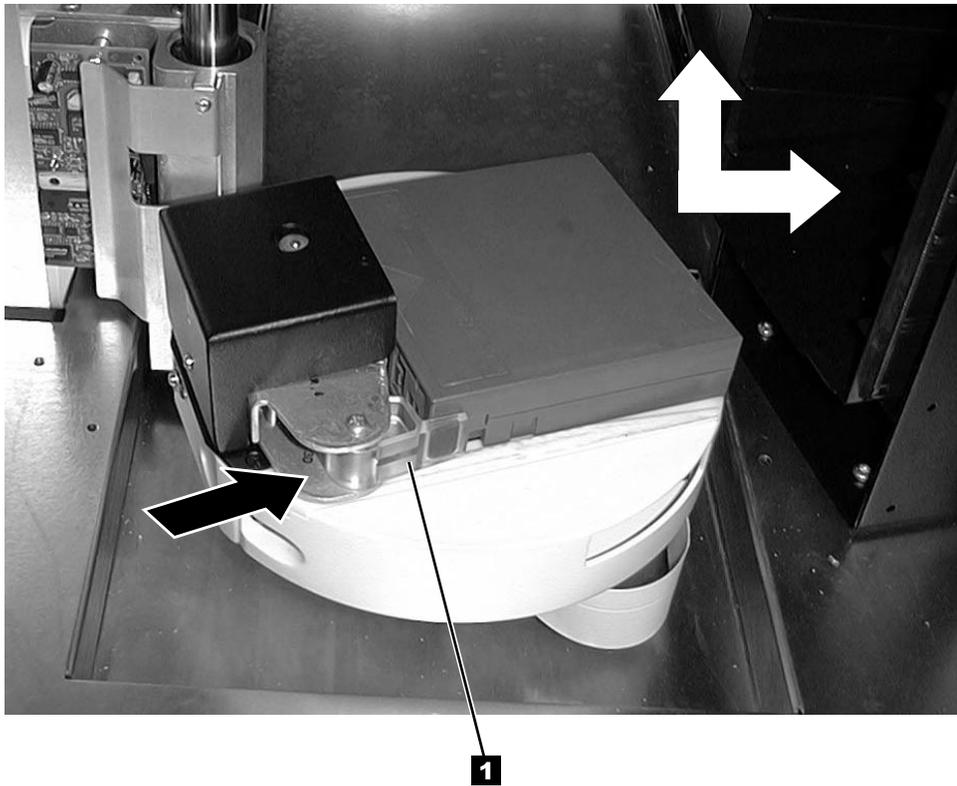


Figure 7-1. Cartridge Removal from Picker Assembly

## Tape Drive Sled

**Tools that are required:** *None.*

### **Removing the Tape Drive Sled:**

See Figure 7-2 for example of SCSI host connections (example on right). If there are multiple hosts that are connected to the drives, determine the SCSI bus that the failing drive is connected to.

See Figure 7-2 for example of Fibre Channel host connections (example on left). If there are multiple hosts that are connected to the drives, determine the SCSI bus that the failing drive is connected to.

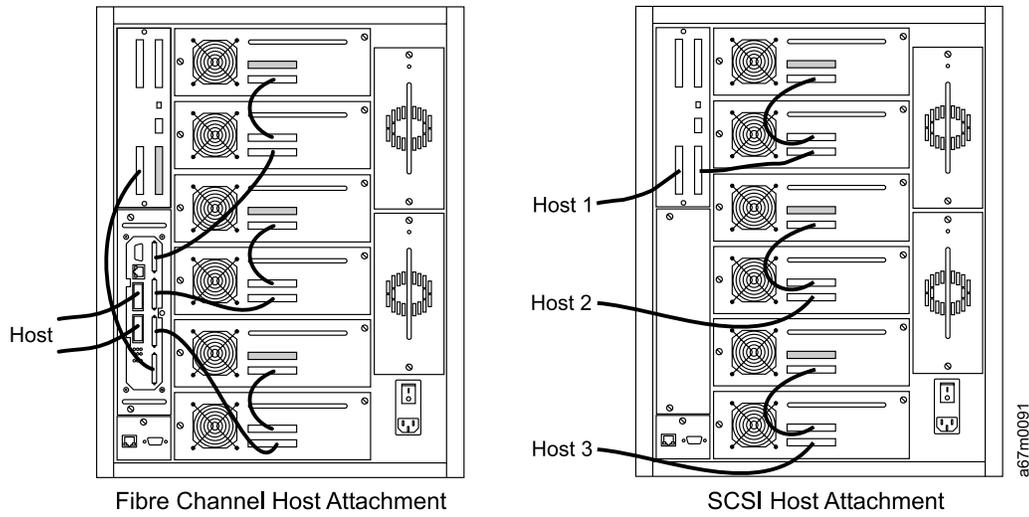


Figure 7-2. Cable Connections

See Figure 7-3 on page 7-4.

1. Ask customer to vary the Library and Drives Offline to **ALL ATTACHED HOSTS**. **Ensure that the SCSI bus is quiesced before proceeding.**
2. Prepare the Library using the Operator Panel (**Main Menu** → **More** → **Service** → **Drives** → **Select Drives** → **OK** → **Repair** → **Remove**) prior to removing the Tape drive.
3. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
4. Disconnect all SCSI cables to the Drive Sled.
5. Loosen the two captive thumbscrews **1** from the drive sled **2** and slide the drive out using the drive handle.
6. Return failing Tape Drive by using specified procedures.

**Replacing the Tape Drive Sled:**

See Figure 7-3.

Perform the above procedure in reverse order.

**Before you ask customer to vary the library online, wait for library to complete initialization.**

| **Initialization will take approximately six minutes after power is applied to the library. This allows the tape drive to be configured to SCSI address of failed tape drive.**

| If the error message One or more drives has downlevel firmware. You will have to update the drives  
| displays on the operator panel, go to "Updating Firmware" on page 8-4 to update firmware. For proper  
| operation of the library, ensure that the firmware level of the replacement part matches the firmware level  
| of the entire library.

| **Note:** The boot code of the new part does not have to match the boot code of the other parts in the  
| library.

Notify the Library that a new drive is replaced by selecting (**Main Menu → Service → Drives → Repair → Replace**).

Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

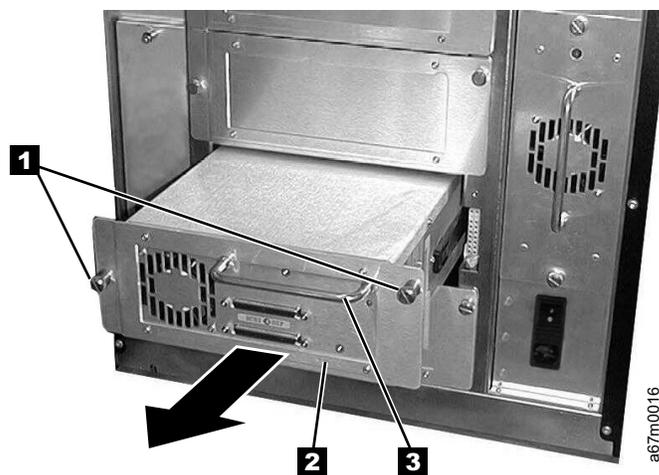


Figure 7-3. Tape Drive Sled Removal and Replacement

---

## Picker Assembly

For Picker Assembly Part Number, see Table 14-1 on page 14-1.

See Figure 7-5 on page 7-7 for locations of the components in the following procedure:

**Tools that are required:** *Phillips screwdriver, Flat blade screwdriver, T8, T10 and T20 Torx drivers, flashlight.*

### **Removing the Picker Assembly:**

1. Ask customer to vary the Library and Drives Offline to **ALL ATTACHED HOSTS**.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Refer to Figure 7-25 on page 7-29 and remove the left front storage column (column 2) **2** by removing screws **1** and **5**. Screws **5** can be reached through holes **4**.
5. See Figure 7-5 on page 7-7 for step 5 through step 9. Lift the Picker Assembly and position it in the middle of the Y-shaft for easy access to its components.
6. Remove the T20 Torx screws **3**, then remove the sheet metal cover.
7. Disconnect the Picker Assembly Flex cable **7** from the Picker Control Board **1**.
8. Use a flat blade screwdriver to pry the E-clip **4** from the Picker shaft. Remove the E-clip and the washer **5** from the Picker shaft.
9. Lift the Picker Assembly up and remove it from the metal base.

**Note:** See Figure 7-4, there is another washer **1** between the Picker Assembly and the casting **2**. Do not lose this washer.

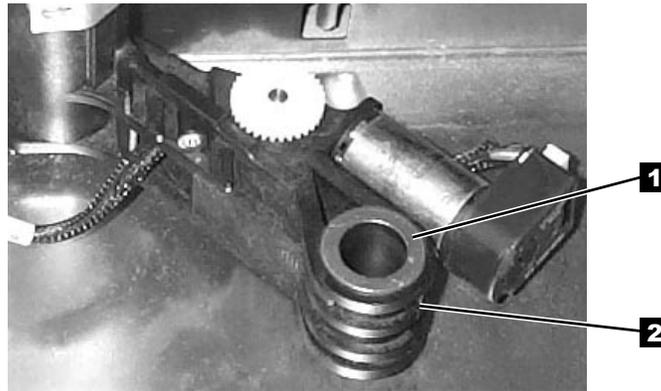


Figure 7-4. Flat Washer and Casting

***Replacing the Picker Assembly:***

- | **Note:** See Figure 7-5 on page 7-7. Before attaching the flex cable cover with the Torx screws, raise the picker assembly and position the cover so that the two pins on the base casting are centered in the holes **6**. Now tighten the Torx screws. Be sure to install the ground strap, and note that the eyelets of the ground strap are of different sizes.
- | Perform the procedure for removing the picker assembly in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

For proper operation of the library, ensure that the firmware level of the replacement part matches the firmware level of the entire library.

**Note:** The boot code of the new part does not have to match the boot code of the other parts in the library.

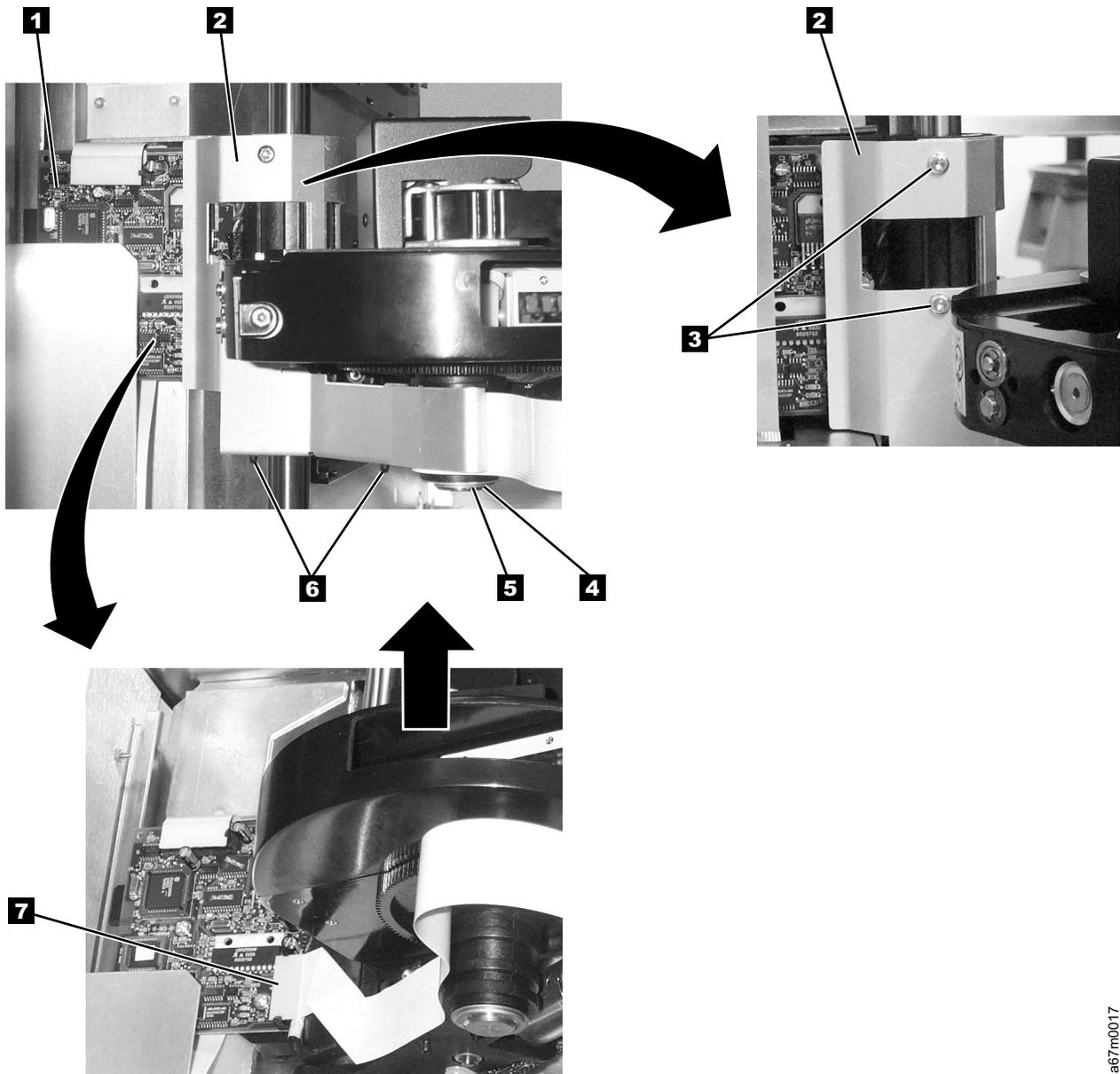


Figure 7-5. Picker Assembly Removal and Replacement

- | Make sure that the connectors on the ground wire between the Picker Control PCBA and the Picker
- | Support are connected so that they do not protrude above the Picker Support. The correct orientation of
- | the ground wire connectors is shown in Figure 7-6 on page 7-8.

a67m0017

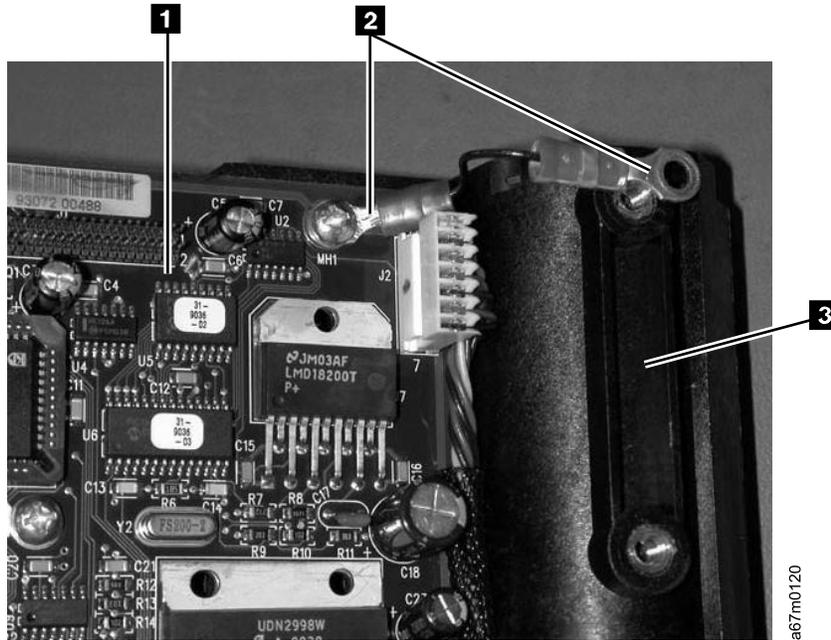


Figure 7-6. Proper orientation of picker control PCBA to picker support ground wire connector

## Picker Carriage Arm Assembly (Picker Assembly and Control Board)

**Tools that are required:** *Small Phillips screwdriver, T20 Torx drivers, 11/32 in. and 3/16 in. nut drivers, and flashlight.*

**Removing the Picker Carriage Arm Assembly:** When Tape Library is installed in a rack, you must remove Library from the rack before continuing with this procedure.

**Attention:** If the library is mounted in a rack, all drives and dc power supplies must be removed before the library is removed from rack. Because of the library weight you will need three people to lift the library out of the rack after the drives and dc power supplies are removed.

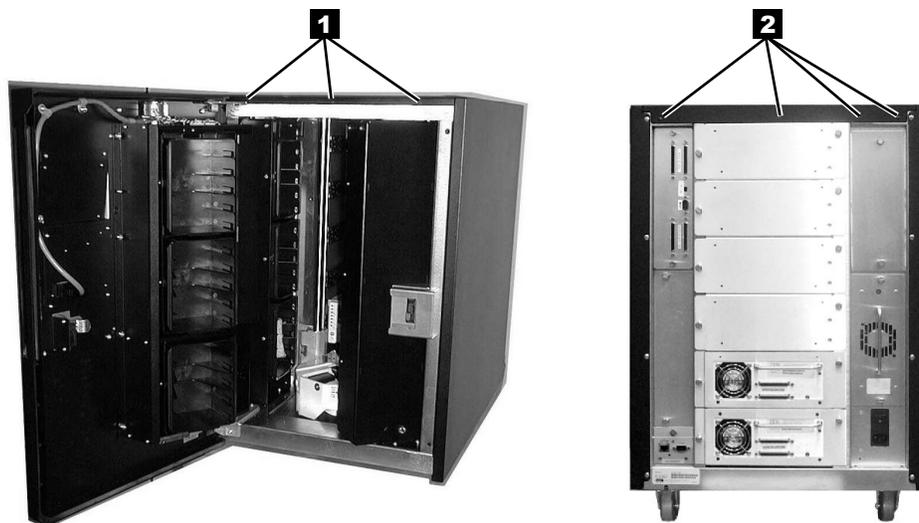


> 18 kg  
(40 lb)

**CAUTION:**

The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes specially trained persons with a lifting device to safely lift this part or unit. (RSFTC206)

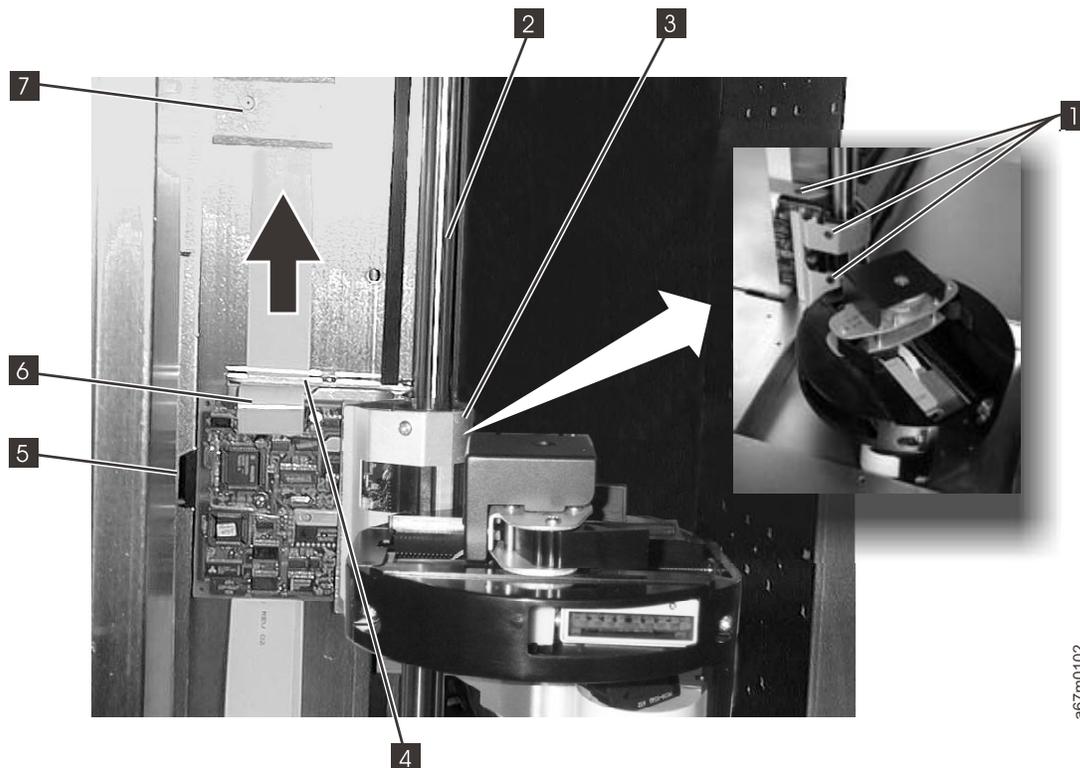
1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Remove storage column 2 (left front). See procedure for removing the storage columns on page 7-29.
4. Perform one of the following:
  - If library is in a rack, perform steps 5 through 7.
  - If library is not in a rack, go to step 8.
5. Remove all Drive Sleds and/or blank panels. Note position of drives so each drive will be inserted in exactly the same position during replace procedure.
6. Perform the procedure to remove the power distribution board on page 7-45.
7. Remove library from rack.
8. See Figure 7-7. Remove the top cover being held to the chassis with three Phillips screws **1** in front and four Phillips screws **2** in back.



a67m0063

Figure 7-7. Top Cover Removal

9. Remove the three Phillips screws attaching the drive shaft to the top of the chassis (see Figure 7-24 on page 7-28 **1**). From the front of the Library, unscrew the drive shaft counterclockwise out of the chassis bottom.
- See Figure 7-13 on page 7-17 for step 10 through step 13:
10. Slide the Drive Shaft **2** up and out of Picker casting and on out through the top of library. Put the shaft aside where it will not be nicked or scratched.
  11. Disconnect the Y-Axis Flex Cable **6** from the Picker Control Board. You may need to raise the Picker Assembly up to a serviceable position.
  12. Remove the three T20 Torx screws **1** which hold the Picker Carriage Assembly **3** and Picker Board to the belt clamp plate. **When installing a new FRU assembly, ensure that the ground cable located behind the belt clamp plate is attached to the belt clamp plate.**
  13. Lift the whole Picker Carriage Assembly out of the belt clamp plate and the Picker Guide **5** out of guide rail.



af7m0102

Figure 7-8. Picker Carriage Arm Assembly Removal and Replacement

**Replacing the Picker Carriage Arm Assembly:** To replace the Picker Carriage Arm Assembly, perform the above procedure in reverse order. Refer to Figure 7-9 and observe the location of the ground strap **1** mentioned in step 12 on page 7-10.

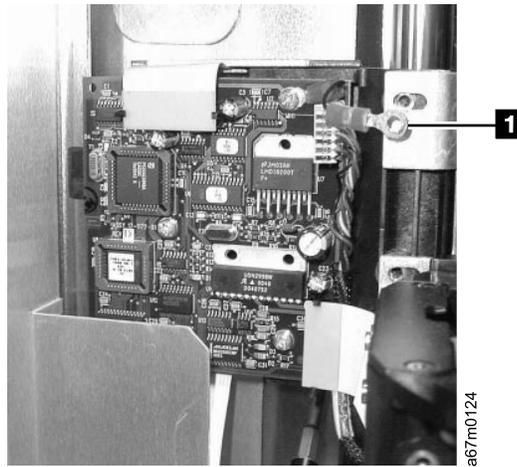


Figure 7-9. Location of ground strap

---

## Rotary Axis Motor

For Rotary Axis Motor Part Number, see Table 14-1 on page 14-1.

See Figure 7-10 on page 7-13 and Figure 7-11 on page 7-15 for locations of components in the following procedure:

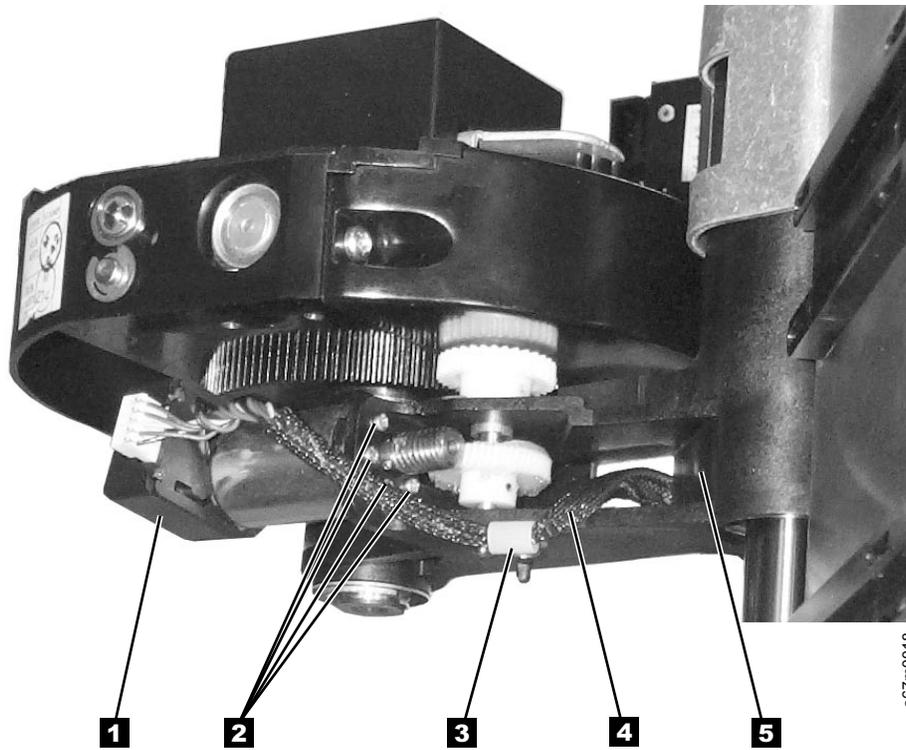
**Tools that are required:** *Small Phillips screwdriver, T8, T10 Torx driver, and flashlight.*

### **Removing the Rotary Axis Motor:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Remove all storage magazines from the left front storage column (column number 2). See **2** in Figure 7-25 on page 7-29 for magazine location.
5. Remove the left front storage column (column 2) for easy access to the Picker Control Board. See Figure 7-25 on page 7-29 **1** and **5** use through holes **4** to reach screws **5**.
6. See Figure 7-11 on page 7-15. Remove two T20 Torx screws **3** holding the sheet metal covering the Picker Assembly Flex Cable. Remove the sheet metal.
7. See Figure 7-11 on page 7-15. At connector **5** disconnect the Rotary Axis Motor cable **6** from the Picker Control Board. See Figure 7-10 on page 7-13 push cable **4** through the hole in casting **5**.
8. Remove all drive sleds or drive filler plates from the back of the Tape Library, refer to “Tape Drive Sled” on page 7-3. You will need this space to access the Rotary Axis Motor from the back of the Library.
9. Remove the Rotary Motor cable clamp **3** from the casting.
10. Remove the four Phillips screws **2** which attach the Rotary Axis Motor to the casting **5**, see Figure 7-10 on page 7-13. Remove the motor assembly. **Note the position of the Rotary Axis Motor and then remove the motor from the gear.**

### **Replacing the Rotary Axis Assembly:**

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.



a67/m0018

Figure 7-10. Rotary Axis Motor Removal and Replacement

---

## Picker Control Board

For Picker Control Board Part Number, see Table 14-1 on page 14-1.

See Figure 7-11 on page 7-15 for locations of components in the following procedure:

**Tools that are required:** *Phillips screwdriver, T8, T10, T20 Torx drivers, 7/16 in. nut driver or open end wrench, and flashlight.*

### **Removing the Picker Control Board:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.

**Note:** You may need to move Picker Assembly up and down to create enough clearance for the next two steps.

4. Remove all storage magazines from the left front storage column (column number two). See **2** in Figure 7-25 on page 7-29 for magazine location.
5. Remove the left front storage column (column 2) for easy access to the Picker Assembly. See Figure 7-25 on page 7-29 **1** and **5**. Screws **5** can be reached by using through holes **4**.
6. Remove two T20 Torx screws **3** holding the sheet metal **2** covering the Picker Assembly Flex Cable. Remove the sheet metal and position the Picker Assembly at the top of the drive shaft.
7. Disconnect all cables, **5**, **7**, and **9** from the Picker Control Board.
8. Remove the three screws **8** attaching the Picker Control Board to the supporting plate.
9. Remove the Picker Control Board.

### **Replacing the Picker Control Board:**

- | Perform the above procedure in reverse order. This FRU contains firmware; verify that the replacement FRU has the latest firmware installed ((**Main Menu** → **More** → **About** → **Details**)). Upgrade the firmware if necessary (see “Updating Firmware” on page 8-4). Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

- | **Note:** Make sure that all cables and the ground strap are properly connected and seated during replacement. Note that the eyelets of the ground strap are of different sizes.

- | Make sure that the connectors on the ground wire between the Picker Control PCBA and the Picker Support are connected so that they do not protrude above the Picker Support. The correct orientation of the ground wire connectors is shown in

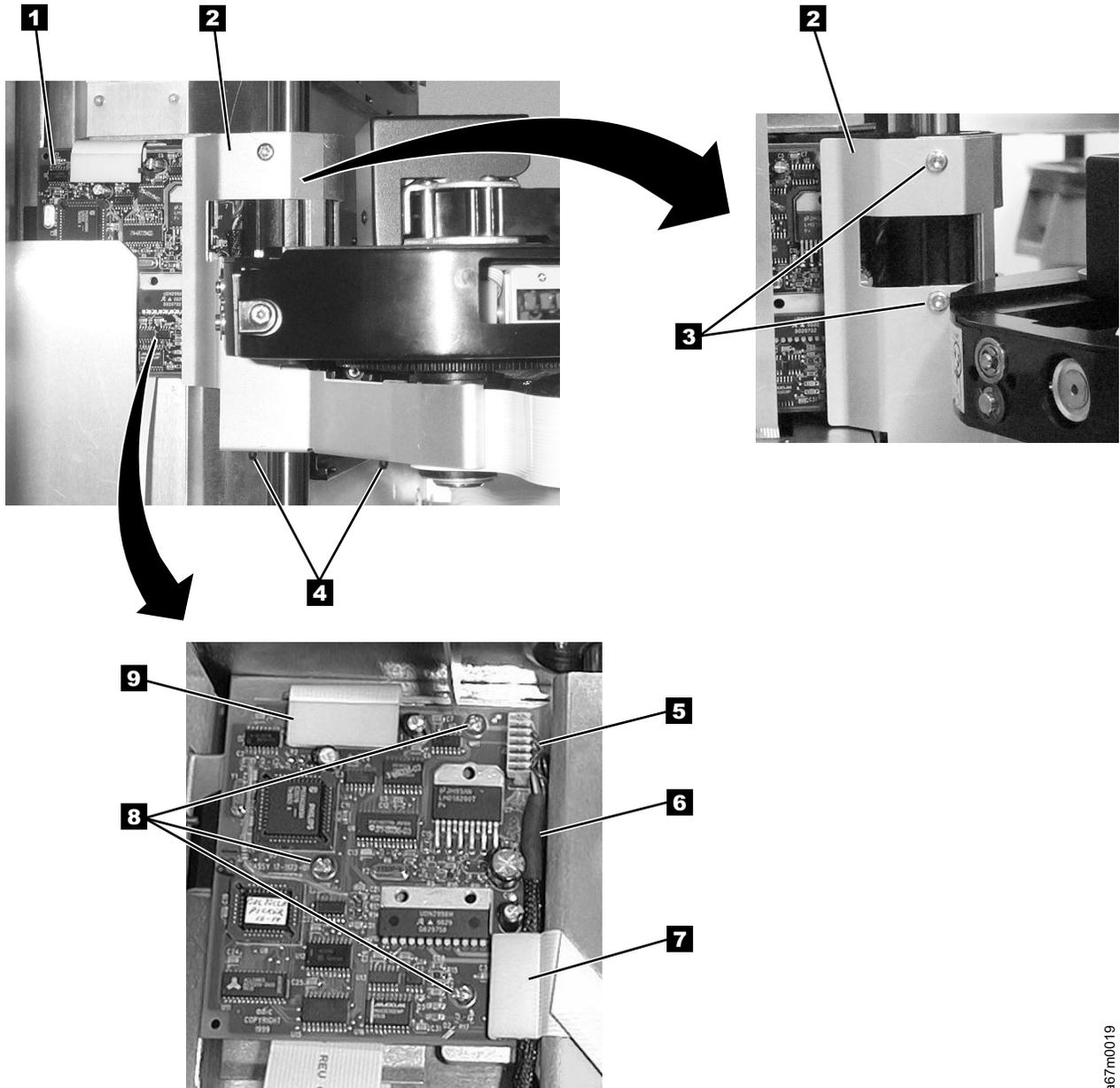


Figure 7-11. Picker Control Board Removal and Replacement

ae7m0019

## Y-Axis Drive Belt

### Notes:

1. For Y-Axis drive belt Part Number, see Table 14-1 on page 14-1.
2. **Tools that are required:** *Small Phillips screwdriver, T10 and T20 Torx drivers, 11/32 in. and 3/16 in. nut drivers, and flashlight.*

### Removing the Y-Axis Drive Belt:

When Tape Library is installed in a rack, you must remove Library from the rack before continuing with this procedure.

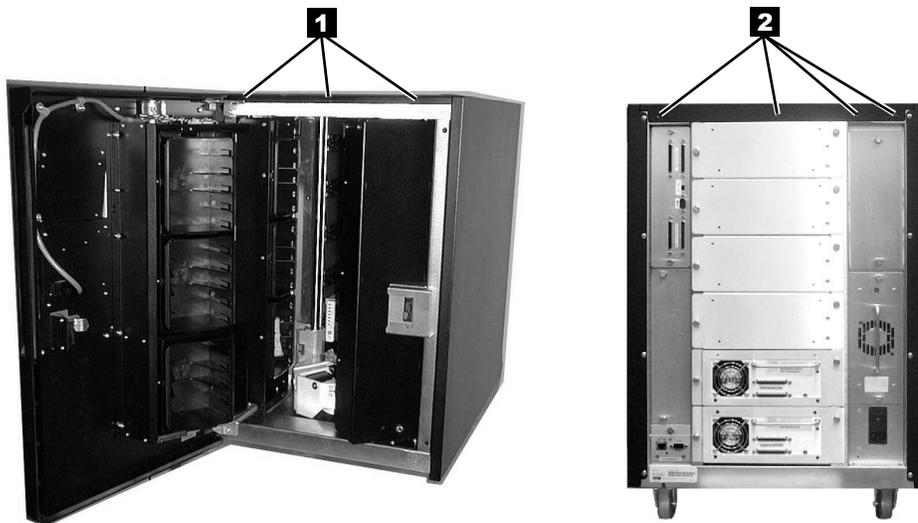
**Attention:** All drives and dc power supplies must be removed before Library is removed from rack. Because of the Library weight you will need three people to lift the Library out of the rack after the drives and dc power supplies are removed.



### CAUTION:

The weight of this part or unit is more than 55 kilograms (121.2 pounds). It takes specially trained persons with a lifting device to safely lift this part or unit. (RSFTC206)

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. You will need to remove storage column 2 (left front) and storage column 5 (right front) if present. To do this see procedure remove the “Storage Columns” on page 7-29.
4. Remove all Drive Sleds and/or blank panels. Note position of drives so each drive will be inserted in exactly the same position during replace procedure.
5. Perform Procedure Remove the “Power Distribution Board” on page 7-45.
6. If Library is in a rack, remove library from rack now.
7. See Figure 7-12. Remove the top cover being held to the chassis with three Phillips screws **1** in front and four T10 Torx screws **2** in back. Newer models will have all seven screws Phillips head.



a67m0063

Figure 7-12. Top Cover Removal

8. Position the Picker Assembly approximately half way between top and bottom chassis.

9. Remove the three Phillips screws attaching the drive shaft to the top of the chassis (See Figure 7-24 on page 7-28 **1**). From the front of the Library, unscrew the drive shaft counterclockwise out of the chassis bottom.

See Figure 7-13 for step 10 through step 13:

10. Slide the Drive Shaft **2** up and out of Picker casting and on out through the top of library. Put the shaft aside where it will not be nicked or scratched.
11. Disconnect the Y-Axis Flex Cable **6** from the Picker Control Board.
12. Remove the T20 Torx screw **1** which hold the Picker Assembly casting **3** and Picker Board to the belt clamp plate.
13. Lift the whole Picker Assembly casting out of the belt clamp plate and the Picker Guide **5** out of guide rail.

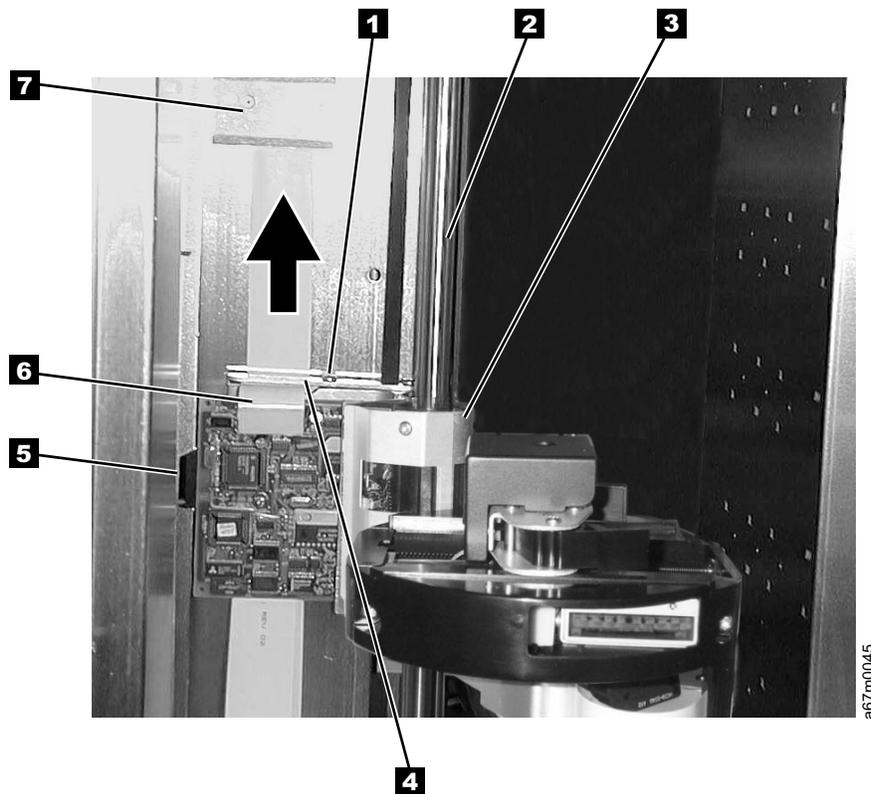


Figure 7-13. Y-Axis Drive Belt Removal and Replacement

14. See Figure 7-14 on page 7-18 for this step. Pay particular attention to the clearance between two ends of the belt **5** at the belt clamps before proceeding. You will need to maintain same clearance between ends of the new belt. The plastic belt retainer **7** behind belt clamps **3** can fall off when you remove the four belt clamp nuts. Be careful to save these belt clamps and retainer which will be needed to maintain alignment of the new belt when installed. Remove four belt clamp nuts **4** by using 3/16 in. nut driver.

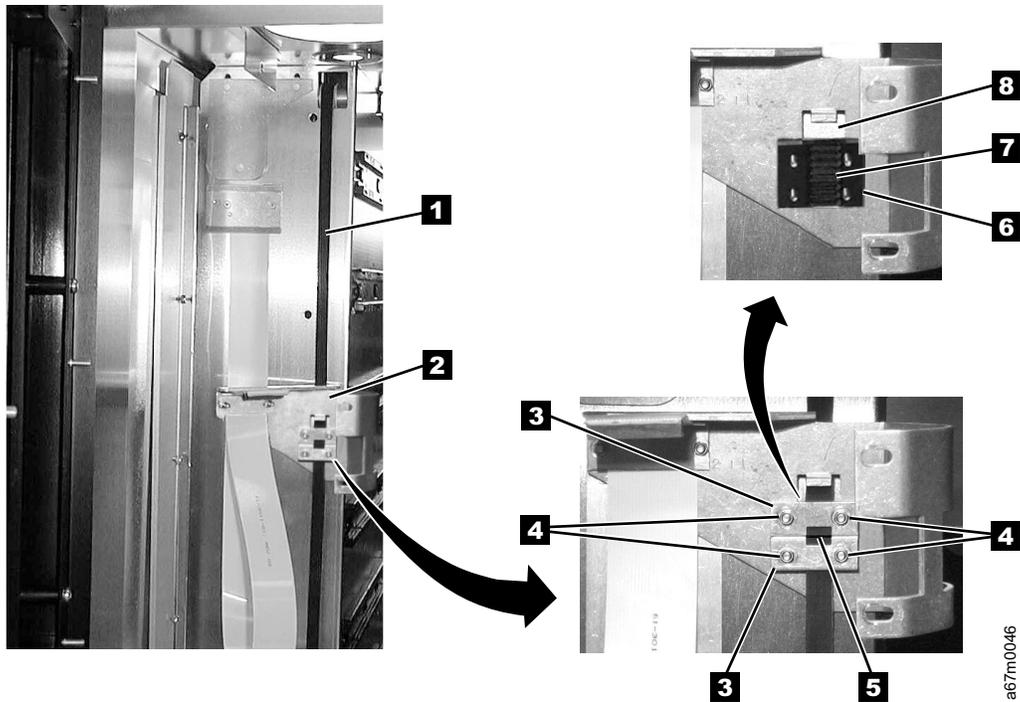


Figure 7-14. Removing the belt clamps

Step 15 through step 16 will be accomplished at rear of the Library in area where you removed the dc power supply or supplies.

15. See Figure 7-15. Loosen three Ny-lock nuts **2** (11/32 Nut driver) then loosen the tensioning screw **1** (T20 Torx driver) to release the belt tension. Do not remove the tensioning screw or Ny-lock nuts. **You may have to loosen the two Phillips screws holding the Flex Cable clamp plate **1** shown in Figure 7-18 on page 7-22 to loosen the belt tension.**

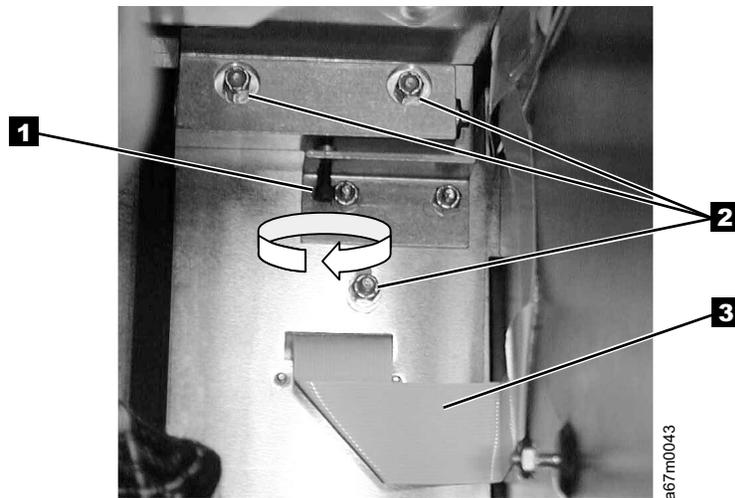
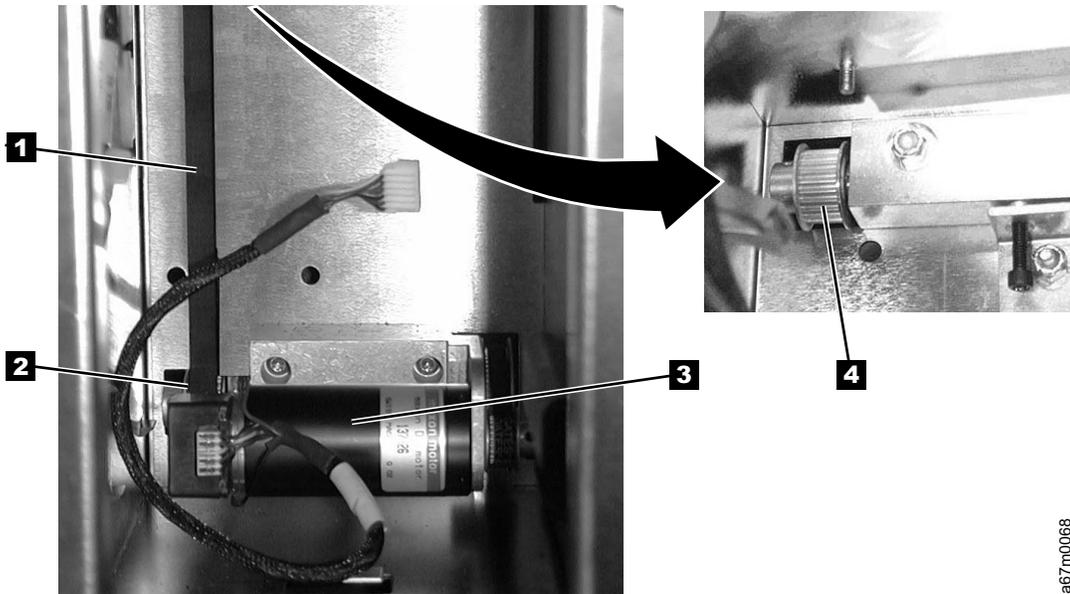


Figure 7-15. Tensioning screw and Ny-lock nuts

16. Remove the drive belt. Go to "Replacing the Y-Axis Drive Belt" on page 7-19.

### Replacing the Y-Axis Drive Belt:

- I **Note:** Prior to installing the new belt, ensure that it is the same length as the old belt.
1. Step 2 through step 3 are accomplished at back of library.
  2. See Figure 7-16. Take new belt so teeth are away from you. Thread one end over idler pulley **4** so belt teeth mesh with idler pulley teeth. You will need to keep idler pulley from turning by using paper to act as a brake.
  3. Thread the other end of the belt **1** under drive pulley. Drive pulley **2** is located in the back at left of the Y-Axis drive motor **3**.



ae7m0068

Figure 7-16. Stud and Tension pulley

4. Step 5 through 25 on page 7-21 will be done at front of the Library.
5. See Figure 7-17 on page 7-20. Find the ends of the Y-axis drive belt at top and bottom of the retaining wall. Bring the top end of belt down behind belt clamp plate **2** and through slot **8** in the belt clamp plate.
6. Retrieve plastic belt retainer **7** and clamps **3**.
7. Bring top belt end down over upper part of plastic belt retainer. Install upper belt clamp **3** but do not install nuts. With belt clamp held in place align belt end with bottom of upper belt clamp. Now install two of the 3/16 in. nuts and tighten to hold upper part of belt.
8. Now retrieve lower belt end and bring it up to lower part of plastic belt retainer **7**.
9. Ensure lower belt end is within 1/16 in. **5** of top end of belt at plastic belt retainer **7**.
10. Install lower belt clamp and remaining two 3/16 in. nuts **4** to retain lower portion of drive belt.

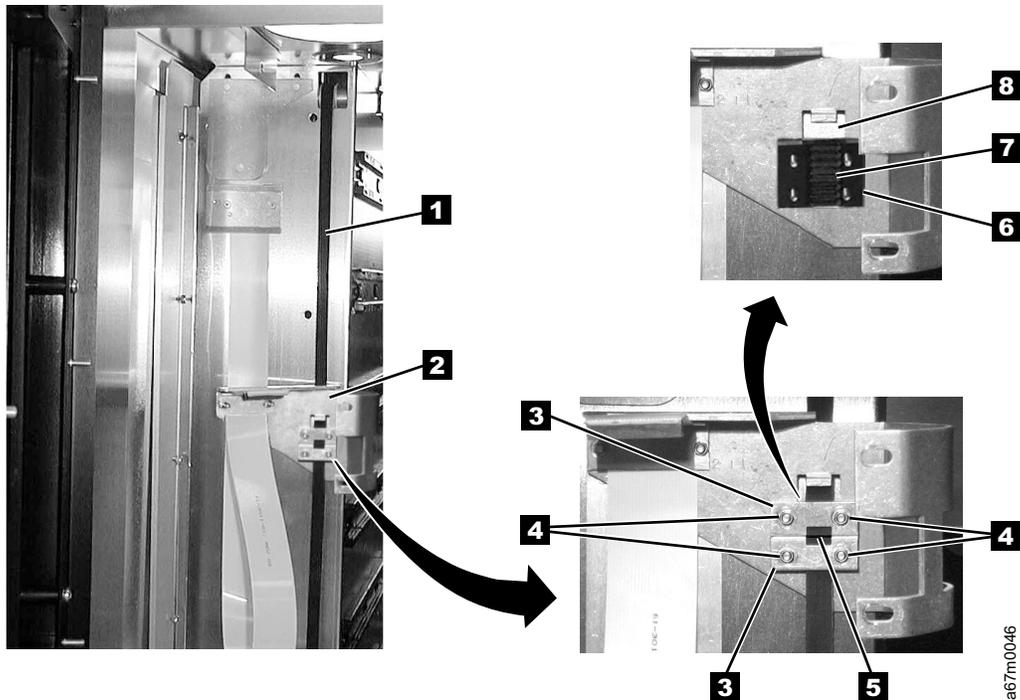


Figure 7-17. Installing Belt Clamps

11. See Figure 7-13 on page 7-17 for next three steps. Fasten the Picker Assembly Casting to the belt clamp plate using two T20 Torx screws **1** removed in step 13 on page 7-17. Ensure the Picker Guide **5** is properly installed on Picker Guide Rail.
12. Connect the Y-Axis Flex Cable **6** to the Picker Control Board being careful to align cable connector with connector pins on the Control Board.
13. Slide the Drive Shaft **2** down through the top of library and through the Picker casting. Screw shaft to stud in chassis bottom by turning shaft clockwise.
14. See Figure 7-24 on page 7-28. Attach the drive shaft to the top of the chassis with three Phillips screws that were **1** removed in step 9 on page 7-17.
15. See Figure 7-12 on page 7-16. Attach top cover to the chassis with three Phillips screws **1** in front and four T10 Torx screws **2** in back.
16. See Figure 7-15 on page 7-18. If you tightened three Ny-lock nuts **2** after releasing the tension in step 15 on page 7-18, proceed with step 17. If you did not tighten three Ny-lock nuts go to step 18.
17. Loosen three Ny-lock nuts **2** using 11/32 in. nut driver.
18. The Y-Axis motor must be plugged into the Power Distribution Board for the next step. The Power Distribution Board provides a load for the motor which acts as a generator when no power is applied. The Power Distribution Board will be turned with its edge facing you so the sockets for cables are facing left. The socket for Y-Axis motor is at the bottom. Tilt the card so its upper edge is away from you and place it into the area where it will normally reside. Insert Y-Axis motor plug into its socket.
19. Adjust the tension screw **1** clockwise (T20 Torx driver) to increase belt tension. Belt tension is properly adjusted when Picker Assembly takes approximately two seconds to drift from top of chassis to bottom of chassis. Check Picker Assembly for full travel. Picker Assembly casting should touch top of chassis and bottom of chassis at upper and lower extremes of travel. Tighten the three Ny-lock nuts **2** when tension is properly adjusted. **If you loosened the two Phillips screws holding the Flex Cable clamp plate **1**, see Figure 7-18 on page 7-22 tighten them now.** If you were sent here from another procedure to do this step return to that procedure now.
20. If you removed library from rack, reinstall library in the rack now.
21. Perform Procedure, replace the "Power Distribution Board" on page 7-45.
22. Replace all Drive Sleds and/or blank panels. Insert each drive sled in the same position as you noted during remove procedure.
23. Perform procedure "Replacing the Storage Column" on page 7-29.

24. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position.  
For switch location see Figure 7-42 on page 7-48.
25. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

---

## Y-Axis Flex Cable

For Y-Axis flex cable Part Number see Table 14-1 on page 14-1.

See Figure 7-18 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver, T8, T10 and T20 Torx drivers and flashlight.*

### **Removing the Y-Axis Flex Cable:**

1. Perform Step 1 on page 7-9 through Step 11 on page 7-17 of Procedure “Removing the Y-Axis Drive Belt” on page 7-16.
2. Remove the two Cable Clamp Plates **1**, see Figure 7-18.
3. Push the Y-Axis Flex Cable **2** to the back of the Library via the opening vacated by the Cable Clamp Plate.
4. Remove the Y-Axis Flex Cable from the cable clamps.
5. Perform Procedure Remove the Main Controller Board (refer to “Removing the Main Controller Board” on page 7-30) and disconnect the Y-axis Flex cable from the Main Controller Board.
6. From the back of the Library, slide the cable through the cable channel and remove it.

### **Replacing the Y-Axis Flex Cable:**

1. **The replacement flex cable is not folded when it is shipped from the factory. Carefully fold replacement cable by using fold marks on new cable and the old cable as a template.**
2. Perform “Removing the Y-Axis Flex Cable” in reverse order.
3. Ensure Y–Axis drive belt tension is properly adjusted. To check and adjust belt tension see “Replacing the Y-Axis Drive Belt” on page 7-19 step 18 on page 7-20. Return here after belt tension is properly adjusted.
4. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 7-42 on page 7-48.
5. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS.*

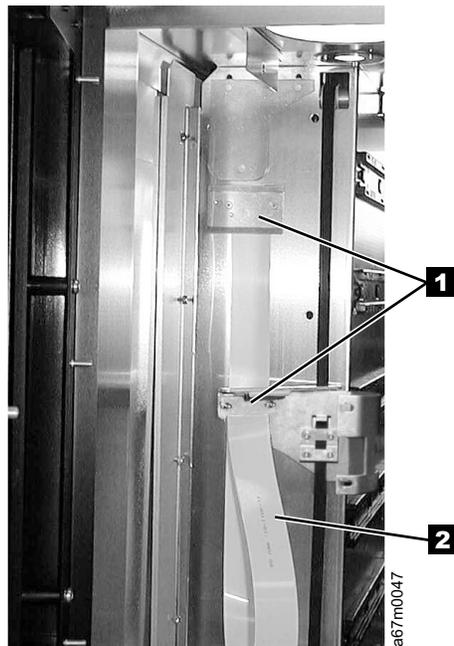


Figure 7-18. Y-Axis Flex Cable Removal and Replacement

---

## Display Assembly Flex Cable

For Display Assembly Flex Cable Part Number see Table 14-1 on page 14-1.

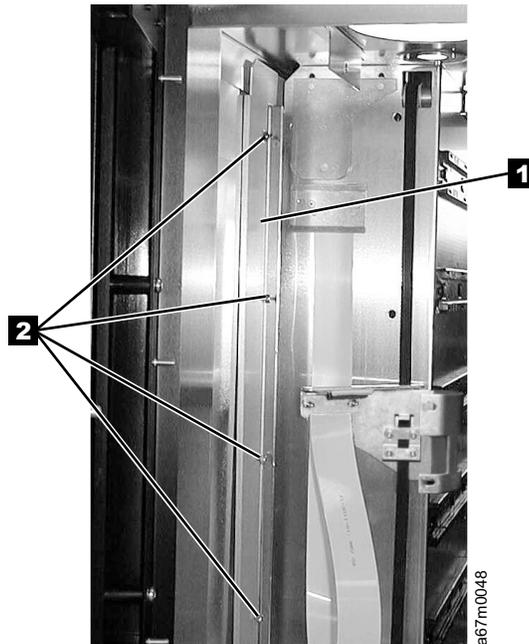
See Figure 7-19 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver, T8, T10 and T20 Torx drivers and flashlight.*

### **Removing the Display Assembly Flex Cable:**

**Perform Step 1 on page 7-9 through Step 12 on page 7-17 of Procedure “Removing the Y-Axis Drive Belt” on page 7-16.**

1. See Figure 7-19, remove the four screws **2** attaching the Cable cover **1** to the chassis.
2. Remove the display assembly flex cable from all the cable clamps.
3. See Figure 7-48 on page 7-56, remove four screws **2** and remove Lower Grill **3** from the Door assembly.



*Figure 7-19. Display Assembly Flex Cable Removal and Replacement*

4. Refer to Figure 7-20 on page 7-24 and remove the Display Assembly Flex Cable from the cable clamps.

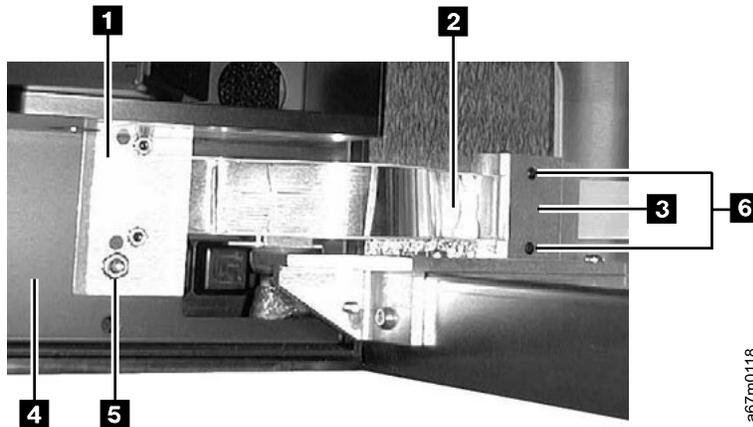


Figure 7-20. Display Assembly Flex Cable Removal and Replacement. The view is from the bottom front of the library, at the juncture of the door and the library.

5. Perform Procedure Remove the Main Controller Board (refer to “Removing the Main Controller Board” on page 7-30) and disconnect the Display Flex cable from the Main Controller Board.
6. From the back of the Library, slide the cable through the cable channel and remove it.

**Replacing the Display Assembly Flex Cable:**

1. **The replacement flex cable is not folded when it is shipped from the factory. Carefully fold replacement cable by using new cable fold marks and the old cable as a template.**
2. Perform the above procedure in reverse order.
3. Ensure Y–Axis drive belt tension is properly adjusted. To check and adjust belt tension see “Replacing the Y-Axis Drive Belt” on page 7-19 step 18 on page 7-20. Return here after belt tension is properly adjusted.
4. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 7-42 on page 7-48.
5. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS..*

---

## Main Controller to Power Distribution Cables (Power or Signal Interface)

There are two cables between the Main Controller Board and the Power Distribution Board. One carries power distribution and the other provides the signal interface. For Part Numbers, see Table 14-1 on page 14-1.

**Tools that are required:** *Phillips screwdriver, T10, T20 Torx drivers and flashlight.*

### **Removing the Main to Power Distribution Cables:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Perform Procedure Remove the “dc Power Supply” on page 7-49.
4. Perform Procedure Remove the “ac Input Power Module” on page 7-48.
5. Disconnect the failing cable (either Power **6** or Signal **5** Interface) from the Power Distribution Board. (See Figure 7-21).
6. Disconnect all SCSI cables at the Library Host Interface Board (SCSI).
7. Loosen the two captive screws on the Host Interface Board (SCSI). (See Figure 7-36 on page 7-41 **1**), then remove the Host Interface Board (SCSI) from the Main Controller Board.
8. (See Figure 7-26 on page 7-31). Remove the T8 Torx screw **2** holding the Main Controller Board to the Library chassis. Now slide the Main Controller Board partially out of the guiding tracks **3**.
9. (See Figure 7-21), disconnect failing cable, (Power **2** or Signal **1**), from Main Controller Board.
10. Slide cable through the cable channel and remove it.

### **Replacing the Main to Power Distribution Cables:**

Perform the above procedure in reverse order. **The replacement flex cable is not folded when it is shipped from the factory. Carefully fold the replacement cable by using the fold marks and the old cable as a template.** Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

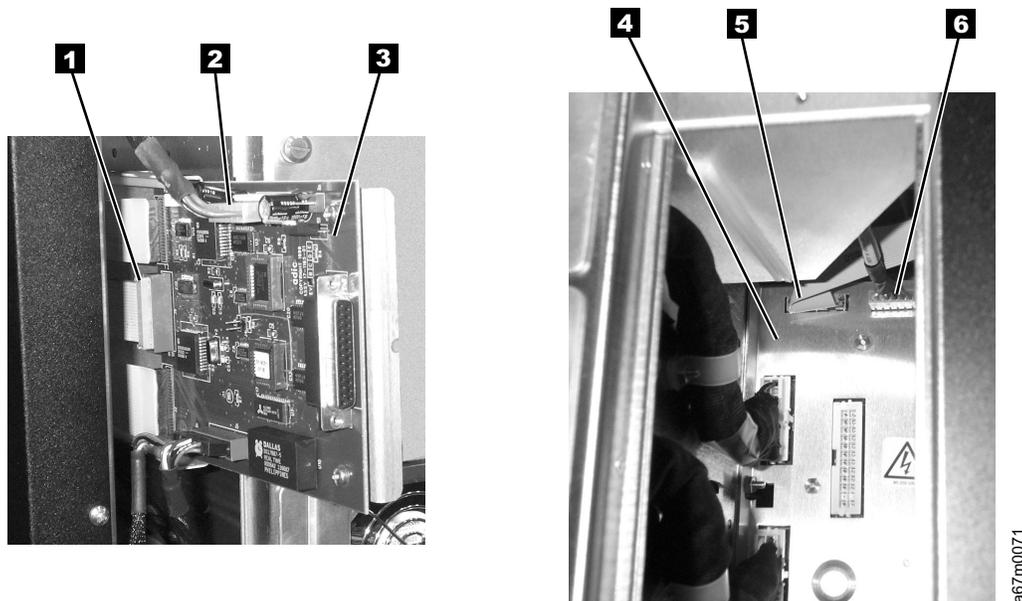


Figure 7-21. Main to Power Distribution Cables Removal and Replacement

## Power Distribution to Drive Sled Cable

There are six cables between the Power Distribution Board and the six Drive Sleds, each one can be replaced independently of the others. For cable part numbers see Table 14-1 on page 14-1.

See Figure 7-22 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver, T8 Torx driver and flashlight.*

### **Removing the Power Distribution to Drive Sled Cable:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Remove the Drive Sled associated with the failing cable. See Procedure Remove the “Tape Drive Sled” on page 7-3.
4. Remove all dc Power Supplies or Power Supply Filler Plate, see “Removing the dc Power Supply” on page 7-51.
5. Perform Procedure Remove the “ac Input Power Module” on page 7-48.
6. See Figure 7-22 for step 6 through step 9. Disconnect the failing cable **2** from the Power Distribution Board.
7. Remove the cable clamp **3** from the chassis.
8. Remove the Phillips screw and Torx screw **1** and **4**.
9. Push the connector and its bracket through the hole and remove the cable.

### **Replacing the Power Distribution to Drive Sled Cable:**

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

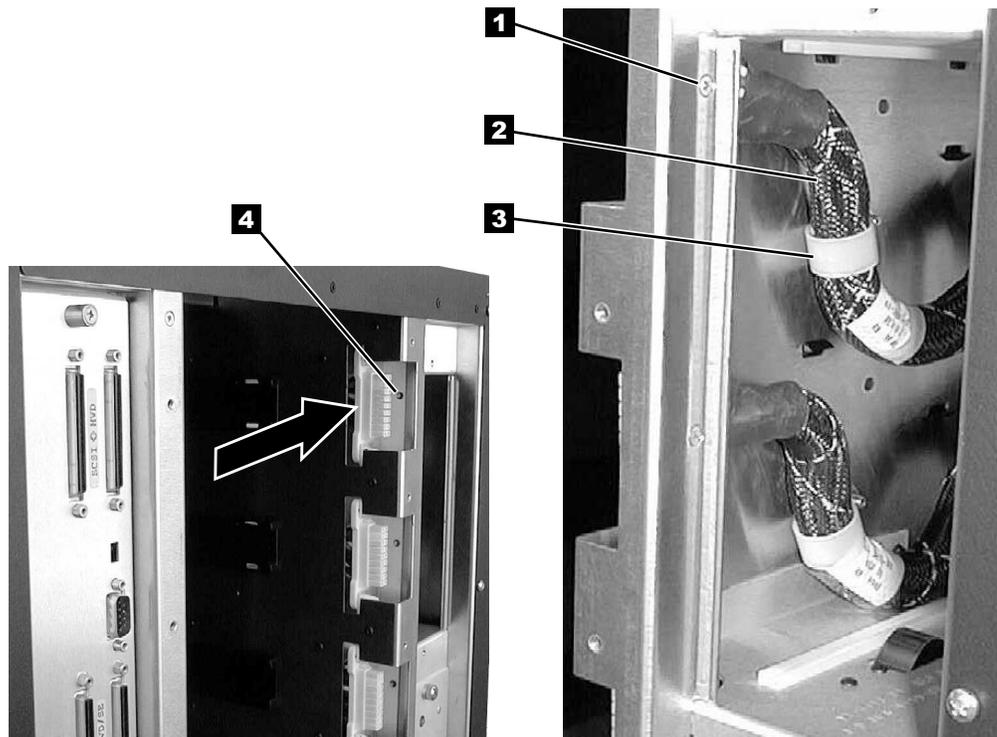


Figure 7-22. Power Distribution to Drive Sled Cable Removal and Replacement

---

## Y-Axis Motor Assembly

For Y-Axis motor part number, see Table 14-1 on page 14-1.

See Figure 7-23 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver, 11/32 in. Nut driver, T10 & T20 Torx drivers and flashlight.*

### **Removing the Y-Axis Motor Assembly:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Perform Procedure Remove the “dc Power Supply” on page 7-49.
4. Perform Procedure Remove the “ac Input Power Module” on page 7-48.
5. Perform Procedure Remove the “Power Distribution Board” on page 7-45.
6. Use **Figure 7-15 on page 7-18**, loosen the three Ny-lock nuts **2** (11/32 in. Nut driver) then loosen the tensioning screw **1** clockwise (T20 Torx driver) to release the belt tension. Do not remove the screws. **You may have to loosen the two Phillips screws holding the Flex Cable clamp plate, see Figure 7-13 on page 7-17 to loosen the belt tension.**
7. Remove the two screws **3** attaching the Y-Axis motor assembly to the chassis.
8. Remove the motor Assembly **2** from the belt.

### **Replacing the Y-Axis Motor Assembly:**

1. Perform the above procedure in reverse order.
2. Ensure Y–Axis drive belt tension is properly adjusted. To check and adjust belt tension see “Replacing the Y-Axis Drive Belt” on page 7-19 step 18 on page 7-20. Return here after belt tension is properly adjusted.
3. Power On the Tape Library by setting the Main Switch on the ac Input Power Module to the I position. For switch location see Figure 7-42 on page 7-48.
4. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

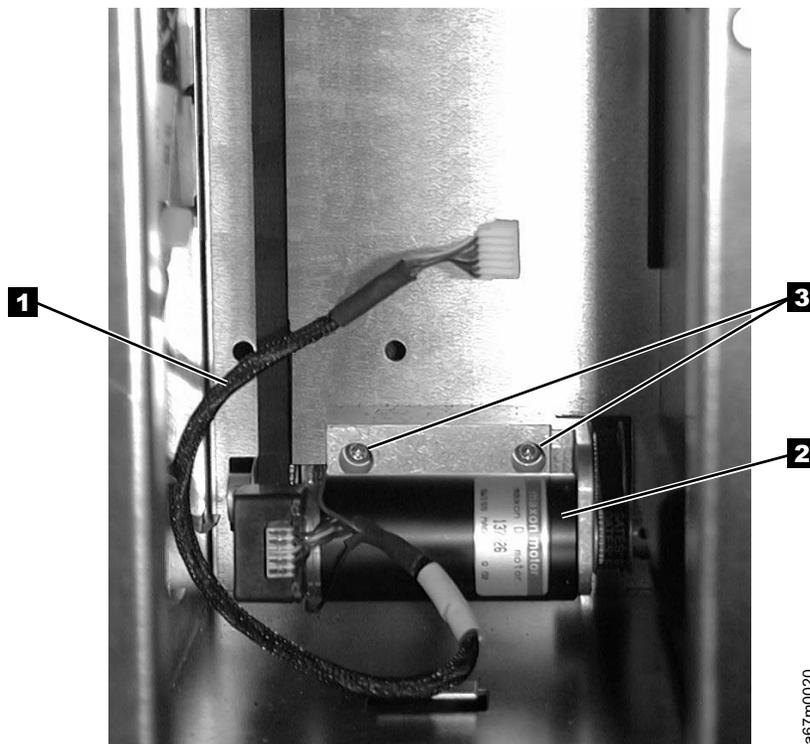


Figure 7-23. Y-Axis Motor Assembly Removal and Replacement

## Y-Axis Drive Shaft Assembly

**Note:** If the library is installed in a rack, you must slide it out prior to performing this procedure. See Figure 7-24 for locations of components in this procedure.

**Tools that are required:** *Phillips screwdriver, T10 Torx driver.*

### **Removing the Vertical Axis Drive Shaft:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library and remove storage column two (left front). See Procedure Remove the “Storage Columns” on page 7-29.
4. Remove the top cover. The top cover is attached to the chassis with three Phillips screws on the front and four T10 Torx screws in the back.
5. Remove the three Phillips screws **1** attaching the drive shaft to the top of the chassis. From the front of the Library, unscrew the drive shaft **2** counterclockwise out of the chassis bottom.
6. Lift the Drive Shaft **2** out of the Picker Assembly casting and remove the Drive shaft through the top of the chassis.

### **Replacing the Vertical Axis Drive Shaft Assembly:**

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

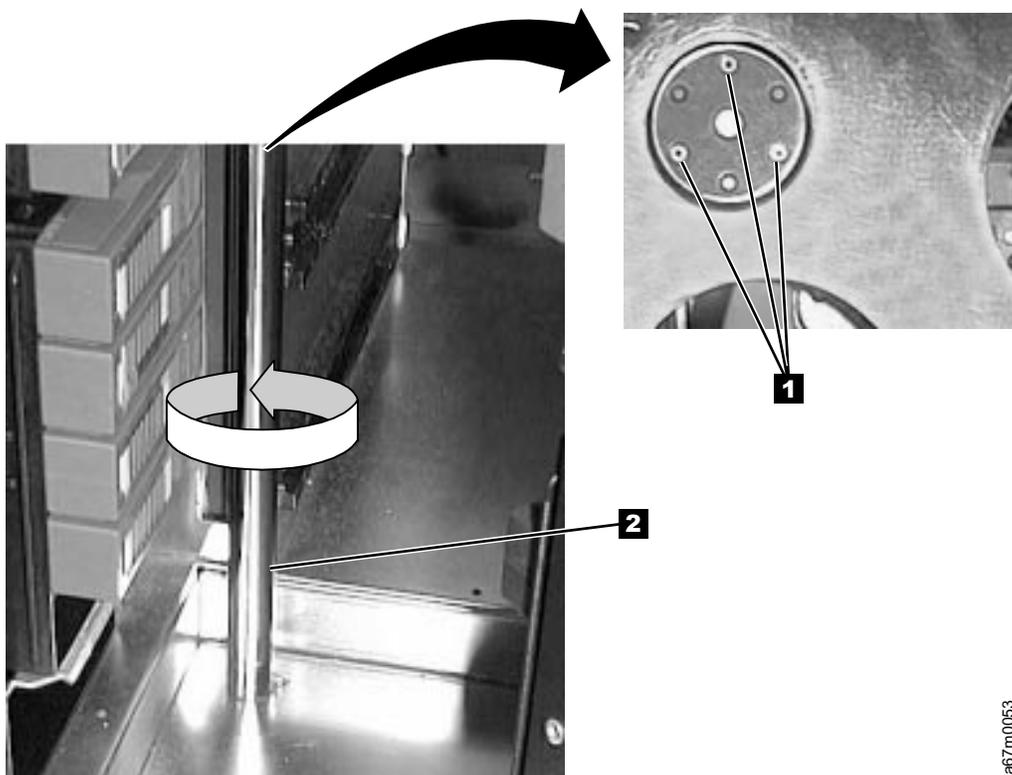


Figure 7-24. Y-Axis Drive Shaft Removal and Replacement

a67m0053

---

## Storage Columns

For Storage Columns Part Number, see Table 14-1 on page 14-1.

See Figure 7-25 for locations of components in the following procedure.

**Tools that are required:** 11-mm or 7/16-in. Nut driver, allen wrench or T20 Torx and flashlight.

### Removing the Storage Column:

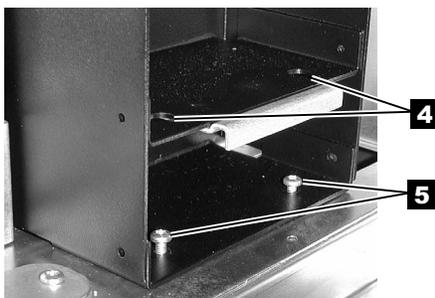
1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Note magazine positions so you can return each magazine to the same position. Remove all storage magazines **2** from the column you wish to remove.
5. Remove the top bolt **1** by using the 7/16 in. Nut driver.
6. Perform one of the following two steps depending on the column you are removing:
  - a. Remove columns **2** or **4**, using Torx or allen wrench to remove two bottom screws **5**. These two screws can be reached by using the through holes **4**.
  - b. If you are removing column **5**, use the 7/16 in. nut driver to remove the bolt **3** attaching the storage column to the bracket.
7. If necessary, move the picker assembly to a position in the vertical axis to allow access to the storage column. Gently slide the storage column out of the library front door. **See Figure 6-7 on page 6-8. It may be easier to remove the storage column 2 if the bar code reader cover 4 is removed from the Picker Assembly.**

### Replacing the Storage Column:

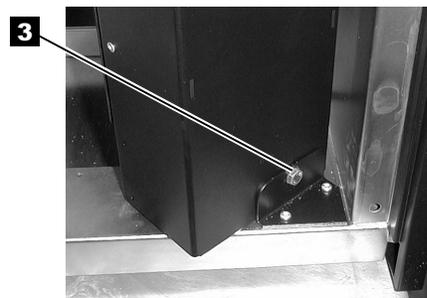
See Table 14-1 on page 14-1 for the correct Part Number. Perform the above procedure in reverse order. Make sure that you install the storage column in front of the mounting bracket of the library (see top picture in Figure 7-25). Replace magazines in same positions as noted in step 4. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*. **Be sure to retest and reinventory the Library by using the Operator Panel if these options are not set automatically.**



Top Attachment for all Storage Columns



Bottom Attachment for Storage Columns 2 and 4



Bottom Attachment for Storage Column 5

Figure 7-25. Storage Removal and Replacement

---

## Main Controller Board

**For service personnel only:** Refer to the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide* and use the procedure for resolving errors to reenter the library's serial number whenever you replace the main controller board. The procedure requires that you enter a special 4-character password before reentering the serial number. If you do not know the password, contact your Support Center.

**Note:** Do not exchange the Main Controller Board, Remote Management Unit, or Display Assembly in the same operation. Instead, exchange one card and determine whether the problem still exists. If so, reinstall the original card before exchanging the other cards. This is necessary to avoid loss of all configuration settings and library VPD.

For Main Controller Board Part Number, see Table 14-1 on page 14-1.

See Figure 7-26 on page 7-31 for locations of components in the following procedure.

**Before doing following remove procedure, if possible, retrieve all Tape Library Subsystem configuration data such as SCSI ID. Using the Setup option on operator panel (Main Menu →Setup →Library).**

**Tools that are required:** *Phillips screwdriver, T8 Torx driver and flashlight.*

### **Removing the Main Controller Board:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. If this is not a LUN 1 library, disconnect all SCSI cables at the Library Host SCSI Interface Board.
4. Loosen the two captive screws on the Host SCSI Interface Board, (See Figure 7-36 on page 7-41 **1**), then remove the Host SCSI Interface Board from the Main Board.
5. (See Figure 7-26 on page 7-31). Remove the T8 Torx screw **2** holding the Main Controller Board to the Library chassis. Now slide the Main Controller Board partially out of the guiding tracks **3**.
6. Disconnect all cables from the Main Controller Board.
7. Remove the Main Controller Board and its supporting plate.

### **Replacing the Main Controller Board:**

Perform the removal steps in reverse order.

- Check the Firmware level of the Library (**Main Menu →More→About**) and update the Firmware if needed (see "Updating Firmware" on page 8-4). For proper operation of the library, ensure that the firmware level of the replacement part matches the firmware level of the entire library.

**Note:** The boot code of the new part does not have to match the boot code of the other parts in the library.

- **For libraries without the Multi-Path feature, record the 11-character library serial number. After new main controller board is installed enter the previously recorded serial number by using Hyper Terminal. See "Methods of Capturing Logs" on page 8-2 on how to set up Hyper Terminal.** From the Hyper Terminal prompt, enter the command "setser" and follow the prompt.
- Reenter other Library configuration data if known.
- For libraries with the Multi-Path feature, the library serial number to be stored on the new main controller board is determined internally by arbitration firmware because the serial number is stored in several library locations. If the arbitration firmware cannot determine the serial number through arbitration, the firmware displays the choices on the operator panel and instructs the operator to choose the correct one.
- Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

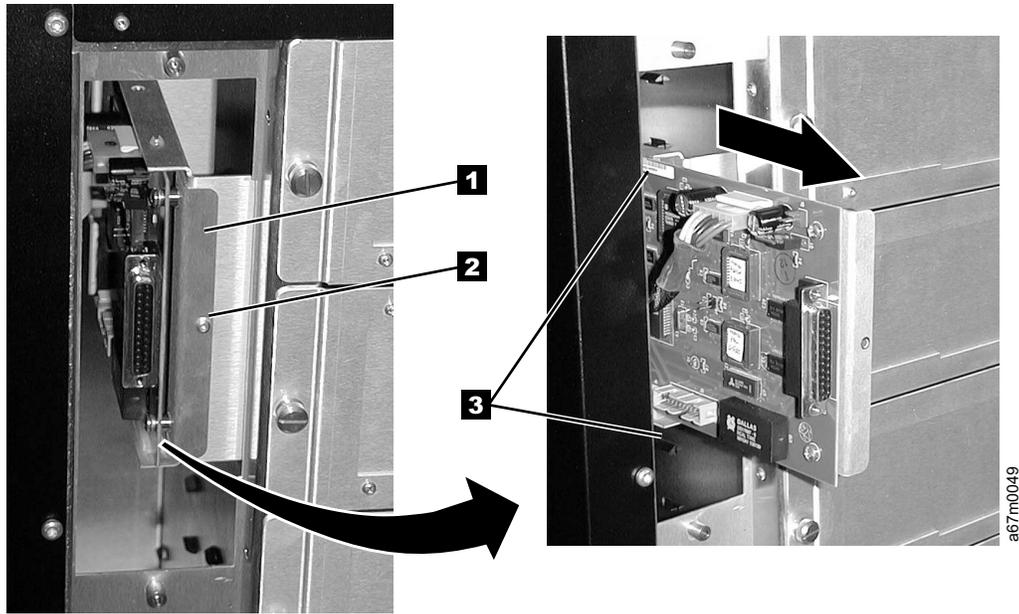


Figure 7-26. Main Board Removal and Replacement

---

## RMU Network Interface Cable

For RMU Network Interface Cable Part Number, see Table 14-1 on page 14-1.

**Tools that are required:** T8 Torx drivers and 11/32 in. nut driver.

### **Removing the RMU Interface Cable:**

1. Perform the procedure for removing the SAN Data Gateway Module. See “SAN Data Gateway Module” on page 7-37.
2. Perform the procedure for removing the RMU. See “Remote Management Unit” on page 7-35.
3. Remove the two T8 Torx screws ( **1** in Figure 7-27) that secure the Lower Fibre Channel Bracket Sub-Assembly to the chassis, then remove the bracket from the chassis.
4. Remove the 11/32 nut ( **2** that secures the RMU Interface Cable to the rear of the chassis.



Figure 7-27. Removing the Lower Fibre Channel Bracket Sub-Assembly

5. Remove the two T8 Torx screws ( **1** in Figure 7-28) that secure the RMU Bracket Sub-Assembly to the bottom of the chassis and slide the bracket out of the chassis.
6. Remove the two T8 Torx screws **2** that secure the RMU Interface Cable connector to the RMU Bracket Sub-Assembly and disconnect the RMU Interface Cable from the RMU Bracket Sub-Assembly.

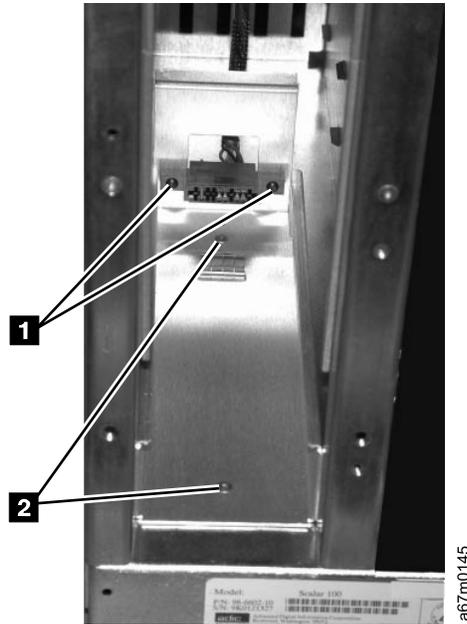


Figure 7-28. View of the RMU Bracket Sub-Assembly and RMU Interface Cable Connector

7. Remove the T8 Torx screw ( **1** in Figure 7-29) holding the Main Controller PCBA to the library chassis and slide the Main Controller PCBA partly out of the guiding tracks.

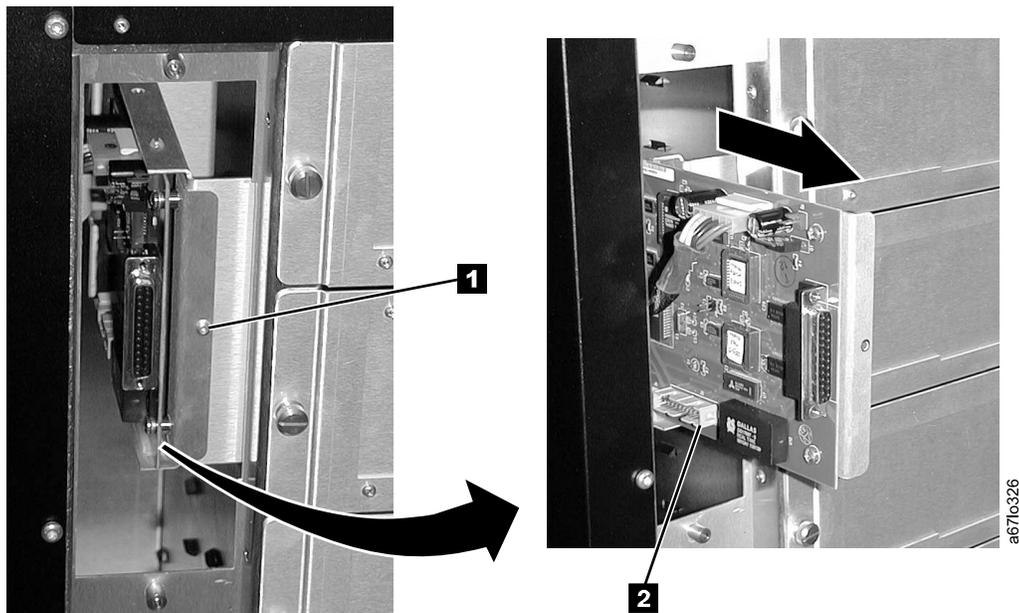


Figure 7-29. Sliding the Main Controller PCBA Out of the Guiding Tracks

8. Disconnect the RMU Interface Cable from the Main Controller PCBA and remove the RMU Interface Cable **2**.

| 9. Remove the cable clamp from the old RMU Interface Cable and reattach the clamp to the new RMU Interface Cable.

| ***Replacing the RMU Interface Cable:***

| Perform the removal steps in reverse order. **Be careful not to bend pins when connecting cables.**

---

## Remote Management Unit

- | **Note:** Do not exchange the Main Controller Board, Remote Management Unit, or Display Assembly in the  
| same operation. Instead, exchange one card and determine whether the problem still exists. If so,  
| reinstall the original card before exchanging the other cards. This is necessary to avoid loss of all  
| configuration settings and library VPD.

For RMU Part Number, see Table 14-1 on page 14-1.

See Figure 7-30 for locations of components in the following procedure.

**Tools that are required:** *Phillips Screwdriver (0)*.

### **Remove RMU:**

1. See Figure 7-30 for RMU location in library.
2. Ensure the RMU **1** is dormant.
3. Disconnect the customer's Ethernet cable from the RMU.
4. Loosen the thumbscrew **2** on the RMU and slide unit out of library.

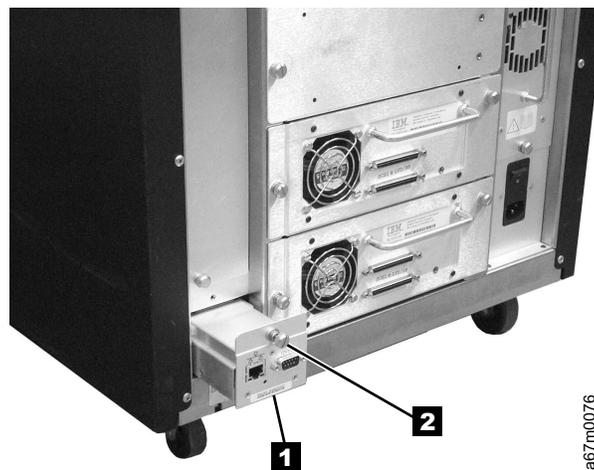
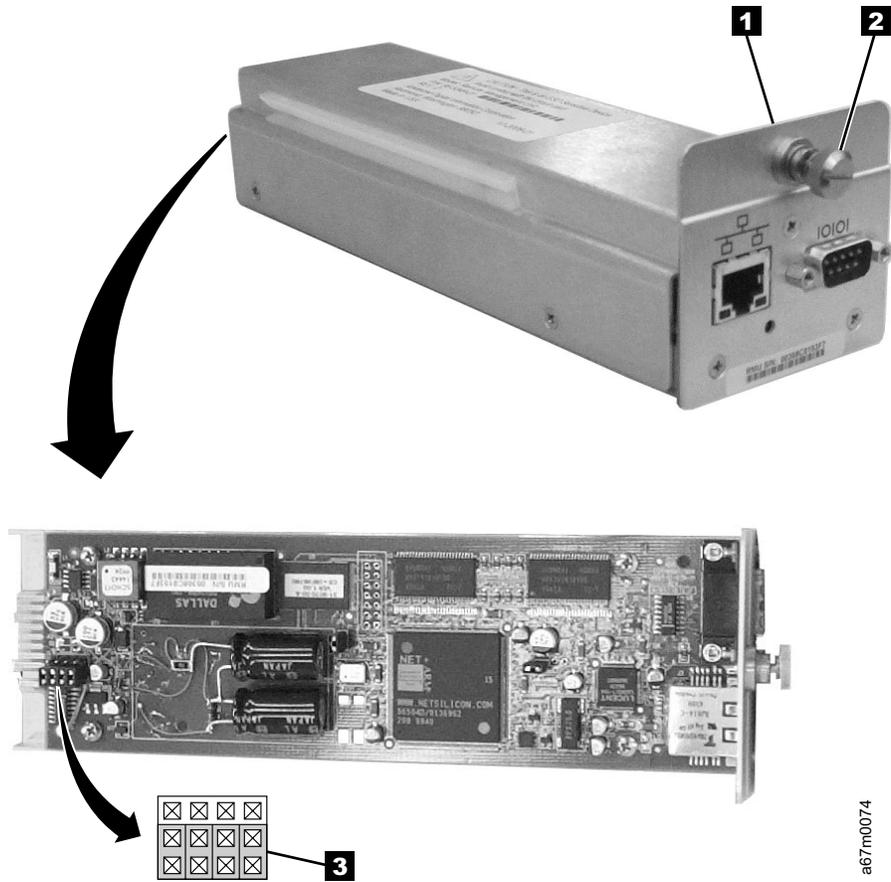


Figure 7-30. RMU

### **Replace RMU:**

1. See Figure 7-31 on page 7-36 for the next steps. Before you install the RMU in the library look into the end of the RMU and verify that the four jumpers are located as shown in detail **3**.
2. Slide the RMU **1** into the library and tighten the thumbscrew **2**.
3. Connect the network cable to RMU.
4. Advise the customer that the RMU is available for configuration. For instructions, refer the customer to the section about configuring the RMU in the installation chapter of the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.



a67m0074

Figure 7-31. RMU Jumpers

---

## SAN Data Gateway Module

**Note:** Before removing or replacing the SAN Data Gateway Module, see the section about preserving the gateway's configuration in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*.

For SAN Data Gateway Module Part Number, see Table 14-1 on page 14-1.  
See Figure 7-32 for location of gateway in the library.

**Tools that are required:** *None.*

### **Remove SAN Data Gateway Module:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. See Figure 7-32 for steps 3 through 4. Disconnect all cables at the gateway **1**.
4. Loosen the thumbscrews **2** on the gateway and slide gateway **1** out of library.



Figure 7-32. SAN Data Gateway Module

### **Replace SAN Data Gateway Module:**

**Note:** Be careful to connect the SCSI VHDCI cables in their proper orientation to the SAN Data Gateway Module.

Perform steps 1 through 4 in “Remove SAN Data Gateway Module” in reverse order. Customer should refer to *Storage Area Network Data Gateway Module Setup, Operator, and Service Guide* for configuration of gateway.

---

## Accessory Bay Cable for the SAN Data Gateway Module

For Accessory Bay Cable Part Number, see Table 14-1 on page 14-1.

See 7-38 and 7-32 for locations of components in the following procedure.

**Tools that are required:** T8 Torx drivers and 11/32 in. nut driver.

### Removing the Accessory Bay Cable for the SAN Data Gateway Module:

1. Perform the procedure for removing the SAN Data Gateway Module. See “SAN Data Gateway Module” on page 7-37.
2. Perform the procedure for removing the Main Controller PCBA. See “Main Controller Board” on page 7-30.
3. Perform the procedure for removing the dc Power Supply. See “dc Power Supply” on page 7-49.
4. Remove the tape drives sleds or filler plates in locations 3 and 4. See “Tape Drive Sled” on page 7-3.
5. Remove the three T8 Torx screws ( **1** in Figure 7-33) that secure the Fibre Channel Bracket Sub-Assembly **2** to the chassis and slide the bracket out of the chassis. (Two of the screws are located between the guide rails for drives 3 and 4. The third T8 Torx screw is located on the outside of the chassis.)

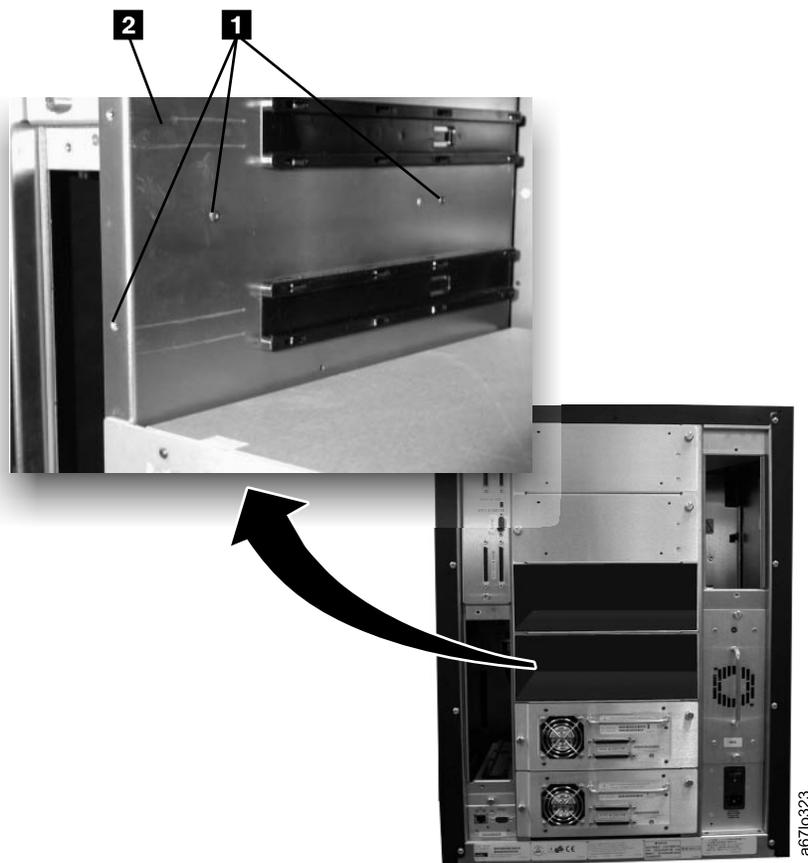


Figure 7-33. Removing the T8 Torx Screws that Secure the Fibre Channel Bracket Sub-Assembly

6. Disconnect the Accessory Bay Cable (1 in Figure 7-34) from the Fibre Channel Bracket Sub-Assembly. If necessary, cut the cable connector locking tabs.

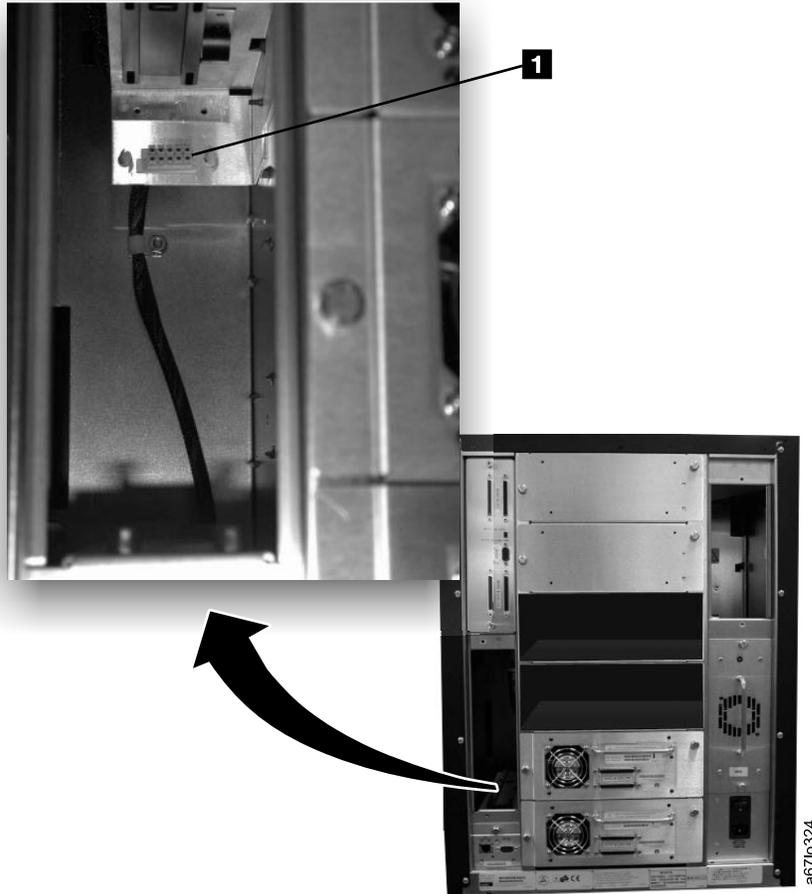
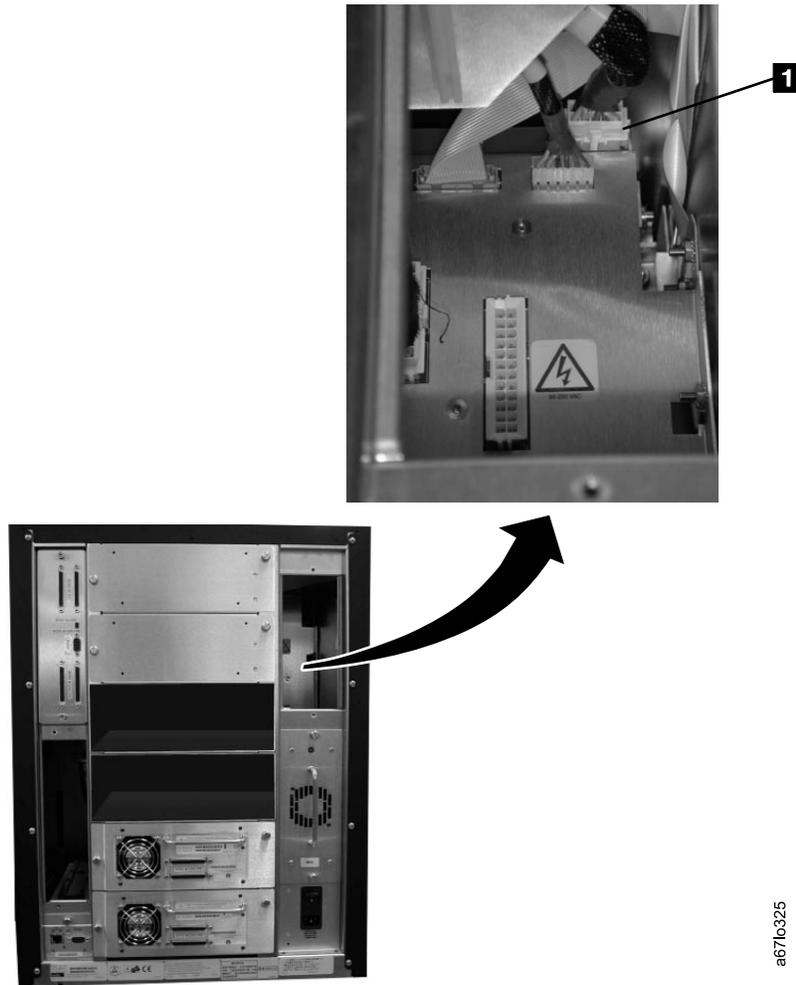


Figure 7-34. Disconnecting the accessory bay cable from the Fibre Channel bracket sub-assembly

- 7. Disconnect the Accessory Bay Cable from the Power Distribution PCBA ( **1** in Figure 7-35). Remove the Accessory Bay Cable by sliding it through the cable channel.



a676325

Figure 7-35. Disconnecting the accessory bay cable from the power distribution PCBA

**Replacing the Accessory Bay Cable for the SAN Data Gateway Module:** Perform the removal steps in reverse order.

**Note:** The Accessory Bay Cable is routed behind the ribbon cables that connect to the Main Controller PCBA. Also, because alignment of the Torx screws between the guide rails for tape drive sleds 3 and 4 may be difficult when reinstalling the Fibre Channel Sub-Assembly, start the Torx screws by hand to ensure the bracket is properly fitted.

---

## Host SCSI Interface Board

For Host SCSI Interface Board Part Number, see Table 14-1 on page 14-1.  
See Figure 7-36 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver.*

### **Removing the Host SCSI Interface Board:**

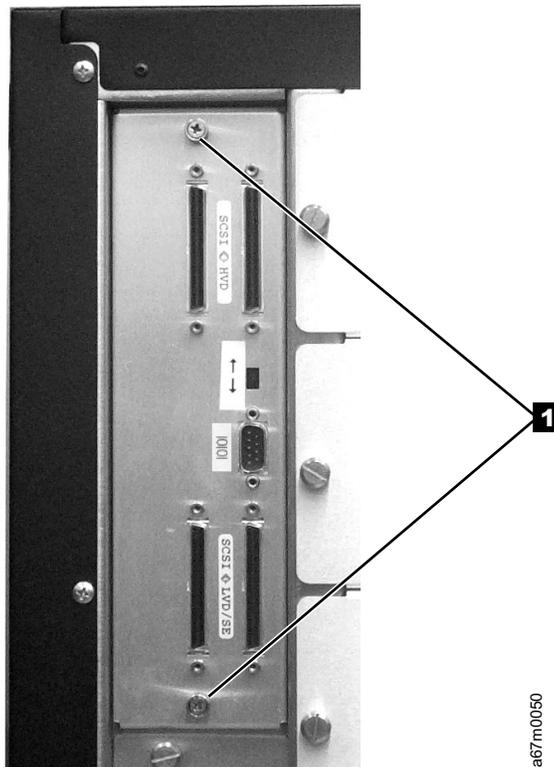
1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Disconnect all SCSI cables to the Library Host SCSI Interface Board.
4. Loosen the two captive screws **1** on the Host SCSI Interface Board. Remove the Host SCSI Interface Board from the Main Board.

### **Replacing the Host SCSI Interface Board:**

Perform the removal steps in reverse order. Ensure replacement Board is configured the same as board you are replacing. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

### **Important Notes:**

1. Set the switch to match the SCSI bus the Tape Library is connected to (HVD or LVD). Connect only the SCSI cables and terminator to the side of the SCSI Board that is selected. Do not connect cables or terminator to the inactive side.
2. Factory will have both jumpers (J3 and J4) installed to provide term power as the default setting.



*Figure 7-36. Host SCSI Interface Board Removal and Replacement. The jumpers are located on the back side of the board and are not shown in this picture. Host 1 (in the SCSI Host Attachment) is the only host that has direct access to library operation.*

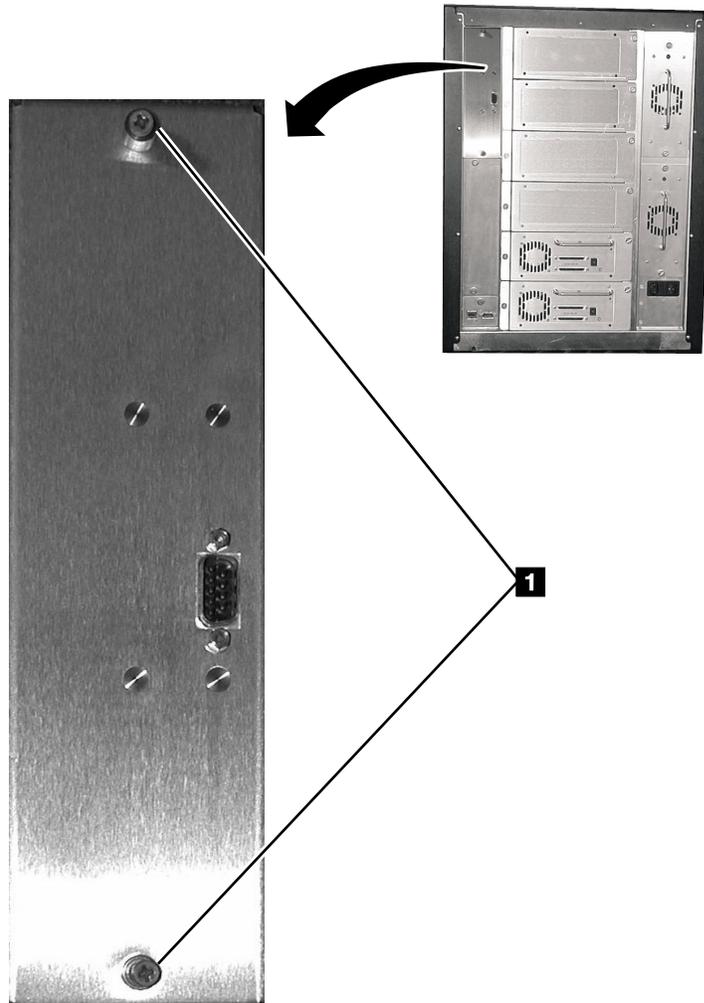
---

## Serial Diagnostic Port Board

- | For Host SCSI Interface Board Part Number, see Table 14-1 on page 14-1.
- | See Figure 7-36 on page 7-41 for locations of components in the following procedure.
- | **Tools that are required:** *Phillips screwdriver.*

### **Removing the Serial Diagnostic Port Board:**

- | 1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
- | 2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
- | 3. Loosen the two captive screws **1** on the Serial Diagnostic Port Board. Remove the Serial Diagnostic Port Board from the Main Board.



a67m0188

Figure 7-37. Serial Diagnostic Port Board Removal and Replacement

- | **Replacing the Serial Diagnostic Port Board:** Perform the removal steps in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

---

## Display Assembly

| **Note:** Do not exchange the Main Controller Board, Remote Management Unit, or Display Assembly in the  
| same operation. Instead, exchange one card and determine whether the problem still exists. If so,  
| reinstall the original card before exchanging the other cards. This is necessary to avoid loss of all  
| configuration settings and library VPD.

