IBM System Storage TS3500 (25th Edition, August 2011)



3584 Maintenance Information

IBM 3584 Tape Library

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Note!

Before using this information and the product it supports, be sure to read the general information in the “Safety and Environmental Notices” on page 249 and “Notices” on page 1157 sections.

Review “Read This First” on page iii to learn about changes since the previous edition of this document, and the use of a revision bar to identify the changes.

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Read This First

"This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications Networks."

This *IBM System Storage TS3500 Tape Library 3584 Maintenance Information* (MI) contains service information **only** for trained service personnel. Use the MI as a guide when you make a service call to diagnose or maintain an IBM 3584 Tape Library subsystem.

You may send your comments to IBM. See **"How to send your comments" on page 1185**.

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A revision character (**|**) appears to the left of some pages in this document. This character identifies information that has been added or changed since the previous release.

Note: Go to the Start section (Table 15 on page 73) **to begin all service activities.**

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What's New in This Edition

Changes in the 24th and 25th Editions (May and August 2011)

- Support for Shuttle Complex (Model SC1) including both long and short span features. Use installation instructions PN 46X9951 to install and configure this feature. All error codes and CARR procedures are contained in this MI.
- Support for new 3592 E07 (TS1140) drive in x22 and x23 models. See **Figure 18 on page 36**.

  Note: 3592 E07 (TS1140) drives require Library FW B120 or higher, and ALMS. The customer must have ALMS installed and enabled.
- When should "Discover Hardware Changes" be run or not run? See **"When to Run Discover Hardware Changes with ALMS Enabled" on page 692**.
- If you are installing **any** new frame in the middle of a library string, and you must uninstall & reinstall frames to accomplish this, see the new topic, **"Procedures to Uninstall Existing Library Frames to Add or Remove Frames from Inside a Library String" on page 231**.
- If a node card is looping through a code update, check the node card version. Firmware levels 95xx and higher require enhanced node cards.
- X and Y motor drive belt wear is difficult to determine. If errors related to X or Y motion are detected, the drive belt should be replaced. New FRUs are now available for both the X and Y motors which include the motors and a new drive belt. See **"Assembly 7: X-Axis Assembly" on page 1128** and **"Assembly 8: Y-Axis Assembly" on page 1130**.
- You can now order an entire column of single-deep cells (LTO or 3592) for all Lxx and Dxx frames. See **1–18 on page 1110**.
- Front doors are now available for replacement. See **1–1 on page 1109**.

Changes in the 23rd Edition (April 2010)

- Support for 3588 LTO Ultrium-5 (F5A) dual fibre port drive.
- LTO error log information through the Web Specialist might be misleading when compared to the operator panel information. See **"LTO Errors Through Web Specialist" on page 592**.
- 3592 drive load/unload errors do not show a FID. See **"3592 Drive Load/Unload Errors & FID" on page 363**.
- We have seen a number of cases where X-Track cable pins are being bent when connecting to either the XCP card (on the back firewall) and the AXY on the accessor. When connecting the X-track cable, carefully position the connector into the XCP or AXY card, then rock it gently in place. Pins can easily bend if care is not taken.
- A blown FIC card fuse may be hard to see. This might help: **"How to Identify Blown FIC Card Fuses" on page 667**.
- When replacing an ACC card (old style with battery) remove the battery from the **new** ACC and leave it out for approximately 10 minutes. This clears residual NVRAM data from the manufacturing test process or from an ACC that may have been returned to stock after being installed in another library. Read the first note in **"Accessor Controller Card (ACC, ACC-CF)" on page 828**.
- A broken I/O station cam on LTO 10 and LTO 20 I/O stations can now be replaced. See **Cam, Toggle FRU Kit on page 1125**.
- Due to the complexity of various library and frame installations, special installation instructions are sometimes provided. These are listed in the Installation section. Read all the information in these "Attention" blocks to determine if special install instructions are required for the installation you will be doing. The Attention boxes are on pages **113** and **121**.
- Several PFE warning letters were recently published. Review them often under *"News you should use"* at the following website:

  `http://snjlnt02.sanjose.ibm.com/tape/tapetec.nsf/pages/opensystems`

Changes in the 22nd Edition (November 2009)

- Added new topic for using the Web UI for TSSC Call Home setup. See **“Using Web Specialist to Configure for Call Home (via TSSC)” on page 752**.
- Updated X-track cable part numbers in the Installation section. See **Table 23 on page 143**.
- Updated information on the lower Lxx rail in an HA installation. See "Replacing the 'L' Rail in the Lxx frame" on page **159**.
- Added a door roller adjustment procedure to ensure front door is properly supported on new installations. See **Door Roller Adjustment on page 147**.
- Added new topic with detailed information on "No Motion Allowed." See **“No Motion Allowed State (NMA)” on page 690**. URC A4BB (No Motion Allowed state) has been updated. See page **465.**
- CETool version 5.2 (or later) has some new features. See **“CETool v5.2 and Later” on page 725** and **“NVRAM Restore” on page 743**.
- Calibration problems may be caused by binding upper Y-mast rollers resulting in erratic Y-motion during calibration. See **“Library calibration results in error” on page 78**.
- B884 errors could be caused by a cartridge gate problem. See **“B884 Error” on page 308**.
- F1 node card hang may occur on standard node cards with 95xx or higher 3584 firmware level. See **“CB C3 Error” on page 311**.
- Added 3592 I/O station slot spring and lockout lever replacement FRU kit. See **FRU Kit, 3592 Spring & Lockout Lever on page 1127**.
- If your ethernet connection appears to be hung, see **“Ethernet Connection is "Hung"” on page 688**.
- Information-only errors (sense key = 01) were added/moved to the beginning of the "Library Sense Data to URC Table." These '01 44 xx xx xx' errors are listed on page 280.
- Reminder that there are three sense data tables in the Unit Reference Codes chapter:
  - “Library Sense Data to URC Table” on page 279.
  - “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
  - “3592 Drive Sense Data to URC Table” on page 344 and “3592 Drive FID to URC Table” on page 357.
  - Many PFE warning letters were sent recently. Be sure to review them often under *"News you should use"* at the following website:

    `http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf/pages/opensystems`

Gripper Issues

- **"Enhanced Gripper"** references were changed to **"HD Grippers"** throughout the MI to eliminate confusion. HD grippers are primarily used in libraries with Sx4 HD frames.
- Never disassemble or attempt to repair a gripper. Always replace the entire gripper FRU.
- Never swap parts between grippers, especially between different gripper types.
- Do not mix Universal and HD grippers in the same dual gripper assembly. HD grippers are only used in libraries with Sx4 High Density frames. Library FW 8870 or higher is required for HD grippers. The gripper types can be positively identified by the barcode label on the right side of each gripper (as you face the gripper). See **"Assembly 13: Dual Gripper Assembly (Universal LTO/3592)" on page 1140** and **"Assembly 14: Dual Gripper Assembly (HD) Required if Sx4 HD frames are installed" on page 1142** for pictures of the labels.
- The Dual Gripper Assembly FRUs (both Universal and HD) will be eliminated in the future. All the components of the dual gripper assemblies are available as FRUs.
- Universal gripper cage wear may cause various problems. See **"Worn Universal Gripper Cage" on page 766**.
- When a cartridge is stuck in a gripper, dropped, or found laying in the aisle, special recovery procedures are necessary to avoid a duplicate volser problem. See **"When Cartridge is Dropped or Stuck in Gripper" on page 1044**.

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Preface

IBM has prepared this maintenance information (MI) manual to guide IBM service representatives (Customer Engineers) during installation, maintenance, and repair of the tape library. This publication is not intended for any other purpose.

To purchase IBM publications, contact your IBM representative or the IBM branch office in your area.

Tape Library Models and Drives Included

This manual contains information about the following models:
- IBM 3584 System Storage Tape Library Model L32, L22, L23, L52, L53 (Base Frames)
- IBM 3584 System Storage Tape Library Model D32, D22, D23, D52, D53, Dx3 (Expansion Frames)
- IBM Ultrium LTO Tape Drives
- IBM 3592 Tape Drives

Using This Manual

Service personnel should use this maintenance information to install, remove, diagnose, repair, or test the IBM System Storage Tape Library 3584.

Use the information and instructions in this maintenance information (MI) as follows:

1. Read this preface and Chapter 1, “Introduction,” on page 1 to get a summary of the tape library and how it is repaired.
2. Start all maintenance at Chapter 2, “Start,” on page 71.

   The instructions in “Start of Call” on page 72 will guide you to the procedures necessary for maintenance and testing.
3. End maintenance at “End-of-Call” on page 794.

Related Publications

Additional information related to the library is available in the following publications:
- *IBM System Storage TS3500 Tape Library with ALMS Operator Guide*, GA32-0594
- *IBM System Storage TS3500 Tape Library with ALMS Introduction and Planning Guide*, GA32-0593
- *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560
- *IBM System Storage TS3500 Tape Library Introduction and Planning Guide*, GA32-0559
- *IBM System Storage TS3500 Tape Library SCSI Reference*, GA32-0561
- *IBM Encryption Key Manager component for the Java™ platform Introduction, Planning, and User's Guide*, GA76-0418

For related information about the Ultrium Tape Drive, refer to:
- *IBM LTO Ultrium Tape Drive SCSI Reference*, GA32-0450
- *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430

For definitions of terms and acronyms, refer to:
- *IBM Dictionary of Computing*, ZC20-1699

For safety information, refer to:
- *Electrical Safety for IBM Customer Engineers*, S229-8124
- *IBM Externally Attached Devices Safety Information*, SA26-2004

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iSeries (AS/400) Information

For additional information about the iSeries (AS/400) subsystems and software, refer to the following publications:

- *Application System/400 Physical Planning Guide and Reference*, GA41-9571
- *Application System/400 Service Functions*, SY44-3902
- *Application System/400 System Operation*, SC41-3203
- *Application System/400 Physical Planning Reference*, SA41-3109
- *Application System/400 Physical Planning Summary*, SA41-3108
- *Application System/400 Control Language Reference*, SC41-0030
- *Application System/400 Security Concepts and Planning*, SC41-8083
- *Automated Tape Library Planning and Management Guide*, SC41-3309

pSeries (RISC System/6000) Information

For additional information about the pSeries (RISC System/6000) systems and software, refer to the following publications:

- *RISC System/6000 Getting Started: Using RISC System/6000*, GC23-2521
- *RISC System/6000 Getting Started: Managing RISC System/6000*, GC23-2378
- *RISC System/6000 V4 Problem Solving Guide*, SC23-2606
- *RISC System/6000 V4 Message Guide & Reference*, SC23-2641
- *RISC System/6000 Problem Solving Guide*, SC23-2204
- *RISC System/6000 System Overview and Planning*, GC23-2406
- *RISC System/6000 Planning for System Installation*, GC23-2407
- *IBM 7015 Install and Service Guide*, SA23-2628

9076 SP2 Information

- *Scalable POWERparallel Systems: System Site Planning*, GC23-3905
- *Scalable POWERparallel Systems: Installation Guide*, SH23-3865
- *Scalable POWERparallel Systems: High-Performance Technical Computing Solutions*, GH23-2485
- *Scalable POWERparallel Systems: Business Solutions,* GA23-2475
- *IBM 9076 Scalable POWERparallel Systems: SP2 Administration Guide*, SH26-2486
- *IBM 9076 Scalable POWERparallel Systems: SP2 Diagnosis and Messages*, SC23-3866
- *IBM 9076 Scalable POWERparallel Systems: SP2 Command and Technical Reference*, GC23-3900
- *IBM 9076 Scalable POWERparallel Systems: Maintenance Information, Volume 1*, SY66-0294
- *IBM 9076 Scalable POWERparallel Systems: Maintenance Information, Volume 2*, SY66-0295

Device Driver Information

- *IBM Ultrium Device Drivers: Installation and User's Guide*, GA32-0430
- *IBM Ultrium Device Drivers: Programming Reference*, WB1304

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IBM System Storage Tape Library 3584

The IBM System Storage Tape Library 3584 is a stand-alone device that provides automated tape handling and storage for unattended mid-range systems and network servers. The basic library is a single storage unit known as the base frame. The library's scalability allows you to increase storage capacity by adding up to 15 additional storage units, called expansion frames. Each frame in the library may contain up to 12 Ultrium Tape Drives (in an L32, L52, L53, D32, D52, D53) and (12) 3592 drives (in a L22, L23 or D22, D23). Data cartridges for 3592 and Ultrium may not be intermixed in the same frame; neither can the drives. The library offers outstanding retrieval performance, with typical cartridge move times of less than 3 seconds for a two-frame library with one accessor. Larger libraries with two active accessors should run at approximately half that time.

Notes:

1. The claims made here and the values shown here are for LTO drives and tapes, unless otherwise stated.

To match your system capacity and performance needs, you can tailor the System Storage Tape Library 3584 to take advantage of the following features:

- The library has been enhanced to a maximum of 16 frames, 192 drives, and 6881 cartridges. This enhancement represents a library capacity of up to 1376 TB (2752 TB at 2:1 compression).
- The Ultrium 2 Tape Drive technology features a native capacity of 200 GB (400 GB at 2:1 compression) with the IBM System Storage LTO Ultrium 200 GB Data Cartridge. It also features 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 frame with Ultrium 1 Tape Drive drives and data cartridges.
- The Ultrium 3 Tape Drive technology features a native capacity of 400 GB (800GB at 2:1 compression) with the IBM System Storage LTO Ultrium data cartridge. It also features a native data rate of 80 MB/s. Ultrium 3 tape drives can read and write on Ultrium 2 data cartridges and can read, but cannot write, Ultrium 1 data cartridges.
- Ultrium drives 2 through 5, and data cartridges, can share any given LTO library frame.
- The IBM System Storage Enterprise 3592 Tape Drive supports only Fibre Channel attachment.
- For the IBM Ultrium 1 and 2 tapes drives, support of any combination of interfaces, including Fibre Channel, Low Voltage Differential (LVD) and High Voltage Differential (HVD)
- The IBM Ultrium-3, Ultrium-4, and Ultrium-5 tape drives support only fibre channel.
- The 3592 Tape Drive features a native capacity of 300 GB (900 GB at 3:1 compression) and up to 40 MB/sec native data rate. Also featured is dynamic digital speed matching and streaming technology that minimizes tape "back hitching."
- Multi-Path Architecture that enables a single library to be shared by multiple homogeneous or heterogeneous applications

Figure 1 on page 4 shows an IBM System Storage Tape Library 3584 that contains 16 frames.

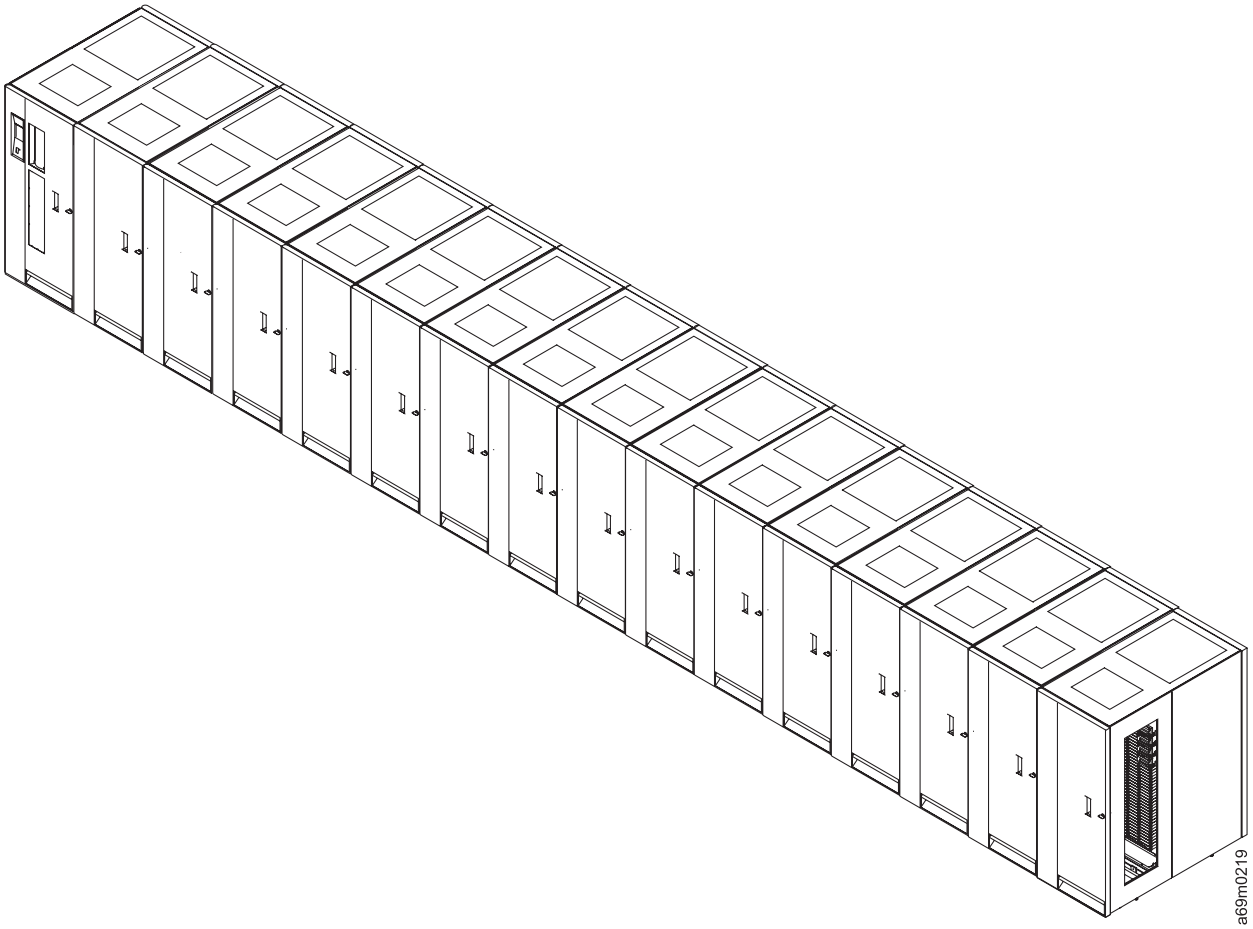


Figure 1. 3584 Tape Library with 16 Frames. Model Lxx base frame (left) and fifteen Model Dxx expansion frames (right of base frame).

With the Capacity Expansion Features (additional storage slots enabled on the front door), the base frame (Model L32, L52, L53) in the library has as many as 281 cartridge storage slots and can support as many as 12 Ultrium Tape Drives. It contains a 10-slot input/output (I/O) station for moving cartridges to and from the library without requiring a re-inventory. For greater storage capacity, you can attach an expansion frame to the base frame. Each expansion frame (Model D32, D52, D52) has as many as 440 cartridge storage slots and contains as many as 12 Ultrium Tape Drives.

A similar situation occurs with the base frame (Model L22, L23). Additional slots (with the Capacity Expansion feature) are made available using the from door and, as with the L32, up to 12 (3592) drives can be installed in each base and expansion frame.

Figure 2 on page 5 shows a base frame and one expansion frame in the System Storage Tape Library 3584.

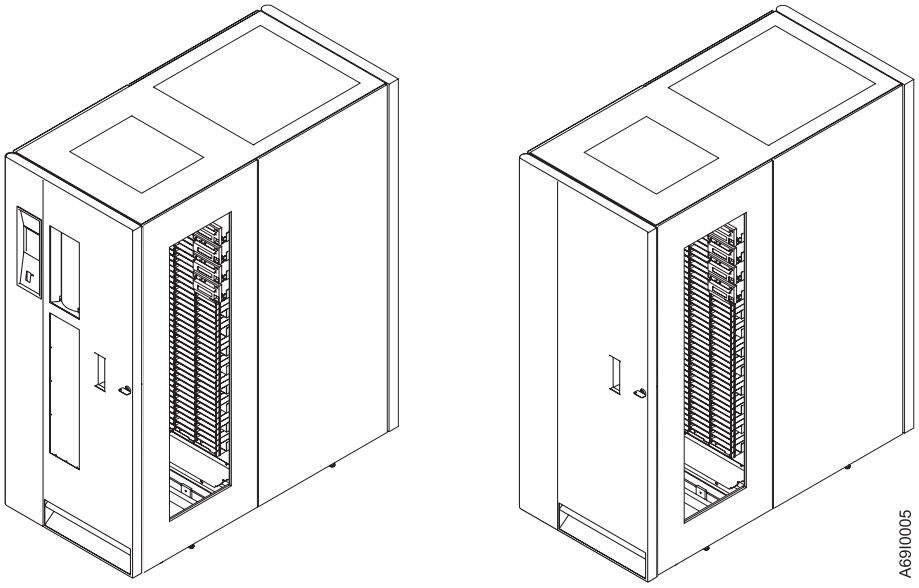


Figure 2. System Storage Tape Library 3584 Frames. Model L32 base frame (left) and Model D32 expansion frame which attaches to base frame.

In addition to the frames shown in Figure 1 and Figure 2, the 3584 now has L22/L23 and D22/D23 frames for 3592 drives, and L52/L53 and D52/D53 frames for LTO drives that are 12.1 inches shorter (from back to front) and minimize customer floor space. These frames, shown in Figure 3, are compatible with, and may be intermixed with, longer x32 frames.

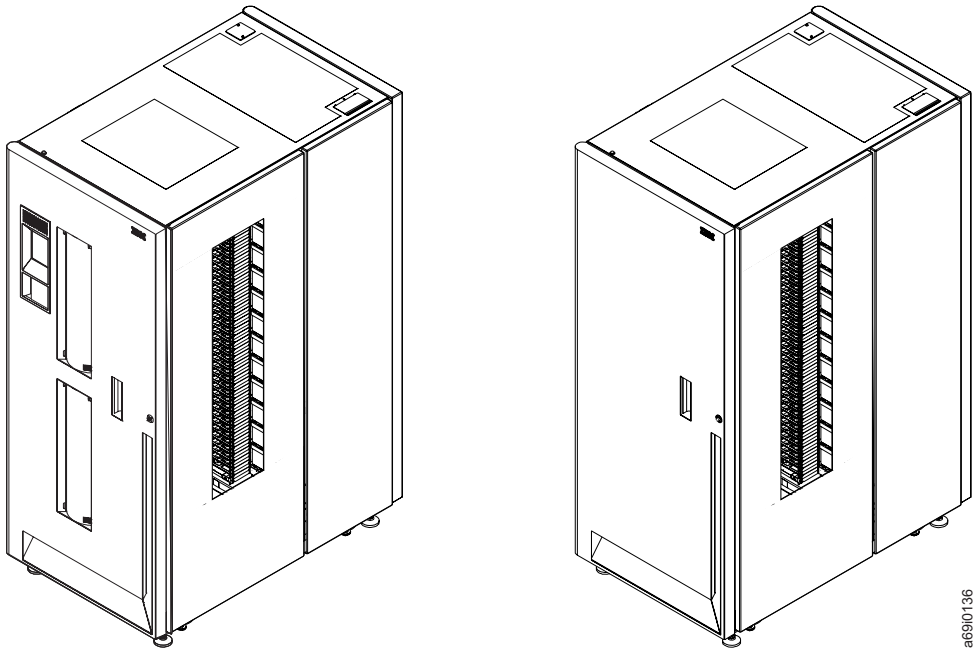


Figure 3. Frames in the 3584. Model L52/L53 (the base frame) is on the left. Model D52/D53 (the expansion frame) is on the right and attaches to the base frame. (Models L22, D22, L23, D23 L32, D32 are not shown). Models L22/L23 and D22/D23 house 3592 Tape Cartridges; Models L32, D32, L52, D52, L53, D53 house LTO Ultrium Tape Cartridges.

The quantity of storage slots in the tape library reduces incrementally whenever you install one or more sets of 4 drives. Table 1 lists the number of storage slots available per quantity of drives in the Model L32 frame (both with and without the Capacity Expansion Feature). Table 2 lists the number of storage slots available per quantity of drives in the Model D32 frame.

Table 1. Quantity of LTO Storage Slots in Base Frame (Model L32). The quantity depends on how many drives are in the frame.

Quantity of Drives Per Frame	Slots in Model L32 Frame	Slots in Model L32 Frame with Capacity Expansion Feature
1-4	141	281
5-8	113	253
9-12	87	227

Table 2. Quantity of LTO Storage Slots in Expansion Frame (Model D32). The quantity depends on how many drives are in the frame.

Quantity of Drives Per Frame	Slots in Model D32 Frame
0	440
1-4	423
5-8	409
9-12	396

Since the addition of the IBM Total Storage Enterprise 3592 Tape System to the 3584 library, four new frames have been introduced along with two new I/O configurations. The L22/D22 and L23/D23 frames have been added to accommodate the 3592 drive and cartridge storage slots. The L52/D52 and L53/D53 frames have been added to accommodate the LTO Ultrium 1, 2, 3, and 4 tape drives and cartridge storage slots. In the L22, L23 and L52, L53 frames, two new I/O stations are available. The original standard 10 slot I/O and optional 20 slot I/O stations have been replaced with an upper (standard) and lower (optional) 16 slot I/O station. Table 3 shows the drive and cartridge capacities possible within these new frames.

Table 3. New Frame Capacities (with Capacity Expansion Feature)

Frame	# Drives	# 16 Cart. I/O	Total Carts	Total Carts & I/O
L22/L23	0	1	261	277
	4	1	261	277
	8	1	249	265
	12	1	238	254
	0	2	223	255
	4	2	223	255
	8	2	211	243
	12	2	200	232
D22/D23	0	N/A	400	N/A
	4	N/A	383	N/A
	8	N/A	371	N/A
	12	N/A	360	N/A
L52/L53	0	1	288	
	4	1	288	
	8	1	274	

Table 3. New Frame Capacities (with Capacity Expansion Feature) (continued)

	12	1	262	
	0	2	246	
	4	2	246	
	8	2	232	
	12	2	220	
D52/D53	0	N/A	440	N/A
	4	N/A	422	N/A
	8	N/A	408	N/A
	12	N/A	396	N/A
S24	N/A	N/A	1000	N/A
S54	N/A	N/A	1320	N/A

The System Storage Tape Library 3584 features Multi-Path Architecture, which allows similar or dissimilar open system hosts to share the library's robotics without middleware, or with a dedicated server acting as a library manager. Multi-Path Architecture makes sharing possible by letting you partition the System Storage Tape Library 3584 storage slots and tape drives into *logical* libraries, with at least one control path for each logical library. Host systems can then run separate applications in each logical library. Multi-Path Architecture also lets you configure additional control paths for any one logical library. This allows the cartridge inventory of the System Storage Tape Library 3584 to be shared by multiple, open-systems hosts. Additional control paths also reduce the possibility that failure in one control path will cause a breakdown in the entire library. For details about configuring the library to share robotics, see “Library Configurations” on page 59.

Expanded I/O Capacity

To insert cartridges into and remove them from the library (without requiring a reinventory), the library offers two input/output (I/O) stations located on the front door of the base frame. For L32 only: The upper I/O station contains 10 slots for LTO Ultrium-1, Ultrium-2, Ultrium-3, Ultrium-4, or Ultrium-5 tape cartridges. The quantity of storage slots in the lower I/O station varies, depending on whether you use mixed media. For LTO tape cartridges, the lower I/O station contains 20 slots.

When inserting or removing cartridges from an L22/L23 or L52/L53 frame, instead of the standard 10 and option 20 I/O slot stations, there will be one standard 16 slot (upper) I/O station and an optional (lower) 16 slot I/O station. The I/O stations will function as follows:

- L22/L23 —
  - Upper I/O station for 3592 Cartridges only.
  - Lower I/O station for LTO cartridges only, if mixed media is installed. If mixed media is not installed, it will be used for 3592 cartridges only.
- L52/D53 —
  - Upper I/O stations for LTO cartridges only.
  - Lower I/O station for 3592 cartridges only, if mixed media is installed. If mixed media is not installed, it will be used for LTO cartridges only.

Capacity Expansion Feature

The capacity expansion feature lets the customer use the storage slots on the front door of the System Storage Tape Library 3584. With the capacity expansion feature installed, the base frame offers the maximum cartridge storage slots. The capacity expansion feature is required when you add one or more expansion frames (Model Dxx) to the base frame.

When customers order the library, they may specify that the capacity expansion feature be factory installed, or they may order the feature and have the IBM customer engineer (CE) install it at a later date.

Only one capacity expansion feature is available on the L32 frame. With this feature installed, the customer has use of all slots on both the back wall and front door. The L22/L23 and L52/L53 frames have two version of Capacity Expansion – Intermediate and Full capacity Expansion. Intermediate expansion provides an additional number of slots in the L22/L23 or L52/L53 frames, and Full expansion provides the remainder of the slots. See Figure 8 on page 24 and Figure 10 on page 26 for more information about these two expansion features. Full Expansion is required before a second frame may be added.

Control Path Failover Feature

Automatic Library Control Path Failover Feature enables the library to resend the command to another control path target for the same logical library. With automatic control path failover installed, the target can be another HBA, SAN, or library control path drive. The library initiates error recovery and continues the operation on the other control path without interrupting the application. Only AIX commands are supported for this feature.

When customers order the library, they may specify that the Control Path Failover feature be factory installed, or they may order the feature and have the IBM customer engineer (CE) install it at a later date.

Dual AC Power Cord Line Feed

The library's dual ac power cord line feed supports 110 Vac or 220 Vac. It provides two independent line cords that may be connected to two independent branch circuits and therefore to two receptacles. A power switch connects to one of the two branch circuits and passes all ac power to the frame from that circuit. The switch monitors the ac line voltage from the circuit it is using and automatically switches to the alternate power circuit if the incoming voltage is lost.

Multi-Path Architecture

The System Storage Tape Library 3584 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. The Multi-Path Architecture is compliant with the following attachment interfaces:

- Small Computer Systems Interface (SCSI)
- Fibre Channel

Whether partitioned or not, the 3584 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 allow the cartridge inventory of the System Storage Tape Library 3584 to be shared by multiple IBM @server, iSeries, and IBM AS/400 servers, or other open systems hosts that run the same applications. Additional control paths also reduce the possibility that failure in one control path will cause the entire logical library to be unavailable.

Advanced Library Management System (ALMS)

The Advanced Library Management System feature is an extension of IBM's patented Multi-Path Architecture. ALMS enables logical libraries to consist of unique drives and ranges of VOLSERs, instead of fixed locations. It offers the ability to assign tape drives to any logical library by using the Tape Library Specialist web interface. Logical libraries can also be added, deleted, or easily changed without disruption.

Another feature of ALMS is the ability to add or remove hardware (drive canisters, storage slots, I/O stations and even frames) without disrupting the logical library structures, and with a minimum of disruption to library availability. For example, drives may be added or removed with no disruption to library operations. ALMS is optional and requires a license key.

Attention: Disabling ALMS is disruptive and all or some Logical Libraries will be removed and not recovered.

Supported Servers and Requirements

The IBM System Storage Tape Library 3584 is supported by a wide variety of servers, operating systems, and adapters. These supported attachments can change throughout the life cycle of the product. To determine the latest attachments, visit the website at `http://www.ibm.com/storage/lto` or contact your customer's IBM marketing representative.

Attachments to the IBM System Storage Tape Library 3584 include (but are not limited to) those shown inTable 4.

Table 4. Supported Servers and System Attachments

Server	Operating System
IBM @server iSeries and IBM AS/400®(see Note)	OS/400®
IBM @server pSeries and IBM RS/6000® and RS/6000 SP®	IBM AIX®
IBM @server xSeries and Netfinity®	Microsoft® Windows NT® and Windows 2000®
HP®	Hewlett-Packard HP-UX®
Intel®-compatible servers	Microsoft® Windows NT® and Windows 2000®
Sun®SPARC™ PCI	Sun Solaris®
Sun®SPARC™ Sbus	Sun Solaris®

Supported Software

IBM does not provide application software with the IBM System Storage Tape Library 3584. To order software, have your customer contact the IBM marketing representative, IBM business partner, or an independent software provider.

The following are among many software products that support the IBM System Storage Tape Library 3584. To get a comprehensive list of compatible software, have your customer visit the Web at `http://www.ibm.com/storage/lto` or contact the IBM representative.

- Tivoli® Storage Manager™ (formerly IBM ADSTAR® Distributed Storage Manager (ADSM))
- Backup Recovery and Media Services (BRMS)
- Computer Associates ARCserve®
- Dantz Retrospect
- Sterling Alexandria
- Legato Systems NetWorker
- SCH Technologies
- VERITAS NetBackup and Backup Exec®
- Help/Systems, Inc. Robot/SAVE

Supported Device Drivers

IBM provides device driver support for the Ultrium and 3592 tape drives and robotics for the System Storage Tape Library 3584. IBM maintains the latest levels of device drivers and driver documentation on the internet. Your customer can access this material from the browser or via the IBM FTP site by doing the following:

Note: If your customer does not have Internet access, contact the IBM marketing representative for information about device drivers.

- From a browser, type one of the following URLs:

ftp://ftp.software.ibm.com/storage/devdrvr

ftp://207.25.253.26/storage/devdrvr

- Using an IBM FTP client, enter the following specifications:

  FTP site: ftp.software.ibm.com

  IP Addr: 207.25.253.26

  Userid: anonymous

  Password: (use your current e-mail address)

  Directory: /storage/devdrvr

  If you do not have internet access and you need information about device drivers, contact your customer's IBM Sales Representative.

IBM provides PostScript- and PDF-formatted versions of its documentation in the /storage/devdrvr directory:

- IBM_ultrium_tape_IUG.pdf and IBM_ultrium_tape_IUG.ps contain the current version of the *IBM Ultrium Device Drivers Installation and User's Guide*.
- IBM_ultrium_tape_PROGREF.pdf and IBM_ultrium_tape_PROGREF.ps contain the current version of the *IBM Ultrium Device Drivers Programming Reference*.

Device drivers for each supported server are under /storage/devdrvr/ in the following directories:

- AIX/
- HPUX/
- Solaris
- WinNT
- Win2000

Note:

- The device driver for the AS/400 is included in the OS/400 operating system.

For more information about device drivers, refer to the preceding device driver operating system directories.

Attachment Interfaces

The System Storage Tape Library 3584 supports three types of attachment interfaces: Fibre Channel, LVD SCSI, and HVD SCSI. Ultrium 1 and 2 drives can attach via all three interfaces. Ultrium-3, Ultrium-4, and Ultrium-5 and 3592, attach only through the fibre channel interface. The information that follows describes each type.

Fibre Channel

In addition to using SCSI interfaces to attach to servers, the 3584 tape library also can use a Fibre Channel interface. Fibre Channel is capable of up to 4 Gbps, full-duplex, serial-communications technology capable of interconnecting Ultrium and 3592 tape drives and servers that are separated by as much as 11 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). Fibre Channel technology offers a new transport mechanism for delivering commands, and provides high performance by allowing processing to be done in the hardware.

The SC fibre cable is a 62.5 micron cable capable of speeds up to 1Mbits/second. The LC fibre cable is a 50 micron cable capable of speeds up to 2Mbit/second. For more information, see the topic, "Overview of 3584 Tape Library" in Chapter 1 of the *IBM System Storage TS3500 Tape Library Operator Guide*.

You can establish Fibre Channel connections between Fibre Channel ports that reside in the library and 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.

LVD SCSI

The System Storage Tape Library 3584 operates as a set of SCSI-3 devices. Any Ultrium 1 or 2 Tape Drive in the library can attach to a server through a Low Voltage Differential (LVD) Ultra2 SCSI interface, or can attach to a server through a Fast/Wide LVD SCSI interface. Each drive uses shielded, VHDCI, 68-pin connectors and can attach directly to a 2-byte-wide SCSI cable (the earlier version of the library used drives with HD68 connectors).

Any combination of initiators (servers) and targets (devices) up to a total of 16 is allowed if:

- The SCSI bus is terminated properly at each end
- Cable restrictions are followed according to SCSI-3 standards

Under the SCSI-3 standards, this type of attachment allows cable lengths of up to 25 m (81 ft), with the appropriate cable and terminator.

HVD SCSI

The System Storage Tape Library 3584 operates as a set of SCSI-3 devices. Any Ultrium 1 or 2 Tape Drive in the library can attach to a server through a High Voltage Differential (HVD) Ultra SCSI interface. Each drive uses shielded, VHDCI, 68-pin connectors and can attach directly to a 2-byte-wide SCSI cable (the earlier version of the library used drives with HD68 connectors).

Any combination of initiators (servers) and targets (devices) up to a total of 16 is allowed if:

- The SCSI bus is terminated properly at each end
- Cable restrictions 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.

IBM System Storage Tape Library Specialist

IBM System Storage Tape Library Specialist (IBM's Enterprise Storage Resource Management solution), is a growing software family whose goal is to enable storage administrators to efficiently manage storage resources from any location within an enterprise. By using this solution, your customer can view and manage widely dispersed storage resources through a single, cohesive control point.

The Specialist family includes a number of storage “specialists,” interfaces that enable you to manage specific storage devices. The (StorWatch) Specialist for the 3584 Tape Library is a platform-independent, web-based, user interface that lets your customer configure and monitor the library from a remote location.

Configuring the IBM System Storage Tape Library Specialist is an operator task. The operator should reference the 3584 Operator Guide for setup and configuration information.

Remote Support (Call Home & Heartbeat Call Home/MRPD Features)

Optional remote support is available for the 3584 Tape library through its Call Home capability. This feature minimizes the time it takes to correct library problems. It uses a modem connection to report failures that are detected by the library. Whenever the library detects a failure, the Call Home feature sends detailed error information to IBM. The IBM Service Representative can prepare an action plan to handle the problem before traveling to the library.

With Library firmware version **34xx or higher** you get Heartbeat/MRPD/Data Call Home in addition to the earlier PMR Call Home.

Heartbeat Call Home / MRPD Reporting Function

Heartbeat Call Home and Machine Reported Product Data - Vital Product Data (MRPD-VPD) is a subprocess with associated data that uniquely defines the content of a customer's installed system such as hardware, firmware, and installed feature codes. This information is sent through RETAIN to an IBM server.

With MRPD reporting, a new Information Record type (6) is created, containing specific 3584 configuration data. From this specific configuration data, nearly all of the 3584 feature codes can be determined. See “Call Home Screen” on page 105 for screen examples of Call Home and Heartbeat Call Home.

Information that can be obtained include:

- Machine type, model, and serial number of each frame.
- Type, host attachment, and serial number of each drive.
- Type and firmware level of each library node card, drive control path, canister card, and hot-swap drive power supply.
- Remote Service (presence of Call Home and WTI switch features).
- SNMP
- IBM Specialist
- Type and number of I/O stations
- Type of grippers
- Feature Codes

To ensure that the connection to IBM for problem reporting and service is operational, a "Heartbeat Call Home" record will be sent by each machine on a periodic basis. The period at which the Heartbeat (HB/MRPD) record is sent is hard coded to every 7 days, and 60 minutes after a power-on reset.

Call Home Reporting

In addition to the periodic scheduled Heartbeat Call Home, records will be sent under the following circumstances:

- Whenever there is a change to the physical configuration or a firmware update.

  Note: In order to avoid repetitive sending of Heartbeat Call Home records when multiple devices are being installed or updated, a delay may be implemented. As an example, a CE may update the library code, the LTO SCSI drive code, and the LTO Fibre Channel drive code. In this case, after each code update completes, there should be a delay before sending the Heartbeat Call Home record in case there are further code updates.
- In response to the CE selecting the Call Home menu item on the Call Home diagnostic menu. The call home test will automatically include heartbeat information if the level of library firmware is 3480 or higher. In library firmware level 5510 or higher, you will have the option to send a drive dump using the Call Home menu item.

  Note: No delay will be implemented when the CE manually initiates a Call Home.

The Call Home feature handles library problems, including those related to loading and unloading the drive; it does not handle drive read/write or server interface problems.

Hardware requirements for the remote support function vary, depending on whether you already have one or more 3584 Tape Libraries. Table 5 on page 14 indicates the requirements.

Table 5. Remote Support Requirements (Call Home Feature)

Quantity of Base Frames (L22, L32, L52)	Requirement
1	Remote Support Facility (modem and cable; feature code #2710)
2	Remote Support Switch (feature code #2711)
3 or more	Remote Support Attachment (cable; feature code #2712)

Library Structure

The basic library is a single storage unit known as the base frame. The library's scalability allows you to increase capacity by adding up to fifteen additional storage units, called expansion frames. The additional expansion frames are supported by one or two common cartridge accessors that require no pass-through mechanism. Each frame in the library may contain up to twelve Ultrium Tape Drives or 3592 Tape Drives, but may not contain a mix of both.

The 3584 tape library features six frame models. The models vary, depending on the type of drives that they contain and whether the frame is a base or expansion frame:

Model L22 / L23
A base frame that uses up to twelve 3592 drives and up to 238 3592 IBM System Storage Enterprise Tape Cartridges. Model L22/L23 is 307 mm (12 in.) shorter in depth than Model L32. The model L23 has a new power structure. See “Enhanced FCA (x23 / x53 Frames Only)” on page 44.

Model D22 / D23
An expansion frame that uses up to twelve 3592 drives and up to 360 3592 IBM System Storage Enterprise Tape Cartridges. Model D22/D23 is 307 mm (12 in.) shorter in depth than Model D32. The model D23 has a new power structure. See “Enhanced FCA (x23 / x53 Frames Only)” on page 44.

Model L32
A base frame that uses up to twelve Ultrium Tape Drives and up to 281 IBM LTO Ultrium Tape Cartridges. The Model L32 is 307 mm (12 in.) longer in depth than Model L52.

Model D32
An expansion frame that uses up to twelve Ultrium Tape Drives and up to 440 IBM LTO Ultrium Tape Cartridges. The Model D32 is 307 mm (12 in.) longer in depth than Model D52.

Model L52 / L53
A base frame that uses up to twelve Ultrium Tape Drives and up to 252 IBM LTO Ultrium Tape Cartridges. The Model L52/L53 is 307 mm (12 in.) shorter in depth than Model L32. The model L53 has a new power structure. See “Enhanced FCA (x23 / x53 Frames Only)” on page 44.

Model D52 / D53
An expansion frame that uses up to twelve Ultrium Tape Drives and up to 396 IBM LTO Ultrium Tape Cartridges. Model D52/D32 is 307 mm (12 in.) shorter in depth than Model D32. The model D53 has a new power structure. See “Enhanced FCA (x23 / x53 Frames Only)” on page 44.

Model HA1
Required when you order the optional second accessor, a frame that is used as a service bay and that contains no tape drives or data cartridge capacity. Model HA1 contains only slots for diagnostic cartridges. This frame is always configured as service bay A. The Model HA1 is approximately 307 mm (12 in.) shorter in depth than Models L32 and D32.

Model Sx4
Required when you order the optional second accessor, a frame that is used as a service bay and that contains no tape drives or data cartridge capacity. Model Sx4 contains deep slots for tape cartridges. The Sx4 frames offer increased capacity without increasing frame size or required floor space by using high density storage slots for tape cartridges. Refer to: "IBM System Storage TS3500 Tape Library with ALMS Operator Guide" for more information.

Models L22, D22, L23, D23, L52, D52, L53, and D53 are compatible with Models L32 and D32, but will require additional features because they use different side and rear covers. If you change from a Model L32 or D32 to a Model D22, D23, D52, or D53 (or from a Model D22, D23, D52, or D53 to a Model L32 or D32) within the same library you may also need the appropriate side covers.

Figure 4 shows examples of a base and an expansion frame.

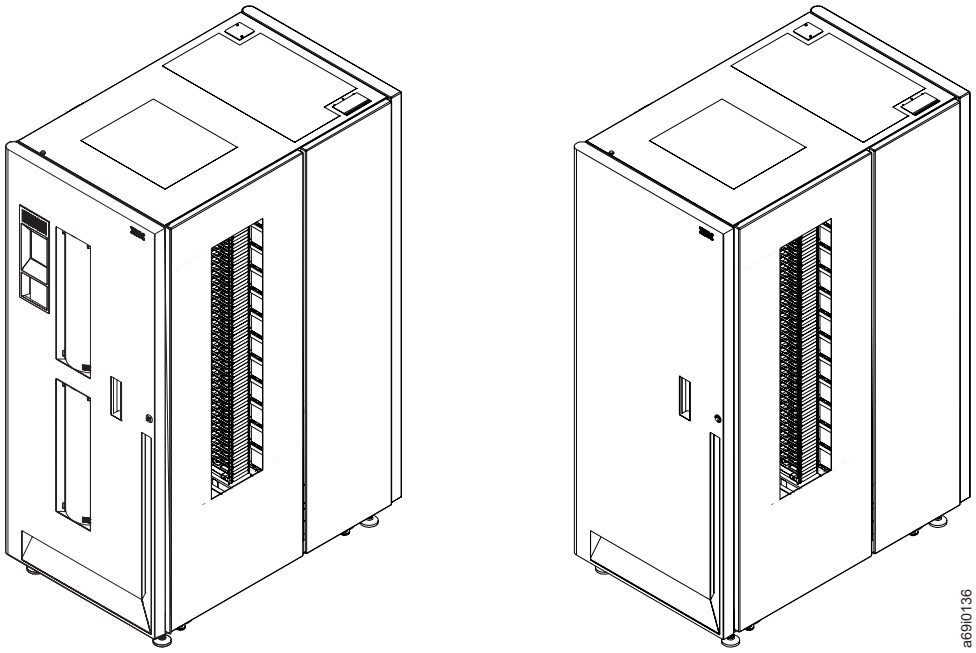


Figure 4. Frames in the 3584. Model L52 (the base frame) is on the left. Model D52 (the expansion frame) is on the right and attaches to the base frame. (Models L22/D22, L32/D32, L52/D52, L23/D23, L53/D53 are not shown). Models L22/D22, L23/D23 house 3592 Tape Cartridges; Models L32/D32, L52/D52, L53/D53 house LTO Ultrium Tape Cartridges.

Library Components – Locations Lxx/Dxx

The System Storage Tape Library 3584 consists of the following major components shown in Figure 5 on page 19. The following paragraphs give a very brief description of each component.

1 Library frames
The base frames (Model Lxx) and the expansion frame (Model Dxx). Each frame contains a rail system, cartridge storage slots, and as many as 12 tape drives.

2 Door safety switch
A device in each frame that shuts off power to the accessor motors when the front door of that frame is opened. Power remains on at the accessor logic (electronic cards).

3 Operator panel and operator panel controller
Located on the front of the base frame, the operator panel is the set of indicators and controls that let you perform operations and determine the status of the library. The panel consists of the library power switch, a power-on indicator, a touchscreen liquid crystal display (LCD) and controller, and the controller for the I/O Station. The operator panel controller is a logic card that facilitates communication between the operator panel and the accessor controller. The operator panel controller posts (to the LCD on the operator panel) status information and information about the sensing and locking of the I/O Station.

4 I/O station
A compartment located on the front door of the base frame (L32, L22, L23, L52, L53). Allows the operator to insert or remove tape cartridges.

5 Front door
The front door of any frame. The front door contains storage slots on the base frames and on the expansion frames. When the Capacity Expansion Feature is added to the Model L32, the storage slots become enabled and can increase the capacity of the tape library. The model L22, L23, L52, L53 have two versions of capacity expansion, each allowing use of front door storage space.

6 Cartridge storage slots
Units that are mounted in the tape library and used to store tape cartridges while they are in the library. The quantity of available storage slots varies, depending on the type of frame that you have (Base frame model, Capacity Expansion feature, expansion frame model) and the quantity of drives that are installed (see Table 1 on page 6, Table 2 on page 6).

7 Accessor Controller Card (ACC)
A logic card that facilitates all accessor motion requests (such as calibrations, moves, and inventory updates). The accessor controller also facilitates other aspects of the library, such as configuration, move and eject operations, automatic drive cleaning, and determination of whether an element (such as a tape drive) is empty or occupied.

8 Rail system
The assembly on which the cartridge accessor moves through the library to add or remove tape cartridges. Includes top and bottom rails.

9 Cartridge accessor
The assembly that moves tape cartridges between storage slots, tape drives, and an I/O Station. Two accessors may be installed if redundancy or faster access is desired.

10 Dual-gripper assembly
A device that gets and puts tape cartridges from and to storage slots, tape drives, and an I/O Station.

11 Tape drive
Mounted in the System Storage Tape Library 3584, one or more units that read and write data stored on tape cartridges. The LTO and 3592 tape drives provide a path for communication between host systems and the accessor controller.

12 Frame Control Assembly (FCA)
An assembly of components that facilitate RS-422 communication between the set of drives within a frame and the accessor controller and operator panel controller. Includes the Media Changer Pack (MCP), power supply, and frame control assembly (FCA) which houses one or two power receptacles for the incoming main AC power, 3 circuit protectors, and 2 vertical rows of 5 AC outlets for powering the tape drives.

13 Enhanced Frame Control Assembly
See “Enhanced FCA (x23 / x53 Frames Only)” on page 44.

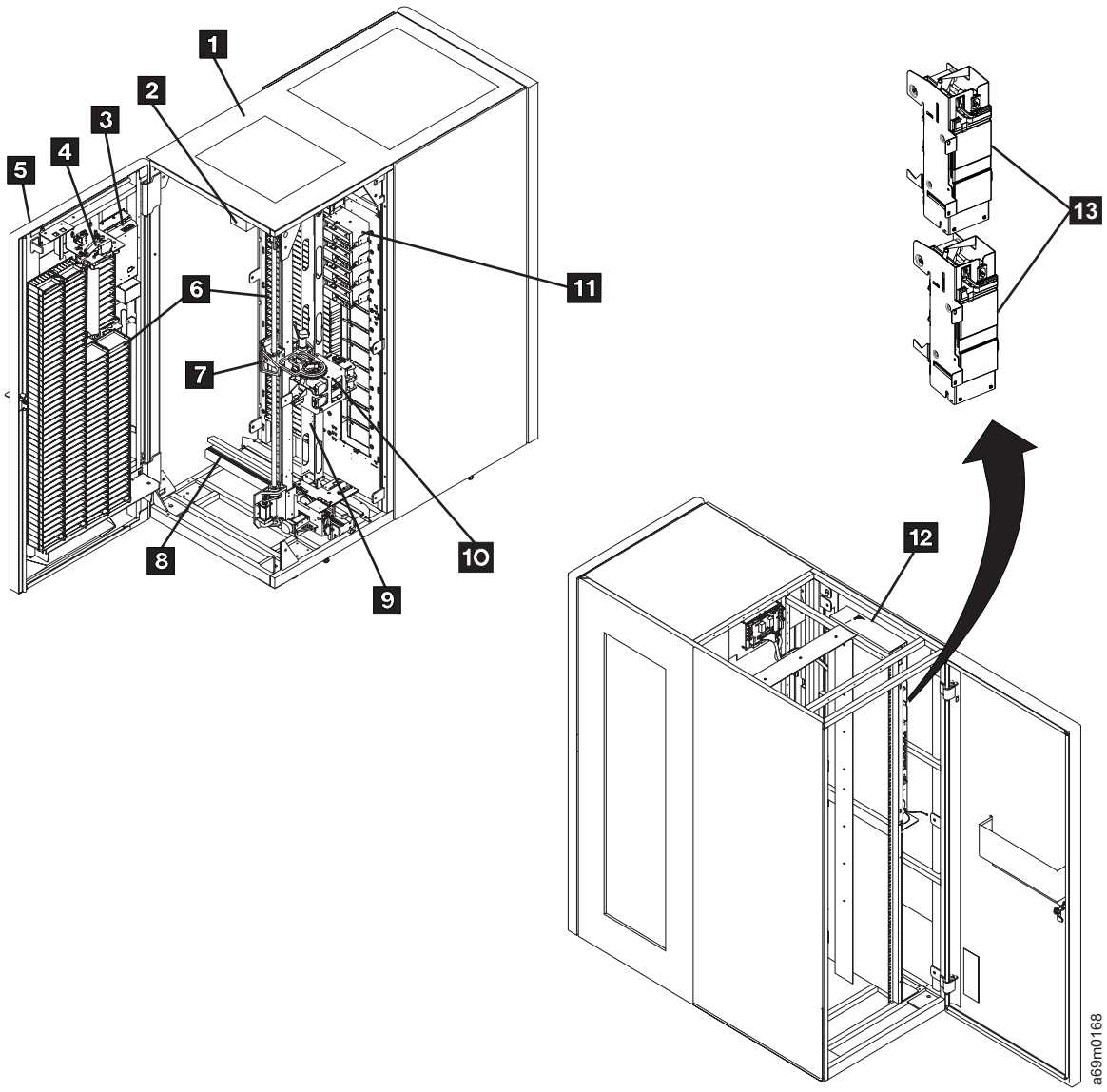


Figure 5. IBM System Storage Tape Library 3584 Components. The front and rear of the library are shown.

Library Components – Detail

Library Frames

Attention

For additional detail on capacity configurations, such as the Sx4, see, *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560

The library frame (**1** at Figure 5 on page 19) is the basic building block for the System Storage Tape Library 3584. There are three types of frames:

- Base frame (Model Lxx)
- Expansion frame (Model Dxx)
- Service Bay frame (Model HA1 and Dxx modified with two accessors installed.

Each frame is 75 cm (29.5 in.) wide, and contains a rail system, cartridge storage slots, and as many as 12 tape drives. The new style frames (L22/D22/L52/D52) are 31 cm (12.1 in) shorter than the original L32/D32. The base frame includes:

- Cartridge accessor
- Accessor controller
- Input/Output (I/O) Station with 10 storage slots (L32 Only)
- Input/Output (I/O) Station with 16 storage slots (L22/L23/L52/L53)
- Only)
- Operator panel
- Operator panel controller

All components of the System Storage Tape Library 3584 are contained inside the frames. The tops of the frames have windows to allow for ambient lighting. In addition, windows are located at each end of the library.

Located at the front of each frame is a front door. The door allows access to the cartridge storage slots and allows service personnel to access the rail system, cartridge accessor, and accessor controller. The front door of the base frame includes the operator panel, power switch, I/O Station, handle for opening the door, and keylock.

Inside each base and expansion frame, cartridge storage slots and I/O slots are mounted on the interior of the front door. Opposite the front door, cartridge storage slots and drives are mounted on the frame wall. The cartridge accessor accesses these storage slots and drives.

At the rear of each frame is a service access door that lets service personnel access the tape drives and frame control assembly (FCA). Each frame that contains at least one installed drive also contains an FCA. An FCA is a sheet-metal box that houses circuit breakers, AC outlets for powering the tape drives and all other components in that frame, and a receptacle for the incoming main AC power.

Cartridge Storage Slots

Cartridge storage slots are mounted inside the library's frames and are used to store tape cartridges. Each storage slot has a unique ID to indicate its physical location. The storage slot ID consists of three values:

Frame number

Represented as Fx, where x equals the frame number. For the base frame, the frame number is 1; for each adjacent expansion frame, the frame number increments by one.

Column number

Represented as Cxx, where xx equals the column number. For each frame, the left frame wall column is column number 1. The column number increments in a zig-zag pattern, alternating

between the frame wall and the door wall, and progressing from left to right. Thus, all column numbers on the frame wall are odd numbers, and all column numbers on the door wall are even numbers. The base frame (Model L32) has 8 columns; the expansion frame (Model D32) has 10 columns. Refer to Figure 6 on page 22 for base frame, and Figure 7 on page 23 for expansion frames. The Models L22/L23/L52/L53 have 8 columns; the expansion frame Models D22/D23/D52/D53 have 10 columns. Refer to Figure 8 on page 24 and Figure 10 on page 26 for base frame, and Figure 9 on page 25 and Figure 11 on page 27 for expansion frames.

Note: Refer to Figure 6 on page 22. If the capacity expansion feature is NOT installed, the cartridge slots (shown in a crossed-out circle), on the front door of the base frame will NOT be accessible.

Row number

Represented as Rxx, where xx equals the row number. For each column, the row number is 1 for the top storage slot in a column and increments by one for each row beneath the top slot. Regardless of whether a storage slot is installed in row number 1, the row numbering is the same for every column.

For example, the storage slot ID F1–C03–R22 means:

F1 Frame 1 (base frame)

C03 Column 3 (second column from left on frame wall)

R22 Row 22 (twenty-second position down from the top of the column)

When tape drive are referenced within a frame they are designated as R01, R02 . . . R12 if a whole column is made up of tape drives.

For example, tape drive ID F2–R03 means:

F2 Frame 2 (1st expansion frame)

R03 3rd drive slot

Note: The drive slots are numbered, not the drives. If only drive slot 2 is empty within a frame, the drives would be numbered R01, R03, R04. . . R12.

Storage Slots in Model L32 (Frame 1)

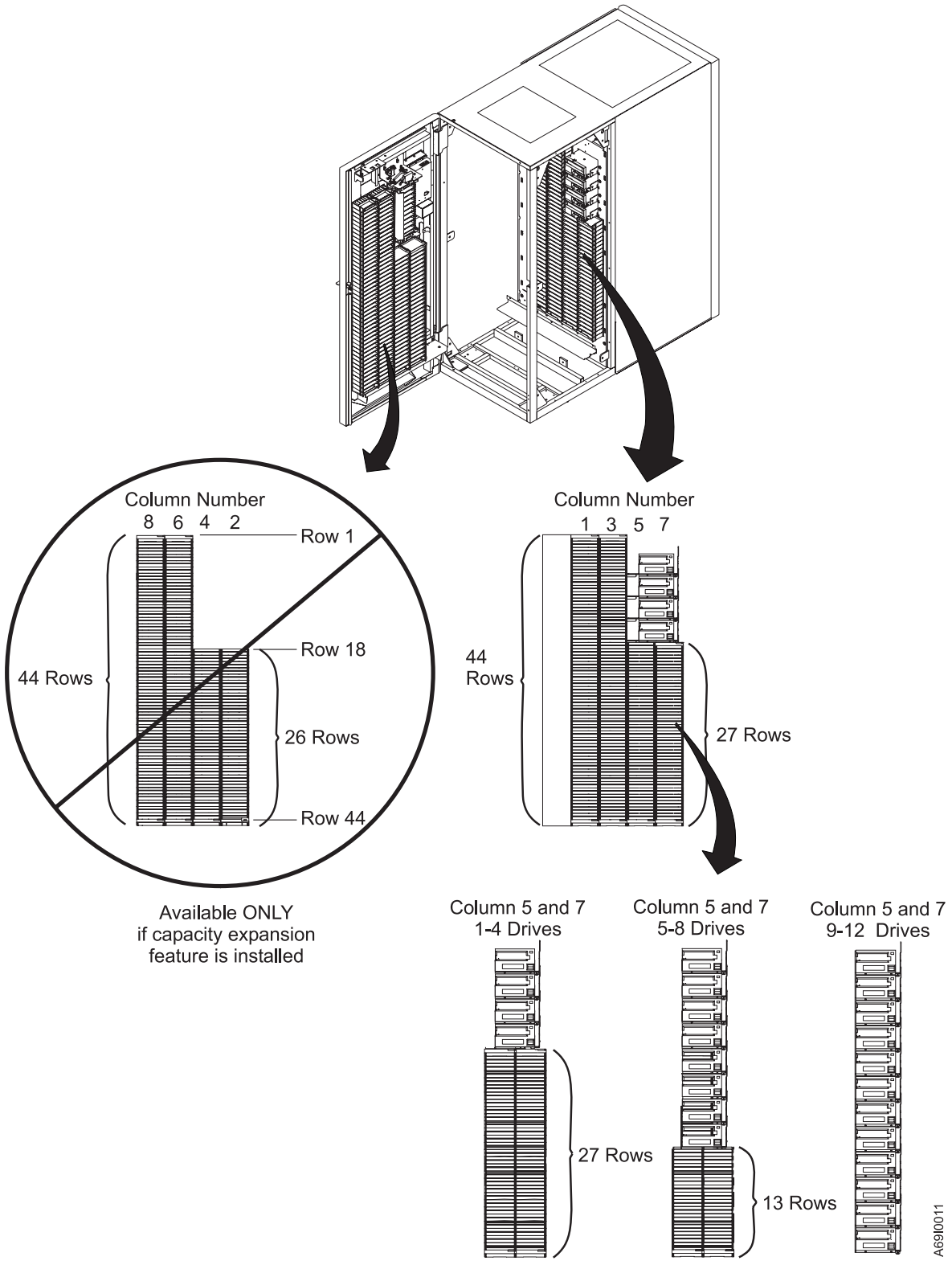


Figure 6. LTO Storage Slots Base Frame (L32). Use this numbering scheme to determine the physical ID (location) of each storage slot. The L32 door storage, depicted by the crossed out circle, is only available if the Capacity Expansion Feature is enabled. Door storage in columns 2 and 4 is not present if the optional, second I/O station is installed.

Storage Slots in Model D32 (Frame 2 to 16)

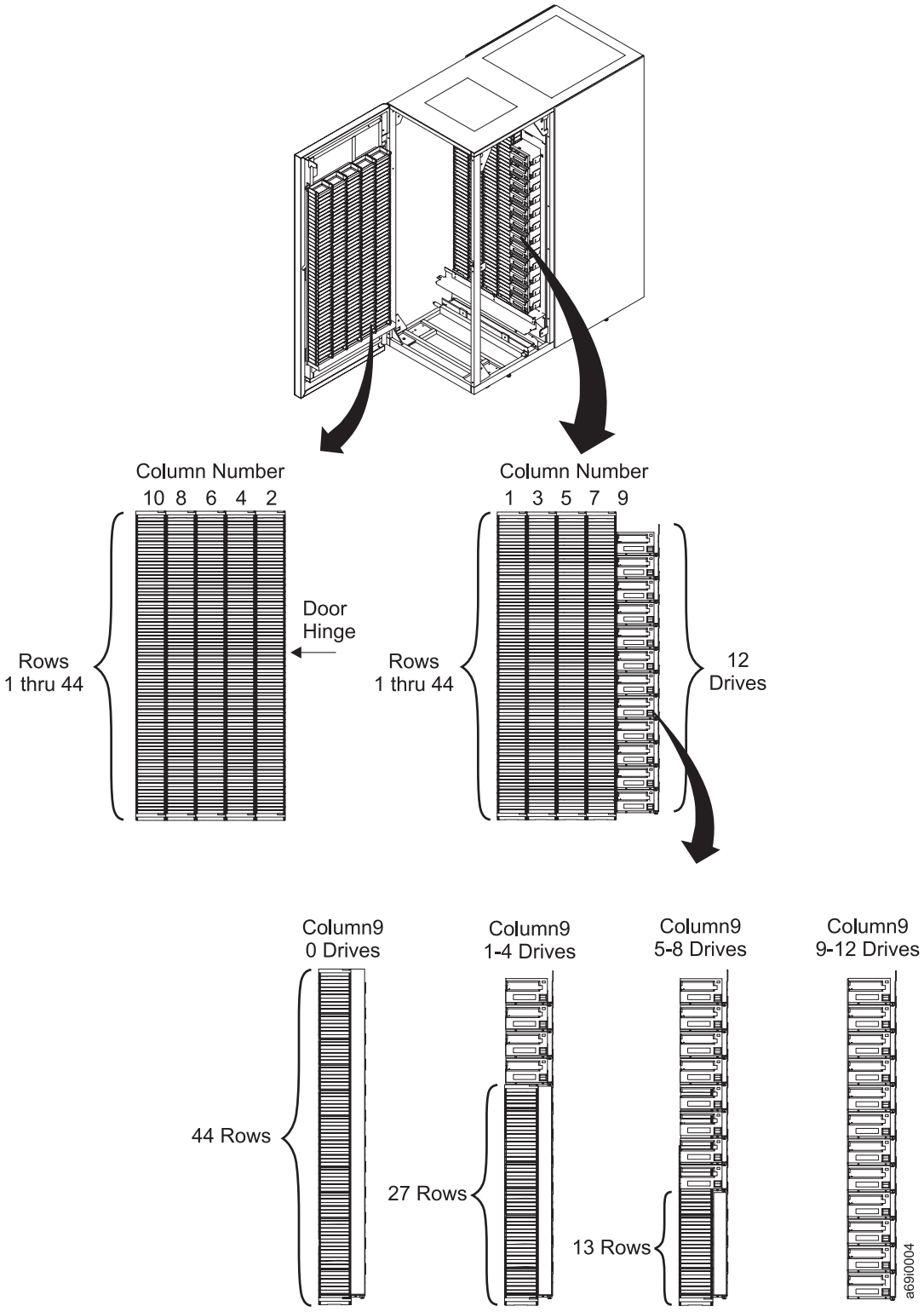


Figure 7. LTO Storage Slots Expansion Frames (D32). Use this numbering scheme to determine the physical ID (location) of each storage slot.

Storage Slots in Model L22 / L23

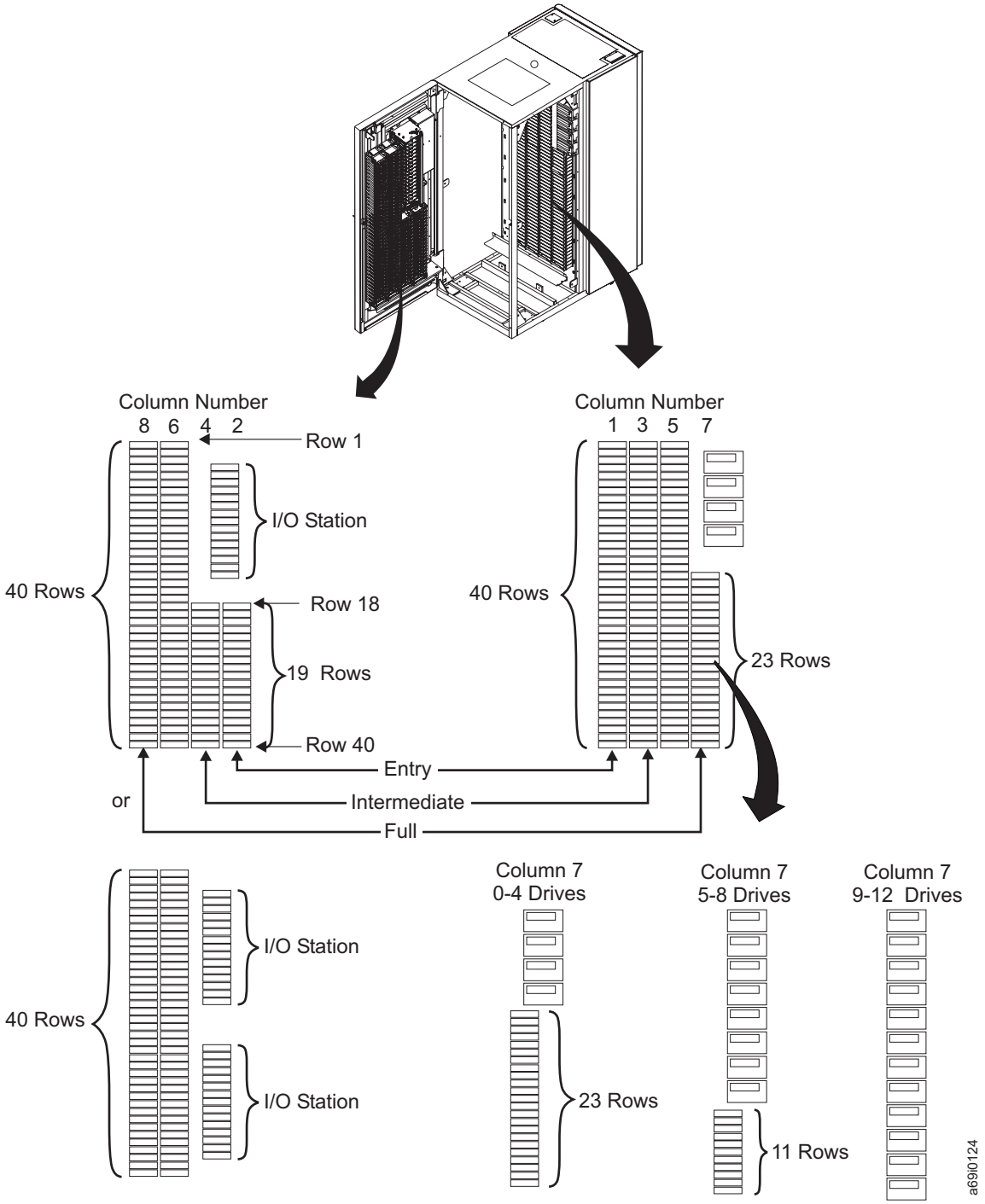


Figure 8. 3592 Storage Slots Base Frame (L22 / L23)

Storage Slots in Model D22 / D23

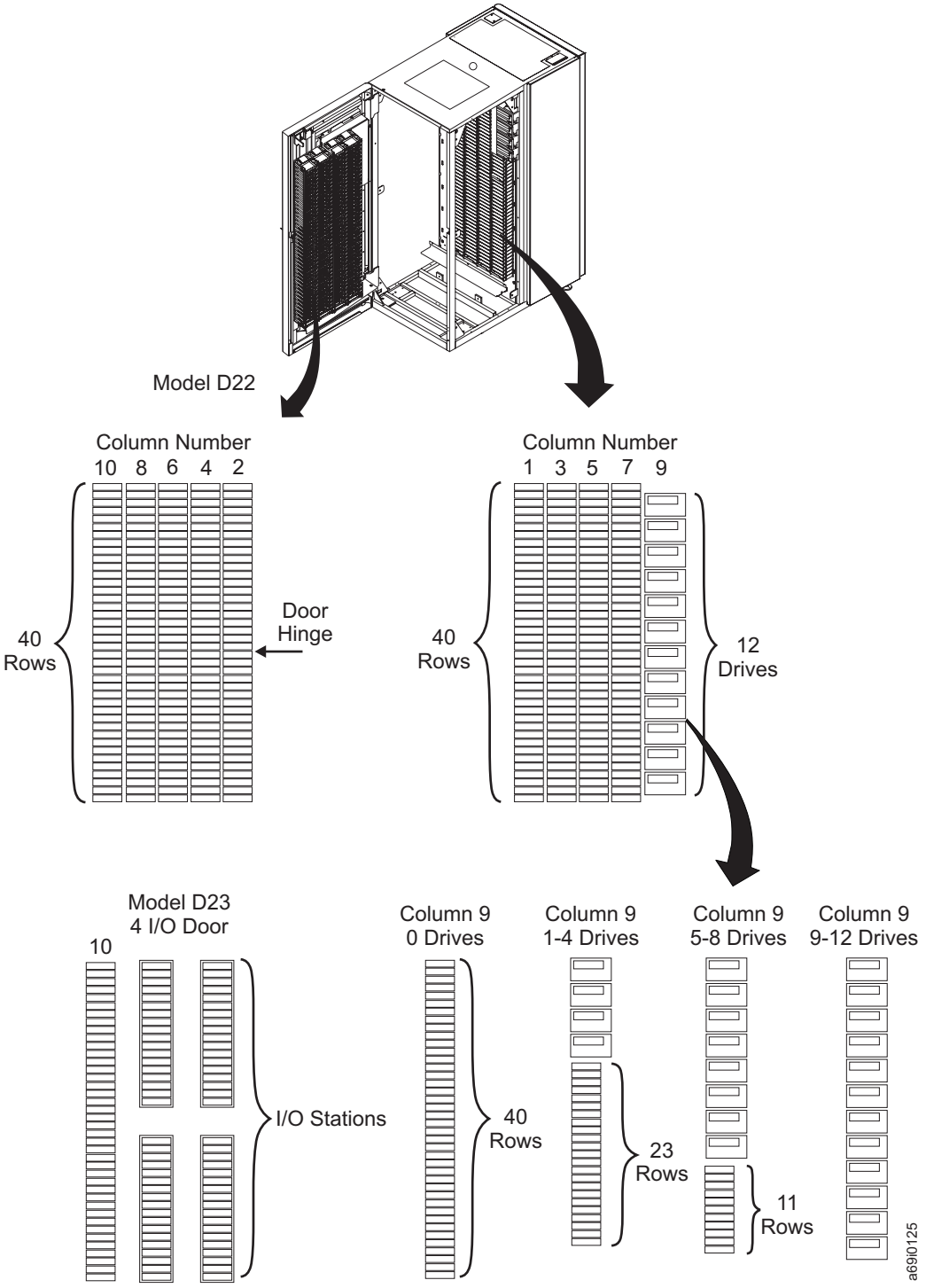


Figure 9. 3592 Storage Slots Expansion Frames (D22 / D23)

Storage Slots in Model L52 / L53

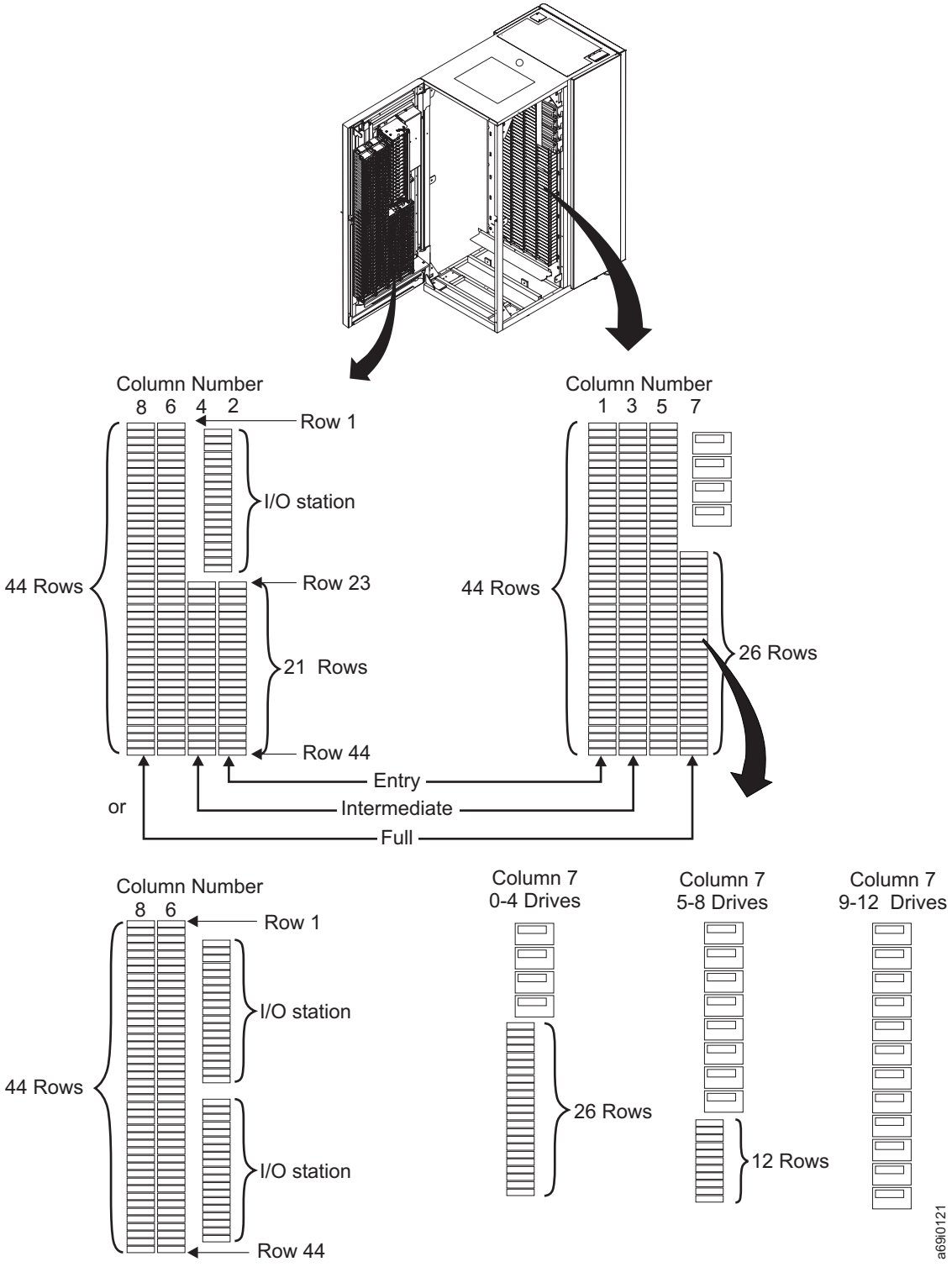


Figure 10. LTO Storage Slots Base Frame (L52 / L53)

Storage Slots in Model D52 / D53

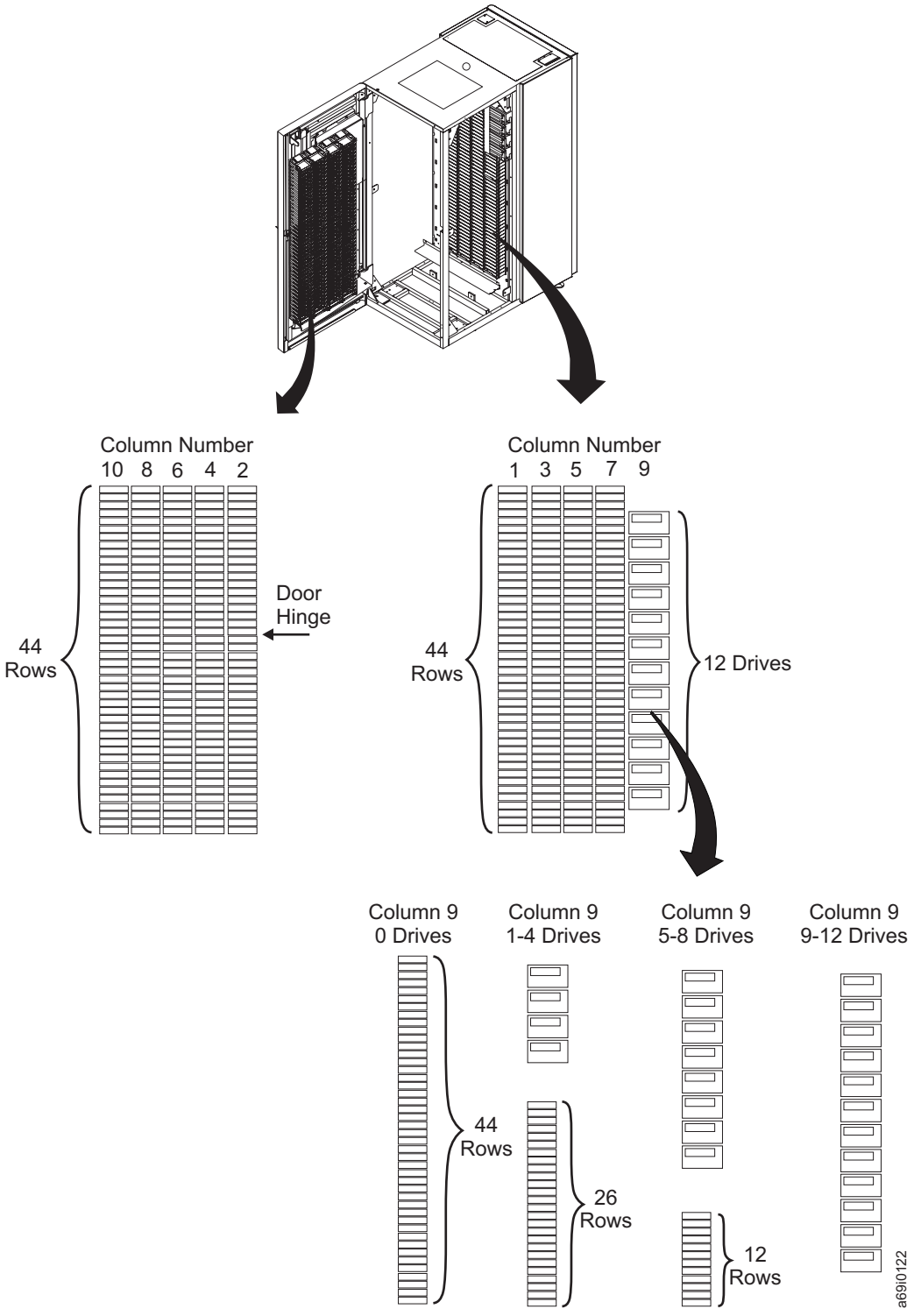


Figure 11. LTO Storage Slots Expansion Frames (D52 / D53)

Accessor Controller Card (ACC)

The accessor controller card (7 on Figure 5 on page 19) is an associated controller (logic card) for the cartridge accessor. The accessor controller handles accessor motion requests, including calibrations, moves, and inventory updates. It also provides centralized management for other aspects of the entire library, including configuration, insert and eject operations, automatic drive cleaning, and determination of element status.

Communication between the accessor controller card (ACC), motor driver assembly (MDA), Media Changer Pack (MCP), and operator panel controller (OPC) is provided by the Controller Area Network (CAN) bus. Communication between the accessor controller card (ACC) and all drives within any one frame is provided by the Media Changer Pack (MCP) in that frame, using the RS-422 interfaces.

Rail System

The cartridge accessor moves through the library on a rail system (8 in Figure 5 on page 19). The rail system consists of a lower X-rail, an upper X-rail, and a trough for the power and control cable. The lower X-rail includes a main bearing way with a rack gear. The L-shaped, upper X-rail runs along the top of the frames. The power and control cable is kept clear of the accessor in a covered trough located at the bottom rear of the library.

Cartridge Accessor

The cartridge accessor (9 on Figure 5 on page 19) moves cartridges between the storage slots, tape drives, and the I/O Station. The accessor consists of several components:

X-Axis motion assembly
: Group of parts that includes a controller with the Controller Area Network (CAN) interface, servo motor, and pinion drive gear. Provides the motive force to move the accessor side-to-side within the frames.

Y-Axis motion assembly
: Group of parts that includes a controller with the Controller Area Network (CAN) interface, servo motor, and a lead screw. Provides the motive force to move the pivot assembly and gripper assembly up and down within the frames.

Pivot assembly
: Group of parts that provides a mounting platform for the dual gripper assembly 10 , calibration sensor, and the bar code reader. Capable of 180° rotation about the vertical axis.

Dual gripper assembly
: Electromechanical device (mounted on the pivot assembly) that gets or puts cartridges from or to a storage slot, a drive, or the I/O station. There are two grippers on the assembly (Gripper 1 upper and Gripper 2 lower). Each gripper is independently controlled and can grip a single cartridge. The grippers are located in the dual-gripper assembly 10 , on Figure 5 on page 19.

Bar code scanner
: A component (mounted on the rear of the gripper assembly) that reads the bar code on the labels of cartridges or empty storage slots. It is used during configuration, inventories, audits, insertions, and inventory updates (a process that is invoked each time the front door is opened; the inventory update determines whether cartridges have been added to or removed from the library, or moved within the library).

Calibration sensor
: Component that provides a means to locate certain positions within the library very precisely during the calibration operation. It is mounted between the dual-gripper assemblies. All positions are calculated from these locating positions.

Tape Drives

The Ultrium and 3592 Tape Drives are high-performance, high-capacity data storage units that can be installed in the System Storage Tape Library 3584. Up to 12 Ultrium Tape Drives may be installed in each L32, D32, L52, D52, L53, D53 frame of the library. Up to (12) 3592 Tape Drives may be installed in each L22/L23 and D22/D23 frame of the library.

Table 6 lists the characteristics of the Ultrium and 3592 Tape Drives.

Table 6. Characteristics of LTO and 3592 Tape Drives

Characteristics	Tape Drive							
	Ultrium-1 / Ultrium-2	**Ultrium-3 (F3A) / (F3B)**	**Ultrium-4 (F4A)**	**Ultrium-5 (F5A)**	**3592 J1A**	**3592 E05**	**3592 E06/EU6**	**3592 E07**
Native sustained data rate	15 / 35 MB per second	80 MB per second	120 MB per second	140 per second	40 MB per second	100 MB/s (using Model E05 format) 50 MB/s (using Model J1A format)	160 MB per second	250 MB/s
Compressed data rate (at 2:1 compression) and (3:1 for 3592)	N/A	N/A	240 MB per second (with Ultrium-4 media)	280 MB per second (with Ultrium-5 media)	80 MB/s (using Model J1A format)	200 MB/s (using Model E05 format) 100 MB/s (using Model J1A format)	320 MB per second	500 MB/s
Supported interface (see Note)	LVD Ultra2 SCSI	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	HVD Ultra SCSI	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Fibre Channel	Fibre Channel	Fibre Channel	Fibre Channel	Fibre Channel (2 ports at 2 Gbps)	Fibre Channel (2 ports at 4 Gbps)	Fibre Channel (2 ports at 4 Gbps)	Fibre Channel (2 ports at 8 Gbps)
Note: In an Ultrium frame, any combination of interfaces for the Ultrium 1 and 2 Tape Drive is supported (including Fibre Channel). Ultrium 3, Ultrium 4, and Ultrium 5 are supported only by fibre channel in the 3584 library. See *3584 Tape Library Introduction and Planning Guide* for more detailed information.								

Tape Drive – LTO

LTO Ultrium Generation 1, 2, 3, 4, and 5 Tape Drives are a high-performance, high-capacity data-storage unit that is installed in the System Storage Tape Library 3584. As many as 12 Ultrium Tape Drives can be installed in the base frame and 12 Ultrium Tape Drives (SCSI, fibre channel, or a combination of both) in any D32 / D52 / D53 expansion frame of the System Storage Tape Library 3584. See Table 6 on page 29 for characteristics of the Ultrium Tape Drive.

The Ultrium Tape Drive uses magneto-resistive heads to record with a linear, serpentine recording method. Located on the heads are high-availability redundant servo readers which ensure consistent data integrity. The following figure shows the LTO-5 drive.

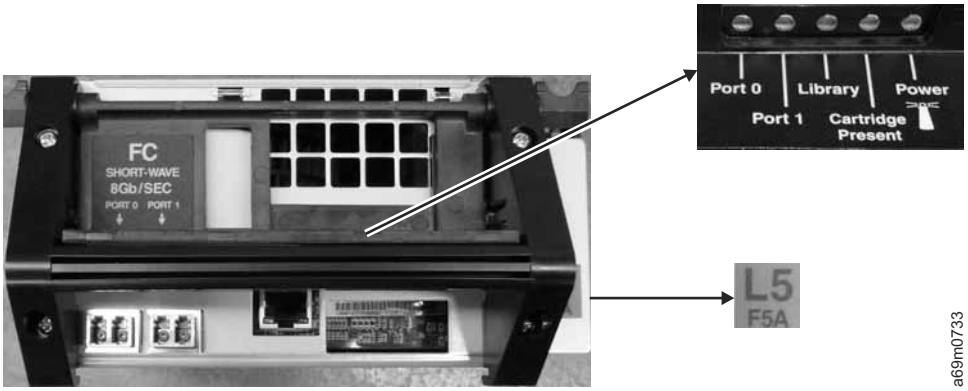


Figure 12. LTO-5 – Drive Canister Rear View

Tape Drive – 3592

The 3592 Tape Drive is a high-performance, high-capacity data-storage unit that is installed in the System Storage Tape Library 3584. As many as (12) 3592 drives can be installed in the base L22/L23 frame, and (12) 3592 tape drives in any D22/D23 expansion frame of the System Storage Tape Library 3584. See Table 6 on page 29 for characteristics of the 3592 tape drive.

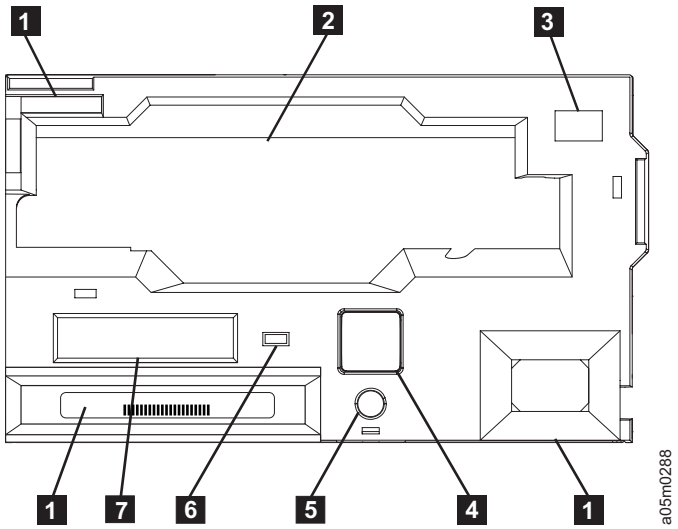


Figure 13. 3592 – Drive Canister Front View

Table 7. Operator Bezel Functional Areas

Reference Number	Item	Additional Information
1	Reflective fiducials	Not used in 3584
2	Tape cartridge slot	Area where tape cartridge is loaded
3	Calibration fiducial	Used by the library to calibrate drive location
4	Unload button	Press to manually unload a tape cartridge **Note:** If you press this button while a tape cartridge is loaded, the drive will complete any operation in progress, then rewind and unload the tape cartridge.
5	Reset button	Press to generate a drive reset **Note:** This will stop tape motion before performing a reset. This button is recessed to prevent accidental activation. Use a pointed object like a pencil to press this button.
6	LED power indicator	Green LED indicates power has been applied. This LED becomes yellow during activities like a microcode load.
7	Eight-character (message) display	Information area for operator. The CE will not use this display for normal maintenance. This display will provide FID messages, attention drive messages, clean messages, and drive status.

Encryption-Capable Drive Identification

- **Encryption capable -** Your drive hardware **can be set** to encipher the data on data cartridge media to prevent unintended or unauthorized persons or equipment from accessing that data. Stated another way, this drive **can be** set to encrypt data.
- **Encryption enabled -** Your drive software **is** set to encipher and decipher the data on data cartridge media. Stated another way, this drive **is** set to encrypt data.

See Figure 14. The label which is affixed to the top of the drive provides drive information such as date of manufacture and drive serial number. When this label includes the letters Enc **1**, the drive is encryption **capable**. The letters Enc **2** on the end of the drive canister also inform you that the drive canister is encryption-capable. This does not mean that the drive or the drive canister are encryption **enabled**. The default setting is **Disabled**.

Notes:

- A Model J1A drive cannot be encryption-capable.
- The factory default setting for a drive that is encryption-capable is **Disabled**.
- Not all E05 drives are encryption-capable. Model E05 drives with the 'Enc' label (**1** and **2**) and all Model EU6, E06 and E07 drives are encryption capable.
- No Model E06 and E07 drives and not all Model EU6 drives show the letters "Enc (**1**) or include an Enc label (**2**).

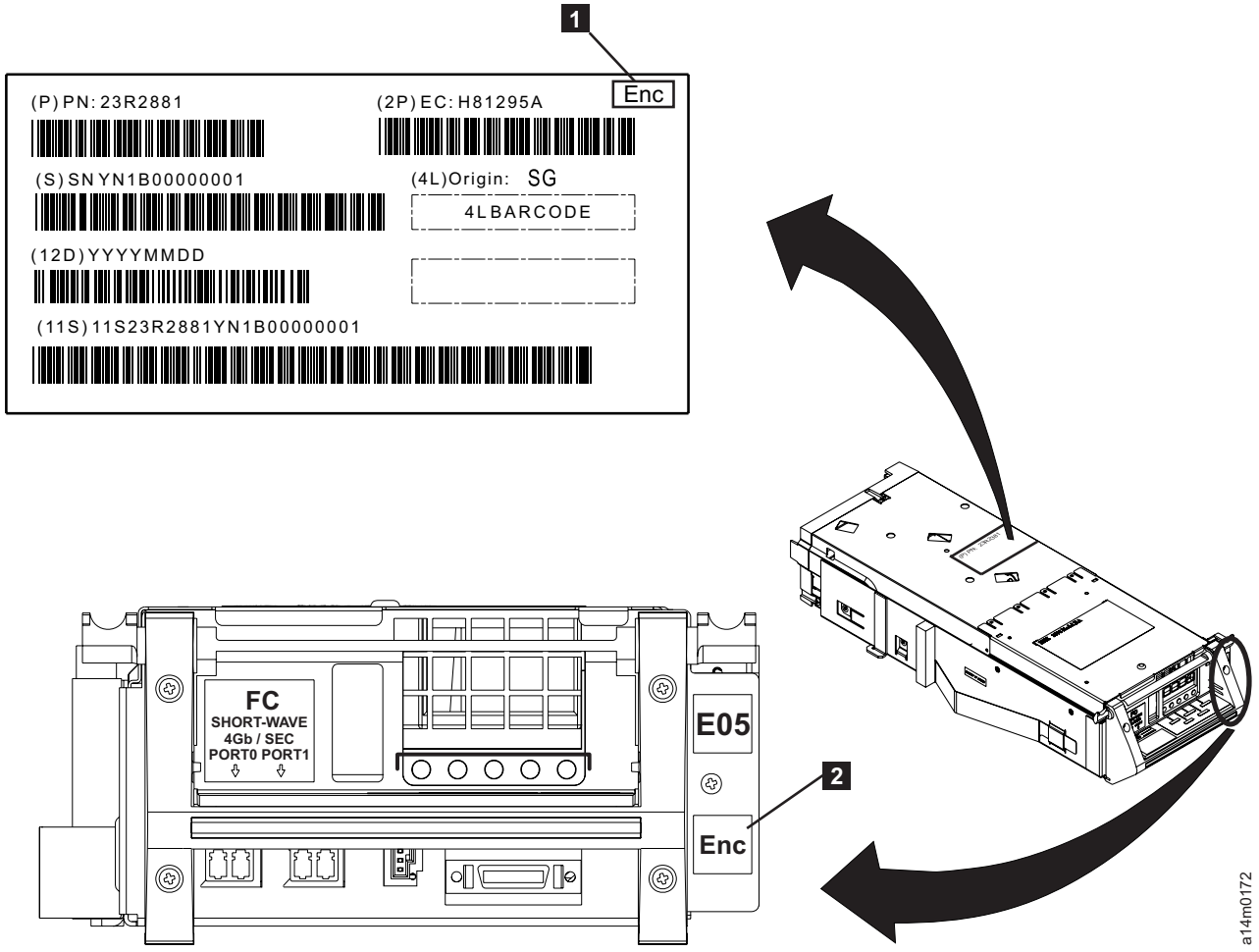


Figure 14. Encryption Capable Drive

Drive Rear Layout

The rear of the drive has the functional areas shown in Figure 15 and Figure 16, and listed and identified in Table 8.

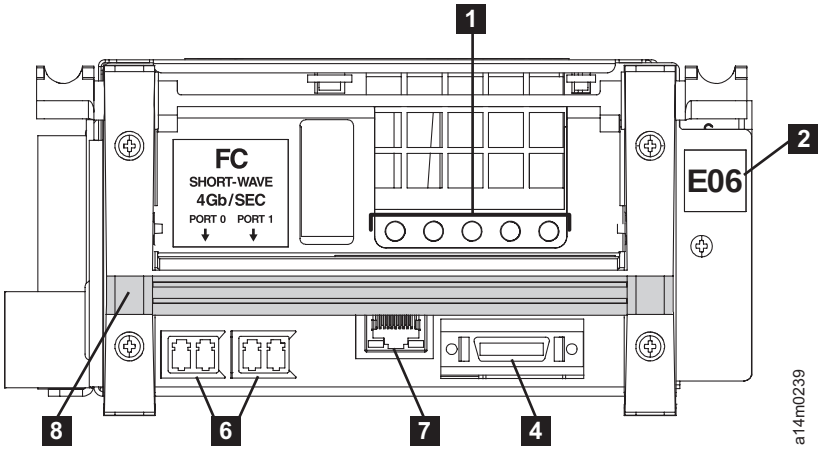


Figure 15. Drive Rear Layout - Model E06. Use with Table 8.

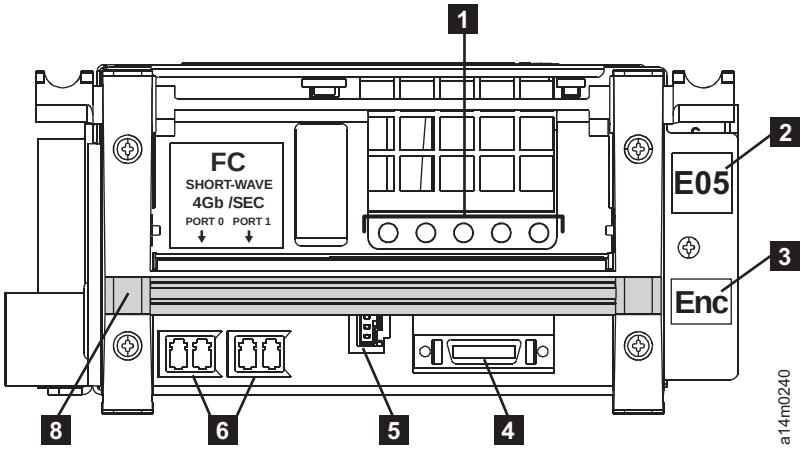


Figure 16. Drive Rear Layout - Models J1A, E05, EU6. Use with Table 8.

Table 8. Drive Rear Layout. Use with Figure 15 and Figure 16.

Item Number	Item Name and Details
1	LED array (described from left to right) • Fibre channel activity • Fibre channel activity • Communications from library • Drive status. This LED blinking indicates that a message is available to be viewed on the operator panel. • Status of power to drive **Notes:** • Green LEDs blink at half-second intervals. Yellow LEDs blink at one-second intervals.
2	Model number label (such as, J1A, E05, E06, or EU6)
3	'Encryption capable' label (on some E05 drives - see “Encryption-Capable Drive Identification” on page 32 to determine if your drive is encryption capable)
4	Not used in 3584 installations

Table 8. Drive Rear Layout (continued). Use with Figure 15 on page 33 and Figure 16 on page 33.

5	RS-232 serial port (used only when loading drive code, or taking drive dumps with HyperTerminal or another emulation program).
6	Dual port fibre channel ports
7	Ethernet port. Available on Model E06 drives and some EU6 (Not for Models J1A or E05)
8	Handle

Notes:
- All EU6, E06, and E07 drives are encryption-capable.
- Not all E05 drives are encryption-capable. Look for the label (Item 3) to verify.
- Model J1A drives are **not** encryption-capable.
- No Model E06 drives and not all Model EU6 drives include an Enc label (Item 3).
- While not common, some Model EU6 drives may have an ethernet port.

The LEDs shown in Figure 17 indicate the various conditions that are explained in the Table.

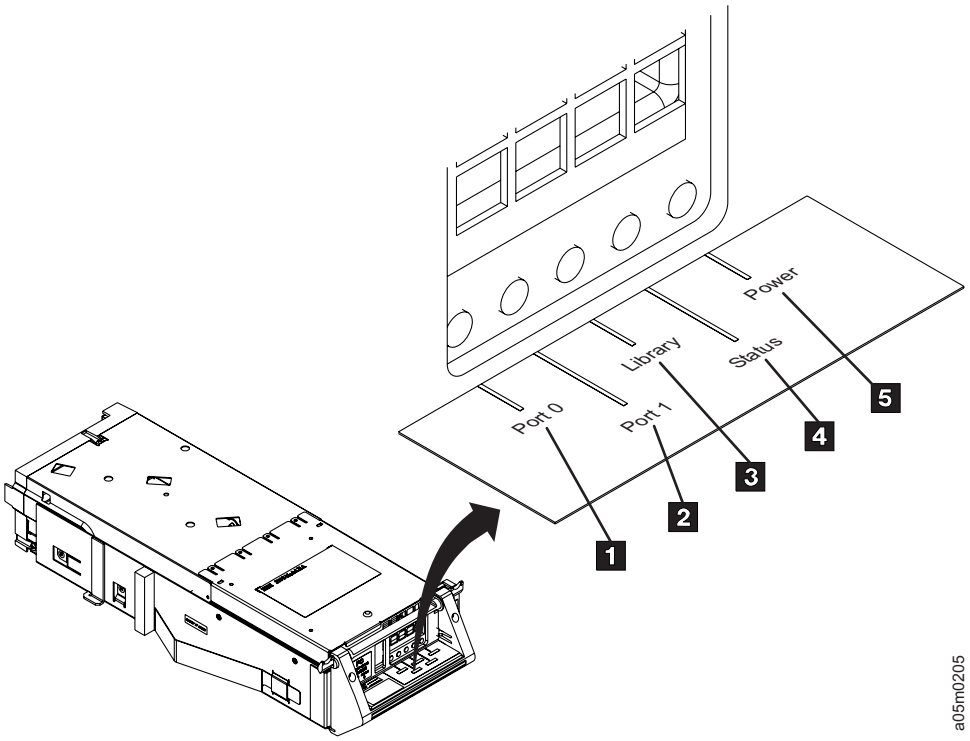


Figure 17. LEDs – Locations for J1A, E05, E06, EU6.. Use with following table.

Table 9. LEDs – Indications for J1A, E05, E06, EU6

LED	Purpose	Color	LED-on indicates:	Blinking LED indicates:	No LED indicates:
1 2	Port 0 - Fibre channel activity **Port 1** – Fibre channel activity	Yellow	N/A	Fibre channel connections are good; not ready to transmit	• No light is detected through fibre channels • Fibre channel cable is disconnected • Port is not in use • Fibre wrap plug is installed on the port • Drive was not returned to operator mode (is still in CE offline mode or CE online mode)
		Green	Fibre channel connections are detecting light, but no data is being transferred. Wrap tools are installed or drive canister is offline to controller or host.	Fibre channel connections are good; data is being transferred	
3	**Library** – Library manager communications	Yellow	N/A	N/A	No communications since last POST of drive
		Green	At least one message received since POST	RS-422 or SDLC communication activity	
4	**Status** – Drive status	Yellow	Power-ON started or microcode soft reset began	Status message is available at service panel	Drive completed POST
		Green	N/A	N/A	
5	**Power** – Drive power status	Yellow	N/A	N/A	+5 V dc or +12 V dc is missing
		Green	+5 V dc or +12 V dc is present at drive	During reset, LED might blink, indicating drive is attempting to unload cartridge prior to actual reset process	

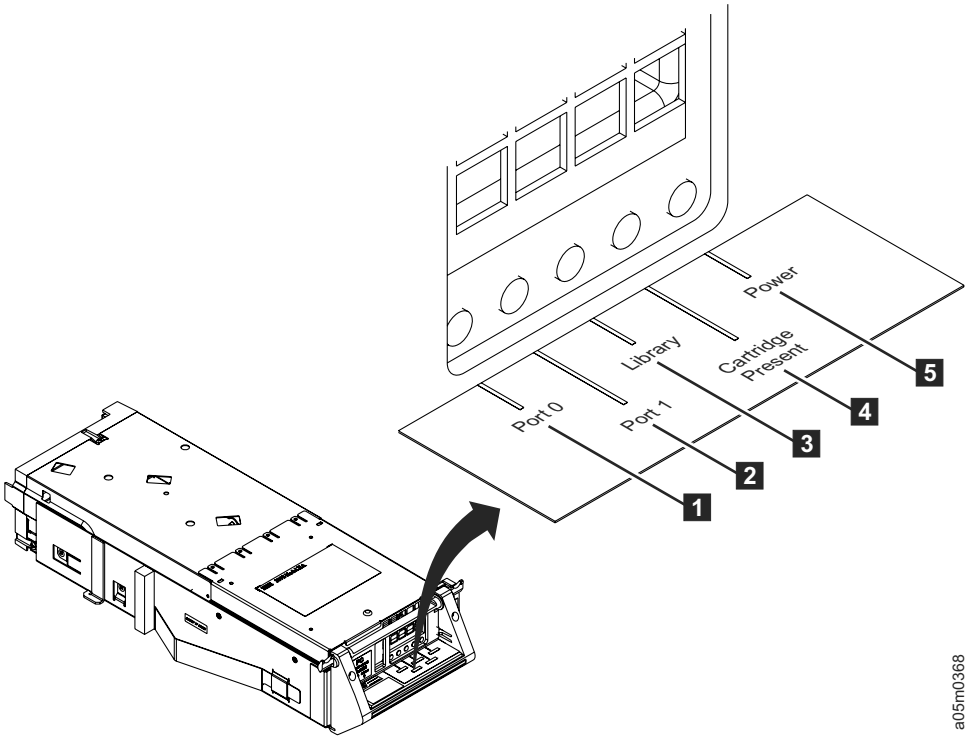


Figure 18. LEDs – Indications for E07.. Use with following table.

Table 10. LEDs – Indications for E07. Numbers in LED column refer to numbers in the above Figure. (N/A = not assigned)

LED	Purpose	Color	LED-on indicates:	Blinking LED indicates:	No LED indicates:
1 2	Port 0 - Fibre channel activity **Port 1** – Fibre channel activity	Yellow	N/A	Fibre channel connections are good; not ready to transmit	• No light is detected through fibre channels • Fibre channel cable is disconnected • Port is not in use • Fibre wrap plug is installed on the port • Drive was not returned to operator mode (is still in CE offline mode or CE online mode)
		Green	Fibre channel connections are detecting light, but no data is being transferred. Wrap tools are installed or drive canister is offline to controller or host.	Fibre channel connections are good; data is being transferred	
3	**Library** – Library manager communications	Yellow	N/A	N/A	No communications since last POST of drive
		Green	At least one message received since POST	RS-422 or SDLC communication activity	
4	**Cartridge Present** – Drive status	Yellow	• Cartridge status not indicated • No message or error • POR diagnostic in progress	• Cartridge not present • Message or error • POR diagnostic completed	• Cartridge not present • No message or error • POR diagnostic completed
		Green	• Cartridge present • No message or error • POR diagnostic completed	• Cartridge present • Message or error • POR diagnostic completed	

Table 10. LEDs – Indications for E07. Numbers in LED column refer to numbers in the above Figure. (N/A = not assigned) (continued)

LED	Purpose	Color	LED-on indicates:	Blinking LED indicates:	No LED indicates:
5	**Power** – Drive power status	Yellow	N/A	N/A	+5 V dc or +12 V dc is missing
		Green	+5 V dc or +12 V dc is present at drive	During reset, LED might blink, indicating drive is attempting to unload cartridge prior to actual reset process	

3592 Drive Emulation Mode

A 3592 J1A drive will only operate in J1A mode. A 3592 E05 drive is set at the factory to operate in E05 mode. You can change an E05 drive to read and write as a J1A (emulation) and to format tapes to be read and written on in either mode (density). The minimum required E05 drive code level to support emulation mode is: **D3I1_6E1** or higher, which can be downloaded from the PFE website

Refer to the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560, Chapter 3, for procedures to reset a 3592 E05 drive to operate in 3592 J1A emulation mode. If you reset an E05 drive to emulate a J1A, the drive will only read and write a data cartridge in J1A format, and it will report itself to the host as a J1A. This is typically an operator function.

Federal Information Processing Standards (FIPS)

IBM has applied for Federal Information Processing Standards (FIPS) certification for 3592 E05 encryption-capable tape drives. To maintain FIPS PUB 140-2 compliance for a 3592 E05 drive, load only FIPS-certified microcode into that tape drive. The latest drive microcode that is available for other 3592 E05 drives might not be FIPS-certified and therefore must not be loaded on a FIPS drive. For more information, see: **http://www.itl.nist.gov/fipspubs/**



Figure 19. 3592 – Drive Rear Layout (E05 Encryption-Capable Drive shown)

3592 E05 Encryption Capable Drives

See Figure 19. All encryption-capable 3592 model E05 (TS1120) drives have a label **1** . An encryption-capable 3592 model E05 can encrypt data as it is written to standard 3592 tape cartridges. Encryption is performed at full line speed in the tape drive after compression. This function adds a strong measure of security to stored data without additional processing overhead and performance. All 3592 model E05 (TS1120) drives delivered after September 8, 2006 are *encryption-capable*. Also see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887.

Refer to the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560, Chapter 3, for procedures to enable encryption, or *IBM System Storage TS3500 Introduction and Planning Guide*, Chapter 8 for TS1120 (3592) "Encryption Overview." Setting and managing encryption is an operator function. Also see “Library Encryption Setup & Systems Assurance” on page 630.

Advanced Encryption Settings (For Service Use Only)

See Figure 20. The purpose of Advanced Encryption Settings is to allow only IBM support personnel (under direction of the drive development team) to either provide a work-around for an unforeseen problem or to support a unique configuration. In some cases, this may be done using a PFE version of drive firmware without needing to also create a new library firmware version. This option is not intended for the customer to use without the guidance of IBM support. The settings are basically a full menu of potential operating modes for the drive that may or may not actually override the behavior established by the method selected. Based on this, trying to match the method to the equivalent advanced setting is not needed. It is a library/drive firmware relationship that there are no plans to establish.

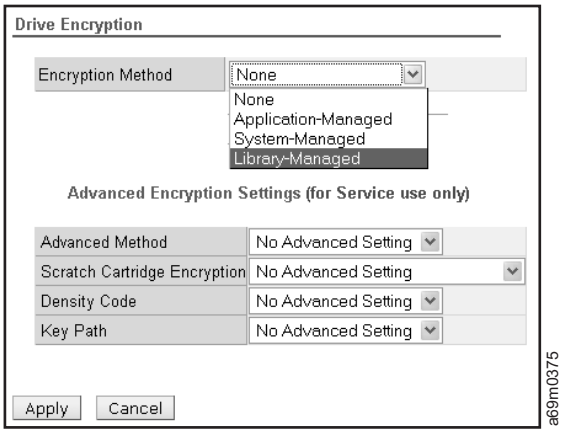


Figure 20. Advanced Encryption Settings Menu

Front Door

Located at the front of the base frame is the front door, shown in Figure 21. The door allows the service representative access to storage slots, rail system, accessor, and other components that may require service.

The operator panel **1** is mounted on the front door of the base frame (Model L32). Also located on the base frame door are the power switch **2** and input/output (I/O) Station **3**. A door handle **4** and a keylock (with key) **5** are included on the front door of all frames. To unlock and open the front door of any frame, insert the key into the keylock and turn it counterclockwise approximately 180°. Some customers order the library with an optional second (or lower) I/O station, which will be located in place of the blank panel **6**.

Each frame of the IBM System Storage Tape Library 3584 also includes a rear door with a keylock (and key). To unlock the rear door of any frame, insert the key into the keylock and turn it counter clockwise. The keys to the front and rear doors are not interchangeable.

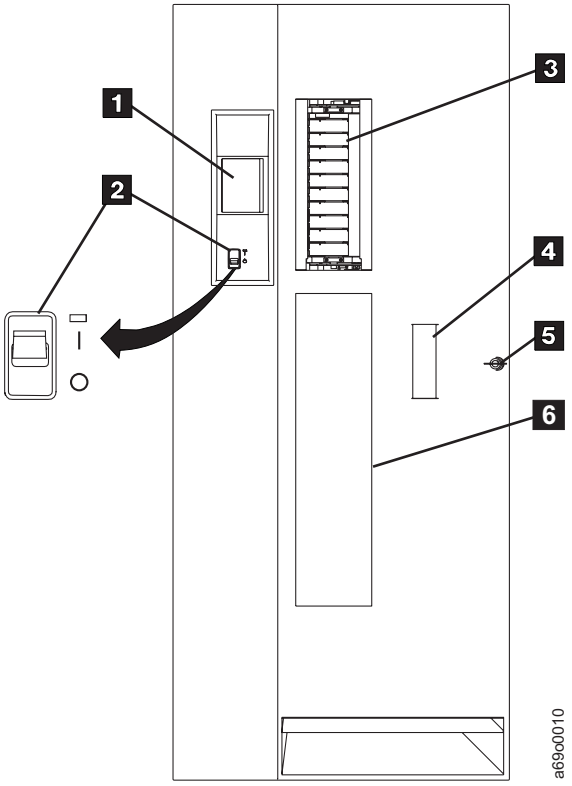


Figure 21. L32 Base Frame Front Door

Note: The door of the I/O Station **3** is shown in an open position.

The front door configuration for the L22/L23 and L52/L53 base frames are very similar except the upper and lower I/O stations are both the same size (each holding 16 cartridges).

Front Door Safety Switch

Each frame includes a door safety switch that automatically turns off power to the accessor motors whenever you open the front door of that frame. Power remains on at the accessor electronics (logic cards).

I/O Station

A 10-slot LTO cartridge storage unit is located on the inside of the Model L32 tape library front-door. The I/O station allows the operator or CE to insert or remove library tape cartridges. An optional 20 slot LTO I/O station is available for the Model L32 in the lower position. A 16 slot 3592 I/O station is available in the lower position in a mixed media library (LTO & 3592).

Model L22/L23 and L52/L53 have a standard 16 slot I/O station on the front door. These models can also have an additional (lower) 16 slot I/O station (either LTO or 3592) available as a feature code.

Four I/O Station Door (64 Additional I/O)

See Figure 22 on page 41. This frame consists of a D53 (LTO) or D23 (3592) frame with a special door that contains four I/O stations **1** of the same media type as the frame. Up to three frames, maximum, that contain four I/O stations each are allowed in a library. There are Light Emitting Diodes (LEDs) **2** for each I/O station, indicating the capacity utilization of the I/O station.

In addition to the 4 I/O stations, there is one column of cells in the door. The column is located in the same location as column 10 on a standard front door.

The front door LED panel contains two LEDs for each I/O station:

- "I/O station Lock/Unlocked LED" will be **ON** when the I/O station is locked, and **OFF** when unlocked. When the I/O station door is open, this LED will **blink**.
- "I/O station full" LED will be **OFF** when the I/O station is empty, **ON** for a partially full I/O station, and **blinking** when the I/O station is full.

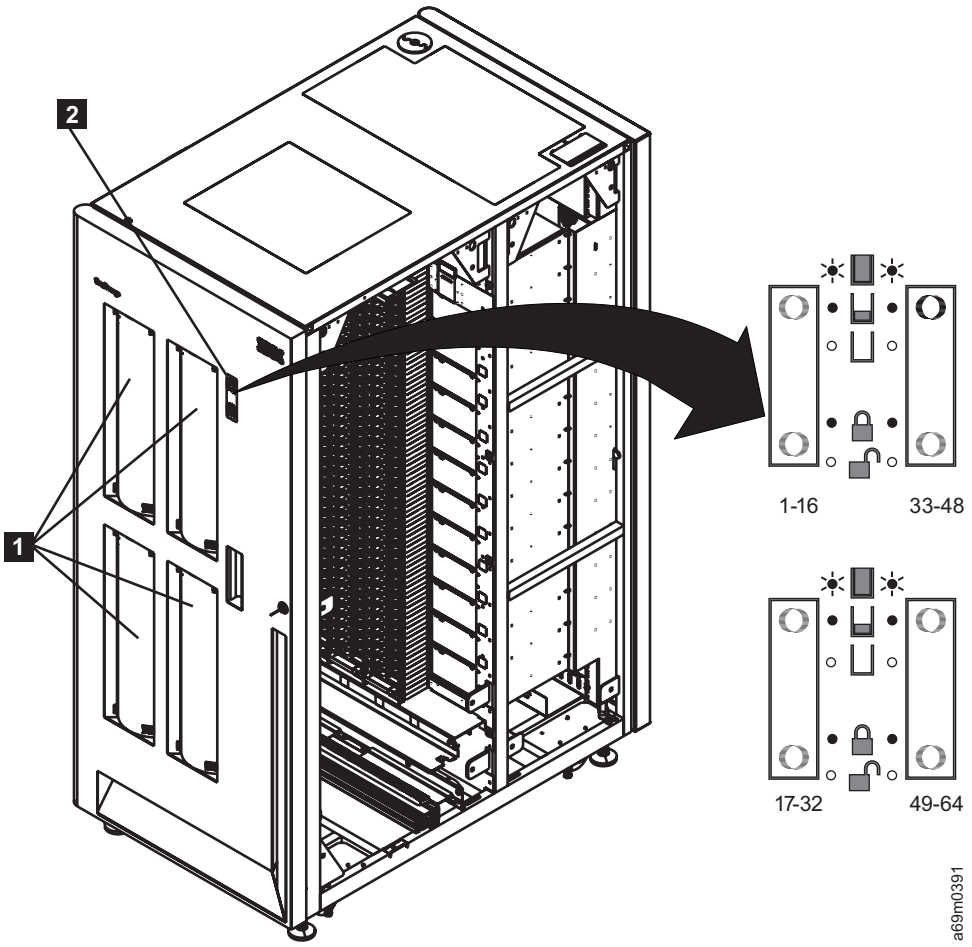


Figure 22. Four I/O Station Door

Operator Panel

The operator panel shown in Figure 23 on page 43 is located in the front door of the base frame (Model Lxx). The operator panel provides information screens and controls that allow you to perform operations, and determine the status of the library. Use the operator panel to check error logs, run diagnostics, and perform other service operations. The operator panel consists of:

1 Library power switch
A toggle switch that allows you to power on and power off the IBM System Storage Tape Library 3584. To power on the library, push the power switch to **|**. To power off the library, push the power switch to **O**.

2 Power-on indicator
A green light that, when lighted, indicates that the library power switch is on and the EPO circuit is enabled.

3 Touchscreen LCD
A liquid crystal display (LCD) that, when touched, allows access to the library's status and menus. Use the display to perform basic and advanced operations, diagnostics, and other service operations. If you are interrupted during an operation and leave the display unattended for more than 5 minutes, the Activity screen displays (see “Activity Screen” on page 43).

The touch screen LCD has been enhanced to be able to select menu items directly without the need to use the four touch keys at the bottom of the LCD screen. Where spacing of selections is not adequate on the touch screen, the UP and DOWN touch keys will continue to be used.

4 Touch keys
An array of up to four pressure-sensitive keys along the bottom of the LCD that lets you select and manipulate menus. For most menus, the four keys are defined as BACK, UP, DOWN, and ENTER.

The operator panel controller facilitates communication between the accessor controller and the operator panel. It provides input and output to and from the LCD. It senses and locks each I/O Station. In addition, the LCD activity and service menus are executed in the operator panel controller, with support from the accessor controller and the drives (via the Media Changer controllers).

The operator panel connects to the accessor controllers and all Media Changer controllers via the Controller Area Network (CAN).

Activity Screen

The Activity screen displays on the LCD of the operator panel when the library is Ready. It shows the current activity in a large font type and provides a history of preceding operations in a smaller font type. The operations are listed from top to bottom, with the most recent at the top and oldest at the bottom. The first line of smaller font types gives a detailed description of the current activity (for example, in the following sample Activity screen, a cartridge with a volume serial number (VOLSER) of 000764L2 was unloaded from the drive in frame 1, row 2).

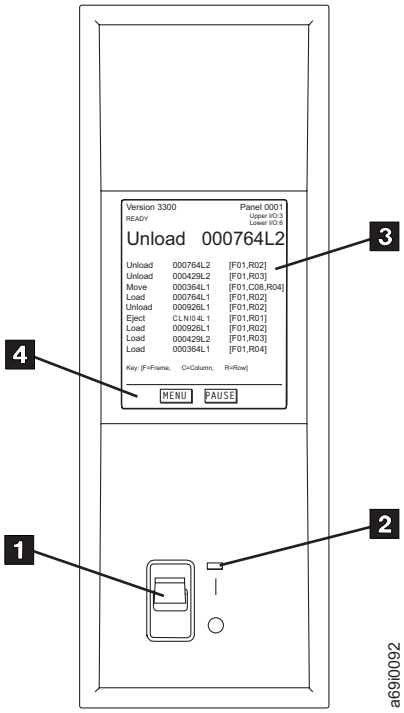


Figure 23. Activity Screen

Information in the Activity screen is automatically replaced by an error message whenever the library detects that:

- An error has occurred
- A drive requires cleaning, automatic cleaning has been enabled, and no cleaning cartridge is present in the library

Menu Key

The [MENU] key is located on the Activity screen of the display. Press the [MENU] key to display the main menu, allowing you to scroll through the various options that are available to the operator, and those options that are available exclusively to the customer engineer.

Pause Key

Press the [PAUSE] button on the operator panel before you power-off the library or open a front door. The Pause button is located on the Activity screen of the display. The Pause button causes the library to park the cartridge accessor in an area that gives you clear access to the library's interior if you open a front door. **Note:** If the door was opened and closed during the pause, the library will inventory itself before resuming customer operations.

The library will resume operation (if the door was not opened) when the pause is over.

Frame Control Assembly (FCA)

The frame control assembly (FCA) **12** , in Figure 5 on page 19 consists of the following:

1. Media Changer Pack (MCP) hot-pluggable FRU, located inside the FCA, has two main functions:
   a. It controls the initial power up sequence, including turning on power to the drives and turning on one 37 V dc supply to power up the ACC, MDA, and OPC node cards.
   b. It handles communications between the drives using its RS-422 interfaces and the rest of the library, using the CAN interfaces.

      An expansion frame may contain an optional FCA and MCP (required if the expansion frame will contain drives).
2. The 37 V dc power supplies, located inside of the FCA, are hot-pluggable FRUs
   a. The base frame (Model L22, L32, and L52) FCA always contains two 37 V dc power supplies if you have a single-frame library. If one power supply fails, the other power supply can provide ample power for the library.
   b. If the first expansion frame (Model D22, D32, and D52) has an FCA installed it will have only one 37 V dc power supply unless FC 1902 (Redundant 37 V dc power supply) has been installed. Additional D32 expansion frames with FCAs will **not** have 37 V dc power supplies, unless FC 1902 (Redundant 37 V dc power supply) has been installed.
   c. These power supplies provide power to the I/O Station, ACC, OPC, MDA, and accessor motors.
   d. Redundant power supplies are enabled and disabled as needed under control of the ACC. Do NOT regard a power supply as faulty unless the library logs a power supply problem.
3. Three circuit protectors
   a. One main line circuit-protector on each FCA. This protector shuts off ac power to the FCA and the entire library (if there is no other FCA powered on).
   b. Two drive power circuit protectors on each FCA. These protectors provide ac power to each bank of 5 drive power receptacles.
4. Ten ac power receptacles for the drive power cables.
5. 24 V dc power supply for EPO circuits, door interlock circuits, frame-counting circuits, and the MCP.
6. Power receptacle for incoming ac power.

Enhanced FCA (x23 / x53 Frames Only)

The Enhanced FCA structure has **two** Bulk Power Card assemblies (BPC). Each BPC provides (+12V) drive power to all tape drives in the frame, plus 37v (to power the robotics) from a single +12V Bulk Power Supply (BPS). The two BPCs provide power redundancy. Either power supply can independently power the library and drives within the frame. New Firmware manages control, and monitors the supplies.

The Enhanced FCA structure consists of new electrical and mechanical hardware to replace the current FCA and the fixed drive power tray. The Enhanced FCA provides a Bulk Power Card (BPC) 'docking station' for each Bulk Power Supply (BPS). It also provides power to the MCA (formerly called the MCP in previous frame types). The BPC controls which power supply provides power, and sends power and fault status to the MCA. See “Enhanced FCA (x23 / x53 Frames Only)” on page 940 for more information.

Controller Area Network (CAN)

The Controller Area Network (CAN) is a serial bus system that complies with ISO Standard 11898. Developed originally for passenger cars, CAN is used in millions of industrial control devices, sensors, and actuators. Features of the system include simplicity and high transmission reliability.

In the IBM System Storage Tape Library 3584, the CAN bus communicates with all the node cards. A list of CAN bus functions includes:

- Broadcasts communication from the Access Controller Card (ACC) to all node cards (for example, a command to set the SCSI status to not ready/ready).
- Provides point-to-point communication between the ACC and any MCP or MCA (for example, a response to a normal work request)
- Provides point-to-point communication between the ACC and the MDA (for example, an accessor service request and response)
- Provides point-to-point communication between the operator panel controller (OPC) and the ACC (for example, an accessor service request and response) or any MCP (for example, a drive service request and response).

Node Cards

Also see **“Node Card Designations and Descriptions” on page 826** for information on Enhanced node cards.

There are four “node” cards in a 3584 Model L32. Although some may appear to be more than just a card, they are called node cards because they function much like nodes on a LAN; they all communicate with each other by sending messages over the CAN bus. The four node cards are (or are contained within) these FRUs:

- Accessor Control Card (ACC)
- Motor Driver Assembly (MDA)
- Operator Panel Controller (OPC)
- Media Changer Pack (MCP) x32, x22, x52
- Media Changer Assembly (MCA) x23/x53

Accessor Control Card (ACC)

The **ACC** node card is the controller for the accessor mechanism. It has several functions:

- Contains the master copy of the library configuration, calibration, VPD, error log, and inventory
- Provides high level control of all cartridge movement; issuing commands to the MDA when X/Y motion is required
- Directly operates the pivot mechanism, grippers, calibration sensor, and bar code reader
- Controls redundant 37 V dc power within the entire library
- Includes the system real-time clock

Motor Driver Assembly (MDA)

The **MDA** node card has several functions related to the X and Y motors and home sensors:

- Directly controls the X and Y servo motors.
- Performs the X and Y rezero functions when commanded by the ACC.
- Contains the dynamic brake card, the XY controller, and the XY motor amps.
- Triggers the bar code scanner, allowing high-speed inventory

Operator Panel Controller (OPC)

The **OPC** node card has these main functions:

- Directly operates the I/O station lock solenoid and monitors the I/O station sensors.
- Performs all the front panel operations, including displaying status, performing manual operations, and initiating maintenance functions such as Library Verify.
- Contains a backup of the library configuration, calibration, VPD, error logs, and inventory.
- Includes a real-time clock

Station Management Card (SMC)

The Shuttle Management Card (SMC) is used for communication with shuttle components.

Media Changer Pack (MCP and MCP+ w/CF) x32, x22, x52

See Figure 248 on page 841 for cable connections.

The **MCP** node card has the following functions:

1. The MCP node card provides a communication path to each tape drive (via the RS-422 interface) so that library commands can be received from the tape drives and sent to the accessor. It includes one RS-422 interface port allotted for each drive in the frame and two Controller Area Network (CAN) ports. It also provides management and service interfaces to outside hosts.
2. The MCP node card controls the initial power-up sequence, including turning on power to the drives and turning on one 37 V dc supply to power up the ACC, MDA, and OPC nodes.
3. The MCP has six RS-232 ports. The bottom port is used to connect a modem for Remote Support.
4. The first MCP in the base (Lxx) frame has an Ethernet port. Some expansion frames may have an MCP with an Ethernet port (FC 1660) for connection to a TSSC / TS3000 (System Console) or Web User interface.
5. The MCP+ w/CF has two 10/100 Ethernet ports. **Port A** is used for the customer's Web User interface. **Port B** is used for TSSC / TS3000 (System Console). See “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840 for more information.
6. Support via the Web user interface. With proper authorization, the Web supports the following tasks:
   a. Enable/disable control paths
   b. Change drive SCSI or Fibre IDs
   c. Clean a drive
   d. Configure logical libraries
   e. Move cartridges; Perform inventory
   f. Change automatic-cleaning setting
   g. Update library, drive, control path and firmware
   h. Download logs
   i. Library verify

Media Changer Assembly (MCA) x23, x53

See “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844 for cable connections.

The **MCA** node card has the following functions:

1. The MCA node card provides a communication path to each tape drive (via the RS-422 interface) so that library commands can be received from the tape drives and sent to the accessor. It includes one RS-422 interface port allotted for each drive in the frame and two Controller Area Network (CAN) ports.
2. The MCA node card controls the initial power-up sequence, including supplying both drive power and 37 V dc library power up the ACC, MDA, and OPC node cards.
3. The MCA has three RS-232 ports:
   - Port J1 is used to connect a laptop for CETool.
   - Port J6 is used to connect a modem for Remote Support.
   - Port J5 is used by development personnel only.
4. The MCA has two 10/100 Ethernet ports. **Port A** is used for the customer's Web User interface. **Port B** is used for TSSC / TS3000 (System Console).
5. Support via the Web user interface provides the following tasks. See the *IBM System Storage TS3500 Tape Library Operator Guide, GA32-0560,* for more information:
   a. Enable/disable control paths
   b. Change drive SCSI or Fibre IDs
   c. Clean a drive
   d. Configure logical libraries
   e. Move cartridges; Perform inventory
   f. Change automatic-cleaning setting
   g. Update library, drive, control path and firmware
   h. Download logs

Functional Block and Cable Diagrams

Figure 24 and Figure 25 on page 49 show an IBM System Storage Tape Library 3584 cable overview for the major components in a library. Figure 26 on page 50 shows a FRU block diagram that ties all the components together for a two-frame library containing a full complement of drives.

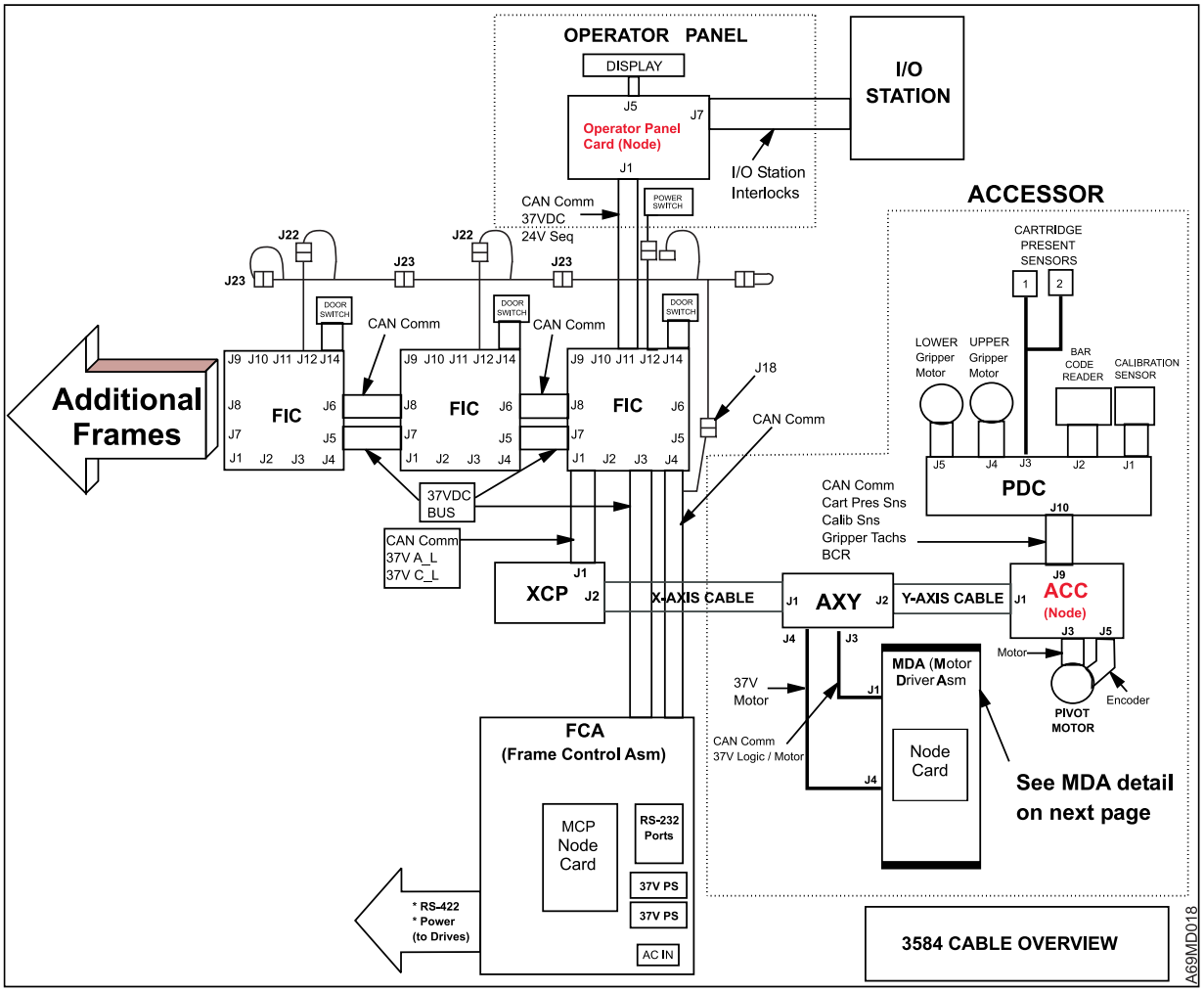


Figure 24. Cable Overview (without Enhanced FCA) – Library

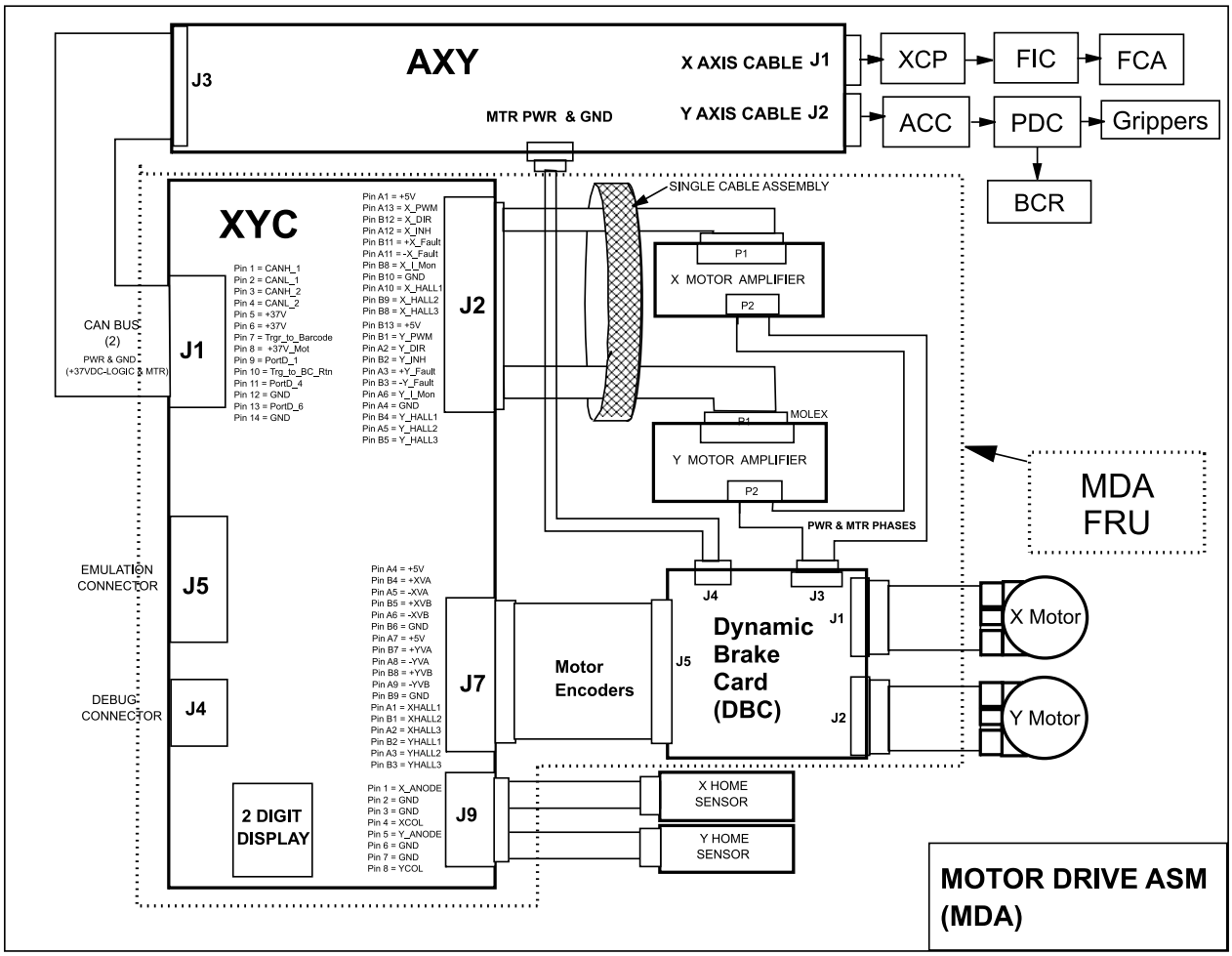


Figure 25. Cable Overview – Motor Drive Assembly

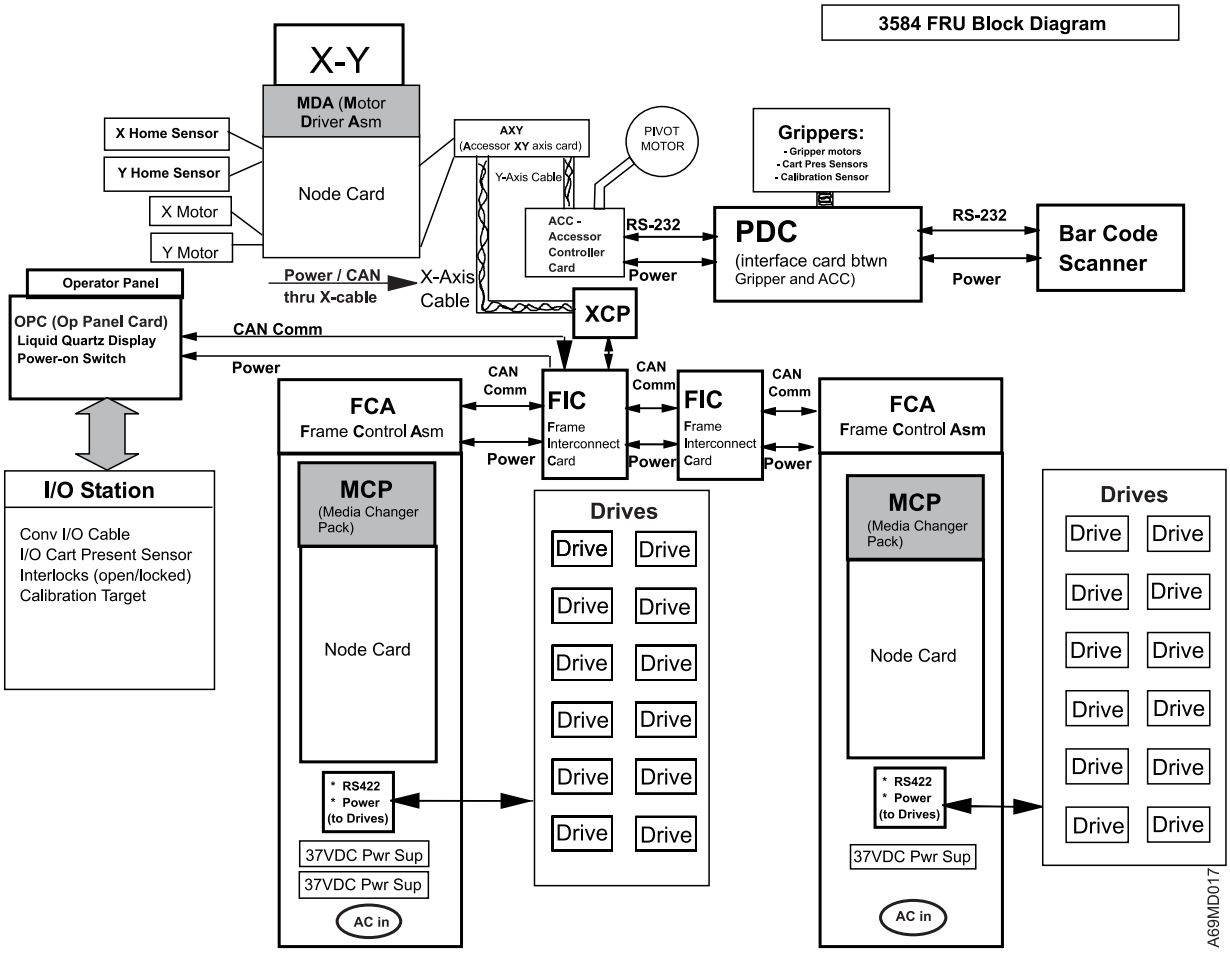


Figure 26. Cable Overview – FRU Block Diagram (without Enhanced FCA)

Node Card Firmware

All of the node cards within a 3584 subsystem contain firmware stored on flash ROMS. Early versions of the node cards, up through firmware version 4390, contained identical firmware to all the other node cards so that if one card was replaced, any other node card could download the appropriate firmware to the new card, thus providing multi-card firmware backup. While each node card used only a small portion of the resident firmware, the entire image on all node cards was available as a backup source. New versions of firmware, from 46xx on, had a change to this architecture, brought on by memory constraints within the node cards. Firmware had grown to the point where not all firmware needed would fit on each node card.

Beginning with Firmware level 46xx, the node cards were redefined into pairs; the OPC card and the MCP card were made into one pair, the ACC card and the MDA card were made into another pair. In each case, the node cards of a specific pair each contained the identical firmware so that one member of the pair could update the other member as needed, but could no longer update node cards that were not pair members. This is shown in detail in the table below:

Table 11. Node Cards and Update Information

Node Card	Can Update the Following	Cannot Update the Following
Operator panel Controller (OPC)	MCP, MCA	ACC, MDA
Media Changer Pack (MCP)	OPC	ACC, MDA
Accessor Control Card (ACC)	MDA	OPC, MCP, MCA
Motor Driver Assembly (MDA)	ACC	OPC, MCP, MCA
Media Changer Assembly (MCA)	OPC	ACC, MDA

Product Development and Manufacturing can update the flash ROM from a debug port on the card. There is little need for you to use the debug port unless the node card has not yet been loaded with firmware.

The node card firmware provides capability to communicate with other node cards over the CAN bus. The node cards can determine the level of firmware on other node cards, and can request a copy of the firmware from another node card. This ability allows the cards to automatically operate at a consistent firmware level throughout the library subsystem.

When a node card completes its POST, it asks all of the other node cards to report their firmware levels. If it determines that another node card has a higher version of firmware it will obtain the firmware from that node card and update its flash ROM before coming Ready. This ensures that when a node card FRU containing downlevel firmware is installed in the library it will automatically be updated. When the FRU is at a much higher firmware level than is the library, an exception may be made depending upon the level of the FRU and the level of the library. If the FRU is at a high level that it is not compatible with the architecture of the library's firmware, and the library cannot be brought up to the FRU's level without risking a large interruption, the FRU is loaded with downlevel firmware to match that of the library.

Each node card contains two complete copies of firmware in flash ROM for redundancy. If a problem such as a power failure interrupts a firmware update, the node card can automatically switch over to the backup copy. Another attempt can then be made to update the firmware. Since the update process always overwrites the damaged or oldest firmware image first, the node cards should always have a usable level of firmware.

For library firmware updates when a CE is present, and to enable future remote support functions, the MCP or MCA has the capability to broadcast a new level of firmware to all the other node cards in the subsystem. If a CE needs to install a code update on the library, the CE Thinkpad can be connected to the MCP or MCA using a 9-pin serial cable. A Windows program running on the Thinkpad can download the new firmware image to the MCP or MCA. Once the entire image is downloaded, the MCP will broadcast the new firmware image to the entire subsystem. This will allow a CE to obtain the latest library firmware

image from the intranet and install it on the entire subsystem using only the CE Thinkpad and a standard 9-pin serial cable. To attach the CE Thinkpad service tool and perform the code update, see “CETool” on page 725.