For Display Assembly Part Number, see Table 14-1 on page 14-1.

**Tools that are required:** *Phillips screwdriver and T8 Torx driver.*

See Figure 7-38 on page 7-44 for locations of components in the following procedure.

### ***Removing the Display Assembly:***

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Remove the six T8 Torx screws holding the Display Assembly to the front door. Refer to **1** in Figure 7-46 on page 7-54 for locations of these screws.
- | 5. Disconnect cables **3** and **6** from the Display Control Board. **Be careful not to bend pins when  
| disconnecting cables.**
6. Remove the Display Assembly.

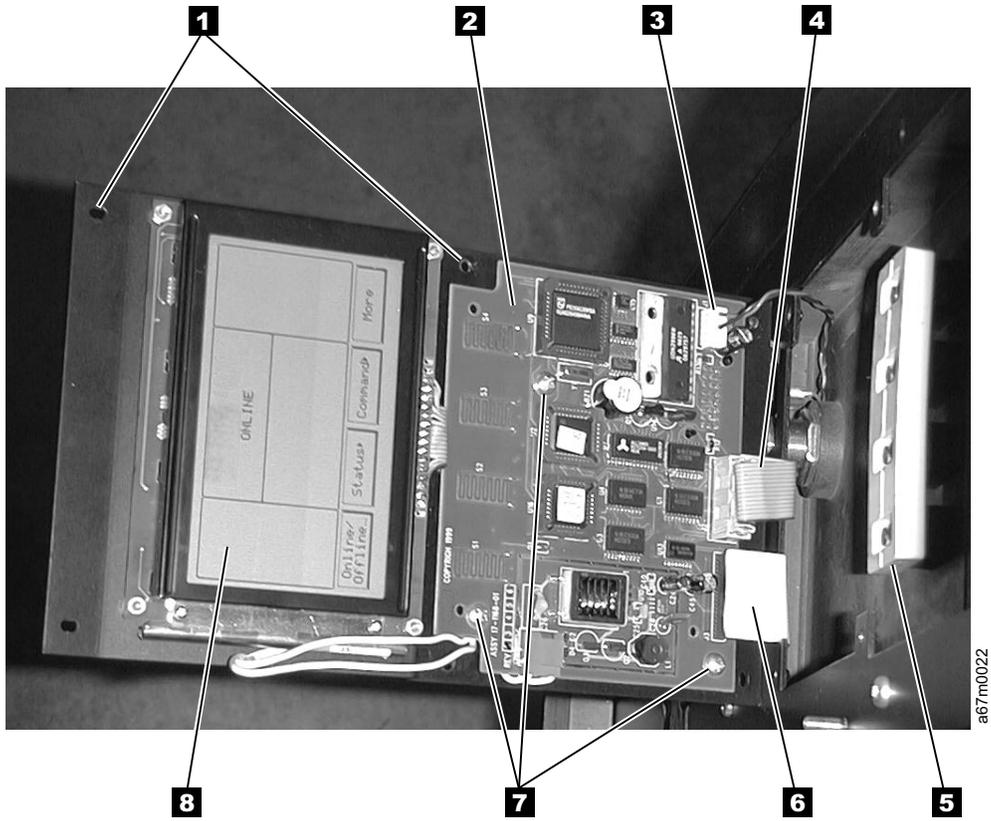
### ***Replacing the Display Assembly:***

Perform the removal steps in reverse order. **Be careful not to bend pins when connecting cables.**

| **Note:** If the code is downlevel from the original display board, you will need to update the code through  
| the serial port (see “Updating Library Firmware by Using the Library’s Serial Port” on page 8-11).

For proper operation of the library, ensure that the firmware level of the replacement part matches the firmware level of the entire library.

**Note:** The boot code of the new part does not have to match the boot code of the other parts in the library.



ac7m0022

Figure 7-38. Display Assembly Removal and Replacement

## Power Distribution Board

- For Type II and Type I Power Distribution Board Part Numbers, see Table 14-1 on page 14-1. See Figure 7-39 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver, T8 Torx driver, 11/32 in. open wrench and flashlight.*

### Removing the Power Distribution Board:

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Perform Procedure Remove the “dc Power Supply” on page 7-49.
4. Perform Procedure Remove the “ac Input Power Module” on page 7-48.
5. Remove four screws **1** then remove bracket **2**.
6. Disconnect all cables on the side of the Power Distribution Board facing you. There are:
  - a. Six Drive sled cables **8**.
  - b. Two cables from the Main Controller Board **3** (Power and Signal).
  - c. The Y-Axis Motor Assembly cable **6**.
  - d. San Appliance Module power cable (only on Type II board) **11**.
7. Using 11/32 in. wrench, remove four nuts **7** holding Power Distribution Board to chassis wall.
8. Lift Power Distribution Board out of the mounting studs **7** and rotate its right side toward you. Be persistent this is a tight fit.
9. Tilt the bottom of Board slightly toward you to remove it.
10. Remove and retain seven screws **9** holding the metal bracket **10** to board you just removed. Use screws **9** to attach bracket **10** to the Type II board.

### Replacing the Power Distribution Board:

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

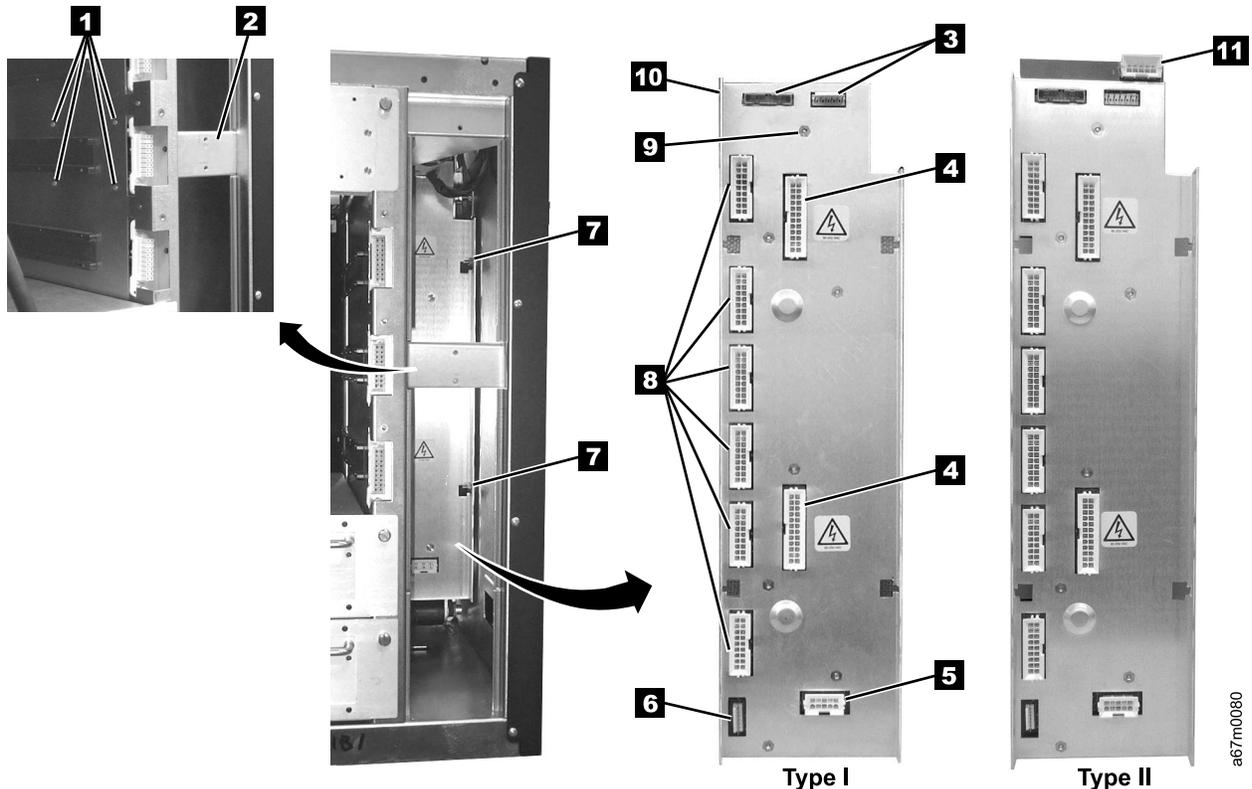


Figure 7-39. Power Distribution Board Removal and Replacement

---

## 12-Slot I/O Station

For I/O station assembly part number, see Table 14-1 on page 14-1.

**Tools that are required:** T20 Torx driver and 11/32 in. nut driver.

### Removing the I/O Station:

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. Remove all magazines (if present) **4**, **5** and cartridges from the I/O Station.
5. See Figure 7-40, disconnect the I/O Station cable harness **3** from the Display Assembly **2** by disconnecting cable connector **7**.
6. Remove the four I/O Station cable clamps **1**. Three of the cable clamps are attached to the door using T20 Torx screws and one is attached with a 11/32 in. nut.
7. Remove eight 11/32 in. nuts **6**, four on each side holding the I/O Station assembly **4** to the front door.
8. Remove the I/O Station.

### Replacing the I/O Station:

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

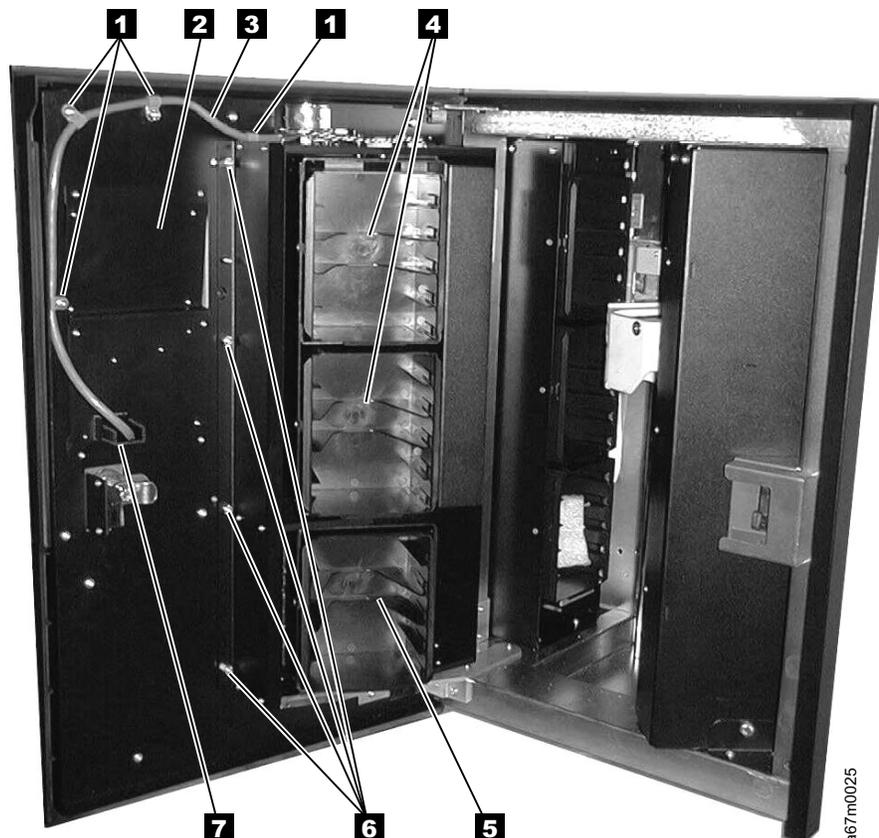


Figure 7-40. I/O Station Removal and Replacement

---

## Single-Slot I/O Station

For I/O station assembly part number, see Table 14-1 on page 14-1.

**Tools that are required:** T20 Torx driver and 11/32 in. nut driver.

### Removing the I/O Station:

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the Tape Library front door.
4. See Figure 7-41, if a cartridge is present at the I/O Station **3**, remove cartridge.
5. See Figure 7-40 on page 7-46, disconnect the I/O Station cable harness **3** from the Display Assembly **2** by disconnecting cable connector **7**.
6. Remove the four I/O Station cable clamps **1**. Three of the cable clamps are attached to the door using T20 Torx screws and one is attached with a 11/32 in. nut.
7. Remove eight 11/32 nuts **6**, four on each side holding the I/O Station assembly **4** to the front door.
8. Remove the I/O Station.

### Replacing the I/O Station:

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

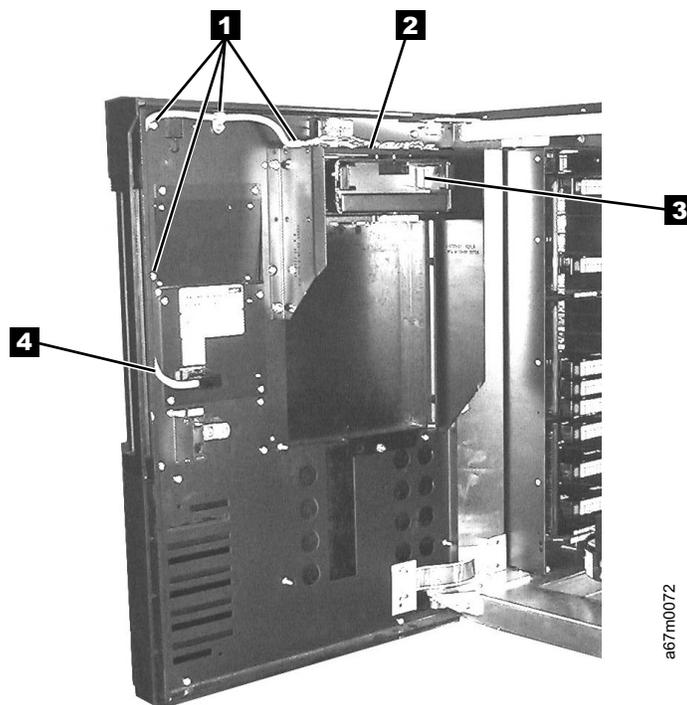


Figure 7-41. I/O Station, Single Slot

---

## Power Supplies Check Procedure

1. Check dc Power Supply by observing light-emitting diode (LED) indicator located on the back of each installed Power Supply, refer to Figure 6-17 on page 6-18. If this LED is RED, replace the Power Supply by using Procedure “dc Power Supply” on page 7-49.
2. Problem which sent you here may be caused by blown fuses (5A) on the ac Input Power Module. Refer to Figure 7-42 for location of fuses. If fuses are blown, replace fuses and power up the Library. If fuses continue to blow, perform Procedure Remove the “ac Input Power Module”.

---

## Power

### ac Input Power Module

See Table 14-1 on page 14-1 for ac Power Input Module Part Number.

See Figure 7-42 for locations of components in the following procedure.

**Tools that are required:** T8 Torx driver.

#### **Removing the ac Input Module:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Disconnect the mainline ac power cable **5** from the ac Input Power Module.
4. Slide the fuse holder **3** out to the stop. Allow fuse holder to tilt down.
5. Check the fuses **3** and replace them if necessary.
6. If you replaced fuses in step 5 and fixed the problem go to “Replacing the ac Input Module”. Otherwise proceed with step 7.
7. Slide fuse holder back into the receptacle. Remove the two Torx screws **4** fastening the ac Power Module to the chassis.
8. Slide the ac Input Module **1** away from the frame and remove the ac Input Module.

#### **Replacing the ac Input Module:**

Perform above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

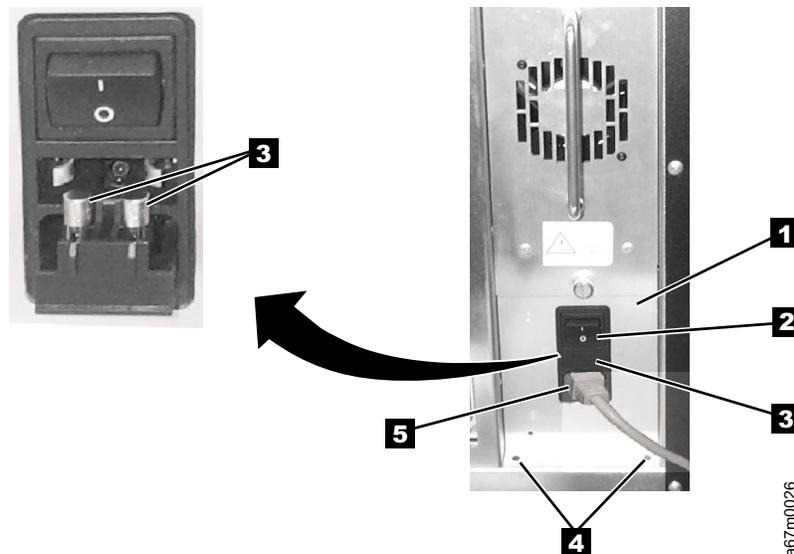


Figure 7-42. ac Input Module Removal and Replacement

## dc Power Supply



### DANGER

Up to 240 V ac is present at the power module connectors when the main power cord is connected to a power source. (RSFTD010)

This procedure removes and replaces the dc Power Supply or either supply if redundant supply is present. See Table 14-1 on page 14-1 for dc Power Supply Part Number.

See Figure 7-44 on page 7-52 for locations of components in the following procedure.

**Tools that are required:** *None.*

**Verifying dc Power Supply Level:** Before replacing a dc Power Supply in the Tape Library, verify that you have the correct dc Power Supply.

1. From the rear of the library, locate the one or two dc power supplies that are currently installed in the library ( **1** in Figure 7-43 on page 7-50).
  - a. If the Type II power architecture (NPA) label **2** is present on the dc Power Supply **1**, then the replacement dc Power Supply also needs to have the NPA label.
  - b. If the NPA label **2** is not present on the dc Power Supply **1**, then the replacement dc Power Supply should not have the NPA label.

**Note:** The presence of the label indicates that the library contains a Type II power architecture and requires a Type II level of dc Power Supply. The library will not operate properly if the power supplies and power architectures are not at the same level. See “Power Distribution PCBA (Type I)” on page 6-13 and “Power Distribution Board (Type II)” on page 6-14 to verify which power architecture is installed in the library.

2. If the dc Power Supplies do not match, do not continue with this installation. Have the customer contact his or her IBM Business Partner or IBM Sales Representative to order the correct dc Power Supply needed for this procedure. Verify that it is the correct power supply.
3. If the dc Power Supplies match, continue with the installation.

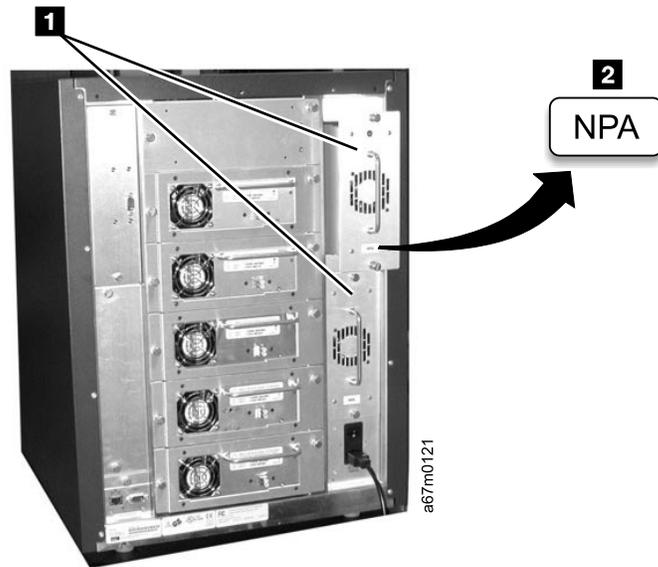


Figure 7-43. Comparing dc Power Supplies

Table 7-1 identifies the effect of mixing dc Power Supplies in libraries that have the Type I power architecture or the Type II power architecture.

Table 7-1. Interchange of Power Supplies with Library Power Architecture

Library Type	Power Supply	Effect
Type I power architecture design	1 Type I	Library operates normally.
	1 Type II	<ul style="list-style-type: none"> <li>Library will not power up (display remains dark).</li> <li>The LED on the back of the Power Supply will remain unlit (neither red or green). There will be a noise (not always clearly audible) coming from one or both stepper motors (gripper and door latch). This is because there is +12 V at the stepper drivers, but no +5 V and they will be in an unknown state. The library should be turned OFF.</li> </ul>
	1 Type I / 1 Type II	<ul style="list-style-type: none"> <li>Library will operate.</li> <li>The Type II Power Supply will have the red LED turned on. There will be redundancy for +12 V, but not for +5 V.</li> </ul>
Type II power architecture design	1 Type I	<ul style="list-style-type: none"> <li>Library will power up.</li> <li>LED on the back of the original Power Supply will turn red and the display will show SAC D2 00, see Table 5-1 on page 5-4</li> </ul>
	1 Type II	Library operates normally.
	1 Type I / 1 Type II	<ul style="list-style-type: none"> <li>Library will operate.</li> <li>LED on the back of the original Power Supply will turn red and the display will show SAC D2 00, see Table 5-1 on page 5-4</li> </ul>

**Removing the dc Power Supply:**

1. **If you have a redundant dc Power Supply installed in the Library go to step 4. The failing dc Power Supply can be removed with the Library powered On.**
2. If you do not have a redundant dc Power Supply: Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
3. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
4. Loosen the two captive thumbscrews **3** located on the back of power supply, see Figure 7-44 on page 7-52 and slide dc Power Supply out of the library.

**Replacing the dc Power Supply:** Perform the removal steps in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.  
**Before inserting dc Power Supply, be sure to orient Power Supply so LED indicator **1** is as seen in Figure 7-44.**

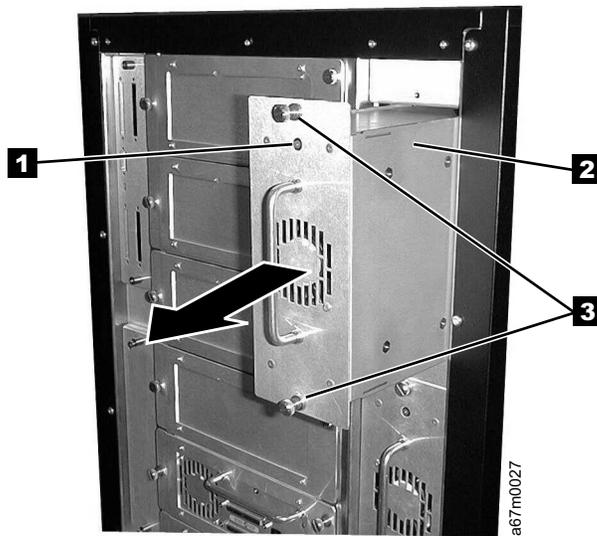


Figure 7-44. DC Power Supply Removal and Replacement

---

## Door Lock Assembly

See Table 14-1 on page 14-1 for door lock Part Number.

See Figure 7-45 for location of components in following procedure.

**Tools that are Required:** *Phillips head screwdriver.*

### **Removing the Door Lock Assembly:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. See Figure 7-45, note the position of the latch **3**. Latch must be in the same position during replacement as during removal.
5. Remove Phillips head screw **4** from back of door lock assembly. Be careful to retain small spacer **2** which is behind the latch **3**. This spacer must be used when the new mechanism is installed. Pull the tumbler assembly **1** out the front of lock housing.

### **Replacing the Door Lock Assembly:**

**Do not over tighten the Phillips Head Screw while replacing assembly.** Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

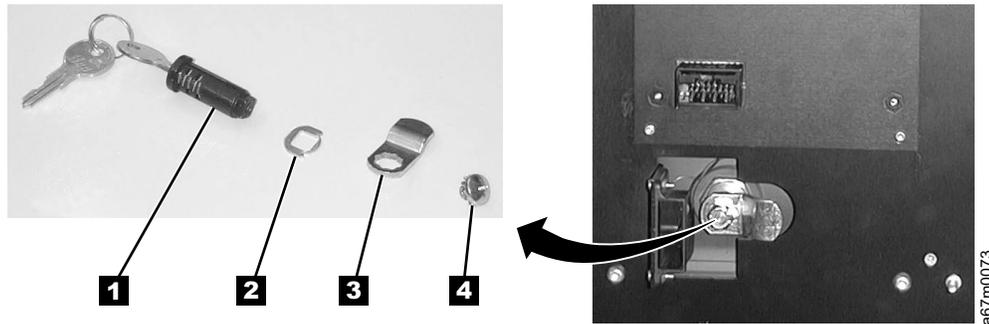


Figure 7-45. Door Lock Assembly, Remove/Replace

---

## Door Interlock Switch and Cable Assembly

- I See Table 14-1 on page 14-1 for Door Interlock Switch and Cable Assembly Part Number. See Figure 7-46 for locations of components in the following procedure.

**Tools that are required:** *T8 Torx driver and small pliers.*

### **Removing the Door Interlock Switch:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
- I 4. Remove the two T8 Torx screws **3** and nuts that attach the Door Interlock switch **2** to the door. You will need the pliers to hold the nuts while removing the screws.
5. Remove the six T8 Torx screws **1** that attach the Operator Panel Assembly **4** to the door. See Procedure Remove the “Display Assembly” on page 7-43 for more information.
6. Disconnect the cable between the Door Interlock switch and the Display Control Board.
7. Remove the switch from the bracket.

### **Replacing the Door Interlock Switch:**

**Do not over tighten the screws and nuts when reinstalling the Door Interlock Switch.** Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

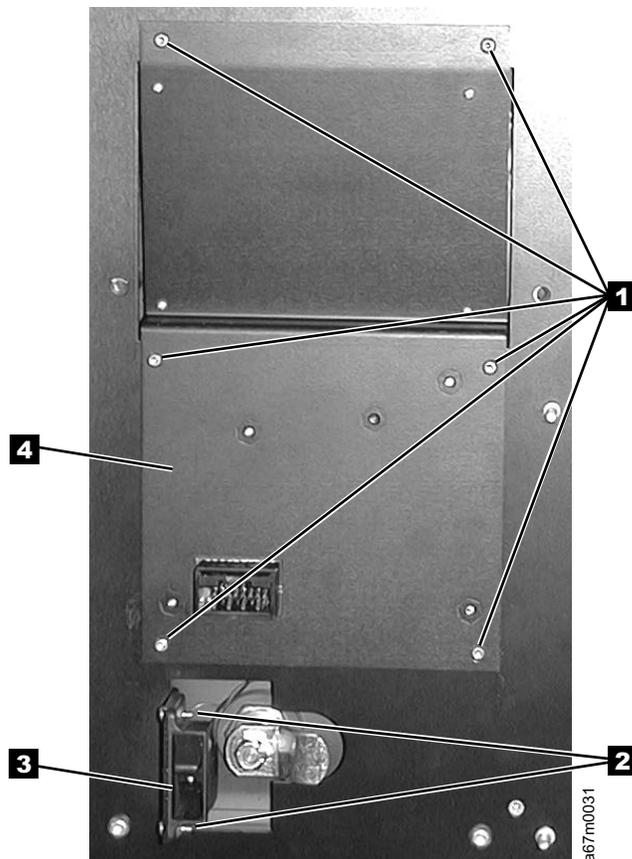


Figure 7-46. Door Interlock Switch Removal and Replacement

---

## Plastic Top Door

See Table 14-1 on page 14-1 for Plastic Top Door Part Number.

See Figure 7-47 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver and T20 Torx driver.*

### **Removing the Plastic Top Door:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. The Plastic Top Door attaches to the door frame with eight screws **1**. Remove these screws shown in Figure 7-47.
5. Remove the Plastic Top Door from the door frame, you may need to close the door slightly. Guide the lock **2** through the opening in the door frame to remove the door.
6. Remove the rubber Operator Panel Button Assembly from the door (this is to be re-installed in the replacement door).

### **Replacing the Plastic Top Door:**

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

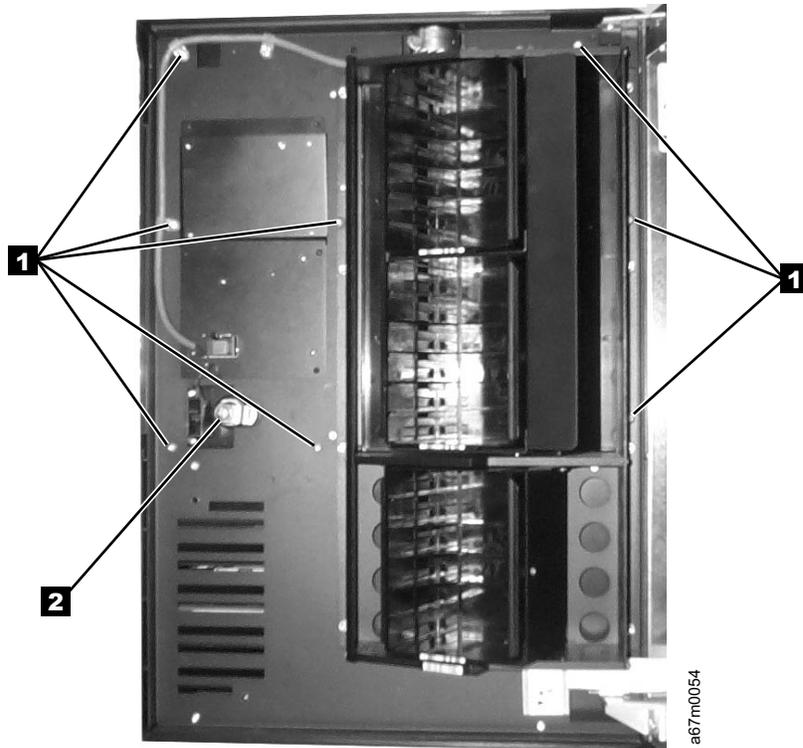


Figure 7-47. Plastic Top Door Removal and Replacement

---

## Plastic Lower Front Door Panel

See Table 14-1 on page 14-1 for plastic lower front door panel part number.  
See Figure 7-48 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver and T20 Torx driver.*

### **Removing the Plastic Lower Front Door Panel:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. The Plastic Lower Front Door Panel is attached to the door frame with four screws **1**. Remove these screws shown in Figure 7-48.
5. Remove the Plastic Lower Front Door Panel **2** from the door frame.

### **Replacing the Plastic Lower Front Door Panel:**

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

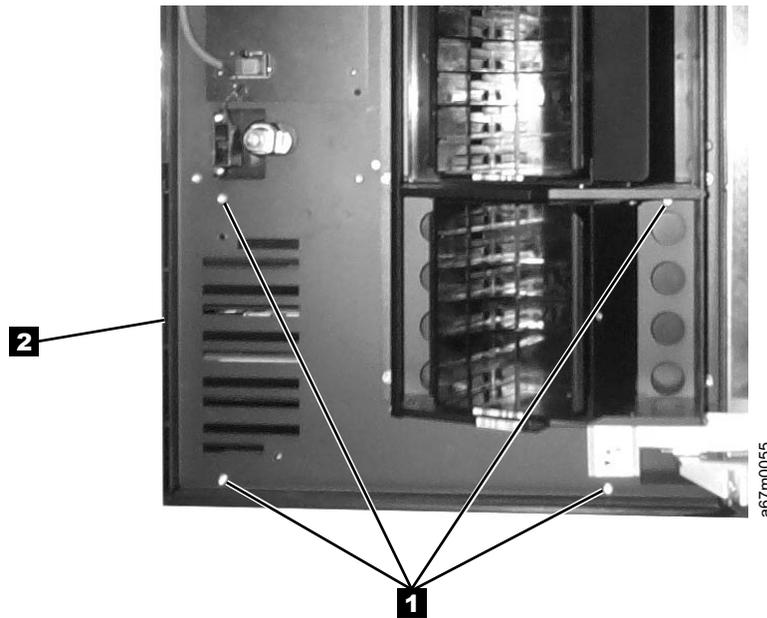


Figure 7-48. Plastic Lower Front Door Panel Removal and Replacement

---

## Side Cover

See Table 14-1 on page 14-1 for Side Cover Part Number.

See Figure 7-49 for locations of components in the following procedure.

**Tools that are required:** *Phillips screwdriver.*

### **Removing the Side Cover:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. Remove the four Phillips screws **1** as shown in Figure 7-49. After removing the Phillips screws, the cover **2** can only be removed if you open the front door.

### **Replacing the Side Cover:**

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

**Note:** Replacement cover that is used for either side of the Library.

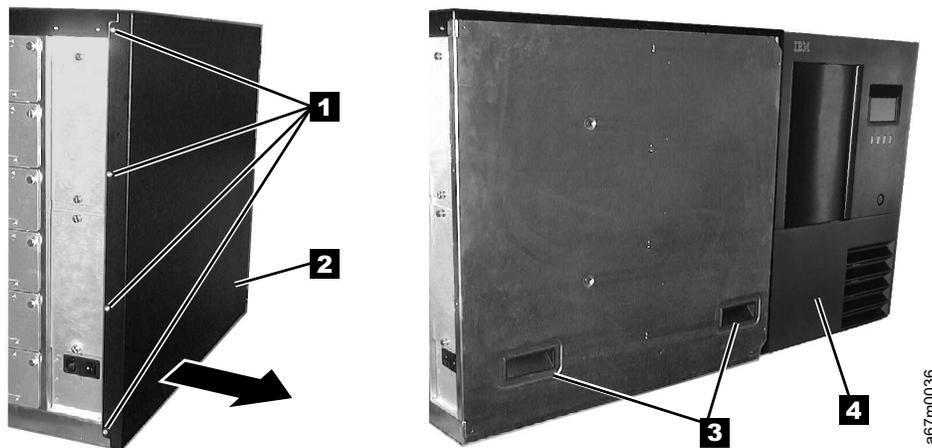


Figure 7-49. Side Cover Removal and Replacement

---

## Top Cover

See Table 14-1 on page 14-1 for Top Cover Part Number.

See Figure 7-49 on page 7-57 for locations of components in the following procedure.

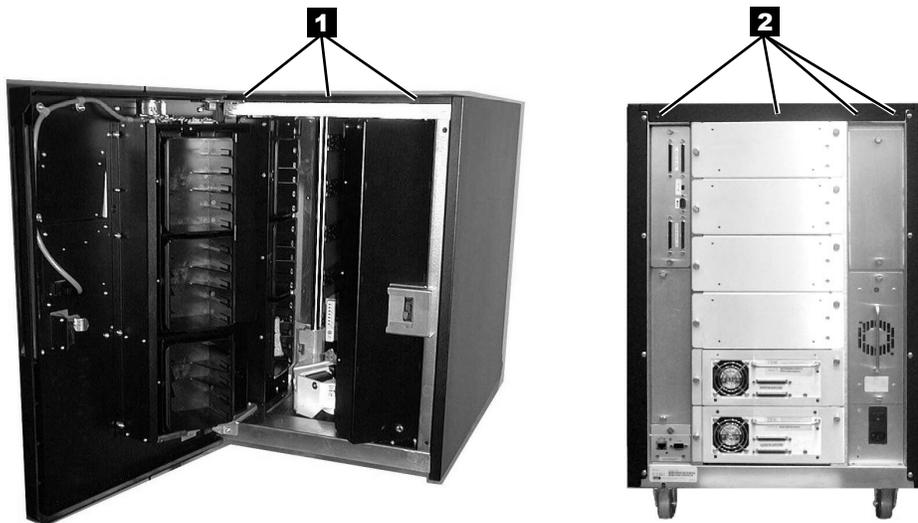
**Tools that are required:** *Phillips screwdriver, T10 Torx driver.*

### **Removing the Top Cover:**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Power Off the Tape Library by setting the Main Switch on the ac Power Module to the O position.
3. Open the front door of the Library.
4. See Figure 7-50, remove the three screws **1** in front and four screws **2** in back.
5. Remove top cover.

### **Replacing the Top Cover:**

Perform the above procedure in reverse order. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.



a67m0063

Figure 7-50. Top Cover Removal and Replacement

---

## Chapter 8. Service Procedures

Overview . . . . .	8-2
Methods of Capturing Logs . . . . .	8-2
Capturing Logs by Using HyperTerminal . . . . .	8-2
Capturing Command Logs . . . . .	8-2
Capturing Error Logs . . . . .	8-3
Capturing Boot-Up Logs. . . . .	8-3
Capturing Serial Logs. . . . .	8-4
Updating Firmware. . . . .	8-4
Updating All Firmware by Using the RMU . . . . .	8-7
Updating Library and Drive Firmware by Using the SCSI Bus . . . . .	8-8
Updating Drive Firmware by Using an FMR Tape . . . . .	8-9
Updating Library Firmware by Using the Library's Serial Port. . . . .	8-11
Reseating Cables. . . . .	8-13
Observing Library Robotics . . . . .	8-15
SCSI or Fibre Channel Wrap Test. . . . .	8-16
SAN Data Gateway Module Wrap Test . . . . .	8-16

---

## Overview

This chapter describes common service procedures for the Tape Library.

---

## Methods of Capturing Logs

There are three methods for retrieving logs:

- Look at the logs by using the Operator panel (Main Menu >Status > Logs then select either >Error Log or >Command Log). Collect as many errors and commands as possible.
- Use HyperTerminal on a PC running Windows that is equipped with an RS-232 port and a **straight through** serial cable P/N 19P1945 (a null modem cable will not work) connected to the serial port on the host interface board (serial diagnostic port board).
- Collect the Command and Error Logs by using the Remote Management Unit (RMU). Refer to the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide* for instructions about how to perform this task.

### Capturing Logs by Using HyperTerminal

To isolate issues, command logs and error logs may be collected from the Ultrium Scalable Tape Library by using the Microsoft HyperTerminal application. If the issue relates to the boot-up process, the serial log may also need to be collected. Serial log capture is performed by recording the machine's boot-up steps, which are logged into the serial port (as text) as the events occur within the library.

The method of capture logs requires a PC running Windows, and equipped with an RS-232 serial port and a straight-through serial cable (a null-modem cable will not work). Connect the serial cable from the PC COM port (any COM port will work) to the serial port located on the SCSI host interface board (serial diagnostic port board).

After a capture is complete, it may be attached to an e-mail message and forwarded to a support center at their request. When you close the HyperTerminal session, you can save it for future use.

### Capturing Command Logs

1. Start the Microsoft HyperTerminal application by selecting **Start** —> **programs** —> **accessories** —> **communications** —> **HyperTerminal**.
2. Name the new connection (for example, 3583 serial capture).
3. Configure the session for the correct Comm Port in the Connect using field.
4. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
5. Press Enter a few times until Monitor> displays.
6. If required, type help to confirm communications.
7. From the HyperTerminal transfer pulldown, select Capture Text.
8. Select the directory and set the file name for the output text file. For example, C:\Temp\3583\_command\_logs.TXT.
9. Select the Start radio button.
10. From Status menu of the 3583 operator panel, select Logs.
11. From the Logs submenu, select Command Log.
12. Press the print button to send the command log to the 3583 serial port and to your PC's HyperTerminal session.
13. Wait for the transfer to complete.
14. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

## Capturing Error Logs

1. Start the Microsoft HyperTerminal application by selecting **Start** → **programs** → **accessories** → **communications** → **HyperTerminal**.
2. Name the new connection (for example, 3583 serial capture).
3. Configure the session for the correct Comm Port in the Connect using field.
4. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
5. Press Enter a few times until Monitor> displays.
6. If required, type help to confirm communications.
7. From the HyperTerminal transfer pulldown, select Capture Text.
8. Select the directory and set the file name for the output text file. For example, C:\Temp\3583\_error\_logs.TXT.
9. Select the Start radio button.
10. From Status menu of the 3583 operator panel, select Logs.
11. From the Logs submenu, select Error Log.
12. Press the print button to send the command log to the 3583 serial port and to your PC's HyperTerminal session.
13. Wait for the transfer to complete.
14. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

## Capturing Boot-Up Logs

1. Power-off the library.
  2. Start the Microsoft HyperTerminal application by selecting **Start** → **programs** → **accessories** → **communications** → **HyperTerminal**.
  3. Name the new connection (for example, 3583 serial capture).
  4. Configure the session for the correct Comm Port in the Connect using field.
  5. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
  6. From the HyperTerminal transfer pulldown, select Capture Text.
  7. Select the directory and set the file name for the output text file. For example, C:\Temp\3583\_Boot\_up.TXT.
  8. Select the Start radio button.
- In the step that follows, stop the capture as noted in step 10 when the library indicates ONLINE and information stops scrolling across your HyperTerminal screen.
9. Power-on the library and watch for ONLINE . The following screen displays:

```
# ADIC Scalar 100 Main Boot ROM
# Copyright (C) 1999,2000 by Advanced Digital Information Corporation.
# All Rights Reserved. Non-published.
# Revision: 2.01.0001 10/12/2000
# We are a Production Main board and we are

ALIVE
```

10. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

## Capturing Serial Logs

1. Start the Microsoft HyperTerminal application by selecting **Start** → **programs** → **accessories** → **communications** → **HyperTerminal**.
2. Name the new connection (for example, 3583 serial capture).
3. Configure the session for the correct Comm Port in the Connect using field.
4. Set the protocol to 38400 8,N,1 with flow control set to none and emulation (if applicable) to ANSI.
5. Press Enter a few times until Monitor> displays.
6. If required, type help to confirm communications.
7. From the HyperTerminal transfer pulldown, select Capture Text.
8. Select the directory and set the file name for the output text file. For example, C:\Temp\3583\_Serial\_log.txt.
9. Select the Start radio button.
10. Power-off the library, wait 10 seconds, then power-on the library. The following screen displays:

```
# ADIC Scalar 100 Main Boot ROM
# Copyright (C) 1999,2000 by Advanced Digital Information Corporation.
# All Rights Reserved. Non-published.
# Revision: 2.01.0001 10/12/2000
# We are a Production Main board and we are
ALIVE
```

11. After the error or capture sequence is shown, issue the PLOG and PERR commands to include command and error log details.
12. From the HyperTerminal transfer pulldown, select Capture Text, then Stop.

---

## Updating Firmware

### Attention::

1. To ensure optimum performance from the Ultrium Scalable Tape Library, use the latest level of firmware. It is the customer's responsibility to obtain and install all firmware.
2. Before visiting the web to obtain the latest level of library firmware, you must determine which generation of library firmware that you have. The firmware for a library without the Multi-Path feature starts with 2.xx.xxxx; the firmware for a library with the Multi-Path feature starts with 5.xx.xxxx. A library without the Multi-Path feature cannot be loaded on a library that is already enabled with the Multi-Path feature.

You can update firmware for the drives, the library, or the RMU by using the following methods:

- RMU
- SCSI bus
- FMR tape (drive firmware only)
- Library serial port (library firmware only)
- SAN Data Gateway Module (optional, if the library has an optional SAN Data Gateway Module installed; see the section about updating firmware in the *IBM Storage Area Network Data Gateway Module Setup, Operator, and Service Guide*)

**Note:** Before updating firmware on the drives, the library, or the RMU, use your server to set the library and drives OFFLINE for all attached servers.

To find out whether the drives, the library, or the RMU are loaded with the most current firmware, go to the web at <http://www.ibm.com/storage/1to> and click **Technical Support**. Compare the current level of firmware against the firmware on the device.

- To view the level of firmware currently loaded on a drive, select **Main Menu (initial screen)** —> **Status** —> **Drives**. The Drives Dialog displays (see Figure 8-1).

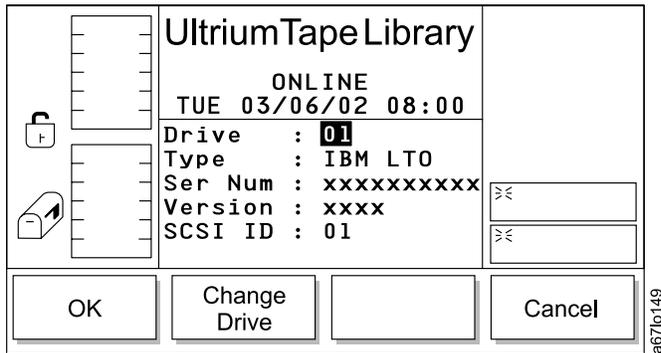


Figure 8-1. Drives Dialog

- To view the level of firmware currently loaded on the library, select **Main Menu (initial screen)** —> **More** —> **About**. The About Menu displays (see Figure 8-2).

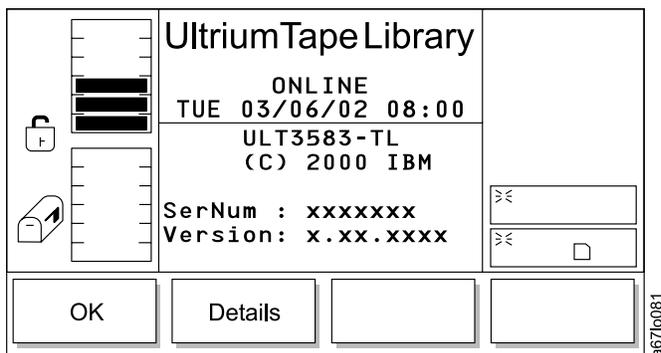


Figure 8-2. About Menu

- You can also view the level of firmware currently loaded on the library or the RMU by opening the RMU web page and selecting the Status tab. The current status of the library displays (see Figure 8-3 on page 8-6).



# Ultrium Tape Library Specialist

Name: RMU ( IBM ULT3583-TL )

Logout
Status
Configuration
Firmware
Diagnostics file
Operator panel
Logs

**IBM ULT3583-TL**



Library Status	Online
Drive Status	LTO: 6 drives
RMU User	admin from 192.1.1.100
Hostname	RMU
IP Address	192.1.1.101
MAC Address	00:30:8C:01:09:BF
Library Serial #	IBM9161327
SNMP Alerts	SNMP Off
Library Firmware	2.50.0004
RMU Firmware	130B.00003

© Copyright IBM Corporation 2003. Licensed Materials. Property of IBM. All Rights Reserved.  
 IBM is a registered trademark of IBM Corp. US Government Users Restricted Rights -  
 Use, duplication, or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.

a6710177

Figure 8-3. Status page

## Updating All Firmware by Using the RMU

To update firmware for the drives, the library, or the RMU by using the RMU, perform the following steps:

**Note:** Updating firmware on the drives by using the RMU takes approximately 50 minutes for the first drive and 15 minutes for each additional drive. If you update firmware on the first drive by using the RMU you can update firmware on additional drives by using an FMR tape (refer to the appropriate sections for creating an FMR tape and updating drive firmware in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*).

1. Obtain the new firmware image by visiting the web at <http://www.ibm.com/storage/1to> and clicking on **Technical Support**.
2. Download the new firmware file to a directory (or diskette) on your PC. Examples of filenames are:
  - C:\xxxxxx.lif for library firmware
  - C:\xxxxxx.ifl for RMU firmware
  - C:\xxxxxx.fmr for drive firmware
3. Use your web browser to access the TotalStorage Specialist, then select the Firmware tab (login, if necessary). The RMU firmware page displays (see Figure 8-4).
4. Select the item that you want to update (Library, RMU, or DriveX).
5. Enter the path and firmware filename, or browse for the file on your PC (the file that you previously downloaded from the web).
6. Select Update Firmware.

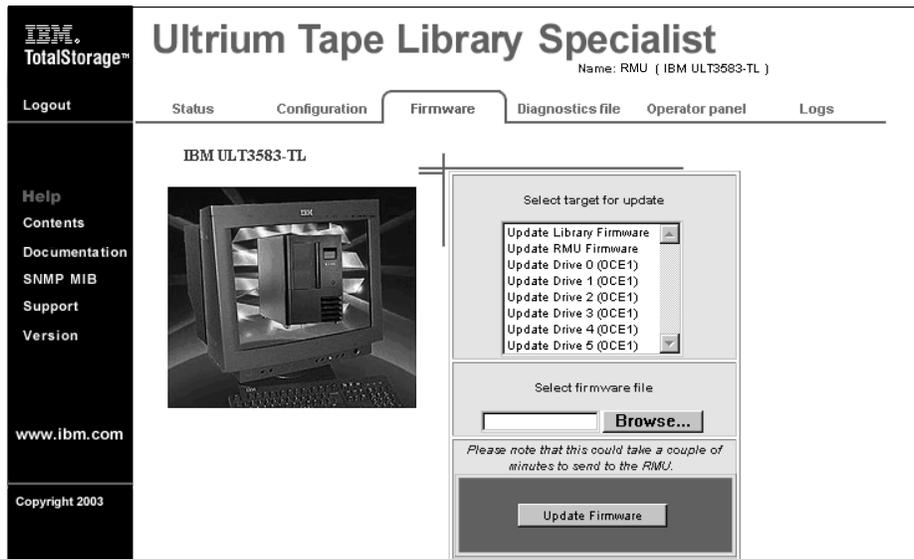


Figure 8-4. RMU firmware page

## Updating Library and Drive Firmware by Using the SCSI Bus

| **Note:** For libraries with the Multi-Path feature, the update could take as long as 2 hours when using the  
| SCSI path.

You can update library and drive firmware over your server's SCSI bus by using the device drivers and utilities that are supplied by IBM. Before updating library or drive firmware, you must:

1. Obtain the new firmware file
2. Install the proper IBM device drivers
3. Install the proper IBM utility (NTUTIL or TAPEUTIL)

To obtain the new firmware, download it from the web to the server by visiting <http://www.ibm.com/storage/1to> and selecting **Technical Support**. If the library contains a drive that is already loaded with the new firmware, you may obtain the firmware by creating a field microcode replacement (FMR) tape cartridge from that drive (see the section about creating an FMR tape in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*).

For instructions about installing and using the appropriate IBM device drivers and utilities (such as NTUTIL or TAPEUTIL), refer to the *IBM Ultrium Device Drivers Installation and User's Guide* that was shipped with the library. Or, for the latest version of the user's guide visit the web at <http://www.ibm.com/storage/1to> and select **Technical Support**. To obtain instructions about using NTUTIL or TAPEUTIL, visit the web at <http://www.ibm.com/storage/1to> and perform the following:

1. At **Need More Information?**, select **Technical Support**.
2. At **Products**, select **Appropriate Product**.
3. At **Downloads**, select **Firmware**.
4. At **Downloadable Files**, select **How to Update IBM Ultrium Tape Device Firmware (FMR)**, then select the appropriate device and utility.

**Note:** It may be necessary to disable or remove any device driver that was supplied with a commercial backup application before using the device driver supplied by IBM. Refer to the *IBM Ultrium Device Drivers Installation and User's Guide* and the documentation provided with your backup application software to determine if there are conflicts.

After you have obtained the new drive firmware file, loaded the appropriate IBM device drivers (if necessary), and installed the proper utility, refer to the instructions for updating library or drive firmware in the *IBM Ultrium Device Drivers Installation and User's Guide*.

## Updating Drive Firmware by Using an FMR Tape

You can update a drive's firmware by using a field microcode replacement (FMR) tape. If the library contains a drive that is already loaded with the new firmware, create an FMR tape from that drive (see the section about creating an FMR tape in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*).