Tape Cartridges

LTO Cartridges

The Ultrium Tape Drive within the System Storage Tape Library 3584 uses the single-reel IBM LTO Ultrium Data Cartridge. The cartridge contains 1/2-inch, metal-particle tape with a highly dense recording area.

The capacity for supported cartridges is:

- IBM System Storage LTO Ultrium-5 1500 GB Data Cartridge (native capacity of 1,500 GB; compressed capacity of 3 TB at 2:1 compression).
- IBM System Storage LTO Ultrium-4 800 GB Data Cartridge (native capacity of 800 GB; compressed capacity of 1600 GB at 2:1 compression). Only one length of tape is offered for LTO-4 Ultrium (820 meters).
- IBM System Storage LTO Ultrium-3 400 GB Data Cartridge (native capacity of 400 GB; compressed capacity of 800 GB at 2:1 compression). Only one length of tape is offered for LTO-3 Ultrium (680 meters).
- IBM System Storage LTO Ultrium-2 200 GB Data Cartridge (native capacity of 200 GB; compressed capacity of 400 GB at 2:1 compression). Only one length of tape is offered for LTO-2 Ultrium (609 meters).
- IBM System Storage LTO Ultrium-1 Data Cartridge (native capacity of 100 GB; compressed capacity of 200 GB at 2:1 compression). The Ultrium Tape Drive also can read from and write to 10 GB, 30 GB, and 50 GB data cartridges.

Read/Write capabilities among LTO Ultrium-1, 2, 3, 4, and 5 diagnostic cartridges

Note: See Table 12 for details on how different generation LTO diagnostic cartridges are used with various LTO drive generations.

- LTO-1 drive only reads/writes LTO-1 cartridges.
- LTO-2 drive reads/writes LTO-1 and LTO-2 cartridges.
- LTO-3 drive reads/writes LTO-2 and LTO-3 cartridges.
- LTO-4 drive only reads/writes LTO-3 and LTO-4 cartridges.
- LTO-5 drive only reads/writes LTO-4 and LTO-5 cartridges.

Table 12. LTO Diagnostic Cartridge Use by Drive Generation

LTO Drive Generations	LTO Diagnostic Cartridges			
	LTO Gen-1 Diag Cart	LTO Gen-2 Diag Cart	LTO Gen-3 Diag Cart	LTO Gen-4 Diag Cart
LTO Gen-1 Drive	YES	—	—	—
LTO Gen-2 Drive	YES	YES	—	—
LTO Gen-3 Drive	—	YES	YES	—
LTO Gen-4 Drive	—	—	YES	YES
LTO Gen-5 Drive	—	—	—	YES

Table 12. LTO Diagnostic Cartridge Use by Drive Generation (continued)

LTO Drive Generations	LTO Diagnostic Cartridges			
	LTO Gen-1 Diag Cart	**LTO Gen-2 Diag Cart**	**LTO Gen-3 Diag Cart**	**LTO Gen-4 Diag Cart**
Notes: • **YES** = read and write capable. • If you have only LTO-1 drives, then you must use the LTO-1 diag cartridge. • If you have only LTO-2 drives, then you may use either the LTO-1 diag cartridge or the LTO-2 diag cartridge. • If you have only LTO-3 drives, then you must use the LTO-2 or LTO-3 diag cartridge. • If you have only LTO-4 drives, then you must use the LTO-3 diag cartridge. • If you have a mixture of LTO-1 and LTO-2 drives, then you should use the LTO-1 diag cartridge. • If you have a mixture of LTO-2 and LTO-3 drives, then you should use the LTO-2 diag cartridge. • If you have a mixture of LTO-3 and LTO-4 drives, then you should use the LTO-3 diag cartridge. • If you have a mixture of LTO-4 and LTO-5 drives, then you should use the LTO-4 diag cartridge.				

In the above cases, put the cartridge that will be used most often (which depends on how many drives of each type you have) in the diag cartridge slot. The cartridge that is used less often is stored in the back of the library. When it is needed, the operator panel will prompt you to put it into the I/O station.

As an example, if you have a library with a lot of LTO-1 drives and a few LTO-3 drives, then you can assume you will be doing diagnostics on the LTO-1 drives more often. So you put the LTO1 diag cartridge in the diag cartridge slot, and the LTO-2 diag cartridge in the back of the library. If you test a single drive (using Library Verify, Drive Diags, or automatically during Finish Drive Replacement) then if the drive is an LTO-1 or LTO-2 it will be tested using the resident LTO-1 diag cartridge. If the drive is an LTO-3 then the operator panel will prompt you to put the LTO-2 diag cartridge into the I/O station and it will be used for testing. Same thing applies if you test ALL drives: you are prompted to put the LTO-2 diag cartridge into the I/O station and the library will switch back and forth between the 2 diag cartridges depending on which drive is being tested.

Within the LTO Ultrium Data Cartridge is the LTO Cartridge Memory (LTO-CM), a silicon chip that contains information about the cartridge and the tape (such as the name of the manufacturer who created the tape. It also contains the cartridge volume serial (VOLSER) number and statistical information about cartridge usage.

The LTO-CM enhances the efficiency of the cartridge. For example, the LTO-CM stores the end-of-tape location which (when you next insert a cartridge and issue the Write command) enables the drive to quickly locate the recording area and begin recording. The LTO-CM also aids in determining the reliability of the cartridge by storing statistical data about its age, how many times it has been loaded, and how many errors it has accumulated.

The LTO Ultrium Data Cartridge has an anticipated life of 5000 load and unload cycles.

Cleaning Cartridge

To maintain the operating efficiency of the drive, IBM supplies a specially labeled IBM LTO Ultrium Universal Cleaning Cartridge and 3592 cleaning cartridge with each System Storage Tape Library 3584. Each drive in the library determines when it needs to be cleaned, and alerts the library. The library can use the cleaning cartridge to automatically clean the drive. For more information about cleaning methods, see “Drive Cleaning” on page 68.

Diagnostic Cartridge

As shown in Table 12 on page 52, there are different types of diagnostic cartridges that may reside in a 3584 library depending upon the type of frames and drives that make up the library. There are four cartridges for LTO - one diagnostic cartridge is used for LTO-1 and LTO-2; Another is used for LTO-2 and LTO-3, Another is used for LTO-3 and LTO-4, and the fourth is used for LTO-4 and LTO-5 drives. The 3592 tape drive has its own diagnostic cartridge. Only one diagnostic cartridge for each media type (LTO or 3592) can reside in active library frames. If more than one is needed, such as when the library contains LTO-1 and LTO-3 drives, then the diagnostics will prompt you to load the second diagnostic cartridge into the I/O station when needed. The diagnostic cartridge part numbers can be found in Table 113 on page 1095 under "Cartridge, CE Diagnostic."

In an HA (dual-accessor) library, the diagnostic cartridges located in the active frames are used for all drive and I/O testing. Each service bay will also have at least one diagnostic cartridge. In a mixed media library (LTO/3592) there will be two diagnostic cartridges, one LTO and one 3592, in each service bay. These are only used for accessor testing within the service bays.

3592 and LTO Diagnostic Cartridge Locations

The 3592 uses a Jx-type, 3584-compatible tape cartridge. The 3592 tape cartridge may be intermixed with other 3592 type tape cartridges within the storage cells of a library L22/D22/L23/D23 frame, but cannot be inserted into a tape drive other than a 3592. In addition, no other type tape cartridges will fit into a 3592 drive.

Diagnostic cartridge use in active frames:

1. If you have a library with all LTO frames (models x32, x52, and/or x53), place an LTO diagnostic cartridge in slot F1C1R01. **See Note 1.**
2. If you have a library with all 3592 frames (models x22 and/or x23), place a 3592 diagnostic cartridge in slot F1C1R01.
3. If you have a library with an LTO frame 1 (model L32, L52, or L53) and at least one 3592 frame (model D22 and/or D23), place an LTO diagnostic cartridge in slot F1C1R01, and place a 3592 diagnostic cartridge in slot C1R01 of the leftmost 3592 frame. **See Note 1.**
4. If you have a library with a 3592 frame 1 (model L22 or L23) and at least one LTO frame (model D32, D52, and/or D53), place a 3592 diagnostic cartridge in slot F1C1R01, and place an LTO diagnostic cartridge in slot C1R01 of the leftmost LTO frame. **See Note 1.**

Note 1: Because LTO drives can read and/or write specific generations of diagnostic tapes, refer to Table 12 on page 52 to determine which LTO diagnostic cartridges to install in the library. You may want to select an LTO diagnostic cartridge that works best with the type(s) of LTO drives installed in the library.

Diagnostic cartridge use in service bays:

Refer to the following installation instructions:

- If you converting an existing single-accessor library to a dual-access (HA) library (FC 9040 / 1440) use instructions PN **96P1241** to install the diagnostic cartridges.
- If you installing the first High Density frame (FC 9050) use instructions PN **45E4417** to install the diagnostic cartridges.

Media Type Indicator

There are several types of cartridges available for 3592. For a complete list of cartridge types, refer to the table, *Types of IBM 3592 TotalStorage Enterprise Tape Cartridges* in the **IBM System Storage TS3500 Tape Library with ALMS Operator Guide**.

- Data cartridge – Identified by the two characters **JA, JB, JJ, JW, JX, JR**, followed by a six-character volume ID number (VOLSER)

  Table 13 provides information about the various 3592 Jx-type data cartridges.

Table 13. Types of 3592 Data Tape Cartridges

Identifier	Case Color	Tab, Door, and Label Color	Capacity	Description
JA	Black	Dark Blue	300 GB	Standard read/write
JB	Black	Dark Green	700 GB (E05 format)	Extended Data
JJ	Black	Light Blue	60 GB	Economy read/write
JW	Platinum (Silvery Gray)	Dark Blue	300 GB	Write-once read-many (WORM)
JX	Platinum (silvery gray)	Dark Green	700 GB (E05 format)	Extended WORM
JR	Platinum (Silvery Gray)	Light Blue	60 GB	Economy write-once read-many (WORM)

- Cleaning cartridge – The unique 3592 cleaning cartridge.
- CE = CE scratch tape
- nnn = the unique serial number to differentiate which tape was used for test on a drive.
- JX = media type for 3592

Jx-Type Tape Cartridge

The 3592 Jx-type tape cartridge contains media that is housed in a cartridge slightly larger than an LTO tape cartridge. This makes it compatible with existing 3584 library components. The cartridge has mechanical differences that prevent it from being loaded into an LTO drive by mistake. The external and internal labels are different for each type of cartridge. When a cartridge is installed into the library, the media type is associated with the storage location within the library. See Figure 27 on page 57.

The tape cartridge used in a 3592 contains a:

- Single reel of magnetic tape
- Leader pin **1**
- Clutch mechanism **2**
- Cartridge file-protect mechanism **3**
- Internal cartridge memory (CM)

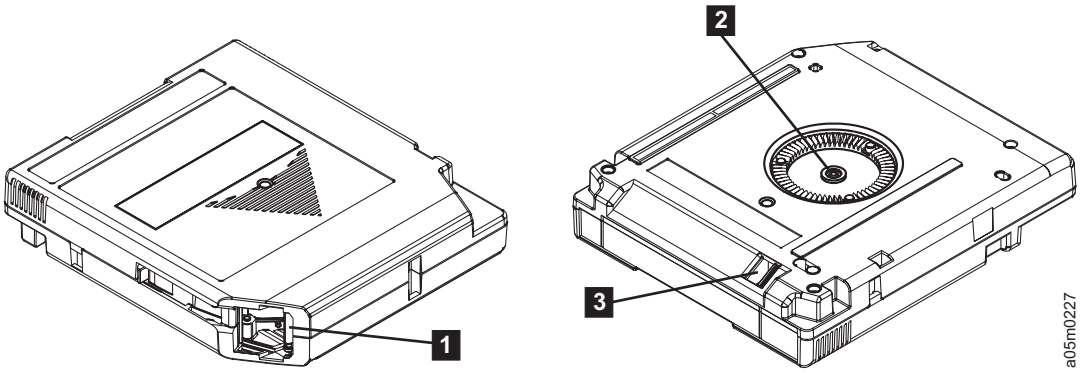


Figure 27. Jx-Type Tape Cartridge

Cartridge Memory (CM)

Each 3592 Jx-Type data cartridge contains a passive silicon storage device called cartridge memory (CM). This CM holds information about the cartridge and the media in the cartridge, and holds statistics about media performance.

The cartridge and media information is stored in a protected, read-only area of the CM.

The CM reader uses a radio-frequency interface to read this information when the cartridge is loaded into the drive.

The media performance statistics are stored in an unprotected, read/write area of the CM. These statistics are updated by the CM reader just before the cartridge is unloaded. The media performance statistics are maintained by the Statistical Analysis and Reporting System (SARS) portion of the drive microcode. For more information see, "Statistical Analysis and Reporting System (SARS)" in the IBM System Storage Enterprise Tape Drive 3592 Maintenance Information.

Write Once Read Many (WORM)

Some records retention and data security applications require the write-once read-many (WORM) function of tape data storage. This WORM function is accomplished on the 3592 by a combination of microcode controls in the drive, and a special WORM tape cartridge.

There are no physical hardware changes required to make the drive WORM-capable. All 3592 drives are WORM-capable with the installation of drive microcode release D3I0_497 or later. If the drive has WORM-capable microcode installed, the drive type will display on the operator panel as J1A-FE (the E in FE means enhanced function).

The WORM cartridge types are JW (300 GB) and JR (60 GB). You can distinguish the WORM cartridges by the platinum (silvery-gray) color of the case, and other markings. See Table 13 on page 56 for additional details.

The WORM tape media is formatted differently than the standard read/write media. This unique format prevents a WORM cartridge from being written on by a drive that does not have the WORM microcode.

One field in the servo manufacturer's word (SMW) on the tape designates that the media is WORM. Also, the cartridge memory (CM) has a WORM indicator byte in the cartridge type field. Both of these conditions must be true for the drive to work with a WORM cartridge. If one condition is true and the other is false, an ATTN DRV - Invalid Cartridge message will post.

Each WORM cartridge also has a 12-byte, unique cartridge identifier (UCID). This UCID is made up of 4 bytes of the unique CM chip serial number and 8 bytes of the unique tape media serial number.

When the drive senses that a cartridge is a WORM cartridge, the microcode prohibits the changing or altering of user data already written on the tape. The microcode keeps track of the last appendable point on the tape by means of an overwrite-protection pointer stored in the cartridge memory (CM).

SARS data can be written and updated on WORM tapes because the SARS data is not in the user area of the tape.

Library Configurations

The System Storage Tape Library 3584's default configuration allows a single application or host to operate the library via a single control path. (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.) Often, however, it is advantageous to be able to share a single library between heterogeneous (dissimilar) or homogeneous (similar) applications or hosts. Some applications (and some host systems) do not allow for sharing a library between systems. With the IBM System Storage Tape Library 3584, however, you can create configurations that enable the library to process commands from multiple dissimilar hosts (for example, an RS/6000 and a Windows NT server) and multiple, similar hosts (for example, several RS/6000s).

From the System Storage Tape Library 3584 operator panel, you can:

- Configure the library so that it is partitioned into separate *logical libraries* that independently communicate with separate applications or hosts via separate control paths. This configuration (see **1** in Figure 28 on page 60) is commonly called the Logical Libraries Configuration and requires no special capabilities from the host system or application. For more information, see “Logical Libraries Configuration” on page 61.
- Configure any single logical library (including the entire physical library) to be shared by two or more hosts. Depending on the capabilities of the host system and application, there are several ways to set up this type of configuration. Three typical ways include:
  - Configuring one server (host) to be responsible for communicating with the library via a single control path; all other servers (hosts) will send requests to that server (host) via a network (see **2** in Figure 28 on page 60). This configuration is not applicable to the IBM @server iSeries or IBM AS/400 servers and requires special capabilities from the application.
  - Configuring all of the hosts to communicate with the library via a single, common control path (see **3** in Figure 28 on page 60). This configuration is not applicable to the IBM@server iSeries or IBM AS/400 servers, and requires special capabilities from the application.
  - Configuring a single logical library to communicate with multiple servers (hosts) via multiple control paths. This configuration (see **4** in Figure 28 on page 60) requires that you add Control Paths and is required by IBM @server iSeries or IBM AS/400 servers. For more information, see “Control Paths” on page 62.

    Notes:
    1. Only one HVD drive is allowed on each SCSI bus when attached to an AS/400 host.

The customer's library configuration is not limited to the examples shown in Figure 28 on page 60. Many configurations are possible, and the configuration can be designed according to business needs. The customer can partition the System Storage Tape Library 3584 into as many as 32 logical libraries by using one of three methods:

- Manually installing logical library bar code labels (no longer supported in library firmware 6xxx or higher) to identify the elements (storage slots and drives) that the customer wants to include in the library, then selecting the Configure Library menu option to identify them to the library. This method enables the customer to view the partition at a glance when the front doors are opened. For examples of these labels and where they may be placed, see “Logical Library Bar Code Labels” on page 62. A maximum of five logical libraries can be configured using this method.
- Identifying the elements that the customer wants to include in each logical library by selecting them from the Advanced Configure menu. This method makes it unnecessary for the customer to manually label the elements, but you cannot view the partition whenever the front doors are opened.
- When the Advanced Library Management System (ALMS) feature is installed, logical libraries may be added, deleted, or easily changed by using the Tape Library Specialist web interface.

  Attention: Disabling ALMS is disruptive and all or some Logical Libraries will be removed and not recovered.

Your customer can create or change the configurations for the library by following the procedures in the 3584 Operator Guide entitled “Changing the Library Configuration.”

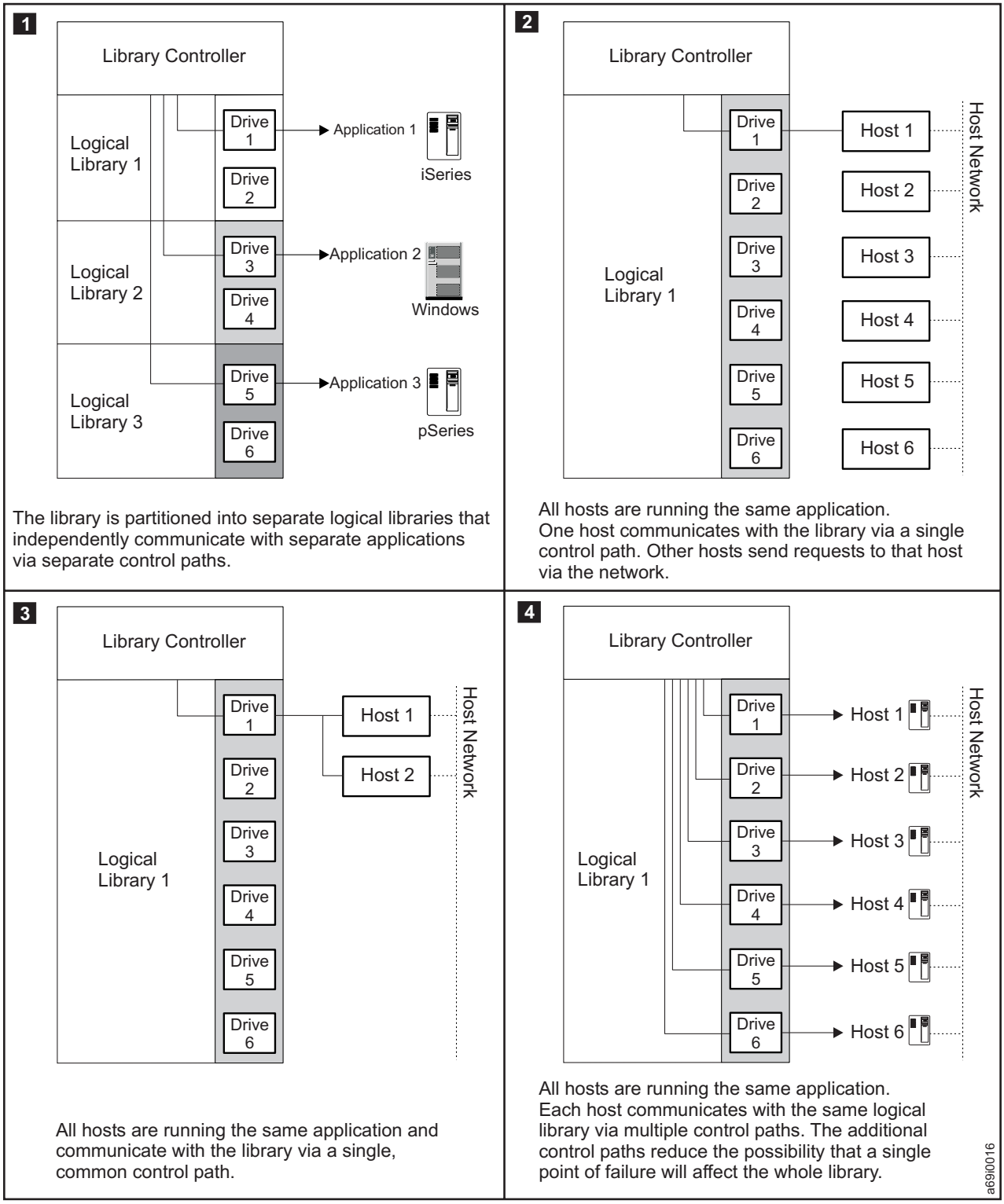


Figure 28. Sample Configurations

Logical Libraries Configuration

The customer can create a Logical Libraries Configuration that allows a single library to be used by multiple systems by partitioning the physical library's storage slots and tape drives into two or more 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). Unless the Advanced Library Management System (ALMS) feature is installed, 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. In addition, a logical library cannot include both LTO and 3592 media. That is, you must configure LTO and 3592 elements (drives, storage slots, and I/O slots) into separate logical libraries.

A logical libraries configuration is an effective way for the System Storage Tape Library 3584 to simultaneously back up and restore data from unshared applications. For example, you can configure the library to process commands from Host 1 (example: Department A) in Logical Library 1, commands from Host 2 (example: Department B) in Logical Library 2, and commands from Host 3 (example: Department C) in Logical Library 3. 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 hosts travel to the library via control paths. Thus, the data processing for Department A is confined to the storage slots and drives in Logical Library 1, processing for Department B is confined to the storage slots and drives in Logical Library 2, and so forth.

For LTO and 3592 frames, each logical library control path is available to servers via logical unit number 1 (LUN 1) of the first drive that is defined as a control path within that logical library. A logical unit number is a number used by a server to identify a drive that is capable of receiving and passing on library commands.

When automatic cleaning is enabled, any cleaning cartridge may be used to clean a drive in any configured logical library of the same media type, even if the cartridge resides in a different logical library.

Frames that use LTO or 3592 tape drives can be partitioned into twelve logical libraries. Your customer can partition multiple logical libraries by using one of three methods:

- Opening the door of the library and manually labeling the elements (storage slot columns and drives) that he wants to include in each logical library (see the section about 'configuring the library using labels' in the *IBM System Storage TS3500 Tape Library Operator Guide*). This method enables the customer to view his partitions at a glance whenever he opens the front doors.
- Identifying the quantity of elements that he wants to include in each logical library, then using operator panel menus to create the logical libraries (see the section about 'configuring the library by using menus' in the *IBM System Storage TS3500 Tape Library Operator Guide*). This method makes it unnecessary for the customer to manually label the elements, but he cannot view his partitions whenever he opens the front doors.
- When the Advanced Library Management System (ALMS) feature is installed, logical libraries may be added, deleted, or easily changed by using the Tape Library Specialist web interface.

  Attention: Disabling ALMS is disruptive and all or some Logical Libraries will be removed and not recovered.

Note: If you have made a change to the configuration of the library subsystem, and if the library is connected to a SAN, it may be necessary to reset various components of the SAN so they will recognize the changes. As an example, a 2108 SAN Data Gateway may need to be reset or IPLed to recognize that new devices have been added.

Control Paths

In addition to partitioning storage slots and drives into logical libraries, you also can configure any logical library so that it shares its entire cartridge inventory between multiple IBM @server, iSeries, or IBM AS/400 servers, or other open-systems hosts that run the same applications. When you add one or more control paths (by enabling LUN 1 of 3592 or Ultrium Tape Drives), any single, configured logical library can be accessed by multiple servers. Additional control paths reduce the possibility that failure in one control path will cause a breakdown in the entire library.

You can configure the System Storage Tape Library 3584 so that servers send commands to it through the multiple control paths. Access by the server to the library is on a first-come, first-served basis. Each control path port for a logical library can accept commands while the library is in use by another port.

Note: Microsoft Windows 2000 Removable Storage Manager (RSM) does not support multiple control paths within a logical library.

To add or remove additional control paths, see the *IBM System Storage TS3500 Tape Library Operator Guide*.

Logical Library Bar Code Labels

When ALMS is not installed, the customer may use logical library bar code labels (no longer supported in library firmware 6xxx or higher) to designate, then observe, the physical breakout of the logical libraries. Each IBM System Storage Tape Library 3584 comes with one sheet of 18 labels for each of 5 logical libraries and 6 holders for logical library labels. A sample label and holder are shown in Figure 29.

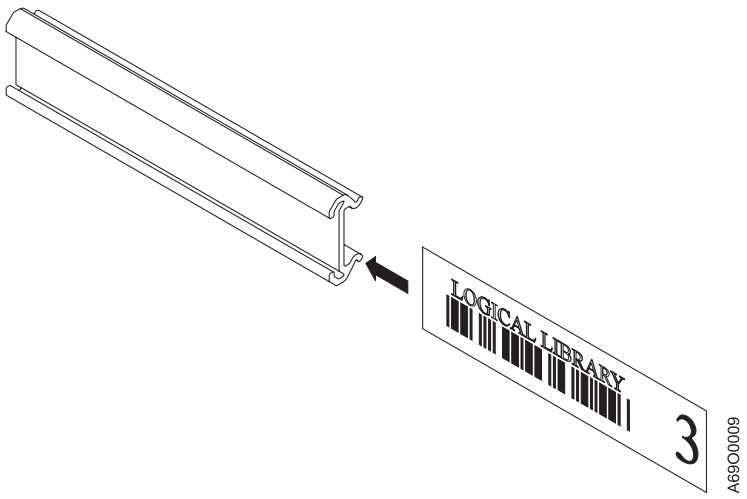


Figure 29. Sample Label and Holder

Examples of label and holder placements in the IBM System Storage Tape Library 3584 are shown in Figure 30 on page 63.

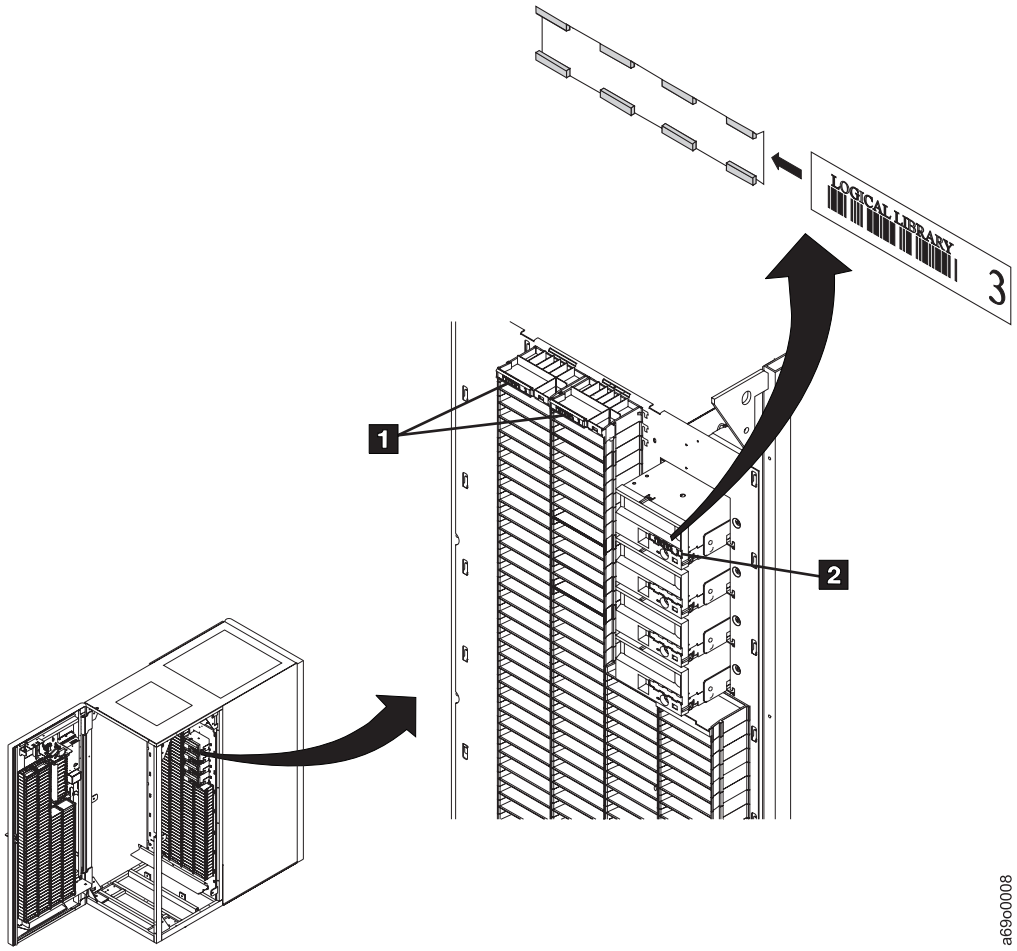


Figure 30. Sample Label and Holder Placement

Physical and Logical Addresses

Each element in the IBM System Storage Tape Library 3584 (the cartridge storage slots, I/O storage slots, and tape drives) has two addresses:

- Physical address
- Logical SCSI element address

If the Advanced Library Management System (ALMS) Feature is installed, each I/O and storage slot, and drive address may take the form of a virtual address, tracked by the library microcode, but not pointing to "real" physical addresses. This may add complexity to isolation of faults in case of a drive or physical slot failure. For this reason, all ALMS library failures associated with these virtual addresses that produce a Library Error Log entry will also create and log a "Trailer" record that gives physical addresses where the failing component may reside. See Table 72 on page 640 for more information on this Trailer record.

When initiating an operator-panel operation such as moving a tape cartridge or performing manual cleaning, the customer can use the physical or logical address to specify a location in the library.

The physical address consists of **frame**, **column**, and **row** identifier that defines a unique physical location in the library. The address is represented as:

- Fx, Cyy, Rzz for a storage slot (where F equals the frame and x equals its number, C equals the column and yy equals its number, and R equals the row and zz equals its number).
- Fx, Rzz for a tape drive and I/O storage slot (where F equals the frame and x equals its number, and R equals the row and zz equals its number). Between the 'Fx' and 'Rzz' may appear two zeros to represent '00' columns.

The SCSI element address consists of a number that defines to the SCSI interface a logical location in the library. This logical address is represented as xxxx(X'yyy'), where xxxx is a decimal value and yyy is a hex value. It is assigned and used by the host when the host processes SCSI commands. The SCSI element address is not unique to a storage slot, drive, or I/O slot; it varies, depending on the quantity of drives in the library.

Drive Performance

If you run applications that are highly dependent on tape-processing speed, you can take advantage of the significant performance improvements provided by the LTO Ultrium and 3592 tape drives. Table 14 lists the performance characteristics.

Note: Drive performance for the **3592** drives can be found in the *IBM System Storage TS3500 Tape Library Operator Guide* .

Table 14. Performance Characteristics of the LTO Ultrium Tape Drives

	Tape Drive				
Characteristics	**Ultrium Tape Drive (Gen-1)**	**Ultrium Tape Drive (Gen-2)**	**Ultrium Tape Drive (Gen-3) F3A & F3B**	**Ultrium Tape Drive (Gen-4) F4A**	**Ultrium Tape Drive (Gen-5) F5A**
Native sustained data rate	15 MB/s	35 MB/s	80 MB/s	120 MB/s	140 MB/s
Compressed data rate (at 2:1 compression)	30 MB/s	70 MB/s (with L2 media) 40 MB/s (with L1 media)	160 MB/s (with L3 media) 70 MB/s (with L2 media) 40 MB/s (with L1 media)	240 MB/s	280 MB/s
Maximum sustained data rate (at maximum compression)	60 MB/s	110 MB/s	280 MB/s	340 MB/s	745 MB/s
Burst data rate for Fibre Channel drives	100 MB/s	200 MB/s	200 MB/s (FC-2) 400 MB/s (FC-4)	400 MB/s	800 MB/s
Burst data rate for Low Voltage Differential (LVD) SCSI drives	80 MB/s (Ultra2)	160 MB/s (Ultra160)	N/A	N/A	N/A
Burst data rate for High Voltage Differential (HVD) SCSI drives	40 MB/s (Ultra)	40 MB/s (Ultra)	N/A	N/A	N/A
Nominal load-to-ready time	20 seconds	15 seconds	15 seconds	15 seconds	12 seconds
Nominal unload time	18 seconds	15 seconds	15 seconds	15 seconds	17 seconds
Average search time to first byte of data	73 seconds	49 seconds	49 seconds	49 seconds	60 seconds

Note: Always refer to the *IBM System Storage TS3500 Tape Library Operator Guide* for the most current performance values.

The tape drives provide efficient tape operations and relief to users who have difficulty completing tape activities in the time available. By using their data compression capability (which enhances data transfer rates and throughput), your customer can rapidly process tape applications and run tape-related

workloads. If there is limited time for system backup or there are large amounts of disk storage, he can use the tape drives to quickly and efficiently back up his systems. If the host files become lost or damaged, the high performance of the tape drives permits fast system recovery.

Your customer can use the built-in data-compression capability of the tape drives to achieve greater data rates than the native data transfer rate. Actual throughput is a function of many components, such as the host system processor, disk data rate, block size, data compression ratio, SCSI bus and fibre channel capabilities, and system or application software. While the System Storage Tape Library 3584 is capable of up to a 7.8-TB/hour rate with Ultrium Tape Drives (at a 2:1 compression), other system components may limit the actual data rate.

For maximum performance with SCSI drives, multiple SCSI busses may be required and the System Storage Tape Library 3584 devices must be the only target devices that are active on each SCSI bus. For more information, see the section about the SCSI interface in the *IBM System Storage TS3500 Tape Library Operator Guide*.

Library Performance

The following performance values, whether measured on test systems or modeled through simulations, are based on a fixed set of workload assumptions to ensure accurate comparisons; however, the results were not evaluated in all production environments. Thus, the performance values show the relative performance of the systems and may not be absolute indicators of performance in your specific environment.

Some of the specific assumptions may not pertain to a given operating environment. Actual performance may vary. Accordingly, the performance information in this section does not constitute a performance guarantee or warranty. Verify that the performance of the library is acceptable in your specific environment.

Preferred Zones

You can set an accessor's preferred zone (area) by using the Tape Library Specialist web interface.

If your 3584 Tape Library includes a second installed accessor, you can set the preferred zone in which both accessors operate. You can set an accessor's preferred zone to only include its service bay. For example, you could set the preferred zone for Accessor A to be the HA1 (Service Bay A) frame or the preferred zone for Accessor B to be the service bay in which it resides. To maximize the library's cartridge mount performance, be sure to establish logical library partitions and control paths so that they are within the preferred zone.

When installing a new library, or when adding additional frames, the preferred accessor zone setting should be evaluated and changed if necessary. The default preferred accessor zone is set between frame 1 and frame 2. However the preferred accessor zone should typically be set towards the middle of the library, unless the customer prefers otherwise.

See, *3584 Tape Library Operator Guide*, Chapter 3 "Setting an Accessor's Preferred Zone" for more information.

Cartridge Inventory

The typical time required for the library to inventory cartridges is less than 60 seconds per frame.

A cartridge inventory operation includes a check to determine whether each cartridge storage slot in the library is empty or full, and a scan of the bar code labels. An inventory occurs whenever the customer:

- Does a power-on of the System Storage Tape Library 3584
- Issues the SCSI Initialize Element Status with Range command
- Selects the appropriate menus from the Library Specialist web interface
- Selects inventory from the Manual Operations menu
- Closes the front door

Note: The System Storage Tape Library 3584 tracks the logical location of all elements in the library by performing an automatic inventory as required (if you issue the SCSI Initialize Element Status command, it is allowed but ignored). The automatic inventory improves application audit performance.

The library keeps track of front doors that were opened. When the library performs an automatic inventory because a front door was closed, the inventory will occur only for those frames whose doors had been opened.

Drive Cleaning

The head of every tape drive in the System Storage Tape Library 3584 must be kept clean to prevent errors caused by contamination. You can keep the drives clean by using the cleaning cartridge. Whenever the library senses that a drive needs to be cleaned, it alerts the customer with a message on the library display or the host console. The library uses the cleaning cartridge to clean the drive with whatever cleaning method that the customer chose. Whichever of the three methods is used, cleaning is performed after the data cartridge has been unloaded from the drive and before the next cartridge is loaded.

IBM recommends that the customer always keeps automatic-cleaning enabled. By continually keeping itself clean, the drive does not shut itself down because of improper maintenance or contaminants that can cause the drive to fail.

For instructions about inserting or removing a cleaning cartridge, or enabling or disabling automatic cleaning, refer to the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560.

Automatic Cleaning

Automatic cleaning enables the 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 using the library. You can enable or disable automatic cleaning by using the menus on the library display, or by using the IBM Tape Library Specialist web interface (formerly StorWatch). The setting is stored in non-volatile memory and becomes the default during subsequent power-on cycles. It applies to all logical libraries that are configured for the System Storage Tape Library 3584. When enabled, any cleaning cartridge may be used for all logical libraries of the same type, that are configured.

Host Cleaning

Host cleaning requires that a host application detect the need to clean a drive. It also requires host application control of the cleaning process. Host cleaning with a cleaning cartridge is only supported when you disable automatic cleaning and only for the logical library in which each cartridge is stored. When you enable automatic cleaning or when the cleaning cartridge is stored in a different logical library, the host application does not have access to the cleaning cartridge.

Manual Cleaning

Manual cleaning requires that you select a menu option from the library display or IBM Specialist web interface to perform cleaning on one or more of the tape drives. Manual cleaning is always supported regardless of whether automatic cleaning is enabled or disabled. However, when ALMS is installed you cannot do manual cleaning from the Web User interface. Refer to the *IBM System Storage TS3500 Tape Library Operator Guide*.

Preventive Maintenance (PM)

PM is not a time-scheduled event, but should be reviewed during every service call. See “Preventive Maintenance (PM)” on page 1085 for more details.

TapeAlert Support

The System Storage Tape Library 3584 is compatible with TapeAlert technology, which provides to the server error and diagnostic reporting for the drives and the library.

SNMP Messaging

Occasionally, the library may encounter a situation that you want to know about, such as an open door that causes the library to stop. Because many servers can attach to the System Storage Tape Library 3584 by differing attachment methods, the library provides a standard TCP/IP protocol called Simple Network Management Protocol (SNMP) to send alerts about conditions (such as an opened door) over a TCP/IP LAN network to an SNMP monitoring station. These alerts are called SNMP traps. Using the information supplied in each SNMP trap, the monitoring station (together with customer-supplied software) can alert operations staff of possible problems or operator interventions that occur. Figure 31 shows the flow of SNMP traps over the Ethernet local area network (LAN) to an SNMP monitoring station.

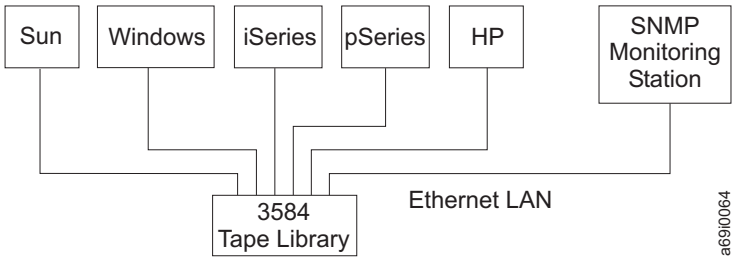


Figure 31. The SNMP Messaging System. The System Storage Tape Library 3584 issues SNMP traps to a monitoring station.

Each trap includes the following fields, which enable staff to locate and resolve the problem:

- Machine type
- Model number
- Serial number
- Failing frame number
- Failing drive number
- SCSI sense key
- SCSI additional sense code (ASC)
- SCSI additional sense code qualifier (ASCQ)
- Hardware error code (HEC)
- Hardware error code qualifier (HECQ)
- Unit reference code (URC)
- TapeAlert number
- Text message

Chapter 2. Start

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Start of Call

Before you begin:

If the library is NOT on a Maintenance Agreement, go to Chapter 6, “Safety and Inspection,” on page 247 before returning here.

Note:

- Do not remove any cartridges from the storage slots, the tape drives, or the grippers, unless instructed to do so.
- If you are having intermittent failures, read “Intermittent Failures” on page 82 before continuing.

Note:

- See Table 15 on page 73 when working with a problem.
- See Table 16 on page 81 for maintenance tasks that are not related to a problem.

Note: If the operator panel is locked, see “Operator Panel Security” on page 756 to unlock.

Failures are categorized into these areas in the following tables:

1. Problems resulting in Library or Drive Error Codes and/or Sense Data
   - URC
   - Library Error Codes (HEC/HECQ or Two-character Display)
   - Library Sense Data
   - Library TapeAlert
   - Drive Error Codes (ASC/ASCQ, FID, or Single-character Display)
   - Drive Sense Data
   - Drive TapeAlert
2. Problems that do NOT result in Library or Drive Error Codes and/or Sense Data
   - Stuck Tape and other media-related problems
   - Host connectivity (SCSI or Fibre Channel) problems
   - Ethernet (IBM Specialist (formerly Storwatch) or SNMP) problems
   - Configuration doesn't accurately discover installed hardware
   - Power problems
   - Call Home problems (Call Home doesn't work)
3. Intermittent or Not Listed

Find the **Error Indication** or **Task** in the left column, then perform the **Action** in the right column.

Note: To view the library or drive error logs, see “Display Error Logs” on page 701. The library error log also may be viewed by using CETool. See “Viewing Library Error Log Entries by Using CETool” on page 736.

Working with a Problem

Table 15. Failure Start

Error Indication	Action
**** Library Error Codes, Messages, & Sense Data ****	
URC (typically from a Call Home PMR or the library operator panel)	Go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
Error message on the library operator panel. (Usually shows the HEC and HECQ.)	Use 04 44 00 followed by the error code you received in the error message (example: if the HEC and HECQ are B8 82, use 04 44 00 B8 82). Go to “Library Sense Data to URC Table” on page 279 to obtain the URC. When you have found the URC, go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
Two-character display code on ACC, MCP, MDA, or OPC (includes blank two-character display)	Go to “Node Card LED Display Codes” on page 274 to locate the LED display, and follow the instructions.
Operator panel displays "Initializing" or "Validating Library Configuration," and the library appears to be hung or unresponsive.	This problem may be caused by a blown 37 V fuse on a FIC resulting in loss of power to an accessor. • 37 A, C, E - LEDs should be ON in a single accessor library. 37 A, B, C, D, E - LEDs should be ON in an HA dual-accessor library. See Table 100 on page 838 and *"37 V dc distribution throughout the 3584 Library."* If one of the above LEDs is not on, go to “Blown Fuse MAP” on page 667. • There could also be a problem on the CAN bus. See “CAN Bus Errors – Failure Isolation” on page 764.
Library Error Log contains recent entries (SK, ASC and ASCQ, HEC and HECQ) data	Go to “Library Sense Data to URC Table” on page 279, and obtain the URC. Locate this URC in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.
Library sense data from host error logs	Go to “Library Sense Data to URC Table” on page 279, and obtain the URC. Locate this URC in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.
DOOR OPEN message on the library operator panel	Use URC A285. Locate this URC in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.
Library door is open, but DOOR OPEN message is NOT displayed on the library operator panel	Use URC A285. Locate this URC in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.
Library doors are CLOSED, but a DOOR OPEN message is displayed on the library operator panel	Use URCs A434 & A435. Locate these URCs in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.
Tape alert or SNMP alert indicating a problem with the library.	1. Check the library error log or the host error log for any library error sense data. 2. Go to “Library Sense Data to URC Table” on page 279, and obtain the URC. Locate this URC in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.
'Insert Notification' is enabled, but unassigned cartridges are found in the library	The system administrator must designate the correct logical library for the unassigned volumes through the web specialist of the 3584 tape library. For more information see Insert Notification in the *3584 Introduction and Planning Guide.*
Unable to set encryption on one or more drives	The library may not have been set up correctly for encryption, or encryption-capable / encryption-enabled drives (LTO, 3592, or a mix of both). These drive may not be properly assigned and/or installed in the correct logical library. There are a number of steps that need to be accomplished before the library will recognize these drives. See “Library Encryption Setup & Systems Assurance” on page 630.

Table 15. Failure Start (continued)

Error Indication	Action
**** Drive Error Codes, Messages, & Sense Data ****	
Drive error message on the library operator panel (may show the ASC and ASCQ and/or the FID)	Go to “Drive Sense Data to URC Tables” on page 314 to look for a drive URC. When you have found the URC, go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions. **Notes:** 1. The error message may only contain the ASC and ASCQ, so you may need to ignore the SK field. 2. Older versions of library and/or drive code do not display the drive SCSI sense log. The only available information for these machines is the error code and the FSC. If you are working on a drive error displayed on the library operator panel, and the ASC and ASCQ are not displayed, then obtain the FSC (see “Drive Error Detail - LTO” on page 776), go to “LTO Ultrium-1 Drive FSC to URC Table” on page 364 to obtain the URC.
Operator panel message, "Internal Error - Command Sequence Error"	This error message will be displayed if the host did not unload the drive before issuing the move command. **Action:** Send an unload command to the drive before issuing a 'move medium' to the library. It is also possible that the drive was unable to unload the cartridge.
Offline message on Drive Status screen at library operator panel	Run the 'Finish Drive Replacement' procedure to make the drive available. Press the MENU button, then select Service, FRU Replacement, Finish Drive Replacement.
3592 or 3588 drive is unavailable to the host	Two drives may have the same drive serial number assigned. Verify this by selecting MENU, Service, Vital Product Data, Drive Serial Numbers. If a 3592 or 3588 drive serial number needs to be changed or corrected use CETool. See “Changing 3592 / 3588 Serial Numbers” on page 739.
3592 drive 8-character display code only	View the 3592 drive error log, and obtain the FID. Go to “Drive Sense Data to URC Tables” on page 314 to look for a drive URC. When you have found the URC, go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
3592 head calibration problems, read/write failures, library verify failures, or FIDs	1. If you are getting 3592 calibration errors, run the "Long Read/Write Test" (Service, Tests/Tools, Diagnostics, Drives). This will cause the drive to calibrate the head if errors are detected. This menu option is only available in a later Library firmware version. See the PFE website to download the latest code. 2. Later versions of 3592 drive code will automatically run a head calibration if Library Verify fails. Then running Library Verify a second time may run clean. 3. FID 85, 8A, D8 or sense 03 03 02, 03 11 00 could also be caused by 3592 head calibration problems. See “3592 Drive FID to URC Table” on page 357. 4. FID ED - Clear a drive dump from flash memory. See “Clearing a 3592 Flash Dump” on page 740.
LTO drive single-character display code only	1. If drive sense **is** available either by viewing the drive error log or the host error log, see "Drive sense data from host error logs" in this table. 2. If drive sense is **not** available, go to “LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)” on page 590 to obtain the URC. When you have found the URC, go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
Drive Error Log or Drive SCSI Sense Log contains recent entries (SK, ASC, ASCQ, and/or FID)	Go to “Drive Sense Data to URC Tables” on page 314 to look for a drive URC. When you have found the URC, go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.

Table 15. Failure Start (continued)

Error Indication	Action
Drive sense data from host error logs	Go to “Drive Sense Data to URC Tables” on page 314 to determine which drive is affected, determine the drive type, and obtain the URC. When you have found the URC, go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
LTO drive FSC	If drive sense is available (either by viewing the drive error log or by viewing host error logs), see "Drive sense data from host error logs" above. If drive sense is not available, go to “LTO Ultrium-1 Drive FSC to URC Table” on page 364 to obtain the URC. When you have found the URC, go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
Tape alert or SNMP alert indicating a problem with a drive	1. Check the drive error log or the host error log for any drive error sense data. 2. Go to "Drive sense data from host error logs" in this table.
3592 or 3588 (LTO Ultrium-3, -4 or -5) drive VPD shows a wrong or duplicate drive serial number	If a 3592 or 3588 drive serial number needs to be changed or corrected use CETool. See “Changing 3592 / 3588 Serial Numbers” on page 739.
Determine if the drive is using FIPS (PUB 140-2) certified microcode (to maintain FIPS compliance) Refer to one of these websites for drive microcode information	• Internal - http://snjlnt02.sanjose.ibm.com/tape/tapetec.nsf/pages/3592page00 • External - http://www-03.ibm.com/servers/storage/support/tape/3592/downloading.html
**** Tape Cartridge Media Problems ****	
Cartridge stuck in gripper or found laying in the aisle	Go to “When Cartridge is Dropped or Stuck in Gripper” on page 1044.
Leader pin missing or out of position in LTO or 3592 cartridge	Re-position the leader pin. Visually check for damage to the leader and leader pin in the tape cartridge. If the leader is damaged it must be repaired using a Leader Pin Replacement Kit (for LTO or 3592) before attempting to recover the data from the cartridge. Part numbers can be found under "Ordering Media Supplies" in the "Using Ultrium Media" or "Using 3592 Media" chapter of the 3584 Operator Guide.
Tape broken, stretched, folded over, or wrinkled inside the cartridge	1. Replace the tape cartridge. 2. Ensure that the latest available drive code is installed. If the problem continues, replace the drive.
A drive is unable to write to an earlier generation cartridge	An LTO Gen 3 drive can't write to an LTO Gen 1 cartridge, and in some cases an operating system or application may further restrict the ability to write to a cartridge that is an earlier generation than the drive. As an example, OS/400 does not allow a 3592 E05 or E06/EU6 drive to write to a cartridge that is formatted as J1A.
**** Communication Problems ****	
Host/Controller SCSI bus or fibre channel error message from the host or controller. Cannot establish connection.	Go to “SCSI Bus Problems” on page 767 or “Fibre Channel Problems” on page 772 to isolate, and repair the problem.
CommFail message on the operator panel	Note the Frame and Row information associated with the message. Go to “Library Sense Data to URC Table” on page 279, look up library sense 04 44 00 38 82, and obtain the URC. Locate this URC in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.
Host fails to communicate with one or more drives	Go to “SCSI Bus Problems” on page 767 or “Fibre Channel Problems” on page 772 to isolate, and repair the problem.

Table 15. Failure Start (continued)

Error Indication	Action
Ethernet or 'Web User Interface' problems – introduction	See “Ethernet Problems” on page 688.
Call Home Problems (Call Home doesn't work)	See “Call Home Facility Configuration” on page 754 to verify Call Home setup. If FC 2711 (WTI Switch) is installed, verify it is setup correctly. Setup procedures are near the end of the Install section. Ensure you have the latest level Library Firmware installed on your system. The latest version is out on the PFE website.

Table 15. Failure Start (continued)

Error Indication	Action
**** Configuration & Calibration Problems ****	
Configuring the library resulted in less storage slots than are actually present	Refer to Table 1 on page 6 and Table 2 on page 6. Compare the information in the tables with the information displayed during the physical configuration process. • If the base frame (model L32) shows fewer storage slots than expected it may be because the Capacity Expansion Feature is not installed. This frame is shipped with all storage slots installed, but it requires the Capacity Expansion Feature to enable use of the storage slots in columns 2, 4, 6, and 8. • If the base frame (model L22 or L52) shows fewer storage slots than expected it may be because the Intermediate Capacity Feature or Full Capacity Feature is not installed. This frame is shipped with all storage slots installed, but it requires the Intermediate Capacity Feature and Full Capacity Feature to enable use of all storage slots. • If any expansion frame shows fewer storage slots than expected, see if the number discovered corresponds to a frame with more drives than are actually installed. If this is the case it indicates that the library does not believe storage slots are installed in the position. The library uses the bar code scanner to discover the storage slots by looking for either a valid cartridge label or an empty slot label. If no bar code label is found then the library may assume there are no storage slots present. This problem could be caused by cartridges with no label or unreadable labels, by missing/damaged empty slot labels, or by a faulty bar code scanner.
Logical library configuration using bar code labels does not function as expected	Use URC A4C7, and go to “URC Table With Descriptions, Actions, and FRUs” on page 375 to locate the code and follow the instructions.
Scanner errors either on inventory or during normal scan operations	• Use URC A4C5 to troubleshoot. Also see “Set Inventory Scan Speed” on page 696 for additional information on how to use this new feature. • A tilted Y-mast can cause calibration problems and barcode scan problems. Ensure the Y-mast is perpendicular to the base. Check the alignment procedure in the notes under "Replacement Procedure" in “Y-Axis Mast Assembly” on page 1040. • Y-mast stability can be improved by installing a heavier bracket. See Y-mast Stiffener Plate FRU Kit on page 1131.
CONFIG message on the library operator panel	For library configuration procedure, go to the “Library Configuration - ALMS Not Enabled” on page 761.
CALIBRATE message on the library operator panel	Perform the calibration procedure. From the **Activity** screen, press [MENU]. From the **Main Menu** screen, select **Service** and press **[Enter]**. From the **Service** screen, select **Calibration** and press **[Enter]**. From the **Calibration** screen, select **Calibrate Library**, and press **[Enter]**.

Table 15. Failure Start (continued)

Error Indication	Action
Library calibration results in error	• See, "Error message on the library operator panel" in this table. Using the error code, go to “Library Sense Data to URC Table” on page 279 to obtain the URC. • A tilted Y-mast can cause calibration problems and barcode scan problems. Check the alignment procedure in the notes under "Replacement Procedure" in “Y-Axis Mast Assembly” on page 1040. • Y-mast stability can be improved by installing a heavier bracket. See Y-mast Stiffener Plate FRU Kit on page 1131. • Binding upper Y-mast rollers may cause erratic Y-motion during calibration. Clean the roller shafts with a small amount of #6 lubricant, and replace the rollers. • A worn Universal gripper cage could result in calibration errors. See “Worn Universal Gripper Cage” on page 766.
Calibration errors and/or Get/Put errors	A worn Universal gripper cage could result in calibration or Get/Put errors. See “Worn Universal Gripper Cage” on page 766. Improved Y-mast stability may lessen get/put errors by installing a heavier bracket. See Y-mast Stiffener Plate FRU Kit on page 1131.
Reinstalling a feature requiring a License Key code	License key numbers are printed on labels located at the rear of the Lxx frame just to the left of the FIC card. Additional license key labels may be found to the right of the FIC card.
Restoring NVRAM	See “NVRAM Restore” on page 743 to restore NVRAM using CETool version 3.7 or higher.
WWNN changed after node card replacement	NVRAM should be backed up prior to node card replacement. NVRAM backup requires library firmware at 5550 or higher, and CETool 4.0. See “NVRAM Backup and Restore” on page 741 for instructions.

Table 15. Failure Start (continued)

Error Indication	Action
**** Power Problems ****	
Power switch ON and power indicator OFF	Go to “Power Isolation MAP” on page 648.
37 V dc power supply – LED status indicator problems.	Check the library error log for an error with HEC/HECQ 34xx. • If an error is found, go to "Library sense data from host error logs" in this table. • If no error is found, then the power supply is functional but has been turned off by the redundant power control function in the library code. **This is not an indication of a problem.** For more information on how the 37 V power supplies function with each other, and how 37 V is distributed in the library, see “Frame Control Assembly (FCA)” on page 44, “37 V dc Power Supply (x32, x22, x52 only)” on page 805, “37 V dc Distribution in an HA1 Library” on page 807, and Figure 320 on page 941.
FIC Card LEDs are off but the 2-character display on the nodes cards are on.	If all the LEDs on one or more FIC cards in Dxx frames are off, but the 2-character display on the nodes cards are on, see **Figure 165 on page 650**. Move the "LED'S ON" switch (near 4) to the left to turn them on. Feature Code 9003 may have directed the CE to turn off LEDs in all Dxx frames to accommodate downlevel MCP(s). After service procedures are complete, move the "LEDs ON" switch to its previous setting.
**** Obvious Symptoms & Mechanical Problems ****	
Library display is blank but power is ON, and the library and drives are operational	Use the following FRU list: 1. FIC card fuse 37 V (check FIC card blown fuse indicator). Also see "FIC Card LEDs are off...." under "Power Problems" above. 2. Operator Panel Card Assembly (OPC) 3. Cable, FIC to OPC 4. Medium Changer Pack (MCP) (xx2 frames only) 5. Medium Changer Assembly (MCA) (xx3 frames only) 6. Frame Interconnect Card (FIC) 7. Frame Control Assembly (FCA) (xx2 frames only) 8. Enhanced Frame Control Assembly (BPCs) (xx3 frames only)
Any library display visual problem (incorrect characters, missing characters, key buttons problem and so forth).	Replace the Operator Panel Card (OPC) (see “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850).
Operator Panel display is dim or too bright.	Most operator panels come with a pot to adjust brightness and contrast. See the figures in “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850.
I/O station door will not open	This is normal while the library is scanning or accessing the I/O station. It also is normal if the host has issued a prevent medium removal SCSI command. If neither condition is true, use URC B330 and go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
I/O station door does not lock when closed	Use URC B331 and go to “URC Table With Descriptions, Actions, and FRUs” on page 375, locate the URC, and follow the instructions.
Bar code scanner problem with no error code. Example: blank or invalid VOLSER	Use URC A4C5 and go to “URC Table With Descriptions, Actions, and FRUs” on page 375 to locate the that code and follow the instructions.
Gripper assembly binds while moving up and down the Y-axis	Go to “Y-Axis Assembly” on page 816 to correct the bind.

Table 15. Failure Start (continued)

Error Indication	Action
X-Axis binding	Go to “X-Axis Assembly” on page 815 to correct the bind. Also see "Noisy accessor" in this table.
Noisy accessor	Go to “Y-Axis Assembly” on page 816 and “X-Axis Assembly” on page 815 to ensure the accessor runs smoothly in all directions. If no obvious problem is found: 1. Determine whether the noise occurs when the accessor is at idle or when it is moving. • If the noise occurs when the accessor is moving, watch the accessor through the end window and attempt to determine whether the noise is associated with the Y-Axis (noisy when moving up/down), or • With the X-Axis (noisy when moving on the X rail) or between frames. Any binding between the X-rails could be due to X-rail expansion of older style X-rails caused by moisture content of the air. This results in swelling of the X-rail which causes binds as the accessor travels from one frame to the next. This is especially noticeable in long multi-frame libraries. See “X-Axis Assembly” on page 815 for more information. • If the accessor makes a 'squealing' sound when moving, this may be caused by new style rubber pads (see Figure 81 on page 153). Put a few drops of IBM Lubricant #6 PN 0223980 on a cloth and wipe the top and bottom X-rail rods, and the front and back Y-rail rods. If you are unable to determine the source of the noise, contact your next level of support.
A dual accessor library is using only one accessor while the other accessor is idle.	See “Preferred Zones” on page 67. It is possible that this is normal behavior. Check the preferred zone setting to see if the behavior is caused by the preferred zone setting. If so then notify the customer that this behavior is due to the preferred zone setting. If not, check Accessor Status (MENU -> Library Status -> Accessor Status) to verify that both accessors are operational. If an accessor has an error, run Library Verify to see if the problem still exists. If it does not exist, look at the library error log to find error codes associated with the problem.
Identifying the failing accessor	Refer to “Identifying the Accessor Associated with a Failure” on page 274 to determine which accessor has failed.
**** Intermittent or Not Listed ****	
Intermittent failure	Go to “Intermittent Failures” on page 82.
A problem is suspected	Go to “Library Verify Test” on page 759.
Any problem not listed	Go to “Library Verify Test” on page 759.

Maintenance Tasks

Table 16. Tape Library Maintenance Tasks

Task	Action
Install (either new or transferred)	Go to Chapter 5, “Install,” on page 109.
Run verification tests	Go to “Library Verify Test” on page 759.
Drive code update	See “Microcode Maintenance Utilities” on page 703.
Library code update	See “Microcode Maintenance Utilities” on page 703.
Collect drive dump	See “Creating Drive Dump by Using CETool” on page 718.
Collect library dump	See “Creating Library Dump by Using CETool” on page 718.
Run drive diagnostics	Go to “Service Menus” on page 774.
FRU exchange history and EC history	Go to Chapter 12, “History,” on page 1087.
Theory of library operation	Go to Chapter 1, “Introduction,” on page 1.
Safety inspection	Go to Chapter 6, “Safety and Inspection,” on page 247.
Accepting a machine for service agreement	Go to Chapter 6, “Safety and Inspection,” on page 247.
Providing per-call service	Go to Chapter 6, “Safety and Inspection,” on page 247.
Reviewing changes or attachments on any IBM machine that is leased, on service agreement, or on per-call service	Go to Chapter 6, “Safety and Inspection,” on page 247.
Discontinue	Go to “Discontinuing a Frame or Relocating a Library” on page 229.
Relocate	Go to “Discontinuing a Frame or Relocating a Library” on page 229.
Sense information	Go to Chapter 9, “Sense,” on page 603.
FRU locations within the library	Go to Chapter 14, “Parts Catalog,” on page 1093.
Obtain library or tape drive error information at the host	See Chapter 4, “Messages,” on page 91.
Clean message from the host or a Clean indicator is on at the drive	See “Drive Cleaning Procedure” in the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560. For highlights about drive cleaning, see “Drive Cleaning” on page 68.
Preventive Maintenance (PM) is not a time-scheduled event, but should be reviewed during every service call.	Go to “Preventive Maintenance (PM)” on page 1085.

Intermittent Failures

Intermittent failures cannot be repeated consistently by running diagnostic routines or by running customer jobs. The time and number of operations vary between failures.

Intermittent failures are corrected by updating code or by exchanging the most likely failing FRU and monitoring for a recurring failure. If the failure recurs, the next most likely FRU is exchanged and tested. This process continues until the failure is resolved.

Information to handle intermittent failures is provided in the following sections of this MI:

- "URC Table With Descriptions, Actions, and FRUs" on page 375 of this MI provides a FRU list for hardware failures.
- Chapter 9, "Sense," on page 603 of this MI provides detailed sense byte descriptions. Then go to "Library Sense Data to URC Table" on page 279 or "Drive Sense Data to URC Tables" on page 314 to determine a URC.
- "Library Verify Test" on page 759 provides the ability to exercise the library. Routines are also provided in the Diagnostics to give complete coverage of library operations.

Table 17 lists hardware problems that may cause intermittent failures. These hardware failures may occur randomly in the machine cycle.

Table 17. Intermittent Errors

Symptom	Possible Cause	Action
Intermittent random failures (Library or drives)	Code problem	Check VPD for code levels. If a later version of code is available, install it. If the problem persists, contact your next level of support (see "Microcode Maintenance Utilities" on page 703).
	Loose or broken cables	See "Cables" on page 800.
	Environment, such as ambient temperature or relative humidity	If the temperature or humidity is out of range, ask the customer to correct the situation.
	Close to noisy equipment, RF sources such as radio, TV, or radar transmitters	Call your next level of support.
	Tape cartridge defect	Try a different cartridge.
Intermittent SCSI bus failures	SCSI hardware	See "SCSI Bus Problems" on page 767.
Intermittent fibre channel failures	Fibre channel hardware	See "Fibre Channel Problems" on page 772.

Chapter 3. Operator Panel

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Main Menu 89

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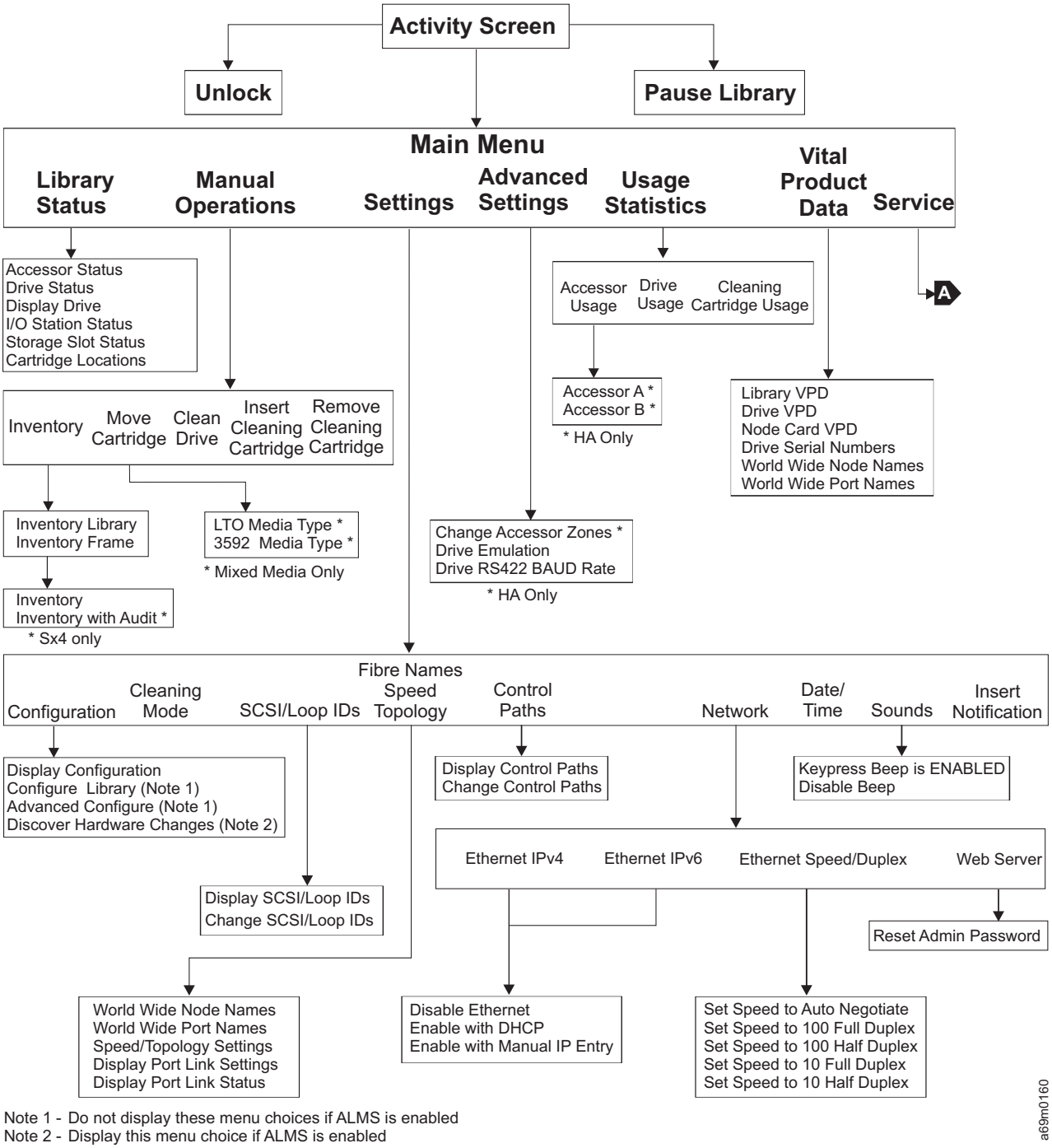
General Information

The following information applies to all screens or menus that display on the IBM System Storage Tape Library 3584:

- The Operator Panel on the IBM System Storage Tape Library 3584 features a touch sensitive display. The display will show current status of the library at the **Activity** screen. When the operator or customer engineer presses the **Menu** button, the screen will display the Main Menu, allowing the user to select operational or service options.
- When the touch sensitive display is touched by a user, a timer is set. Each time the screen is touched, the timer is reset. If no “touch” activity is detected for 5 minutes, the screen will reset back to the Activity screen.
- The bottom line of each screen will contain from one to four “buttons.” These buttons are icons that correspond to functions such as **Back**, **Up**, **Down**, and **Enter**. Other buttons may be labeled **Continue**, **Cancel**, or **Details**.
- The first time each menu is displayed, the top item will be visibly pre-selected (highlighted). The **Up** or **Down** buttons will change the highlighted selection.
- Pressing the **Back** button will take you back to the previous screen. You may need to press the **Back** button several times to get all the way back to the Activity screen.
- If any menu selection is attempted that will disrupt library operations, the user will be warned and given the choice to Continue or to Cancel the operation.
- When a screen is scrolled down, each depression of the **Down** button will move the cursor down one line. When a screen has an extremely large amount of data to display, such as displaying a list of cartridges in the library, pressing and holding the **Down** button will cause the scrolling operation to speed up. The longer the button is held down, the faster it scrolls. Scrolling will end when the **Down** button is released or the end of screen lines has been reached. The same fast scrolling will occur in the upward direction if the **Up** button is pressed and held.
- Beginning with library code level 4630 and later, the operator panel's touch screen will be enhanced so that all Double Spaced selectable menus will allow a user to select a specific item in the list by touching the item twice in addition to using the **Up/Down/Enter** buttons. Single spaced lists do not allow enough resolution to differentiate between items in the list. For these lists, **Up/Down/Entry** buttons will still have to be used.
- While the screen buttons will not visibly change when depressed, a beep will occur to indicate that the depression was detected. These beeps may be disabled or enabled using the Settings menu.
- In general, user actions at the touch panel display will have a higher priority than host initiated activity, to minimize the wait time for the user. Confirmation screens will allow the user to decide whether to interrupt host operations.

Library Console Screens

Figure 32 provides an overview of operator functions for **Library firmware 7xxx** or higher. Figure 33 on page 86 and Figure 34 on page 87 together show an overview of service functions that are available to the service representative.



Note 1 - Do not display these menu choices if ALMS is enabled
Note 2 - Display this menu choice if ALMS is enabled

Figure 32. Operator Function Menu Tree

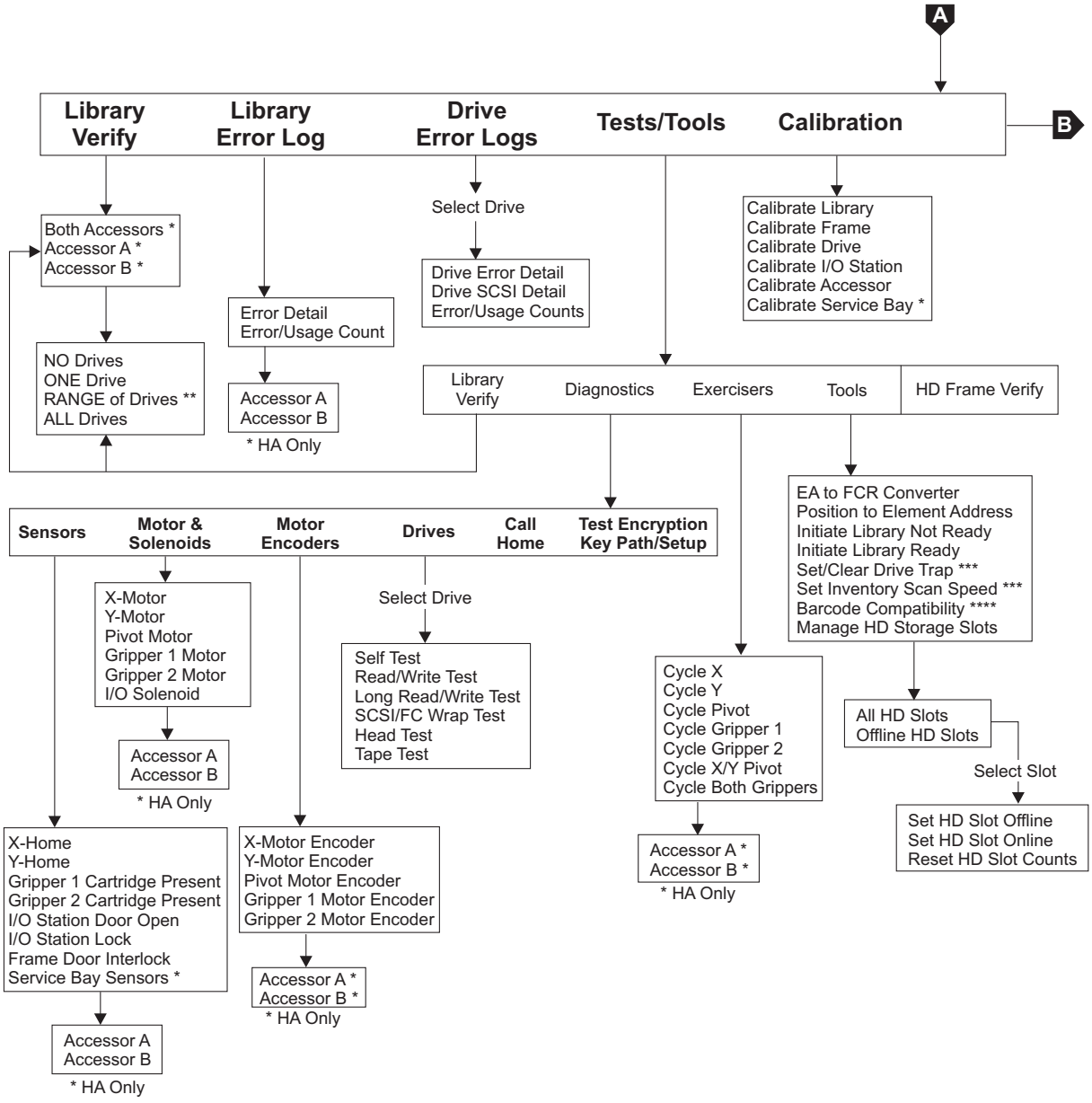


Figure 33. Service Function Menu Tree

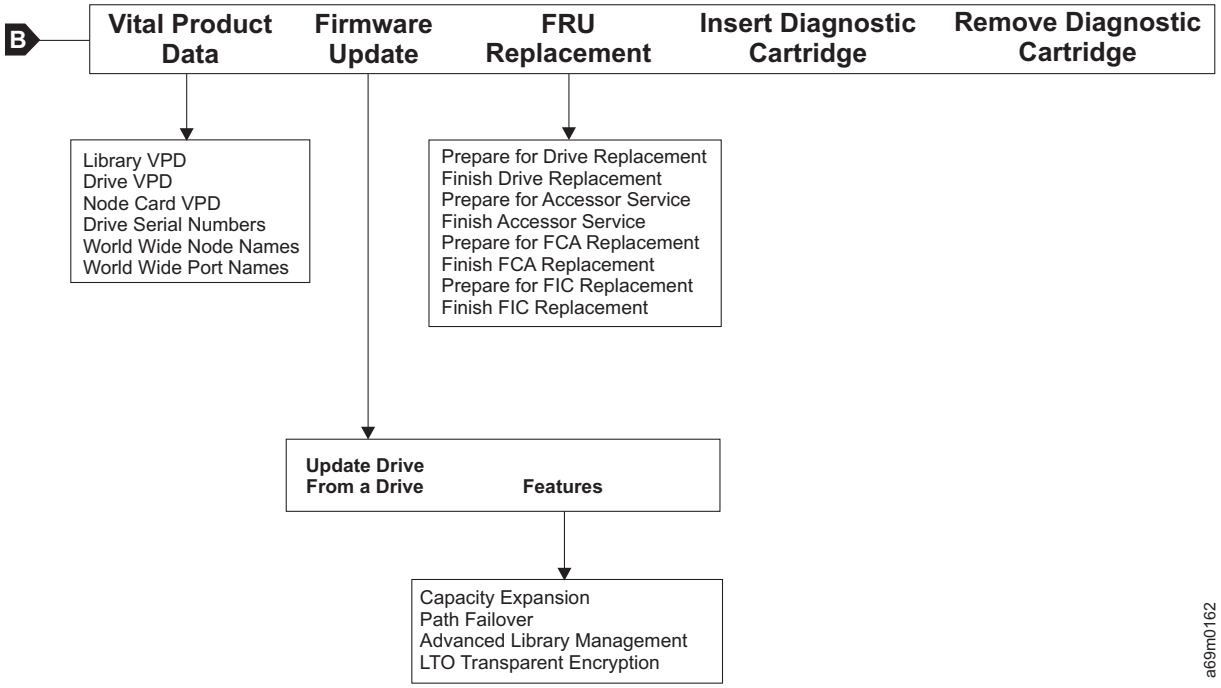


Figure 34. Service Function Menu Tree (Continued)

Activity Screen

The Activity screen, that the operator sees during library operations will look similar to the example shown in Figure 35.

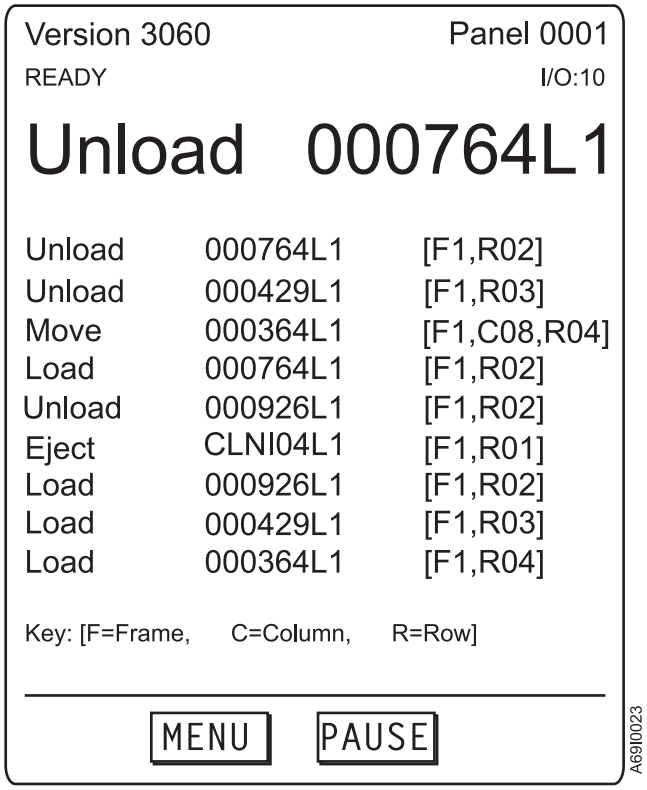


Figure 35. Activity Screen (Library Status Screen)

Note the following:

- The top line will display the code version number (nnnn) and the number of the panel (**Panel 0001**).
- The second line displays library status, READY/NOT READY/INITIALIZING and I/O station status, such as “I/O: OPEN” for when the I/O station is open, “I/O: CLOSED” for the time between closing the I/O station and completing the I/O scan, and “I/O: xx” showing the number of cartridges in the I/O station after the I/O scan has completed.
- The current activity, **Unload 000764L1**, is in a large font. This large font allows the customer to see the current operation at a greater distance from the operator panel.

  Note: Some messages may take two lines of large font to display the current activity.
- A rolling history of operations appears in the order the operations occurred, beginning with the current operation. The older activities are found lower on the screen. As new activities occur, the older activities are pushed down and off the screen.

  Note: The locations for slots are shown in [frame, column, row] notation. The locations for drives and I/O station are shown in [frame, row] notation.
- The message area of the screen will be overwritten if a permanent error occurs or if a drive needs to be cleaned and auto-clean is disabled or there is no cleaning cartridge in the library. An error message might be: “ERROR xxyy” where xx is the Hardware Error Code (HEC) and yy is the Hardware Error Code Qualifier (HECQ). A cleaning message might be: “Clean Drive [Fx, Ryy]” where x is the frame number and yy is the drive number.
- High priority messages will be removed from the large font area in the following conditions:

– Open Door messages will be cleared by closing the door.
– Error message will be cleared by pressing the MENU button.
– Clean Drive message will be cleared by cleaning the drive.

When a message is cleared it will remain in the normal font area until it scrolls down.

- A time (hh:mm) will be displayed with each message to provide the user feedback as to how long the library has been in this condition.
- Action buttons **[MENU]** and **[PAUSE]**.
  1. Pressing **[MENU]** will take the user to Panel 0002, the “Main Menu”.
  2. Pressing **[PAUSE]** button on the operator panel will display panel 0013 with a text string and options which looks like the following screen:

```
Warning:                    Panel 0013

If you open the door the library will go Not Ready and any remaining
jobs in the work queue may fail. Press ENTER to Continue.

[BACK]                   [ENTER]
```

     If you wanted to Pause the library, you would select [PAUSE] on the operator panel. **Use CAUTION here. Customer jobs may be running**. At panel 0013, if you select [ENTER], the code will begin the Pause operation. If you press [BACK] at panel 0013, you will be returned to the previous screen.
  3. In most cases, you will want to select [MENU] which will take you to the Main Menu screen below.

Main Menu

```
Main Menu              Panel 0002

 Library Status
Manual Operations
Settings
Usage Statistics
Vital Product Data
Service

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

For information on the following selections, go to the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560.

- **Library Status**
- **Manual Operations**
- **Settings**
- **Usage Statistics**
- **Vital Product Data**

If **Service** was selected, go to “Service Menus” on page 774.

Chapter 4. Messages

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Obtaining Error Information From a RS/6000 92
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Obtaining Error Information From an HP-UX System 105
Call Home Screen. 105

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Obtaining Tape Drive 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
4. data (if available)

When you have obtained the SCSI sense data, go to “Library Sense Data to URC Table” on page 279 or “Drive Sense Data to URC Tables” on page 314.

Obtaining Error Information From a 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 |pg** to display a summary report, or type **errpt -a |pg** 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 = **smc**n (for example, smc0) and Resource Type = 3584]), refer to Figure 36 on page 93 and locate the SCSI sense data. After you have located and recorded the sense data, go to “Library Sense Data to URC Table” on page 279 to resolve the problem.
- For drive errors [Resource Name = **rmt**n (for example, rmt0) and Resource Type = LTO], refer to Figure 37 on page 94 and locate the SCSI sense data. After you have located and recorded the sense data, go to “Drive Sense Data to URC Tables” on page 314 to resolve the problem.
- For SCSI bus errors (not SCSI adapter errors), refer to Figure 40 on page 98 and Figure 41 on page 99 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 “SCSI Bus Problems” on page 767 to resolve the problem.
- For fibre channel errors (not fibre channel adapter errors), determine which host adapter and device are affected, and go to “Fibre Channel Problems” on page 772.
- For SCSI and fibre channel adapter errors (not SCSI or fibre channel bus errors), use the maintenance package for the host.

Note: See Chapter 9, “Sense,” on page 603 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:   3584
Location:        40-60-00-0,1
VPD:    Manufacturer................IBM
        Machine Type and Model......03584L32
        Serial Number...............000000010031
        Device Specific . (FW) .....2460   (Firmware Level)

Description TAPE DRIVE FAILURE
Probable Causes TAPE DRIVE
Failure Causes TAPE or TAPE DRIVE
        Recommended Actions
        PERFORM PROBLEM DETERMINATION PROCEDURES

SENSE DATA
0C00 0000 A500 0001 0104 0401 0000 0000 0000 0000 7000 0400 0000 0046 0000 0000
4400 0000 0000 B882 0000 0080 1114 0200 4801 E300 0000 0090 0104 8004 0100 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 36. AIX ERRPT Library Error Log Example

Table 18. AIX ERRPT Library Sense Data

Hex	Description
A5	SCSI Command
0001, 0104, 0401	Command Parameters
70	Byte 0 of Library Sense Data
04	Sense Key
4400	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier)
B882	HEC/HECQ (Hardware Error Code/Hardware Error Code Qualifier)
80	Mechanism Status Bit Map
11	Control Path Frame / Control Path Device (Drive)
14	Failing Frame / Failing Device (Drive)
90	Source Element Bit Map
0104	Source Element Address (See Note)
80	Destination Element Bit Map
0401	Destination Element Address (See Note)
Bytes 41 to 46	Secondary source and Destination Element Bit Maps and Element Address

Note: If the 3584 has the ALMS feature installed, you cannot use the Source or the Destination Element addresses because they will be virtual. Instead, see the “Trailer Log” in Table 72 on page 640.

Drive Error Log Example – LTO

```
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 7000 0300 0000 001C 0000 0000
5200 0700 20B0 0000 0000 0000 0000 0000 0000 0000 058A 0213 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 37. AIX ERRPT Drive Error Log Example

Table 19. 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 (Media error in this example)
5200	ASC/ASCQ (Additional Sense Code/Additional Sense Code Qualifier) Cartridge fault in this case.
20B0	FSC (Fault Symptom Code)
058A	Relative LPOS
02	SCSI ID
13	Frame/row of the drive within the library **Note:** This byte is only valid if the drive firmware level is 1550 or higher AND the library firmware level is 130 or higher.

Drive Error Log Example - 3592

```
_____________________________________________________________________________
LABEL:           TAPE_ERR1
IDENTIFIER:      A7AB4C8F

Date/Time:       Tue Oct 21 07:33:21
Sequence Number: 1563
Machine ID:      0000C9DF4C00
Node ID:         kitt
Error Class:     H
Error Type:      PERM
Resource Name:   rmt1
Resource Class:  tape
Resource Type:   3592
Location:        00-02-01-20
VPD:
        Manufacturer................IBM
        Machine Type and Model......03592J1A
        Serial Number...............000000000083
        Device Specific . (FW) .....0462
        Loadable Microcode Level...A170029E

Description
TAPE SIM/MIM RECORD

Probable Causes
TAPE DRIVE

10
TAPE
TAPE DRIVE

        Recommended Actions
        PERFORM PROBLEM DETERMINATION PROCEDURES

Detailed Data
SENSE DATA
0604 0000 1101 FFFF FE00 0000 0000 0000 0102 0000 7000 0400 0000 0048 0000 0000
4400 8603 3010 004A 1E01 0191 004A 8250 0000 1100 0036 2800 0033 4D00 0033 0600
0000 0000 0190 0000 2700 0000 0020 0000 0000 0000 0000 0000 C700 0000 3433 4120
2020 2000 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
_____________________________________________________________________________
```

HEX	ASCII	Description
04		Sense key
4400		ASC/ASCQ (additional sense code/additional sense code qualifier)
	(See **XXXX** for error sense information.)	
86		FID (FRU identification number) In this case, Drive Hardware or Media problem.
3010		First FSC (fault symptom code)
3628		Second FSC (fault symptom code)
334D		Next to last FSC (fault symptom code)
3306		Last FSC (fault symptom code)
343341	41F	Microcode level
(not shown)		VOLSER Number in ASCII or EBCDIC (Bytes 83-88)

Figure 38. AIX SMIT and ERRPT Command Error Log Example

```
---------------------------------------------------------------------------
LABEL:           RECOVERED_ERROR
IDENTIFIER:      0F78A011

Date/Time:       Tue Oct 21 07:33:21
Sequence Number: 15026
Machine ID:      0000C9DF4C00
Node ID:         kitt
Error Class:     H
Error Type:      PERM
Resource Name:   rmt1
Resource Class:  tape
Resource Type:   3592
Location:        00-02-01
VPD:
        Manufacturer................IBM
        Machine Type and Model......03592J1A
        Serial Number...............YN1A00000083
        Device Specific . (FW) .....045B
        Loadable Microdode Level....A170029E

Description
TAPE DRIVE FAILURE

Probable Causes
TAPE DRIVE

Failure Causes
TAPE
TAPE DRIVE

        Recommended Actions
        PERFORM PROBLEM DETERMINATION PROCEDURES

Detail Data
SENSE DATA
0600 0000 0A01 0000 0200 0000 0000 0000 0102 0000 F100 0400 0000 0058 0000 0000
5300 8602 8E02 0000 0006 0191 00FF 0000 0025 0AFF E733 4300 0033 4D00 0033 4100
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000 3435 4220
2020 2000 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
---------------------------------------------------------------------------
```

HEX	ASCII	Description
04		Sense Key
5300		ASC/ASCQ (additional sense code/additional sense code qualifier) In this case, Media load or Eject failure. (See **XXXX** for error sense information.)
86		FID (FRU identification number) In this case, Drive Hardware or Media problem.
8E02		First FSC (fault symptom code)
33 43		Second FSC (fault symptom code)
33 4D		Next to Last FSC (fault symptom code)
33 41		Last FSC (fault symptom code)
343542	45B	Microcode level
(not shown)		VOLSER (Bytes 83-88)

Figure 39. AIX SMIT and ERRPT Command Error Log Example

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 40. 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:   3584
Location:        40-58-00-0,1
VPD:
        Manufacturer................IBM
        Machine Type and Model......03584L32
        Serial Number..............000000010031
        Device Specific.(FW)........1200
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
```

Figure 41. SCSI Problem Points to Library Control Path as Possible Cause

Summary Report

```
   1        2     3 4   5            6
FFE2F73A   1012150900 U H   rmt5          UNDETERMINED ERROR
0BA49C99   1012150800 T H  scsi8         SCSI BUS ERROR          7
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 42. 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.

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SCSI Sense Data Definition

Following is an example of a tape drive failure attached to an Open Systems host using SCSI protocol. When the host detected the failure, it built the following SCSI Sense Data record. An explanation of the SCSI Sense Data breakout in this example follows.

```
SENSE DATA

aabb xxxx ccdd eeee eeee eeee eeee eeee ffgg hhxx ssss ssss ssss ssss ssss ....
0600 0000 1200 0000 0000 0000 0000 0000 0200 0300 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
```

Note: The bold area above represents the SCSI Sense Data presented by the host. The regular font data (in this case many bytes of 'zero'), designated by 'ssss' would normally contain device sense data, but with the kind of failure in this example (COMMAND TIMEOUT), the host could not collect valid device sense data, so zeros are the result and should be ignored. If the host had been able to collect valid sense data from the drive, the first byte 'ss' would be '70', '71', 'F0' or 'F1', and valid device sense data would be listed.

```
Detail Data:
aabb xxxx ccdd eeee eeee eeee eeee eeee ffgg hhxx ssss ssss ssss ....

aa Length of the Command Descriptor Block (CDB) sent by the host. In this case, '06' bytes.
bb SCSI target address. In this example, SCSI address '00'.
xx Unused or reserved
cc Start of CDB, cc is the operation code (byte 0). In this case, '12' which was an "Inquiry".
```

The following pages list valid SCSI Operation Codes for tape drives.

SCSI Operation Codes for Tape Drives

```
 '00' Test unit Ready
 '01' Rewind
 '03' Request Sense Data
 '05' Read block limits
 '08' Read
 '0A' Write
 '0D' Extended Diagnostics
 '10' Write Filemark
 '11' Space
 '12' Inquiry
 '13' Verify
 '14' Recover Buffered data
 '15' Mode select
 '16' Reserve
 '17' Release
 '18' Copy
 '19' Erase
 '1A' Mode sense
 '1B' Load/unload
 '1C' Receive Diagnostics Results
 '1D' Send diagnostic
 '1E' Prevent/Allow Media Removal
 '1F' Read Log
 '34' Read position
 '3B' Locate

dd Logical unit (byte 1) in the CDB. In this case, '00'.
ee Bytes 2 through 11 in the CDB. A maximum of 12 bytes (0 through 11) are reserved for the CDB,
though not all the bytes are used every time. "aa" above tells how many bytes
are used of the 12 available. In this example, 6.
ff Status validity field.
   '01'  SCSI bus error was reported - byte gg indicates the type of error.
   '02'  Adapter error was reported -  byte hh indicates the type of error.
gg This byte indicated the type of SCSI error that occurred:
 '02' CHECK CONDITION - Device reported a check condition.
 '08' BUSY STATUS - Target is busy.
 '18' RESERVATION CONFLICT - Target is reserved to another initiator.
 '22' COMMAND TERMINATED - Device terminated the command.
 '28' QUEUE FULL - Device's command queue is full.
hh This byte indicates the type of adapter error that occurred.
```

For parallel SCSI adapters, this is the general_card status code as defined in /usr/include/sys/scsi.h:

```
 '01' HOST IO BUS ERROR - Host I/O bus error during data transfer.
 '02' SCSI BUS FAULT - SCSI bus protocol hardware error.
 '04' COMMAND TIMEOUT - Command timed out before completion.
 '08' NO DEVICE RESPONSE - Target did not respond to selection phase.
 '10' ADAPTER HARDWARE FAILURE - Adapter indicated a hardware failure.
 '20' ADAPTER SOFTWARE FAILURE - Adapter indicated a microcode failure.
 '40' FUSE OR TERMINAL PWR - Blown terminator fuse or bad termination.
 '80' SCSI BUS RESET - Adapter indicated SCSI bus has been reset.
```

For FCP adapters, this is the adapter_status code as defined in /usr/include/sys/scsi_buf.h:

```
 '01'  HOST IO BUS ERROR - Host I/O bus error during data transfer.
 '02' TRANSPORT FAULT - Failure in the transport layer.
 '03' COMMAND TIMEOUT - Command timed out before completion.
  AIX Device Driver (Atape). The example above shows this to be the failure.
 '04' NO DEVICE RESPONSE - Target did not respond to attempts to select it.
 '05' ADAPTER HARDWARE FAILURE - Adapter indicated a hardware failure.
 '06' ADAPTER SOFTWARE FAILURE - Adapter indicated a microcode failure.
 '07' WW NAME CHANGE - Adapter detected a new world wide name for the device.
 '08' FUSE OR TERMINAL PWR - Blown terminator fuse or bad termination.
 '09' TRANSPORT RESET - Adapter detected an external SCSI bus reset.
 '0A' TRANSPORT BUSY - The transport layer is busy.
 '0B' TRANSPORT DEAD - The transport layer is currently inoperative.
   '00...' DEVICE SENSE DATA - Since the first byte is not '70', '71', 'F0' or 'F1', the area
normally reserved for device sense data is not valid (and therefore contains zeros).
If byte 'gg' indicates a check condition, the 'ss' byte would contain '70', '71', 'F0' or 'F1'
and the remaining bytes would be valid device sense data. See the appropriate device reference manual
for the specific format and content of these bytes.
```

The error condition shown above was a COMMAND TIMEOUT. The likely cause was the drive failing to respond or a component of the fibre channel failing.

Hexadecimal to ASCII Conversion

Table 20. Hex-to-ASCII Conversion

Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII	Hex	ASCII
00	Null	30	0	41	A	4A	J	54	T
20	Space	31	1	42	B	4B	K	55	U
		32	2	43	C	4C	L	56	V
		33	3	44	D	4D	M	57	W
		34	4	45	E	4E	N	58	X
		35	5	46	F	4F	O	59	Y
		36	6	47	G	50	P	5A	Z
		37	7	48	H	51	Q	5F	–
		38	8	49	I	52	R		
		39	9			53	S		

Note: Not all codes are shown.

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 3584 (library), 3580 (drive), or 3592 (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 2, “Start,” on page 71.

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 **tapesrvc.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/stddutil/tapesrvc** 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/stddutil/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 2, “Start,” on page 71.

Call Home Screen

Figure 43 on page 106 shows an example of a Call Home screen, and Figure 44 on page 107 shows an example of a Heartbeat Call Home screen, as they might appear at the host. For information on how to configure the library for Call Home, see “Call Home Facility Configuration” on page 754.

```
38554 CL1L1  SV4    <-PROB-STAT-SV     B227  C000  A11 RRH <-B/O
TAPECH 1 DIA  P1 __ <-QUE-LVL-CAT-PPG  12345_____________ <-GP1
L095 000 USA ______ <-CTR-CTRY-BU-PRS  DO NOT DISPATCH____ <-CP2
D/T3584L42  13AAA25 <-DEV-SER                             <-CON
_________________   <-ALIAS   OEMXX    T___  NET/_________ <-TERR-NET
FE010615  _________ <-T/D-ECT URSF]           3584 13AAA25 <-CPU
______ ___  TA43210 <-NQ/C-C# TUCSON RAS LAB - DO NOT DISP <-CUST
PMR Call_____________________________________________     <-CMTS

 # Begin of call home record .............. =
 # Product Manufacturer ID and Date ....... =
 # Business/Company Name................... =
 # Product Machine type and model number... = 3584 L32
 # Remote service call back number ........ =
 # Call back expander port ID.............. =
 # Call Back Password ..................... =
 # Outside Line Prefix .................... =
 # Customer voice phone number ............ = 123-4567
 # Customer offshift voice phone number ... = 123-4567
 # LIC level of local complex.............. =
 # LIC level of remote complex............. =
 # Reporting Cluster Number................ =
 # Record Type............................. = 1
 # Report Time/Date stamp.................. = Jun 7 2002 08:12:09
 # Host system type(s)..................... =
 # Level_CPSS information.................. =
 # Remaining Presentations................. = 0


            Manufacturer.....................IBM
            Machine Type and Model..........3584 L32
            Serial Number...................13AAA25
            Library Firmware Level .........211f

   Detail Data
   URC.............................0xC800
   Failing Frame...................0x00
   Failing Device..................0x01
   Tape Alert......................0x01
   COMMAND.........................0x00
   PARAMETERS......................0x0000 0x0000 0x0000 0x0000
   Sense Key.......................... 0x4
   ASC_ASCQ .......................0x4400
   HEC_HECQ........................0x3880
   FRU.............................0x00
   BitFields.......................0x00
   FieldPointerLSB.................0x00
   MechanismStateBitMap............0x00
   CallingFrameDevice..............0x00
   Retry Count.....................0x0
   ObjectId........................0x00
   ObjectError.....................0x0102
   SourceElementBitMap.............0x0D
   FirstDestinationElementBitmap .....0x02
   SecondSourceElementBitmap..........0x02
   SecondDestinationElementBitmap.....0x00
```

Figure 43. Call Home Screen Example

```
# Business/Company Name.................= IBM Tucson RAS
# Product Machine type and model number.= 3584L32
# Product serial number.................= 1310203
# Remote service call back number.......= xxx-xxxx
# Call back expander port ID............= 2
# Call back user ID.....................=
# Call back password....................=
# Outside line prefix...................= 9
# Customer voice phone number...........= 123-4567
# Customer offshift voice phone number..= 789-1234
# LIC level of local complex............= 2450
# LIC level of remote complex...........=
# Reporting Cluster Number..............= 1
# Record type...........................= 6
# Report time/date stamp................= 05/06/2002 04:48:10
# Machine Location......................= Tucson RAS Lab
# Host system type(s)...................=
# Level_CPSS information................=
CHHBINTRVL:1:7
MRPDVERSION:1:2.5
FRAME:1:3584:L32:1310203
FRAME:2:3584:D32:1330101
NODECARD:1:MDA:2450::35L0897:YN1000139XYZ
NODECARD:1:OPC:2450::19P3158:YN1000143R4L
NODECARD:1:ACC:2450::35L0892:YN1000139F0V
NODECARD:1:MCP:2450:2450:19P2770:YN10JB143PS7
GRIPPER:1:1:1:LTO
GRIPPER:1:1:2:LTO
IOSTATION:1:1:LTO
IOSTATION:1:2:LTO
SLOTS:1:LTO:282
SLOTS:2:LTO:440
ETHERNET:1
SNMP:1
STORWATCH:1
CPFAILOVER:1
REMOTESUPPORT:1:FC2710:Remote Support Facility
REMOTESUPPORT:1:FC2711:Remote Support Switch
TAPEDRIVE:1:1:L1:22UD:LVD:YN123456789A:19P0101:19P1234
TAPEDRIVE:1:2:L1:22UD:HVD:YN123456789B:19P0101:19P1234
TAPEDRIVE:1:3:L1:22UD:FC:YN123456789C:19P0101:19P1234
TAPEDRIVE:1:4:L1:22UD:FC:YN123456789D:19P0101:19P1234
DCC:1:1:023:19P0902:YN123456789E
DCC:1:2:023:19P0902:YN123456789F
DCC:1:3:023:19P0902:YN123456789G
DCC:1:4:023:19P0902:YN123456789H
DRIVEPS:1:1:35L1234:19P9998:YN345678912A:IBM
DRIVEPS:1:2:35L1234:19P9998:YN345678912B:IBM
DRIVEPS:1:3:35L1234:19P9998:YN345678912C:IBM
DRIVEPS:1:4:35L1234:19P9998:YN345678912D:IBM
EOD
# End of record flag ..... = END OF FILE
```

Figure 44. Heartbeat Call Home Screen Example

Chapter 5. Install

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Introduction

If a library failure prevents you from continuing with a procedure, go to Chapter 2, "Start," on page 71 to correct the problem. Return to the steps in this section after making the repairs.

If you have a quality problem with this installation, call the quality hotline (see "Manufacturing Problems? Call Quality Hotline" on page 228).

Install Time

Plan install time to allow 3.7 hours for an Lxx frame and 4.0 hours for each additional Dxx frame. Actual hardware install time is typically about 1.8 hours for an Lxx frame and 2 hours for each additional Dxx. Be sure to report pre-installation planning time as PLAN/INSTL/RR code 1, and actual hardware install time as PLAN/INSTL/RR code 2.

The LTO 1 and 2 drives that are located within an IBM System Storage Tape Library 3584 are features of the library. All installation and repair call reporting should reference the library machine type and serial number. Installation reporting and call reporting must be completed for each library frame. The 3592 drives are machine types, not features, which must be written off against each drive's serial number. LTO drives are CSU and can be installed by the CE if the appropriate FC was ordered. Write off all 3588 drive install time against the feature code for which they were ordered.

Preparation for Installation

Ensure the customer has completed all pre-installation planning tasks (see the *IBM System Storage TS3500 Tape Library Introduction and Planning Guide*, GA32-0559.

Configurations on initial shipments of the IBM System Storage Tape Library 3584 can include as many as 16 frames. When planning for a smaller installation (fewer than 16 frames), consider the possibility of adding more frames in the future. Complete a library configuration plan defining the frame layout before you start the installation. For a single accessor library, the base frame (Model Lxx) is always on the left and as many as 15 additional expansion frames (Model Dxx) can be added to the right side. If the HA version (dual accessors) of the library is to be installed, the HA frame (Service Bay A) is installed to the left of the Lxx frame.

Notes:

1. **The correct initial positioning of the base frame is critical for a successful installation.**
2. If your customer plans to expand this library with additional expansion frames in the future, or with the addition of a second accessor, you should take this into consideration when you work with the customer to plan the machine layout.

Door keys are shipped with each frame. The key with the round opening is the customer key for the front door. The key with the square opening is the CE key for the rear door.

The IBM System Storage Tape Library 3584 requires at least one cleaning cartridge and one CE diagnostic cartridge to be installed within the library subsystem. **These cartridges are shipped with the 3584 base frame Lxx**. If you are installing a mixed-media library (LTO and 3592) you will also receive one cleaning cartridge and one CE diagnostic cartridge of the new media type. In addition, if LTO-3 or LTO-4 drives are to be installed along with the LTO-1 or LTO-2 drives, an additional CE diagnostic cartridge is required.

Note: See Table 12 on page 52 for details on how different generation LTO diagnostic cartridges are used with various LTO drive generations.

Installing New or Transferred Library

Follow each section in the order shown, unless told to skip a section. Perform each step within a section in sequence. **Check off each step after you complete it.**

Unpack

Important Notice about IBM, Customer, and Shipper Responsibilities When Moving Large, Heavy IBM Systems

IBM and IBM Business Partner sales representatives should ensure that customers are aware of who is responsible for moving large IBM systems at customer locations. Please read the following notice:

Attention - Delivery And Subsequent Transportation Of The Equipment

Only professional movers/riggers should transport the equipment. The customer should prepare his environment to accept the new product based on the installation planning information provided, with assistance from an IBM Installation Planning Representative (IPR) or IBM authorized service provider. In anticipation of the equipment delivery, the final installation site should be prepared in advance such that professional movers/riggers can transport the equipment to the final installation site within the computer room. If for some reason, this is not possible at the time of delivery, the customer will need to make arrangements to have professional movers/riggers return to finish the transportation at a later date. The customer is also responsible for using professional movers/riggers in the case of equipment relocation or disposal. The IBM authorized service provider will only perform minimal frame repositioning within the computer room, as needed, to perform required service actions.



Figure 45. Library Frame Warning Label

Be aware that this topic does not give the complete unpacking instructions. For complete instructions, see the unpacking instructions for each 3584 frame.

Some parts you need are packaged in the packing material and are labeled. When you unpack the frames and remove the packing material, do not lose or misplace any enclosed parts.

Note: Each library frame box has a Tilt indicator on the side. If the box has been tilted or laid on its side, the tilt indicator is red. If this is the case, do the following:
- Unpack the machine
- Check for visible damage
- If undamaged, install the machine and open a PMH for tracking any problems.
- If damage is visible, contact the carrier immediately.

Refer to Figure 46 on page 115 as you unpack the library:

Attention

Note: See the information box on page 121 for a list of **install instructions used for specific installations.** These instructions are also listed here for the benefit of the CE.

1. If you are installing a base frame (Lxx), and one or more expansion frames (Dxx), unpack the base frame first, then unpack the first expansion frame, and repeat the procedure until all frames have been unpacked.
2. If you are adding one or more expansion frames to an existing library, unpack the first expansion frame, then repeat the procedure until all frames have been unpacked.
3. **If you are installing a totally new dual accessor HA library shipped from the plant** with Lxx and Dxx frames, unpack the HA (Service Bay A) frame first, then the Lxx frame. Next, unpack the Dxx frame(s). Finally, unpack the Dxx frame that will be Service Bay B. This frame contains the second accessor. Then go to **"Dual Accessor Library and Service Bay Installations" on page 149** to begin installation of the dual accessor HA library.
4. If you are installing the first Dxx expansion frame in the library, use instructions **PN 19P1432** *SC 9002 "First Expansion Frame Attachment"* shipped with the frame for the install procedures.
5. If you are installing the second or more Dxx expansion frame in the library, use instructions **PN 19P1433** *FC 9003 "Additional Expansion Frame Attachment"* shipped with the frame for the install procedures.
6. If you are adding an expansion Dxx frame in an existing dual-accessor HA library, you **must** use instructions **PN 96P1240** shipped with that frame for the install procedures.
7. If you converting an existing single-accessor library to a dual-access (HA) library (FC 9040 / 1440), you **must** use instructions **PN 96P1241** shipped with the frames for the install procedures.
8. If you are installing a 4-I/O door Dxx frame in a Single or Dual-accessor HA library, (FC 1655 or 1656) you **must** use instructions **PN 95P5917**, *"Install Four I/O Door FC 1655 (D53) or 1656 (D23) in a Single or Dual Accessor (HA) Library"* shipped with that frame for the 4-I/O door installation procedures.
9. If you installing the first High Density frame (FC 9050), you **must** use instructions **PN 45E4417** shipped in the "L" frame ship group for the install procedures.
10. If you installing an additional High Density frame you **must** use instructions **PN 46X4166** shipped with the Sx4 frame for the install procedures.

__ 1. If you are not unpacking a base frame (model Lxx), go to step 10 on page 114.
__ 2. Remove the shipping carton from the base frame.
__ 3. Remove the base frame shipping braces and packing materials per the unpack instructions.
__ 4. Locate and remove the set of keys taped to the door handle.
__ 5. Open the front door **2** .
__ 6. Refer to the unpacking instructions and remove the packing material and tie wraps from the accessor and Y-Axis assembly. Remove the plastic film from the window at the top inside of the frame.
__ 7. Remove the X-Axis shipping pin located on the lower left side of the X-Axis assembly.

Note: Store the shipping pin in the hole **4** in the frame (this is not the hole used to secure the X-Axis assembly for shipping). The pin and cable should remain in the machine. Ensure the shipping pin cable is positioned so as not to interfere with the accessor movement.

__ 8. Move the accessor **5** vertically and horizontally to ensure that all packing material was removed and that no binds exist.

Note: When moving the picker assembly **3** vertically, lift the picker assembly from underneath the ACC card. To avoid damaging the gripper/pivot assembly, do not lift the picker assembly using the gripper.

__ 9. If you are not unpacking any expansion base frames, go to step 14.

__ 10. Remove the shipping carton from the expansion frame.

__ 11. Remove the parts packed in the shipping carton.

__ 12. Remove the expansion frame shipping braces and packing materials per the unpack instructions.

__ 13. Remove the plastic film from the window at the top inside of the frame.

__ 14. If the Library is new or was previously covered by an IBM Service Agreement, continue with the next step. Otherwise, go to Chapter 6, “Safety and Inspection,” on page 247 and perform a complete Safety Inspection before continuing.

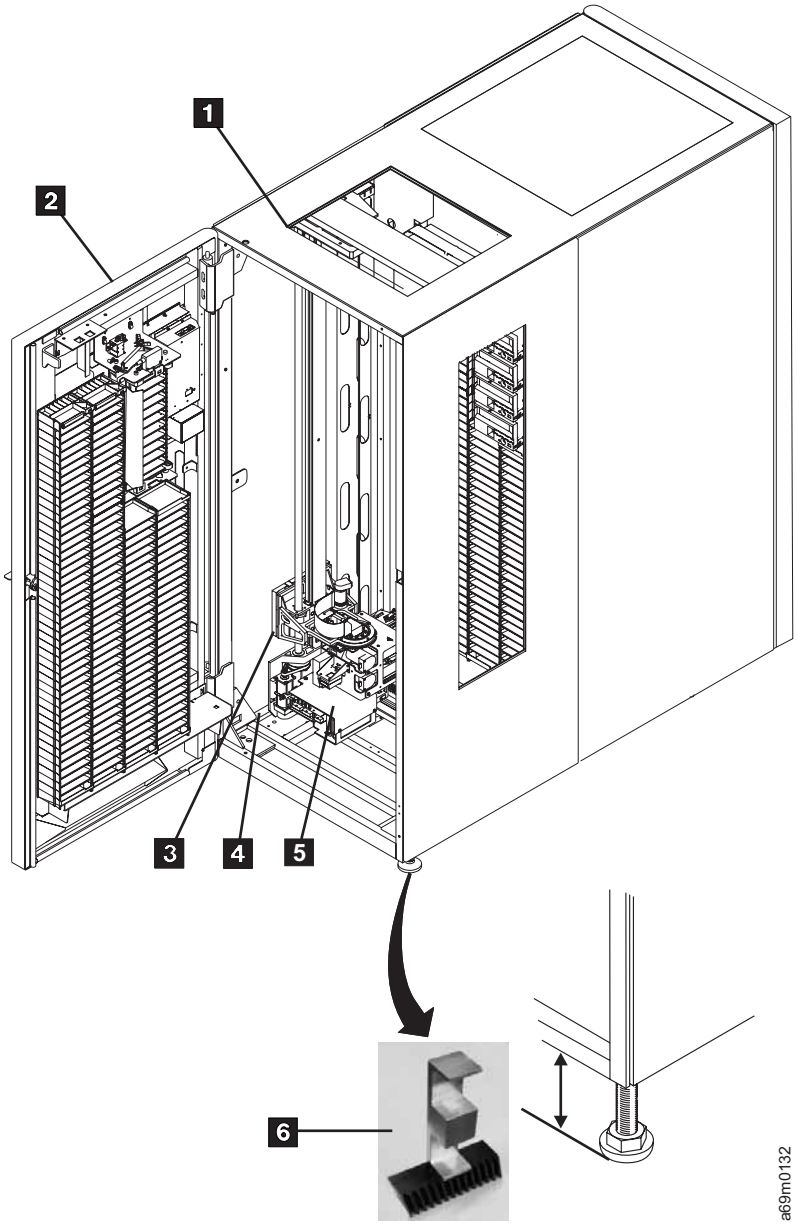


Figure 46. Base Frame

__ 15. **Check the Ship Group.**

Refer to your ship group documentation (the packing list) and verify that all listed parts and supplies have arrived and are not damaged. If parts are missing or damaged, refer to “Manufacturing Problems? Call Quality Hotline” on page 228.

__ 16. If you have more frames to unpack, go back to step 10 on page 114.

__ 17. To install a base frame, go to “Base Frame (Lxx) Installation” on page 118.

__ 18. If you are installing an expansion frame, go to “Expansion Frame (Dxx) Installation” on page 121.

End Stop Styles and Locations

Drawings of each type of end stop are shown in the figures below to aid in correct installation. These end stops cannot be interchanged and must be placed on the correct side of the lower frame member as indicated. The view of each end stop is from the front of the library frame.

Table 21. End Stop Locations (x32, x22/x23, x52/x53, SBA, SBB)

Install INSIDE frame member tight against the frame.

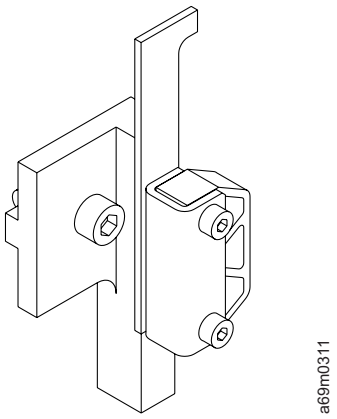


Figure 47. L32 Left Side

Install INSIDE frame member tight against the frame.

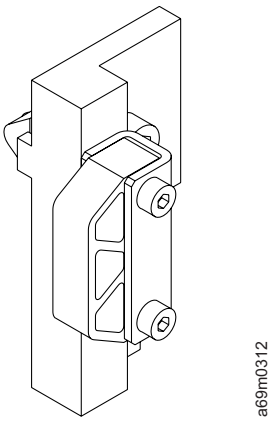


Figure 48. L32/D32 Right Side

Install OUTSIDE frame member tight against the frame.

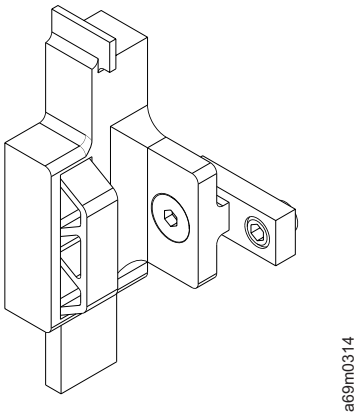


Figure 49. L22/L23 L52/L53 SBA Left Side

Install INSIDE frame member tight against the frame.

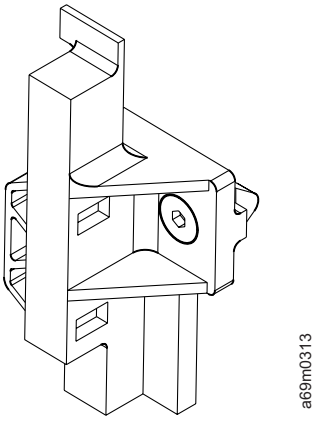


Figure 50. D22/D23 D52/D53 SBB Right Side

Base Frame (Lxx) Installation

See **Attention - Delivery And Subsequent Transportation Of The Equipment** on page 112 for information on unloading library frames.

__ 1. If this is a raised floor environment, and power cables will exit through the floor, ensure that there is a cutout in the floor for the power and communications cables. The cutout should be near the rear of the base frame, and must not be close enough to the leveling pads to allow a leveling pad to fall into the hole. If the customer plans to route the power cables out the top of the frame (see Figure 127 on page 201).

__ 2. Locate the device driver kit and ask the customer to install the device driver and utilities.

Note: Since the host will need to be reconfigured to connect to the library, the customer should be able to load the device driver and utilities with minimum impact. This will help ensure that the utilities are available if you should need them for future service actions.

__ 3. Move the base frame into position on the floor.

__ 4. Open the front and rear doors, and remove the front and rear side covers, to assist in the installation. See Figure 53 on page 120. Newer L22/L52 frames may have quick disconnect side covers as shown.

Single Lxx Base Frame Installs Only

If you are installing a single frame Lxx only (with no immediate plans to install Dxx expansion frames):

- Frame leveling is not required. Ignore all steps referring to frame leveling.
- Do not lower the leveling pads. They remain up off the floor.
- Casters (wheels) are locked in place using the existing thumbscrew on each caster. See Figure 52 on page 120.

__ 5. Loosen the locknuts on the leveling pads and lower the leveling pads to the floor.

__ 6. Refer to Figure 46 on page 115. Using the 5/16" hex bit (supplied with the base frame), adjust the leveling pads so that the clearance from the floor to the bottom of the frame is 115 mm (3.3 in.) ± 5 mm (0.2 in.) at all four corners of the base frame. The frame should be approximately level, and the casters must be off the floor. You may use the rack alignment tool P/N 50G0406 and E-shaped tool PN 24R0183 **6** **together** as a floor-to-frame clearance gauge for the initial adjustment. The combined length of both tools is 115 mm (4.5 in.).

Note: The 113 mm (4.5 in.) clearance may be needed to ensure that any variation in the level of the customer's floor will not affect the installation of the expansion frames.

__ 7. Move the accessor assembly to the left side of the base frame. Inspect the grippers to ensure they are still fully-seated in their dual gripper housings.

__ 8. **Note:** A tilted Y-mast can cause calibration problems and barcode scan problems. Check to ensure the Y-mast is perpendicular to the base. See the alignment procedure in the notes under "Replacement Procedure" in “Y-Axis Mast Assembly” on page 1040.

__ 9. Refer to Figure 51 on page 119. Place the level **3** on the right side of the base frame. Ensure that the base frame is level from front to back.

The bubble should be centered between the two lines.

- If the bubble is too close to the rear of the frame, raise the front of the frame by turning **both** front leveling pads an equal number of turns.
- If the bubble is too close to the front of the frame, raise the rear of the frame by turning **both** rear leveling pads an equal number of turns.

Note: If any leveling pad is off the floor, turn the pad jackscrew down to the floor and then turn ¼ turn more.

Refine the leveling adjustments until the bubble is centered between the two lines.

__ 10. Place the level **2** on the lower **front** frame member as shown below. **Do NOT place the level on the X-rail, or any other frame member.** Ensure that the base frame is level (left to right).

The bubble should be centered between the two lines.

Refine the leveling adjustments until the bubble is centered between the two lines.

__ 11. Repeat steps 9 on page 118 and 10 until the frame is level (front to rear) and (left to right).

__ 12. See Figure 54 on page 120. Open the front door. Loosen the two bolts **1** on the frame door roller. Close and lock the front door. From inside the frame push the door roller up until it touches the bracket **2**, then tighten bolt **3**. Open the door and tighten both bolts **1** securely.

__ 13. Install the CE Diagnostic Cartridge(s) (DG nnnL1 for L1/L2 drives, DG nnnL2 for L2/L3 drives, DG nnnL3 for L3/L4 drives) in column 1, Row 1 of the L32/L52/L53. Install the CE Diagnostic Cartridge for 3592 (CE nnnJ1 for 3592 J1A, E05 and E06/EU6 drives) in L22/L23 into column 1, row 1 (on the top left of the rear wall; see Figure 6 on page 22). Each column is identified with a numbered label located below the column. Rows are identified with labels located to the left of column 1.

Note: If there is a mix of LTO drive generations in the library, the second cartridge is requested via the I/O station when needed. For information on installing CE diagnostic cartridges in an HA (dual accessor) library, see "3592 and LTO Diagnostic Cartridge Locations" on page 55.

__ 14. If you **ARE NOT** adding an expansion frame (Dxx) at this time, tighten the locknuts on the base frame leveling pads, and then go to "Installing Tape Drives" on page 178. If this is a single frame Lxx installation only, see Figure 52 on page 120 and tighten the thumbscrews on all four casters.

__ 15. If you are **ARE** adding an expansion frame at this time, go to "Expansion Frame (Dxx) Installation" on page 121.

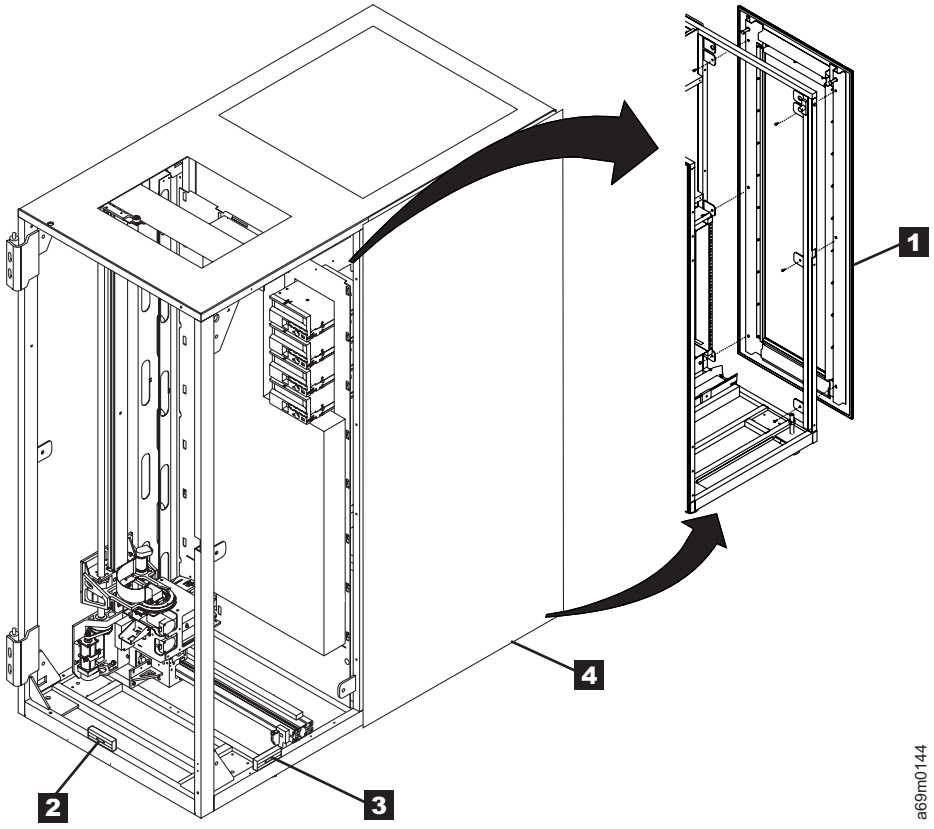


Figure 51. Leveling

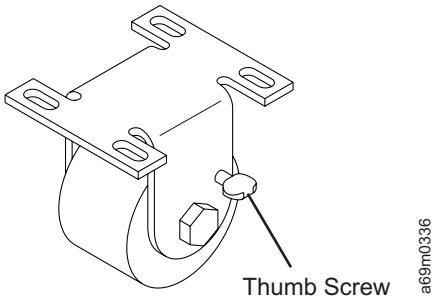


Figure 52. Caster Locking Thumbscrew

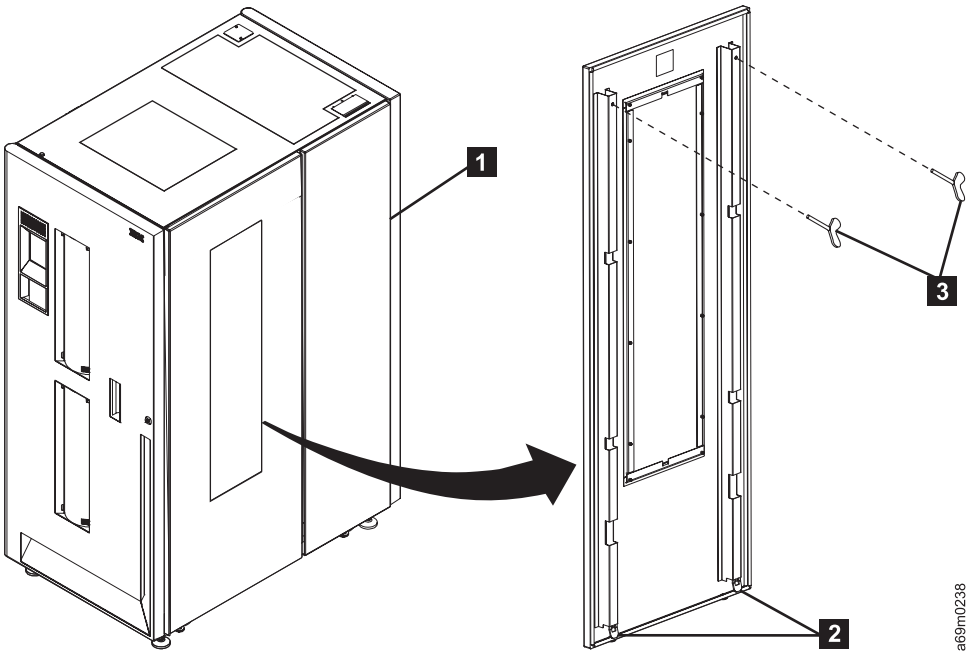


Figure 53. L22/L23/L52/L53 Side Cover

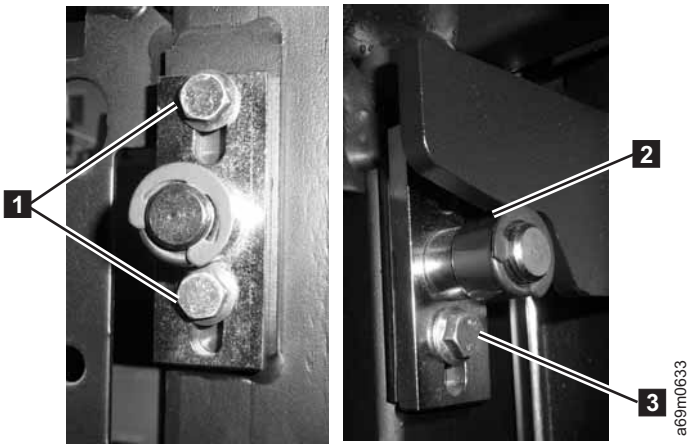


Figure 54. Door Roller Adjustment

Expansion Frame (Dxx) Installation

See **Attention - Delivery And Subsequent Transportation Of The Equipment** on page 112 for information on unloading library frames.

Attention -Installation Instructions are Provided for the Following Installations

Note: If you are doing one of the following library installations:

- Installing the first or additional Dxx frame to an existing library, or
- Installing a Dxx frame in an existing HA Library, or
- Installing FC 9040 to convert a single-accessor library to HA, or
- Installing FC 1655 (D53) or 1656 (D23) 4-I/O Door frame in an existing single or dual-access library, or
- Installing FC 9050 (High Density Sx4 frame) in an existing single or dual-access library

Note: If you are installing the new expansion frame in the middle of a library string, and you must uninstall & reinstall frames to accomplish this, see **"Procedures to Uninstall Existing Library Frames to Add or Remove Frames from Inside a Library String" on page 231**.

Start with one of the following **separate installation instructions** (shipped with the hardware) for the following install activities:

- If you are installing the first Dxx expansion frame in the library, use instructions **PN 19P1432** *SC 9002 "First Expansion Frame Attachment"* shipped with the frame for the install procedures.
- If you are installing the second or more Dxx expansion frame in the library, use instructions **PN 19P1433** *FC 9003 "Additional Expansion Frame Attachment"* shipped with the frame for the install procedures.
- If you are adding an expansion Dxx frame to an existing dual-accessor HA library, you **must** use instructions **PN 96P1240** shipped with that frame for the install procedures.
- If you converting an existing single-accessor library to a dual-access (HA) library (FC 9040 / 1440), you **must** use instructions **PN 96P1241** shipped with the frames for the install procedures.
- If you are installing a 4-I/O door Dxx frame in a Single or Dual-accessor HA library, (FC 1655 or 1656) you **must** use instructions **PN 95P5917**, *"Install Four I/O Door FC 1655 (D53) or 1656 (D23) in a Single or Dual Accessor (HA) Library"* shipped with that frame for the 4-I/O door installation procedures.
- If you installing the first High Density frame (FC 9050), you **must** use instructions **PN 45E4417** shipped in the "L" frame ship group for the install procedures.
- If you installing an additional High Density frame you **must** use instructions **PN 46X4166** shipped with the Sx4 frame for the install procedures.

Expansion frames are added to the right side of the base frame.

Note:

- Any references made in this MI to the 'previous frame' means the frame to the left of the frame you are installing.
- If you are installing a mixed-media library (LTO/3592) ask the customer if they want to group all frames of a particular drive type to be next to similar frames.
- If you are adding an expansion frame to an existing library, ensure all previously-installed frames are not resting on the casters, and **ENSURE all frames are level before you begin this procedure.**
- If you are installing mixed frame sizes, see Figure 57 on page 124 and the note the follows.

Attention: If you are installing a library **larger** than 6 frames, be sure to review the "Prerequisite" section of the Install Instruction for "Additional Expansion Frame Attachment (FC 1814, or 1816)" for information on:

- Library firmware requirements
- LTO drive code levels for Ultrium-1, Ultrium-2, Ultrium-3, Ultrium-4, and Ultrium-5.
- 3592 drive code levels
- MCP (with Ethernet support) in your Lxx
- Later-style MCPs (without Ethernet support) in D-frames 2–6.

Required library firmware and drive code can be downloaded from the following websites.

For IBM service personnel with access to the Internal PFE website:

`http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

For non-IBM personnel (and those without access to the IBM intranet) see “Loading LTO or 3592 Drive Microcode by Using CETool” on page 711 for information on the external website where library and/or drive code can be downloaded.

__ 1. If attached, remove the wood shipping lumber attached to the left side of the expansion frame.

__ 2. Perform the following steps:

__ a. Notify the customer that you will be powering the subsystem down to begin the installation of the additional expansion frame.

__ b. Power off the base frame.

__ c. See **Figure 55 on page 123.** Power off the main circuit breaker **1** on every frame that contains an FCA.

__ d. For D23 or D53 frames see **Figure 56 on page 123.** Raise the handle **1** all the way up on both Bulk Power Card assemblies (BPC). This disconnects the line cord from the Bulk Power Supply (BPS).

__ e. If the Dxx frame being installed is the first one in the library that has an FCA **without** a 37V power supply, do the following:

- Open the rear door of the L32, L22, or L52 frame.
- Remove the 37V power supply in position 2 (right-hand side).
- Reinstall the 37V power supply in the FCA in the NEW Dxx frame in position 1 (left-hand side).

Notes:

1) The reason for moving one 37 V dc power supply from the Lx2 frame to a Dx2 frame is to reduce single points of failure for power in a frame associated with incoming power, line cord, FCA, and MCP. The benefits result in robotic power coming in from two separate frames. See **“37 V dc Distribution in an HA1 Library” on page 807** for information on how 37 V dc power distribution and redundancy works, and where 37 V dc power supplies must be installed for true redundancy.

   If the 37 V ps is moved after the library is powered-up a 34A2 error will be posted. You must power cycle the library to clear the 34A2 error and update the library firmware configuration to show that the Lxx has only one PS and the Dx2 has one. Both power supplies will then be enabled and 34A2 will no longer be posted.

   FC 1902 (Redundant 37 V DC Power Supply) provides an additional (3rd or more) 37V DC power supply to the library. This Feature Code is intended for customers who wish to have this additional redundancy.

   In a dual-accessor (HA1) library, four 37 V dc power supplies are recommended to provide total redundancy. If possible, install one 37 V dc power supply in each frame that has an FCA. If you have only three active frames (Lxx, Dxx, Dxx) each having an FCA, then:

- Install one 37 V supply in the Lxx frame
- Install two 37 V supplies in the first Dxx frame
- Install one 37V supply in the second Dxx frame.

__ 3. If you are installing a new library, go to step 8 on page 125. If you are adding an expansion frame to a previously installed library, continue with the next step.

Table 22. FCA and BPC Power Assemblies

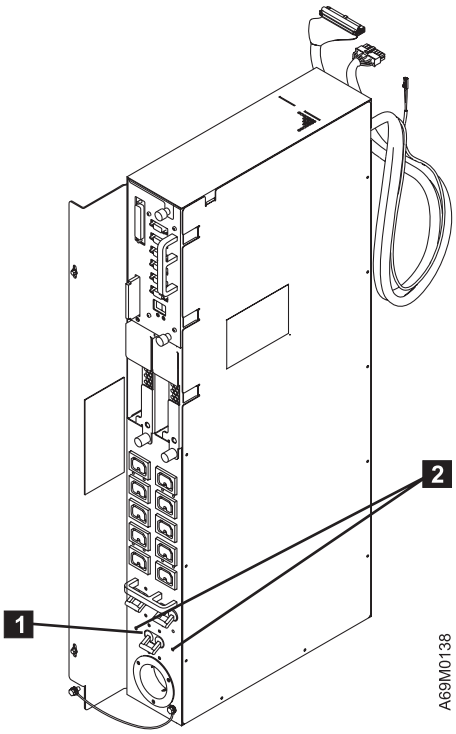


Figure 55. FCA Assembly

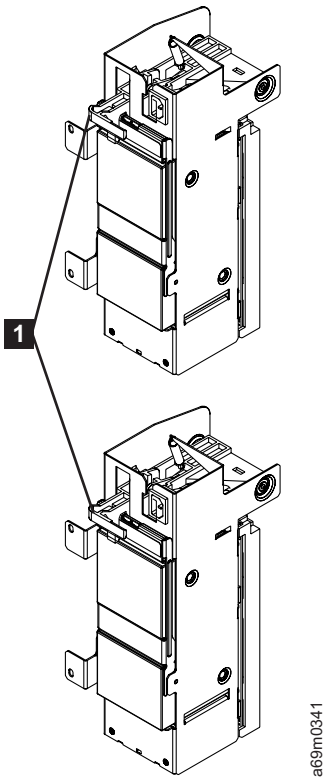


Figure 56. BPC Assemblies

Note: Although most figures in the following steps show the original longer frames (L32/D32), the procedures listed also refer to the newer short frames (x22/x23/x52/x53), except where noted.

__ 4. If you have a later level D32 expansion frame, or a D22/D23/D52/D53 expansion frame, remove the right side cover **4** of the previous frame (if not already removed).

__ 5. If a D32 expansion frame came with rear side covers **4** it is an early level frame. Note whether you have an early level or later level frame. You will need this information later in the install process.

__ 6. See Figure 51 on page 119 and remove the right side cover **1** of the previous frame (if not already removed). Figure 53 on page 120 shows an L22/L23/L52/L53 with a shorter rear side cover **1** . Newer covers are quick disconnect. Remove two wing screws **3** and lift the cover off the lower tabs **2** to remove.

Note: The right side covers will be reinstalled on the last expansion frame.

Attention: Figure 57 is a **top view** example of two mixed-frame libraries. Original L32 and D32 LTO frames are deeper than the newer style L52/D52/L53/D53 (for LTO) and L22/D22/L53/D53 (for 3592). Short and long frames can be installed in any configuration in the same library. Short side covers **1** are provided the accommodate a mixed-frame installation. When moving and installing side covers, refer to this figure and Figure 58 on page 125 for assistance.

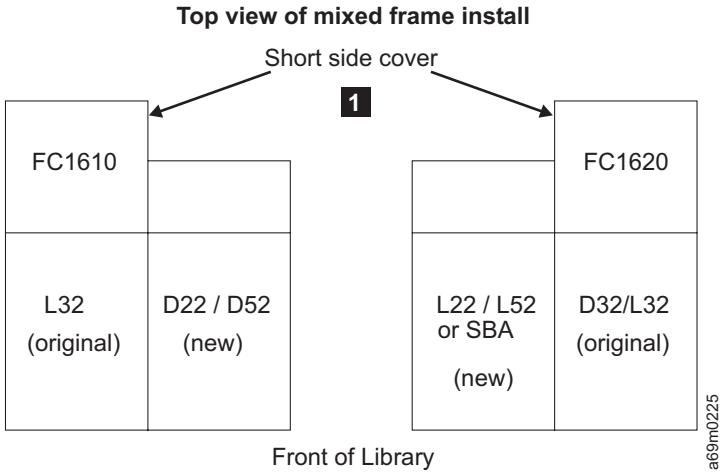


Figure 57. Mixed Frame Side Cover Diagram

Side Cover Feature Codes 1610 and 1620

If you are installing short frames to long frames (or long frames to short frames), you will require one of the following side cover feature codes:

a. **(FC 1610) Adding Model D22/D23/D52/D53 to Installed Model D32/L32:**

   This feature is required when a short depth frame (Model D22, D23, D52, D53) is added to an installed long depth frame (Model D32 or L32) in a 3584 library. This feature includes a short rear side cover for the Model D32/L32 frame and the Model D22, D23, D52, D53 front and rear side covers.

b. **(FC 1620) Add Model D32 to Installed Model D22/D52/L22/L52:**

   This feature is required when a long depth frame (Model D32) is added to an installed short depth frame (Model D22, D52, L22, L52) in a 3584 library. This feature includes a short rear side cover for one side of the Model D32 frame and the Model D32 front and rear side covers for the other side.

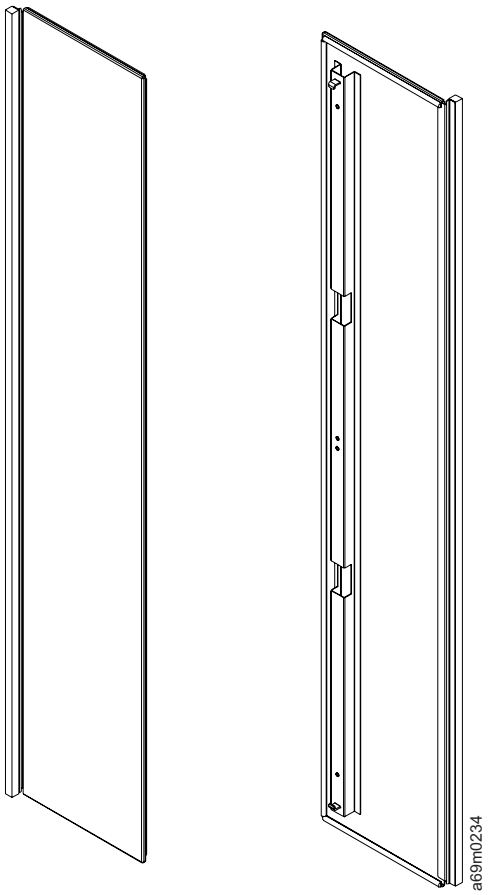


Figure 58. Mixed Frame Short Side Covers

Attention

Note: Although most figures in the following steps show the original longer frames (L32/D32), the procedures listed also refer to the newer short frames (x22/x23/x52/x53), except where noted.

__ 7. Move the accessor assembly to the left side of the base frame.

__ 8. Refer to Figure 83 on page 154. If the X-axis (horizontal) right end stop has not been removed from the previous frame, remove it by removing the center screw **2** . Slide the T-nut to the right until it comes out of the rail. **Be careful not to move the accessor assembly too far to the right until after the end stop has been reinstalled. The accessor assembly could come off the rail.**

Note: This end stop and T-nut will be reinstalled later on the right side of the last expansion frame.

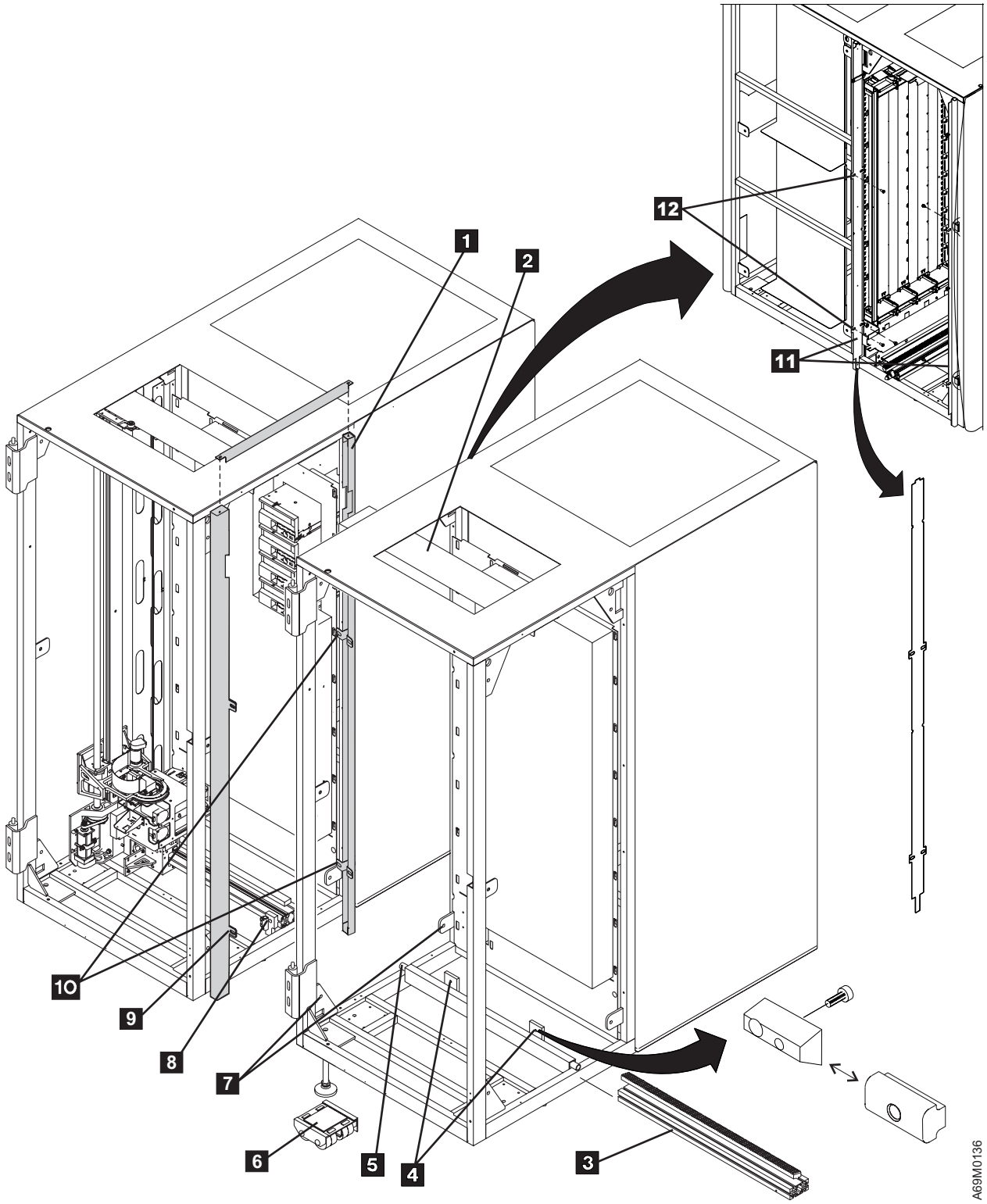


Figure 59. Frame-to-Frame Attachment (A). This figure will be repeated for the benefit of the CE.

__ 9. **Note:** The following steps are also used to install and level a Service Bay B frame in a dual accessor library.

Note: The upper guide rail, lower X-rail and rods, trough cover, and alignment rod are **packaged separately** from the frame. Locate those parts for the following steps.

__ 10. Locate the upper X-axis guide rail **2** and install it in the new frame. Ensure the left end of the upper X-axis guide rail does NOT extend past the left side of the frame. The four screws in the upper guide rail must be loose. Slide the guide rail to the right so it will not interfere when joining the two frames together. **Note:** The slots in the guide rail are keyed, so if you slide the guide rail too far to the right it can come off the screws.

__ 11. Refer to Figure 59 on page 126. Locate the lower X-rail. Loosen the two short T-nuts **4** on the new frame, then install the X-rail. Slide the X-rail **3** to the right about 15 cm (6 in.). This will prevent the rail from interfering when joining the two frames together.

Note: The X-rail you received may have an errata sheet (PN 95P1964) taped to the rail showing cutouts on the bottom. This Dxx rail is functionally equivalent to the standard Dxx rail. This rail aids in the installation when the frames are not perfectly aligned in the vertical direction to one another. The cutout in this rail aids in the installation when the frames are not perfectly aligned in the vertical direction to each other.

__ 12. If this is a raised floor environment, and if the expansion frame you are installing has drives or an optional Frame Controller Assembly (FCA), ensure that there is a cutout in the floor for the power and communications cables. The cutout should be near the rear of the frame, and must not be too close to the leveling pads where a leveling pad could fall into the hole.

__ 13. **See Figure 60 on page 128.** On early-style frames only, form the tabs **1**, **9**, **10** (shown in gray) on the front and rear frame separators inward approximately 6 mm (¼ in.) so that they do not interfere when the two frames are pushed together.

__ 14. Locate the alignment rod and install it on the bottom left in the new frame. Ensure the alignment rod is fully seated in the frame. Move the expansion frame you are installing into position beside the previous frame. The alignment rod **5** should just touch the previous frame, and the front covers of the two frames should be approximately even.

__ 15. Loosen the locknuts on the expansion frame leveling pads and unscrew the locknuts.

__ 16. Place a frame skate **6** P/N 05H7999 under the two leveling pads on the left side of the frame you are installing, and lower the leveling pads into the recessed area on top of each frame skate. The skates should be positioned so they will roll toward the base frame.

__ 17. Raise the left side of the expansion frame by adjusting the left-side leveling pads evenly until the alignment rod **5** is aligned with the hole in the previous frame.

Note: The left side of the frame you are installing is supported by the leveling pads and frame skates. The right side of the frame is resting on the casters. Do NOT lower the right side leveling pads until instructed to do so.

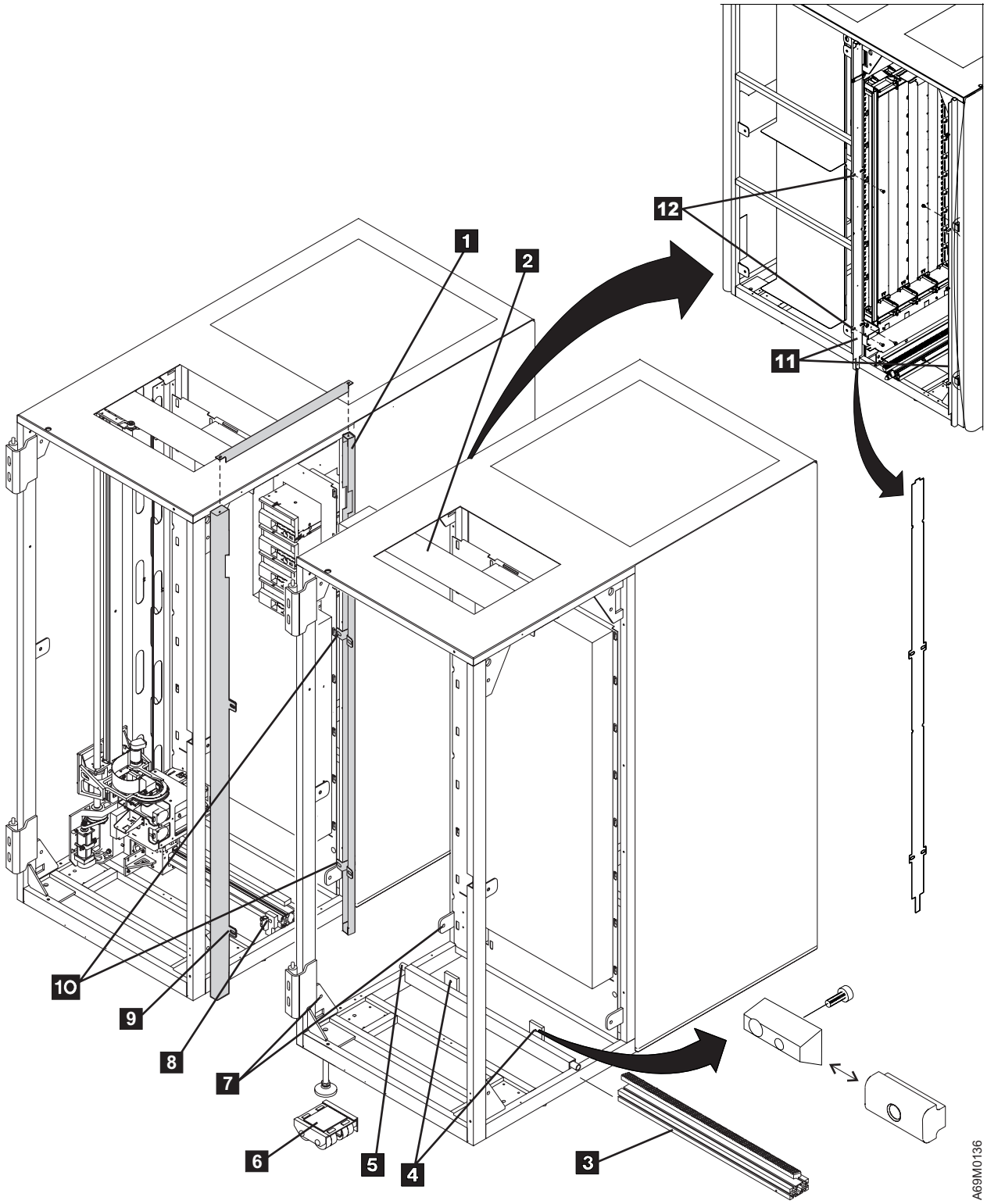


Figure 60. Frame-to-Frame Attachment (B). This figure is repeated for the benefit of the CE.

__ 18. Refer to Figure 61 on page 131. Carefully push the expansion frame against the previous frame until the alignment rod **5** is seated at the bottom of the hole in the previous frame. The front cover of the frame you are installing should be approximately parallel to the front cover of the previous frame.

Note: You must not push so hard that you move the previous frame. If the alignment rod is at the correct height, and if the frames are in line along the X-axis, then the alignment rod will eventually seat itself easily when both frames are level to one another.

__ 19. Visually check that the lower X-rail in the expansion frame is in line with the lower X-rail in the previous frame. If necessary, move the right side of the expansion frame forward or back to align the X-rails.

__ 20. Insert an M8 bolt (P/N 1621592) from the left, through the hole in the lower front frame stiffener **7** on the previous frame and through the corresponding hole in the expansion frame. Install and finger-tighten nut P/N 1622406 on the bolt.

__ 21. Repeat the previous step, installing another bolt through the lower frame stiffener at the rear of the accessor aisle.

Note: The bolts ensure that the alignment rod will not fall out of the hole in the previous frame. They should NOT yet be tight.

__ 22. Raise the left-side leveling pads of the expansion frame off the frame skates. The weight of the expansion frame will be on the alignment rod and the right side casters.

Note: This will allow alignment of the frames using only the two leveling pads on the right side of the expansion frame.

__ 23. Remove the frame skates **6** and store them in rear of the last frame. **DO NOT lower the leveling pads on the left-side of the expansion frame until instructed to do so.**

__ 24. If you are installing on carpet, put a carpet pad P/N 05H7004 under each of the leveling pads.

__ 25. Lower the right side leveling pads until the right side of the frame is approximately 84 mm (3.3 in.) from the floor. This will allow you to level the library in the event the floor is not perfectly level. Use a ruler or CE scale to determine this approximate height.

__ 26. An E-shaped tool (PN 24R0183) is shipped with each new frame and will ensure the frames are correctly aligned to one another. If an E-shaped frame alignment tool (shown in Figure 62 on page 132) is not available, an alternate procedure is available. Refer to Figure 63 on page 133. Check the X-Axis rail alignment using the cable trough cover **2** as a straight edge. Use a light to ensure no gap **1** in the center or either end is visible. A piece of white paper under the trough cover may also make the gap, if any, more visible. If necessary, move the expansion frame to align.

Note: When installing multiple expansion frames it is important that the frames are properly aligned. The method of using the trough cover as a straight edge becomes less accurate as more frames are added. Alternate methods are available:

a. The new E-shaped alignment tool (shipped with new frames) ensures frame spacing at the back of the frames is correct as expansion frames are added. The tool should also be used at the front and top to further check correct frame alignment.

b. If you have access to a laser level it is recommended that you use the laser level only to align the frames.

c. If you do not have access to a laser level, you can use masonry string P/N 34G8395 to align the frames. Tie a loop in the end of the masonry string. Insert an allen wrench or similar tool into the right end of the lower X rail in the expansion frame and use it to hold the end of the masonry string. Stretch the masonry string along the X rail rack as far into the base frame as possible. Now you can use the string as a straight edge and visually check that the X rail rack in each frame is aligned with the masonry string.

__ 27. **Refer to Figure 61 on page 131**. Re-tighten the two M8 bolts located in bottom corners **7** of the accessor aisle until they are just finger-tight.

__ 28. See **2** in **Figure 51 on page 119**. Place the level on the lower **front** frame member in the expansion frame. **Do NOT place the level on the X-rail, or any other frame member.** Raise or lower the two leveling pads on the right side of the expansion frame until the lower X-rail is level (left to right). Ensure that the alignment rod **5** was not driven out or allowed to slip out when you tightened the M8 bolts **7** .

Note: The bubble should be centered between the two lines.

- If the bubble is too far to the right, lower the right side of the frame by raising **both** right-side leveling pads.
- If the bubble is too far to the left, raise the right side of the frame by lowering **both** right-side leveling pads.
- Refine the right side leveling pad adjustments until the bubble is centered between the two lines.

__ 29. Align the upper X-rails **2** .

a. Loosen the screws holding the right side of the upper X-rail in the PREVIOUS FRAME.

b. Slide the EXPANSION FRAME upper X-rail **2** to the left, and visually check the alignment of the front vertical surface of the two upper X-rails. Adjust as follows:

- Use the RIGHT SIDE leveling pads only. To move the upper X-rail in the expansion frame toward the rear, raise the front of the machine and lower the rear of the machine an equal amount. The front vertical surface of the upper X-rail is the critical surface, and is used as a track for the top roller of the accessor.

  OR

- Use the RIGHT SIDE leveling pads only. To move the upper X-rail in the expansion frame toward the front, lower the front of the machine and raise the rear of the machine an equal amount.

c. Connect the two upper X-rails together, overlapping the upper rail in the previous frame. The upper X-rail vertical edges should be touching. Finger tighten the screws at this time.

d. Continue to adjust the leveling pads until the upper X-rail vertical edges are in alignment.

__ 30. See Figure 62 on page 132. Install the E-shaped alignment tool **1** PN 24R0183 in the lower rear frame members between the existing frame and the new frame. This tool ensures correct frame spacing between frames at the back. Each new frame comes with an E-tool. Leave the tool in place for now. The tool can also be used at the front and top to further check correct frame alignment.

__ 31. Recheck the lower X-rail to ensure it is still level and adjust the frame level, if necessary.

__ 32. Recheck the upper X-rail to ensure it is still aligned with the previous frame and adjust, if necessary.

__ 33. Remove the E-shaped alignment tool from the rear of the frame and place it between the upper front frame members. If the tool will not fit, carefully and slowly raise or lower both right-hand jack pads an equal amount until the tool fits. Remove the tool.

__ 34. Turn both left-side leveling pads by hand until they are snug to the floor, then tighten them an additional 1/4 turn (90°). **Do not overtighten, as this may raise the library.**

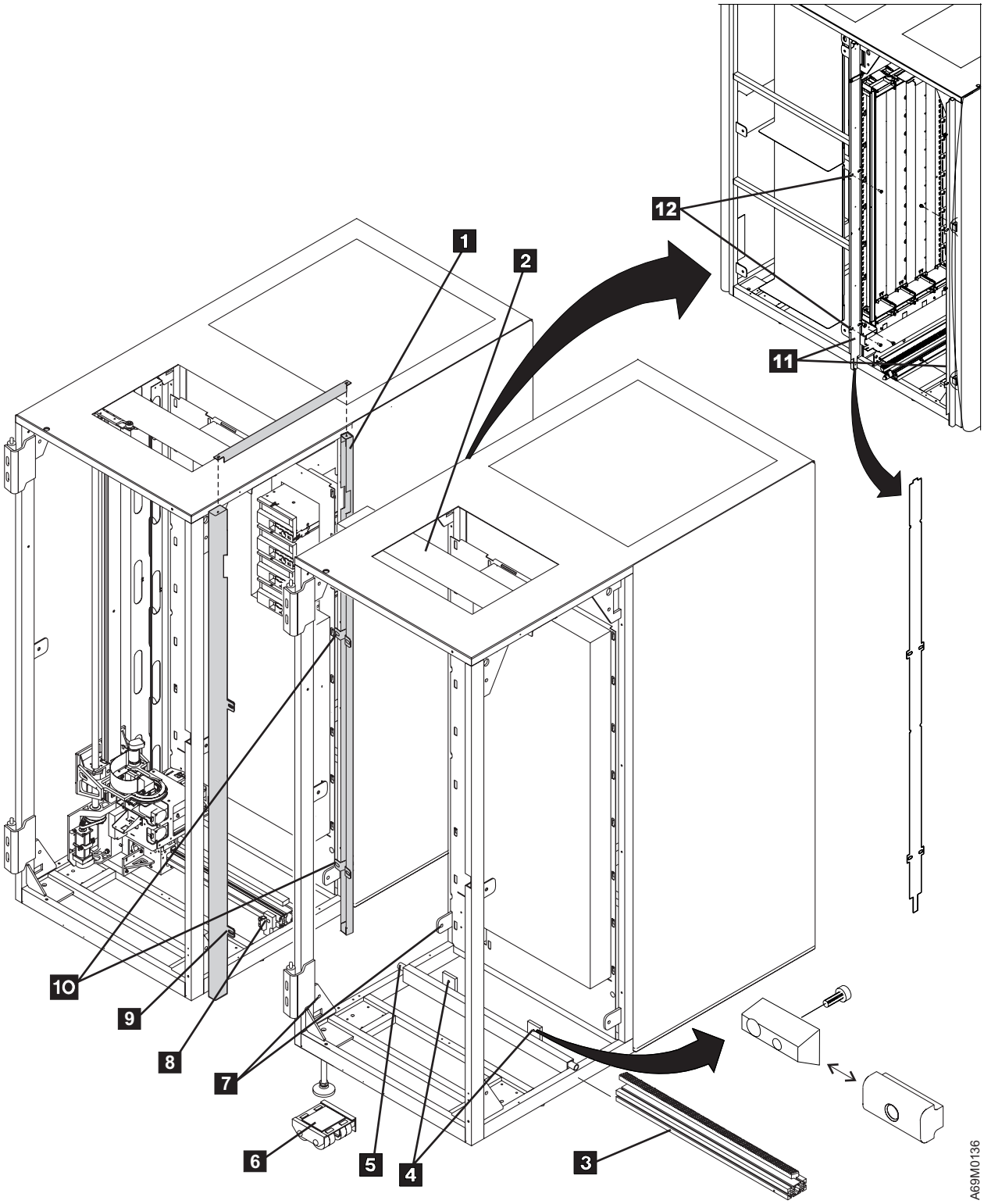


Figure 61. Frame-to-Frame Attachment (C). This figure is repeated for the benefit of the CE.

__ 35. Slightly loosen the T-nut bolts to allow the lower X-rail to slide.

__ 36. Verify that no debris or burrs exist on the bottom of the lower X-rail geared rack.

__ 37. Slide the X-rail back to the right approximately 150 mm (6 in.) to allow room to insert the long T-nut.

__ 38. See Figure 64 on page 135. Using a 3mm allen wrench, install the setscrews P/N 23R4661 **1** into the long T-nut P/N 23R2334 **2** , if not already installed. **Note:** The T-nut should have the setscrew sockets facing the front.

__ 39. Insert the long T-nut **2** approximately halfway into the opening closest to the front of the library on the X-rail assembly of the previous frame. Snug but do not fully tighten the set screws in the T-nut.

__ 40. Slide the lower X-rail assembly **4** in the expansion frame to the left onto the long T-nut until the gear teeth of both X-rail surfaces are touching. The lower X-rail assembly should slide freely into the previous frame. **Do not force the X-rail assembly into the next frame**.

__ 41. Use a 3mm allen wrench to snug, but not fully tighten, the long T-nut **1** (setscrews) and the two short T-nut **3** screws.

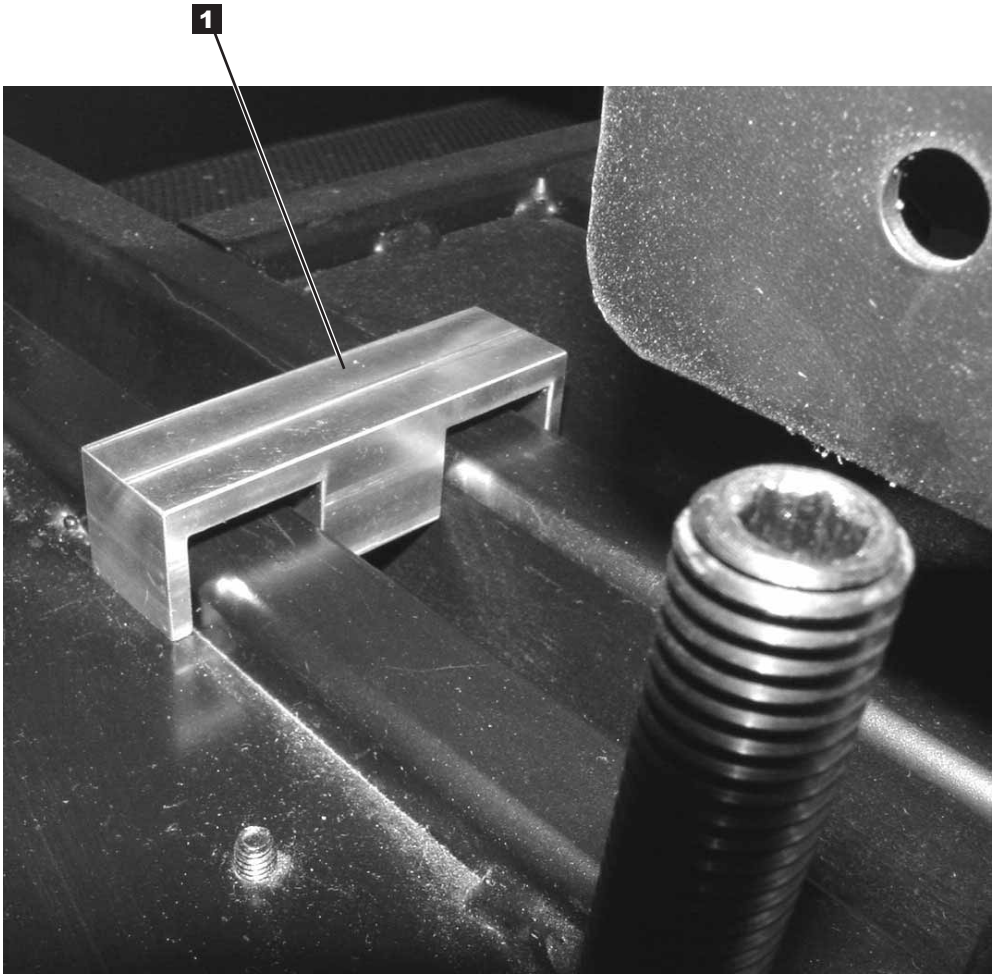


Figure 62. E-Tool for Rear Frame-to-Frame Alignment

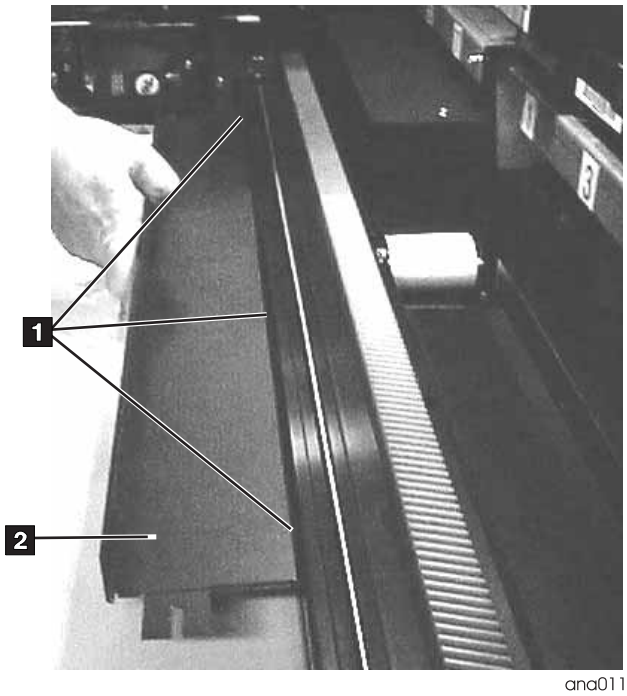


Figure 63. X-Rail Alignment Check

__ 42. Refer to Figure 61 on page 131. Visually check that the alignment rod **5** is fully seated in the hole in the previous frame. If it is NOT fully seated you must fully seat it and recheck the frame alignment before you continue.

__ 43. Fully tighten the frame M8 bolts.

Note: Do not overtighten the frame M8 bolts. Their purpose is only to keep the frames together.

__ 44. Refer to Figure 64 on page 135. Place the rack alignment tool **6** on the junction of the two gear racks.

__ 45. Hammer the rack alignment tool onto the racks until the tool is fully seated in the gear teeth on both X-rail assemblies. Ensure no gap exists between the tool teeth and the rail teeth.

__ 46. Keep the alignment tool in place for the next step.

__ 47. Hold downward pressure on the left-hand side of the rack while you tighten the left-hand short T-nut **3** in the expansion frame.

__ 48. Hold downward pressure on the right-hand side of the rack while you tighten the right-hand short T-nut **3** . Recheck the track alignment by ensuring the rack alignment tool does not rock side-to-side.

__ 49. Tighten the setscrews on the long T-nut **1** (using a 3mm allen wrench).

__ 50. Recheck the alignment between the upper X-rails (from the base frame to the expansion frame). When both the upper X-rails and the lower X-rails are aligned, tighten the screws to secure the upper guide rails.

__ 51. Place the two X-axis bearing way rods **5** in their slots against the X-rail assembly rods in the previous frame. One X-axis bearing way rod goes on top and the other goes on the bottom of the lower edge of the X-rail assembly.

__ 52. **Ensure each rod touches the rod in the previous frame. They must be tight end-to-end**

__ 53. Starting from the left end, press the rods in place with the bearing shaft clamp tool PN 50G0405 **7** . The rods fit tightly in the recesses of the X-rails, so start on the left side and clamp the shafts in place about every 50 mm (2 in.) to the fully-seated position.

Notes:

a. If the rods do not seat fully, adjust the bearing shaft clamp tool to provide more pressure to the rod.

b. **Do not use the accessor to press the rods into place. While this may have worked on 3494, it will not work on 3584 because the lower wheels are spring-loaded causing the accessor to 'ride up and over' any rod that is not fully seated.**

c. In the next step, to prevent the accessor assembly from falling off the X-rail, do not move the accessor assembly to the extreme right until after the right end stop has been reinstalled.

__ 54. **Note: If you were using the previous steps in install and level a Service Bay B frame in a dual accessor library, stop here and return to step 10 on page 151.**

__ 55. If this is the last expansion frame to be installed (in a non-HA library), reinstall the X-Axis right side end stop **tight** against the frame. See Table 21 on page 116 for placement information. First, install the short nut. The flat surface of the T-nut should face to the front, with the end stop assembly to the right. The end stop must rest **tight** against the right side of the frame. Tighten the mounting screw.

__ 56. Move the accessor across the junctions of the upper guide rail and the lower bottom X-rail. If you can feel any binds, correct the alignment of the frame before continuing.

Notes:

a. If you hear any 'clicking' sounds, this indicates the bearing rods are not flush, or a gap exists between the rods.

b. If you feel a 'bump,' this indicates that either the gear rack is not flush, the gear rack spacing is incorrect, or the upper rail vertical alignment is not flush.

c. If the accessor makes a 'squealing' sound when moving, this may be caused by new style rubber pads (see Figure 81 on page 153). Put a few drops of IBM Lubricant #6 PN 0223980 on a cloth and wipe the top and bottom X-rail rods, and the front and back Y-rail rods.

d. Do not damage the X-axis cable. The expansion frame X-axis cable trough cover is not installed yet.

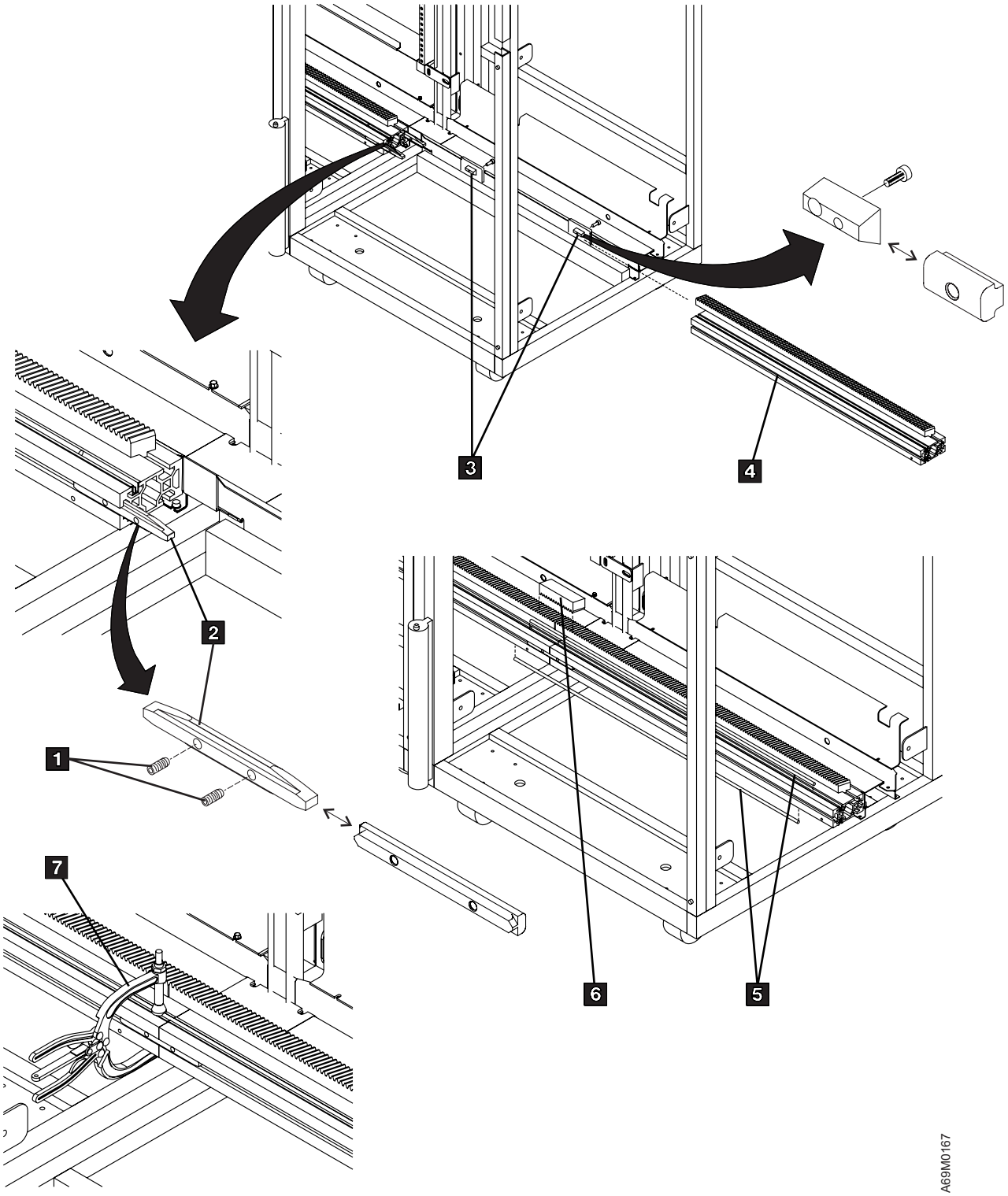


Figure 64. Base Frame with Expansion Frame

__ 57. Refer to Figure 61 on page 131. On earlier-style frames only, connect frame spacers **1** and **9** to the previous frame by installing screws into the frame spacer mounting slots **10** .

Note: On the rear wall of the library (between frames) the frame spacer **11** is installed underneath the attachment bracket screws (as shown in the middle of Figure 65 on page 137). You must loosen and remove the screws and attachment brackets before you install the spacer. When you reinstall the screws and attachment brackets, be sure to position the brackets in the correct position, and reinstall the screws in the same location where they were removed. The black-colored spacer **4** is installed on the door side of the library (between frames). On later-style frames:

a. x32 to x32 Only – connect frame spacers **11** to the previous frame by installing screws into the frame spacer mounting slots **12** .

See Figure 65 on page 137.

b. If you are installing x22,x23,x52,x53 to x22,x23,x52,x53, install frame-to-frame spacer **1** as shown.
c. If you are installing x32 to x22,x23,x52,x53, install frame-to-frame spacer **2** as shown.
d. If you are installing an x22,x23,x52,x53 to x32, position the spacer so the x32 side is on the left, and the x22,x23,x52,x53 side is on the right.

Note: These spacers are secured to the frame using only two bolts, one at each tab. No bolts are required on the other end of the spacer. And only ONE frame-to-frame bracket is installed near the bottom of the spacer (near row 29). The small notch in the bracket allows you to install the frame bracket. Leave the remaining three brackets hang loose in the x22,x23,x52,x53 frame.

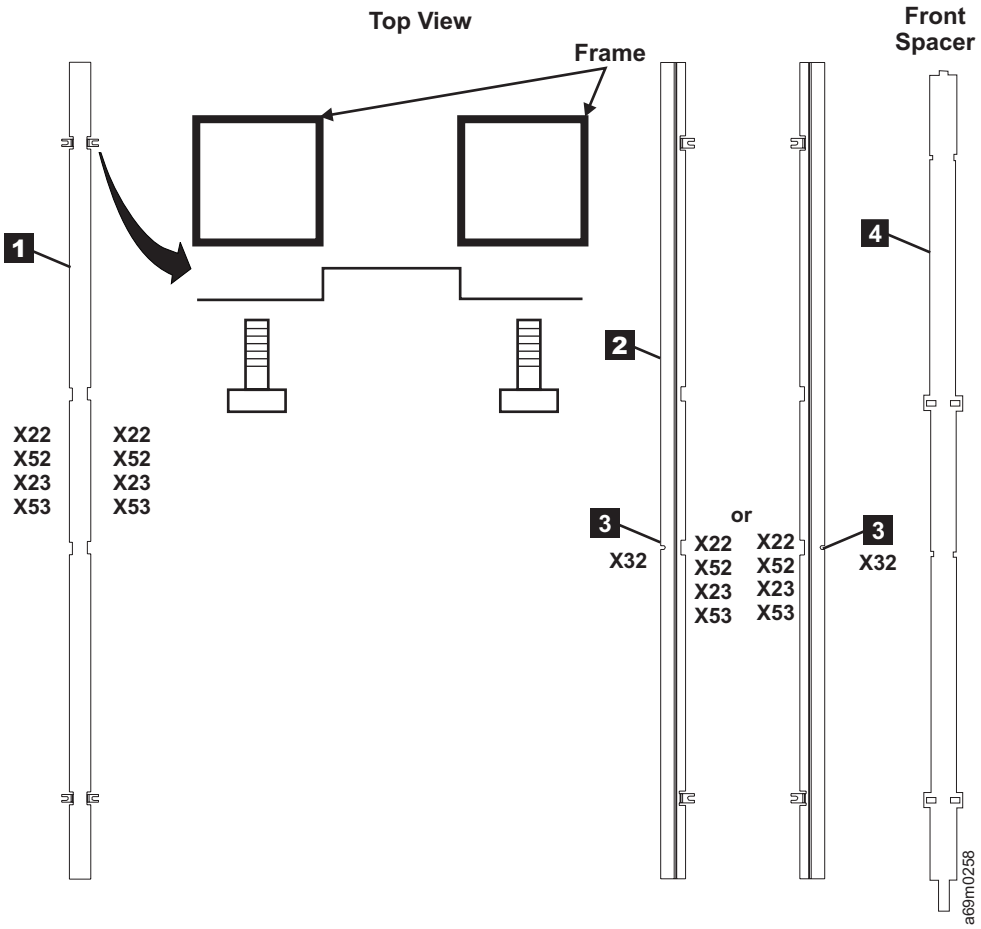


Figure 65. Frame to Frame Spacers with New Style Frames

__ 58. **Refer to Figure 66.** Locate the three frame-to-frame attachment brackets **1** that are factory-mounted on the left side of the expansion frame. Locate screws **2** P/N 1624790 provided in the ship group. You will install them in the following steps.

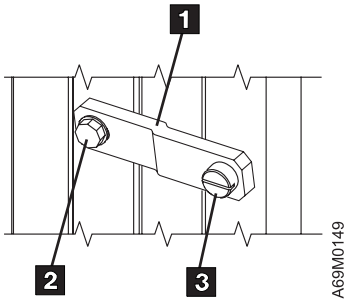


Figure 66. Expansion Frame Attachment Bracket – Positioning

Note: When the frames are correctly aligned, the attachment bracket holes will be correctly spaced making it easy to install the bolts.

__ 59. **Refer to Figure 67.** Connect a frame-to-frame attachment bracket **1** near the top of the front vertical frame, connecting the expansion frame to the previous frame.

Notes:

a. The slotted side of the bracket **1** must be on the previously-installed frame. **Note:** Factory installed.

b. The screw **3** and bushing (or the shoulder screw on some machines) must be installed in the round hole. **Note:** Factory installed.

c. The remaining screw **2** must be installed in the slotted hole.

d. See Figure 61 on page 131. On earlier-style frames only, install and tighten one screw into the mounting slot of each separator **10** of the previous frame. On later-style frames only, install and tighten the two screws **12** on the previous frame.

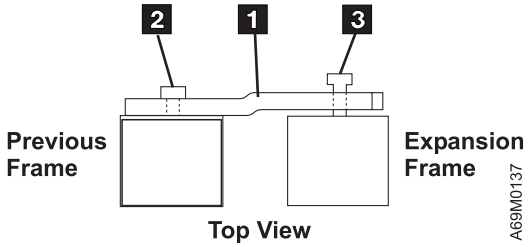


Figure 67. Expansion Frame Attachment Bracket – Offset

Note: If there are more Dxx frames to be installed, go back and repeat this process for other Dxx frames you are installing. If not, then read the information in the following box and/or continue at the next step.

Service Bay B or Dxx frame in an HA Library

If you were using this Expansion Frame Dxx procedure to install a Service Bay B using install instructions **PN 96P1241** (FC 9040 / FC 1440), **stop here** and return to the step in those instructions that sent you here. If not, then continue at the next step.

__ 60. **X-Axis Track Cable**

Note: The X-track cable you received may need to be reworked so it can be connected to your existing accessor AXY card. See Figure 393 on page 1019 and Figure 394 on page 1019 and associated rework information as required.

Track cable installation will be affected if your library install falls into one of the following two categories:

a. You are installing a second expansion frame (the library is now 3 frames long), and you received a new X-axis track cable to replace your existing cable. Use Table 23 on page 143 to determine where the X-axis track cable will be clamped down to the cable trough, then refer to, “X-Axis Track Cable” on page 1014 to remove the old 2-frame cable and replace it with the new cable. Then return here to continue with the installation at Step 59d.

b. You are installing a library with 3 or more frames. Your Lxx came **without** a track cable installed in your Lxx, and you received a **new** 3-6 frame track cable with your machine. Continue at the next step.

__ 61. **Refer to Figure 68 on page 141.** Lay the X-axis cable **4** in the cable trough **2** . Position the end with the plastic track (plastic track up **1**) at the left end of frame 1, with the connector for the accessor AXY card protruding out the left end approximately 300 mm (12 in.).

__ 62. Run the end without the plastic track **3** back under the cable trough. The cable will be looped around the end of the cable trough in frame 3 **2** for (3 through 6 frame libraries.)

Note: In the following step, position the X-track cable connector very carefully into the XCP, then rock it gently in place. Pins can easily bend if care is not taken.

__ 63. **Refer to Figure 70 on page 143.** Fold the XCP-card end of the X-axis cable 4 toward the rear wall (XCP card) and under the trough. Carefully remove the XCP card from the rear firewall, then fully connect the track cable into the XCP card 1 . Reinstall the XCP card on the frame firewall.

__ 64. Attach the mid-cable end of the cable track 5 to the trough by following these steps:

a. Refer to **Figure 69 on page 142** and **Figure 70 on page 143** to determine if you have the **OLD** or **NEW** style track cable.

b. (**OLD** style) Remove cable mounting block 3 from the end of the cable track 2 .

c. (**OLD** style) Attach the cable mounting block 3 (provided with the cable) to the right end of the cable trough in the appropriate frame (as shown in Table 23 on page 143) with 2 screws P/N 1621510 and tighten the screws.

d. (**OLD** style) Re-attach the cable 2 to the cable mounting block 3 and tighten the screws 1 .

e. (**NEW** style) Attach the cable and mounting block assembly to the right end of the cable trough in the appropriate frame as shown in Table 23 on page 143. Install two screws 1 PN 1695243 (provided with the cable) through the cable mounting block and into the holes originally used to mount the old style mounting block. Tighten screws securely.

__ 65. See Table 23 on page 143 to identify your track cable. If your library has a 7 to 14 frame track cable, and you are installing frame 8 or greater, install the X-axis trough liner, P/N 05H7979 **5** in frames 8 through 14. If your library has an 8 to 16 frame track cable, **remove** the trough liner from frame 8 and install trough liners P/N 05H7979 **5** in frames 9 through 16.

Note: The liner protects the foam strips on the trough covers from damage.

a. Hook the left end mounting tabs of the liner on the left end of the trough.

b. Attach the right end mounting tabs of the liner to the trough with two screws P/N 1621510 and tighten the screws.

Note: Due to manufacturing logistics, you may receive an extra trough liner. This liner is not needed and may be discarded after you finish the installation.

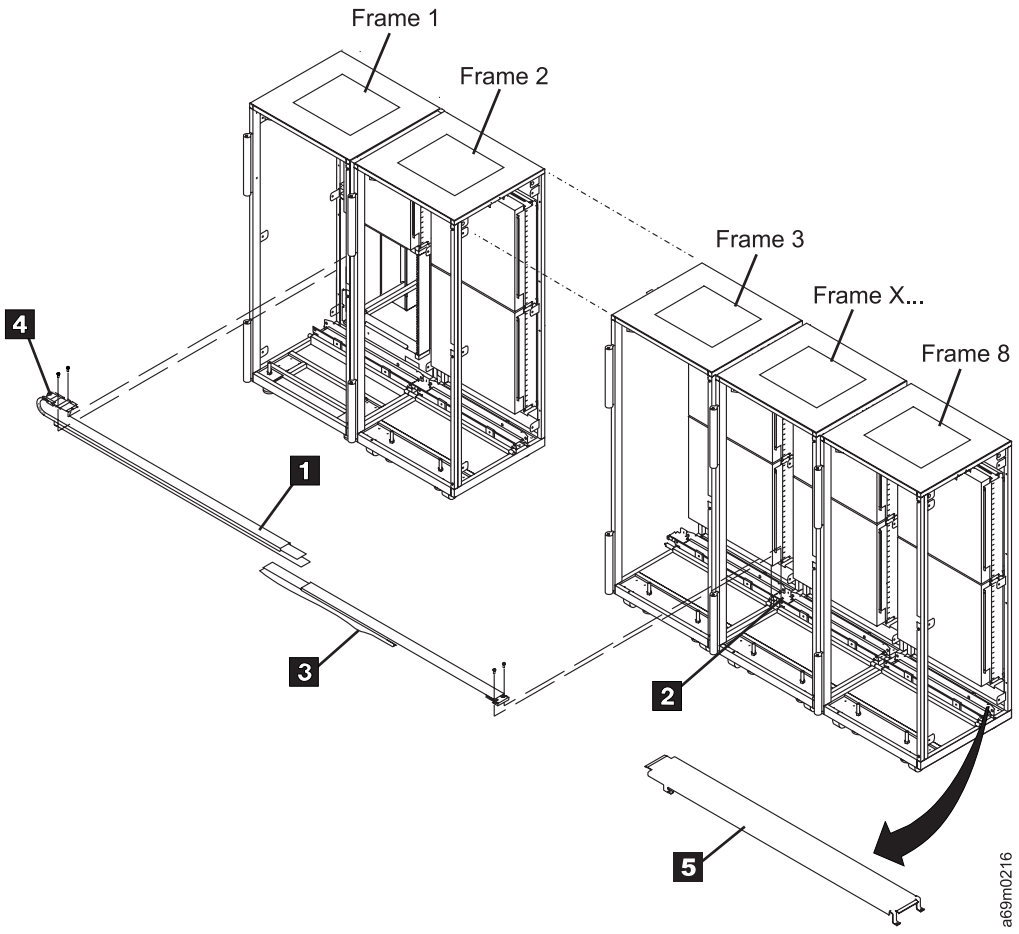


Figure 68. X-Cable Frame Attachment

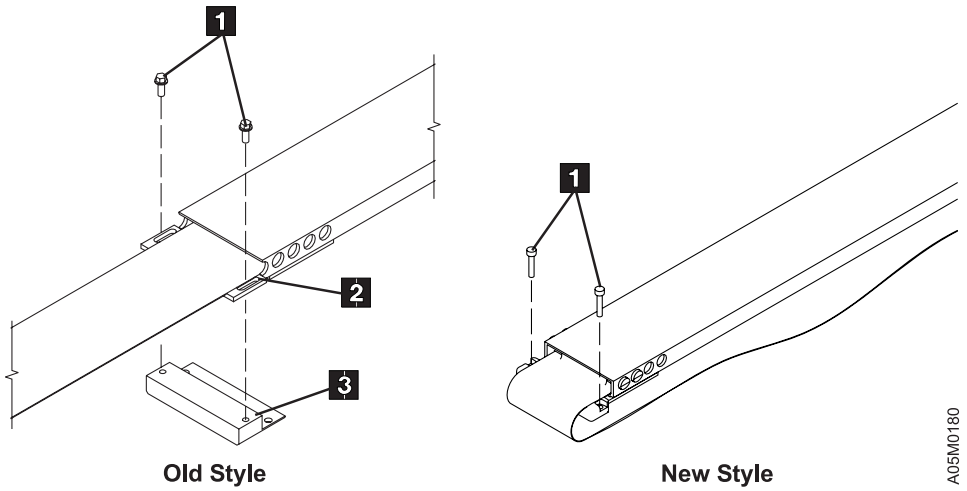


Figure 69. Cable Mounting (Old and New Style)

Note: In the following step, position the X-track cable connector very carefully into the AXY, then rock it gently in place. Pins can easily bend if care is not taken.

__ 66. **Refer to Figure 70.** Move the accessor over the X-axis cable. Loop the accessor end of the cable around the end of the accessor (as shown) and plug it into the AXY card **1** . On the **old style** cable, attach the X-axis cable bracket to the accessor with two screws **2** PN 1621510. On the **new style** cable, slide the metal mounting plate **6** **under** the AXY card. Plug the cable into the AXY card **7** then install two M3x10 screws PN 05H1779 through the larger holes **8** in the card and into the metal plate. Tighten screws securely.

Track cable activities are now complete. Continue with the rest of the installation.

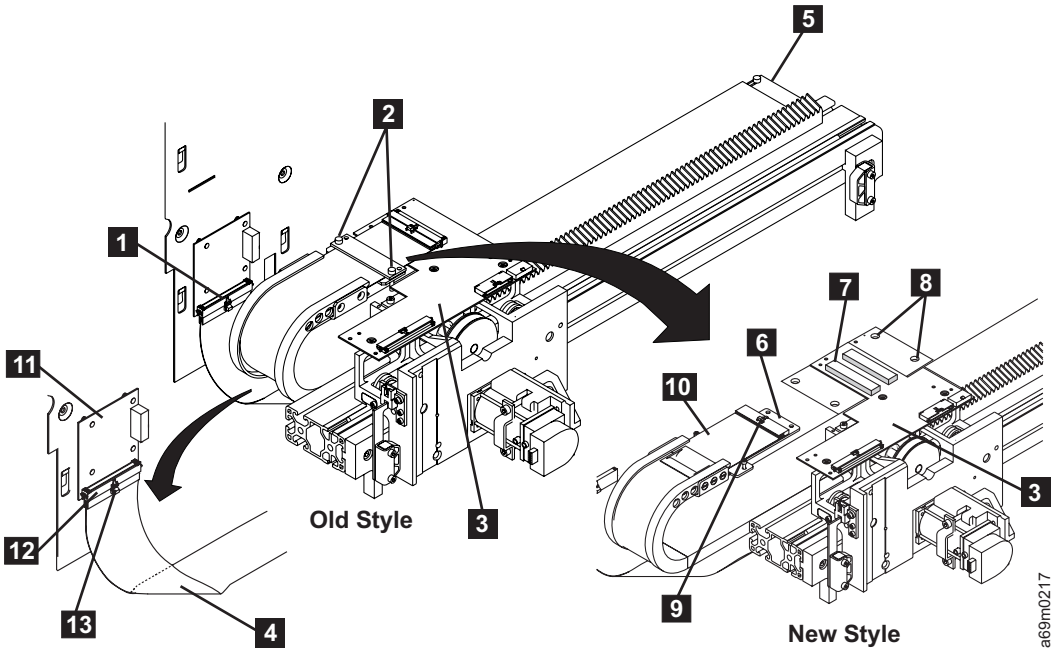


Figure 70. X-Cable to AXY Connections

Table 23. X-Axis Track Cable Positioning

Number of Frames	Cable PN	X-Axis Track Cable attaches to the RIGHT side of:
1 or 2	23R2684	Frame 1
3 to 6	23R2687	Frame 3
7 to 14	23R2695	Frame 7
8 to 16	23R2697	Frame 8

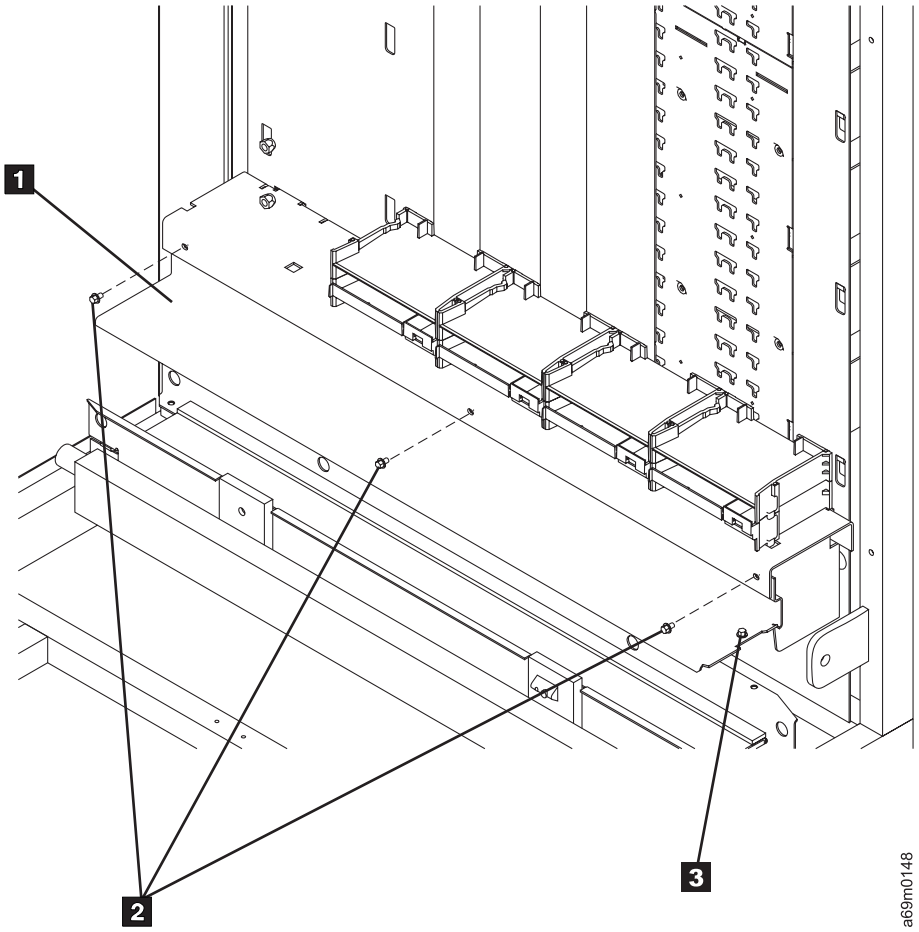


Figure 71. Cable Trough Cover

__ 67. **See Figure 71.** Use screws P/N 1624764 **2** to install the X-rail cable trough covers P/N 35L0192 (Lxx), P/N 35L0185 (Dxx) **1** . Later style trough covers may require only two screws (one on each end, none in the center).

Note: Early level trough covers connect to the previous trough cover with a short screw **3** . If you are installing an early level trough cover with a short screw **3** , ensure that the screw does not protrude below the trough cover since it could damage the X-axis track cable. If it protrudes below the trough cover you must add a washer under the head of the screw to ensure it does not protrude below the trough cover. Later level trough covers will use a tab and slot to connect to the previous trough cover. No short screw **3** is needed for later level trough covers.

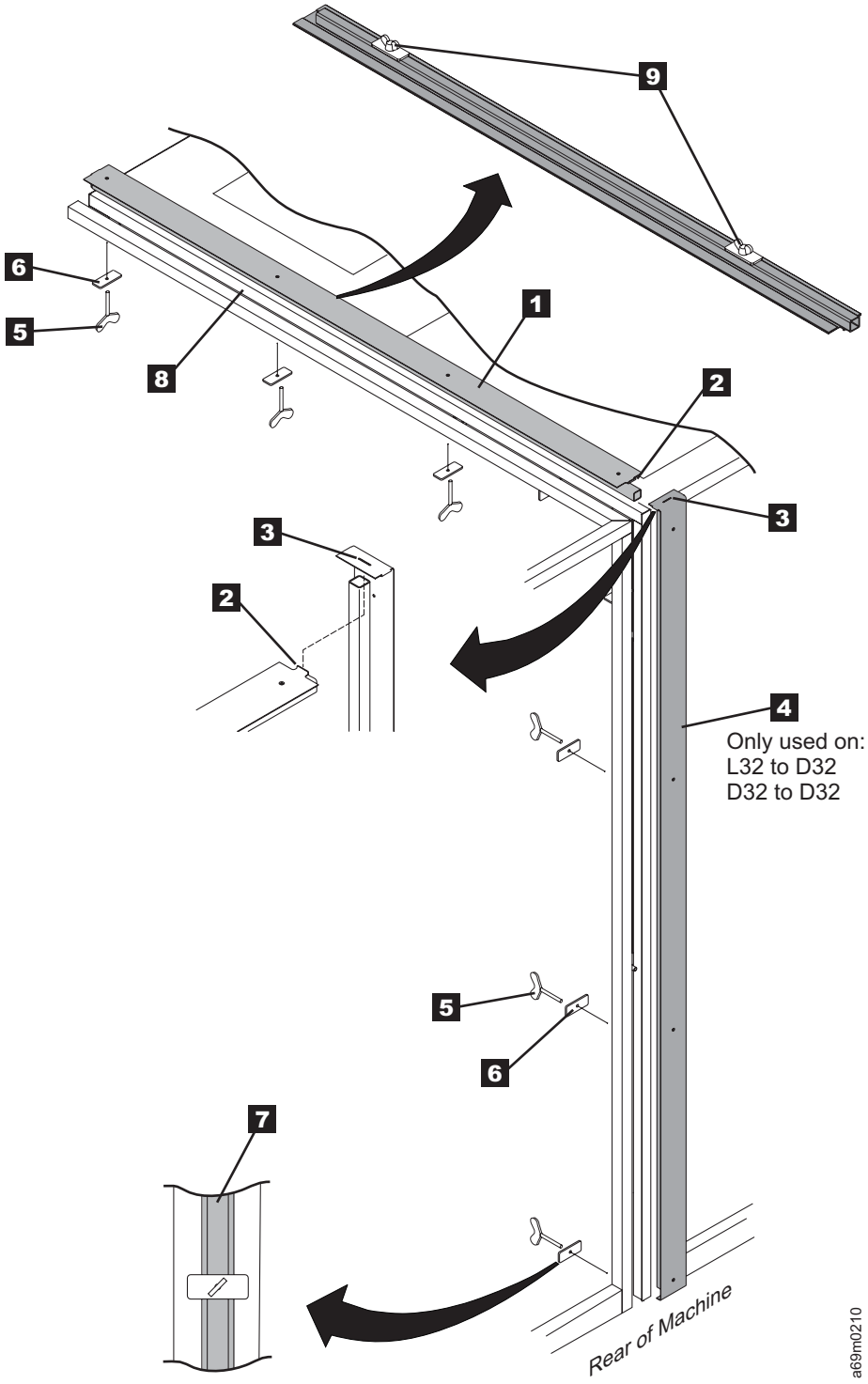


Figure 72. Expansion Frame Spacers - (used on x32 frames only)

__ 68. Move the X-axis back and forth to ensure that the cable moves smoothly without binds or interference anywhere along the X-axis rail, and that it is centered in the track. If the X-track cable is rubbing against the cable trough cover, or not centered in the track, do the following:

a. Remove the trough cover to expose the AXY card.

b. Loosen the X-track cable mounting screws and move the X-track cable mounting plate either towards the front or towards the back, then retighten the screws. Reinstall the trough cover and check the cable operation.

c. You can also adjust the cable where it mounts to the frame. Reinstall the trough cover and check the cable operation.

__ 69. If you installed a **later-style D32 expansion frame**, refer to Figure 72 on page 145 and use the following procedure to install two RFI seals. **Note:** If you are installing a short frame D22, D23, D52, D53, or an x32 to a D22, D23, D52, D53, only the TOP seal is installed using two retainer plates **6** and wing-screws **5** as in **9** (shown upside down for clarity). **Position the wing-screws so they will not hit the top of the accessor as it moves between frames.**

a. The RFI seals **1** and **4** were shipped with the retainer plates **6** and wing-screws **5** already installed.

b. Lay the top seal **1** in place between the frames **8**. Turn the retainer plates **6** so they drop between the frames.

c. On the rear seal **4**, remove the three retainer plates **6** and wing screws **5**.

d. Install the rear seal **4**, hooking the tab **2** on the top seal into the slot **3** on the rear seal.

e. Reinstall the three retainer plates **6** and wing-screws **5** in the rear seal as shown.

f. Position the plates as shown in **7**. Securely tighten the three wing screws on the rear seal first, then tighten the three screws on the top seal.

__ 70. Inspect the grippers to ensure they are still fully-seated in their dual gripper housings.

__ 71. If you have more expansion frames to install, go back to step 1 on page 122 and install the next frame.

__ 72. Tighten the locknuts on the leveling pads of all the frames.

__ 73. If your expansion frame is a new media type (3592 frame in an LTO-only library, or LTO frame in a 3592-only library), install the CE Diagnostic Cartridge (LTO in D52, D53 or 3592 in D22, D23) into column 1, row 1 (on the top left of the rear wall; see Figure 6 on page 22). Each column is identified with a numbered label located below the column. Rows are identified with labels located to the left of column 1.

__ 74. If your expansion frame is a new media type (3592 frame in an LTO-only library, or LTO frame in a 3592-only library), load the new media cleaning cartridge into the library (see “Cleaning the Tape Drive” in the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560).

__ 75. Install the right side covers (removed earlier) to the last expansion frame. If newer short frames (D22, D23, D52, D53) were installed to an L32 or D32, see Figure 57 on page 124 and Figure 58 on page 125 to install the short cover.

Note: In the next step, early-style D32 frames (with rear side covers installed on each frame) require you to route frame-to-frame cables into accessor aisle through foam-covered holes and back into the next frame. On later-style D32 frames (without rear side covers installed on each frame), frame-to-frame cables are routed on the inside the rear of the machine. All D22, D23, D52, D53 frames are considered 'later-style.'

__ 76. Refer to Figure 74 on page 148.

__ 77. Early-Style D32 Frames: Thread the three (frame-to-frame) cables from the rear of the last frame (through the foam covered hole in the upper right corner of the frame bulkhead) to the front of the last frame.

__ 78. Connect interframe power cable from connector J5 of the FIC card in the rear of the last frame to J7 on the previous frame (for more details on FIC card connectors, see Figure 24 on page 48).

Note: Ensure that the cable connector numbers match the FIC card connector numbers (J5 to J5, and J7 to J7).

Continue to connect the power cables (J5 to J7) in all of the frames.

__ 79. Connect the interframe signal cable from connector J6 of the FIC card in the rear of the last frame to J8 on the previous frame.

Note: Ensure that the cable connector numbers match the FIC card connector numbers (J6 to J6 and J8 to J8).

Continue to connect the signal cables (J6 to J8) in all of the frames.

__ 80. Refer to Figure 74 on page 148. Connect interframe EPO cable connectors P23 on the previous frame.

Continue to connect the EPO cables P23 in all of the frames.

__ 81. Ensure that the tethered jumper 1 of the EPO cable is installed on the last expansion frame as shown.

__ 82. Ensure that the jumper is installed on the base frame 4, as shown.

__ 83. The following steps remove extra terminators from the FIC cards. **If these terminators are not removed, they may cause problems with communications between frames and may cause a problem with the power-up sequence. Ensure that you follow the next two steps very carefully. When completed, you should have a terminator on connector J15 3 of the base frame and on connector J16 2 of the last expansion frame. Only the last frame receives the tethered jumper 1.**

__ 84. Remove the multi-pin terminators if present from connector J15 3 on all of the FIC cards in the expansion frames.

__ 85. Remove the multi-pin terminators if present from connector J16 2 on all of the FIC cards, except in the last active Dxx frame.

Note: Excess terminators should be stored on one row of pins on the FIC cards, as shown. Newer FIC cards have FIC terminator jumpers that are black instead of the original blue.

__ 86. See Figure 73. Open the front door. Loosen the two bolts 1 on the frame door roller. Close and lock the front door. From inside the frame push the door roller up until it touches the bracket 2, then tighten bolt 3. Open the door and tighten both bolts 1 securely.

__ 87. Go to “Installing Tape Drives” on page 178.

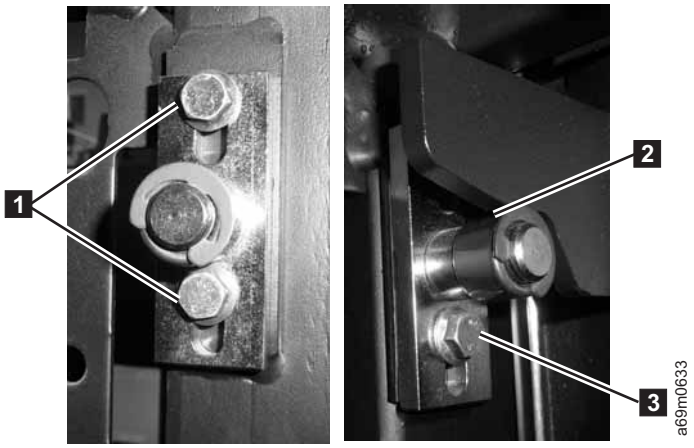


Figure 73. Door Roller Adjustment

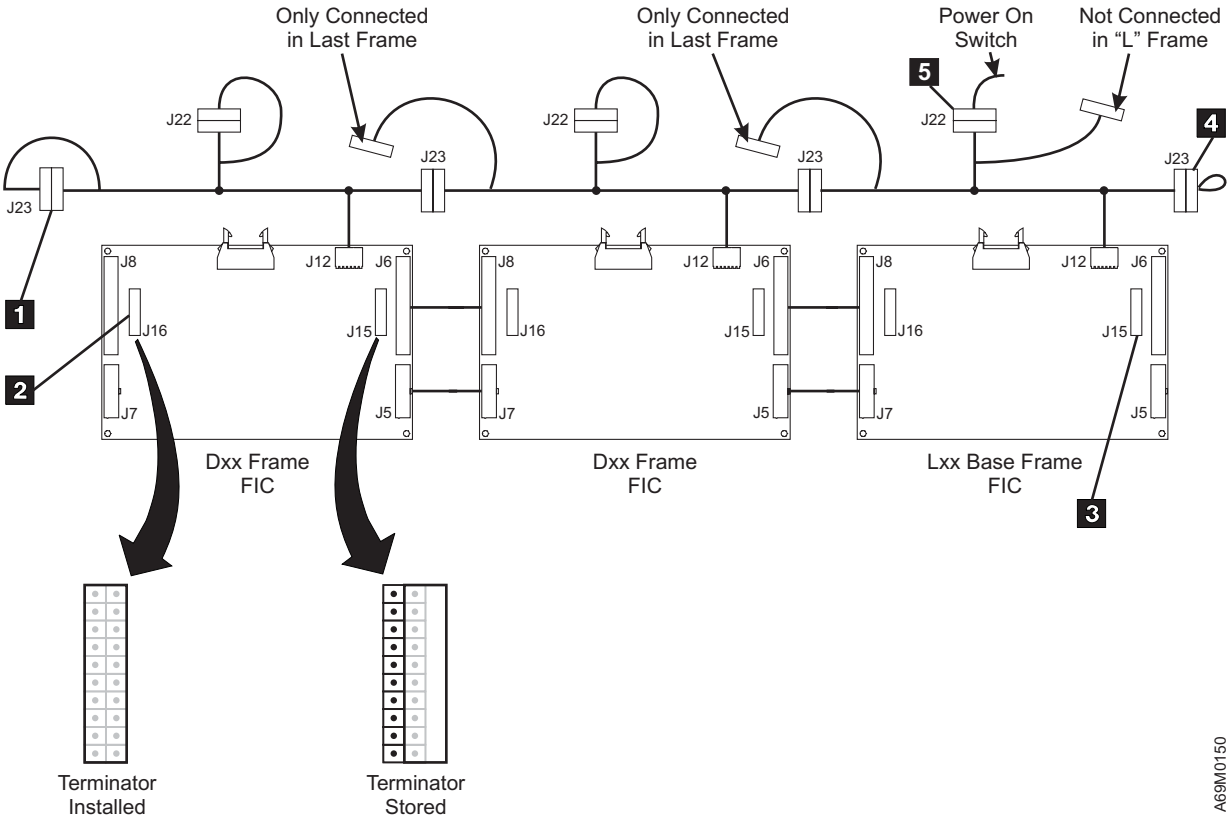


Figure 74. FIC Card Interface Cables Schematic. Three-Frame Example

Dual Accessor Library and Service Bay Installations

Note: You will be directed to “Service Bay 'B' Installation Procedures” on page 150 and “Model HA1 Service Bay 'A' Install Procedures” on page 155 (in that order) for the actual installation procedures.

The purpose of this section is to install a dual-accessor library with Model HA1 (Service Bay A) and Model Dxx (Service Bay B). The service bay on the left-hand side (as you face the front the library) is referred to as Service Bay 'A' or SBA. The service bay on the right-hand side (as you face the front the library) is referred to as Service Bay 'B' or SBB. Any references to **Active frames** are defined as the Lxx and all Dxx frames in the library, excluding the two service bays on either end.

Note:

- Any references made in this MI to the 'previous frame' (except where noted) means the frame to the left of the frame you are installing, as you face the front the library.
- If you are installing a mixed-media library (LTO/3592) ask the customer if they want to group all frames of a particular drive type to be next to similar frames.
- Ensure all previously-installed frames are not resting on the casters, and ensure they are leveled before you begin this procedure.
- Verify that both Service Bays will have correct service clearances on both ends of the library. See the *3584 Introduction and Planning Guide* for more information.

Required library firmware and drive code can be downloaded from the following websites.

For IBM service personnel with access to the Internal PFE website:

`http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

For non-IBM personnel (and those without access to the IBM intranet) see “Loading LTO or 3592 Drive Microcode by Using CETool” on page 711 for information on the external website where library and/or drive code can be downloaded.

__ 1. Continue to install the complete model HA library starting with the Lxx and Dxx storage frames. Go to:

   a. “Base Frame (Lxx) Installation” on page 118 to install the 'L' frame only, then return here. See Notes below.

   b. “Expansion Frame (Dxx) Installation” on page 121 to install the 'D' frames (not including Service Bay B), then return here. See Notes below.

      Notes:

      1) Do not install X-track cables referenced in either the base Lxx or Dxx expansion frame installation sections. The track cables will be installed in this section.
      2) Do not install any of the side covers, cables, or cable trough covers at this time. Those procedures will be covered in this section.
      3) Do not install the end stops. They will be installed later as part of this section.
      4) Accessor “A” is shipped in the Lxx frame; Look for the Dxx frame with Accessor “B”. This is the Service Bay B frame.

Service Bay 'B' Installation Procedures

__ 1. Accessor B and the service barrier are shipped in Service Bay B.

__ 2. Remove all the shipping materials from Service Bay B, including the ties at the top of the accessor and the accessor locking pin at the bottom.

__ 3. The door keys are taped to the front door handle.

Attention - Storing the Service Barrier

a. Refer to the following figures.
b. The bottom mount **2** on the service barrier is detented to hold it in place during use. This mount pivots up and out of the way for storage.
c. To store the service barrier, pivot the bottom mount away as shown in Figure 76 and Figure 77.
d. Refer to **Figure 75.** Store it in Service Bay A by hanging the two tabs **1** on the document holder, or bracket, on the inside rear cover. Now slide the barrier towards the hinge-side so it will not interfere with the door lock. If no document holder exists, store the service barrier either in another frame with a document holder or in another out-of-the-way location.

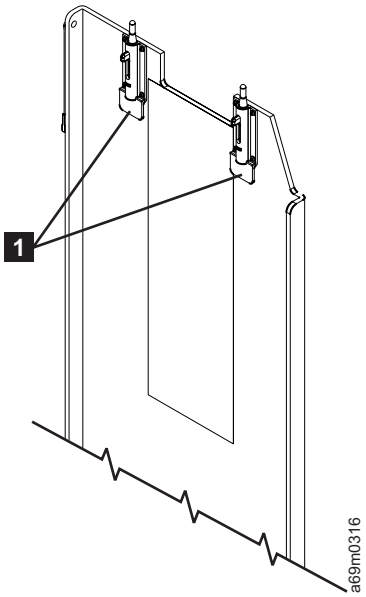


Figure 75. Service Barrier

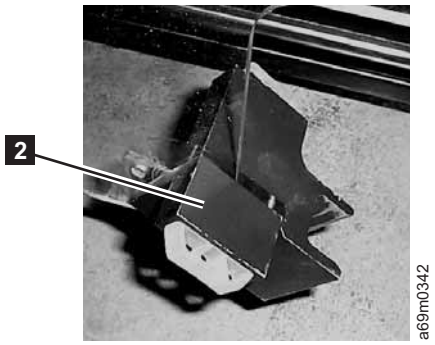


Figure 76. Partially Pivoted

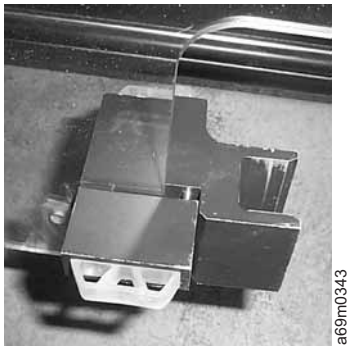


Figure 77. Fully Pivoted

__ 4. Open the front and rear doors.

__ 5. Remove both right-hand side covers from the previous Dxx frame (if not already removed).

__ 6. **See Figure 78.** Accessor 'B' is shipped on a temporary orange plastic rail **1** in Service Bay B with a locking pin at the bottom.

__ 7. Hold and support the accessor by the 'Y' mast, and carefully slide the accessor out the right side of Service Bay B. Stand it upright very carefully in a secure location so as not to damage the accessor bearings.

__ 8. Remove the orange plastic shipping rail **1** from Service Bay B by sliding it out to the right. Discard this shipping rail, and wipe clean any plastic residue from around the lower rail where the plastic shipping rail was installed for shipment. If debris is present, also wipe the bottom of the accessor bearings.

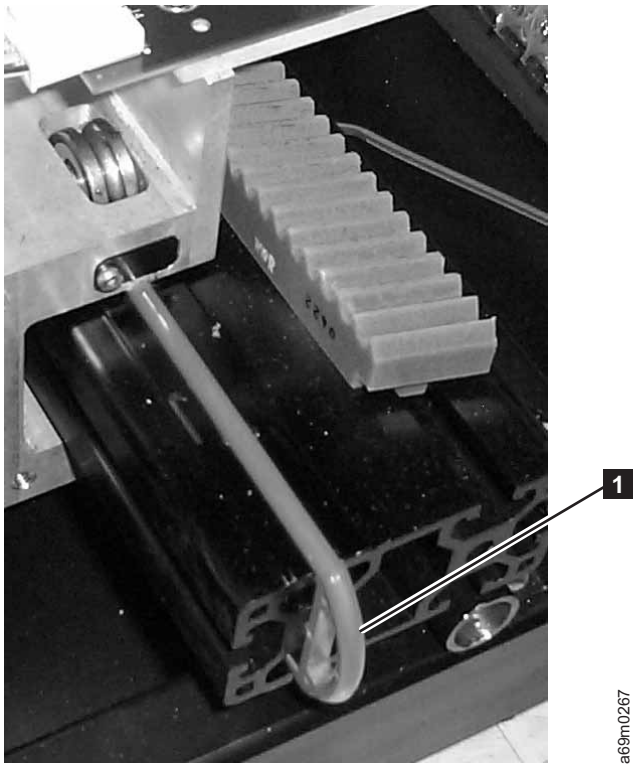


Figure 78. Accessor Rail Guide Shipping Rod

__ 9. Steps for installing Service Bay B are similar to installing a typical Dxx expansion frame. Perform **steps 9 on page 127** through **step 54 on page 134** to only install and level Service Bay B. **Then return here** to continue the installation.

__ 10. **See Figure 79 on page 152.** Install the short orange plastic rail tool **1** PN 18P9496 (included in the ship group) into the right side of the rail in Service Bay B.

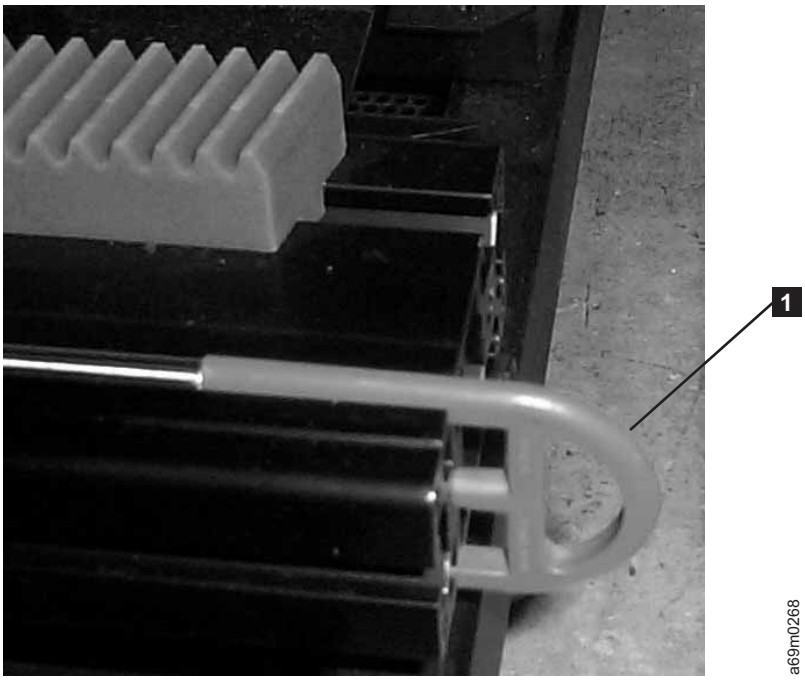


Figure 79. Accessor Rail Guide Install Tool

__ 11. **See Figure 80 on page 153** and **Figure 81 on page 153**. There are four felt or rubber pads **1** (two at the front of the accessor and two at the rear). These pads ride on the top and bottom rods. Ensure the pads on the accessor are aligned with the top and bottom rods as you reinstall the accessor into Service Bay B (using the short plastic rail tool as a guide).

__ 12. **See Figure 82 on page 153.** Carefully align the top of the accessor bumper **1** in the upper guide rail **2** . Remove the rail tool. It is not needed for the procedures that follow.

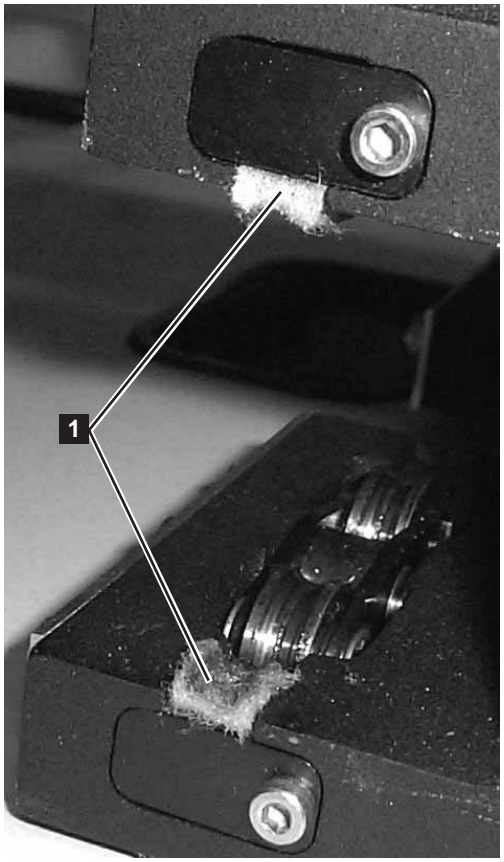


Figure 80. Felt Pads

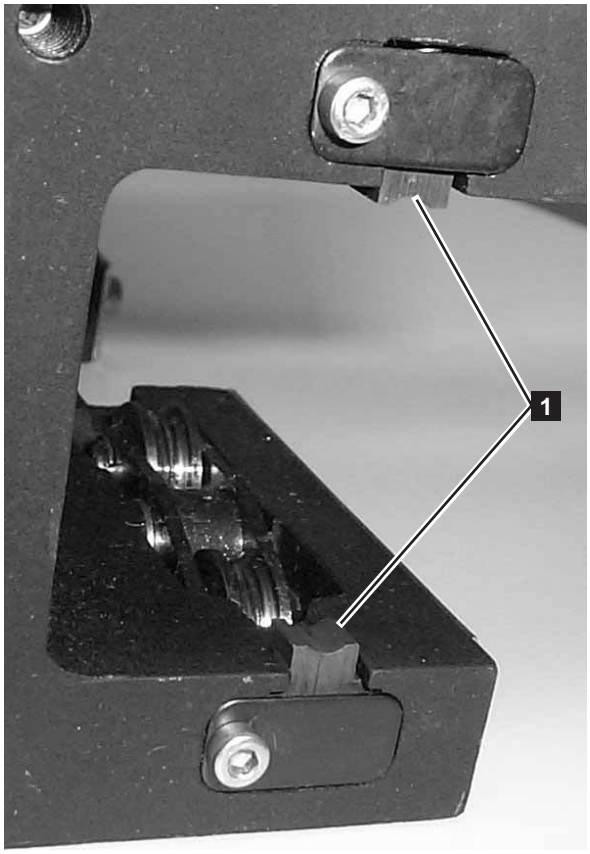


Figure 81. Rubber Pads

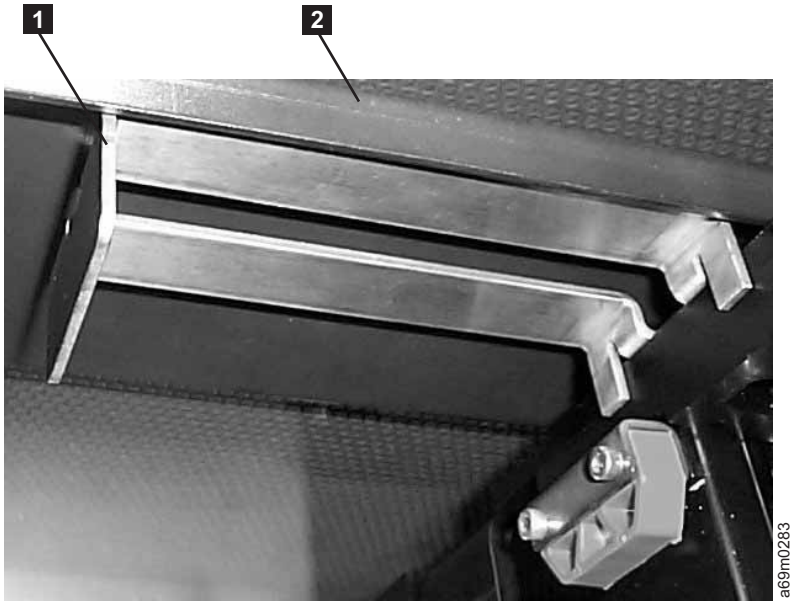


Figure 82. Accessor B Top Guide

__ 13. **See Figure 83** and **Table 21 on page 116**. Install the end stop **tight** against the frame in Service Bay B. Remove the screw **2** . Slide the T-nut into the rail. Position the end stop and reinstall the screw **2** . Position the stop **1** **tight** against the inside of the Service Bay B frame and tighten the screw securely.

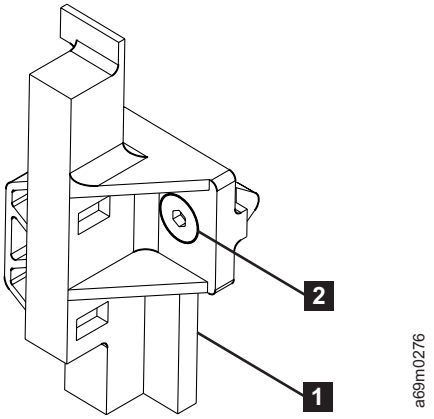


Figure 83. SBB End Stop Assembly

Attention – For libraries that will have 16 Active Frames

Perform the following steps to relocate the XCP card and cable in Service Bay B for libraries that will have 16 active frames:

__ 1. At the front of Service Bay B, remove the XCP card (located in the lower right-hand side) and disconnect the cable. Push the cable out through the foam opening.

__ 2. At the back of Service Bay B, pull this cable up from the frame then route the cable down the **right** side of the drive shelves (and to the left of where frame power would be located).

__ 3. From the rear of the frame, push the cable through the foam opening at the bottom where the XCP card will be relocated.

__ 4. At the front of Service Bay B, carefully plug this cable into the XCP card, then re-mount the card on the frame.

__ 5. **Figure 97 on page 167** shows XCP card locations (for Accessors A and B) for 16 active-frame libraries, and for less than 16 active-frame libraries. These locations are different because of different size X-track cables provided for a 16 active-frame library.

Service Bay B Installation in an HA Library

If you were using this Service Bay B Installation procedure to install a Service Bay B using install instructions **PN 96P1241** (FC 9040 / FC 1440), **stop here** and return to the step in those instructions that sent you here. If not, then continue at the next step.

Model HA1 Service Bay 'A' Install Procedures

Note: Service Bay A installs to the left of the Lxx frame. Ensure the side covers have been removed from the Lxx frame, if not already done.

__ 1. Remove the shipping materials attached to Service Bay A.

__ 2. **See Figure 84.** In an L22, L23, L52, L53 frame, remove the accessor locking pin **1** and lay it in the base of the frame. Ensure it will not interfere with accessor movement.

__ 3. **See Figure 85.** In an L32 frame, remove the shipping brackets (if present) **1** and **2** located near the bottom of the accessor, and the locking pin **3** . Store the brackets, screws, locking pin and cable in the rear base of the Lxx frame.

__ 4. **Refer to Figure 86 on page 156.** Locate the upper X-axis guide rail **1** in Service Bay A. Loosen the four screws holding the guide rail and slide the guide rail to the left so it will not interfere when joining Service Bay A and Lxx frames together.

Note: The slots in the guide rail are keyed, so if you slide the guide rail too far to the left it can come off the screws. Tighten a couple of the screws to keep the top rail in place while you continue the installation.

__ 5. Move Accessor A out of the Lxx frame into one of the Dxx frames.

__ 6. If present, remove the left-hand end stop.

Table 24. Accessor Shipping Pins & Brackets

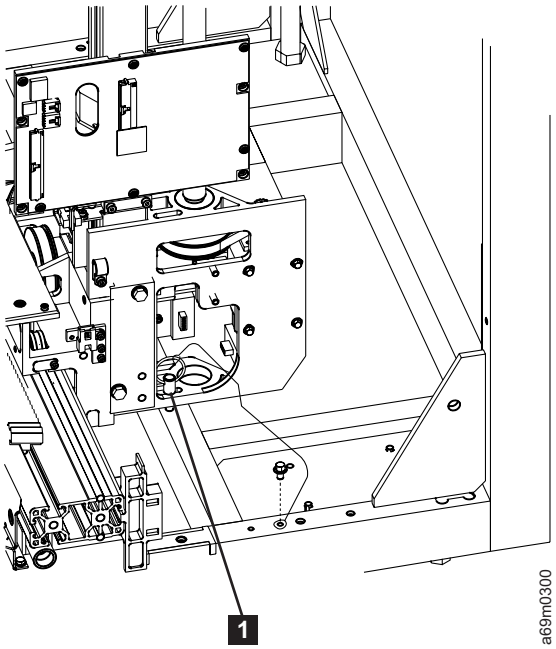


Figure 84. Lxx Accessor Shipping Bracket - (L22, L23, L52, L53 frames only)

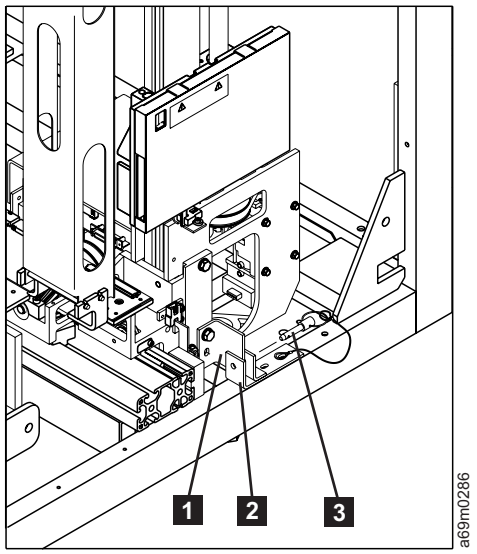


Figure 85. Lxx Accessor Shipping Bracket - (L32 frames only)

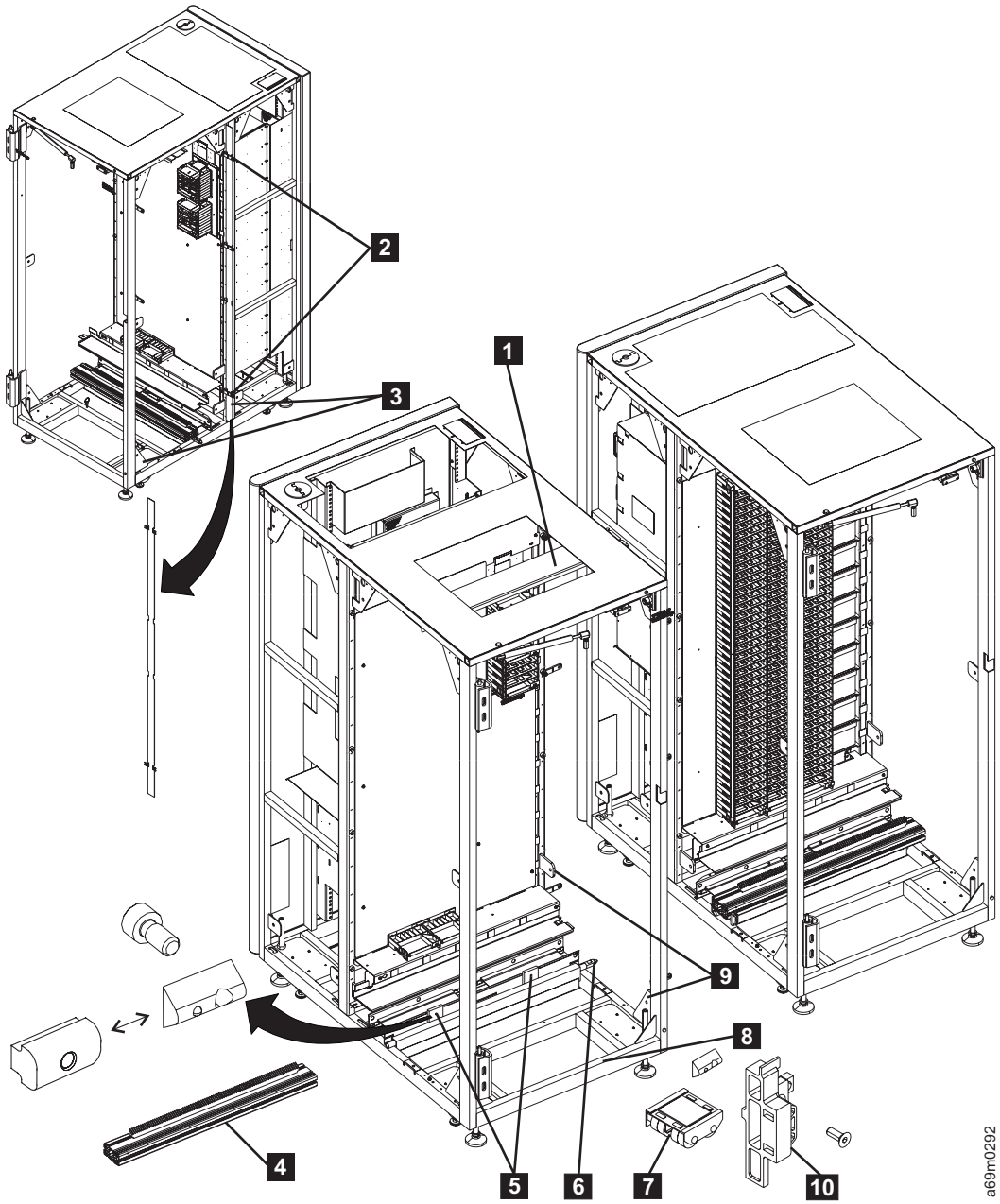


Figure 86. Frame-to-Frame Attachment. Some components have been removed for clarity

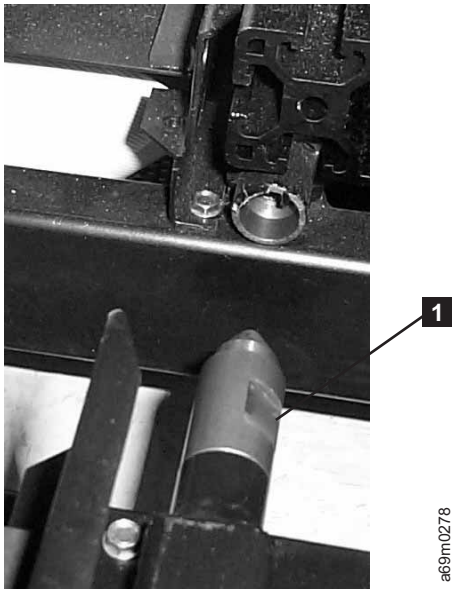


Figure 87. Service Bay A Frame Alignment Rod

Note: The upper guide rail, lower X-rail and rods, trough cover, and alignment rod are **packaged separately** from the frame. Locate those parts for the following steps.

__ 7. See **Figure 87.** Locate the alignment rod and install it on the bottom right in the Service Bay A frame. Ensure the alignment rod is fully seated in the frame. Move Service Bay A into position beside the Lxx frame. The alignment rod **1** should just touch the previous frame, and the front of the two frames should be approximately even.

__ 8. Loosen the locknuts on Service Bay A leveling pads and unscrew the locknuts upwards approximately 38 mm (1.5 in).

__ 9. **Refer to Figure 86 on page 156.** Place a frame skate **7** P/N 05H7999 under each of the two leveling pads on the right side of the frame you are installing, and lower the leveling pads into the recessed area on top of each frame skate. The skates should be positioned so they will roll toward the Lxx frame.

__ 10. Raise the right side of Service Bay A by adjusting the right-side leveling pads evenly until the alignment rod is aligned with the hole in the Lxx frame.

Note: The right side of Service Bay A is supported by the leveling pads and frame skates. The left side of the frame is resting on the casters. Do NOT lower the left side leveling pads until instructed to do so.

__ 11. Carefully push Service Bay A against the Lxx frame until the alignment rod is fully seated in the hole of the Lxx frame. The front of Service Bay A should be parallel to the front of the Lxx frame.

Note: You must not push so hard that you move the Lxx frame. If the alignment rod is at the correct height, and if the frames are in line along the X-axis, then the alignment rod can easily be pushed into its seat.

__ 12. **See Figure 88 on page 158.** Install the E-shaped alignment tool **1** PN 24R0183 in the lower rear frame members between the Lxx frame and the new Service Bay A. This tool ensures correct frame spacing between frames at the back. Leave the tool in place for now. The tool should also be used at the front and top to further check correct frame alignment.

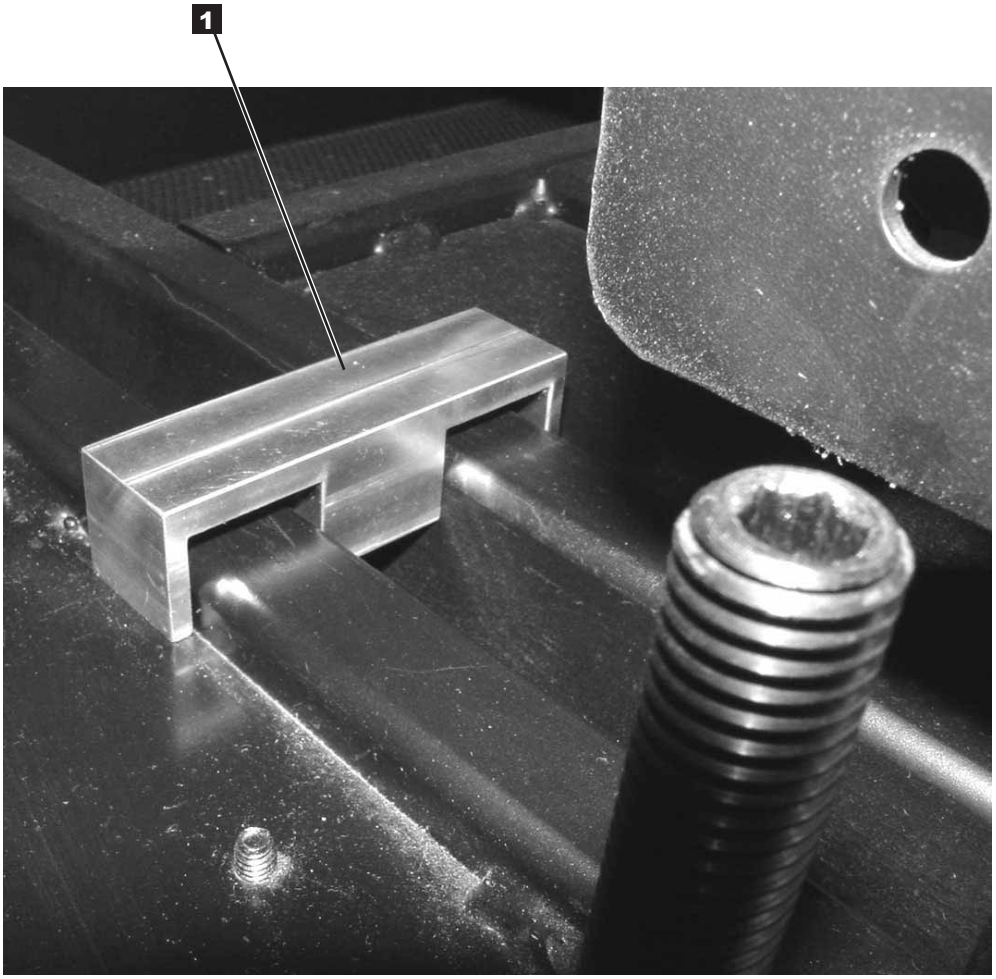


Figure 88. E-Tool for Rear Frame-to-Frame Alignment

__ 13. **See Figure 86 on page 156.** Insert an M8 bolt (P/N 1621592) from the right, through the hole in the lower front frame stiffener **9** in the Lxx frame and through the corresponding hole in the Service Bay A frame. Install and finger-tighten nut P/N 1622406 on the bolt.

__ 14. Repeat the previous step, installing another bolt through the lower frame stiffener at the rear of the accessor aisle.

__ 15. Tighten the two M8 bolts located in bottom corners **9** of the accessor aisle until they are just snug. **Do not overtighten or bend the tabs.**

Note: These bolts ensure that the alignment rod will not fall out of the hole in the Lxx frame.

__ 16. Raise the right-side leveling pads of Service Bay A off the frame skates. The weight of Service Bay A will be on the alignment rod and the left side casters.

Note: This will allow alignment of the frames using only the two leveling pads on the left side of Service Bay A.

__ 17. Remove the frame skates and store them in rear of the Service Bay B frame. **DO NOT lower the leveling pads on the right-side of Service Bay A until instructed to do so.**

__ 18. If you are installing on carpet, put a carpet pad P/N 05H7004 under each of the leveling pads.

__ 19. Lower the left side leveling pads until they just touch the floor.

__ 20. Re-tighten the two M8 bolts located in bottom corners **9** of the accessor aisle until they are snug. **Do not overtighten or bend the tabs.** The frames should now be parallel to one another.

__ 21. Place the level 8 on the lower **front** frame member in Service Bay A. **Do NOT place the level on the X-rail, or any other frame member.** Lower the two leveling pads using equal turns on the left side of Service Bay A until the frame is level (left to right). Ensure that the alignment rod 6 was not driven out or allowed to slip out when you tightened the M8 bolts 9 .

Note: The bubble should be centered between the two lines.

- If the bubble is too far to the right, raise the left side of the frame by lowering **both** left-side leveling pads.
- If the bubble is too far to the left, lower the left side of the frame by raising **both** left-side leveling pads.
- Refine the left side leveling pad adjustments until the bubble is centered between the two lines.

__ 22. Install the upper X-rail 1 . **Note:** The upper rail in the HA frame does NOT overlap the upper rail in the Lxx frame, as other library frames do. Instead, the HA rail butts up against the Lxx rail with no overlap.

a. Slide Service Bay A upper X-rail 1 to the right, and visually check the alignment of the front vertical surface of the two upper X-rails. Adjust as follows:

- Use the LEFT SIDE leveling pads only. To move the upper X-rail in Service Bay A toward the rear, raise the front of the machine and lower the rear of the machine an equal amount. The front vertical surface of the upper X-rail is the critical surface, and is used as a track for the top roller of the accessor.

  OR

- Use the LEFT SIDE leveling pads only. To move the upper X-rail in Service Bay A toward the front, lower the front of the machine and raise the rear of the machine an equal amount.

b. Butt the two upper X-rails together (they do **not** overlap into the Lxx frame as other top rails do). The upper X-rail vertical edges should be touching. Tighten the screws.

c. Re-tighten the two M8 bolts located in bottom corners 9 of the accessor aisle until they are snug. **Do not overtighten or bend the tabs.**

__ 23. Recheck the upper X-rail to ensure it is still aligned with the previous frame and adjust, if necessary.

__ 24. Recheck the frame left to right to ensure it is still level.

__ 25. Turn both right-side leveling pads by hand until they are snug to the floor, then tighten them an additional 1/4 turn (90°). **Do not overtighten, as this may raise the library.** Tighten the locking nuts on the four leveling pads.

Replacing the 'L' Rail in the Lxx frame:

__ 26. Make sure the accessor is moved out of the way for the following steps.

__ 27. You will remove the existing 'Lxx' X-rail and install a new 'Dxx' X-rail in the Lxx frame to accommodate Service Bay A.

Note: The removed 'Lxx' X-rail (with its rods) will not be reused, as it is difficult to remove the rods without damage. This rail can be discarded. A new 'Lxx' X-rail is provided for the Service Bay A frame.

Do the following:

__ a. Remove the left-hand end stop in the Lxx frame (if not already removed).

__ b. Using a 3mm allen wrench, loosen the setscrews in the long T-nut between the Lxx and Dxx frames, and slide it to the right into the adjacent Dxx frame.

__ c. Loosen the T-nuts on the lower Lxx X-rail.

__ d. Use a heavy-duty screwdriver as a wedge to pry the L X-rail to the left and away from the Dxx X-rail. Slide the rail out of the frame. This rail will NOT be reused and can be discarded.

__ e. Leave the T-nuts in the Lxx frame loose.

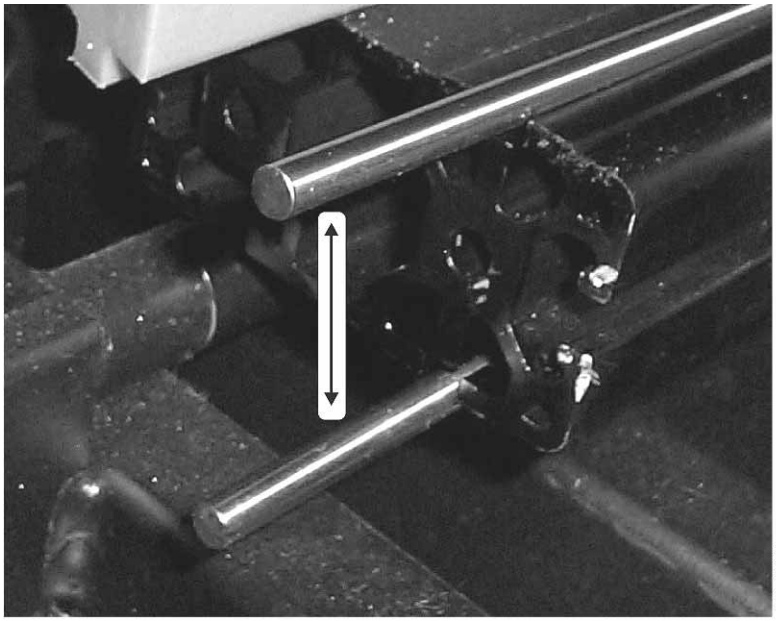


Figure 89. Rods Spread in Dxx Frame

__ f. **See Figure 89.** In the adjacent Dxx frame, use your fingers to pry the upper and lower rods open slightly so a new 'D' rail can be installed in the Lxx frame.
__ g. Slide a new 'D' rail PN 34G9611 into the Lxx frame and slightly tighten the nuts.
__ h. Place the rack alignment tool **6** on the junction of the two gear racks.
__ i. Hammer the rack alignment tool onto the racks until the tool is fully seated in the gear teeth on both X-rail assemblies. Ensure no gap exists between the tool teeth and the rail teeth.
__ j. Keep the alignment tool in place for the next step.
__ k. Hold downward pressure on the right-hand side of the rack while you tighten the right-hand short T-nut **3** .
__ l. Hold downward pressure on the left-hand side of the rack while you tighten the left-hand short T-nut **3** . Recheck the track alignment by ensuring the rack alignment tool does not rock left-to-right.
__ m. **See Figure 90 on page 161.** Slide the long T-nut **2** back between the Lxx and Dxx frames and tighten the setscrews securely using a 3mm allen wrench.

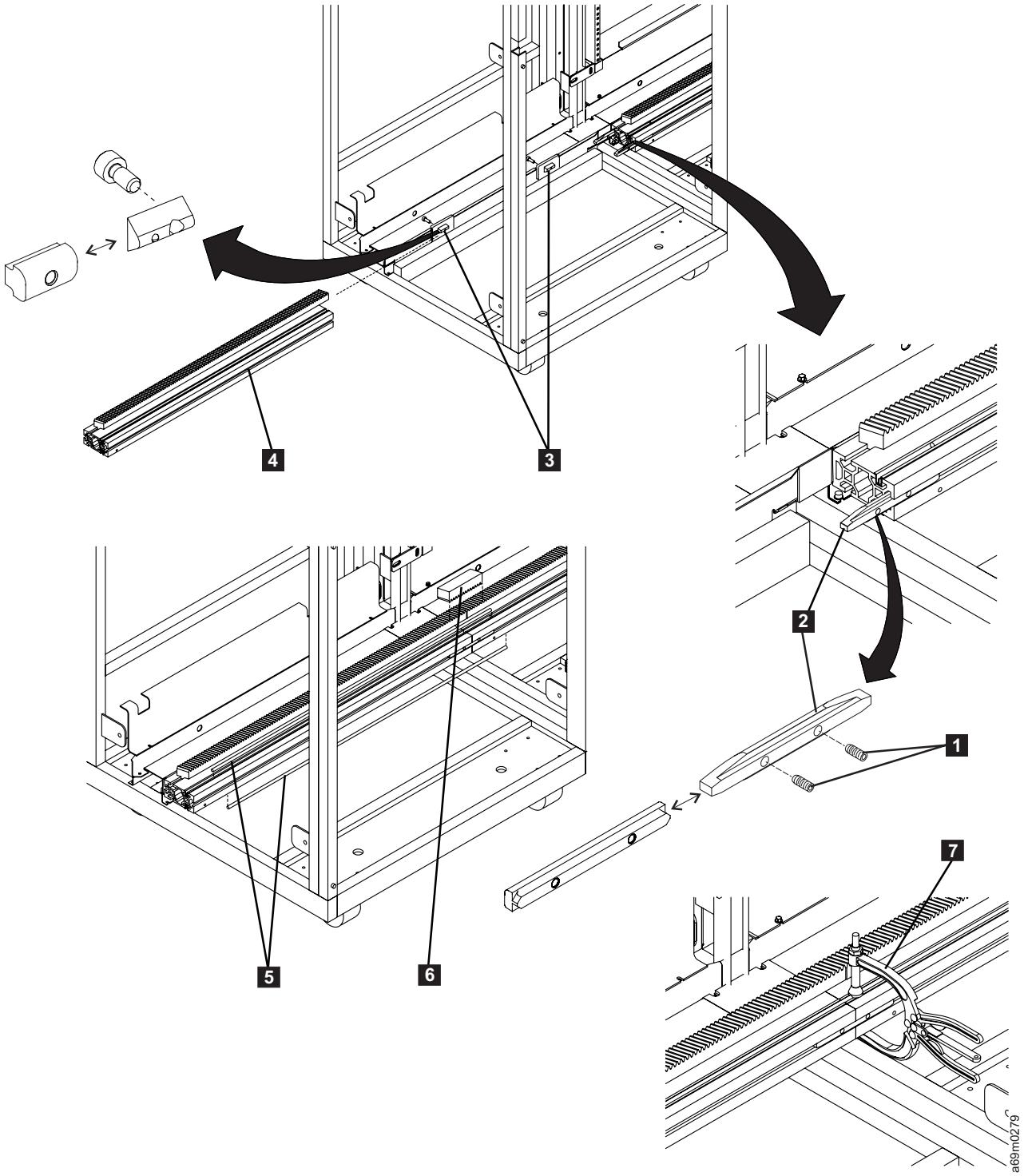


Figure 90. Service Bay A Frame with Lxx Frame

Installing the Lower Rail in Service Bay A:

__ 28. **See Figure 90 on page 161.** Install two T-nut bolts and screws 3 in Service Bay A. Leave the screws loose to allow X-rail installation.

__ 29. Verify that no debris or burrs exist on the bottom of the lower X-rail geared rack.

__ 30. Use a 3mm allen wrench to install the setscrews P/N 23R4661 1 into the long T-nut P/N 23R2334 2 , if not already installed.

Note: The T-nut should have the setscrew sockets facing the front.

__ 31. Slide the long T-nut 2 into the X-rail assembly of the Lxx frame.

__ 32. Install the new lower X-rail 4 PN 24R1695 in Service Bay A until the gear teeth of both X-rail surfaces are touching. The lower X-rail assembly should slide freely into the Service Bay A frame. If not, recheck frame alignment. **Never force the X-rail assembly into the frame**.

__ 33. Slide the long T-nut between the two rails.

__ 34. Snug, but do not fully tighten, the long T-nut 1 (setscrews) using a 3mm allen wrench, and the two short T-nut 3 screws using a 5mm allen wrench.

__ 35. Place the rack alignment tool 6 on the junction of the two gear racks.

__ 36. Hammer the rack alignment tool onto the racks until the tool is fully seated in the gear teeth on both X-rail assemblies. Ensure no gap exists between the tool teeth and the rail teeth.

__ 37. Keep the alignment tool in place for the next step.

__ 38. Hold downward pressure on the right-hand side of the rack while you tighten the right-hand short T-nut 3 in Service Bay A.

__ 39. Hold downward pressure on the left-hand side of the rack while you tighten the left-hand short T-nut 3 . Recheck the track alignment by ensuring the rack alignment tool does not rock side-to-side.

__ 40. Tighten the setscrews on the long T-nut 1 using a 3mm allen wrench.

__ 41. Starting approximately 76 mm (3 in.) to the right of the rods that were spread apart earlier (when the Lxx rail was removed), use the bearing rod clamp tool 7 (working from right to left) to fully reseat the rods in the Dxx frame.

__ 42. There are two sets of bearing rods (2 long rods and 2 shorter rods). The longer rods will be installed in the Lxx frame, and the shorter rods will be installed in the HA frame.

__ 43. Place the two X-axis bearing way rods 5 in their slots against the X-rail assembly rods in the Lxx frame. One X-axis bearing way rod goes on top and the other goes on the bottom of the lower edge of the X-rail assembly.

__ 44. **Ensure each sets of rods touch the rods in the previous frames. They must be tight end-to-end.**

__ 45. Starting from the right end, ensure the rods are up against the rods in the previous frame then press the rods in place with the bearing shaft clamp tool PN 50G0405 7 . The rods fit tightly in the recesses of the X-rails, so start on the right side and clamp the shafts in place about every 50 mm (2 in.) to the fully-seated position.

__ 46. Now install the rods in Service Bay A using the same procedure.

Notes:

a. If the rods do not seat fully, adjust the bearing shaft clamp tool to provide more pressure to the rod.

b. **Do not** use the accessor to press the rods into place. While this may have worked on 3494, it will not work on 3584 because the lower wheels are spring-loaded causing the accessor to 'ride up and over' any rod that is not fully seated.

__ 47. **Refer to Figure 91** and Table 21 on page 116. The Service Bay A end stop PN 18P9492 will be installed **tight** against the **outside** 1 of the frame as shown. **See Figure 92.** Install Service Bay A end stop PN 18P9492 flat 3 **tight** against the **outside left** of the frame. Tighten screw 2 first, then tighten the setscrew 1 securely.

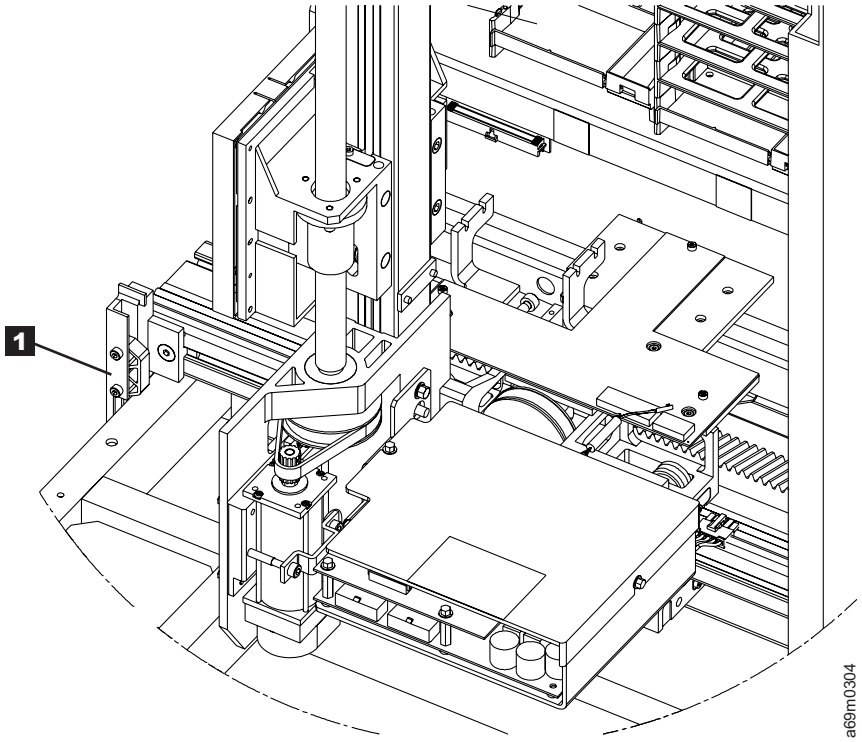


Figure 91. Service Bay A End Stop Location

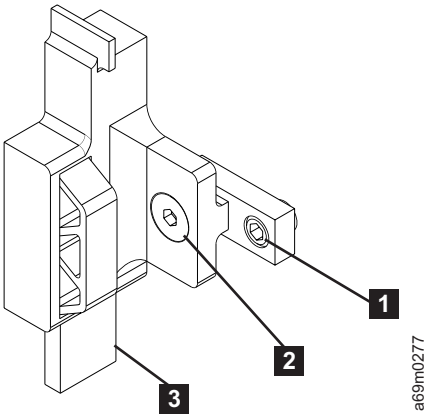


Figure 92. Service Bay A End Stop

__ 48. **Refer to Figure 93.** Install the frame-to-frame spacer **1** between the Lxx and SBA frame at the inside back of the frame, and the black-colored spacer **2** (between frames) in the last Dxx and SBB frame at the inside front of the frame. You may have to loosen and/or remove the screws and attachment brackets before you install the spacers. When you reinstall the screws and attachment brackets, be sure to position the brackets in the correct position, and reinstall the screws in the same location where they were removed.

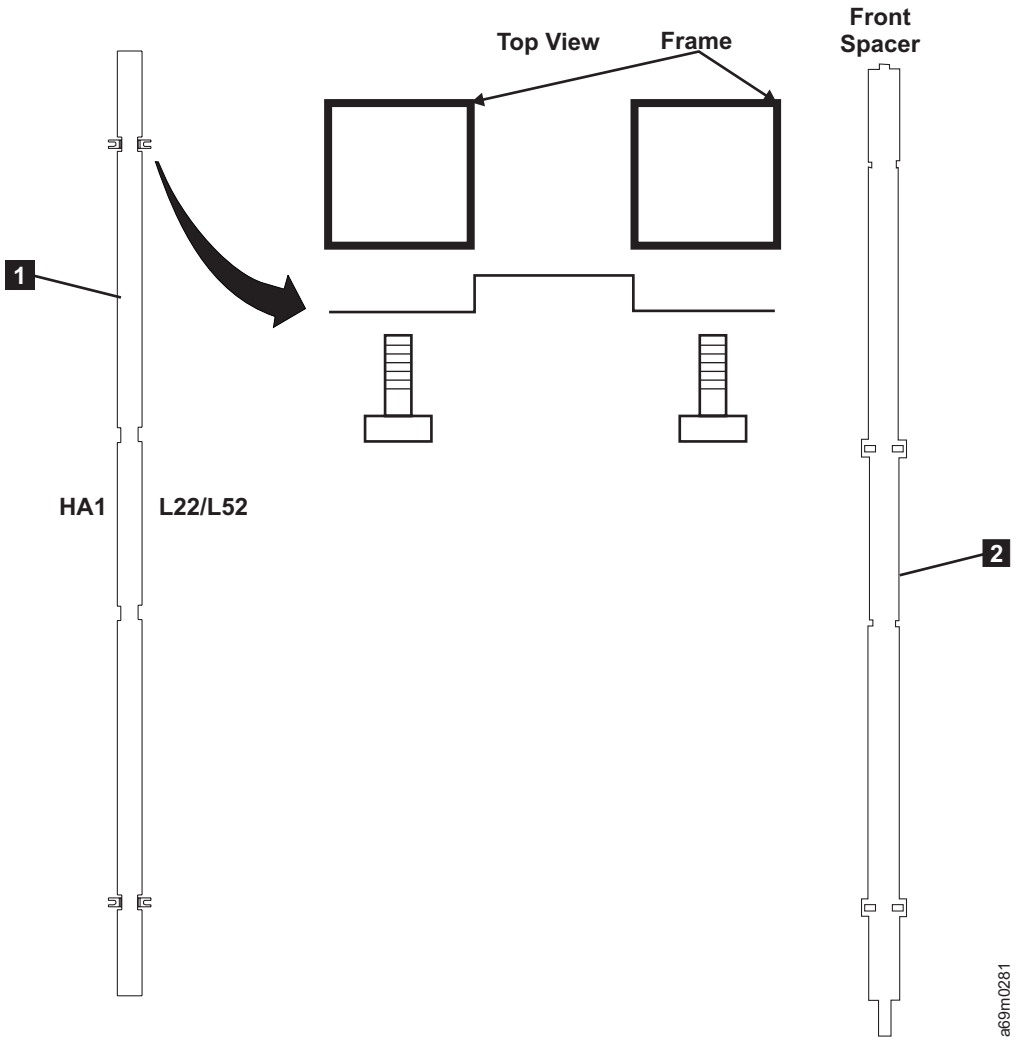


Figure 93. Frame to Frame Spacers with New Style Frames

__ 49. **Refer to Figure 94.** Locate the frame-to-frame attachment brackets **1** that are factory-mounted on the right side of Service Bay A. Locate screws **2** P/N 1624790 provided in the ship group. You will install them in the following steps.

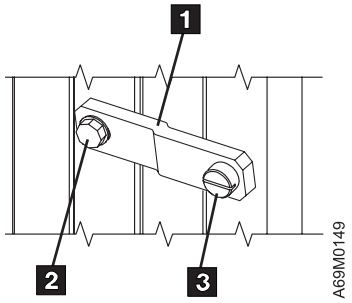


Figure 94. Service Bay A Attachment Bracket – Positioning

__ 50. **Refer to Figure 95.** Connect a frame-to-frame attachment bracket **1** near the top of the front vertical frame, connecting Service Bay A to the Lxx frame.

Notes:

a. The slotted side of the bracket **1** must be on Service Bay A.

b. The remaining screw **2** must be installed in the slotted hole.

c. Follow the same procedures on the other brackets.

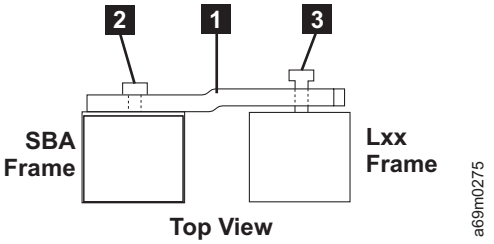


Figure 95. Expansion Frame Attachment Bracket — Offset

Service Bay A Installation in an HA Library

If you were using this procedure to install a Service Bay A using install instructions **PN 96P1241** (FC 9040 / FC 1440), **stop here** and return to the step in those instructions that sent you here. If not, then continue at the next step.

Dual Accessor FIC Cable Connections

Before you install the X-track cables, you must move the XCP card from the Lxx frame to Service Bay A using the following steps:

__ 1. **Refer to Figure 96 on page 167.** Carefully unsnap the XCP card from the back wall. Disconnect the cable **3** from the XCP card **2**.

__ 2. Push the cable out through the foam opening **4** into the rear of the frame. **Note:** On older L32 frames, the cable may be secured at the back with a clamp which can be removed.

__ 3. Disconnect the other end of this cable at J1 on the FIC card. Pull the cable up and out of the frame. This cable will not be reused and can be discarded.

__ 4. Locate cable PN 95P3183 which was included in the ship group. Find the end of the cable with the label "FIC-J1." This cable also has a special label showing where to connect the cable to the FIC.

__ 5. At the back of Service Bay A, plug this end of the cable into the FIC at J1.

__ 6. **For libraries that contain less than 16 Active frames:**

- At the back of Service Bay A, route the cable down the **right** side of the drive shelves (and to the **left** of where frame power would be located).

__ 7. **For libraries that contain the maximum 16 Active frames:**

- At the back of Service Bay A, route the cable down the narrow opening immediately to the **left** of the drive shelves.

__ 8. **Figure 97 on page 167** shows XCP card locations (for Accessors A and B) for 16 active-frame libraries, and for less than 16 active-frame libraries. These locations are different because of different size X-track cables provided for a 16 active-frame library.

__ 9. From the rear of the frame, push the cable through the foam opening where the XCP card will be mounted.

__ 10. At the front of Service Bay A, carefully plug this cable into the XCP card (that you removed from the Lxx frame) at **3**.

__ 11. Now mount the XCP card **2** in Service Bay A by carefully snapping it in place in the holes provided.

__ 12. (See 'Terminator Installed' and 'Terminator Stored' in **Figure 99 on page 169** and **Figure 100 on page 169**). Check to ensure the terminators on both SBA and SBB FIC cards are not installed over the pins. If terminators are present, make sure they are 'stored' over only one of the vertical row of pins. As an example, other Dxx frames in the middle of the library have their terminators in this 'stored' (unterminated) position. Newer FIC cards have FIC terminator jumpers that are black instead of the original blue.

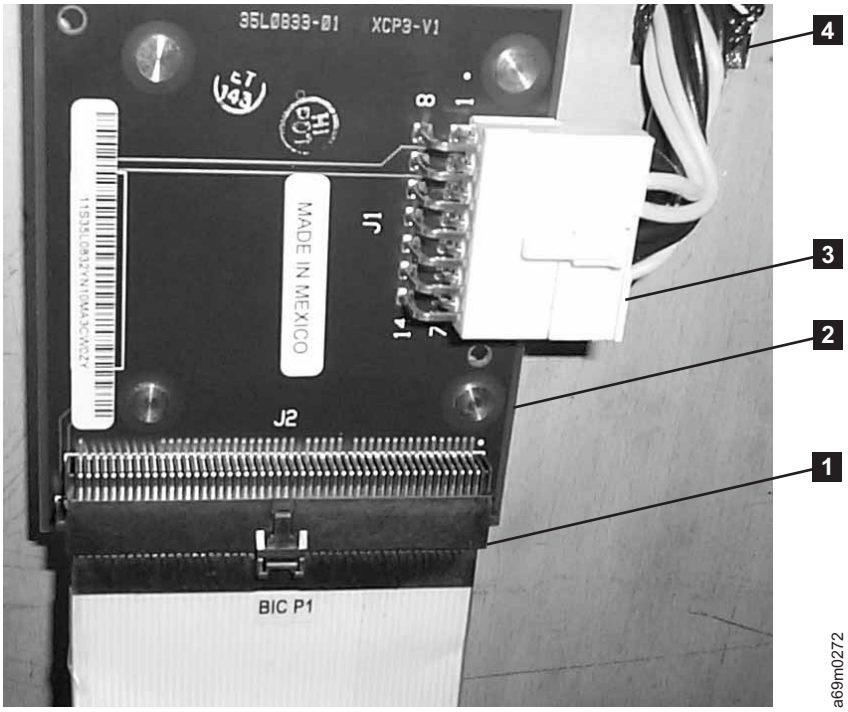


Figure 96. XCP Card and Cables

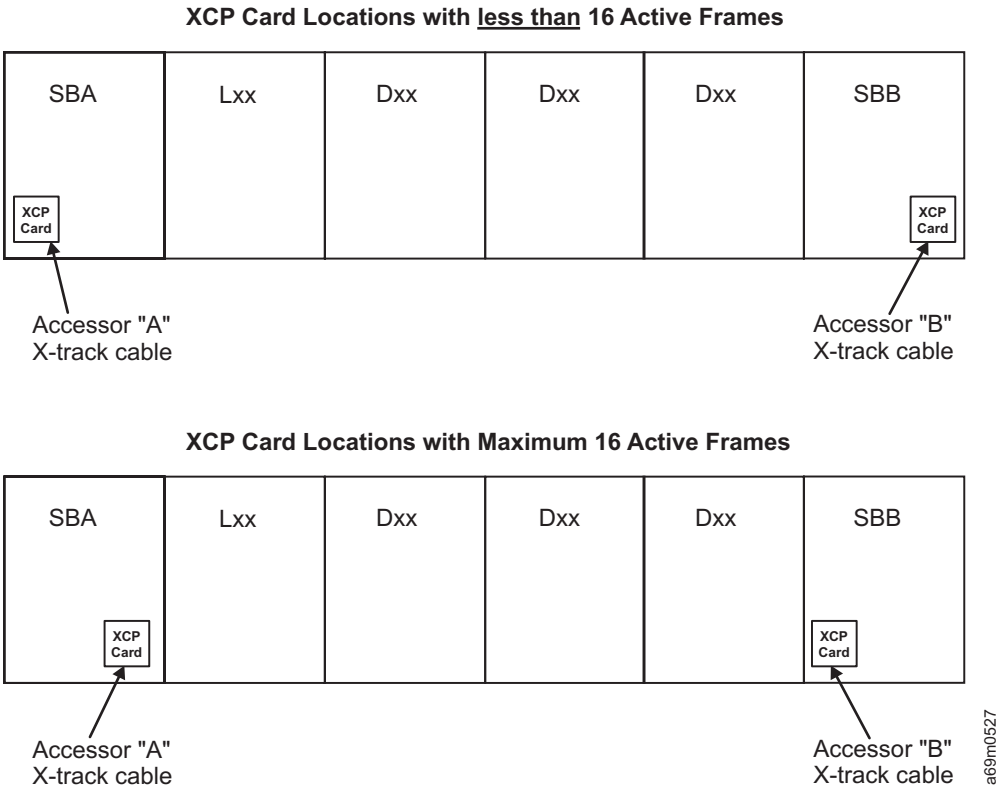


Figure 97. X-Track Cables Connected to XCP Cards

__ 13. **Note:** In the following steps, be aware that the FIC cables are 'keyed' and will only plug one way.

__ 14. Route the two cables (J7 & J8) from the **Service Bay A** FIC card into the Lxx frame. **See Figure 98.** Plug the FIC cables into J5 & J6 on the FIC card in the Lxx frame.

__ 15. In a similar manner, route the two cables (J5 & J6) from **Service Bay B** FIC card into the adjacent Dxx frame. Plug the FIC cables into J7 & J8 on the FIC card in the Dxx frame. **Note:** Do not move terminators or jumpers on any of the FIC cards. The cables from the XCP cards in each service bay should have already been connected to their respective **J1 ACC-A** **3** (Service Bay A) and **J2 ACC-B** **4** (Service Bay B) connections on the FIC card.

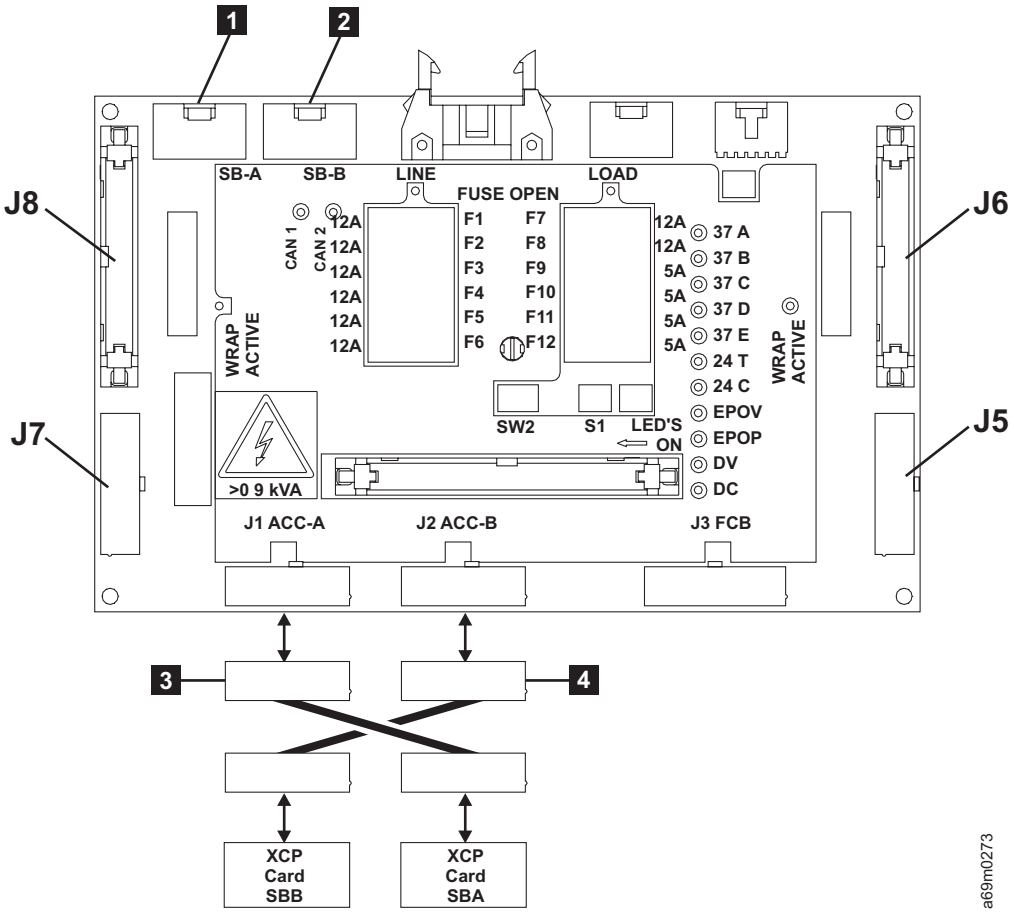


Figure 98. FIC Card in SBA and SBB

37 V dc distribution throughout the 3584 Library

Note: There are five 37V buses used in the library as follows:

- 37A - Accessor A Motor Voltage
- 37B - Accessor B Motor Voltage
- 37C - Accessor A Logic Voltage
- 37D - Accessor B Logic Voltage
- 37E - Op Panel Logic Voltage

If a library door is opened the 37A and 37B voltage buses are disabled. This removes the 37V from the Accessor A and Accessor B motors. Motor encoders use logic power.

__ 16. **See Figure 99.** (Number of frames reduced for clarity purposes).

__ 17. Connect J23 between the last Dxx frame and Service Bay B.

__ 18. Plug the tethered jumper **1** on the EPO cable in Service Bay B. Ensure the tethered jumper is plugged in the Lxx frame **2**.

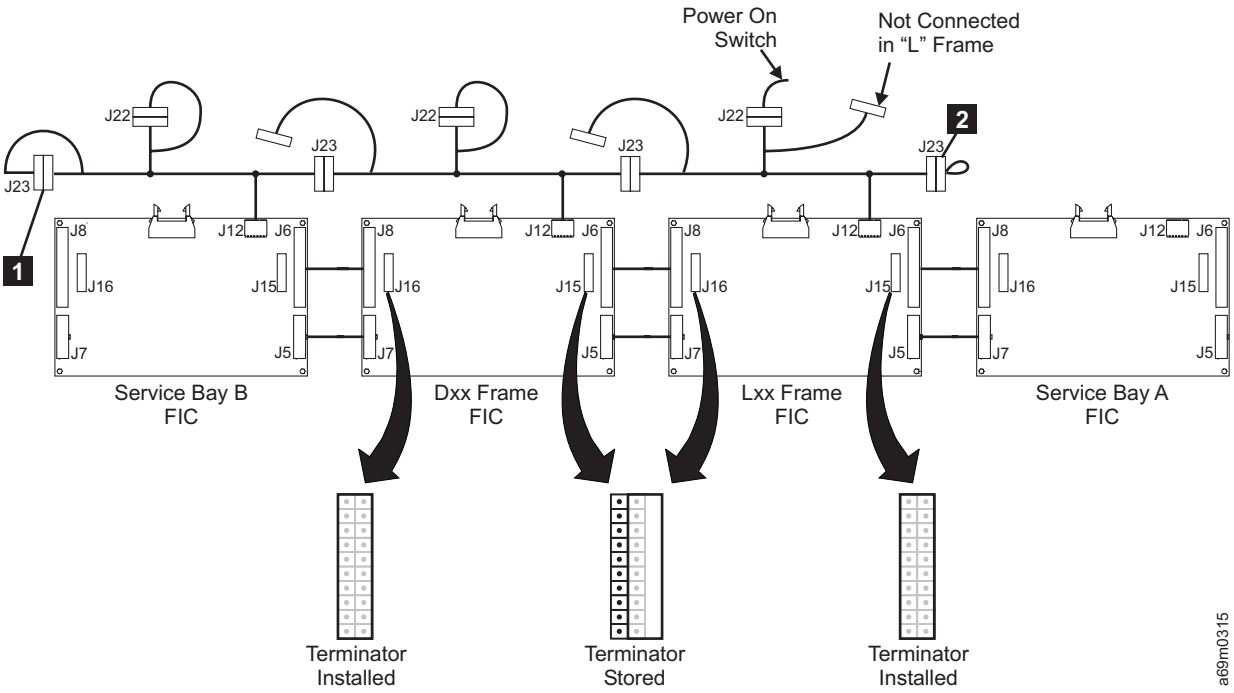


Figure 99. J23 and Terminator FIC Card Cabling.

Simplified diagram of FIC terminators in a dual-accessor installation:

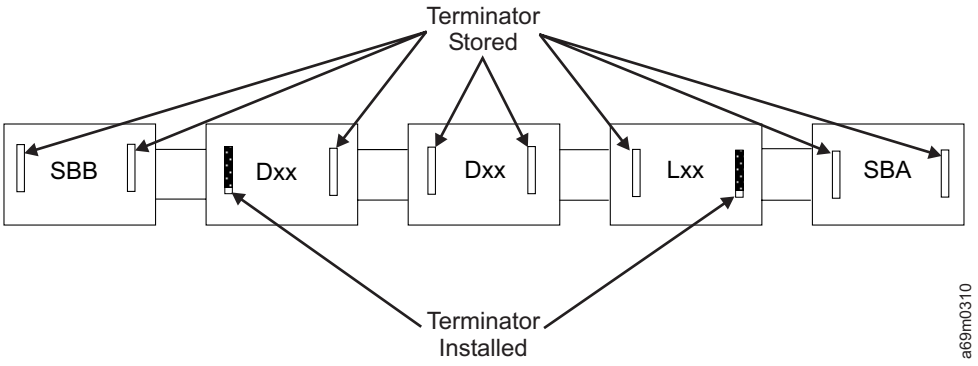


Figure 100. 'Stored' and 'Installed' Terminators in a Dual Accessor Library

Service Bay B Door Interlock Cabling

__ 19. **Refer to Figure 101 on page 171** for the following steps.

__ 20. **Note:** If the Service Bay B and A cables were preinstalled, continue at “Install Dual Accessor X-Track Cables” on page 172. If not, continue at the next step.

__ 21. Route the door interlock cable over the top rail, securing it inside the clamps provided at the top of the frame.

__ 22. Place the cable through the foam hole on the top right-hand side (as viewed from the front of the frame).

__ 23. At the rear of the SBB frame, plug this cable (labeled FIC J14) into the (DOOR J14) connector on the Y cable PN 24R1743 which is connected at SB-B J10. **NOTE:** The connector that plugs into SB-B J10 is labeled 'FIC-J9/J10.'

__ 24. Route the JB-J1 (service barrier) connector, which is part of the Y cable, through the foam opening on the top right-hand side (as viewed from the rear of the frame) approximately 50mm (2 in.).

Service Bay A Door Interlock Cabling

__ 25. Route the door interlock cable over the top rail, securing it inside the clamps provided at the top of the frame.

__ 26. Place the cable through the foam hole on the top right-hand side (as viewed from the front of the frame).

__ 27. At the rear of the SBA frame, plug this cable (labeled FIC J14) into the (DOOR J14) connector on the Y cable PN 24R1743 which is connected at SB-A J9.

__ 28. Route the JB-J1 (service barrier) connector, which is part of the Y cable, through the foam opening on the top left-hand side (as viewed from the rear of the frame) approximately 50mm (2 in.).

Service Bay B must NOT have power applied

The FCA or Enhanced FCA (Frame Control Assembly) provides power to the frame that it is installed in. If your Service Bay B came with **FC 1453** (Frame Control Assembly) or **FC 1451** (Enhanced Frame Control Assembly) installed, power cable(s) can be physically connected to the FCA or Enhanced FCA, however the FCA or Enhanced FCA must NOT have power applied, as this will provide un-needed power to Service Bay B which will result in library configuration errors.

- To ensure the FCA is **NOT** powered on, manually trip all three circuit breakers near the bottom of the FCA
- To ensure the Enhanced FCA is **NOT** powered on, see Figure 56 on page 123. Raise the handle **1** all the way up on both Bulk Power Card assemblies (BPC). This disconnects the line cords from each power assembly.

When Service Bay B is later converted to a Dxx frame, the breakers can be reset (on the FCA), or the handles lowered on the Enhanced FCA, to allow power to be applied.

Dual Accessor FIC Cable Connections

If you were using this procedure to install a Dual Accessor FIC Cable Connections using install instructions **PN 96P1241** (FC 9040 / FC 1440), **stop here** and return to the step in those instructions that sent you here. If not, then continue at the next step.

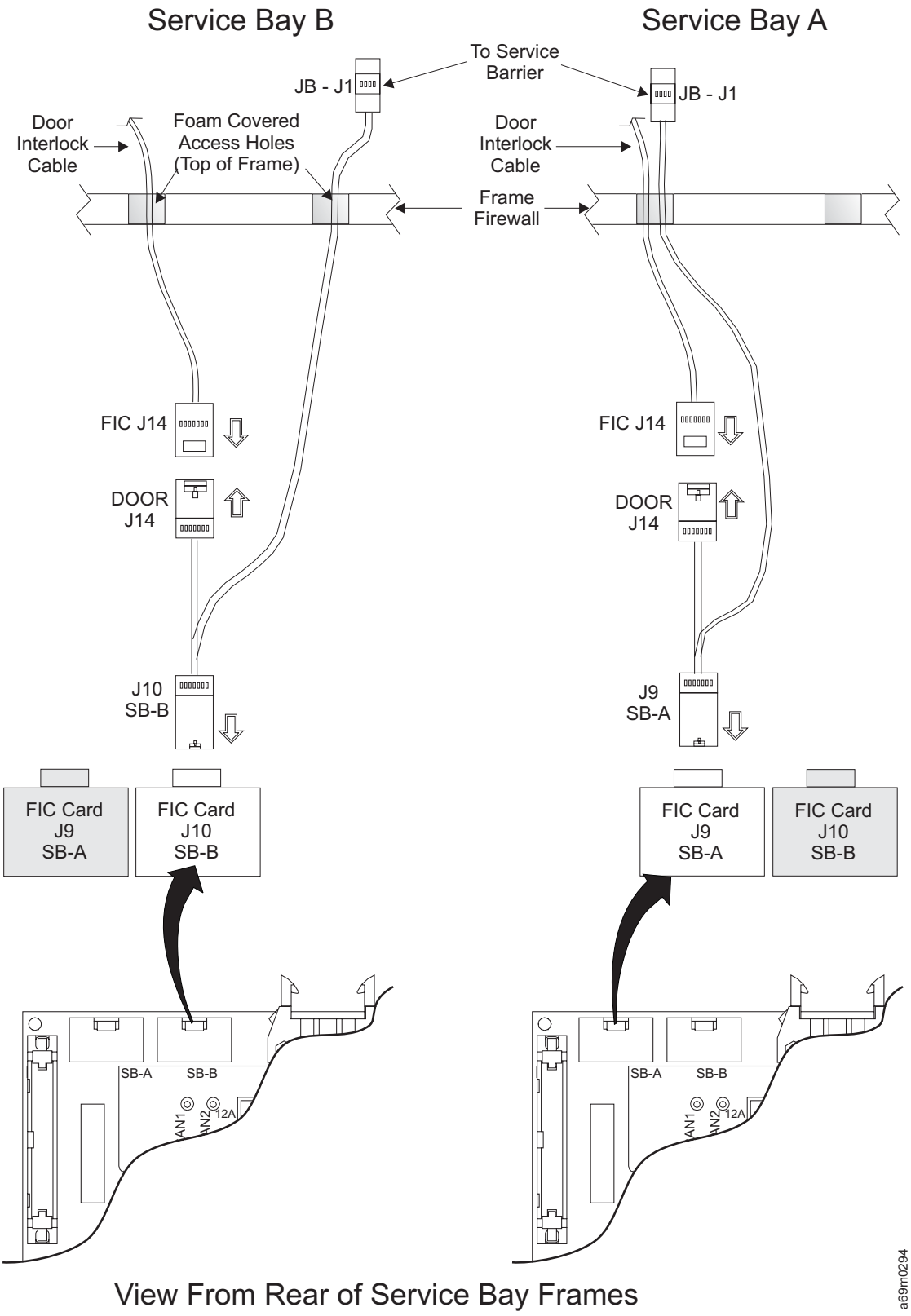


Figure 101. SBA and SBB Door Interlock and Service Barrier Cabling

Install Dual Accessor X-Track Cables

__ 1. **Refer to Table 25 on page 174.** The X-track cables always mount in the center of the active frames in the library. For example, if you are installing a dual-accessor library with an Lxx/Dxx (2 active-frame library), the X-track cable mounts between the frames. If you are installing a dual-accessor library with an Lxx/Dxx/Dxx (3 active-frame library), the X-track cable mounts in the middle of the first Dxx frame.

Note: **See Figure 102.** If the X-track cables will mount in the middle of a Dxx frame, see if the existing trough has cable mounting holes **1** in the center of the frame. If it does, continue at the next step. If it does not have cable mounting holes, swap the cable trough in Service Bay A with the one in the required Dxx frame by removing four mounting screws **2** (two on each end).



Figure 102. Trough Cover with Center X-Track Mounting

Note: Refer to Figure 68 on page 141. Libraries with more than 7 frames may have trough liners **5** installed. Trough liners are NOT used in a dual accessor library and must be removed before you continue.

__ 2. **See Figure 104 on page 173**. Install the track cables using the *X-Axis Track Cable* procedure in the CARR section of the MI. **Note:** This procedure shows how to install a single track cable. The procedure to install a second track cable is similar. **Refer to Figure 106 on page 175** to see how the cables are routed to each accessor.

Note: The track cable on accessor 'A' **1** plugs into the AXY card at **2** . The track cable on accessor 'B' **4** plugs into the AXY card at **3** .

Use a 3mm hex wrench and screws **PN 1695243** to secure the track cables at mid-point, and **PN 05H1779** to mount the track cable to the AXY card on the accessors. Both track cable lengths are identical.

Note: In the following step, position the X-track cable connector very carefully into the XCP, then rock it gently in place. Pins can easily bend if care is not taken.

__ 3. Remove the XCP cards from the rear firewall and pivot them up slightly to gain access to the X-track cable connector. Carefully align the pins on the X-track cable, then fully connect the end of the X-track cable to the XCP cards in both Service Bay A and Service Bay B as shown in **Figure 103**. Reinstall the XCP cards on the rear firewall.

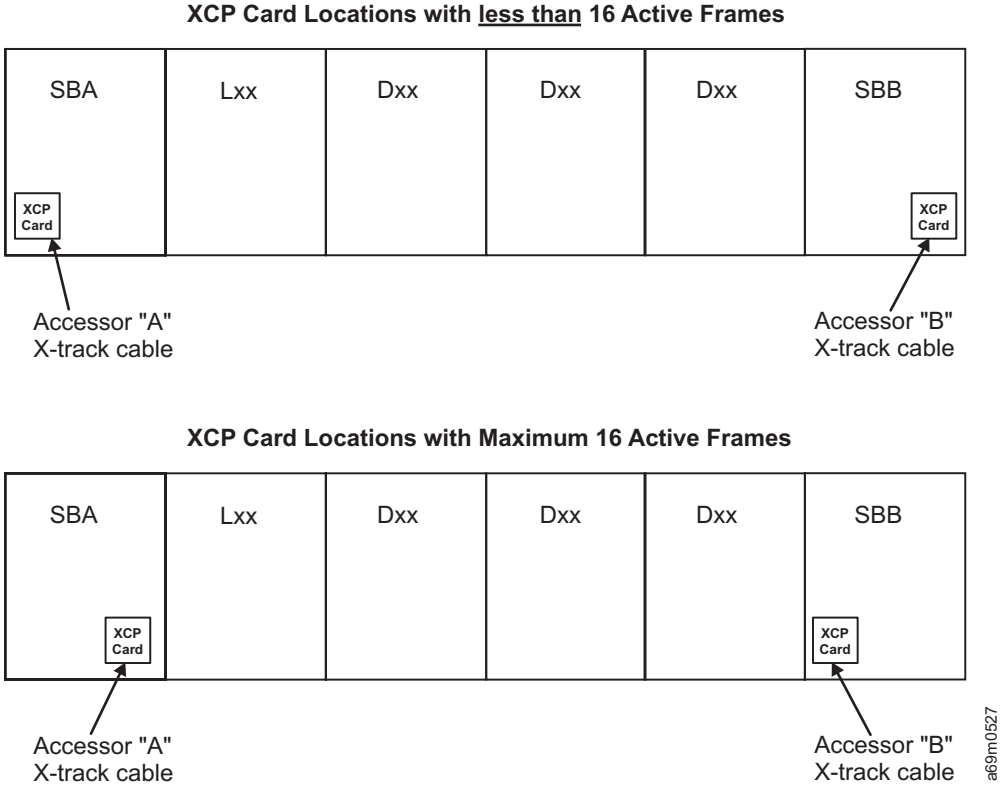


Figure 103. X-Track Cables Connected to XCP Cards

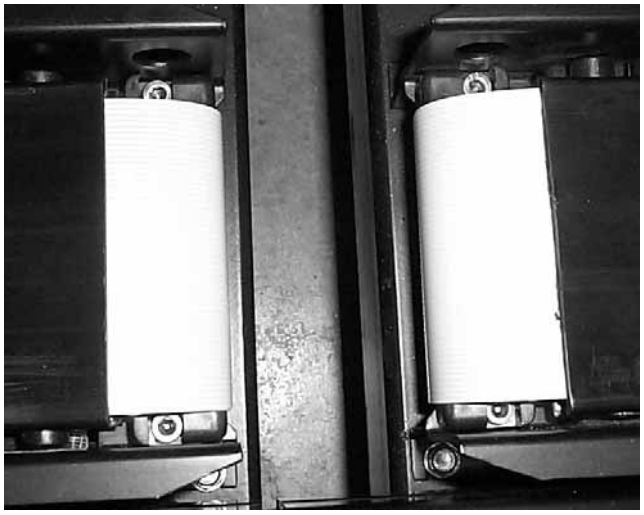


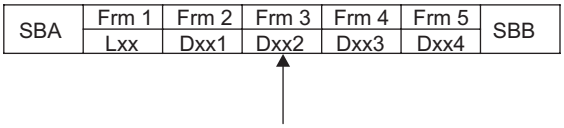
Figure 104. X-Track Cables Shown Mounted Between Frames

Table 25. X-Axis Track Cables Center Positions

Number of Active Frames *(See Note)	**Cable PN**	**X-Axis Track Cables must attach in the center of the library:**
Note: Active frames are defined as the Lxx and all Dxx frames in the library, not including the two service bays on either end. See Figure 105 for a 5 and 10 frame example.		
2	23R2685	Between Lxx & Dxx/Sx4
3	23R2686	Middle of 1st Dxx/Sx4
4	23R2687	Between 1st & 2nd Dxx/Sx4
5	23R2688	Middle of 2nd Dxx/Sx4
6	23R2689	Between 2nd & 3rd Dxx/Sx4
7	23R2690	Middle of 3rd Dxx/Sx4
8	23R2691	Between 3rd & 4th Dxx/Sx4
9	23R2692	Middle of 4th Dxx/Sx4
10	23R2693	Between 4th & 5th Dxx/Sx4
11	23R2694	Middle of 5th Dxx/Sx4
12	23R2695	Between 5th & 6th Dxx/Sx4
13	23R2696	Middle of 6th Dxx/Sx4
14	23R2697	Between 6th and 7th Dxx/Sx4
15	23R2698	Middle of 8th Dxx/Sx4
16	23R2699 (See **Note** below)	Between 7th and 8th Dxx/Sx4
Note: Installation of this 16 frame X-track cable requires moving the XCP cards in both Service Bay A and B to the inside position as shown in **Figure 103 on page 173**.		