After you have obtained an FMR tape with the new drive firmware file, update the drive's firmware by performing the following steps.



**Shortcut: Main Menu (initial screen) → Command → Drives → Firmware Update**

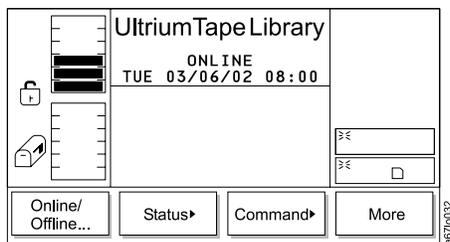


Figure 8-5. Main Menu (initial screen)

1. From the Main Menu's initial screen, press the button below the **Command** softkey. The Command Menu displays (see Figure 8-6).

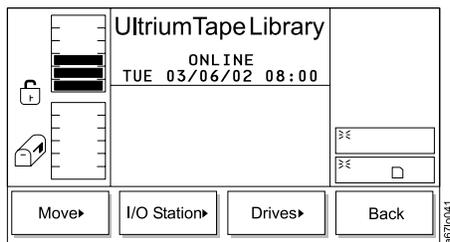


Figure 8-6. Command Menu

2. Press the button below the **Drives** softkey. The Drives Submenu displays (see Figure 8-7 on page 8-10).

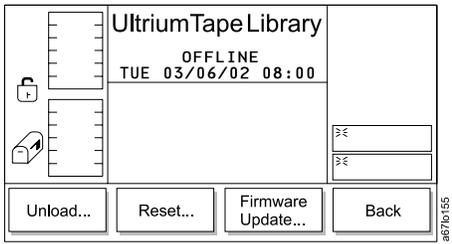


Figure 8-7. Drives Submenu

3. Press the button below the **Firmware Update** softkey. The Firmware Update Dialog displays (see Figure 8-8).

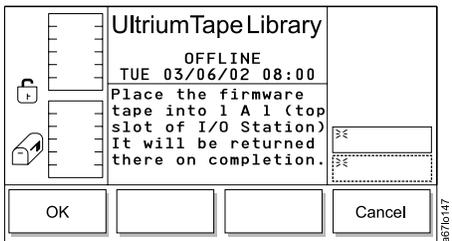


Figure 8-8. Firmware Update Dialog

4. Open the door of the I/O station.
5. Place the FMR tape cartridge into the top slot of the I/O station.
6. Close the door of the I/O station. The library executes the TEACH and INVENTORY procedures.
7. Press the button below the **OK** softkey. The Select Drive Dialog displays a list of installed tape drives and their current level of firmware (see Figure 8-9). The checkboxes in the left column contain checkmarks that indicate which drives are to be updated. The default is to update all drives (all checkboxes contain checkmarks).

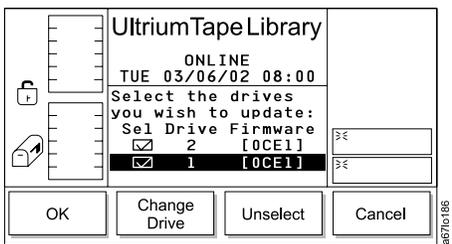


Figure 8-9. Select Drive Dialog

8. Choose which drive to update by performing the following steps:
  - a. Press the button below the **Change Drive** softkey until the number of the drive that you want is highlighted.
  - b. Decide which drives you want to update. To cancel an update, press the button below the **Unselect** softkey until the checkmark disappears from the checkbox. To reselect an update, press the button below the **Select** softkey.
 To deselect multiple drives, repeat steps 8a and 8b.

- Press the button below the **OK** softkey. The Firmware Update Starting Dialog displays (see Figure 8-10) and the update begins.

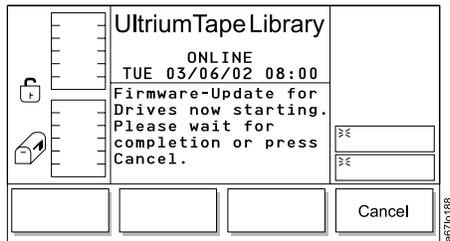


Figure 8-10. Firmware Update Starting Dialog

The picker takes the FMR tape cartridge from the I/O station and places it into the first selected drive. The drive updates the firmware and unloads the cartridge. The picker then removes the cartridge from the drive and places it back into the I/O station until the updated drive completes rebooting. If the reboot was successful, the picker then places the FMR cartridge into the next drive that you selected (if applicable). After the firmware on the last selected drive is updated, the picker removes the tape from that drive and returns it into the top slot of the I/O station. The operator panel displays the confirmation message **Drive migration finished**.

- To return to the Drives Submenu, press the button below the **OK** softkey. To return to the Main Menu press the button below the **OK** softkey, then press the button below the **Back** softkey until the Main Menu displays.

## Updating Library Firmware by Using the Library's Serial Port

Go to the web at <http://www.ibm.com/storage/lto> (see the **Technical Support** section), download `appcode.exe` to a temporary directory on your PC, and execute it. The downloaded file, `appcode.exe`, creates two files: the latest library firmware (for example, `v2.62.01.lif`) and an executable file (`download.exe`).

- Power-off the library.
- Open a command prompt window and change the current directory to the temporary directory where `appcode.exe` was extracted.
- Connect the serial cable P/N 19P1945 between the PC and the serial port located on the SCSI host interface board.
- From the command prompt, type the following command and press Enter:

```
download -cx -fxxxxx.lif
```

Where:

<b>download</b>	Firmware Download Command
<b>-c</b>	Required characters that precede the Communication Port Number
<b>-x</b>	Communication Port Number
<b>-f</b>	Required characters that precede the file name
<b>xxxxxx.lif</b>	File name (v2.00.00.lif for libraries without the Multi-Path feature; v5.00.00.lif for libraries with the Multi-Path feature)

The message Waiting for ALIVE message displays

**Note:** For help enter the command:

```
download -h
```

- After the message Waiting for ALIVE message displays, power-on the library.

After downloading firmware, verify the installation by using the inquiry command available on the utilities menu of your server, or from the library operator panel select **Main Menu (initial screen) —> More —> About**.

**Note:** Some backup application software packages will not reflect the firmware change until the registry is refreshed by rebooting the server.

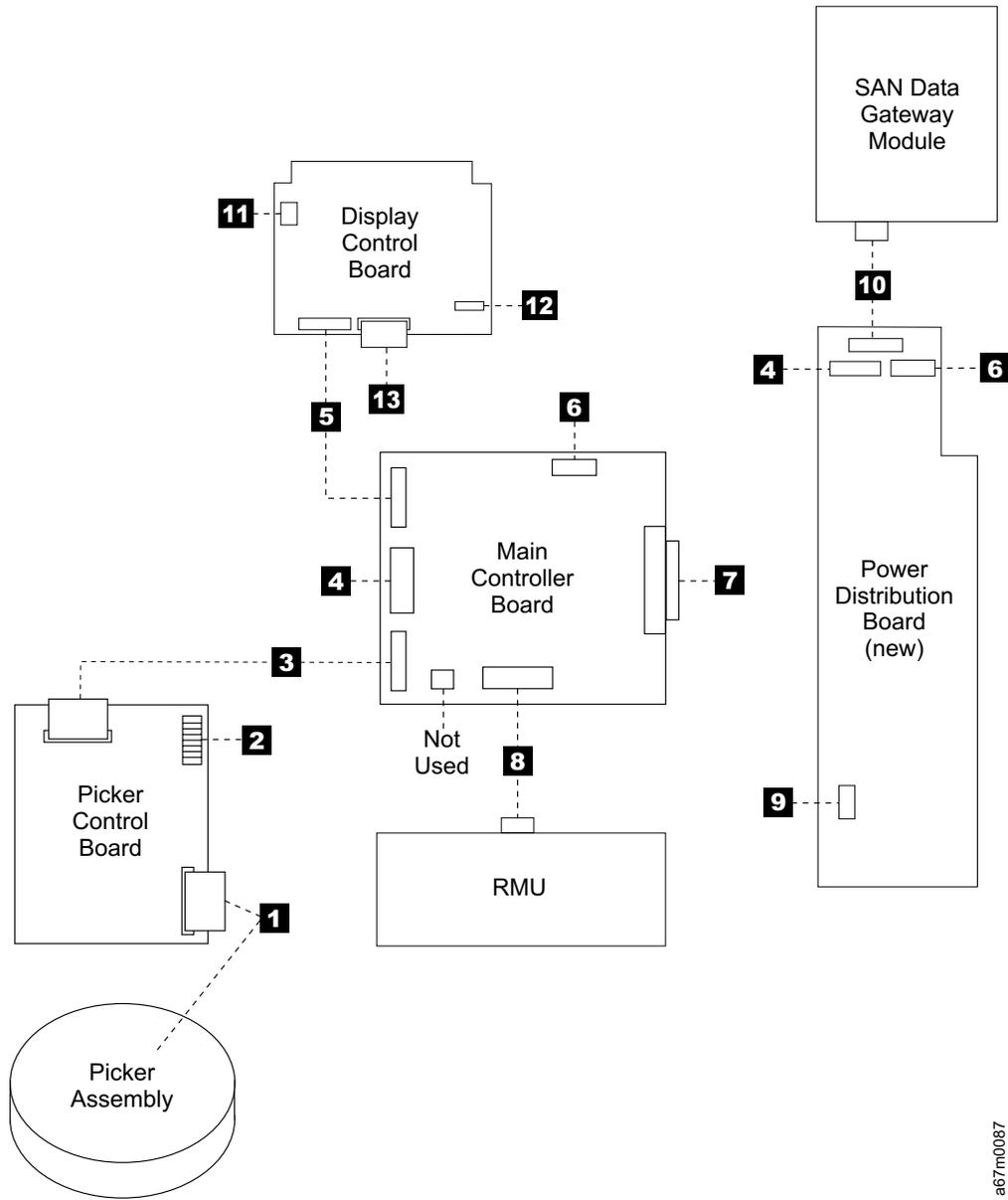
## Reseating Cables

To reseat cables in the Tape Library perform the following steps:

1. Locate each cable by finding the key number in Table 8-1 and the corresponding key number in Figure 8-11 on page 8-14.
2. If access to the cable connection requires removal of covers or cartridge columns see the appropriate page in the Check, Adjust, Remove and Replace chapter.
3. Do not remove the cable connection. Press firmly on each connector to ensure the cable connector is firmly seated on the board or other component.

Table 8-1. Library Cables

Key	From	Remove, Replace Procedure	To	Remove, Replace Procedure
<b>1</b>	Picker Control Board	7-14	Picker Assembly	7-5
<b>2</b>	Picker Control Board	7-14	Rotary Axis Motor	7-12
<b>3</b>	Picker Control Board	7-14	Main Controller Board	7-3
<b>4</b>	Main Controller Board	7-3	Power Distribution Board (signal)	7-45
<b>5</b>	Main Controller Board	7-25	Display Control Board	7-43
<b>6</b>	Main Controller Board	7-3	Power Distribution Board (distribution)	7-45
<b>7</b>	Main Controller Board	7-3	Host Interface Board	7-41
<b>8</b>	Main Controller Board	7-3	RMU	7-35
<b>9</b>	Power Distribution Board	7-45	Y-Axis Motor Assembly	7-27
<b>10</b>	Power Distribution Board	7-45	SAN Data Gateway Module	7-37
<b>11</b>	Display Control Power Cable	7-43	Display Back Light	7-43
<b>12</b>	Display Control Board	7-43	Door Interlock Switch	7-54
<b>13</b>	Display Control Board	7-43	LCD Assembly	7-43



ae7m0087

Figure 8-11. Cable Diagram

---

## Observing Library Robotics

Perform the following steps to observe the robotics within the library.

**Tools that are required:** *Phillips screwdriver, T10 Torx driver.*

**Note:** The picker assembly contains a charge coupled diode (CCD), it is not a laser device and presents no laser danger.

### CAUTION:

**When you are observing the Robotics action do not reach into the Robotics area while power switch is in the I position.**

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Open the front door of the Library.
3. Remove the three screws **1** in front and four screws **2** in back, see Figure 8-12.
4. Remove top cover.
5. Close the front door securely.
6. Retry the operation that directed you to this procedure and view the library robotics through the holes in the top of the library.

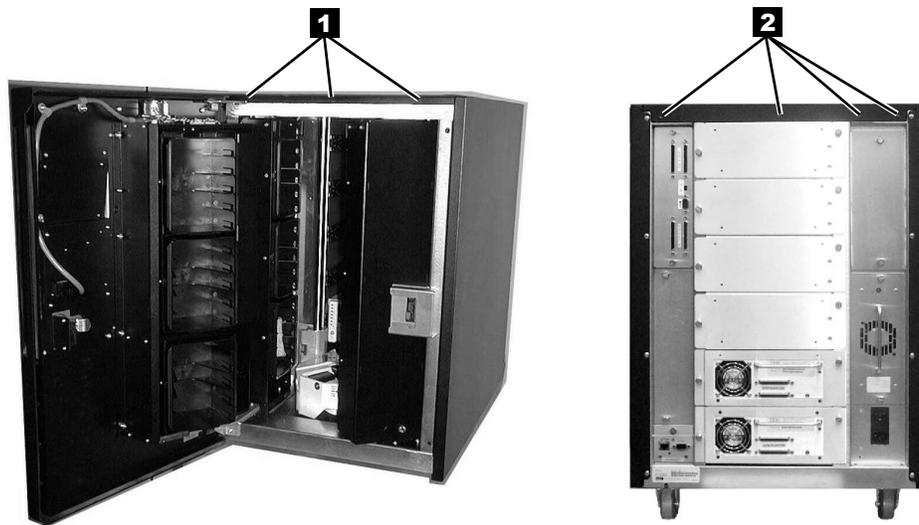


Figure 8-12. Top Cover Removal

a67m0063

---

## SCSI or Fibre Channel Wrap Test

| You are here because of a suspected SCSI or Fibre Channel connector or cable problem.  
| See Table 14-1 on page 14-1 for part number of SCSI Wrap Tool and SCSI Terminator.

**Tools that are Required:** *SCSI or Fibre Channel Wrap Tool, SCSI Terminator.*

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. From the main menu select **Online/Offline** → **OK**.
- | 3. Remove the SCSI or Fibre Channel Cables from the drive being tested.
- | 4. Install correct SCSI Wrap Tool (HVD or LVD) to lower connector or install Fibre Channel Wrap Tool to  
| the connector.
5. For SCSI, install the correct (HVD or LVD) SCSI Terminator to the upper connector. Alternative is to  
connect SCSI cable which has terminator at the end of daisy chain to the upper connector.
- | 6. Start the SCSI or Fibre Channel Wrap Test by selecting **More** → **Service** → **Drives** → **Change**  
| **Drive/OK** → **Diags** → **SCSI Wrap Test/Fibre Wrap Test** → **OK**.
  
- | **Note:** At **Change Drive** if you need to change drive address choose this key. If operator panel  
| shows correct drive address choose **OK**.
7. If the wrap test failed go to “Removing the Tape Drive Sled” on page 7-3.
- | 8. If the wrap test is successful suspect the SCSI or Fibre Channel Cables.
9. If cables do not fix the problem call your next level of support.
10. When problem is fixed reconnect all cables.
11. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

---

## SAN Data Gateway Module Wrap Test

| To perform wrap tests for the SAN Data Gateway Module, refer to the instructions in the *IBM Storage Area*  
| *Network Data Gateway Module Setup, Operator, and Service Guide*.

---

## Chapter 9. Messages

Obtaining Tape Drive or Library Error Information at the Host . . . . .	9-2
Obtaining Error Information From an RS/6000. . . . .	9-2
Obtaining Service Information Message from an AS/400 . . . . .	9-8
AS/400 System with RISC Processor . . . . .	9-8
Obtaining Error Information From a Sun System . . . . .	9-9
Obtaining Error Information From an HP-UX System . . . . .	9-9

---

## Obtaining Tape Drive or Library Error Information at the Host

IBM device drivers for the RS/6000 and AS/400 systems log error information when an error occurs on a tape drive or library.

The error information includes the following:

1. Device VPD
2. SCSI command parameters
3. SCSI sense data (if available)

---

## Obtaining Error Information From an RS/6000

The AIX Tape and Media Changer Device Driver for the RS/6000 provides logging to the system error log for a variety of errors. You can view the error log by following this procedure.

1. At the AIX command line, type **errpt lpg** to display a summary report, or type **errpt -a lpg** to display a detailed report. Press **[Enter]**.

**Note:** In most cases you will use the summary report to find the date and time of any errors related to library devices, then use the detail report to obtain the sense data needed to identify the cause of the error.

2. Press **[Enter]** to scroll through the error log.
3. Type **q** and press **[Enter]**, to quit the error log at any time.

To correct a problem you noticed in the **errpt** report, determine the type of error by using the examples that follow:

- For library errors [Resource Name = **smcn** (for example, smc0) and Resource Type = 3583]), refer to Figure 9-1 on page 9-3 and locate the SCSI sense data.
- For drive errors [Resource Name = **rmtn** (for example, rmt0) and Resource Type = LTO], refer to Figure 9-2 on page 9-4 and locate the SCSI sense data.
- For SCSI bus errors (not SCSI adapter errors), refer to Figure 9-3 on page 9-5 and Figure 9-4 on page 9-6 to determine which host adapter, SCSI bus, and device or devices are affected. After you have determined which device or devices are affected, go to “Fixing SCSI Bus Errors” on page A-9 to resolve the problem.
- For Fibre Channel errors (not Fibre Channel adapter errors), determine which host adapter and device are affected, and go to “Fixing Fibre Channel Errors” on page A-11.
- For SCSI adapter errors (not SCSI bus errors), use the maintenance package for the host.

**Note:** See Chapter 10, “Sense”, on page 10-1 for further details on sense data.

## Library Error Log Example

```

LABEL:          TAPE_ERR2
IDENTIFIER:     476B351D

Date/Time:     Wed Oct 11 11:42:17
Sequence Number: 25265
Machine ID:    000D090D4C00
Node ID:      tsm
Error Class:   H
Error Type:    PERM
Resource Name: smc0
Resource Class: tape
Resource Type: 3583
Location:     40-60-00-6,0
VPD:
    Manufacturer.....IBM
    Machine Type and Model.....ULT3583-TL
    Serial Number.....IBM7810698
    Device Specific . (FW) .....2.80 (Firmware Level)

Description
TAPE DRIVE FAILURE

Probable Causes
TAPE DRIVE

Failure Causes
TAPE
TAPE DRIVE
    Recommended Actions
    PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0C00 0000 A500 0001 1009 0101 0000 0000 0000 0000 7000 0400 0000 0046 0000 0000
4400 8100 0000 0000 0000 0000 0000 0200 4801 E300 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
    
```

Figure 9-1. AIX ERRPT Library Error Log Example

Table 9-1. AIX ERRPT Library Sense Data

Hex	Description
A5	SCSI Command
0001, 1009, 0101	Command Parameters
70	Byte 0 of Library Sense Data
04	Sense Key
4400	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier)
81	Library SAC (Service Action Code)

## Drive Error Log Example

```

LABEL:          TAPE_ERR1
IDENTIFIER:     4865FA9B

Date/Time:     Wed Oct 10 11:39:43
Sequence Number: 25264
Machine ID:    000D090D4C00
Node ID:      tsm
Class:        H
Type:         PERM
Resource Name: rmt2
Resource Class: tape
Resource Type: LTO
Location:     40-60-00-2,0
VPD:
  Manufacturer.....IBM
  Machine Type and Model.....ULT3580-TD1
  Serial Number.....1300015078
  Device Specific.(FW).....25D4 (Firmware Level)

Description
TAPE OPERATION ERROR

Probable Causes
TAPE

User Causes
MEDIA DEFECTIVE
DIRTY READ/WRITE HEAD

Recommended Actions
FOR REMOVABLE MEDIA, CHANGE MEDIA AND RETRY
PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0602 0000 0100 0000 0200 0000 0000 0000 0000 0000 0000 7000 0300 0000 001C 0000 0000
5200 0700 20B0 0000 0000 0000 0000 0000 0000 0000 0000 058A 0212 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000

```

Figure 9-2. AIX ERRPT Drive Error Log Example

Table 9-2. AIX ERRPT Drive Sense Data

Hex	Description
01	SCSI Command
0000, 0200, 0000	Command Parameters
70	Byte 0 of Tape Drive Sense Data
03	Sense key (Hardware error in this example)
5200	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier)
20B0	FSC (Fault Symptom Code)
058A	Relative LPOS
02	SCSI ID

## SCSI Bus Error Example

```
LABEL:          SCSI_ERR10
IDENTIFIER:     0BA49C99

Date/Time:     Wed Oct 17 09:55:32
Sequence Number: 16140
Machine Id:    00003ABF4C00
Node Id:      ofgtsm
Class:        H
Type:         TEMP
Resource Name: scsi3
Resource Class: adapter
Resource Type: sym896
Location:     40-59
VPD:
    Product Specific.( ).....DUAL CHANNEL PCI TO ULTRA2 SCSI
                          ADAPTER
    Part Number.....03N3606
    EC Level.....F71335
    Manufacture ID.....A16592
    Serial Number.....0749

Description
SCSI BUS ERROR

Probable Causes
CABLE
CABLE TERMINATOR
DEVICE
ADAPTER

Failure Causes
CABLE LOOSE OR DEFECTIVE
DEVICE
ADAPTER

    Recommended Actions
    PERFORM PROBLEM DETERMINATION PROCEDURES
    CHECK CABLE AND ITS CONNECTIONS

Detail Data
SENSE DATA
0001 0017 0000 0000 0000 0091 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 4304 0000 0000 0000 0000 2000 0003 0203 6760 9808 0000 F7FB E1B8
0000 0015 000B 0210 0678 C800 0000 8200 8277 1B20 00A2 ED00 0000 0002 FFFF FFFF
00FF 0000 111F F000 F3DF F110
```

Figure 9-3. Example of Error Suggesting SCSI Bus Problem, Which Takes Down Entire Bus

## SCSI Bus Error Example

```
LABEL:          TAPE_ERR4
IDENTIFIER:     5537AC5F

Date/Time:      Wed Oct 17 09:00:41
Sequence Number: 16101
Machine Id:     00003ABF4C00
Node Id:        ofgtsm
Class:          H
Type:           PERM
Resource Name:  smc0
Resource Class: tape
Resource Type:  3583
Location:      40-58-00-0,1
VPD:
  Manufacturer.....IBM
  Machine Type and Model.....ULT3583-TL
  Serial Number.....IBM7810698
  Device Specific.(FW).....2.80

Description
TAPE DRIVE FAILURE

Probable Causes
ADAPTER
TAPE DRIVE

Failure Causes
ADAPTER
TAPE DRIVE

Recommended Actions
PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0600 0000 1200 0000 FF00 0000 0000 0000 0200 0800 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
```

Figure 9-4. SCSI Problem Points to Library Control Path as Possible Cause

## Summary Report

1	2	3	4	5	6	7
FFE2F73A	1012150900	U	H	rmt5	UNDETERMINED ERROR	
<b>0BA49C99</b>	<b>1012150800</b>	<b>T</b>	<b>H</b>	<b>scsi8</b>	<b>SCSI BUS ERROR</b>	
C60BB505	1012141500	P	S		SOFTWARE PROGRAM ABNORM TERMINATED	
C42F11D4	1012105200	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1012105000	U	S	VSC:DE	SOFTWARE ERROR	
FFFA352B	1012104900	U	S	MS:CS	SOFTWARE ERROR	
FFFA352B	1012104900	U	S	MS:CS	SOFTWARE ERROR	
5537AC5F	1012091700	P	H	rmt9	TAPE DRIVE FAILURE	
5537AC5F	1012091700	P	H	rmt9	TAPE DRIVE FAILURE	
5537AC5F	1012091700	P	H	rmt9	TAPE DRIVE FAILURE	
5537AC5F	1012091600	P	H	rmt8	TAPE DRIVE FAILURE	
5537AC5F	1012091600	P	H	rmt8	TAPE DRIVE FAILURE	
5537AC5F	1012091600	P	H	rmt8	TAPE DRIVE FAILURE	
C60BB505	1012082000	P	S		SOFTWARE PROGRAM ABNORM TERMINATED	
C42F11D4	1011183600	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011183300	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011181800	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011174700	U	S	VSC:DE	SOFTWARE ERROR	
FFFA352B	1011172900	U	S	MS:CS	SOFTWARE ERROR	
FFFA352B	1011172900	U	S	MS:CS	SOFTWARE ERROR	
C42F11D4	1011155300	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011153900	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011153800	U	S	VSC:DE	SOFTWARE ERROR	
C42F11D4	1011150900	U	S	VSC:DE	SOFTWARE ERROR	

Figure 9-5. AIX ERRPT Commands Error Log Example

NUMBER	DESCRIPTION
1	Error ID
2	Timestamp
3	Error Type
4	Error Class
5	Resource Name
6	Error Description
7	How SCSI Bus Error will Display in Log

ERROR CLASS	DESCRIPTION
H	Hardware
S	Software
O	Informational

ERROR TYPE	DESCRIPTION
PEND	The availability loss of a device or component is imminent.
PERF	The performance of a device or component has degraded to an unacceptable level.
PERM	A hardware or software condition that could not be recovered from.
TEMP	A hardware condition that was recovered from after several unsuccessful attempts.
UNKN	The severity of the condition could not be determined.

A69M0170

---

## Obtaining Service Information Message from an AS/400

To gain access to the AS/400 problem logs and error logs, sign on at any available workstation using the QSRV logon and its security password (QSRV). After sign on, the proper access authorizations will be granted and the AS/400 MAIN MENU displays.

### AS/400 System with RISC Processor

1. Type STRSST (Start System Service Tools) command on the command entry line on the AS/400 Main Menu, and press **[Enter]**.
2. On the "System Service Tool (SST)" screen, select **Start a service tool**, and press **[Enter]**.
3. On the "Start a Service Tool" screen, select **Product activity log**, and press **[Enter]**.
4. On the "Product activity log" screen, select **Analyze log**, and press **[Enter]**.
5. On the "Select Subsystem Data" screen, select **Magnetic media**, enter the From and To time period for searching the error log, and press **[Enter]**.
6. On the "Select Analysis Report Options" screen, select the following, and press **[Enter]**.
  - a. Report type. . . . . 1
  - b. Optional entries to include
    - 1) Informational . . . . . YES
    - 2) Statistic . . . . . NO
  - c. Reference code selection
    - 1) Option . . . . . 1
    - 2) Reference codes. . . . . \*ALL
  - d. Device selection
    - 1) Option . . . . . 1
    - 2) Device type or resource names . . \*ALL
7. On the "Log Analysis Report" screen, enter a **5** on an error line that has a resource type of 3583 (library) or 3580 (drive), and press **[Enter]**.
8. On the "Display Detail Report for Resource" screen, press:
  - F4=Additional Information.  
Pressing F4 will display the machine type and serial number of the device. It also will display SCSI sense data, if available.
  - F6=Hexadecimal report.  
Pressing F6 will display the device hexadecimal data (for support use).
  - F9=Address Information.  
Pressing F9 will display the SCSI address information.

---

## Obtaining Error Information From a Sun System

The Sun system does not provide error logs for analysis; therefore, you must use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination. When you have located the error information, go to Chapter 4, “Start”, on page 4-1.

The two following service aid programs are provided with the IBM SCSI Tape Device Driver for SunOS:

- Tape service program

A tape service program called **tapesrv.c** is provided and contains the following service aids:

- Query device serial number
- Format tape cartridge
- Force device error dump
- Save device error dump
- Download device code

The tape service program is invoked by using the **/opt/stdutil/tapesrv** command.

**Note:** You must have root authority to run the tape service program.

The program is menu driven. Use discretion when running this program because it opens the device in diagnostic mode.

- Sample program

A sample program called **tapetest.c** is provided, which gives a demonstration of the device driver interface usage.

The sample program is invoked by using the **/opt/stdutil/tapetest** command. The program is useful for verifying that the device driver and the device are functional. The program is menu driven.

---

## Obtaining Error Information From an HP-UX System

The HP-UX system does not provide error logs for analysis; therefore, you must use error logs from the application (such as Tivoli Storage Manager), or the Device Error Log for problem determination. When you have located the error information, go to Chapter 4, “Start”, on page 4-1.



| **Chapter 10. Sense**

| Library Sense Data . . . . . 10-2  
| Drive Sense Data. . . . . 10-6

## Library Sense Data

Table 10-1. Sense Information Format

Bytes	Bits	7	6	5	4	3	2	1	0
0	Valid	70 = Existing Error 71 = Deferred Error							
1	Reserved								
2	Reserved				Sense Key (see Table 10-2)				
3 : 6	MSB	Information Bytes							LSB
7	Additional Sense Length (n-7) If the sense key is 4, the additional sense length is 70. For all other errors, the additional sense length is 10.								
8 : 11	MSB	Command Specific Bytes							LSB
12	Additional Sense Code (ASC) (see Table 10-3 on page 10-3)								
13	Additional Sense Qualifier (ASCQ) (see Table 10-3 on page 10-3)								
14	Service Action Code								
15	SKSV	C/D	Reserved		BPV	Bit Pointer			
16 : 17	MSB	Field Pointer							LSB

Table 10-2. Sense Keys

Sense Key	Description
0h	No Sense. No specific sense key information to report.
2h	Not Ready. The library is not ready to perform motion commands.
4h	Hardware Error. A hardware error was detected and operator intervention may be required.
5h	Illegal Request. The CDB or supplied parameter data contains an unsupported or illegal parameter.
6h	Unit Attention. The library operating status changed. The cartridge inventory may be invalid.
Bh	Command Aborted. The library aborted a command. The initiator may try the command again.

Table 10-3. Additional Sense Codes and Qualifiers (Bytes 12 and 13)

Sense Key	Condition	ASC	ASCQ	Description
00h	No Sense	00h	00h	No Additional Sense Code.
02h	Not Ready	04h	00h	The library is not ready due to an unknown cause.
			01h	The library is becoming ready.
			03h	The library is not ready and a manual intervention is required.
			83h	A door is open and a magazine is missing.
			8Dh	Offline
			90h	Library needs teaching.
04h	Hardware Error	15h	01h	A mechanical positioning error occurred.
			80h	The accessor dropped a cartridge.
			81h	The accessor could not pick a cartridge.
			83h	The accessor could not put a cartridge.
		3Bh	0Dh	The destination element is full.
			0Eh	The source element is empty.
		3Fh	80h	Could not erase EEPROM.
			84h	Could not program EEPROM.
		40h	01h	Cartridge in gripper at power on.
			80h	Component (number - 80) failure.
			91h	Gripper error.
			A0h	The accessor could not move on the vertical (Y) axis.
			A1h	The accessor could not home the vertical (Y) axis.
			B0h	The accessor could not move on the horizontal (X) axis.
			B1h	Could not home the horizontal (X) axis.
			C0h	The accessor could not move.
		E0h	The accessor lost power.	
		44h	00h	Firmware detected an internal logic failure.
		53h	00h	A drive did not load or unload a tape.
			82h	Cannot lock the I/E station.
			83h	Cannot unlock the I/E station.
		83h	00h	Label too short, too long or duplicate.
			01h	Cannot read a barcode label due to a reader problem.
		84h	00	Firmware error.

Table 10-3. Additional Sense Codes and Qualifiers (Bytes 12 and 13) (continued)

05h	Illegal Request	1Ah	00h	Parameter List length error.	
		20h	00h	Illegal opcode in CDB.	
		21h	01h	Invalid element address in CDB.	
		24h	00h	Invalid field in CDB.	
			80h	Attempt to write a read-only buffer.	
		25h	00h	Illegal LUN.	
		26h	00h	Invalid field in Parameter List.	
			02h	Invalid parameter in Parameter List.	
			80h	Parameter data checksum failure.	
		30h	00h	Incompatible media installed.	
		3Bh	0Dh	Destination element full for MOVE MEDIUM command.	
			0Eh	Source element empty for MOVE MEDIUM command.	
			85h	Destination of MOVE MEDIUM command cannot be accessor.	
			86h	Source of MOVE MEDIUM command cannot be accessor.	
			87h	Cartridge stuck in tape drive.	
			90h	Source cartridge loaded into tape drive and not accessible.	
			A0h	Media type does not match destination media type.	
		3Dh	00h	Invalid bit in "Identify" message.	
		3Eh	00h	Incorrect LUN configuration.	
		44h	00h	Firmware detected an internal logic failure.	
		53h	01h	A drive did not unload a tape.	
			80h	Cartridge rejected in the Mailbox because it was not properly loaded.	
				81h	Mailbox is open.
			83h	02h	Cartridge magazine not installed.
				03h	Cell status and barcode questionable.
		04h		Drive not installed.	
		06h	Unit Attention	28h	00h
01h	Mailbox opened.				
29h	00h			Power on, SCSI bus reset, or Bus device reset occurred.	
	80h			Reset for permanent error occurred.	
	81h			Reset into degraded mode of operation.	
2Ah	01h			Mode parameters have been changed.	
3Fh	01h			New firmware loaded.	

Table 10-3. Additional Sense Codes and Qualifiers (Bytes 12 and 13) (continued)

0Bh	Abort	43h	00h	Message received at inappropriate time.
		45h	00h	Host rejected "Identify" message sent for reselection.
		47h	00h	Message system was disabled during parity error detection on SCSI bus, message system enabled but initiator rejected "Restore Data Pointer," or all parity error retries exhausted.
		48h	00h	Received an "Initiator Detected Error" or initiator rejected "Restore Data Pointer" in response to an "Initiator Detected Error."
		4Eh	00h	Disconnect during command processing.

## Drive Sense Data

Table 10-4. LTO Tape Drive Sense Data

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
0	Address valid  When set to 1, the info byte field contains a valid logical block address.	Error Code						
1	Segment Number (0)							
2	Filemark	EOM (end of medium)	ILI (Incorrect length indicator)	Reserved	Sense Key	Description		
					0 ---	No sense		
					1 ---	Recovered error		
					2 ---	Not ready		
					3 ---	Media error		
					4 ---	Hardware error		
					5 ---	Illegal request		
					6 ---	Unit attention		
					7 ---	Data protect		
					8 ---	Blank Check		
					9 ---	Reserved		
					A ---	Reserved		
					B ---	Aborted command		
					C ---	Reserved		
					D ---	Volume overflow		
					E ---	Reserved		
					F ---	Reserved		
3	Information byte (most significant byte)							
4	Information byte							
5	Information byte							
6	Information byte (least significant byte)							
7	Additional Sense Length							
8–11	Command specific information							

Table 10-4. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12–13	Additional Sense Code (ASC) Additional Sense Code Qualifier (ASCQ)							
	<b>Byte 12</b>	<b>Byte 13</b>						
	<b>ASC</b>	<b>ASCQ</b>						
00	00	00 - No additional sense — The flags in the sense data indicate the reason for the command failure						
00	01	01 - Filemark detected — A Read or Space command terminated early due to an FM. The FM flag is set.						
00	02	02 - EOM — A Write or Write File Marks command failed because the physical end of tape was encountered, or a Read or Space command encountered EOM. The EOM flag is set						
00	04	04 - BOM — A space command ended at Beginning of Tape. The EOM bit is also set						
00	05	05 - EOD — Read or Space command terminated early because End of Data was encountered						
04	00	00 - Cause not reportable — A cartridge is present in the drive, but it is in the process of being unloaded						
04	01	01 - Becoming Ready — A media access command was received during a front panel initiated load or an immediate reported load command						
04	02	02 - Initializing Command Required — A cartridge is present in the drive, but is not logically loaded. A Load command is required						
04	03	03 - Manual Intervention Required — A cartridge is present in the drive but could not be loaded or unloaded without manual intervention						
0C	00	00 - Write Error — A Write operation has failed. This is probably due to bad media, but may be hardware related						
11	00	00 - Unrecovered Read Error — A Read operation failed. This is probably due to bad media, but may be hardware related						
14	00	00 - Recorded Entity Not Found — A space or Locate command failed because a format violation prevented the target from being found.						
14	03	03 - End Of Data not found — A Read type operation failed because a format violation related to a missing EOD data set						
1A	00	00 - Parameter list length error — The amount of parameter data sent is incorrect						
20	00	00 - Invalid Command Operation Code — The Operation Code in the command was not a valid Operation Code						
24	00	00 - Invalid field in CDB — An invalid field has been detected in a Command Descriptor Block						
25	00	00 - LUN not supported — The command was addressed to a non-existent logical unit number						
26	00	00 - Invalid Field in Parameter List — An invalid field has been detected in the data sent during the data phase						
27	00	00 - Write Protect — A Write type operation has been requested on a cartridge which has been write protected						
28	00	00 - Not Ready to Ready Transition — A cartridge has been loaded successfully into the drive and is now ready to be accessed						
29	00	00 - Reset — The drive has powered on, received a reset signal or a bus device reset signal since the initiator last accessed it						
2A	01	01 - Mode Parameters Changed — The Mode parameters for the drive have been changed by an initiator other than the one issuing the command						
30	00	00 - Incompatible Media Installed — A write type operation could not be executed because it is not supported on the cartridge type that is loaded.						
30	01	01 - Unknown Format — An operation could not be carried out because the cartridge in the drive is of a format not supported by the drive						

(Continued on next page)

Table 10-4. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12-13	Additional Sense Code (ASC) — Additional Sense Code Qualifier (ASCQ) (Continued)							
	<b>Byte 12</b>	<b>Byte 13</b>						
	<b>ASC</b>	<b>ASCQ</b>						
30	02	Incompatible Format — An operation could not be completed because the Logical Format is not correct						
30	03	Cleaning Cartridge Installed — An operation could not be carried out because the cartridge in the drive is a cleaning cartridge						
30	07	Cleaning Failure — A cleaning operation was attempted, but could not be completed for some reason						
31	00	Media format corrupted — Data could not be read because the format on tape is not valid, but is a known format. A failure occurred attempting to write the FID						
37	00	Rounded parameter — A Mode Select command parameter has been rounded because the drive can not store it with the accuracy of the command.						
3A	00	Media Not Present — A media access command has been received when there is no cartridge loaded						
3B	00	Sequential Positioning Error — A command has failed and left the logical position at an unexpected location						
3D	00	Invalid bits in identify Message — An illegal Identify Message has been received at the drive at the start of a command						
3E	00	Logical Unit has not Self-Configured — The drive has just powered on and has not completed its self test sequence and can not process commands						
3F	01	Code Download — The firmware in the drive has just been changed by a Write Buffer command						
40	xx	Diagnostic failure — A diagnostic test has failed. The xx (ASCQ) is a vendor specific code indicating the failing component.						
43	00	Message Error — A message could not be sent or received due to excessive transmission errors						
44	00	Internal target failure — A hardware failure has been detected in the drive that has caused the command to fail						
45	00	Select/Reset Failure — An attempt to reselect an initiator in order to complete the command has failed						
4B	00	Data Phase Error — A command could not be completed because too many parity errors occurred during the Data phase						
4E	00	Overlapped Commands — An initiator selected the drive even though it already had a command outstanding in the drive						
50	00	Write Append Error — A write type command failed because the point at which to append data was unreadable						
51	00	Erase failure — An Erase command failed to erase the required area on the media						
52	00	Cartridge fault — A command could not be completed due to a fault in the tape cartridge						
53	00	Media Load/Eject Failed — (Sense Key 03) An attempt to load or eject the cartridge failed due to a problem with the cartridge.						
53	00	Media Load/Eject Failed — (Sense Key 04) An attempt to load or eject the cartridge failed due to a problem with the drive						
53	02	Media Removal Prevented — An Unload command has failed to eject the cartridge because media removal has been prevented						
5D	00	Failure Prediction Threshold — Failure Prediction thresholds have been exceeded indicating that a failure may occur soon						
5D	FF	Failure Prediction False — A Mode Select command has been used to test for Failure Prediction system.						
82	82	Drive requires cleaning — The drive has detected that a cleaning operation is required to maintain good operation						
82	83	Bad Code Detected — The data transferred to the drive during a firmware upgrade is corrupt or incompatible with drive hardware						

Table 10-4. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
14	FRU code							
15	SKSV	C/D	Reserved		BPV	Bit pointer		
					When set to 1, the bit pointer is valid.			
16–17	SKSV = 0: First Error Fault Symptom Code (FSC). SKSV = 1: Field Pointer							
18–19	First Error Flag Data							
20	Reserved (0)							
21					CLN	Reserved	Reserved	VolValid
22–28	Volume Label							
29	Current Wrap							
30–33	Relative LPOS							
34	SCSI Address							
35	Reserved				Reserved			

The descriptions below serve only as an overview of sense reporting in the tape drive. This tape drive conforms to all sense field reporting as specified in the SCSI standards.

**Notes:**

1. The Error Code field (Byte 0) is set to 70h to indicate a current error, that is one associated with the most recently received command. It is set to 71h to indicate a deferred error which is not associated with the current command.
2. The segment number (Byte 1) is zero since the Copy, Compare, and Copy and Verify commands are not supported.
3. The File Mark flag (Byte 2, bit 7) is set if a Space, Read, or Verify command did not complete because a file mark was read.
4. The End of Media (EOM) flag (Byte 2, bit 6) is set if a Write or Write File Marks command completed in the early warning area. Spacing into BOM also causes this flag to be set. It is also set on an attempt to read or space past EOD, or if an attempt is made to space into Beginning of Media.
5. The Illegal Length Indicator (ILI) flag (Byte 2, bit 5) is set if a Read or Verify ended because a block was read from tape that did not have the block length requested in the command.
6. The Information Bytes (Bytes 3–5) are only valid if the Valid flag is set. This occurs only for current errors and not for deferred errors.
7. The Field Replaceable Unit field (Byte 14) is set to either zero or to a non-zero, vendor-specific code indicating which part of the drive is suspected of causing the failure.
8. The Clean (CLN) flag (Byte 21, bit 3) is set if the drive needs cleaning and clear otherwise.
9. The Volume Label Fields Valid (VolValid) bit (Byte 21, bit 0) is set if the Volume Label being reported is valid.
10. The Volume Label field (Bytes 22–28) reports the volume label if a cartridge is loaded in the drive and Volume Label Fields Valid is set.

- | 11. The Current Wrap field (Byte 29) reports the physical wrap of the tape. The least significant bit reflects the current physical direction. A 0 means that the current direction is away from the physical beginning of the tape. A 1 means that the current direction is towards the physical beginning of the tape.
  - | 12. Relative LPOS fields (Bytes 30–33) reports the current physical position on the tape.
  - | 13. SCSI Address field (Byte 34) reports the SCSI Bus Address for the drive. Values returned range from 00h to 0Fh.
- |

---

## Chapter 11. Power

Overview . . . . .	11-2
ac and dc Power . . . . .	11-2
ac and dc Power Distribution . . . . .	11-3
ac and dc Power Distribution for Type I Power Supply in a Library With the Multi-Path Feature	11-4
ac and dc Power Distribution for Type I Power Supply in a Library Without the Multi-Path Feature	11-5
ac and dc Power Distribution for Type II Power Supply in a Library With the Multi-Path Feature	11-6
ac and dc Power Distribution for Type II Power Supply in a Library Without the Multi-Path Feature	11-7

---

## Overview

This chapter describes the power system for the Ultrium Scalable Tape Library.

---

### ac and dc Power

The Tape Library contains an ac Input Power Module **3** that requires 110 V or 230 V, 10 Amperes single phase ac power. The ac Power Module supplies ac to the dc Power Supplies **1** and all Tape Drive Sleds **4** in the Library.

Standard Tape Library configuration requires one dc Power Supply which generates +5 V dc and +12 V dc to be used in the Library. An optional dc Power Supply can be installed to provide dc power redundancy in the Library. When two dc Power Supplies are installed, one output switches on in the event the other output should fail. The dc Power Supplies are auto-ranging and can accept either 110 or 230 V ac.

Each Drive Sled has a built-in dc Power Supply and only requires ac input. This dc Power Supply is also auto-ranging and can accept either 110 or 230 V ac.

Figure 11-1 shows the locations of the ac Power Module and the dc Power Supplies in the Tape Library.

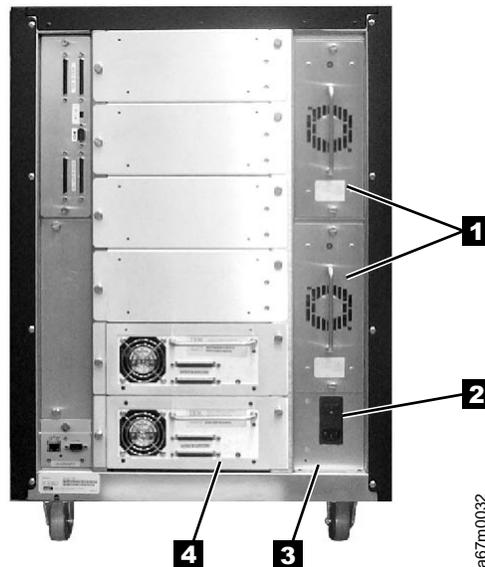


Figure 11-1. ac Power Module and dc Power Supplies locations

---

## ac and dc Power Distribution

The AC Input Power Module distributes ac to all Tape Drive Modules and the DC Power Supplies through the Power Distribution PCBA. The output of the AC Input Power Module is controlled by a Switch and protected by two 5A fuses. The DC Power Supplies and all Tape Drive Modules are plugged into the Power Distribution PCBA with self-docking or blind-mate connectors.

Each DC Power Supply has a built-in switch that is activated as the DC Power Supply is plugged into the Power Distribution PCBA. ac voltage is immediately available to the DC Power Supply as soon as the connection is made.

There are two versions of the DC Power Supplies, with each requiring a corresponding Power Distribution PCBA to operate. Physically, these two types of DC Power supplies look the same. You need to order the correct one for the library. **The library will not power up if the DC power supply and the Power Distribution PCBA are not compatible:**

- Type I dc power supply provides +5 Vdc and +12 Vdc to the Power distribution PCBA to be distributed throughout the library. This DC Power Supply is used in older libraries.
- Type II dc power supply only provides +12 Vdc to its associated Power Distribution PCBA. The Power Distribution PCBA generates +5 Vdc from the +12 Vdc and distributes these two voltages throughout the library. This DC Power Supply is used in newer libraries to handle additional appliances, such as the SAN Data Gateway Module.

When two DC Power Supplies are installed in the library, their outputs are connected together. If one of these DC Power Supplies fails, the library can still operate normally. Each DC Power Supply also has an LED indicator in the back to indicate its status:

- Green indicates that the power supply is operating normally
- Red indicates a failures that requires a replacement

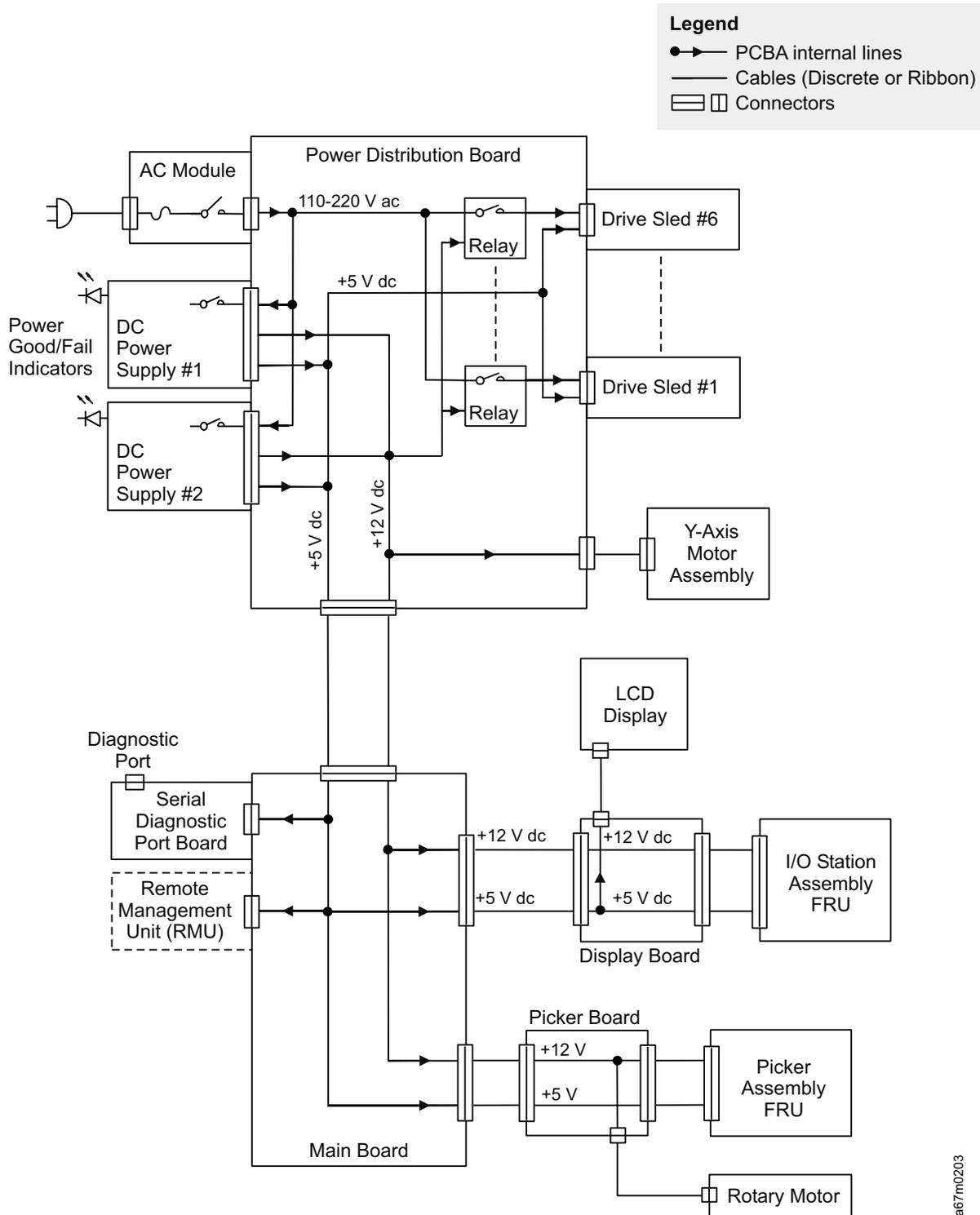
The operator panel presents a message when this condition occurs. The failing DC Power Supply can be removed and replaced without interrupting the library's operations.

As each Tape Drive Module is plugged into the Power Distribution PCBA, its Drive Communication PCBA receives +5 Vdc power from the Power Distribution PCBA. Firmware on the Drive Communication PCBA attempts to communicate with the library firmware. After this communication is established, the library firmware activates a relay that provides ac power to the Tape Drive Module. Options are provided through the operator panel menus to remove and restore ac power to the Tape Drive Module during a service call.

Use the following diagrams for ac and dc power distribution within the library:

- | • “ac and dc Power Distribution for Type I Power Supply in a Library With the Multi-Path Feature” on page 11-4. Note that each DC Power Supply generates +5 Vdc and +12 Vdc.
- | • “ac and dc Power Distribution for Type I Power Supply in a Library Without the Multi-Path Feature” on page 11-5. Note that each DC Power Supply generates +5 Vdc and +12 Vdc.
- | • “ac and dc Power Distribution for Type II Power Supply in a Library With the Multi-Path Feature” on page 11-6. Note that each DC Power Supply generates only +12 Vdc and there is a dc-to-dc converter on the Power Distribution PCBA that generates +5 Vdc from the +12 Vdc.
- | • “ac and dc Power Distribution for Type II Power Supply in a Library Without the Multi-Path Feature” on page 11-7. Note that each DC Power Supply generates only +12 Vdc and there is a dc-to-dc converter on the Power Distribution PCBA that generates +5 Vdc from the +12 Vdc.