In the following figures you could have Sx4 frames in place of Dxx frames. The same principle applies regardless of the frame type.

5 Active Frame Library Mid Point:



10 Active Frame Library Mid Point:

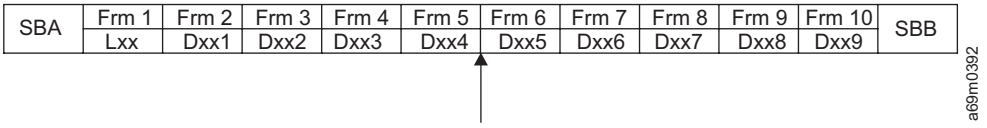


Figure 105. Track Cable Midpoint Examples

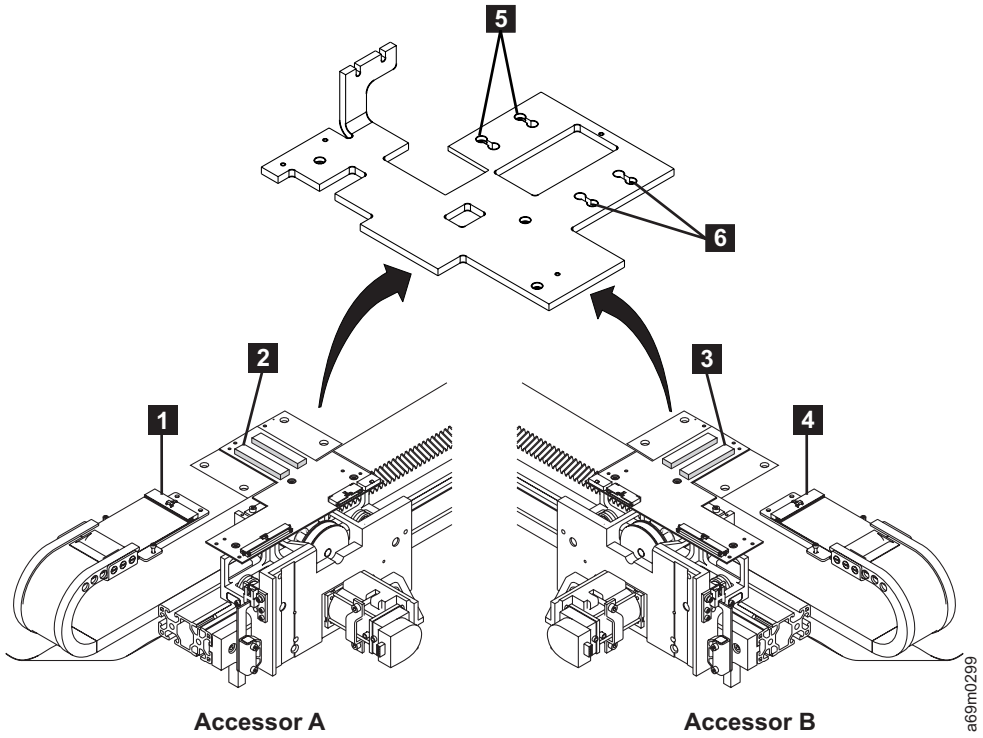


Figure 106. Accessor A and Accessor B X-track Cabling

__ 4. **See Figure 107 on page 177.** Install the track cable cover plate **1** over the junction between the two track cables by sliding one side of the plate under the plastic track, and then the other side.

__ 5. **Inspect the grippers on both accessors to ensure they are still fully-seated in their dual gripper housings.**

__ 6. **Note:** Cable trough covers in the Lxx, Dxx, and Service Bay B are longer than the trough cover in Service Bay A.

__ 7. Install the long cable trough covers starting with Service Bay B, working towards Service Bay A. The covers are designed to interlock with each other.

__ 8. Install the short cable trough cover in Service Bay A. Adjust the trough covers in Service Bay A and in the Lxx frames to minimize any gap. These two covers do not interlock with each other.

__ 9. Move the X-axis back and forth to ensure that the cable moves smoothly without binds or interference anywhere along the X-axis rail, and that it is centered in the track. If the X-track cable is rubbing against the cable trough cover, or not centered in the track, do the following:

   a. Remove the trough cover to expose the AXY card.

   b. Loosen the X-track cable mounting screws and move the X-track cable mounting plate either towards the front or towards the back, then retighten the screws. Reinstall the trough cover and check the cable operation.

   c. You can also adjust the cable where it mounts to the frame. Reinstall the trough cover and check the cable operation.

__ 10. **See Figure 72 on page 145** and **Step 69 on page 146** to install the RFI seals on all library frames including the SBA and SBB frames.

__ 11. Reinstall the library end covers. See Figure 53 on page 120. Newer side covers (for x22/x23/x52/x53 frames) are quick disconnect. Place the tabs **2** into the slots in the bottom of the frame. Pivot the cover into place and secure with two wing nuts **3** at the top as shown.

Dual Accessor Track Cables

If you were using this procedure to install Dual Accessor Track Cables using install instructions **PN 96P1241** (FC 9040 / FC 1440), **stop here** and return to the step in those instructions that sent you here. If not, then continue at the next step.

Note: If you were using install instructions **PN 96P1241**, also refer to the 3584 MI, Chapter 1. Introduction, and find the topic **"Preferred Zones."** Follow those procedures to set and/or change accessor "A" and accessor "B" zones after the installation.

__ 12. Go to “Installing Tape Drives” on page 178.

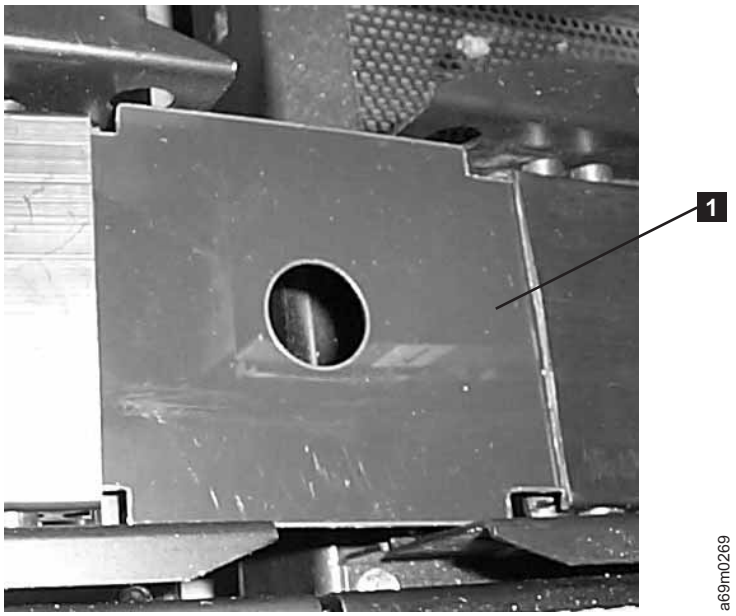


Figure 107. X-Track Cable Cover

Installing Tape Drives

Attention

Ensure the drive power supply cables (bifurcated cables) did not come loose from the fixed trays during shipping. Firmly push each cable into the fixed tray assemblies before you continue.

1. If all the tape drives were pre-installed in the frames you are installing, or if you do not have any drives to install, go to “Drive Cabling” on page 191.
2. Examine the packing list for each frame to determine the quantity of drive features, and the types that were ordered for each frame. Use the following information to determine where to install the tape drives.

Table 26. Feature Codes and Drive Types

Feature Code	Description
1454	LTO Ultrium-1 (L1) LVD Drive Canister and Mounting Kit
1455	LTO Ultrium-1 (L1) HVD Drive Canister and Mounting Kit
1456	LTO Ultrium-1 (L1) Fibre Channel Drive Canister and Mounting Kit
1464	LTO Ultrium-1 (L1) LVD Fixed Tray
1465	LTO Ultrium-1 (L1) HVD Fixed Tray
1466	LTO Ultrium-1 (L1) Fibre Channel Fixed Tray
1474	LTO Ultrium-2 (L2) LVD Drive Canister and Mounting Kit
1475	LTO Ultrium-2 (L2) HVD Drive Canister and Mounting Kit
1476	LTO Ultrium-2 (L2) Fibre Channel Drive Canister and Mounting Kit
1678	3588 Drive Field Install Assist (x32, x52, x53)
1674	3592 Drive Field Install (L22/D22, L23/D23)
1501	Fibre Drive Move Kit (L32/D32)
1503	Fibre Drive Mounting Kit 3592 (L22/D22)
1504	Fibre Drive Mounting Kit LTO (L52/D52, L32/D32)
1513	3592 Fibre Drive Mounting Kit (L23/D23)
1514	LTO Fibre Drive Mounting Kit (L53/D53
1515	3592 Fibre Drive Mounting Kit (L23/D23)

Stacking Drives – Drives must be installed starting in Row 1 (the top drive position). Additional drives in the same frame must be installed in the vertically-adjacent positions. Stated another way, if you are installing four drives in a frame, they must be in rows 1 through 4 in the same column. If there is a mixture of drive features (a mixture of SCSI LVD, SCSI HVD, or Fibre Channel), install drives with the same feature number in adjacent positions. As an example, if you install two SCSI LVD drives and two SCSI HVD drives, stack the two LVD drives next to each other, and stack the two HVD drives next to each other. This is necessary if you have more than one drive on a SCSI bus. And if you have a mixture of fixed trays and hot swap canisters, you should group the hot swap canisters together, if possible, to allow redundant (drive) power cables to be installed.

3. Use the procedures in Table 27 when installing the various drive types.

Table 27. Drive Type Installation Procedures

Drive Type	**Use the Procedures At**
Fixed tray assemblies	“LTO Fixed Tray Installation” on page 180
Fixed tray (all hot swap canister models)	“LTO Drive Canister and Fixed Tray Installation (L32/D32 Only)” on page 182.
	“3592/LTO Drive Canister and Fixed Tray Installation (x22, x52, x23, x53)” on page 186.

LTO Fixed Tray Installation

__ 1. See Figure 108 and Figure 109 on page 181. From the rear of the library, slide the drive assembly into the highest available drive location.

Attention:

- Ensure that the tab at the front of the drive (the end opposite the cable-end) is seated into the slots in the bulkhead.
- Ensure that the fixed tray is completely seated at both tabs before tightening the screws **3** ; each tab should be flush to the frame. To prevent deforming the tabs, ensure the fixed tray is not skewed before you begin to tighten the screws. Failure to properly install the drive will bend the tabs, and prevent the gripper assembly from picking a cartridge.
- Do NOT remove the drive safety flaps when installing drives. The safety flaps will pivot up out of the way.

__ 2. Tighten the two screws **3** .

__ 3. Repeat the previous steps to install the remaining LTO fixed tray assemblies.

__ 4. If all drives and drive types have been installed, go to “RS-422 Cables and Power Cables Installation (x32, x22, x52 only)” on page 188. If more drives are to be installed, go to the appropriate procedure in Table 27 on page 179.

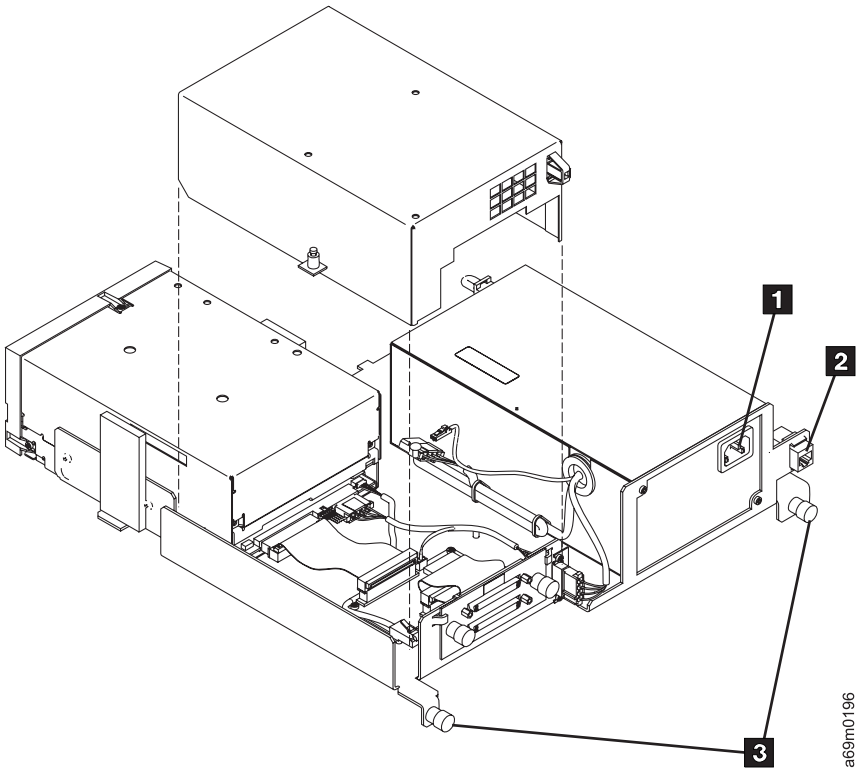


Figure 108. LTO SCSI Fixed Tray Assembly

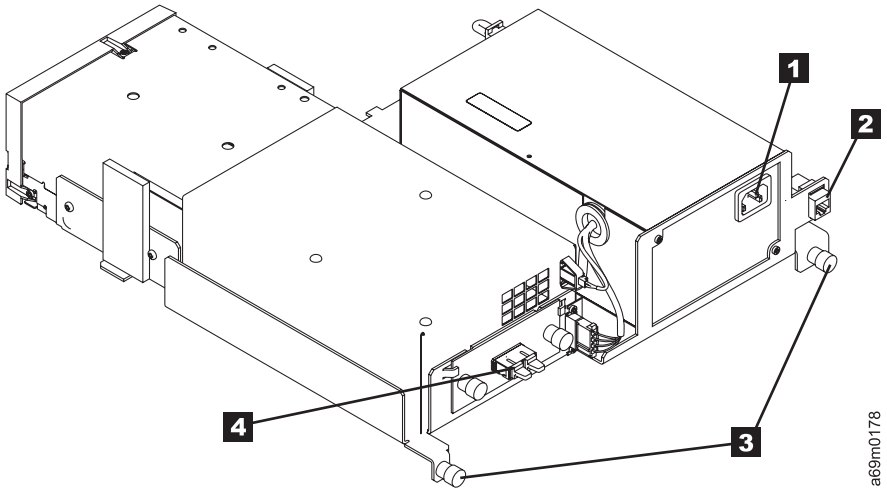


Figure 109. LTO Fibre Fixed Tray Assembly

LTO Drive Canister and Fixed Tray Installation (L32/D32 Only)

Attention: All canister Feature Codes require a fixed tray assembly. See Feature Codes 1501 and 1504 in Table 26 on page 178.

Attention: LTO Ultrium-1, Ultrium-2, Ultrium-3, Ultrium-4, and Ultrium-5 drive canisters can all coexist in the same L32/D32, L52/D52, or L53/D53 frames. 3592 drives can only be installed in L22/D22 or L23/D23 frames. LTO drives of any generation can NOT be installed in L22/D22 or L23/D23 frames. The LTO Ultrium-3, Ultrium-4 and Ultrium-5 drive canisters need Feature Codes 1504 to install into a L32/D32 frame. If you install an Ultrium-1 canister (FC 1454-1456) or an Ultrium-2 canister (FC 1474-1476), the fixed tray assembly is included in these Feature Codes. FC 1501 is necessary when you move a LTO drive canister from a x52 into an x32 frame.

Note: For L32/D32 frames, continue at the next step. For L22/D22 and L52/D52, see “3592/LTO Drive Canister and Fixed Tray Installation (x22, x52, x23, x53)” on page 186.

__ 1. See Figure 110 on page 183. Slide in the fixed tray assembly, keeping it toward the right side. Ensure the front locating tab **1** on the tray assembly slides securely into the front slot in the frame.

Note: As the front locating tab seats into the slot in the frame, the indicator slide will move to partially cover the indicator hole **3** . If you see the indicator slide move toward the indicator hole (partially covering it), then the locating tab is positioned in the slot. If the indicator slide does not move, slide the front of the fixed tray assembly left or right until the locating tab slides into the slot.

Note: The drive safety flaps must NOT be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

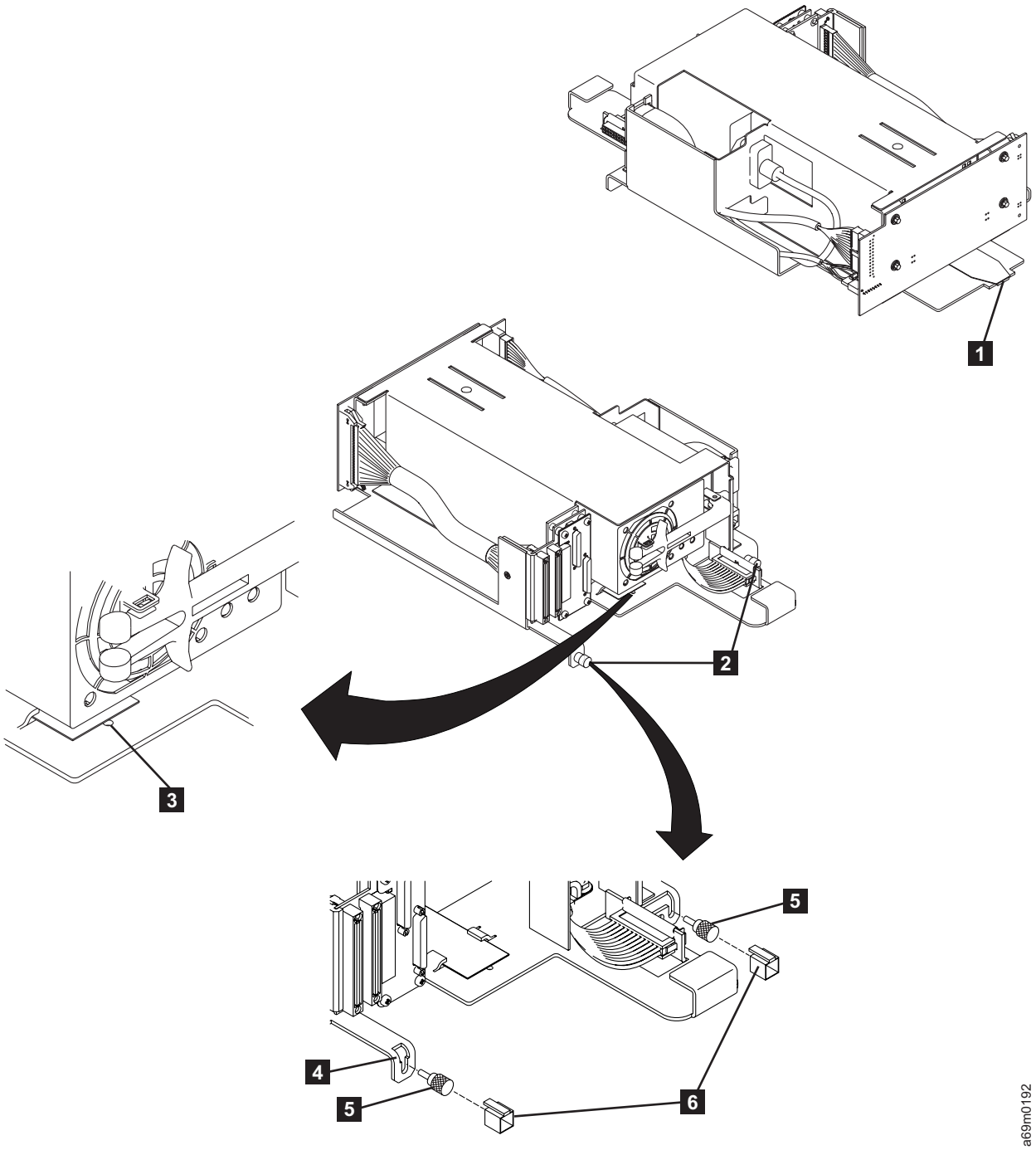


Figure 110. Fixed Tray — L32/D32 Only

Note: Early style fixed tray assemblies had separate thumbscrews and plastic caps. The caps were used for shipping only, and are not required for library operation. Later style fixed tray assemblies have captive thumbscrews.

__ 2. Tighten both thumbscrews **2** to be **fingertight only**. Do not overtighten these screws.

__ 3. Thumbscrew caps **6** do not need to be installed over the screws.

__ 4. See Figure 111 on page 184. Carefully slide the drive canister into the left side of the fixed tray assembly.

__ 5. While holding the locking lever **2** **up** to ensure the tabs on both sides of the lever will clear the frame.

__ 6. Grasp the drive canister handle **3**, and carefully but firmly push the drive into position. Ensure the connectors to the right correctly align and fully engage with the fixed tray connectors.

__ 7. Lower the locking lever **2** until it snaps into place.

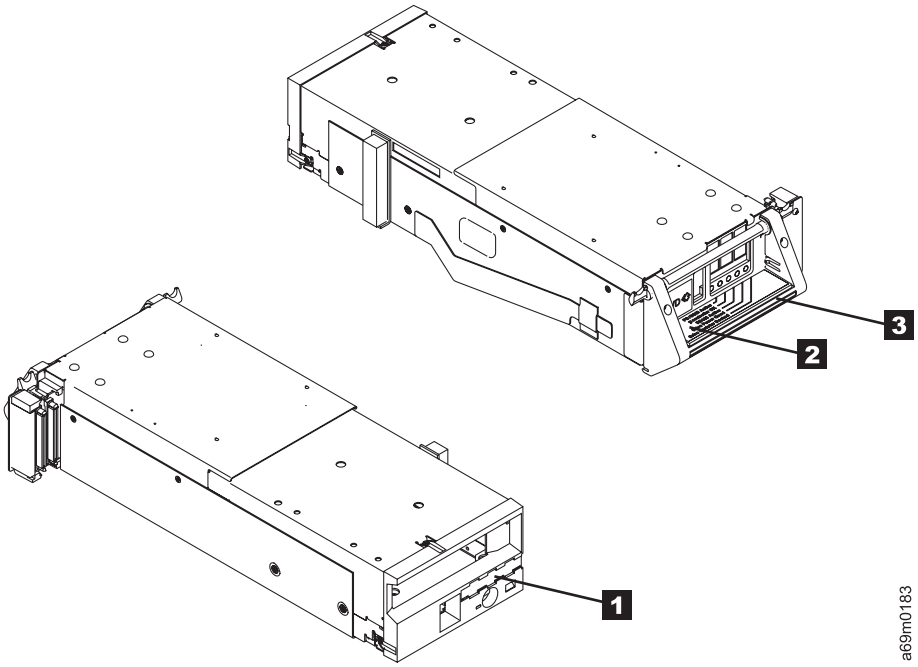


Figure 111. Drive Canister

__ 8. See Figure 112 on page 185. Visually check to see if the hot swap power supply **3** is already installed in the fixed tray. If it is already installed, go to step “RS-422 Cables and Power Cables Installation (x32, x22, x52 only)” on page 188. If it is not installed, continue with the next step.

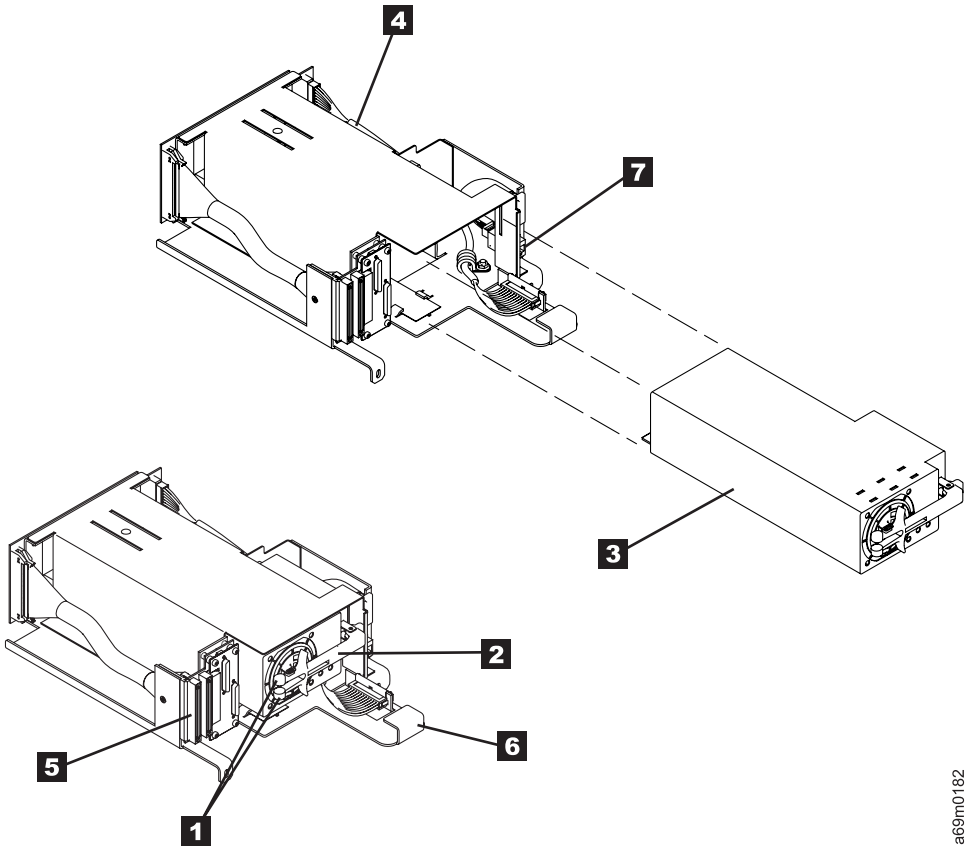


Figure 112. Hot Swap Power Supply

__ 9. Pivot locking arm assembly **2** outward.

__ 10. Firmly slide the power supply **3** into the fixed tray assembly.

__ 11. Swing the locking arm to the left while you pinch the two locking tabs **1** together, securing the arm in place.

3592/LTO Drive Canister and Fixed Tray Installation (x22, x52, x23, x53)

Attention: All canister Feature Codes require a fixed tray assembly. See Feature Codes 1501, 1503, 1504, 1513, and 1514 in Table 26 on page 178.

Attention: LTO Ultrium-1, Ultrium-2, Ultrium-3, Ultrium-4 and Ultrium-5 drive canisters can all coexist in the same L32/D32, L52/D52, or L53/D53 frame. 3592 drives can only be installed in L22/D22 or L23/D23 frames. LTO drives of any generation can NOT be installed in an L22/D22 or L23/D23 frames.

__ 1. See Figure 113. Slide in the fixed tray assembly, keeping it toward the right side.

Note: The drive safety flaps must NOT be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

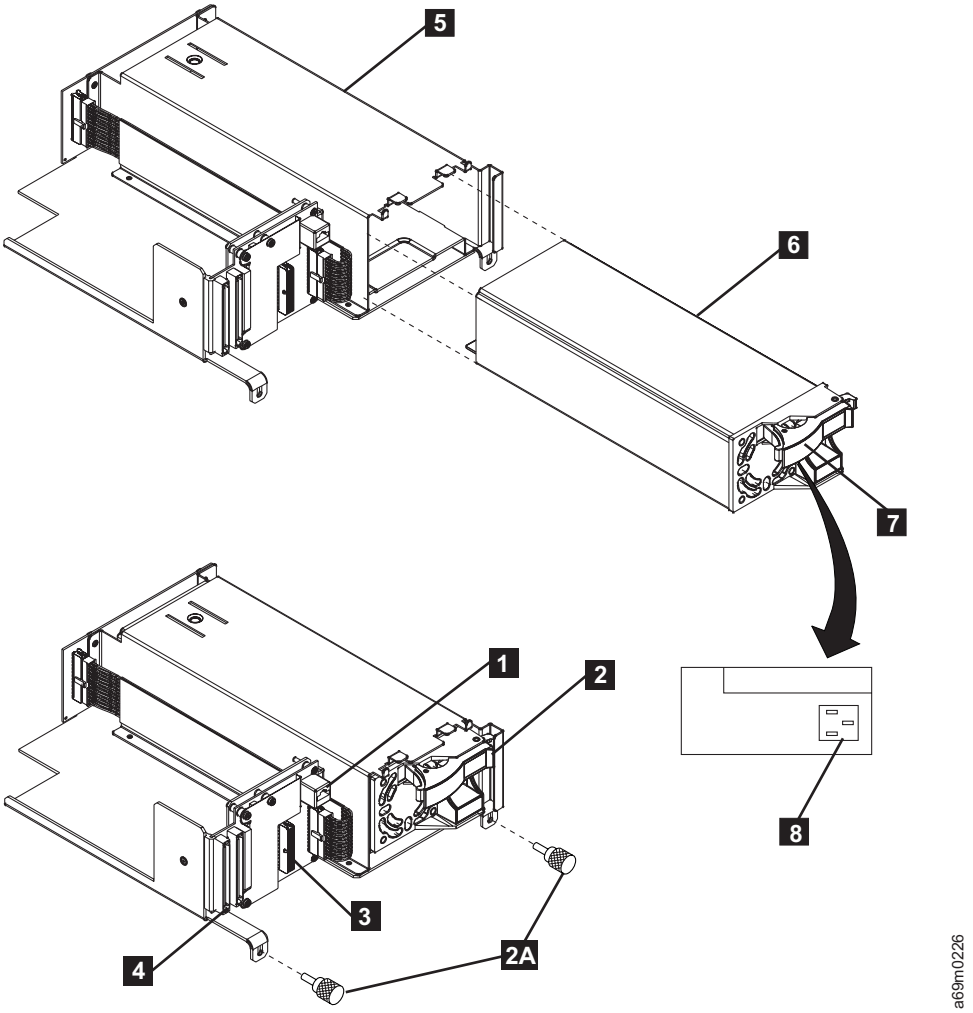


Figure 113. Fixed Tray and Power Supply – L22/D22/L52/D52 Only

__ 2. Tighten both thumbscrews **2A** securely.
__ 3. See Figure 114 on page 187. Carefully slide the drive canister into the left side of the fixed tray assembly.
__ 4. While holding the locking lever **3** **up** to ensure the tabs on both sides of the lever will clear the frame.
__ 5. Grasp the drive canister handle **4**, and carefully but firmly push the drive into position.

__ 6. Lower the locking lever **3** until it snaps into place.

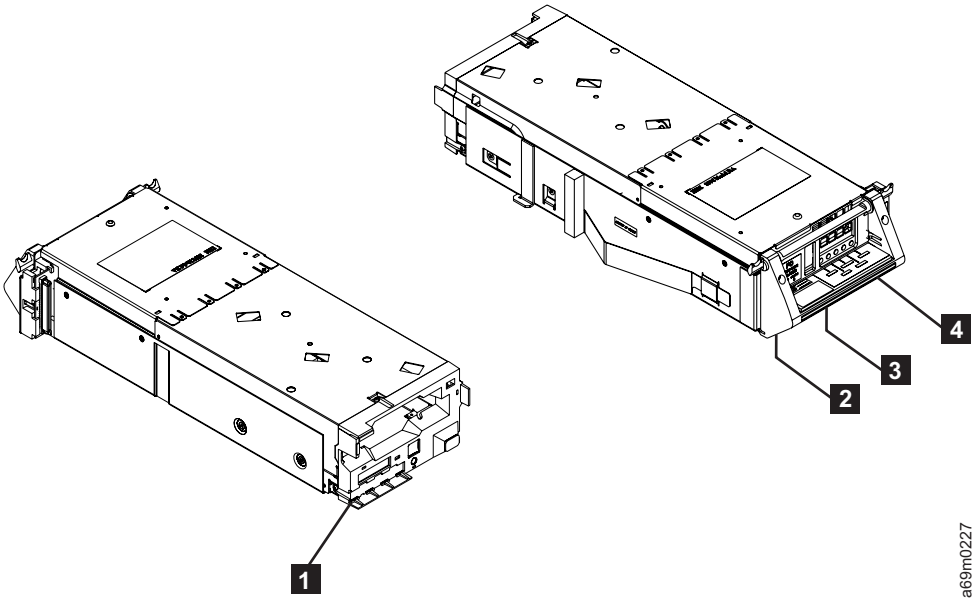


Figure 114. Drive Canister – 3592

__ 7. See Figure 113 on page 186. Visually check to see if the hot swap power supply **6** is already installed in the fixed tray. If it is already installed, go to step “RS-422 Cables and Power Cables Installation (x32, x22, x52 only)” on page 188. If it is not installed, continue with the next step.
__ 8. Firmly slide the power supply **6** into the fixed tray assembly.
__ 9. With the locking arm in the outward position, carefully slide the power supply canister **6** into the fixed tray assembly **5** as far as it will go.
__ 10. Pivot the locking arm **7** in, making sure it engages in fixed tray frame **2** as you snap the arm into a locked position.

RS-422 Cables and Power Cables Installation (x32, x22, x52 only)

Use this procedure for x32, x22, x52 frames only.

__ 1. Connect the RS-422 cable to connector **2** on the right side of the fixed tray or fixed tray assembly. Be sure to use the connector labeled with the row number.

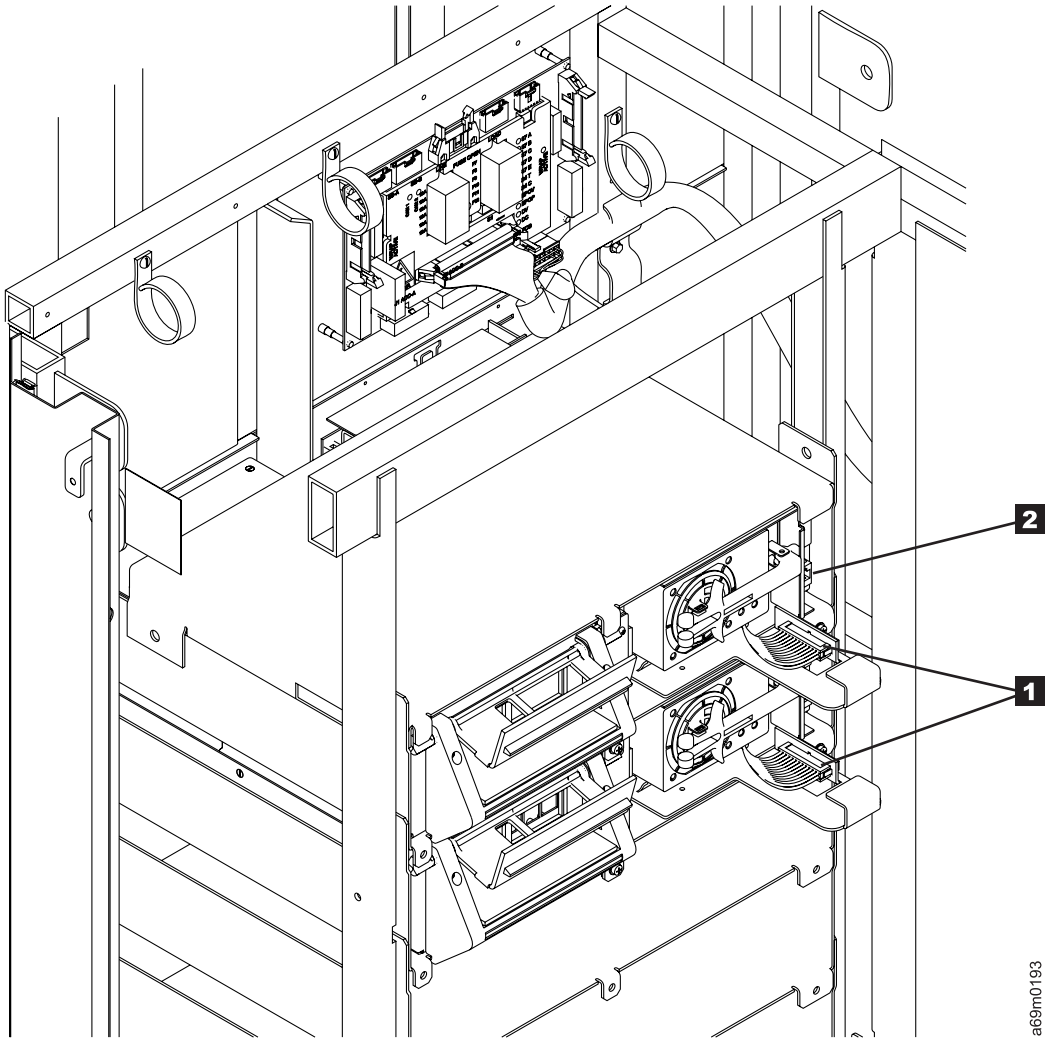


Figure 115. Cables and Power Cord (x32, x22, x52 Only)

__ 2. For canister devices only, install the appropriate Redundant Power Supply power cable between the fixed trays **1** , also shown as **2** in Figure 117 on page 190.
__ 3. Bifurcated power cords come pre-installed in x22 and x52 frames. Connect the bifurcated power cord on the right side **2** of the new fixed tray assembly (see Figure 115). This is shown as **1** in Figure 117 on page 190. For canister devices, ensure you install the power cords exactly as shown in Figure 117 on page 190 to ensure true power redundancy.
__ 4. Continue at the next step if you have x22 or x52 frames in the library. If not, go to “Drive Cabling” on page 191.

Use this procedure for X22/X52 frames only.

__ 1. Connect the RS-422 cable to connector **2** on the fixed tray assembly. Be sure to use the connector labeled with the row number.

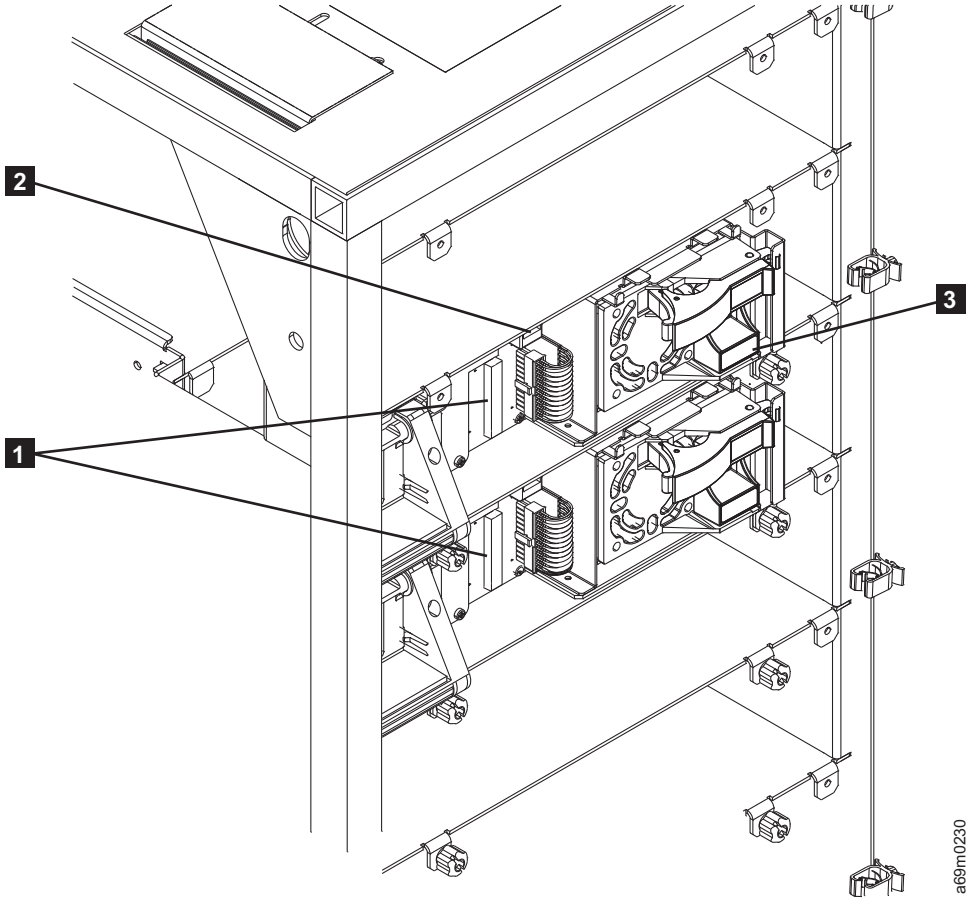


Figure 116. Cables and Power Cord (x22/X52 Only)

__ 2. Install the appropriate Redundant Power Supply power cables (18P9176) between the fixed trays **1**, also shown as **2** in Figure 117 on page 190.
__ 3. Connect the bifurcated power cord into the drive power supply on the right side **3** (see Figure 116). This is shown as **1** in Figure 117 on page 190. For canister devices, ensure you install the power cords exactly as shown in Figure 117 on page 190 to ensure true power redundancy.
__ 4. Go to “Drive Cabling” on page 191.

Redundant Power Cabling

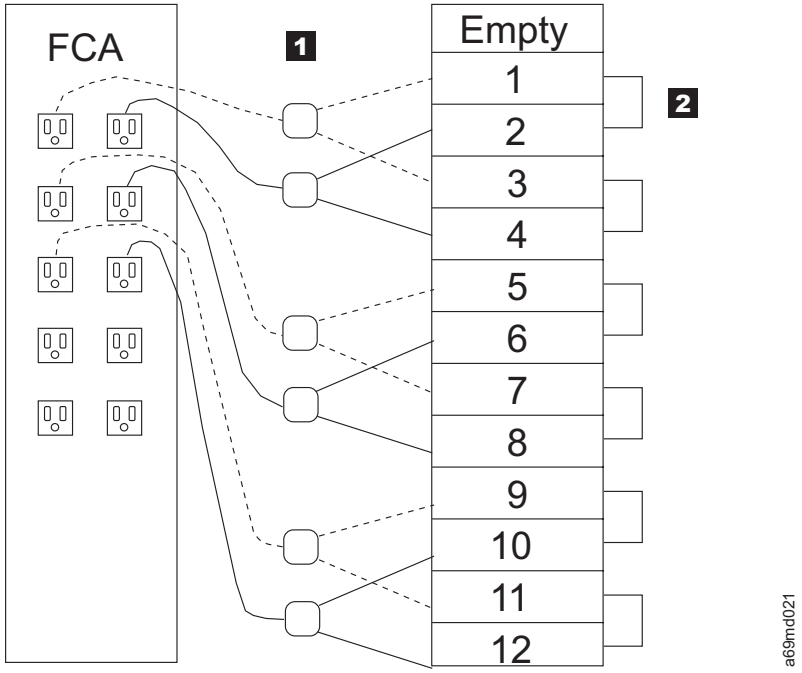


Figure 117. Redundant Power Cabling (x32, x22, x52 Only)

3592/LTO Drive Canister and Fixed Tray Installation (L23/D23, L53/D53)

Attention: All canister Feature Codes require a fixed tray Fibre Drive Mounting Kit. See Feature Codes 1513, 1514, 1674, and 1678 in Table 26 on page 178.

Attention: LTO Ultrium-1, Ultrium-2, Ultrium-3, Ultrium-4, and Ultrium-5 drive canisters can all coexist in the same L53/D53 frame. 3592 drives can only be installed in an L22/D22, L23/D23. LTO drives of any generation can NOT be installed in an L22/D22 or L23/D23.

Refer to the appropriate Feature Codes to install fibre drive mounting kits and drives. See "Feature Codes & Model Conversions" on page 227.

Drive Cabling

Table 28 provides pointers to the cabling procedures for all newly installed drives.

Table 28. Drive Cabling Procedures

Drive Type Installed	Use Cabling Procedure At
Fibre Channel Canister (LTO & 3592)	Use the procedure at "Fibre Cabling (Canisters)."
SCSI Canister (LTO only)	Use the procedure at "SCSI Cabling (Canisters)" on page 195.
LTO Fibre Channel Fixed Tray	"Fibre Cabling (Trays)" on page 197.
LTO SCSI Fixed Tray	"SCSI Cabling (Trays)" on page 198.

Fibre Cabling (Canisters)

__ 1. If you are not installing any fibre drive **canisters**, go to "SCSI Cabling (Canisters)" on page 195.

For x32 Frames:

__ 2. Carefully route each cable to the left side frame, through the plastic cable clamps. Do not overtighten the clamp. To prevent damage to the fibre cables, do not use the metal SCSI cable clamps to secure the fibre cables.
__ 3. Connect one end of each fibre cable to the fibre connection at the back of a drive canister.
__ 4. Route the fibre cables through the plastic clips at the bottom of the frame. Form a loop with any excess cable.
__ 5. Plug the fibre cables into the back of the bulkhead at the bottom of the frame.
__ 6. Go to **"Attach Power and Bring-Up" on page 199**.

For x22/x52 Frames:

__ 1. See Figure 118 on page 192 and Figure 120 on page 193.
__ 2. Carefully route each cable to the left side frame as shown.
__ 3. Connect one end of each fibre cable to the fibre connection at the back of a drive canister.
__ 4. Route the fibre cables to the bottom of the frame. Form a loop with any excess cable.
__ 5. Plug the fibre cables into the back of the bulkhead at the bottom of the frame.
__ 6. Secure all fibre cables (as shown) with Velcro© [1] ties that are pre-installed in the frame.
__ 7. Customer host fibre cables can be routed through either the bottom of the frame, or through the top of the frame. For information on top cable routing, see "Top Frame Fibre Cable access" on page 194. Then continue at the next step.
__ 8. Go to **"Attach Power and Bring-Up" on page 199**.

1. Velcro© is a registered trademark of Velcro USA Inc.



Figure 118. Cable Routing x22/x52

For x23/x53 Frames:

__ 1. See Figure 119 on page 193.
__ 2. Carefully route each cable to the left side frame as shown.
__ 3. Connect one end of each fibre cable to the fibre connection at the back of a drive canister.
__ 4. Route the fibre cables to the bottom of the frame. Form a loop with any excess cable.
__ 5. Plug the fibre cables into the back of the bulkhead at the bottom of the frame.
__ 6. Secure all fibre cables (as shown) with Velcro© [2] ties that are pre-installed in the frame.
__ 7. Customer host fibre cables can be routed through either the bottom of the frame, or through the top of the frame. For information on top cable routing, see “Top Frame Fibre Cable access” on page 194. Then continue at the next step.
__ 8. Go to **“Attach Power and Bring-Up” on page 199**.

2. Velcro© is a registered trademark of Velcro USA Inc.



Figure 119. Cable Routing x23/x53

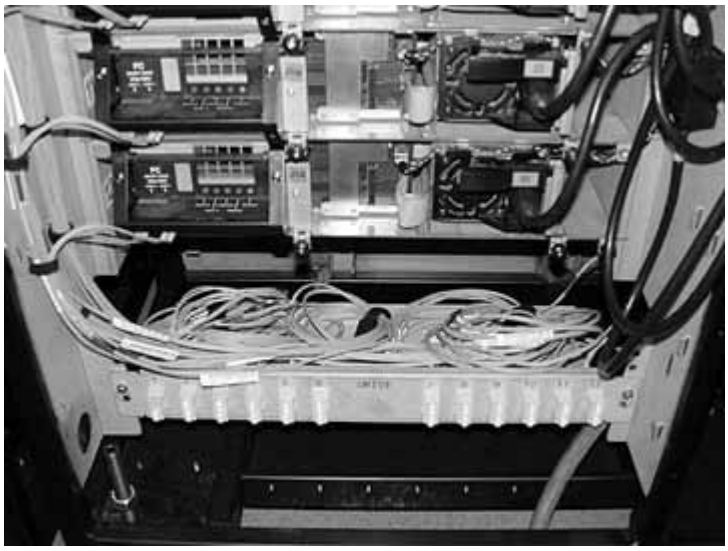


Figure 120. Cable Routing and Patch Panel x22/x52

Top Frame Fibre Cable access:

1. See Figure 121. Fibre cables can be routed through the top opening **1** .
2. See Figure 122. Open the cable access door **1** at the top of the frame from the inside.
3. Bring the host fibre cable(s) in through the fibre cable access door, down to the bulkhead assembly.
4. Plug the host fibre cable(s) into the appropriate position(s) in the bulkhead.
5. Secure the fibre cable(s) along the left-hand side inside of the frame using the Velcro© ties.
6. See Figure 123 on page 195. When all the host fibre cables have been installed, position them as shown.

   CAUTION:
   Ensure all fibre cables are approximately parallel to each other as shown. Do not cross one fibre cable over another, as this could damage the cable.
7. See Figure 124 on page 195. When all the fibre cables are positioned as shown, carefully close the cable access door securely. Padding on the door will hold the cables safely and securely in place.

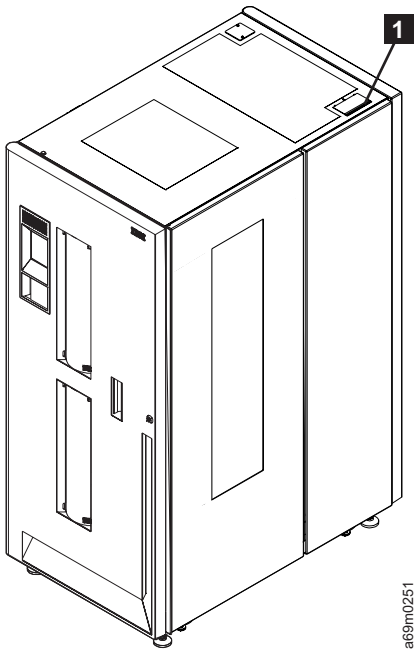


Figure 121. Top Frame Fibre Cable access

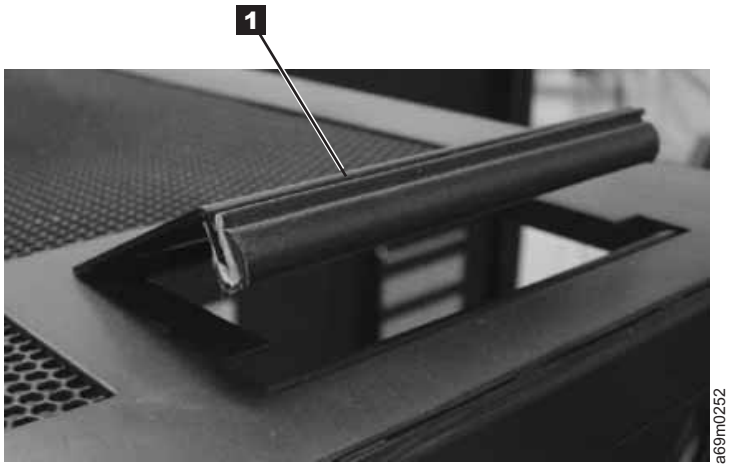


Figure 122. Top Frame Fibre Cable Cover

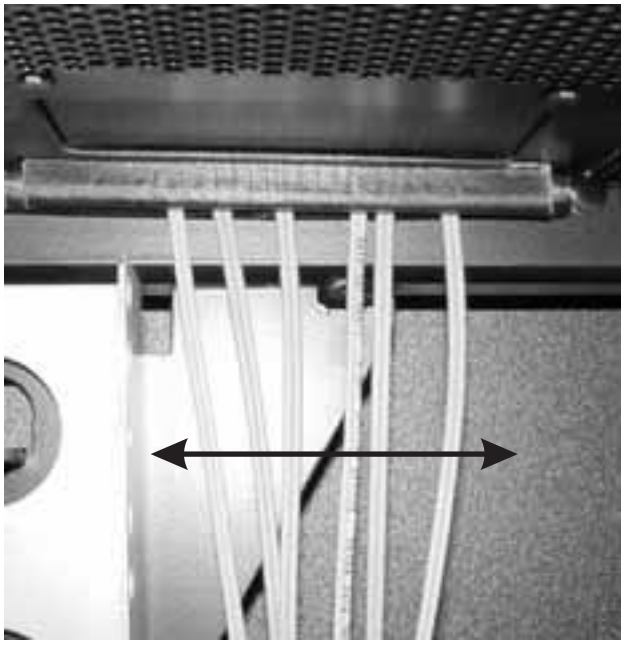


Figure 123. Fibre Cables Inside Frame



Figure 124. Fibre Cables Outside Frame

SCSI Cabling (Canisters)

If you are not installing any SCSI drives **canisters**, go to “Fibre Cabling (Trays)” on page 197.

__ 1. Consult with your customer and review the examples shown in Figure 125 on page 196. You will be attaching necessary SCSI cables and terminators in the following steps.

Attention: Only one HVD drive is allowed on each SCSI bus when attached to an AS/400 host.

- A maximum of four drives is supported on a single SCSI bus. For best performance, one drive per SCSI bus is recommended.

Attention: The following comments apply to Figure 125.

- RS/6000 does not support High Availability (HA) on LVD devices.
- An RS/6000 LVD adapter card does not allow you to remove termination. Using an external Y-cable and terminator will cause multiple termination problems.
- The RS/6000 does not offer a VHDCI Y-cable.
- Due to a SCSI-stub maximum-length limitation of 10 cm (3.9 in.), you cannot use an HD68-to-VHDCI interposer cable on a Y-cable.

__ 2. If the customer configuration requires more than one drive on each SCSI bus, install the appropriate SCSI drive-to-drive cables.

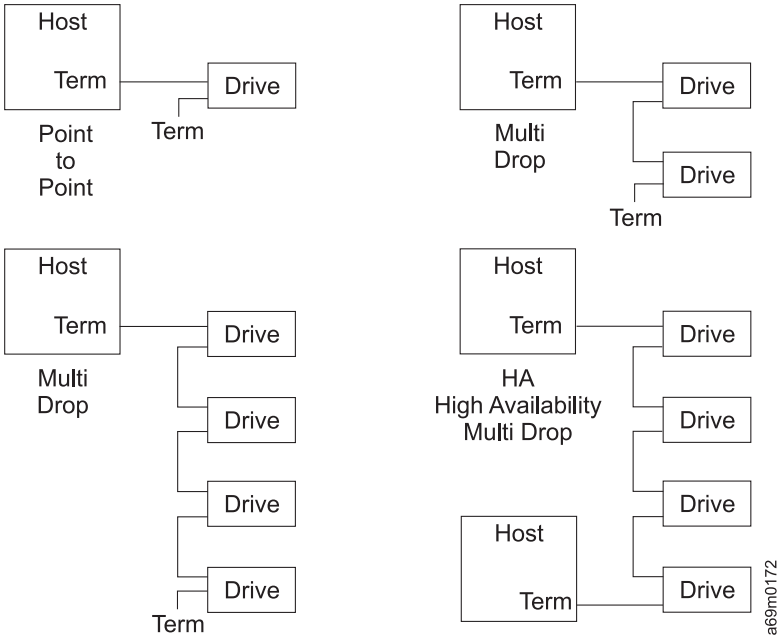


Figure 125. SCSI Interface Cables (Various Layouts)

__ 3. Ensure that every SCSI bus (even if the SCSI bus has only a single drive) has a SCSI bus terminator installed at the end of the bus farthest from where the host SCSI cable will connect.

Notes:

a. Ensure that you use an LVD terminator (34L3926) on an LVD drive and an HVD terminator (09L0877) on an HVD drive.
b. The two SCSI connectors on the fixed tray are interchangeable, it makes no difference which connector you use for which cable.
c. If a terminator is not installed at the end of each SCSI bus, failures will occur when the host application tries to use the library.

__ 4. Connect the appropriate drive-to-drive SCSI cables. Route each cable through the cable guide at the back of the fixed tray. Secure the cables by using the strain relief clamps that are located on the side wall, to the right of the fixed trays. You will be instructed to connect host SCSI cables in another procedure.

Fibre Cabling (Trays)

Note: If you are not installing any fibre drive **trays**, go to “SCSI Cabling (Trays)” on page 198.

__ 1. Locate a 2 m (6.56 ft) fibre drive cable that was shipped with each drive.
__ 2. Connect one end of each fibre cable to the fibre connection at the back of a fixed tray.
__ 3. Carefully route each cable to the left side frame, through the plastic cable clamps. Do not overtighten the clamp. To prevent damage to the fibre cables, do not use the metal SCSI cable clamps to secure the fibre cables.
__ 4. Route the fibre cables through the plastic clips at the bottom of the frame. Form a loop with any excess cable.
__ 5. Plug the fibre cables into the back of the bulkhead, at the bottom of the frame.
__ 6. Return to Table 28 on page 191 and continue to cable other drive types that are not done yet. If you have completed the cabling of the various drive types for this library, go to **“Attach Power and Bring-Up” on page 199**.

SCSI Cabling (Trays)

Note: If you are not installing any SCSI drive **trays**, go to “Attach Power and Bring-Up” on page 199.

__ 1. Consult with your customer and review the examples shown in Figure 126. You will be attaching necessary SCSI cables and terminators in the following steps.

Attention: Only one HVD drive is allowed on each SCSI bus when attached to an AS/400 host.
- A maximum of four drives is supported on a single SCSI bus. For best performance, one drive per SCSI bus is recommended.

Attention: The following comments apply to Figure 126.
- RS/6000 does not support High Availability (HA) on LVD devices.
- An RS/6000 LVD adapter card does not allow you to remove termination. Using an external Y-cable and terminator will cause multiple termination problems.
- The RS/6000 does not offer a VHDCI Y-cable.
- Due to a SCSI-stub maximum-length limitation of 10 cm (3.9 in.), you cannot use an HD68-to-VHDCI interposer cable on a Y-cable.

__ 2. If the customer configuration requires more than one drive on each SCSI bus, install the appropriate SCSI drive-to-drive cables.

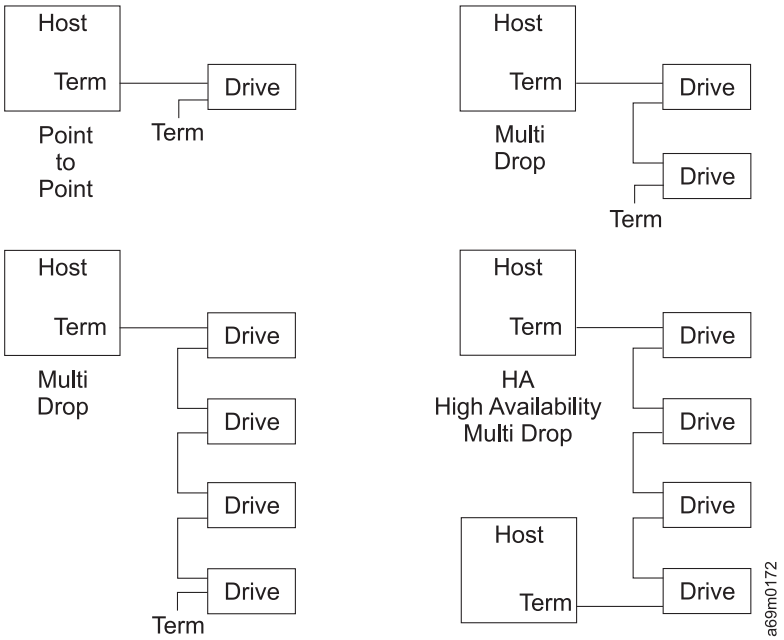


Figure 126. SCSI Interface Cables (Various Layouts)

__ 3. Ensure that every SCSI bus (even if the SCSI bus has only a single drive) has a SCSI bus terminator installed at the end of the bus farthest from where the host SCSI cable will connect.

Notes:
a. Ensure that you use an LVD terminator on an LVD drive and an HVD terminator on an HVD drive.
b. The two SCSI connectors on the fixed tray are interchangeable, it makes no difference which connector you use for which cable.
c. If a terminator is not installed at the end of each SCSI bus, failures will occur when the host application tries to use the library.

__ 4. Continue at **“Attach Power and Bring-Up” on page 199**.

Attach Power and Bring-Up

This procedure will direct you to attach the library power cord to the base frame and any expansion frame with an FCA installed.



Be aware that each frame that contains an FCA is protected by a main line circuit protector (CP) in the FCA. Each FCA must be further protected by a circuit breaker (CB) of the proper rating at the service rail (customer outlet).

__ 1. Have the customer switch on the circuit breakers that supply mainline ac voltage to the customer power receptacles.

__ 2. Go to Chapter 6, “Safety and Inspection,” on page 247, and perform the power receptacle safety check. If you have already performed a Safety inspection, go to the next step.

__ 3. Locate the AC power cords provided with the library.

Notes:

a. If this is a single frame installation (L32, L22, L52 base frame only), you will have only one power cord.

b. If **FC 1909** (Single Power Source Bifurcated Cable) has been ordered and installed, you will only have one power cord.

c. **If FC 1901 (Dual AC Line Cords Feature) is installed, you will have two power cords. Ensure the PDU-to-FCA cable is securely plugged into the back of the PDU and to the FCA.**

d. If this is a single frame L23 or L53 installation you will have two power cords, one for each Enhanced FCA.

e. If an expansion frame is being installed, and it does NOT contain the optional Frame Control Assembly (FCA) or Enhanced FCA, then it will not have power cords.

__ 4. Visually inspect the power cord plugs to ensure they match the customer receptacles. If a plug does not match the receptacle, refer to “Power Cord, Plug, and Receptacle Specifications” on page 595 to determine the correct power cord, and order the cord through your local ordering procedures.

Note: In many countries, the end of the power cord that will connect to the customer receptacle comes without a plug. It is the customer's responsibility to furnish this plug. The plug that connects to the Frame Control Assembly (FCA) is standard for all installations.

__ 5. Refer to Figure 128 on page 202. For each frame being installed, secure each power cord **1** coming from the customer power source to the FCA with two plastic cable ties **2** (P/N 1159519), using the EIA holes to the left of the FCA **3** . Place one tie near the FCA [about 35.6 cm (14 in.)] below the FCA power receptacle and another near the bottom of the frame [about 20.3 cm (8 in.)], above the access hole **4** in the bottom of the frame.

Top Frame Power Access

x22/x23/x52/x53 frames have the option to route the power cord in through the top of the frame. If your customer prefers this option, use the following steps to install the power cord through the top frame opening.

__ a. See Figure 127 on page 201. Your frame should have come with a ferrite/cable restraint assembly pre-installed at 1 .

__ b. Remove the ferrite/cable restraint assembly 2 and 3 that came pre-installed and set it aside for now. **For x22/x52 frames only:**

1) Feed the end of the power cable 5 (that connects to the FCA) through the top access hole and plug the cable into the FCA.
2) Determine how much cable you will need inside the frame 4 to route the power cable from the FCA to the top access hole. Typically this will be approximately 115 cm (45 in.). Mark the power cable at the point where it enters the top of the frame.
3) Remove the power cable from the machine.
4) Open the plastic cable restraint housing 2 and remove the ferrite 3 .
5) Open the ferrite and secure it around the power cable at the point you marked 4 . Close the ferrite securely around the power cable as shown.
6) Place the ferrite inside the plastic cable restraint housing (with the top cap 2 positioned as shown) and close it securely.
7) Feed the end of the power cable back into the opening and press the cable restraint in place at the top of the frame.
8) Firmly connect the power cord into the FCA.

__ c. **For x23/x53 frames only:**

1) Feed the end of both power cables (that connect to the BPC assemblies) through the top access hole.
2) Measure 132 cm (52 in.) of cable 6 and 89 cm (35 in.) of cable 7 you will need inside the frame to route the power cable from both BPC assemblies to the top access hole. Mark the power cables at these points.
3) Remove the power cable from the machine.
4) Open the plastic cable restraint housing 2 and remove the ferrite 3 .
5) Open the ferrite and secure it around the power cable at the points you marked (6 and 7). Close the ferrite securely around the power cable as shown. The cables will not be clamped securely, so ensure they do not slip through the ferrite assembly as you do the following steps.
6) Place the ferrite inside the plastic cable restraint housing (with the top cap 2 positioned as shown) and close it securely.
7) Feed the ends of the power cables back into the opening and press the cable restraint in place at the top of the frame.
8) Firmly connect the shorter power cord into the upper BPC, and the longer power cord into the lower BPC.

__ d. **See Figure 129 on page 202**. Remove the power cord retaining plate 1 , located near the 37V power supply(s), by removing one screw 2 . Position the cord behind the plate, then reinstall the retaining plate and screw.

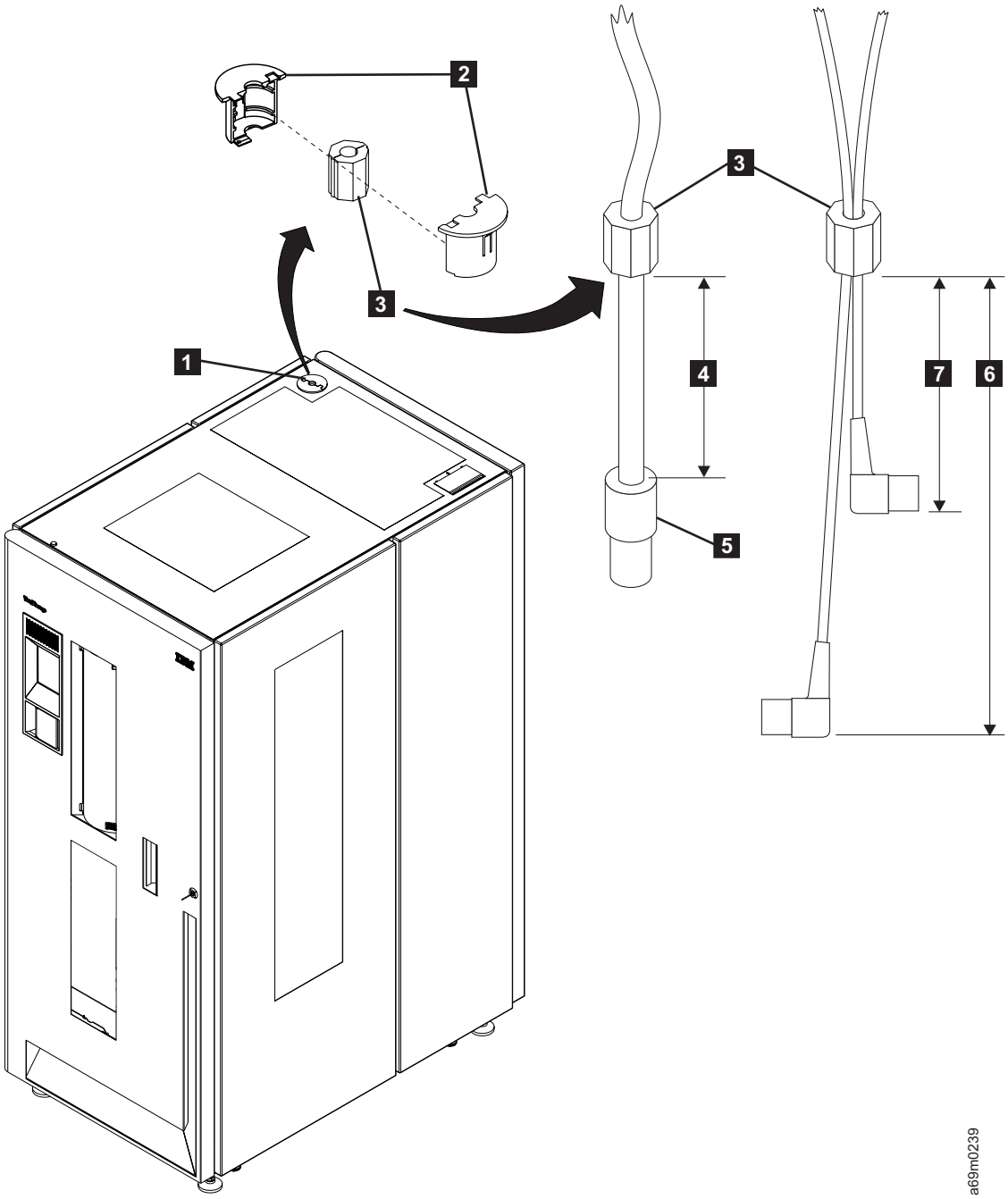


Figure 127. Securing 220V Power Cord (Top Feed Power Cord)

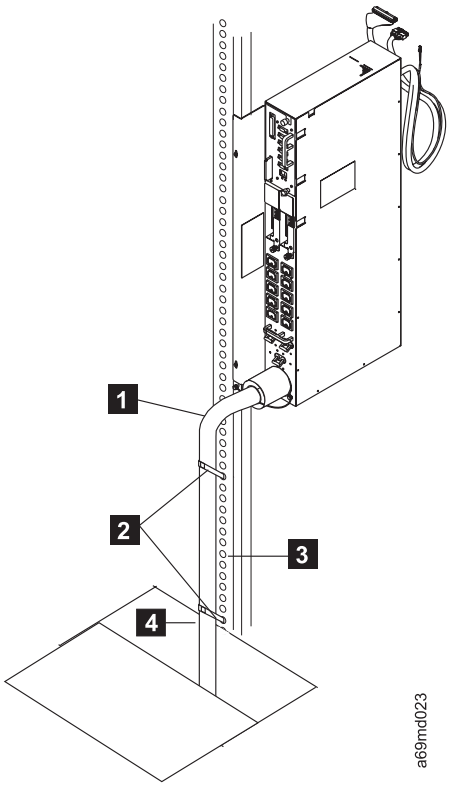


Figure 128. Securing 220V Power Cord (Bottom Feed Power Cord)

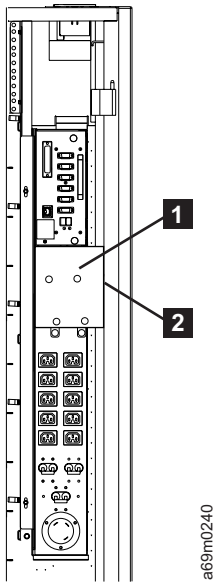


Figure 129. Power Cord Securing Plate

__ 6. If you are installing a 110V FCA (FC 1452 with SC 9951) the 110V power cord strain relief bracket is no longer required.

Note: New style x22/x52 frames have the option to route the power cord in through the top of the frame. If your customer prefers to use this option, use the above procedure to install the power cord through the top opening. See "Top Frame Power Access" on page 200.

__ 7. Ensure all the FCA power switches (located on the rear of the FCA just above the power cord receptacle) are off.

__ 8. Ensure the handles on both BPC power supplies (with Enhanced FCA) are raised all the way UP in the disconnected position.

__ 9. Ensure that the library power switch (located on the front panel, below the operator panel) is OFF (O).

__ 10. Connect the AC power cords into the FCA receptacles in the rear of the base and any expansion frames. **See Figure 130.**

Note: If FC 1901 (Dual AC Line Cords Feature) is installed, ensure the PDU-to-FCA cable is securely plugged into the back of the PDU and to the FCA.

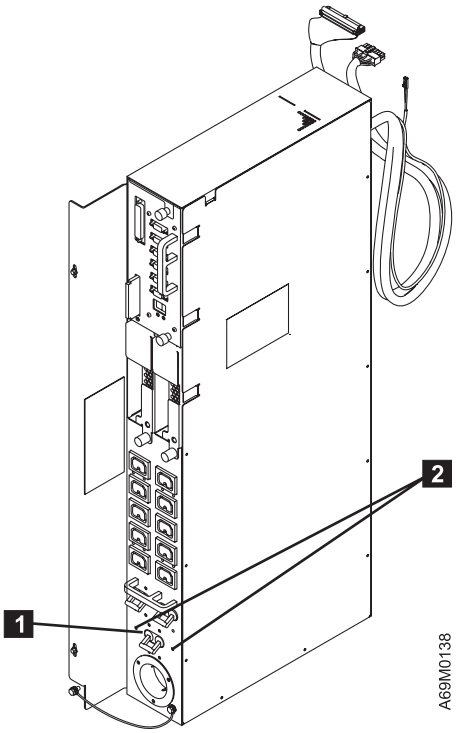


Figure 130. FCA Assembly

__ 11. See **Figure 131.** Connect power cords to both BPCs in frames with an Enhanced FCA.



Figure 131. Enhanced FCA Assembly

__ 12. Connect the power cords to the customer power receptacles.

__ 13. See **Figure 132 on page 205** to ensure the FIC terminators are installed correctly in a non-HA library.

__ 14. Starting at the base frame, switch on all the FCA circuit protectors, and lower the BPC handles on all power supplies which have the enhanced FCA installed.

__ 15. If the power and interframe cables are connected correctly (see **Figure 133 on page 205**):

- Each FIC card's green LED EPOV **1** should be On.
- The wrap active green LED **2** should be On in the base frame and Off in all other frames.
- The wrap active green LED **3** should be On in the last frame and Off in all other frames. **3** .

Note: If this is a base frame (Lxx) only installation, both terminators will be installed on the FIC card, and both wrap active LEDs will be On in the Lxx frame.

If the green LEDs are not correct, recheck your cabling and the FIC card termination jumpers. If you do not find a problem, go to “Power Isolation MAP” on page 648 to correct the problem, and return here.

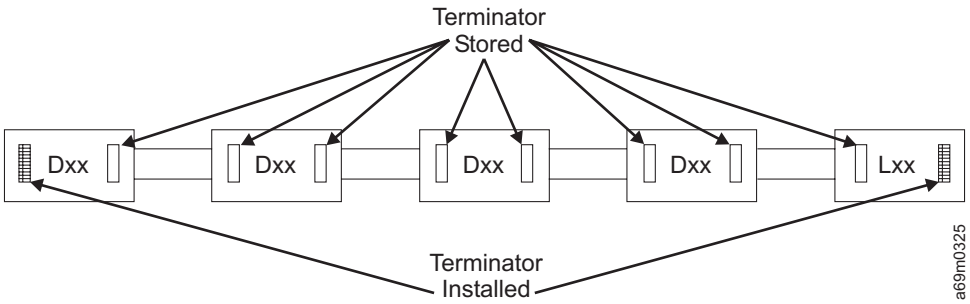


Figure 132. FIC Card Terminator Jumpers on non-HA Libraries

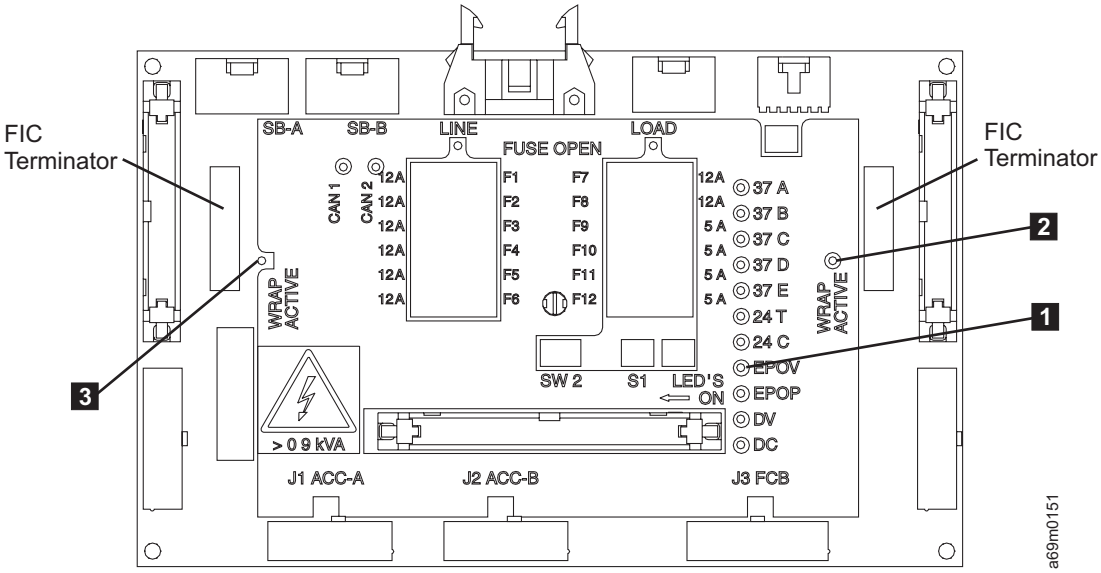


Figure 133. FIC Card Indicator Lights

Power On And Set Up

Note: If FC 1901 (Dual AC Line Cords Feature) is installed, ensure the PDU-to-FCA cable is securely plugged into the back of the PDU and to the FCA.

Feature Codes Requiring License Keys

Locate any install instructions for Feature Codes requiring a License Key. Install these features when you bring up the library. If the library came with a license key that was factory installed, manufacturing installed a label with that key number at the rear of the Lxx frame just to the left of the FIC card. Additional license key labels may be found to the right of the FIC card.

Note: If several new Dxx frames (containing an MCA or MCP) were added using FC 9003, leave power off on all the new Dxx frames except one. This will allow the library firmware to update the MCA/MCP in that frame when power is applied. Then power on the other Dxx frames, one at a time, and allow the library firmware to update. This process ensures the existing library firmware level is written to all new Dxx frames.

__ 1. Ensure all front doors are closed.

__ 2. Power on the library at the front panel power switch.

__ 3. The power indicator (located on the library front panel) should be On. If NOT, go to “Power Isolation MAP” on page 648, correct the problem, and return here.

__ 4. Near the top of each installed FCA is a Media Changer Pack (MCP). On the top shelf of each installed Enhanced FCA is a Media Changer Assembly (MCA). The two-character display on the rear of each MCP, and/or MCA, should display numbers starting at X'FF and counting down. These numbers have the following meaning:

- Numbers in the range from X'E0 through X'FF indicate stages in the MCP and/or MCA Power On Self Test (POST). If the two-character display continues to show a number in this range for more than 5 minutes it indicates a problem. If a problem is detected, go to Chapter 2, “Start,” on page 71, locate a match to your symptom, and repair the problem. Return here when the problem is fixed.
- Numbers in the range from X'20 through X'DF indicate that an error has been detected after MCP POST completed. If you see numbers between X'20 and X'DF, determine the error code. The first 2 numbers of the error code are displayed for about two seconds, then the second two numbers are displayed for about one second, then it repeats. As an example, if X'34 shows for about two seconds, then X'91 shows for about one second, this indicates the error code X'3491. When you have determined the error code, go to Chapter 2, “Start,” on page 71, locate a match to your symptom, and repair the problem. Return here when the problem is fixed.
- Numbers in the range from X'0E and X'0F indicate that the library is transferring code to one or more node cards. Wait as long as 30 minutes for the code transfer to complete before you continue.
- Numbers in the range from X'00 through X'16 are used for Frame Counting. This is an indication that MCP and/or MCA POST has completed with no critical errors. The two-character display will alternate between X'00 and X'nn (where nn is the frame number).

  Note: The frame number is 01 for the base frame, 02 for the first expansion frame, 03 for the next expansion frame, and so on. As an example, the two-character display on the base frame will display 00, then 01, and then repeat. If the first expansion frame (frame 2) has an FCA or an Enhanced FCA, its two-character display will display 00, then 02, and then repeat.

  If the wrong frame number is indicated, go to Chapter 2, “Start,” on page 71, locate a match to your symptom, and repair the problem. Return here when the problem is fixed.

Note: In an HA dual accessor library the MDA on accessor A should show 00 01 after it finishes POST. The MDA on accessor B should show 00 02 after it finishes POST. If accessor B shows 00 01 then it is necessary to swap the MDA on accessor A with the MDA from accessor B, and let the automatic code update complete.

__ 5. When the MCP and/or MCA has completed its POST successfully, it will enable power to the accessor and the front panel display. The two-character displays on the ACC, MDA, and OPC should light up and show progress through the POST procedures. The information on the two-character displays has the same meaning as in the last step.

__ 6. When the ACC, MDA, and OPC have completed their POST procedures, the accessor will attempt to rezero (move the accessor to bottom left side of the base frame, the home position). If the rezero is successful, the accessor performs an inventory of any frames that are already configured. As an example, if you are adding an expansion frame to an existing base frame, an inventory of the base frame will take place. If an error is detected, the operator panel will display the error information. Go to Chapter 2, “Start,” on page 71, locate a match to your symptom, and repair the problem. Return here when the problem is fixed.

__ 7. Check the fixed trays in the frame to ensure the 12v LEDs for both BPC1 (J2) and BPC2 (J3), and the 5v LED are on.

Capacity Expansion Features:

- Capacity Expansion (FC 1603) for L32,
- Intermediate Capacity on Demand FC 1641 (L22/L52) - plant
- Intermediate Capacity on Demand FC 1643 (L22/L52) - field, (L23/L53) plant/field
- Full Capacity on Demand FC 1644 (L22/L52) - field
- Full Capacity on Demand FC 1644 (L23/L53) - plant/field

Notes:

a. If you are adding one or more expansion frames to an existing library that already has two or more frames, go to **Configuration** below.

b. If you are installing a base frame with expansion frames, go to step 8.

c. If you are installing a base frame only, the “Capacity Expansion” feature is optional. Look at the packing list to see if the customer ordered the feature. If the customer ordered the feature, go to step 8. If the customer did not order the feature, go to **Configuration** below.

Attention: For detailed information on capacity expansion features, refer to the appropriate Lxx frame figures in “Library Components – Locations Lxx/Dxx” on page 18.

__ 8. Perform the following steps to determine if the “Capacity Expansion” feature is installed on the base frame.

a. At the **Activity** screen, press [MENU].

b. At the **Main Menu** screen, use the [DOWN] button to locate **Settings**, and press [ENTER].

c. At the **Settings** screen, select **Configuration**, and press [ENTER].

d. At the **Configuration** screen, select **Display Configuration**, and press [ENTER].

e. At the **Physical Configuration** screen, look at the total storage slots.

- If the number of total storage slots is **more than 160** (example: 227, 253, or 281), the “Capacity Expansion feature” (L32) or “Intermediate or Full Capacity on Demand features” (L22/L52) are already enabled. Go to **Installing and Enabling ALMS** below.
- If the number of total storage slots is **less than 160** (example: 87, 113, or 141), go to the next step.

__ 9. Look in the ship group or the MES kit for the “Capacity Expansion” (L32) or "Intermediate Capacity on Demand" or “Full Capacity on Demand feature” (L22/L52) features. Obtain the capacity expansion feature key, then either use the Install Instructions provided with the feature, or perform the following:

a. At the **Activity** screen, press [MENU].

b. At the **Main Menu** screen, using the [DOWN] button, select **Service**, and press [ENTER].

c. At the **Service** screen, select **Firmware Update**, and press [ENTER].

d. At the **Firmware Update** screen, select **Features**, and press [ENTER].

e. At the **Features** screen, select **Capacity Expansion Feature** (L32), or **Intermediate Capacity Expansion** or **Full Capacity Expansion** (L22/L52), and press [ENTER].

f. Enter the capacity expansion key, and press [ENTER].

g. Once the capacity expansion feature is enabled, press the [BACK] button to exit this routine.

Installing and Enabling ALMS

If ALMS was ordered as part of this installation, verify that ALMS is installed, select **MENU -►**, **Service -► Firmware Update -► Features**.

Note: The complete ALMS procedure is documented in **Chapter 3, "Enabling or Disabling ALMS in the 3584 Tape Library"** of the 3584 Operator Guide. The steps are repeated here for

the benefit of the CE. The ALMS feature (FC 1690) must have been previously ordered. The customer must have a configured and operational Web User Interface before any ALMS procedures can be used.

If ALMS has been installed and configured, you can enable the feature using the following steps:

a. Type the Ethernet IP address on the URL line of the browser and press Enter. The Welcome Page displays.

b. **Select Manage Library —> Enable ALMS**. The Advanced Library Management System Mode screen displays.

c. Follow the instructions on the screens to enable ALMS. When ALMS is enabled, the button displays **Disable ALMS** when ALMS is disabled, the button displays **Enable ALMS**.

Configuration

Note: By default, the library subsystem is configured as one logical library. If necessary, the subsystem can be configured as multiple logical libraries. The maximum number of logical libraries is the number of tape drives, although we recommend at least two tape drives per logical library.

For more detailed information about configuration, see the *IBM System Storage TS3500 Tape Library Operator Guide*.

If **Advanced Library Management System (ALMS)** feature is installed and enabled, select ***Discover Hardware Changes***, then press **ENTER**. Follow the instructions on the machine and wait until the library becomes 'Ready'. **Note:** The customer will need to assign drives and slots to logical libraries using the IBM Tape Library Specialist (Web UI) before the configuration is complete. Then go to step **17 on page 210**.

If the customer wants to define a single logical library, go to step **11**. If the customer wants to define multiple logical libraries, ask whether they want to install logical library bar code labels (no longer supported in library firmware 6xxx or higher).

Note: Very few customers use logical library bar code labels. Use of logical library bar code labels is no longer supported. However, the customer can use Advanced Configuration. As an example, if the customer needs to define logical libraries that are smaller than one column (or smaller than two columns if the Capacity Expansion Feature is enabled), they must use Advanced Configuration.

__ 10. If the customer wants to use logical library barcode labels (no longer supported in library firmware 6xxx or higher), open the front doors, install the logical library bar code labels as required by the customer, then close the front doors. Barcode label support is no longer being tested, however barcode label support is still in the code.

Note: Logical library bar code labels must be positioned at the top of each odd-numbered column and on the bezel of each drive.

__ 11. At the **Activity** screen, press [MENU].

__ 12. At the **Main Menu** screen, using the [DOWN] button, select **Settings**, and press [ENTER].

__ 13. At the **Settings** screen, select **Configuration**, and press **ENTER**.

__ 14. At the **Configuration** screen, select **Configure Library** or **Advanced Configuration**, and press **ENTER**.

Notes:

a. If the customer used logical library bar code labels, or if this is a single logical library configuration, select **Configure Library**.

b. If this is a multiple logical library configuration and the customer did not use logical library bar code labels, select **Advanced Configuration**.

__ 15. Follow the instructions on the screens to complete the configuration.

Note: When the configuration has been completed, the library will be calibrated automatically, if necessary.

__ 16. If you have installed any frames containing drives, go to the operator panel.

a. At the **Activity** screen, press [MENU].

b. At the **Main Menu** screen, using the [DOWN] button, select **Settings**, and press [ENTER].

c. At the **Settings** screen, select **SCSI/Loop IDs**, and press [ENTER]. Assign SCSI or loop IDs to each drive you installed. Return here when you have finished setting the SCSI or loop IDs.
Note: The customer provides the Loop IDs for all drives in the library.

__ 17. Review the packing list to see if you have any of the (FC) feature codes listed below to install. If you have a feature to install go to “Installing Remote Support (Call Home Feature)” on page 211 to determine the feature you will be installing. If you do not have a feature to install go to “Completing and Verifying Installation” on page 224.

- FC 2710, Remote Support Facility (modem and cable)
- FC 2711, Remote Support Switch
- FC 2712, Remote Support Attachment (cable)
- FC 2720, Remote Support Facility (modem and cable)
- FC 2715, Console Attachment
- FC 2714, Console Expansion
- FC 1662, 3584 Library Specialist. See Note below.

Note: **Configuring the IBM Specialist is an operator task**. The operator should reference the 3584 "IBM System Storage TS3500 Tape Library Operator Guide" for setup and configuration information.

Installing Remote Support (Call Home Feature)

Optional remote support is available for the 3584 library through its Call Home capability. This feature minimizes the time it takes to repair library problems. It uses a modem connection to report failures that are detected by the library. Whenever the library detects a failure, the Call Home feature sends detailed error information to IBM. The IBM service representative can then prepare an action plan to handle the problem before traveling to the library. Call Home can also be configured through the Master Console using FC 9217 as shown in the table below. 'TotalStorage Master Console' and 'TS3000 System Console' are one in the same.

The Call Home feature handles library problems (including those related to loading and unloading the drive); it does not handle drive read/write or server interface problems.

Hardware requirements for the remote support function vary, depending on whether you already have one or more 3584 Tape Libraries. Table 29 indicates the requirements.

Table 29. Requirements for Remote Support (Call Home Feature)

Quantity of Lxx Frames	Requirement	Perform this Procedure
1	**(FC 2710)** Remote Support Facility (modem and cable) **Note:** Available on all Lxx frames.	Refer to the Install Instructions for this Feature Code, then continue at “Remote Support Facility (FC 2710) – Modem Installation and Initialization” on page 212.
	(FC 2720) Master Console for Service. Provides the IBM TotalStorage Master Console, an Ethernet switch, ethernet cables, RS-232 cable, and modem for connection of one 3584 to enable remote enhanced service. **Note:** Available on all Lxx frames.	See **Figure 220 on page 754** for a diagram layout. Refer to the Install Instructions for this Feature Code.
2	**(FC 2711)** Remote Support Switch **Note:** Only available of L22, L32, L52 frames.	Refer to the Install Instructions for this Feature Code, then continue at “Remote Support Facility WTI Switch (FC 2711)” on page 212.
	(FC 2715) Console Attachment. Provides an ethernet cable to attach a 3584 to the Ethernet switch which was provided by the Master Console for Service (2720)	See **Figure 220 on page 754** for a diagram layout. Refer to the Install Instructions for this Feature Code.
3 or more	**(FC 2712)** Remote Support Attachment (cable)	Refer to the Install Instructions for this Feature Code, then continue at “Remote Support Attachment (FC 2712)” on page 219.
	(FC 2714) Console Expansion. Provides an (2x) attachment cables for connection of one machine, and an Ethernet switch hub for expanding the number of machines that can be attached to the Master Console for Service (FC 2720).	See **Figure 220 on page 754** for a diagram layout. Refer to the Install Instructions for this Feature Code.
1 or more	**(FC 9217)** 3584 Attached to zSeries OS (cable). Installation instructions provide the required pre-reqs (both hardware and firmware) for this feature. Refer to those instructions before continuing here.	Go to “Using CETool to Configure for Call Home (via TSSC)” on page 750 for configuration details.

See “Using CETool to Configure for Call Home (via Modem)” on page 746 for more information configuring and/or disabling Call Home.

Remote Support Facility (FC 2710) – Modem Installation and Initialization

If Feature Code 2710 (modem and cable) is to be installed on this library, perform the following procedure.

Note: An analog telephone line and an ac power receptacle will be needed to complete the installation.

Note: When installing the modem and cables, ensure that the cables are placed where they do not cause a tripping hazard.

1. Place the modem outside the base frame, or where the customer wants to have it installed.
2. Plug the modem power adapter into the modem and an ac power receptacle.

   Note: The modem does not receive power from the library.
3. Power off the modem.
4. Connect the modem cable (19P4692) between the 3584 base frame (for L22, L32, L52) MCP connector **J6** and the modem, or (for L23, L53) connect the modem cable (23R4630) between the 3584 base frame MCA connector **J6** and the modem.

   Note: Route the cable through the opening in the bottom of the Lxx frame.
5. Connect the modem phone cable (provided with the modem) from the 'line' jack on the back of the modem to the customer's analog phone jack.
6. Power on the modem.
7. Connect the CETool serial cable (19P1061 or 23R4629) to the 3584 base frame (L22, L32, L52) MCP connector **J1** or (for L23, L53) connect the CETool serial cable (19P1061 or 23R4629) to the 3584 base frame MCA connector **J1**.
8. If you do NOT already have CETool Version 3.4 (or higher) installed on your CE laptop, see “Downloading and Installing CETool” on page 726.
9. Perform Call Home configuration (see “Call Home Facility Configuration” on page 754. This will configure your modem automatically as part of the procedure.
10. Quit CETool.
11. Using the library front panel display, send a test call home as follows:-
    a. Select **Main Menu**.
    b. Select **Service**.
    c. Select **Tests/Tools**.
    d. Select **Diagnostics**.
    e. Select **Call Home**.
12. To verify that the test worked, access RETAIN directly or ask your local Support Center to check that a RETAIN PMR was opened. The call home record will show, -URC = ACCA (Call Home Test).
13. If this is the last feature code for Remote Support you will be installing go to “Completing and Verifying Installation” on page 224. If you have another feature code to install go to Table 29 on page 211 to determine the next feature code to be installed.

Remote Support Facility WTI Switch (FC 2711)

If feature code 2711 is to be installed on this library, perform the following procedure.

1. On the back of the WTI switch, check and set the line voltage to the proper voltage for your user's environment (115 V ac or 230 V ac).
2. Located on the bottom of the WTI switch is an 8-position feature switch. Set the switch so positions 2, 4, 5, 6, and 7 are ON; positions 1, 3, and 8 are OFF.
3. Plug the WTI switch power cord into the switch and into the customer power receptacle.
4. Connect one end of the DB9F to DB9F Null Modem cable (P/N 19P4693) to port 1 on the WTI switch.
5. Connect the other end of the cable to a serial port on your MOST Laptop PC (or any Windows PC).

The following steps start the HyperTerminal program and ensure that it can communicate with the WTI switch.

Note: If you normally use a different terminal emulator program (such as NetTerm), you can use it for this procedure. Only the initial setup to connect to the switch will be different.

6. Start the HyperTerminal program on the PC:
   a. For Windows NT, click on **Start**. Select **Programs**, **Accessories**, **HyperTerminal**, **HyperTerminal**. The HyperTerminal program will start.
   b. For Windows 95/98/2000, click on **Start**. Select **Programs**, **Accessories**, **Communications**, **HyperTerminal**. The HyperTerminal folder displays.

      Double-click on the Hypertrm icon (hypertrm.exe). The HyperTerminal program will start.
7. If a Location Information screen appears, select your country/region, enter your area code, and click on the **Close** button. This information will not be used in this procedure, but is required for the HyperTerminal program.
8. If a message appears stating that 'You need to install a modem before you can make a connection. Would you like to do this now?,' click on the **No** button.
9. At the Connection Description screen, type **APS16** in the 'name' field, and click on **OK**.
10. At the Connect To screen, set the 'Connect using' field to the Comm port you plugged the WTI switch cable into (example: COM1), and click on **OK**.
11. At the Port Settings screen, set the 'Bits per second' field to 38400, and ensure the Data Bits = 8, Parity = none, Stop Bits = 1, and Flow Control = Hardware, and click on **OK**.
12. Ensure the PC Caps Lock is OFF before continuing.
13. Turn on the WTI switch. The power switch is located on the back of the WTI switch.
14. Reset the WTI switch by pressing and holding for at least three seconds both the **SET** button and **CLEAR** button. Release the **Clear** button, wait one second and release the **Set** button.

    Note: This clears any settings that were previously stored in the WTI switch, and causes the switch to function as specified by the feature switches.
15. Use the keyboard of your PC to issue the Wake Port command. Use this to ensure the WTI switch is ready to receive commands. Follow these steps:
    a. Type **/** (forward slash).
    b. Type **Ctrl+e** (hold down the **CTRL** key, type the letter **e**, then release the **Ctrl** key.
    c. Press Enter.
16. The HyperTerminal screen should show one of the following prompts.

    APS> This indicates a good connection between HyperTerminal and the WTI switch.

    ATH Enter Password
    This also indicates a good connection between HyperTerminal and the WTI switch, but should only occur if a password was previously set into the WTI switch. Since the previous step reset the switch, this should not occur. If it does occur, enter the password, and the APS> prompt should appear. The default password is 'pfe4u' though in some cases the customer may have specified a different password.

    Blank
    This indicates that the WTI switch is not communicating with the HyperTerminal program. Check the WTI switch feature switch settings and the cable connections, and reset the WTI switch. If you are unable to establish a connection, possible causes are a problem with the PC serial port, the wrong COM port is specified in HyperTerminal, the WTI switch is defective, or the cable is defective.
17. At the APS> prompt, type **/h**, and press **Enter**. The Command menu displays.

Note: Your PC may default to a different font, so entries may not line up as neatly as is shown in Figure 134. This will not cause problems performing the procedure.

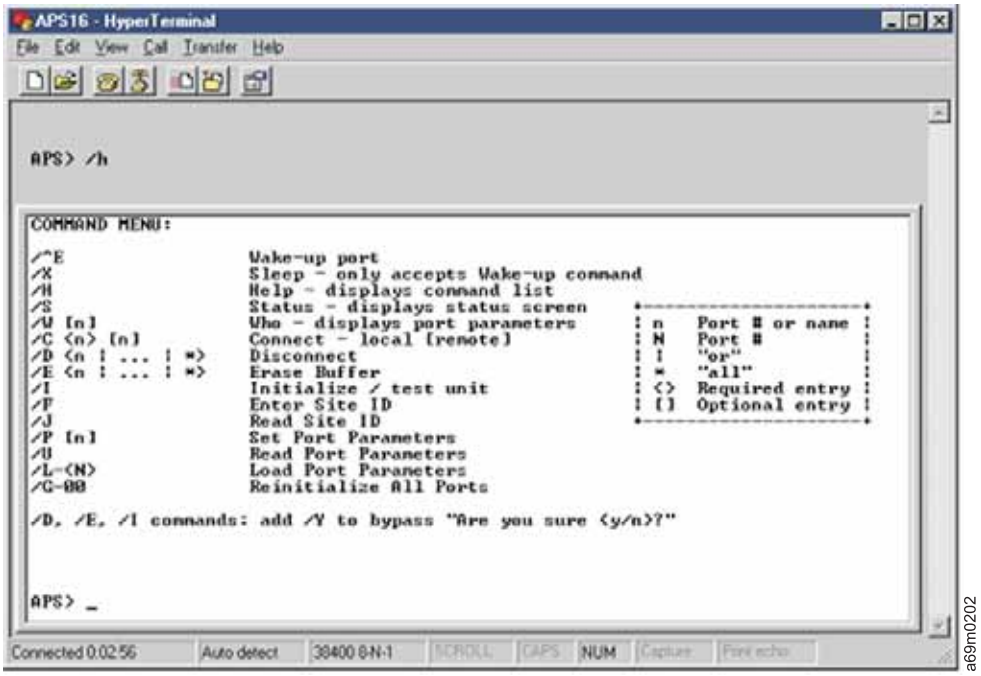


Figure 134. WTI Command Menu (FC2711)

18. At the APS> prompt, type **/s**, and press **Enter**. The System Status screen displays.

The following steps setup switch port 1 for connection to the modem.

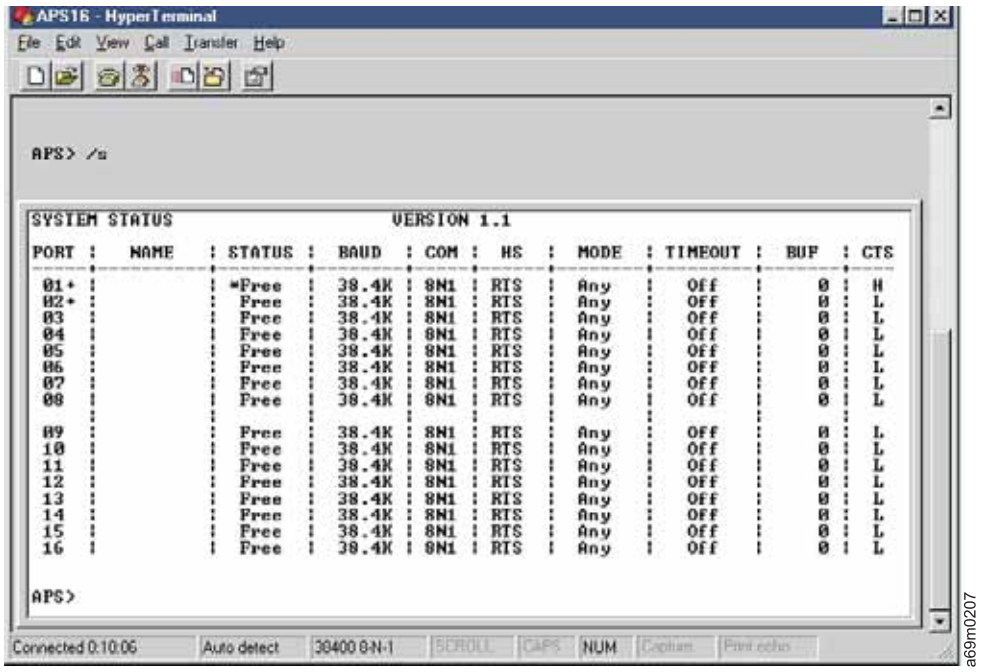


Figure 135. WTI System Status Screen (FC2711)

19. At the APS> prompt, type **/p 1**, and press **Enter**. The Port Parameters screen displays.

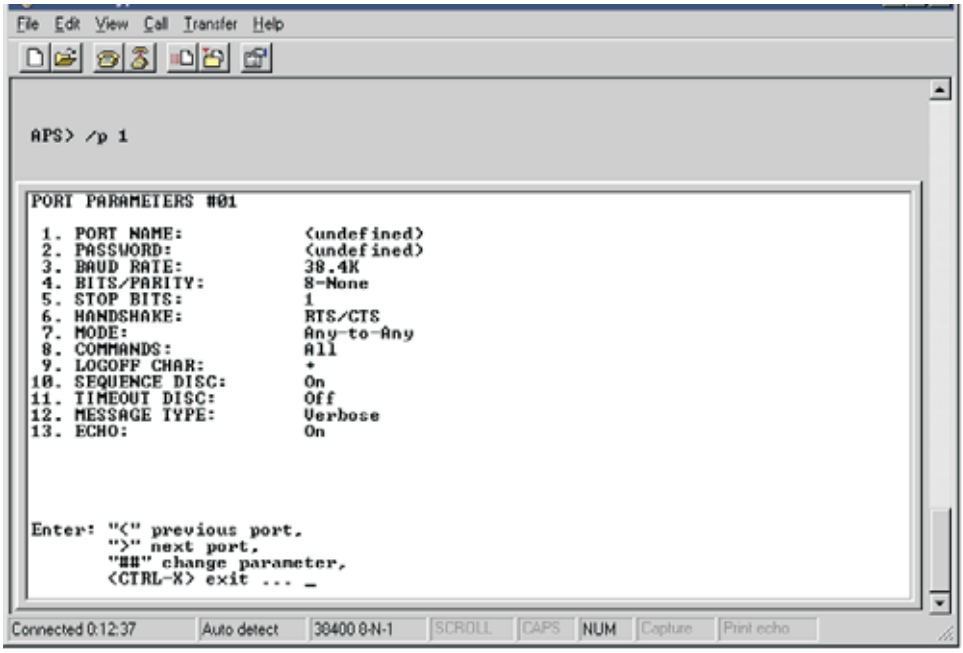


Figure 136. WTI Port Parameters Screen (FC2711)

20. Type **1**, and press **Enter** to select the PORT NAME option.
21. Type **Modem**, and press **Enter**.
22. Type **7**, and press **Enter** to select the MODE option.
23. Type **4**, and press **Enter** to set the MODE to Modem.
24. Type **71**, and press **Enter** to select the RESET STRING option.
25. Press the spacebar once, then press **Enter** to clear the RESET STRING.
26. Type **72**, and press **Enter** to select the INIT STRING option.
27. Press the spacebar once, then press **Enter** to clear the INIT STRING.
28. Type **73**, and press **Enter** to select the HANG-UP STRING option.
29. Type **ATH0** (0 is the number zero), then press **Enter** to set the HANG-UP STRING to ATH0.
30. Type **2**, and press **Enter** to select the PASSWORD option.
31. Type **pfe4u**, and press **Enter** to set the PASSWORD to 'pfe4u.'

    Note: If the customer requests a specific password, enter the customer's password in place of 'pfe4u.'
32. Verify that items 1 and 7 are set to 'Modem', item 2 is set to 'pfe4u' (or the customer password), items 71 and 72 are set to '(undefined)', and item 73 is set to 'ATH0.' If any of these items is not set correctly, set it again before you continue. The screen should look like Figure 137 on page 216.

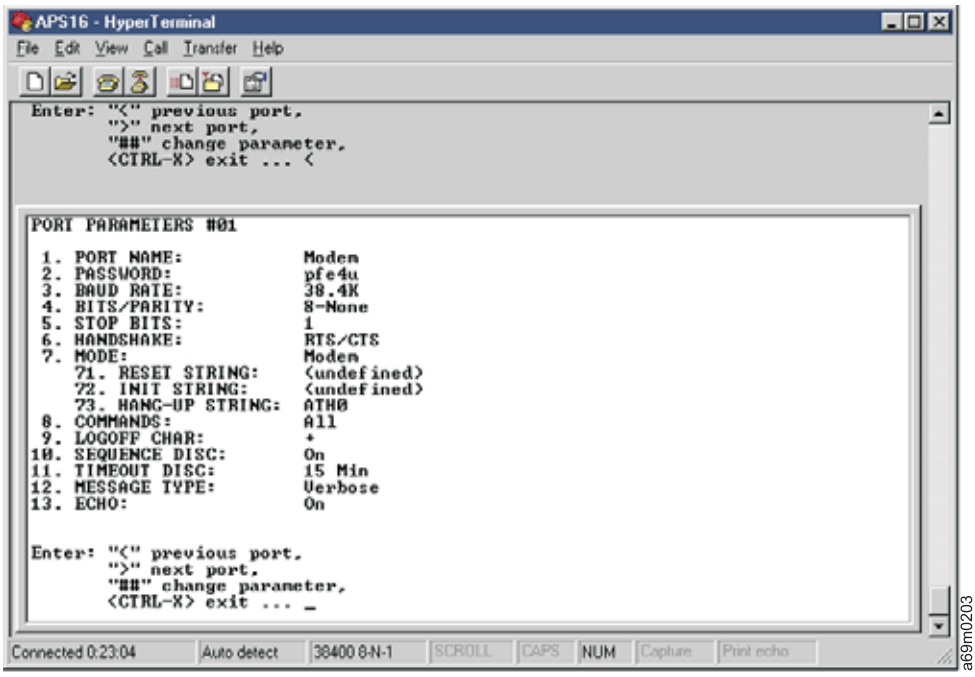


Figure 137. WTI Port Parameters #01 Screen (FC2711)

33. Press **Ctrl+X** to exit the Port Parameters screen.

Note: If prompted to enter the password, type **pfe4u** (or the customer password), and press **Enter**.

The following steps setup switch ports 2 - 16 for connection to the IBM 3584 Ultrascalable Tape Library.

34. At the APS> prompt, type **/p n** (where n is the port number where a 3584 will be connected), and press **Enter** (example: /p 2). The Port Parameters screen displays.

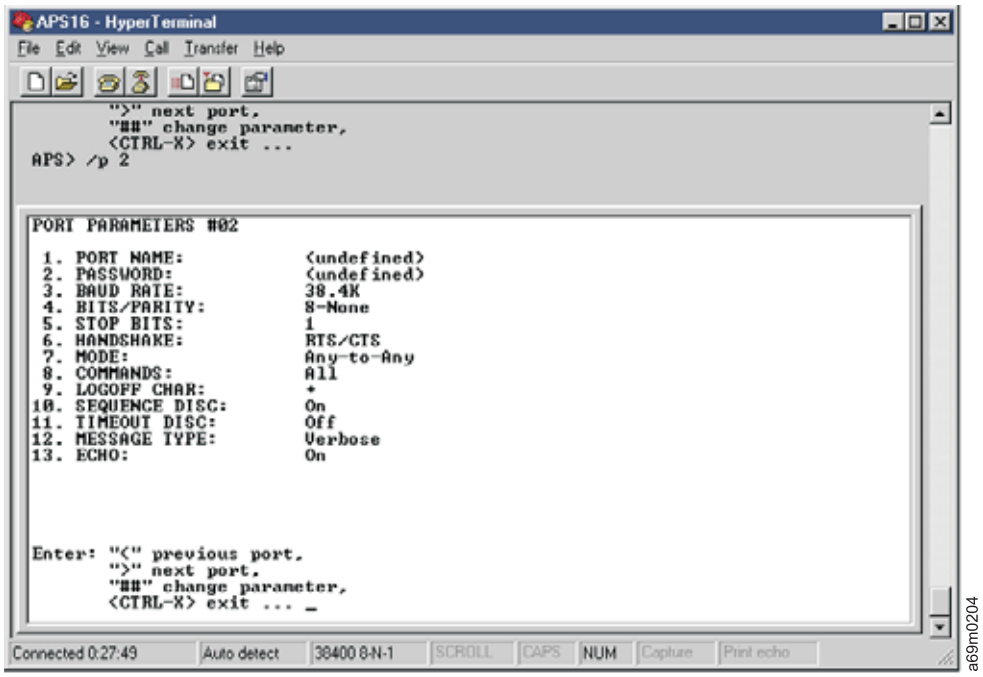


Figure 138. WTI Port Parameters #02 Screen (FC2711)

35. Type **1**, and press **Enter** to select the PORT NAME option.
36. Type **IBM3584A** (or any other descriptive name the customer wants to call the first library - it must start with an alpha character, contain no blanks, and be no more than 8 characters long), and press **Enter**.
37. Press **Ctrl+X** to exit the Port Parameters screen.

    Note: Leave all Port Parameters, except for the Port Name, set to the defaults.
38. Repeat steps 34 on page 216 through 37, selecting the next port number, until all ports that will be connected to 3584 libraries have been named.
39. Type **/s**, and press **Enter** to display the System Status screen.
40. Verify that port 1 is named Modem, and any port from 2 - 16 that will be connected to a 3584 library is named with a unique descriptive name. If any port shows the wrong name, correct it before you continue. The screen should now appear as shown in 34 on page 216.

    Note:

    - There could be more libraries attached.
    - Customer descriptive names may be used in place of the library names in the following screen.

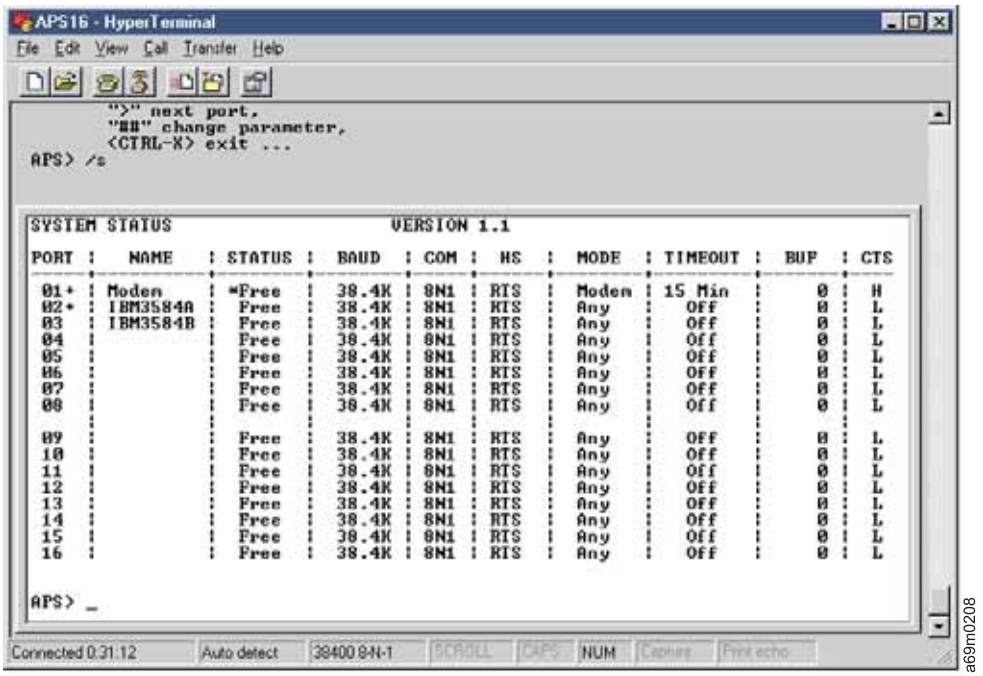


Figure 139. WTI System Status Screen - Second View (FC2711). Includes 'Status Name.'

41. Type ***/x***, and press **Enter**. The word Asleep will be displayed, indicating that the switch is now in sleep mode.
42. Turn off the WTI switch.
43. Close the HyperTerminal program. When asked whether you want to disconnect now, click on **Yes**. When asked whether you want to save session APS16, click on **No**.

The following steps connect the WTI switch to the modem and to each 3584 library.

44. Remove the cable from switch port 1.
45. Acquire the DB9F-to-DB25M modem cable (P/N 19P4692). Attach the DB9F-end of the modem cable to port 1 of the WTI switch.
46. Attach the DB25M-end of the modem cable (P/N 19P4692) to the modem.
47. Locate a DB9F-to-DB9F Null Modem cable (P/N 19P4693) for each 3584 library that will be connected to the WTI switch.
48. Connect the Null Modem cable to port 2 of the WTI switch and to the J6 connector on the MCP in frame 1 of the first library (called IBM3584A, in the example).
49. Repeat the previous step for each library until all 3584 libraries have been connected to the designated ports on the switch.
50. Ensure that the modem is connected to the phone line and that the modem is powered on.
51. Ensure that the WTI switch is powered on.

The following steps configure the 3584 to call home through the WTI switch.

52. Use CETool version 2.7 or higher to set the Remote Support Configuration. This must be done on each 3584 library that is connected to the WTI switch. See “Call Home Facility Configuration” on page 754.

    Note: Ensure that the WTI Switch field is checked, and that the Switch Port Number field is set to the number of the WTI switch port connected to the library.
53. Perform a Call Home test at the library before you proceed to configure the next library. At the library front panel, press **MENU**, then select **SERVICE**, **TESTS/TOOLS**, **DIAGNOSTICS**, **CALL HOME**.

54. Verify that RETAIN received the Call Home with URC ACCA from the library. If no Call Home was received, verify that all of the Call Home configuration information was entered correctly, that the WTI switch and modem are powered on, that all cables are securely connected, and that the phone line is active.
55. Repeat steps 52 on page 218 through 54 until all 3584 libraries connected to the WTI switch have been configured and have called home successfully.
56. If this is the last feature code for Remote Support you will be installing go to “Completing and Verifying Installation” on page 224. If you have another feature code to install go to Table 29 on page 211 to determine the next feature code to be installed.

Remote Support Attachment (FC 2712)

This procedure helps you setup the remote support cable for the WTI switch.

1. Unplug the modem cable from port 1 of the WTI switch.
2. Connect one end of the DB9F to DB9F Null Modem cable (P/N 19P4693) to port 1 on the WTI switch.
3. Connect the other end of the cable to a serial port on your MOST Laptop PC (or any Windows PC).

The following steps start the HyperTerminal program on the PC, and ensure that it can communicate with the WTI switch.

Note: If you normally use a different terminal emulator program (such as NetTerm), you can use it for this procedure. Only the initial setup to connect to the switch will be different.

4. Start the HyperTerminal program on the PC:
   - For Windows NT, click on **Start**. Select **Programs**, **Accessories**, **HyperTerminal**, **HyperTerminal**. The HyperTerminal program will start.
   - For Window 95/98/2000, click on **Start**. Select **Programs**, **Accessories**, **Communications**, **HyperTerminal**. The HyperTerminal folder displays.

     Double-click on the Hypertrm icon (hypertrm.exe). The HyperTerminal program will start.
5. At the Connection Description screen, type **APS16** in the 'name' field, and click on **OK**.
6. At the Connect To screen, set the 'Connect using' field to the Comm port you plugged the WTI switch cable into (example: COM1), and click on **OK**.
7. At the Port Settings screen, set the 'Bits per second' field to 38400, and ensure the Data Bits = 8, Parity = none, Stop Bits = 1, and Flow Control = Hardware, and click on **OK**.
8. Ensure the PC Caps Lock is OFF before continuing.
9. Turn the WTI switch off, then on. The power switch is located on the back of the WTI switch. The HyperTerminal screen should show one of the following prompts:

   ATH0 Enter Password

   This also indicates a good connection between HyperTerminal and the WTI switch, but also indicates that a password was previously set into the WTI switch. Enter the password, and the APS> prompt should appear. The default password is 'pfe4u' though in some cases the customer may have specified a different password.

   APS> This can indicate both:

   - That a good connection exists between HyperTerminal and the WTI switch.
   - No password was previously set into the WTI switch. If a password should have been set, refer to the WTI switch configuration procedure, and set a password on modem port 1 using the Port Settings command **(/p 1)**.

   Blank

   This indicates that the WTI switch is not communicating with the HyperTerminal program. Check the WTI switch feature switch settings, the cable connections, and the HyperTerminal COM settings. Turn the WTI switch off, then on.

Note: If you are unable to correct the problem, you can reset the WTI switch by pressing and holding for at least 3 seconds both the SET button and the CLEAR button . Release the CLEAR button first, then release the SET button. This clears any settings previously stored in the WTI switch and causes the switch to function as specified by the feature switches.

If you do this, you MUST locate the WTI switch configuration procedure (either in the Feature Code 2711 installation instructions, or in the MI) and reconfigure the WTI switch. If you reconfigure the WTI switch according to the Feature Code 2711 installation instructions, you will not need to return to the 2711 instructions, but should still consider feature code 2711 installed.

If you are still unable to establish a connection, the possible causes are a problem with the PC serial port, a defective WTI switch, or a defective cable.

10. At the APS> prompt, type **/h**, and press **Enter**. The Command menu displays.

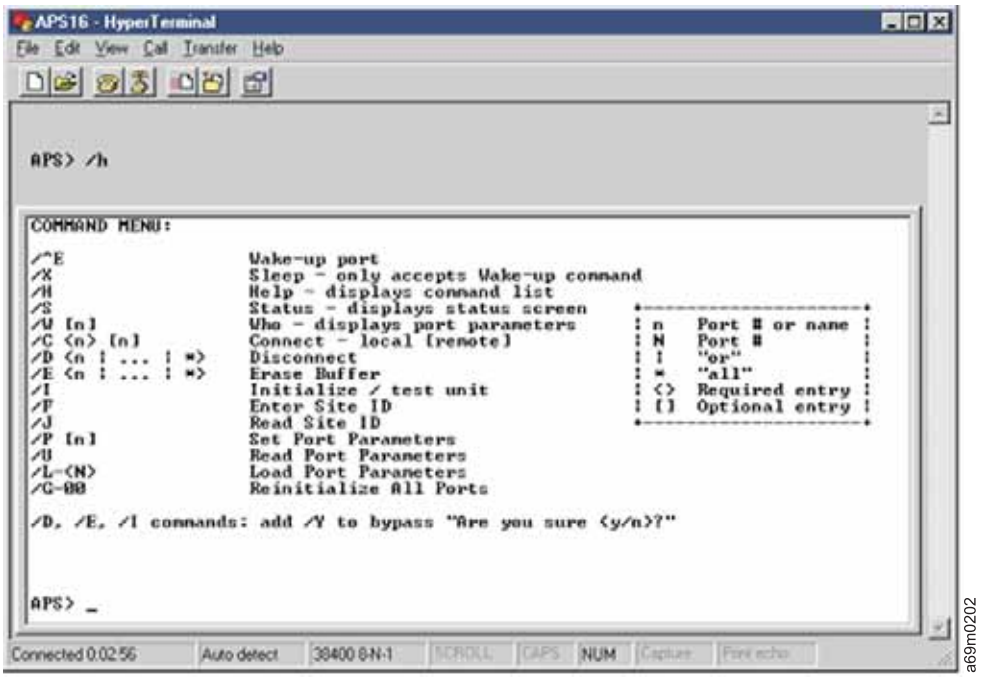


Figure 140. WTI Command Menu (FC2712)

11. At the APS> prompt, type **/s**, and press **Enter**. The System Status screen displays.

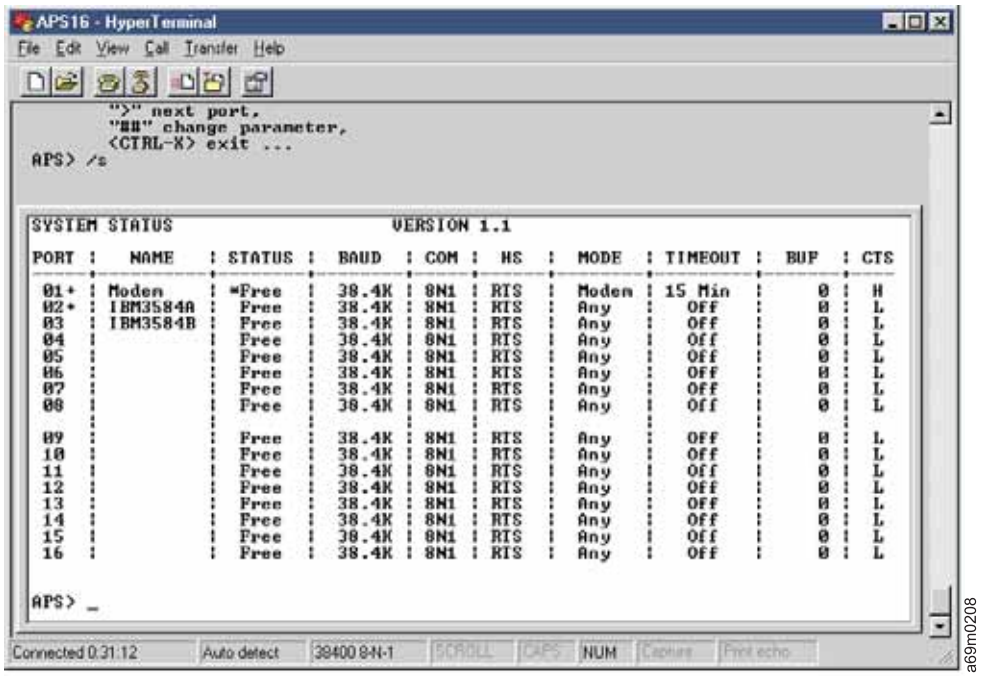


Figure 141. WTI System Status Screen (FC2712)

Note: Figure 141 assumes three 3584 libraries are already connected to the WTI switch. The number of ports that are in use and the port name of ports 2 - 16 may be different in your environment.

The following steps setup one additional switch port for connection to the IBM 3584 Ultrascalable Tape Library.

12. At the APS> prompt, type **/p n** (where n is the next unused port number where a 3584 will be connected), and press **Enter** (example: /p 4). The Port Parameters screen displays.

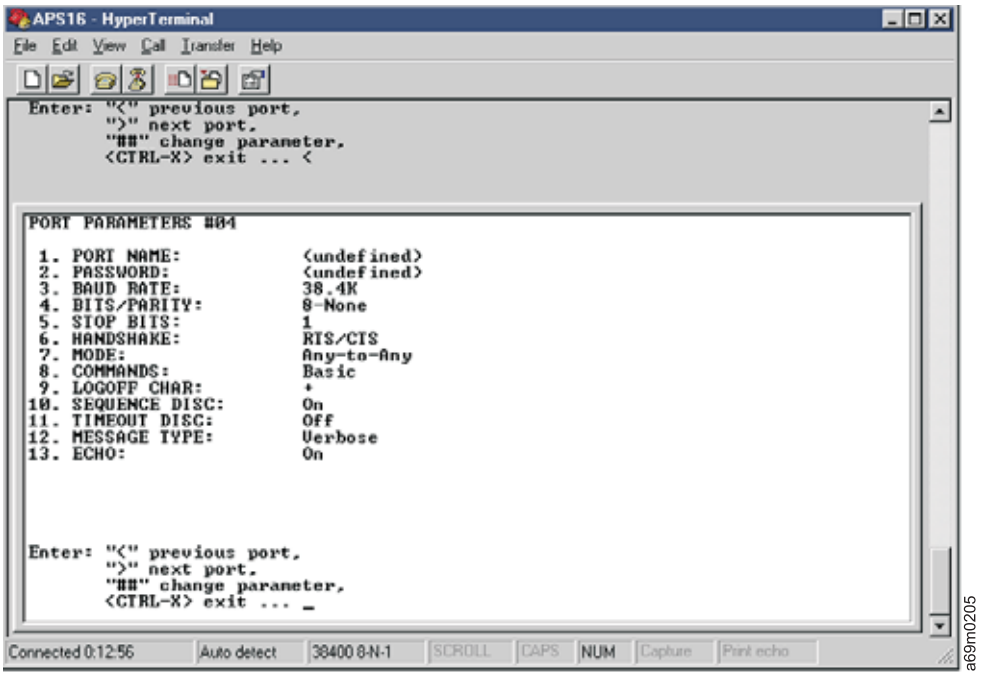


Figure 142. WTI Port Parameters Screen (FC2712)

13. Type **1**, and press **Enter** to select the PORT NAME option.
14. Type **IBM3584C** (or any other descriptive name the customer wants to call the first library; it must start with an alpha character, contain no blanks, and be no more than 8 characters long), and press **Enter**.
15. Press Ctrl+X to exit the Port Parameters screen.

    Note: Leave all Port Parameters except for Port Name set to the defaults.
16. If you are adding more than one library to the WTI switch, repeat steps 12 on page 221 through 15, selecting the next port number until all ports that will be connected to 3584 libraries have been named.
17. Type ***/s*** and press **Enter** to display the System Status screen.
18. Verify that port 1 is named Modem, and any port from 2 - 16 that will be connected to a 3584 library is named with a unique descriptive name. If any port shows the wrong name, correct it before you continue. The screen should now be as follows (customer descriptive names may be used in place of the library names in the following screen):

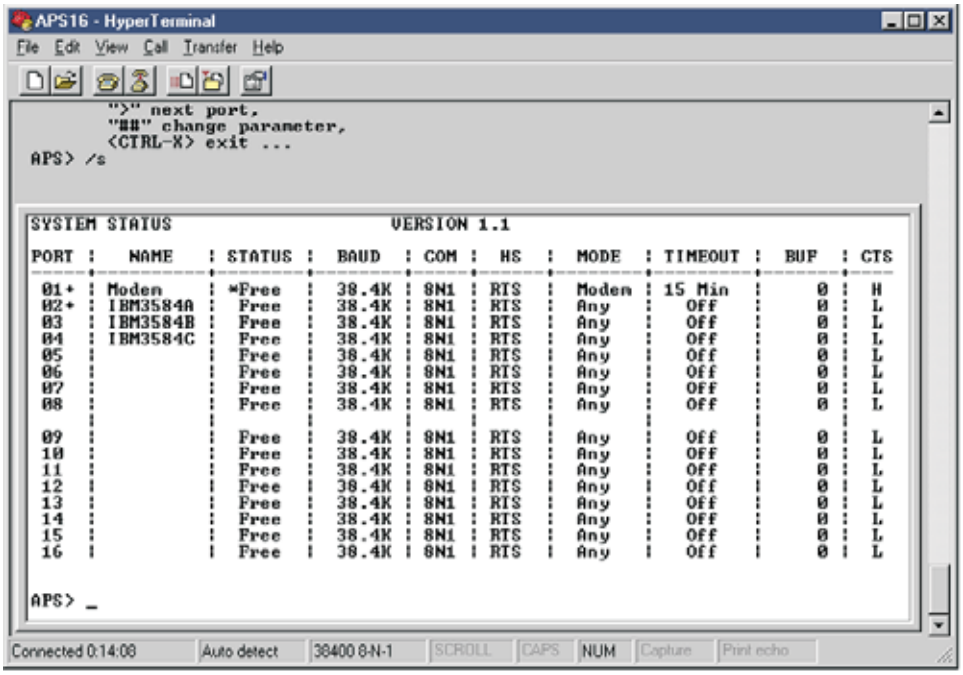


Figure 143. WTI System Status Screen-Updated (FC2712)

19. Type ***/x***, and press **Enter**. The word Asleep displays, indicating that the switch is now in sleep mode.
20. Turn off the WTI switch.
21. Close the HyperTerminal program. When you are asked whether you want to disconnect now, click on **Yes**. When you are asked whether you want to save session APS16, click on **No**.

The following steps connect the WTI switch to the modem and to each 3584 library.

22. Remove the cable from switch port 1.
23. Reconnect the modem cable (disconnected in step 1 of this procedure) to port 1 of the WTI switch.
24. Locate a DB9F to DB9F Null Modem cable (P/N 19P4693) for each 3584 library that is being added to the WTI switch.
25. Connect the Null Modem cable to the next port of the WTI switch and to the J6 connector on the MCP in frame 1 of the first library (in the example, the library called IBM3584C is connected to port 4 of the WTI switch.

26. Repeat the previous step for each library until all 3584 libraries have been connected to the designated ports on the switch.
27. Ensure that the WTI switch is powered on.

The following steps configure the 3584 to call home through the WTI switch.

28. Use CETool version 2.7 or higher to set the Remote Support Configuration. This must be done on each 3584 library that is connected to the WTI switch. See “Call Home Facility Configuration” on page 754.

    Note: Ensure that the WTI Switch field is checked, and that the Switch Port Number field is set to the number of the WTI switch port connected to the library.
29. Perform a Call Home test at the library before you proceed to configure the next library. At the library front panel, press **MENU**, then select **SERVICE**, **TESTS/TOOLS**, **DIAGNOSTICS**, **CALL HOME**.
30. Verify that RETAIN received the Call Home with URC ACCA from the library. If no Call Home was received, verify that all of the Call Home configuration information was entered correctly, that the WTI switch and modem are powered on, that all cables are securely connected, and that the phone line is active.
31. Repeat steps 28 through 30 until all 3584 libraries connected to the WTI switch have been configured and have called home successfully.
32. Go to “Completing and Verifying Installation” on page 224

FC 2714, FC 2715, FC 2720 (TSSC Master Console)

See the feature code install instructions for installation of these feature codes.

FC 4873 - Re-install LM/TS7700 Backend Switch

If FC 4873 was shipped from the Plant, installation instructions PN 45E6704 can be download from the following website. This instruction covers installation procedures for feature codes 4871, 4872, and 4873.

IBM service personnel with access to the Internal PFE website:

`http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

FC 4874 - Adjacent Frame Support for TS7700

If FC 4874 was shipped from the Plant, installation instructions PN 45E6707 can be download from the following website.

IBM service personnel with access to the Internal PFE website:

`http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

Completing and Verifying Installation

__ 1. Open and close all the front doors one at a time to verify correct operation of each door and interlock switch. When you open a front door, the operator panel will show DOOR OPEN. When all front doors are closed, the operator panel will show DOOR CLOSED and an inventory will be performed.

__ 2. Verify that you have installed the LTO or 3592 CE diagnostic cartridge in the base frame: column 1, row 1 (see Figure 6 on page 22 or Figure 8 on page 24).

__ 3. Set Date and Time:

   a. At the **Activity** screen, press [MENU].

   b. At the **Main Menu** screen, select **Settings**, and press [ENTER].

   c. At the **Settings** screen, select **Date/Time**, and press [ENTER].

   d. Follow the instructions on the screen.

__ 4. Run Library Verify (see “Library Verify Test” on page 759). If you have library firmware 6090 or higher **also** run the door safety interlock open/close test. If a failure occurs, go to “Working with a Problem” on page 73 to repair the problem. Return here when the problem is fixed.

__ 5. Load the cleaner cartridge into the library (see “Cleaning the Tape Drive” in the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560).

__ 6. Set automatic clean to ON (see “Cleaning the Tape Drive” in the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560.

__ 7. If you installed SCSI drives, attach the external (drive to host) SCSI cables to the drives and host SCSI adapters. If connecting to a fixed tray (used with drive canisters), route the cables through the fixed tray cable guide **6** in (see Figure 294 on page 913). Secure the cables by using the strain relief clamps that are located on the side wall.

   Notes:

   a. The length of any SCSI bus (including any drive-to-drive SCSI cables) must not exceed the maximum lengths specified in Table 30.

   b. Cable labels are provided. It is recommended that you label the drive and host end of each external cable.

Table 30. SCSI Cable Length Maximums

SCSI Bus Type	Maximum Length
SCSI HVD	25 Meters (82.02 ft)
SCSI LVD Point-to-Point (one host adapter and one drive)	25 Meters (82.02 ft)
SCSI LVD Multidrop	12 Meters (39.37 ft)

   Notes:

   a. In most configurations, the host SCSI adapter is at the end of the SCSI bus. If so, ensure that the host SCSI adapter is terminated.

   b. If you have made a change to the configuration of the library subsystem, and if the library is connected to a SAN, it may be necessary to reset various components of the SAN so they will recognize the changes. As an example, a 2108 SAN Data Gateway may need to be reset or IPL'd to recognize that new devices have been added.

__ 8. If you installed Fibre drives, attach the external Fibre Channel cables to the Fibre Channel bulkhead. Consult with the customer to determine where to connect the host end of each Fibre Channel cable.

   Note: Cable labels are provided. It is recommended that you label each end of each external cable.

__ 9. Reinstall any access panels or covers removed during installation.

__ 10. Give the front door keys to the customer and inform the customer that the tape library is ready to be configured to the host system and is available for use.

__ 11. Give one copy of the *IBM System Storage TS3500 Tape Library Operator Guide* to the customer.

Note: An NLS CDROM at EC H81574A (or higher) was shipped with the library. The CD contains all translated and English versions of the *IBM System Storage TS3500 Tape Library Introduction and Planning Guide*, *IBM System Storage TS3500 Tape Library Operator Guide*. The CD also contains the 3584 Maintenance Information, Call Home for Automated Tape Library Controllers Maintenance Information, and System Console for Service Maintenance Information in PDF format. You should have received two copies of this CDROM. Give one to the customer and keep the other one. You may find the PDF version of the 3584 MI very useful when trying to quickly locate information.

__ 12. **Complete a separate install (service code 20, PLAN/INSTL/RR code 2) for each library frame that you installed. The same applies to any 3592 drives. If you installed any 3588 drives, they are NOT reported as separate installations. LTO drives are CSU and can be installed by the CE if the appropriate FC was ordered. Write off all 3588 drive install time against the feature code they were ordered against.** Any time spent repairing the library during the installation should be charged to the appropriate frame serial number. Time spent repairing 3592 drives should be charged to the 3592 drive serial number. Time spent repairing 3588 drives should be written against the feature code for which they were ordered.

Note: Time associated with attachment, configuration, or service of devices not provided with the library must not be charged against the 3584 library.

__ 13. Give the shipping material to the customer to use for future relocations.

__ 14. Store one copy of the *IBM System Storage TS3500 Tape Library Operator Guide*, and other ship group items that may be needed on future service calls, in the storage bin on the inside of the base frame rear door. Store this MI inside the bottom in the base frame.

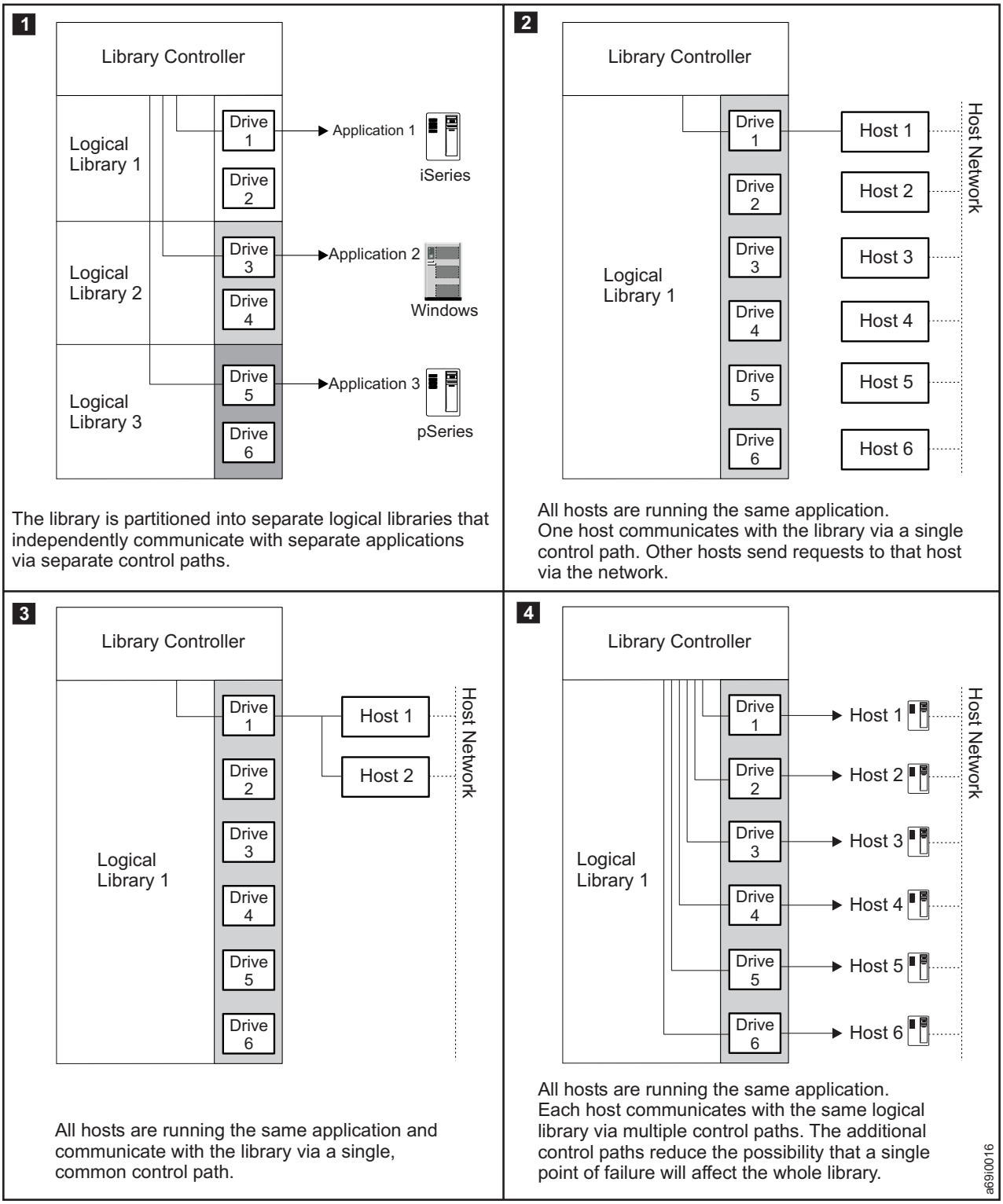


Figure 144. Cabling Examples

Feature Codes & Model Conversions

When ordering the IBM 3584 Tape Library, you can use feature codes to perform the following actions:

- Specify plant or field installation of tape drives
- Specify host configurations
- Identify the specific attachment type
- Order open systems device drivers

License Keys

License key numbers are printed on labels located at the rear of the Lxx frame just to the left of the FIC card. Additional license key labels may be found to the right of the FIC card.

Depending on the model, different features are available for the 3584. See *IBM System Storage TS3500 Tape Library with ALMS: Introduction and Planning Guide,* "Chapter 3. Standard features of the Library" for the complete list of feature codes.Table 31 lists the model conversions currently available.

Table 31. Model Conversions

Model Conversion	Description
L22 to L52	3592 to LTO
D22 to D52	3592 to LTO
L52 to L22	LTO to 3592
D52 to D22	LTO to 3592
L23 TO L53	3592 to LTO
L53 TO L23	LTO to 3592
L52 TO L53	Convert LTO to new Enhanced FCA
L22 TO L23	Convert 3592 to new Enhanced FCA
D23 TO D53	3592 to LTO (Enhanced FCA already installed)
D53 TO D23	LTO to 3592 (Enhanced FCA already installed)
D52 TO D53	Convert LTO to new Enhanced FCA
D22 TO D23	Convert 3592 to new Enhanced FCA
S24 to S54	Convert S24 high density 3592 frame to S54 high density LTO
S54 to S24	Convert S54 high density LTO frame to S24 high density 3592

Manufacturing Problems? Call Quality Hotline

IBM needs your timely feedback on the IBM System Storage Tape Library 3584 products (new installations, EC activities, or MES changes). This will allow us to quickly correct any quality problem and implement any necessary changes for future shipments.

HOTLINE telephone numbers (Available 24 hrs/day, 7 days/week)

U.S. and Canada - Tieline **8-648-8459 or 1-800-442-6773**

Note: If using the toll-free number, select option 1: Tape Quality Hotline.

For EMEA countries you have to address quality problems and missing parts with the 'Missing Parts Form' to CIM-Copenhagen (CIM = Central Inventory Management). For details, contact your local support who will provide you the 'Missing Parts Form'.

WT - Tieline **8-648-8459 or 1-770-858-8459**

For issues that don't require an immediate response, you can also send a Lotus note to: **HOTLINE7/San Jose/IBM@IBMUS**

Use this HOTLINE immediately if you have any quality problems, questions, or concerns during installation, EC activity, or MES change with a 3584 tape library.

Have the following information available:
- Your name and telephone number
- Machine type, model, and serial number
- Branch office, territory, and area (if IBM CE)
- Customer name
- Customer telephone number
- Activity (new installation, EC, or MES)
- Description of the problem
- Other pertinent information:
  - Incident number
  - EC number
  - MES number
  - FCS number
  - Bill of material number

This HOTLINE will be answered Monday through Friday (except holidays) from 7:00 a.m. to 4:00 p.m., PST. At all other times, leave a detailed message for action during the next work day.

This HOTLINE is an addition to existing reporting and service procedures, but it does not replace them.

Thank you,

IBM System Storage Tape Library 3584 Manufacturing

Discontinuing a Frame or Relocating a Library

__ 1. When uninstalling a single Dxx frame with drives, and ALMS is installed, you must first 'Unassign' those drives and then remove them from the frame before uninstalling the Dxx frame. If not, then after the Dxx removal they will still show up 'greyed out' indicating they are missing.