# ac and dc Power Distribution for Type I Power Supply in a Library With the Multi-Path Feature



a67m0203

Figure 11-2. ac and dc power distribution for Type I power supply in a library with the Multi-Path feature

# ac and dc Power Distribution for Type I Power Supply in a Library Without the Multi-Path Feature

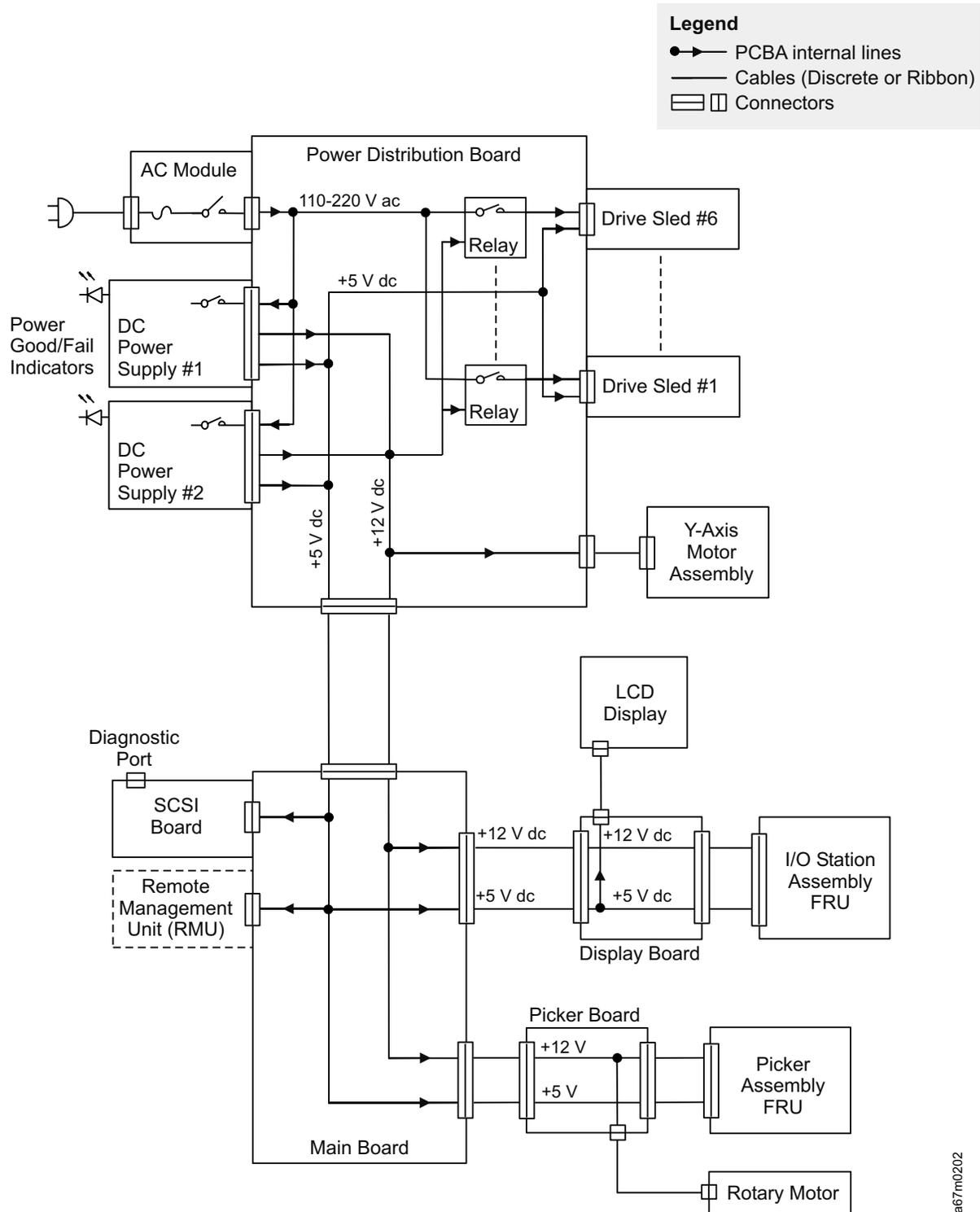
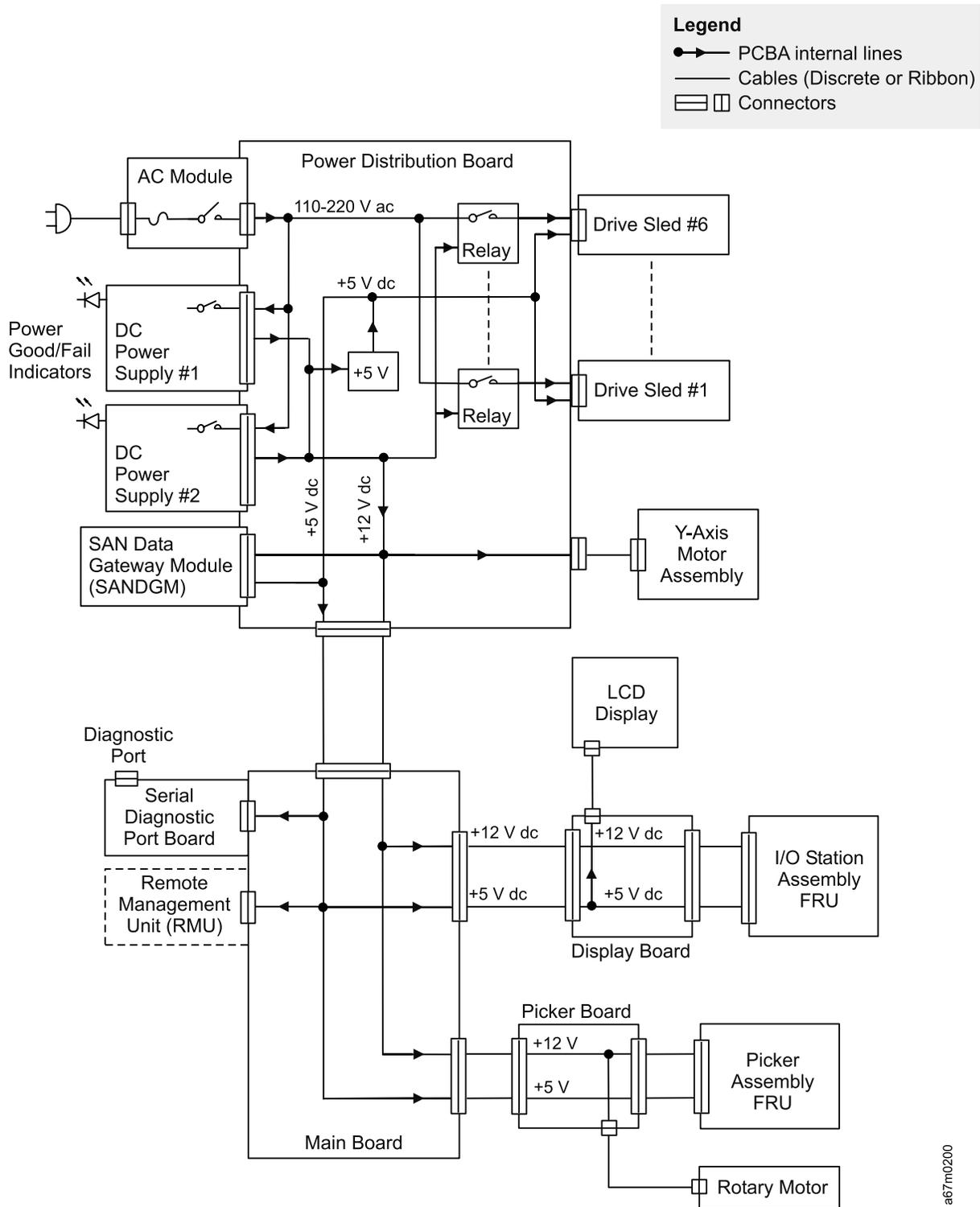


Figure 11-3. ac and dc power distribution for Type I power supply in a library without the Multi-Path feature

a67m0202

# ac and dc Power Distribution for Type II Power Supply in a Library With the Multi-Path Feature



a67m0200

Figure 11-4. ac and dc power distribution for Type II power supply in a library with the Multi-Path feature

# ac and dc Power Distribution for Type II Power Supply in a Library Without the Multi-Path Feature

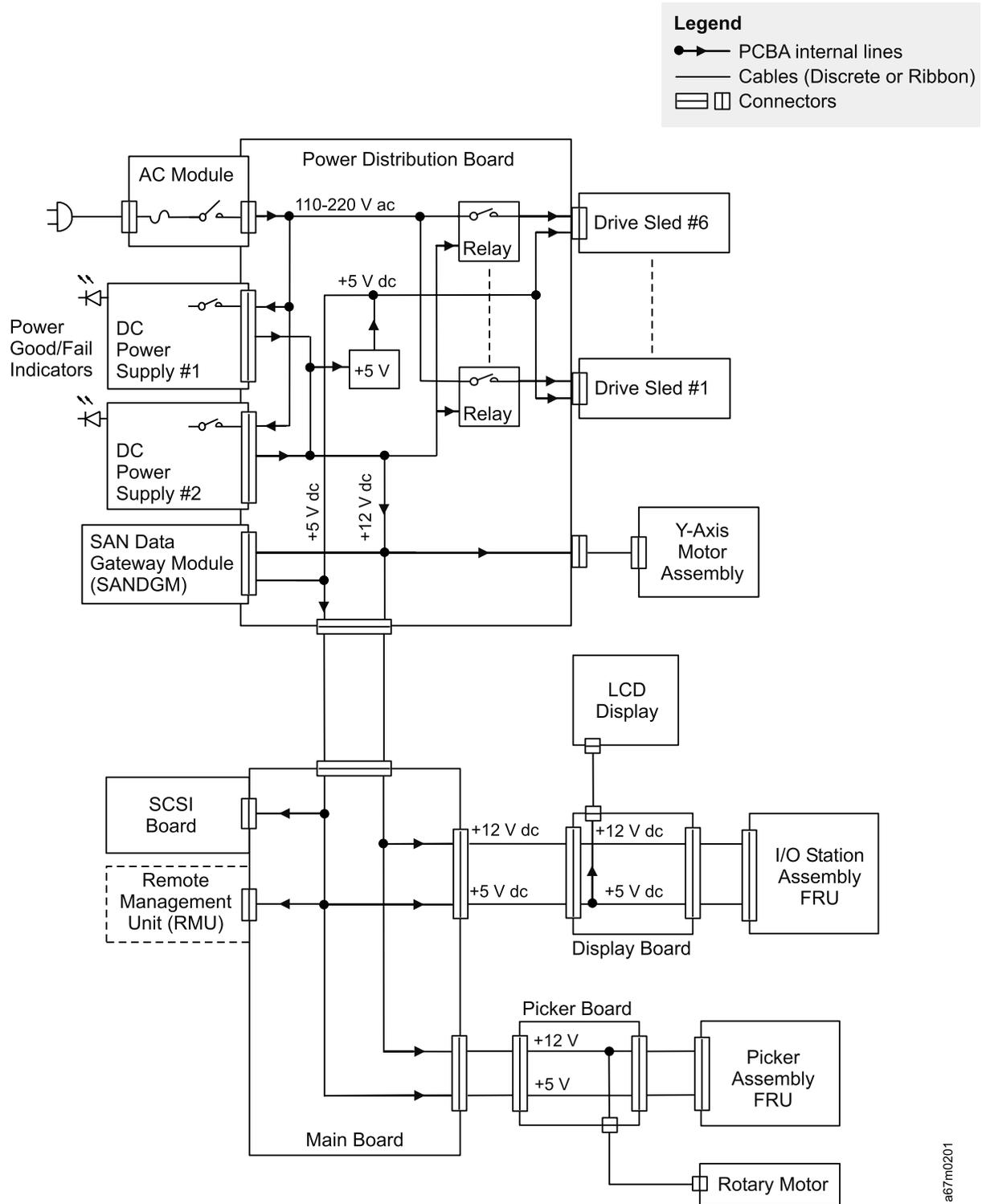


Figure 11-5. ac and dc power distribution for Type II power supply in a library without the Multi-Path feature

a67m0201



---

## Chapter 12. Cable

Overview . . . . .	12-2
Cable Diagram for Type I Power Distribution PCBA in a Library With the Multi-Path Feature . . . .	12-3
Cable Diagram for Type I Power Distribution PCBA in a Library Without the Multi-Path Feature . . . .	12-4
Cable Diagram for Type II Power Distribution PCBA in a Library With the Multi-Path Feature . . . .	12-5
Cable Diagram with Type II Power Distribution PCBA in a Library Without the Multi-Path Feature . . . .	12-6

---

## Overview

This chapter shows the interconnections between major components in the Ultrium Scalable Tape Library.

The following diagrams show the connector and cable designations. The designation **J** used in the diagrams means connectors on electronic cards or major assemblies.

- | • “Cable Diagram for Type I Power Distribution PCBA in a Library With the Multi-Path Feature” on  
| page 12-3.
- | • “Cable Diagram for Type I Power Distribution PCBA in a Library Without the Multi-Path Feature” on  
| page 12-4
- | • “Cable Diagram for Type II Power Distribution PCBA in a Library With the Multi-Path Feature” on  
| page 12-5
- | • “Cable Diagram with Type II Power Distribution PCBA in a Library Without the Multi-Path Feature” on  
| page 12-6

# Cable Diagram for Type I Power Distribution PCBA in a Library With the Multi-Path Feature

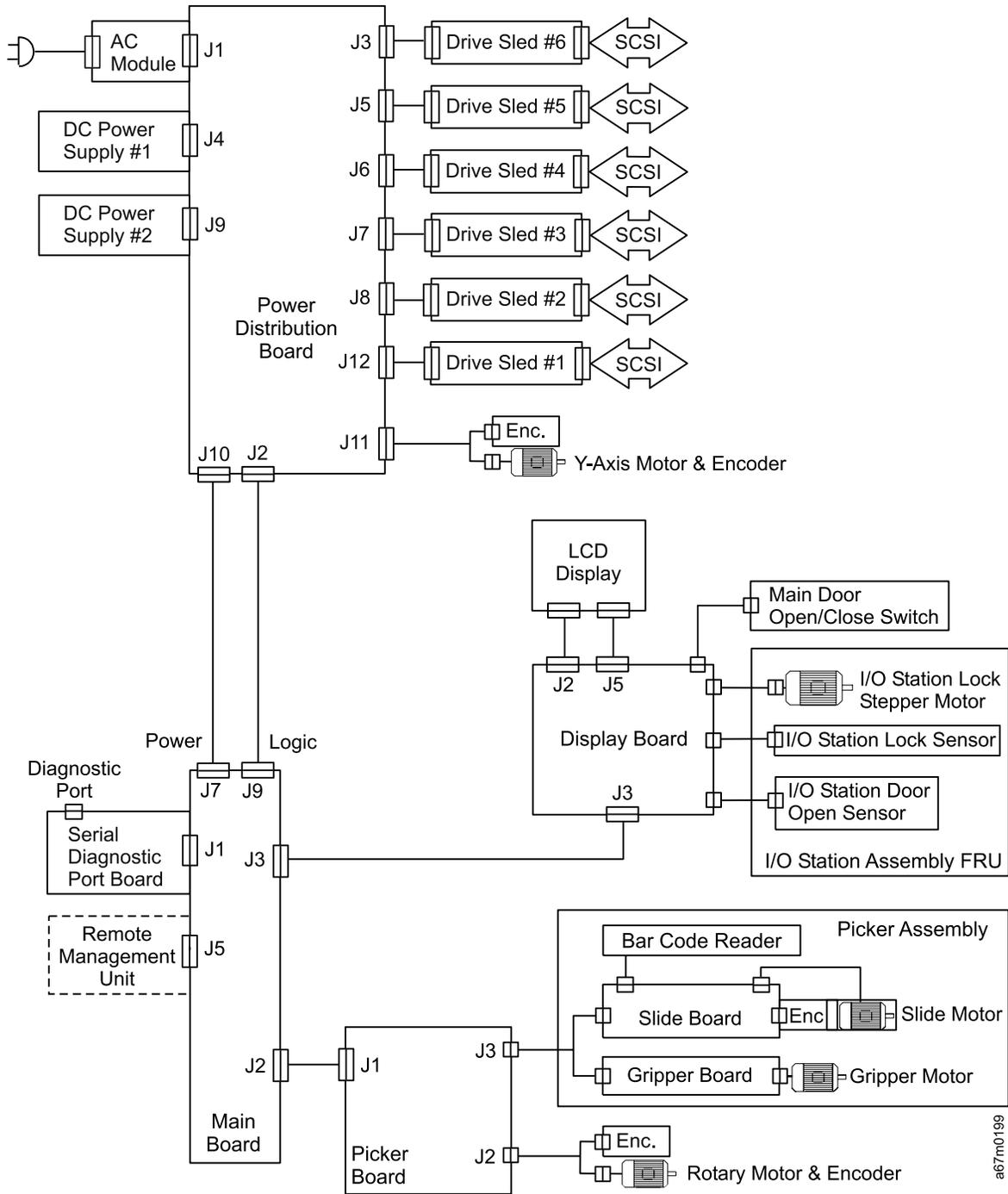


Figure 12-1. Cable diagram for Type I power distribution PCBA in a library with the Multi-Path feature

# Cable Diagram for Type I Power Distribution PCBA in a Library Without the Multi-Path Feature

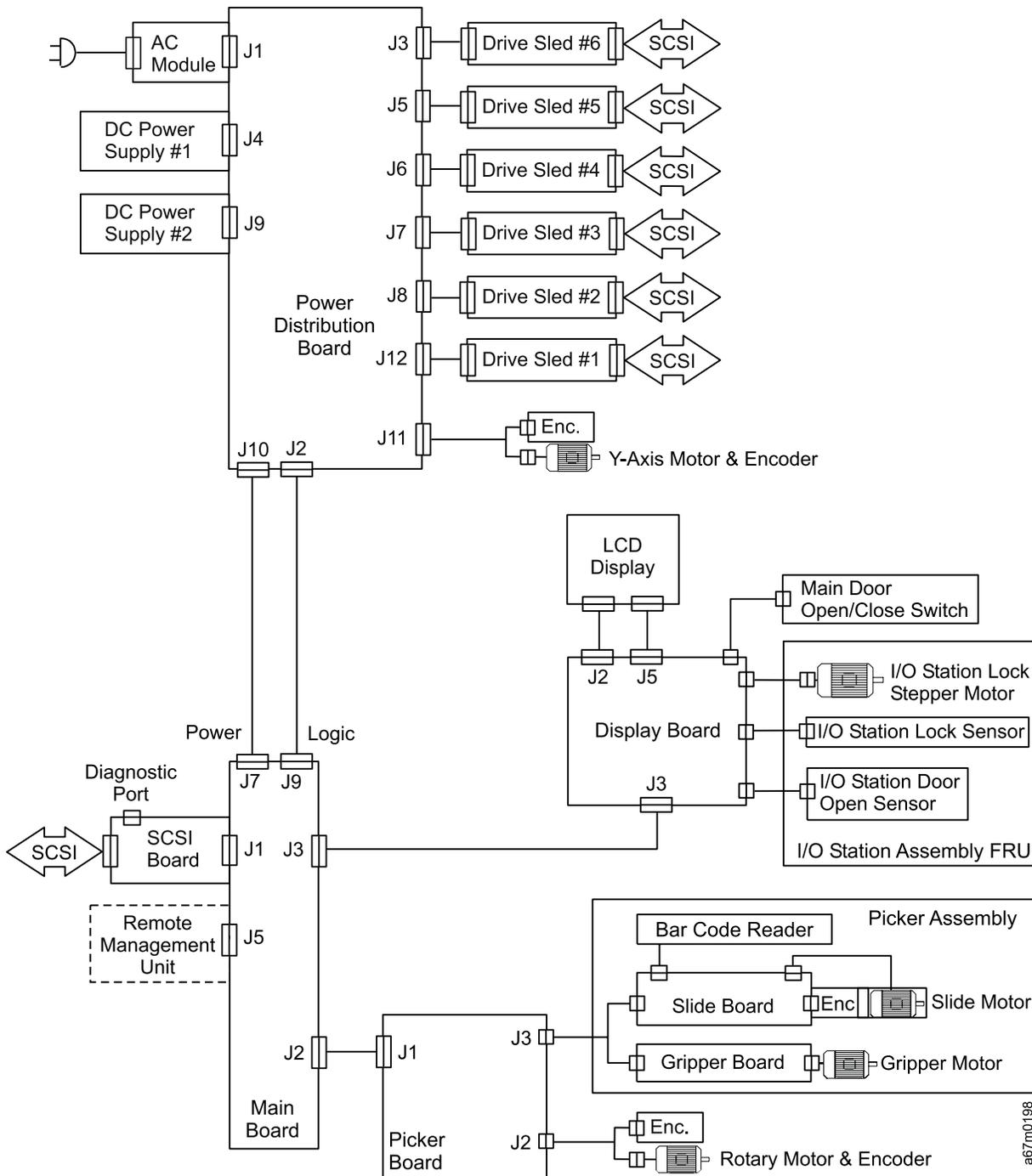


Figure 12-2. Cable diagram for Type I Power Distribution PCBA in a library without the Multi-Path feature

# Cable Diagram for Type II Power Distribution PCBA in a Library With the Multi-Path Feature

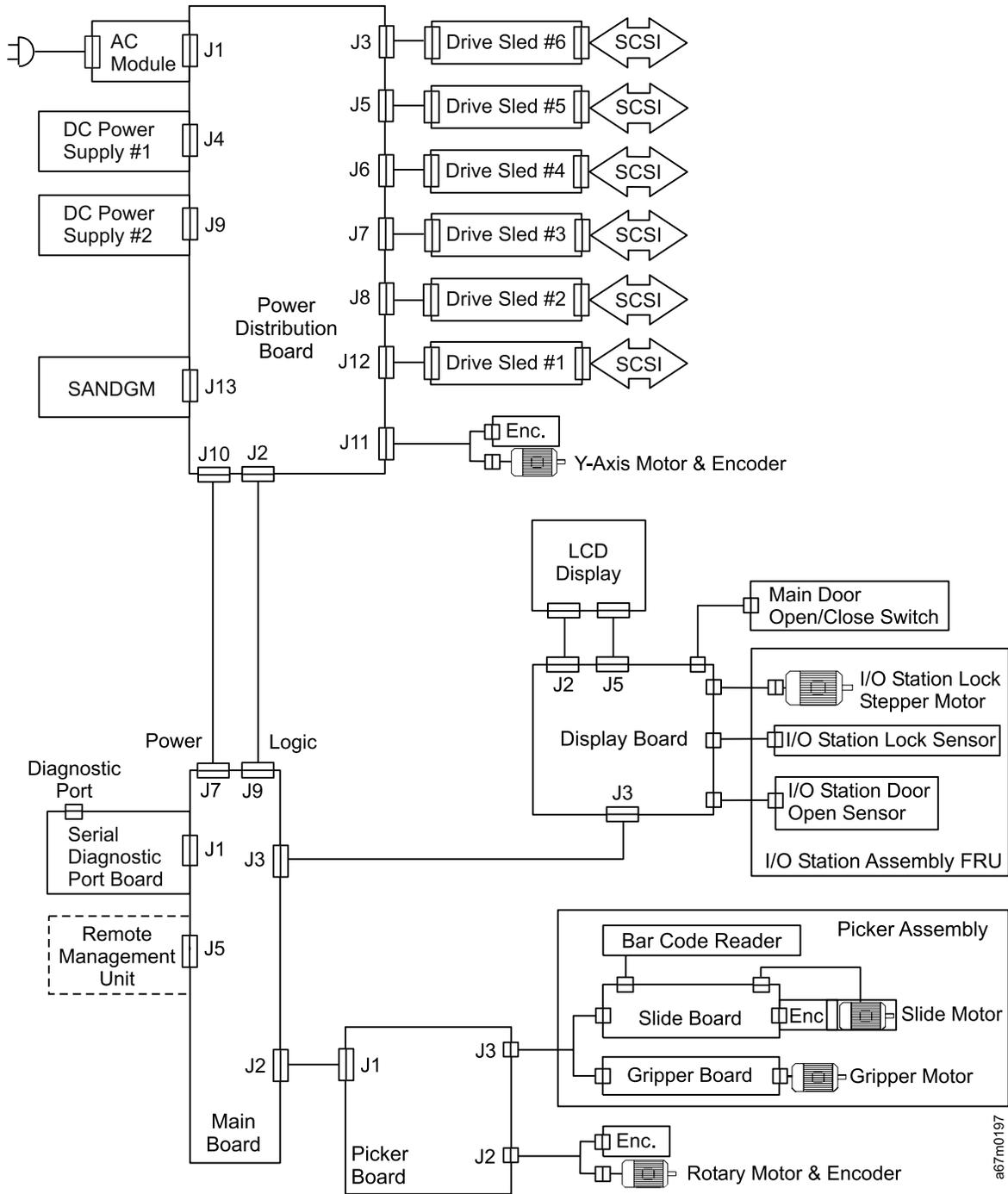


Figure 12-3. Cable diagram for Type II Power Distribution PCBA in a library with the Multi-Path feature

# Cable Diagram with Type II Power Distribution PCBA in a Library Without the Multi-Path Feature

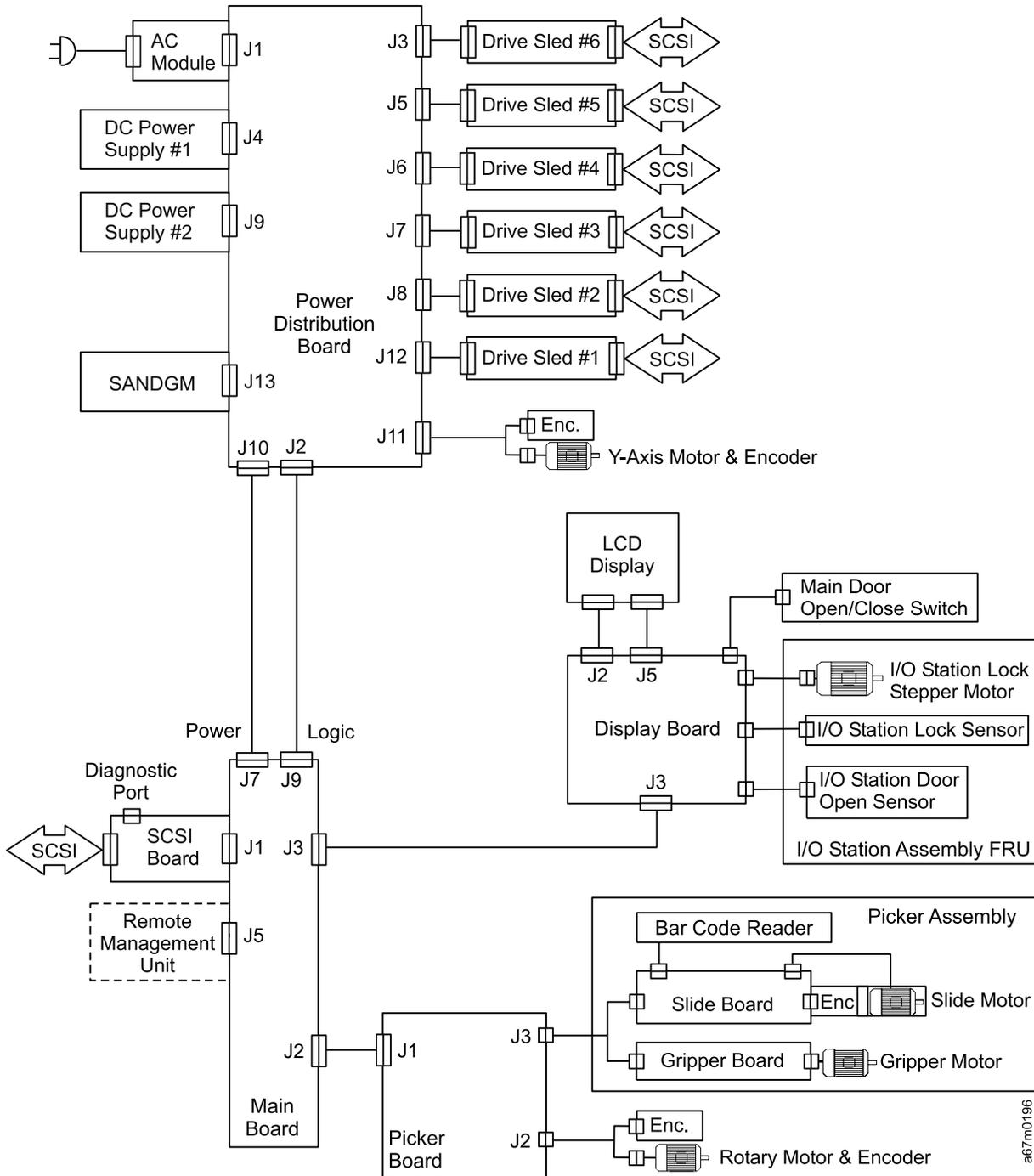


Figure 12-4. Cable diagram with Type II Power Distribution PCBA in a library without the Multi-Path feature

---

## Chapter 13. Install

- | **Attention:** The Ultrium Scalable Tape Library is a customer setup unit. It is the customer's responsibility to install this product.
  
- | To ensure optimum performance, obtain the latest level of firmware from the web by visiting <http://www.storage.ibm.com/hardsoft/tape/ltto/index.html>. After you access the web site, select Technical Support to locate and download the firmware. Be sure to verify that you have the latest firmware installed on your machine before you contact IBM for any necessary technical support.
  
- | To install this product, refer to the instructions in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.
  
- | If you choose not to install this product yourself, IBM will install it for a fee. You can purchase installation services by contacting your local IBM Service office or your IBM Business Partner.



## Chapter 14. Parts List

This section include a list of field replaceable units (FRUs) for the Ultrium Scalable Tape Library. It also includes a list of compatible power cords.

Table 14-1. Parts List for Ultrium Scalable Tape Library

FRU Type	FRU Name	FRU Part Number	Reference Information on Page
<b>Boards</b>	Power Distribution Board (Type II, required for Fibre Channel support)	19P3255	7-45
	Power Distribution Board (Type I)	35L1066 19P1749	7-45
	Main Controller Board	35L1067 19P3467	7-30
	Host SCSI Interface Board (without Multi-Path feature)	35L1068	7-41
	Serial Diagnostic Port Board (with Multi-Path feature)	18P8171	7-42
	Picker Control Board	35L1069 19P3469	7-14
	Display Assembly	35L1070 19P3468	7-43
<b>Modules</b>	SAN Data Gateway Module	19P3258 19P5065	7-37
	Remote Management Unit (RMU)	19P3254	7-35
	GBIC (2 Gbit)	19P3259	7-37
<b>Power</b>	DC Power Supply Module (Type II, required for Fibre Channel support)	19P3256	7-49
	DC Power Supply Module (Type I)	35L1071	7-49
	AC Input Power Module	35L1072	7-48
<b>Tape Drive Sleds</b>	Ultrium 2 Tape Drive Sled (LTO - LVD)	18P8157	7-3
	Ultrium 2 Tape Drive Sled (LTO - HVD)	18P8158	7-3
	Ultrium 1 Tape Drive Sled (LTO - LVD)	35L1079 19P3978	7-3
	Ultrium 1 Tape Drive Sled (LTO - HVD)	35L1080	7-3
	Ultrium 2 Tape Drive Sled (LTO - Fibre Channel)	18P8159	7-3
<b>Terminators (SCSI)</b>	LVD	19P0874	Not applicable
	HVD	61G8324	Not applicable
	Inline HVD SCSI terminator	19P0378	Not applicable
<b>Wrap Tool (SCSI)</b>	LVD	19P0481	8-16
	HVD	19P1213	8-16
<b>Fibre Channel Wrap Tool</b>	LC Wrap Tool	11P3847	8-16
<b>Interposers (SCSI)</b>	VHDCI-to-HD68	19P0482	Not applicable
	AS/400-to-HD68 (Feature 6501)	05H3834	Not applicable

Table 14-1. Parts List for Ultrium Scalable Tape Library (continued)

FRU Type	FRU Name	FRU Part Number	Reference Information on Page
<b>Interposers (Fibre)</b>	SC-to-LC	11P1373	Not applicable
<b>Fuses</b>	AC Input (5 amp)	19P1665	7-48
<b>Mechanical Parts</b>	Y-Axis Motor Assembly	35L1077	7-27
	Picker Assembly	35L1075 19P3470	7-5
	Picker Arm Carriage Assembly	18P7450	7-9
	Library Front Door Key	35L1086	Not applicable
	Door Lock Assembly	35L1095	7-53
	I/O Station Assembly (Single Slot) - LTO	35L1073 19P5284	7-47
	I/O Station Assembly (Multiple Slot) - LTO	35L1074 19P4531	7-46
	Rotary Axis Motor Assembly	35L1076	7-12
	Storage Column (LTO)	35L1087 19P4530	7-29
	Storage Magazine (LTO)	35L1088 19P4529	Not applicable
	Y-Axis Drive Belt	35L1078 19P5666	7-16
	Top Plastic Door Cover	35L1089	7-55
	Plastic Lower Grill	35L1090	7-56
	Side Cover	35L1091	7-57
	Drive Filler Panel	35L1093	7-5
	Library Top Cover	19P1281	7-58
Caster Kit	35L1092	See the section about installing the library in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>	

Table 14-1. Parts List for Ultrium Scalable Tape Library (continued)

FRU Type	FRU Name	FRU Part Number	Reference Information on Page
<b>Cables</b>	Cable between Main Controller Board and Display Control Board	35L1081	7-23
	Cable between Main Controller Board and Picker Control Board	35L1082	7-22
	Cable between Power Distribution Board and Individual Drive Sled	35L1083	7-26
	Signal Cable between Main Controller Board and Power Distribution Board	35L1084	7-25
	Power Cable between Main Controller Board and Power Distribution Board	35L1085	7-25
	Door Interlock Switch Cable and Cable Assembly	35L1094	7-54
	Cable between Power Distribution Board and SAN Data Gateway Module (Accessory Bay Cable)	19P3257	7-38
	Serial Cable (Straight Through)	19P1945	8-4
	RMU Interface Cable	19P5364	7-32
	RJ45 Crossover Cable	09L0294	8-7
	Cable Retainer Clips	19P5362	Not applicable
<b>Cables, Universal HD68-to-HD68 ((LVD/HVD) SCSI)</b>	Cable, 0.41 m	19P0872	Not applicable
	Cable, 0.72 m	19P0873	Not applicable
	Cable, 2.5 m	35L1307	Not applicable
	Cable, 5.0 m	19P0052	Not applicable
	Cable, 10 m	19P0053	Not applicable
	Cable, 18 m	19P0097	Not applicable
	Cable, 25 m	19P0054	Not applicable
<b>Cables, Universal VHDCI-to-HD68 ((LVD/HVD) SCSI)</b>	Cable, 0.6 m	19P3132	Not applicable
	Cable, 2.5 m	19P0279	Not applicable
	Cable, 4.5 m	19P0050	Not applicable
	Cable, 10 m	19P0048	Not applicable
	Cable, 20 m	19P0049	Not applicable
	Cable, 25 m	35L1977	Not applicable
<b>Cables, SC-to-SC (Fibre Channel)</b>	Cable, 5 m	03K9201	Not applicable
	Cable, 13 m	54G3386	Not applicable
	Cable, 25 m	03K9204	Not applicable
	Cable, 61 m	54G3390	Not applicable
<b>Cables, SC-to-LC (Fibre Channel)</b>	Cable, 7 m	11P1345	Not applicable
	Cable, 13 m	11P1346	Not applicable
	Cable, 25 m	11P1347	Not applicable
	Cable, 61 m	11P1350	Not applicable

## Other Available Parts

Table 14-2. Other Available Parts

Part Name	Part Number	Refer to...
<b>Kits</b>		
Rack Mount Kit with Rack Power Cord	35L1559	See the section about installing the library in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>
SAN Data Gateway Module Service Accessory Kit: <ul style="list-style-type: none"> <li>• VHDCI-to-VHDCI SCSI wrap cable (0.5 m)</li> <li>• SC-to-SC Fibre Channel coupler block</li> <li>• Gateway service tools: <ul style="list-style-type: none"> <li>– Null modem cable</li> <li>– Ethernet wrap tool</li> <li>– Fibre Channel wrap tool</li> </ul> </li> </ul>	19P3461	Included in Ship Group; see the inventory checklist located in the section about installing the library in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>
<b>Cables, Power</b>		
Rack Mount Power Cable	05H8911	See the section about installing the library in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide</i>
All Other Library Power Cords		"Power Cords"

## Power Cords



To avoid electrical shock, a power cord with a grounded attachment plug has been provided. Use only properly grounded outlets.

Table 14-3 on page 14-5 lists the power cord part number, feature code, the country or region where the power cord can be used, and the plug's standard reference. The last column in the table contains an index number that you can match to a specific receptacle type in Figure 14-1 on page 14-7. These power cords are only available at the time of initial purchase or as a field replaceable unit (FRU) part from your IBM Service Representative.

All power cords use an appliance coupler that complies with the International Electrotechnical Commission (IEC) Standard 320, Sheet C13.

If the power cord that you receive does not match your receptacle, contact your local dealer.

Power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL), are certified by the Canadian Standards Association (CSA), and comply with the plug standards of the National Electrical Manufacturers Association (NEMA). For other worldwide geographies, plug standards are listed in Table 14-3 on page 14-5.

## Power Cord Information

Table 14-3. Power cord information

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 14-1 on page 14-7
<b>US/Canada</b> 2.8 m, 125V FC 9800 PN 6952300 (See Note)	NEMA 5-15P	Aruba, Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Curacao, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, South Korea, Suriname, Taiwan, Trinidad Tobago, Venezuela, US	1
<b>Chicago</b> 1.8 m, 125 V FC 9986 PN 6952301	NEMA 5-15P	Chicago, U.S.A.	1
<b>US/Canada</b> 2.8 m, 250 V FC 9833 PN 1838574	NEMA 6-15P	Aruba, Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Costa Rica, Curacao, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Liberia, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Suriname, Taiwan, Thailand, Trinidad Tobago, Venezuela, US	2
<b>Australia</b> 2.8 m, 250V FC 9831 PN 13F9940	AS 3112 NZN 198	Argentina, Australia, China, Colombia, New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	3
<b>France, Germany</b> 2.8 m, 250V FC 9820 PN 13F9979	CEE 7 - VII	Afghanistan, Algeria, Andorra, Angola, Aruba, Austria, Belgium, Benin, Brazil, Bulgaria, Burundi, Cameroon, Central African Republic, Chad, Congo Brazzaville, Curacao, Czechoslovakia, Denmark, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Kenya, Korea, Lebanon, Luxembourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, Netherlands Antilles, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Saudi Arabia, Senegal, Spain, Sweden, Sudan, Syria, Togo, Tunisia, Turkey, Upper Volta, USSR, Yugoslavia, Zaire, Zimbabwe, Vietnam	4
<b>Denmark</b> 2.8 m, 250V FC 9821 PN 13F9997	DK2-5A	Denmark	5

Table 14-3. Power cord information (continued)

Description, Feature Code (FC), and Part Number (PN)	Plug Standard Reference	Country or Region	Index Number in Figure 14-1 on page 14-7
<b>South Africa</b> 2.8 m, 250V FC 9829 PN 14F0015	SABS 164	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka	6
<b>United Kingdom</b> 2.8 m, 250V FC 9825 PN 14F0033	BS 1363	Antigua, Bahrain, Bermuda, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Fiji, Ghana, Guyana, India, Iraq, Ireland, Jordan, Kenya, Kuwait, Malaysia, Malawi, Malta, Nepal, Nigeria, Oman, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, UK, United Arab Emirate (Dubai), Yemen, Zambia	7
<b>Switzerland</b> 2.8 m, 250V FC 9828 PN 14F0051	SEV SN 416534	Liechtenstein, Switzerland	8
<b>Italy</b> 2.8 m, 250V FC 9830 PN 14F0069	CEI 23- 16	Chile, Ethiopia, Italy, Libya, Somalia	9
<b>Israel</b> 2.8 m, 250V FC 9827 PN 14F0087	S11-32-1971	Israel	10
<b>Argentina</b> 2.8 m, 250V FC 9834 PN 36L8880	IEC 83-A5	Argentina, Brazil, Colombia, Paraguay, Trinidad Tobago, Uruguay	11
<b>China</b> 2.8 m, 250V FC 9840 PN 02K0546	CCEE	People's Republic of China	12
<b>Note:</b> Part number 6952300 is the default power cord for the countries or regions listed. If you do not specify a power cord when you place your order, IBM provides this power cord.			

## Types of Plugs

Figure 14-1 on page 14-7 shows the plugs that are used by the power cords in Table 14-3 on page 14-5. Match the index number that is beside each plug to the index number in the table.

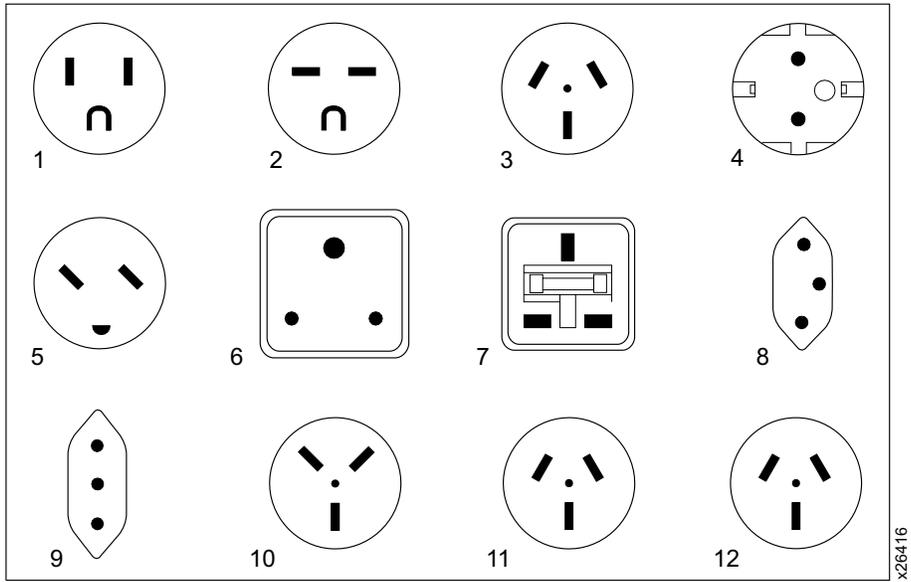


Figure 14-1. Types of receptacles



## TapeAlert Flags

***This appendix is intended to provide additional information to the reader about the tape drive. All error code and diagnostic information contained in this chapter can be accessed from the Operator Panel of the Library. The drive portion of the Operator Panel Display will contain any drive error codes. Therefore there is no need to open the Library to access the buttons on the drive as described in this chapter. See IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide for a complete description of the Operator Panel functions and Displays.***

| TapeAlert is a standard that defines status conditions and problems experienced by devices such as tape drives, autoloaders, and libraries. The standard enables a server to read TapeAlert messages (called *flags*) from a tape drive via the SCSI bus. The server reads the flags from Log Sense Page 0x2E.

| The Ultrium Scalable Tape Library is compatible with TapeAlert technology, which provides error and diagnostic information about the drives and the library to the server. Because library and drive firmware may change periodically, the SNMP interface in the library does not require code changes if devices add additional TapeAlerts that are not supported today. However, should this occur the MIB is written to minimize impact to the SNMP monitoring station. At the time of this writing, the TapeAlert flags in this appendix correctly represent TapeAlerts that will be sent. The MIB file should not be taken to mean that all traps that are defined in the MIB will be sent by the library or that they will be sent in the future.

| This appendix lists TapeAlert flags that are supported by the Ultrium Tape Drives and the Ultrium Scalable Tape Library.

---

### TapeAlert Flags Supported by the Drive

*Table A-1. TapeAlert Flags Supported by the Ultrium Tape Drive*

Flag Number	Flag	Description	Action Required
3	Hard error	Set for any unrecoverable read, write, or positioning error. (This flag is set in conjunction with flags 4, 5, or 6.)	See the Action Required column for Flag Number 4, 5, or 6 in this table.
4	Media	Set for any unrecoverable read, write, or positioning error that is due to a faulty tape cartridge.	Replace the tape cartridge.
5	Read failure	Set for any unrecoverable read error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 in Table 5-2 on page 5-19.
6	Write failure	Set for any unrecoverable write or positioning error where isolation is uncertain and failure could be due to a faulty tape cartridge or to faulty drive hardware.	If Flag Number 9 is also set, make sure that the write-protect switch is set so that data can be written to the tape (see "Setting the Write-Protect Switch" on page A-4). If Flag Number 4 is also set, the cartridge is defective. Replace the tape cartridge. If Flag Number 4 is not set, see Error Code 6 page Table 5-2 on page 5-19.
8	Not data grade	Set when the cartridge is not data-grade. Any data that you write to the tape is at risk.	Replace the tape with a data-grade tape.

Table A-1. TapeAlert Flags Supported by the Ultrium Tape Drive (continued)

Flag Number	Flag	Description	Action Required
9	Write protect	Set when the tape drive detects that the tape cartridge is write-protected.	Make sure that the cartridge's write-protect switch is set so that the tape drive can write data to the tape (see "Setting the Write-Protect Switch" on page A-4).
10	No removal	Set when the tape drive receives an UNLOAD command after the server prevented the tape cartridge from being removed.	Refer to the documentation for your server's operating system.
11	Cleaning media	Set when you load a cleaning cartridge into the drive.	No action required.
12	Unsupported format	Set when you load an unsupported cartridge type into the drive or when the cartridge format has been corrupted.	Use a supported tape cartridge.
14	Unrecoverable snapped tape	Set when the operation failed because the tape in the drive snapped.	Do not attempt to extract the old tape cartridge. Call the tape drive supplier's help line.
15	Cartridge memory chip failure	Set when a cartridge memory (CM) failure is detected on the loaded tape cartridge.	Replace the tape cartridge. If this error occurs on multiple cartridges, see Error Code 6 in Table 5-2 on page 5-19
16	Forced eject	Set when you manually unload the tape cartridge while the drive was reading or writing.	No action required.
18	Tape directory corrupted in the cartridge memory	Set when the drive detects that the tape directory in the cartridge memory has been corrupted.	Re-read all data from the tape to rebuild the tape directory.
20	Clean now	Set when the tape drive detects that it needs cleaning.	Clean the tape drive (see the section about cleaning drives in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide</i> ).
21	Clean periodic	Set when the drive detects that it needs routine cleaning.	Clean the tape drive as soon as possible. The drive can continue to operate, but you should clean the drive soon. See the section about cleaning drives in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide</i> .
22	Expired clean	Set when the tape drive detects a cleaning cartridge that has expired.	Replace the cleaning cartridge.
23	Invalid cleaning tape	Set when the drive expects a cleaning cartridge and the loaded cartridge is not a cleaning cartridge.	Use a valid cleaning cartridge.
30	Hardware A	Set when a hardware failure occurs that requires that you reset the tape drive to recover.	If resetting the drive does not recover the error, note the error code on the single-character display and see Table 5-2 on page 5-19 for the appropriate instructions.

Table A-1. TapeAlert Flags Supported by the Ultrium Tape Drive (continued)

Flag Number	Flag	Description	Action Required
31	Hardware B	Set when the tape drive fails its internal Power-On Self Tests.	Note the error code on the single-character display and see Table 5-2 on page 5-19 for the appropriate instructions.
32	Interface	Set when the tape drive detects a problem with the SCSI, Fibre Channel, or RS-422 interface.	Locate Error Code 8 or 9 in Table 5-2 on page 5-19
33	Eject media	Set when a failure occurs that requires you to unload the cartridge from the drive.	Unload the tape cartridge, then reinsert it and restart the operation.
34	Download fail	Set when an FMR image is unsuccessfully downloaded to the tape drive through the SCSI or Fibre Channel interface.	Ensure that it is the correct FMR image. Download the FMR image again.
36	Drive temperature	Set when the drive's temperature sensor indicates that the drive's temperature is exceeding the recommended temperature of the library.	See Error Code 1 in Table 5-2 on page 5-19
37	Drive voltage	Set when the drive detects that the externally supplied voltages are either approaching the specified voltage limits or are outside the voltage limits (see Table 1-5 on page 1-19).	See Error Code 2 in Table 5-2 on page 5-19
39	Diagnostics required	Set when the drive detects a failure that requires diagnostics for isolation.	See Error Code 6 in Table 5-2 on page 5-19
51	Tape directory invalid at unload	Set when the tape directory on the tape cartridge that was previously unloaded is corrupted. The file-search performance is degraded.	Use your backup software to rebuild the tape directory by reading all the data.
52	Tape system area write failure	Set when the tape cartridge that was previously unloaded could not write its system area successfully.	Copy the data to another tape cartridge, then discard the old cartridge.
53	Tape system area read failure	Set when the tape system area could not be read successfully at load time.	Copy the data to another tape cartridge, then discard the old cartridge.

---

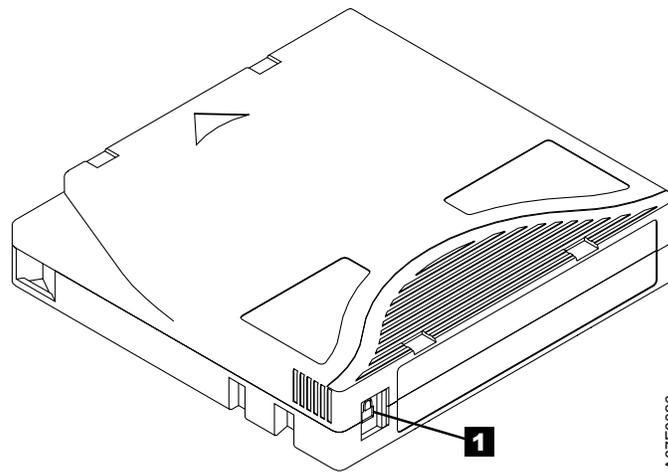
## Setting the Write-Protect Switch

The position of the write-protect switch on the tape cartridge (see **1**) determines whether you can write to the tape:

- If the switch is set to  (solid red), data cannot be written to the tape.
- If the switch is set to unlocked (black void), data can be written to the tape.

Advise your customer that it is better to use the host application software to write protect the cartridges instead of manually using the write protect switch. The host software will identify a cartridge that no longer contains current data. The host software will then make a scratch cartridge by removing the software generated write protect.

If you must manually set the write-protect switch **1**, slide it left or right to the desired position.



A67E0026

Figure A-1. Cartridge Write-Protect Switch

## TapeAlert Flags Supported by the Library

Table A-2. TapeAlert Flags Supported by the Tape Library

Flag Number	Flag	Description	Action Required
1	Library hardware A	The library has trouble communicating with the drive.	Restart the operation.
2	Library hardware B	The library has a hardware failure.	Restart the operation.
4	Library hardware D	The library has a hardware fault that is not mechanically related.	Restart the operation.
7	Predictive failure	Predictive failure of library hardware.	Not applicable.
8	Library maintenance	Library Preventive Maintenance required.	Not applicable.
13	Library pick retry	The operation to pick a cartridge had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
14	Library place retry	The operation to place a cartridge had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
15	Library load retry	The operation to load a cartridge into a drive had to perform an excessive number of retries before succeeding.	No action needs to be taken at this time.
16	Library door	A library door is open and prevents the library from functioning.	Close the library door.
17	Library I/O station	A problem exists with the I/O station.	<ol style="list-style-type: none"> <li>1. Ensure that there is no obstruction in the I/O station.</li> <li>2. Restart the operation.</li> </ol>
19	Library security	Library door opened then closed during operation.	Library security has been compromised.
20	Library security mode	Library security mode changed.	The security mode of the library has been changed. For information purposes only. No action required.
21	Library offline	Library manually turned offline.	The library has been manually turned offline and is unavailable for use.
23	Library scan retry	The operation to scan the bar code on a cartridge had to perform an excessive number of retries before succeeding. A potential problem exists with the bar code label or the reader hardware in the library mechanism.	Check for damaged, misaligned, or peeling bar code labels on cartridges.
24	Library inventory	An inventory of the media was inconsistent.	<ol style="list-style-type: none"> <li>1. Run a library inventory to correct the inconsistency.</li> <li>2. Restart the operation.</li> </ol>
28	Power supply	A redundant power supply failure exists inside the library.	Contact your IBM Technical Support
32	Unreadable bar code label	During an inventory or scan, the library was unable to read a bar code label on a cartridge.	Check for damaged, misaligned, or peeling bar code labels on the cartridge.

## Resolving Problems

If you encounter problems when running the Ultrium Tape Drive, refer to Table A-3. If the problem is not identified in Table A-3, refer to “Methods of Receiving Errors and Messages” on page A-7.

Table A-3. Troubleshooting Tips for the Ultrium Tape Drive

If the problem is this....	Do this....
A code displays on the single-character display.	The Ultrium Tape Drive detected an error or is directing you to an informational message. See Table 5-2 on page 5-19.
The status light or single-character display never turns on.	The Ultrium Tape Drive has not been properly terminated or has no power. If the SCSI bus is terminated externally, try a different terminator or use the drive’s internal termination. If the SCSI bus is terminated properly, check the power at the power source. Ensure the tape drive sled is connected properly, (see “Tape Drive Sled” on page 7-3). If the problem persists, replace the tape drive sled.
The Ultrium Tape Drive won’t load a tape cartridge.	<p>One of the following has occurred:</p> <ul style="list-style-type: none"> <li>• A tape cartridge is already inserted. To remove the cartridge, press the unload button. If the cartridge does not eject, turn off the power to Ultrium Tape Drive, then turn it back on and press the unload button.</li> <li>• The tape cartridge was inserted incorrectly. To properly insert a cartridge, see “Inserting a Tape Cartridge” on page A-17.</li> <li>• The tape cartridge was defective. Insert another tape cartridge. If the problem persists, replace the tape drive sled (see “Tape Drive Sled” on page 7-3).</li> <li>• The Ultrium Tape Drive has no power. Ensure the drive sled is plugged into the Library correctly. (See “Tape Drive Sled” on page 7-3.) If there are multiple drives in the library and the other drives are powered up correctly, suspect the power cable or power distribution card.</li> <li>• If the problem exists for multiple cartridges, the Ultrium Tape Drive is defective. Replace the tape drive (see “Tape Drive Sled” on page 7-3).</li> </ul>
The Ultrium Tape Drive won’t unload the tape cartridge.	The tape cartridge is stuck or is broken. Press the unload button. If the cartridge does not eject, turn off the power to Ultrium Tape Drive, then turn it back on. If the cartridge still does not eject, manually remove it (see “Removing a Tape Cartridge” on page B-1).
The host received TapeAlert messages.	See “TapeAlert Flags” on page A-1.
The host reported SCSI problems (such as selection or command time-outs, or parity errors).	See “Resolving Problems Reported to the Server” on page A-9.
A library reported an interface problem.	Run drive diagnostics. The drive sled or RS-422 circuitry may be defective. Refer to the section about running drive diagnostics in the <i>IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide</i> .
Codes display on the single-character display, but the status light doesn’t turn on.	The Ultrium Tape Drive is defective. Replace the tape drive sled, (see “Tape Drive Sled” on page 7-3).

## Methods of Receiving Errors and Messages

Use Table A-4 as a guide for identifying error and message codes reported to the Ultrium Tape Drive, library, or host.

**Note:** The codes on the single-character display have different meanings, depending on whether they display during normal operations or while the drive is in maintenance mode. Codes that occur during normal operations are defined in Table 5-2 on page 5-19. Codes that occur while in maintenance mode are defined in Table A-8 on page A-19

Table A-4. Methods of Receiving Errors and Messages for the Ultrium Tape Drive

If the error or message was presented by....	Do this....
The library's display (if the tape drive is enclosed in a library or autoloader)	See "Maintenance Starting Point" on page 4-2.
The tape drive's single-character display and the status light flashes yellow	See Table 5-2 on page 5-19. To determine the meaning of status light activity, see "Status Light" on page A-16.
The tape drive's single-character display and the status light is solid yellow	See Table A-8 on page A-19. To determine the meaning of status light activity, see "Status Light" on page A-16.
SCSI log sense data (such as TapeAlert flags) or request sense data at the host console	See "TapeAlert Flags" on page A-1, Table 5-2 on page 5-19, Chapter 9, "Messages", on page 9-1, Chapter 10, "Sense", on page 10-1, or "Using Host Sense Data" on page A-8.
Drive sense data sent to a library (if the tape drive is enclosed in a library)	See "Maintenance Starting Point" on page 4-2, Chapter 9, "Messages", on page 9-1, and Chapter 10, "Sense", on page 10-1, then see Table 5-2 on page 5-19
The tape drive's error log	See Table 5-2 on page 5-19 and "Viewing the Drive Error Log" on page A-9

## Descriptions and Corrective Actions for Errors and Messages

For a description of the errors and messages that pertain to the Ultrium Tape Drive, see "Drive Error Codes" on page 5-19.

## Using Host Sense Data

Table A-5 lists the hosts to which the Ultrium Tape Drive attaches. It gives the operating system for each host and describes how the host records errors from the Ultrium Tape Drive.

To determine the meaning of host sense data, see Chapter 9, “Messages”, on page 9-1 and Chapter 10, “Sense”, on page 10-1. Also refer to the *IBM Ultrium Device Drivers Installation and User’s Guide* or visit the web at <http://www.ibm.com/storage/1to>.

Table A-5. Host Method of Recording Tape Drive Errors

Host	Operating System	Method of Recording Tape Drive Errors
IBM AS/400 or iSeries	OS/400	Records tape drive errors and associated sense data in the AS/400 problem and error logs. View the logs by using the System Service Tools application and the userid QSRV.
IBM RS/6000, RS/6000/SP, or pSeries	AIX	Uses the IBM Atape device driver (provided with the Ultrium Tape Drive) to record tape drive errors and sense data in the host error log. View the host error log by using one or more of the following utilities: tapeutil, diag, smit, or errpt.
HP	HP-UX	Uses the IBM device driver for HP. Error and trace logging are proprietary to Hewlett-Packard.
Sun Microsystems	Solaris	Uses the IBM device driver for Solaris to post sense information to the Solaris host-wide messages file <code>/var/adm/messages</code> .
Intel-based PCs	Windows-based operating systems	Uses the NTUTIL device driver to log some sense data in the Event Viewer host log.

## Viewing the Drive Error Log

The Ultrium Tape Drive keeps an error log that you can use to identify and correct errors. The log contains the 10 most recent error codes, which appear (one at a time) on the single-character display.

To view the drive error log:

1. Make sure that no cartridge is in the drive.
2. Within a 1 second interval press the unload button 3 times. The status light becomes solid amber, indicating that the drive is in maintenance mode.

**Note:** If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

3. Press the unload button once per second until **9** appears in the single-character display.

**Note:** If you cycle past the desired code, press the unload button once per second until the code redisplay.

4. Press the unload button to view the most recent error code.
5. Refer to Table 5-2 on page 5-19 to determine the meaning of the code and the action to take.
6. Press the unload button to view the next error code. (The codes are ordered; the most recent is presented first and the oldest (tenth) is presented last. Each time you press the unload button to view an error, the single-character display turns on, the error displays, then the single-character display turns off.)
7. Continue to press the unload button until the 10 error codes have been displayed. After you display the tenth error code, the Ultrium Tape Drive automatically exits maintenance mode.

To re-display the error codes, repeat steps 1-7.

| This function is also available from the library's operator panel by selecting **Main Menu** → **Status** →  
| **Logs** → **Drive Log**.

---

## Resolving Problems Reported to the Server

### Fixing SCSI Bus Errors

**Note:** If you are using a Storage Area Network (SAN) Data Gateway to convert a drive with a SCSI interface to a Fibre Channel interface, ensure that the problem is occurring between the SAN Data Gateway and the drive by running the SCSI wrap test on the drive and running the SCSI loopback test on the SAN Data Gateway. (To run the SCSI wrap test, see Function Code 6 in Table A-8 on page A-19; to run the SCSI loopback test, refer to the section about that test in the *IBM Storage Area Network Gateway Module Setup, Operator, and Service Guide*.) If you are using a Fibre Channel drive and are having problems, see "Fixing Fibre Channel Errors" on page A-11.

### Fixing a Consistent Error with a Single Drive on a SCSI Bus

1. Ensure that the power is on to the Ultrium Tape Drive.
2. Ensure that the tape drive's SCSI address is the same as the SCSI address assigned by the server.
3. Run the SCSI wrap test (see Function Code 6 in Table A-8 on page A-19).
  - If the test runs successfully, replace the SCSI terminator first, then the SCSI cable and the interposer (if installed). Repeat the operation that caused the error. If you replaced the SCSI terminator or SCSI cable and the problem persists, the fault is with the server's hardware or software. To isolate the cause of the failure, refer to the server's service documentation.
  - If the test fails, replace the tape drive (see "Tape Drive Sled" on page 7-3).

## Fixing a Consistent Error with Multiple Drives on a SCSI Bus

When a consistent error occurs in a configuration that has multiple tape drives on the SCSI bus, you must determine if the problem exists with more than one tape drive. If the problem is with all of the devices on the SCSI bus, the bus is stuck in a SCSI phase and cannot change to another phase or the SCSI cable from the server to the first device is defective.

1. Ensure that the SCSI cable from the server to the first device is connected.
2. Disconnect all but the first tape drive on the SCSI bus. Move the terminator to the first SCSI device.
3. Run a device driver utility (such as IBM's *ntutil* or *tapeutil*) to determine whether the error will occur.
  - If the error occurs, run the SCSI wrap test on the first tape drive (see Function Code 6 in Table A-8 on page A-19).
    - If the test runs successfully, replace the SCSI terminator first, then the SCSI cable and the interposer (if installed) to the first tape drive. Repeat the operation that caused the error. If you replaced the SCSI terminator or SCSI cable and the problem persists, the fault is with the server's hardware or software. To isolate the cause of the failure, refer to the server's service documentation.
    - If the test fails, replace the tape drive (see "Tape Drive Sled" on page 7-3).
  - If the error does not occur, connect one tape drive at a time back to the bus and repeat step 3 for each tape drive until you can identify which drive is defective.

**Note:** Ensure that the SCSI terminator is always on the last tape drive on the SCSI bus.

4. Determine if the problem is with only one tape drive or with two or more tape drives.
  - If the problem is with only one tape drive, run the SCSI wrap test on that tape drive (see Function Code 6 in Table A-8 on page A-19).
    - If the test runs successfully, replace the SCSI terminator first, then the SCSI cable to that tape drive and interposer (if installed).
    - If the test fails, replace the tape drive (see "Tape Drive Sled" on page 7-3).
  - If the problem is with two or more tape drives, locate the first tape drive that has the error and replace the SCSI cable that connects the tape drive and the interposer (if installed).

## Fixing an Intermittent Error with a Single Drive on a SCSI Bus

1. Replace the SCSI terminator on the tape drive.
2. Run the operation that caused the error. If the problem persists, the problem may be with the cable.
3. Isolate which cable is causing the problem by replacing one cable at a time and running the operation that caused the error after each replacement. If the problem persists after all cables have been replaced, the problem may be with the Ultrium Tape Drive.
4. Replace the tape drive (see "Tape Drive Sled" on page 7-3). If the problem persists, the problem is with your server. Consult your server's documentation.

## Fixing an Intermittent Error with Multiples Drives on a SCSI Bus

Refer to the server's error logs to determine which tape drive is the source of the problem:

- If only one tape drive is reporting a SCSI failure, replace that tape drive (see "Tape Drive Sled" on page 7-3).
- If multiple tape drives are reporting SCSI failures, the problem may be with the terminator or the SCSI cables:
  - Replace the terminator and run the operation that caused the error. If the problem persists, the problem may be with the cables.
  - Isolate which cable is causing the problem by replacing one cable at a time and run the operation that caused the error after each replacement.

## Fixing Fibre Channel Errors

If you are connected to a Fibre Channel Storage Area Network (SAN) by using a SAN Data Gateway, use the *IBM Storage Area Network Gateway Module Setup, Operator, and Service Guide* to determine whether the problem is occurring between the drive and the SAN Data Gateway. If you are using a SCSI drive and are having SCSI problems, see “Fixing SCSI Bus Errors” on page A-9.

## Supported Topologies

The Ultrium 2 Tape Drive can be attached in a two-node configuration, either directly to a switch as a public device (switched fabric) or directly to a host bus adapter (HBA) as a private device. It can do so in a Point-to-Point topology (through an N\_port or F\_port) or Arbitrated Loop topology (through an L\_port or FL\_port).

The Ultrium 2 Tape Drive automatically configures to an L\_port or an N\_port when it boots. The type of port to which it configures depends on whether the drive recognizes the connection as a loop or a point-to-point connection:

- An L\_port supports a Fibre Channel Arbitrated Loop connection to an NL\_port or FL\_port.
- An N\_port supports direct connection to another N\_port or to an F\_port (for example, a director-class switch) in a point-to-point topology.

Regardless of the port to which you connect the drive, it automatically configures to a public device (through an F\_port or FL\_port to a switch) or to a private device (through an N\_port or L\_port by using direct attachment to a server).

Table A-6 lists the topologies in which the Ultrium 2 Tape Drive can operate, the Fibre Channel server connections that are available, and the port (NL, N, FL, or F) through which communication must occur.

Table A-6. Choosing the port for your topology and Fibre Channel connection

Type of Topology	Type of Fibre Channel Connection to Server	
	Direct Connection (Private)	Switched Fabric (Public)
Fibre Channel-Arbitrated Loop (can be Two-Node Arbitrated Loop or Two-Node Switched Fabric Loop; is limited to two nodes)	L_Port	FL_Port
Point-to-Point (two nodes)	N_Port	F_Port

## Starting Problem Determination

Before starting the problem determination, perform the following steps:

1. Determine the type of Fibre Channel topology that you are using (see page A-11). Ensure that the drive and the port to which it is attached are configured in compatible topologies.
2. Using this guide or the service guides of associated switch, hub, or fiber products, try to determine where the problem exists (whether in the drive, cable, or the device to which the drive and cable attach).
3. Ensure that the configuration and software levels are supported (to determine the latest supported attachments or to get a comprehensive list of compatible software, perform one of the following):
  - Visit the web at <http://www.ibm.com/storage/lto>. Select LTO support, then Interoperability matrix and software (ISVs). Under Supported servers and operating systems or Supported storage management software, select IBM 3583 (Models) Tape Library.
  - Contact your IBM Sales Representative.
4. Ensure that the Fibre Channel cables are installed correctly. Refer to the appropriate steps about cabling in the installation section of the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.

5. Go to one of the following procedures:
  - “Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop”
  - “Fixing a Consistent Error with Multiple Drives on a Fibre Channel Loop”
  - “Fixing a Consistent Error in a Point-to-Point Topology” on page A-13
  - “Fixing Intermittent Fibre Channel Errors” on page A-14

### **Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop**

1. Ensure that the tape drive is powered on.
2. Verify that the tape drive’s serial number is the same as the drive serial number that the server program is using.
3. Ensure that the drive’s Fibre Channel AL\_PA is set correctly, that it is on the loop, and that it is not being used by another device (see the section about setting Fibre Channel Loop IDs in the installation chapter of the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*). The tape drive must be able to detect light and communicate with the server.
4. Run the Fibre Channel wrap test at the drive’s Fibre Channel connector (see Function Code 6 in Table A-8 on page A-19).
  - If the test fails, replace the tape drive.
  - If the test is successful, go to step 5.
5. Run the Fibre Channel wrap test at the end of the fiber cable (see Function Code 6 in Table A-8 on page A-19).
  - If the test fails, replace the fiber cable.
  - If the test is successful, go to step 6.
6. Check the Fibre Channel cable connection at the server.
7. Using a device driver utility such as *ntutil* or *tapeutil*, verify that the drive is properly configured and available at the server.
8. If the problem persists, the fault may be with the server’s hardware or software. Refer to your server’s service manual.
9. When the problem is corrected (or determined to be a server problem), restore all of the fiber cables to their correct position.

### **Fixing a Consistent Error with Multiple Drives on a Fibre Channel Loop**

Use the following procedure to determine if all of the drives on the Fibre Channel have the problem:

1. Use a device driver utility (such as *ntutil* or *tapeutil*) to verify that the drive is available and properly configured at the server.
2. Determine the type of Fibre Channel topology that you are using (see “Supported Topologies” on page A-11).
3. Using this guide or the service guides of associated switch, hub, or fiber products, try to isolate which part of the Fibre Channel Storage Area Network (SAN) is experiencing problems.
4. Perform one of the following:
  - If the problem exists on a small number of drives, go to “Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop”.
  - If the problem exists with a large number of drives, perform the following steps:
    - a. Disconnect all except one failing drive on the Fibre Channel.
    - b. Run the Fibre Channel wrap test to determine if a failure occurs on that drive (see Function Code 6 in Table A-8 on page A-19). If it does, perform the procedure in “Fixing a Consistent Error with a Single Drive on a Fibre Channel Loop”.
    - c. Continue to connect one drive at a time to the Fibre Channel loop.
5. When the problem is corrected, restore all of the Fibre Channel cables to their correct position.

## | **Fixing a Consistent Error in a Point-to-Point Topology**

- | 1. Ensure that the tape drive is powered on.
- | 2. Verify that the tape drive's serial number is the same as the drive serial number that the server program is using.
- | 3. Ensure that the drive is connected to the host or switch. The drive must be able to detect light and communicate with the server.
- | 4. Run the Fibre Channel wrap test at the drive's Fibre Channel connector (see Function Code 6 in Table A-8 on page A-19).
  - | • If the test fails, replace the tape drive.
  - | • If the test is successful, go to step 5.
- | 5. Run the Fibre Channel wrap test at the end of the fiber cable (see Function Code 6 in Table A-8 on page A-19).
  - | • If the test fails, replace the fiber cable.
  - | • If the test is successful, go to step 6.
- | 6. Check the Fibre Channel cable connection at the server.
- | 7. Using a device driver utility such as *ntutil* or *tapeutil*, verify that the drive is properly configured and available at the server.
- | 8. If the problem persists, the fault may be with the server's hardware or software. Refer to your server's service manual.
- | 9. When the problem is corrected (or determined to be a server problem), restore all of the fiber cables to their correct position.

## Fixing Intermittent Fibre Channel Errors

1. Determine the type of Fibre Channel topology that you are using (see “Supported Topologies” on page A-11).
2. Ensure that the configuration and software levels are supported (to determine the latest supported attachments or to get a comprehensive list of compatible software, perform one of the following):
  - Visit the web at <http://www.ibm.com/storage/lto>. Select LTO support, then Interoperability matrix and software (ISVs). Under Supported servers and operating systems or Supported storage management software, select IBM 3583 (Models) Tape Library.
  - Contact your IBM Sales Representative.
3. Check that each Fibre Channel cable does not exceed 500 m (1640 ft).
4. Ensure that all Fibre Channel cables are installed correctly. Refer to the appropriate steps about cabling in the installation section of the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Setup and Operator Guide*.
5. Using this guide or the service guides of associated switch, hub, or fiber products, determine that a problem exists between the drive, drive cable, and the device to which they attach. Try to isolate which part of the Storage Area Network (SAN) is experiencing problems.
6. Using this guide or the service guides of associated switch, hub, or fiber products, verify that the SAN configurations are correct (such as switch zoning for drive sharing).
7. Obtain all errors reported by the drive to the server (see “Using Host Sense Data” on page A-8), then contact your OEM Product Application Engineer (PAE) for error analysis.

---

## Resolving Media-Related Problems

To resolve problems that are related to media, the Ultrium Tape Drive includes:

- Test Cartridge & Media diagnostic that verifies whether a suspect cartridge and its magnetic tape are acceptable for use (see Function E in Table A-8 on page A-19).
- A Statistical Analysis and Reporting System (SARS) to assist in isolating failures between media and hardware. To determine the cause of failure, SARS uses the cartridge performance history that is saved in the cartridge memory (CM) and the drive performance history that is kept in the drive’s flash erasable programmable read-only memory (EPROM). Any failures that SARS detects are reported as TapeAlert flags on the host (see “TapeAlert Flags” on page A-1).

**Attention:** If you insert the IBM LTO Ultrium Data Cartridge into another manufacturer’s tape drive, the SARS data in the cartridge memory may become lost or invalid.

If you encounter a media-related problem, use the following procedure:

**Attention:** When you run the Test Cartridge & Media diagnostic, data on the suspect tape is overwritten. Similarly, use only a scratch data cartridge when you run tape drive diagnostics; the test overwrites data on the cartridge.

1. If possible, run the tape cartridge in a different tape drive. If the operation in the other tape drive fails and **6** or **7** displays, replace the media. If the operation succeeds, run the Test Cartridge & Media diagnostic (see Function Code E in Table A-8 on page A-19).
2. If the Test Cartridge & Media diagnostic fails, replace the media. If it runs successfully, clean the tape drive and run the tape drive diagnostics (see the section about running drive diagnostics in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide* and Function Code 1 in Table A-8 on page A-19).
3. If the tape drive diagnostics fail, replace the tape drive sled, see “Tape Drive Sled” on page 7-3. If the tape drive diagnostics run successfully, perform the operation that produced the initial media error.

---

## Operating the Tape Drive

**Attention:** Before you use a tape cartridge, acclimate it to the operating environment for 24 hours or the time necessary to prevent condensation on the cartridge or in the drive (the time will vary, depending on the environment extremes to which the cartridge and drive were exposed).

When operating the Ultrium Tape Drive, refer to Figure A-2 which shows the front of the unit.

- |          |               |          |                          |
|----------|---------------|----------|--------------------------|
| <b>1</b> | Unload button | <b>3</b> | Single-character display |
| <b>2</b> | Status light  |          |                          |

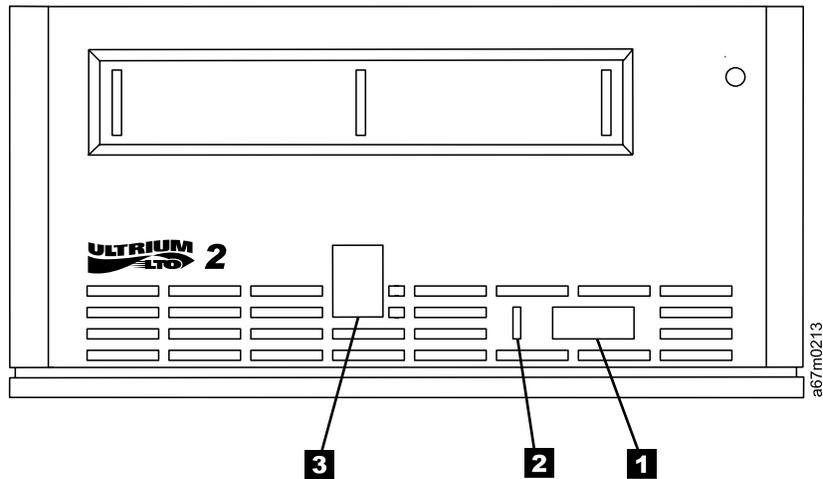


Figure A-2. Front view of the Ultrium Tape Drive

## Status Light

The status light ( **2** in Figure A-2 on page A-15) is a light-emitting diode (LED) that provides information about the state of the Ultrium Tape Drives. The light can be green or amber, and (when lit) solid or flashing. Table A-7 lists the conditions of the status light and provides an explanation of what each condition means.

Table A-7. Meaning of Status Light Activity

Color and Condition of Status Light	Meaning
Off	The tape drive has no power or is powered off.
Green/Solid	The tape drive is powered on and is idle.
Green/Flashing	The tape drive is reading from the tape, writing to the tape, rewinding the tape, locating data on the tape, loading the tape, or unloading the tape. The status light also flashes green if the tape drive contains a cartridge during the power-on cycle. In this case, the drive completes POST and slowly rewinds the tape (the process may take approximately 13 minutes). The light stops blinking and becomes solid when the drive completes the recovery and is ready for a read or write operation. To eject the cartridge, press the unload button.
Amber/Solid	The tape drive is powering on, is resetting, or is in maintenance mode. For information about the functions that are available when the drive is in maintenance mode, see “Selecting a Diagnostic or Maintenance Function” on page A-19.
Amber/Flashing	One of the following applies: <ul style="list-style-type: none"> <li>• If the light flashes once per second, an error occurred and the tape drive or media may require service. Note the code on the single-character display, then go to Table 5-2 on page 5-19 to determine the action that is required. If a solid C appears in the single-character display, the drive needs cleaning.</li> <li>• If the light flashes twice per second, the tape drive is updating firmware. For more information, see “Updating Firmware” on page 8-4.</li> <li>• If the light flashes four times per second, the tape drive detected an error and is performing a firmware recovery. It resets automatically.</li> </ul>

## Unload Button

The unload button ( **1** in Figure A-2 on page A-15) enables you to perform the following functions:

- Rewind the tape into the cartridge and eject the cartridge from the tape drive. For more information, see “Removing a Tape Cartridge” on page A-18.
- Enter or exit maintenance mode, or perform diagnostic or maintenance functions. For more information, see “Selecting a Diagnostic or Maintenance Function” on page A-19.
- Perform a panic reset of the drive. **Attention:** If the tape drive detected a permanent error and displayed an error code, it automatically forces a drive dump (also known as a save of the firmware trace). If you perform a panic reset of the drive, the existing dump will be overwritten and lost. To perform a panic reset, press and hold the unload button on the drive for 10 seconds. The drive forces a dump and overwrites the existing dump. The drive then reboots to allow communication.

## Single-Character Display

The Ultrium Tape Drive features a light-emitting diode (LED) ( **3** in Figure A-2 on page A-15) that presents a single-character code for:

- Diagnostic or maintenance functions
- Error conditions and informational messages

Table A-8 on page A-19 lists each single-character code used for diagnostic or maintenance functions. Table 5-2 on page 5-19 lists the codes for error conditions and informational messages. If multiple errors

occur, the code with the highest priority (represented by the lowest number) displays first. When the error is corrected, the code with the next highest priority displays, and so on until no errors remain.

### Single Red Dot

The single-character display is blank during normal operation. However, if a drive dump is present while the drive is in maintenance mode, a single red dot illuminates on the display. This indicator is for use by IBM Support personnel. To copy the dump to tape, see Function Code 5 in Table A-8 on page A-19.

The red dot turns off when you obtain the dump (by using a data cartridge, a SCSI command, or a library command). If no dump is present while the drive is in maintenance mode, the single red dot does not illuminate.

## Inserting a Tape Cartridge

To insert a tape cartridge:

1. Ensure that the Ultrium Tape Drive is powered-on.
2. Ensure that the write-protect switch is properly set (see Figure A-1 on page A-4).
3. Grasp the cartridge so that the write-protect switch faces you (see **1** in Figure A-3).
4. Slide the cartridge into the tape load compartment.

#### Notes:

- a. If the cartridge is already in an ejected position and you want to reinsert it, remove the cartridge then insert it again.
- b. If the cartridge is already loaded and you cycle the power (turn it off, then on), the tape will reload.

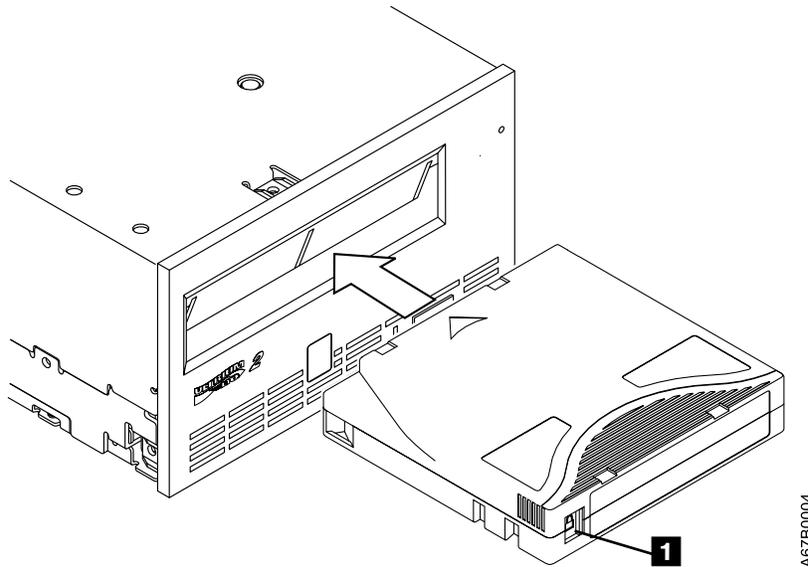


Figure A-3. Inserting a Cartridge into the Ultrium Tape Drive

## Removing a Tape Cartridge

To remove a tape cartridge:

1. Ensure that the Ultrium Tape Drive is powered on.
2. Press the unload button. The drive rewinds the tape and partially ejects the cartridge. The status light flashes green while the tape rewinds, then goes out before the cartridge partially ejects.
3. After the cartridge partially ejects, grasp the cartridge and remove it.

If you are unable to remove the cartridge, see “Removing a Tape Cartridge” on page B-1. Whenever you unload a tape cartridge, the Ultrium Tape Drive writes any pertinent information to the cartridge memory.

## Cleaning the Drive Head

| **Attention:** To clean the drive head, use the IBM TotalStorage Cleaning Cartridge (Ultrium LTO 2), the IBM LTO Ultrium Cleaning Cartridge, or an IBM-approved cleaning cartridge.

| Clean the drive head whenever **C** displays on the single-character display and the status light flashes amber. To clean the head, insert the cleaning cartridge into the tape load compartment (see Figure A-3 on page A-17). The drive performs the cleaning automatically. When the cleaning is finished, the drive ejects the cartridge. The cleaning cartridges are generally valid for 50 uses.

### | **Automatic Cleaning**

| Automatic cleaning enables the Ultrium Scalable Tape Library to automatically respond to any tape drive's request for cleaning and to begin the cleaning process. Automatic cleaning makes the cleaning process transparent to any host application that uses the library. You can enable or disable automatic cleaning by using the library's operator panel. The setting is stored in non-volatile memory and becomes the default during subsequent power-on cycles. The cleaning cartridge must be located in a nonaddressable storage slot. For more information, see the section about enabling or disabling automatic cleaning in the *IBM TotalStorage Ultrium Scalable Tape Library 3583 Planning and Operator Guide*.

## Selecting a Diagnostic or Maintenance Function

The Ultrium 2 Tape Drive can run diagnostics, test write and read functions, test a suspect tape cartridge, update its own firmware, and perform other diagnostic and maintenance functions listed in Table A-8. The drive must be in maintenance mode to perform these functions. To place the drive in maintenance mode and to select a function, see Table A-8.

**Attention:** Maintenance functions cannot be performed concurrently with read or write operations. While in maintenance mode, the Ultrium 2 Tape Drive does not receive SCSI commands from the host.

Table A-8. Diagnostic and maintenance functions

Function Code 1 - Run SCSI or Fibre Channel Tape Drive Diagnostics
--

Causes the tape drive to run self tests.
--

<b>Attention:</b> Insert only a scratch data cartridge for this test. Data on the cartridge will be overwritten.
--

- |  |
|--|
| <ol style="list-style-type: none"><li>1. Make sure that no cartridge is in the drive.</li><li>2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.</li><li>3. Press the unload button once per 1.5 seconds until <b>1</b> appears in the single-character display. If you cycle past <b>1</b>, continue to press the unload button until it redisplay.</li><li>4. To select the function, press and hold the unload button for 3 seconds. After you select the function, <b>1</b> flashes, the drive runs diagnostics for approximately 90 seconds, then <b>C</b> flashes. When <b>C</b> flashes, the drive is waiting for a cartridge.</li><li>5. Within 60 seconds, insert a scratch data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, <b>1</b> flashes:<ul style="list-style-type: none"><li>• If the diagnostic completes successfully, it begins again and runs for a maximum of 10 times. Each loop takes approximately 20 minutes to run. After the tenth loop, the diagnostic stops and automatically exits maintenance mode. To halt the diagnostic, press the unload button within the first 20 minutes of the test (or the diagnostic will run another 20 minutes). The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The diagnostic continues to the end of its loop and then stops. The tape drive then displays <b>0</b>, rewinds and unloads the cartridge, and exits maintenance mode.</li><li>• If the diagnostics fail, the status light flashes amber and an error code displays. The tape drive unloads the tape cartridge and exits maintenance mode. To resolve the error, locate the code in Table 5-2 on page 5-19.</li></ul></li></ol> |
|--|

Table A-8. Diagnostic and maintenance functions (continued)

**Function Code 2 - Update Tape Drive Firmware from FMR Tape**

Causes the tape drive to load updated firmware from a field microcode replacement (FMR) tape.

**Attention:** Do not power-off the tape drive while loading code.

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until 2 appears in the single-character display. If you cycle past 2, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the FMR tape cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, 2 flashes and the tape drive loads the updated firmware from the FMR tape cartridge into its erasable programmable read-only memory (EPROM) area:
  - If the update completes successfully, the tape drive displays 0, rewinds and unloads the FMR tape, resets itself, and is ready to use the new firmware.
  - If the update fails, the tape drive posts an error code to the single-character display (to resolve the error, see Table 5-2 on page 5-19). The drive then unloads the FMR tape and exits maintenance mode.

**Function Code 3 - Create FMR Tape**

Causes the tape drive to copy its field microcode replacement (FMR) data to a scratch data cartridge.

**Attention:** If you select this function, the tape drive will overwrite existing data on the scratch data cartridge.

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until 3 appears in the single-character display. If you cycle past 3, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge that is not write protected (or the tape drive exits maintenance mode). After you insert the cartridge, 3 flashes and the tape drive copies the FMR data to the scratch data cartridge:
  - If the tape drive creates the FMR tape successfully, it displays 0, rewinds and unloads the new FMR tape, and exits maintenance mode.
  - If the tape drive fails to create the FMR tape, it displays 7, unloads the FMR tape, and exits maintenance mode.

Table A-8. Diagnostic and maintenance functions (continued)

**Function Code 4 - Force a Drive Dump**

Causes the tape drive to perform a collection (or *dump*) of data. (A drive dump is also known as a save of the firmware trace.) The dump (firmware trace) can only be analyzed by IBM.

**Note:** When an error code displays, a red dot also displays to remind you that a dump already exists. If you perform Function Code 4, it will overwrite the dump and cause the error information to be lost.

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until 4 appears in the single-character display. If you cycle past 4, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, 4 displays, followed by 0. The single-character display then goes blank, and the tape drive exits maintenance mode.

An illuminated red dot on the single-character display indicates that a drive dump has been created. To retrieve the dump from the drive, see Function Code 5 on page A-21.

You can also perform this operation when the tape drive is in normal operating mode. Simply press and hold the unload button for 10 seconds.

**Function Code 5 - Copy the Drive Dump to Tape (at Beginning of Tape)**

Causes the tape drive to copy data from a drive dump (captured with Function Code 4) to the beginning of a scratch data cartridge. An illuminated red dot on the single-character display indicates that a drive dump has been created.

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until 5 appears in the single-character display. If you cycle past 5, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge that is not write-protected (or the tape drive exits maintenance mode). After you insert the cartridge, 5 flashes and the tape drive writes the dump data to the tape (at the beginning of the tape). When the function is complete, 0 displays, the drive rewinds and unloads the tape, and exits maintenance mode.

From the server, issue the SCSI READ command to read the dump from the tape to a file or electronic image. For information about where to send the electronic image, contact your OEM Product Application Engineer (PAE).

Table A-8. Diagnostic and maintenance functions (continued)

### Function Code 6 - Run SCSI or Fibre Channel Wrap Test

Causes the drive to perform one of the following:

- A check of the SCSI circuitry from and to the SCSI connector
- A check of the Fibre Channel circuitry from and to the Fibre Channel connector or fiber cable

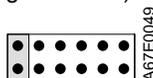
To run the test, determine whether your drive uses a SCSI or Fibre Channel interface, then choose one of the following procedures.

#### Running a SCSI Wrap Test

This test evaluates the SCSI circuitry. A SCSI LVD wrap plug, a SCSI LVD terminator, and a Y-cable are required for this procedure.

**Note:** You can terminate the Generation 1 drive internally while running the SCSI wrap test. Internal termination is not built into the Generation 2 drive, therefore you must run the SCSI wrap test by using a Y-cable and external termination.

Before you select this function, you must configure the drive to supply term power, terminate the SCSI bus, and attach the SCSI wrap plug. Configure the drive to supply term power by placing a jumper on pin 6 of the drive's SCSI ID connector (as shown by the shaded area in the figure below).



Connect a Y-cable to the drive's SCSI connector. Place a terminator on one end of the Y-cable and the wrap plug on the other end.

1. Ensure that the drive does not contain a cartridge.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until **6** appears in the single-character display. If you cycle past **6**, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:
  - If the test is successful, it loops and begins again. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop, then stops. **0** displays and the drive exits maintenance mode. To continue to isolate the problem, go to "Fixing SCSI Bus Errors" on page A-9 and locate the steps to take after you run the SCSI wrap test.
  - If the test fails, **8** displays, the test stops, and the tape drive exits maintenance mode. To resolve the error, replace the tape drive (see "Tape Drive Sled" on page 7-3).

Table A-8. Diagnostic and maintenance functions (continued)

### **Running a Fibre Channel Wrap Test**

This test evaluates the Fibre Channel circuitry at the drive's Fibre Channel connector, then at the fiber cable. A Fibre Channel wrap plug is required for this procedure. To run the wrap test through the fiber cable, a duplex adapter is required.

All cables and wrap plugs are hot-pluggable (that is, they can be removed from or added to the drive while the drive or its enclosure is powered-on). Do not bend the fiber cable more than a radius of 50.8 mm (2 in.) or the optical fiber may break.

1. Take all devices on the Fibre Channel offline (for instructions, refer to your server's documentation).
2. Make sure that no cartridge is in the drive.
3. Disconnect the fiber cable from the drive and replace it with the Fibre Channel wrap plug. (When you disconnect the cable, the connection to the Fibre Channel loop may break, but will be restored at the end of the procedure when you reconnect the cable. For other devices on the loop, operations may temporarily be disrupted.)

**Attention:** Do not run the wrap test while the drive is connected to a Fibre Channel loop. This could disturb the Fibre Channel loop and cause performance or I/O problems.

4. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.  
**Note:** If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, remove the cartridge and repeat this step.
5. Press the unload button once per 1.5 seconds until **6** appears in the single-character display.  
**Note:** If you cycle past **6**, press the unload button once per second until it redisplay.

### **Testing the Circuitry at the Drive's Fibre Channel Connector**

6. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:
  - If the test is successful, the circuitry at the drive's Fibre Channel connector is working properly. The test loops and begins again. Press the unload button. **0** displays and the tape drive exits maintenance mode. Continue to step 7 to test the fiber cable.
  - If the test fails, an error code displays and the status light flashes amber. The test stops and the drive exits maintenance mode. To resolve the error, locate the code in Table 5-2 on page 5-19.
7. Disconnect the Fibre Channel wrap plug from the drive.

### **Testing the Circuitry at the Fiber Cable**

8. Connect the duplex adapter, then the Fibre Channel wrap plug to the end of the fiber cable.  
**Note:** The Fibre Channel wrap test can only be run on cable lengths up to 250 meters (820 ft).
9. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.  
**Note:** If a cartridge is in the drive, it will eject the first time that you press the unload button and the drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, remove the cartridge and repeat this step.
10. Press the unload button once per 1.5 seconds until **6** appears in the single-character display.  
**Note:** If you cycle past **6**, press the unload button once per second until it redisplay.
11. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive automatically starts the test:
  - If the test is successful, the drive and the cable are working properly. The problem is at the server. To resolve the error, refer to the service guide for the server.
  - If the test fails, replace the fiber cable.
12. Remove the Fibre Channel wrap plug and the duplex adapter, and reconnect the fiber cable.

Table A-8. Diagnostic and maintenance functions (continued)

**Function Code 7 - Run LDI or RS-422 Wrap Test**

Causes the tape drive to perform a check of the circuitry from and to the LDI or RS-422 connector.

Before you select this function, attach an LDI or RS-422 wrap plug to the tape drive's LDI or RS-422 connector (in place of the LDI or RS-422 cable).

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until 7 appears in the single-character display. If you cycle past 7, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, 7 flashes and the tape drive automatically starts the test:
  - If the test is successful, it loops and begins again. To halt the test, press the unload button. The test continues to the end of its loop and then stops. The tape drive then displays 0 and exits maintenance mode.
  - If the test fails, 9 displays, the test stops, and the tape drive exits maintenance mode. To resolve the error, locate 9 in Table 5-2 on page 5-19.

**Function Code 8 - Convert FMR Tape to Scratch Tape**

Causes the tape drive to erase the field microcode replacement (FMR) data on a scratch data cartridge and rewrite the cartridge memory on the tape. This turns the cartridge into a valid scratch data cartridge.

1. Make sure that no cartridge is in the drive.
2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.
3. Press the unload button once per 1.5 seconds until 8 appears in the single-character display. If you cycle past 8, continue to press the unload button until it redisplay.
4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the FMR cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, 8 flashes, the tape drive erases the firmware on the tape, then rewrites the header in the cartridge memory to change the cartridge to a valid scratch data cartridge:
  - If the operation is successful, the tape drive displays 0, rewinds and ejects the newly converted scratch data cartridge, and exits maintenance mode.
  - If the operation is not successful, an error code displays. To resolve the error, locate the code in Table 5-2 on page 5-19.

Table A-8. Diagnostic and maintenance functions (continued)

<p><b>Function Code 9 - Display Error Code Log</b></p> <p>Causes the tape drive to display the last 10 error codes, one at a time (the codes are ordered; the most recent is presented first and the oldest (tenth) is presented last).</p> <ol style="list-style-type: none"> <li>1. Make sure that no cartridge is in the drive.</li> <li>2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.</li> <li>3. Press the unload button once per 1.5 seconds until <b>9</b> appears in the single-character display. If you cycle past <b>9</b>, continue to press the unload button until it redisplay.</li> <li>4. To select the function, press and hold the unload button for 3 seconds. After you select the function, press the unload button to view the most recent error code. Press the unload button again to view successive error codes. If you press the unload button for 3 seconds after the tenth error code displays, <b>0</b> displays (if there are no errors in the log) and the drive exits maintenance mode.</li> </ol>
<p><b>Function Code A - Clear Error Code Log</b></p> <p>Causes the tape drive to erase the contents of the error code log.</p> <ol style="list-style-type: none"> <li>1. Make sure that no cartridge is in the drive.</li> <li>2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.</li> <li>3. Press the unload button once per 1.5 seconds until <b>A</b> appears in the single-character display. If you cycle past <b>A</b>, continue to press the unload button until it redisplay.</li> <li>4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the tape drive erases all errors from the error code log, displays <b>0</b>, then exits maintenance mode.</li> </ol>
<p><b>Function Code C - Insert Cartridge into Tape Drive</b></p> <p>This function cannot be selected by itself. It relates to other maintenance functions (such as Run Tape Drive Diagnostics or Create FMR Tape) that require an FMR tape cartridge or scratch tape cartridge that is not write protected.</p>

Table A-8. Diagnostic and maintenance functions (continued)

<p><b>Function Code E - Test Cartridge &amp; Media</b></p> <p>Causes the tape drive to perform a Write/Read test (on the edge bands) to ensure that a suspect cartridge and its magnetic tape are acceptable. The tape drive takes approximately 10 minutes to run the test.</p> <p><b>Attention:</b> Data on the suspect tape will be overwritten.</p> <ol style="list-style-type: none"> <li>1. Make sure that no cartridge is in the drive.</li> <li>2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.</li> <li>3. Press the unload button once per 1.5 seconds until E appears in the single-character display. If you cycle past E, continue to press the unload button until it redisplay.</li> <li>4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the suspect data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, E flashes and the test begins: <ul style="list-style-type: none"> <li>• If no error is detected, the test begins again and runs for a maximum of 10 times. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays 0, and exits maintenance mode.</li> <li>• If an error is detected, the tape drive displays 7, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate 7 in Table 5-2 on page 5-19.</li> </ul> </li> </ol>
<p><b>Function Code F - Fast Read/Write Test</b></p> <p>Causes the tape drive to perform tests to ensure that the drive can read from and write to tape. This diagnostic performs fewer tests than the Run Tape Drive Diagnostics test (Function Code 1). The tape drive takes approximately three minutes to run the test. The Fast Read/Write Test is not as comprehensive a test and is not recommended for isolating errors between the drive and the media.</p> <p><b>Attention:</b> Data on the suspect tape will be overwritten.</p> <ol style="list-style-type: none"> <li>1. Make sure that no cartridge is in the drive.</li> <li>2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.</li> <li>3. Press the unload button once per 1.5 seconds until F appears in the single-character display. If you cycle past F, continue to press the unload button until it redisplay.</li> <li>4. To select the function, press and hold the unload button for 3 seconds. After you select the function, C flashes. When C flashes, the drive is waiting for a cartridge. Within 60 seconds, insert the suspect data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, F flashes and the test begins. <ul style="list-style-type: none"> <li>• If no error is detected, the test begins again and runs for a maximum of 10 times. Each loop takes approximately 3 minutes to run. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays 0, and exits maintenance mode.</li> <li>• If an error is detected, the tape drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate the code in Table 5-2 on page 5-19.</li> </ul> </li> </ol>

Table A-8. Diagnostic and maintenance functions (continued)

<p><b>Function Code H - Test Head</b></p> <p>Causes the tape drive to perform the Head Resistance Measurements test and a Write/Read test (on the center of the tape). The drive runs these tests to ensure that the tape drive's head and tape-carriage mechanics are working correctly. The tape drive takes approximately 10 minutes to run the test.</p> <ol style="list-style-type: none"> <li>1. Make sure that no cartridge is in the drive.</li> <li>2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.</li> <li>3. Press the unload button once per 1.5 seconds until <b>H</b> appears in the single-character display. If you cycle past <b>H</b>, continue to press the unload button until it redisplay.</li> <li>4. To select the function, press and hold the unload button for 3 seconds. After you select the function, <b>C</b> flashes. When <b>C</b> flashes, the drive is waiting for a cartridge. Within 60 seconds, insert a scratch data cartridge (or the tape drive exits maintenance mode). After you insert the cartridge, <b>H</b> flashes and the test begins: <ul style="list-style-type: none"> <li>• If no error is detected, the test begins again and runs for a maximum of 10 times. Each loop takes approximately 10 minutes to run. After the tenth loop, the test stops and the drive automatically exits maintenance mode. To halt the test, press the unload button. The drive acknowledges the request by slowing the length of time that the currently displayed character flashes on the single-character display (from twice per second to once per second). The test continues to the end of its loop and then stops. The tape drive then rewinds and unloads the cartridge, displays <b>0</b>, and exits maintenance mode.</li> <li>• If an error is detected, the tape drive displays <b>5</b>, unloads the tape cartridge, and exits maintenance mode. To resolve the error, locate <b>5</b> in Table 5-2 on page 5-19.</li> </ul> </li> </ol>
<p><b>Function Code L - Reserved for Future Use</b></p> <p>Reserved for future use.</p>
<p><b>Function Code P or U - Enable or Disable Post Error Reporting</b></p> <p>Used by support personnel during error detection, this function is an alternate method of setting or preventing the post error (PER) bit in the SCSI Read-Write Error Recovery Page. For more information, refer to the MODE SENSE command in the <i>IBM TotalStorage LTO Ultrium Tape Drive SCSI Reference</i>.</p> <ol style="list-style-type: none"> <li>1. Make sure that no cartridge is in the drive.</li> <li>2. Within a 1.5-second interval, press the unload button three times. The status light becomes solid amber, which means that the drive is in maintenance mode.</li> <li>3. Perform one of the following: <ul style="list-style-type: none"> <li>• To enable post error reporting, press the unload button once per 1.5 seconds until <b>U</b> appears in the single-character display. If you cycle past <b>U</b>, continue to press the unload button until it redisplay.</li> <li>• To disable post error reporting, press the unload button once per 1.5 seconds until <b>P</b> appears in the single-character display. If you cycle past <b>P</b>, continue to press the unload button until it redisplay.</li> </ul> </li> <li>4. To select the function, press and hold the unload button for 3 seconds. After you select the function, the drive displays one of the following: <ul style="list-style-type: none"> <li>• <b>P</b> to indicate that post error reporting is enabled.</li> <li>• <b>U</b> to indicate that post error reporting is disabled.</li> </ul> </li> </ol>

### Exiting Maintenance Mode

To manually exit maintenance mode, press the unload button once per second until **0** appears on the single-character display. Press and hold the unload button for 3 seconds. The drive exits maintenance mode (the solid amber status light turns off).

## Repositioning or Reattaching a Leader Pin



**Attention:** Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

If the leader pin in your cartridge becomes dislodged from its pin-retaining spring clips or detaches from the tape, you must use the IBM Leader Pin Reattachment Kit (part number 08L9129) to reposition or reattach it. (Do not reattach the pin if you must remove more than 7 meters (23 feet) of leader tape.) The sections that follow describe each procedure.

### Repositioning a Leader Pin

A leader pin that is improperly seated inside a cartridge can interfere with the operation of the drive. Figure A-4 shows a leader pin in the incorrect **1** and correct **2** positions.

To place the leader pin in its proper position, you will need the following tools:

- Plastic or blunt-end tweezers
- Cartridge manual rewind tool (from Leader Pin Reattachment Kit, part number 08L9129)

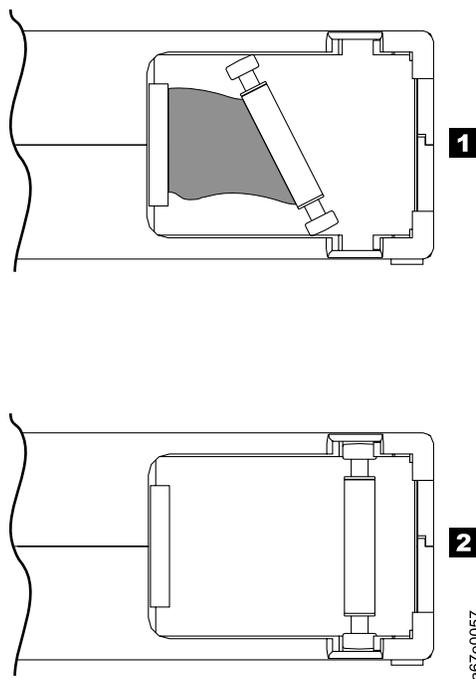


Figure A-4. Leader pin in the incorrect and correct positions. The cartridge door is open and the leader pin is visible inside the cartridge.