Notes:

a. Ensure the relocation kit and packing materials are on site before beginning to discontinue or pack a 3584 library.

b. The library requires special packing material. For instructions and part numbers, see “Relocation Kit” in Chapter 14, “Parts Catalog,” on page 1093. If the Drive Removal label is present, order extra packing materials for the fixed tray assemblies.

__ 2. Run Library Verify (see “Library Verify Test” on page 759). If Library Verify fails, go to “Working with a Problem” on page 73 to repair the problem. Return here when the problem is fixed.

__ 3. Power off (O) the library.

__ 4. Open the front door.

__ 5. Ask the customer to remove all tape cartridges from the library frames to be discontinued.

__ 6. Manually move the accessor into the base frame. If you have a dual accessor library, move the second accessor into Service Bay B.

__ 7. Power off (O) customer power to all FCAs.

__ 8. Disconnect the power cord from the frames to be discontinued.

__ 9. Disconnect the controller SCSI cables from the frames to be discontinued.

__ 10. If the Drive Removal label is present in a frame to be discontinued, remove all fixed tray assemblies from that frame.

__ 11. See Figure 145 for "Previous Frame" activities. Disconnect the interframe EPO cable at J23 and plug the tethered EPO jumper (P23) into J23 as shown. Disconnect J7 and J8 on the FIC. Now put all three cable ends into the frame that is being discontinued.

Note: If the library is NOT going to be discontinued, ensure that the terminators are reinstalled in the previous frame as shown in Figure 146 on page 230. If the library IS going to be discontinued, ensure that the terminators are reinstalled in the Lxx base frame.

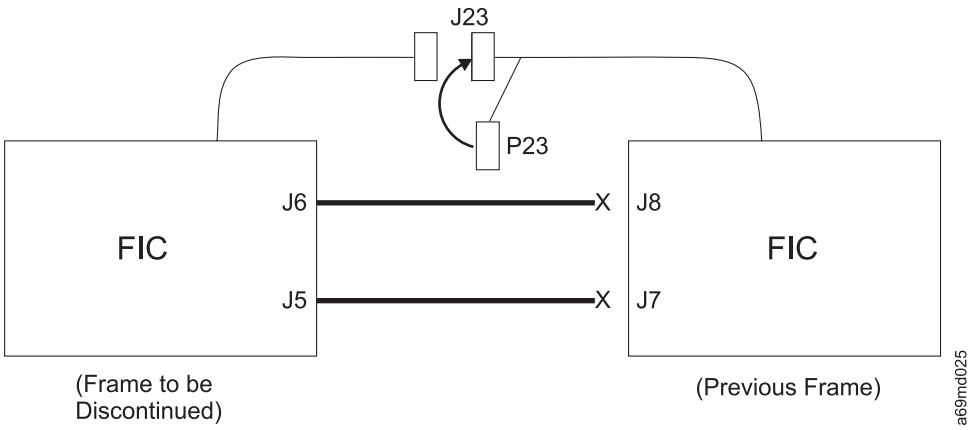


Figure 145. FIC Connections

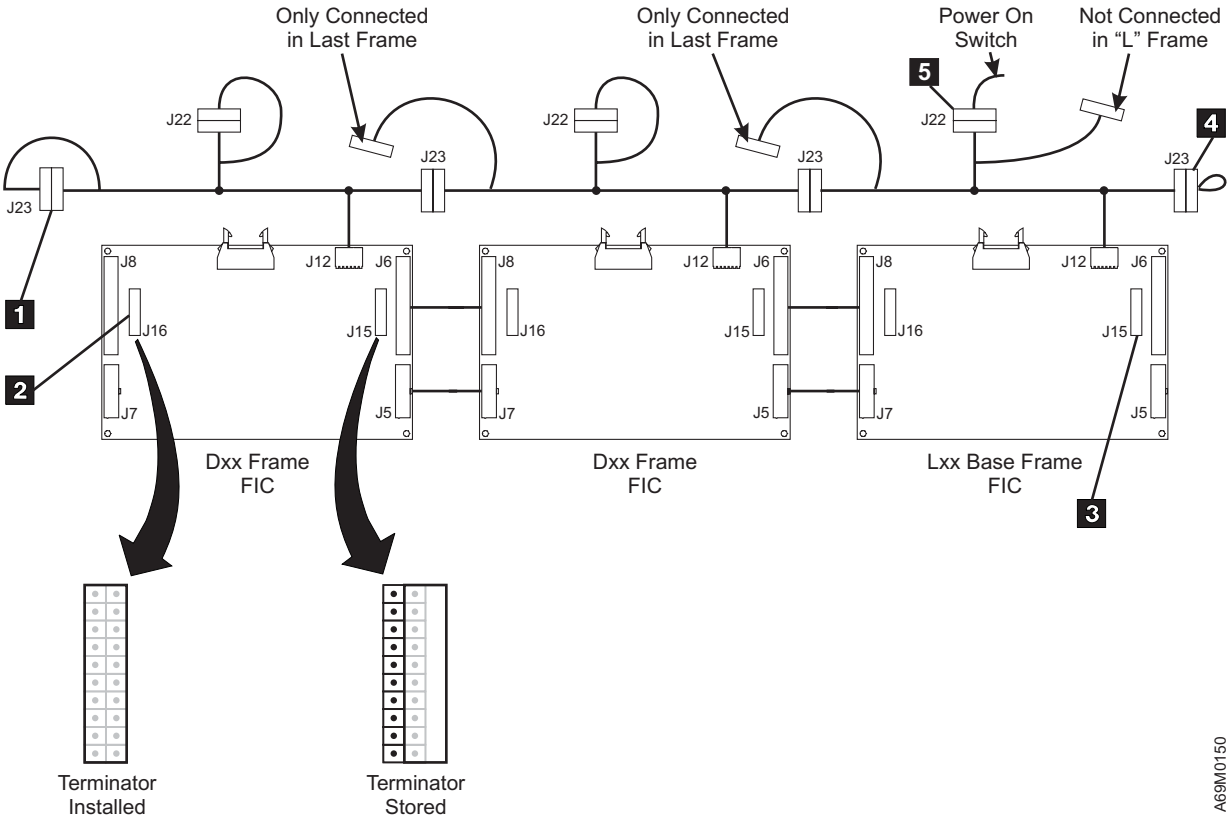


Figure 146. FIC Card Interface Cables Schematic

__ 12. If you are discontinuing an Lxx base frame only (a base frame with no expansion frames), go to step 26 on page 231.

__ 13. Refer to Figure 61 on page 131. Loosen the screws that secure the upper X-axis guide rail **2**. Slide the rail to the right.

__ 14. Refer to Figure 63 on page 133. Remove the cable trough cover.

__ 15. Refer to Figure 61 on page 131 to remove the frame-to-frame separators. On early-style frames, remove the screws **10** holding the frame separator to the previous frame. On later-style frames, remove the screws **12** holding the frame separator **11**.

Note: The frame separator will be left attached to the expansion frame.

__ 16. Remove the right end stop **8**. This end stop will be reinstalled on the base frame or the last expansion frame in the library.

__ 17. Remove the M8 bolts **7** that hold the frames together. You will find two bolts at the bottom and possibly two bolts at the top.

__ 18. Refer to Figure 64 on page 135. Loosen the X-axis rail holding screws **3** (using a 5mm allen wrench) and the X-axis rail long T-nut setscrews **1** (using a 3mm allen wrench). Slide the X-axis rail **4** to the right.

__ 19. Refer to Figure 67 on page 139. Remove the screw **2** from the three frame-to-frame attachment hardware brackets. Leave the brackets attached to the expansion frame.

__ 20. Raise the two left side leveling pads on the frame to be discontinued. Insert a frame skate under each leveling pad. Lower the leveling pads until the pads are on the skates (see item **6** in Figure 59 on page 126). Turn the leveling pads an additional 90° (¼ turn).

__ 21. Raise the leveling pads (all the way up) on the right side of the frame to be discontinued.

__ 22. Move the frame away from the preceding frame.

__ 23. Raise the leveling pads (all the way up) on the left side of the frame.

__ 24. Pick up the frame skates and store them in a safe place. DO NOT leave the skates on the floor where someone could step on them.

__ 25. Return to step 13 on page 230 for the next expansion frame. If all expansion frames have been disconnected, continue with the next step.

__ 26. If the base frame is to be discontinued, continue with the next step. If the base frame is NOT going to be discontinued, go to step 28.

__ 27. Raise the four leveling pads on the base frame all the way up.

__ 28. Using the packing instructions, pack the tape library frames for shipment.

__ 29. Verify that the ship group items are packed with the correct machine.

__ 30. Complete a separate discontinuance (service code 20, PLAN/INSTL/RR code 3 or 4) for each library frame that you discontinued. The drives are a feature of the library and are not separate machines.

Procedures to Uninstall Existing Library Frames to Add or Remove Frames from Inside a Library String

This topic provides information on how to un-install and re-install existing library frames, when necessary, to install or remove a new frame somewhere in the middle of a library string. Always use any special installation instructions that came with the **new** frame for the actual frame installation procedures.

Adding a Dxx or Sx4 frame in middle of library string with other Dxx or Sx4 frames to the right.

Note: If necessary, refer to the 3584 MI Install section for detailed information on re-installing the frames.

__ 1. The library must be taken offline from all host-attached systems.

__ 2. If there are drives in the Dxx frames to the RIGHT of where a new frame will be installed, eject any cartridge from the drive(s) then put the drives into ‘unassigned’ status from the Web UI.

Note: If there are any Dxx frames with drives that will be moved, the drive WWNN and WWPN will change based on the movement to a new frame position. This will require a reconfigure by the host.

__ 3. Open the front door of any Dxx frame(s) that will be moved and remove all the data cartridges.

__ 4. Open the front door of any Sx4 frame that will be moved and remove all the data cartridges. This method is preferred because the weight of a fully-loaded Sx4 frame is approximately 1,260 lbs (571 kg). An empty Sx4 frame is approximately 640 lbs (290 kg). Un-installing and re-installing a fully-loaded Sx4 frame is difficult and not recommended.

__ 5. Close all the Dxx and Sx4 front doors and allow the library to inventory the empty cells.

__ 6. At the ***Main Menu*** select ***Settings***, ***Configuration***, ***Discover Hardware Changes*** then press **ENTER**.

__ 7. Wait until the library goes into PAUSE mode then **power off the library.**

__ 8. Disconnect the FIC frame-to-frame power and signal cables in the affected frame(s).

__ 9. Disconnect the frame-to-frame EPO cable(s) in the affected frame(s).

__ 10. Remove all the trough covers to accommodate the removal and installation of the X-track cable(s).

__ 11. Disconnect the X-track cable(s). Adding or removing a frame may require new length cable(s). If required, new track cable(s) should have been shipped with the new frame order:

a. Disconnect X-track cable(s) from the accessor(s) [both accessors if HA1].

b. Disconnect X-track cable(s) from the XCP card(s) [both XCP cards if HA1].

c. Remove the X-track cable(s) from the library.

The following steps apply to each frame as it is being disconnected from the library.

__ 12. Begin the following procedures at the far **end** of the library string.

__ 13. Remove the end stop.

__ 14. Loosen the upper X-rail screws and slide the rail to the right. **Note: Re-tighten all the top rail screws when discontinuing a frame or relocating a library so the screws and the top rail do not fall out!**

__ 15. Remove the screws from the front and rear frame-to-frame spacers and remove them.

__ 16. See **Figure 147**. Remove one screw **2** from the three frame-to-frame attachment brackets **1**. Loosely thread the screws back into the empty holes to prevent loss.

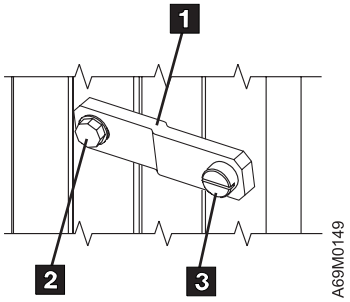


Figure 147. Frame-to-Frame Attachment Brackets

__ 17. Refer to **Figure 148 on page 233** as a general guide to some of the parts mentioned below.

__ 18. Remove the M8 bolts from the lower front and back inside the frames, and lay them in the bottom of the frame.

__ 19. Loosen the T-nuts **3** on the lower X-rail **4**.

__ 20. Loosen the setscrews **1** on the long T-nut **2** located between the X-rails.

__ 21. Use a heavy-duty screwdriver as a wedge to pry the **left** side of the rail away from the previous frame.

__ 22. Remove both the upper and lower X-rail rods and lay them in the bottom of the frame.

__ 23. Remove the long T-nut and place it in the bottom of the frame.

__ 24. Lower the two **left** leveling pads down onto two frame skates, then give each pad an additional 1/4 to 1/2 turn.

__ 25. Raise the leveling pads on the **right** until the right side of the frame is resting on the wheels.

__ 26. Pull the frame away from the library, then raise the two **left** leveling pads until the frame is resting on the wheels.

__ 27. Remove the frame skates.

__ 28. Perform the above steps for the other frames to be removed from the library to accommodate the new frame.

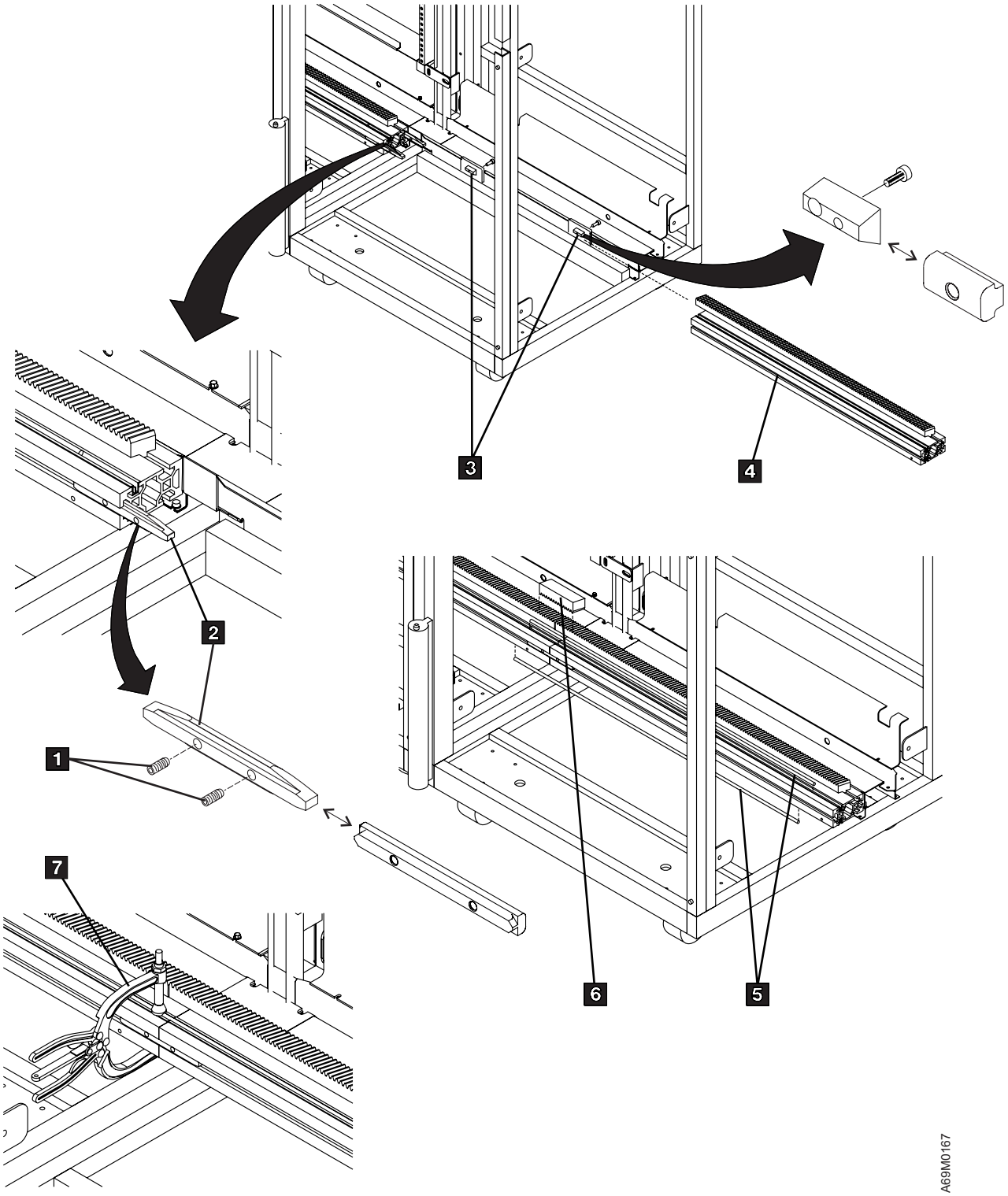


Figure 148. Library Frame Overview

Install the new frame using any special install instructions provided, then continue with the following steps to reinstall the other frames. Refer to the 3584 MI Install chapter for installation details.

__ 29. Reinstall all library frames and reconnect all signal cables.

__ 30. Install the X-track cables. **Note:** In an HA1 library, the center position for both cables will be shifted to the RIGHT because of the new frame that was installed. Refer to the 3584 MI, Chapter 5 Install, Table: *"X-Axis Track Cables Center Positions"* to determine the correct location.

__ 31. Connect the X-track cables to the accessor(s) and XCP card(s).

__ 32. Reinstall all trough covers.

__ 33. Leave the front doors open on frames that are new, or were un-installed, to accommodate the new frame(s).

__ 34. **Power on the library.**

__ 35. Close the front doors when directed by operator panel messages.

__ 36. Allow the library to reconfigure the new frame and the empty frame(s) where data cartridges were removed earlier.

__ 37. Open the front door(s) of each Dxx and/or Sx4 frame where data cartridges were removed and re-install the cartridges.

__ 38. Close the Dxx and/or Sx4 frame front doors and allow the library to inventory the cartridges. This may take up to 45 minutes on a fully-loaded Sx4 frame.

__ 39. Verify that the drives have the correct WWNN and WWPN before reassigning them based on the new frame location. Then re-assign drives that were un-assigned in Dxx frame(s).

__ 40. Run Library Verify and fix any problems before returning the library back to the customer.

SCSI Configuration

SCSI configuration of the tape library may be performed by the customer or by a service representative. The following information is for reference only.

Physical Interface Characteristics

The tape library operates as a set of SCSI-3 devices. Each drive in a tape library attaches to host system processors through an Ultra-2/Wide, HVD or LVD. Early LTO SCSI drives use shielded, high-density SCSI-3, 68-pin P-connectors and can attach directly to a 2-byte wide, SCSI-3 P-cable. Current LTO drive canisters use Very High Density Centronics Interface (VHDCI) connectors (also known as 0.8 mm).

Under the SCSI-3 protocol, this type of attachment allows cable lengths of up to 25 m (82 ft) with the appropriate cable and terminator selection. Table 32 gives the maximum bus path-length between terminators for HVD and LVD interfaces.

Table 32. Maximum Bus Path Length Between Terminators

Type of Interconnection	Maximum Bus Path Length Between Terminators – In Meters (Feet)	
	LVD	HVD
Point-to-point (one host adapter and one drive)	25 (82 ft)	25 (82 ft)
Multidrop	12 (39.4 ft)	25 (82 ft)

The tape library also logically supports the narrow (8-bit) protocol. You need an interposer to connect the tape library to an 8-bit SCSI-2 bus. Use of 8-bit SCSI is not recommended since performance may be unacceptable.

Note: Only eight bus addresses (0 to 7) are valid for an 8-bit bus.

Default SCSI ID and LUN Assignments

Based on its physical position in the library, each tape drive is assigned a default SCSI ID (from 0 to 12). Table 33 lists the SCSI ID for each drive.

Table 33. Default SCSI ID and LUN for Each Device in Tape Drive

Drive	SCSI ID	LUN
Drive 1	0	0
Drive 2	1	0
Drive 3	2	0
Drive 4	3	0
Drive 5	4	0
Drive 6	5	0
Drive 7	6	0
Drive 8	8	0
Drive 9	9	0
Drive 10	10	0
Drive 11	11	0
Drive 12	12	0

One or more LTO or 3592 tape drives operate as a 2-LUN device, with separately addressable Sequential Access (drive) and (Independent) Media Changer (library) devices. These devices are compatible with SCSI-2 or SCSI-3.

In all cases, the tape drive is always LUN 0. The Media Changer is always LUN 1. All other LUNs are invalid unit addresses. For information about the SCSI commands for a Sequential Access or Media Changer device, see the applicable sections in the *IBM 3584 UltraScalable Tape Library SCSI Reference*, GA32-0410.

Note: You can change the SCSI IDs for the drives by using the SETTINGS menu option on the operator panel. You can enable additional LTO or 3592 drives to optionally provide Media Changer (LUN 1) addressing by configuring more than one logical library or by enabling additional control paths (using the SETTINGS menu option).

Using Multiple Buses

The tape library has two a SCSI connectors for each tape drive in the library. Each device can be daisy-chained by using a SCSI bus jumper which is included with each tape drive.

You can create up to 12 SCSI buses per frame for attachment to multiple hosts or to multiple SCSI adapter cards on one host. Multiple SCSI buses may be required for maximum performance, depending on the customer application and data compression ratio. However, note that library control is required on at least one SCSI bus (that which includes the Media Changer device). The Media Changer device is required to be addressed via LUN 1 of the lowest numbered drive of each LTO logical library. The Media Changer Device may additionally be addressed via LUN 1 of other drives in any LTO logical library (referred to as *Additional Control Paths Configuration*). For information about control paths, see “Library Configurations” on page 59.

Any bus containing a Media Changer device is referred to as a control/data path. Any other bus is referred to as a data path.

Terminating the Bus

Each end of the SCSI bus must be properly terminated according to the SCSI standard.

Note: The SCSI terminator **must be installed on the back of the tape drive if it is the last (or only) drive on a bus**. The only exception is an HVD High Availability (HA) configuration where termination is at the host adapters.

An external LVD terminator is included with each LVD tape drive. An external HVD terminator is included with each HVD tape drive.

SCSI Cables, Connectors, and Interposers

AS/400

Attention

Only one HVD drive is allowed on each SCSI bus when attached to an AS/400 host.

Figure 149 shows the connectors, and interposers that the AS/400 uses to attach to the tape library. Table 34 describes the connectors and interposers.

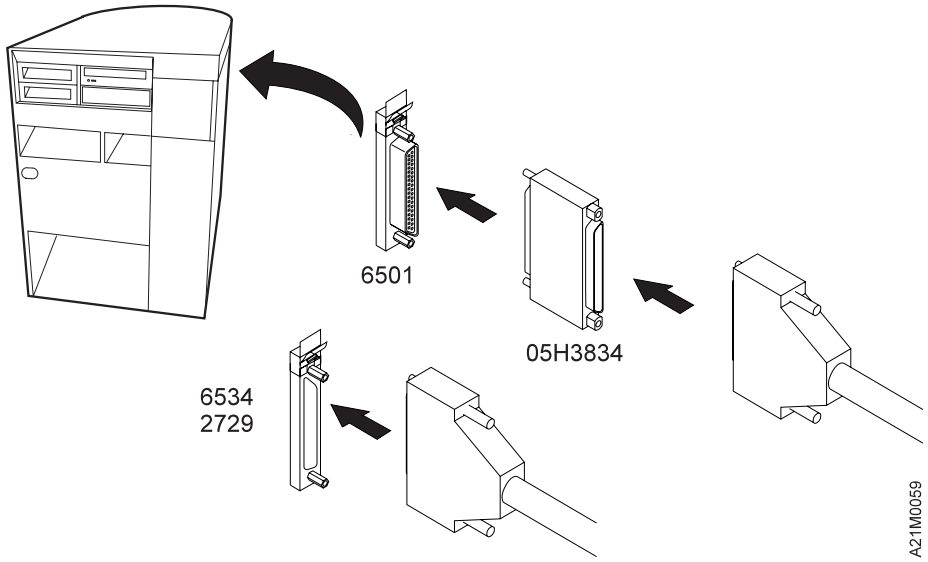


Figure 149. AS/400 SCSI Cable Attachment to Library. The controllers are identified by feature code; the interposers are identified by part number.

Table 34. Connectors and Interposers for AS/400

Host Connector and IBM Feature Codes (FC)	Interposer Part Number and IBM Feature Code (FC)
Magnetic Media Subsystem Controller (FC 6501)	05H3834 (FC 2895)
Magnetic Media Subsystem Controller (FC 6534)	None required
Magnetic Media Subsystem Controller (FC 2729)	None required
Magnetic Media Subsystem Controller (FC 2749)	None required

Note: The AS/400 host attachment cables all use an HD68 connector at the host end of the cable (either directly to the AS/400 IOP, or in the case of IOP 6581 to the FC 2895 interposer).

RS/6000

Figure 150 shows the SCSI connectors and interposers that the RS/6000 uses to attach to the tape library. Table 35 describes the connectors and interposers.

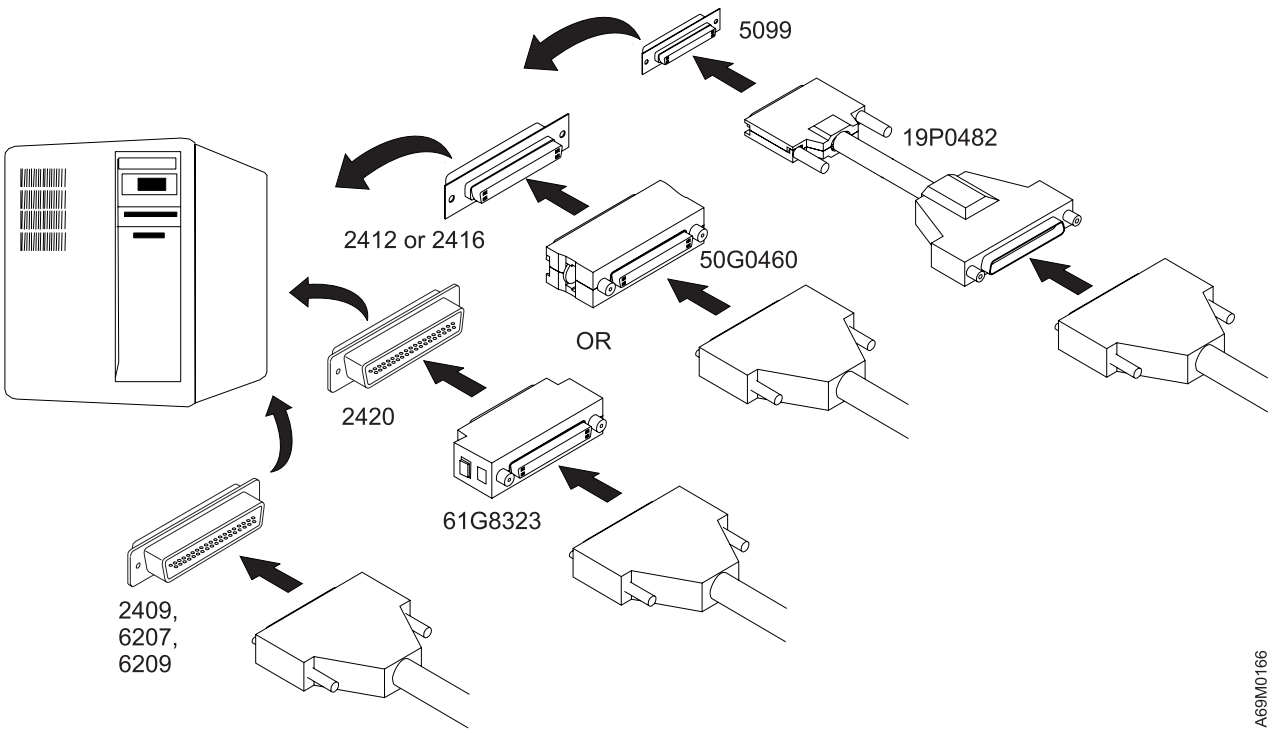


Figure 150. SCSI Cable Attachment of RS/6000 to Library. The adapters (and controller) are identified by feature code; the interposers are identified by part number.

Table 35. Connectors and Interposers for RS/6000

Host Connector and IBM Feature Codes (FC)	Interposer Part Number and IBM Feature Code (FC)
Enhanced SCSI-2 Differential Fast/Wide Adapter/A (FC 2412, identifier 4-C)	50G0460 (FC 2892)
SCSI-2 Differential Fast/Wide Adapter/A (FC, 2416 identifier 4-6)	50G0460 (FC 2892)
SCSI-2 Differential Fast/Narrow High-Performance External I/O Controller (FC 2420, identifier 4-2)	61G8323 (FC 2891)
PCI SCSI-2 Differential Fast/Wide Adapter (FC 2409, identifier 4-B)	None required
PCI SCSI-2 Differential Fast/Wide Adapter (FC 6207, identifier 4-L)	None required
PCI SCSI-2 Fast/Wide Differential Adapter (FC 6209, identifier 4-B)	None required
SCSI LVD/SE Adapter (FC 6205, identifier 4-R)	19P0482 (FC 5099)
SCSI LVD/SE Adapter (FC 6203, identifier 4-Y) Ultra3	19P0482 (FC 5099)

Connectors And Interposers For Other Supported Host Systems

Table 36. Connectors and Interposers for Other Supported Host Systems

Host	Host Connector	Interposer Part Number and Feature Code (FC)
HP	HP-PB Fast/Wide Differential Adaptec® 28696A	None required
Sun	Sun SBus Ultra Differential Fast/Wide Intelligent SCSI-2 Host Adapter	None required
Sun	Sun Dual-Channel Differential Ultra SCSI Host Adapter (PCI)	None required
Sun	Sun PCI Wide Ultra SCSI Adapter	(FC 5099)
Windows NT	Adaptec AHA® 2944UW PCI-to-Ultra Wide Differential SCSI Adapter	None required
Windows NT	Adaptec AHA 2940U2W PCI-to-Ultra-2 SCSI Adapter	None required

Cables

Table 37. Feature Codes and Lengths for SCSI and Fibre Channel Cables

Feature Code	IBM Part Number (P/N)	Cable Length (Approximate)
FC5098	19P0378	Inline HVD SCSI Terminator
FC5099	19P0482	VHDCI-to-HD68 SCSI Cable/Interposer
FC 5305	19P0052	HD68-to-HD68 SCSI Cable, 5 m (16.5 ft)
FC 5310	19P0053	HD68-to-HD68 SCSI Cable, 10 m (32.8 ft)
FC 5318	19P0097	HD68-to-HD68 SCSI Cable, 18 m (59 ft)
FC 5325	19P0054	HD68-to-HD68 SCSI Cable, 25 m (82 ft)
FC 6005	19K1252	LC-LC Fibre cable, 5 m (16.4 ft)
FC 6013	11P3880	LC-LC Fibre cable, 13 m (42.6 ft)
FC 6025	19K1253	LC-LC Fibre cable, 25 m (82 ft)
FC 6061	11P3884	LC-LC Fibre cable, 61 m (200 ft)
FC 5604	19P0050	VHDCI (0.8 mm)-to-HD68 SCSI Cable, 4.5 m (15 ft)
FC 5610	19P0048	VHDCI (0.8 mm)-to-HD68 SCSI Cable, 10 m (32.8 ft)
FC 5620	19P0049	VHDCI (0.8 mm)-to-HD68 SCSI Cable, 20 m (65.6 ft)
FC 5625	35L1977	VHDCI (0.8 mm)-to-HD68 SCSI Cable, 25 m (82 ft)
FC 5704	19P2499	VHDCI-to-VHDCI SCSI Cable, 4.5 m (14 ft)
FC 5710	09L0881	VHDCI-to-VHDCI SCSI Cable, 10 m (33 ft)
FC 5720	19P1904	VHDCI-to-VHDCI SCSI Cable, 20 m (65 ft)
FC 5725	19P2500	VHDCI-to-VHDCI SCSI Cable, 25 m (822 ft)
FC 5805	19P2367	SC-SC Fibre Channel Cable, 5 m (17 ft)
FC 5813	19P2368	SC-SC Fibre Channel Cable, 13 m (43 ft)
FC 5825	19P2369	SC-SC Fibre Channel Cable, 25 m (82 ft)
FC 5861	19P2370	SC-SC Fibre Channel Cable, 61 m (200 ft)
FC 5907	19P3972	LC-SC Fibre Channel Cable, 7 m (23 ft)
FC 5913	See Chapter 14, “Parts Catalog,” on page 1093.	LC-SC Fibre Channel Cable, 13 m (43 ft)
FC 5922	See Chapter 14, “Parts Catalog,” on page 1093.	LC-SC Fibre Channel Cable, 22 m (72 ft)

Table 37. Feature Codes and Lengths for SCSI and Fibre Channel Cables (continued)

Feature Code	IBM Part Number (P/N)	Cable Length (Approximate)
FC 5961	See Chapter 14, “Parts Catalog,” on page 1093.	LC-SC Fibre Channel Cable, 61 m (200 ft)

Notes:

1. On AS/400 systems, cable lengths up to 25 m (82 ft) can be used with feature code 2729, 6501, and 6534.
2. On RS/6000 systems, cable lengths greater than 18 m (59 ft) are not permitted with feature code 2420. Cable lengths up to 25 m (81 ft) can be used with feature code 2409, 6207, 6209, 2412, or 2416.

Connecting Tape Library To Multiple Systems

AS/400

You cannot connect an AS/400 system on the same logical library, with any other host system (including another AS/400). Instead, you must configure the tape library with multiple logical libraries before you can attach it to an AS/400 and another type of host at the same time (see “Logical Libraries Configuration” on page 61).

RS/6000

You can attach multiple RS/6000 systems to a tape library. For cabling information, refer to the documents listed in “pSeries (RISC System/6000) Information” on page xxx.

Hewlett-Packard

You can attach multiple Hewlett-Packard host systems to a tape library. For cabling information, consult your system manuals.

Sun

You can attach multiple Sun host systems to a tape library. For cabling information, consult your system manuals.

Windows NT

You can attach multiple Windows NT systems to a tape library. For cabling information, consult your system manuals.

Fibre Channel Information

- Fibre channel configurations do not accept 'daisy chaining,' which is the practice of directly connecting a drive to another drive. Each drive must connect directly to a host, switch, system, network, or hub.
- When a single fibre-channel drive powers on, all drives on the same hub can be affected. This includes unplugging and replugging a single drive.

External Fibre Channel Device Info

If the fibre channel drives in the 3584 are attached to a McData ES-1000, default configuration settings on the ES-1000 must be changed to avoid problems when replacing drives or adding new drives. If the ES-1000 is configured in **Shared** (Hub) or **Switch** mode, adding a new drive (or replacing an existing drive) can cause an active drive (running backup/restore operations) to abort the host job. To avoid this problem, set the ES-1000 **Fabric Address Notification** (FAN) option to **Enable**. Refer to the ES-1000 documentation for configuration procedures.

Fibre Channel Attachment

Direct fibre channel attachment is available on LTO and 3592 fibre drives. You also can attach the library via a storage area network (SAN), hub, or switch, to any RS/6000, Windows NT/2000, Sun, or other host system that supports the fibre channel, and has the proper device drivers installed.

The drive node name and two port names are worldwide, unique names that are set by the library.

Fibre Channel Cables

Each LTO drive has one external fibre channel port. Each 3592 has two external fibre channel ports. The cable is a shortwave or multi-mode type (50 micron cable), and is suitable for distances up to 500 m (1640.4 ft). The connection is a duplex, SC connector type for Ultrium-1 (L1) drives, or LC connector type for Ultrium 2 (L2), Ultrium 3 (L3), Ultrium 4 (L4), Ultrium 5 (L5), and 3592 drives.

Table 38. Feature Codes and Lengths for Fibre Cables

Feature Code	IBM Part Number (P/N)	Cable Length (Approximate)
FC 6005	19K1252	LC-LC Fibre cable, 5 m (16.4 ft)
FC 6013	11P3880	LC-LC Fibre cable, 13 m (42.6 ft)
FC 6025	19K1253	LC-LC Fibre cable, 25 m (82 ft)
FC 6061	11P3884	LC-LC Fibre cable, 61 m (200 ft)
FC 5805	19P2367	SC-SC Fibre cable, 5 m (16.4 ft)
FC 5813	19P2368	SC-SC Fibre cable, 13 m (42.6 ft)
FC 5825	19P2369	SC-SC Fibre cable, 25 m (82 ft)
FC 5861	19P2370	SC-SC Fibre cable, 61 m (200 ft)

Notes:

1. A customer who requires cable lengths greater than 61 m (200 ft) should contact IBM Site and Connectivity Services (I/T Consulting and Implementation Services in the U.S.A.) for custom cable system design and installation.
2. When installing Fibre drives, a 2 m (6.6 ft) cable (P/N 11P2227) goes from the drive ports to an interposer connector on a bulkhead at the bottom of the frame. The customer's cable attaches to the other side of the bulkhead connector. See Figure 151 on page 242.

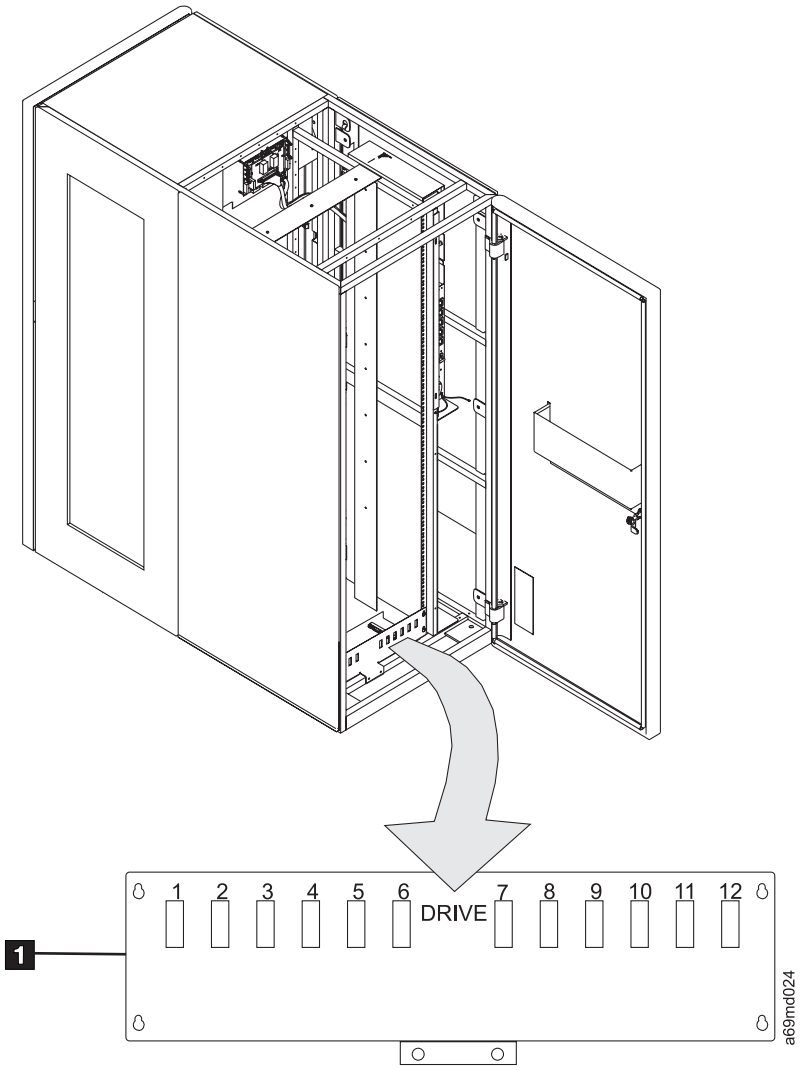


Figure 151. Fibre Channel Bulkhead

Fibre Channel Device Drivers

The device driver tables in this section provide the following information:

- Adapters supported
- Location of supported device driver level for host bus adapters
- Operating system levels supported
- RMSS device driver levels supported for continuing test for the LTO and 3592 Fibre Attachment

The version information listed below was accurate as of March 1, 2002. Check the following website for updates:

Required library firmware and drive code can be downloaded from the following websites.

For IBM service personnel with access to the Internal PFE website:

`http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

For non-IBM personnel (and those without access to the IBM intranet) see “Loading LTO or 3592 Drive Microcode by Using CETool” on page 711 for information on the external website where library and/or drive code can be downloaded.

For RS/6000 Attachment

Table 39. RS/6000 Drivers and Locations

Component	Minimum Acceptable Level	Location
Gigabit Fibre Channel Adapter for PCI bus - FC 6227	3.21A0 for AIX 4.3.3 3.22A0 for AIX 5.1 APAR IY17356 is required for AIX 4.3.3	http://www.rs6000.ibm.com/support/micro/download.html
Gigabit Fibre Channel Adapter for 64–bit PCI bus - FC 6228	3.82A0 for AIX 4.3.3 or AIX 5.1 APAR IY16132 and IY17356 is required for AIX 4.3.3	http://www.rs6000.ibm.com/support/micro/download.html
Atape Ultrium Driver Level	6.0.2.0	ftp://ftp.software.ibm.com/storage/devdrvr/AIX
IBM 2108 SAN Data Gateway	3.42.12	http://www.storage.ibm.com/hardsoft/products/sangateway/support/form1.htm
IBM 2109 Fibre Channel Switch	2.1.7	http://www.storage.ibm.com/ibmsan/products/2109/download.html

For Sun Attachment

Table 40. Sun Device Drivers and Locations

Component	Minimum Acceptable Level	Location
QLogic QLA2200F Fibre Channel Adapter for PCI Bus (for PCI-based systems only)	Driver 8.00.08 BIOS 1.61	http://www.qlogic.com
Solaris Operating System Level	2.6, 2,7, or 2.8	
IBMTape Ultrium Driver Level	4.0.4.7	ftp://ftp.software.ibm.com/storage/devdrvr/Solaris/

For Microsoft Windows 2000 Attachment

Table 41. Microsoft Windows 2000 Device Drivers Locations

Component	Minimum Acceptable Level	Location
QLogic QLA2200F Fibre Channel Adapter for PCI Bus (for PCI-based systems only)	Driver 8.00.08 BIOS 1.61	http://www.qlogic.com
Windows 2000 Operating System	Build 2195 or later. Service Pack 2 if attaching through the 2108.	
IBMtape Ultrium Driver Level	5.0.2.4	ftp://ftp.software.ibm.com/storage/devdrvr/Win2000/
IBM 2108 SAN Data Gateway	3.42.12	http://www.storage.ibm.com/hardsoft/products/sangateway/support/form1.htm
IBM 2109 Fibre Channel Switch	2.1.7	http://www.storage.ibm.com/ibmsan/products/2109/download.html

For Microsoft Windows NT Attachment

Table 42. Microsoft Windows NT Device Drivers and Locations

Component	Minimum Acceptable Level	Location
QLogic QLA2200F Fibre Channel Adapter for PCI Bus (for PCI-based systems only)	Driver 8.00.08 BIOS 1.61	http://www.qlogic.com
Emulex LP8000 and LP9002 Fibre Channel Adapters Note: If using cascaded switches you must enable FCTape support in the Emulex cards for proper error recovery. Contact Emulex for instructions.	Multiprotocol Port Driver 4–2.00a14	http://www.emulex.com
Windows NT Operating System	Server Version 4 with Server Pack 6 Server Pack 6A if attaching through the 2108	
IBMtape Ultrium Driver Level	1.1.7.8	ftp://ftp.software.ibm.com/storage/devdrvr/WinNT/

Table 42. Microsoft Windows NT Device Drivers and Locations (continued)

Component	Minimum Acceptable Level	Location
IBM 2108 SAN Data Gateway	3.42.12 for model R03 3.43.07 for model R07	http://www.storage.ibm.com/hardsoft/products/sangateway/support/form1.htm
IBM 2109 Fibre Channel Switch	2.1.7	http://www.storage.ibm.com/ibmsan/products/2109/download.html

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General Instructions

The safety checklist procedures in this chapter ensure that a 3584 not under an IBM maintenance agreement has the necessary safety items installed, and that no changes were made to the product to make it unsafe. Each 3584, as designed and assembled, has safety items installed to protect operators and service personnel from injury. These checklist procedures verify only these items.

The safety checklist procedures must be performed before the normal inspection for a maintenance agreement. *The 3584 must be considered unsafe until the presence and condition of all checklist items are satisfied and verified*. If any unsafe conditions are present, you must decide how serious the hazard is and whether you can continue without first correcting the problem.

When performing the safety checklist procedures, consider the following conditions and the potential safety hazards they present:

- Electrical, especially primary power. For example, an electrically-charged library frame can cause serious or lethal electrical shock.
- Explosive. For example, damaged or expanding capacitors can cause serious injury.
- Mechanical hazards. For example, missing safety covers can cause injury to service personnel.

Education

Service personnel must be trained on the 3584, and on the following:

- General maintenance agreement qualification (MAQ)
- Tailored maintenance agreement qualification
- Changed machine safety inspection procedures as part of the electrical safety course

Safety and Environmental Notices

Observe the safety notices when using this product. These safety notices contain danger and caution notices. The notices are sometimes accompanied by symbols that represent the severity of the safety condition.

Most danger or caution notices contain a reference number (Dxxx or Cxxx). Use the reference number to check the translation in the *IBM Systems Safety Notices*, G229–9054 manual.

The sections that follow define each type of safety notice and give examples.

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. *(D004)*

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:

If the symbol is...	It means....
	A generally hazardous condition not represented by other safety symbols.
 Class II	This product contains a Class II laser. Do not stare into the beam. (*C029*) Laser symbols are always accompanied by the classification of the laser as defined by the U. S. Department of Health and Human Services (for example, Class I, Class II, and so forth)..
	A hazardous condition due to mechanical movement in or around the product.
	A hazardous condition due to mechanical movement in or around the product.
 > 18 kg (40 lb)	This part or unit is heavy but has a weight smaller than 18 kg (39.7 lb). Use care when lifting, removing, or installing this part or unit. (*C008*)

Sample caution notices follow:

Caution

The battery is a lithium ion battery. To avoid possible explosion, do not burn. Exchange only with the IBM-approved part. Recycle or discard the battery as instructed by local regulations. In the United States, IBM has a process for the collection of this battery. For information, call 1-800-426-4333. Have the IBM part number for the battery unit available when you call. (*C007*)

Caution

The system contains circuit cards, assemblies, or both that contain lead solder. To avoid the release of lead (Pb) into the environment, do not burn. Discard the circuit card as instructed by local regulations. (*C014*)

Caution

When removing the Modular Refrigeration Unit (MRU), immediately remove any oil residue from the MRU support shelf, floor, and any other area to prevent injuries because of slips or falls. Do not use refrigerant lines or connectors to lift, move, or remove the MRU. Use handholds as instructed by service procedures. (*C016*)

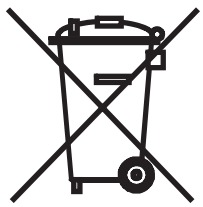
Caution

Do not connect an IBM control unit directly to a public optical network. The customer must use an additional connectivity device between an IBM control unit optical adapter (that is, fibre, ESCON, FICON) and an external public network . Use a device such as a patch panel, a router, or a switch. You do not need an additional connectivity device for optical fibre connectivity that does not pass through a public network.

Product Recycling and Disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at **http://www.ibm.com/ibm/recycle/us/index.shtml** and **http://www.ibm.com/ibm/environment/products/index.shtml**

Esta unidad debe reciclarse o desecharse de acuerdo con lo establecido en la normativa nacional o local aplicable. IBM recomienda a los propietarios de equipos de tecnología de la información (TI) que reciclen responsablemente sus equipos cuando éstos ya no les sean útiles. IBM dispone de una serie de programas y servicios de devolución de productos en varios países, a fin de ayudar a los propietarios de equipos a reciclar sus productos de TI. Se puede encontrar información sobre las ofertas de reciclado de productos de IBM en el sitio web de IBM **http://www.ibm.com/ibm/recycle/us/index.shtml** y **http://www.ibm.com/ibm/environment/products/index.shtml**



Notice: This mark applies only to countries within the European Union (EU) and Norway.

Appliances are labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Note: This paragraph is also translated into French Canadian and Japanese as follows:

Remarque : Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Product information

For Turkey:

This notice is effective as of May 30, 2009: Pursuant to Turkey's Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (EEE Directive), IBM, commencing as of May 30, 2009, provides Turkey's Ministry of Environment and Forestry with an annual Compliance Declaration Form, certifying to such entity that the applicable IBM product(s), as and when introduced by IBM into Turkey, conforms to the EEE Directive.

Battery Return Program

This product may contain one or more sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion batteries. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to **http://www.ibm.com/ibm/environment/products/index.shtml** or contact your local waste disposal facility.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and other battery packs from IBM Equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

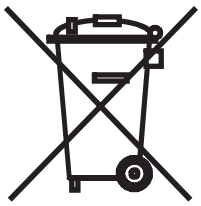
For Taiwan:



Please recycle batteries

廢電池請回收

For the European Union:



Notice: This mark applies only to countries within the European Union (EU).

Batteries or packaging for batteries are labeled in accordance with European Directive 2006/66/EC concerning batteries and accumulators and waste batteries and accumulators. The Directive determines the framework for the return and recycling of used batteries and accumulators as applicable throughout the European Union. This label is applied to various batteries to indicate that the battery is not to be thrown away, but rather reclaimed upon end of life per this Directive.

Note: This paragraph is also translated into French Canadian and Japanese as follows:

> Les batteries ou emballages pour batteries sont étiquetés conformément aux directives européennes 2006/66/EC, norme relative aux batteries et accumulateurs en usage et aux batteries et accumulateurs usés. Les directives déterminent la marche à suivre en vigueur dans l'Union Européenne pour le retour et le recyclage des batteries et accumulateurs usés. Cette étiquette est appliquée sur diverses batteries pour indiquer que la batterie ne doit pas être mise au rebut mais plutôt récupérée en fin de cycle de vie selon cette norme.

バッテリーあるいはバッテリー用のパッケージには、EU 諸国に対する廃電気電子機器指令 2006/66/EC のラベルが貼られています。この指令は、バッテリーと蓄電池、および廃棄バッテリーと蓄電池に関するものです。この指令は、使用済みバッテリーと蓄電池の回収とリサイクルの骨子を定めているもので、EU 諸国にわたって適用されます。このラベルは、使用済みになったときに指令に従って適正な処理をする必要があることを知らせるために種々のバッテリーに貼られています。

In accordance with the European Directive 2006/66/EC, batteries and accumulators are labeled to indicate that they are to be collected separately and recycled at end of life. The label on the battery may also include a chemical symbol for the metal concerned in the battery (Pb for lead, Hg for mercury and Cd for cadmium). Users of batteries and accumulators must not dispose of batteries and accumulators as unsorted municipal waste, but use the collection framework available to customers for the return, recycling and treatment of batteries and accumulators. Customer participation is important to minimize any potential effects of batteries and accumulators on the environment and human health due to the potential presence of hazardous substances. For proper collection and treatment, contact your local IBM representative.

Spain

This notice is provided in accordance with Royal Decree 106/2008 of Spain: The retail price of batteries, accumulators and power cells includes the cost of the environmental management of their waste.

For California:

Perchlorate Material - special handling may apply. See

http://www.dtsc.ca.gov/hazardouswaste/perchlorate

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

Operator Panel Flat Panel Display

This notice applies to products with a liquid crystal display, such as flat panel displays in monitors, point of sale products and laptop computers, and liquid crystal display screens in tape library products. The fluorescent lamp or lamps in the liquid crystal display contain mercury. Dispose of it as required by local ordinances and regulations.

Monitors and workstations

New Jersey - For information about recycling covered electronic devices in the State of New Jersey, go to the New Jersey Department of Environmental Protection web site at **http://www.state.nj.us/dep/dshw/recycle/Electronic_Waste/index.html**

Oregon - Oregon E-Cycles provides FREE e-cycling for your computers, monitors and TVs at participating collection sites near you. For more information, visit **http://www.oregonecycles.org** or call 1-888-5-ECYCLE.

Washington State - For information about recycling covered electronic devices in the State of Washington, go to the Department of Ecology Web site at **https://fortress.wa.gov/ecy/recycle/** or telephone the Washington Department of Ecology at 1-800-RECYCLE.

Safety Inspection Procedure

This topic provides the inspection procedures needed to ensure that the 3584 has the necessary safety items installed and that no changes made it unsafe.

Preparation

The following reference items are useful during the inspection:

- Copies of safety service memorandums (SMs) and engineering change announcements (ECAs) for this machine type
- Parts catalog
- 3584 history (see Chapter 12, “History,” on page 1087)
- *Electrical Safety for IBM Customer Engineers*, S229-8124

Branch Circuit CB Switched Off Check



Be aware that each frame that contains an FCA is protected by a main line circuit breaker (CB) in the FCA. Each FCA must be further protected by a circuit breaker (CB) of the proper rating at the service rail (customer outlet).

__ 1. Have the customer locate and switch off the circuit breaker (CB) for each branch circuit that supplies voltage to a 3584 line cord.

__ 2. Perform one of the following for each receptacle:

Note: There is a line cord for each control unit frame and drive unit frame in the library.

- A metal clad connector is not an approved connector to use on this product. If a metal clad connector is used, perform the “Safe-to-Handle Check” and the “Disconnect Precautions” procedures in “Miscellaneous Safety Tips” of the *Electrical Safety for IBM Customer Engineers*.
- If the power cord has an insulated plug, grip the plug without touching any metal parts, and remove the plug from the customer power receptacle.

__ 3. Perform the “Power Receptacle Safety Check” in *Electrical Safety for IBM Customer Engineers.*

D02 **DANGER**

Hazardous voltages are present. Do not touch the internal parts (pins and sockets) of the outlet.

__ 4. Measure the phase-to-ground voltage at each receptacle.

If a neutral is present, measure the phase-to-neutral voltage, phase-to-ground voltage, and the neutral-to-ground voltage.

If all voltage values are not less than 1.0 V ac, have an electrician check the circuit.

Branch Circuit CB Switched On Check

__ 1. Have the customer switch on the CB that supplies voltage to each receptacle for the library.

D02 **DANGER**

Hazardous voltages are present. Do not touch the internal parts (pins and sockets) of the outlet.

__ 2. Measure the phase-to-ground voltage at each receptacle.

If a neutral is present, measure the phase-to-neutral voltage, phase-to-ground voltage, and the neutral-to-ground voltage.

Record the voltages for future reference. You can use the log provided in Table 43.

__ 3. Have the customer switch off the branch circuit CB before you connect the machine power cord to the customer's outlet.

Table 43. Voltages Log

Date	Description of Circuits Checked	Voltage Values	Comments	Name

Safety Labels and AC Grounds

Understand the meaning of the safety labels before beginning any repair of a component with a label.

Check that the labels are located where shown in Figure 152 on page 258. Make any necessary corrections. See Chapter 14, “Parts Catalog,” on page 1093 for part numbers of labels in the various languages.

The general caution symbol



identifies conditions where caution must be used.

The electrical caution symbol



identifies electrical hazards where extreme caution must be used. The electrical caution label locations may change.

The laser radiation label



shows that the 3584 contains a Class II laser device. It is located within the bar code scanner.

A similar symbol defines the use of a Class I laser for the fibre channel feature.



See also “Laser Safety and Compliance.”

Laser Safety and Compliance

This product complies with the performance standards set by the U.S. Food and Drug Administration for a Class II Laser Product. This product belongs to a class of laser products that requires precautions be taken to avoid prolonged viewing of the laser beam. Under normal working conditions, the operator should not come in direct contact with the laser beam. This classification was accomplished by providing the necessary protective housings and scanning safeguards to ensure that laser radiation is inaccessible during operation or is within Class II limits. These products have been reviewed by external safety agencies and have obtained approvals to the latest standards as they apply to this product type.

Safety Labels and Grounds for the Model L22, L23, L32, L52 or L53 (Base) Frame

Figure 152 shows the approximate locations of the following:

1. Class II laser caution label, bar code scanner
2. Current leakage caution label
3. Power cord label

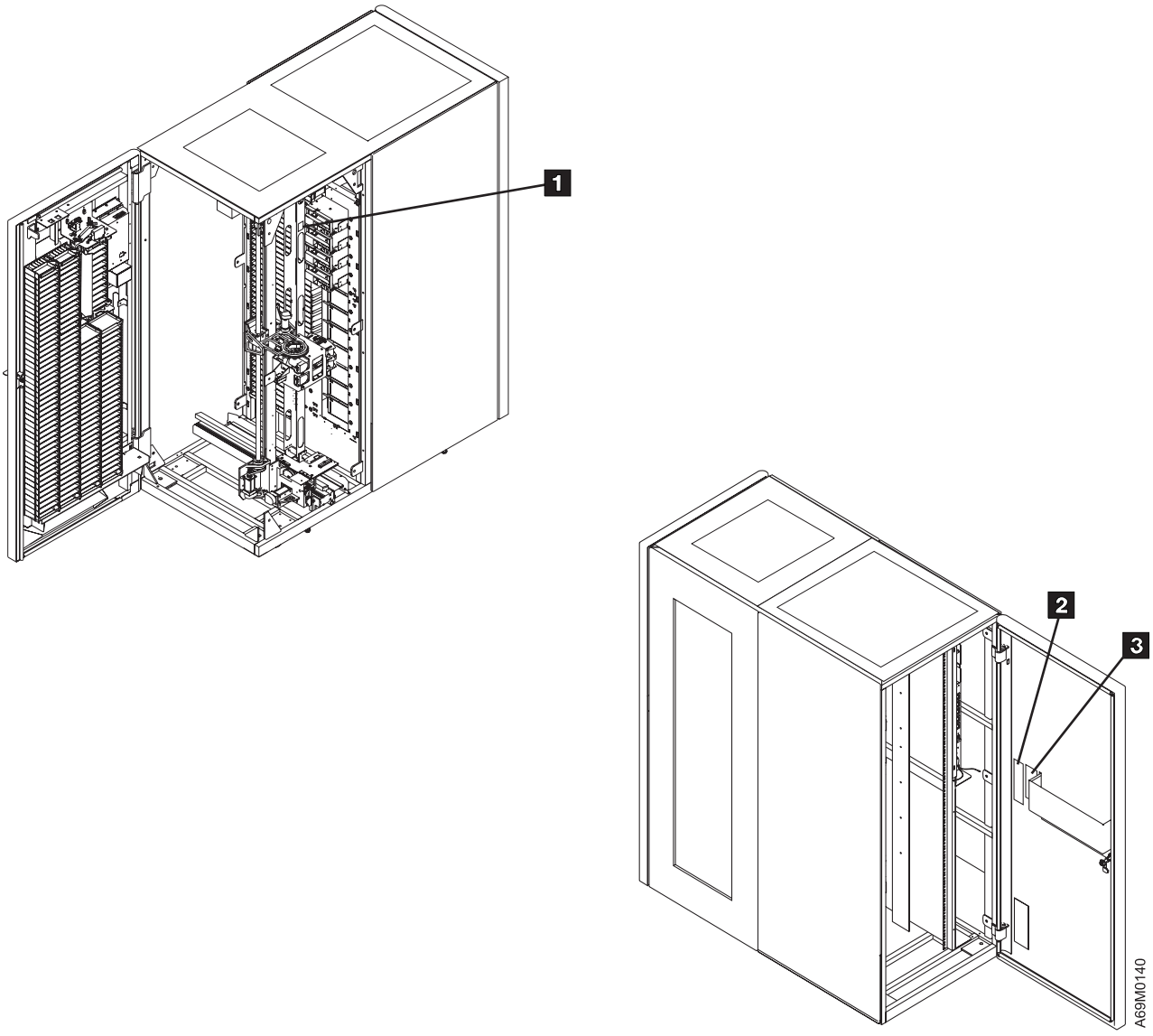


Figure 152. Base Frame Safety Labels

Safety Labels and Grounds for the Model D22, D23, D32, D52 or D53 (Expansion) Frames

Use Figure 152 on page 258 keys **2** through **3** for the locations of the safety labels in the expansion frames.

Note: If the expansion frame has no FCA, it may not have any safety labels.

Safety Engineering Changes

Check the following safety items and correct as needed:

__ 1. All safety engineering changes (ECs) have been installed correctly.

__ 2. The location or list of engineering change announcements (ECAs) is accessible.

Power Cord Ground Pin Identification

There are different types of power cords (based on country) supplied with the 3584 tape library system. See Figure 153 to help identify the power cord ground pin **1** as you perform the power cord grounding checks in this chapter. If the power cord you received does not have a plug attached (which may be the case in selected EMEA countries) perform the grounding check using either the yellow/green wire or the solid green wire.

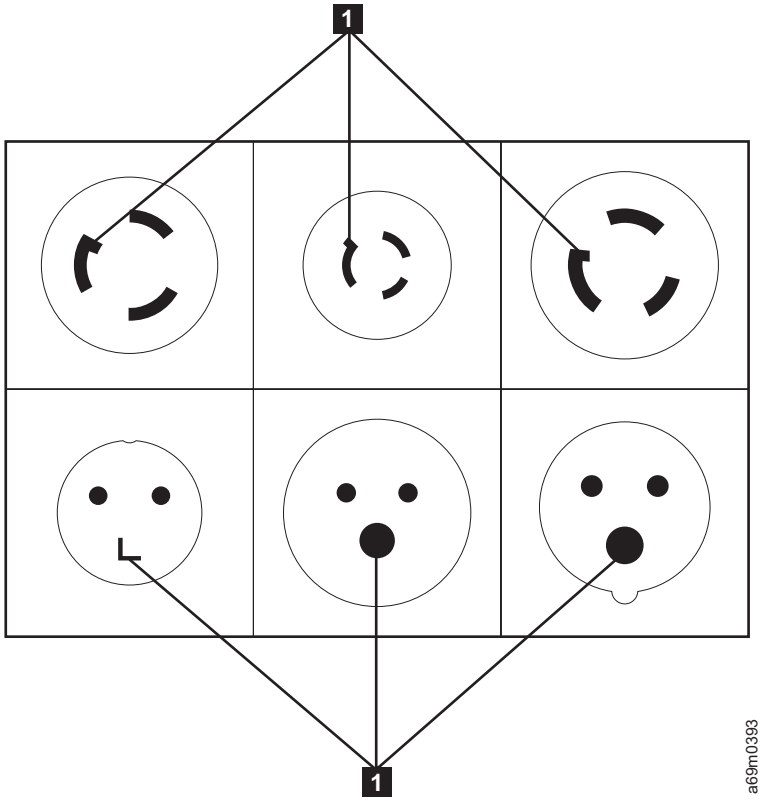


Figure 153. Types of Power Cord Plugs used in the 3584 Tape Library. (50 Hz and 60 Hz)

Safety Checks (Single Line Cord)

Refer to Figure 153 on page 259 and Figure 154 on page 261 as you perform the following safety checks.

Note: The 3584 must be powered off, with the main power cable leading to each FCA disconnected from the customer's power source. See item **5** .

Check the following safety items and correct as needed:

__ 1. All hinges and latches are in acceptable operating condition and are not broken or corroded.

__ 2. All door interlocks and safety switches are operating and are not bypassed with jumpers or taped closed.

__ 3. All ac power cables have the correct part number.

Note: See Chapter 14, “Parts Catalog,” on page 1093 for the correct part number for the power cables. See also *IBM System Storage TS3500 Tape Library Operator Guide*, GA32–0468, or *IBM System Storage TS3500 Tape Library Introduction and Planning Guide*, GA32–0469.

__ 4. The two screws with lock washers holding the yellow/green ground strap item **4** are tight. See Figure 154 on page 261.

__ 5. The two mounting bolts **6** for each FCA are tight.

__ 6. Check that all covers, housings, and metal box sides have proper ground continuity (less than 0.1 ohm).

__ 7. Check continuity as shown two places in Figure 154 on page 261, and two places as shown on Figure 155 on page 262. The readings must be less than 0.1 ohm.

__ 8. For any library with 2 or more frames, check continuity between one frame and the next at the yellow/green ground wire, item **4** . A reading must be less than 0.1 ohm.

__ 9. Inspect covers and sheet metal:
- All access safety covers must be in place.
- Sharp corners or edges should be protected.

__ 10. The customer’s circuit breakers and circuit panels for the 3584 frames are identified as 3584 branch circuits.

__ 11. No obvious non-IBM changes have been made.

__ 12. No metal filings, dirt, contaminants, water, or other fluids are present.

__ 13. There are no marks from earlier smoke or burning. Check the maintenance agreement qualification (MAQ) report for the correct procedures for repair action, if needed.

__ 14. No damaged or frayed power wiring.

__ 15. The 37 V dc power supplies **3** are secure within their housings.

__ 16. All latches or clamps are in acceptable condition.

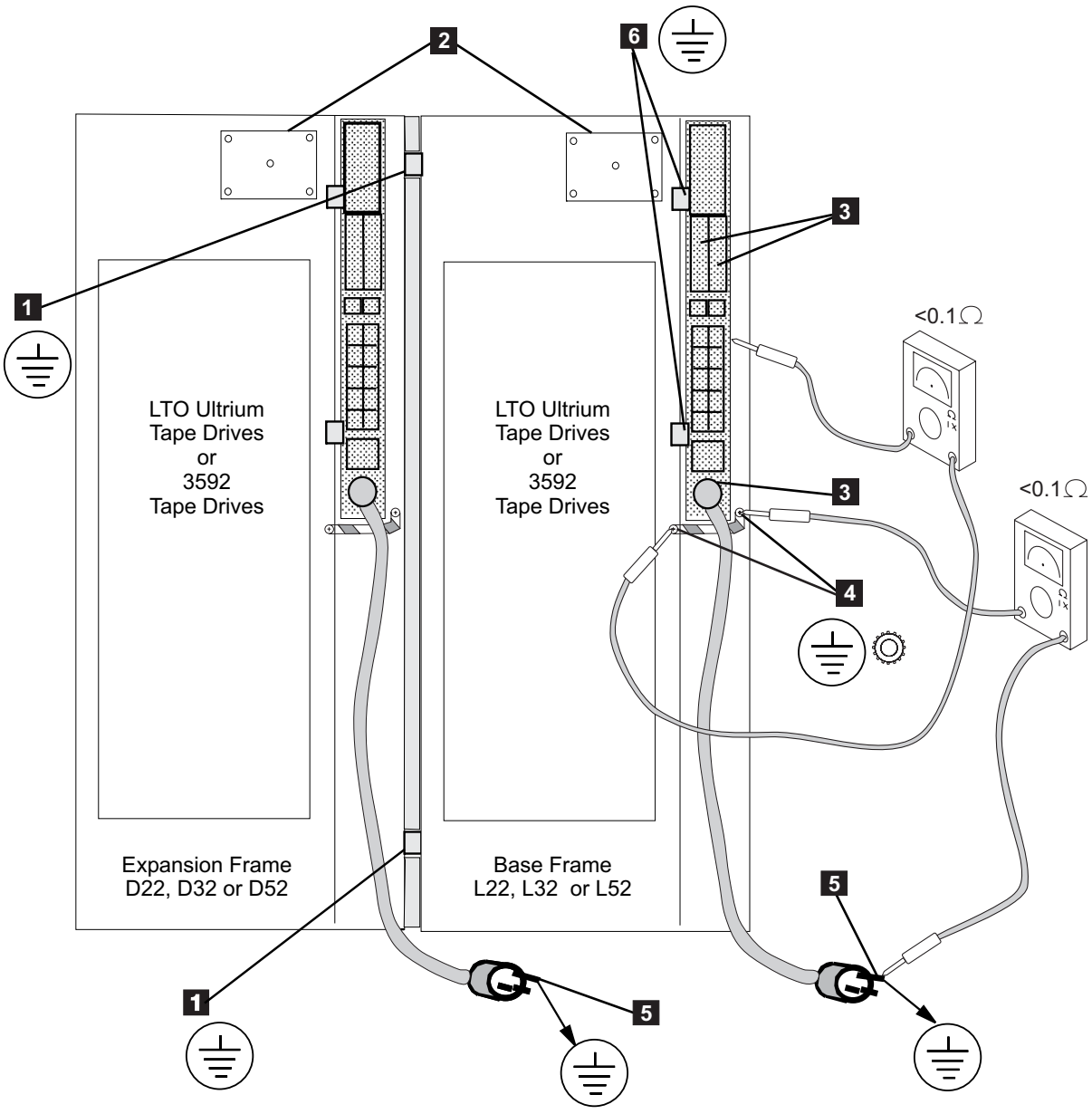


Figure 154. FCA to Frame AC Grounding Diagram. (50 Hz and 60 Hz)

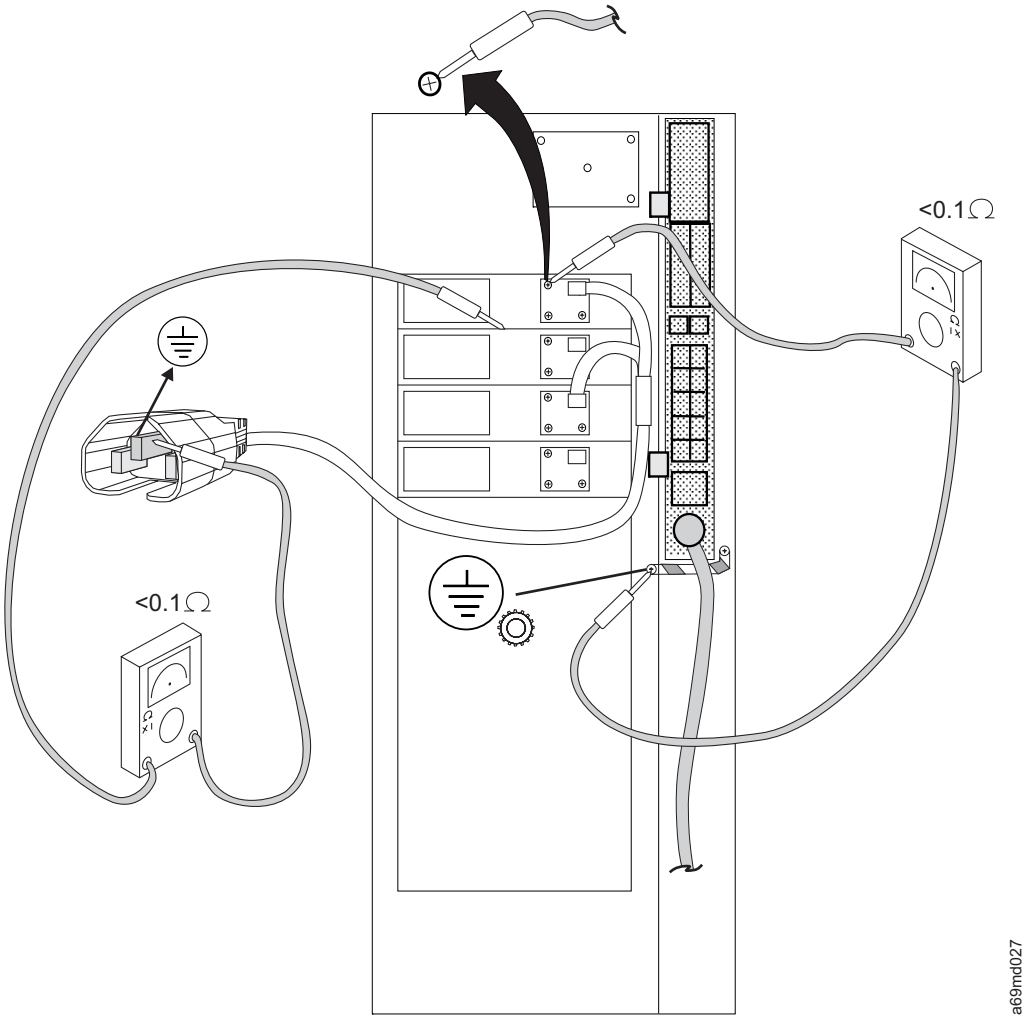


Figure 155. Tape Drive AC Grounding Diagram. (50 Hz and 60 Hz)

Safety Checks x23 / x53 (Dual Line Cords)

Refer to Figure 153 on page 259 and Figure 156 on page 264 as you perform the following safety checks.

Note: The 3584 must be powered off, with the main power cables leading to each BPC assembly disconnected from the customer's power source. See item **1** .

Check the following safety items and correct as needed:

__ 1. All hinges and latches are in acceptable operating condition and are not broken or corroded.

__ 2. All door interlocks and safety switches are operating and are not bypassed with jumpers or taped closed.

__ 3. All ac power cables have the correct part number.

Note: See Chapter 14, “Parts Catalog,” on page 1093 for the correct part number for the power cables. See also *IBM System Storage TS3500 Tape Library Operator Guide*, GA32–0468, or *IBM System Storage TS3500 Tape Library Introduction and Planning Guide*, GA32–0469.

__ 4. Check continuity between the ground pin of the power cord **1** and the Bulk Power Supply (BPS) screw **2** as shown in Figure 156 on page 264. Be sure to measure to the BPS screw and **not** the frame. The readings must be less than 0.1 ohm.

__ 5. Check frame-to-frame continuity by measuring between the BPC mounting screws **3** in each frame as shown in Figure 156 on page 264. The readings must be less than 0.1 ohm.

__ 6. Inspect covers and sheet metal:
- All access safety covers must be in place.
- Sharp corners or edges should be protected.

__ 7. The customer’s circuit breakers and circuit panels for the 3584 frames are identified as 3584 branch circuits.

__ 8. No obvious non-IBM changes have been made.

__ 9. No metal filings, dirt, contaminants, water, or other fluids are present.

__ 10. There are no marks from earlier smoke or burning. Check the maintenance agreement qualification (MAQ) report for the correct procedures for repair action, if needed.

__ 11. No damaged or frayed power wiring.

__ 12. All latches or clamps are in acceptable condition.

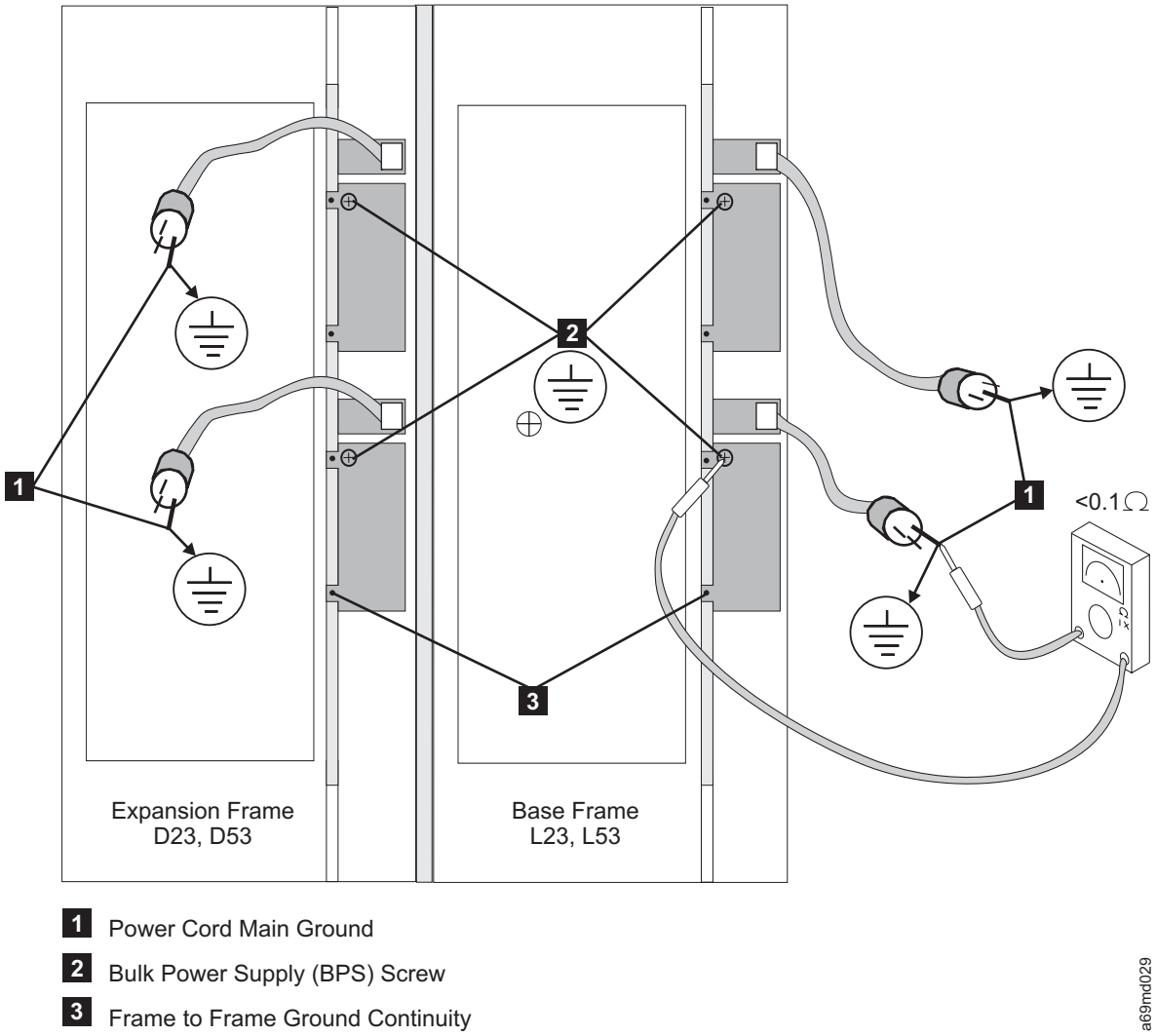


Figure 156. AC Power to BPS Grounding Diagram. (50 Hz and 60 Hz)

Safety Checks (Dual AC Line Cords and PDU) FC 1901

Refer to Figure 153 on page 259 and Figure 157 on page 266 as you perform the following safety checks.

Note: The 3584 must be powered off, with the main power cables leading to each PDU (Power Distribution Unit) disconnected from the customer's power source.

Check the following safety items and correct as needed:

__ 1. All hinges and latches are in acceptable operating condition and are not broken or corroded.

__ 2. All door interlocks and safety switches are operating and are not bypassed with jumpers or taped closed.

__ 3. All ac power cables have the correct part number.

Note: See Chapter 14, “Parts Catalog,” on page 1093 for the correct part number for the power cables. See also *IBM System Storage TS3500 Tape Library Operator Guide*, GA32–0468, Appendix B. Technical Components, Dual ac Power.

__ 4. The two screws with lock washers holding the yellow/green ground strap item **4** are tight. See Figure 157 on page 266.

__ 5. The two mounting bolts **6** for each FCA are tight, also PDU mounting screw **7** .

__ 6. Check that all covers, housings, and metal box sides have proper ground continuity (less than 0.1 ohm).

__ 7. Check continuity as shown in three places as shown on Figure 157 on page 266, and two places as shown in Figure 158 on page 267. The readings must be less than 0.1 ohm. (Make sure to check both ac line cords – ground to PDU case).

__ 8. For any library with 2 or more frames, check continuity between one frame and the next at the yellow/green ground wire, item **4** . A reading must be less than 0.1 ohm.

__ 9. Inspect covers and sheet metal:
- All access safety covers must be in place.
- Sharp corners or edges should be protected.

__ 10. The customer’s circuit breakers and circuit panels for the 3584 frames are identified as 3584 branch circuits.

__ 11. No obvious non-IBM changes have been made.

__ 12. No metal filings, dirt, contaminants, water, or other fluids are present.

__ 13. There are no marks from earlier smoke or burning. Check the maintenance agreement qualification (MAQ) report for the correct procedures for repair action, if needed.

__ 14. No damaged or frayed power wiring.

__ 15. The 37 V dc power supplies **3** are secure within their housings.

__ 16. All latches or clamps are in acceptable condition.

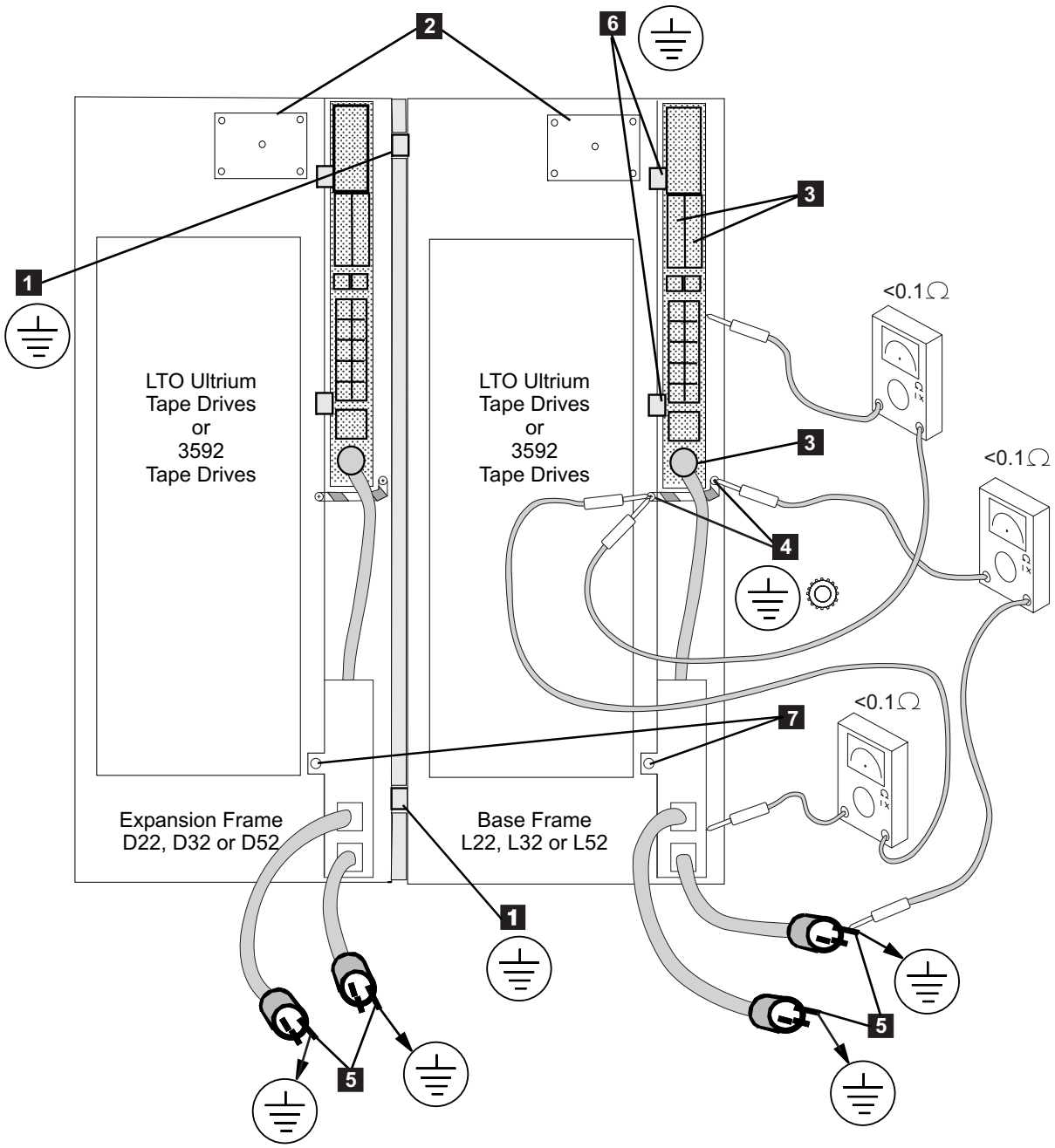


Figure 157. FCA to Frame AC Grounding Diagram. (50 Hz and 60 Hz)

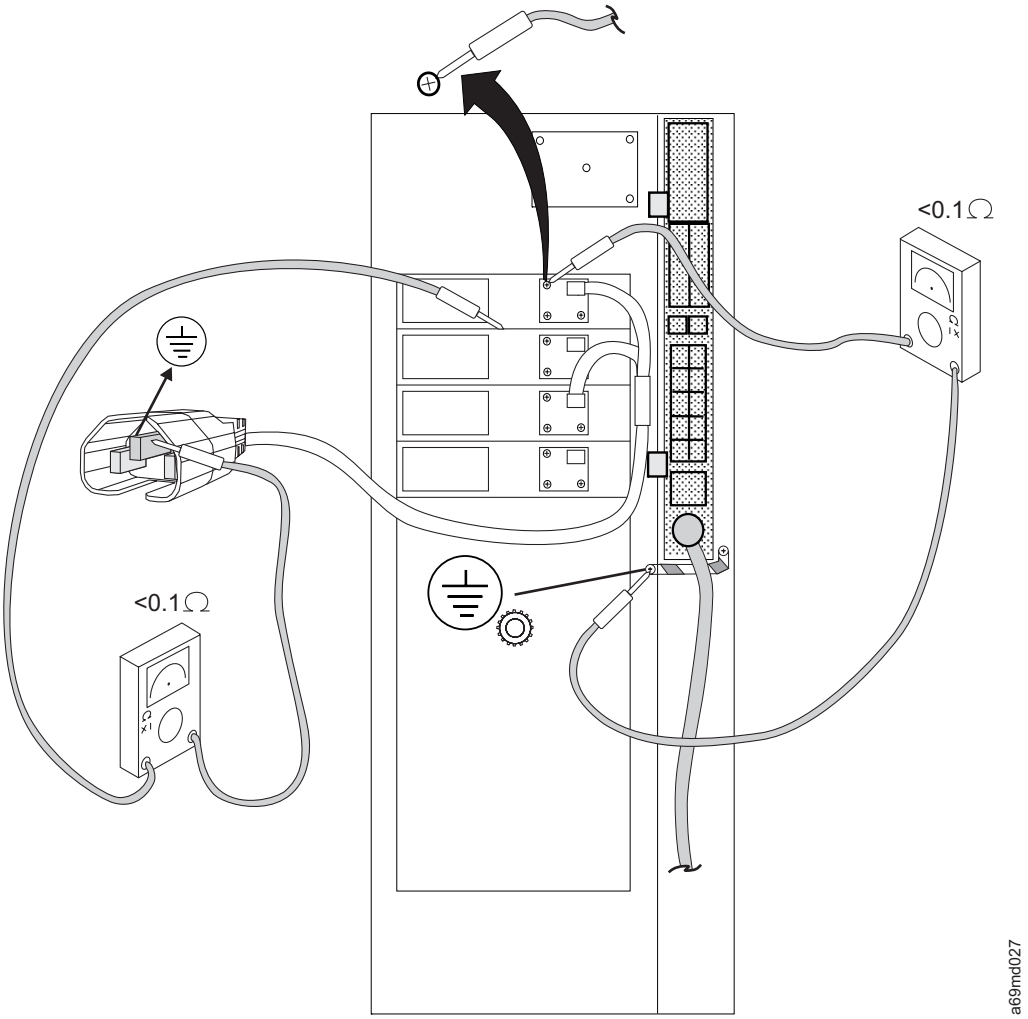


Figure 158. Tape Drive AC Grounding Diagram. (50 Hz and 60 Hz)

Shuttle Complex (Model SC1) Safety

When performing any service activities on the shuttle complex library, pay close attention to all posted warning labels on the shuttle components. Carefully read all **Safety Warnings** when servicing shuttle components as listed in **Chapter 11, "CARR (Checks, Adjustments, Removal, and Replacement)," on page 787**.

There are no safety interlocks on the covers anywhere in the span. Sudden unexpected shuttle car motion is possible, and all voltages are still present.

Important Ladder Safety information

A special ladder, provided in this kit, is required to install this feature. Please read, comply with, and be aware of the following important ladder safety information:

1. Do not use the ladder if it is damaged or unstable.
2. Set up the ladder on a solid, level surface so that both side rails (or all four feet of a step ladder) have a secure footing. Be sure the floor is free of slippery or unstable substances.
3. Be sure it is fully open and the divider is locked before you climb.
4. Be sure your shoes are free of grease, mud, or anything slippery before you climb.
5. Climb one step at a time and maintain a firm grip on the rails, keeping your weight on your feet.
6. Do not try to climb the ladder while holding large bulky items. Have someone hand them to you after you have ascended the ladder.
7. Only one person at a time can be on the ladder.
8. Be careful when ascending or descending the ladder. Always face the ladder when ascending or descending and hold the side rails or hand rails.
9. Reposition the ladder to avoid the need to lean too far in either direction to reach your work. Move the ladder if necessary.
10. Always maintain your balance.
11. If you are uncomfortable working in elevated areas, discuss your concerns with your manager.

Completion Report and Signature

Use this form to aid you with conducting a safety inspection. After completing the inspection, sign and date the checklist and store it with the maintenance agreement inspection. You are signing to verify the following activities:

- Safety inspection for machine type 3584
- General safety inspection
- Maintenance agreement qualification (MAQ)

_____ _____
Name/Signature Date

Safety Hazards

List all safety hazards. If you did not find any, write 'None.'

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

Chapter 7. Unit Reference Codes and Other Code Types

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Identifying the Accessor Associated with a Failure 274
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URC Table With Descriptions, Actions, and FRUs 375
LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5) 590
LTO Errors Through Web Specialist 592

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Identifying Device Type

Before you look up the library sense data in Table 48 on page 280, you may need to know what type of device is causing the failure. In some cases, you will need to determine a drive type, gripper type, I/O station type, or storage column/cell type before you can determine which URC to use as a symptom. The following information is designed to assist you in determining the devices installed. When you have determined the type of devices you are dealing with, look up the URC in Table 48 on page 280 and go to "URC Table With Descriptions, Actions, and FRUs" on page 375 to repair the problem.

Note: The Lxx frame is always frame number 1. Service bay A is not frame 1.

Identifying Drive Type

If you need to determine a drive type, first determine the location of the affected drive. There are several ways to do this:

- If you are working with an error that was displayed on the library operator panel then the error message may have indicated the frame and row of the drive.
- If you are working with a RETAIN PMR or a library error log entry, the drive location is indicated by the *Failing Frame/Device* byte in the library sense data. The first digit of the failing frame/device byte is the frame in which the drive is located. The second digit of the failing frame/device byte is the row in which the drive is located. As an example if the failing frame/device byte is X'14' (hex) this indicates that the drive is located in frame 1, row 4. And if the failing frame/device byte is X'3A' (hex) this indicates that the drive is located in frame 3, row 10 (10 in decimal is X'A' hex).
- If you are working with drive sense data in a host error log, the length of the sense data may help determine whether the drive is an LTO Ultrium or a 3592. The error sense data for an LTO Ultrium drive is typically 36 bytes. The error sense data for a 3592 drive is much longer, typically 96 bytes.

  Note: Some host error logs truncate the sense data so you may not be able to determine the length. If byte 7 (Additional Sense Length) is X'58' (hex) or more it indicates a 3592 drive. If byte 7 is X'1C' (hex) it indicates an LTO Ultrium drive.

  If you determine that you are working with sense data from an LTO Ultrium drive then the drive location is available in byte 35 of the drive sense data. The first digit of the byte 35 is the frame in which the drive is located. The second digit of byte 35 is the row in which the drive is located. As an example if byte 35 is X'14' (hex) this indicates that the drive is located in frame 1, row 4. And if byte 35 is X'3A' (hex) this indicates that the drive is located in frame 3, row 10 (10 in decimal is X'A' hex). See Table 44 and Table 45.

Table 44. Frame Number vs Failing Frame

	Lxx	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**
Physical Frame	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Failing Frame	1x	2x	3x	4x	5x	6x	7x	8x	9x	Ax	Bx	Cx	Dx	Ex	Fx	0x
x = Device																

Table 45. Drive Position vs Failing Drive

Drive Position	N/A	1	2	3	4	5	6	7	8	9	10	11	12	N/A	N/A	N/A
Failing Drive	x0	x1	x2	x3	x4	x5	x6	x7	x8	x9	xA	xB	xC	xD	xE	xF
x = Failing Frame Location																

When you have determined the frame and row number of the drive, visually check to see whether the

drive assembly is a tray or a canister. To determine the type of drive that is in your library, consider the following:

- Drive types may be abbreviated on the labels. **L1** indicates an LTO Ultrium-1 drive. **L2** indicates an LTO Ultrium-2 drive. **L3** indicates an LTO Ultrium-3 (3588 model F3A or F3B) drive. **L4** indicates an LTO Ultrium-4 (3588 model F4A) drive. **L5** indicates an LTO Ultrium-5 (3588 model F5A) drive. **J1A** indicates a 3592 model J1A drive. **E05** indicates a 3592 model E05 drive, **E06** indicates a 3592 model E06 drive, and **EU6** indicates a 3592 model EU6 drive.
- Early Fixed Tray assemblies did not have labels. These are LTO1 LVD drives.
- For further information on Fixed Trays and drive canisters, see the table at Table 101 on page 874 and review the listed procedures and drawings for each type of drive.

Identifying Library Component Type

- **To determine gripper type:**
  - If you are at the machine you can use the library operator panel to display the gripper type. Press the MENU button, then select Library Status, Accessor Status. If a gripper is listed as LTO then it is an LTO-only gripper. If a gripper is listed as LTO/3592 or as UNIV then it is a Universal (LTO and 3592) gripper.
  - If frame 1 is a model L22 or L52 then it contains two Universal (LTO and 3592) grippers. Each universal gripper can grip LTO cartridges and 3592 cartridges.
  - If frame 1 is a model L32 then it was originally shipped with two LTO grippers. If one or more model D22 frames are attached then it has been upgraded with two Universal (LTO and 3592) grippers.
- **To determine I/O station type:**
  - The upper I/O station type is dependent on the model number of frame 1.
    - If frame 1 is a model L32 then the upper I/O station is a 10 cartridge LTO I/O station.
    - If frame 1 is a model L52/L53 then the upper I/O station is a 16 cartridge LTO I/O station.
    - If frame 1 is a model L22/L23 then the upper I/O station is a 16 cartridge 3592 I/O station.
  - The lower I/O station type is dependent on the model number of frame 1 and the model number of the expansion frames.
    - If frame 1 is a model L32 and there are no model D22/D23 expansion frames then the lower I/O station is a 20 cartridge LTO I/O station.
    - If frame 1 is a model L32 with one or more model D22/D23 expansion frames then the lower I/O station is a 16 cartridge 3592 I/O station.
    - If frame 1 is a model L52/D53 and there are no model D22/D23 expansion frames then the lower I/O station is a 16 cartridge LTO I/O station.
    - If frame 1 is a model L52/D53 with one or more model D22/D23 expansion frames then the lower I/O station is a 16 cartridge 3592 I/O station.
    - If frame 1 is a model L22/D23 with no model D32, D52, or D53 expansion frames then the lower I/O station is a 16 cartridge 3592 I/O station.
    - If frame 1 is a model L22/D23 with one or more model D32 or D52, expansion frames then the lower I/O station is a 16 cartridge LTO I/O station.
- **To determine a storage column/cell type**, first determine in which frame the column/cell is located. See the failing frame/device byte in the library sense data. The first digit of the failing frame/device byte is the frame in which the column/cell is located. After you locate the frame, find the model number of that frame. The second digit of the model number indicates the column/cell type (models x3x and x5x contain LTO columns/cells, model x2x contains 3592 columns/cells).

  Note: LTO cells in a model x3x and in a model x5x are both compatible with LTO cartridges, but are different FRUs.

Identifying the Accessor Associated with a Failure

When an accessor-related failure occurs in a dual accessor library (a library containing a model HA1 frame and a Dxx frame with the service bay B feature installed), it may not be obvious which accessor is affected. The library SCSI sense data contains a field which identifies the accessor. This field is in byte 23 of the library SCSI sense, called the Mechanism State Bitmap.

The Mechanism State Bitmap is included in the library error log. When viewing the library error log on the library operator panel this field is called MSB. When viewing the library error log with the CETool this field is called 'Mech State Bitmap'. The Mechanism State Bitmap is typically displayed as 0x**ZZ** where **ZZ** is the Mechanism State Bitmap value indicating the failing accessor as shown in the following table:

If the value of ZZ is:	Failing Accessor is:
x0, x1, x4, x5, x8, x9, xC, xD	Accessor A
x2, x3, x6, x7, xA, xB, xE, xF	Accessor B

Note: When a failure exists on the library, you may also be able to identify the accessor by viewing Accessor Status at the library operator panel. Press MENU, then select Library Status -> Accessor Status.

Node Card LED Display Codes

Node cards display a variety of codes in their two-character LEDs. **Table 46** shows the basic meaning of these various codes. The first 2 numbers of the error code are displayed for about two seconds, then the second two numbers are displayed for about one second, then it repeats. As an example, if **34** shows for about two seconds, then **91** shows for about one second, this indicates the error code **3491**. When you have determined the error code, go to Chapter 2, “Start,” on page 71, locate a match to your symptom, and repair the problem.

When the MCP and/or MCA has completed its POST successfully, it will enable power to the accessor and the front panel display. The two-character displays on the ACC, MDA, and OPC should light up and show progress through the POST procedures. The information on the two-character displays has the same meaning as in the last step.

When the ACC, MDA, and OPC have completed their POST procedures, the accessor will attempt to rezero (move the accessor to bottom left side of the base frame, the home position). If the rezero is successful, the accessor performs an inventory of any frames that are already configured. As an example, if you are adding an expansion frame to an existing base frame, an inventory of the base frame will take place. If an error is detected, the operator panel will display the error information. Go to Chapter 2, “Start,” on page 71, locate a match to your symptom, and repair the problem.

Table 46. Basic LED Node Card Display Codes

Codes	Description
E0 through FF	Stages in the MCP and/or MCA Power On Self Test (POST). If the two-character display continues to show a number in this range for more than 5 minutes it indicates a problem.
20 through FF	Numbers in this range indicate that an error has been detected after MCP and/or MCA POST completed.
0E and 0F	The library is transferring code to one or more node cards. 0E is displayed on the node card receiving the code. 0F is displayed on the node card sending the code. Code transfer can take as long at 30 minutes.

Table 46. Basic LED Node Card Display Codes (continued)

Codes	Description
00 through 16	Numbers in this range are used for Frame Counting. This indicates that the MCP and/or MCA POST completed with no critical errors. The two-character display will alternate between 00 and nn (where nn is the frame number). **Note:** The frame number is 01 for the base frame, 02 for the first expansion frame, 03 for the next expansion frame, and so on. As an example, the two-character display on the base frame will display 00, then 01, and then repeat. If the first expansion frame (frame 2) has an FCA or an Enhanced FCA, its two-character display will display 00, then 02, and then repeat. If the wrong frame number is indicated, go to Chapter 2, “Start,” on page 71, locate a match to your symptom, and repair the problem. **Note:** In an HA dual accessor library the MDA on accessor A should show 00 01 after it finishes POST. The MDA on accessor B should show 00 02 after it finishes POST. If accessor B shows 00 01 then it is necessary to swap the MDA on accessor A with the MDA from accessor B, and let the automatic code update complete.

The codes listed in Table 47 provide more specific details on the node cards (electronic cards located on the CAN bus) LED display in the base frame and all extension frames that contain node cards. These node cards are the ACC, MDA, MCP, MCA, and OPC. Not all expansion frames will have all the node cards that are in the base frame.

During Node card POST (power-on self test), a code will flash showing the progress through the test. If POST completes successfully, the display will cycle between 00 and 01 (for the base frame). Expansion frames should flash 00 and xx in the node card LEDs after Node card POST, where xx= the frame number. Each frame will have its own number regardless of whether it has an FCA installed or not.

If a failure occurs during Node card POST, a solid display of a two-digit error code will occur. See Table 47. When an error occurs after completion of the Node card POST, the LED will cycle between the HEC and HECQ codes.

Two-digit error codes also may appear during code load on one of the node cards. When this occurs, see Table 47.

If you have a solid display of a two-digit error code that is not listed in Table 47, call your next level of support.

Table 47. Node Card LED Displays

LED Display	Description	Action
Blank	Node card missing power	Go to “Power Isolation MAP” on page 648.
Flashing 00 then 0x	Normal display with power up following POST. The 0x is the frame number for the MCP/MCA and OPC node cards, and the accessor number for the ACC and MDA node cards. Cycles between 00 and 0x. **Note:** Whether a frame has an FCA or not, it will still have a frame number. This number is associated with the frame FIC card which all frames will have.	None
Flashing 00 then 0E or 0F	The node card is updating code.	None

Table 47. Node Card LED Displays (continued)

LED Display	Description	Action
Flashing 00 then 0x	If the wrong frame number flashes within a frame, or all the MCP or MCA node cards (in a multi-frame library) all flash 00 01, a problem exists with the FIC electronics between frames.	1. For 00 01 displays on all MCP or MCA node cards, check FIC terminators in the base frame (Lxx) and expansion frames (Dxx) to ensure they are plugged correctly. • On a single accessor library, see step 83 on page 147 and Figure 74 on page 148. • On a dual accessor library, see Figure 100 on page 169. 2. Checkout the FIC electronics and cabling between frames.
Flashing HEC and HECQ codes (20 through DF)	The HEC code stays on longer than the HECQ code.	Go to “Library Sense Data to URC Table” on page 279 to obtain the URC. Use 04 44 00 followed by the error code you received. Then go to “URC Table With Descriptions, Actions, and FRUs” on page 375 to locate the code and follow the instructions.
F1 followed by 8 separate 2-digit hex numbers, repeating	Microcode on the node card has encountered a critical error. This condition usually prevents the node card from logging an error in the error log and from responding on the CAN. This could also be caused by Library Firmware download incompatible with Library Hardware. **Note:** This is the case if 95xx or higher firmware is loaded on earlier style nodes cards. Enhanced node cards with a Compact Flash (CF) FC 1700/1701 are required for firmware levels 95xx or higher. **Note:** Frame models Dx2 without node cards do not require FC 1701.	1. Record the entire sequence of numbers. Each number will be displayed for a set time. If one number appears to be displayed for twice the time, it is probably the same number shown twice. For example, the number might be F1 01 02 03 03 04 05 06 07. The two 03 displays will appear to be one long 03 display. 2. Reset the node card by pressing the reset button on the node card, or by power cycling the library. **Note:** Do Not power cycle the library unless you are sure that no customer jobs are still running on any of the drives. 3. If the node card completes POST normally, and does not display the F1 error again, verify that all the node cards in the library contain the same level of microcode (go to Main Menu, Vital Product Data, Node Card VPD, use UP/DOWN keys to step through all configured cards). 4. Check to see if the level of library code is the highest level available. See “Display Library Firmware Version” on page 702 for library code version and the Tucson PFE Website to check for code levels. 5. Use CETool to obtain the library logs, see “Creating Library Dump by Using CETool” on page 718. 6. If any node card is at a different level, or if the entire library is downlevel, use CETool to install the latest code (see “Loading Library Microcode by Using CETool” on page 709. 7. Send the library logs and the F1 error code numbers to your Product Field Engineering Support location.

Table 47. Node Card LED Displays (continued)

LED Display	Description	Action
F2 alternating with xx, where xx=frame number from 01 to 16.	An F1 (node card processor exception) occurred. The node card saved log information for the error and then reset to restore normal operation. The F2 indicates that this log information is available to be collected. The F2 will be cleared when the log has been collected, either manually or via a Call Home.	Use CETool to obtain the library logs, see “Creating Library Dump by Using CETool” on page 718.
Cycling Fx	Display during POST. As long as numbers continue to change, no error has occurred. These numbers will be in the range of Fn.	None
Solid 0x	Error occurred during POST. The code has probably hung or has gone into a loop.	Cycle power. If problem reoccurs, reload code into the card that is hung with the X'0x.
Solid E9	POST Error or Code update error. Thread exec error (Idle_Diag did not start).	Reload code in the card with the X'E9 display. If problem reoccurs, replace the card that displays this error code.
Solid EA	POST Error or Code update error. Memory Allocation Error	Reload code in the card with the X'EA display. If problem reoccurs, replace the card that displays this error code.
Solid EB	POST Error or Code update error. Semaphore Creation Error	Reload code in the card with the X'EB display. If problem reoccurs, replace the card that displays this error code.
Solid EC	POST Error or Code update error. Memory Pool Creation Error	Reload code in the card with the X'EC display. If problem reoccurs, replace the card that displays this error code.
Solid ED	POST Error or Code update error. Thread Queue Creation Error	Reload code in the card with the X'ED display. If problem reoccurs, replace the card that displays this error code.
Solid EE	POST Error or Code update error. Thread Creation Error	Reload code in the card with the X'EE display. If problem reoccurs, replace the card that displays this error code.
Solid EF	POST Error or Code update error. PROM Programming Error	Reload code in the card with the X'EF display. If problem reoccurs, call your next level of support. If the latest code does not fix the error, replace the card that displays this error code. The hardware may be mimicking a code error.
Solid F0	POST Error or Code update error. Base Interrupt Error	Reload code in the card with the X'F0 display. If problem reoccurs, replace the card that displays this error code.
Solid F1	POST Error or Code update error. Exception Interrupt Error	Reload code in the card with the X'F1 display. If problem reoccurs, replace the card that displays this error code. This problem may be caused by a library code bug or by a hardware problem on the node card. Reset the card with the X'F1 display. If the problem immediately recurs, replace the node card. If the problem does not immediately recur, see if a higher version of library code is available. If a higher version of library code is available, update the library code.

Table 47. Node Card LED Displays (continued)

LED Display	Description	Action
Solid F2	POST Error or Code update error. TLB Interrupt Error	Reload code in the card with the X'F2 display. If problem reoccurs, replace the card that displays this error code. This problem may be caused by a library code bug or by a hardware problem on the node card. Reset the card with the X'F2 display. If the problem immediately recurs, replace the node card. If the problem does not immediately recur, see if a higher version of library code is available. If a higher version of library code is available, update the library code.
Solid F3	POST Error or Code update error. Unknown Interrupt Error	Reload code in the card with the X'F3 display. If problem reoccurs, replace the card that displays this error code.
Solid F4	POST Error or Code update error. CAN Test Error	Replace the card that displayed this error code.
Solid F5	POST Error or Code update error. FPGA Test Error	Replace the card that displayed this error code.
Solid F6	POST Error or Code update error. Unable to initialize operating system.	Replace the card that displayed this error code.
Solid F7	POST Error or Code update error. NVRAM Test Error	Replace the card that displayed this error code.
Solid F8	POST Error or Code update error. Error Initializing the C Environment.	Replace the card that displayed this error code.
Solid F9	POST Error or Code update error. Error Copying Code to SDRAM	Replace the card that displayed this error code.
Solid FA or FB	POST Error or Code update error. SDRAM Test Error	Replace the card that displayed this error code.
Solid FC	POST Error or Code update error. Processor XY Memory Error	Replace the card that displayed this error code.
Solid FD	POST Error or Code update error. Processor Test Error	Replace the card that displayed this error code.
Solid FE or FF	POST Error or Code update error. Flash PROM Checksum Error	Replace the card that displayed this error code.

Library Sense Data to URC Table

The data in the **Error Data** column of Table 48 on page 280 is divided into 5 groups. These groups from left to right are:

- Sense Byte 02 = SK (Sense Key)
- Sense Byte 12 = ASC (Additional Sense Code)
- Sense Byte 13 = ASCQ (Additional Sense Code Qualifier)
- Sense Byte 18 = HEC (Hardware Error Code)
- Sense Byte 19 = HECQ (Hardware Error Code Qualifier)

Table 48 on page 280 also contains an error **Description** and a **URC** for the error data.

Notes:

1. The URC is for reference only and is not part of the sense data.
2. In the **Error Data** column of the following table, a '—' denotes that data is not applicable. An 'xx' denotes variable data will occur.
3. If you are working with sense data from an **LTO Drive**, go to "LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table" on page 315.
4. If you are working with sense data from a **3592 Drive**, go to "3592 Drive Sense Data to URC Table" on page 344.
5. The following abbreviations apply to Table 48 on page 280: Library Sense Data to URC.

LTO1 DT LVD. LTO Ultrium-1 Fixed Tray (SCSI Low Voltage Differential)

LTO1 DT HVD. LTO Ultrium-1 Fixed Tray (SCSI High Voltage Differential)

LTO1 DT FC. LTO Ultrium-1 Fixed Tray (Fibre Channel)

LTO1 DC LVD. LTO Ultrium-1 drive canister (SCSI Low Voltage Differential)

LTO1 DC HVD. LTO Ultrium-1 drive canister (SCSI High Voltage Differential)

LTO1 DC FC. LTO Ultrium-1 drive canister (Fibre Channel)

LTO2 DC LVD. LTO Ultrium-2 drive canister (SCSI Low Voltage Differential)

LTO2 DC HVD. LTO Ultrium-2 drive canister (SCSI High Voltage Differential)

LTO2 DC FC. LTO Ultrium-2 drive canister (Fibre Channel)

LTO3 DC F3A. LTO Ultrium-3 3588 F3A drive canister (Fibre Channel)

LTO3 DC F3B. LTO Ultrium-3 3588 F3B drive canister (Fibre Channel)

LTO4 DC F4A. LTO Ultrium-4 3588 F4A drive canister (Fibre Channel)

LTO5 DC F5A. LTO Ultrium-5 3588 F5A drive canister (Fibre Channel)

J1A DC FC. 3592 model J1A drive canister (Fibre Channel)

E05 DC FC. 3592 model E05 drive canister (Fibre Channel)

E06/EU6 DC FC. 3592 model E06/EU6 drive canister (Fibre Channel)

E07 DC FC. 3592 model E07 drive canister (Fibre Channel)

Table 48. Library Sense Data to URC

Error Data	Description	URC
00 00 00 — —	No sense information. This usually means there was no error. In rare instances it also can occur when a SCSI failure prevents the library from returning sense information.	A000
Sense Key = 1		
01 44 00 xx xx	Recovered error (logged but not reported as SCSI sense). In most cases you should not attempt to repair anything due to a recovered error. However if you are seeing excessive numbers of a specific recovered error you can repair it as follows: 1. Determine the ASC, ASCQ, HEC, and HECQ for the recovered error you want to repair. 2. Substitute Sense Key 04 in place of sense key 01. As an example, **01** 44 00 40 81 becomes **04** 44 00 40 81. 3. Look up the new sense data in this table, find the URC, then go to “URC Table With Descriptions, Actions, and FRUs” on page 375 to repair the problem.	— — — —
01 44 00 C0 80	Library Firmware download completed successfully. **Note:** This is informational only.	ACC0
01 44 00 C2 08	Station offline. **Note:** Trailer record will contain information on library.	A060
01 44 00 C3 00	Car reset unexpectedly	A061
01 44 00 38 10	MCC ESM RAM data rebuilt from NVRAM. **Note:** This is informational only.	AE10
01 44 00 38 20	MCC ESC Descriptor data rebuilt from NVRAM. **Note:** This is informational only.	
01 44 00 93 20	Inventory of Sxx frame has started. **Note:** This is informational only.	A4D2
01 44 00 93 80	Inventory of Sxx frame has completed. **Note:** This is informational only.	
01 44 00 B3 85	Gripper retry on get operation. **Note:** This is informational only.	B710
01 44 00 B3 89	Fixed home slot not available. **Note:** This is informational only.	B730
01 44 00 B5 10	Calibration data of column 1 on Sxx frame has been calculated based off of column 3 calibration values.**Note:** This is informational only.	A804
Sense Key = 2		
02 04 00 — —	Not ready — Logical unit is offline (maintenance mode).	A200
02 04 01 — —	Not ready — Logical unit is in process of becoming ready.	A201
02 04 03 — —	Not ready — Manual intervention required.	A203
02 04 83 — —	Not ready — Library has not been setup (needs configuration or calibration).	A283
02 04 84 — —	Not ready — I/O Station open. **Note:** I/O Station Open is usually not considered to be an error unless a command that involves the I/O station (such as a move from or to the I/O station) is received while the I/O station is open. In this case you should just close the I/O station. The only time this condition requires a repair action is if it is reported when the I/O station is closed.	A284

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
02 04 85 — —	Ready condition when a door is open (Door Open not sensed) **Note:** A Door Open should be posted on the operator panel whenever a library door has been opened. If Door Open is not posted when a door is opened a repair action is required.	A285
Sense Key = 4		
04 44 00 00 00	If this sense combination is received at the host it indicates that a Control Path drive experienced a problem communicating with the library MCP/MCA over the RS-422. See “Identifying Device Type” on page 272.	LTO1 DT LVD – 3009 LTO1 DT HVD – 3409 LTO1 DT FC – 3809 LTO1 DC LVD – 3C09 LTO1 DC HVD – 4009 LTO1 DC FC – 4409 LTO2 DC LVD – 4809 LTO2 DC HVD – 4C09 LTO2 DC FC – 5009 LTO3 DC F3A– 5C09 LTO3 DC F3B– 6009 LTO4 DC F4A– 6C09 LTO5 DC F5A– 7C09 J1A DC FC – 1009 E05 DC FC – 1409 E06/EU6 DC FC – 1809 E07 DC FC – 1909
04 44 00 21 80	MCP Card Internal Failure.	A421
	MCA-CF Card Internal Failure.	A411
	MCP+ (w/ CF) Card Internal Failure.	A401
04 44 00 21 81	MCP Internal Failure — CAN bus 1 fault.	A421
	MCA-CF Internal Failure — CAN bus 1 fault.	A411
	MCP+ (w/ CF) Internal Failure — CAN bus 1 fault.	A401
04 44 00 21 82	MCP Internal Failure — CAN bus 2 fault.	A421
	MCA-CF Internal Failure — CAN bus 2 fault.	A411
	MCP+ (w/ CF) Internal Failure — CAN bus 2 fault.	A401
04 44 00 22 80	OPC Internal Failure.	A422
	OPC-CF Internal Failure	A412
	OPC+ (w/ CF) Internal Failure	A402
04 44 00 22 81	OPC Internal Failure — CAN bus 1 fault.	A422
	OPC-CF Internal Failure — CAN bus 1 fault.	A412
	OPC+ (w/ CF) Internal Failure — CAN bus 1 fault.	A402

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 22 82	OPC Internal Failure — CAN bus 2 fault.	A422
	OPC-CF Internal Failure — CAN bus 2 fault.	A412
	OPC+ (w/ CF) Internal Failure — CAN bus 2 fault.	A402
04 44 00 23 80	ACC Internal Failure.	A423
	ACC-CF Internal Failure.	A413
04 44 00 23 81	ACC Internal Failure — CAN bus 1 fault.	A423
	ACC-CF Internal Failure — CAN bus 1 fault.	A413
04 44 00 23 82	ACC Internal Failure — CAN bus 2 fault.	A423
	ACC-CF Internal Failure — CAN bus 2 fault.	A413
04 44 00 24 80	MDA Internal Failure.	A424
	MDA-CF Internal Failure.	A414
04 44 00 24 81	MDA Internal Failure — CAN bus 1 fault.	A424
	MDA-CF Internal Failure — CAN bus 1 fault.	A414
04 44 00 24 82	MDA Internal Failure — CAN bus 2 fault.	A424
	MDA-CF Internal Failure — CAN bus 2 fault.	A414
04 44 00 25 xx	MCP in frame xx not responding on CAN bus.	A425
	MCA-CF in frame xx not responding on CAN bus.	A415
	MCA+ (w/ CF) in frame xx not responding on CAN bus.	A405
04 44 00 26 xx	OPC in frame xx not responding on CAN bus.	A426
	OPC-CF in frame xx not responding on CAN bus.	A416
	OPC+ (w/ CF) in frame xx not responding on CAN bus.	A406
04 44 00 27 xx	ACC on accessor xx not responding on CAN bus.	A427
	ACC-CF on accessor xx not responding on CAN bus.	A417
04 44 00 28 xx	MDA on accessor xx not responding on CAN bus.	A428
	MDA-CF on accessor xx not responding on CAN bus	A418
04 44 00 29 xx	SMC Card in frame xx not responding on CAN bus. **Note:** The valid entries for xx are in the range decimal 02 to 16.	A419
04 44 00 29 80	No response from any other card on the CAN bus.	A429
04 44 00 30 80	Frame Sequencing failure.	A430
04 44 00 30 81	Frame Not Found failure.	A431
04 44 00 30 82	Door interlock frame number sensing failure.	A432
04 44 00 30 83	Door interlock circuit open due to missing/open service bay cable.	A433
04 44 00 30 84	Door interlock failure detected by the library. **Note:** A door safety circuit diagnostic detected that a frame door was opened without shutting down the 37Vdc motor power. The failure frame/device byte can be used to determine which frame was opened.	A434
04 44 00 30 85	Door interlock failure detected by the CE. **Note:** The CE was running a door safety circuit diagnostic and indicated that the door open/close sequence displayed on the op panel did not match what the CE actually performed.	A435

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 30 86	Door interlock consistency failure detected by the library. **Note:** During the Library Verify test, one or more node cards disagreed on the detected door interlock switch status.	A436
04 44 00 31 80	FCA Cooling Fan Failure.	A440
04 44 00 31 81	Drive xx is overcurrent from BPC1	A4E1
04 44 00 31 82	Drive xx is overcurrent from BPC2	A4E1
04 44 00 31 83	Drive xx is overcurrent from both BPCs	A4E3
04 44 00 31 84	Overcurrent condition on the entire BPC 1	A4E4
04 44 00 31 85	Overcurrent condition on the A or B bus on BPC 1	A4E5
04 44 00 31 86	Overcurrent condition on the C or D bus on BPC 1	A4E6
04 44 00 31 87	Overcurrent condition on the E bus on BPC 1	A4E7
04 44 00 31 88	Overcurrent condition on the entire BPC 2	A4E4
04 44 00 31 89	Overcurrent condition on the A or B bus on BPC 2	A4E5
04 44 00 31 8A	Overcurrent condition on the C or D bus on BPC 2	A4E6
04 44 00 31 8B	Overcurrent condition on the E bus on BPC 2	A4E7
04 44 00 31 8C	Overcurrent condition on both BPC	A4EC
04 44 00 31 8D	Overcurrent condition on the A or B bus on both BPC	A4ED
04 44 00 31 8E	Overcurrent condition on the C or D bus on both BPC	A4EE
04 44 00 31 8F	Overcurrent condition on the E bus on both BPC	A4EF
04 44 00 32 81	Bad BPC 1 detected. **Note:** No power detected by MCC, but BPS 1 provides good status on I²C bus.	A4F0
	Bad BPS 1 detected **Note:** No power detected by MCC, and BPS 1 provides bad status on I²C bus.	A4F1
	Bad BPC 2 detected. **Note:** No power detected by MCC, but BPS 2 provides good status on I²C bus.	A4F2
	Bad BPS 2 detected **Note:** No power detected by MCC, and BPS 2 provides bad status on I²C bus.	A4F3
04 44 00 33 81	24 V dc PS#1 out of range – probable failure of 24 V dc PS#1.	A451
04 44 00 33 82	24 V dc PS#2 out of range – probable failure of 24 V dc PS#2.	A452
04 44 00 34 81	37 V dc PS#1 out of range – probable failure of 37 V dc PS#1.	A453
04 44 00 34 82	37 V dc PS#2 out of range – probable failure of 37 V dc PS#2.	A454
04 44 00 34 91	• (x32, x22, x52) 37 V dc PS#1 will not turn on – probable failure of 37 V dc PS#1 • (x23, x53) No power from BPC1 • (x23, x53) Cable BPC1 J5 to FIC EPO	A455
04 44 00 34 92	• (x32, x22, x52) 37 V dc PS#2 will not turn on – probable failure of 37 V dc PS#2. • (x23, x53) No power from BPC2 • (x23, x53) Cable BPC2 J5 to FIC EPO	A456

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 34 A1	• (x32, x22, x52) 37 V dc PS#1 not present – probably disconnected. • (x23, x53) Cable BPC1 J2 to MCA	A457
04 44 00 34 A2	• (x32, x22, x52) 37 V dc PS#2 not present – probably disconnected. • (x23, x53) Cable BPC2 J2 to MCA	A458
04 44 00 35 81	Drive Power Supply not present – probably disconnected.	A45D
04 44 00 35 82	Drive Power Supply reported an error.	A45E
04 44 00 35 83	Drive Power Supply not responding on I²C bus.	A45F
04 44 00 38 80	MCP/MCA cannot sense a configured drive on RS-422 cable loop. See “Identifying Device Type” on page 272.	LTO1 DT LVD – C800 LTO1 DT HVD – C900 LTO1 DT FC – CA00 LTO1 DC LVD – CB00 LTO1 DC HVD – CC00 LTO1 DC FC – CD00 LTO2 DC LVD – CE00 LTO2 DC HVD – CF00 LTO2 DC FC – D000 LTO3 DC F3A– D300 LTO3 DC F3B– D400 LTO4 DC F4A - D700 LTO5 DC F5A - DA00 J1A DC FC – C000 E05 DC FC – C100 E06/EU6 DC FC – C200 E07 DC FC – C300

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 38 81	MCP/MCA cannot get a response from a configured drive on RS-422. See “Identifying Device Type” on page 272.	LTO1 DT SCSI LVD – C801 LTO1 DT HVD – C901 LTO1 DT FC – CA01 LTO1 DC LVD – CB01 LTO1 DC HVD – CC01 LTO1 DC FC – CD01 LTO2 DC LVD – CE01 LTO2 DC HVD – CF01 LTO2 DC FC – D001 LTO3 DC F3A– D301 LTO3 DC F3B– D401 LTO4 DC F4A - D701 LTO5 DC F5A - DA01 J1A DC FC – C001 E05 DC FC – C101 E06/EU6 DC FC – C201 E07 DC FC – C301

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 38 82	MCP/MCA detected an RS-422 problem communicating with a configured drive – possible parity problem. See “Identifying Device Type” on page 272.	LTO1 DT SCSI LVD – C802 LTO1 DT HVD – C902 LTO1 DT FC – CA02 LTO1 DC LVD – CB02 LTO1 DC HVD – CC02 LTO1 DC FC – CD02 LTO2 DC LVD – CE02 LTO2 DC HVD – CF02 LTO2 DC FC – D002 LTO3 DC F3A– D302 LTO3 DC F3B– D402 LTO4 DC F4A - D702 LTO5 DC F5A - DA02 J1A DC FC – C002 E05 DC FC – C102 E06/EU6 DC FC – C202 E07 DC FC – C302

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 38 83	MCP/MCA detected too many retries communicating with a configured drive over RS-422. See “Identifying Device Type” on page 272.	LTO1 DT SCSI LVD – C803 LTO1 DT HVD – C903 LTO1 DT FC – CA03 LTO1 DC LVD – CB03 LTO1 DC HVD – CC03 LTO1 DC FC – CD03 LTO2 DC LVD – CE03 LTO2 DC HVD – CF03 LTO2 DC FC – D003 LTO3 DC F3A– D303 LTO3 DC F3B– D403 LTO4 DC F4A - D703 LTO5 DC F5A - DA03 J1A DC FC – C003 E05 DC FC – C103 E06/EU6 DC FC – C203 E07 DC FC – C303
04 44 00 38 84	MCP/MCA can't get a response from the DCC card in a configured drive canister. See “Identifying Device Type” on page 272.	LTO1 DC LVD – CB04 LTO1 DC HVD – CC04 LTO1 DC FC – CD04 LTO2 DC LVD – CE04 LTO2 DC HVD – CF04 LTO2 DC FC – D004 LTO3 DC F3A– D304 LTO3 DC F3B– D404 LTO4 DC F4A - D704 LTO5 DC F5A - DA04 J1A DC FC – C004 E05 DC FC – C104 E06/EU6 DC FC – C204 E07 DC FC – C304

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 39 80	MCP/MCA timed out waiting for a configured drive to complete an RS-422 command. See “Identifying Device Type” on page 272.	LTO1 DT SCSI LVD – C810 LTO1 DT HVD – C910 LTO1 DT FC – CA10 LTO1 DC LVD – CB10 LTO1 DC HVD – CC10 LTO1 DC FC – CD10 LTO2 DC LVD – CE10 LTO2 DC HVD – CF10 LTO2 DC FC – D010 LTO3 DC F3A– D310 LTO3 DC F3B– D410 LTO4 DC F4A - D710 LTO5 DC F5A - DA10 J1A DC FC – C010 E05 DC FC – C110 E06/EU6 DC FC – C210 E07 DC FC – C310

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 39 81	MCP/MCA received unknown RS-422 message from a configured drive. See “Identifying Device Type” on page 272.	LTO1 DT LVD – C811 LTO1 DT HVD – C911 LTO1 DT FC – CA11 LTO1 DC LVD – CB11 LTO1 DC HVD – CC11 LTO1 DC FC – CD11 LTO2 DC LVD – CE11 LTO2 DC HVD – CF11 LTO2 DC FC – D011 LTO3 DC F3A– D311 LTO3 DC F3B– D411 LTO4 DC F4A - D711 LTO5 DC F5A - DA11 J1A DC FC – C011 E05 DC FC – C111 E06/EU6 DC FC – C211 E07 DC FC – C311

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 39 82	MCP/MCA detected that drive/canister type does not match what is currently configured. See “Identifying Device Type” on page 272.	LTO1 DT LVD – C812 LTO1 DT HVD – C912 LTO1 DT FC – CA12 LTO1 DC LVD – CB12 LTO1 DC HVD – CC12 LTO1 DC FC – CD12 LTO2 DC LVD – CE12 LTO2 DC HVD – CF12 LTO2 DC FC – D012 LTO3 DC F3A– D312 LTO3 DC F3B– D412 LTO4 DC F4A - D712 LTO5 DC F5A - DA12 J1A DC FC – C012 E05 DC FC – C112 E06/EU6 DC FC – C212 E07 DC FC – C312

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 39 83	MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID.	LTO1 DT LVD – C813 LTO1 DT HVD – C913 LTO1 DT FC – CA13 LTO1 DC LVD – CB13 LTO1 DC HVD – CC13 LTO1 DC FC – CD13 LTO2 DC LVD – CE13 LTO2 DC HVD – CF13 LTO2 DC FC – D013 LTO3 DC F3A– D313 LTO3 DC F3B– D413 LTO4 DC F4A - D713 LTO5 DC F5A - DA13 J1A DC FC – C013 E05 DC FC – C113 E06/EU6 DC FC – C213 E07 DC FC – C313

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 39 84	MCP/MCA received unexpected or invalid diagnostic status from a drive.	LTO1 DT LVD – C814 LTO1 DT HVD – C914 LTO1 DT FC – CA14 LTO1 DC LVD – CB14 LTO1 DC HVD – CC14 LTO1 DC FC – CD14 LTO2 DC LVD – CE14 LTO2 DC HVD – CF14 LTO2 DC FC – D014 LTO3 DC F3A– D314 LTO3 DC F3B– D414 LTO4 DC F4A - D714 LTO5 DC F5A - DA14 J1A DC FC – C014 E05 DC FC – C114 E06/EU6 DC FC – C214 E07 DC FC – C314
04 44 00 40 81	Gripper #1 will not move – no encoder pulses. Also see the following information on the PFE website: • http://snjlnt02.sanjose.ibm.com/tape/tapetec.nsf • Select "Open Systems" in the left-hand pane • Select "3584/TS3500 Library" in the left-hand pane • Locate the topic, "3584 Defective ACC card caused by gripper or pivot motor"	3592 Gripper – B101 LTO Gripper – B301 3592 HD Gripper – B401 LTO HD Gripper – B501
04 44 00 40 82	Gripper #1 encountered unexpected hard stop while extending.	3592 Gripper – B102 LTO Gripper – B302 3592 HD Gripper – B402 LTO HD Gripper – B502
04 44 00 40 83	Gripper #1 encountered unexpected hard stop while retracting.	3592 Gripper – B103 LTO Gripper – B303 3592 HD Gripper – B403 LTO HD Gripper – B503

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 40 84	Gripper #1 encountered high current condition while extending.	3592 Gripper – B104 LTO Gripper – B304 3592 HD Gripper – B404 LTO HD Gripper – B504
04 44 00 40 85	Gripper #1 encountered high current condition while retracting.	3592 Gripper – B105 LTO Gripper – B305 3592 HD Gripper – B405 LTO HD Gripper – B505
04 44 00 40 86	Gripper #1 unable to find hard stop while extending.	3592 Gripper – B106 LTO Gripper – B306 3592 HD Gripper – B406 LTO HD Gripper – B506
04 44 00 40 87	Gripper #1 unable to find hard stop while retracting.	3592 Gripper – B107 LTO Gripper – B307 3592 HD Gripper – B407 LTO HD Gripper – B507
04 44 00 40 88	Gripper #1 unable to get cartridge. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Gripper – B108 LTO Gripper – B308 3592 HD Gripper – B408 LTO HD Gripper – B508
04 44 00 40 89	Gripper #1 unable to put cartridge. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Gripper – B109 LTO Gripper – B309 3592 HD Gripper – B409 LTO HD Gripper – B509
04 44 00 40 8A	Gripper #1 lost 37 V dc power. Could be caused if door opened during hourly rezero. • Update library firmware to 7422 or 8872 or later (code level is library dependent) • Follow the latest MI for further Isolation. Check for blown fuse on FIC card or for loose cable connection. • See associated URCs for further information.	3592 Gripper – B10A LTO Gripper – B30A 3592 HD Gripper – B40A LTO HD Gripper – B50A
04 44 00 40 8B	Gripper #1 encountered a low current condition while retracting.	3592 Gripper – B10B LTO Gripper – B30B 3592 HD Gripper – B40B LTO HD Gripper – B50B

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 40 8C	Gripper #1 cartridge misplaced (lost)	3592 Gripper – B10C LTO Gripper – B30C 3592 HD Gripper – B40C LTO HD Gripper – B50C
04 44 00 40 8D	Gripper #1 wrong type – does not match configuration.	3592 Gripper – B10D LTO Gripper – B30D 3592 HD Gripper – B40D LTO HD Gripper – B50D
04 44 00 40 91	Gripper #2 will not move – no encoder pulses. Also see the following information on the PFE website: • http://snjlnt02.sanjose.ibm.com/tape/tapetec.nsf • Select "Open Systems" in the left-hand pane • Select "3584/TS3500 Library" in the left-hand pane • Locate the topic, "3584 Defective ACC card caused by gripper or pivot motor"	3592 Gripper – B111 LTO Gripper – B311 3592 HD Gripper – B411 LTO HD Gripper – B511
04 44 00 40 92	Gripper #2 encountered unexpected hard stop while extending.	3592 Gripper – B112 LTO Gripper – B312 3592 HD Gripper – B412 LTO HD Gripper – B512
04 44 00 40 93	Gripper #2 encountered unexpected hard stop while retracting.	3592 Gripper – B113 LTO Gripper – B313 3592 HD Gripper – B413 LTO HD Gripper – B513
04 44 00 40 94	Gripper #2 encountered high current condition while extending.	3592 Gripper – B114 LTO Gripper – B314 3592 HD Gripper – B414 LTO HD Gripper – B514
04 44 00 40 95	Gripper #2 encountered high current condition while retracting.	3592 Gripper – B115 LTO Gripper – B315 3592 HD Gripper – B415 LTO HD Gripper – B5151
04 44 00 40 96	Gripper #2 unable to find hard stop while extending.	3592 Gripper – B116 LTO Gripper – B316 3592 HD Gripper – B416 LTO HD Gripper – B516

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 40 97	Gripper #2 unable to find hard stop while retracting.	3592 Gripper – B117 LTO Gripper – B317 3592 HD Gripper – B417 LTO HD Gripper – B5171
04 44 00 40 98	Gripper #2 unable to get cartridge. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Gripper – B118 LTO Gripper – B318 3592 HD Gripper – B418 LTO HD Gripper – B518
04 44 00 40 99	Gripper #2 unable to put cartridge. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Gripper – B119 LTO Gripper – B319 3592 HD Gripper – B419 LTO HD Gripper – B519
04 44 00 40 9A	Gripper #2 lost 37 V dc power.	3592 Gripper – B11A LTO Gripper – B31A 3592 HD Gripper – B41A LTO HD Gripper – B51A
04 44 00 40 9B	Gripper #2 encountered a low current condition while retracting.	3592 Gripper – B11B LTO Gripper – B31B 3592 HD Gripper – B41B LTO HD Gripper – B51B
04 44 00 40 9C	Gripper #2 cartridge misplaced (lost)	3592 Gripper – B11C LTO Gripper – B31C 3592 HD Gripper – B41C LTO HD Gripper – B51C
04 44 00 40 9D	Gripper #2 wrong type – does not match configuration.	3592 Gripper – B11D LTO Gripper – B31D 3592 HD Gripper – B41D LTO HD Gripper – B51D
04 44 00 41 81	Gripper #1 sensor hard failure (sensor blocked when it should not be).	3592 Gripper – B10E LTO Gripper – B30E 3592 HD Gripper – B40E LTO HD Gripper – B50E

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 41 82	Gripper #1 sensor hard failure (sensor not blocked when it should be).	3592 Gripper – B10F LTO Gripper – B30F 3592 HD Gripper – B40F LTO HD Gripper – B50F
04 44 00 41 83	Gripper #1 sensor marginal	3592 Gripper – B10E LTO Gripper – B30E 3592 HD Gripper – B40E LTO HD Gripper – B50E
04 44 00 41 84	Gripper #1 sensor failure - output not within acceptable limits	3592 Gripper – B10E LTO Gripper – B30E 3592 HD Gripper – B40E LTO HD Gripper – B50E
04 44 00 41 91	Gripper #2 sensor failure (sensor blocked when it should not be).	3592 Gripper – B11E LTO Gripper – B31E 3592 HD Gripper – B41E LTO HD Gripper – B51E
04 44 00 41 92	Gripper #2 sensor failure (sensor not blocked when it should be).	3592 Gripper – B11F LTO Gripper – B31F 3592 HD Gripper – B41F LTO HD Gripper – B51F
04 44 00 41 93	Gripper #2 sensor marginal	3592 Gripper – B11E LTO Gripper – B31E 3592 HD Gripper – B41E LTO HD Gripper – B51E
04 44 00 41 94	Gripper #2 sensor failure - output not within acceptable limits	3592 Gripper – B11E LTO Gripper – B31E 3592 HD Gripper – B41E LTO HD Gripper – B51E
04 44 00 41 A0	HD frame detected incorrect gripper types.	A800
04 44 00 41 A1	HD frame detected with incorrect config.	A801
04 44 00 41 A2	HD frame detected more than 6887 cartridge slots with Standard (non-CF) node cards.	A802
04 44 00 41 A3	HD slot disabled by library.	A803
04 44 00 41 B0	Sx4 Frame detected but ALMS is disabled.	A810
04 44 00 41 B1	Sx4 Frame detected but VIO is disabled.	A811

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 41 B2	Sx4 Frame detected but Insert Notification is enabled.	A812
04 44 00 42 80	Calibration sensor failure (sensor blocked when it should not be).	A460
04 44 00 42 81	Calibration sensor failure (sensor not blocked when it should be).	A461
04 44 00 43 80	X home sensor failure (sensor blocked when it should not be).	A470
04 44 00 43 81	X home sensor failure (unable to find sensor during re-zero). Also refer to “Loose X-Access Pinion Gear” on page 766.	A471
04 44 00 44 80	Y home sensor failure (sensor blocked when it should not be).	A480
04 44 00 44 81	Y home sensor failure (unable to find sensor during re-zero).	A481
04 44 00 45 80	X motor will not move (no encoder pulses).	A490
04 44 00 45 81	X motion cannot find a hard stop while moving left. Also refer to “Loose X-Access Pinion Gear” on page 766.	A491
04 44 00 45 82	X motion cannot find a hard stop while moving right. Also refer to “Loose X-Access Pinion Gear” on page 766.	A492
04 44 00 45 83	X motion encountered an unexpected hard stop while moving left.	A493
04 44 00 45 84	X motion encountered an unexpected hard stop while moving right.	A494
04 44 00 45 85	X motion – excessive force required to move left.	A495
04 44 00 45 86	X motion – excessive force required to move right.	A496
04 44 00 45 87	X motion failed due to loss of 37 V dc.	A497
04 44 00 45 88	X motion failure – probable motor driver problem.	A498
04 44 00 45 89	X motion failure – re-zero detected positioning drift. Also refer to “Loose X-Access Pinion Gear” on page 766.	A499
04 44 00 45 90	X motion – an accessor rezero was performed and logged into the error log.	A475
04 44 00 45 91	X motion – rezero performed, action required. Also refer to “Loose X-Access Pinion Gear” on page 766.	A476
04 44 00 46 80	Y motor will not move (no encoder pulses).	A4A0
04 44 00 46 81	Y motion cannot find a hard stop while moving up.	A4A1
04 44 00 46 82	Y motion cannot find a hard stop while moving down.	A4A2
04 44 00 46 83	Y motion encountered an unexpected hard stop while moving up.	A4A3
04 44 00 46 84	Y motion encountered an unexpected hard stop while moving down.	A4A4
04 44 00 46 85	Y motion – excessive force required to move up.	A4A5
04 44 00 46 86	Y motion – excessive force required to move down.	A4A6
04 44 00 46 87	Y motion failed due to loss of 37 V dc.	A4A7
04 44 00 46 88	Y motion failure – probable motor driver problem.	A4A8
04 44 00 46 89	Y motion failure – re-zero detected positioning drift.	A4A9
04 44 00 46 90	Y motion – an accessor rezero was performed and logged into the error log.	A485
04 44 00 46 91	Y motion – rezero performed, action required.	A486

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 47 80	Pivot motor will not move (no encoder pulses). Note: **A4Bx** errors are for standard pivot. **A5Bx** errors are for HD Gripper pivot.	A4B0 A5B0
04 44 00 47 81	Pivot motion cannot find a hard stop while pivoting toward door. Note: **A4Bx** errors are for standard pivot. **A5Bx** errors are for HD Gripper pivot.	A4B1 A5B1
04 44 00 47 82	Pivot motion cannot find a hard stop while pivoting toward rear. Note: **A4Bx** errors are for standard pivot. **A5Bx** errors are for HD Gripper pivot.	A4B2 A5B2
04 44 00 47 83	Pivot motion encountered an unexpected hard stop while pivoting toward door. Note: **A4Bx** errors are for standard pivot. **A5Bx** errors are for HD Gripper pivot.	A4B3 A5B3
04 44 00 47 84	Pivot motion encountered an unexpected hard stop while pivoting toward rear. Note: **A4Bx** errors are for standard pivot. **A5Bx** errors are for HD Gripper pivot.	A4B4 A5B4
04 44 00 47 85	Pivot motion – excessive force required to pivot toward door. Note: **A4Bx** errors are for standard pivot. **A5Bx** errors are for HD Gripper pivot.	A4B5 A5B5
04 44 00 47 86	Pivot motion – excessive force required to pivot toward rear. Note: **A4Bx** errors are for standard pivot. **A5Bx** errors are for HD Gripper pivot.	A4B6 A5B6
04 44 00 47 87	Pivot motion failed due to loss of 37 V dc.	A4B7
04 44 00 48 40	XY positioning undetermined. Also refer to “Loose X-Access Pinion Gear” on page 766.	A4B9
04 44 00 48 80	Accessor Failover occurred.	A4BA
04 44 00 48 90	XY impact detected.	A4BB
04 44 00 48 91	Cartridge present sensor flag detected while in motion. Library put into NMA, check accessor aisle for obstacles, and check cartridge present sensor/cable on gripper.	
04 44 00 48 A0	Accessor in No Motion Allowed (NMA) state. Check accessor aisle for obstacles, and check cartridge present sensor/cable on gripper.	
04 44 00 5B 80	Element scan failed (bar code scanner failure). Note: **A4Cx** errors are for the Datalogic or Microscan scanner.	A4C0
04 44 00 5B 81	Bar code mis-compare (bar code was read twice with different results). Note: **A4Cx** errors are for the Datalogic or Microscan scanner.	A4C1
04 44 00 5B 82	MDA to ACC loopback test of bar code scanner trigger circuit failed. Note: **A4Cx** errors are for the Datalogic or Microscan scanner.	A4C2

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 5B 83	ACC cannot trigger the bar code scanner. Note: **A4Cx** errors are for the Datalogic or Microscan scanner.	A4C3
04 44 00 5B 84	MDA cannot trigger the bar code scanner. Note: **A4Cx** errors are for the Datalogic or Microscan scanner.	A4C4
04 44 00 5B 85	Bar code unreadable – probable missing or damaged label. Also refer to “Loose X-Access Pinion Gear” on page 766.	A4C5
04 44 00 5B 86	Frame machine type and model, frame serial number, or frame World Wide Node Name (WWNN); bar code label unreadable – probable missing or damaged label. Also refer to “Loose X-Access Pinion Gear” on page 766.	A4C6
04 44 00 5B 87	Unexpected logical library bar code label configuration.	A4C7
04 44 00 5B 88	Bar code scanner test label (located above drive F1, R1) is unreadable. Note: **A4Cx** errors are for standard scanner. Also refer to “Loose X-Access Pinion Gear” on page 766.	A4C8
04 44 00 5B 89	I/O station type bar code label unreadable. Also refer to “Loose X-Access Pinion Gear” on page 766.	A4C9
04 44 00 60 8x	Compact flash (CF) card not present. "x" identifies the node card. • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 6081 MDA-CF 6082 OPC-CF, OPC+ w/CF 6083 ACC-CF 6084 MCA-CF, MCP+ w/CF	A700
04 44 00 60 9x	Compact flash (CF) card has an unexpected size. "x" identifies the node card. • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 6091 MDA-CF 6092 OPC-CF, OPC+ w/CF 6093 ACC-CF 6094 MCA-CF, MCP+ w/CF	A701
04 44 00 60 Ax	Compact flash (CF) card does not become ready. "x" identifies the node card. • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 60A1 MDA-CF 60A2 OPC-CF, OPC+ w/CF 60A3 ACC-CF 60A4 MCA-CF, MCP+ w/CF	A702