- To reposition the leader pin, perform the following steps.
- Slide open the cartridge door ( **1** in Figure A-5) and locate the leader pin ( **2** ) (you may need to shake the cartridge gently to roll the pin toward the door).
  - With plastic or blunt-end tweezers, grasp the leader pin and position it in the pin-retaining spring clips ( **3** ).
  - Press the leader pin gently into the clips until it snaps into place and is firmly seated. Ensure that there are no gaps in the seam of the cartridge ( **4** ).
- Attention:** If gaps exist, do not continue with this procedure and do not use the cartridge. Instead, contact your OEM Product Application Engineer (PAE).
- Close the cartridge door.

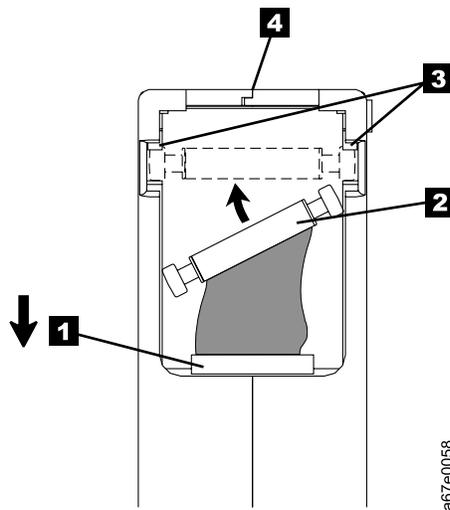


Figure A-5. Placing the dislodged leader pin into the correct position. The cartridge door is open to show the leader pin.

- To rewind the tape, insert the cartridge manual rewind tool ( **1** in Figure A-6) into the cartridge's hub ( **2** ) and turn it clockwise until the tape becomes taut.

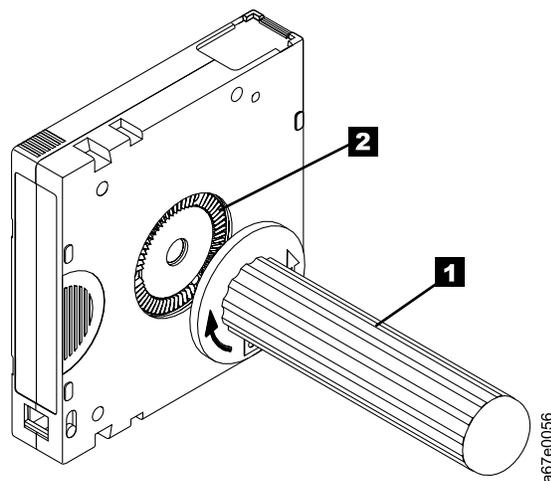


Figure A-6. Rewinding the tape into the cartridge

- Remove the rewind tool by pulling it away from the cartridge.

## Reattaching a Leader Pin

The first meter of tape in a cartridge is leader tape. Once the leader tape has been removed there is a possibility of tape breakage. After reattaching the leader pin, transfer data from the defective tape cartridge. **Do not reuse the defective tape cartridge.**

The Leader Pin Reattachment Kit contains three parts:

- **Leader pin attach tool** (see **1** in Figure A-7). A plastic brace that holds the cartridge door open.
- **Cartridge manual rewind tool** (see **2** in Figure A-7). A device that fits into the cartridge's hub and lets you wind the tape into and out of the cartridge.
- **Pin supplies** (see **3** in Figure A-7). Leader pins and C-clips.

### Attention:

- Use only the IBM Leader Pin Reattachment Kit to reattach the leader pin to the tape. Other methods of reattaching the pin will damage the tape, the drive, or both.
- Use this procedure on your tape cartridge only when the leader pin detaches from the magnetic tape and you must copy the cartridge's data onto another cartridge. Destroy the damaged cartridge after you copy the data. This procedure may affect the performance of the leader pin during threading and unloading operations.
- Touch only the end of the tape. Touching the tape in an area other than the end can damage the tape's surface or edges, which may interfere with read or write reliability.

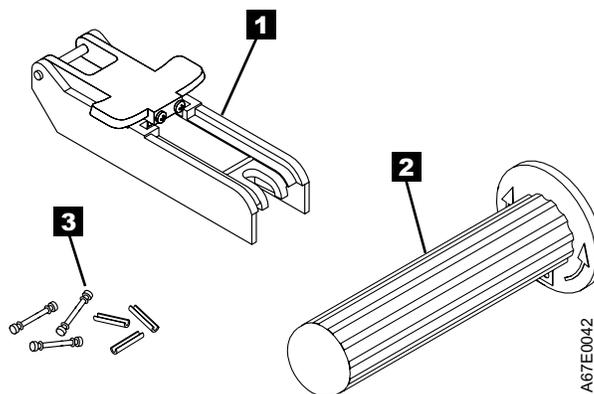


Figure A-7. Leader Pin Reattachment Kit

The following procedure describes how to reattach a leader pin.

To reattach a leader pin by using the IBM Leader Pin Reattachment Kit:

1. Attach the leader pin attach tool (**1** in Figure A-8) to the cartridge (**2**) so that the tool's hook (**3**) latches into the cartridge's door (**4**). Pull the tool back to hold the door open, then slide the tool onto the cartridge. Open the tool's pivot arm (**5**).

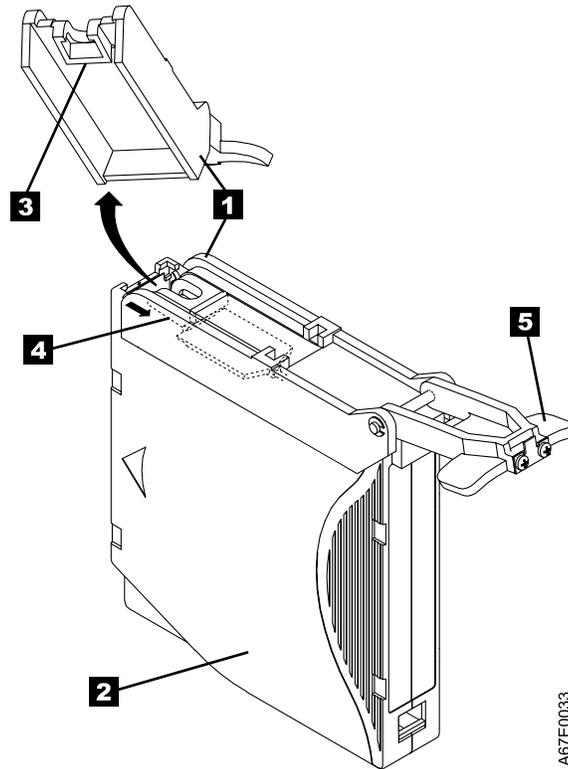


Figure A-8. Attaching the leader pin attach tool to the cartridge. To hold the cartridge door open, hook the tool into the door and pull the tool back.

2. To find the end of the tape inside the cartridge, attach the cartridge manual rewind tool ( **1** in Figure A-9) to the cartridge's hub ( **2** ) by fitting the tool's teeth between the teeth of the hub. Turn the tool clockwise until you see the end of the tape inside the cartridge. Then, slowly turn the rewind tool counterclockwise to bring the tape edge toward the cartridge door ( **3** ).
3. Continue to turn the rewind tool counterclockwise until approximately 12.7 cm (5 in.) of tape hangs from the cartridge door. If necessary, grasp the tape and pull gently to unwind it from the cartridge.
4. Remove the rewind tool by pulling it away from the cartridge. Set the tool and the cartridge aside.

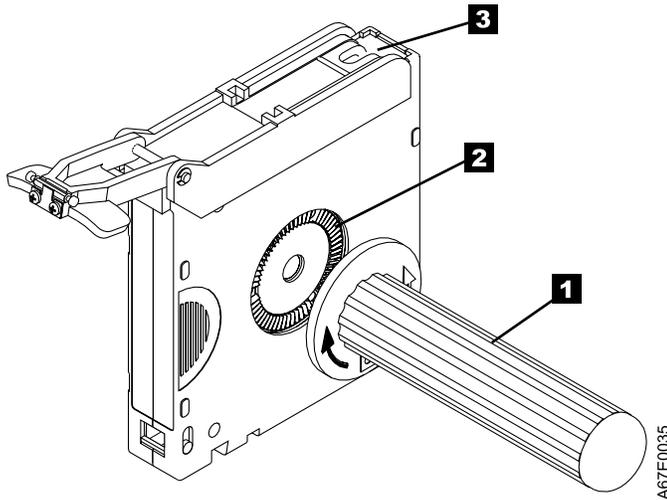


Figure A-9. Winding the tape out of the cartridge. Turn the cartridge manual rewind tool clockwise to see the end of the tape, then turn it counterclockwise to bring the tape to the cartridge door.

5. On the leader pin ( **1** in Figure A-10), locate the open side of the C-clip ( **2** ). The C-clip is a small black part that secures the tape ( **3** ) to the pin.
6. Remove the C-clip from the leader pin by using your fingers to push the clip away from the pin. Set the pin aside and discard the clip.

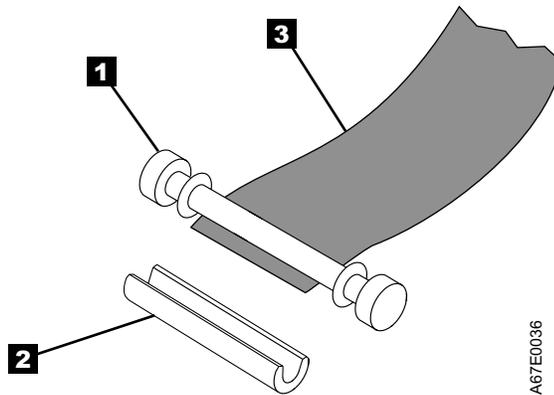


Figure A-10. Removing the C-clip from the leader pin. Use your fingers to push the C-clip from the leader pin.

7. Position the tape in the alignment groove of the leader pin attach tool (see **1** in Figure A-11).
8. Place a new C-clip into the retention groove **2** (Figure A-11) on the leader pin attachment tool and make sure that the clip's open side faces up.
9. Place the leader pin (from step 6 on page A-32) into the cavity **3** (Figure A-11) of the leader pin attach tool.

**Attention:** To prevent the leader pin from rolling into the cartridge, in the following step use care when folding the tape over the pin.

10. Fold the tape over the leader pin and hold it with your fingers (see Figure A-11).

**Note:** Use care to ensure that the tape is centered over the leader pin. Failure to properly center the tape on the pin will cause the repaired cartridge to fail. When the tape is properly centered, a 0.25-mm (0.01-in.) gap exists on both sides of the pin.

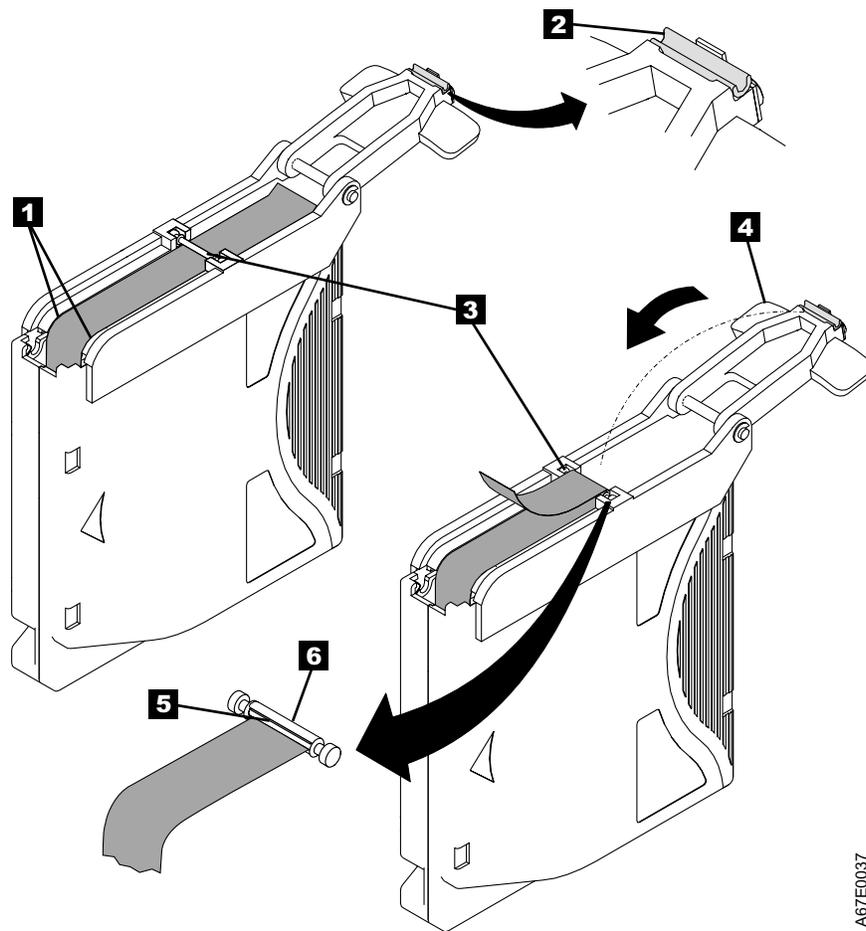


Figure A-11. Attaching the leader pin to the tape

11. Close the pivot arm **4** of the leader pin attach tool by swinging it over the leader pin so that the C-clip snaps onto the pin and the tape.
12. Swing the pivot arm open and trim the excess tape **5** so that it is flush with the reattached leader pin **6**.
13. Use your fingers to remove the leader pin from the cavity **3** in the leader pin attach tool.
14. Use the cartridge manual rewind tool to wind the tape back into the cartridge (wind the tape clockwise). Ensure that the leader pin is latched by the pin-retaining spring clips on each end of the leader pin.

15. Remove the rewind tool.

16. Remove the leader pin attach tool by lifting its end up and away from the cartridge.



**Attention:** Use a repaired tape cartridge only to recover data and move it to another cartridge. Continued use of a repaired cartridge may void the warranties of the drive and the cartridge.

---

## Removing a Tape Cartridge

If a tape cartridge fails to eject from the Ultrium Tape Drive there are two methods to remove the cartridge. The following sections describe the two procedures, resetting the drive and ejecting the cartridge, and manually removing the cartridge.

---

### Resetting the Drive and Ejecting the Cartridge

If a tape cartridge fails to eject from the Ultrium Tape Drive, you can perform the following steps to reset the drive and eject the cartridge.

1. Vary the library and drives Offline to *all* attached hosts.
2. Open the library front door.
3. Locate the drive that contains the stuck tape cartridge. If the picker ( **1** in Figure B-1) is in front of the drive **2** , gently lift and hold the picker out of the way.
4. Press and release the eject button **5** on the front of the drive and wait for approximately two minutes. If the cartridge ejects the procedure was successful. If the cartridge does not eject continue with the next step.
5. Press and hold the eject button **5** for at least 10 seconds. The single character display **3** should change as the drive performs a power-on self test (POST). If this does not happen cycle power to the library (turn it off, then on again).

**Note:** If you raised the picker to access the tape drive, lower the picker before cycling power to the library.

6. After a reset or power cycle, the drive should start a slow rewind. During the slow rewind the activity LED **4** will be flashing. You must wait for the LED to stop flashing, indicating that the slow rewind is complete. **This process may take up to 20 minutes.**
7. Press and release the eject button **5** on the front of the drive and wait for approximately two minutes. If the cartridge ejects the procedure was successful. If the cartridge does not eject continue with the following procedure.

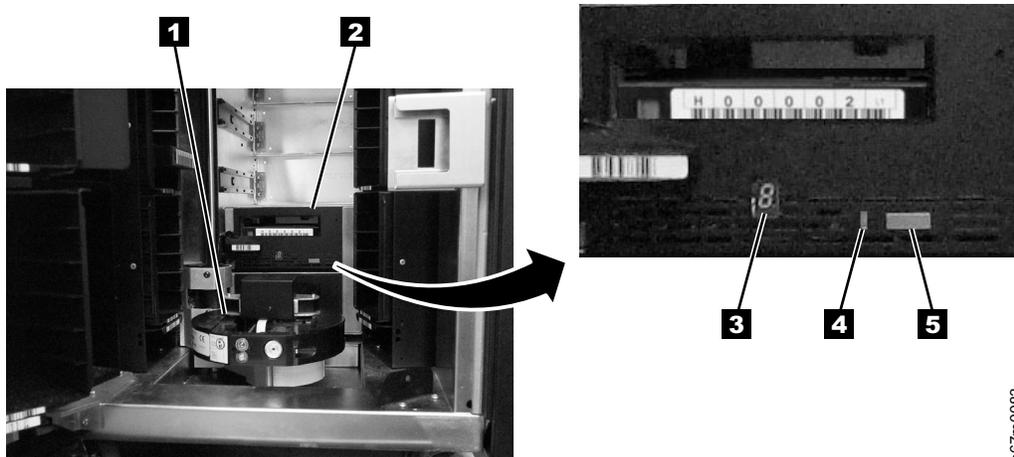


Figure B-1. Resetting the Tape Drive

---

## Manually Removing the Tape Cartridge

**Attention:**

**If you are not a trained service person, do not attempt to open the drive for repairs. Attempting a repair other than the manual removal of a tape cartridge will void your warranty.**

### Removing the Cartridge

If a tape cartridge fails to eject from an Ultrium Tape Drive, you can manually remove the cartridge. The following tools are required for the procedure:

- 2.5-mm allen wrench
- Small-blade screwdriver or potentiometer-setting tool
- 2-mm hex wrench
- #3 Phillips screwdriver
- Needle-nose pliers
- Flashlight (optional)



**Attention:** Before performing this procedure, note the following:

- Ensure that you have attempted all normal methods of removing the tape cartridge from the drive. Refer to “Resetting the Drive and Ejecting the Cartridge” on page B-1.
- This procedure may damage the stuck tape cartridge. If you use this procedure, copy the data from the stuck cartridge to another cartridge. If you choose to reuse the stuck cartridge, refer to the instructions in “Repositioning or Reattaching a Leader Pin” on page A-28. If you believe the cartridge has been damaged, replace it.
- If you use a power screwdriver to perform this procedure it could destroy the tape.
- Never touch the head or electronic components within the drive. Touching may cause contamination or damage by electrostatic discharge.

To manually remove a tape cartridge, perform the following steps:

1. Ask customer to vary the Library and Drives Offline to *ALL ATTACHED HOSTS*.
2. Prepare the Library for drive sled removal. Using the operator panel, select **More** → **Service** → **Drives** → **Repair** → **Remove**.
3. Power Off the Tape Library by setting the Main Switch on the ac Input Power Module to the O position.
4. Disconnect all cables to the drive sled that contains the stuck cartridge.
5. Loosen the two captive thumbscrews **1** on the drive sled **2** and slide the drive sled out using the handle **3** (see Figure B-2 on page B-3).

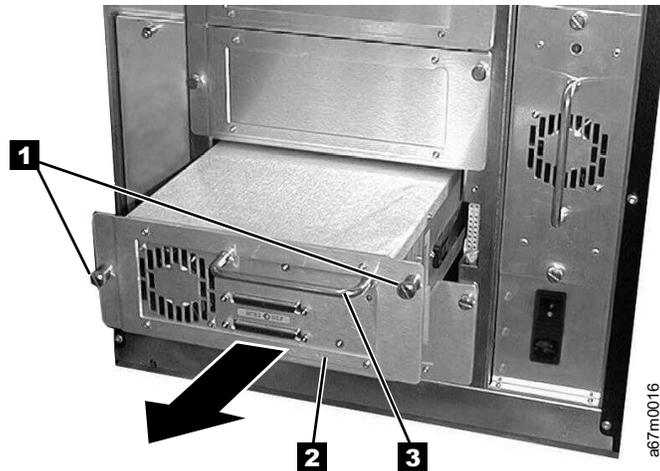


Figure B-2. Removing the Drive Sled

6. Place the drive sled so the front of the drive faces you, then tilt it on its left side (see Figure B-3).
7. Locate the access hole at the bottom of the unit **1** in Figure B-3.
8. Insert a 2.5-mm allen wrench into the access hole **1** and position the wrench so it is seated in the screw of the supply reel motor (not visible).
9. Push open the door of the tape load compartment and locate the flag **2** on the drive's takeup reel.

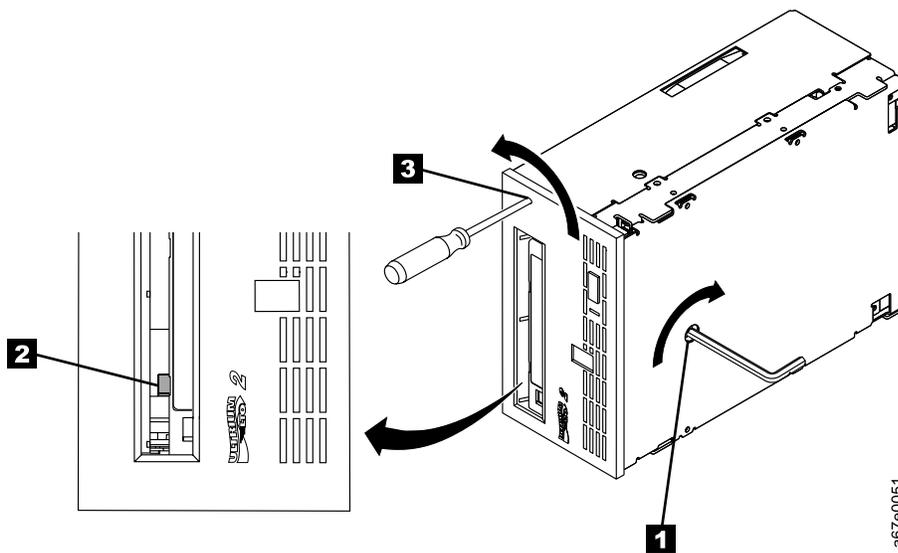


Figure B-3. Determining whether the tape is broken. The view is from the front of the drive.



**Attention:** In the following step, rotate the allen wrench clockwise, not counterclockwise. A counterclockwise motion may damage the tape.

10. To determine whether the tape is broken, watch the flag **2** on the drive's takeup reel while you rotate the allen wrench **1** clockwise (do not let the wrench move counterclockwise):
  - If you feel resistance to the allen wrench while attempting to turn the supply reel motor screw clockwise, go to step 12 on page B-4.
  - If the takeup reel turns when you rotate the supply reel motor screw clockwise with the allen wrench, the tape is not broken. Go to step 11 on page B-4.

- If the takeup reel does not turn when you rotate the supply reel motor screw clockwise with the allen wrench and if supply reel motor screw rotates freely, the tape is broken. You must determine the location of the leader block. To do so, insert a small-blade screwdriver or potentiometer-setting tool into the access hole for the loader motor gear **3**. Rotate the screwdriver counterclockwise. You may have to rotate for a lengthy period:
    - If the cartridge moves up, the tape is completely in the cartridge and the leader block is in the home position. Continue rotating the screwdriver until the cartridge ejects. Remove the cartridge.
    - If you feel resistance and the cartridge does not move up, the leader block is not in the home position. Contact your IBM Service Representative to perform the procedure in “Fixing an Internal Jam” on page B-5.
11. Continue to rotate the allen wrench until you feel resistance. The tape has been rewound as far as it can go without unthreading.
 

**Note:** The number of rotations required depends on where the beginning of the tape is on the take up reel. You may have to rotate the allen wrench for a lengthy period.
  12. With the allen wrench still inserted into the bottom access hole, insert a small-blade screwdriver or potentiometer-setting tool into the access hole for the loader motor gear **3**.
  13. While keeping torque on the supply reel motor screw and rotating the allen wrench **1** clockwise, rotate the loader motor gear with the small-blade screwdriver **3** counterclockwise (see arrow). As you rotate the screwdriver, the allen wrench moves slightly.
  14. With the small-blade screwdriver continue to rotate the loader motor gear in the unload direction (counterclockwise).
    - If you feel no resistance to the allen wrench and the cartridge slowly moves up and out of the tape load compartment, the procedure was successful. Go to step 15.
    - If you feel resistance to the allen wrench and the cartridge does not move, the loader mechanism is jammed or the leader block is not at the home position. Remove the small-blade screwdriver and contact your IBM Service Representative to perform the procedure in “Fixing an Internal Jam” on page B-5.
  15. Remove the tape cartridge. If the leader pin is not seated correctly in the cartridge, see “Repositioning or Reattaching a Leader Pin” on page A-28.
  16. Copy the data on the stuck tape cartridge to another cartridge. After you remove the stuck tape cartridge, advise customer to copy the data on the tape to another tape. Then, advise the customer to discard the stuck tape cartridge.
  17. Slide the drive sled into slot you removed it from using the handle **3** (see Figure B-2 on page B-3). Tighten the two captive thumbscrews **1** on the drive sled **2**.
  18. Connect the SCSI cables that were disconnected in step 4 on page B-2.
  19. Power On the library by setting the Main Switch on the ac Input Power Module to the I position.
  20. Refer to Table A-8 on page A-19 and run the Fast Read/Write Diagnostic (Function Code F).
  21. Ask customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.

## Fixing an Internal Jam



**Attention:**

**This procedure must be performed only by trained service personnel.**

**If problem-determination procedures identify the Ultrium Tape Drive as the source of a problem, replace the entire unit. If you are not a trained service person, do not attempt to open the drive for repairs. Attempting a repair other than the manual removal of a tape cartridge will void your warranty.**

Before performing this procedure, ensure that you have completed the steps that begin on page B-2. Do not attempt this procedure until you have completed these steps.

If you have reached this point, the tape is broken or the leader pin dropped (or looked like it dropped) from the leader block. To fix these conditions, perform the following procedure.

1. Tilt the drive so that its bottom rests on a nonslip surface.
2. Remove the cover of the drive by performing the following steps:
  - a. Use an appropriate tool to remove the three screws and washers (see **1** in Figure B-4 on page B-6) that secure the bezel **2**. Remove the bezel.
  - b. Use a screwdriver to remove the four cover-mounting screws and washers **3**.
  - c. Remove the cover by lifting it up. Set the cover aside.

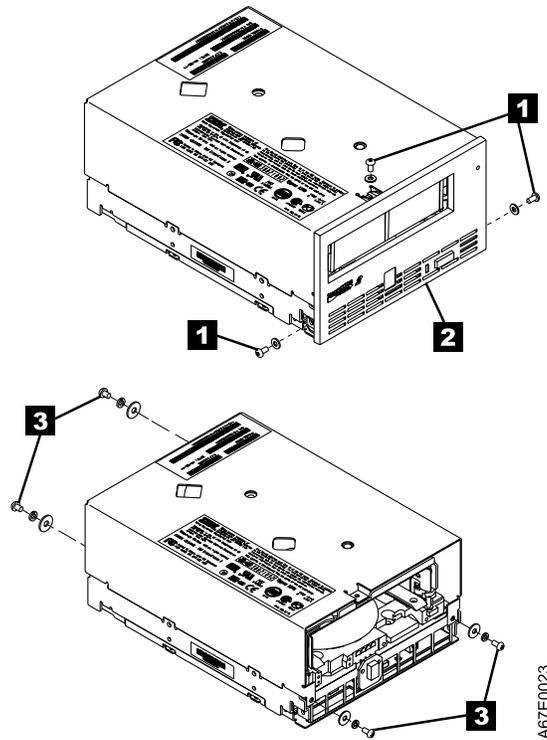


Figure B-4. Removing the top cover of the drive

3. Examine the drive to determine the cause of the problem:

- If the tape is broken, do not attempt repair. Return the drive and the stuck tape to your reseller for maintenance (note that your tape will be scrapped).
- If the leader pin dropped from the leader block, go to step 4 on page B-7 and continue this procedure.
- If the leader block pulled the tape (but not the pin) from the spool so that it looks like the pin was dropped, go to step 4 on page B-7 and continue this procedure.

4. Place the tape drive so that the front faces you, then tilt it on its left side (see Figure B-5).
5. At the bottom of the drive, locate the access hole ( **1** in Figure B-5).



**Attention:** In the following steps, do not allow drive components to touch the head **2**. Damage may result to the head.

6. Insert a 2.5-mm allen wrench into the access hole and position the wrench so that it is seated in the screw of the supply reel motor.

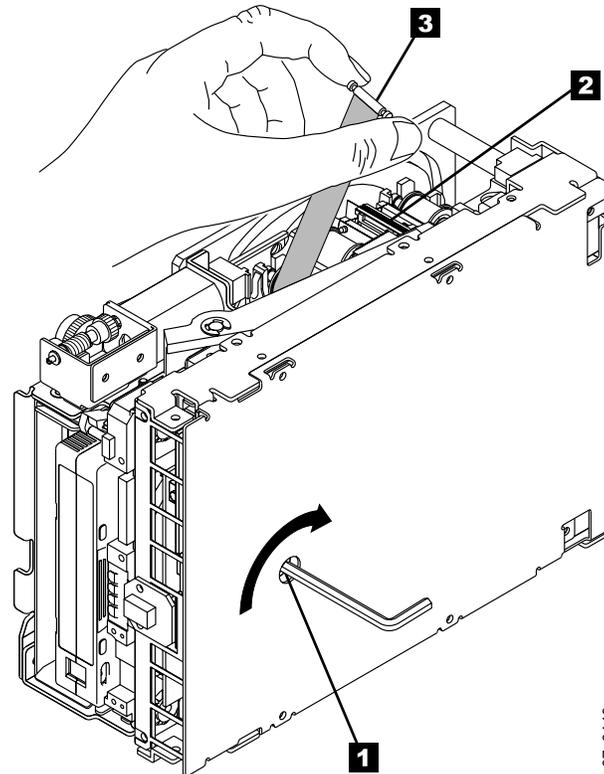


Figure B-5. Rewinding the leader pin into the tape cartridge

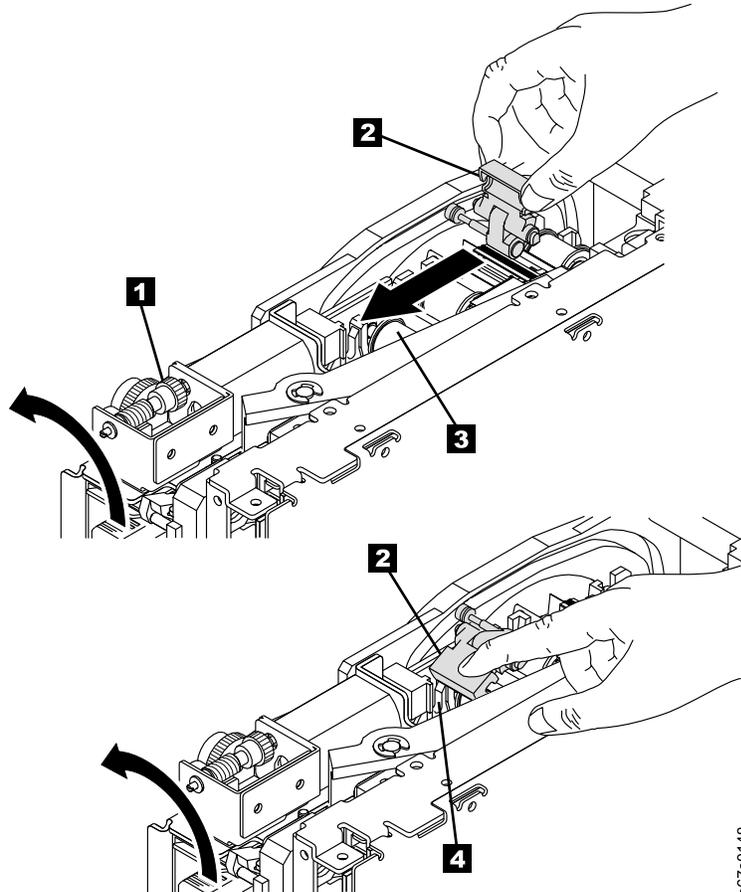
7. With clean needle-nose pliers, grasp the end of the leader pin and pull it out of the cartridge so that you can grip it with your fingers (see **3** in Figure B-5).

**Note:** If the leader pin is not connected to the tape, set the pin aside. After you remove the cartridge, reattach the pin (see “Repositioning or Reattaching a Leader Pin” on page A-28).

8. While keeping the tape taut with your fingers, rotate the allen wrench clockwise **1** to wind the excess tape into the cartridge. Guide the leader pin toward the cartridge and drop it inside the cartridge door. Ensure that no tape is left outside of the cartridge. Remove the allen wrench.

**Note:** Do not attempt to seat the leader pin into the cartridge's clips; this will interfere with the motion of the leader block.

9. Manually rotate the loader motor gear (see **1** in Figure B-6) in the unload direction (counterclockwise) until the leader block **2** reaches the last roller **3**.
10. While manually rotating the loader motor gear in the unload direction, guide the end of the leader block **2** into the white guide block **4**.



a67s0148

Figure B-6. Guiding the leader block into the home position

11. Rotate the loader motor gear in the unload direction until the leader block is fully inside the drive (see **1** in Figure B-7).

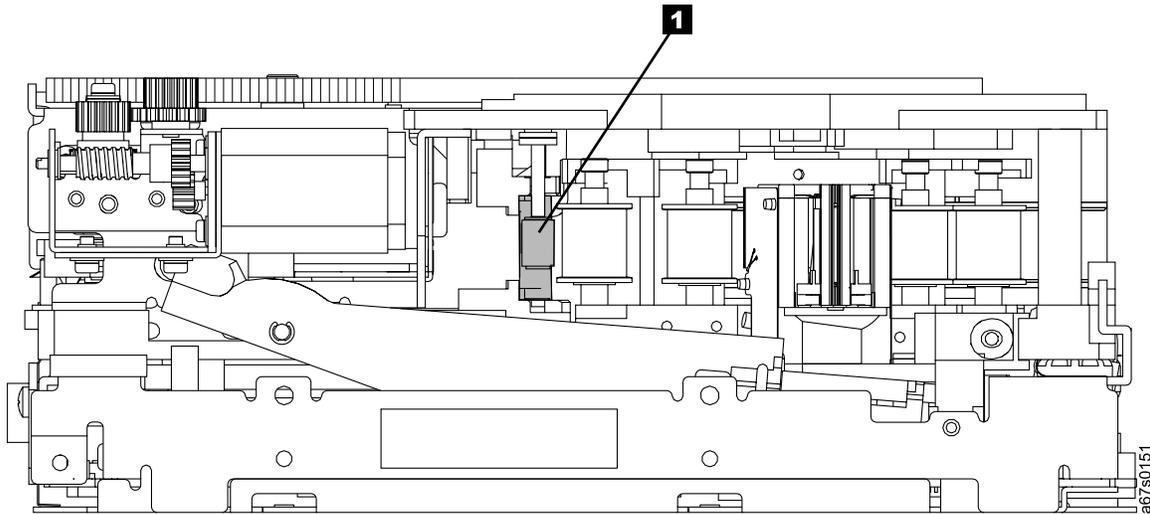


Figure B-7. Rotating the loader motor gear until the leader block is fully inside the drive. The drive is shown on its side. The head is on the right and the arm of the head brush at the bottom of the figure.

12. Continue to rotate the loader motor gear counterclockwise. The leader block retracts and occupies the opening to the drive (see **1** in Figure B-8).

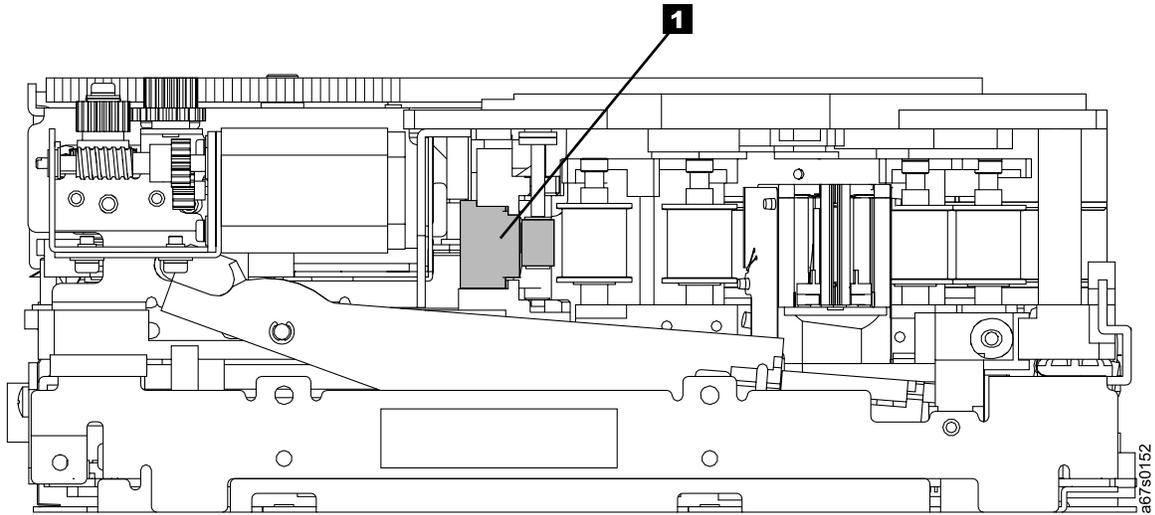


Figure B-8. Rotating the loader motor gear so that the leader block retracts. The drive is shown on its side. The head is on the right and the arm of the head brush at the bottom of the figure.

13. Rotate the loader motor gear counterclockwise until you feel resistance and the cartridge rises and ejects (see Figure B-9).

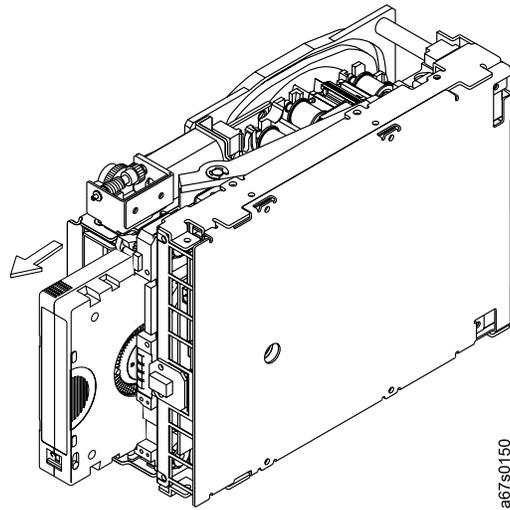


Figure B-9. Rotating the loader motor gear until the cartridge ejects

14. Remove the tape cartridge. If the leader pin is not seated correctly in the cartridge, see “Repositioning or Reattaching a Leader Pin” on page A-28.
  15. Copy the data on the stuck tape cartridge to another cartridge. If appropriate, return the stuck tape cartridge for analysis in its original packaging or in the packaging from its replacement.
  16. Reassemble the tape drive by reversing the preceding steps.
  17. Install the new Tape Drive Sled.
  18. Restore power to the tape library by setting the main power switch to I.
  19. Ask the customer to vary the Library and Drives Online to *ALL ATTACHED HOSTS*.
  20. To ensure that the drive operates properly, refer to page A-19 and select Function Code 1 - Run Tape Drive Diagnostics.
- I If you need help with this procedure, contact your OEM Product Application Engineer (PAE).



---

## Element Addressing

**Note:** The phrase Windows 200x in this appendix refers to both Microsoft Windows 2000 and Microsoft Windows 2003 operating systems.

# All Operating Systems and Windows 200x with RSM Disabled

Element addressing in this section applies to all operating systems and Windows 200x that has the Remote Storage Manager (RSM) disabled.

Figure C-1 shows the element addressing for the Ultrium Scalable Tape Library with a single-slot I/O station.

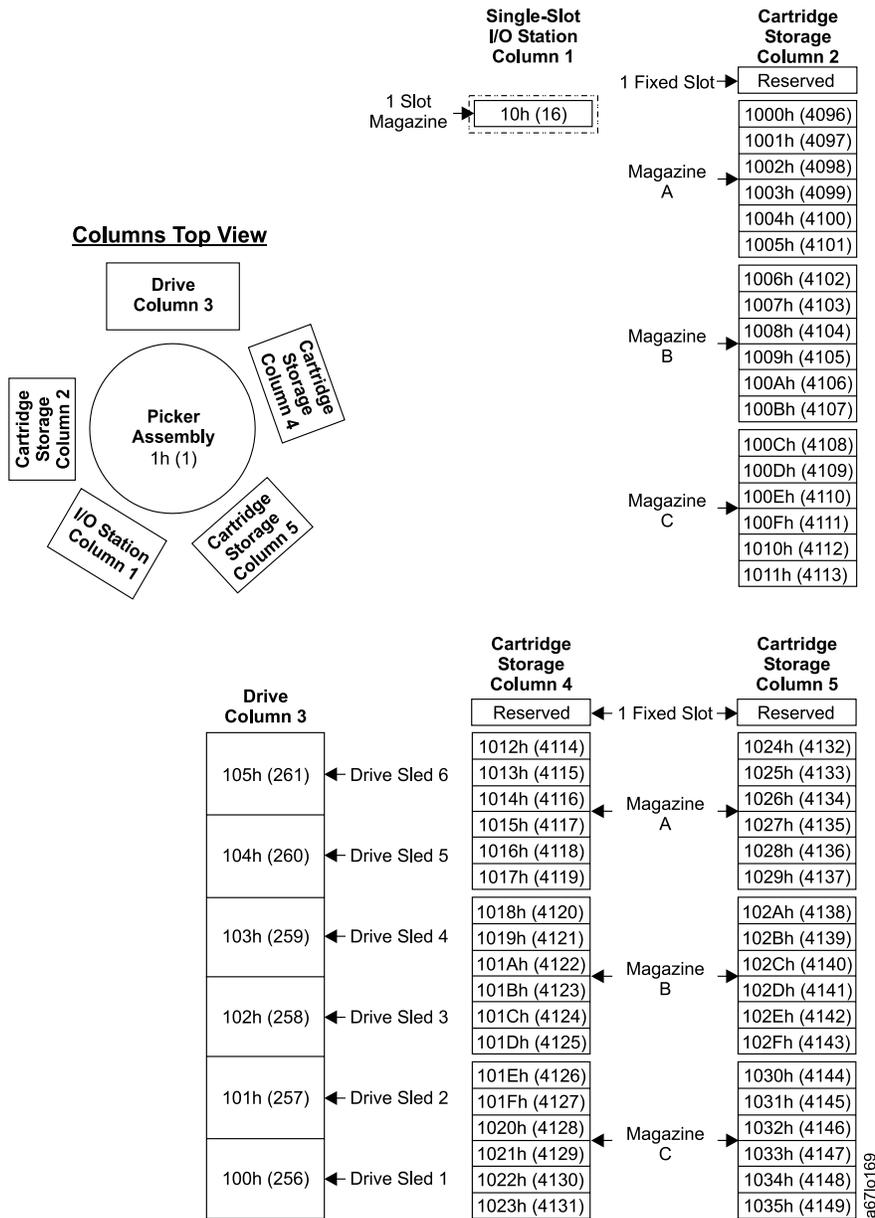


Figure C-1. Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station. RSM (in Windows 200x) is disabled.

Figure C-2 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as I/O slots.

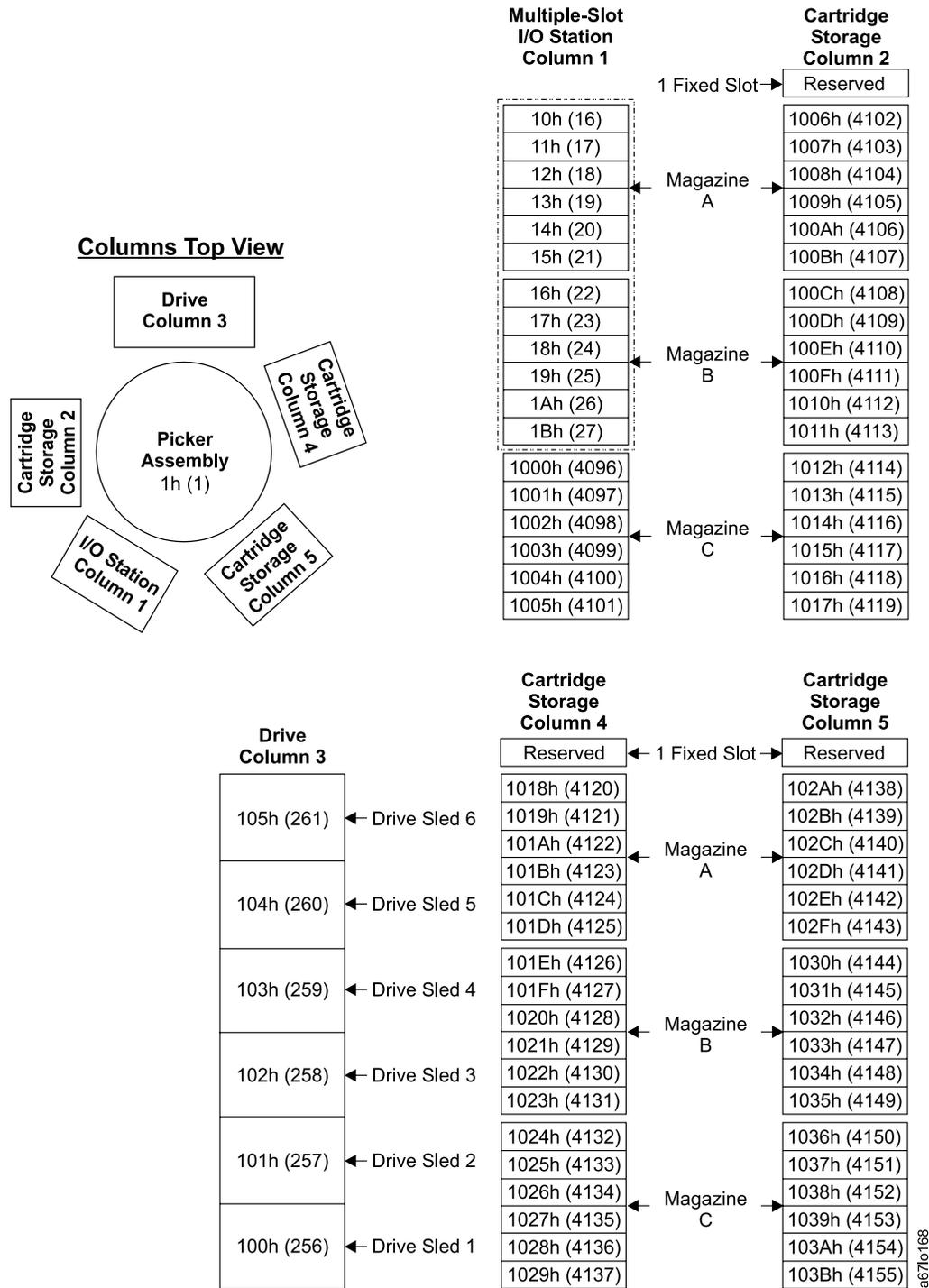


Figure C-2. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station. RSM (in Windows 200x) is disabled.

I Figure C-3 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots.

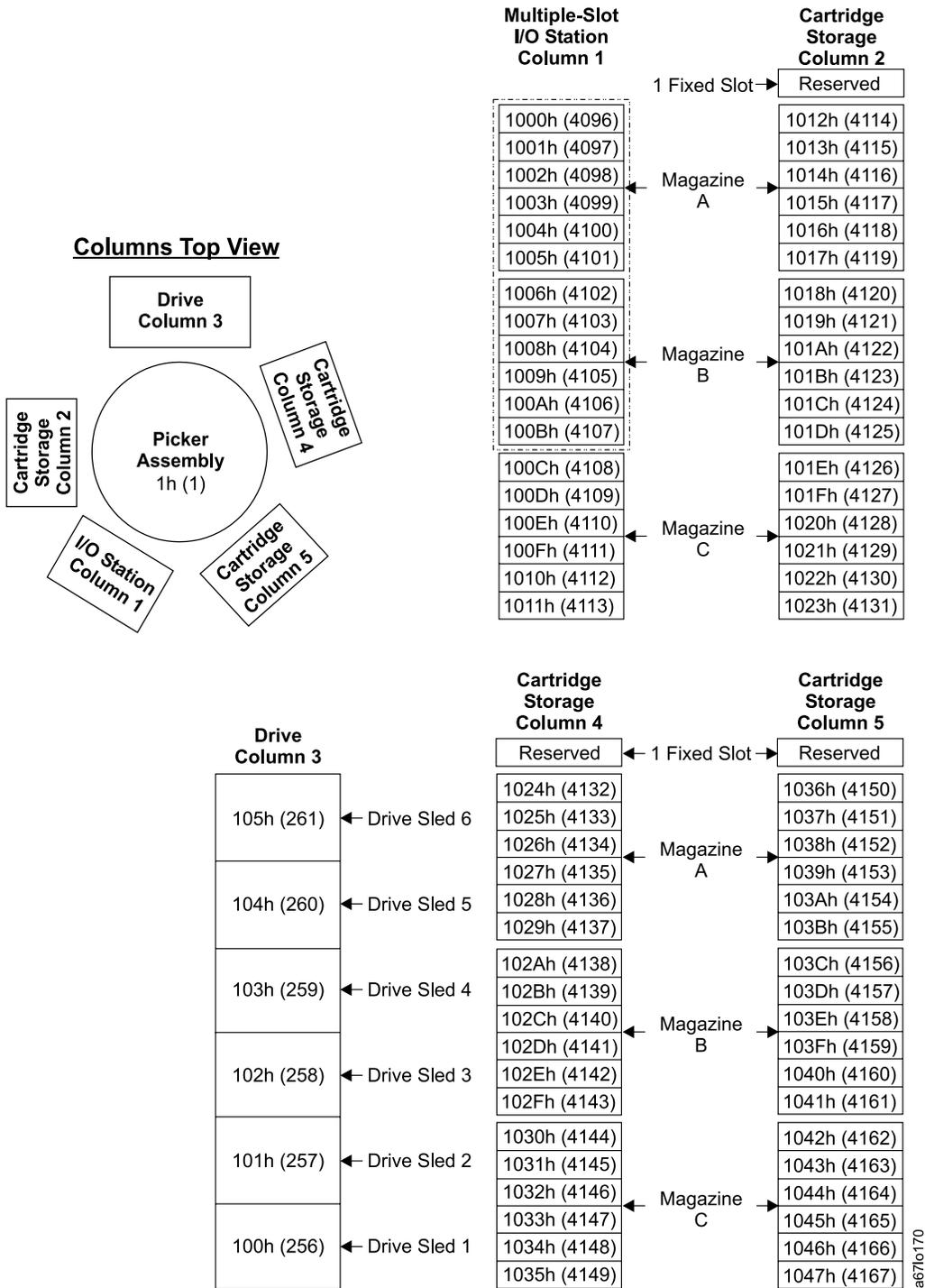


Figure C-3. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots. RSM (in Windows 200x) is disabled.

# Windows 200x with RSM Enabled

Element addressing in this section applies to the Windows 200x operating system that has the Remote Storage Manager (RSM) enabled.

Figure C-4 shows the element addressing for the Ultrium Scalable Tape Library with a single-slot I/O station.

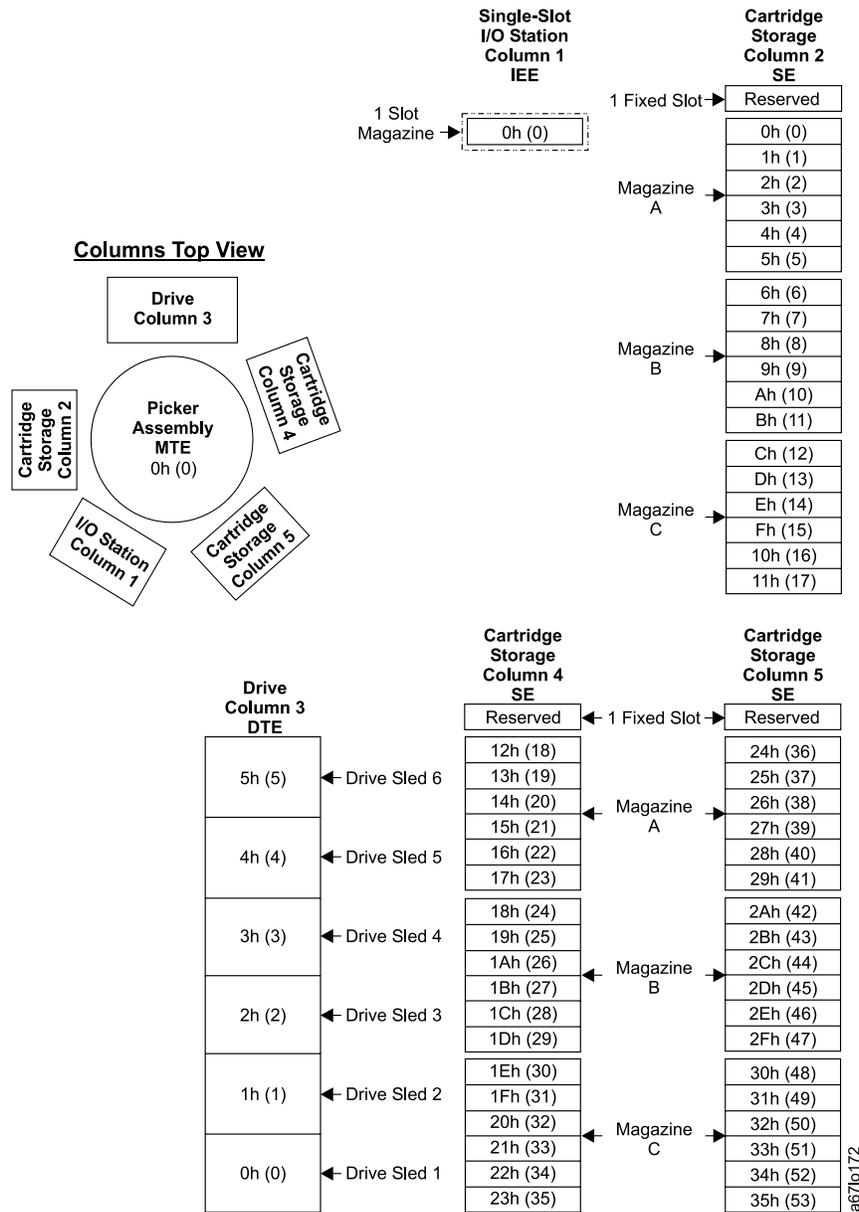
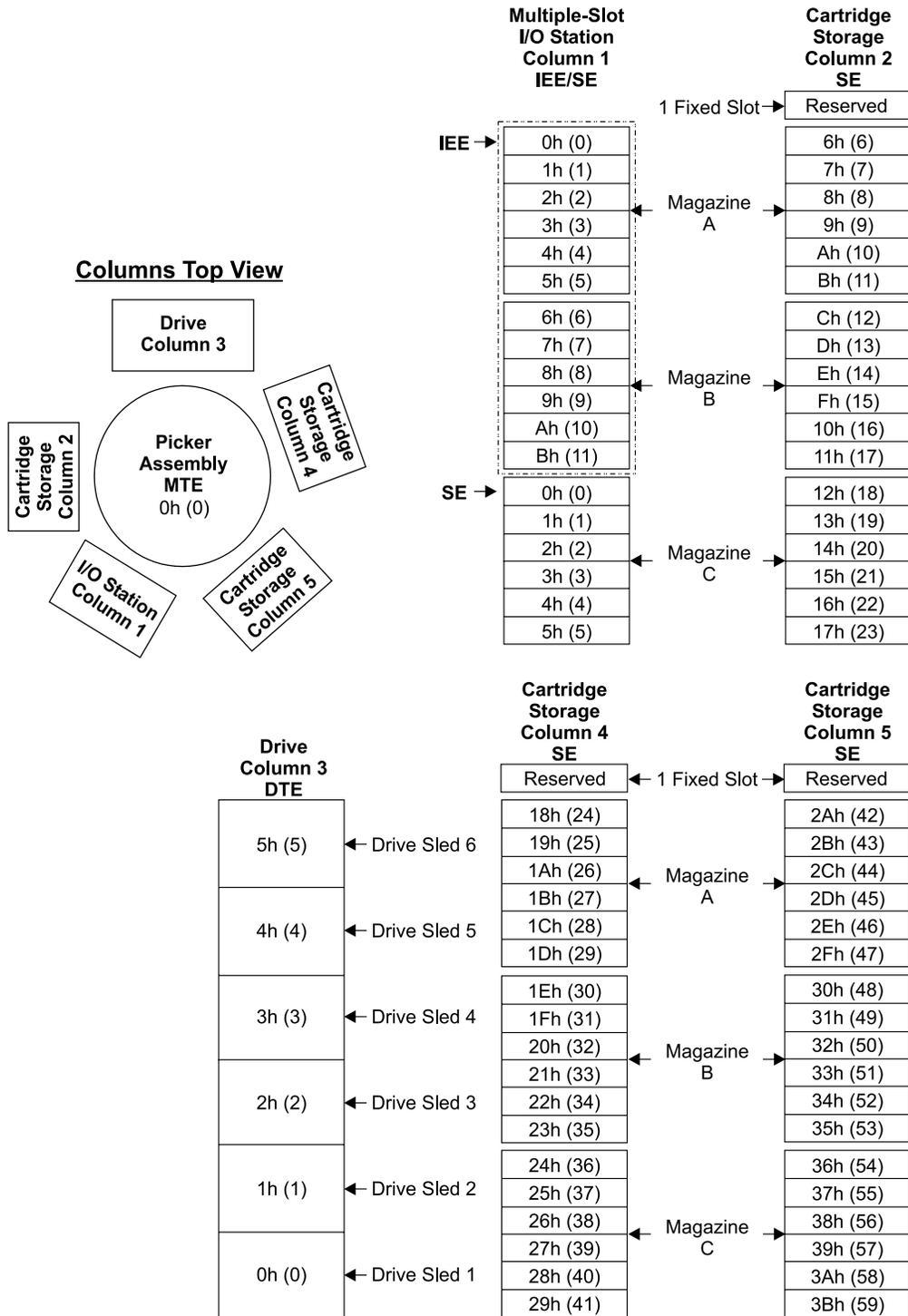


Figure C-4. Element addresses for a Ultrium Scalable Tape Library with a single-slot I/O station. RSM (in Windows 200x) is enabled.

Figure C-5 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as I/O slots.



a671o171

Figure C-5. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station. RSM (in Windows 200x) is enabled.

Figure C-6 shows the element addressing for the Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots.

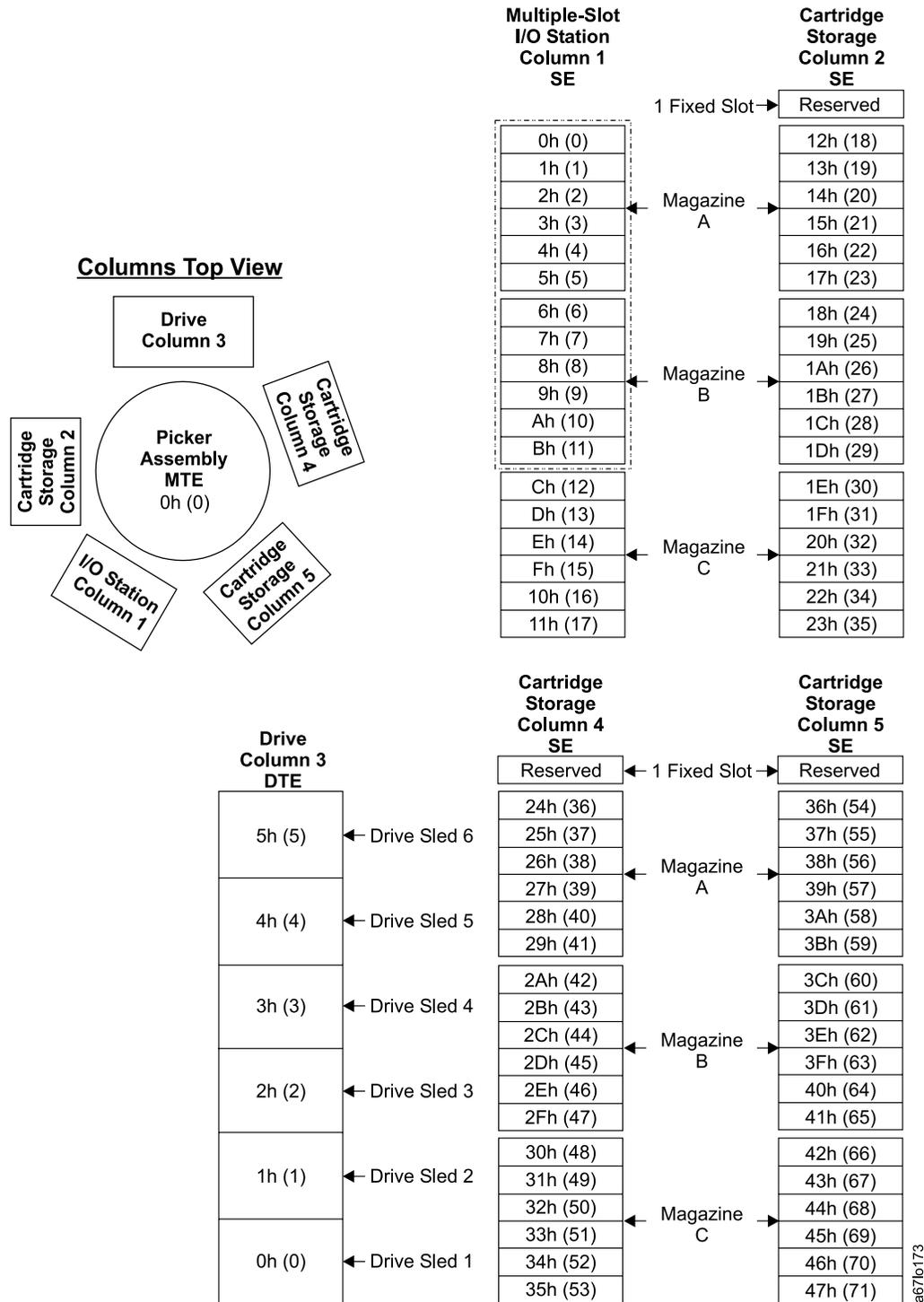


Figure C-6. Element addresses for a Ultrium Scalable Tape Library with a multiple-slot I/O station configured as storage slots. RSM (in Windows 200x) is enabled.



---

## Notices

This information was developed for products and services offered in the U.S.A. IBM may not offer the products, services, or features discussed in this document in other countries (or regions). Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing  
IBM Corporation  
North Castle Drive  
Armonk, NY 10504-1785  
U.S.A.

For license inquiries regarding double-byte (DBCS) information, contact the IBM Intellectual Property Department in your country (or region) or send inquiries, in writing, to:

IBM World Trade Asia Corporation  
Licensing  
2-31 Roppongi 3-chome, Minato-ku  
Tokyo 106, Japan

**The following paragraph does not apply to the United Kingdom or any other country (or region) where such provisions are inconsistent with local law:** INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states (or regions) do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM web sites are provided for convenience only and do not in any manner serve as an endorsement of those web sites. The materials at those web sites are not part of the materials for this IBM product and use of those web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

IBM Corporation,  
Department GZW  
9000 South Rita Road  
Tucson, Arizona 85775-4401 U.S.A.

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this information and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement, or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

All IBM prices shown are IBM's suggested retail prices, are current and are subject to change without notice. Dealer prices may vary.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

---

## Trademarks

The following are trademarks of International Business Machines Corporation in the United States, or other countries (or regions), or both:

AIX	RS/6000
AS/400	xSeries
IBM	Tivoli
iSeries	TotalStorage
OS/400	xSeries
pSeries	

The following are U.S. trademarks of Hewlett-Packard Company, International Business Machines Corporation, and Seagate Technology.

Linear Tape-Open  
LTO  
Ultrium

Intel is a registered trademark of Intel Corporation in the United States, or other countries (or regions), or both.

Microsoft, Windows, Windows NT, Windows 2000, and the Windows logo are registered trademarks of Microsoft Corporation in the United States, or other countries (or regions), or both.

Solaris and Sun are registered trademarks of Sun Microsystems Incorporated.

Unix is a trademark of The Open Group in the United States, or other countries or regions, or both.

Other company, product, or service names may be the trademarks or service marks of others.

---

## Electronic Emission Notices

### Federal Communications Commission (FCC) Class A Statement

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

IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

### European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

**Attention:** This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for any interference caused by using other than recommended cables and connectors.

## Chinese Class A Electronic Emission Statement

中华人民共和国“A类”警告声明

声明

此为A级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

## Taiwan Class A Electronic Emission Statement

警告使用者：  
這是甲類的資訊產品，在  
居住的環境中使用時，可  
能會造成射頻干擾，在這  
種情況下，使用者會被要  
求採取某些適當的對策。<sup>talenti</sup>

## Japan VCCI Class A ITE Electronic Emission 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）の基準に基づきクラス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。<sup>vcci</sup>

## Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

## Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

## Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 18. September 1998 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die: IBM Deutschland Informationssysteme GmbH 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 4 Abs. (1) 4:

**Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.**

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: "Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen."

Anmerkung: Um die Einhaltung des EMVG sicherzustellen, sind die Geräte wie in den IBM Handbüchern angegeben zu installieren und zu betreiben.



---

# Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication. If you do not find the term you are looking for, refer to the index or to the *Dictionary of Computing*, 1994.

## Numbers

**2:1 compression.** The relationship between the quantity of data that can be stored with compression as compared to the quantity of data that can be stored without compression. In 2:1 compression, twice as much data can be stored with compression as can be stored without compression.

**Ultrium Scalable Tape Library.** A device that can be attached to a supported server and used to write data to and from magnetic tape. With its robotics, the Tape Library can process up to 72 tape cartridges each with a capacity of 100 GB and at a data transfer rate of 14.9 MB per second.

## A

**A.** Ampere.

**ac.** Alternating current.

**access method.** A technique for moving data between main storage and input or output devices.

**adapter card.** A circuit board that adds function to a computer.

**adj.** Adjustment.

**AIX.** Advanced Interactive Executive. IBM's implementation of the UNIX<sup>®</sup> operating system. The RS/6000 system, among others, uses AIX as its operating system.

**alphanumeric.** Pertaining to a character set that contains letters, numerals, and usually other characters, such as punctuation marks.

**alter.** To change.

**ambient temperature.** The temperature of air or other media in a designated area, particularly the area surrounding equipment.

**ampere (A).** A unit of measure for electric current that is equivalent to a flow of one coulomb per second, or to the current produced by one volt applied across a resistance of one ohm.

**ANSI.** American National Standards Institute.

**archive.** To collect and store files in a designated place.

**ASCII.** American National Standard Code for Information Interchange. A 7 bit coded character set (8 bits including parity check) that consists of control characters and graphic characters.

**assigning a device .** The establishing of the relationship of a device to a running task, process, job, or program.

**assignment.** The naming of a specific device to perform a function.

**asynchronous.** Pertaining to two or more processes that do not depend upon the occurrence of specific events such as common timing signals.

**attention (notice).** A word for calling attention to the possibility of danger to a program, device, or system, or to data. Contrast with *caution* and *danger*.

**ATTN.** Attention.

**AUTOCLEAN function.** A choice on the Tape Library's menu that lets you specify the library to automatically clean the tape drive head with a cleaning cartridge.

## B

**backup.** To make additional copies of documents or software for safekeeping.

**bar code.** A code representing characters by sets of parallel bars of varying thickness and separation which are read optically by transverse scanning.

**bar code label.** Pertaining to the Tape Library, a slip of paper bearing a bar code and having an adhesive backing. The bar code label must be affixed to a tape cartridge to enable the library to identify the cartridge and its volume serial number.

**bar code reader.** In the Tape Library, a laser device specialized for scanning and reading bar codes and converting them into either the ASCII or EBCDIC digital character code.

**bezel.** Decorative and safety cover.

**bicolored.** Having two colors.

**bit.** Either of the digits 0 or 1 when used in the binary numbering system.

**BM or bill of materials.** A list of specific types and amounts of direct materials expected to be used to produce a given job or quantity of output.

**browser.** A client program that initiates requests to a Web server and displays the information that the server returns.

**buffer .** A routine or storage used to compensate for a difference in rate of flow of data or time of occurrence of events, when transferring data from one device to another.

**bus .** A facility for transferring data between several devices located between two end points, only one device being able to transmit at a given moment.

**byte.** A string consisting of a certain number of bits (usually 8) that are treated as a unit and represent a character. A fundamental data unit.

## C

**capacity.** The amount of data that can be contained on storage media and expressed in bytes of data.

**cartridge manual rewind tool.** A device that can be fitted into the reel of a cartridge and used to rewind tape into or out of the cartridge.

**cartridge storage slot.** Individual slot located within a magazine that is used to house tape cartridges.

**caution (notice) .** A word to call attention to possible personal harm to people. Contrast with *attention* and *danger*.

**CE .** Customer engineer; field engineer; service representative.

**centimeter (cm).** One one-hundredth of a meter (0.01 m). Approximately 0.39 inch.

**channel command .** An instruction that directs a data channel, control unit, or device to perform an operation or set of operations.

**char .** Character.

**CHK .** Check.

**cleaning cartridge.** A tape cartridge that is used to clean the heads of a tape drive. Contrast with *data cartridge*.

**command .** A control signal that initiates an action or the start of a sequence of actions.

**compact disc (CD).** A disc, usually 4.75 inches in diameter, from which data is read optically by means of a laser.

**compression.** The process of eliminating gaps, empty fields, redundancies, and unnecessary data to shorten the length of records or blocks.

**concurrent .** Refers to diagnostic procedures that can be run on one control unit while the rest of the subsystem remains available for customer applications.

**contingent connection.** A connection between a channel path and a drive caused when a unit check occurs during an I/O operation.

**controller .** A device that provides the interface between a system and one or more tape drives.

**CP .** Circuit protector.

**ctrl .** Control.

**CU .** Control unit.

## D

**danger (notice) .** A word to call attention to possible lethal harm to people. Contrast with *attention* and *caution*.

**data .** Any representations such as characters or analog quantities to which meaning is or might be assigned.

**data buffer .** The storage buffer in the control unit. This buffer is used to increase the data transfer rate between the control unit and the channel.

**data cartridge.** A tape cartridge dedicated to storing data. Contrast with *cleaning cartridge*.

**data check .** A synchronous or asynchronous indication of a condition caused by invalid data or incorrect positioning of data.

**dc .** Direct current.

**degauss.** To make a magnetic tape nonmagnetic by means of electrical coils carrying currents that neutralize the magnetism of the tape.

**degausser.** A device that makes magnetic tape nonmagnetic.

**degradation .** A decrease in quality of output or throughput or an increase in machine error rate.

**degraded .** Decreased in quality of output or throughput or increased machine error rate.

**deserialize .** To change from serial-by-bit to parallel-by-byte.

**detented .** A part being held in position with a catch or lever.

**device.** Any hardware component or peripheral, such as a tape drive or tape library, that can receive and send data.

**device driver.** A file that contains the code needed to use an attached device.

**DIAG .** Diagnostic section of maintenance information manual.

**differential .** See *High Voltage Differential (HVD)*.

**direct access storage .** A storage device in which the access time is independent of the location of the data.

**download.** (1) To transfer programs or data from a computer to a connected device, typically a personal computer. (2) To transfer data from a computer to a connected device, such as a workstation or microcomputer.

**DRAM .** Dynamic random-access memory.

**drive, magnetic tape .** A mechanism for moving magnetic tape and controlling its movement.

**DRV .** Drive.

**DSE .** Data security erase.

**DSP .** Digital signal processor.

## E

**EBCDIC.** Extended binary-coded decimal interchange code.

**EC .** Edge connector. Engineering change.

**ECC .** Error correction code.

**EEPROM .** Electrically erasable programmable read-only memory.

**EIA .** Electronics Industries Association.

**EIA unit .** A unit of measure, established by the Electronic Industries Association, equal to 44.45 millimeters (1.75 inches).

**eject.** To remove or force out from within.

**electronic mail.** Correspondence in the form of messages transmitted between user terminals over a computer network.

**e-mail.** See *electronic mail*.

**EPO .** Emergency power off.

**EPROM .** Erasable programmable read only memory.

**EQC .** Equipment check.

**equipment check .** An asynchronous indication of a malfunction.

**Error log .** A dataset or file in a product or system where error information is stored for later access.

**ESD .** Electrostatic discharge.

## F

**fault symptom code (FSC) .** A hexadecimal code generated by the drive or the control unit microcode in response to a detected subsystem error.

**FC .** Feature code.

**FCC .** Federal communications commission.

**FE .** Field engineer, customer engineer, or service representative.

**fiducial .** A target used for teaching a physical location to a robot.

**field replaceable unit (FRU) .** An assembly that is replaced in its entirety when any one of its components fails.

**file .** A named set of records stored or processed as a unit. Also referred to as a dataset.

**file protection .** The processes and procedures established in an information system that are designed to inhibit unauthorized access to, contamination of, or deletion of a file.

**file transfer protocol (FTP).** In the Internet suite of protocols, an application layer protocol that uses TCP and Telnet services to transfer bulk-data files between machines or hosts.

**firmware.** Proprietary code that is usually delivered as microcode as part of an operating system. Firmware is more efficient than software loaded from an alterable medium and more adaptable to change than pure hardware circuitry. An example of firmware is the Basic Input/Output System (BIOS) in read-only memory (ROM) on a PC motherboard.

**FLASH EEPROM .** An electrically erasable programmable read-only memory (EEPROM) that can be updated.

**FMR .** Field microcode replacement.

**format .** The arrangement or layout of data on a data medium.

**formatter .** Part of a magnetic tape subsystem that performs data conversion, speed matching, encoding, first level error recovery, and interfaces to one or more tape drives.

**FP .** File protect.

**frayed .** Damaged as if by an abrasive substance.

**FRU .** Field replaceable unit.

**FSC .** Fault symptom code.

**FSI** . Fault symptom index.

**functional microcode** . Microcode that is resident in the machine during normal customer operation.

## G

**g**. Gram.

**GB**. gigabyte.

**GBIC**. Gigabit Interface Converter.

**Gbi**. gigabit

**gigabit (Gbit)**. 1 000 000 000 bits.

**gigabyte (GB)**. 1 000 000 000 bytes.

**Gigabit Interface Converter (GBIC)**. Converts copper interface to optic interface.

**gnd** . Ground.

## H

**hertz (Hz)** . Unit of frequency. One hertz equals one cycle per second.

**hex** . Hexadecimal.

**High Voltage Differential (HVD)**. A logic signaling system that enables data communication between a supported host and the Tape Library. HVD signaling uses a paired plus and minus signal level to reduce the effects of noise on the SCSI bus. Any noise injected into the signal is present in both a plus and minus state, and is thereby canceled. Synonymous with *differential*.

**HVD**. SCSI Bus High Voltage Differential

**Hz** . Hertz (cycles per second).

## I

**IBM Ultrium Tape Drive**. Located within the Tape Library, a data-storage device that controls the movement of the magnetic tape in an IBM LTO Ultrium Tape Cartridge. The drive houses the mechanism (drive head) that reads and writes data to the tape. The drive is the first of four drives planned for the Ultrium format. Its native data capacity is 100 GB per cartridge; with 2:1 compression, its capacity is up to 200 GB.

**ID** . Identifier.

**identifier (ID)** . (1) In programming languages, a lexical unit that names a language object; for example, the names of variables, arrays, records, labels, or procedures. An identifier usually consists of a letter optionally followed by letters, digits, or other characters. (2) One or more characters used to identify or name

data element and possibly to indicate certain properties of that data element. (3) A sequence of bits or characters that identifies a program, device, or system to another program, device, or system.

**IML** . Initial microprogram load.

**initial microprogram load (IML)** . The action of loading a microprogram from an external storage to writable control storage.

**initiator** . The component that executes a command. The initiator can be the host system or the tape control unit.

**INST** . Installation.

**interface** . A shared boundary. An interface might be a hardware component to link two devices or it might be a portion of storage or registers accessed by two or more computer programs.

**interposer** . The part used to convert a 68-pin connector to a 50-pin D-shell connector.

**intervention required** . Manual action is needed.

**INTRO** . Introduction.

**I/O** . Input/output.

**IOP** . Input/output processor.

**IPL** . Initial program load.

**ITST** . Idle-time self-test.

## K

**kilogram (kg)**. One thousand grams (approximately 2.2 pounds).

**km** . kilometer. 1000 Meters, Approximately 5/8 mile.

## L

**LAN** . Local area network. A computer network within a limited area.

**LCD**. See *liquid crystal display*.

**LED** . Light-emitting diode.

**Linear Tape-Open (LTO)**. A type of tape storage technology developed by the IBM Corporation, Hewlett-Packard, and Seagate. LTO technology is an "open format" technology, which means that its users will have multiple sources of product and media. The "open" nature of LTO technology enables compatibility between different vendors' offerings by ensuring that vendors comply with verification standards. The LTO technology is implemented in two formats: the Accelis format focuses on fast access; the Ultrium format

focuses on high capacity. The Ultrium format is the preferred format when capacity (rather than fast access) is the key storage consideration. An Ultrium cartridge has a compressed data capacity of up to 200 GB (2:1 compression) and a native data capacity of up to 100 GB. The Ultrium format is designed with a 4-generation road map that provides for up to 1.6 TB per cartridge (2:1 compression) in Generation 4, with compressed transfer rate of up to 320 MB per second.

**liquid crystal display (LCD)** . A low-power display technology used in computers and other I/O devices.

**loadable** . Having the ability to be loaded.

**LTO cartridge memory (LTO-CM)** . Within each LTO Ultrium data cartridge, an embedded electronics and interface module that can store and retrieve a cartridge's historical usage and other information.

**LVD** . SCSI Bus Low Voltage Differential

## M

**magnetic tape** . A tape with a magnetical surface layer on which data can be stored by magnetic recording.

**MAP** . Maintenance analysis procedure.

**mask** . A pattern of characters that controls the retention or elimination of portions of another pattern of characters. To use a pattern of characters to control the retention or elimination of portions of another pattern of characters.

**master file** . A file used as an authority in a given job and that is relatively permanent, even though its contents may change. Synonymous with main file.

**MB** . Mega Byte (usually expressed as data rate in MB/s or MB/second).

**media capacity** . The amount of data that can be contained on a storage medium, expressed in bytes of data.

**media-type identifier** . Pertaining to the bar code on the bar code label of the IBM Ultrium Tape Cartridge, a 2-character code, L1, that represents information about the cartridge. L identifies the cartridge as one that can be read by devices which incorporate LTO technology; 1 indicates that it is the first generation of its type.

**mega** . One million of.

**meter** . In the Metric System, the basic unit of length; equal to approximately 39.37 inches.

**micro** . One millionth of.

**microcode** . (1) One or more micro instructions. (2) A code, representing the instructions of an instruction set,

implemented in a part of storage that is not program-addressable. (3) To design, write, and test one or more micro instructions. (4) See also *microprogram*.

**microdiagnostic routine** . A program that runs under the control of a supervisor, usually to identify field replaceable units.

**microdiagnostic utility** . A program that is run by the customer engineer to test the machine.

**microinstruction** . A basic or elementary machine instruction.

**microprogram** . A group of microinstructions that when executed performs a preplanned function.

The term microprogram represents a dynamic arrangement or selection of one or more groups of microinstructions for execution to perform a particular function. The term microcode represents microinstructions used in a product as an alternative to hard-wired circuitry to implement certain functions of a processor or other system component.

**MIM** . Media information message.

**mm** . Millimeter.

**modifier** . That which changes the meaning.

**mount a device** . To assign an I/O device with a request to the operator.

**MP** . Microprocessor.

**ms** . Millisecond.

**MSG** . Message.

**multipath** . Pertaining to using more than one path.

## N

**N/A** . Not applicable.

**node** . In a network, a point at which one or more functional units connect channels or data circuits.

**NVS** . Nonvolatile storage. A storage device whose contents are not lost when power is cut off.

## O

**oersted** . The unit of magnetic field strength in the unrationalized centimeter-gram-second (cgs) electromagnetic system. The oersted is the magnetic field strength in the interior of an elongated, uniformly wound solenoid that is excited with a linear current density in its winding of one abampere per  $4\pi$  centimeters of axial length.

**offline** . Pertaining to the operation of a functional unit without the continual control of a computer. Contrast with *online*.

**online** . Pertaining to the operation of a functional unit that is under the continual control of a computer. Contrast with *offline*.

**OPER** . Operation.

**ov** . Over voltage.

**overrun** . Loss of data because a receiving device is unable to accept data at the rate it is transmitted.

**overtightening** . To tighten too much.

## P

**parameter** . A variable that is given a constant value for a specified application and that may denote the application.

**p bit** . Parity bit.

**PC** . Parity check.

**PCC** . Power control compartment.

**PDF** . Portable Document Format.

**PE** . Parity error. Product engineer.

**pick** . Pertaining to the Tape Library, to remove, by means of a robotic device, a tape cartridge from a storage slot or drive.

**picker** . A robotic mechanism located inside the Tape Library that moves cartridges between the cartridge storage slots and the drive.

**PM** . Preventive maintenance.

**POR** . Power-on reset.

**port** . A physical connection for communication between the 3590 and the host processor. The 3590 has two SCSI ports.

**Portable Document Format (PDF)** . A standard specified by Adobe Systems, Incorporated, for the electronic distribution of documents. PDF files are compact, can be distributed globally (via e-mail, the Web, intranets, or CD-ROM), and can be viewed with the Acrobat Reader, which is software from Adobe Systems that can be downloaded at no cost from the Adobe Systems home page.

**PROM** . Programmable read only memory.

**PS** . Power supply.

**PWR** . Power.

## R

**rack** . A unit that houses the components of a storage subsystem, such as the Tape Library.

**rackmount kit** . A packaged collection of articles used to install the rack mounted version of the Tape Library.

**RAM** . Random access memory.

**Random access memory** . A storage device into which data is entered and from which data is retrieved in a nonsequential manner.

**RAS** . Reliability, availability, and serviceability.

**record** . A collection of related data or words, treated as a unit.

**recording density** . The number of bits in a single linear track measured per unit of length of the recording medium.

**recoverable error** . An error condition that allows continued execution of a program.

**ref** . Reference.

**reg** . Register.

**reinventor** . To inventory again.

**retension** . The process or function of tightening the tape onto the cartridge, if it is sensed that the tape has a loose wrap on the cartridge.

**RPQ** . Request for price quotation.

**R/W** . Read/write.

## S

**s** . Seconds of time.

**SAC** . Service Action Code. Code developed to indicate possible FRU or FRU's to replace to repair the hardware.

**scratch cartridge** . A data cartridge that contains no useful data, but can be written to with new data.

**SCSI** . Small computer system interface.

**segment** . A part.

**sel** . Select.

**serialize** . To change from parallel-by-byte to serial-by-bit.

**serializer** . A device that converts a space distribution of simultaneous states representing data into a corresponding time sequence of states.

**servo, servos** . An adjective for use in qualifying some part or aspect of a servomechanism.

**servomechanism** . A feedback control system in which at least one of the system signals represents mechanical motion.

**Small Computer Systems Interface (SCSI)** . A standard used by computer manufacturers for attaching peripheral devices (such as tape drives, hard disks, CD-ROM players, printers, and scanners) to computers (servers). Pronounced “scuzzy”. Variations of the SCSI interface provide for faster data transmission rates than standard serial and parallel ports (up to 160 megabytes per second). The variations include:

- Fast/Wide SCSI: Uses a 16-bit bus, and supports data rates of up to 20 MBps.
- SCSI-1: Uses an 8-bit bus, and supports data rates of 4 MBps.
- SCSI-2: Same as SCSI-1, but uses a 50-pin connector instead of a 25-pin connector, and supports multiple devices.
- Ultra SCSI: Uses an 8- or 16-bit bus, and supports data rates of 20 or 40 MBps.
- Ultra2 SCSI: Uses an 8- or 16-bit bus and supports data rates of 40 or 80 MBps.
- Ultra3 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.
- Ultra160 SCSI: Uses a 16-bit bus and supports data rates of 80 or 160 MBps.

**SNS** . Sense.

**special feature** . A feature that can be ordered to enhance the capability, storage capacity, or performance of a product, but is not essential for its basic work.

**SR** . Service representative, see also *CE*.

**SRAM** . Static random access memory.

**SS** . Status store.

**ST** . Store.

**standard feature** . The significant design elements of a product that are included as part of the fundamental product.

**START** . Start maintenance.

**subsystem** . A secondary or subordinate system, usually capable of operating independently of, or asynchronously with, a controlling system.

**SUPP** . Support.

**sync** . Synchronous, synchronize. Occurring with a regular or predictable time relationship.

## T

**tachometer, tach** . A device that emits pulses that are used to measure/check speed or distance.

**tape cartridge** . A container holding magnetic tape that can be processed without separating it from the container.

**tape void** . An area in the tape in which no signal can be detected.

**TCP/IP** . Transmission Control Protocol/Internet Protocol.

**TCU** . Tape control unit.

**TH** . Thermal.

**thread/load operation** . A procedure that places tape along the tape path.

**TM** . Tapemark.

## U

**UART** . Universal asynchronous receiver/transmitter.

**unload** . Prepare the tape cartridge for removal from the drive.

**utilities** . Utility programs.

**utility programs** . A computer program in general support of the processes of a computer; for instance, a diagnostic program.

**uv** . Under voltage.

## V

**VOLSER** . Volume serial number.

**volume** . A certain portion of data, together with its data carrier, that can be handled conveniently as a unit.

**VPD** . Vital product data. The information contained within the tape drive that requires nonvolatile storage used by functional areas of the drive, and information required for manufacturing, RAS, and engineering.

## W

**word** . A character string that is convenient for some purpose to consider as an entity.

**Write** . Write command.

**WT** . world trade.

# **X**

**XR** . External register.

**XRA** . External register address register.

---

# Index

## Special characters

- (RMU), Remote Management Unit 7-35
- RMU, Remove 7-35
- RMU, Replace 7-35

## A

- ac grounding diagram 2-5
- ac input power module 1-22
  - remove/replace procedure 7-48
- ac input power module view 6-19
- access 2-6
- adapters, supported 1-5
- analyze power problem 4-5
- area of application 2-4
  - associated references xvi
- AS/400
  - in library configurations 1-15
- attaching leader pin to tape, procedure A-28
- automatic cleaning
  - description 1-17
- axis assembly view 6-7

## B

- bar code reader 1-21
- before restarting equipment 2-8
  - live parts 2-8
- before working on equipment
  - operating modes 2-7
    - emergency operating mode 2-7
    - normal operating mode 2-7
- bridges, in Fibre Channel network 1-4
- bus cable, SCSI
  - cable, host interface board (SCSI) to tape drive 14-3
  - cable, tape drive to tape drive 14-3

## C

- cable diagram 12-2
- cable diagrams 12-2
- cables
  - display assembly 7-23
  - main to power distribution 7-25
  - power distribution to drive sled 7-26
  - SCSI 1-3
  - Y-axis 7-22
- cartridge
  - Cartridge Removal, Manual B-1
  - removal procedure 7-2
- cartridge storage 1-9
- channel calibration 1-7
- Channel Router, Fibre 7-37

- check, adjust, remove, replace
  - remove, replace 7-3, 7-4, 7-5, 7-6, 7-9, 7-12, 7-14, 7-16, 7-19, 7-22, 7-23, 7-24, 7-25, 7-26, 7-27, 7-28, 7-29, 7-30, 7-32, 7-34, 7-38, 7-40, 7-41, 7-42, 7-43, 7-45, 7-46, 7-47, 7-48, 7-51, 7-52, 7-54, 7-55, 7-56, 7-57, 7-58
- Check, Adjust, Remove, Replace 7-2
- clearing error code log A-25
- configurations
  - sample 1-15, 1-16
- connectors, for SCSI interface 1-3
- control path
  - additional, role in reducing library failure 1-14, 1-18
  - additional, role in reducing library failure in iSeries servers 1-18
  - using for control path failover 1-18
- control path failover feature
  - use with multiple control paths 1-18
- converting an FMR tape to a scratch tape A-24
- copying a drive dump to tape A-21
- creating an FMR tape A-20

## D

- dc power supply
  - remove/replace procedure 7-49
- dc power supply assembly view 6-18
- depth of tape library 1-19
- diagnostics
  - fast read/write test A-26
  - Fibre Channel wrap test A-23
  - Library/Drive Interface wrap test (LDI or RS-422) A-24
  - SCSI wrap test A-22
  - Test Cartridge & Media A-26
  - Test Head A-27
- dimensions of tape library 1-19
- display assembly
  - cable remove/replace procedure 7-23
- display assembly view 6-12, 6-20
- display control board
  - remove/replace procedure 7-43
- displaying error code log A-25
- door interlock switch
  - I/O station 1-11
  - remove/replace procedure 7-54
- drive dump
  - copying to tape A-21
  - forcing A-21
- drive errors
  - Isolate Media A-14
  - Media errors A-14
  - Test Media A-14
- drive sled
  - description 1-5
- drive, tape
  - Drive Diag or Maint Function A-19
  - Drive Display A-16

drive, tape (*continued*)  
Drive Head Clean A-18  
Drive in Maint Mode A-19  
Drive Unload Button A-16  
Drive, Exit Maint Mode A-27  
Drive, Operating A-15  
light, drive status A-16  
Manually Remove Tape Cartridge from Drive B-1

## E

element addressing  
for other supported operating systems C-2  
for Windows 2000 with RSM Enabled C-5  
emergency operating mode 2-7  
environment 1-20  
operating 1-20  
particulates 1-20  
error code log  
clearing A-25  
displaying A-25  
errors  
Fibre Channel A-11  
obtaining from library and drives 9-2  
RS/6000 9-2  
SCSI bus A-9  
errors, library  
Errors, Library (SAC) 5-3  
errpt command, using 9-2

## F

fabric, switched A-11  
fast read/write test A-26  
FC-AL topology A-11  
Fibre Channel connectivity  
description 1-3  
Fibre Channel drive  
compatibility with Multi-Path Architecture 1-14  
fixing errors A-11  
supported topologies A-11  
use with bridge 1-4  
use with hub 1-4  
use with repeaters 1-4  
use with switch 1-4  
wrap test A-23  
Fibre Channel interface  
attachment 1-4  
ports on SAN Data Gateway Module 1-5  
supported adapters 1-5  
Fibre Channel Router 7-37  
FCR, Remove 7-37  
FCR, Replace 7-37  
Fibre Channel-Arbitrated Loop topology A-11  
firmware  
displaying current level 8-4  
recovery from error A-16  
updating 8-4, 8-7, 8-8, 8-9  
from FMR tape A-16, A-20  
library 8-4, 8-7, 8-8, 8-11  
RMU 8-4

firmware (*continued*)  
updating by using FMR tape 8-4, 8-11  
updating by using library serial port 8-4, 8-11  
updating by using SAN Data Gateway Module 8-4,  
8-7  
through SCSI or Fibre Channel interface A-16  
updating by using the RMU 8-4, 8-7  
updating by using the SCSI bus 8-4, 8-8  
FMR tape  
converting to scratch tape A-24  
creating A-20  
updating firmware from A-20  
use in updating drive firmware 8-4, 8-9  
forcing a drive dump A-21  
functional description 1-2  
functional diagram 1-21  
ac input power module 1-22  
bar code reader 1-21  
display board 1-21  
host interface board (SCSI) 1-21  
insert/eject station 1-21  
main controller board 1-21  
picker assembly 1-21  
picker carriage arm assembly 1-21  
picker control board 1-21  
power distribution board 1-21  
power supplies 1-21  
SAN Data Gateway Module 1-22  
tape drive sleds 1-22  
vertical axis motor and belt 1-21  
functional units 1-9

## G

gigabit interface converter (GBIC) module 1-5  
glossary E-1  
grounding diagram 2-5  
guards 2-6, 4-4  
access 2-6  
main switch 2-7

## H

head, testing A-27  
height of tape library 1-19  
high voltage differential (HVD/DIFF) SCSI  
interface 1-3, 1-5  
High Voltage Differential (HVD) SCSI interface 1-3  
host  
sharing library 1-14, 1-15  
host attachment  
Fibre Channel 1-4  
host interface board (SCSI) 1-21  
remove/replace procedure 7-41  
Host Interface Board (SCSI) 1-11  
host interface board (SCSI) view 6-16  
hp-ux system error information 9-9  
hub  
in Fibre Channel network 1-4

HVD/DIFF SCSI interface  
See high voltage differential (HVD/DIFF) SCSI interface

## I

I/O station 1-21  
description 1-11  
I/O station, multiple 1-2, 1-3, 1-11, 7-46, 7-47  
I/O station, single 1-2, 1-11, 7-46, 7-47  
I/O station view 6-9  
IBM Ultrium Tape Drive 1-5  
installation  
remove/replace procedure 7-46, 7-47  
intended use 2-2  
interfaces, supported 1-3, 1-5

## L

leader pin  
reattaching to tape A-30  
repositioning in cartridge A-28  
leader pin attachment kit, ordering  
using A-31  
library control hardware 1-11  
library service approach 3-2, 4-2  
push buttons 3-2  
visual indications 3-2  
Library/Drive (LDI) wrap test, running A-24  
light-emitting diode (LED) A-16  
light, status A-16  
live parts 2-8  
Locations 6-1, 6-2  
logical library  
creating and using multiple for sharing 1-17  
description 1-15  
maximum quantity in library 1-15  
sharing 1-14, 1-15  
using with mixed drive types 1-17  
logical unit number (LUN)  
description 1-17  
low voltage differential (LVD) SCSI interface 1-3, 1-5  
Low Voltage Differential (LVD) SCSI interface 1-3, 1-4  
low-power mode 1-7  
LUN, description 1-17  
LVD SCSI interface  
See low voltage differential (LVD) SCSI interface

## M

main controller board  
remove/replace procedure 7-30  
main controller board view 6-11  
main switch 2-7  
main to power distribution  
cable remove/replace procedure 7-25  
maintenance function  
clearing error code log A-25  
converting an FMR tape to a scratch tape A-24  
copying drive dump to tape A-21  
creating FMR tape A-20

maintenance function (*continued*)  
displaying error code log A-25  
forcing drive dump A-21  
inserting cartridge into tape drive A-25  
maintenance mode  
updating firmware from FMR tape A-20  
maintenance plan 1-20  
maintenance start 1-20  
preventive maintenance 1-20  
maintenance start 1-20  
maintenance starting point 4-2  
analyze power problems 4-5  
library service approach 4-2  
other library failures 4-7  
start service 4-3  
Management Unit (RMU), Remote 7-35  
manual tape cartridge removal  
Manual Tape Cartridge Removal Procedure B-1  
McDATA switch A-11  
mechanical maintenance 2-9  
messages, drive error  
Corrective Actions A-7  
Do This A-7  
Drive Error Log A-9  
Error Messages, Receiving A-7  
Host Sense Data A-8  
Media Related Problems A-14  
Media, Drive Isolation A-14  
Messages, Receiving A-7  
SCSI Bus Errors, Fix A-9  
Tape Errors, AS/400 A-8  
Tape Errors, HP A-8  
Tape Errors, PCs (Intel based) A-8  
Tape Errors, RS/6000 A-8  
tape errors, server reported A-9  
Tape Errors, Sun A-8  
microcode xvi  
mixed drive types, protection against non-support 1-14  
modifier  
SAC modifiers 5-3  
motor  
Motor, Rotary Axis 7-12  
Y-axis motor assembly remove/replace 7-27  
motor assembly P/N 14-2  
motor assembly picture 7-27  
Multi-Path Architecture 1-14  
multiple control paths  
for control path failover 1-18  
for iSeries and AS/400 attachment 1-18

## N

normal operating mode 2-7

## O

operating modes 2-7  
optional features 1-13  
SAN Data Gateway Module 1-12  
other library failures 4-7

- overview
  - cable 12-2
  - FRU (field replaceable unit) 7-2
  - power
    - overview 11-2

## P

- panic reset, performing A-16
- partitioning capability of SAN-ready Multi-Path Architecture 1-14
- picker assembly 1-21
  - remove/replace procedure 7-5
- picker carriage arm assembly 1-21
- picker control board view 6-15
- point-to-point connection A-11
- power
  - ac and dc power distribution 11-3
  - inventory list, power cord 14-4
  - specifications 1-19
- power distribution board
  - remove/replace procedure 7-45
- power distribution board view 6-13, 6-14
- power distribution to drive sled
  - cable remove/replace procedure 7-26
- power management 1-7
- power supplies 1-21
  - check procedure 7-48
- preventive maintenance 1-20

## R

- red dot A-17
- Remote Management Unit (RMU) 7-35
  - Remove RMU 7-35
  - Replace RMU 7-35
- repeaters, in Fibre Channel network 1-4
- resetting the tape drive
  - panic reset A-16
- resolving problems
  - Resolving Problems, Hints A-6
- robotics
  - introduction 1-11
- rotary axis motor
  - figure, remove replace 7-13
  - remove/replace procedure 7-12
  - rotary axis motor figure 7-13
  - rotary axis motor part number 14-2
- Router, Fibre Channel 7-37
  - Remove FCR 7-37
  - Replace FCR 7-37
- RS-422 wrap test, running A-24
- RS/6000
  - error information 9-2

## S

- safety check 2-9
- safety instructions 2-1
- SC connector 1-5

- SCSI drive
  - fixing errors A-9
  - wrap test A-22, A-23
- SCSI interface
  - description 1-3, 1-5
  - high voltage differential (HVD/DIFF) 1-3
  - low voltage differential (LVD) 1-3
- SCSI ports, on SAN Data Gateway Module 1-5
- SCSI wrap test, running A-22
- SCSI wrap tool
  - SCSI Wrap tool, HVD 14-1
    - HVD Wrap Tool P/N 14-1
  - SCSI Wrap tool, LVD 14-1
    - LVD WrapTool P/N 14-1
- serial diagnostic port board
  - replacing 7-42
- service action code
  - overview 5-2
  - table 5-3
- service action codes (SAC)
  - (SAC) Definitions 5-3
- servicing the tape drive 8-2, A-16
- single red dot A-17
- single-character display A-16
- sled, description of tape drive 1-5
- small computer systems interface (SCSI)
  - bus length between terminator 1-3
  - cables 1-3
  - connectors 1-3
    - High Voltage Differential (HVD) signaling 1-3, 1-4
    - Low Voltage Differential (LVD) signaling 1-3, 1-4
    - Ultra 160 support 1-3
- specification, library 1-19
- speed matching 1-7
- start
  - See start service
- start service 4-3
- status light A-16
- Storage Area Network (SAN) Data Gateway Module
  - description 1-12
  - functional diagram 1-22
- storage column
  - remove/replace procedure 7-29
  - use in Fibre Channel connectivity 1-4
- subscriber connector (SC) 1-5
- subsystem description 1-2
  - functional description 1-2
  - functional units 1-9
    - cartridge storage 1-9
    - I/O station 1-11
    - library control hardware 1-11
- subsystem overview figure 6-2
- switch, in network 1-4
- switched fabric loop A-11

## T

- tape cartridge 1-7
  - Fast Read/Write test A-26
  - leader pin
    - reattaching A-30

- tape cartridge *(continued)*
  - leader pin *(continued)*
    - repositioning A-28
  - Tape Cartridge Removal, Manual B-1
  - test cartridge and media diagnostic A-26
  - using a repaired cartridge A-28
- tape drive
  - Fibre Channel connection 1-4
  - quantity in library 1-5
  - updating firmware
    - by using FMR tape 8-9
    - by using RMU 8-7
    - by using SAN Data Gateway Module 8-4
    - by using SCSI bus 8-8
- tape drive sled
  - remove/replace Procedure 7-3
- tape drive sleds 1-22
- Tape Library rear view 6-4
- Tape Library front view 6-3
- TapeAlert flags
  - Definition, TapeAlert Flags A-1
  - LTO Drive Supported Flags A-1
  - Table of Drive Alert Flags A-1, A-2, A-3
  - TapeAlert Flags, Library A-5
- Test Cartridge & Media diagnostic A-26
- Test Head diagnostic A-27
- topologies, supported Fibre Channel A-11
- TotalStorage Specialist application
  - use with SAN Data Gateway Module 1-12
- two-node configuration A-11

## U

- Ultra 160 SCSI interface support 1-3
- Ultrium Tape Drives 1-5
- Unit (RMU), Remote Management 7-35
- unload button A-16
- updating firmware
  - by using an FMR tape 8-9
  - by using the library serial port 8-4, 8-11
  - by using the SAN Data Gateway Module 8-4
  - drive 8-4, 8-7, 8-8, 8-9
  - from FMR tape A-16, A-20
    - through SCSI or Fibre Channel interface A-16
  - library 8-4, 8-7, 8-8, 8-11
  - RMU 8-4, 8-7

## V

- verifying firmware levels 8-4
- vertical axis motor and belt 1-21
- voltage 1-19

## W

- weight of tape library 1-19
- width of tape library 1-19
- wrap test, running
  - Fibre Channel A-23
  - LDI (or RS-422) A-24
  - SCSI A-22

- write-protect switch
  - Write Protect Switch Setting A-2

## Y

- Y-axis
  - cable remove/replace procedure 7-22
  - drive belt - remove/replace procedure 7-16
  - Picker Assembly 7-5
    - Remove Picker Assembly 7-5
    - Replace Picker Assembly 7-6
  - Picker Control Board 7-14
    - Remove Picker Control Board 7-14
    - Replace Picker Control Board 7-14
  - Y-axis drive shaft assembly 7-28



---

# Readers' Comments — We'd Like to Hear from You

IBM TotalStorage  
Ultrium Scalable Tape Library 3583  
Maintenance Information

Publication No. SA37-0425-02

Overall, how satisfied are you with the information in this book?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Overall satisfaction	<input type="checkbox"/>				

How satisfied are you that the information in this book is:

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Accurate	<input type="checkbox"/>				
Complete	<input type="checkbox"/>				
Easy to find	<input type="checkbox"/>				
Easy to understand	<input type="checkbox"/>				
Well organized	<input type="checkbox"/>				
Applicable to your tasks	<input type="checkbox"/>				

Please tell us how we can improve this book:

Thank you for your responses. May we contact you?  Yes  No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

---

Name

---

Address

---

Company or Organization

---

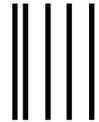
Phone No.



Fold and Tape

Please do not staple

Fold and Tape



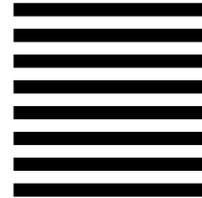
NO POSTAGE  
NECESSARY  
IF MAILED IN THE  
UNITED STATES

# BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

International Business Machines Corporation  
Information Development  
Department GZW  
9000 South Rita Road  
Tucson, Arizona U.S.A. 85775-4401



Fold and Tape

Please do not staple

Fold and Tape





Part Number: 18P8013

Printed in U.S.A.

SA37-0425-02



(1P) P/N: 18P8013



Spine information:



IBM TotalStorage  
Ultrium Scalable Tape Library  
3583

Ultrium Scalable Tape Library 3583 Maintenance  
Information