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 60 Bx	Compact flash (CF) card does not show the correct library serial number. "x" identifies the node card. • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 60B1 MDA-CF 60B2 OPC-CF, OPC+ w/CF 60B3 ACC-CF 60B4 MCA-CF, MCP+ w/CF	A703
04 44 00 60 Cx	Compact flash (CF) card data is corrupted. • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 60C1 MDA-CF 60C2 OPC-CF, OPC+ w/CF 60C3 ACC-CF 60C4 MCA-CF, MCP+ w/CF	A704
04 44 00 61 80	Library contains x23 or x53 frames with new style node cards, but the current Library Firmware level is at a lower level that cannot support the new style node cards.	A720
04 44 00 62 80	Ethernet wrap test failed.	A740
04 44 00 63 80	Both Ethernet Ports of the MCA are configured to the same network. **Note:** The correct frame will be identified by the MSB.	A750
04 44 00 65 80	Test Key Manager address failed.	A760
04 44 00 65 81	Test Encryption Key Path failed (Perform EKM Path Check).	A761
04 44 00 65 82	Test Encryption Key Path failed (Perform EKM Full Check).	A762
04 44 00 70 8x	Node card reset from Web Specialist. **Note:** This is not an error, but is logged for tracking purposes only. 7081 MDA 7082 OPC 7083 ACC 7084 MCP 7085 All node cards (MDA, OPC, ACC, MCP, MCA)	A770
04 44 00 75 80	Redundant Part Error – Gripper 1 (upper)	A780
04 44 00 75 81	Redundant Part Error – Gripper 2 (lower)	
04 44 00 75 82	Redundant Part Error – Calibration Sensor	
04 44 00 75 83	Redundant Part Error – Scanner	
04 44 00 75 84	Redundant Part Error – Pivot Assembly	
04 44 00 75 85	Redundant Part Error – XY Assembly Also refer to “Loose X-Access Pinion Gear” on page 766.	
04 44 00 75 86	Redundant Part Error – X Assembly Also refer to “Loose X-Access Pinion Gear” on page 766.	
04 44 00 75 87	Redundant Part Error – Y Assembly	
04 44 00 75 89	Redundant Part Error – Storage slot **Note:** Trailer record will contain slot location	

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 76 20	Sx4 HD slot marked offline. **Note:** Trailer record will contain information as to which slot was marked offline.	A7B0
04 44 00 90 80	Source element unexpectedly empty (status message).	A4D0
04 44 00 91 80	Audit Failure.	A4D5
04 44 00 91 90	Not enough free slots available. Library may be full. Check for any offline storage slots.	A4D6
04 44 00 94 80	Destination element unexpectedly full (status message).	A4D1
04 44 00 9C 80	No LTO diagnostic cartridge found in library.	A4DC
04 44 00 9C 82	No 3592 diagnostic cartridge found in library.	A4DE
04 44 00 A0 10	Cartridge missing from previous inventory. Recorded in move forward table.	A950
04 44 00 A0 12	Inventory self-correction executed in response to illegal request. Inventory updated. No service action necessary.	A952
04 44 00 A0 80	Invalid Config – No gripper is installed for an installed frame (media) type. Other causes: • Library with 3592 frames with old style LTO gripper installed. • Both grippers are full. • With HD frames: – Both grippers are in a failed status – Both grippers are full – Therefore, no gripper is available to complete the operation.	3592 Gripper – B120 LTO Gripper – B320 3592 HD Gripper – B420 LTO HD Gripper – B520
04 44 00 A0 81	Invalid Config - Mixed grippers are installed but only one frame (media) type is installed.	3592 Gripper – B121 LTO Gripper – B321 3592 HD Gripper – B421 LTO HD Gripper – B521
04 44 00 A0 83	Invalid Config - Mixed media - 3592 gripper 1 (upper) with LTO gripper 2 (lower).	3592 Gripper – B123 LTO Gripper – B323 3592 HD Gripper – B423 LTO HD Gripper – B523
04 44 00 A0 85	Invalid Config – No I/O is installed for an installed frame (media) type.	LTO I/O – B325 3592 I/O – B125
04 44 00 A0 86	Invalid Config – A lower I/O station is installed with no matching frame (media) type.	LTO I/O – B326 3592 I/O – B126
04 44 00 A0 87	Invalid Config – L-frame upper I/O station is not the same media type as the L-frame.	LTO I/O – B327 3592 I/O – B127
04 44 00 A0 88	Invalid Config - An I/O station in a 4 I/O door config was found invalid (during lib verify). **Note:** The I/O station type label will only be checked during library verify.	LTO I/O – B328 3592 I/O – B128
04 44 00 A0 8C	Invalid Config - Drive type incompatible original Drive type.	B32C

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 A0 8D	Invalid Config – Drive type incompatible with frame type.	LTO frame – B32D 3592 frame – B12D
04 44 00 A0 8E	Invalid Config – this library code version does not support DLT.	B32E
04 44 00 A1 80	Invalid Config – The frame serial number in VPD does not match the frame serial number bar code label.	A4CC
04 44 00 A1 81	Configuration problem - Duplicate drive serial number detected. **Note:** The A1 81 condition should be reported, but should not cause any operation to fail. Ideally we only check for it during Library Verify or the drive testing that occurs during Finish Drive Replacement. This condition is ONLY to be reported for drives that are serviced as separate machine type/model/serial, not as features of the library.	A4CD
04 44 00 B0 80	Cannot open Top I/O station (solenoid failure or sensor not blocked when it should be).	LTO I/O – B330 3592 I/O – B130
04 44 00 B0 81	Cannot lock Top I/O station (solenoid failure or sensor blocked when it should not be). See “Identifying Device Type” on page 272.	LTO I/O – B331 3592 I/O – B131
04 44 00 B0 82	Top I/O station type does not match configuration. See “Identifying Device Type” on page 272.	LTO I/O – B332 3592 I/O – B132
04 44 00 B0 83	Cannot open 4-I/O door TOP LEFT I/O station (solenoid failure or sensor not blocked when it should be).	LTO I/O – B333 3592 I/O – B133
04 44 00 B0 84	Cannot open 4-I/O door TOP RIGHT I/O station (solenoid failure or sensor not blocked when it should be).	LTO I/O – B333 3592 I/O – B133
04 44 00 B0 85	Cannot lock 4-I/O door TOP LEFT I/O station (solenoid failure or sensor blocked when it shouldn't be).	LTO I/O – B334 3592 I/O – B134
04 44 00 B0 86	Cannot lock 4-I/O door TOP RIGHT I/O station (solenoid failure or sensor blocked when it shouldn't be).	LTO I/O – B334 3592 I/O – B134
04 44 00 B0 87	TOP LEFT I/O station type does not match configuration.	LTO I/O – B335 3592 I/O – B135
04 44 00 B0 88	TOP RIGHT I/O station type does not match configuration.	LTO I/O – B335 3592 I/O – B135
04 44 00 B0 90	Cannot open bottom I/O station (solenoid failure or sensor not blocked when it should be). See “Identifying Device Type” on page 272.	LTO I/O – B338 3592 I/O – B138
04 44 00 B0 91	Cannot lock bottom I/O station (solenoid failure or sensor blocked when it should not be). See “Identifying Device Type” on page 272.	LTO I/O – B339 3592 I/O – B139
04 44 00 B0 92	Bottom I/O station type does not match configuration. See “Identifying Device Type” on page 272.	LTO I/O – B33A 3592 I/O – B13A
04 44 00 B0 93	Cannot open BOTTOM LEFT I/O station (solenoid failure or sensor not blocked when it should be).	LTO I/O – B33B 3592 I/O – B13B

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 B0 94	Cannot open BOTTOM RIGHT I/O station (solenoid failure or sensor not blocked when it should be).	LTO I/O – B33B 3592 I/O – B13B
04 44 00 B0 95	Cannot lock BOTTOM LEFT I/O station (solenoid failure or sensor blocked when it shouldn't be).	LTO I/O – B33C 3592 I/O – B13C
04 44 00 B0 96	Cannot lock BOTTOM RIGHT I/O station (solenoid failure or sensor blocked when it shouldn't be).	LTO I/O – B33C 3592 I/O – B13C
04 44 00 B0 97	BOTTOM LEFT I/O station type does not match configuration.	LTO I/O – B33D 3592 I/O – B13D
04 44 00 B0 98	BOTTOM RIGHT I/O station type does not match configuration.	LTO I/O – B33D 3592 I/O – B13D
04 44 00 B1 80	4 I/O station door LED panel failure.	B380
04 44 00 B2 82	Top I/O Station get failure (I/O station will not release cartridge). See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct I/O station. A worn Universal gripper cage could result in 'get' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO I/O – B340 3592 I/O – B140
04 44 00 B2 88	Top I/O Station put failure (I/O station will not accept cartridge). See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct I/O station. A worn Universal gripper cage could result in 'put' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO I/O – B341 3592 I/O – B141
04 44 00 B2 8F	Top I/O Station is full so cartridge export not possible. See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct I/O station.	LTO I/O – B34F 3592 I/O – B14F
04 44 00 B2 92	Bottom I/O Station get failure (I/O station will not release cartridge). See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct I/O station. A worn Universal gripper cage could result in 'get' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO I/O – B348 3592 I/O – B148

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 B2 98	Bottom I/O Station put failure (I/O station will not accept cartridge). See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct I/O station. A worn Universal gripper cage could result in 'put' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO I/O – B349 3592 I/O – B149
04 44 00 B2 9F	Bottom I/O Station is full so cartridge export is not possible. See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct I/O station.	LTO I/O – B34E 3592 I/O – B14E
04 44 00 B3 82	Slot get failure (slot will not release cartridge). See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct slot. A worn Universal gripper cage could result in 'get' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Slot – B150 LTO Slot – B350 3592 HD Door Slot – B452 LTO HD Door Slot – B552 3592 HD Slot – B453 LTO HD Slot – B553
04 44 00 B3 83	Unable to get cartridge out of slot. Gripper retracted but no cartridge is present in gripper. **Note:** A trailer record will contain information to identify the failing frame, column, row of the failing slot. A worn Universal gripper cage could result in 'get' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Slot – B152 LTO Slot – B352 3592 HD Door Slot – B456 LTO HD Door Slot – B556 3592 HD Slot – B457 LTO HD Slot – B557
04 44 00 B3 84	Unable to get cartridge out of slot. Gripper is unable to retract; cartridge is stuck in the slot. **Note:** A trailer record will contain information to identify the failing frame, column, row of the failing slot. A worn Universal gripper cage could result in 'get' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Slot – B153 LTO Slot – B353 3592 HD Door Slot – B458 LTO HD Door Slot – B558 3592 HD Slot – B459 LTO HD Slot – B559
04 44 00 B3 88	Slot put failure (slot will not accept cartridge). See “Identifying Device Type” on page 272. **Note:** A trailer record will contain information to identify the correct slot. A worn Universal gripper cage could result in 'put' errors. See “Worn Universal Gripper Cage” on page 766. Also refer to “Loose X-Access Pinion Gear” on page 766.	3592 Slot – B151 LTO Slot – B351 3592 HD Door Slot – B454 LTO HD Door Slot – B554 3592 HD Slot – B455 LTO HD Slot – B555

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 B4 80	X or Y motion command exceeds limits – calibration data may be corrupted. See “Identifying Device Type” on page 272. Also refer to “Loose X-Access Pinion Gear” on page 766.	AACA
04 44 00 B5 00	Calibration has failed. Gripper 2 is marked failed. Suspect gripper 2 is dislodged or bad calibration sensor. A worn Universal gripper cage could result in calibration errors. See “Worn Universal Gripper Cage” on page 766.	B190
04 44 00 B5 8x	Calibration encountered a missing fiducial on column x. See the error log detail to identify the failing frame. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO Column – B360 3592 Column – B160
04 44 00 B6 8x	Calibration encountered a missing fiducial on drive x. See “Identifying Device Type” on page 272. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO1 DT LVD – C820 LTO1 DT HVD – C920 LTO1 DT FC – CA20 LTO1 DC LVD – CB20 LTO1 DC HVD – CC20 LTO1 DC FC – CD20 LTO2 DC LVD – CE20 LTO2 DC HVD – CF20 LTO2 DC FC – D020 LTO3 DC F3A– D320 LTO3 DC F3B– D420 LTO4 DC F4A - D720 J1A DC FC – C020 E05 DC FC – C120 E06/EU6 DC FC – C220 E07 DC FC – C320

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 B7 8x	Calibration encountered a missing fiducial on I/O station x. See "Identifying Device Type" on page 272 and the following information: • Upper I/O when x = 1 – **B370** LTO, **B170** 3592 • Lower I/O when x = 2 – **B371** LTO, **B171** 3592 • Upper Left (4-I/O) when x = 3 – **B372** LTO, **B172** 3592 • Lower Left (4-I/O) when x = 4 – **B373** LTO, **B173** 3592 • Upper Right (4-I/O) when x = 5 – **B374** LTO, **B174** 3592 • Lower Right (4-I/O) when x = 6 – **B375** LTO, **B175** 3592 Also refer to "Loose X-Access Pinion Gear" on page 766.	LTO Top I/O - B370 3592 Top I/O - B170 LTO Bottom I/O - B371 3592 Bottom I/O - B171 4-I/O Upper Left LTO - B372 4-I/O Upper Left 3592 - B172 4-I/O Lower Left LTO - B373 4-I/O Lower Left 3592 - B173 4-I/O Upper Right LTO - B374 4-I/O Upper Right 3592 - B174 4-I/O Lower Right LTO - B375 4-I/O Lower Right 3592 - B175
04 44 00 B7 8C	Calibration encountered a missing fiducial on Shuttle Station tray. **Note:** See frame number.	B37C
04 44 00 B7 9x	Calibration encountered a second missing fiducial on I/O station x. **Note:** See frame number. See "Identifying Device Type" on page 272.	LTO Top I/O - B370 LTO Bottom I/O - B371 3592 Top I/O - B170 3592 Bottom I/O - B171

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 B8 81	Drive unload failure (get failure at drive – unable to get a cartridge that is in the unloaded position at the drive). See “Identifying Device Type” on page 272. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO1 DT LVD – C831 LTO1 DT HVD – C931 LTO1 DT FC – CA31 LTO1 DC LVD – CB31 LTO1 DC HVD – CC31 LTO1 DC FC – CD31 LTO2 DC LVD – CE31 LTO2 DC HVD – CF31 LTO2 DC FC – D031 LTO3 DC F3A– D331 LTO3 DC F3B– D431 LTO4 DC F4A - D731 J1A DC FC – C031 E05 DC FC – C131 E06/EU6 DC FC – C231 E07 DC FC – C331
04 44 00 B8 82	Drive eject failure (there is no cartridge in the unloaded position in the drive). See “Identifying Device Type” on page 272.	LTO1 DT LVD – C832 LTO1 DT HVD – C932 LTO1 DT FC – CA32 LTO1 DC LVD – CB32 LTO1 DC HVD – CC32 LTO1 DC FC – CD32 LTO2 DC LVD – CE32 LTO2 DC HVD – CF32 LTO2 DC FC – D032 LTO3 DC F3A– D332 LTO3 DC F3B– D432 LTO4 DC F4A - D732 J1A DC FC – C032 E05 DC FC – C132 E06/EU6 DC FC – C232 E07 DC FC – C332

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 B8 83	Drive load failure (put failure at drive – unable to extend cartridge to the drive load position). See “Identifying Device Type” on page 272. Also refer to “Loose X-Access Pinion Gear” on page 766.	LTO1 DT LVD – C833 LTO1 DT HVD – C933 LTO1 DT FC – CA33 LTO1 DC LVD – CB33 LTO1 DC HVD – CC33 LTO1 DC FC – CD33 LTO2 DC LVD – CE33 LTO2 DC HVD – CF33 LTO2 DC FC – D033 LTO3 DC F3A– D333 LTO3 DC F3B– D433 LTO4 DC F4A - D733 J1A DC FC – C033 E05 DC FC – C133 E06/EU6 DC FC – C233 E07 DC FC – C333
04 44 00 B8 84	Drive load failure (put failure at drive – drive loader did not load the cartridge after it was extended to the drive load position). See “Identifying Device Type” on page 272. This failure could also be caused by a cartridge gate not opening due to a gate mechanical problem.	LTO1 DT LVD – C834 LTO1 DT HVD – C934 LTO1 DT FC – CA34 LTO1 DC LVD – CB34 LTO1 DC HVD – CC34 LTO1 DC FC – CD34 LTO2 DC LVD – CE34 LTO2 DC HVD – CF34 LTO2 DC FC – D034 LTO3 DC F3A– D334 LTO3 DC F3B– D434 LTO4 DC F4A - D734 J1A DC FC – C034 E05 DC FC – C134 E06/EU6 DC FC – C234 E07 DC FC – C334

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 B8 86	Canister cooling fan failure	LTO1 DC LVD– CB36 LTO1 DC HVD– CC36 LTO1 DC FC– CD36 LTO2 DC LVD– CE36 LTO2 DC HVD– CF36 LTO2 DC FC– D036 LTO3 DC F3A– D336 LTO3 DC F3B– D436 LTO4 DC F4A - D736 J1A DC FC – C036 E05 DC FC – C136 E06/EU6 DC FC – C236 E07 DC FC – C336
04 44 00 BA 21	Battery failure on ACC. **Note:** This error is only reported on early style ACC cards prior to release of x23 and x53 frames.	ABB1
04 44 00 BA 22	Battery failure on OPC card. **Note:** This error is only reported on early style OPC cards prior to release of x23 and x53 frames.	ABB2
04 44 00 BA 23	NVRAM ML Battery voltage low on ACC card. **Note:** This error is only reported on later style ACC cards for x23 and x53 frames.	ABB3
04 44 00 BA 24	NVRAM ML Battery voltage low on OPC card. **Note:** This error is only reported on later style OPC cards for x23 and x53 frames.	ABB4
04 44 00 C0 80	Library Firmware download completed successfully.	ACC0
04 44 00 C2 00	Shuttle car tray Y motion encountered unexpected hardstop moving up.	A050
04 44 00 C2 01	Shuttle car tray Y motion encountered unexpected hardstop moving down.	A050
04 44 00 C2 02	Shuttle car Z motion encountered unexpected hardstop moving forward. **Note:** Forward is considered towards station SC1 in the connection.	A051
04 44 00 C2 03	Shuttle car Z motion encountered unexpected hardstop moving backward (away from station SC1). **Note:** Backward is considered towards station **n** in the connection where **n** is the largest station number.	A051
04 44 00 C2 04	Shuttle car move operation timed out.	A054
04 44 00 C2 05	Shuttle car failed to find station. **Note:** Trailer record will contain information on library serial number and frame location	A052

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 C2 06	Station power failure. **Note:** Trailer record will contain information on library serial number and frame location.	A053
04 44 00 C2 07	Station communication failure. **Note:** Trailer record will contain information on library serial number and frame location.	A053
04 44 00 C2 12	Shuttle car z flag sensor hard failure.	A055
04 44 00 C2 13	Shuttle car y flag sensor hard failure.	A055
04 44 00 C2 15	Shuttle car z motor overcurrent condition.	A055
04 44 00 C2 16	Shuttle car y motor overcurrent condition.	A055
04 44 00 C2 17	Shuttle car z motor no encoder pulses detected.	A055
04 44 00 C2 18	Shuttle car y motor no encoder pulses detected.	A055
04 44 00 C2 19	Shuttle car did not latch when raising.	A055
04 44 00 C2 20	Shuttle car did not unlatch when lowering.	A055
04 44 00 C2 30	Shuttle car legs are lowered when they should be raised. **Note:** Trailer record will contain information on library serial number and frame location.	A055
04 44 00 C2 50	Unknown media in the shuttle car.	A058
04 44 00 C2 51	Media type mismatch detected. **Note:** This occurs when the media type of the cartridge in the shuttle car does not match the media type of the logical library the shuttle station is assigned to.	A059
04 44 00 C2 35	Shuttle car could not find endstop.	A056
04 44 00 CA 80	Call Home successful – information only – not an error.	ACCA
04 44 00 CA 81	Call Home failed – try again later.	ACCA
04 44 00 CA 82	Call Home failed – machine not registered with Retain.	ACCA
04 44 00 CA 83	Call Home failed because it is disabled or not configured.	ACCA
04 44 00 CA 84	Call Home failed - the library is unable to establish a connection between the library MCP/MCA and the local modem, or to the Master Console. 'TotalStorage Master Console' and 'TS3000 System Console' are one in the same.	ACCA
04 44 00 CA 85	Call Home failed - the library encountered a failure while using the primary phone number. It either failed while contacting the remote modem or it disconnected after contacting the remote modem.	ACCA
04 44 00 CA 86	Call Home failed - the library encountered a failure while using the secondary phone number. It either failed while contacting the remote modem or it disconnected after contacting the remote modem	ACCA
04 44 00 CA 87	Call Home failed - the library established a connection to the remote modem but could not log into the ATT Global Network.	ACCA
04 44 00 CA 88	Call Home failed - the library logged into the ATT Global Network but could not establish a TCP/IP connection to RETAIN using the primary IP address.	ACCA
04 44 00 CA 89	Call Home failed - the library logged into the ATT Global Network but could not establish a TCP/IP connection to RETAIN using the secondary IP address.	ACCA

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 CA 8A	Call Home failed - the library established a TCP/IP connection but could not log into RETAIN.	ACCA
04 44 00 CA 8B	Call Home failed - the library is unable to establish a connection from the library MCP/MCA to the local WTI switch.	ACCA
04 44 00 CA 8C	Call Home failed - the library established a connection to the local WTI switch, but is unable to establish a connection from WTI switch to the local modem. This is normal if an attempt was made to call home while another machine on the same WTI switch was also calling home.	ACCA
04 44 00 CA 8D	Call Home failed - the local modem Carrier Detect signal was high before the library attempted to dial the modem. This indicates that either a modem connection was previously established by another modem session which did not hang up, or that there is a problem with the modem or modem setup.	ACCA
04 44 00 CA 8E	Call Home failed - At least one data file was not sent to RETAIN.	ACCA
04 44 00 CA 8F	Call Home failed - all retries have been exhausted.	ACCA
04 44 00 CA 90	Call Home logfile transmission successful. Not an error, log only.	ACCA
04 44 00 CA CA	Call Home Test performed.	ACCA
04 44 00 CB B0	Library Not Ready. ALMS feature needs to be installed and enabled.	ACCD
04 44 00 CB C0	Library Firmware download incompatible with Virtual I/O.	ACCB
04 44 00 CB C1	Library Firmware download incompatible with Library Hardware. **Note:** This is the case if pre-6xxx code is loaded on Enhanced node cards.	ACCB
04 44 00 CB C2	Library Firmware download incompatible with Library Hardware. **Note:** This is the case if 7xxx or lesser code is loaded on a library with an Sx4 frame installed.	ACCB
04 44 00 CB C3	Library Firmware download incompatible with Library Hardware. **Note:** This is the case if 95xx or higher firmware is loaded on earlier style nodes cards. Enhanced node cards with a Compact Flash (CF) are required for firmware levels 95xx or higher.	ACCB
04 44 00 CB CA	Library Firmware update is required because at least one node card has a code version different than the rest of the library. The Library Firmware needs to be reloaded.	ACCB
04 44 00 CB CB	Library Firmware download failed or was interrupted, or the MCP/MCA (with Ethernet) was replaced in a single frame library, and the FRU has downlevel code. The Library Firmware needs to be reloaded.	ACCB
04 44 00 CB CC	Corrupted Library Firmware was downloaded and rejected.	ACCB
04 44 00 CB CD	An attempt to update drive code failed.	ACCB
04 44 00 CB CE	Library code in XYLINX module didn't update - reset node card.	ACCB
04 44 00 CC CA	Library Firmware detected a memory allocation or stack error. **Note:** This error will typically have a sense key of 01 so it is logged but not reported.	ACCC
04 44 00 CC CC	Library Firmware Error (see Object ID and Object Error).	ACCC
04 44 00 CC CE	Library Firmware detected that the web server is not responding.	ACCC
04 44 00 CC CF	Library Firmware Error (dual accessor X axis authorization failure).	ACCF

Table 48. Library Sense Data to URC (continued)

Error Data	Description	URC
04 44 00 CE CE	Configuration of more than one frame was attempted but the Base frame does not have the Capacity Expansion Feature installed.	ACCE
04 44 00 F2 F2	A node card encountered a processor exception, saved information about the exception to Flash memory, then reset itself.	ACF2
05 1A 00 — —	Parameter list length error.	A51A
05 20 00 — —	Invalid command operation code.	A520
05 21 01 — —	Invalid element address.	A521
05 24 00 — —	Invalid field in CDB (see field pointer).	A524
05 25 00 — —	Logical unit not supported.	A525
05 26 00 — —	Invalid field in parameter list (see field pointer).	A526
05 2C 00— —	Command sequence error.	A52C
05 30 00— —	Incompatible Media Installed.	A530
05 39 00 — —	Saving parameters not supported.	A539
05 3B 0D — —	Media destination element full.	A53B
05 3B 0E — —	Media source element empty.	A53C
05 3B 80 — —	Media transport element full.	A53D
05 3B 81 — —	Element Not Accessible, Cartridge Present was Exported by another logical library.	A53E
05 3B 82 — —	Element Not Accessible, drive is Not Present.	A53F
05 3D 00 — —	Invalid bits in identify message.	A540
05 53 02 — —	Media removal prevented (status message).	A553
05 80 00 — —	CU Mode, vendor-unique.	A580
06 28 00 — —	Not-ready-to-ready transition, media may have changed.	A628
06 28 01 — —	I/O station accessed.	A620
06 29 00 — —	Power-on or reset occurred.	A629
06 2A 01 — —	Mode parameters changed.	A62A
06 3F 01 — —	Microcode has been changed.	A63F
0B 1B 00 — —	Synchronous data transfer error.	AB1B
0B 43 00 — —	Message error.	AB43
0B 44 00 — —	Internal target failure.	AB44
0B 45 00 — —	Select or reselect failure.	AB45
0B 47 00 — —	SCSI parity error.	AB47
0B 48 00 — —	Initiator detected error message received.	AB48
0B 49 00 — —	Invalid message error.	AB49
0B 4A 00 — —	Command phase error.	AB4A
0B 4B 00 — —	Data phase error.	AB4B
0B 4E 00 — —	Overlapped commands attempted.	AB4E

Notes:
1. For any sense key 05 conditions, the command was rejected as invalid and no motion attempted.
2. For MCP/MCA or power supply problems, see failing frame number.

3. For fiducial-related failures at columns or I/O stations, see failing frame number.
4. For drive or control port-related failures, see failing frame and drive numbers.

Drive Sense Data to URC Tables

There are two different drive technologies available in the library, LTO and 3592. Before you can correlate drive sense data to a URC, you must determine with which drive technology you are working:

1. Obtain the model number of each frame in the library subsystem.
2. If the second digit of the model number of ALL frames is a 3 or a 5 (example: L**3**2, D**5**2) then all drives in the library are LTO. Go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
3. If the second digit of the model number of ALL frames is a 2 (example: L**2**2, D**2**2) then all drives in the library are 3592. Go to “3592 Drive Sense Data to URC Table” on page 344.
4. If the second digit of the model number in some frames is 3 or 5 (example: L**3**2, D**5**2) and in the other frames is a 2 (example: L**2**2, D**2**2) then your library is a "mixed media" library with both LTO and 3592 drives. Go to either “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315 or “3592 Drive Sense Data to URC Table” on page 344.
5. If you are working with a drive error reported on the library front panel, the drive location, presented in frame/row format, displays on the library front panel. You can determine the drive type visually by going to the rear of the library and matching the frame/row information (from the library front panel) to the Frame and Row location for that frame (see “Drive Types, Fixed Trays, and Power Supplies” on page 874 to identify the drive or canister type).
   - Any drive in a fixed tray assembly is LTO.
   - If the drive assembly is a canister, refer to the labels on the back of the drive canister to determine whether it is an LTO or 3592 drive.
   - Drive types may be abbreviated on the labels. **L1** indicates an LTO Ultrium-1 drive. **L2** indicates an LTO Ultrium-2 drive. **L3** indicates an LTO Ultrium-3 (3588 model F3A or F3B) drive. **L4** indicates an LTO Ultrium-4 (3588 model F4A) drive. **L5** indicates an LTO Ultrium-5 (3588 model F5A) drive.**J1A** indicates a 3592 model J1A drive. **E05** indicates a 3592 model E05 drive, **E06** indicates a 3592 model E06 drive, and **EU6** indicates a 3592 model EU6 drive.
   - **If the drive is LTO, go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.**
   - **If the drive is 3592 go to “3592 Drive FID to URC Table” on page 357.**
6. If you are working with a drive error reported at the host, you will need to use host utilities to identify the drive type. The host should be able to display the inquiry string or VPD for the drive.
   - If the inquiry string is "ULT3580–TD1," then the drive is LTO Ultrium-1. Go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
   - If the inquiry string is "ULT3580–TD2," then the drive is LTO Ultrium-2. Go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
   - If the inquiry string is "ULT3580–TD3," then the drive is LTO Ultrium-3 (3588). Go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
   - If the inquiry string is "ULT3580–TD4," then the drive is LTO Ultrium-4 (3588). Go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
   - If the inquiry string is "ULT3580–TD5," then the drive is LTO Ultrium-5 (3588). Go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
   - If the inquiry string is "03592J1A," then the drive is 3592 model J1A. Go to “3592 Drive FID to URC Table” on page 357.
   - If the inquiry string is "03592E05," then the drive is 3592 model E05. Go to “3592 Drive FID to URC Table” on page 357.
   - If the inquiry string is "03592E06," then the drive is 3592 model E06. Go to “3592 Drive FID to URC Table” on page 357.
   - If the inquiry string is "03592EU6," then the drive is 3592 model EU6. Go to “3592 Drive FID to URC Table” on page 357.

LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table

Note: Use this section to find a URC with **SK, ASC, ASCQ** sense data obtained from the “Drive SCSI Detail Menu” on page 777.

The data in the **Error Data** column of Table 49 on page 316 is divided into 3 groups. These groups from left to right are:

- Sense Byte 02 = Sense Key (SK)
- Sense Byte 12 = Additional Sense Code (ASC)
- Sense Byte 13 = Additional Sense Code Qualifier (ASCQ)

In the **Error Data** column of Table 49 on page 316, a ‘—’ denotes that data is not applicable. An ‘xx’ denotes variable data will occur. Table 49 on page 316 also contains an error **Description** and a **URC** column.

The following abbreviations apply to the URC column:
LTO1 DT LVD. LTO Ultrium-1 Fixed Tray (SCSI Low Voltage Differential)
LTO1 DT HVD. LTO Ultrium-1 Fixed Tray (SCSI High Voltage Differential)
LTO1 DT FC. LTO Ultrium-1 Fixed Tray Fibre Channel
LTO1 DC LVD. LTO Ultrium-1 drive canister (SCSI Low Voltage Differential)
LTO1 DC HVD. LTO Ultrium-1 drive canister (SCSI High Voltage Differential)
LTO1 DC FC. LTO Ultrium-1 drive canister Fibre Channel
LTO2 DC LVD. LTO Ultrium-2 drive canister (SCSI Low Voltage Differential)
LTO2 DC HVD. LTO Ultrium-2 drive canister (SCSI High Voltage Differential)
LTO2 DC FC. LTO Ultrium-2 drive canister Fibre Channel
LTO3 DC F3A. LTO Ultrium-3 (3588 F3A) drive canister Fibre Channel
LTO3 DC F3B. LTO Ultrium-3 (3588 F3B) drive canister Fibre Channel
LTO4 DC F4A. LTO Ultrium-4 (3588 F4A) drive canister Fibre Channel
LTO5 DC F5A. LTO Ultrium-5 (3588 F5A) drive canister Fibre Channel

Determine what type of LTO drive assembly you are working with (see notes below), look up the drive sense data in this table to determine the URC, then go to “URC Table With Descriptions, Actions, and FRUs” on page 375 to repair the problem.

Notes:

1. The URC is for reference only and is not part of the sense data.
2. If you are working with **Library** sense data, go to “Library Sense Data to URC Table” on page 279.
3. **If the drive is a 3592, go to “3592 Drive FID to URC Table” on page 357**.
4. If you need to determine a drive type, first determine the location of the affected drive. See byte 35 of the drive sense data. As an example if the failing frame/device byte is X'14' (hex) this indicates that the drive is located in frame 1, row 4. When you have determined the frame and row number of the drive, visually check to see whether the drive assembly is a tray or a canister. To determine the type of drive that is in your library, consider the following:
   - Determine the drive type (3592, LTO LVD/HVD/FC) by referring to the labels on the back of the drive.
   - Drive types may be abbreviated on the labels. **L1** indicates an LTO Ultrium-1 drive. **L2** indicates an LTO Ultrium-2 drive. **L3** indicates an LTO Ultrium-3 (3588 model F3A or F3B) drive. **L4** indicates an LTO Ultrium-4 (3588 model F4A) drive. **L5** indicates an LTO Ultrium-5 (3588 model F5A) drive. **J1A** indicates a 3592 model J1A drive. **E05** indicates a 3592 model E05 drive, **E06** indicates a 3592 model E06 drive, and **EU6** indicates a 3592 model EU6 drive.
   - Early Fixed Tray assemblies did not have labels. These are LTO1 DT LVD drives.
   - For further information on Fixed Trays and drive canisters, see the table at Table 101 on page 874 and review the listed procedures and drawings for each type of drive.

Table 49. LTO Drive Sense Data to URC

Error Data	Description	URC
00 00 00	No sense information. This usually means there was no error. In rare instances it also can occur when a SCSI failure prevented the drive from returning sense information. If the flags in the sense data are non-zero they indicate the reason this sense was returned. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3010 LTO1 DT HVD — 3410 LTO1 DT FC — 3810 LTO1 DC LVD — 3C10 LTO1 DC HVD — 4010 LTO1 DC FC — 4410 LTO2 DC LVD — 4810 LTO2 DC HVD — 4C10 LTO2 DC FC — 5010 LTO3 DC F3A– 5C10 LTO3 DC F3B– 6010 LTO4 DC F4A– 6C10 LTO5 DC F5A– 7C10
00 00 01	Filemark Detected — A Read or Space command terminated early because a File Mark has been encountered. The File Mark flag is set. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3011 LTO1 DT HVD — 3411 LTO1 DT FC — 3811 LTO1 DC LVD — 3C11 LTO1 DC HVD — 4011 LTO1 DC FC — 4411 LTO2 DC LVD — 4811 LTO2 DC HVD — 4C11 LTO2 DC FC — 5011 LTO3 DC F3A– 5C11 LTO3 DC F3B– 6011 LTO4 DC F4A– 6C11 LTO5 DC F5A– 7C11

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
00 00 02	End Of Medium (EOM) Partition — A Write or Write File Marks command ended in the early warning area. The EOM flag is set. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3012 LTO1 DT HVD — 3412 LTO1 DT FC — 3812 LTO1 DC LVD — 3C12 LTO1 DC HVD — 4012 LTO1 DC FC — 4412 LTO2 DC LVD — 4812 LTO2 DC HVD — 4C12 LTO2 DC FC — 5012 LTO3 DC F3A– 5C12 LTO3 DC F3B– 6012 LTO4 DC F4A– 6C12 LTO5 DC F5A– 7C12
00 00 04	Beginning Of Medium (BOM) Partition — A Space command ended at Beginning of Tape. The EOM flag is also set. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3013 LTO1 DT HVD — 3413 LTO1 DT FC — 3813 LTO1 DC LVD — 3C13 LTO1 DC HVD — 4013 LTO1 DC FC — 4413 LTO2 DC LVD — 4813 LTO2 DC HVD — 4C13 LTO2 DC FC — 5013 LTO3 DC F3A– 5C13 LTO3 DC F3B– 6013 LTO4 DC F4A– 6C13 LTO5 DC F5A– 7C13

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
00 82 82	Drive Requires Cleaning — The drive has detected that a cleaning operation is required to maintain good operation. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3015 LTO1 DT HVD — 3415 LTO1 DT FC — 3815 LTO1 DC LVD — 3C15 LTO1 DC HVD — 4015 LTO1 DC FC — 4415 LTO2 DC LVD — 4815 LTO2 DC HVD — 4C15 LTO2 DC FC — 5015 LTO3 DC F3A– 5C15 LTO3 DC F3B– 6015 LTO4 DC F4A– 6C15 LTO5 DC F5A– 7C15
01 37 00	Recovered Error — A Mode Select command parameter has been rounded because the drive cannot store it with the accuracy of the command. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3019 LTO1 DT HVD — 3419 LTO1 DT FC — 3819 LTO1 DC LVD — 3C19 LTO1 DC HVD — 4019 LTO1 DC FC — 4419 LTO2 DC LVD — 4819 LTO2 DC HVD — 4C19 LTO2 DC FC — 5019 LTO3 DC F3A– 5C19 LTO3 DC F3B– 6019 LTO4 DC F4A– 6C19 LTO5 DC F5A– 7C19

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
01 5D 00	Recovered Error — Failure Prediction thresholds have been exceeded indicating that a failure may occur soon. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 301A LTO1 DT HVD — 341A LTO1 DT FC— 381A LTO1 DC LVD — 3C1A LTO1 DC HVD — 401A LTO1 DC FC — 441A LTO2 DC LVD — 481A LTO2 DC HVD — 4C1A LTO2 DC FC — 501A LTO3 DC F3A– 5C1A LTO3 DC F3B– 601A LTO4 DC F4A– 6C1A LTO5 DC F5A– 7C1A
02 04 00	Not Ready — Cause Not reportable. A cartridge is present in the drive, but it is in the process of being unloaded. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 301B LTO1 DT HVD — 341B LTO1 DT FC — 381B LTO1 DC LVD — 3C1B LTO1 DC HVD — 401B LTO1 DC FC — 441B LTO2 DC LVD — 481B LTO2 DC HVD — 4C1B LTO2 DC FC — 501B LTO3 DC F3A– 5C1B LTO3 DC F3B– 601B LTO4 DC F4A– 6C1B LTO5 DC F5A– 7C1B

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
02 04 01	Not Ready — Becoming Ready. A Media Access command was received during a load. The drive has not finished the load and thread process yet. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 301C LTO1 DT HVD — 341C LTO1 DT FC — 381C LTO1 DC LVD — 3C1C LTO1 DC HVD — 401C LTO1 DC FC — 441C LTO2 DC LVD — 481C LTO2 DC HVD — 4C1C LTO2 DC FC — 501C LTO3 DC F3A– 5C1C LTO3 DC F3B– 601C LTO4 DC F4A– 6C1C LTO5 DC F5A– 7C1C
02 04 02	Not Ready — Initializing Command Required. A cartridge is present in the drive, but is not logically loaded. A Load command is required. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 301D LTO1 DT HVD — 341D LTO1 DT FC — 381D LTO1 DC LVD — 3C1D LTO1 DC HVD — 401D LTO1 DC FC — 441D LTO2 DC LVD — 481D LTO2 DC HVD — 4C1D LTO2 DC FC — 501D LTO3 DC F3A– 5C1D LTO3 DC F3B– 601D LTO4 DC F4A– 6C1D LTO5 DC F5A– 7C1D

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
02 30 03	Not Ready — Cleaning Cartridge Installed. An operation could not be carried out because the cartridge in the drive is a cleaning cartridge. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 301E LTO1 DT HVD — 341E LTO1 DT FC — 381E LTO1 DC LVD — 3C1E LTO1 DC HVD — 401E LTO1 DC FC — 441E LTO2 DC LVD — 481E LTO2 DC HVD — 4C1E LTO2 DC FC — 501E LTO3 DC F3A– 5C1E LTO3 DC F3B– 601E LTO4 DC F4A– 6C1E LTO5 DC F5A– 7C1E
02 30 07	Not Ready — Cleaning Failure. A cleaning operation was attempted, but could not be completed. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 301F LTO1 DT HVD — 341F LTO1 DT FC — 381F LTO1 DC LVD — 3C1F LTO1 DC HVD — 401F LTO1 DC FC — 441F LTO2 DC LVD — 481F LTO2 DC HVD — 4C1F LTO2 DC FC — 501F LTO3 DC F3A– 5C1F LTO3 DC F3B– 601F LTO4 DC F4A– 6C1F LTO5 DC F5A– 7C1F

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
02 3A 00	Not Ready — Media Not Present. A Media Access command was received when there was no cartridge loaded. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3020 LTO1 DT HVD — 3420 LTO1 DT FC — 3820 LTO1 DC LVD — 3C20 LTO1 DC HVD — 4020 LTO1 DC FC — 4420 LTO2 DC LVD — 4820 LTO2 DC HVD — 4C20 LTO2 DC FC — 5020 LTO3 DC F3A– 5C20 LTO3 DC F3B– 6020 LTO4 DC F4A– 6C20 LTO5 DC F5A– 7C20
02 3E 00	Not Ready — Logical Unit Not Configured. The drive has just powered on or reset, and has not completed POST and configuration. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3021 LTO1 DT HVD — 3421 LTO1 DT FC — 3821 LTO1 DC LVD — 3C21 LTO1 DC HVD — 4021 LTO1 DC FC — 4421 LTO2 DC LVD — 4821 LTO2 DC HVD — 4C21 LTO2 DC FC — 5021 LTO3 DC F3A– 5C21 LTO3 DC F3B– 6021 LTO4 DC F4A– 6C21 LTO5 DC F5A– 7C21
03 04 10	Not Ready — Auxiliary memory not accessible. The drive is not able to become ready because it is unable to access the Auxiliary Memory in a WORM cartridge. See “Identifying Device Type” on page 272.	LTO3 DC F3A– 5C50 LTO3 DC F3B– 6050 LTO4 DC F4A– 6C50 LTO5 DC F5A– 7C50

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
03 0C 00	Write Error — A Write operation has failed. This is probably due to a media defect, but may be a drive failure. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3022 LTO1 DT HVD — 3422 LTO1 DT FC — 3822 LTO1 DC LVD — 3C22 LTO1 DC HVD — 4022 LTO1 DC FC — 4422 LTO2 DC LVD — 4822 LTO2 DC HVD — 4C22 LTO2 DC FC — 5022 LTO3 DC F3A– 5C22 LTO3 DC F3B– 6022 LTO4 DC F4A– 6C22 LTO5 DC F5A– 7C22
03 11 00	Unrecovered Read Error — A Read operation failed. This is probably due to a media defect, but may be a drive failure. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3023 LTO1 DT HVD — 3423 LTO1 DT FC — 3823 LTO1 DC LVD — 3C23 LTO1 DC HVD — 4023 LTO1 DC FC — 4423 LTO2 DC LVD — 4823 LTO2 DC HVD — 4C23 LTO2 DC FC — 5023 LTO3 DC F3A– 5C23 LTO3 DC F3B– 6023 LTO4 DC F4A– 6C23 LTO5 DC F5A– 7C23
03 11 12	Auxiliary memory read error. The drive reported that it is unable to read the Auxiliary Memory in a WORM cartridge. See “Identifying Device Type” on page 272.	LTO3 DC F3A– 5C51 LTO3 DC F3B– 6051 LTO4 DC F4A– 6C51 LTO5 DC F5A– 7C51

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
03 14 00	Recorded Entity Not Found — A Space or Locate command failed because a format violation prevented the target from being found. This is probably due to a media defect, but may be a drive failure. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3024 LTO1 DT HVD — 3424 LTO1 DT FC — 3824 LTO1 DC LVD — 3C24 LTO1 DC HVD — 4024 LTO1 DC FC — 4424 LTO2 DC LVD — 4824 LTO2 DC HVD — 4C24 LTO2 DC FC — 5024 LTO3 DC F3A– 5C24 LTO3 DC F3B– 6024 LTO4 DC F4A– 6C24 LTO5 DC F5A– 7C24
03 30 01	Unknown Format — An operation could not be carried out because the cartridge in the drive has a logical format that is not recognized by the drive. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3025 LTO1 DT HVD — 3425 LTO1 DT FC — 3825 LTO1 DC LVD — 3C25 LTO1 DC HVD — 4025 LTO1 DC FC — 4425 LTO2 DC LVD — 4825 LTO2 DC HVD — 4C25 LTO2 DC FC — 5025 LTO3 DC F3A– 5C25 LTO3 DC F3B– 6025 LTO4 DC F4A– 6C25 LTO5 DC F5A– 7C25

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
03 30 02	Incompatible Format — An operation could not be completed because the cartridge in the drive has a Logical Format that is not correct. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3026 LTO1 DT HVD — 3426 LTO1 DT FC — 3826 LTO1 DC LVD — 3C26 LTO1 DC HVD — 4026 LTO1 DC FC — 4426 LTO2 DC LVD — 4826 LTO2 DC HVD — 4C26 LTO2 DC FC — 5026 LTO3 DC F3A– 5C26 LTO3 DC F3B– 6026 LTO4 DC F4A– 6C26 LTO5 DC F5A– 7C26
03 30 0D	Medium Error — WORM integrity check. The drive rejected a Read operation because the cartridge is a suspicious WORM cartridge. See “Identifying Device Type” on page 272.	LTO3 DC F3A– 5C52 LTO3 DC F3B– 6052 LTO4 DC F4A– 6C52 LTO5 DC F5A– 7C52
03 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 file ID. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3027 LTO1 DT HVD — 3427 LTO1 DT FC — 3827 LTO1 DC LVD — 3C27 LTO1 DC HVD — 4027 LTO1 DC FC — 4427 LTO2 DC LVD — 4827 LTO2 DC HVD — 4C27 LTO2 DC FC — 5027 LTO3 DC F3A– 5C27 LTO3 DC F3B– 6027 LTO4 DC F4A– 6C27 LTO5 DC F5A– 7C27

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
03 3B 00	Sequential Positioning Error — A command has failed and left the logical position at an unexpected location. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3028 LTO1 DT HVD — 3428 LTO1 DT FC — 3828 LTO1 DC LVD — 3C28 LTO1 DC HVD — 4028 LTO1 DC FC — 4428 LTO2 DC LVD — 4828 LTO2 DC HVD — 4C28 LTO2 DC FC — 5028 LTO3 DC F3A– 5C28 LTO3 DC F3B– 6028 LTO4 DC F4A– 6C28 LTO5 DC F5A– 7C28
03 50 00	Write Append Error — A Write type command failed because the point at which to append data was unreadable. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 302A LTO1 DT HVD — 342A LTO1 DT FC — 382A LTO1 DC LVD — 3C2A LTO1 DC HVD — 402A LTO1 DC FC — 442A LTO2 DC LVD — 482A LTO2 DC HVD — 4C2A LTO2 DC FC — 502A LTO3 DC F3A– 5C2A LTO3 DC F3B– 602A LTO4 DC F4A– 6C2A LTO5 DC F5A– 7C2A

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
03 52 00	Cartridge Fault — A command could not be completed due to a fault in the tape cartridge. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 302B LTO1 DT HVD — 342B LTO1 DT FC — 382B LTO1 DC LVD — 3C2B LTO1 DC HVD — 402B LTO1 DC FC — 442B LTO2 DC LVD — 482B LTO2 DC HVD — 4C2B LTO2 DC FC — 502B LTO3 DC F3A– 5C2B LTO3 DC F3B– 602B LTO4 DC F4A– 6C2B LTO5 DC F5A– 7C2B
03 53 00	Media Load/Eject Failed — An attempt to load or eject the cartridge failed due to a problem with the cartridge. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 302C LTO1 DT HVD — 342C LTO1 DT FC — 382C LTO1 DC LVD — 3C2C LTO1 DC HVD — 402C LTO1 DC FC — 442C LTO2 DC LVD — 482C LTO2 DC HVD — 4C2C LTO2 DC FC — 502C LTO3 DC F3A– 5C2C LTO3 DC F3B– 602C LTO4 DC F4A– 6C2C LTO5 DC F5A– 7C2C

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
04 04 03	Manual Intervention Required — A cartridge is present in the drive but cannot be loaded or unloaded without manual intervention. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 302D LTO1 DT HVD — 342D LTO1 DT FC — 382D LTO1 DC LVD — 3C2D LTO1 DC HVD — 402D LTO1 DC FC — 442D LTO2 DC LVD — 482D LTO2 DC HVD — 4C2D LTO2 DC FC — 502D LTO3 DC F3A– 5C2D LTO3 DC F3B– 602D LTO4 DC F4A– 6C2D LTO5 DC F5A– 7C2D
04 40 XX	Diagnostic Failure — A diagnostic test has failed. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 302E LTO1 DT HVD — 342E LTO1 DT FC — 382E LTO1 DC LVD — 3C2E LTO1 DC HVD — 402E LTO1 DC FC — 442E LTO2 DC LVD — 482E LTO2 DC HVD — 4C2E LTO2 DC FC — 502E LTO3 DC F3A– 5C2E LTO3 DC F3B– 602E LTO4 DC F4A– 6C2E LTO5 DC F5A– 7C2E

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
04 44 00	Internal Target Failure — A hardware failure has been detected in the drive and has caused the command to fail. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 302F LTO1 DT HVD — 342F LTO1 DT FC — 382F LTO1 DC LVD — 3C2F LTO1 DC HVD — 402F LTO1 DC FC — 442F LTO2 DC LVD — 482F LTO2 DC HVD — 4C2F LTO2 DC FC — 502F LTO3 DC F3A– 5C2F LTO3 DC F3B– 602F LTO4 DC F4A– 6C2F LTO5 DC F5A– 7C2F
04 51 00	Erase Failure — An Erase command failed to erase the required area on the tape. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3030 LTO1 DT HVD — 3430 LTO1 DT FC — 3830 LTO1 DC LVD — 3C30 LTO1 DC HVD — 4030 LTO1 DC FC — 4430 LTO2 DC LVD — 4830 LTO2 DC HVD — 4C30 LTO2 DC FC — 5030 LTO3 DC F3A– 5C30 LTO3 DC F3B– 6030 LTO4 DC F4A– 6C30 LTO5 DC F5A– 7C30

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
04 53 00	Media Load/Eject Failed — An attempt to load or eject the cartridge failed due to a problem with the drive. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3031 LTO1 DT HVD — 3431 LTO1 DT FC — 3831 LTO1 DC LVD — 3C31 LTO1 DC HVD — 4031 LTO1 DC FC — 4431 LTO2 DC LVD — 4831 LTO2 DC HVD — 4C31 LTO2 DC FC — 5031 LTO3 DC F3A– 5C31 LTO3 DC F3B– 6031 LTO4 DC F4A– 6C31 LTO5 DC F5A– 7C31
05 1A 00	Illegal Request — Parameter list length error. The amount of parameter data sent is incorrect. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3032 LTO1 DT HVD — 3432 LTO1 DT FC — 3832 LTO1 DC LVD — 3C32 LTO1 DC HVD — 4032 LTO1 DC FC — 4432 LTO2 DC LVD — 4832 LTO2 DC HVD — 4C32 LTO2 DC FC — 5032 LTO3 DC F3A– 5C32 LTO3 DC F3B– 6032 LTO4 DC F4A– 6C32 LTO5 DC F5A– 7C32

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
05 20 00	Illegal Request — Invalid Command Operation Code in CDB. The Operation Code specified in the Command Descriptor Block was not valid. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3033 LTO1 DT HVD — 3433 LTO1 DT FC — 3833 LTO1 DC LVD — 3C33 LTO1 DC HVD — 4033 LTO1 DC FC — 4433 LTO2 DC LVD — 4833 LTO2 DC HVD — 4C33 LTO2 DC FC — 5033 LTO3 DC F3A– 5C33 LTO3 DC F3B– 6033 LTO4 DC F4A– 6C33 LTO5 DC F5A– 7C33
05 24 00	Illegal Request — Invalid field in CDB. An invalid value was detected in the Command Descriptor Block. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3034 LTO1 DT HVD — 3434 LTO1 DT FC — 3834 LTO1 DC LVD — 3C34 LTO1 DC HVD — 4034 LTO1 DC FC — 4434 LTO2 DC LVD — 4834 LTO2 DC HVD — 4C34 LTO2 DC FC — 5034 LTO3 DC F3A– 5C34 LTO3 DC F3B– 6034 LTO4 DC F4A– 6C34 LTO5 DC F5A– 7C34

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
05 25 00	Illegal Request — LUN not supported. The command was addressed to a non-existent Logical Unit Number. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3035 LTO1 DT HVD — 3435 LTO1 DT FC — 3835 LTO1 DC LVD — 3C35 LTO1 DC HVD — 4035 LTO1 DC FC — 4435 LTO2 DC LVD — 4835 LTO2 DC HVD — 4C35 LTO2 DC FC — 5035 LTO3 DC F3A– 5C35 LTO3 DC F3B– 6035 LTO4 DC F4A– 6C35 LTO5 DC F5A– 7C35
05 26 00	Illegal Request — Invalid Field in Parameter List. An invalid value was detected in the data sent during the data phase. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3036 LTO1 DT HVD — 3436 LTO1 DT FC — 3836 LTO1 DC LVD — 3C36 LTO1 DC HVD — 4030 LTO1 DC FC — 4436 LTO2 DC LVD — 4836 LTO2 DC HVD — 4C30 LTO2 DC FC — 5036 LTO3 DC F3A– 5C36 LTO3 DC F3B– 6036 LTO4 DC F4A– 6C36 LTO5 DC F5A– 7C36

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
05 53 02	Illegal Request — Media Removal Prevented. An Unload command was rejected because the drive previously received a Prevent Media Removal command. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3037 LTO1 DT HVD — 3437 LTO1 DT FC — 3837 LTO1 DC LVD — 3C37 LTO1 DC HVD — 4037 LTO1 DC FC — 4437 LTO2 DC LVD — 4837 LTO2 DC HVD — 4C37 LTO2 DC FC — 5037 LTO3 DC F3A– 5C37 LTO3 DC F3B– 6037 LTO4 DC F4A– 6C37 LTO5 DC F5A– 7C37
05 82 83	Illegal Request — Bad Code Detected. The data transferred to the drive during a firmware upgrade is corrupt or incompatible with the drive. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3038 LTO1 DT HVD — 3438 LTO1 DT FC — 3838 LTO1 DC LVD — 3C38 LTO1 DC HVD — 4038 LTO1 DC FC — 4438 LTO2 DC LVD — 4838 LTO2 DC HVD — 4C38 LTO2 DC FC — 5038 LTO3 DC F3A– 5C38 LTO3 DC F3B– 6038 LTO4 DC F4A– 6C38 LTO5 DC F5A– 7C38

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
06 28 00	Unit Attention — Not Ready to Ready Transition. A cartridge has been loaded successfully into the drive and is now ready to be accessed. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3039 LTO1 DT HVD — 3439 LTO1 DT FC — 3839 LTO1 DC LVD — 3C39 LTO1 DC HVD — 4039 LTO1 DC FC — 4439 LTO2 DC LVD — 4839 LTO2 DC HVD — 4C39 LTO2 DC FC — 5039 LTO3 DC F3A– 5C39 LTO3 DC F3B– 6039 LTO4 DC F4A– 6C39 LTO5 DC F5A– 7C39
06 29 00	Unit Attention — Reset. The drive has powered on or received a reset since the initiator last accessed it. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 303A LTO1 DT HVD — 343A LTO1 DT FC — 383A LTO1 DC LVD — 3C3A LTO1 DC HVD — 403A LTO1 DC FC — 443A LTO2 DC LVD — 483A LTO2 DC HVD — 4C3A LTO2 DC FC — 503A LTO3 DC F3A– 5C3A LTO3 DC F3B– 603A LTO4 DC F4A– 6C3A LTO5 DC F5A– 7C3A

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
06 2A 01	Unit Attention — Mode Parameters Changed. The Mode parameters for the drive have been changed by an initiator other than the one issuing the command. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 303B LTO1 DT HVD — 343B LTO1 DT FC — 383B LTO1 DC LVD — 3C3B LTO1 DC HVD — 403B LTO1 DC FC — 443B LTO2 DC LVD — 483B LTO2 DC HVD — 4C3B LTO2 DC FC — 503B LTO3 DC F3A– 5C3B LTO3 DC F3B– 603B LTO4 DC F4A– 6C3B LTO5 DC F5A– 7C3B
06 3F 01	Unit Attention — Code Download. The firmware in the drive has just been changed. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 303C LTO1 DT HVD — 343C LTO1 DT FC — 383C LTO1 DC LVD — 3C3C LTO1 DC HVD — 403C LTO1 DC FC — 443C LTO2 DC LVD — 483C LTO2 DC HVD — 4C3C LTO2 DC FC — 503C LTO3 DC F3A– 5C3C LTO3 DC F3B– 603C LTO4 DC F4A– 6C3C LTO5 DC F5A– 7C3C

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
06 5D FF	Unit Attention — Failure Prediction False. A Mode Select command has been used to test for Failure Prediction system. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 303D LTO1 DT HVD — 343D LTO1 DT FC — 383D LTO1 DC LVD — 3C3D LTO1 DC HVD — 403D LTO1 DC FC — 443D LTO2 DC LVD — 483D LTO2 DC HVD — 4C3D LTO2 DC FC — 503D LTO3 DC F3A– 5C3D LTO3 DC F3B– 603D LTO4 DC F4A– 6C3D LTO5 DC F5A– 7C3D
07 27 00	Write Protect — A Write type operation has been requested on a cartridge which has been write protected. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 303E LTO1 DT HVD — 343E LTO1 DT FC — 383E LTO1 DC LVD — 3C3E LTO1 DC HVD — 403E LTO1 DC FC — 443E LTO2 DC LVD — 483E LTO2 DC HVD — 4C3E LTO2 DC FC — 503E LTO3 DC F3A– 5C3E LTO3 DC F3B– 603E LTO4 DC F4A– 6C3E LTO5 DC F5A– 7C3E

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
07 30 00	Incompatible Media Installed — A Write type operation could not be executed because it is not supported on the tape type that is loaded.	LTO1 DT LVD — 303F LTO1 DT HVD — 343F LTO1 DT FC — 383F LTO1 DC LVD — 3C3F LTO1 DC HVD — 403F LTO1 DC FC — 443F LTO2 DC LVD — 483F LTO2 DC HVD — 4C3F LTO2 DC FC — 503F LTO3 DC F3A– 5C3F LTO3 DC F3B– 603F LTO4 DC F4A– 6C3F LTO5 DC F5A– 7C3F
07 30 0C	Data Protect — WORM overwrite attempted. The drive rejected a write operation because it would have resulted in an overwrite. Overwrite is not allowed on WORM media. See “Identifying Device Type” on page 272.	LTO3 DC F3A– 5C53 LTO3 DC F3B– 6053 LTO4 DC F4A– 6C53 LTO5 DC F5A– 7C53
07 30 0D	Data Protect — WORM integrity check. The drive rejected a write operation because the cartridge is a suspicious WORM cartridge. See “Identifying Device Type” on page 272.	LTO3 DC F3A– 5C54 LTO3 DC F3B– 6054 LTO4 DC F4A– 6C54 LTO5 DC F5A– 7C54

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
08 00 05	End Of Data — A Read or Space command terminated early because End of Data was encountered. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3040 LTO1 DT HVD — 3440 LTO1 DT FC — 3840 LTO1 DC LVD — 3C40 LTO1 DC HVD — 4040 LTO1 DC FC — 4440 LTO2 DC LVD — 4840 LTO2 DC HVD — 4C40 LTO2 DC FC — 5040 LTO3 DC F3A– 5C40 LTO3 DC F3B– 6040 LTO4 DC F4A– 6C40 LTO5 DC F5A– 7C40
08 14 03	End Of Data Not Found — A Read type operation failed because of a format violation related to a missing EOD data set. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3041 LTO1 DT HVD — 3441 LTO1 DT FC — 3841 LTO1 DC LVD — 3C41 LTO1 DC HVD — 4041 LTO1 DC FC — 4441 LTO2 DC LVD — 4841 LTO2 DC HVD — 4C41 LTO2 DC FC — 5041 LTO3 DC F3A– 5C41 LTO3 DC F3B– 6041 LTO4 DC F4A– 6C41 LTO5 DC F5A– 7C41

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
0B 3D 00	Aborted Command — Invalid Bits In Identify message. An illegal Identify Message was received by the drive at the start of a command. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3042 LTO1 DT HVD — 3442 LTO1 DT FC — 3842 LTO1 DC LVD — 3C42 LTO1 DC HVD — 4042 LTO1 DC FC — 4442 LTO2 DC LVD — 4842 LTO2 DC HVD — 4C42 LTO2 DC FC — 5042 LTO3 DC F3A– 5C42 LTO3 DC F3B– 6042 LTO4 DC F4A– 6C42 LTO5 DC F5A– 7C42
0B 43 00	Aborted Command — Message Error. A message could not be sent or received due to excessive transmission errors. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3043 LTO1 DT HVD — 3443 LTO1 DT FC — 3843 LTO1 DC LVD — 3C43 LTO1 DC HVD — 4043 LTO1 DC FC — 4443 LTO2 DC LVD — 4843 LTO2 DC HVD — 4C43 LTO2 DC FC — 5043 LTO3 DC F3A– 5C43 LTO3 DC F3B– 6043 LTO4 DC F4A– 6C43 LTO5 DC F5A– 7C43

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
0B 45 00	Aborted Command — Select/Reset Failure. An attempt to reselect an initiator in order to complete the command failed. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3044 LTO1 DT HVD — 3444 LTO1 DT FC — 3844 LTO1 DC LVD — 3C44 LTO1 DC HVD — 4044 LTO1 DC FC — 4444 LTO2 DC LVD — 4844 LTO2 DC HVD — 4C44 LTO2 DC FC — 5044 LTO3 DC F3A– 5C44 LTO3 DC F3B– 6044 LTO4 DC F4A– 6C44 LTO5 DC F5A– 7C44
0B 48 00	Aborted Command — Initiator Detected Error Message. A command failed because an Initiator Detected Error message was received. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3045 LTO1 DT HVD — 3445 LTO1 DT FC — 3845 LTO1 DC LVD — 3C45 LTO1 DC HVD — 4045 LTO1 DC FC — 4445 LTO2 DC LVD — 4845 LTO2 DC HVD — 4C45 LTO2 DC FC — 5045 LTO3 DC F3A– 5C45 LTO3 DC F3B– 6045 LTO4 DC F4A– 6C45 LTO5 DC F5A– 7C45

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
0B 49 00	Aborted Command — Invalid Message Error. A command failed because an invalid message was received by the drive. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3046 LTO1 DT HVD — 3446 LTO1 DT FC — 3846 LTO1 DC LVD — 3C46 LTO1 DC HVD — 4046 LTO1 DC FC — 4446 LTO2 DC LVD — 4846 LTO2 DC HVD — 4C46 LTO2 DC FC — 5046 LTO3 DC F3A– 5C46 LTO3 DC F3B– 6046 LTO4 DC F4A– 6C46 LTO5 DC F5A– 7C46
0B 4A 00	Aborted Command — Command Phase Error. A command could not be executed because too many parity errors occurred during the Command phase. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3047 LTO1 DT HVD — 3447 LTO1 DT FC — 3847 LTO1 DC LVD — 3C47 LTO1 DC HVD — 4047 LTO1 DC FC — 4447 LTO2 DC LVD — 4847 LTO2 DC HVD — 4C47 LTO2 DC FC — 5047 LTO3 DC F3A– 5C47 LTO3 DC F3B– 6047 LTO4 DC F4A– 6C47 LTO5 DC F5A– 7C47

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
0B 4B 00	Aborted Command — Data Phase Error. A command could not be completed because too many parity errors occurred during the Data phase. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3048 LTO1 DT HVD — 3448 LTO1 DT FC — 3848 LTO1 DC LVD — 3C48 LTO1 DC HVD — 4048 LTO1 DC FC — 4448 LTO2 DC LVD — 4848 LTO2 DC HVD — 4C48 LTO2 DC FC — 5048 LTO3 DC F3A– 5C48 LTO3 DC F3B– 6048 LTO4 DC F4A– 6C48 LTO5 DC F5A– 7C48
0B 4E 00	Aborted Command — Overlapped Commands. An initiator selected the drive even though it already had a command outstanding in the drive. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 3049 LTO1 DT HVD — 3449 LTO1 DT FC — 3849 LTO1 DC LVD — 3C49 LTO1 DC HVD — 4049 LTO1 DC FC — 4449 LTO2 DC LVD — 4849 LTO2 DC HVD — 4C49 LTO2 DC FC — 5049 LTO3 DC F3A– 5C49 LTO3 DC F3B– 6049 LTO4 DC F4A– 6C49 LTO5 DC F5A– 7C49

Table 49. LTO Drive Sense Data to URC (continued)

Error Data	Description	URC
0D 00 02	Volume Overflow — End Of Media. A command failed because the physical end of tape was encountered. The EOM flag is set. See “Identifying Device Type” on page 272.	LTO1 DT LVD — 304A LTO1 DT HVD — 344A LTO1 DT FC — 384A LTO1 DC LVD — 3C4A LTO1 DC HVD — 404A LTO1 DC FC — 444A LTO2 DC LVD — 484A LTO2 DC HVD — 4C4A LTO2 DC FC — 504A LTO3 DC F3A– 5C4A LTO3 DC F3B– 604A LTO4 DC F4A– 6C4A LTO5 DC F5A– 7C4A

3592 Drive Sense Data to URC Table

This table should be used ONLY if you are unable to determine the FRU ID (FID) associated with a problem. Using the FID to determine an action plan and FRU list is preferred. If you are working with a host-reported problem attempt to find the FRU ID (FID). The FID is in byte 14 of the drive sense data - see Figure 38 on page 96. If unable to find the FID in the drive sense data at the host (as might be the case if the host only logs a subset of the sense data) then use the library operator panel to view the drive error log (MENU -> Service -> Drive Error Logs -> Drive Error Detail) to find the FID. If a FID is found then go to “3592 Drive FID to URC Table” on page 357 to find the URC. If you are unable to locate a FID but you do have the sense key, additional sense code (ASC), and additional sense code qualifier (ASCQ) then you must use the table below.

The data in the **Error Data** column of Table 50 on page 345 is divided into 3 groups. These groups from left to right are:

- Sense Byte 02 = Sense Key (SK)
- Sense Byte 12 = Additional Sense Code (ASC)
- Sense Byte 13 = Additional Sense Code Qualifier (ASCQ)

The **Sense Key** field may contain the following values:

- 00 — No Error or Status Information Only
- 01 — Recovered Error
- 02 — Not Ready
- 03 — Media Error
- 04 — Hardware Error
- 05 — Illegal Request
- 06 — Unit Attention
- 07 — Data Protect
- 08 — Blank Check
- 0B — Aborted Command
- 0D — Volume Overflow

In the **Error Data** column of Table 50 on page 345, a ‘—’ denotes that data is not applicable. An ‘xx’ denotes variable data will occur. Table 50 on page 345 also contains an error **Description** and a **URC** column.

Look up the 3592 drive sense data in this table to determine the URC, then go to “URC Table With Descriptions, Actions, and FRUs” on page 375 to repair the problem.

Notes:

1. The URC is for reference only and is not part of the sense data.
2. If you are working with **Library** sense data, go to “Library Sense Data to URC Table” on page 279.
3. If the drive is an **LTO**, go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
4. If you need to determine a drive type, first determine the location of the affected drive. Use host configuration data or application configuration data to determine the World Wide Node Name (WWNN) of the affected drive. Then use the library operator panel to display the WWNNs of all drives within the library (press the MENU button, the select Settings, Fibre Ports, World Wide Node Names), find the matching WWNN, and note the frame and row of the drive. To determine the drive type, consider the following:
   - Determine the drive type (3592 or LTO) by referring to the labels on the back of the drive.
   - Drive types may be abbreviated on the labels. **L1** indicates an LTO Ultrium-1 drive. **L2** indicates an LTO Ultrium-2 drive. **L3** indicates an LTO Ultrium-3 (3588 model F3A or F3B) drive. **L4** indicates an LTO Ultrium-4 (3588 model F4A) drive. **L5** indicates an LTO Ultrium-5 (3588 model F5A) drive. **J1A**

indicates a 3592 model J1A drive. **E05** indicates a 3592 model E05 drive, **E06** indicates a 3592 model E06 drive, and **EU6** indicates a 3592 model EU6 drive.

- For further information on Fixed Trays and drive canisters, see the table at Table 101 on page 874 and review the listed procedures and drawings for each type of drive.

Table 50. 3592 Drive Sense Data to URC

Error Data	Description	URC
xx 00 00	No sense information. This usually means there was no error. In rare instances it also can occur when a SCSI failure prevented the drive from returning sense information. If the flags in the sense data are non-zero they indicate the reason this sense was returned.	J1A DC FC — 1010 E05 DC FC — 1410 E06/EU6 DC FC — 1810 E07 DC FC — 1910
xx 00 01	Filemark Detected — A Read or Space command terminated early because a File Mark has been encountered. The File Mark flag is set.	J1A DC FC — 1011 E05 DC FC — 1411 E06/EU6 DC FC — 1811 E07 DC FC — 1911
xx 00 02	End of Partition/Medium Detected.	J1A DC FC — 1012 E05 DC FC — 1412 E06/EU6 DC FC — 1812 E07 DC FC — 1912
xx 00 04	Beginning of Partition/Medium Detected.	J1A DC FC — 1013 E05 DC FC — 1413 E06/EU6 DC FC — 1813 E07 DC FC — 1913
xx 00 05	End Of Data (EOD) detected — A Read or Space command terminated early because End of Data was encountered.	J1A DC FC — 1040 E05 DC FC — 1440 E06/EU6 DC FC — 1840 E07 DC FC — 1940
xx 00 16	Operation in Progress.	J1A DC FC — 1014 E05 DC FC — 1414 E06/EU6 DC FC — 1814 E07 DC FC — 1914
xx 00 17	Drive Requires Cleaning — The drive has detected that a cleaning operation is required to maintain good operation.	J1A DC FC — 1015 E05 DC FC — 1415 E06/EU6 DC FC — 1815 E07 DC FC — 1915

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 03 02	Excessive Write Errors.	J1A DC FC — 1022 E05 DC FC — 1422 E06/EU6 DC FC — 1822 E07 DC FC — 1922
xx 04 00	Not Ready — Cause Not reportable. **Note:** This error can also be caused if a 3592 CE cartridge was written on a 3592 E05 drive, and was then used to perform a read/write test on a 3592 J1A drive. This problem can be fixed by updating the 3592 J1A drive to code level 81A or higher.	J1A DC FC — 101B E05 DC FC — 141B E06/EU6 DC FC — 181B E07 DC FC — 191B
xx 04 01	Not Ready — Becoming Ready. A Media Access command was received during a load. The drive has not finished the load and thread process yet.	J1A DC FC — 101C E05 DC FC — 141C E06/EU6 DC FC — 181C E07 DC FC — 191C
xx 04 03	Not Ready — Manual Intervention Required.	J1A DC FC — 102D E05 DC FC — 142D E06/EU6 DC FC — 182D E07 DC FC — 191D
xx 04 04	Not Ready — Format in Progress.	J1A DC FC — 1050 E05 DC FC — 1450 E06/EU6 DC FC — 1850 E07 DC FC — 1950
xx 04 07	Not Ready — Operation in Progress.	J1A DC FC — 1051 E05 DC FC — 1451 E06/EU6 DC FC — 1851 E07 DC FC — 1951
xx 09 00	Track Following Error.	J1A DC FC — 1052 E05 DC FC — 1452 E06/EU6 DC FC — 1852 E07 DC FC — 1952
xx 0C 00	Write Error — A Write operation has failed.	J1A DC FC — 1022 E05 DC FC — 1422 E06/EU6 DC FC — 1822 E07 DC FC — 1922

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 11 00	Read Error — Unrecovered Read Error.	J1A DC FC — 1023 E05 DC FC — 1423 E06/EU6 DC FC — 1823 E07 DC FC — 1923
xx 11 01	Read Error — Read Retries Exhausted.	J1A DC FC — 1023 E05 DC FC — 1423 E06/EU6 DC FC — 1823 E07 DC FC — 1923
xx 11 08	Read Error — Incomplete Block Read.	J1A DC FC — 1023 E05 DC FC — 1423 E06/EU6 DC FC — 1823 E07 DC FC — 1923
xx 14 00	Recorded Entity Not Found.	J1A DC FC — 1024 E05 DC FC — 1424 E06/EU6 DC FC — 1824 E07 DC FC — 1924
xx 14 01	Record Not Found.	J1A DC FC — 1024 E05 DC FC — 1424 E06/EU6 DC FC — 1824 E07 DC FC — 1924
xx 14 02	File Mark or Set Mark Not Found.	J1A DC FC — 1024 E05 DC FC — 1424 E06/EU6 DC FC — 1824 E07 DC FC — 1924
xx 14 03	End of Data (EOD) Not Found.	J1A DC FC — 1041 E05 DC FC — 1441 E06/EU6 DC FC — 1841 E07 DC FC — 1941
xx 14 04	Block Sequence Error. Incompatible Media Installed.	J1A DC FC — 1025 E05 DC FC — 1425 E06/EU6 DC FC — 1825 E07 DC FC — 1925

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 15 01	Mechanical Positioning Error.	J1A DC FC — 1053 E05 DC FC — 1453 E06/EU6 DC FC — 1853 E07 DC FC — 1953
xx 17 01	Recovered Data with Retries.	J1A DC FC — 1017 E05 DC FC — 1417 E06/EU6 DC FC — 1817 E07 DC FC — 1917
xx 18 00	Recovered Data with Error Correction Applied.	J1A DC FC — 1018 E05 DC FC — 1418 E06/EU6 DC FC — 1818 E07 DC FC — 1918
xx 1A 00	Parameter list length error. The amount of parameter data sent is incorrect.	J1A DC FC — 1032 E05 DC FC — 1432 E06/EU6 DC FC — 1832 E07 DC FC — 1932
xx 1B 00	Synchronous Data Transfer Error.	J1A DC FC — 1043 E05 DC FC — 1443 E06/EU6 DC FC — 1843 E07 DC FC — 1943
xx 20 00	Invalid Command Operation Code in CDB. The Operation Code specified in the Command Descriptor Block was not valid.	J1A DC FC — 1033 E05 DC FC — 1433 E06/EU6 DC FC — 1833 E07 DC FC — 1933
xx 24 00	Invalid field in CDB. An invalid value was detected in the Command Descriptor Block.	J1A DC FC — 1034 E05 DC FC — 1434 E06/EU6 DC FC — 1834 E07 DC FC — 1934
xx 25 00	LUN not supported. The command was addressed to a non-existent Logical Unit Number.	J1A DC FC — 1035 E05 DC FC — 1435 E06/EU6 DC FC — 1835 E07 DC FC — 1935

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 26 00	Invalid Field in Parameter List. An invalid value was detected in the data sent during the data phase.	J1A DC FC — 1036 E05 DC FC — 1436 E06/EU6 DC FC — 1836 E07 DC FC — 1936
xx 26 01	Parameter Not Supported. A parameter was sent to the drive which is not supported by the drive.	J1A DC FC — 1036 E05 DC FC — 1436 E06/EU6 DC FC — 1836 E07 DC FC — 1936
xx 26 02	Parameter Value Invalid. A parameter value was sent to the drive which is not supported by the drive.	J1A DC FC — 1036 E05 DC FC — 1436 E06/EU6 DC FC — 1836 E07 DC FC — 1936
xx 26 03	Threshold Parameters Not Supported. A threshold value was sent to the drive which is not supported by the drive.	J1A DC FC — 1036 E05 DC FC — 1436 E06/EU6 DC FC — 1836 E07 DC FC — 1936
xx 27 00	A Write type operation has been requested on a cartridge which has been write protected.	J1A DC FC — 103E E05 DC FC — 143E E06/EU6 DC FC — 183E E07 DC FC — 193E
xx 28 00	Not Ready to Ready Transition. A cartridge has been loaded successfully into the drive and is now ready to be accessed.	J1A DC FC — 1039 E05 DC FC — 1439 E06/EU6 DC FC — 1839 E07 DC FC — 1939
xx 29 00	Reset. The drive has powered on or received a reset since the initiator last accessed it.	J1A DC FC — 103A E05 DC FC — 143A E06/EU6 DC FC — 183A E07 DC FC — 193A
xx 2A 01	Mode Parameters Changed. The Mode parameters for the drive have been changed by an initiator other than the one issuing the command.	J1A DC FC — 103B E05 DC FC — 143B E06/EU6 DC FC — 183B E07 DC FC — 193B

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 2A 02	Log Parameters Changed. The Log parameters for the drive have been changed by an initiator other than the one issuing the command.	J1A DC FC — 103B E05 DC FC — 143B E06/EU6 DC FC — 183B E07 DC FC — 193B
xx 2C 00	Command Sequence Error.	J1A DC FC — 104A E05 DC FC — 144A E06/EU6 DC FC — 184A E07 DC FC — 194A
xx 2F 00	Commands Cleared by another initiator.	J1A DC FC — 103B E05 DC FC — 143B E06/EU6 DC FC — 183B E07 DC FC — 193B
xx 30 00	Incompatible Media Installed.	J1A DC FC — 1025 E05 DC FC — 1425 E06/EU6 DC FC — 1825 E07 DC FC — 1925
xx 30 01	Unknown Format — An operation could not be carried out because the cartridge in the drive has a logical format that is not recognized by the drive.	J1A DC FC — 1025 E05 DC FC — 1425 E06/EU6 DC FC — 1825 E07 DC FC — 1925
xx 30 02	Incompatible Format — An operation could not be completed because the cartridge in the drive has a Logical Format that is not correct.	J1A DC FC — 1026 E05 DC FC — 1426 E06/EU6 DC FC — 1826 E07 DC FC — 1926
xx 30 03	Cleaning Cartridge Installed. An operation could not be carried out because the cartridge in the drive is a cleaning cartridge.	J1A DC FC — 101E E05 DC FC — 141E E06/EU6 DC FC — 181E E07 DC FC — 191E
xx 30 05	Cannot Write Medium. Incompatible Format.	J1A DC FC — 1026 E05 DC FC — 1426 E06/EU6 DC FC — 1826 E07 DC FC — 1926

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 30 07	Cleaning Failure. A cleaning operation was attempted, but could not be completed.	J1A DC FC — 101F E05 DC FC — 141F E06/EU6 DC FC — 181F E07 DC FC — 191F
xx 31 00	Data could not be read because the format on tape is not valid, but is a known format.	J1A DC FC — 1027 E05 DC FC — 1427 E06/EU6 DC FC — 1827 E07 DC FC — 1927
xx 31 01	Format Command Failed.	J1A DC FC — 1026 E05 DC FC — 1426 E06/EU6 DC FC — 1826 E07 DC FC — 1926
xx 33 00	Tape Length Error.	J1A DC FC — 102B E05 DC FC — 142B E06/EU6 DC FC — 182B E07 DC FC — 192B
xx 37 00	A Mode Select command parameter has been rounded because the drive cannot store it with the accuracy of the command.	J1A DC FC — 1019 E05 DC FC — 1419 E06/EU6 DC FC — 1819 E07 DC FC — 1919
xx 39 00	Saving Parameters Not Supported.	J1A DC FC — 104B E05 DC FC — 144B E06/EU6 DC FC — 184B E07 DC FC — 194B
xx 3A 00	Media Not Present.	J1A DC FC — 1020 E05 DC FC — 1420 E06/EU6 DC FC — 1820 E07 DC FC — 1920
xx 3B 00	Sequential Positioning Error.	J1A DC FC — 1028 E05 DC FC — 1428 E06/EU6 DC FC — 1828 E07 DC FC — 1928

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 3B 08	Reposition Error.	J1A DC FC — 1054 E05 DC FC — 1454 E06/EU6 DC FC — 1854 E07 DC FC — 1954
xx 3D 00	Invalid Bits in Identify Message.	J1A DC FC — 1042 E05 DC FC — 1442 E06/EU6 DC FC — 1842 E07 DC FC — 1942
xx 3F 01	Code Download. The firmware in the drive has just been changed.	J1A DC FC — 103C E05 DC FC — 143C E06/EU6 DC FC — 183C E07 DC FC — 193C
xx 3F 02	Changed Operating Definition.	J1A DC FC — 104C E05 DC FC — 144C E06/EU6 DC FC — 184C E07 DC FC — 194C
xx 3F 03	Inquiry Data has changed.	J1A DC FC — 104D E05 DC FC — 144D E06/EU6 DC FC — 184D E07 DC FC — 194D
xx 40 00	A diagnostic test has failed.	J1A DC FC — 102E E05 DC FC — 142E E06/EU6 DC FC — 182E E07 DC FC — 192E
xx 43 00	Message Error. A message could not be sent or received due to excessive transmission errors.	J1A DC FC — 1043 E05 DC FC — 1443 E06/EU6 DC FC — 1843 E07 DC FC — 1943
xx 44 00	Internal Target Failure — Drive Needs Cleaning, Warning Threshold Exceeded.	J1A DC FC — 102F E05 DC FC — 142F E06/EU6 DC FC — 182F E07 DC FC — 192F

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 45 00	Select/Reset Failure. An attempt to reselect an initiator in order to complete the command failed.	J1A DC FC — 1044 E05 DC FC — 1444 E06/EU6 DC FC — 1844 E07 DC FC — 1944
xx 47 00	SCSI Parity Error.	J1A DC FC — 1043 E05 DC FC — 1443 E06/EU6 DC FC — 1843 E07 DC FC — 1943
xx 47 80	Read Internal CRC Error.	J1A DC FC — 102E E05 DC FC — 142E E06/EU6 DC FC — 182E E07 DC FC — 192E
xx 47 81	Write Internal CRC Error.	J1A DC FC — 102E E05 DC FC — 142E E06/EU6 DC FC — 182E E07 DC FC — 192E
xx 48 00	Initiator Detected Error Message. A command failed because an Initiator Detected Error message was received.	J1A DC FC — 1045 E05 DC FC — 1445 E06/EU6 DC FC — 1845 E07 DC FC — 1945
xx 49 00	Invalid Message Error. A command failed because an invalid message was received by the drive.	J1A DC FC — 1046 E05 DC FC — 1446 E06/EU6 DC FC — 1846 E07 DC FC — 1946
xx 4A 00	Command Phase Error. A command could not be executed because too many parity errors occurred during the Command phase.	J1A DC FC — 1047 E05 DC FC — 1447 E06/EU6 DC FC — 1847 E07 DC FC — 1947
xx 4B 00	Data Phase Error. A command could not be completed because too many parity errors occurred during the Data phase.	J1A DC FC — 1048 E05 DC FC — 1448 E06/EU6 DC FC — 1848 E07 DC FC — 1948

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 4C 00	Drive failed Self-Configuration	J1A DC FC — 1021 E05 DC FC — 1421 E06/EU6 DC FC — 1821 E07 DC FC — 1921
xx 4E 00	Overlapped Commands. An initiator selected the drive even though it already had a command outstanding in the drive.	J1A DC FC — 1049 E05 DC FC — 1449 E06/EU6 DC FC — 1849 E07 DC FC — 1949
xx 50 01	Write Append Position Error.	J1A DC FC — 102A E05 DC FC — 142A E06/EU6 DC FC — 182A E07 DC FC — 192A
xx 51 00	Erase Failure.	J1A DC FC — 1030 E05 DC FC — 1430 E06/EU6 DC FC — 1830 E07 DC FC — 1930
xx 52 00	Cartridge Fault — A command could not be completed due to a fault in the tape cartridge.	J1A DC FC — 102B E05 DC FC — 142B E06/EU6 DC FC — 182B E07 DC FC — 192B
xx 53 00	Media Load or Eject Failed.	J1A DC FC — 102C E05 DC FC — 142C E06/EU6 DC FC — 182C E07 DC FC — 192C
xx 53 01	Unload Failed.	J1A DC FC — 1031 E05 DC FC — 1431 E06/EU6 DC FC — 1831 E07 DC FC — 1931
xx 53 02	Media Removal Prevented. An Unload command was rejected because the drive previously received a Prevent Media Removal command.	J1A DC FC — 1037 E05 DC FC — 1437 E06/EU6 DC FC — 1837 E07 DC FC — 1937

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 5A 01	Operator Medium Removal request.	J1A DC FC — 104F E05 DC FC — 144F E06/EU6 DC FC — 184F E07 DC FC — 194F
xx 5B 02	Log Counter at Maximum.	J1A DC FC — 104E E05 DC FC — 144E E06/EU6 DC FC — 184E E07 DC FC — 194E
xx 5B 03	Log List Codes Exhausted.	J1A DC FC — 103B E05 DC FC — 143B E06/EU6 DC FC — 183B E07 DC FC — 193B
xx 5D 00	Failure Prediction thresholds have been exceeded, indicating that a failure may occur soon.	J1A DC FC — 101A E05 DC FC — 141A E06/EU6 DC FC — 181A E07 DC FC — 191A
xx 5D FF	Failure Prediction thresholds have been exceeded.	J1A DC FC — 103D E05 DC FC — 143D E06/EU6 DC FC — 183D E07 DC FC — 193D
xx 83 83	Drive has been cleaned.	J1A DC FC — 1055 E05 DC FC — 1455 E06/EU6 DC FC — 1855 E07 DC FC — 1955
xx 85 00	Cartridge is Write Protected because of Cartridge or Drive Failure.	J1A DC FC — 103E E05 DC FC — 143E E06/EU6 DC FC — 183E E07 DC FC — 193E
xx 85 01	Cartridge is Write Protected because of Cartridge Failure.	J1A DC FC — 103E E05 DC FC — 143E E06/EU6 DC FC — 183E E07 DC FC — 193E

Table 50. 3592 Drive Sense Data to URC (continued)

Error Data	Description	URC
xx 85 02	Cartridge is Write Protected because of Drive Failure.	J1A DC FC — 103E E05 DC FC — 143E E06/EU6 DC FC — 183E E07 DC FC — 193E
xx 85 03	Write Protected because of Current Tape Position.	J1A DC FC — 103E E05 DC FC — 143E E06/EU6 DC FC — 183E E07 DC FC — 193E

3592 Drive FID to URC Table

If you are working with a host-reported problem attempt to find the FRU ID (FID). The FID is in byte 14 of the drive sense data - see Figure 38 on page 96. If unable to find the FID in the drive sense data at the host (as might be the case if the host only logs a subset of the sense data) then use the library operator panel to view the drive error log (MENU -> Service -> Drive Error Logs -> Drive Error Detail) to find the FID. If a FID is found then use the table below to find the URC. If you are unable to locate a FID but you do have the sense key, additional sense code (ASC), and additional sense code qualifier (ASCQ) then go to “3592 Drive Sense Data to URC Table” on page 344.

Look up the 3592 drive FID in this table to determine the URC, then go to **“URC Table With Descriptions, Actions, and FRUs” on page 375** to repair the problem. Also see **“3592 Drive Load/Unload Errors & FID” on page 363.**

Notes:

1. The URC is for reference only and is not part of the sense data.
2. If you are working with **Library** sense data, go to “Library Sense Data to URC Table” on page 279.
3. If the drive is an **LTO**, go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.
4. If you need to determine a drive type, first determine the location of the affected drive. Use host configuration data or application configuration data to determine the World Wide Node Name (WWNN) of the affected drive. Then use the library operator panel to display the WWNNs of all drives within the library (press the MENU button, the select Settings, Fibre Ports, World Wide Node Names), find the matching WWNN, and note the frame and row of the drive. To determine the drive type, consider the following:
   - Determine the drive type (3592 or LTO) by referring to the labels on the back of the drive.
   - Drive types may be abbreviated on the labels. **L1** indicates an LTO Ultrium-1 drive. **L2** indicates an LTO Ultrium-2 drive. **L3** indicates an LTO Ultrium-3 (3588 model F3A or F3B) drive. **L4** indicates an LTO Ultrium-4 (3588 model F4A) drive. **L5** indicates an LTO Ultrium-5 (3588 model F5A) drive. **J1A** indicates a 3592 model J1A drive. **E05** indicates a 3592 model E05 drive, **E06** indicates a 3592 model E06 drive, and **EU6** indicates a 3592 model EU6 drive.
   - For further information on Fixed Trays and drive canisters, see the table at Table 101 on page 874 and review the listed procedures and drawings for each type of drive.

Table 51. 3592 FID Severity Codes

Severity Code	Meaning
FID1	Problem is acute. Drive requires immediate service attention
FID2	Problem is serious. Drive is operating in a degraded condition
FID3	Problem is moderate. Drive is operating in a degraded condition
FID4	Drive requires service, but operation is not affected

Table 52. 3592 Drive FID to URC

FID	Description	URC
50	Encryption Configuration 100% Drive Canister	Encryption configuration installed during manufacturing is incorrect. Drive canister must be replaced.
51	Encryption Self-Test (POST HW) 100% Drive Canister	Encryption hardware power on self test failed. Drive canister must be replaced.
52	Encryption Self-Test (POST FW)	Encryption firmware power on self test failed. See FID E6 in this table.

Table 52. 3592 Drive FID to URC (continued)

FID	Description	URC
53	Encryption Self-Test (Invoked) 50% Drive Canister 50% Microcode	An explicitly invoked encryption self test failed. See FID E6 in this table.
54	Encryption Self-Test (Automatic) 80% Drive Canister 20% Microcode	An automatically invoked encryption diagnostic failed
55	Encryption Module Failure 80% Drive Canister 20% Microcode	An unexpected failure of hardware function occurred.
58	Encryption Error 100% Drive Canister	An error was detected during the encryption of data.
59	Decryption Error 25% Drive Canister 25% Microcode 25% EKM 25% Cartridge	An error was detected during the decryption of data.
5A	Encryption External Key Manager (EKM) Failure	An unexpected status was returned by the key manager. Check library/proxy interface, check EKM log. **Not a drive or microcode problem. Requires investigation by customer.**
5B	Encryption PROXY Failure	A failure or timeout occured on the proxy interface. Check library/proxy interface, check EKM log. **Not a drive or microcode problem. Requires investigation by customer.**
5F	Security Prohibited Function	A function was attempted which is prohibited due to the current security settings.
81	A thermal sensor inside the drive detected an over-temperature condition.	J1A DC FC — 1081 E05 DC FC — 1481 E06/EU6 DC FC — 1881 E07 DC FC — 1981
82	The drive detected that an input voltage is out of range, a power supply has failed, or a power supply cooling fan has failed.	J1A DC FC — 1082 E05 DC FC — 1482 E06/EU6 DC FC — 1882 E07 DC FC — 1982

Table 52. 3592 Drive FID to URC (continued)

FID	Description	URC
83	The drive detected a drive microcode fault.	J1A DC FC — 1083 E05 DC FC — 1483 E06/EU6 DC FC — 1883 E07 DC FC — 1983
84	The drive detected a timing problem in the drive microcode or drive electronics.	J1A DC FC — 1084 E05 DC FC — 1484 E06/EU6 DC FC — 1884 E07 DC FC — 1984
85	The drive detected a read, read/write, or track following error.	J1A DC FC — 1085 E05 DC FC — 1485 E06/EU6 DC FC — 1885 E07 DC FC — 1985
86	The drive detected a drive hardware or media fault.	J1A DC FC — 1086 E05 DC FC — 1486 E06/EU6 DC FC — 1886 E07 DC FC — 1986
87	The drive detected a cartridge/media problem	J1A DC FC — 1087 E05 DC FC — 1487 E06/EU6 DC FC — 1887 E07 DC FC — 1987
8A	The drive detected degraded drive hardware. The drive will continue to operate, but with degraded performance.	J1A DC FC — 108A E05 DC FC — 148A E06/EU6 DC FC — 188A E07 DC FC — 198A
90	The drive detected a drive electronics fault - possibly related to the drive service panel. Note: the drive service panel must not be used on drives in a 3584 library except under direction from support personnel.	J1A DC FC — 1090 E05 DC FC — 1490 E06/EU6 DC FC — 1890 E07 DC FC — 1990
9C	The drive detected a C20 hardware error. Note: This error should never be reported by a drive in a 3584 library. If it is reported it indicates that the drive is not configured for a 3584.	J1A DC FC — 109C E05 DC FC — 149C E06/EU6 DC FC — 189C E07 DC FC — 199C

Table 52. 3592 Drive FID to URC (continued)

FID	Description	URC
AA	The drive detected that its serial number is invalid (set to default value).	J1A DC FC — 10AA E05 DC FC — 14AA E06/EU6 DC FC — 18AA E07 DC FC — 19AA
AB	The drive detected that its setup is invalid.	J1A DC FC — 10AB E05 DC FC — 14AB E06/EU6 DC FC — 18AB E07 DC FC — 19AB
AC	The drive detected that its World Wide ID is blank, invalid, or unreadable.	J1A DC FC — 10AC E05 DC FC — 14AC E06/EU6 DC FC — 18AC E07 DC FC — 19AC
AD	The drive detected a mismatch between the drive VPD and the fixed tray BVPD.	J1A DC FC — 10AD E05 DC FC — 14AD E06/EU6 DC FC — 18AD E07 DC FC — 19AD
AE	The drive detected a hardware problem with the fixed tray BVPD.	J1A DC FC — 10AE E05 DC FC — 14AE E06/EU6 DC FC — 18AE E07 DC FC — 19AE
AF	The drive detected a problem in the eight-character operator display (located on the drive bezel).	J1A DC FC — 10AF E05 DC FC — 14AF E06/EU6 DC FC — 18AF E07 DC FC — 19AF
BF	The drive detected a drive canister fan fault.	J1A DC FC — 10BF E05 DC FC — 14BF E06/EU6 DC FC — 18BF E07 DC FC — 19BF
C1	The drive detected that an input voltage is out of range, a power supply has failed, or a power supply cooling fan has failed.	J1A DC FC — 10C1 E05 DC FC — 14C1 E06/EU6 DC FC — 18C1 E07 DC FC — 19C1

Table 52. 3592 Drive FID to URC (continued)

FID	Description	URC
D8	The drive detected degraded drive hardware. The drive will continue to operate, but with degraded performance.	J1A DC FC — 10D8 E05 DC FC — 14D8 E06/EU6 DC FC — 18D8 E07 DC FC — 19D8
E4	The drive detected a drive electronics fault.	J1A DC FC — 10E4 E05 DC FC — 14E4 E06/EU6 DC FC — 18E4 E07 DC FC — 19E4
E5	The drive detected a drive microcode fault.	J1A DC FC — 10E5 E05 DC FC — 14E5 E06/EU6 DC FC — 18E5 E07 DC FC — 19E5
E6	The drive detected a timing problem in the drive microcode or drive electronics.	J1A DC FC — 10E6 E05 DC FC — 14E6 E06/EU6 DC FC — 18E6 E07 DC FC — 19E6
ED	The drive detected that a drive dump has been written to flash memory. To clear a drive dump, go to “Clearing a 3592 Flash Dump” on page 740.	J1A DC FC — 10ED E05 DC FC — 14ED E06/EU6 DC FC — 18ED E07 DC FC — 19ED
F2	The drive detected a drive hardware or media fault.	J1A DC FC — 10F2 E05 DC FC — 14F2 E06/EU6 DC FC — 18F2 E07 DC FC — 19F2
F4	The drive detected a problem with the RS-422 library to drive interface.	J1A DC FC — 10F4 E05 DC FC — 14F4 E06/EU6 DC FC — 18F4 E07 DC FC — 19F4
F5	The drive detected a problem with the Fibre Channel host interface.	J1A DC FC — 10F5 E05 DC FC — 14F5 E06/EU6 DC FC — 18F5 E07 DC FC — 19F5

Table 52. 3592 Drive FID to URC (continued)

FID	Description	URC
F6	The drive reported an informational message - drive cleaning is required.	J1A DC FC — 10F6 E05 DC FC — 14F6 E06/EU6 DC FC — 18F6 E07 DC FC — 19F6
F7	The drive reported that the Fibre Channel Wrap Test failed.	J1A DC FC — 10F7 E05 DC FC — 14F7 E06/EU6 DC FC — 18F7 E07 DC FC — 19F7
FE	The drive detected a cartridge/media problem.	J1A DC FC — 10FE E05 DC FC — 14FE E06/EU6 DC FC — 18FE E07 DC FC — 19FE
FF	The drive reported an informational or non-hardware status error.	J1A DC FC — 10FF E05 DC FC — 14FF E06/EU6 DC FC — 18FF E07 DC FC — 19FF

3592 Drive Load/Unload Errors & FID

The 3592 drive error codes are based on the FID. All errors will translate into the appropriate FID, with one exception. Drive load/unload errors don't show a FID, even though the drive will display the words "load error" or "unload error" on it's front panel. This will be fixed in a later level of library firmware.

The library retrieves the error information as usual from the drive. However, the data retrieved from the drive for the load/unload error has a different format compared to the information retrieved for a load/unload error.

Following is an example of a 3592 drive load/unload error displayed through the Web Specialist and on the operator panel. It is always Severity=5, FID=12.

Date	Time	Severity
2008 10 08	13:46:43	5

FID	1st FSC
12	0100

2nd FSC	Cartridge
0000	



Figure 159. 3592 Load / Unload Error from Web Specialist

```
Panel 1062
Drive Error Detail
----------------------------
Key: F=Frame, R=Row

Drive  [F01, R01]   Log Entry 01

Legend:       yyyy/mm/dd hh:mm:ss
Date/Time:  2008/10/08 13:46:34
This log entry is a non-error entry. Raw data below.
0512010000002DA0
```

As you can see, the Web Specialist simply shows the raw data using the following scheme:

```
Byte 1 (lower nibble) -► Severity
Byte 2 -► FID
Byte 3&4 -► 1st FSC
Byte 5&6 -► 2nd FSC
```

LTO Ultrium-1 Drive FSC to URC Table

Determine what type of LTO Ultrium drive assembly you are working with (see notes below), look up the drive FSC (fault symptom code) in this table to determine the URC (unit reference code), then go to "URC Table With Descriptions, Actions, and FRUs" on page 375 to repair the problem.

Notes:

1. The URC is for reference only and is not part of the sense data.
2. The information in Table 53 only applies to LTO Ultrium-1 drives. If the drive is an LTO Ultrium-2, Ultrium-3, Ultrium-4, or Ultrium-5, go to "LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table" on page 315.
3. **If the drive is a 3592, go to "3592 Drive FID to URC Table" on page 357**.
4. If you are working with **Library** sense data, go to "Library Sense Data to URC Table" on page 279.
5. If you need to determine a drive type, first determine the location of the affected drive. See byte 35 of the drive sense data. As an example if the failing frame/device byte is X'14' (hex) this indicates that the drive is located in frame 1, row 4. When you have determined the frame and row number of the drive, visually check to see whether the drive assembly is a tray or a canister. To determine the type of drive that is in your library, consider the following:
   - Determine the drive type (3592, LTO LVD/HVD/FC) by referring to the labels on the back of the drive.
   - Drive types may be abbreviated on the labels. **L1** indicates an LTO Ultrium-1 drive. **L2** indicates an LTO Ultrium-2 drive. **L3** indicates an LTO Ultrium-3 (3588 model F3A or F3B) drive. **L4** indicates an LTO Ultrium-4 (3588 model F4A) drive. **L5** indicates an LTO Ultrium-5 (3588 model F5A) drive. **J1A** indicates a 3592 model J1A drive. **E05** indicates a 3592 model E05 drive, **E06** indicates a 3592 model E06 drive, and **EU6** indicates a 3592 model EU6 drive.
   - Early Fixed Tray assemblies did not have labels. Regard these as LTO1 DT LVD drives.
   - For further information on Fixed Trays and drive canisters, see the table at Table 101 on page 874 and review the listed procedures and drawings for each type of drive.

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
1000	3000	3400	3800	3C00	4000	4400
1010 through 1026	3000	3400	3800	3C00	4000	4400
1027	3007	3407	3807	3C07	4007	4407
1028	3005	3405	3805	3C05	4005	4405
1029	3000	3400	3800	3C00	4000	4400
1031 through 1033	3000	3400	3800	3C00	4000	4400
1035 through 1036	3000	3400	3800	3C00	4000	4400
1040 through 1047	3000	3400	38050	3C00	4000	4400
1050 through 1051	3005	3405	3805	3C05	4005	4405

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
1052 through 1058	3000	3400	3800	3C00	4000	4400
1410 through 1415	3000	3400	3800	3C00	4000	4400
1420 through 1423	3008	3408	3808	3C08	4008	4408
1430 through 1431	3008	3408	3808	3C08	4008	4408
1432	300A	340A	380A	3C0A	400A	440A
1433	3008	3408	3808	3C08	4008	4408
1434 through 1435	300A	340A	380A	3C0A	400A	440A
1440	300A	340A	380A	3C0A	400A	440A
1450 through 1451	3003	3403	3803	3C03	4003	4403
1460	3008	3408	3808	3C08	4008	4408
1461	N/A	N/A	380D	N/A	N/A	440D
1462	N/A	N/A	380E	N/A	N/A	440E
1463	N/A	N/A	380F	N/A	N/A	440F
1C00 through 1C08	3000	3400	3800	3C00	4000	4400
1C09	3003	3403	3803	3C03	4003	4403
1C0A through 1C0F	3000	3400	3800	3C00	4000	4400
1C10	3003	3403	3803	3C03	4003	4403
1C11 through 1C17	3000	3400	3800	3C00	4000	4400
2000 through 2001	3000	3400	3800	3C00	4000	4400
2002 through 2004	3003	3403	3803	3C03	4003	4403
2005 through 2006	3004	3404	3804	3C04	4004	4404

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
2010 through 2012	3003	3403	3803	3C03	4003	4403
2013	3006	3406	3806	3C06	4006	4406
2020 through 2025	3006	3406	3806	3C06	4006	4406
2026 through 202C	3000	3400	3800	3C00	4000	4400
202D	3006	3406	3806	3C06	4006	4406
2030 through 2034	3000	3400	3800	3C00	4000	4400
2040 through 2044	3005	3405	3805	3C05	4005	4405
204A	3005	3405	3805	3C05	4005	4405
2050 through 2052	3000	3400	3800	3C00	4000	4400
2060	3005	3405	3805	3C05	4005	4405
2061	3006	3406	3806	3C06	4006	4406
2062	3004	3404	3804	3C04	4004	4404
2070	300A	340A	380A	3C0A	400A	440A
2071 through 2072	3006	3406	3806	3C06	4006	4406
2073 through 2074	3000	3400	3800	3C00	4000	4400
2075	3006	3406	3806	3C06	4006	4406
2076	3000	3400	3800	3C00	4000	4400
2077	3006	3406	3806	3C06	4006	4406
2080 through 2081	3006	3406	3806	3C06	4006	4406
2082	3000	3400	3800	3C00	4000	4400
2083 through 2086	3007	3407	3807	3C07	4007	4407
2087	3000	3400	3800	3C00	4000	4400
2088 through 2091	3006	3406	3806	3C06	4006	4406

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
2092 through 2093	3000	3400	3800	3C00	4000	4400
2094	3006	3406	3806	3C06	4006	4406
2095 through 2096	3000	3400	3800	3C00	4000	4400
2097	3005	3405	3805	3C05	4005	4405
2098	3004	3404	3804	3C04	4004	4404
2099 through 209C	3006	3406	3806	3C06	4006	4406
209D through 209F	3004	3404	3804	3C04	4004	4404
20A0 through 20A1	3007	3407	3807	3C07	4007	4407
20A2 through 20A5	3006	3406	3806	3C06	4006	4406
20A6 through 20A7	3000	3400	3800	3C00	4000	4400
20A8	3007	3407	3807	3C07	4007	4407
20B0 through 20B2	3007	3407	3807	3C07	4007	4407
2101 through 2102	3000	3400	3800	3C00	4000	4400
2119	3000	3400	3800	3C00	4000	4400
2133	3006	3406	3806	3C06	4006	4406
2136	3000	3400	3800	3C00	4000	4400
2147 through 2148	3006	3406	3806	3C06	4006	4406
2161	3006	3406	3806	3C06	4006	4406
2177	3006	3406	3806	3C06	4006	4406
2180	3006	3406	3806	3C06	4006	4406
2189	3006	3406	3806	3C06	4006	4406
2191	3006	3406	3806	3C06	4006	4406
2197	3005	3405	3805	3C05	4005	4405
219B	3006	3406	3806	3C06	4006	4406
219D	3004	3404	3804	3C04	4004	4404

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
21A3	3007	3407	3807	3C07	4007	4407
21A6	3007	3407	3807	3C07	4007	4407
21A7	3000	3400	3800	3C00	4000	4400
2280	3006	3406	3806	3C06	4006	4406
2289	3006	3406	3806	3C06	4006	4406
22A6	3000	3400	3800	3C00	4000	4400
2800 through 2804	3006	3406	3806	3C06	4006	4406
2805	3007	3407	3807	3C07	4007	4407
2806	3006	3406	3806	3C06	4006	4406
2C00 through 2C09	3000	3400	3800	3C00	4000	4400
2C20 through 2C22	300A	340A	380A	3C0A	400A	440A
2C23 through 2C26	300C	340C	380C	3C0C	400C	440C
2C40	300A	340A	380A	3C0A	400A	440A
2C41	3000	3400	3800	3C00	4000	4400
2C42 through 2C26	3007	3407	3807	3C07	4007	4407
2C43 through 2C44	3007	3407	3807	3C07	4007	4407
2C45	3003	3403	3803	3C03	4003	4403
2C60 through 2C61	300A	340A	380A	3C0A	400A	440A
3001 through 3005	3003	3403	3803	3C03	4003	4403
3006 through 3007	300A	340A	380A	3C0A	400A	440A
3008	3006	3406	3806	3C06	4406	4406
3100 through 3101	3006	3406	3806	3C06	4006	4406
3102	3000	3400	3800	3C00	4000	4400
3103 through 3106	3006	3406	3806	3C06	4006	4406

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
3108 through 3110	3006	3406	3806	3C06	4006	4406
3111	300A	340A	380A	3C0A	400A	440A
3112 through 3114	3006	3406	3806	3C06	4006	4406
3115 through 3118	3005	3405	3805	3C05	4005	4405
3119	3006	3406	3806	3C06	4006	4406
3200 through 3204	3006	3406	3806	3C06	4006	4406
3205	300A	340A	380A	3C0A	400A	440A
3206 through 3209	3006	3406	3806	3C06	4006	4406
3210	3007	3407	3807	3C07	4007	4407
3211 through 3214	3006	3406	3806	3C06	4006	4406
3215	3005	3405	3805	3C05	4005	4405
3216	3007	3407	3807	3C07	4007	4407
4001 through 4002	3006	3406	3806	3C06	4006	4406
4003 through 4006	3000	3400	3800	3C00	4000	4400
4007 through 4008	3006	3406	3806	3C06	4006	4406
4010	300C	340C	380C	3C0C	400C	440C
4095	3000	3400	3800	3C00	4000	4400
5000 through 500F	3003	3403	3803	3C03	4003	4403
5010 through 5013	3003	3403	3803	3C03	4003	4403
5020 through 5028	3003	3403	3803	3C03	4003	4403

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
5040 through 5042	3003	3403	3803	3C03	4003	4403
5060 through 5065	3003	3403	3803	3C03	4003	4403
5070	3000	3400	3800	3C00	4000	4400
5100	3000	3400	3800	3C00	4000	4400
5101	3003	3403	3803	3C03	4003	4403
5110 through 5117	3005	3405	3805	3C05	4005	4405
5120	3005	3405	3805	3C05	4005	4405
5121	3004	3404	3804	3C04	4004	4404
5130 through 5133	3005	3405	3805	3C05	4005	4405
5140 through 5146	3008	3408	3808	3C08	4008	4408
5147	300F	340F	380F	3C0F	400F	440F
5148	3008	3408	3808	3C08	4008	4408
5150 through 5152	3009	3409	3809	3C09	4009	4409
5159 through 515B	3009	3409	3809	3C09	4009	4409
5160	300A	340A	380A	3C0A	400A	440A
5170 through 517E	3005	3405	3805	3C05	4005	4405
5180	3007	3407	3807	3C07	4007	4407
5190	3001	3401	3801	3C01	4001	4401
5191 through 5193	3002	3402	3802	3C02	4002	4402
5194 through 5197	3005	3405	3805	3C05	4005	4405
51A0	3003	3403	3803	3C03	4003	4403
51A1	3005	3405	3805	3C05	4005	4405
51A2	3004	3404	3804	3C04	4004	4404
51C0	3003	3403	3803	3C03	4003	4403
51C1	3004	3404	3804	3C04	4004	4404

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
51C2 through 51C4	3005	3405	3805	3C05	4005	4405
51D0	3005	3405	3805	3C05	4005	4405
51D1	3003	3403	3803	3C03	4003	4403
51D2 through 51D3	3005	3405	3805	3C05	4005	4405
51D5 through 51D9	3005	3405	3805	3C05	4005	4405
51DC	3003	3403	3803	3C03	4003	4403
51E0 through 51E1	3003	3403	3803	3C03	4003	4403
51E2 through 51E3	3005	3405	3805	3C05	4005	4405
51E4	3005	3405	3805	3C05	4005	4405
51F0 through 51F1	3003	3403	3803	3C03	4003	4403
51F2 through 51F3	3005	3405	3805	3C05	4005	4405
5200	3005	3405	3805	3C05	4005	4405
5210	3003	3403	3803	3C03	4003	4403
5211 through 5212	3005	3405	3805	3C05	4005	4405
5220 through 5221	3003	3403	3803	3C03	4003	4403
5222 through 5223	300A	340A	380A	3C0A	400A	440A
5224	3003	3403	3803	3C03	4003	4403
5225	300A	340A	380A	3C0A	400A	440A
5230 through 5232	3005	3405	3805	3C05	4005	4405
5233	3003	3403	3803	3C03	4003	4403
5234	3005	3405	3805	3C05	4005	4405
5240 through 5242	3005	3405	3805	3C05	4005	4405
5250	3007	3407	3807	3C07	4007	4407

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
5251 through 5253	3006	3406	3806	3C06	4006	4406
5254	3003	3403	3803	3C03	4003	4403
5260 through 5262	3007	3407	3807	3C07	4007	4407
5263	3006	3406	3806	3C06	4006	4406
5264	3003	3403	3803	3C03	4003	4403
5270	3007	3407	3807	3C07	4007	4407
5271 through 5272	300A	340A	380A	3C0A	400A	440A
5273	3006	3406	3806	3C06	4006	4406
5274	3003	3403	3803	3C03	4003	4403
5278	3007	3407	3807	3C07	4007	4407
5279 through 527B	3006	3406	3806	3C06	4006	4406
527C	3003	3403	3803	3C03	4003	4403
5280 through 5285	300A	340A	380A	3C0A	400A	440A
5290 through 5294	300A	340A	380A	3C0A	400A	440A
52A0 through 52AB	3005	3405	3805	3C05	4005	4405
52B0 through 52B5	3000	3400	3800	3C00	4000	4400
52C0	300A	340A	380A	3C0A	400A	440A
52C1	3003	3403	3803	3C03	4003	4403
52D0 through 52D1	300A	340A	380A	3C0A	400A	440A
52D2	3005	3405	3805	3C05	4005	4405
52D3	3003	3403	3803	3C03	4003	4403
5400	3006	3406	3806	3C06	4006	4406
5401	3007	3407	3807	3C07	4007	4407
5402	3006	3406	3806	3C06	4006	4406
5403 through 5404	3007	3407	3807	3C07	4007	4407

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
5405	3003	3403	3803	3C03	4003	4403
5410	3006	3406	3806	3C06	4006	4406
5411	3007	3407	3807	3C07	4007	4407
5412	3003	3403	3803	3C03	4003	4403
5421	3007	3407	3807	3C07	4007	4407
5422	3003	3403	3803	3C03	4003	4403
5430 through 5434	3004	3404	3804	3C04	4004	4404
5435 through 5437	3000	3400	3800	3C00	4000	4400
5510	3006	3406	3806	3C06	4006	4406
5520	3006	3406	3806	3C06	4006	4406
5521	3007	3407	3807	3C07	4007	4407
5600	3003	3403	3803	3C03	4003	4403
5601 through 5605	3003	3403	3803	3C03	4003	4403
5606 through 5607	300A	340A	380A	3C0A	400A	440A
5608 through 5609	3006	3406	3806	3C06	4006	4406
5640 through 5644	3003	3403	3803	3C03	4003	4403
5645 through 5646	3006	3406	3806	3C06	4006	4406
5647	300A	340A	380A	3C0A	400A	440A
5680	3006	3406	3806	3C06	4006	4406
5681	3007	3407	3807	3C07	4007	4407
5682	300A	340A	380A	3C0A	400A	440A
5683 through 5684	3006	3406	3806	3C06	4006	4406
5700	3003	3403	3803	3C03	4003	4403
5701 through 5702	300A	340A	380A	3C0A	400A	440A
5703	3003	3403	3803	3C03	4003	4403

Table 53. LTO Ultrium-1 Drive FSC to URC Conversion (continued)

FSC	URC (SCSI LVD Fixed Tray)	URC (SCSI HVD Fixed Tray)	URC (FC Fixed Tray)	URC (SCSI LVD Hot Swap Drive Canister)	URC (SCSI HVD Hot Swap Drive Canister)	URC (FC Hot Swap Drive Canister)
5704 through 5706	300A	340A	380A	3C0A	400A	440A
5707	3003	3403	3803	3C03	4003	4403
5708 through 570A	300A	340A	380A	3C0A	400A	440A
570B through 570E	3003	3403	3803	3C03	4003	4403
570F	300A	340A	380A	3C0A	400A	440A
5710	3003	3403	3803	3C03	4003	4403
5711 through 5712	300A	340A	380A	3C0A	400A	440A
5713	3008	3408	3808	3C08	4008	4408
5714	3003	3403	3803	3C03	4003	4403
5715 through 5718	300A	340A	380A	3C0A	400A	440A
F200	3000	3400	3800	3C00	4000	4400
F400	3000	3400	3800	3C00	4000	4400

URC Table With Descriptions, Actions, and FRUs

New Format for URC Table

Table 54 on page 376 combines URCs for 3592 and LTO drives, and other library components. Combining URCs reduces the overall size of the table making it more usable. The URC ranges, and starting locations, for drives, and other library components, are combined as follows:

Following URCs start on page 376:
- 1000 - 13FF -► 3592 J1A Drive
- 1400 - 17FF -► 3592 E05 Drive
- 1800 - 18FF -► 3592 E06/EU6 Drive
- 1900 - 19FF -► 3592 E07 Drive

Following URCs start on page 395:
- 3000 - 33FF -► LTO-1 Drive LVD (Tray)
- 3400 - 37FF -► LTO-1 Drive HVD (Tray)
- 3800 - 3BFF -► LTO-1 Drive Fibre (Tray)

Following URCs start on page 406:
- 3C00 - 3FFF -► LTO-1 Drive LVD (Canister)
- 4000 - 43FF -► LTO-1 Drive HVD (Canister)
- 4400 - 47FF -► LTO-1 Drive Fibre (Canister)

Following URCs start on page 417:
- 4800 - 4BFF -► LTO-2 Drive LVD (Canister)
- 4C00 - 4FFF -► LTO-2 Drive HVD (Canister)
- 5000 - 53FF -► LTO-2 Drive Fibre (Canister)

Following URCs start on page 428:
- 5C00 - 5FFF -► LTO-3 Drive Fibre (Canister)
- 6000 - 63FF -► LTO-3 4Gbit Drive Fibre (Canister)
- 6400 - 6BFF -► LTO-4 Drive Fibre (Canister)

Following URCs start on page 533:
- C000 - C0FF -► Library - DRIVE RELATED - 3592 J1A
- C100 - C1FF -► Library - DRIVE RELATED - 3592 E05
- C200 - C2FF -► Library - DRIVE RELATED - 3592 E06/EU6
- C300 - C3FF -► Library - DRIVE RELATED - 3592 E07

Following URCs start on page 446:
- A401 - A428 -► Node Cards (OPC, MCP, MCA, ACC, MDA)

Following URCs start on page 528:
- B401 - B710 -► Grippers

Following URCs start on page 512:
- B120 - B523 -► Grippers

Following URCs start on page 464:
- A4B0 - A4C9 -► Pivot and Scanners

Following URCs start on page 523:
- B150 - B559 -► Storage Slots

The first column in Table 54 lists the URC codes (unit reference codes) numerically. The second column gives a description of the URC, often followed by any associated **Failure Isolation Procedures.** In some cases, the Failure Isolation Procedures (also known as Checks) are followed by a **URC FRU List**. If the Checks find an obvious problem such as a loose cable, you may be able to repair the problem without referring to the FRU list. When FRUs (field replaceable units) are listed, they are in the order of probability of causing the error associated with that URC. The FRUs should be replaced and verified one at a time, in the order in which they are listed. You should **only** consider replacing **all** the FRUs shown in a list for a URC when you encounter an intermittent problem that is unusually difficult to diagnose.

If you have a URC that is not listed in Table 54, contact your next level of support.

Table 54. URC Description with Action and FRUs

URC	Description of Symptom, Required Action, and FRU
1010 1410 1810 1910	**Description** No sense information. This usually means there was no error. In rare instances it can occur when a host interface error prevents the drive from returning sense data. If the flags in the sense data are non-zero they indicate the reason this sense was returned. **Failure Isolation Procedure** **No repair action required**.
1011 1411 1811 1911	**Description** File Mark detected. A Read or Space command terminated early because a File Mark was encountered. The File Mark flag is set. **Failure Isolation Procedure** **No repair action required**.
1012 1412 1812 1912	**Description** End of Partition or Media detected. **Failure Isolation Procedure** **No repair action required**.
1013 1413 1813 1913	**Description** Beginning of Partition or Media detected. **Failure Isolation Procedure** **No repair action required**.
1014 1414 1814 1914	**Description** Operation in Progress. **Failure Isolation Procedure** **No repair action required**.
1015 1415 1815 1915	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** 1. If the problem persists after a successful cleaning, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1017 1417 1817 1917	**Description** Data was recovered with retries. **Failure Isolation Procedure** **No repair action required**.
1018 1418 1818 1918	**Description** Data was recovered with error correction applied. **Failure Isolation Procedure** **No repair action required**.
1019 1419 1819 1919	**Description** A Mode Select command parameter was rounded off because the drive cannot store it with the specified accuracy. **Failure Isolation Procedure** **No repair action required**.
101A 141A 181A 191A	**Description** Failure Prediction thresholds have been exceeded indicating that a failure may occur soon. **URC FRU List** 1. replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
101B 141B 181B 191B	**Description** Not Ready — Cause Not Reportable. **Failure Isolation Procedure** **Note:** This error can also be caused if a 3592 CE cartridge was written on a 3592 E05 drive, and was then used to perform a read/write test on a 3592 J1A drive. This problem can be fixed by updating the 3592 J1A drive to code level 81A or higher. **No repair action required**.
101C 141C 181C 181C	**Description** Not Ready — Becoming Ready. The drive has not finished the load and thread operation yet. **Failure Isolation Procedure** **No repair action required**.
101E 141E 181E 191E	**Description** Cleaning Cartridge Installed. The host attempted to access the cartridge currently loaded in the drive, but it is a cleaning cartridge. **Failure Isolation Procedure** Ask the customer to remove the cleaning cartridge from the drive and retry the job with a data cartridge.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
101F 141F 181F 191F	**Description** Cleaning Failure. An attempt to clean the drive failed. **Failure Isolation Procedure** **Attempt to clean the drive using a different cleaning cartridge.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
1020 1420 1820 1920	**Description** Not Ready — Media Not Present. The host attempted to access a cartridge in the drive, but there is no cartridge loaded. **Failure Isolation Procedure** **No repair action required**.
1021 1421 1821 1921	**Description** Not Ready — Drive Not Configured. The drive has just powered on or reset, and it has not completed its POST and configuration process. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged in securely at the Fixed Tray and at the MCP or MCA. Do not unplug the RS-422 cable from the MCP or MCA since this would affect all drives in the frame.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 3. If the problem persists, replace the MCP or MCA.
1022 1422 1822 1922	**Description** Write failure. The drive detected a failure during a Write operation. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job using a different tape cartridge. If the problem persists, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 2. If the problem persists, contact your next level of support.
1023 1423 1823 1923	**Description** Read failure. The drive detected a Read failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists then replace the tape cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1024 1424 1824 1924	**Description** Recorded Entity Not Found, Record Not Found, or File/Set Mark Not Found. This is probably due to bad media, but may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, contact your next level of support.
1025 1425 1825 1925	**Description** Incompatible Media. **Failure Isolation Procedure** **Notify the customer that the tape is incompatible with the drive.**.
1026 1426 1826 1926	**Description** Incompatible Format on Media. An operation could not be completed because the tape has a logical format that is not correct. This may be the result of a Format failure. If the customer uses different generations of 3592 drive, such as J1A, E05, E06/EU6 or E07 then it is important that the J1A drives be at the latest available version of code. This will allow the customer to reformat cartridges from E05 or E06/EU6 format to J1A format when necessary. Important: Do not reformat a cartridge unless you no longer need the data on the cartridge. **Note:** If this problem occurs when running diagnostics, it may be the result of using the same diagnostic cartridge in different generation tape drives. As an example, if you run diagnostics on a 3592 E05, E06/EU6 or E07 drive it will automatically logically format the media for E05, E06/EU6 or E07. If you then run diagnostics on a 3592 J1A drive with downlevel drive code then the diagnostics will fail because the J1A drive can't write in E05, E06/EU6 or E07 format. Installing the latest available code (81A or higher) on the 3592 J1A drive will resolve this problem by automatically reformatting the media for J1A when running diagnostics. **Failure Isolation Procedure** If this problem occurs on a customer cartridge, notify the customer that the tape has an incompatible format. The customer can reformat the cartridge. If this problem occurs on a diagnostic cartridge, update the drive to the latest available code then run the diagnostic again.
1027 1427 1827 1927	**Description** Media Format Corrupted. Data could not be read because the format on the tape is not valid, but it is a recognized format. **Failure Isolation Procedure** **Notify the customer that the tape has a corrupted format**.
1028 1428 1828 1928	**Description** Sequential Positioning Error. A command has failed and left the logical position at an unexpected location. **Failure Isolation Procedure** **Ask the customer to unload and reload the cartridge. If the problem persists, replace the cartridge.** **URC FRU List** If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
102A 142A 182A 192A	**Description** Write Append Error. A Write command has failed because the point at which to append data was unreadable. **Failure Isolation Procedure** **If this error occurred while running Library Verify or drive diagnostics, check to see if a WORM cartridge was used. Diagnostics are not supported on WORM cartridges. If this error occurred during normal operation, ask the customer to try the job in a different drive. If the problem persists in another drive, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, contact your next level of support.
102B 142B 182B 192B	**Description** Cartridge Fault or Tape Length Error. A command could not be completed because of a fault in the tape cartridge. **Failure Isolation Procedure** **Replace the cartridge.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, contact your next level of support.
102C 142C 182C 192C	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed. **Failure Isolation Procedure** **If the problem occurred while trying to load the cartridge, replace the cartridge. If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From a 3592 Drive" on page 1070. Notify the customer that the cartridge should not be used again**.
102D 142D 182D 182D	**Description** Manual Intervention Required. A cartridge is present in the drive, but it is in the unloaded position and cannot be loaded without manual intervention. **Failure Isolation Procedure** **Use the library to move the cartridge from the drive to its home slot or the I/O station. At the library operator panel, press MENU, then select Manual Operations, Manual Move. If the library is able to put the cartridge away without error then suspect a host application problem.**
102E 142E 182E 192E	**Description** Diagnostic Failure. A drive diagnostic or drive self-test failed. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
102F 142F 182F 192F	**Description** Internal Target Failure. A failure has been detected in the drive. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **Drive needs cleaning; Went past the cleaning threshold.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, contact your next level of support.
1030 1430 1830 1930	**Description** Erase Failure. An Erase command failed to erase the specified area on the tape. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, contact your next level of support.
1031 1431 1831 1831	**Description** Unload Failed. An attempt to unload the cartridge failed because of a problem with the drive or cartridge. **Failure Isolation Procedure** **If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048.** **URC FRU List** If the problem persists after removing the cartridge, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1032 1432 1832 1932 1033 1433 1833 1933 1034 1434 1834 1934 1035 1435 1835 1935 1036 1436 1836 1936	**Description** Wrong or invalid firmware values: • URC=1032, 1432, 1832, 1932 Parameter list length error. • URC=1033, 1433, 1833, 1933 Invalid command operation code. • URC=1034, 1434, 1834, 1934 Invalid field in CDB (see field pointer). • URC=1035, 1435, 1835, 1935 Logical unit not supported. • URC=1036, 1436, 1836, 1936 Invalid field in parameter list (see field pointer). **Failure Isolation Procedure** **The host application is sending invalid commands. Contact your next level of support.**
1037 1437 1837 1937	**Description** Illegal Request — Media Removal Prevented. An unload command was rejected because the drive previously received a Prevent Media Removal command. **Failure Isolation Procedure** **Ask the customer to clear the Prevent Media Removal command from the host.**
1039 1439 1839 1939 103A 143A 183A 193A 103B 143B 183B 193B 103C 143C 183C 193C 103D 143D 183D 193D	**Description** Status Changed: • URC=1039, 1439, 1839, 1939 Not-ready-to-ready transition, media was just loaded into the drive. • URC=103A, 143A, 183A, 193A Power on or Reset occurred. • URC=103B, 143B, 183B, 193B Log Select or Mode Select parameters were changed by another host, or commands were cleared by another host. • URC=103C, 143C, 183C, 193C Code Download. The firmware in the drive has just been changed. • URC=103D, 143D, 183D, 193D Failure Prediction False. A Mode Select command has been used to test for Failure Prediction system. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
103E 143E 183E 193E	**Description** Write Protect. A Write operation was requested on a cartridge which has been write protected. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
1040 1440 1840 1940	**Description** End Of Data. A Read or Space command terminated early because End Of Data was encountered. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
1041 1441 1841 1941	**Description** End Of Data Not Found. A Read operation failed because of a format violation related to a missing End Of Data. **Failure Isolation Procedure** **Notify the customer that the cartridge has a missing End Of Data.**
1042 1442 1842 1942 1043 1443 1843 1943 1044 1444 1844 1944 1045 1445 1845 1945 1046 1446 1846 1946 1047 1447 1847 1947 1048 1448 1848 1949	**Description** Aborted Command: • URC=1042, 1442, 1842, 1942 Invalid bits in Identify message. An illegal Identify Message was received by the drive at the start of a command. • URC=1043, 1443, 1843, 1943 Message Error. A message could not be sent or received due to excessive transmission errors and/or host interface parity errors. • URC=1044, 1444, 1844, 1944 Select/Reselect Failure. An attempt by the drive to reselect an initiator in order to complete a command failed. • URC=1045, 1445, 1845, 1945 Initiator Detected Error message. A command failed because the Initiator Detected Error message was received by the drive. • URC=1046, 1446, 1846, 1946 Invalid Message Error. A command failed because an invalid message was received by the drive. • URC=1047, 1447, 1847, 1947 Command Phase Error. A command could not be executed because too many parity errors occurred during the Command phase. • URC=1048, 1448, 1848, 1948 Data Phase Error. A command could not be executed because too many parity errors occurred during the Data phase. **Failure Isolation Procedure** **If the problem persists, go the “Fibre Channel Problems” on page 772.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1049 1449 1849 1949 104A 144A 184A 194A 104B 144B 184B 194B	**Description** Illegal Request or Aborted Command: • URC=1049, 1449, 1849, 1949 Overlapped Commands. An initiator attempted to send a command to the drive even though it already had another command being processed in the drive. • URC=104A, 144A, 184A, 194A Command Sequence Error. A command could not be executed because it is out of sequence. • URC=104B, 144B, 184B, 194B Saving Parameters is not supported. **Failure Isolation Procedure** **No action is necessary. These messages indicate that a host application sent an invalid/unsupported command or multiple hosts attempted to use a drive at the same time.**
104C 144C 184C 194C 104D 144D 184D 194D 104E 144E 184E 194E 104F 144F 184F 194F	**Description** Status Changed: • URC=104C, 144C, 184C, 194C Changed operating definition. • URC=104D, 144D, 184D, 194D Inquiry data has changed. • URC=104E, 144E, 184E, 194E Log Counter at maximum. • URC=104F, 144F, 184F, 194F Operator Medium Removal Request. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**
1050 1450 1850 1950 1051 1451 1851 1951	**Description** Not Ready: • URC=1050, 1450, 1850, 1950 Not ready, format in process. • URC=1051, 1451, 1851, 1951 Not ready, operation in process. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**
1052 1452 1852 1952 1053 1453 1853 1953 1054 1454 1854 1954	**Description** • URC=1052, 1452, 1852, 1952 Track following error. • URC=1053, 1453, 1853, 1953 Mechanical positioning error. • URC=1054, 1454, 1854, 1954 Reposition error. **Ask the customer to try the job using a different tape cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **Failure Isolation Procedure** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1055 1455 1855 1955	**Description** Status Changed: the drive has been cleaned. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
1081 1481 1881 1981	**Description** Cooling problem. The drive has detected an over-temperature condition. **Failure Isolation Procedure** **This problem could be caused by an out-of-spec (too hot) environment, by blocked air vents on the back of the Fixed Tray, or by a hardware problem with the Fixed Tray. If the room temperature is too high, notify the customer. Ensure the air vents on the back of the Fixed Tray are not blocked.** **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
1082 1482 1882 1982	**Description** The drive detected that an input voltage is out of range, a drive power supply has failed, 12v from BPC1 or BPC2 is out of range (x23/x53), or a drive power supply cooling fan has failed. **Failure Isolation Procedure** **x32, x22, x52 only:** Visually check the status LEDs on the drive power supply. If the AC LED is on but the DC LED is off then the power supply has failed. If the AC LED is off then ensure the bifurcated power cable is securely connected to the power supply and the MCP/MCA. **Note:** Do not unplug the bifurcated power cable at the MCP/MCA unless both of the drives supplied by this cable have redundant power. **x23, x53 only:** Visually check the 12v and 5v present LEDs on the fixed tray. If the 12v LED is on but the 5v LED is off then the fixed tray has failed. If 12v LED is off from either BPC1 (J2) or BPC2 (J3), check the cable from the failing BPC to the fixed tray to ensure it is securely connected to the BPC and the fixed tray. **URC FRU List** **x32, x22, x52 only:** 1. If the problem persists, replace the failing drive power supply. (see “Power Supply (x22/x52), Redundant – Hot Swap” on page 896). 2. If the problem persists, replace the Bifurcated FCA to Drive power cord. 3. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928). 4. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). **x23, x53 only:** 1. If the problem persists, replace the Fixed Tray Assembly. (see “Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models” on page 934). 2. If the problem persists, replace the failing BPC. (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942). 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1083 1483 1883 1983	**Description** Drive code problem. The drive detected an internal code problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU).
1084 1484 1884 1984	**Description** Drive code or drive hardware problem. The drive detected a timing problem but could not determine whether it is caused by drive code or by a drive hardware problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. 3. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of that cartridge. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. 4. Run the Library Verify diagnostic to determine whether the failure is repeatable. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive - contact support and provide the drive dump for analysis. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU). 2. If the problem persists, try the same operation using a different tape cartridge. 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1085 1485 1885 1985	**Description** The drive detected a Read, Read/Write, or Track Following problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. 3. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of that cartridge. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. 4. Run the Library Verify diagnostic to determine whether the failure is repeatable. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive - contact support and provide the drive dump for analysis. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU). 2. If the problem persists, try the same operation using a different tape cartridge. 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
1086 1486 1886 1986	**Description** The drive detected a Media or Drive hardware problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. 3. Obtain the bar code label volser of the cartridge that was in the drive at the time of the failure. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. 4. Run the Library Verify diagnostic to determine whether the failure is repeatable. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive. Notify the customer that the cartridge should be removed from the library. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU). 2. If the problem persists, try the same operation using a different tape cartridge. 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
1087 1487 1887 1987	**Description** The drive detected a Media/Cartridge problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. 3. Obtain the bar code label volser of the cartridge that was in the drive at the time of the failure. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. When you have identified the cartridge, notify the customer that this cartridge should be removed from the library. 4. Run the Library Verify diagnostic to test the drive. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive. **URC FRU List** 1. Media (tape cartridge). 2. Drive code (downloadable — do not order as a FRU). 3. If Library Verify reported a drive failure, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
108A 148A 188A 198A	**Description** The drive detected degraded drive hardware. The drive will continue to operate, but with reduced performance. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of the cartridge that was in the drive at the time of the failure. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. **URC FRU List** 1. replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
1090 1490 1890 1990	**Description** The drive detected a drive electronics fault. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. If a drive service panel is connected to the drive, remove it. The drive service panel is used to service the 3592 drive in other environments, but it is not supported for 3592 drives in the 3584 library. **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
109C 149C 189C 199C	**Description** The drive detected a C20 hardware failure. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. This failure should never be reported in a 3584 since it can only happen if the drive is configured for a C20 frame. Contact your next level of support.
10AA 14AA 18AA 19AA	**Description** The drive detected that its serial number is invalid (set to default value). **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Also obtain a library dump. Keep these dumps in case they are needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent the dumps. 2. Use the CETool program to update the drive serial number. Start the CETool program, then select "Update Drive Serial Number" on the "Commands" pull-down menu. Set the drive serial number to the number specified on the label on the back of the drive canister.
10AB 14AB 18AB 19AB 10AC 14AC 18AC 19AC 10AD 14AD 18AD 19AC	**Description** The drive detected a configuration problem: • URC=10AB, 14AB, 18AB, 19AB The drive detected that its setup is invalid. • URC=10AC, 14AC, 18AC, 19AC The drive detected that its World Wide ID is blank, invalid, or unreadable. • URC=10AD, 14AD, 18AD, 19AD The drive detected a mismatch between the drive Vital Product Data (VPD) and the Fixed Tray Backup VPD (BVPD). **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Also obtain a library dump. Keep these dumps in case they are needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent the dumps. 2. The drive setup (configuration) and World Wide ID is provided by the library each time the drive is reset or powered on. The VPD and BVPD are syncronized after a drive replacement or drive move by the library code. So for the setup to be invalid, it is likely that the library and drive are not communicating. Ensure that the RS/422 cable is securely connected at the fixed tray and at the MCP/MCA (do not unplug the cable at the MCP since this will affect all drives in the frame). Also ensure that the drive canister is securely seated in the fixed tray. 3. Determine whether the library is communicating with the drive. At the library operator panel, press the MENU button, then select Library Status, Drive Status. If the library is not communicating with the drive then the drive will show a 'CommFail' status. 4. If the library is communicating with the drive, reset the drive by removing and reinstalling the drive canister. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU). 2. Library code (downloadable — do not order as a FRU). 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 4. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
10AE 14AE 18AE 19AE	**Description** The drive detected a hardware problem with the Backup Vital Product Data (BVPD) on the Fixed Tray. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent the dump. 2. Ensure that the drive canister is securely seated in the fixed tray. **URC FRU List** 1. Replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928). 2. Replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models” on page 934). 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
10AF 14AF 18AF 19AF	**Description** The drive detected a hardware problem with the eight-character display on the drive bezel. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent the dump. **URC FRU List** 1. replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
10BF 14BE 18BE 19BE	**Description** The drive detected a hardware problem with the drive canister cooling fan. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent the dump. **URC FRU List** 1. replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
10C1 14C1 18C1 19C1	**Description** The drive detected that an input voltage is out of range, a drive power supply has failed, 12v from BPC1 or BPC2 is out of range (x23/x53), or a drive power supply cooling fan has failed. **Failure Isolation Procedure** **x32, x22, x52 only:** Visually check the status LEDs on the drive power supply. If the AC LED is on but the DC LED is off then the power supply has failed. If the AC LED is off then ensure the bifurcated power cable is securely connected to the power supply and the MCP. Note: Do not unplug the bifurcated power cable at the MCP unless both of the drives supplied by this cable have redundant power. **x23, x53 only:** Visually check the 12v and 5v present LEDs on the fixed tray. If the 12v LED is on but the 5v LED is off then the fixed tray has failed. If 12v LED is off from either BPC1 (J2) or BPC2 (J3), check the cable from the failing BPC to the fixed tray to ensure it is securely connected to the BPC and the fixed tray. **URC FRU List** **x32, x22, x52 only:** 1. If the problem persists, replace the failing drive power supply. (see “Power Supply (x22/x52), Redundant – Hot Swap” on page 896). 2. If the problem persists, replace the Bifurcated FCA to Drive power cord. 3. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928). 4. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). **x23, x53 only:** 1. If the problem persists, replace the Fixed Tray Assembly. (see “Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models” on page 934). 2. If the problem persists, replace the failing BPC. (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942). 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
10D8 14D8 18D8 19D8	**Description** The drive detected degraded drive hardware. The drive will continue to operate, but with reduced performance. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of the cartridge that was in the drive at the time of the failure. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. **URC FRU List** 1. replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
10E4 14E4 18E4 19E4	**Description** The drive detected a hardware fault in the drive electronics. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. **URC FRU List** 1. replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
10E5 14E5 18E5 19E5	**Description** Drive code problem. The drive detected an internal code problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU).
10E6 14E6 18E6 19E6	**Description** Drive code or drive hardware problem. The drive detected a timing problem but could not determine whether it is caused by drive code or by a drive hardware problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. 3. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of that cartridge. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. 4. Run the Library Verify diagnostic to determine whether the failure is repeatable. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive - contact support and provide the drive dump for analysis. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU). 2. If the problem persists, try the same operation using a different tape cartridge. 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
10ED 14ED 18ED 19ED	**Description** The drive detected that a drive dump has been written to flash memory. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. This is not an error, it is an indication that a service action was taken which copied a drive dump to flash memory. Writing a drive dump to flash memory should only be done when the drive is going to be exchanged. It provides dump information to the drive repair center indicating what failure led up to the drive replacement. 3. If a dump was accidentally written to flash memory, you may be able to clear it by loading drive code. **URC FRU List** 1. replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887).
10F2 14F2 18F2 19F2	**Description** The drive detected a Media or Drive hardware problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. 3. Obtain the bar code label volser of the cartridge that was in the drive at the time of the failure. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. 4. Run the Library Verify diagnostic to determine whether the failure is repeatable. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive. Notify the customer that the cartridge should be removed from the library. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU). 2. If the problem persists, try the same operation using a different tape cartridge. 3. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
10F4 14F4 18F4 19F4	**Description** The drive detected a problem with the RS-422 Library to Drive Interface **Failure Isolation Procedure** 1. It is likely that the library and drive are not communicating. Ensure that the RS-422 cable is securely connected at the fixed tray and at the MCP or MCA (do not unplug the cable at the MCP or MCA since this will affect all drives in the frame). Also ensure that the drive canister is securely seated in the fixed tray. 2. Determine whether the library is communicating with the drive. At the library operator panel, press the MENU button, then select Library Status, Drive Status. If the library is not communicating with the drive then the drive will show a 'CommFail' status. 3. If the library is communicating with the drive, obtain a drive dump from the failing drive (see “CETool” on page 725). Also obtain a library dump. Keep these dumps in case they are needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent the dumps. 4. If the library is communicating with the drive, reset the drive by removing and reinstalling the drive canister. **URC FRU List** 1. Drive code (downloadable — do not order as a FRU). 2. Library code (downloadable — do not order as a FRU). 3. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 4. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928 or “Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models” on page 934). 5. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 6. If the problem persists, replace the MCP or MCA (see “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840 or “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844).
10F5 14F5 18F5 19F5	**Description** The drive detected a problem with the Fibre Channel host interface. **Failure Isolation Procedure** 1. Go to“Fibre Channel Problems” on page 772 and use the Fibre Wrap Test to determine whether the problem is the drive or an external device. **URC FRU List** 1. If the Fibre Wrap Test indicates the drive is bad, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
10F6 14F6 18F6 19F6	**Description** The drive reported an informational message — drive cleaning is required. **Failure Isolation Procedure** 1. This is not an error. It indicates that the drive has determined that a cleaning is required. 2. Clean the drive: at the library operator panel press the MENU button, then select Manual Operations, and select Clean Drive. Select the drive that reported this error. 3. If any errors are displayed, such as No Cleaning Cartridge, or Cleaning Cartridge Expired, then correct the problem and restart the cleaning. **URC FRU List** 1. If the drive has been cleaned successfully but continues to indicate that it requires cleaning, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
10F7 14F7 18F7 19F7	**Description** The drive reported that the Fibre Channel Wrap Test failed. **Failure Isolation Procedure** 1. This indicates that the Fibre Channel Wrap Test was run and it detected a failure. 2. Ensure that a Fibre Channel Wrap Plug was on each of the two ports at the time the test failed. **URC FRU List** 1. If the Fibre Wrap Test continues to fail, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
10FE 14FE 18FE 19FE	**Description** The drive detected a Media/Cartridge problem. **Failure Isolation Procedure** 1. Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. **Note:** If this problem was reported by a Call Home then it is likely that the library already collected and sent a dump. 2. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. 3. Obtain the bar code label volser of the cartridge that was in the drive at the time of the failure. The volser may be in host **or** control unit error logs and may also be found by viewing the drive error log using the library operator panel. When you have identified the cartridge, notify the customer that this cartridge should be removed from the library. 4. Run the Library Verify diagnostic to test the drive. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive. **URC FRU List** 1. Media (tape cartridge). 2. Drive code (downloadable — do not order as a FRU). 3. If Library Verify reported a drive failure, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).
10FF 14FF 18FF 19FF	**Description** The drive reported an informational or status message. **Failure Isolation Procedure** 1. This is not an indication of a hardware error. It indicates that the drive has reported status or an informational message. 2. Look up the sense key (byte 2), additional sense code (byte 12), and additional sense code qualifier (byte 13) in the drive sense data. 3. Refer to the SENSE section to find the meaning of the sense data that was reported.
3000 3400 3800	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3001 3401 3801	**Description** Cooling problem. The drive has detected an over-temperature condition. **Failure Isolation Procedure** **This problem could be caused by an out-of-spec (too hot) environment, by blocked air vents on the back of the Fixed Tray, or by a hardware problem with the Fixed Tray. If the room temperature is too high, notify the customer. Ensure the air vents on the back of the Fixed Tray are not blocked.** **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
3002 3402 3802	**Description** 5 V dc drive power problem. The drive detected that the power is outside the required voltage range. **URC FRU List** The drive power supply is contained in the Fixed Tray, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
3003 3403 3803	**Description** Drive code problem. The drive detected an internal code problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support.
3004 3404 3804	**Description** Drive code or drive hardware problem. The drive detected a problem but could not determine whether it is caused by drive code or by a drive hardware problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see “CETool” on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it. **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3005 3405 3805	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** If the error occurred with the latest level of drive code already installed, additional actions are needed: 1. Capture a drive dump. 2. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of that cartridge. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. 3. Run the Library Verify diagnostic to determine whether the failure is repeatable. 4. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive - contact support and provide the drive dump for analysis. The drive dump analysis will attempt to determine whether the cause was media or an intermittent drive problem. **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
3006 3406 3806	**Description** Drive hardware or media problem. The drive detected a problem, but could not determine whether it was caused by an internal hardware problem or by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). If the problem persists, contact your next level of support.
3007 3407 3807	**Description** Media problem. The drive detected a problem and determined that it was caused by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support**.
3008 3408 3808	**Description** Drive SCSI error. The drive detected an error in the SCSI interface to the host computer. **Failure Isolation Procedure** **Go to "SCSI Bus Problems" on page 767**.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3009 3409 3809	**Description** The drive detected an error or timeout in RS-422 communications between the drive and the library MCP or MCA. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged securely at the Fixed Tray and at the MCP or MCA. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since unplugging it will affect all drives in the frame.** Determine whether the problem still exists. At the front panel of the library, select **[MENU], Library Status,** and **Drive Status**. If the failing drive indicates **CommFail** then the problem still exists. If the problem does still exist, use the FRU list below to repair the problem. If the problem does not still exist then the failure is intermittent. This usually indicates a microcode problem. Capture a library dump, then attempt to capture a drive dump for possible analysis by IBM Support. Do not replace any FRUs unless instructed to do so by your next level of support. **URC FRU List** 1. LTO Ultrium-1 LVD Fixed Tray (see “Drive Tray Assembly – LTO SCSI” on page 876). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 3. If the problem persists, replace the MCP or MCA.
300A 340A 380A	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see “CETool” on page 725). If newer drive code is available, install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
300C 340C 380C	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
380D	**Description** The drive determined that another device is using the same Fibre Channel AL_PA (Loop ID). The drive is offline. **Failure Isolation Procedure** This problem is caused when multiple devices on the same loop are set to the same Fibre Channel Loop ID. On the operator panel, press [MENU], select **Settings**, **SCSI/Loop**, **Display SCSI/Loop IDs**. Verify that all drives that are on a common loop (that is, attached to the same Fibre Channel hub) have different Loop IDs. If a conflict is found, press **Back**. Select **Change SCSI/Loop IDs**, and correct the problem. **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
380E	**Description** The drive received an OFFLINE command from another device on the Fibre Channel Arbitrated Loop. **Failure Isolation Procedure** **Go to "Fibre Channel Problems" on page 772**. **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
380F	**Description** Tape drive determined that there is no light on the Fibre Channel port. **Failure Isolation Procedure** Go to "Fibre Channel Problems" on page 772. **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
3010 3410 3810	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.
3011 3411 3811	**Description** Filemark detected. A Read or Space command terminated early because a File Mark was encountered. The File Mark flag is set. **Failure Isolation Procedure** **No repair action required**.
3012 3412 3812	**Description** End of Media. A Write or Write File Marks command ended in the early warning area. The EOM flag is set. **Failure Isolation Procedure** **No repair action required**.
3013 3413 3813	**Description** Beginning of Media. A Space command ended at Beginning of Media. The EOM flag also is set. **Failure Isolation Procedure** **No repair action required**.
3015 3415 3815	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3019 3419 3819	**Description** Recovered Error. A Mode Select command parameter was rounded off because the drive cannot store it with the specified accuracy. **Failure Isolation Procedure** **No repair action required**.
301A 341A 381A	**Description** Recovered Error. Failure Prediction thresholds have been exceeded indicating that a failure may occur soon. **URC FRU List** **replace the LTO Fixed Tray** (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
301B 341B 381B	**Description** Not Ready — Cause Not Reportable. A cartridge is present in the drive, but it is in the process of unloading. **Failure Isolation Procedure** **No repair action required**.
301C 341C 381C	**Description** Not Ready — Becoming Ready. The drive has not finished the load and thread operation yet. **Failure Isolation Procedure** **No repair action required**.
301D 341D 381D	**Description** Not Ready — Initializing Command Required. A cartridge is present in the drive, but is not logically loaded. A Load command is required. **Failure Isolation Procedure** **No repair action required**.
301E 341E 381E	**Description** Not Ready — Cleaning Cartridge Installed. The host attempted to access the cartridge currently loaded in the drive, but it is a cleaning cartridge. **Failure Isolation Procedure** **No repair action required**.
301F 341F 381F	**Description** Not Ready — Cleaning Failure. An attempt to clean the drive failed. **Failure Isolation Procedure** **Attempt to clean the drive using a different cleaning cartridge.** **URC FRU List** **If the problem persists, replace the LTO Fixed Tray** (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3020 3420 3820	**Description** Not Ready — Media Not Present. The host attempted to access a cartridge in the drive, but there is no cartridge loaded. **Failure Isolation Procedure** **No repair action required**.
3021 3421 3821	**Description** Not Ready — Drive Not Configured. The drive has just powered on or reset, and it has not completed its POST and configuration process. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged in securely at the Fixed Tray and at the MCP or MCA. Do not unplug the RS-422 cable from the MCP or MCA since this would affect all drives in the frame.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 3. If the problem persists, replace the MCP or MCA.
3022 3422 3822	**Description** Write failure. The drive detected a Write failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job using a different tape cartridge. If the problem persists, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Tray Assembly – LTO SCSI” on page 876). 2. If the problem persists, contact your next level of support.
3023 3423 3823	**Description** Read failure. The drive detected a Read failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists then replace the tape cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3024 3424 3824	**Description** Recorded Entity Not Found. A Space or Locate command failed because a format violation prevented the target from being found. This is probably due to bad media, but may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
3025 3425 3825	**Description** Unknown Format on Media. An operation could not be completed because the tape has a logical format that is not recognized by the drive. **Failure Isolation Procedure** **Notify the customer that the tape has an unknown format**.
3026 3426 3826	**Description** Incompatible Format on Media. An operation could not be completed because the tape has a logical format that is not correct. **Failure Isolation Procedure** **Notify the customer that the tape has an incompatible format**.
3027 3427 3827	**Description** Media Format Corrupted. Data could not be read because the format on the tape is not valid, but it is a recognized format. A failure occurred attempting to write the file ID. **Failure Isolation Procedure** **Notify the customer that the tape has a corrupted format**.
3028 3428 3828	**Description** Sequential Positioning Error. A command has failed and left the logical position at an unexpected location. **Failure Isolation Procedure** **Ask the customer to unload and reload the cartridge. If the problem persists, replace the cartridge.** **URC FRU List** If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
302A 342A 382A	**Description** Write Append Error. A Write command has failed because the point at which to append data was unreadable. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
302B 342B 382B	**Description** Cartridge Fault. A command could not be completed because of a fault in the tape cartridge. **Failure Isolation Procedure** **Replace the cartridge.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
302C 342C 382C	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the cartridge. **Failure Isolation Procedure** **If the problem occurred while trying to load the cartridge, replace the cartridge. If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to “From an LTO Drive” on page 1048. Notify the customer that the cartridge should not be used again**.
302D 342D 382D	**Description** Manual Intervention Required. A cartridge is present in the drive, but it cannot be loaded or unloaded without manual intervention. **Failure Isolation Procedure** **If the cartridge is still in the drive, go to “From an LTO Drive” on page 1048.** **URC FRU List** replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
302E 342E 382E	**Description** Diagnostic Failure. A diagnostic self-test failed. **Failure Isolation Procedure** **See if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
302F 342F 382F	**Description** Internal Target Failure. A hardware failure has been detected in the drive. **Failure Isolation Procedure** **See if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3030 3430 3830	**Description** Erase Failure. An Erase command failed to erase the specified area on the tape. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
3031 3431 3831	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the drive. **Failure Isolation Procedure** **If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048.** **URC FRU List** replace the LTO Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
3032 3432 3832 3033 3433 3833 3034 3434 3834 3035 3435 3835 3036 3436 3836	**Description** Wrong or invalid firmware values: • URC=3032, Parameter list length error. • URC=3033, Invalid command operation code. • URC=3034, Invalid field in CDB (see field pointer). • URC=3035, Logical unit not supported. • URC=3036, Invalid field in parameter list (see field pointer). **Failure Isolation Procedure** **The host application is sending invalid commands. Contact your next level of support.**
3037 3437 3837	**Description** Illegal Request — Media Removal Prevented. An unload command was rejected because the drive previously received a Prevent Media Removal command. **Failure Isolation Procedure** **Ask the customer to clear the Prevent Media Removal command from the host.**
3038 3438 3838	**Description** Illegal Request — Bad Code Detected. The code transferred to the drive during a firmware upgrade is corrupt or incompatible with the drive. **Failure Isolation Procedure** **The drive will continue to operate on the existing level of firmware. If you want to load new firmware, try to apply it again. If the problem persists, obtain a new firmware file and attempt to apply it again. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3039 3439 3839 303A 343A 383A 303B 343B 38AB 303C 343C 383C 303D 343D 38AD	**Description** Status Changed: • URC=3039, 3439, 3839, Not-ready-to-ready transition, media was just loaded into the drive. • URC=303A, 343A, 383A, Power on or Reset occurred. • URC=303B, 343B, 38AB, Mode select parameters were changed by another host. • URC=303C, 343C, 383C, Code Download. The firmware in the drive has just been changed. • URC=303D, 343D, 38AD, Failure Prediction False. A Mode Select command has been used to test for Failure Prediction system. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**
303E 343E 383E	**Description** Write Protect. A Write operation was requested on a cartridge which has been write protected. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
303F 343F 383F	**Description** Incompatible Media. A Write operation was requested on a cartridge which is not writable. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
3040 3440 3840	**Description** End Of Data. A Read or Space command terminated early because End Of Data was encountered. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
3041 3441 3841	**Description** End Of Data Not Found. A Read operation failed because of a format violation related to a missing End Of Data data set. **Failure Isolation Procedure** **Notify the customer that the cartridge has a missing End Of Data data set.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3042 3442 3842 3043 3443 3843 3044 3444 3844 3045 3445 3845 3046 3446 3846 3047 3447 3847 3048 3448 3848 3049 3449 3849	**Description** Aborted Command: • URC=3042, 3442, 3842, Invalid bits in Identify message. An illegal Identify Message was received by the drive at the start of a command. • URC=3043, 3443, 3843, Message Error. A message could not be sent or received due to excessive transmission errors. • URC=3044, 3444, 3844, Select/Reselect Failure. An attempt by the drive to reselect an initiator in order to complete a command failed. • URC=3045, 3445, 3845, Initiator Detected Error message. A command failed because the Initiator Detected Error message was received by the drive. • URC=3046, 3446, 3846, Invalid Message Error. A command failed because an invalid message was received by the drive. • URC=3047, 3447, 3847, Command Phase Error. A command could not be executed because too many parity errors occurred during the Command phase. • URC=3048, 3448, 3848, Data Phase Error. A command could not be executed because too many parity errors occurred during the Data phase. • URC=3049, 3449, 3849, Overlapped Commands. An initiator attempted to send a command to the drive even though it already had another command being processed in the drive. **Failure Isolation Procedure** **If the problem persists, go the "SCSI Bus Problems" on page 767.**
304A 344A 384A	**Description** Volume Overflow — End Of Media. A command failed because the physical end of tape was encountered. The End Of Media flag is set. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
3C00 4000 4400	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.
3C01 4001 4401	**Description** Cooling problem. The drive has detected an overtemperature condition. **Failure Isolation Procedure** **This problem could be caused by an out-of-spec (too hot) environment, by blocked air vents on the back of the Fixed Tray, or by a hardware problem with the Fixed Tray. If the room temperature is too high, notify the customer. Ensure the air vents on the back of the Fixed Tray are not blocked.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C02 4002 4402	**Description** 5 V dc drive power problem. The drive detected that the power is outside the required voltage range. **URC FRU List** The drive power supply is a separate FRU located on the fixed tray. Replace the drive power supply (see "Power Supply (x32), Redundant – Hot Swap" on page 892).
3C03 4003 4403	**Description** Drive code problem. The drive detected an internal code problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support.
3C04 4004 4404	**Description** Drive code or drive hardware problem. The drive detected a problem but could not determine whether it is caused by drive code or by a drive hardware problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
3C05 4005 4405	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** If the error occurred with the latest level of drive code already installed, additional actions are needed: 1. Capture a drive dump. 2. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of that cartridge. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. 3. Run the Library Verify diagnostic to determine whether the failure is repeatable. 4. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive - contact support and provide the drive dump for analysis. The drive dump analysis will attempt to determine whether the cause was media or an intermittent drive problem. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C06 4006 4406	**Description** Drive hardware or media problem. The drive detected a problem, but could not determine whether it was caused by an internal hardware problem or by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). If the problem persists, contact your next level of support.
3C07 4007 4407	**Description** Media problem. The drive detected a problem and determined that it was caused by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support**.
3C08 4008 4408	**Description** Drive SCSI error. The drive detected an error in the SCSI interface to the host computer. **Failure Isolation Procedure** **Go to "SCSI Bus Problems" on page 767**.
3C09 4009 4409	**Description** The drive detected an error or timeout in RS-422 communications between the drive and the library MCP or MCA. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged securely at the Fixed Tray and at the MCP or MCA. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since unplugging it will affect all drives in the frame.** Determine whether the problem still exists. At the front panel of the library, select **[MENU], Library Status,** and **Drive Status**. If the failing drive indicates **CommFail** then the problem still exists. If the problem does still exist, use the FRU list below to repair the problem. If the problem does not still exist then the failure is intermittent. This usually indicates a microcode problem. Capture a library dump, then attempt to capture a drive dump for possible analysis by IBM Support. Do not replace any FRUs unless instructed to do so by your next level of support. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see"Drive Types, Fixed Trays, and Power Supplies" on page 874). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 4. If the problem persists, replace the MCP or MCA.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C0A 400A 440A	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
3C0C 400C 440C	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
3C0D 400D 440D	**Description** The drive determined that another device is using the same Fibre Channel AL_PA (Loop ID). The drive is offline. **Failure Isolation Procedure** This problem is caused when multiple devices on the same loop are set to the same Fibre Channel Loop ID. On the operator panel, press [MENU], select **Settings**, **SCSI/Loop IDs**, **Display SCSI/Loop IDs**. Verify that all drives that are on a common loop (that is, attached to the same Fibre Channel hub) have different Loop IDs. If a conflict is found, press **Back**. Select **Change SCSI/Loop IDs**, and correct the problem **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
3C0E 400E 440E	**Description** The drive received an OFFLINE command from another device on the Fibre Channel Aribitrated Loop. **Failure Isolation Procedure** Go to "Fibre Channel Problems" on page 772. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
3C0F 400F 440F	**Description** The drive determined that there is no light on the Fibre Channel port. **Failure Isolation Procedure** Go to "Fibre Channel Problems" on page 772. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C10 4010 4410	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.
3C11 4011 4411	**Description** Filemark detected. A Read or Space command terminated early because a File Mark was encountered. The File Mark flag is set. **Failure Isolation Procedure** **No repair action required**.
3C12 4012 4412	**Description** End of Media. A Write or Write File Marks command ended in the early warning area. The EOM flag is set. **Failure Isolation Procedure** **No repair action required**.
3C13 4013 4413	**Description** Beginning of Media. A Space command ended at Beginning of Media. The EOM flag also is set. **Failure Isolation Procedure** **No repair action required**.
3C15 4015 4415	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
3C19 4019 4419	**Description** Recovered Error. A Mode Select command parameter was rounded off because the drive cannot store it with the specified accuracy. **Failure Isolation Procedure** **No repair action required**.
3C1A 401A 441A	**Description** Recovered Error. Failure Prediction thresholds have been exceeded indicating that a failure may occur soon. **URC FRU List** Replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C1B 401B 441B	**Description** Not Ready — Cause Not Reportable. A cartridge is present in the drive, but it is in the process of unloading. **Failure Isolation Procedure** **No repair action required**.
3C1C 401C 441C	**Description** Not Ready — Becoming Ready. The drive has not finished the load and thread operation yet. **Failure Isolation Procedure** **No repair action required**.
3C1D 401D 441D	**Description** Not Ready — Initializing Command Required. A cartridge is present in the drive, but is not logically loaded. A Load command is required. **Failure Isolation Procedure** **No repair action required**.
3C1E 401E 441E	**Description** Not Ready — Cleaning Cartridge Installed. The host attempted to access the cartridge currently loaded in the drive, but it is a cleaning cartridge. **Failure Isolation Procedure** **No repair action required**.
3C1F 401F 441F	**Description** Not Ready — Cleaning Failure. An attempt to clean the drive failed. **Failure Isolation Procedure** **Attempt to clean the drive using a different cleaning cartridge.** **URC FRU List** **If the problem persists, replace the LTO Fixed Tray** (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
3C20 4020 4420	**Description** Not Ready — Media Not Present. The host attempted to access a cartridge in the drive, but there is no cartridge loaded. **Failure Isolation Procedure** **No repair action required**.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C21 4021 4421	**Description** Not Ready — Drive Not Configured. The drive has just powered on or reset, and it has not completed its POST and configuration process. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged in securely at the Fixed Tray and at the MCP or MCA. Do not unplug the RS-422 cable from the MCP or MCA since this would affect all drives in the frame.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 3. If the problem persists, replace the MCP or MCA.
3C22 4022 4422	**Description** Write failure. The drive detected a Write failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job using a different tape cartridge. If the problem persists, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
3C23 4023 4423	**Description** Read failure. The drive detected a Read failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists then replace the tape cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
3C24 4024 4424	**Description** Recorded Entity Not Found. A Space or Locate command failed because a format violation prevented the target from being found. This is probably due to bad media, but may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C25 4025 4425	**Description** Unknown Format on Media. An operation could not be completed because the tape has a logical format that is not recognized by the drive. **Failure Isolation Procedure** **Notify the customer that the tape has an unknown format**.
3C26 4026 4426	**Description** Incompatible Format on Media. An operation could not be completed because the tape has a logical format that is not correct. **Failure Isolation Procedure** **Notify the customer that the tape has an incompatible format**.
3C27 4027 4427	**Description** Media Format Corrupted. Data could not be read because the format on the tape is not valid, but it is a recognized format. A failure occurred attempting to write the file ID. **Failure Isolation Procedure** **Notify the customer that the tape has a corrupted format**.
3C28 4028 4428	**Description** Sequential Positioning Error. A command has failed and left the logical position at an unexpected location. **Failure Isolation Procedure** **Ask the customer to unload and reload the cartridge. If the problem persists, replace the cartridge.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
3C2A 402A 442A	**Description** Write Append Error. A Write command has failed because the point at which to append data was unreadable. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
3C2B 402B 442B	**Description** Cartridge Fault. A command could not be completed because of a fault in the tape cartridge. **Failure Isolation Procedure** **Replace the cartridge.** **URC FRU List** 1. If the problem persists, replace the If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C2C 402C 442C	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the cartridge. **Failure Isolation Procedure** **If the problem occurred while trying to load the cartridge, replace the cartridge. If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048. Notify the customer that the cartridge should not be used again**.
3C2D 402D 442D	**Description** Manual Intervention Required. A cartridge is present in the drive, but it cannot be loaded or unloaded without manual intervention. **Failure Isolation Procedure** **If the cartridge is still in the drive, and go to "From an LTO Drive" on page 1048.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
3C2E 402E 442E	**Description** Diagnostic Failure. A diagnostic self-test failed. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
3C2F 402F 442F	**Description** Internal Target Failure. A hardware failure has been detected in the drive. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
3C30 4030 4430	**Description** Erase Failure. An Erase command failed to erase the specified area on the tape. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C31 4031 4431	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the drive. **Failure Isolation Procedure** **If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
3C32 4032 4432 3C33 4033 4433 3C34 4034 4434 3C35 4035 4435 3C36 4036 4436	**Description** Wrong or invalid firmware values: • URC=3C32, 4032, 4432, Parameter list length error. • URC=3C33, 4033, 4433, Invalid command operation code. • URC=3C34, 4034, 4434, Invalid field in CDB (see field pointer). • URC=3C35, 4035, 4435, Logical unit not supported. • URC=3C36, 4036, 4436, Invalid field in parameter list (see field pointer). **Failure Isolation Procedure** **The host application is sending invalid commands. Contact your next level of support.**
3C37 4037 4437	**Description** Illegal Request — Media Removal Prevented. An unload command was rejected because the drive previously received a Prevent Media Removal command. **Failure Isolation Procedure** **Ask the customer to clear the Prevent Media Removal command from the host.**
3C38 4038 4438	**Description** Illegal Request — Bad Code Detected. The code transferred to the drive during a firmware upgrade is corrupt or incompatible with the drive. **Failure Isolation Procedure** **The drive will continue to operate on the existing level of firmware. If you want to load new firmware, try to apply it again. If the problem persists, obtain a new firmware file and attempt to apply it again. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C39 4039 4439 3C3A 403A 443A 3C3B 403B 443B 3C3C 403C 443C 3C3D 403D 443D	**Description** Status Changed: • URC=3C39, 4039, 4439, Not-ready-to-ready transition, media was just loaded into the drive. • URC=3C3A, 403A, 443A, Power on or Reset occurred. • URC=3C3B, 403B, 443B, Mode select parameters were changed by another host. • URC=3C3C, 403C, 443C, Code Download. The firmware in the drive has just been changed. • URC=3C3D, 403D, 443D, Failure Prediction False. A Mode Select command has been used to test for Failure Prediction system. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**
3C3E 403E 443E	**Description** Write Protect. A Write operation was requested on a cartridge which has been write protected. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
3C3F 403F 443F	**Description** Incompatible Media. A Write operation was requested on a cartridge which is not writable. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
3C40 4040 4440	**Description** End Of Data. A Read or Space command terminated early because End Of Data was encountered. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
3C41 4041 4441	**Description** End Of Data Not Found. A Read operation failed because of a format violation related to a missing End Of Data data set. **Failure Isolation Procedure** **Notify the customer that the cartridge has a missing End Of Data data set.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
3C42 4042 4442 3C43 4043 4443 3C44 4044 4444 3C45 4045 4445 3C46 4046 4446 3C47 4047 4447 3C48 4048 4448 3C49 4049 4449	**Description** Aborted Command: • URC=3C42, 4042, 4442, Invalid bits in Identify message. An illegal Identify Message was received by the drive at the start of a command. • URC=3C43, 4043, 4443, Message Error. A message could not be sent or received due to excessive transmission errors. • URC=3C44, 4044, 4444, Select/Reselect Failure. An attempt by the drive to reselect an initiator in order to complete a command failed. • URC=3C45, 4045, 4445, Initiator Detected Error message. A command failed because the Initiator Detected Error message was received by the drive. • URC=3C46, 4046, 4446, Invalid Message Error. A command failed because an invalid message was received by the drive. • URC=3C47, 4047, 4447, Command Phase Error. A command could not be executed because too many parity errors occurred during the Command phase. • URC=3C48, 4048, 4448, Data Phase Error. A command could not be executed because too many parity errors occurred during the Data phase. • URC=3C49, 4049, 4449, Overlapped Commands. An initiator attempted to send a command to the drive even though it already had another command being processed in the drive. **Failure Isolation Procedure** **If the problem persists, go the “SCSI Bus Problems” on page 767.**
3C4A 404A 444A	**Description** Volume Overflow — End Of Media. A command failed because the physical end of tape was encountered. The End Of Media flag is set. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
4800 4C00 5000	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.
4801 4C01 5001	**Description** Cooling problem. The drive has detected an overtemperature condition. **Failure Isolation Procedure** **This problem could be caused by an out-of-spec (too hot) environment, by blocked air vents on the back of the Fixed Tray, or by a hardware problem with the Fixed Tray. If the room temperature is too high, notify the customer. Ensure the air vents on the back of the Fixed Tray are not blocked.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4802 4C02 5002	**Description** 5 V dc drive power problem. The drive detected that the power is outside the required voltage range. **URC FRU List** The drive power supply is a separate FRU located on the fixed tray. Replace the drive power supply (see "Power Supply (x32), Redundant – Hot Swap" on page 892).
4803 4C03 5003	**Description** Drive code problem. The drive detected an internal code problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support.
4804 4C04 5004	**Description** Drive code or drive hardware problem. The drive detected a problem but could not determine whether it is caused by drive code or by a drive hardware problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
4805 4C05 5005	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** If the error occurred with the latest level of drive code already installed, additional actions are needed: 1. Capture a drive dump. 2. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of that cartridge. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. 3. Run the Library Verify diagnostic to determine whether the failure is repeatable. 4. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive - contact support and provide the drive dump for analysis. The drive dump analysis will attempt to determine whether the cause was media or an intermittent drive problem. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4806 4C06 5006	**Description** Drive hardware or media problem. The drive detected a problem, but could not determine whether it was caused by an internal hardware problem or by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). If the problem persists, contact your next level of support.
4807 4C07 5007	**Description** Media problem. The drive detected a problem and determined that it was caused by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support**.
4808 4C08 5008	**Description** Drive SCSI error. The drive detected an error in the SCSI interface to the host computer. **Failure Isolation Procedure** **Go to "SCSI Bus Problems" on page 767**.
4809 4C09 5009	**Description** The drive detected an error or timeout in RS-422 communications between the drive and the library MCP or MCA. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged securely at the Fixed Tray and at the MCP or MCA. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since unplugging it will affect all drives in the frame.** Determine whether the problem still exists. At the front panel of the library, select **[MENU], Library Status,** and **Drive Status**. If the failing drive indicates **CommFail** then the problem still exists. If the problem does still exist, use the FRU list below to repair the problem. If the problem does not still exist then the failure is intermittent. This usually indicates a microcode problem. Capture a library dump, then attempt to capture a drive dump for possible analysis by IBM Support. Do not replace any FRUs unless instructed to do so by your next level of support. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 4. If the problem persists, replace the MCP or MCA.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
480A 4C0A 500A	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
480C 4C0C 500C	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
480D 4C0D 500D	**Description** The drive determined that another device is using the same Fibre Channel AL_PA (Loop ID). The drive is offline. **Failure Isolation Procedure** This problem is caused when multiple devices on the same loop are set to the same Fibre Channel Loop ID. On the operator panel, press [MENU], select **Settings**, **SCSI/Loop IDs**, **Display SCSI/Loop IDs**. Verify that all drives that are on a common loop (that is, attached to the same Fibre Channel hub) have different Loop IDs. If a conflict is found, press **Back**. Select **Change SCSI/Loop IDs**, and correct the problem **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
480E 4C0E 500E	**Description** The drive received an OFFLINE command from another device on the Fibre Channel Aribitrated Loop. **Failure Isolation Procedure** Go to "Fibre Channel Problems" on page 772. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
480F 4C0F 500F	**Description** The drive determined that there is no light on the Fibre Channel port. **Failure Isolation Procedure** Go to "Fibre Channel Problems" on page 772. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4810 4C10 5010	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.
4811 4C11 5011	**Description** Filemark detected. A Read or Space command terminated early because a File Mark was encountered. The File Mark flag is set. **Failure Isolation Procedure** **No repair action required**.
4812 4C12 5012	**Description** End of Media. A Write or Write File Marks command ended in the early warning area. The EOM flag is set. **Failure Isolation Procedure** **No repair action required**.
4813 4C13 5013	**Description** Beginning of Media. A Space command ended at Beginning of Media. The EOM flag also is set. **Failure Isolation Procedure** **No repair action required**.
4815 4C15 5015	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
4819 4C19 5019	**Description** Recovered Error. A Mode Select command parameter was rounded off because the drive cannot store it with the specified accuracy. **Failure Isolation Procedure** **No repair action required**.
481A 4C1A 501A	**Description** Recovered Error. Failure Prediction thresholds have been exceeded indicating that a failure may occur soon. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
481B 4C1B 501B	**Description** Not Ready — Cause Not Reportable. A cartridge is present in the drive, but it is in the process of unloading. **Failure Isolation Procedure** **No repair action required**.
481C 4C1C 501C	**Description** Not Ready — Becoming Ready. The drive has not finished the load and thread operation yet. **Failure Isolation Procedure** **No repair action required**.
481D 4C1D 501D	**Description** Not Ready — Initializing Command Required. A cartridge is present in the drive, but is not logically loaded. A Load command is required. **Failure Isolation Procedure** **No repair action required**.
481E 4C1E 501E	**Description** Not Ready — Cleaning Cartridge Installed. The host attempted to access the cartridge currently loaded in the drive, but it is a cleaning cartridge. **Failure Isolation Procedure** **No repair action required**.
481F 4C1F 501F	**Description** Not Ready — Cleaning Failure. An attempt to clean the drive failed. **Failure Isolation Procedure** **Attempt to clean the drive using a different cleaning cartridge.** **URC FRU List** **If the problem persists, replace the LTO Ultrium-2 LVD Fixed Tray** (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
4820 4C20 5020	**Description** Not Ready — Media Not Present. The host attempted to access a cartridge in the drive, but there is no cartridge loaded. **Failure Isolation Procedure** **No repair action required**.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4821 4C21 5021	**Description** Not Ready — Drive Not Configured. The drive has just powered on or reset, and it has not completed its POST and configuration process. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged in securely at the Fixed Tray and at the MCP or MCA. Do not unplug the RS-422 cable from the MCP or MCA since this would affect all drives in the frame.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 3. If the problem persists, replace the MCP or MCA.
4822 4C22 5022	**Description** Write failure. The drive detected a Write failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job using a different tape cartridge. If the problem persists, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
4823 4C23 5023	**Description** Read failure. The drive detected a Read failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists then replace the tape cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
4824 4C24 5024	**Description** Recorded Entity Not Found. A Space or Locate command failed because a format violation prevented the target from being found. This is probably due to bad media, but may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4825 4C25 5025	**Description** Unknown Format on Media. An operation could not be completed because the tape has a logical format that is not recognized by the drive. **Failure Isolation Procedure** **Notify the customer that the tape has an unknown format**.
4826 4C26 5026	**Description** Incompatible Format on Media. An operation could not be completed because the tape has a logical format that is not correct. **Failure Isolation Procedure** **Notify the customer that the tape has an incompatible format**.
4827 4C27 5027	**Description** Media Format Corrupted. Data could not be read because the format on the tape is not valid, but it is a recognized format. A failure occurred attempting to write the file ID. **Failure Isolation Procedure** **Notify the customer that the tape has a corrupted format**.
4828 4C28 5028	**Description** Sequential Positioning Error. A command has failed and left the logical position at an unexpected location. **Failure Isolation Procedure** **Ask the customer to unload and reload the cartridge. If the problem persists, replace the cartridge.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
482A 4C2A 502A	**Description** Write Append Error. A Write command has failed because the point at which to append data was unreadable. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
482B 4C2B 502B	**Description** Cartridge Fault. A command could not be completed because of a fault in the tape cartridge. **Failure Isolation Procedure** **Replace the cartridge.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
482C 4C2C 502C	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the cartridge. **Failure Isolation Procedure** **If the problem occurred while trying to load the cartridge, replace the cartridge. If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048. Notify the customer that the cartridge should not be used again**.
482D 4C2D 502D	**Description** Manual Intervention Required. A cartridge is present in the drive, but it cannot be loaded or unloaded without manual intervention. **Failure Isolation Procedure** **If the cartridge is still in the drive, and go to "From an LTO Drive" on page 1048.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
482E 4C2E 502E	**Description** Diagnostic Failure. A diagnostic self-test failed. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
482F 4C2F 502F	**Description** Internal Target Failure. A hardware failure has been detected in the drive. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
4830 4C30 5030	**Description** Erase Failure. An Erase command failed to erase the specified area on the tape. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4831 4C31 5031	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the drive. **Failure Isolation Procedure** **If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
4832 4C32 5032 4833 4C33 5033 4834 4C34 5034 4835 4C35 5035 4836 4C36 5036	**Description** Wrong or invalid firmware values: • URC=4832, 4C32, 5032, Parameter list length error. • URC=4833, 4C33, 5033, Invalid command operation code. • URC=4834, 4C34, 5034, Invalid field in CDB (see field pointer). • URC=4835, 4C35, 5035, Logical unit not supported. • URC=4836, 4C36, 5036, Invalid field in parameter list (see field pointer). **Failure Isolation Procedure** **The host application is sending invalid commands. Contact your next level of support.**
4837 4C37 5037	**Description** Illegal Request — Media Removal Prevented. An unload command was rejected because the drive previously received a Prevent Media Removal command. **Failure Isolation Procedure** **Ask the customer to clear the Prevent Media Removal command from the host.**
4838 4C38 5038	**Description** Illegal Request — Bad Code Detected. The code transferred to the drive during a firmware upgrade is corrupt or incompatible with the drive. **Failure Isolation Procedure** **The drive will continue to operate on the existing level of firmware. If you want to load new firmware, try to apply it again. If the problem persists, obtain a new firmware file and attempt to apply it again. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4839 4C39 5039 483A 4C3A 503A 483B 4C3B 503B 483C 4C3C 503C 483D 4C3D 503D	**Description** Status Changed: • URC=4839, 4C39, 5039, Not-ready-to-ready transition, media was just loaded into the drive. • URC=483A, 4C3A, 503A, Power on or Reset occurred. • URC=483B, 4C3B, 503B, Mode select parameters were changed by another host. • URC=483C, 4C3C, 503C, Code Download. The firmware in the drive has just been changed. • URC=483D, 4C3D, 503D, Failure Prediction False. A Mode Select command has been used to test for Failure Prediction system. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**
483E 4C3E 503E	**Description** Write Protect. A Write operation was requested on a cartridge which has been write protected. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
483F 4C3F 503F	**Description** Incompatible Media. A Write operation was requested on a cartridge which is not writable. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
4840 4C40 5040	**Description** End Of Data. A Read or Space command terminated early because End Of Data was encountered. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
4841 4C41 5041	**Description** End Of Data Not Found. A Read operation failed because of a format violation related to a missing End Of Data data set. **Failure Isolation Procedure** **Notify the customer that the cartridge has a missing End Of Data data set.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
4842 4C42 5042 4843 4C43 5043 4844 4C44 5044 4845 4C45 5045 4846 4C46 5046 4847 4C47 5047 4848 4C48 5048 4849 4C49 5049	**Description** Aborted Command: • URC=4842, 4C42, 5042, Invalid bits in Identify message. An illegal Identify Message was received by the drive at the start of a command. • URC=4843, 4C43, 5043, Message Error. A message could not be sent or received due to excessive transmission errors. • URC=4844, 4C44, 5044, Select/Reselect Failure. An attempt by the drive to reselect an initiator in order to complete a command failed. • URC=4845, 4C45, 5045, Initiator Detected Error message. A command failed because the Initiator Detected Error message was received by the drive. • URC=4846, 4C46, 5046, Invalid Message Error. A command failed because an invalid message was received by the drive. • URC=4847, 4C47, 5047, Command Phase Error. A command could not be executed because too many parity errors occurred during the Command phase. • URC=4848, 4C48, 5048, Data Phase Error. A command could not be executed because too many parity errors occurred during the Data phase. • URC=4849, 4C49, 5049, Overlapped Commands. An initiator attempted to send a command to the drive even though it already had another command being processed in the drive. **Failure Isolation Procedure** **If the problem persists, go the "SCSI Bus Problems" on page 767.**
484A 4C4A 504A	**Description** Volume Overflow — End Of Media. A command failed because the physical end of tape was encountered. The End Of Media flag is set. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
5C00 6000 6C00 7000	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.
5C01 6001 6C01 7001	**Description** Cooling problem. The drive has detected an over-temperature condition. **Failure Isolation Procedure** **This problem could be caused by an out-of-spec (too hot) environment, by blocked air vents on the back of the Fixed Tray, or by a hardware problem with the Fixed Tray. If the room temperature is too high, notify the customer. Ensure the air vents on the back of the Fixed Tray are not blocked.** **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C02 6002 6C02 7002	**Description** 5 V dc drive power problem. The drive detected that the power is outside the required voltage range. **URC FRU List** The drive power supply is a separate FRU located on the fixed tray. Replace the drive power supply (see "Power Supply (x32), Redundant – Hot Swap" on page 892).
5C03 6003 6C03 7003	**Description** Drive code problem. The drive detected an internal code problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support.
5C04 6004 6C04 7004	**Description** Drive code or drive hardware problem. The drive detected a problem but could not determine whether it is caused by drive code or by a drive hardware problem. **Failure Isolation Procedure** Obtain a drive dump from the failing drive (see "CETool" on page 725). Keep this drive dump in case it is needed by support. See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
5C05 6005 6C05 7004	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** If the error occurred with the latest level of drive code already installed, additional actions are needed: 1. Capture a drive dump. 2. If a cartridge was loaded at the time of the failure, obtain the bar code label volser of that cartridge. **Note:** In some cases an unusual media defect may cause this failure, and it may repeat in multiple drives. 3. Run the Library Verify diagnostic to determine whether the failure is repeatable. 4. If Library Verify reports a drive failure, replace the drive. If Library Verify completes without a drive failure, do not exchange the drive - contact support and provide the drive dump for analysis. The drive dump analysis will attempt to determine whether the cause was media or an intermittent drive problem. **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C06 6006 6C06 7006	**Description** Drive hardware or media problem. The drive detected a problem, but could not determine whether it was caused by an internal hardware problem or by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). If the problem persists, contact your next level of support.
5C07 6007 6C07 7007	**Description** Media problem. The drive detected a problem and determined that it was caused by a media defect. **Failure Isolation Procedure** **Ask the customer to try the job using a different cartridge. If the problem persists, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it. If the problem persists, contact your next level of support**.
5C08 6008 6C08 7008	**Description** Drive SCSI error. The drive detected an error in the SCSI interface to the host computer. **Failure Isolation Procedure** **Go to "SCSI Bus Problems" on page 767**.
5C09 6009 6C09 7009	**Description** The drive detected an error or timeout in RS-422 communications between the drive and the library MCP/MCA. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged securely at the Fixed Tray and at the MCP or MCA. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since unplugging it will affect all drives in the frame.** Determine whether the problem still exists. At the front panel of the library, select **[MENU], Library Status,** and **Drive Status**. If the failing drive indicates **CommFail** then the problem still exists. If the problem does still exist, use the FRU list below to repair the problem. If the problem does not still exist then the failure is intermittent. This usually indicates a microcode problem. Capture a library dump, then attempt to capture a drive dump for possible analysis by IBM Support. Do not replace any FRUs unless instructed to do so by your next level of support. **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 4. If the problem persists, replace the MCP or MCA.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C0A 600A 6C0A 700A	**Description** Drive hardware problem. The drive detected an internal hardware problem. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available, install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
5C0C 600C 6C0C 700C	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
5C0D 600D 6C0D 700D	**Description** The drive determined that another device is using the same Fibre Channel AL_PA (Loop ID). The drive is offline. **Failure Isolation Procedure** This problem is caused when multiple devices on the same loop are set to the same Fibre Channel Loop ID. On the operator panel, press [MENU], select **Settings**, **SCSI/Loop IDs**, **Display SCSI/Loop IDs**. Verify that all drives that are on a common loop (that is, attached to the same Fibre Channel hub) have different Loop IDs. If a conflict is found, press **Back**. Select **Change SCSI/Loop IDs**, and correct the problem **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
5C0E 600E 6C0E 700E	**Description** The drive received an OFFLINE command from another device on the Fibre Channel Aribitrated Loop. **Failure Isolation Procedure** Go to "Fibre Channel Problems" on page 772. **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
5C0F 600F 6C0F 700F	**Description** The drive determined that there is no light on the Fibre Channel port. **Failure Isolation Procedure** Go to "Fibre Channel Problems" on page 772. **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C10 6010 6C10 7C10	**Description** No error. The operation was successful. **Failure Isolation Procedure** **No repair action required**.
5C11 6011 6C11 7C11	**Description** Filemark detected. A Read or Space command terminated early because a File Mark was encountered. The File Mark flag is set. **Failure Isolation Procedure** **No repair action required**.
5C12 6012 6C12 7C12	**Description** End of Media. A Write or Write File Marks command ended in the early warning area. The EOM flag is set. **Failure Isolation Procedure** **No repair action required**.
5C13 6013 6C13 7C13	**Description** Beginning of Media. A Space command ended at Beginning of Media. The EOM flag also is set. **Failure Isolation Procedure** **No repair action required**.
5C15 6015 6C15 7C15	**Description** The drive needs to be cleaned. **Failure Isolation Procedure** **Ask the customer to clean the drive.** **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
5C19 6019 6C19 7C19	**Description** Recovered Error. A Mode Select command parameter was rounded off because the drive cannot store it with the specified accuracy. **Failure Isolation Procedure** **No repair action required**.
5C1A 601A 6C1A 7C1A	**Description** Recovered Error. Failure Prediction thresholds have been exceeded indicating that a failure may occur soon. **URC FRU List** Replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C1B 601B 6C1B 7C1B	**Description** Not Ready — Cause Not Reportable. A cartridge is present in the drive, but it is in the process of unloading. **Failure Isolation Procedure** **No repair action required**.
5C1C 601C 6C1C 7C1C	**Description** Not Ready — Becoming Ready. The drive has not finished the load and thread operation yet. **Failure Isolation Procedure** **No repair action required**.
5C1D 601D 6C1D 7C1D	**Description** Not Ready — Initializing Command Required. A cartridge is present in the drive, but is not logically loaded. A Load command is required. **Failure Isolation Procedure** **No repair action required**.
5C1E 601E 6C1E 7C1E	**Description** Not Ready — Cleaning Cartridge Installed. The host attempted to access the cartridge currently loaded in the drive, but it is a cleaning cartridge. **Failure Isolation Procedure** **No repair action required**.
5C1F 601F 6C1F 7C1F	**Description** Not Ready — Cleaning Failure. An attempt to clean the drive failed. **Failure Isolation Procedure** **Attempt to clean the drive using a different cleaning cartridge.** **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
5C20 6020 6C20 7C20	**Description** Not Ready — Media Not Present. The host attempted to access a cartridge in the drive, but there is no cartridge loaded. **Failure Isolation Procedure** **No repair action required**.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C21 6021 6C21 7C21	**Description** Not Ready — Drive Not Configured. The drive has just powered on or reset, and it has not completed its POST and configuration process. **Failure Isolation Procedure** **Ensure that the RS-422 cable is plugged in securely at the Fixed Tray and at the MCP or MCA. Do not unplug the RS-422 cable from the MCP or MCA since this would affect all drives in the frame.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 3. If the problem persists, replace the MCP or MCA.
5C22 6022 6C22 7C22	**Description** Write failure. The drive detected a Write failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job using a different tape cartridge. If the problem persists, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
5C23 6023 6C23 7C23	**Description** Read failure. The drive detected a Read failure. This is probably due to bad media, but it may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists then replace the tape cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
5C24 6024 6C24 7C24	**Description** Recorded Entity Not Found. A Space or Locate command failed because a format violation prevented the target from being found. This is probably due to bad media, but may be a drive failure. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C25 6025 6C25 7C25	**Description** Unknown Format on Media. An operation could not be completed because the tape has a logical format that is not recognized by the drive. **Failure Isolation Procedure** **Notify the customer that the tape has an unknown format**.
5C26 6026 6C26 7C26	**Description** Incompatible Format on Media. An operation could not be completed because the tape has a logical format that is not correct. **Failure Isolation Procedure** **Notify the customer that the tape has an incompatible format**.
5C27 6027 6C27 7C27	**Description** Media Format Corrupted. Data could not be read because the format on the tape is not valid, but it is a recognized format. A failure occurred attempting to write the file ID. **Failure Isolation Procedure** **Notify the customer that the tape has a corrupted format**.
5C28 6028 6C28 7C28	**Description** Sequential Positioning Error. A command has failed and left the logical position at an unexpected location. **Failure Isolation Procedure** **Ask the customer to unload and reload the cartridge. If the problem persists, replace the cartridge.** **URC FRU List** If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
5C2A 602A 6C2A 7C2A	**Description** Write Append Error. A Write command has failed because the point at which to append data was unreadable. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see “CETool” on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.
5C2B 602B 6C2B 7C2B	**Description** Cartridge Fault. A command could not be completed because of a fault in the tape cartridge. **Failure Isolation Procedure** **Replace the cartridge.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C2C 602C 6C2C 7C2C	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the cartridge. **Failure Isolation Procedure** **If the problem occurred while trying to load the cartridge, replace the cartridge. If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048. Notify the customer that the cartridge should not be used again**.
5C2D 602D 6C2D 7C2D	**Description** Manual Intervention Required. A cartridge is present in the drive, but it cannot be loaded or unloaded without manual intervention. **Failure Isolation Procedure** **If the cartridge is still in the drive, and go to "From an LTO Drive" on page 1048.** **URC FRU List** Replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
5C2E 602E 6C2E 7C2E	**Description** Diagnostic Failure. A diagnostic self-test failed. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
5C2F 602F 6C2F 7C2F	**Description** Internal Target Failure. A hardware failure has been detected in the drive. **Failure Isolation Procedure** **See if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.
5C30 6030 6C30 7C30	**Description** Erase Failure. An Erase command failed to erase the specified area on the tape. **Failure Isolation Procedure** **Ask the customer to try the job in a different drive. If the problem persists, replace the cartridge. If the problem only occurs in one drive, see if updated drive code is available (see "CETool" on page 725). If newer drive code is available install it.** **URC FRU List** 1. If the problem persists, replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C31 6031 6C31 7C31	**Description** Load/Eject Failed. An attempt to load or eject the cartridge failed because of a problem with the drive. **Failure Isolation Procedure** **If the problem occurred while trying to eject the cartridge and the cartridge is still in the drive, go to "From an LTO Drive" on page 1048.** **URC FRU List** Replace the appropriate LTO FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
5C32 6032 6C32 7C32 5C33 6033 6C33 7C33 5C34 6034 6C34 7C34 5C35 6035 6C35 7C35 5C36 6036 6C36 7C36	**Description** Wrong or invalid firmware values: • URC=5C32, 6032, 6C32, Parameter list length error. • URC=5C33, 6033, 6C33, Invalid command operation code. • URC=5C34, 6034, 6C34, Invalid field in CDB (see field pointer). • URC=5C35, 6035, 6C35, Logical unit not supported. • URC=5C36, 6036, 6C36, Invalid field in parameter list (see field pointer). **Failure Isolation Procedure** **The host application is sending invalid commands. Contact your next level of support.**
5C37 6037 6C37 7C37	**Description** Illegal Request — Media Removal Prevented. An unload command was rejected because the drive previously received a Prevent Media Removal command. **Failure Isolation Procedure** **Ask the customer to clear the Prevent Media Removal command from the host.**
5C38 6038 6C38 7C38	**Description** Illegal Request — Bad Code Detected. The code transferred to the drive during a firmware upgrade is corrupt or incompatible with the drive. **Failure Isolation Procedure** **The drive will continue to operate on the existing level of firmware. If you want to load new firmware, try to apply it again. If the problem persists, obtain a new firmware file and attempt to apply it again. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C39 6039 6C39 5C3A 603A 6C3A 7C3A 5C3B 603B 6C3B 7C3B 5C3C 603C 6C3C 7C3C 5C3D 603D 6C3D 7C3D	**Description** Status Changed: • URC=5C39, 6036, 6C36, Not-ready-to-ready transition, media was just loaded into the drive. • URC=5C3A, 603A, 6C3A, Power on or Reset occurred. • URC=5C3B, 603B, 6C3B, Mode select parameters were changed by another host. • URC=5C3C, 603C, 6C3C, Code Download. The firmware in the drive has just been changed. • URC=5C3D, 603D, 6C3D, Failure Prediction False. A Mode Select command has been used to test for Failure Prediction system. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**
5C3E 603E 6C3E 7C3E	**Description** Write Protect. A Write operation was requested on a cartridge which has been write protected. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
5C3F 603F 6C3F 7C3F	**Description** Incompatible Media. A Write operation was requested on a cartridge which is not writable. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
5C40 6040 6C40 7C40	**Description** End Of Data. A Read or Space command terminated early because End Of Data was encountered. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
5C41 6041 6C41 7C41	**Description** End Of Data Not Found. A Read operation failed because of a format violation related to a missing End Of Data data set. **Failure Isolation Procedure** **Notify the customer that the cartridge has a missing End Of Data data set.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C42 6042 6C42 7C42 5C43 6043 6C43 7C43 5C44 6044 6C44 7C44 5C45 6045 6C45 7C45 5C46 6046 6C46 7C46 5C47 6047 6C47 7C47 5C48 6048 6C48 7C48 5C49 6049 6C49 7C49	**Description** Aborted Command: • URC=5C42, 6042, 6C42, Invalid bits in Identify message. An illegal Identify Message was received by the drive at the start of a command. • URC=5C43, 6043, 6C43, Message Error. A message could not be sent or received due to excessive transmission errors. • URC=5C44, 6044, 6C44, Select/Reselect Failure. An attempt by the drive to reselect an initiator in order to complete a command failed. • URC=5C45, 6045, 6C45, Initiator Detected Error message. A command failed because the Initiator Detected Error message was received by the drive. • URC=5C46, 6046, 6C46, Invalid Message Error. A command failed because an invalid message was received by the drive. • URC=5C47, 6047, 6C47, Command Phase Error. A command could not be executed because too many parity errors occurred during the Command phase. • URC=5C48, 6048, 6C48, Data Phase Error. A command could not be executed because too many parity errors occurred during the Data phase. • URC=5C49, 6049, 6C49, Overlapped Commands. An initiator attempted to send a command to the drive even though it already had another command being processed in the drive. **Failure Isolation Procedure** **If the problem persists, go the “SCSI Bus Problems” on page 767.**
5C4A 604A 6C4A 7C4A	**Description** Volume Overflow — End Of Media. A command failed because the physical end of tape was encountered. The End Of Media flag is set. **Failure Isolation Procedure** **No action is necessary. This is only a status message.**
5C50 6050 6C50 7C50	**Description** Not Ready — Auxiliary memory not accessible. The drive is not able to become ready because it is unable to access the Auxiliary Memory in a WORM cartridge. **Failure Isolation Procedure** **Use the Library Verify test to verify that the drive operates normally using the diagnostic cartridge. If Library Verify passes, notify the customer that the cartridge has a problem and should be replaced. If Library Verify fails, use the resulting error code to resolve the problem.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
5C51 6051 6C51 7C51	**Description** Auxiliary memory read error. The drive reported that it is unable to read the Auxiliary Memory in a WORM cartridge. The most likely cause is that the cartridge has not yet been initialized. **Failure Isolation Procedure** **Notify the customer that the cartridge may need to be initialized. If the problem persists, notify the customer that the cartridge has a problem and should be replaced.**
5C52 6052 6C52 7C52	**Description** Medium Error — WORM integrity check. The drive rejected a Read operation because the cartridge is a suspicious WORM cartridge. **Failure Isolation Procedure** **Notify the customer that the WORM cartridge may have been tampered with in an attempt to modify data. Report the problem to your next level of support.**
5C53 6053 6C53 7C53	**Description** Data Protect — WORM overwrite attempted. The drive rejected a write operation because it would have resulted in an overwrite. Overwrite is not allowed on WORM media. **Failure Isolation Procedure** **Notify the customer that the error occurred due to an attempt to write over data that was previously written on the WORM cartridge. This is probably an application problem.**
5C54 6054 6C54 7C54	**Description** Medium Error — WORM integrity check. The drive rejected a Write operation because the cartridge is a suspicious WORM cartridge. **Failure Isolation Procedure** **Notify the customer that the WORM cartridge may have been tampered with in an attempt to modify data. Report the problem to your next level of support.**
9020	**Description** I/O processor detected a SCSI bus configuration error. **Failure Isolation Procedure** Go to “SCSI Bus Problems” on page 767. If no problem is found, contact your next level of support.
9100	**Description** Interface error detected by I/O processor or by tape unit. **Failure Isolation Procedure** Go to “SCSI Bus Problems” on page 767. If no problem is found, contact your next level of support.
9200	**Description** I/O processor addressed the tape unit; no response. **Failure Isolation Procedure** Go to “SCSI Bus Problems” on page 767. If no problem is found, contact your next level of support.
9201	**Description** Tape unit command timeout. **Failure Isolation Procedure** Go to “SCSI Bus Problems” on page 767. If no problem is found, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
9202	**Description** Tape unit failed after Licensed Internal Code was loaded. **Failure Isolation Procedure** Display drive VPD. If the latest level drive code is not already installed, download and apply it using the "CETool" on page 725. If the problem persists, contact your next level of support.
9210	**Description** Illegal or unsupported tape-unit response. **Failure Isolation Procedure** Obtain the sense data from the response. Go to Chapter 2, "Start," on page 71. If unable to correct the problem, contact your next level of support.
9300	**Description** Tape unit failure. **Failure Isolation Procedure** Obtain the sense data from the failure. Go to Chapter 2, "Start," on page 71. If unable to correct the problem, contact your next level of support.
9301	**Description** Tape device failure, redundancy lost. **Failure Isolation Procedure** Obtain the sense data from the failure. Go to Chapter 2, "Start," on page 71. If unable to correct the problem, contact your next level of support.
9302	**Description** Tape unit failure or media failure. **Failure Isolation Procedure** Obtain the sense data from the failure. Go to Chapter 2, "Start," on page 71. If unable to correct the problem, contact your next level of support.
9310	**Description** Licensed Internal Code for the tape unit is not correct. **Failure Isolation Procedure** Contact your next level of support.
9320	**Description** Tape device licensed internal code failure. **Failure Isolation Procedure** Obtain the sense data from the failure. Go to Chapter 2, "Start," on page 71. If unable to correct the problem, contact your next level of support.
9350	**Description** Tape unit detected a read or write error on tape media. **Failure Isolation Procedure** Obtain the sense data from the failure. Go to Chapter 2, "Start," on page 71. If unable to correct the problem, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
9351	**Description** Tape with excessive error rate was mounted in tape device. **Failure Isolation Procedure** Obtain the sense data from the failure. Go to Chapter 2, “Start,” on page 71. If unable to correct the problem, contact your next level of support.
9355	**Description** The data format is incorrect, the tape cannot be read. **Failure Isolation Procedure** Obtain the sense data from the failure. Go to Chapter 2, “Start,” on page 71. If unable to correct the problem, contact your next level of support.
9500	**Description** I/O processor Licensed Internal Code error. **Failure Isolation Procedure** Contact your next level of support.
980x	**Description** I/O processor successfully recovered from temporary error. **Failure Isolation Procedure** No corrective action is required. If you need a description of the specific recovered error, obtain the sense data from the error. Go to Chapter 2, “Start,” on page 71.
9900	**Description** Tape unit Licensed Internal Code was not upgraded. **Failure Isolation Procedure** Display drive VPD. If the latest level drive code is not already installed, download and apply it using the “CETool” on page 725. If the problem persists, contact your next level of support.
A000	**Description** No additional sense information. **Failure Isolation Procedure** **Run the Library Verify Test, (see “Library Verify Test” on page 759). If a failure occurs, follow that symptom**.
A050	**Description** • Shuttle car tray Y motion encountered unexpected hardstop moving up • Shuttle car tray Y motion encountered unexpected hardstop moving down. **Failure Isolation Procedure & FRU List** **Note:** Refer to the **"IBM System Storage TS3000 System Console (TSSC) 27th Edition"** (or later), Chapter 2. "Adding a 3584 Model SC1 Complex System" for specific details on the following procedures. • Run Span Verify. Look for any binding or erratic movement. • Check for obstructions by manually moving the shuttle car tray in the up and down direction. Inspect the left and right station Y-rack gear teeth. • Inspect the teeth on either end of the shuttle car tray for wear or binding. • If no obstruction is found, replace the shuttle car assembly.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A051	**Description** Shuttle car Z motion encountered unexpected hardstop moving forward. **Note:** Forward is considered towards station SC1 in the span. Shuttle car Z motion encountered unexpected hardstop moving backward. **Note:** Backward is considered towards station ***n*** in the span where ***n*** is the largest station number. **Failure Isolation Procedure & FRU List** **Note:** Refer to the **"IBM System Storage TS3000 System Console (TSSC) 27th Edition"** (or later), Chapter 2. "Adding a 3584 Model SC1 Complex System" for specific details on the following procedures. • Run Span Verify. Look for any binding or erratic movement. • Check for obstructions by manually moving the shuttle car along the span. Covers must be removed to perform this service check. Inspect the track segments to ensure they are firmly engaged in the span. • Inspect the gear on the shuttle car for wear or binding. • If no obstruction is found, replace the shuttle car assembly.
A052	**Description** Shuttle car failed to find station. **Note:** Trailer record will contain information on library serial number and frame location. **Failure Isolation Procedure & FRU List** **Note:** Refer to the **"IBM System Storage TS3000 System Console (TSSC) 27th Edition"** (or later), Chapter 2. "Adding a 3584 Model SC1 Complex System" for specific details on the following procedures. • Run Span Verify. Observe if station flag aligns with car home sensor at the station. • Press the reset button on the shuttle car, and run Span Verify again to see if station flag aligns with car home sensor at the station. • Check for the presence of the station home flag to ensure it is not damaged or missing. • If the station home flag is OK, the sensor on the shuttle car may be defective. • Replace the shuttle car, then run Span Verify.
A053	**Description** Station power failure. **Note:** Trailer record will contain information on library serial number and frame location. **Failure Isolation Procedure & FRU List** • Check the power LEDs on the station card. They should be as follows: – (Green LED) PWR – (Yellow LED) Fault – (Green LED) This is ON when SSC is providing PWR to the pads that connect to the brushes on SRC • If the LEDs are not as shown, check the cables from the station card to the SMC "J10 SSC" and to the FIC "J3 FCB." • SMC card LEDs: - PWR (Green LED), - Fault (Yellow LED) • Check the left LED on the shuttle car to verify the SSC is providing power to the car. • Replace the station card.
A054	**Description** Shuttle car move operation timed out

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A055	**Description** • Shuttle car z flag sensor hard failure • Shuttle car y flag sensor hard failure • Shuttle car z motor overcurrent condition • Shuttle car y motor overcurrent condition • Shuttle car z motor no encoder pulses detected • Shuttle car y motor no encoder pulses detected • Shuttle car did not latch when raising • Shuttle car did not unlatch when lowering. **Note:** Trailer record will contain information on library serial number and frame location. **Failure Isolation Procedure & FRU List** • Press the reset button on the shuttle car. • Replace the shuttle car, then run the station verify test.
A056	**Description** Shuttle car could not find endstop. **Failure Isolation Procedure & FRU List** • Ensure the end stops are correctly installed. Refer to the SC1 installation instructions for procedures • Press the reset button on the shuttle car • Run Discovery • Run Distribute.
A058	Unknown media in the shuttle car.
A059	Media type mismatch detected. **Note:** This occurs when the media type of the cartridge in the shuttle car does not match the media type of the logical library the shuttle station is assigned to. If media is still in the car, remove the media and return it to the customer.
A060	**Description** Station offline. **Note:** Trailer record will contain information on library serial number and frame location. Put station online.
A061	**Description** Car reset unexpectedly. Information only. No repair action is necessary — consider this a recovered error.
A200	**Description** Not ready — Cause not reportable. **Failure Isolation Procedure** **Call your next level of support**.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A201	**Description** Not ready — In process of coming ready. **Failure Isolation Procedure** **This is usually not a failure. If the problem persists, run the Library Verify Test , (see "Library Verify Test" on page 759).**
A203	**Description** Not ready — Manual intervention required. **Failure Isolation Procedure** **Check the library front doors to ensure that they are all closed. Ensure that power is on each of the Node cards. Possible failure of a door switch.** **URC FRU List** 1. Replace the Door Switch (see "Door Interlock Switch and Actuator" on page 872). 2. Replace the Door Switch Cable. Also check for bent pins.
A283	**Description** Not ready — Library has not been set up (needs configuration and/or calibration). **Failure Isolation Procedure** **Have your customer run Library Configuration.**
A284	**Description** Not ready — I/O Station Open. **Failure Isolation Procedure** **Close the I/O Station if it is open. If not open, run the Library Verify Test , (see "Library Verify Test" on page 759).**
A285	**Description** Ready condition when a door is open (Door Open not sensed). **Failure Isolation Procedure** • If a door is open but not sensed, determine the problem by using the sensor diagnostics. Press MENU, then select Service, Tests/Tools, Diagnostics, Sensors, Frame Door Interlock. Select a frame and the diagnostic will indicate BLOCKED if the sensor indicates door closed, or OPEN if the sensor indicates door open. Check each frame, if necessary, until you locate the failing door sensor. • Ensure that the door interlock is adjusted properly before changing the sensor. • On Library Firmware 6090 or higher, run Library Verify and perform the door safety interlock open/close test. See "Library Verify Test" on page 759 for more information on this test. **URC FRU List** **Note:** FIC card LEDs T&C (24v) may be flashing on all FIC cards. 1. Door Switch (see "Door Interlock Switch and Actuator" on page 872). 2. FIC Card (see "FIC Card" on page 835). 3. Frame to frame signal cables (See Table 113 on page 1095 and look for "Cable, FIC-to-FIC Power" and "Cable, FIC-to-FIC Signal." Also check for bent pins. 4. MCP or MCA (see "Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840 or "Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)" on page 844). 5. FCA Assembly (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938). 6. (x23/x53) Bulk Power Supply (BPS) (see "Bulk Power Supply (BPS) (x23 / x53 Frames Only)" on page 940). 7. (x23/x53) Bulk Power Card assembly (BPC) (see "Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)" on page 942).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A401 A411 A421	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A401, MCP+ w/CF Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) • URC=A411, MCP-CF Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) • URC=A421, MCP Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) MCP, MCP-CF or MCP+ w/CF Internal Failure. Possible CAN bus fault. See the HECQ (byte 19 of the SCSI sense data) to find the frame number. **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. Replace the MCP, MCP-CF, or MCP+ w/CF (see **"Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840 or "Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)" on page 844).** 2. Cable from MCP, MCP-CF, or MCP+ w/CF to FIC J4 3. FIC Card (see **"FIC Card" on page 835**). 4. FIC cards in frames between failing Dxx frame and Lxx frame (without MCP, MCP-CF, or MCP+ w/CF)
A402 A412 A422	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A402, OPC+ w/CF Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) • URC=A412, OPC-CF Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) • URC=A422, OPC Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. Replace the OPC, OPC-CF, or OPC+ w/CF (see **"Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)" on page 850**). 2. Cable from OPC, OPC-CF, or OPC+ w/CF J1 to FIC J11 in the Lxx frame. 3. FIC Card in Lxx frame (see **"FIC Card" on page 835**). 4. Other FIC cards and CAN bus cables in the library (Reduce library size to isolate). This is done by installing the FIC terminator on J16 in the frame you want to terminate CAN bus communication. See Figure 246 on page 837 for terminator placement. 5. If the problem persists, and if the machine has a lower I/O station installed, replace the XIO Card (see "XIO Card (Lxx Frame Only)" on page 862).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A413 A423	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A413, ACC-CF Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) • URC=A423, ACC Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. Replace the ACC, ACC-CF (see **"Accessor Controller Card (ACC, ACC-CF)" on page 828).** 2. Y-Axis cable from ACC J1 to AXY J2 3. AXY card (see "XCP Card " on page 860). 4. X-Track cable from AXY J1 to XCP J2. **Note**: When the X-track cable is securely plugged into the AXY card, there should be a slight 'hump' in the X-track cable between where it's clamped to the plastic track to where it plugs into the AXY card. This ensures enough slack in the cable to fully and securely plug into the AXY card. 5. XCP Card in Lxx frame (see "XCP Card " on page 860). On HA1 libraries the XCP card is located either in Service Bay "A" for Accessor "A" failures, or in Service Bay "B" for Accessor "B" failures. 6. Cable from XCP J1 to FIC J1 in the Lxx frame 7. FIC Card in Lxx frame (see **"FIC Card" on page 835**). 8. Other FIC cards and CAN bus cables in the library (Reduce library size to isolate). This is done by installing the FIC terminator on J16 in the frame you want to terminate CAN bus communication. See Figure 246 on page 837 for terminator placement.
A414 A424	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A414, MDA-CF Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) • URC=A424, MDA Internal Failure; Possible CAN 1 or CAN 2 fault (see frame number) **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. Replace the MDA, MDA-CF (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 2. Cable from MDA, MDA-CF J1 to AXY J3 3. AXY card (see "XCP Card " on page 860). 4. X-Track cable from AXY J1 to XCP J2. **Note**: When the X-track cable is securely plugged into the AXY card, there should be a slight 'hump' in the X-track cable between where it's clamped to the plastic track to where it plugs into the AXY card. This ensures enough slack in the cable to fully and securely plug into the AXY card. 5. XCP Card in Lxx frame (see "XCP Card " on page 860). On HA1 libraries the XCP card is located either in Service Bay "A" for Accessor "A" failures, or in Service Bay "B" for Accessor "B" failures. 6. Cable from XCP J1 to FIC J1 in the Lxx frame 7. FIC Card in Lxx frame (see **"FIC Card" on page 835**). 8. Other FIC cards and CAN bus cables in the library (Reduce library size to isolate). This is done by installing the FIC terminator on J16 in the frame you want to terminate CAN bus communication. See Figure 246 on page 837 for terminator placement.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A405 A415 A425	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A405, MCP+ w/CF not responding on CAN bus. See the HECQ (byte 19 of the SCSI sense data) to find the frame number of the failing MCP+ w/CF. This error will show on other node cards (ACC, MDA, OPC, and other MCP/MCA if installed) if an MCP/MCA is unplugged or otherwise unable to communicate over the CAN bus. It will also show for a short time if the MCP is reset, but in this case it is not considered an error. • URC=A415, MCA-CF not responding on CAN bus. See the HECQ (byte 19 of the SCSI sense data) to find the frame number of the failing MCA-CF. This error will show on other node cards (ACC, MDA, OPC, and other MCP/MCA if installed) if an MCP/MCA is unplugged or otherwise unable to communicate over the CAN bus. It will also show for a short time if the MCA-CF is reset, but in this case it is not considered an error. • URC=A425, MCP not responding on CAN bus. See the HECQ (byte 19 of the SCSI sense data) to find the frame number of the failing MCP. This error will show on other node cards (ACC, MDA, OPC, and other MCP/MCA if installed) if an MCP/MCA is unplugged or otherwise unable to communicate over the CAN bus. It will also show for a short time if the MCP is reset, but in this case it is not considered an error. **Failure Isolation Procedure** **Note:** If the affected node card appears to be powered on (the two-character display is not blank), please get library logs before you attempt to repair the problem. **Note:** If there is an F1 in the display, this indicates a code bug. Record the F1 codes, reset the node card, then pass the F1 codes to PFE or your next level of support. **Note:** If you have error 25xx where **xx** refers to a frame that is not present, or that doesn't have an MCP or MCA installed, then a reconfiguration is required to correct the false error. • Ensure that the MCP or MCP+ w/CF is fully seated in the FCA, and that the retaining screws are tight. • (x23/x53) Ensure that connector (FIC J10) on the MCA-CF is fully seated, and that the other end of this cable is fully seated at the FIC J4. Also check for bent pins. • Ensure that at least one of the 24 V dc indicators on the FCA are on. If not, go to the "Power Isolation MAP" on page 648. • If the failure is on a library subsystem containing only one frame, ensure that both of the Wrap Jumpers are installed on the FIC. If the failure is on a library subsystem containing multiple frames, ensure that the Wrap Jumpers are installed only on the right end (as viewed from the rear) of the base frame and the left end of the last expansion frame. Also for a library with multiple frames, ensure that the FIC-to-FIC signal cables are fully seated. Also check for bent pins. **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. MCP, MCP+ w/CF (see "Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840). 2. (x23/x53) MCA-CF (see "Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)" on page 844). 3. Cable from MCP, MCA-CF, or MCP+ w/CF to FIC J4 4. FIC-to-FIC CAN bus cables (J6 to J8). Also check for bent pins. 5. FIC Card (see "FIC Card" on page 835). 6. FIC cards in frames between failing Dxx frame and Lxx frame (without MCP, MCP+ w/CF, or MCA). 7. FCA Assembly (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938). 8. (x23/x53) Bulk Power Supply (BPS) (see "Bulk Power Supply (BPS) (x23 / x53 Frames Only)" on page 940). 9. (x23/x53) Bulk Power Card assembly (BPC) (see "Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)" on page 942).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A406 A416 A426	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A406, OPC+ w/CF not responding on CAN bus. This error will show on other node cards (ACC, MDA, and MCP/MCAs) if the OPC is unplugged or otherwise unable to communicate over the CAN bus. It also will show for a short time if the OPC is reset; but in this case it is not considered an error. • URC=A416, OPC-CF not responding on CAN bus. This error will show on other node cards (ACC, MDA, and MCP/MCAs) if the OPC is unplugged or otherwise unable to communicate over the CAN bus. It also will show for a short time if the OPC is reset; but in this case it is not considered an error. • URC=A426, OPC not responding on CAN bus. This error will show on other node cards (ACC, MDA, and MCP/MCAs) if the OPC is unplugged or otherwise unable to communicate over the CAN bus. It also will show for a short time if the OPC is reset; but in this case it is not considered an error. **Failure Isolation Procedure** **Note:** If the affected node card appears to be powered on (the two-character display is not blank), please get library logs before you attempt to repair the problem. **Note:** If there is an F1 in the display, this indicates a code bug. Record the F1 codes, reset the node card, then pass the F1 codes to PFE or your next level of support. • Ensure that the FIC to OPC cable is fully seated in the FIC and the OPC. Also check for bent pins. • A two-character display on the OPC is blank may indicate a power problem. Visually check the 37E bus power indicator on the frame 1 FIC card. If this indicator is not lighted, there is no power to the OPC. This may be normal if "Prepare for FIC Replacement" has been run. It also could indicate a blown fuse. See "Blown Fuse MAP" on page 667. **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. FIC card fuse (if the OPC two-character display is blank). 2. OPC, OPC-CF, OPC+ w/CF (see "Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)" on page 850). 3. Cable from OPC J1 to FIC J11 in the Lxx frame. Also check for bent pins. 4. FIC Card in Lxx frame (see **"FIC Card" on page 835**). 5. Other FIC cards and CAN bus cables in the library (Reduce library size to isolate). This is done by installing the FIC terminator on J16 in the frame you want to terminate CAN bus communication. See Figure 246 on page 837 for terminator placement.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A417 A427	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A417, ACC-CF not responding on CAN bus. This error will show on other node cards (MDA, OPC, and MCP/MCAs) if the ACC is unplugged, powered off, or otherwise unable to communicate over the CAN bus. It also will show for a short time if the ACC is reset; but in this case it is not considered an error. • URC=A427, ACC not responding on CAN bus. This error will show on other node cards (MDA, OPC, and MCP/MCAs) if the ACC is unplugged, powered off, or otherwise unable to communicate over the CAN bus. It also will show for a short time if the ACC is reset; but in this case it is not considered an error. **Failure Isolation Procedure** **Note:** If the affected node card appears to be powered on (the two-character display is not blank), please get library logs before you attempt to repair the problem. **Note:** If there is an F1 in the display, this indicates a code bug. Record the F1 codes, reset the node card, then pass the F1 codes to PFE or your next level of support. • Ensure that the cable connections from the FIC in frame 1 (or in SBA/SBB for HA), through the XCP, through the X-axis Flex Cable, through the AXY, through the Y-axis flex cable, to the ACC are fully seated. Check all these cables for visible damage, or bent pins and replace any damaged cables. **Note**: When the X-track cable is securely plugged into the AXY card, there should be a slight 'hump' in the X-track cable between where it's clamped to the plastic track to where it plugs into the AXY card. This ensures enough slack in the cable to fully and securely plug into the AXY card. • If the two-character displays on both the ACC and the MDA are blank it may indicate a power problem. Visually check the 37C bus power indicator on the frame 1 FIC card. If this indicator is off then there is no power to the ACC and MDA. This may be normal if "Prepare for Accessor Service" has been run, but it could also mean that a fuse has blown or the 37 V dc power supplies have tripped due to an overcurrent. **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. FIC card fuse (if both the ACC and MDA two-character displays are blank). See "Blown Fuse MAP" on page 667. 2. MDA (if both the ACC and MDA two-character displays are blank). 3. ACC, ACC-CF (see "Accessor Controller Card (ACC, ACC-CF)" on page 828). 4. Y-Axis Flex Cable from ACC J1 to AXY J2 (see "Y-Axis Cable" on page 1032). Also check for bent pins. 5. X-Axis Flex Cable from AXY J1 XCP J2 (see "X-Axis Track Cable" on page 1014). **Note**: When the X-track cable is securely plugged into the AXY card, there should be a slight 'hump' in the X-track cable between where it's clamped to the plastic track to where it plugs into the AXY card. This ensures enough slack in the cable to fully and securely plug into the AXY card. Also check for bent pins. 6. AXY Card (see "AXY Card (X-Axis)" on page 832). 7. XCP Card in Lxx frame. On HA1 libraries the XCP card is located either in Service Bay "A" for Accessor "A" failures, or in Service Bay "B" for Accessor "B" failures. (see "XCP Card " on page 860). 8. Cable from XCP J1 to FIC J1 in the Lxx frame. 9. FIC Card in Lxx frame. In HA1 libraries the FIC cards in Service Bay "A" for Accessor "A" failures, or in Service Bay "B" for Accessor "B" failures. (see "FIC Card" on page 835). 10. Other FIC cards and CAN bus cables in the library (Reduce library size to isolate). This is done by installing the FIC terminator on J16 in the frame you want to terminate CAN bus communication. See Figure 246 on page 837 for terminator placement.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A418 A428	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** • URC=A418, MDA-CF not responding on CAN bus. This error will show on other node cards (ACC, OPC, and MCP/MCAs) if the MDA is unplugged, powered off, or otherwise unable to communicate over the CAN bus. It also will show for a short time if the MDA is reset; but in this case it is not considered an error. • URC=A428, MDA not responding on CAN bus. This error will show on other node cards (ACC, OPC, and MCP/MCAs) if the MDA is unplugged, powered off, or otherwise unable to communicate over the CAN bus. It also will show for a short time if the MDA is reset; but in this case it is not considered an error. **Failure Isolation Procedure** **Note:** If the affected node card appears to be powered on (the two-character display is not blank), please get library logs before you attempt to repair the problem. Ensure that the cable connections from the FIC in frame 1 (or in SBA/SBB for HA), through the XCP, through the X-axis Flex Cable, through the AXY, through the Y-axis flex cable, to the ACC are fully seated. Check all these cables for visible damage, or bent pins and replace any damaged cables. **Note:** If there is an F1 in the display, this indicates a code bug. Record the F1 codes, reset the node card, then pass the F1 codes to PFE or your next level of support. **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. MDA, MDA-CF (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 2. Cable from MDA J1 to AXY J3 3. AXY Card (see "AXY Card (X-Axis)" on page 832). 4. X-Track cable from AXY J1 XCP J2. **Note**: When the X-track cable is securely plugged into the AXY card, there should be a slight 'hump' in the X-track cable between where it's clamped to the plastic track to where it plugs into the AXY card. This ensures enough slack in the cable to fully and securely plug into the AXY card. (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 5. XCP Card in Lxx frame. On HA1 libraries the XCP card is located either in Service Bay "A" for Accessor "A" failures, or in Service Bay "B" for Accessor "B" failures. (see "XCP Card " on page 860). 6. Cable from XCP J1 to FIC J1 in the Lxx frame. 7. FIC Card in Lxx frame. In HA1 libraries the FIC cards in Service Bay "A" for Accessor "A" failures, or in Service Bay "B" for Accessor "B" failures. (see "FIC Card" on page 835). 8. Other FIC cards and CAN bus cables in the library (Reduce library size to isolate). This is done by installing the FIC terminator on J16 in the frame you want to terminate CAN bus communication. See Figure 246 on page 837 for terminator placement.
A419	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. The SMC card connects to the CAN 1 & CAN 2 through the J1 FIC connector and cable. **Description** • URC=A419, SMC card in frame 'xx' not responding on CAN bus. The valid entries for 'xx' are in the range decimal 02 to 16. **Failure Isolation Procedure & FRU List** • Check the cable from the SMC card 'J1 FIC' to the FIC card. • Press the 'SMC RESET' button on the SMC card to see if communication resumes. • Replace the SMC card.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A429	See **"CAN Bus Errors – Failure Isolation" on page 764** for additional information on diagnosing and isolating CAN bus problems. **Description** No response from any other card on the CAN bus. This error will show on the two-character display on any node card (ACC, MDA, OPC, or MCP/MCA) if it is unable to communicate to any other node card over the CAN bus. If any two-character display on a node card is blank, go to"Power Entry MAP" on page 648. **Failure Isolation Procedure** • If 29 80 is observed on the two-character display on the ACC, ensure that the cable connections from the FIC in frame 1, through the XCP, through the X-axis Flex Cable, through the AXY, through the Y-axis flex cable, to the ACC are fully seated. Check all these cables for visible damage, or bent pins, and replace any damaged cables. • If 29 80 is observed on the two-character display on the MDA, ensure that the cable connections from the FIC in frame 1, through the XCP, through the X-axis Flex Cable, through the AXY, through the AXY to MDA cable, to the MDA are fully seated. Check all these cables for visible damage, or bent pins and replace any damaged cables. • If 29 80 is observed on the two-character display on the OPC, ensure that the cable connections from the FIC in frame 1, through the FIC to OPC cable, to the OPC are fully seated. Check the cable for visible damage, or bent pins and replace if damaged. • If 29 80 is observed on the two-character display on the MCP, ensure that the MCP is fully seated and that the mounting screws are securely fastened. Also ensure that the cable connections from that MCP to the FIC in the same frame are fully seated. If there is more than one MCP/MCA in the library subsystem, ensure that the FIC to FIC signal cables are fully seated and that the FIC Wrap Jumpers are installed ONLY at the ends of the bus (at the right side as viewed from the rear of the FIC in frame 1, and at the left side of the FIC in the last frame). • If 29 80 is observed on the two-character display on the MCA, ensure that connector (FIC J10) on the MCA is fully seated, and that this cable from the MCP/MCA to the FIC is fully seated. If there is more than one MCA (or MCP) in the library subsystem, ensure that the FIC to FIC signal cables are fully seated and that the FIC Wrap Jumpers are installed ONLY at the ends of the bus (at the right side as viewed from the rear of the FIC in frame 1, and at the left side of the FIC in the last frame). • If the problem persists, and the ACC, MDA, and OPC two-character displays are blank, there is a 37 V dc power problem. **URC FRU List** (Refer to **Figure 223 on page 765** for CAN a bus diagram). 1. The node card that is flashing 29 80. 2. CAN bus cabling between the failing node card and the other node cards. 3. FIC Card (see "FIC Card" on page 835).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A430	**Description** Frame Sequencing failure. A frame sequencing operation produced invalid data. **Failure Isolation Procedure** 1. Check that the FIC wrap jumpers are installed correctly. The wrap jumper should be installed on the right side (as viewed from the rear) of the Lxx frame and the left side of the last frame (active frame, not service bay B). No other wrap jumpers should be installed. Do not install wrap jumpers in service bays. 2. Check that the frame to frame signal cables are securely connected. Also check for bent pins. 3. Check that the FCA to FIC cables are securely connected. Also check for bent pins. 4. If the problem persists, check for bent pins in the frame to frame signal cable connections and in the FCA to FIC cable connections. Also check for bent pins. **URC FRU List** 1. Replace each FIC - one at a time - starting in frame 1. Note: use only one FRU, and keep moving it until you find the failing FIC. See “FIC Card” on page 835. 2. If the problem persists, replace each MCP/MCA - one at a time - starting in frame 1. Note: use only one FRU, and keep moving it until you find the failing MCP/MCA. See “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840. 3. If the problem persists, replace each frame to frame signal cable - one at a time starting with the cable that connects frame 1 to frame 2. Note: use only one FRU, and keep moving it until you find the failing cable. Also check for bent pins.
A431	**Description** Frame Not Found. At power on, a previously configured frame was not found by the frame sequencing operation. See the failing frame number in the sense data or in the library error log. **URC FRU List** **Replace the failing FIC (see “FIC Card” on page 835).**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A432	**Description** Door interlock frame number sensing failure. The library is unable to determine which door was opened. **Failure Isolation Procedure** • Ensure that the door interlock switch cable is securely connected at the FIC. Repeat for each frame. Also check for bent pins. • If the library has only one frame go directly to the FRU list. If the library has more than one frame continue with the remaining steps in this Failure Isolation Procedure. • If the library has more than one frame, use the following procedure to determine which frame is causing the problem. **Note:** You can use the automatic inventory which occurs after a front door has been opened/closed to determine which frame is causing the problem. If you open/close the front door on a frame that is NOT causing this problem then the automatic inventory will scan only the frame where the door was opened/closed. If you open/close the front door on the frame that IS causing this problem then the automatic inventory will scan ALL frames. The following procedure will guide you through the isolation process. 1. Close all front doors and wait until the inventory has completed. 2. Open the front door on frame 1, then close it and observe the inventory process through the side window. 3. If the inventory scans ALL frames, then the problem is in frame 1. Use the FRU list to replace FRUs in frame 1 until the inventory scans only frame 1. 4. If the inventory scans only frame 1, the problem is not in frame 1. Go to the next frame and repeat steps 2 through 4. Continue to check each frame until you have identified the frame which is causing the problem. **URC FRU List** 1. Replace the FIC (see “FIC Card” on page 835). 2. If the problem persists, replace the Door Switch (see “Door Interlock Switch and Actuator” on page 872).
A433	**Description** Door interlock circuit is open due to missing/open service bay cable. **Failure Isolation Procedure** • Ensure that the service bay cable is securely connected at the FIC in each service bay frame. • Ensure that the door interlock cable is securely connected to the service bay cable in each service bay frame. **URC FRU List** 1. Replace the service bay cable. Also check for bent pins. 2. If the problem persists, replace the FIC (see “FIC Card” on page 835). 3. If the problem persists, replace the Door Switch (see “Door Interlock Switch and Actuator” on page 872).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A434	**Description** Not ready — Door Open. **Failure Isolation Procedure** • Close the doors if they are open. If all doors are closed, determine which frame is affected by using the sensor diagnostics. Press MENU, then select Service, Tests/Tools, Diagnostics, Sensors, Frame Door Interlock. Select a frame and the diagnostic will indicate BLOCKED if the sensor indicates door closed, or OPEN if the sensor indicates door open. Check each frame until you locate the failing door sensor. • Ensure that the door interlock is adjusted properly before changing the sensor. • Isolate multi-frame libraries by electrically making them smaller. Shorten the library by moving the FIC wrap jumper back one frame and unplug the frame to frame signal cables. Example: If the problem occurred after adding a new Dxx frame to an existing library, suspect the new Dxx frame and the last frame of the existing string. • If the problem occurs on an all new multi-frame library, move the FIC jumper and remove the frame-to-frame signal cables to electrically remove the last frame and see if the problem still exists. If so, remove another frame and continue until the problem has been isolated. **URC FRU List** 1. Door Switch (see “Door Interlock Switch and Actuator” on page 872). 2. FIC Card (see “FIC Card” on page 835). 3. Frame to frame signal cables (See Table 113 on page 1095 and look for "Cable, FIC-to-FIC Power" and "Cable, FIC-to-FIC Signal." Also check for bent pins. 4. MCP-►ensure it is fully seated. (see “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840). 5. (x23/x53) MCA (see “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844). 6. FCA Assembly (see “Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)” on page 938). 7. (x23/x53) Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 8. (x23/x53) Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A435	**Description** Not ready — Door Open. **Failure Isolation Procedure** • Close the doors if they are open. If all doors are closed, determine which frame is affected by using the sensor diagnostics. Press MENU, then select Service, Tests/Tools, Diagnostics, Sensors, Frame Door Interlock. Select a frame and the diagnostic will indicate BLOCKED if the sensor indicates door closed, or OPEN if the sensor indicates door open. Check each frame until you locate the failing door sensor. • Ensure that the door interlock is adjusted properly before changing the sensor. • Isolate multi-frame libraries by electrically making them smaller. Shorten the library by moving the FIC wrap jumper back one frame and unplug the frame to frame signal cables. Example: If the problem occurred after adding a new Dxx frame to an existing library, suspect the new Dxx frame and the last frame of the existing string. • If the problem occurs on an all new multi-frame library, move the FIC jumper and remove the frame-to-frame signal cables to electrically remove the last frame and see if the problem still exists. If so, remove another frame and continue until the problem has been isolated. **URC FRU List** 1. Door Switch (see “Door Interlock Switch and Actuator” on page 872). 2. FIC Card (see “FIC Card” on page 835). 3. Frame to frame signal cables (See Table 113 on page 1095 and look for "Cable, FIC-to-FIC Power" and "Cable, FIC-to-FIC Signal." Also check for bent pins. 4. MCP-►ensure it is fully seated. (see “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840). 5. (x23/x53) MCA (see “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844). 6. FCA Assembly (see “Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)” on page 938). 7. (x23/x53) Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 8. (x23/x53) Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942).
A436	**Description** Not ready — Door interlock consistency failure detected by the library. **Failure Isolation Procedure** • During the Library Verify test, one or more node cards disagreed on the detected door interlock switch status. Rerun Library Verify. If the test still fails, contact your next level of support. • Rerun Library Verify to determine if the problem is solid or intermittent. • Replace the failing door interlock switch. • If the problem cannot be isolated or resolved, capture the library logs and send to your next level of support. • Also see URC's A434 and A435 for additional failure isolation procedures.
A440	**Description** FCA Cooling Fan Failure. See “FCA Cooling Fan Problems” on page 692 for the procedure to diagnose this problem. **URC FRU List** 1. If 37 V dc power is present at the ACC, MDA, and OPC, replace the failing FCA (see “Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)” on page 938). 2. 37 V dc power is NOT present at the ACC, MDA, and OPC, Replace: a. MDA (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). b. 37 V dc Power Supply (see “Power Supply, 37 V dc (x32, x22, x52 only)” on page 994).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A451 A452	**Description** 24 V dc PS Out Of Range — probable failure of 24 V dc PS. **URC FRU List** **Replace the failing FCA (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938).**
A453 A454 A455 A456	**Description** • URC=A453, (x32, x22, x52) 37 V dc PS#1 out of range, — probable failure of 37 V dc PS#1. • URC=A454, (x32, x22, x52) 37 V dc PS#2 out of range, — probable failure of 37 V dc PS#2. • URC=A455: – (x32, x22, x52) 37 V dc PS#1 will not turn on – probable failure of 37 V dc PS#1. – (x23, x53) No power from BPC1 • URC=A456: – (x32, x22, x52) 37 V dc PS#2 will not turn on – probable failure of 37 V dc PS#2. – (x23, x53) No power from BPC2 **Failure Isolation Procedure** Check FIC cards for blown fuse. If you find a blown fuse, go to "Blown Fuse MAP" on page 667. Check the interframe power cables which connect FIC J5 to adjacent frame FIC J7 for a loose connection. Do NOT unplug the cables unless the library is already powered off. See Failing Frame in the sense data or library error log to determine in which frame the failing power supply is located.**Check to see if the power supply is installed correctly (not loose).** (x23, x53) Check both BPCs to ensure the BPC disconnect handle is in the fully-down position and that both the AC and DC LEDs are on. 1. If URC = A453 or A455; the failure is with 37 V dc PS#1 (x32, x22, x52), or missing power from BPC (x23, x53). 2. If URC = A454 or A456; the failure is with 37 V dc PS#2 (x32, x22, x52), or missing power from BPC (x23, x53). **Note:** PS#1 is on the left and PS#2 is on the right as viewed from the rear. **URC FRU List** 1. (x32, x22, x52) 37 V dc Power Supply (see "Power Supply, 37 V dc (x32, x22, x52 only)" on page 994). 2. (x23, x53) 37 V dc Power Supply integrated inside the BPC (see "Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)" on page 942). 3. (x23, x53) Cable from BPC J5 to FIC EPO loose or defective. Also check for bent pins. 4. (x32, x22, x52) MCP (see "Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840). 5. MDA (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 6. FIC (see "FIC Card" on page 835). 7. FIC-to-FIC power cable. Also check for bent pins. 8. (x32, x22, x52) FCA (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A457 A458	**Description** • URC=A457: – (x32, x22, x52) 37 V dc PS#1 not present – probably disconnected. – (x23, x53) Cable BPC1 J2 to MCA. Also check for bent pins. • URC=A458: – (x32, x22, x52) 37 V dc PS#2 not present – probably disconnected. – (x23, x53) Cable BPC2 J2 to MCA. Also check for bent pins. **Failure Isolation Procedure** See Failing Frame in the sense data or library error log to determine in which frame the failing power supply is located. **Note:** The Lxx frame is always frame number 1. Service bay A is not frame 1. **Check to see if the power supply is installed correctly (not loose).** **Note:** PS#1 is on the left and PS#2 is on the right as viewed from the rear. (x23, x53) Ensure cable from BPC J2 to MCA is fully seated. Also check for bent pins. If the problem persists, exchange the power supply. If the problem still persists, the problem may be a bad connection in the MCP, MCA, or the FCA. **Note:** You can remove and reinstall the MCP to reseat it without dropping power to the drives. However, it will affect all library communications through control path drives in the same frame as the MCP. In x23/x53 frame, If you must reseat cables in the MCA see “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844 for cable disconnect procedures. **URC FRU List** 1. (x32, x22, x52) 37 V dc Power Supply (see “Power Supply, 37 V dc (x32, x22, x52 only)” on page 994). 2. (x32, x22, x52) MCP (see “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840). 3. (x32, x22, x52) FCA (see “Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)” on page 938). 4. (x23, x53) Cable from BPC1 or BPC2 to MCA. Also check for bent pins.
A45D	**Description** Drive Power Supply not present — probably disconnected. **URC FRU List** **Ensure that the power supply is present and connected.** **Replace the failing power supply (see “Power Supply (x32), Redundant – Hot Swap” on page 892).**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A45E	**Description** Hot-Swap Drive Power Supply failure. **Failure Isolation Procedure** Visually check the 2 LEDs on every drive power supply in the affected frame. Record the status of the AC and DC LEDs on each drive power supply. Find your symptom in the following list and follow the instructions to resolve the problem. **All LEDs are ON** This indicates that all the power supplies are powered on and that none of them has detected any internal problem. Ensure the Redundant Drive Power Cable is fully seated at each Fixed Tray, but do NOT unplug the cable if either drive is in use. Remove and reinstall the affected power supply to ensure it is fully seated. If the drive canister adjacent to the power supply is not in use, remove and reinstall the drive canister. If problem persists, replace following FRUs one at a time until resolved: **Note:** In rare cases this problem can result from a failure in the **adjacent** drive position. If the problem is not fixed by the initial FRU list, then perform the same replacements in the adjacent position. • Fixed Tray • Drive Canister • Drive Power Supply • Redundant Drive Power Cable. Also check for bent pins. **All AC LEDs are ON, but at least one DC LED is OFF** If a power supply has its AC LED ON and its DC LED OFF, then it has detected a problem in its DC output. This could be caused by a failing power supply or by an overcurrent in a device receiving power from that power supply. Remove and reinstall the affected power supply to reset it and to ensure it is fully seated. If problem persists, replace FRUs, one at a time, until resolved: **Note:** In rare cases this problem can result from a failure in the **adjacent** drive position. If the problem is not fixed by the initial FRU list, then perform the same replacements in the adjacent position. • Drive Power Supply • Fixed Tray • Redundant Drive Power Cable. Also check for bent pins. • Drive Canister **A single AC LED is OFF** Disconnect and reconnect the bifurcated FCA-to-drive AC power cord from the fixed tray that contains the affected power supply. Do NOT unplug the other connectors on the same line cord. This could cause another drive to lose power. If the problem persists, remove and reinstall Drive Power Supply. If the problem persists, replace FRUs one at a time until resolved: **Note:** In rare cases this problem can result from a failure in the **adjacent** drive position. If the problem is not fixed by the initial FRU list, then perform the same replacements in the adjacent position. • Fixed Tray • Bifurcated FCA-to-drive AC power cord • Drive Power Supply • FCA

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A45F	**Failure Isolation Procedure** **URC FRU List** 1. Drive power supply 2. Redundant power cable. Also check for bent pins. 3. Fixed tray
A460 A461	**Description** Calibration Sensor Failure. • URC=A460, sensor unplugged or blocked when it should not be blocked. • URC=A461, sensor not blocked when it should be blocked. **URC FRU List** 1. Replace the calibration sensor (see “Calibration Sensor” on page 822). 2. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 3. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828) 4. PDC (see “PDC Card” on page 856).
A470 A471	**Description** X Home Sensor Failure. 1. URC=A470, sensor unplugged or blocked when it should not be blocked. 2. URC=A471, sensor not blocked when it should be blocked. **Failure Isolation Procedure** **Look for obstacles or broken wires near the X-Axis home sensor, or a bent or broken sensor flag. If no problem is found, replace the following FRUs:** **URC FRU List** 1. X- Home Sensor (see “X-Axis Home Sensor” on page 1022). 2. MDA (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846).
A475 A476	**Description** X-Position Drift Detected During Re-zero. 1. URC=A475, X motion - an accessor rezero was performed and logged into the error log (information only; no action required). 2. URC=A476, X motion - rezero performed, action required as follows: **Failure Isolation Procedure** This problem can be caused by a loose or worn X-drive belt. If the drive belt slips a cog, the X-position drift will be off by 133 encoder pulses. See “X-Axis Motor and Drive Belt” on page 1024 for the following procedures. 1. A worn belt is difficult to determine. Replace the belt and adjust belt tension as shown in the CARR procedure listed below. 2. If no problems are found, replace the following FRUs. **URC FRU List** 1. X-motor drive and drive belt (new combined FRU). See “X-Axis Motor and Drive Belt” on page 1024

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A480 A481	**Description** Y Home Sensor Failure. 1. URC=A480, sensor unplugged or blocked when it should not be blocked. 2. URC=A481, sensor not blocked when it should be blocked. **Failure Isolation Procedure** **Look for obstacles or broken wires near the Y-Axis home sensor, a bent or broken sensor flag. If no problem is found, replace the following FRUs:** **URC FRU List** 1. Y-Home Sensor (see “Y-Axis Home Sensor” on page 1038). 2. MDA (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846).
A485 A486	**Description** Y-Position Drift Detected During Re-zero. 1. URC=A485, Y motion - an accessor rezero was performed and logged into the error log (information only; no action required). 2. URC=A486, Y motion - rezero performed, action required as follows: **Failure Isolation Procedure** This problem can be caused by a loose or worn Y-drive belt. If the drive belt slips a cog, the Y-position drift will be off by 133 encoder pulses. See “Y-Axis Motor and Drive Belt” on page 1042 for the following procedures. 1. Adjust the Y-drive belt tension. Allow the spring to reset the belt tension. 2. A worn belt is difficult to determine. Replace the belt and adjust belt tension as shown in the CARR procedure listed below. 3. If no problems are found, replace the following FRUs. **URC FRU List** 1. Y-motor drive and drive belt (new combined FRU). See “Y-Axis Motor and Drive Belt” on page 1042.
A490 A491 A492 A493 A494 A495 A496	**Description** X Motor Problem: • URC=A490, X motor will not move (no encoder pulses). • URC=A491, X motion cannot find a hard stop while moving left. • URC=A492, X motion cannot find a hard stop while moving right. • URC=A493, X motion encountered an unexpected hard stop while moving left. • URC=A494, X motion encountered an unexpected hard stop while moving right. • URC=A495, X motion — excessive force required to move left. • URC=A496, X motion — excessive force required to move right. **Failure Isolation Procedure** **Manually move the accessor right and left to check for any obvious binds. Check the X motor drive belt for any obvious damage. If the URC is A493 ensure that the shipping pin is not preventing the accessor from moving all the way to the home position. If no problem is found, replace the following FRUs:** **URC FRU List** 1. X-Drive Motor and Drive Belt (see “X-Axis Motor and Drive Belt” on page 1024). 2. Cable, XYC-to-home sensor(s). Also check for bent pins. 3. MDA (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A497	**Description** X Motor Lost 37 V dc Power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to "Blown Fuse MAP" on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. X-Axis Flex Cable (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 2. AXY-to-MDA Cable. Also check for bent pins. 3. FIC-to-XCP Cable. Also check for bent pins. 4. MDA (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 5. AXY Card. 6. XCP Card.
A498	**Description** X Motor Driver Failure. **URC FRU List** **Replace the MDA Assembly (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846).**
A499	**Description** X-Position Drift Detected During Re-zero. **Failure Isolation Procedure** This problem can be caused by a loose or worn X-drive belt. If the drive belt slips a cog, the X-position drift will be off by 133 encoder pulses. See "X-Axis Motor and Drive Belt" on page 1024 for the following procedures. 1. Adjust the X-drive belt tension. Allow the spring to reset the belt tension. 2. A worn belt is difficult to determine. Replace the belt and adjust belt tension as shown in the CARR procedure listed below. 3. If no problems are found, replace the following FRUs. **URC FRU List** 1. X-motor drive and drive belt (new combined FRU). See "X-Axis Motor and Drive Belt" on page 1024.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4A0 A4A1 A4A2 A4A3 A4A4 A4A5 A4A6	**Description** Y Motor Problem: • URC=A4A0, Y motor will not move (no encoder pulses). • URC=A4A1, Y motion cannot find a hard stop while moving up. • URC=A4A2, Y motion cannot find a hard stop while moving down. • URC=A4A3, Y motion encountered an unexpected hard stop while moving up. • URC=A4A4, Y motion encountered an unexpected hard stop while moving down. • URC=A4A5, Y motion — excessive force required to move up. • URC=A4A6, Y motion — excessive force required to move down. **Failure Isolation Procedure** Manually move the accessor up and down to check for any obvious binds. Ensure that it contacts the bumper stop without impacting the library ceiling. Check the Y motor drive belt for any obvious damage. If this error occurred after replacing a pivot cable, Y-mast, or Y-axis cable, see Figure 408 on page 1041 to ensure the plate **4** was reinstalled correctly with the angle facing upwards. If no problem is found, replace the following FRUs: **URC FRU List** 1. Y-motor drive and drive belt (new combined FRU). See"Y-Axis Motor and Drive Belt" on page 1042 2. Cable, XYC-to-Home Sensor. 3. MDA (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846).
A4A7	**Description** Y Motor Lost 37 V dc Power. **Failure Isolation Procedure** **Check the fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to "Blown Fuse MAP" on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. X-Axis Flex Cable (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 2. AXY-to-MDA Cable. Also check for bent pins. 3. FIC-to-XCP Cable. Also check for bent pins. 4. MDA (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 5. AXY Card. 6. XCP Card.
A4A8	**Description** Y Motor Driver Failure. **URC FRU List** **Replace the MDA Assembly (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846).**
A4A9	**Description** Y-Position Drift Detected During Re-zero. **Failure Isolation Procedure** **Check the Y drive belt tension. If no problem is found, replace the following FRUs:** **URC FRU List** Y-motor drive and drive belt (new combined FRU). See"Y-Axis Motor and Drive Belt" on page 1042

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4B0 A5B0 A4B1 A5B1 A4B2 A5B2 A4B3 A5B3 A4B4 A5B4 A4B5 A5B5 A4B6 A5B6	**Description** Pivot Motion Problem. Note:**A4Bx** errors are for standard pivot. **A5Bx** errors are for HD gripper pivot. • URC=A4B0, A5B0, Pivot motor will not move (no encoder pulses). • URC=A4B1, A5B1, Pivot motion cannot find a hard stop while pivoting toward door. • URC=A4B2, A5B2, Pivot motion cannot find a hard stop while pivoting away from door. • URC=A4B3, A5B3, Pivot motion encountered an unexpected hard stop while pivoting toward door. • URC=A4B4, A5B4, Pivot motion encountered an unexpected hard stop while pivoting away from door. • URC=A4B5, A5B5, Pivot motion — excessive force required to pivot toward door. • URC=A4B6, A5B6, Pivot motion — excessive force required to pivot away from door. **Failure Isolation Procedure** **Note:** Metal particles or debris laying on the AXY card can cause these errors. Before you replace any of the following FRUs use a non-conductive sash brush and thoroughly clean the top of the AXY card and all exposed connectors. Manually pivot the accessor forward and back to check for any obvious binds. Check the Pivot motor belt for any obvious damage. If no problem is found replace the following FRUs: **URC FRU List** 1. Pivot Belt or Motor (see “Pivot Belt and Motor Assembly” on page 988). **Note:** Ensure the belt tension spring is installed and tensioned correctly. 2. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 3. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 4. PDC (see “PDC Card” on page 856). 5. Pivot Assembly (see “Pivot Assembly” on page 986).
A4B7	**Description** Pivot Motor Lost 37 V dc Power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to the “Blown Fuse MAP” on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found replace the following FRUs:** **URC FRU List** 1. X-Axis Flex Cable (see “X-Axis Track Cable” on page 1014). Also check for bent pins. 2. Y-Axis Flex Cable (see “Y-Axis Cable” on page 1032). Also check for bent pins. 3. FIC-to-XCP Cable. Also check for bent pins. 4. ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828).
A4B9	**Description** XY positioning undetermined **Failure Isolation Procedure** Open and close a library door to force a rezero.
A4BA	**Description** An accessor failover has occurred. **Failure Isolation Procedure** Access failover – This is not a failure. It indicates that a previous failure caused an accessor failover. Examine the library error log, locate the failure that occurred immediately before the accessor failover, and repair that failure.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4BB	**Description** Library put in 'No Motion Allowed' state due to one of the situations listed below. See **"No Motion Allowed State (NMA)" on page 690** for more detailed information. **Failure Isolation Procedure** • The accessor colliding with an obstacle in the accessor aisle such as a cartridge sticking out of a cell. Other possible causes include debris in the lower X-rail gear rack such as a screw, piece of plastic, or other debris which would interfere with accessor motion. • Gripper mis-picks or failure to put a cartridge in a slot or drive that leaves a cartridge only partially in the gripper. • Cartridge coming loose in the gripper during a move operation caused by a possible failed 'get' or 'put' operation. • Worn-out pivot motor, which would allow normal vibrations to move the pivot motor encoder even though there was no collision. Pivot motor is designed to last 2 million+ cycles. • Loose cartridge present sensor cable on the grippers (it may appear plugged in, but it may be loose). • Defective cartridge present sensor. • Worn, cracked, or incorrectly plugged pivot cable. • Worn, cracked, or incorrectly plugged Y-Axis cable. • An excessive gap in the lower X-rail between frames (only on a new library or frame installation) which may be detected as an obstruction. **URC FRU List** Replace the gripper assembly if gripper fingers or other components of the gripper appear worn. See "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954. Replace the pivot assembly, especially if the test fails. See "Pivot Belt and Motor Assembly" on page 988.
A4C0	**Description** Bar Code Scanner Failure. **Note:** A4C0 error is for Datalogic or Microscan scanners. **URC FRU List** 1. A tilted Y-mast can cause calibration problems and barcode scan problems. Ensure the Y-mast is perpendicular to the base. Check the alignment procedure in the notes under "Replacement Procedure" in "Y-Axis Mast Assembly" on page 1040. 2. Y-mast stability can be improved by installing a heavier bracket. See Y-mast Stiffener Plate FRU Kit on page 1131. 3. Binding upper Y-mast rollers may cause erratic Y-motion during calibration. Clean the roller shafts with a small amount of #6 lubricant, and replace the rollers. 4. Replace the Bar Code Scanner (see "Bar Code Scanner (Old Style)" on page 818 or "Bar Code Scanner (New Style)" on page 820). 5. Pivot Flex Cable (see "Pivot Flex Cable" on page 992. 6. Y-Axis Cable (see "Y-Axis Cable" on page 1032.
A4C1	**Description** Bar Code Miscompare. A label was read twice with different results. **Note:** A4C1 error is for Datalogic or Microscan scanners. **Failure Isolation Procedure** • Ensure that all bar code labels on tape cartridges and on library components are located correctly and not damaged. • Clean the bar code scanner. **URC FRU List** If the problem persists, replace the bar code scanner (see "Bar Code Scanner (Old Style)" on page 818 or "Bar Code Scanner (New Style)" on page 820).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4C2 A4C3 A4C4	**Description** Bar Code Trigger Failure. **Note:** A4Cx errors are for Datalogic or Microscan scanners. • URC=A4C2, MDA to ACC cable loopback test failed. • URC=A4C3, ACC cannot trigger the bar code scanner. • URC=A4C4, MDA cannot trigger the bar code scanner. **Failure Isolation Procedure** • Ensure that the pivot flex cable, Y-flex cable, and AXY to MDA cables are securely connected and are not damaged. • Ensure that the ACC and the MDA are at the same firmware level. If no problem is found replace the following FRUs: **Note:** Metal particles or debris laying on the AXY card can cause these errors. Before you replace any of the following FRUs use a non-conductive sash brush and thoroughly clean the top of the AXY card and all exposed connectors. **URC FRU List** 1. **A4C2** • MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). • ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). • Bar Code Scanner (see “Bar Code Scanner (Old Style)” on page 818 or “Bar Code Scanner (New Style)” on page 820). • AXY-to-MDA Cable. Also check for bent pins. • Y-Axis Flex Cable (see “Y-Axis Cable” on page 1032). Also check for bent pins. 2. **A4C3** • A tilted Y-mast can cause calibration problems and barcode scan problems. Ensure the Y-mast is perpendicular to the base. Check the alignment procedure in the notes under "Replacement Procedure" in “Y-Axis Mast Assembly” on page 1040. • Y-mast stability can be improved by installing a heavier bracket. See Y-mast Stiffener Plate FRU Kit on page 1131. • Binding upper Y-mast rollers may cause erratic Y-motion during calibration. Clean the roller shafts with a small amount of #6 lubricant, and replace the rollers. • ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). • Bar Code Scanner (see “Bar Code Scanner (Old Style)” on page 818). 3. **A4C4** • ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). • Bar Code Scanner (see “Bar Code Scanner (Old Style)” on page 818). **Other FRUs:** 1. AXY Card (see “AXY Card (X-Axis)” on page 832). 2. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 3. PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4C5	**Description** A cartridge bar code label is missing or is unreadable, or the 'empty slot' bar code label (located behind the cartridge slot) is unreadable. **Failure Isolation Procedure** A tilted Y-mast can cause calibration problems and barcode scan problems. Ensure the Y-mast is perpendicular to the base. Check the alignment procedure in the notes under "Replacement Procedure" in “Y-Axis Mast Assembly” on page 1040. Y-mast stability can be improved by installing a heavier bracket. See Y-mast Stiffener Plate FRU Kit on page 1131. Binding upper Y-mast rollers may cause erratic Y-motion during calibration. Clean the roller shafts with a small amount of #6 lubricant, and replace the rollers. Determine if the library has the Advanced Library Management System enabled. At the library operator panel, press MENU, then select Settings, Configuration, Display Configuration. At the bottom of the screen you will see the configuration mode. • If the library has the Advanced Library Management System enabled: 1. Ask the library administrator to sign onto the library web user interface, then select Manage Cartridges. If there are any cartridges with unreadable bar code labels they will have a volser of UNKNOWN. The administrator can move any unknown cartridges to the I/O station and examine the bar code labels. If you identify a problem with a cartridge label, instruct the administrator that the bar code label needs to be replaced. 2. If you still have not identified the location of the unreadable label, use the CETool program to get the library error log, then view the log and check for a trailer record. If there is a trailer record then it will contain the location of the unreadable label in Frame, Column, Row format. • If the library does NOT have the Advanced Library Management System enabled: 1. Obtain the element address of the storage slot where the first failure occurred. To do this, get the SCSI parameter data from the library error log entry. The second group of four hex digits (bytes 2 and 3) contains the element address. 2. Using the element address, refer to Appendix D in the *IBM System Storage TS3500 Tape Library Operator Guide*. If there is a cartridge in the slot, examine its bar code label. If there is **NOT** a cartridge in the slot, examine the 'empty slot' bar code label in the back of the storage slot. – If you identify a problem with a cartridge label, instruct the customer to replace the bar code label. – If you identify a problem with an 'empty slot' bar code label, see page 1102 (Label, Bar Code - Empty Cell / Scanner Calibration) to order a replacement label. – If you do not find any obvious problem with a bar code label and the problem persists, it is possible that the bar code scanner is not calibrated correctly. Calibrate frame 1 to ensure the bar code scanner is calibrated. – Change inventory scan speed: MENU, Service, Tests/Tools, Tools, Set Inventory Scan Speed. See “Set Inventory Scan Speed” on page 696 for more information.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4C6	**Description** A frame machine type and model, serial number, or base World Wide Node Name bar code label is unreadable. **Note:** Ensure the scanner is mounted correctly. The scanner cable should exit to the left side as you face the front of the scanner. **Failure Isolation Procedure** 1. On a model L22, L52, or HA1 frame, ensure the left-hand end stop is installed on the outside of the Lxx frame. 2. Obtain the Failing Frame number from the library error log entry. 3. Open the front door of the failing frame, and locate the labels, which are affixed to the frame, below the bottom storage slot of columns 1, 3, and (on model L22/L52 only) 5. Inspect the frame bar code labels for smudges, dirt, or damage. 4. If no obvious problem is found, obtain the column number from byte 0 of the SCSI parameter data in the library error log. This will allow you to determine which of the labels is unreadable. 5. Clean any dirt or smudge from the label. If a label is damaged, take notice of the machine type and model, and the serial number of the frame. Contact Support for a replacement labels.
A4C7	**Description** Invalid Logical Library Bar Code Label Configuration. While reading logical library bar code labels, an unexpected sequence of labels was encountered. **Failure Isolation Procedure** • Ensure that all logical library bar code labels are installed in a valid sequence and are not damaged. • High gloss labels can produce this failure. **Notes:** 1. If a label is encountered which is out of sequence (perhaps because the preceding label was unreadable) then byte 1 of the SCSI parameter info will contain the logical library number found on the last good label before the sequence problem was encountered. As an example, if the library is being partitioned into 4 logical libraries, and the sequence detected by the bar code scanner jumps from 1 to 3 without finding 2, then byte 1 of the SCSI parameter info will contain 1. If the sequence detected jumps from 2 to 4 without finding 3 then byte 1 of the SCSI parameter info will be 2. 2. After scanning all the logical library labels, if the number of logical libraries determined by scanning column labels is different from the number of logical libraries determined by scanning drive labels, then the second byte of the SCSI parameter info will contain the number of logical libraries determined by scanning column labels and the third byte will contain the number of logical libraries determined by scanning drive labels. If no obvious label sequence problem is found, use one of the following methods of resolving the problem: 1. Use Advanced Configuration. **OR** 2. Replace the labels with clean, photocopied labels (do not use glossy paper), or cover the glossy labels with frosted, cellophane tape. **URC FRU List** 1. Logical Library Bar Code Labels. 2. Bar Code Scanner (see “Bar Code Scanner (Old Style)” on page 818).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4C8	**Description** Bar code scanner test label is unreadable. **Note:** A4C8 error is for Datalogic or Microscan scanners. **Failure Isolation Procedure** **Visually examine the bar code scanner test label. It is located in Frame 1, on the rear cell wall, just above Drive 1. The label should be clean and not damaged. If the label is dirty, clean it. The label has a matte finish, and if this finish is removed - perhaps by cleaning with solvent - then the label may become glossy. A glossy label won't read properly. If it is damaged, replace it.** **URC FRU List** 1. Bar Code Scanner (see “Bar Code Scanner (Old Style)” on page 818 or “Bar Code Scanner (New Style)” on page 820). 2. Find **"Label, Bar Code - Empty Cell / Scanner Calibration"** in Table 113 on page 1095.
A4C9	**Description** An I/O station type bar code label is unreadable. **Note:** A trailer record will contain information to identify the correct I/O station. **Failure Isolation Procedure** Visually examine the I/O station type bar code label on each I/O station. This is a small bar code label with either LTO or 3592 on it, located near a calibration fiducial on the I/O station. The label should be clean and not damaged. If the label is dirty, clean it. If the label is damaged, contact your next level of support for a replacement label.
A4CC	**Description** The library has detected that the frame serial number stored in library VPD does not match the frame serial number bar code label. **Failure Isolation Procedure** This should only occur if the ACC and the OPC are exchanged at the same time, which should not be done. If possible, reinstall one or both of the original cards since this should correct the problem. If the problem persists, display the Library VPD and record the frame serial number. Examine the frame serial number bar code label (located below column 1). If the serial number does match then it is possible that the bar code scanner misread the label. Ensure that the label is clean and not damaged. If no cause is found then it may be necessary to reconfigure the library to update the VPD. Capture a library dump for possible analysis by IBM Support before you reconfigure the library.
A4CD	**Description** Duplicate drive serial number detected. **Failure Isolation Procedure** 1. Use the operator panel to view the drive serial numbers and look for duplicates. If duplicates are found then compare them to the labels (or RID tags) on the drive canister handles. Use CETool to correct the incorrect serial number(s). See “Changing 3592 / 3588 Serial Numbers” on page 739. 2. If the drive serial numbers look OK (no duplicates) check the Web UI for duplicate drive serial numbers. If duplicate drive serial numbers are found, do the following. Note: The operator panel typically shows the current and correct information because it communicates directly with each drive. • Unassign, then reassign the drives. • Remove the drives from their current position(s) and install them in a different drive location. • If the Web UI is out of sync with what is shown on the operator panel, reset the MCP or MCA in the frame with the affected drives. 3.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4D0	**Description** Source element unexpectedly empty (status message). No additional sense information. **Failure Isolation Procedure** Verify that the CE cartridge is installed in the library. If you ran drive diagnostics, and you had to manually eject the diagnostic cartridge from the drive, reinstall the diagnostic cartridge in its home cell. Also see “From a 3592 Drive After Read/Write Cartridge Eject Failure” on page 1082. **Perform an inventory.**
A4D1	**Description** Destination element unexpectedly full (status message). **Failure Isolation Procedure** **Perform an inventory.**
A4D2	**Description** Inventory of Sxx frame has started/completed. **Note:** This is informational only.
A4D5	**Description** Audit Failure. **Failure Isolation Procedure** With an Sx4 high density frame in the library, the trailer record information will follow the format below. • Location 1 (source) Slot F0x C0x R0x • Location 2 (intended destination) Slot F0x C0x R0x • Location 3 (failed location) Slot F0x C0x R0x Location 3 could be the same place as either Location 1 or 2 based on where the Audit failed.
A4D6	**Description** Not enough free slots available. Library may be full. Check for any offline storage slots. **Failure Isolation Procedure** The trailer record information will follow the format below. • Location 1 (source) Slot F0x C0x R0x • Location 2 (intended destination) Slot F0x C0x R0x • Location 3 (failed location) Slot F0x C0x R0x Location 3 could be the same place as either Location 1 or 2 based on where the shuffle failed.
A4DC	**Description** No LTO diagnostic cartridge found in the library. **Failure Isolation Procedure** **Look in the base frame (F1) rear wall, leftmost cartridge storage rack (C01), at the top (R01). If the slot is empty, place a LTO diagnostic cartridge there.**
A4DE	**Description** No 3592 diagnostic cartridge found in the library. **Failure Isolation Procedure** **Look in the base frame (F1) rear wall, leftmost cartridge storage rack (C01), at the top (R01). If the slot is empty, place a 3592 diagnostic cartridge there.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4E1	**Description** Drive xx is overcurrent from BPC1 or BPC2 **Failure Isolation Procedure** **URC FRU List** 1. Fixed tray (see “Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models” on page 934). 2. Tape drive (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 3. Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 4. Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942).
A4E3	**Description** Drive xx is overcurrent from both BPCs **Failure Isolation Procedure** **URC FRU List** 1. Fixed tray (see “Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models” on page 934). 2. Tape drive (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 3. Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 4. Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942). 5. MCA (See “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844).
A4E4	**Description** Overcurrent condition on the entire BPC1 or BPC2 **Failure Isolation Procedure** **URC FRU List** 1. Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 2. Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4E5	**Description** Overcurrent condition on the A or B bus on BPC1 or BPC2 **Failure Isolation Procedure** **URC FRU List** 1. Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 2. Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942). 3. MCA (See “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844).
A4E6	**Description** Overcurrent condition on the C or D on bus BPC1 or BPC2 **Failure Isolation Procedure** **URC FRU List** 1. Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 2. Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942). 3. MCA (See “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844).
A4E7	**Description** Overcurrent condition on the E bus on BPC1 or BPC2 **Failure Isolation Procedure** **URC FRU List** 1. Bulk Power Supply (BPS) (see “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940). 2. Bulk Power Card assembly (BPC) (see “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942). 3. MCA (See “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844).
A4EC	**Description** Overcurrent condition on both BPCs **Failure Isolation Procedure** **URC FRU List** 1. 2. 3.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4ED	**Description** Overcurrent condition on the A or B bus on both BPCs **Failure Isolation Procedure** **URC FRU List** 1. 2. 3.
A4EE	**Description** Overcurrent condition on the C or D bus on both BPCs **Failure Isolation Procedure** **URC FRU List** 1. 2. 3.
A4EF	**Description** Overcurrent condition on the E bus on both BPCs **Failure Isolation Procedure** **URC FRU List** 1. 2. 3.
A4F0 A4F1	**Description** Bad BPC1 or BPS1 detected **Note:** No power detected by MCC, but BPS1 provides good status on I^2C bus **Failure Isolation Procedure** **URC FRU List** 1. Check cable from BPA J2 to MCA to ensure it is fully seated. Also check for bent pins. 2. Replace the cable (group) that includes J2 to MCA.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A4F2 A4F3	**Description** Bad BPC2 or BPS2 detected **Note:** No power detected by MCC, but BPS2 provides good status on I²C bus **Failure Isolation Procedure** **URC FRU List** 1. Check cable from BPA J2 to MCA to ensure it is fully seated. Also check for bent pins. 2. Replace the cable (group) that includes J2 to MCA.
A51A A520 A521 A524 A525 A526	**Description** Wrong or invalid firmware values: • URC=A51A, Parameter list length error. • URC=A520, Invalid command operation code. • URC=A521, Invalid element address. • URC=A524, invalid field in CDB (see field pointer). • URC=A525, Logical unit not supported. • URC=A526, Invalid field in parameter list (see field pointer). **Failure Isolation Procedure** **The host application is sending invalid commands. Contact your next level of support.**
A52C	**Description** Command sequence error. **Failure Isolation Procedure** **This error is reported if the host sends a Move Medium or Exchange Medium command to the library to move a cartridge from a drive when the cartridge is not in the unloaded state at the drive. The host application is supposed to send an Eject command to the drive and wait for it to complete BEFORE sending the Move Medium of Exchange Medium command to the library. If this problem persists, contact your next level of support.**
A530	**Description** Incompatible media installed.. **Failure Isolation Procedure** **The library was given a command to move a cartridge into a drive that is not compatible with the cartridge. As an example, moving an LTO Gen 2 cartridge into an LTO Gen 1 drive. The library rejected the command. Contact your next level of support.**
A539	**Description** Saving parameters not supported. **Failure Isolation Procedure** **The host application is sending invalid commands. Contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A53B A53C A53D	**Description** The host is attempting to move a cartridge, but the attempt was rejected as invalid: • URC=A53B, Specified destination element is already full. • URC=A53C, Specified source element is empty. • URC=A53D, Gripper is already full. **Failure Isolation Procedure** • For URCs A53B and A53C, have the customer perform an Inventory (also known as Audit or Remap) from the host in order to get the host in sync with the library inventory. • For URC A53D, remove the cartridge from the gripper.
A53E	**Description** Status only. An attempt was made to import a cartridge from the I/O station. This cartridge was exported from a different logical library. Importing a cartridge that was exported by a different logical library is not allowed.
A53F	**Description** Status only. An attempt was made to access a drive that is not present or has not been configured.
A540	**Description** Invalid bits in identify message. **Failure Isolation Procedure** The control path drive received a SCSI 'Identify' message from the host which contained invalid parameters. If the problem persists, contact your next level of support.
A553 A580	**Description** The host is attempting to move a cartridge, but the attempt was rejected as invalid: • URC=A553, A Prevent Media Removal command, prevents the specified move. • URC=A580, Control Unit Mode. **Failure Isolation Procedure** • For URC A553, have the customer clear the Prevent Media Removal command from the host. • For URC A580, contact your next level of support.
A620 A628 A629 A62A	**Description** Status Changed: • URC=A620, Import or export element accessed. • URC=A628, Not-ready-to-ready transition, media may have changed. • URC=A629, Power on or Reset occurred. • URC=A62A, Mode select parameters were changed by another host. **Failure Isolation Procedure** **No action is necessary. These are only status messages.**
A63F	**Description** Microcode has been changed. **Failure Isolation Procedure** Not a failure. Status message.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A700	**Description** Compact flash (CF) card not present **Note:** Idle diagnostics checks for CF card periodically. **Failure Isolation Procedure** **Note:** Different node cards are identified by the last digit of the HECQ • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 6081 MDA-CF 6082 OPC-CF, OPC+ w/CF 6083 ACC-CF 6084 MCA-CF, MCP+ w/CF **URC FRU List** 1. Install the CF card on the appropriate node card. For the procedure, see the CARR section for the specific node card. 2. CF card is installed upside down. See Figure 249 on page 845 to determine correct position. 3. If CF card is defective, order a new replacement. **Note:** If you replace the CF card in the MCA (that has the web user interface code) the replacement card will not have the web UI code image. If the customer is using the Web UI, code can be loaded to the new CF card as follows: • If the library has only one MCA, you must reload library code • If the library has more than one MCA, install the new CF card and then press the reset button on the MCA. This is a **disruptive** process that will initiate a Web UI code reload from another MCA's CF to this MCA's CF card.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A701	**Description** Compact flash (CF) card has an unexpected size **Failure Isolation Procedure** **Note:** Different node cards are identified by the last digit of the HECQ • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 6091 MDA-CF 6092 OPC-CF, OPC+ w/CF 6093 ACC-CF 6094 MCA-CF, MCP+ w/CF **URC FRU List** **Note:** If you replace the CF card in the MCA (that has the web user interface code) the replacement card will not have the web UI code image. If the customer is using the Web UI, code can be loaded to the new CF card as follows: • If the library has only one MCA, you must reload library code • If the library has more than one MCA, install the new CF card and then press the reset button on the MCA. This is a disruptive process that will initiate a Web UI code reload from another MCA's CF to this MCA's CF card. 1. Replace the CF card. For the procedure, see the CARR section for the specific node card. 2. Replace the node card that contains the CF card. It may not be interpreting the size correctly.
A702	**Description** Compact flash (CF) card does not become ready **Failure Isolation Procedure** **Note:** Different node cards are identified by the last digit of the HECQ • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 60A1 MDA-CF 60A2 OPC-CF, OPC+ w/CF 60A3 ACC-CF 60A4 MCA-CF, MCP+ w/CF (See note) **URC FRU List** **Note:** If you replace the CF card in the MCA (that has the web user interface code) the replacement card will not have the web UI code image. If the customer is using the Web UI, code can be loaded to the new CF card as follows: • If the library has only one MCA, you must reload library code • If the library has more than one MCA, install the new CF card and then press the reset button on the MCA. This is a disruptive process that will initiate a Web UI code reload from another MCA's CF to this MCA's CF card. 1. Replace the CF card. For the procedure, see the CARR section for the specific node card.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A703	**Description** Compact flash (CF) card does not show the correct lib S/N or node card designator. **Failure Isolation Procedure** CF card from the old FRU needs to be installed in the new FRU. **Note:** Different node cards are identified by the last digit of the HECQ • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 60B1 MDA-CF 60B2 OPC-CF, OPC+ w/CF 60B3 ACC-CF 60B4 MCA-CF, MCP+ w/CF (See note) **URC FRU List** **Note:** If you replace the CF card in the MCA (that has the web user interface code) the replacement card will not have the web UI code image. If the customer is using the Web UI, code can be loaded to the new CF card as follows: • If the library has only one MCA, you must reload library code • If the library has more than one MCA, install the new CF card and then press the reset button on the MCA. This is a disruptive process that will initiate a Web UI code reload from another MCA's CF to this MCA's CF card. 1. If this error occurred after a node card FRU replacement, pause the library. For the ACC and MDA: Open the door and swap the CF from the old FRU to the new FRU. The OPC and MCA node cards do NOT require you to open the front doors of the library. **Note:** Do not swap CF cards between node cards within the library, because a node card designator is written on the CF card linking it to a specific node card. 2. Reset the CF card designator. See “CETool Compact Flash Card Reset Option” on page 736.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A704	**Description** Compact flash (CF) card data is corrupted **Note:** Idle diagnostics checks for CF card periodically. **Failure Isolation Procedure** **Note:** Different node cards are identified by the last digit of the HECQ • **Frame 1** will be displayed on the op panel for MDA or ACC failures associated with Accessor A in an HA library. • **Frame 2** will be displayed on the op panel for MDA or ACC failures associated with Accessor B in an HA library. 60C1 MDA-CF 60C2 OPC-CF, OPC+ w/CF 60C3 ACC-CF 60C4 MCA-CF, MCP+ w/CF (See note) **URC FRU List** **Note:** If you replace the CF card in the MCA (that has the web user interface code) the replacement card will not have the web UI code image. If the customer is using the Web UI, code can be loaded to the new CF card as follows: • If the library has only one MCA, you must reload library code • If the library has more than one MCA, install the new CF card and then press the reset button on the MCA. This is a disruptive process that will initiate a Web UI code reload from another MCA's CF to this MCA's CF card. 1. Replace the CF card.
A720	**Description** The current Library firmware level cannot support the node card FRU. **Failure Isolation Procedure** This style card requires library firmware level 6090 or higher. Library firmware needs to be updated. The latest library firmware can be downloaded from the PFE website. **URC FRU List** 1. Replace the MCA.
A740	**Description** Ethernet wrap test failed. **Failure Isolation Procedure** **URC FRU List**
A750	**Description** Both Ethernet Ports of the MCA are configured to the same network. **Failure Isolation Procedure** The CE or customer must configure the two ports of the MCA to separate networks. The MCA has two 10/100 Ethernet ports. **Port A** is used for the customer's Web User interface. **Port B** is used for TSSC / TS3000 (Master Console).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A760	**Description** Test Key Manager address failed. **Failure Isolation Procedure** Perform the following: • If you are using library-managed encryption, perform the EKM connection test (see “Using the Web to Ping a Key Manager Address” in the 3584 Op Guide). – If the test fails, a problem could exist with the IP address, the Ethernet cable, or the switches. Perform the following: 1. Refer to your network's documentation. 2. Check the Ethernet connection between the library and the EKM server. 3. Check the TCP/IP configuration of the library and the server. • If the test succeeds, test the encryption key path and setup from the library’s operator panel (see “Using the Operator Panel to Test the Encryption Key Path and Setup” in the 3584 Op Guide): – If the test succeeds the connection has been properly tested and is good. – If the test fails, perform the following. To obtain instructions for each task, see the documentation for your EKM. 1. Check that the EKM is correctly installed and configured, and that the EKM application is properly started. 2. Ensure the 3592 TS1120 or LTO Gen-4 Tape Drive is registered in the EKM. 3. Ensure that a default key label is defined in the EKM.
A761	**Description** Test Encryption Key Path failed. **Failure Isolation Procedure** Perform the following: • If you are using library-managed encryption, perform the EKM connection test (see “Using the Web to Ping a Key Manager Address” in the 3584 Op Guide). – If the test fails, a problem could exist with the IP address, the Ethernet cable, or the switches. Perform the following: 1. Refer to your network's documentation. 2. Check the Ethernet connection between the library and the EKM server. 3. Check the TCP/IP configuration of the library and the server. • If the test succeeds, test the encryption key path and setup from the library’s operator panel (see “Using the Operator Panel to Test the Encryption Key Path and Setup” in the 3584 Op Guide): – If the test succeeds the connection has been properly tested and is good. – If the test fails, perform the following. To obtain instructions for each task, see the documentation for your EKM. 1. Check that the EKM is correctly installed and configured, and that the EKM application is properly started. 2. Ensure the 3592 TS1120 or LTO Gen-4 Tape Drive is registered in the EKM. 3. Ensure that a default key label is defined in the EKM.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A762	**Description** Test Encryption Key Path failed. **Failure Isolation Procedure** Perform the following: • If you are using library-managed encryption, perform the EKM connection test (see “Using the Web to Ping a Key Manager Address” in the 3584 Op Guide). – If the test fails, a problem could exist with the IP address, the Ethernet cable, or the switches. Perform the following: 1. Refer to your network's documentation. 2. Check the Ethernet connection between the library and the EKM server. 3. Check the TCP/IP configuration of the library and the server. • If the test succeeds, test the encryption key path and setup from the library’s operator panel (see “Using the Operator Panel to Test the Encryption Key Path and Setup” in the 3584 Op Guide): – If the test succeeds the connection has been properly tested and is good. – If the test fails, perform the following. To obtain instructions for each task, see the documentation for your EKM. 1. Check that the EKM is correctly installed and configured, and that the EKM application is properly started. 2. Ensure the 3592 TS1120 or LTO Gen-4 Tape Drive is registered in the EKM. 3. Ensure that a default key label is defined in the EKM.

A770	**Description**
	
	Node card reset from Web Specialist. **Note:** This is not an error, but is logged for tracking purposes only.
	
	Failure Isolation Procedure
	Note: Different node cards are identified by the last digit of the HECQ
	`7081 MDA`
	`7082 OPC`
	`7083 ACC`
	`7084 MCP`
	`7085 All node cards (MDA, OPC, ACC, MCP, MCA)`

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU

A780	**Description**
	
	A library internal health check occurs every 5 seconds, and will flag an error if a bad component is detected. This error is intended to ensure the library performs a Call Home and SNMP traps for recovered errors when one of the following components failed. A common URC is used, as the original error of the redundant component is already logged (as a recovered error).
	
	Failure Isolation Procedure
	Note: Do not replace any of the following FRUS because of these error codes. These errors are used for reporting only. The error log needs to be analyzed to find the root cause before performing any service actions. Example: In an HA environment, occasionally if a gripper in Accessor A fails, Accessor B will attempt to complete the operation and may push Accessor A into Service Bay A. A 7585 (XY assembly error) will be reported, since accessor A got pushed out of the way, even though there is nothing wrong with the XY motion of Accessor A. In the error log there will be an error 2 minutes previous to the 758x error that will indicate a failed operation (i.e. B883) with Accessor A. This error should be used to isolate the problem.
	`Gripper 1`
	`Gripper 2`
	`Calibration Sensor`
	`Scanner`
	`Pivot Assembly`
	`XY Assembly`
	`X Assembly`
	`Y Assembly`
	`Storage Slot`

A7B0	Sx4 HD slot marked offline. **Note:** Trailer record will contain information as to which slot was marked offline.
A800	**Description** HD frame detected incorrect gripper types. This happens when an HD frame is installed without first installing HD Grippers. **URC FRU List** 1. If the library has an HD frame installed, FC 2205 (single accessor) or FC 2206 (HA1 library) HD Gripper feature code(s) must be installed.
A801	**Description** HD frame detected with incorrect configuration. **URC FRU List**
A802	**Description** HD frame detected exceeded maximum 6887 cartridge limit with Standard node cards installed. **URC FRU List** 1. If the library has an HD frame installed, FC 1700 (Enhanced Node Cards) and, if necessary, FC 1701 (Enhanced MCP+ w/ CF in any Dx2 frame with an FCA) must be installed.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
A803	**Description** HD frame HD slot disabled by library. **URC FRU List** 1. Replace gate/spring assembly. See “Gate and Spring Assembly (High Density Frames)” on page 978.
A804	Calibration data of column 1 on Sxx frame has been calculated based off of column 3 calibration values. **Notes:** 1. This is informational only. 2. See additional sense information for difference in actual, versus calculated, values.
A810	**Description** HD frame detected but ALMS is disabled. **URC FRU List** 1. ALMS is required with code levels 8xxx and HD frames. Ensure ALMS is installed and enabled.
A811	**Description** HD frame detected but VIO is disabled, **URC FRU List** 1. Virtual I/O (VIO) must be enabled.
A812	**Description** HD frame detected but Insert Notification is enabled. **URC FRU List** 1. Insert Notification must be disabled.
A950	**Description** Cartridge missing from previous inventory. Recorded in move forward table. **Failure Isolation Procedure**
A952	**Description** Inventory self-correction executed in response to illegal request. Inventory updated. This error will trigger a callhome, but is intended for log gathering purposes only. No service action necessary. **Failure Isolation Procedure**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
AACA	**Description** X or Y motion command specified a destination that exceeds limits. Calibration data is corrupted. **Failure Isolation Procedure** 1. Verify that the X-axis right end-stop is tight against the right side frame. 2. If this problem is occurring on a new installation, repeat the Configuration procedure to ensure that the X-axis maximum travel position is configured correctly. 3. Perform the Calibration Procedure. Select the Service menu. Select Calibration, Calibrate Library (see "Service Menus" on page 774). Also check the library error log (Select the Service menu, Library Error Log, Error Detail) for errors that were not posted on the operator panel. If un-posted errors are found, follow the procedures to fix those errors first, then return here. Example: If a B480 is posted on the operator panel, but an additional B588 is found in the error log (indicating a missing fiducial in column 8) verify the fiducial is present and clean. Clean the fiducial if necessary, then retry calibration. HINT: Watch the accessor during the calibration procedure to see which fiducial is having a calibration problem. 4. If the problem persists, check the two-character display on the ACC, then perform the Configuration and Calibrate Library procedures. 5. If the problem persists, the Y-axis mast may be loose or incorrectly installed. The X-axis drive belt may also be loose. Refer to the Notes in the Replacement Procedure in "Y-Axis Mast Assembly" on page 1040. If this error occurred after replacing a pivot cable, Y-mast, or Y-axis cable, see Figure 408 on page 1041 to ensure the plate **4** was reinstalled correctly with the angle facing upwards. 6. Perform the Calibration Procedure. Select the Service menu. Select Calibration, Calibrate Library (see "Service Menus" on page 774).
AB1B AB43 AB44 AB45 AB47 AB48 AB49 AB4A AB4B	**Description** • URC=AB1B, SCSI Synchronous data transfer error. • URC=AB43, SCSI Message error. • URC=AB44, SCSI Internal target failure. • URC=AB45, SCSI Select or Reselect failure. • URC=AB47, SCSI Parity error. • URC=AB48, SCSI Initiator Detected Error message received. • URC=AB49, SCSI Invalid Message error. • URC=AB4A, SCSI Command Phase error. • URC=AB4B, SCSI Data Phase error. **Failure Isolation Procedure** Review host error data to determine which control path drive reported the error, then isolate and repair the failing SCSI or Fibre Channel component (see "SCSI Bus Problems" on page 767 or "Fibre Channel Problems" on page 772).
AB4E	**Description** Overlapped commands attempted. **Failure Isolation Procedure** The host sent another command before the preceding command completed. If the problem persists, contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
ABB1 ABB2	**Description** Battery failure (x32, x22, x52 frames only): • URC=ABB1, Battery failure on ACC. **Note:** If you have a dual-accessor library, you will see an additional message identifying Accessor 'A' or Accessor 'B'. • URC=ABB2, Battery failure on OPC. **URC FRU List** **Replace the failing battery.** See “Accessor Controller Card (ACC, ACC-CF)” on page 828 or “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850
ABB3	**Description** NVRAM Battery voltage low on ACC card (x23 and x53 frames only). **URC FRU List** Replace the ACC node card (See “Accessor Controller Card (ACC, ACC-CF)” on page 828).
ABB4	**Description** NVRAM ML Battery voltage low on OPC card (x23 and x53 frames only). **URC FRU List** Replace the OPC node card (See “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850).
ACC0	**Description** Library Firmware download completed successfully.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
ACCA	**Description** This URC indicates that the library attempted to Call Home (either as the result of someone initiating a Call Home Test or as the result of detecting a problem within the library). **Failure Isolation Procedure** If you are here because you found that this URC is in a PMH on Retain, then it indicates that someone initiated a Call Home Test. The Call Home Test is typically performed after installing and configuring the Remote Support Facility (library feature codes 2710, 271, or 2712). Contact the CE and report that the Call Home Test successfully opened a Retain PMH. After the CE has been notified, you may close the PMH. If you are at the machine, find the HEC/HECQ (in library sense or an error message on the operator panel) and find the corresponding problem description below. • Error=CA80 indicates that the Remote Support Facility was able to successfully Call Home. This is not a problem. – With a direct attached modem, or a modem connected through a WTI switch, this indicates a PMR has successfully been opened. – With a TSSC call home, the data package that opens the PMR is sent to the TSSC. TSSC must then initiate the call home. • Error=CA81 indicates that the Remote Support Facility attempted to Call Home, but was unable to connect to Retain. • Error=CA82 indicates that the Remote Support Facility successfully established a connection to RETAIN, but RETAIN did not open a PMH because the frame 1 serial number is not registered or because it is not covered by IBM warranty or maintenance agreement. • Error=CA83 indicates Call Home failed because it is disabled or not configured. • Error=CA84 indicates the library is unable to establish a connection between the library MCP/MCA and the local modem or to the Master Console. **FRUS**: modem, MCP/MCA-to-modem cable. • Error=CA85 indicates the library encountered a failure while using the **primary** phone number. It either failed while contacting the remote modem or it disconnected after contacting the remote modem. Verify that the primary phone number has been set correctly using CETool Remote Support Configuration. • Error=CA86 indicates the library encountered a failure while using the **secondary** phone number. It either failed while contacting the remote modem or it disconnected after contacting the remote modem. Verify that the secondary phone number has been set correctly using CETool Remote Support Configuration. • Error=CA87 indicates the library established a connection to the remote modem but could not log into the ATT Global Network. Verify that the account, userid, and password have been set correctly using CETool Remote Support Configuration. • Error=CA88 indicates the library logged into the ATT Global Network but could not establish a TCP/IP connection to RETAIN using the **primary** IP address. Verify that the primary IP address has been set correctly using CETool Remote Support Configuration. This error may indicate that the RETAIN server is temporarily down. • Error=CA89 indicates the library logged into the ATT Global Network but could not establish a TCP/IP connection to RETAIN using the **secondary** IP address. Verify that the secondary IP address has been set correctly using CETool Remote Support Configuration. This error may indicate that the RETAIN server is temporarily down. • Error=CA8A indicates the library established a TCP/IP connection but could not log into RETAIN. This error may indicate that the RETAIN server is temporarily down. **(Continued on the NEXT page)**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
ACCA (cont)	**(Continued from the PREVIOUS page)** • Error=CA8B indicates the library is unable to establish a connection from the library MCP/MCA to the local WTI switch. Verify the WTI switch configuration using the Remote Support Facility WTI Switch (FC2711) procedure in the INSTALL section of the MI. **FRUS**: MCP/MCA-to-WTI switch cable, WTI switch. • Error=CA8C indicates the library established a connection to the local WTI switch, but is unable to establish a connection from WTI switch to the local modem. This is normal if an attempt was made to call home while another machine on the same WTI switch was also calling home. **FRUS**: WTI switch, modem cable, modem. • Error=CA8D indicates the local modem Carrier Detect signal was high before the library attempted to dial the modem. This indicates that either a modem connection was previously established by another modem session which did not hang up, or that there is a problem with the modem or modem setup. • Error=CA8E indicates that Call Home failed - At least one data file was not sent to RETAIN. • Error=CA8F indicates that multiple retries have been attempted, but all retries have failed. This results in an SNMP trap to notify the customer. • Error=CA90 indicates logfile transmission successful. Not an error, log only. • Error=CACA indicates Test Call Home successful. **Note:** Multiple errors may be logged during a single attempt to call home. As an example, a CA85 indicating that the primary phone number didn't work, followed by a CA80 indicating a successful Call Home. The primary phone number didn't work, but since the call home was successful the secondary phone number must have worked.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
ACCB	**Description** • Error=CBC0, This error occurs if you try to downlevel library code to a level that does not support Virtual I/O. If you must downlevel to a level that does not support Virtual I/O then you must first disable Virtual I/O. This is done by the administrator using the web user interface. • Error=CBC1, This error occurs if node cards with compact flash (CF) are loaded with library firmware at a pre-6090 level (5xxx or earlier). Library Firmware **must** be updated to 6090 or higher **before** the new compact-flash-capable node card is installed. **Note:** If the library has at least one 4-I/O Dxx frame installed, Library Firmware 72xx or higher **must** be installed. • Error=CBC2. This error occurs if 7xxx or lesser code is loaded on a library with an Sx4 frame installed. Library Firmware **must** be updated to 8870 or higher. • Error=CBC3, Library Firmware download incompatible with Library Hardware. **Note:** This is the case if 95xx or higher firmware is loaded on earlier style nodes cards. Enhanced node cards with a Compact Flash (CF) FC 1700/1701 are required for firmware levels 95xx or higher. • Error=CBCA, Library Firmware download is required because at least one node card has a code version that is different than the rest of the library. • Error=CBCB, Library Firmware download failed or was interrupted, or the MCP/MCA (with Ethernet) was replaced in a single frame library, and the FRU has downlevel code, the Library Firmware needs to be reloaded via CETool. • Error=CBCC, Corrupted Library Firmware was downloaded and rejected. • Error=CBCD, An attempt to update drive code failed. If the problem persists, contact your next level of support. Time spent resolving code induced errors should be written against the Service Code 33 QSAR / RCMS using ECA 910. • Error=CBCE, Library code in XYLINX module didn't update - reset node card. An attempt to load new library firmware failed. **Failure Isolation Procedure** The library will continue to operate on the existing level of firmware. If you want to load new firmware, try to apply it again. If the problem persists, obtain a new firmware file and attempt to apply it again. If the problem persists, contact your next level of support. If the MCP/MCA (with Ethernet) was replaced in a single frame library and the FRU has downlevel code, you must use CETool to download and install the latest Library Firmware level. All node card with compact flash (CF) must have library firmware 6090 or higher.
ACCC	**Description** Library firmware error (see Object ID and Object Error). **Description** Error=CCCA, Library Firmware detected a memory allocation or stack error. **Note:** This error will typically have a sense key of 01 so it is logged but not reported. Error=CCCC, Library Firmware Error (see Object ID and Object Error). Have the customer update their library firmware to the latest level. Use FC 0500 if CE is asked to update the code. If there was no customer impact, the call should be cancelled. Error=CCCE, Library Firmware detected that the web server is not responding. **Failure Isolation Procedure** 1. Logs should be available in the CallHome database as a result of the CallHome. 2. Update the library firmware to the latest level. 3. If the library is already at latest code level, and logs are not available in the CallHome database (and there is an impact to the customer) then obtain a library dump, obtain the object ID and object error codes from the library error logs, and contact your next level of support.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
ACCD	**Description** Library Not Ready. ALMS feature needs to be installed and enabled. **Failure Isolation Procedure** **Library firmware level 8xxx or higher requires ALMS to be installed and enabled.** **Downlevel library firmware to a 7xxx level.**
ACCE	**Description** An attempt was made to configure additional frames, but the base frame does not have the Capacity Expansion Feature enabled. **Failure Isolation Procedure** **The library will operate, but will not use the expansion frame. You must enable the Capacity Expansion Feature before you can configure any additional frames.**
ACCF	Dual accessor X Axis Authorization Error. **Note:** This error can only occur in a dual accessor library. It indicates that an accessor needed to move to an X location that the other accessor currently 'owns' but it was unable to get the other accessor to grant permission. If one accessor is down then this condition may be considered normal. Fix the problem with the accessor. But if it happens with no other obvious problems then treat it like a code bug. Collect logs and contact support.
ACF2	**Description** A node card encountered a processor exception, saved information about the exception to Flash memory, then reset itself. **Failure Isolation Procedure** **No repair action is necessary — consider this a recovered error. Note: this condition is usually the result of a code bug. If the Remote Support Facility is installed then a call home should have sent information about the failure to IBM. If the Remote Support Facility is not installed, please collect Library Logs and contact your next level of support to provide the logs.**
AE10	**Description** MCC ESM RAM data rebuilt from NVRAM. **Note:** This is informational only. MCC ESC Descriptor data rebuilt from NVRAM. **Note:** This is informational only.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B101 B102 B103 B104 B105 B106 B107 B108 B109	**Description** Gripper #1 Problem. • URC=B101, Gripper #1 will not move — no encoder pulses. • URC=B102, Gripper #1 encountered obstacle while extending. • URC=B103, Gripper #1 encountered obstacle while retracting. • URC=B104, Gripper #1 encountered a high current condition while extending. • URC=B105, Gripper #1 encountered a high current condition while retracting. • URC=B106, Gripper #1 was unable to find a hard stop while extending. • URC=B107, Gripper #1 was unable to find a hard stop while retracting. • URC=B108, Gripper #1 unable to pick cartridge. • URC=B109, Gripper #1 unable to put cartridge. **Failure Isolation Procedure** **Notes:** 1. Before you attempt to resolve a B102 or B103 problem, please get library logs. If the error occurred at a drive, also get a drive dump from that drive. 2. Ensure that the gripper #1 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. 3. If your library has Universal Grippers, see “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140 to locate **"Kit, Gripper Clips FRU."** If your Universal Grippers do not have gripper clips installed, order and install this kit. 4. Check both X and Y accessor drive belts for damage and proper tension. 5. Run the gripper test: **MENU-> Service-> Tests/Tools-> Exercisers.** 6. Calibrate the accessor: **MENU-> Service-> Calibration.** 7. Calibrate the frame where the error occurred or the entire library if necessary. This calibration procedure can be run after the library has been returned to the customer. Select: **MENU-> Service-> Calibration.** 8. If the problem persists, replace the following FRUs: **Note:** To disable the gripper and prevent further errors until the faulty gripper can be replaced, manually retract the gripper fully and then unplug the gripper motor cable. When the door is closed, and the library goes through its rezero, it will see that the gripper won't move and will stop trying to use it. **URC FRU List** 1. Replace the failing LTO Gripper Assembly or mounting blocks or the LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Universal Gripper Assembly. Replace it with the "Gripper Assembly FRU Kit" as listed in “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140. b. If frame 1 is a model L32 then it is likely you have an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with Universal (LTO and 3592) grippers. 2. Check universal gripper clips to ensure they are properly installed. See “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B10A	**Description** Gripper #1 lost 37 V dc power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to the "Blown Fuse MAP" on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. Y-Axis Flex Cable (see "Y-Axis Cable" on page 1032). Also check for bent pins. 2. X-Axis Flex Cable (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 3. FIC-to-XCP Cable. Also check for bent pins. 4. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B10B	**Description** Gripper #1 encountered a low current condition while retracting. **Failure Isolation Procedure** **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO/3592 Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B10C	**Description** Gripper #1 cartridge misplaced. **Failure Isolation Procedure** Look for a cartridge laying in the base of the library. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO/3592 Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B10D	**Description** Gripper #1 wrong type - doesn't match configured type. **Failure Isolation Procedure** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the LTO/3592 Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B10E B10F	**Description** Gripper #1 sensor failure. **Failure Isolation Procedure** Ensure that the gripper sensor-to-PDC cable is connected securely at each gripper sensor and at the PDC card. Push the gripper sensor flag up gently and ensure that it moves all the way back down without binding. If it is binding then the flag has probably been pushed back. Gently pull the flag out to free it. **Run Library Verify to clear any errors**, and to verify proper gripper operation after cleaning or replacing the gripper. **URC FRU List** 1. Replace the failing LTO/3592 Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 2. Gripper Sensor-to-PDC Cable Card. Also check for bent pins. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B111 B112 B113 B114 B115 B116 B117 B118 B119	**Description** Gripper #2 problem. • URC=B111, Gripper #2 will not move — no encoder pulses. • URC=B112, Gripper #2 encountered obstacle while extending. • URC=B113, Gripper #2 encountered obstacle while retracting. • URC=B114, Gripper #2 encountered a high current condition while extending. • URC=B115, Gripper #2 encountered a high current condition while retracting. • URC=B116, Gripper #2 was unable to find a hard stop while extending. • URC=B117, Gripper #2 was unable to find a hard stop while retracting. • URC=B118, Gripper #2 unable to pick cartridge. • URC=B119, Gripper #2 unable to put cartridge. **Failure Isolation Procedure** **Notes:** 1. Before you attempt to resolve a B112 or B113 problem, please get library logs. If the error occurred at a drive, also get a drive dump from that drive. 2. Ensure that the gripper #1 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. 3. Ensure that the gripper #2 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. Also check for bent pins. 4. If your library has Universal Grippers, see “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140 to locate **"Kit, Gripper Clips FRU."** If your Universal Grippers do not have gripper clips installed, order and install this kit. 5. Check both X and Y accessor drive belts for damage and proper tension. 6. Run the gripper test: **MENU-> Service-> Tests/Tools-> Exercisers.** 7. Calibrate the accessor: **MENU-> Service-> Calibration.** 8. Calibrate the frame where the error occurred or the entire library if necessary. This calibration procedure can be run after the library has been returned to the customer. Select: **MENU-> Service-> Calibration.** 9. If the problem persists, replace the following FRUs: **Note:** To disable the gripper and prevent further errors until the faulty gripper can be replaced, manually retract the gripper fully and then unplug the gripper motor cable. When the door is closed, and the library goes through its rezero, it will see that the gripper won't move and will stop trying to use it. **URC FRU List** 1. Replace the failing LTO Gripper Assembly or mounting blocks or the LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Universal Gripper Assembly. Replace it with the "Gripper Assembly FRU Kit" as listed in “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140. b. If frame 1 is a model L32 then it is likely you have an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with Universal (LTO and 3592) grippers. 2. Check universal gripper clips to ensure they are properly installed. See “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B11A	**Description** Gripper #2 lost 37 V dc power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to the "Blown Fuse MAP" on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. Y-Axis Flex Cable (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 2. X-Axis Flex Cable (see "Y-Axis Cable" on page 1032). Also check for bent pins. 3. FIC to XCP Cable. Also check for bent pins. 4. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B11B	**Description** Gripper #2 encountered a low current condition while retracting. **Failure Isolation Procedure** **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO/3592 Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B11C	**Description** Gripper #2 cartridge misplaced. **Failure Isolation Procedure** Look for a cartridge laying in the base of the library. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO/3592 Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B11D	**Description** Gripper #2 wrong type - doesn't match configured type. **Failure Isolation Procedure** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the LTO/3592 Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B11E B11F	**Description** Gripper #2 sensor failure. **Failure Isolation Procedure** Ensure that the gripper sensor-to-PDC cable is connected securely at each gripper sensor and at the PDC card. Push the gripper sensor flag up gently and ensure that it moves all the way back down without binding. If it is binding then the flag has probably been pushed back. Gently pull the flag out to free it. **Run Library Verify to clear any errors**, and to verify proper gripper operation after cleaning or replacing the gripper. **URC FRU List** 1. Replace the failing LTO/3592 Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 2. Gripper Sensor-to-PDC Cable Card. Also check for bent pins. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).
B125 B126 B127	**Description** Invalid Config — I/O station related: • URC=B125, No I/O is installed for an installed frame (media) type. • URC=B126, A lower I/O station is installed with no matching frame (media) type. • URC=B127, L-frame upper I/O station is not the same media type as the L-frame. **Failure Isolation Procedure** **Ensure that the I/O stations installed match the media types that are installed. The upper I/O station must be the same media type as the base (model Lxx) frame. If the library has mixed media (a mixture of LTO and 3592 frames) then the lower I/O must support the other media type.** If no problem is found, replace the following FRUs: **URC FRU List** 1. I/O Station, Upper (if in error) (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. I/O Station, Lower (if in error) (see “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962). 3. I/O Station signal cable leading to the Operator panel or XIO card. Also check for bent pins. 4. Operator panel (if the upper I/O station is the configuration problem). 5. XIO card (if the lower I/O station is the configuration problem).
B12D	**Description** Invalid Config — a frame that is intended for 3592 drives/media contains an incompatible drive type (example: an LTO Ultrium drive in an L22/D22 frame). **Failure Isolation Procedure** **Visually check all drives to ensure that they are in compatible frames. LTO Ultrium drives (labeled Lx) are only supported in frame models L32/D32/L52/D52. Remove any unsupported drives.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B130 B131	**Description** Cannot open or cannot lock top I/O station: • URC=B130, Cannot open top I/O station (solenoid failure or sensor is not blocked when it should be blocked). • URC=B131, Cannot lock top I/O station (solenoid failure or sensor is blocked when it should not be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B130 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. 3592 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). 3. Replace the OPC to I/O Station Cable. Also check for bent pins. 4. Replace the OPC (see “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850). 5. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).
B132	**Description** Top I/O station does not match configuration. **Failure Isolation Procedure** **Ensure that the top I/O station is a 3592 I/O station, and that it has a '3592' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** If the problem persists, replace the following FRUs: **URC FRU List** 1. 3592 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. Replace the OPC to I/O Station Cable. Also check for bent pins. 3. Replace the OPC (see “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850). 4. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B133	**Description** Cannot open 4-I/O door TOP LEFT or TOP RIGHT I/O station. • URC=B133, Cannot open 4-I/O door TOP LEFT or TOP RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B133 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. 3592 I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B134	**Description** Cannot lock 4-I/O door TOP LEFT or TOP RIGHT I/O station: • URC=B134, Cannot open TOP LEFT or TOP RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B134 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. 3592 I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).
B135	**Description** TOP LEFT or TOP RIGHT I/O station type does not match configuration. **Failure Isolation Procedure** **Ensure that the TOP LEFT or TOP RIGHT I/O station is an LTO or 3592 I/O station, and that it has an 'LTO' or '3592' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** If the problem persists, replace the following FRUs: **URC FRU List** 1. Replace the XIO to I/O Station Cable. Also check for bent pins. 2. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B138 B139	**Description** Cannot open or cannot lock bottom I/O station: • URC=B138, Cannot open bottom I/O station (solenoid failure or sensor is not blocked when it should be blocked). • URC=B139, Cannot lock bottom I/O station (solenoid failure or sensor is blocked when it should not be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B138 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. 3592 I/O Station (see “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). 3. Replace the OPC to I/O Station Cable. Also check for bent pins. 4. Replace the OPC (see “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850). 5. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).
B13A	**Description** Bottom I/O station does not match configuration. **Failure Isolation Procedure** **Ensure that the bottom I/O station is a 3592 I/O station, and that it has a '3592' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** If the problem persists, replace the following FRUs: **URC FRU List** 1. 3592 16 I/O Station (see “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B13B	**Description** Cannot open 4-I/O door BOTTOM LEFT or BOTTOM RIGHT I/O station. • URC=B13B, Cannot open 4-I/O door BOTTOM LEFT or BOTTOM RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B13B can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. 3592 I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B13C	**Description** Cannot lock 4-I/O door BOTTOM LEFT or BOTTOM RIGHT I/O station: • URC=B13C, Cannot open BOTTOM LEFT or BOTTOM RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B13C can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. 3592 I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).
B13D	**Description** BOTTOM LEFT or BOTTOM I/O station type does not match configuration. **Failure Isolation Procedure** **Ensure that the BOTTOM LEFT or BOTTOM I/O station is an LTO or 3592 I/O station, and that it has an 'LTO' or '3592' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** If the problem persists, replace the following FRUs: **URC FRU List** 1. Replace the XIO to I/O Station Cable (see Figure 269 on page 868. Also check for bent pins. 2. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B140 B141	**Description** 3592 I/O station get or put failure: • URC=B140, 3592 I/O station will not release cartridge. • URC=B141, 3592 I/O station will not accept cartridge. **Failure Isolation Procedure** **Visually inspect the I/O station looking for any obvious obstruction or broken part. If no obvious problem is found, run the library verify test. If the test fails, replace the following FRUs:** **URC FRU List** 1. 3592 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 6. ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. PDC Card (see “PDC Card” on page 856).
B148 B149	**Description** Bottom (3592) I/O station get or put failure: • URC=B148, Bottom I/O station get failure (I/O station won't release cartridge). • URC=B149, Bottom I/O station put failure (I/O station will not accept cartridge). **Failure Isolation Procedure** **Run the library verify test. If the test fails, replace the following FRUs:** **URC FRU List** 1. 3592 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 6. ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. PDC Card (see “PDC Card” on page 856).
B14E	**Description** Bottom I/O station (3592) is full so cartridge export is not possible. **Failure Isolation Procedure** **No repairs are required. Have the operator remove cartridges from the bottom I/O station to allow room for cartridge export.**
B14F	**Description** Top I/O station (3592) is full so cartridge export is not possible. **Failure Isolation Procedure** **No repairs are required. Have the operator remove cartridges from the I/O station to allow room for cartridge export.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B150 Go to page 523	**Description** Slot get failure. Slot will not release cartridge. Go to page 523.
B151 Go to page 524	**Description** Slot put failure. Slot will not accept cartridge. Go to page 524.
B160	**Description** Calibration encountered a missing fiducial on a 3592 column. **Failure Isolation Procedure** See “Fiducial Missing Problems” on page 693 for a recovery procedure.
B170 B171 B172 B173 B174 B175	**Description** Calibration encountered a missing fiducial on a 3592 I/O station: • URC=B170, Top 3592 16 I/O station is #1. • URC=B171, Bottom 3592 16 I/O station is #2. • URC=B172, 4-I/O Door, upper left I/O station is #3. • URC=B173, 4-I/O Door, lower left I/O station is #4. • URC=B174, 4-I/O Door, upper right I/O station is #5. • URC=B175, 4-I/O Door, lower right I/O station is #6. **Failure Isolation Procedure** **The I/O station may be out of position. Repair or replace it. Perform the Calibration Procedure. Select the Service menu, then the Calibration menu (see “Service Menus” on page 774).** **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. 3592 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960 and “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962).
B190	**Description** Calibration has failed. Gripper 2 is marked failed. **Failure Isolation Procedure** 1. Ensure gripper 2 is firmly seated in the gripper housing assembly. 2. Calibration sensor may be defective.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B301 B302 B303 B304 B305 B306 B307 B308 B309	**Description** Gripper #1 Problem. • URC=B301, Gripper #1 will not move — no encoder pulses. • URC=B302, Gripper #1 encountered obstacle while extending. • URC=B303, Gripper #1 encountered obstacle while retracting. • URC=B304, Gripper #1 encountered a high current condition while extending. • URC=B305, Gripper #1 encountered a high current condition while retracting. • URC=B306, Gripper #1 was unable to find a hard stop while extending. • URC=B307, Gripper #1 was unable to find a hard stop while retracting. • URC=B308, Gripper #1 unable to pick cartridge. • URC=B309, Gripper #1 unable to put cartridge. **Failure Isolation Procedure** **Notes:** 1. Before you attempt to resolve a B302 or B303 problem, please get library logs. If the error occurred at a drive, also get a drive dump from that drive. 2. Ensure that the gripper #1 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. 3. Refer to Figure 336 on page 959. Inspect the gripper mounting blocks to ensure they are secure, and that the tip of the support pads are not broken. 4. If your library has Universal Grippers, see “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140 to locate **"Kit, Gripper Clips FRU."** If your Universal Grippers do not have gripper clips installed, order and install this kit. 5. Check both X and Y accessor drive belts for damage and proper tension. 6. Run the gripper test: **MENU-> Service-> Tests/Tools-> Exercisers.** 7. Calibrate the accessor: **MENU-> Service-> Calibration.** 8. Calibrate the frame where the error occurred or the entire library if necessary. This calibration procedure can be run after the library has been returned to the customer. Select: **MENU-> Service-> Calibration.** 9. If the problem persists, replace the following FRUs: **Note:** To disable the gripper and prevent further errors until the faulty gripper can be replaced, manually retract the gripper fully and then unplug the gripper motor cable. When the door is closed, and the library goes through its rezero, it will see that the gripper won't move and will stop trying to use it. **URC FRU List** 1. Replace the failing LTO Gripper Assembly or mounting blocks or the LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Universal Gripper Assembly. Replace it with the "Gripper Assembly FRU Kit" as listed in “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140. b. If frame 1 is a model L32 then it is likely you have an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with Universal (LTO and 3592) grippers. 2. Check universal gripper clips to ensure they are properly installed. See “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B30A	**Description** Gripper #1 lost 37 V dc power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to the "Blown Fuse MAP" on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. Y-Axis Flex Cable (see "Y-Axis Cable" on page 1032). Also check for bent pins. 2. X-Axis Flex Cable (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 3. FIC-to-XCP Cable. Also check for bent pins. 4. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B30B	**Description** Gripper #1 encountered a low current condition while retracting. **Failure Isolation Procedure** **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO Gripper Assembly or the LTO/3592 Gripper Assembly (see "Gripper Assembly, Single LTO (New Style)" on page 958 or "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Gripper Assembly. Replace it with the same type of gripper. b. If frame 1 is a model L22, L23, L52, or L53 then the gripper is an LTO/3592 Gripper Assembly. c. If frame 1 is a model L32 then it is likely to be an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with two Universal (LTO and 3592) grippers. d. If you are not at the machine and are not sure which type of gripper is installed, order both types to ensure you have the right part on hand. 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B30C	**Description** Gripper #1 cartridge misplaced. **Failure Isolation Procedure** Look for a cartridge laying in the base of the library. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO Gripper Assembly or the LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Gripper Assembly. Replace it with the same type of gripper. b. If frame 1 is a model L22, L23, L52, or L53 then the gripper is an LTO/3592 Gripper Assembly. c. If frame 1 is a model L32 then it is likely to be an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with two Universal (LTO and 3592) grippers. d. If you are not at the machine and are not sure which type of gripper is installed, order both types to ensure you have the right part on hand. 2. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 3. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828).
B30D	**Description** Gripper #1 wrong type - doesn't match configured type. **Failure Isolation Procedure** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO or LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B30E B30F	**Description** Gripper #1 sensor failure. **Failure Isolation Procedure** Ensure that the gripper sensor-to-PDC cable is connected securely at each gripper sensor and at the PDC card. If the gripper is an LTO/3592 (universal) type, push the gripper sensor flag up gently and ensure that it moves all the way back down without binding. If it is binding then the flag has probably been pushed back. Gently pull the flag out to free it. Obtain the HEC/HECQ from the Retain Call Home record, host logs, or the library error log. The HEC is byte 18 of the library sense data, and the HECQ is byte 19 of the library sense data. – If the HEC/HECQ is 41 81, 41 82, or 41 83, replace Gripper #1 (Upper Gripper). – If the HEC/HECQ is 41 84, clean dust or debris from the lens on both sensor cards on Gripper #1 (Upper Gripper). **Run Library Verify to clear any errors**, and to verify proper gripper operation after cleaning or replacing the gripper. **URC FRU List** 1. Replace the failing LTO or LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Gripper Assembly. Replace it with the same type of gripper. b. If frame 1 is a model L22, L23, L52, or L53 then the gripper is an LTO/3592 Gripper Assembly. c. If frame 1 is a model L32 then it is likely to be an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with two Universal (LTO and 3592) grippers. d. If you are not at the machine and are not sure which type of gripper is installed, order both types to ensure you have the right part on hand. 2. Gripper Sensor-to-PDC Cable Card. Also check for bent pins. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B311 B312 B313 B314 B315 B316 B317 B318 B319	**Description** Gripper #2 problem. • URC=B311, Gripper #2 will not move — no encoder pulses. • URC=B312, Gripper #2 encountered obstacle while extending. • URC=B313, Gripper #2 encountered obstacle while retracting. • URC=B314, Gripper #2 encountered a high current condition while extending. • URC=B315, Gripper #2 encountered a high current condition while retracting. • URC=B316, Gripper #2 was unable to find a hard stop while extending. • URC=B317, Gripper #2 was unable to find a hard stop while retracting. • URC=B318, Gripper #2 unable to pick cartridge. • URC=B319, Gripper #2 unable to put cartridge. **Failure Isolation Procedure** **Notes:** 1. Before you attempt to resolve a B312 or B313 problem, please get library logs. If the error occurred at a drive, also get a drive dump from that drive. 2. Ensure that the gripper #2 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. Also check for bent pins. 3. If your library has Universal Grippers, see “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140 to locate **"Kit, Gripper Clips FRU."** If your Universal Grippers do not have gripper clips installed, order and install this kit. 4. Check both X and Y accessor drive belts for damage and proper tension. 5. Run the gripper test: **MENU-> Service-> Tests/Tools-> Exercisers.** 6. Calibrate the accessor: **MENU-> Service-> Calibration.** 7. Calibrate the frame where the error occurred or the entire library if necessary. This calibration procedure can be run after the library has been returned to the customer. Select: **MENU-> Service-> Calibration.** 8. If the problem persists, replace the following FRUs: **Note:** To disable the gripper and prevent further errors until the faulty gripper can be replaced, manually retract the gripper fully and then unplug the gripper motor cable. When the door is closed, and the library goes through its rezero, it will see that the gripper won't move and will stop trying to use it. **URC FRU List** 1. Replace the failing LTO Gripper Assembly or mounting blocks or the LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Universal Gripper Assembly. Replace it with the "Gripper Assembly FRU Kit" as listed in “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140. b. If frame 1 is a model L32 then it is likely you have an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with Universal (LTO and 3592) grippers. 2. Check universal gripper clips to ensure they are properly installed. See “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B31A	**Description** Gripper #2 lost 37 V dc power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to the "Blown Fuse MAP" on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. Y-Axis Flex Cable (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 2. X-Axis Flex Cable (see "Y-Axis Cable" on page 1032). Also check for bent pins. 3. FIC to XCP Cable. Also check for bent pins. 4. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B31B	**Description** Gripper #2 encountered a low current condition while retracting. **Failure Isolation Procedure** **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO Gripper Assembly or the LTO/3592 Gripper Assembly (see "Gripper Assembly, Single LTO (New Style)" on page 958 or "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Gripper Assembly. Replace it with the same type of gripper. b. If frame 1 is a model L22, L23, L52, or L53 then the gripper is an LTO/3592 Gripper Assembly. c. If frame 1 is a model L32 then it is likely to be an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with two Universal (LTO and 3592) grippers. d. If you are not at the machine and are not sure which type of gripper is installed, order both types to ensure you have the right part on hand. 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B31C	**Description** Gripper #2 cartridge misplaced. **Failure Isolation Procedure** Look for a cartridge laying in the base of the library. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO Gripper Assembly or the LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Gripper Assembly. Replace it with the same type of gripper. b. If frame 1 is a model L22, L23, L52, or L53 then the gripper is an LTO/3592 Gripper Assembly. c. If frame 1 is a model L32 then it is likely to be an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with two Universal (LTO and 3592) grippers. d. If you are not at the machine and are not sure which type of gripper is installed, order both types to ensure you have the right part on hand. 2. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 3. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828).
B31D	**Description** Gripper #2 wrong type - doesn't match configured type. **Failure Isolation Procedure** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing LTO or LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B31E B31F	**Description** Gripper #2 sensor failure. **Failure Isolation Procedure** Ensure that the gripper sensor-to-PDC cable is connected securely at each gripper sensor and at the PDC card. Also check for bent pins. If the gripper is an LTO/3592 (universal) type, push the gripper sensor flag up gently and ensure that it moves all the way back down without binding. If it is binding then the flag has probably been pushed back. Gently pull the flag out to free it. Obtain the HEC/HECQ from the Retain Call Home record, host logs, or the library error log. The HEC is byte 18 of the library sense data, and the HECQ is byte 19 of the library sense data. – If the HEC/HECQ is 41 91, 41 92, or 41 93, replace Gripper #2 (Lower Gripper). – If the HEC/HECQ is 41 94, clean dust or debris from the lens on both sensor cards on Gripper #2 (Lower Gripper). **Run Library Verify to clear any errors**, and to verify proper gripper operation after cleaning or replacing the gripper. **URC FRU List** 1. Replace the failing LTO or LTO/3592 Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Gripper Assembly. Replace it with the same type of gripper. b. If frame 1 is a model L22, L23, L52, or L53 then the gripper is an LTO/3592 Gripper Assembly. c. If frame 1 is a model L32 then it is likely to be an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with two Universal (LTO and 3592) grippers. d. If you are not at the machine and are not sure which type of gripper is installed, order both types to ensure you have the right part on hand. 2. Gripper Sensor-to-PDC Cable Card. Also check for bent pins. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B120 B320 B420 B520	**Description** Config - Gripper related. Current grippers do not support installed media types. Other causes: • Library with 3592 frames with old style LTO gripper installed. • Both grippers are full. • With HD frames: – Both grippers are in a failed status – Both grippers are full – Therefore, no gripper is available to complete the operation. B120 – 3592 Gripper B320 – LTO Gripper B420 – 3592 HD Gripper B520 – LTO HD Gripper **Failure Isolation Procedure** • Ensure that the grippers that are installed match the media types that are installed. • Ensure no cartridges are left in the grippers • Ensure grippers are working normally. If the grippers are correct, perform the 'Finish Accessor Service' procedure to force the library to update the gripper configuration. If no problem is found, replace the following FRUs: **URC FRU List** 1. Ensure the correct grippers are installed. If old style LTO grippers are installed, replace the dual gripper assembly with universal grippers. (See “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 2. PDC Card (see “PDC Card” on page 856). 3. Accessor Controller Card (ACC) (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 4. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B121 B321 B421 B521	**Description** Invalid Config - Mixed grippers are installed but only one frame (media) type is installed. B121 – 3592 Gripper B321 – LTO Gripper B421 – 3592 HD Gripper B521 – LTO HD Gripper **Failure Isolation Procedure** **Ensure the grippers that are installed match the media type in the library (either both LTO or both 3592 but not a mix). This does not apply if universal grippers (LTO/3592) are installed.** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing gripper, ensure the correct grippers are installed (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954).
B123 B323 B423 B523	**Description** Invalid Config - Mixed media - 3592 gripper 1 (upper) with LTO gripper 2 (lower). B123 – 3592 Gripper B323 – LTO Gripper B423 – 3592 HD Gripper B523 – LTO HD Gripper **Failure Isolation Procedure** **Ensure the grippers that are installed match the media type in the library.** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing gripper, ensure the correct grippers are installed (see “Gripper Assembly, Single LTO (New Style)” on page 958 or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B125 B325 B126 B326 B127 B327	**Description** Invalid Config — I/O station related: B125 – 3592 I/O B325 – LTO I/O B126 – 3592 I/O B326 – LTO I/O B127 – 3592 I/O B327 – LTO I/OL • URC=B125, B325, No I/O is installed for an installed frame (media) type. • URC=B126, B326 , An I/O station is installed with no matching frame (media) type. • URC=B127, B327, L-frame 10 cartridge I/O is not the same media type as the L-frame. **Failure Isolation Procedure** **Ensure that the I/O stations installed match the media types that are installed. The L-frame must contain an LTO I/O station, and if the library is mixed media, there must also be a 3592 I/O station in the L-frame. If the library is not mixed media, two LTO I/O stations are possible.** If no problem is found, replace the following FRUs: **URC FRU List** 1. I/O Station, Upper (if in error) (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. I/O Station, Lower (if in error) (see “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962). 3. I/O Station signal cable leading to the Operator panel or XIO card. Also check for bent pins. 4. Operator panel (if the upper I/O station is the configuration problem). 5. XIO card (if the lower I/O station is the configuration problem).
B128 B328	**Description** Invalid Config - An I/O station in a 4 I/O door config was found invalid during library verify. **Note:** The I/O station type label is only checked during library verify. B128 – 3592 I/O B328 – LTO I/O **Failure Isolation Procedure** This error would be posted if a different media type I/O station was installed in a 4-I/O door. For Example: Three LTO I/O stations, and one 3592 I/O station in the same 4-I/O frame, or vice virsa. Verify that all four I/O stations are of the same media type, and that all I/O station barcode labels are intact.
B32C	**Description** Invalid Config - Drive type incompatible with original drive type. **Failure Isolation Procedure** This error is logged on drive FRU replacements if a 3592 J1A is replaced with a 3592 E05, or if a 3592 E05 encryption-capable drive is replaced with a 3592 E05 non-encryption capable drive. See “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B32D	**Description** Invalid Config — a frame that is intended for LTO Ultrium drives/media contains an incompatible drive type (example: a 3592 drive in an L32/D32/L52/D52 frame). **Failure Isolation Procedure** **Visually check all drives to ensure that they are in compatible frames. 3592 drives (labeled J1A) are only supported in frame models L22/D22. Remove any unsupported drives.** Check for a bent pin on FIC card J8 in the Lxx frame.
B32E	**Description** Invalid Config — DLT is not supported with this code version. **Failure Isolation Procedure** **Load a version of library firmware which supports DLT (3060 is recommended).**
B330 B331	**Description** Cannot open or cannot lock top I/O station: • URC=B330, Cannot open top I/O station (solenoid failure or sensor is not blocked when it should be blocked). • URC=B331, Cannot lock top I/O station (solenoid failure or sensor is blocked when it should not be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B330 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. LTO I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). 3. Replace the OPC to I/O Station Cable. Also check for bent pins. 4. Replace the OPC (see “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850). 5. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B332	**Description** Top I/O station does not match configuration. **Failure Isolation Procedure** **Ensure that the top I/O station is an LTO I/O station, and that it has an 'LTO' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** **Note:** Early model L32 frames had high-gloss, bar code labels that limited the performance of the bar code scanner. A Field Bill to replace these labels was released but may not have been installed on all machines. If you suspect that a glossy label is causing this problem, replace the labels with clean, photocopied labels (do not use glossy paper), or cover the glossy labels with frosted, cellophane tape. This can reduce the reflectivity of the label, making it possible for the bar code scanner to scan it successfully. Use this technique until the customer can acquire proper label material. If the problem persists, replace the following FRUs: **URC FRU List** 1. If the base frame is a model L32: LTO 10 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). If the base frame is a model L52: LTO 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. Replace the OPC to I/O Station Cable. Also check for bent pins. 3. Replace the OPC (see “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850). 4. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).
B333	**Description** Cannot open 4-I/O door TOP LEFT or TOP RIGHT I/O station. • URC=B333, Cannot open 4-I/O door TOP LEFT or TOP RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B333 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. LTO I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B334	**Description** Cannot lock 4-I/O door TOP LEFT or TOP RIGHT I/O station: • URC=B334, Cannot open TOP LEFT or TOP RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B334 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. LTO I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).
B335	**Description** TOP LEFT or TOP RIGHT I/O station type does not match configuration. **Failure Isolation Procedure** **Ensure that the TOP LEFT or TOP RIGHT I/O station is an LTO or 3592 I/O station, and that it has an 'LTO' or '3592' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** If the problem persists, replace the following FRUs: **URC FRU List** 1. Replace the XIO to I/O Station Cable. Also check for bent pins. 2. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B338 B339	**Description** Cannot open or cannot lock bottom I/O station: • URC=B338, Cannot open bottom I/O station (solenoid failure or sensor not blocked when it should be). • URC=B339, Cannot lock bottom I/O station (solenoid failure or sensor blocked when it shouldn't be). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B338 can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. LTO I/O Station (see “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid (L32)” on page 968). 3. Replace the OPC to I/O Station Cable. Also check for bent pins. 4. Replace the OPC (see “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850). 5. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).
B33A	**Description** Bottom I/O station does not match configuration. **Failure Isolation Procedure** **Ensure that the bottom I/O station is an LTO I/O station, and that it has a 'LTO' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** If the problem persists, replace the following FRUs: **URC FRU List** 1. If the base frame is a model L32: LTO 20 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). If the base frame is a model L52: LTO 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Card (Lxx Frame Only)” on page 862).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B33B	**Description** Cannot open 4-I/O door BOTTOM LEFT or BOTTOM RIGHT. • URC=B33B, Cannot open 4-I/O door BOTTOM LEFT or BOTTOM RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B33B can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. LTO I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B33C	**Description** Cannot lock 4-I/O door BOTTOM LEFT or BOTTOM RIGHT I/O station: • URC=B33C, Cannot open BOTTOM LEFT or BOTTOM RIGHT I/O station (solenoid failure or sensor is not blocked when it should be blocked). **Failure Isolation Procedure** **Ensure that the solenoid and sensor connections are tight, and that the sensor flag on the solenoid shaft is aligned with the sensor. If solenoid connections are reversed, a URC B33C can result. Check the alignment of the I/O lock solenoid to the I/O station door by manually operating the solenoid plunger while observing the sensor flag and sensor. If the solenoid plunger is not aligned with the I/O station door then the plunger will hit the I/O station door instead of entering the hole in the I/O station door, preventing the sensor flag from blocking the sensor.** **Note:** If the sensor flag is misaligned with the sensor then you can adjust the sensor flag or sensor to correct this problem. However if the solenoid plunger is misaligned with the I/O door then adjusting the solenoid is unlikely to correct the problem. **URC FRU List** **If the solenoid plunger is misaligned with the I/O station door:** 1. I/O Station Door (see “I/O Station Door (L22, L23, L52, L53)” on page 964 or “I/O Station Door, 3592 (L32)” on page 966). 2. LTO I/O Station (see “I/O Stations (4-I/O Frame Only)” on page 868). 3. I/O Station Door Locked Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). **If the solenoid plunger is aligned with the I/O station door:** 1. I/O Station Door Locked Sensor or Solenoid (see “I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)” on page 974). 2. Replace the XIO to I/O Station Cable. Also check for bent pins. 3. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).
B33D	**Description** BOTTOM LEFT or BOTTOM RIGHT I/O station type does not match configuration. **Failure Isolation Procedure** **Ensure that the BOTTOM LEFT or BOTTOM RIGHT I/O station is an LTO or 3592 I/O station, and that it has an 'LTO' or '3592' bar code label located on the rear surface of the I/O station, just below the lowest I/O slot.** If the problem persists, replace the following FRUs: **URC FRU List** 1. Replace the XIO to I/O Station Cable (see Figure 269 on page 868. Also check for bent pins. 2. Replace the XIO Card (see “XIO Cards (4-I/O Frame Only)” on page 864).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B340 B341	**Description** LTO I/O station get or put failure: • URC=B340, LTO I/O station will not release cartridge. • URC=B341, LTO I/O station will not accept cartridge. **Failure Isolation Procedure** **Visually inspect the I/O station looking for any obvious obstruction or broken part. If no obvious problem is found, run the library verify test. If the test fails, replace the following FRUs:** **URC FRU List** 1. If the base frame is a model L32: LTO 10 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). If the base frame is a model L52: LTO 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. LTO Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 6. ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. PDC Card (see “PDC Card” on page 856).
B348 B349	**Description** Bottom (LTO) I/O station get or put failure: • URC=B348, Bottom I/O station get failure (I/O station won't release cartridge). • URC=B349, Bottom I/O station put failure (I/O station will not accept cartridge). **Failure Isolation Procedure** **Run the library verify test. If the test fails, replace the following FRUs:** **URC FRU List** 1. If the base frame is a model L32: LTO 20 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). If the base frame is a model L52: LTO 16 I/O Station (see “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960). 2. LTO Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 6. ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. PDC Card (see “PDC Card” on page 856).
B34E	**Description** Bottom I/O station (LTO) is full so cartridge export is not possible. **Failure Isolation Procedure** **No repairs are required. Have the operator remove cartridges from the bottom I/O station to allow room for cartridge export.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B34F	**Description** Top I/O station (LTO) is full so cartridge export is not possible. **Failure Isolation Procedure** **No repairs are required. Have the operator remove cartridges from the I/O station to allow room for cartridge export.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B150 B350 B452 B552 B453 B553	**Description** Slot get failure. Slot will not release cartridge. B150 – 3592 Slot B350 – LTO Slot B452 – 3592 HD Door Slot B552 – LTO HD Door Slot B453 – 3592 HD Slot B553 – LTO HD Slot **Failure Isolation Procedure** With an Sx4 high density frame in the library, the trailer record information will follow the format below. – Location 1 (source) Slot F0x C0x R0x – Location 2 (intended destination) Slot F0x C0x R0x – Location 3 (failed location) Slot F0x C0x R0x Update library firmware to 7422 or 8872 or later (based on library configuration). Location 3 could be the same place as either Location 1 or 2 based on where the LTO Slot Get failed. 1. To acquire the Element Address corresponding to the failure from the sense data or error log, see "Element Address to Frame, Column, Row Converter" on page 702. 2. Run the library verify test to determine whether there is a repeatable problem with a gripper. If library verify fails, use the information from that failure to resolve the problem. 3. If the get failure occurred at a storage slot in column 7 of an expansion frame (model Dxx), the problem may be caused by an improperly installed tape drive. If a drive is mounted too close to the adjacent column of slots then it can interfere with the gripper. When the gripper extends to get a cartridge from a slot in column 7 the right gripper finger may contact the drive bezel, causing the finger to cam out. This results in the gripper trying to get the cartridge using only the left gripper finger. Check the clearance between tape drive and the failing column 7 storage cell tray. Remove and reinstall the fixed tray (or Fixed Tray), ensuring that the locator tab at the front of the tray is in the locator slot in the storage wall. 4. If no problem has been found, verify that the failure still occurs. Use the library operator panel to move a cartridge from/to the affected storage slot. At the operator panel press MENU, then select Manual Operations, Move Cartridge. 5. If the failure still occurs, calibrate the library. At the operator panel, press MENU, then select Service, Calibration, and calibrate the library. **Note:** Calibration takes about 5 minutes per frame, and in a large library this may not be necessary. If this problem only occurs in a single frame, you can calibrate that frame. 6. Update library firmware level to 7422 or 8872 (or later). Firmware level is dependent on library type. 7. If the problem persists, use the following FRU list. Exchange one FRU at a time until the problem has been resolved. **URC FRU List** 1. Cartridge cell (see "Storage Slot Section" on page 1000). 2. LTO/3592 Gripper Assembly (see "Gripper Assembly, Single LTO (New Style)" on page 958 or "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 3. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 4. X-Axis Motor and Belt (see "X-Axis Motor and Drive Belt" on page 1024). 5. Y-Axis Motor and Belt (see "Y-Axis Motor and Drive Belt" on page 1042). 6. ACC Card (see "Accessor Controller Card (ACC, ACC-CF)" on page 828). 7. MDA Assembly (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 8. PDC Card (see "PDC Card" on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B151 B351 B454 B554 B455 B555	**Description** Slot put failure. Slot will not accept cartridge. B151 – 3592 Slot B351 – LTO Slot B454 – 3592 HD Door Slot B554 – LTO HD Door Slot B455 – 3592 HD Slot B555 – LTO HD Slot **Note:** To acquire the Element Address corresponding to the failure from the sense data or error log, see "Element Address to Frame, Column, Row Converter" on page 702. With an Sx4 high density frame in the library, the trailer record information will follow the format below. • Location 1 (source) Slot F0x C0x R0x • Location 2 (intended destination) Slot F0x C0x R0x • Location 3 (failed location) Slot F0x C0x R0x Location 3 could be the same place as either Location 1 or 2 based on where the Slot Put failed. **URC FRU List** 1. Cartridge cell (see "Storage Slot Section" on page 1000). 2. LTO/3592 Gripper Assembly (see "Gripper Assembly, Single LTO (New Style)" on page 958 or "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 3. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 4. X-Axis Motor and Belt (see "X-Axis Motor and Drive Belt" on page 1024). 5. Y-Axis Motor and Belt (see "Y-Axis Motor and Drive Belt" on page 1042). 6. ACC Card (see "Accessor Controller Card (ACC, ACC-CF)" on page 828). 7. MDA Assembly (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 8. PDC Card (see "PDC Card" on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B152 B352 B456 B556 B457 B557	**Description** Unable to get cartridge out of slot. Gripper retracted but no cartridge is present in gripper • B152 – 3592 Slot • B352 – LTO Slot • B456 – 3592 HD Door Slot • B556 – LTO HD Door Slot • B457 – 3592 HD Slot • B557 – LTO HD Slot **Note:** To acquire the Element Address corresponding to the failure from the sense data or error log, see "Element Address to Frame, Column, Row Converter" on page 702. With an Sx4 high density frame in the library, the trailer record information will follow the format below. • Location 1 (source) Slot F0x C0x R0x • Location 2 (intended destination) Slot F0x C0x R0x • Location 3 (failed location) Slot F0x C0x R0x Location 3 could be the same place as either Location 1 or 2 based on where the Slot Put failed. **Possible Causes** **Single Deep Cell:** • Check to see if there is a cartridge in the failing slot. It could be empty (inventory issue). • Check gripper and gripper fingers for damage or wear that could cause fingers to slip off the cartridge. • Check that a gripper did not get dislodged from the housing assembly. • Check X and Y Calibration. **Note:** Binding upper Y-mast rollers cause the mast to wobble, resulting in calibration errors and cartridge mis-picks. Clean the roller shafts with a small amount of #6 lubricant, and replace the rollers. **HD Slot:** • Check to see if there is a cartridge in the slot. • Check for a defective gate/spring assembly (not pushing cartridge forward). • Check for an open gate in the adjacent cell that could affect the failing cell. • In a HD slot, the gate was not kept open while retracting the cartridge. • Check for damaged or worn gripper fingers. • Calibrate the column or frame. **URC FRU List** 1. Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Gate/Spring assembly if HD slot on back wall. (see "Gate and Spring Assembly (High Density Frames)" on page 978). 3. Cartridge cell (see "Storage Slot Section" on page 1000). 4. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 5. X-Axis Motor and Belt (see "X-Axis Motor and Drive Belt" on page 1024). 6. Y-Axis Motor and Belt (see "Y-Axis Motor and Drive Belt" on page 1042). 7. ACC Card (see "Accessor Controller Card (ACC, ACC-CF)" on page 828). 8. MDA Assembly (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 9. PDC Card (see "PDC Card" on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B153 B353 B458 B558 B459 B559	**Description** Unable to get cartridge out of slot. Gripper is unable to retract; cartridge is stuck in the slot. • B153 – 3592 Slot • B353 – LTO Slot • B458 – 3592 HD Door Slot • B558 – LTO HD Door Slot • B459 – 3592 HD Slot • B559 – LTO HD Slot **Note:** To acquire the Element Address corresponding to the failure from the sense data or error log, see "Element Address to Frame, Column, Row Converter" on page 702. With an Sx4 high density frame in the library, the trailer record information will follow the format below. • Location 1 (source) Slot F0x C0x R0x • Location 2 (intended destination) Slot F0x C0x R0x • Location 3 (failed location) Slot F0x C0x R0x Location 3 could be the same place as either Location 1 or 2 based on where the Slot Put failed. **Possible Causes** **Single Deep Cell:** • Check the slot to ensure the cartridge is not physically stuck in the slot. This could be caused by a cell with a rough surface not allowing the cartridge to be extracted. • Check gripper assembly. May be a problem with motor or belt. **HD Slot:** • Check to see if you can pull the cartridge out of the slot by hand. • Inspect the secondary catch assembly (it may be broken). • Check Y-calibration. If calibration is too low, the gate will not open. • Check for damaged or worn gripper fingers. • If the bottom plate of the gripper is plastic, check for wear in the bottom of the grooves. If there is more than 0.5 mm (0.020") replace the gripper. • Check for a jammed or defective secondary catch assembly (it may be broken). • Check the HD slot and secondary catch assembly for damage. **URC FRU List** 1. Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Cartridge cell (see "Storage Slot Section" on page 1000). 3. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 4. X-Axis Motor and Belt (see "X-Axis Motor and Drive Belt" on page 1024). 5. Y-Axis Motor and Belt (see "Y-Axis Motor and Drive Belt" on page 1042). 6. ACC Card (see "Accessor Controller Card (ACC, ACC-CF)" on page 828). 7. MDA Assembly (see "Motor Driver Assembly (MDA, MDA-CF)" on page 846). 8. PDC Card (see "PDC Card" on page 856).
B360	**Description** Calibration encountered a missing fiducial on an LTO column. **Failure Isolation Procedure** See "Fiducial Missing Problems" on page 693 for a recovery procedure.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B370 B371 B372 B373 B374 B375	**Description** Calibration encountered a missing fiducial on an LTO I/O station: • URC=B370, Top LTO I/O station is #1. • URC=B371, Bottom LTO I/O station #2. • URC=B372, 4-I/O Door, upper left I/O station is #3. • URC=B373, 4-I/O Door, lower left I/O station is #4. • URC=B374, 4-I/O Door, upper right I/O station is #5. • URC=B375, 4-I/O Door, lower right I/O station is #6. **Failure Isolation Procedure** **The I/O station may be out of position. Repair or replace it. Perform the Calibration Procedure. Select the Service menu, then the Calibration menu (see "Service Menus" on page 774).** **URC FRU List** 1. Calibration sensor (see "Calibration Sensor" on page 822). 2. I/O Station (see "I/O Station, Upper (L32, L22, L23, L52, L53)" on page 960, "I/O Station, Lower (L32, L22, L23, L52, L53)" on page 962, and "I/O Stations (4-I/O Frame Only)" on page 868). **Notes:** a. The top I/O Station for a model L32 is an LTO 10 I/O station. b. The top I/O Station for a model L52 is an LTO 16 I/O station. c. The bottom LTO I/O station for a model L32 is an LTO 20 I/O station. d. The bottom LTO I/O station for a model L52 is an LTO 16 I/O station. e. In a 4-I/O door frame (D53), all four are LTO 16 I/O stations.
B37C	**Description** • URC=B37C, Calibration encountered a missing fiducial on Shuttle Station tray. See Frame number. **Failure Isolation Procedure & FRU List** • The problem can be caused by dust accumulation in the fiducial hole that is used during calibration. Blow or brush the dust from the fiducial hole. • If this does not fix the problem, replace the Station Base Tray Asm with Fiducial. Refer to the parts catalog in the Shuttle Complex installation instructions. • When the problem has been corrected, the station must be re-calibrated.
B380	**Description** 4 I/O station door LED panel failure. **URC FRU List** 1. Check cables from XIO card to LED panel (see Figure 269 on page 868). Also check for bent pins. 2. Check cable from MCA to XIO card (see Figure 269 on page 868). Also check for bent pins. 3. LED panel assembly. (See "LED Panel (4-I/O Frame Only)" on page 866). 4. XIO card (See "XIO Cards (4-I/O Frame Only)" on page 864). 5. MCA (See "Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)" on page 844).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B401 B501 B402 B502 B403 B503 B404 B504 B405 B505 B406 B506 B407 B507 B408 B508 B409 B509	**Description** Gripper #1 Problem. • URC=B401 B501, Gripper #1 will not move — no encoder pulses. • URC=B402 B502, Gripper #1 encountered obstacle while extending. • URC=B403 B503, Gripper #1 encountered obstacle while retracting. • URC=B404 B504, Gripper #1 encountered a high current condition while extending. • URC=B405 B505, Gripper #1 encountered a high current condition while retracting. • URC=B406 B506, Gripper #1 was unable to find a hard stop while extending. • URC=B407 B507, Gripper #1 was unable to find a hard stop while retracting. • URC=B408 B508, Gripper #1 unable to pick cartridge. • URC=B409 B509, Gripper #1 unable to put cartridge. **Failure Isolation Procedure** **Notes:** 1. Before you attempt to resolve a Bx02 or Bx03 problem, please get library logs. If the error occurred at a drive, also get a drive dump from that drive. 2. Ensure that the gripper #1 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. 3. Check both X and Y accessor drive belts for damage and proper tension. 4. Run the gripper test: **MENU-> Service-> Tests/Tools-> Exercisers.** 5. Calibrate the accessor: **MENU-> Service-> Calibration.** 6. Calibrate the frame where the error occurred or the entire library if necessary. This calibration procedure can be run after the library has been returned to the customer. Select: **MENU-> Service-> Calibration.** 7. If the problem persists, replace the following FRUs: **Note:** To disable the gripper and prevent further errors until the faulty gripper can be replaced, manually retract the gripper fully and then unplug the gripper motor cable. When the door is closed, and the library goes through its rezero, it will see that the gripper won't move and will stop trying to use it. **URC FRU List** 1. Replace the failing HD Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 2. Check gripper clips to ensure they are properly installed and locked in place. See “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).
B40A B50A	**Description** Gripper #1 lost 37 V dc power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to the “Blown Fuse MAP” on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. Y-Axis Flex Cable (see “Y-Axis Cable” on page 1032). Also check for bent pins. 2. X-Axis Flex Cable (see “X-Axis Track Cable” on page 1014). Also check for bent pins. 3. FIC-to-XCP Cable. Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B40B B50B	**Description** Gripper #1 encountered a low current condition while retracting. **Failure Isolation Procedure** **Replace the following FRUs:** **URC FRU List** 1. Replace the failing HD Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 2. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 3. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828).
B40C B50C	**Description** Gripper #1 cartridge misplaced. **Failure Isolation Procedure** Look for a cartridge laying in the base of the library. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing HD Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 2. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 3. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828).
B40D B50D	**Description** Gripper #1 wrong type - doesn't match configured type. **Failure Isolation Procedure** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the HD Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B40E B50E B40F B50F	**Description** Gripper #1 sensor failure. **Failure Isolation Procedure** Ensure that the gripper sensor-to-PDC cable is connected securely at each gripper sensor and at the PDC card. Obtain the HEC/HECQ from the Retain Call Home record, host logs, or the library error log. The HEC is byte 18 of the library sense data, and the HECQ is byte 19 of the library sense data. – If the HEC/HECQ is 41 81, 41 82, or 41 83, replace Gripper #1 (Upper Gripper). – If the HEC/HECQ is 41 84, clean dust or debris from the cartridge present sensor on Gripper #1 (Upper Gripper). **Run Library Verify to clear any errors**, and to verify proper gripper operation after cleaning or replacing the gripper. **URC FRU List** 1. Replace the failing HD Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. Be sure to replace it with the same type of gripper. b. If library has any HD frames installed then the gripper is an HD Gripper Assembly. 2. Gripper Sensor-to-PDC Cable Card. Also check for bent pins. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B411 B511 B412 B512 B413 B513 B414 B514 B415 B515 B416 B516 B417 B517 B418 B518 B419 B519	**Description** Gripper #2 problem. • URC=B411 B511, Gripper #2 will not move — no encoder pulses. • URC=B412 B512, Gripper #2 encountered obstacle while extending. • URC=B413 B513, Gripper #2 encountered obstacle while retracting. • URC=B414 B514, Gripper #2 encountered a high current condition while extending. • URC=B415 B515, Gripper #2 encountered a high current condition while retracting. • URC=B416 B516, Gripper #2 was unable to find a hard stop while extending. • URC=B417 B517, Gripper #2 was unable to find a hard stop while retracting. • URC=B418 B518, Gripper #2 unable to pick cartridge. • URC=B419 B519, Gripper #2 unable to put cartridge. **Failure Isolation Procedure** **Notes:** 1. Before you attempt to resolve a Bx12 or Bx13 problem, please get library logs. If the error occurred at a drive, also get a drive dump from that drive. 2. Ensure that the gripper #1 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. 3. Ensure that the gripper #2 motor cable is firmly seated at the PDC card, and that the pivot flex cable is firmly seated at the PDC card and the ACC card. Also check for bent pins. 4. Check both X and Y accessor drive belts for damage and proper tension. 5. Run the gripper test: **MENU-> Service-> Tests/Tools-> Exercisers.** 6. Calibrate the accessor: **MENU-> Service-> Calibration.** 7. Calibrate the frame where the error occurred or the entire library if necessary. This calibration procedure can be run after the library has been returned to the customer. Select: **MENU-> Service-> Calibration.** 8. If the problem persists, replace the following FRUs: **Note:** To disable the gripper and prevent further errors until the faulty gripper can be replaced, manually retract the gripper fully and then unplug the gripper motor cable. When the door is closed, and the library goes through its rezero, it will see that the gripper won't move and will stop trying to use it. **URC FRU List** 1. Replace the failing HD Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). **Notes:** a. The gripper may be an LTO Gripper Assembly or an LTO/3592 Universal Gripper Assembly. Replace it with the "Gripper Assembly FRU Kit" as listed in “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140. b. If frame 1 is a model L32 then it is likely you have an LTO Gripper Assembly. If one or more model D22 frames are attached then it has been upgraded with Universal (LTO and 3592) grippers. 2. Check gripper clips to ensure they are properly installed and locked in place. See “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B41A B51A	**Description** Gripper #2 lost 37 V dc power. **Failure Isolation Procedure** **Check the Fuses on the FIC in frame 1. If this is an HA1 library, check the fuses in the last active frame and in Service Bay B. If any fuse is blown, go to the "Blown Fuse MAP" on page 667. If no fuse is blown, check for a loose connection in the cabling from the FIC card to the ACC. If no problem is found, replace the following FRUs:** **URC FRU List** 1. Y-Axis Flex Cable (see "X-Axis Track Cable" on page 1014). Also check for bent pins. 2. X-Axis Flex Cable (see "Y-Axis Cable" on page 1032). Also check for bent pins. 3. FIC to XCP Cable. Also check for bent pins. 4. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B41B B51B	**Description** Gripper #2 encountered a low current condition while retracting. **Failure Isolation Procedure** **Replace the following FRUs:** **URC FRU List** 1. Replace the failing HD Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B41C B51C	**Description** Gripper #2 cartridge misplaced. **Failure Isolation Procedure** Look for a cartridge laying in the base of the library. **Replace the following FRUs:** **URC FRU List** 1. Replace the failing HD Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954). 2. Pivot Flex Cable (see "Pivot Flex Cable" on page 992). Also check for bent pins. 3. ACC (see "Accessor Controller Card (ACC, ACC-CF)" on page 828).
B41D B51D	**Description** Gripper #2 wrong type - doesn't match configured type. **Failure Isolation Procedure** The gripper type that is detected does not match the gripper type that is stored in configuration data. If you just replaced a gripper then you may have installed the wrong replacement part. If you are sure that the gripper is the right type, you may need to configure the library to update the gripper type in configuration. If the problem persists, collect library logs and contact your next level of support. **Replace the following FRUs:** **URC FRU List** 1. Replace the HD Gripper Assembly (see "Gripper Assembly, Single, LTO/3592 (Universal), & HD" on page 954).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
B41E B51E B41F B51F	**Description** Gripper #2 sensor failure. **Failure Isolation Procedure** Ensure that the gripper sensor-to-PDC cable is connected securely at each gripper sensor and at the PDC card. Push the gripper sensor flag up gently and ensure that it moves all the way back down without binding. If it is binding then the flag has probably been pushed back. Gently pull the flag out to free it. **Run Library Verify to clear any errors**, and to verify proper gripper operation after cleaning or replacing the gripper. **URC FRU List** 1. Replace the failing LTO/3592 Gripper Assembly (see “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954). 2. Gripper Sensor-to-PDC Cable Card. Also check for bent pins. 3. Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. ACC (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 5. PDC (see “PDC Card” on page 856).
B710	Gripper retry on get operation. **Note:** This is informational only.
B730	Fixed home slot not available. **Note:** This is informational only.
C000 C100 C200 C300	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Note:** The Lxx frame is always frame number 1. Service bay A is not frame 1. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 2. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928). 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C001 C101 C201 C301 C002 C102 C202 C302 C003 C103 C203 C303 C004 C104 C204 C304 C010 C110 C210 C310	**Description** • URC=C001, C101, C201, C301 MCP or MCA cannot get a response from a configured drive on RS-422. • URC=C002, C102, C202, C302 MCP or MCA detected an RS-422 problem with the response from a drive. • URC=C003, C103, C203, C303 MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=C004, C104, C204, C304 MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=C010, C110, C210, C310 MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Note:** The Lxx frame is always frame number 1. Service bay A is not frame 1. **Failure Isolation Procedure** See "Drive Problems" on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models" on page 928). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 4. If the problem persists, replace the MCP or MCA.
C011 C111 C211 C311	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Note:** The Lxx frame is always frame number 1. Service bay A is not frame 1. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**
C012 C112 C212 C312	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Note:** The Lxx frame is always frame number 1. Service bay A is not frame 1. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887).
C013 C113 C213 C313	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C014 C114 C214 C314	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Note:** The Lxx frame is always frame number 1. Service bay A is not frame 1. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
C020 C120 C220 C320	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Note:** The Lxx frame is always frame number 1. Service bay A is not frame 1. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C031 C131 C231 C331 C033 C133 C233 C333	**Description** Drive Load or Unload failure: • URC=C031 (J1A) Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=C131 (E05) Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=C231 (E06/EU6) Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=C331 (E07) Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=C033 (J1A) Drive load failure — unable to extend cartridge to the drive load position. • URC=C133 (E05) Drive load failure — unable to extend cartridge to the drive load position. • URC=C233 (E06/EU6) Drive load failure — unable to extend cartridge to the drive load position. • URC=C333 (E07) Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C032 C132 C232 C332 C034 C134 C234 C334	**Description** Drive Load or Unload failure: • URC=C032 (J1A) Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=C132 (E05) Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=C232 (E06/EU6) Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=C332 (E07) Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=C034 (J1A) Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. • URC=C134 (E05) Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. • URC=C234 (E06/EU6) Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. • URC=C334 (E07) Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the 3592 Drive Canister (see “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
C033 C133 C233, C333	See C031, C131, C231, C333
C034, C134 C234, C334	See C034, C134, C234. C334

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C036 C136 C236 C336	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the 3592 Drive Canister (see "Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement" on page 887).
C800	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 LVD Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the MCP or MCA to drives RS-422 cable. Also check for bent pins. 3. If the problem persists, replace the MCP or MCA.
C801 C802 C803 C810	**Description** • URC=C801, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=C802, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=C803, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=C810, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See "Drive Problems" on page 672 for corrective actions. **URC FRU List** 1. LTO Ultrium-1 LVD Fixed Tray (see "Drive Tray Assembly – LTO SCSI" on page 876). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. Also check for bent pins. 3. If the problem persists, replace the MCP or MCA.
C811	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C812	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 LVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
C813	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 LVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
C814	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
C820	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-1 LVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C831 C832 (next page) C833	**Description** Drive Load or Unload failure: • URC=C831, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=C833, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Remove any cartridge that is in the drive. 2. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. • If the cartridge is damaged or defective, give it to the customer for replacement. • If the cartridge is okay, continue with the next step in this procedure. 3. A spring clip EC is available to reduce the extraction force of the L1 drive. If this spring is **not** already installed on the drive, order and install it (see the FRU list below). **Note:** If installing the spring clip EC, it is recommended that you install it on all L1 drives in the tape subsystem. 4. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. A spring clip EC is available to reduce the extraction force of LTO Ultrium-1 (L1) drives. If the spring clip EC is not already installed on your drive, see page 1103 to order, "Spring Clip Kit, L1, LTO". The kit comes with installation instructions. 2. If the problem persists, replace the LTO Ultrium-1 LVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C832 C834	**Description** Drive Load or Unload failure: • URC=C832, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=C834, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-1 LVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). Also check for bent pins. 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
C900	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-1 HVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 3. If the problem persists, replace the MCP or MCA (see “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C901 C902 C903 C910	**Description** • URC=C901, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=C902, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=C903, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=C910, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See "Drive Problems" on page 672 for corrective actions. **URC FRU List** 1. LTO Ultrium-1 HVD Fixed Tray (see "Drive Tray Assembly – LTO SCSI" on page 876). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 3. If the problem persists, replace the MCP or MCA (see "Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840).
C911	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**
C912	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 HVD Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
C913	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 HVD Fixed Tray (see "Drive Types, Fixed Trays, and Power Supplies" on page 874).
C914	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C920	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-1 HVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C931 C932 (see next page) C933	**Description** Drive Load or Unload failure: • URC=C931, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=C933, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Remove any cartridge that is in the drive. 2. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. • If the cartridge is damaged or defective, give it to the customer for replacement. • If the cartridge is okay, continue with the next step in this procedure. 3. A spring clip EC is available to reduce the extraction force of the L1 drive. If this spring is **not** already installed on the drive, order and install it (see the FRU list below). **Note:** If installing the spring clip EC, it is recommended that you install it on all L1 drives in the tape subsystem. 4. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. A spring clip EC is available to reduce the extraction force of LTO Ultrium-1 (L1) drives. If the spring clip EC is not already installed on your drive, see page 1103 to order, "Spring Clip Kit, L1, LTO". The kit comes with installation instructions. 2. If the problem persists, replace the LTO Ultrium-1 HVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
C932 C934	**Description** Drive Load or Unload failure: • URC=C932, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=C934, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-1 HVD Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
CA00	**Description** MCP or MCA cannot see a configured drive on the feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA, if possible, since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Fibre Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 3. If the problem persists, replace the MCP or MCA.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CA01 CA02 CA03 CA10	**Description** • URC=CA01, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=CA02, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=CA03, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=CA10, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See “Drive Problems” on page 672 for corrective actions. **URC FRU List** 1. LTO Ultrium-1 Fibre Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 3. If the problem persists, replace the MCP or MCA.
CA11	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**
CA12	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Fibre Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CA13	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Fibre Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CA14	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CA20	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-1 Fibre Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CA31 CA33	**Description** Drive Load or Unload failure: • URC=CA31, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=CA33, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Remove any cartridge that is in the drive. 2. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. • If the cartridge is damaged or defective, give it to the customer for replacement. • If the cartridge is okay, continue with the next step in this procedure. 3. A spring clip EC is available to reduce the extraction force of the L1 drive. If this spring is **not** already installed on the drive, order and install it (see the FRU list below). **Note:** If installing the spring clip EC, it is recommended that you install it on all L1 drives in the tape subsystem. 4. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. A spring clip EC is available to reduce the extraction force of LTO Ultrium-1 (L1) drives. If the spring clip EC is not already installed on your drive, see page 1103 to order, "Spring Clip Kit, L1, LTO". The kit comes with installation instructions. 2. If the problem persists, replace the LTO Ultrium-1 Fibre Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CA32 CA34	**Description** Drive Load or Unload failure: • URC=CA32, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=CA34, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-1 Fibre Fixed Tray (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
CA33	See CA31.
CA34	See CA32.
CB00	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CB01 CB02 CB03 CB04 CB10	**Description** • URC=CB01, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=CB02, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=CB03, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=CB04, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=CB10, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See “Drive Problems” on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
CB11	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**
CB12	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CB13	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CB14	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
CB20	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-1 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CB31 CB33	**Description** Drive Load or Unload failure: • URC=CB31, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=CB33, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Remove any cartridge that is in the drive. 2. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. • If the cartridge is damaged or defective, give it to the customer for replacement. • If the cartridge is okay, continue with the next step in this procedure. 3. A spring clip EC is available to reduce the extraction force of the L1 drive. If this spring is **not** already installed on the drive, order and install it (see the FRU list below). **Note:** If installing the spring clip EC, it is recommended that you install it on all L1 drives in the tape subsystem. 4. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. A spring clip EC is available to reduce the extraction force of LTO Ultrium-1 (L1) drives. If the spring clip EC is not already installed on your drive, see page 1103 to order, "Spring Clip Kit, L1, LTO". The kit comes with installation instructions. 2. If the problem persists, replace the LTO Ultrium-1 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CB32 CB34	**Description** Drive Load or Unload failure: • URC=CB32, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=CB34, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-1 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
CB33	See CB31.
CB34	See CB32.
CB36	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CC00	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models” on page 918 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
CC01 CC02 CC03 CC04 CC10	**Description** • URC=CC01, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=CC02, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=CC03, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=CC04, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=CC10, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See “Drive Problems” on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models” on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
CC11	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CC12	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CC13	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CC14	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
CC20	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CC31 CC33	**Description** Drive Load or Unload failure: • URC=CC31, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=CC33, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Remove any cartridge that is in the drive. 2. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. • If the cartridge is damaged or defective, give it to the customer for replacement. • If the cartridge is okay, continue with the next step in this procedure. 3. A spring clip EC is available to reduce the extraction force of the L1 drive. If this spring is **not** already installed on the drive, order and install it (see the FRU list below). **Note:** If installing the spring clip EC, it is recommended that you install it on all L1 drives in the tape subsystem. 4. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. A spring clip EC is available to reduce the extraction force of LTO Ultrium-1 (L1) drives. If the spring clip EC is not already installed on your drive, see page 1103 to order, "Spring Clip Kit, L1, LTO". The kit comes with installation instructions. 2. If the problem persists, replace the LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CC32 CC34	**Description** Drive Load or Unload failure: • URC=CC32, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=CC34, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
CC33	See CC31.
CC34	See CC32.
CC36	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CD00	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
CD01 CD02 CD03 CD04 CD10	**Description** • URC=CD01, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=CD02, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=CD03, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=CD04, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=CD10, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See “Drive Problems” on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
CD11	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CD12	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CD13	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CD14	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
CD20	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CD31 CD33	**Description** Drive Load or Unload failure: • URC=CD31, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=CD33, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Remove any cartridge that is in the drive. 2. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. • If the cartridge is damaged or defective, give it to the customer for replacement. • If the cartridge is okay, continue with the next step in this procedure. 3. A spring clip EC is available to reduce the extraction force of the L1 drive. If this spring is **not** already installed on the drive, order and install it (see the FRU list below). **Note:** If installing the spring clip EC, it is recommended that you install it on all L1 drives in the tape subsystem. 4. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. A spring clip EC is available to reduce the extraction force of LTO Ultrium-1 (L1) drives. If the spring clip EC is not already installed on your drive, see page 1103 to order, "Spring Clip Kit, L1, LTO". The kit comes with installation instructions. 2. If the problem persists, replace the LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CD32 CD34	**Description** Drive Load or Unload failure: • URC=CD32, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=CD34, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
CD33	See CD31.
CD34	See CD32.
CD36	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-1 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CE00	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
CE01 CE02 CE03 CE04 CE10	**Description** • URC=CE01, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=CE02, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=CE03, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=CE04, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=CE10, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See “Drive Problems” on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
CE11	**Description** MCP or MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CE12	**Description** MCP or MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CE13	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CE14	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
CE20	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CE31 CE33	**Description** Drive Load or Unload failure: • URC=CE31, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=CE33, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CE32 CE34	**Description** Drive Load or Unload failure: • URC=CE32, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=CE34, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
CE33	See CE31.
CE34	See CE32.
CE36	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 LVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CF00	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models” on page 918 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
CF01 CF02 CF03 CF04 CF10	**Description** • URC=CF01, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=CF02, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=CF03, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=CF04, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=CF10, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See “Drive Problems” on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models” on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
CF11	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CF12	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CF13	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
CF14	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
CF20	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CF31 CF33	**Description** Drive Load or Unload failure: • URC=CF31, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=CF33, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
CF32 CF34	**Description** Drive Load or Unload failure: • URC=CF32, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=CF34, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042). 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
CF33	See CF31.
CF34	See CF32.
CF36	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 HVD Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D000	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models” on page 918 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
D001 D002 D003 D004 D010	**Description** • URC=D001, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=D002, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=D003, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=D004, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=D010, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See “Drive Problems” on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see “Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models” on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
D011	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D012	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D013	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D014	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
D020	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D031 D033	**Description** Drive Load or Unload failure: • URC=D031, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=D033, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D032 D034	**Description** Drive Load or Unload failure: • URC=D032, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=D034, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. Open the door where the failing drive is located. 3. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from being picked. 4. Run Library Verify on the failing drive to see if the problem repeats. 5. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
D033	See D031.
D034	See D032.
D036	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-2 Fibre Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D300	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-3 (3588 F3A) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
D301 D302 D303 D304 D310	**Description** • URC=D301, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=D302, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=D303, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=D304, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=D310, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See "Drive Problems" on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-3 (3588 F3A) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
D311	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D312	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-3 (3588 F3A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D313	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-3 (3588 F3A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D314	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
D320	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-3 (3588 F3A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D331 D332 (see row below) D333	**Description** Drive Load or Unload failure: • URC=D331, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=D333, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-3 (3588 F3A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D332 D334	**Description** Drive Load or Unload failure: • URC=D332, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=D334, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-3 (3588 F3A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
D333	See D331.
D334	See D332.
D336	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-3 (3588 F3A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D400	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-3 (3588 F3B) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
D401 D402 D403 D404 D410	**Description** • URC=D401, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=D402, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=D403, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=D404, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=D410, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See "Drive Problems" on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-3 (3588 F3B) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
D411	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D412	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-3 (3588 F3B) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D413	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-3 (3588 F3B) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D414	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
D420	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-3 (3588 F3B) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D431 D433	**Description** Drive Load or Unload failure: • URC=D431, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=D433, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-3 (3588 F3B) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D432 D434	**Description** Drive Load or Unload failure: • URC=D432, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=D434, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-3 (3588 F3B) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
D436	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-3 (3588 F3B) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D700	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-4 (3588 F4A) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
D701 D702 D703 D704 D710	**Description** • URC=D701, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=D702, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=D703, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=D704, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=D710, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See "Drive Problems" on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-4 (3588 F4A) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
D711	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D712	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-4 (3588 F4A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D713	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-4 (3588 F4A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
D714	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
D720	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-4 (3588 F4A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D731 D733	**Description** Drive Load or Unload failure: • URC=D731, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=D733, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-4 (3588 F4A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
D732 D734	**Description** Drive Load or Unload failure: • URC=D732, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=D734, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-4 (3588 F4A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
D736	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-4 (3588 F4A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
DA00	**Description** MCP or MCA cannot see a configured drive on feedback loop. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check for a loose RS-422 cable. Avoid unplugging the RS-422 cable from the MCP or MCA if possible since that will affect other drives.** If this problem occurs at installation it is possible that manufacturing removed a drive from the library but did not update the configuration prior to shipping the library. If the failing frame/drive location does not contain a drive then this error will be resolved by configuring the library. **URC FRU List** If the problem persists, replace the following FRUs: 1. If the problem persists, replace the LTO Ultrium-5 (3588 F5A) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918 3. If the problem persists, replace the MCP or MCA to drives RS-422 cable. 4. If the problem persists, replace the MCP or MCA.
DA01 DA02 DA03 DA04 DA10	**Description** • URC=DA01, MCP or MCA cannot get a response from a configured drive on RS-422. • URC=DA02, MCP or MCA detected an RS-422 problem with the response from a drive. • URC=DA03, MCP or MCA detected too many RS-422 retries communicating with a drive. • URC=DA04, MCP or MCA cannot get a response from the DCC card in a configured drive canister on RS-422. • URC=DA10, MCP or MCA timed out waiting for a drive to complete a command. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** See "Drive Problems" on page 672 for corrective actions. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-5 (3588 F5A) FC Drive Canister (see "Drive Types, Fixed Trays, and Power Supplies" on page 874). 2. If the problem persists, replace the Fixed Tray Assembly (see "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" on page 918). 3. If the problem persists, replace the RS-422 cable from the MCP or MCA to the drives. 4. If the problem persists, replace the MCP or MCA.
DA11	**Description** MCP/MCA received an unrecognized message from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, contact your next level of support.**

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
DA12	**Description** MCP/MCA detected that drive/canister type does not match what is currently configured. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** **If you just replaced a drive, ensure that the drive you installed is the same type as the original. If the problem persists, replace the drive. If the problem still persists, the library configuration may be incorrect. Reconfigure the library.** **URC FRU List** If the problem persists, replace the LTO Ultrium-5 (3588 F5A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
DA13	**Description** MCP/MCA attempted to change the drive SCSI ID or FC Loop ID but the drive would not accept the new ID. **URC FRU List** If the problem persists, replace the LTO Ultrium-5 (3588 F5A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
DA14	**Description** MCP/MCA received unexpected or invalid status from a drive over RS-422. See Failing Frame and Failing Drive numbers in the sense data or library error log. **Failure Isolation Procedure** This is usually due to a microcode problem. **Check the level of code in the drive and on the library. If either is downlevel, update the code. If the problem persists, collect library and drive dumps, then contact your next level of support. Do not replace any FRUs unless instructed to do so by your next level of support.**
DA20	**Description** Calibration encountered a missing fiducial on a drive. See the Failing Frame and Failing Device in the library error log to know which drive is affected. **Failure Isolation Procedure** • The problem can be caused by dust accumulation in the fiducial hole that is used during drive calibration. Blow or brush the dust from the fiducial hole. • The problem can also be caused by a drive bezel that has been knocked out of place, or a drive that is not installed properly. Ensure the drive is mounted properly. If the drive bezel is missing, locate the drive bezel and reinstall it. • When the problem has been corrected, the drive must be recalibrated. At the front panel, select MENU, Service, Calibration, and calibrate the affected drive (see “Service Menus” on page 774) **URC FRU List** 1. Calibration sensor (see “Calibration Sensor” on page 822). 2. LTO Ultrium-5 (3588 F5A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
DA31 DA33	**Description** Drive Load or Unload failure: • URC=DA31, Drive unload failure — unable to get a cartridge that is in the unloaded position at the drive. • URC=DA33, Drive load failure — unable to extend cartridge to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. Open the door where the failing drive is located. 2. Remove the cartridge from the drive. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from unloading. Also check for any mis-positioned cartridge label. 3. If the cartridge is damaged or defective, give it to the customer for replacement. 4. If the cartridge is not in the drive, check the gripper. Inspect both grippers to ensure they are securely mounted in the gripper frame. 5. If the tape cartridge is not damaged, place it in any empty cell in the frame. If all the cells are full, open the door of an adjacent frame and install the cartridge there. 6. Inspect all the cartridges in the frame (back wall and door) to ensure they are fully seated in their storage cells. 7. Run Library Verify on the failing drive to see if the problem repeats. **URC FRU List** 1. If the problem persists, replace the LTO Ultrium-5 (3588 F5A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 2. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 3. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 4. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 5. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 6. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 7. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 8. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).

Table 54. URC Description with Action and FRUs (continued)

URC	Description of Symptom, Required Action, and FRU
DA32 DA34	**Description** Drive Load or Unload failure: • URC=DA32, Drive eject failure — there is no cartridge in the unloaded position at the drive. • URC=DA34, Drive load failure — drive loader did not load the cartridge after it was extended to the drive load position. See the failing frame and failing drive fields in the sense data or the library error log to determine which drive is affected. **Failure Isolation Procedure** 1. See “Drive Problems” on page 672 to determine whether the drive is hung and to remove any cartridge that is in the drive. 2. For drive load failures only, perform the “Drive Load Problems - LTO Only” on page 674. **URC FRU List** 1. This failure could be caused by a cartridge gate not opening due to a gate mechanical problem. 2. If the problem persists, replace the LTO Ultrium-5 (3588 F5A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874). 3. If the problem persists, replace the Gripper Assembly (see “Gripper Assembly, Single LTO (New Style)” on page 958). 4. If the problem persists, replace the Pivot Flex Cable (see “Pivot Flex Cable” on page 992). 5. If the problem persists, replace the X-Axis Motor and Belt (see “X-Axis Motor and Drive Belt” on page 1024). 6. If the problem persists, replace the Y-Axis Motor and Belt (see “Y-Axis Motor and Drive Belt” on page 1042) 7. If the problem persists, replace the ACC Card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828). 8. If the problem persists, replace the MDA Assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846). 9. If the problem persists, replace the PDC Card (see “PDC Card” on page 856).
DA36	**Description** The library has detected that the cooling fan inside a drive canister has failed. **Failure Isolation Procedure** The Failing Frame/Device field in the sense data specifies the location of the canister. **URC FRU List** If the problem persists, replace the LTO Ultrium-5 (3588 F5A) FC Drive Canister (see “Drive Types, Fixed Trays, and Power Supplies” on page 874).
FFFF	**Description** The library was unable to assign a unique URC to this failure. **Failure Isolation Procedure** This indicates that the library did not have all the information it needed to assign a more specific URC for this failure. As an example, if a failure occurred which was related to a drive, but the library was unable to determine the drive type, then it could not assign a URC. Perform the following steps: 1. Find the HEC/HECQ in the sense data associated with the error. 2. Go to “Library Sense Data to URC Table” on page 279, and obtain the URC. 3. Locate the URC in “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.

LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)

Use Table 56 on page 591 only if no sense data is available. Whenever possible, use sense data or a drive FSC instead of the drive single-character display (SCD) code.

The Ultrium Tape Drive has a single-character display (SCD) which will display a code that can aid in servicing the drive. While the library is active, it can be difficult to see the SCD without opening the library door. An easier way to obtain information about a drive error is to see which drive is reporting an error, then access that drive's error log using the library operator panel. A drive error log may be accessed from the library operator panel, using the **Service** and **Drive Error Logs** menus.

Determine what type of drive you are working with (see notes below) and use Table 55 to cross reference the drive SCD code to a URC. Then, use the URC in "URC Table With Descriptions, Actions, and FRUs" on page 375 to locate and repair the problem. You can review Table 56 on page 591 to read a brief description of the problem.

Notes:

1. Determine the drive type (LTO Ultrium-1 or LTO Ultrium-2, LVD/HVD/FC) or (LTO Ultrium-3, -4, -5, 3592, FC) by referring to the labels on the back of the drive.
2. Drive types may be abbreviated on the labels. **L1** indicates an LTO Ultrium-1 drive. **L2** indicates an LTO Ultrium-2 drive. **L3** indicates an LTO Ultrium-3 (3588 model F3A or F3B) drive. **L4** indicates an LTO Ultrium-4 (3588 model F4A) drive. **L5** indicates an LTO Ultrium-5 (3588 model F5A) drive. **J1A** indicates a 3592 model J1A drive. **E05** indicates a 3592 model E05 drive, **E06** indicates a 3592 model E06 drive, and **EU6** indicates a 3592 model EU6 drive.
3. Early-production Fixed Tray assemblies did not have labels. Regard these as LTO1 DT LVD drives.

The following abbreviations apply to the URC column:

LTO1 DT LVD. LTO Ultrium-1 Fixed Tray (SCSI Low Voltage Differential)

LTO1 DT HVD. LTO Ultrium-1 Fixed Tray (SCSI High Voltage Differential)

LTO1 DT FC. LTO Ultrium-1 Fixed Tray Fibre Channel

LTO1 DC LVD. LTO Ultrium-1 drive canister (SCSI Low Voltage Differential)

LTO1 DC HVD. LTO Ultrium-1 drive canister (SCSI High Voltage Differential)

LTO1 DC FC. LTO Ultrium-1 drive canister Fibre Channel

LTO2 DC LVD. LTO Ultrium-2 drive canister (SCSI Low Voltage Differential)

LTO2 DC HVD. LTO Ultrium-2 drive canister (SCSI High Voltage Differential)

LTO2 DC FC. LTO Ultrium-2 drive canister Fibre Channel

LTO3 DC F3A. LTO Ultrium-3 3588 F3A drive canister (Fibre Channel)

LTO3 DC F3B. LTO Ultrium-3 3588 F3B drive canister (Fibre Channel)

LTO4 DC F4A. LTO Ultrium-4 3588 F4A drive canister (Fibre Channel)

LTO5 DC F5A. LTO Ultrium-5 3588 F5a drive canister (Fibre Channel)

Table 55. LTO Drive SCD to URC Conversion

SCD Code	URC (LTO1 DT LVD)	URC (LTO1 DT HVD)	URC (LTO1 DT FC)	URC (LTO1 DC LVD)	URC (LTO1 DC HVD)	URC (LTO1 DC FC)	URC (LTO2 DC LVD)	URC (LTO2 DC HVD)	URC (LTO2 DC FC)	URC (LTO3 DC F3A)	URC (LTO3 DC F3B)	URC (LTO4 DC F4A)	URC (LTO5 DC F5A)
0	3000	3400	3800	3C00	4000	4400	4800	4C00	5000	5C00	6000	6C00	7C00

Table 55. LTO Drive SCD to URC Conversion (continued)

SCD Code	URC (LTO1 DT LVD)	URC (LTO1 DT HVD)	URC (LTO1 DT FC)	URC (LTO1 DC LVD)	URC (LTO1 DC HVD)	URC (LTO1 DC FC)	URC (LTO2 DC LVD)	URC (LTO2 DC HVD)	URC (LTO2 DC FC)	URC (LTO3 DC F3A)	URC (LTO3 DC F3B)	URC (LTO4 DC F4A)	URC (LTO5 DC F5A)
1	3001	3401	3801	3C01	4001	4401	4801	4C01	5001	5C01	6001	6C01	7C01
2	3002	3402	3802	3C02	4002	4402	4802	4C02	5002	5C02	6002	6C02	7C02
3	3003	3403	3803	3C03	4003	4403	4803	4C03	5003	5C03	6003	6C03	7C03
4	3004	3404	3804	3C04	4004	4404	4804	4C04	5004	5C04	6004	6C04	7C04
5	3005	3405	3805	3C05	4005	4405	4805	4C05	5005	5C05	6005	6C05	7C05
6	3006	3406	3806	3C06	4006	4406	4806	4C06	5006	5C06	6006	6C06	7C06
7	3007	3407	3807	3C07	4007	4407	4807	4C07	5007	5C07	6007	6C07	7C07
8	3008	3408	3808	3C08	4008	4408	4808	4C08	5008	5C08	6008	6C08	7C08
9	3009	3409	3809	3C09	4009	4409	4809	4C09	5009	5C09	6009	6C09	7C09
A	300A	340A	380A	3C0A	400A	440A	480A	4C0A	500A	5C0A	600A	6C0A	7C0A
C	300C	340C	380C	3C0C	400C	440C	480C	4C0C	500C	5C0C	600C	6C0C	7C0C
D	N/A	N/A	380D	N/A	N/A	440D	N/A	N/A	500D	5C0D	600D	6C0D	7C0D
E	N/A	N/A	380E	N/A	N/A	440E	N/A	N/A	500E	5C0E	600E	6C0E	7C0E
F	N/A	N/A	380F	N/A	N/A	440F	N/A	N/A	500F	5C0F	600F	6C0F	7C0F

Table 56. LTO Drive SCD Codes

SCD Code	Description
0	No Error. Ran successfully.
1	Cooling problem.
2	5V dc power problem. Tape drive detected that the Drive Power Supply is either approaching the specified voltage limit (drive is still operating) or is outside the specified voltage range (drive is not operating).
3	Tape drive determined that a microcode error occurred.
4	Microcode or tape drive problem. Tape drive determined that a microcode or tape drive hardware failure occurred.
5	Tape drive problem. Tape drive determined that a hardware failure occurred.
6	Tape drive or media error. Tape drive determined that an error occurred, but it cannot isolate the error due to faulty hardware or to the tape cartridge.
7	Media error.
8	Tape drive, SCSI bus or fibre channel error.
9	Tape drive or RS-422 error.
A	Tape drive hardware problem.
C	Tape drive needs to be cleaned.
D	Tape drive determined that another device is using the same Fibre Channel AL_PA (Loop ID).
E	Tape drive received an OFFLINE command from another device on the Fibre Channel Arbitrated Loop.
e	Encryption Error. Displayed when the drive detects an error associated with an encryption operation. **Note:** This problem is typically related to encryption configuration, and the drive hardware must **not** be replaced for this error code. Refer to Table 66 on page 616.
F	Tape drive determined that there is no light on the Fibre Channel port.

LTO Errors Through Web Specialist

The TS3500 allows viewing drive error log information through the operator panel and the Web Specialist.

The error log information provided through the Web Specialist might be misleading as it could show unexpected (undefined) error information, while the operator panel will show the correct status. Most customers typically use the Web Specialist and therefore would be concerned if they could not find those undefined errors.

The LTO tape drive error codes are based on the SCD. The possible values are 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, A, C, D, E, e, F. Numeric values will be shown correctly (0 - 9), yet the non-numeric ones will show up incorrect (A - F). Use the following table to determine the true error code based on the presented value. This will be fixed in a later level of library firmware.

Table 57. LTO Error Codes and SCD

Error code	SCD
17	A
19	C
20	D
21	E
53	e
22	F

Chapter 8. Power

Power and Cooling Specifications 594
Power Cord, Plug, and Receptacle Specifications 595
Power Cords for Models L22, D22, L52, and D52 597
Power Cords for Models L23, D23, L53, and D53 598
Library Power Checkout 600

Figure 160 shows the frame control assembly (FCA). Figure 161 shows the Enhanced frame control assembly. These are the power sources for the library and drive components.

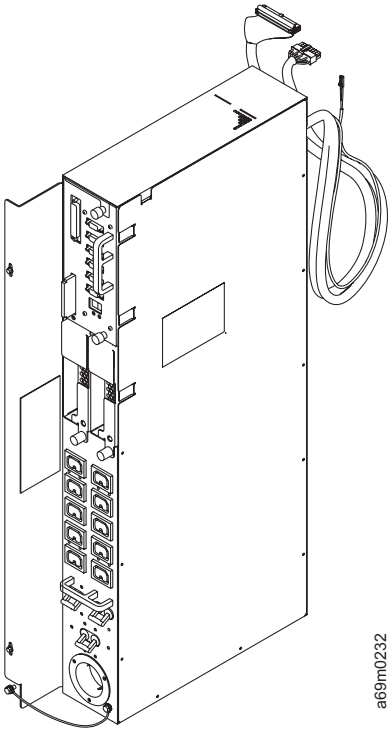


Figure 160. Frame Control Assembly (FCA)

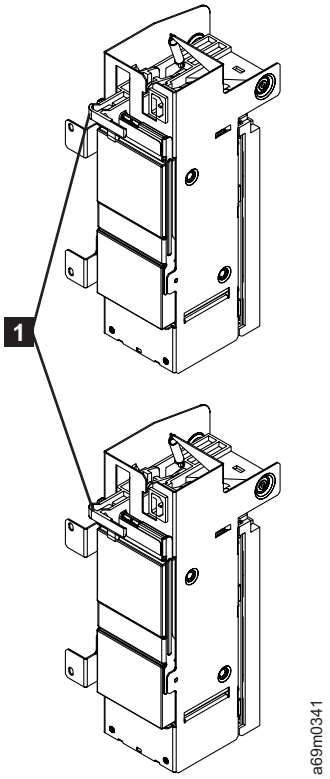


Figure 161. Enhanced Frame Control Assembly

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Power and Cooling Specifications

Note: For cable diagrams and FRU block diagrams, refer to “Functional Block and Cable Diagrams” on page 48.

Power and cooling for tape library components are provided by the frame within which the components are housed. Each base frame and expansion frame (that contains drives) has its own frame control assembly (FCA) or Enhanced FCA. Each FCA or Enhanced FCA receives power from a customer-supplied outlet, and provides AC power to all tape drives within that frame.

The FCA in the base frame (Model L32, L22, L52) contains two 37 V dc power supplies and a Media Changer Pack assembly (MCP). An expansion frame (Model D32, D22, or D52) with an FCA will contain no more than one 37 V dc power supply unless FC 1902 (Redundant 37 V dc power supply) has been installed. The FCA is not required in expansion frames without tape drives.

Each Enhanced FCA (Model L23, L53, or D23, D53) requires **220 to 240 Vac** power input. The Enhanced FCA provides 37 V dc for the robotics, and 12 V dc to the drive trays

Each frame receives its single-phase power on its own power cord from a customer-supplied outlet. Certain countries require two-phase power.

Be aware that each frame that contains an FCA is protected by a main line circuit breaker (CB) in the FCA. The Enhanced FCA does not have a main line breaker. Both the FCA or Enhanced FCA must be further protected by a circuit breaker (CB) of the proper rating at the service rail (customer outlet).

Table 58. Power and Cooling Specifications — Per Frame

Power or Cooling Measurement	**Range or Value – Base and Expansion Frames**	
	Models L23, D23, L53, D53	**Models L22, D22, L32, D32, L52, D52**
AC line voltage	200 to 240 Vac (nominal) 180 V ac (minimum) 259 V ac (maximum)	100 to 127 Vac (nominal) 90 V ac (minimum) 137 V ac (maximum)
Line frequency	50 to 60 Hz (with no adjustments)	50 to 60 Hz (with no adjustments)
Nominal power	1.4 kW	1.1 kW
Line current	8.0 A	12.0 A
kVA	1.6 kVA	1.2 kVA
Heat output	4.8 kBtu/hr	3.8 kBtu/hr
Inrush current	200 A (peak for 1/2 cycle) @ 200-240 volts	100 A (peak for 1/2 cycle) @ 100-127 volts

Notes:

1. All power and cooling data is based on the maximum number of 12 drives in any single frame.
2. Currents shown are the maximum for the voltage range; the operating current was measured during the movement of cartridges.

Power Cord, Plug, and Receptacle Specifications

The appropriate power cord is attached at the factory (based on your destination country code). Chicago, Illinois (U.S.A.) requires feature code 9986. Power cords used in the U.S.A. and Canada are listed by the Underwriter's Laboratories (UL™) and certified by the Canadian Standards Association (CSA™).

The service ratings for all **200 to 240 Vac** plug types follow:

- Maximum voltage: 250 V ac
- Current: 30 A
- Phases: 1
- Wires: 3

Table 59. Specifications for 200 to 240 Vac power cords

Length and Type of Power Cord	Single Branch Circuit 30A Service Rating		Dual ac Line Cords 15 A Service Rating (Feature Code 1901)	
	Part Number/ Feature Code	Type of Service Receptacle	Part Number/ Feature Code	Type of Service Receptacle
4.3 m (14 ft) non-watertight twistlock (default in U.S., Canada, Japan, Korea, Taiwan and Philippines)	23R3230/ 9987	NEMA L6-30R	14F1550/ 9987	NEMA L6-15R
4.3 m (14 ft) (in countries or regions other than the U.S., Canada, Japan, Korea, Taiwan and Philippines)	46F6063/ None	Per local requirements	36L8823/ None	IEC 309 Type 2P+GND 330R6W
4.3 m (14 ft) watertight (in U.S., Canada, Japan, Korea, Taiwan and Philippines)	41V2003/ 9988	Russellstoll 3933/9C33U0 or 3753 9R33U0W	86F2646/ 9988	Russellstoll 3913U2 9C23U2 or 3743U2 9R23U2W
1.8 m (6 ft) watertight (in Chicago, Illinois, U.S.)	23R3231/ 9986	Russellstoll 3933/9C33U0 or 3753 9R33U0W	86F2645/ 9986	Russellstoll 3913U2 9C23U2 or 3743U2 9R23U2W

The service rating for all **100 to 127 Vac** plug types is as follows:

- Maximum voltage: 125 Vac
- Current: 20A
- Phases: 1
- Wires: 3

Table 60. Specifications for 100 to 127 Vac power cords

Length and Type of Power Cord	Single Branch Circuit 20A Service Rating		Dual ac Line Cords 20 A Service Rating (Feature Code 1901)	
	Part Number/ Feature Code	Type of Service Receptacle	Part Number/ Feature Code	Type of Service Receptacle
4.3 m (14 ft) non-watertight twistlock (in U.S. and Canada)	19P5903/ 9951 and 9987	NEMA L5-20R	12J5117/ 9951 and 9987	NEMA L5-20R
1.8 m (6 ft) non-watertight twistlock (in Chicago, Illinois, U.S.)	19P5904/ 9951 and 9986	NEMA L5-20R	12J5115/ 9951 and 9986	NEMA L5-20R

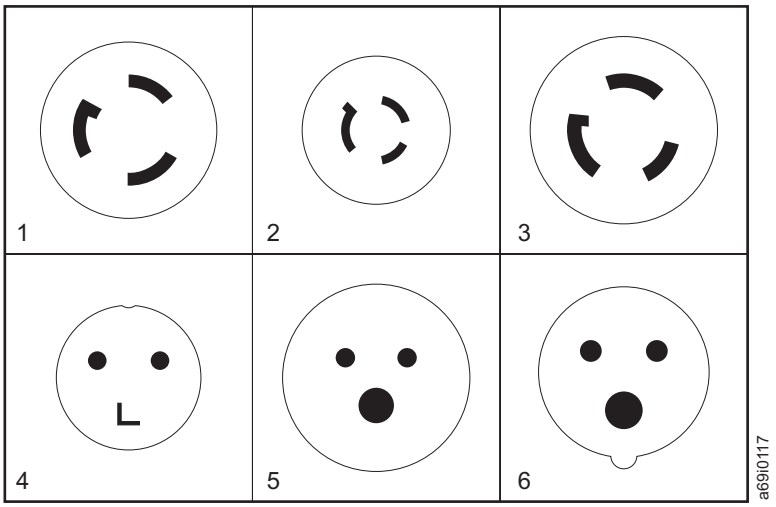


Figure 162. Types of receptacles

Power Cords for Models L22, D22, L52, and D52

Table 61. Specifications for power cords used with the IBM System Storage UltraScalable Tape Library 3584, Models L22, D22, L52, and D22

Length and Type of Power Cord	Part Number and Feature Code	Type of Service Receptacle
4.3 m (14 ft) international 250 V ac, 30 A. This is the default power cord, if no other feature is specified, in all countries except the United States, Canada, Japan, Korea, Philippines, and Taiwan.	46F6063 / 9960	No connector (a connector can be attached per local requirements)
1.8 m (6 ft) watertight, in Chicago, Illinois, U.S. 250 V ac, 30 A	23R3231 / 9961	Russellstoll 3753 or 9R33UOW receptacle, or a Russellstoll 3933 or 9C33UO connector (receptacle #5)
4.3 m (14 ft) non-watertight, twistlock 250 V ac, 30 A. This is the default power cord if no other feature is specified in the United States, Canada, Japan, Korea, Philippines, and Taiwan.	23R3230 / 9962	NEMA L6-30R (receptacle #3)
4.3 m (14 ft) watertight in U.S., Canada, Asia/Pacific 250 V ac	41V2003 / 9963	Russellstoll 3753 or 9R33UOW receptacle, or a Russellstoll 3933 or 9C33UO connector (receptacle #5)
1.8 m (6 ft) non-watertight (in Chicago, Illinois, U.S.), 110 V ac, 20 A	19P5904 / 9964	NEMA L5-20R (receptacle #1)
4.3 m (14 ft) non-watertight (in U.S. and Canada only), 110 V ac, 20 A	19P5903 / 9965	NEMA L5-20R (receptacle #1)
Dual 4.3 m (14 ft) non-watertight, international 250 V ac, 16 A single phase. In all countries except the United States, Canada, Japan, Korea, Philippines, and Taiwan, if no other feature is specified, this is the default power cord that is supplied when the dual ac power feature (1901) is ordered.	36L8823 / 9970	IEC-309 2P +GND 16 A (receptacle #6)
Dual 1.8 m (6 ft) watertight (in Chicago, Illinois, U.S.) 250 V ac, 15 A	86F2645 / 9971	Russellstoll 3743U2 or 9R23U2W receptacles, or Russellstoll 3913U2 or 9C23U2 connectors (receptacle #4)
Dual 4.3 m (14 ft) non-watertight, twistlock 250 V ac, 15 A. This is the default power cord if no other feature is specified in the United States, Canada, Japan, Korea, Philippines, and Taiwan.	14F1550 / 9972	NEMA L6-15R (receptacle #2)
Dual 4.3 m (14 ft) watertight in U.S., Canada, Asia/Pacific 250 V ac, 15 A. This feature is available in the United States, Canada, Japan, Korea, Philippines, and Taiwan.	86F2646 / 9973	Russellstoll 3743U2 or 9R23U2W receptacles, or Russellstoll 3913U2 or 9C23U2 connectors (receptacle #4)
Dual 1.8 m (6 ft) in Chicago, Illinois, U.S.110 V ac, 20 A	12J5115 / 9974	NEMA L5-20R (receptacle #1)
Dual 4.3 m (14 ft) in U.S. and Canada only 110 V ac, 20 A	12J5117 / 9975	NEMA L5-20P (receptacle #1)

Power Cords for Models L23, D23, L53, and D53

Table 62. Specifications for power cords used with the IBM 3584 Tape Library, Models L23, D23, L53, and D23

Length and Type of Power Cord	Part Number and Feature Code	Type of Service Receptacle
Dual 4.3 m (14 ft) 250 VAC 15A non-watertight Twist Lock connector. Used in US, Canada, Japan, Korea, Phillipines, and Taiwan	39M5114 / 9972	Nema L6-15P mates with L6-15R. See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m EU (14 ft) watertight, 250 VAC 16A. International, except for US, Canada, Japan, Korea, Phillipines, and Taiwan.	39M5177 / 9970	IEC-309. See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) watertight, 250 VAC 20A, for US & Canada.	23R9540 / 9970	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 10 A, IRAM 2073. This power cord is for Argentina.	39M5066 / 9976	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 15 A, Earth Pin InMetro NBR 14136. This power cord is for Brazil.	39M5238 / 9977	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 10 A, AS/NZS 3112/2000. This power cord is for Australia and New Zealand.	39M5100 / 9978	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 15 A, JIS C8303, C8306. This power cord is for Japan.	39M5184 / 9979	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 10 A, GB 2099.1, 1002. This power cord is for China.	39M5204 / 9980	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 15 A, with earth pin KS C8305, K60884-1. This power cord is for Korea.	39M5211 / 9981	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 10 A, CNS 10917-3. This power cord is for Taiwan.	39M5252 / 9982	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight, 250 V ac, 16 A, SANS 164-1. This power cord is for South Africa.	39M5142 / 9983	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) non-watertight twistlock 250 V ac, 15A single phase line cord, 20A plugs. This power cord is for US and Canada.	23R9760 / 9984	See "3584 Tape Library Introduction and Planning Guide" for more information.
Dual 4.3 m (14 ft) watertight 250 V ac, 15A single phase line cord, 15A plugs. This power cord is for US and Canada.	23R9972 / 9985	See "3584 Tape Library Introduction and Planning Guide" for more information.

Customer Circuit Breakers (CBs) for Models L23, D23, L53 and D53

For the L23, D23, L53 and D53 models, the maximum permissible CB rating is 20A. Depending on the specific line cord feature selected, some local building codes may require the use of smaller CB ratings. Using a CB rating smaller than 10A may result in nuisance trips and is not recommended.

The various 3584 line cord features come with plugs rated at 20A, 16A, 15A or 10A and wiring appropriate for the 3584 load current (8A maximum). In general, customers should provide a CB rated to match the current rating of the line cord plug on the feature they have selected (i.e. 20A, 16A, 15A or 10A), unless their local building codes specify a different rating.

Library Power Checkout

This procedure assumes that the customer receptacle has the proper AC voltage, and that a line cord is attached to the FCA and to the customer receptacle.

Refer to Figure 163 for the location and sequence of green LEDs on each FIC card as you perform this power-on check. **Note:** If all the LEDs on one or more FIC cards in Dxx frames are off, but the 2-character display on the nodes cards are on, see the following figure. Move the "LED'S ON" switch (near **6**) to the left to turn them on. Feature Code 9003 may have directed the CE to turn off LEDs in all Dxx frames to accommodate downlevel MCP(s). After service procedures are complete, move the "LEDs ON" switch to its previous setting.

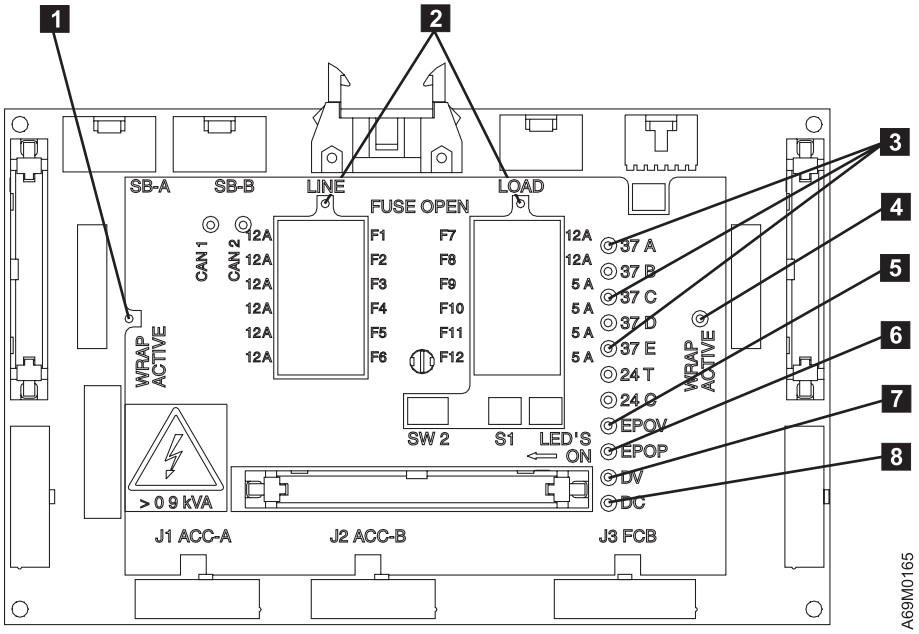


Figure 163. FIC Card Green Power LED Display

1. Set all three FCA circuit protectors (CPs) to OFF, and set the front library power switch to OFF (O).
2. Turn on the Main circuit protector above the line cord in each FCA and observe the green LEDs on each FIC card in each frame.
   a. LED **5** EPOV, should be lighted on all FIC cards.
   b. LED **4** Wrap Active, should be lighted on the base frame only.
   c. LED **1** Wrap Active, should be lighted on the last installed "active" frame in a dual-accessor library.
   d. If the LEDs fail to light, go to “Power Isolation MAP” on page 648 for failure isolation.
3. Turn on the remaining circuit protectors on each FCA.
4. Power on the library, and observe the following:
   a. LED **6** EPOP should be lighted on all frames.
   b. LED **7** DV (door voltage) should be lighted on all frames.
   c. LED **8** DC (door closed) should be lighted on all frames if the front doors are closed.
   d. The two-character LEDs on the MCP cards should be lighted. As the MCP runs its power-on self test (POST), the LEDs will display characters. The LEDs will gradually begin to flash 00, then nn (where nn is the frame number). This display will cycle between these two sets of numbers unless an error is detected.

5. After a few seconds, when the MCP has completed its POST, power is applied to the rest of the library, as follows:
   a. You should hear the relay pick. This is the relay that supplies 110 V ac power to the drives. After a short delay, a long beep will sound when 37 V dc power is applied to buses A, B, and E. The E Bus supplies power to the OPC, which during its POST, causes the long beep sound to start and stop.
   b. LEDs **2** Fuse Open should NOT be lighted on any FIC cards.
   c. LEDs **3** A, C, and E bus power should be lighted on all frames.
   d. If the LEDs fail to light, go to “Power Isolation MAP” on page 648 for failure isolation.
   e. When accessor power is applied (after ACC POST completes), the library will begin to initialize.

      Note: The front doors must be closed for the initialization to begin.
6. **LTO —** As ac power reaches each tape drive, each drive will run POST tests. As the test progresses, the single character display (SCD) on the front of each drive will cycle through a series of bring-up numbers until the POST concludes.
   a. If a drive error was detected, an error code will remain on the SCD of the failing drive.
   b. If the SCD fails to come on, drive power is missing at that drive or the drive has failed. Go to “Power Isolation MAP” on page 648 for failure isolation. If the SCD comes on, then goes blank after POST complete, library power-up was successful.
   c. If the SCD comes on, then goes blank after POST complete, library power-up was successful.
7. **3592 —** As ac power reaches each tape drive, each drive will run POST tests. As the test progresses, the 8 character LED display on the front of each drive will display “DIAG” until the POST completes.
   a. If a drive error was detected, a FID will be displayed in the 8 character LED display.
   b. At the successful conclusion of the POST, the drive will display “EMPTY.”
   c. If the 8 character LED display fails to display, drive power is missing at that drive or the drive has failed. Go to “Power Isolation MAP” on page 648 for failure isolation.

Chapter 9. Sense

Library Sense Data 604
LTO Tape Drive Sense Data 616
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Library Encryption Setup & Systems Assurance 630
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CETool Library Error Log Display 640
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Locating Physical Position of Failure 643

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Library Sense Data

Attention

Go to “Library Sense Data to URC Table” on page 279 to convert sense data to a URC.

Table 63. Library Sense Data

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
0	Set data valid (Always 0)	70 - Existing Error 71 - Deferred Error						
1	Reserved							
2	Reserved				Sense Key 0 - No Sense 1 - Recovered Error 2 - Not Ready 4 - Hardware Error 5 - Illegal Request 6 - Unit Attention B - Aborted Command			
3–6	Reserved							
7	Additional Sense Length (n–7) If the sense key is 1 or 4, the additional sense length is 70. For all other errors, the additional sense length is 10.							
8–11	Reserved							

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
12–13	Additional Sense Code (ASC) — Additional Sense Code Qualifier (ASCQ) **Byte 12 Byte 13** **ASC ASCQ** 00 00 - No additional sense information 04 00 - Not ready - Logical unit is offline (maintenance mode) 04 01 - Not ready - Logical unit is in process of becoming ready 04 03 - Not ready - Manual intervention required 04 83 - Not ready - Library has not been set up (needs configuration and/or calibration) 04 84 - Not ready - I/O Station open 04 85 - Not ready - Door open 1A 00 - Parameter list length error 1B 00 - Synchronous data transfer error 20 00 - Invalid command operation code 21 01 - Invalid element address 24 00 - Invalid field in command descriptor block (CDB) 25 00 - Logical unit not supported 26 00 - Invalid field in parameter list 28 00 - Not ready to ready transition, media may have changed 28 01 - Import or export element accessed 29 00 - Power on, Reset, or Bus device reset occurred 2A 01 - Mode parameters changed 2C 00 - Command sequence error 39 00 - Saving parameters not supported 3B 81 - Element not accessible. Cartridge was exported by another logical library 3B 82 - Element not accessible. Drive not present 3B 0D - Media destination element full 3B 0E - Media source element empty 3B 80 - Media transport element full 3D 00 - Invalid bits in identity message 3F 01 - Microcode has been changed 43 00 - Message error 44 00 - Device reported error (see bytes 18 and 19) 45 00 - Select or reselect failure 47 00 - SCSI parity error 48 00 - Initiator detected error message received 49 00 - Invalid message error 4A 00 - Command phase error 4B 00 - Data phase error 4E 00 - Overlapped commands attempted 53 02 - Media removal prevented 80 00 - CU Mode, vendor-unique							
14	Field Replaceable Unit Code							
15	Sense Key Specific Valid If set to 1, bytes 15, 16, and 17 contain valid data.	C/D If set to 1, there was an illegal parameter in the command description block.	Reserved		BPV If set to 1, the bit pointer field is valid.	Bit Pointer Specifies which bit was invalid.		
16–17	(MSB) Field pointer — Specifies which byte was invalid. (LSB)							

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
Bytes 18 and 19 contain hardware error code (HEC) and hardware error code qualifier (HECQ).								
18–19	**Byte 18 HEC**	**Byte 19 HECQ**						
	21	80 - MCP card internal failure (see frame number)						
	21	81 - MCP Card Internal failure - CAN 1 fault (see frame number)						
	21	82 - MCP Card Internal failure - CAN 2 fault (see frame number)						
	22	80 - OPC card internal failure						
	22	81 - OPC card internal failure - CAN 1 fault (see frame number)						
	22	82 - OPC card internal failure - CAN 2 fault (see frame number)						
	23	80 - ACC card internal failure						
	23	81 - ACC card internal failure - CAN 1 fault						
	23	82 - ACC card internal failure - CAN 2 fault						
	24	80 - MDA card Internal failure						
	24	81 - MDA card Internal failure - CAN 1 fault						
	24	82 - MDA card Internal failure - CAN 2 fault						
	25	xx - MCP card in frame xx not responding on CAN bus						
	26	xx - OPC card in frame xx not responding on CAN bus						
	27	xx - ACC card in frame xx not responding on CAN bus						
	28	xx - MDA card in frame xx not responding on CAN bus						
	29	80 - No response from any other card on the CAN bus						
	30	80 - Frame sequencing failure						
	30	81 - Frame not found						
	30	82 - Door interlock frame sensing failure						
	30	83 - Door interlock circuit open due to missing/open service bay cable						
	30	84 - Door interlock failure detected by the library						
	30	85 - Door interlock failure detected by the CE						
	30	86 - Door interlock consistency failure detected by the library						
	31	80 - FCA cooling fan failure						
	31	81 - Drive xx is overcurrent from BPC1						
	31	82 - Drive xx is overcurrent from BPC2						
	31	83 - Drive xx is overcurrent from both BPC2						
	31	84 - Overcurrent condition on the entire BPC 1						
	31	85 - Overcurrent condition on the A or B bus on BPC 1						
	31	86 - Overcurrent condition on the C or D bus on BPC 1						
	31	87 - Overcurrent condition on the E bus on BPC 1						
	31	88 - Overcurrent condition on the entire BPC 2						
	31	89 - Overcurrent condition on the A or B bus on BPC 2						
	31	8A - Overcurrent condition on the C or D bus on BPC 2						
	31	8B - Overcurrent condition on the E bus on BPC 2						
	31	8C - Overcurrent condition on both BPC						
	31	8D - Overcurrent condition on the A or B bus on both BPC						
	31	8E - Overcurrent condition on the C or D bus on both BPC						
	31	8F - Overcurrent condition on the E bus on both BPC						
	32	81 - Bad BPC/BPS 1/2 detected						
	33	81 - 24 V dc PS #1 out of range. Probable failure of 24 V dc PS #1.						
	33	82 - 24 V dc PS #2 out of range. Probable failure of 24 V dc PS #2						
		(Continued on next page)						

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
18–19	**Byte 18 HEC**	**Byte 19 (Continued) HECQ**						
	34	81 - 37 V dc PS #1 out of range. Probable failure of 37 V dc as #1						
	34	82 - 37 V dc PS #2 out of range. Probable failure of 37 V dc as #2						
	34	91 - 37 V dc PS #1 will not turn on. Probable failure of 37 V dc as #1						
	34	92 - 37 V dc PS #2 will not turn on. Probable failure of 37 V dc as #2						
	34	A1 - 37 V dc PS #1 not present. Probably disconnected						
	34	A2 - 37 V dc PS #2 not present. Probably disconnected						
	35	81 - Drive power supply not present. Probably disconnected						
	35	82 - Drive power supply reported an error						
	35	83 - Drive Power Supply not responding on I2C bus						
	38	80 - MCP card cannot see a configured drive on RS-422 cable feedback loop						
	38	81 - MCP card cannot get a response from a configured drive on RS-422						
	38	82 - MCP card detected an RS-422 problem. Bad response						
	38	83 - MCP card detected too many retries communicating with drive						
	38	84 - MCP card can't get a response from a configured canister DCC card						
	39	80 - MCP card timed out waiting for a drive to complete an RS-422 command						
	39	81 - MCP card received unknown message from drive						
	39	82 - MCP card detected that drive/canister type does not match what is currently configured)						
	39	83 - MCP attempted to change the drive SCSI ID or FC Loop ID, but the drive would not accept the new ID						
	39	84 - MCP received unexpected or invalid diagnostic status from a drive.						
	40	81 - Gripper #1 will not move. No encoder pulses						
	40	82 - Gripper #1 encountered unexpected hard stop while extending						
	40	83 - Gripper #1 encountered unexpected hard stop while retracting						
	40	84 - Gripper #1 encountered high current condition while extending						
	40	85 - Gripper #1 encountered high current condition while retracting						
	40	86 - Gripper #1 unable to find hard stop while extending						
	40	87 - Gripper #1 unable to find hard stop while retracting						
	40	88 - Gripper #1 unable to get cartridge						
	40	89 - Gripper #1 unable to put cartridge						
	40	8A - Gripper #1 lost 37 V dc power						
	40	8B - Gripper #1 encountered low current condition while retracting						
	40	8C - Gripper #1 lost cartridge (misplaced)						
	40	8D - Gripper #1 wrong type. Doesn't match configuration						
	40	91 - Gripper #2 will not move. No encoder pulses						
	40	92 - Gripper #2 encountered unexpected hard stop while extending						
	40	93 - Gripper #2 encountered unexpected hard stop while retracting						
	40	94 - Gripper #2 encountered high current condition while extending						
	40	95 - Gripper #2 encountered high current condition while retracting						
	40	96 - Gripper #2 unable to find hard stop while extending						
	40	97 - Gripper #2 unable to find hard stop while retracting						
	40	98 - Gripper #2 unable to get cartridge						
	40	99 - Gripper #2 unable to put cartridge						
	40	9A - Gripper #2 lost 37 V dc power						
	40	9B - Gripper #2 encountered low current condition while retracting						
	40	9C - Gripper #2 lost cartridge						
	40	9D - Gripper #2 wrong type. Doesn't match configuration						
	41	81 - Gripper #1 sensor hard failure. Sensor blocked when it should not be						
	41	82 - Gripper #1 sensor hard failure. Sensor not blocked when it should be						
	41	83 - Gripper #1 sensor marginal						

(Continued on next page)

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
18–19	**Byte 18 HEC**	**Byte 19 (Continued) HECQ**						
	41	84 - Gripper #1 sensor failure. Output out-of-limits l						
	41	91 - Gripper #2 sensor failure. Sensor blocked when it should not be						
	41	92 - Gripper #2 sensor failure. Sensor not blocked when it should be						
	41	93 - Gripper #2 sensor marginal (probable dirty sensor)						
	41	94 - Gripper #2 sensor failure imminent						
	41	A0 - Sx4 Frame detected with incorrect gripper types						
	41	A1 - Sx4 Frame detected with incorrect config						
	41	A2 - Sx4 Frame detected with EA > limit and Standard node cards						
	41	A3 - HD slot disabled by library						
	41	B0 - Sx4 Frame detected but ALMS is disabled						
	41	B1 - Sx4 Frame detected but VIO is disabled						
	41	B2 - Sx4 Frame detected but Insert Notification is enabled						
	42	80 - Calibration sensor failure. Sensor blocked when it should not be						
	42	81 - Calibration sensor failure. Sensor not blocked when it should be						
	43	80 - X home sensor failure. Sensor blocked when it should not be						
	43	81 - X home sensor failure. Unable to find sensor during rezero						
	44	80 - Y home sensor failure. Sensor blocked when it should not be						
	44	81 - Y home sensor failure. Unable to find sensor during rezero						
	45	80 - X motor will not move. No encoder pulses						
	45	81 - X motion cannot find a hard stop while moving left						
	45	82 - X motion cannot find a hard stop while moving right						
	45	83 - X motion encountered an unexpected hard stop while moving left						
	45	84 - X motion encountered an unexpected hard stop while moving right						
	45	85 - X motion - excessive force required to move left						
	45	86 - X motion - excessive force required to move right						
	45	87 - X motion failed due to loss of 37 V dc						
	45	88 - X motion failure. Probable motor driver problem						
	45	89 - X motion failure. Rezero detected positioning drift						
	46	80 - Y motor won't move. No encoder pulses						
	46	81 - Y motion cannot find a hard stop while moving up						
	46	82 - Y motion cannot find a hard stop while moving down						
	46	83 - Y motion encountered an unexpected hard stop while moving up						
	46	84 - Y motion encountered an unexpected hard stop while moving down						
	46	85 - Y motion - excessive force required to move up						
	46	86 - Y motion - excessive force required to move down						
	46	87 - Y motion failed due to loss of 37 V dc						
	46	88 - Y motion failure - probable motor driver problem						
	46	89 - Y motion failure - rezero detected positioning drift						
	46	90 - Y motion - rezero performed						
	46	91 - Y motion - rezero performed, action required						
	47	80 - Pivot motor will not move. No encoder pulses						
	47	81 - Pivot motion cannot find a hard stop while pivoting toward door						
	47	82 - Pivot motion cannot find a hard stop while pivoting toward rear						
	47	83 - Pivot motion encountered unexpected hard stop pivoting toward door						
	47	84 - Pivot motion encountered unexpected hard stop pivoting toward rear						
	47	85 - Pivot motion - excessive force required to pivot toward door						
	47	86 - Pivot motion - excessive force required to pivot toward rear						
	47	87 - Pivot motion failed due to loss of 37 V dc						
	48	80 - An accessor failover has occurred						
	48	A0 - Accessor in No Motion Allowed (NMA) state						
	(Continued on next page)							

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
18–19	**Byte 18 HEC**	**Byte 19 (Continued) HECQ**						
	5B	80 - Element scan failed (bar code reader failure)						
	5B	81 - Bar code miscompare. Bar code read twice with different results						
	5B	82 - MDA to ACC loopback test of barcode scanner trigger circuit failed						
	5B	83 - ACC cannot trigger the bar code scanner						
	5B	84 - MDA cannot trigger the bar code scanner						
	5B	85 - Bar code unreadable. Probable missing or damaged label						
	5B	86 - Frame machine type and model, frame serial number barcode, or WorldWide Node Name label unreadable. Possible missing or damaged label.						
	5B	87 - Invalid logical library bar code label configuration						
	5B	88 - Unreadable bar code test label						
	5B	89 - I/O station type Bar Code unreadable						
	60	8x - Compact flash (CF) card not present						
	60	9x - Compact flash (CF) card has an unexpected size						
	60	Ax - Compact flash (CF) card does not become readyt						
	60	Bx - Compact flash (CF) card does not show the correct lib S/N						
	60	Cx - Compact flash (CF) card data is corrupted						
	61	80 - Library contains x23 or x53 frames with new style node cards, but the current Library Firmware level is at a lower level that cannot support the new style node cards.						
	62	80 - Ethernet wrap test failed						
	63	80 - Both Ethernet Ports of the MCA are configured to the same network.						
	65	80 - Test Key Manager address failed						
	65	81 - Test Encryption Key Path failed						
	65	82 - Test Encryption Key Path failed						
	70	8x - Node card reset from WebSpecialist						
	75	8x - Redundant Part Error						
	90	80 - Source element unexpectedly empty (status message) **See Note below.**						
	94	80 - Destination element unexpectedly full (status message) **See Note below.**						
	9C	80 - No LTO diagnostic cartridge found in library						
	9C	82 - No 3592 diagnostic cartridge found in library						
	A0	80 - Invalid config. No gripper installed for an installed frame (media) type						
	A0	81 - Mixed grippers are installed, but only one frame media type is installed						
	A0	83 - Invalid Config - Mixed media - 3592 gripper 1 with LTO gripper 2						
	A0	85 - Invalid config. No I/O installed for an installed frame (media) type						
	A0	86 - Invalid config. An I/O station is installed with no matching frame (media type)						
	A0	87 - Invalid config. L-frame to cartridge I/O is not the same media type as the L-frame						
	A0	88 - Invalid Config - An I/O station in a 4 I/O door config was found invalid						
	A0	8C - Invalid Config - Drive type incompatible original Drive type						
	A0	8D - Invalid config - Drive type incompatible with frame type						
	A0	8E - Invalid config - DLT is not supported with this code version						
	A1	80 - Invalid configuration - Frame serial number in VPD does not match the frame serial number bar code label						
	A1	81 - Configuration problem - Duplicate drive serial number detected						
	(Continued on next page)							
	Note: A HEC/HECQ of 9080 or 9480 indicates that the command is considered an operator error. The command was attempted but failed, probably because a cartridge was manually inserted or manually removed.							

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
18–19	**Byte 18 HEC**	**Byte 19 (Continued) HECQ**						
	B0	80 - Cannot open I/O station (solenoid failure or sensor not blocked when it should be)						
	B0	81 - Cannot lock upper I/O station. Solenoid failure or sensor blocked when it should not be						
	B0	82 - Upper I/O station type does not match configuration						
	B0	83 - Cannot open top LEFT I/O station						
	B0	84 - Cannot open top RIGHT I/O station						
	B0	85 - Cannot lock top LEFT I/O station						
	B0	86 - Upper I/O station type does not match configuration						
	B0	87 - Top LEFT I/O station type does not match configuration.						
	B0	88 - Top RIGHT I/O station type does not match configuration						
	B0	90 - Cannot open lower I/O station. Solenoid failure or sensor blocked when it should not be						
	B0	91 - Cannot lock lower I/O station. Solenoid failure or sensor blocked when it should not be						
	B0	92 - Lower I/O station type does not match configuration						
	B0	93 - Cannot open bottom LEFT I/O station						
	B0	94 - Cannot open bottom RIGHT I/O station						
	B0	95 - Cannot lock bottom LEFT I/O station						
	B0	96 - Cannot lock bottom RIGHT I/O station						
	B0	97 - Bottom LEFT I/O station type does not match configuration						
	B0	98 - Bottom RIGHT I/O station type does not match configuration						
	B1	80 - 4 I/O station door LED panel failure						
	B2	82 - I/O station Get failure (I/O station will not release cartridge)						
	B2	88 - I/O station Put failure (I/O station will not accept cartridge)						
	B2	8F - I/O station full						
	B2	92 - Lower I/O station Pick failure. I/O station won't release cartridge						
	B2	98 - Lower I/O station Put failure. I/O station won't accept cartridge						
	B2	9F - Lower I/O station is full so cartridge export is not possible						
	B3	82 - Slot Get failure (slot will not release cartridge)						
	B3	88 - Slot Put failure (slot will not accept cartridge)						
	B4	80 - X/Y motion command outside limits - suspect corrupted calibration						
	B5	8x - Calibration encountered a missing fiducial on column x.						
	B6	8x - Calibration encountered a missing fiducial on drive x						
	B7	8x - Calibration encountered a missing fiducial on I/O station x						
	B8	81 - Drive unload failure. Get failure at drive; unable to get a cartridge that is in the unloaded position at the drive						
	B8	82 - Drive eject failure. There is no cartridge in the unloaded position at the drive						
	B8	83 - Drive load failure. Put failure at drive; could not extend cartridge to the drive load position						
	B8	84 - Drive load failure. Put failure at drive; drive loader did not load the cartridge after it was extended to the drive load position)						
	B8	85 - Unable to cycle drive door. Cartridge may be extending from drive						
	B8	86 - Canister cooling fan failure						
	(Continued on next page)							

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
18–19	**Byte 18 HEC**	**Byte 19 (Continued) HECQ**						
	BA	21 - Battery failure on ACC card						
	BA	22 - Battery failure on OPC card						
	BA	23 - NVRAM ML Battery voltage low on ACC card						
	BA	24 - NVRAM ML Battery voltage low on OPC card						
	C0	80 - Library Firmware download completed successfully						
	CA	80 - Call Home successful - information only - not an error						
	CA	81 - Call Home failed - try again						
	CA	82 - Call Home failed - machine not registered with Retain						
	CA	83 - Call Home failed - disabled or not configured						
	CA	84 - Call Home failed - no connection from library to local modem or to the Master Console						
	CA	85 - Call Home failed - unable to contact remote modem using primary phone number						
	CA	86 - Call Home failed - unable to contact remote modem using secondary phone number						
	CA	87 - Call Home failed - connected to remote modem but could not log into the ATT Global Network						
	CA	88 - Call Home failed - unable to connect to RETAIN using primary IP						
	CA	89 - Call Home failed - unable to connect to RETAIN using secondary IP						
	CA	8A - Call Home failed - connected to RETAIN but login failed						
	CA	8B - Call Home failed - no connection from library to WTI switch						
	CA	8C - Call Home failed - no connection from WTI switch to local modem						
	CA	8D - Call Home failed - Carrier Detect unexpectedly high						
	CA	8E - Call Home failed - At least one data file was not sent to RETAIN						
	CA	8F - Call Home failed - all retries have been exhausted						
	CA	90 - Call Home logfile transmission successful. Not an error, log only						
	CA	CA - Call Home Test performed						
	CB	B0 - Library Not Ready. ALMS feature needs to be installed and enabled.						
	CB	C0 - Library Firmware download incompatible with Virtual I/O						
	CB	C1 - Library Firmware download incompatible with Library Hardware						
	CB	CA - Library Firmware update is required because at least one node card has a code version out of sync with the rest of the library						
	CB	CB - Library Firmware download failed/interrupted						
	CB	CC - Corrupted Library Firmware was downloaded and rejected						
	CB	CD - Drive Firmware download failed - probable corrupted code image						
	CB	CE - Library code in XYLINX module didn't update - reset node card						
	CC	CA - Library Firmware detected a memory allocation or stack error						
	CC	CC - Library Firmware Error (see Object ID and Object Error)						
	CC	CE - Library Firmware detected that the web server is not responding						
	CC	CF - Dual accessor X Axis Authorization Error						
	CE	CE - Configuration of more than one frame was attempted but the L frame does not have the Capacity Expansion Feature installed.						
	F2	F2 - A node card encountered a processor exception, saved information about the exception to Flash memory, then reset itself						
20–22	Reserved							
Byte 23 contains the Mechanism Status Bit Map (see page 612)								
23	Move capability. If set to 1, the accessor can move.	Last SCSI state	Completed	All Returned	PKR1 Full	PKR2 Full	Determines which accessor failed.	Fail2

Table 63. Library Sense Data (continued)

Byte	Bit Number or Name							
	7	6	5	4	3	2	1	0
24	Control Path Frame				Control Path Device (Drive)			
25	Failing Frame				Failing Device			
26	Tape Alert Flag Number							
27	Reserved				Retry Count			
28	Object ID							
29–30	Object Error Code							
31–34	Reserved							
Byte 35 contains the Source Element Bit Map (see page 612)								
35	Byte valid If set to 1, bytes 35–37 are valid. See page 613.	Error enroute	Cartridge in transport	Cartridge in element	PKR2	Reserved	Reserved	Reserved
36–37	Source element address							
38	Destination element bit map (see byte 35 for bit definition)							
39–40	Destination element address							
41	Secondary source element bit map (see byte 35 for bit definition)							
42–43	Secondary source element address							
44	Second destination element bit map (see byte 35 for bit definition)							
45–46	Second destination element address							
47–77	Reserved							
Note: Bytes 18–77 are only returned when sense key is 1 or 4.								

Notes:

1. **Hardware Error Code (HEC) (Byte 18)**

   The error code determined by fault isolation to indicate the cause of the failure. This indicates an area of the machine, **not a specific FRU number**.

2. **Hardware Error Code Qualifier (HECQ) (Byte 19)**

   This byte is used as a qualifier of the hardware error code. As an example, the HEC might point to an I/O station problem. The HECQ might then indicate whether it was a problem with a specific sensor or the lock solenoid.

3. **Mechanism Status Bit Map (Byte 23)**

   This is the state of the accessor after the termination of any retry or recovery algorithms. This byte is bit-mapped, as shown below, from Most Significant Bit (7) to Least Significant Bit (0).

   Bit 7 - Move Capability

   A “1” indicates that the accessor is capable of performing movement commands.

   Bit 6 - Last SCSI State

   A “1” indicates that the accessor is in the same condition as before the execution of the failed command.

   Bit 5 - Completed

   A “1” indicates that the cartridges were moved and the last command completed successfully.

   Bit 4 - All Returned

A “1” indicates that the cartridges were restored to the locations they occupied prior to the previous failed command.

Bit 3 - PKR1 full

A “1” indicates a cartridge is in the first media transport element. The transport was either unexpectedly full, or a cartridge remained in it after an attempt to recover from a failure. If the latter is true, the appropriate Element Bit Map byte will indicate which cartridge is in the transport.

Bit 2 - PKR2 full

A “1” indicates a cartridge is in the second media transport element. The transport was either unexpectedly full, or a cartridge remained in it after an attempt to recover from a failure. If the latter is true, the appropriate Element Bit Map byte will indicate which cartridge is in the transport.

Bit 1 - Accessor

A "0" indicates accessor A

A "1" indicates accessor B

Bit 0 - Fail2

A “1” indicates the failure occurred on the second move of an EXCHANGE MEDIUM command (from the First Destination Element to the Second Destination Element). A “0” indicates that the failure occurred on the first move (from the Source Element to the First Destination Element).

4. **Control Path Frame (Byte 24)**

   The frame number that passed the SCSI command to the accessor.

5. **Control Path Device (Byte 24)**

   The drive number (within the control path frame) of the drive that passed the SCSI command to the accessor.

Note: The Control Path Frame and Control Path Device (Drive) information is logged to record where the command came from, since it may not be a drive that is involved in the actual command. For example, a command might be received from frame 1 drive 1 to load a cartridge into frame 1 drive 2. In some cases, this information will help clarify the exact chain-of-events that lead to the failure.

6. **Failing Frame {first nibble} (Byte 25)**

   The frame number of the device that failed.

7. **Failing Device {second nibble} (Byte 25)**

   The device number (within the frame) of the device (drive) that failed.

Note: See **Table 64 on page 614**. The Failing Frame and Failing Device information is logged to record which device (usually a drive) was involved with the failure. Unlike previous libraries, there is no need to assign a unique HEC to each drive. For example, a failure that occurs while loading or unloading a drive will cause the HEC/HECQ to indicate the type of failure, while the Failing Frame/Failing Device will indicate which drive was involved. In most cases involving load or unload errors, this information also will be in bytes 36–46. One exception is if a parity error is detected on the RS-422 interface while talking to a specific drive.

Note: See **Table 65 on page 614**. If you have a library with from 1 to 15 frames, the first nibble of byte 25 is the frame number and the second nibble is the device number, with a zero meaning Not Applicable (see Table 64 on page 614). 00 indicates that the frame/device is not applicable to the error. 11 indicates frame 1, drive 1. 10 indicates frame 1, device not applicable. If you have a library with 16 frames, then all errors for frames 1 - 15 are as previously described, but frame 16 rolls the first nibble to 0 (see **Table 65 on page 614**). Since we can't tell whether 00 is (frame/device not applicable) or frame 16, a change was made. If the device nibble is 'not applicable' it will show an **F** instead of a 0. So a failure affecting drive 5 in frame 16 would show as 05. A failure affecting frame 16 that is not device specific would show as 0F.

Table 64. Drive Position vs Failing Drive

Drive Position	N/A	1	2	3	4	5	6	7	8	9	10	11	12	N/A	N/A	N/A
Failing Drive	x0	x1	x2	x3	x4	x5	x6	x7	x8	x9	xA	xB	xC	xD	xE	xF
x = Failing Frame Location																

8. **Tape Alert Flag Number (Byte 26)**

   The Tape Alert Flag Number corresponding to an accessor failure.

9. **Retry Count (Byte 27)**

   The total number of retry attempts that were performed.

10. **Object ID (Byte 28)**

    A number indicating a specific object in the ACC firmware where the error was detected. If the error may have been caused by a firmware problem, this number will allow the firmware team to quickly determine which firmware object detected the problem.

11. **Object Error Code (Byte 29–30)**

    A number indicating the specific location in the ACC firmware object where the error was detected. If the error may have been caused by a firmware problem, this number and the Object ID are used to identify the exact location in the firmware at which the problem was detected.

12. **Source Element Bit Map (Byte 35)**

    This byte indicates the status of the cartridge that was in the specified Source Element of the Move or Exchange command after the failure or retry, as well as the status of the element itself:

    Bit 7 - Valid

    A “1” indicates that the values in this byte and the Element Address byte are valid. A zero indicates that the remainder of this byte and the Element Address byte are invalid, unless you have a 16 frame library. See **Table 65**. In a 16 frame library, frame 16 rolls the frame count bit to 0. If the device is not applicable it will show a F instead of a 0. So a failure affecting drive 5 in frame 16 would show as 05. A failure affecting frame 16 that is not device specific would show as 0F.

Table 65. Frame Number vs Failing Frame

	Lxx	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**	**Dxx**
Physical Frame	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Failing Frame	1x	2x	3x	4x	5x	6x	7x	8x	9x	Ax	Bx	Cx	Dx	Ex	Fx	0x
x = Device																

    Bit 6 - Error Enroute

    An error occurred while the transport mechanism was enroute to this element.

    Bit 5 - Cartridge In Transport

    After the exhaustion of all recovery algorithms, the posting of a “1” indicates that the cartridge, which was originally in this element, has remained in the transport. If this bit is “1” then bit 3 (PKR2) will indicate whether the cartridge is in PKR1 or PKR2.

    Bit 4 - Cartridge In Element

    After exhaustion of all recovery algorithms, a “1” indicates the cartridge associated with this move is in this element.

    Bit 3 - PKR2

This bit is only valid if Bit 5 (Cartridge in Transport) is “1”. If valid, then a bit of “0” indicates the cartridge from this element is in PKR1, and a bit of “1” indicates the cartridge from this element is in PKR2.

Bit 2 - Reserved

Bit 1 - Reserved

Bit 0 - Reserved

13. **Source Element Address (Byte 36–37)**

    The Source Element Address specified in the Move Medium Exchange command.

14. **Destination Element Bit Map (Byte 38)**

    This byte indicates the status of the element that was the Destination Element of a MOVE MEDIUM (or the First Destination of an EXCHANGE MEDIUM command) after the failure or retry of the command. This byte is bit mapped as described in the “Source Element Bit Map” Byte 35.

15. **Destination Element Address (Byte 39–40)**

    The Element Address the Destination Element Bit Map data refers to.

16. **Secondary Source Element Bit Map (Byte 41)**

    This byte indicates the status of the element that was the source (First Destination Element) of the second stage of an Exchange Medium command after any error recovery attempts have been completed. The “Valid” bit in this byte will only be set during the Exchange Medium command. This byte is bit-mapped, as described in the “Source Element Bit Map” Byte 35.

17. **Secondary Source Element Address (Byte 42–43)**

    The Element Address the First Destination Element (1st Move) Bit Map data refers to.

18. **Second Destination Element Bit Map (Byte 44)**

    This byte indicates the status of the element that was the destination of the second stage an Exchange Medium command after any error recovery attempts have been completed. The “valid” bit in this byte will only be set during the Exchange Medium command. This byte is bit mapped as described in the “Source Element Bit Map” Byte 35.

19. **Second Destination Element Address (Byte 45–46)**

    The Element Address the Second Destination Element Bit Map data is referring to.

Notes:

a. The library will log 32 bytes for each error log entry:
   - 4 bytes for time stamp
   - 1 byte for the SCSI command op code (byte 0 of the CDB)
   - 8 bytes for SCSI parm data (for example, an exchange command will log bytes 2–9 of the CDB)
   - 19 bytes of accessor sense data.

b. The Sense key and the Retry Count are each 1/2-byte long, sharing one byte within the library error log.

LTO Tape Drive Sense Data

Attention

Go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315 to convert sense data to a URC.

LTO Ultrium-and Ultrium-5 drives contain hardware which performs user data write encryption and read decryption, protecting all user data written to the medium from unauthorized use, provided it is integrated into a secure system design.

To use this table, find the FSC (Bytes 16 – 17), look up the URC in “LTO Ultrium-1 Drive FSC to URC Table” on page 364, and go to “URC Table With Descriptions, Actions, and FRUs” on page 375 for repair directions.

Table 66. 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 66. 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) **Byte 12 Byte 13** **ASC ASCQ** 00 00 - No additional sense — The flags in the sense data indicate the reason for the command failure 00 01 - Filemark detected — A Read or Space command terminated early due to an FM The FM flag is set. 00 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 - BOM — A space command ended at Beginning of Tape The EOM bit is also set 00 05 - EOD — Read or Space command terminated early because End of Data was encountered 04 00 - Cause not reportable — A cartridge is present in the drive, but it is in the process of being unloaded 04 01 - Becoming Ready — A media access command was received during a front panel initiated load or an immediate reported load command 04 02 - Initializing Command Required — A cartridge is present in the drive, but is not logically loaded. A Load command is required 04 03 - Manual Intervention Required — A cartridge is present in the drive but could not be loaded or unloaded without manual intervention 0C 00 - Write Error — A Write operation has failed. This is probably due to bad media, but may be hardware related 14 10 - Not Ready — Auxiliary memory not accessible. The drive is not able to become ready because it is unable to access the Auxiliary Memory in a WORM cartridge. 11 00 - Unrecovered Read Error — A Read operation failed. This is probably due to bad media, but may be hardware related 11 12 - Auxiliary memory read error. The drive reported that it is unable to read the Auxiliary Memory in a WORM cartridge. 14 00 - Recorded Entity Not Found — A space or Locate command failed because a format violation prevented the target from being found. 14 03 - End Of Data not found — A Read type operation failed because a format violation related to a missing EOD data set 1A 00 - Parameter list length error — The amount of parameter data sent is incorrect 20 00 - Invalid Command Operation Code — The Operation Code in the command was not a valid Operation Code 24 00 - Invalid field in CDB — An invalid field has been detected in a Command Descriptor Block 25 00 - LUN not supported — The command was addressed to a non-existent logical unit number 26 00 - Invalid Field in Parameter List — An invalid field has been detected in the data sent during the data phase 27 00 - Write Protect — A Write type operation has been requested on a cartridge which has been write protected 28 00 - Not Ready to Ready Transition — A cartridge has been loaded successfully into the drive and is now ready to be accessed 29 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 - Mode Parameters Changed — The Mode parameters for the drive have been changed by an initiator other than the one issuing the command							

Table 66. 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) **Byte 12 Byte 13** **ASC ASCQ** 30 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 - Unknown Format — An operation could not be carried out because the cartridge in the drive is of a format not supported by the drive 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 30 0C - Data Protect — WORM overwrite attempted. The drive rejected a write operation because it would have resulted in an overwrite. Overwrite is not allowed on WORM media. 30 0D - Medium Error — WORM integrity check. The drive rejected a Read or Write operation because the cartridge is a suspicious WORM cartridge. 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							

Table 66. 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) **Byte 12 ASC** / **Byte 13 ASCQ** 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 66. 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) **Byte 12 Byte 13** **ASC ASCQ** **Sense Key 0 (No Sense)** EE 13 - Encryption - Key Translate EF 13 - Encryption - Key Translate EKM **Sense Key 3 (Medium Error)** 30 02 - Encryption - Encryption feature is not enabled so format/processing is not supported EE 60 - Encryption - Proxy Command Error EE D0 - Encryption - Data Read Decryption Failure EE D1 - Encryption - Data Read after Write Decryption Failure EE E0 - Encryption - Key Translation Failure EE E1 - Encryption - Key Translation Ambiguous EE F0 - Encryption - Decryption Fenced (Read) EE F1 - Encryption - Encryption Fenced (Write) **Sense Key 4 (Hardware Error)** EE 0E - Encryption - Key Service Timeout EE 0F - Encryption - Key Service Failure 40 00 - Encryption - Failure Hardware, POST or Module Failure **Sense Key 5 (Illegal Request)** EE 00 - Encryption - Key Service Not Enabled EE 01 - Encryption - Key Service Not Configured EE 02 - Encryption - Key Service Not Available EE 10 - Encryption - Key Required EE 20 - Encryption - Key Count Exceeded EE 21 - Encryption - Key Alias Exceeded EE 22 - Encryption - Key Reserved EE 23 - Encryption - Key Conflict EE 24 - Encryption - Key Method Change EE 25 - Encryption - Key Format Not Supported EE 26 - Encryption - Unauthorized Request - dAK EE 27 - Encryption - Unauthorized Request - dSK EE 28 - Encryption - Unauthorized Request - eAK EE 29 - Encryption - Authentication Failure EE 2A - Encryption - Invalid RDKi EE 2B - Encryption - Key Incorrect EE 2C - Encryption - Key Wrapping Failure EE 2D - Encryption - Sequencing Failure EE 2E - Encryption - Unsupported Type EE 2F - Encryption - New Key Encrypted Write Pending EE 30 - Encryption - Prohibited Request EE 31 - Encryption - Key Unknown EE 42 - Encryption - EKM Challenge Pending EE E2 - Encryption - Key Translation Disallowed EE FF - Encryption - Security Prohibited Function EF 01 - Encryption - Key Service Not Configured 26 11 - Encryption - Incomplete Key - Associate Data Set 26 12 - Encryption (T10) - Vendor Specific Reference Key Not Found 55 08 - Encryption (T10) - Maximum Number of Supplemental Keys Exceeded							

Table 66. LTO Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12–13	**Sense Key 6 (Unit Attention)** EE 12 - Encryption - Key Change Detected EE 18 - Encryption - Changed (Read) EE 19 - Encryption - Changed (Write) EE 40 - Encryption - EKM Identifier Changed EE 41 - Encryption - EKM Challenge Changed EE 50 - Encryption - Initiator Identifier Changed EE 51 - Encryption - Initiator Response Changed 2A 11 - Encryption - Data Encryption Parameters Changed by Another I_T Nexus 2A 12 - Encryption - Data Encryption Parameters Changed by Vendor Specific Event **Sense Key 7 (Data Protect)** EF 10 - Encryption - Key Required EF 11 - Encryption - Key Generation EF 13 - Encryption - Key Translate EF 1A - Encryption - Key Optional EF C0 - Encryption - No Operation 26 10 - Encryption - Data Decryption Key Fail Limit 2A 13 - Encryption - Data Encryption Key Instance Counter Has Changed 74 00 - Security Error 74 01 - Encryption - Unable to Decrypt Data 74 02 - Encryption - Unencrypted Data Encountered While Decrypting 74 03 - Encryption - Incorrect Data Encryption Key 74 04 - Encryption - Cryptographic Integrity Validation Failed 74 05 - Encryption - Error Decrypting Data							
14	FRU code							
15	SKSV	C/D	Reserved		BPV When set to 1, the bit pointer is valid.	Bit pointer		
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	Frame number				Drive number			

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.
14. This field (Byte 35) contains the frame and drive number, passed across the RS-422 serial interface.

3592 Tape Drive Sense Data (J1A, E05, E06/EU6) & E07

Attention

Go to “3592 Drive FID to URC Table” on page 357 to convert a FID to a URC.

To use this table, find the ASC/ASCQ (Bytes 12–13), then go to “3592 Drive Sense Data to URC Table” on page 344 and look up the URC. Then go to “URC Table With Descriptions, Actions, and FRUs” on page 375.

Table 67. Sense Key Definitions

SK	Definition
00	No Sense
01	Recovered Error
02	Not Ready
03	Medium Error
04	Hardware Error
05	Illegal Request
06	Unit Attention
07	Data Protect
08	Blank Check
0B	Aborted Command
0D	Volume Overflow

Table 68. 3592 Tape Drive Sense Data

	Bit Address or Name							
Byte	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
0	Valid	Error Code						
1	Segment Number x'00'							
2	Filemark	EOM	ILI	Reserved	Sense Key			
3–6	Information byte							
7	Additional sense length							
8–11	Command specific information bytes							

Table 68. 3592 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) **Byte 12 Byte 13** **ASC ASCQ** 00 00 - No additional sense information 00 01 - FM (filemark) detected 00 02 - EOM detected 00 04 - BOM detected 00 05 - EOD detected 00 16 - Operation in progress 00 17 - Drive needs cleaning 03 02 - Excessive write errors 04 00 - Unit not ready, cause not reportable 04 01 - Unit not ready, to ready transition in process 04 03 - Unit not ready, manual intervention needed 04 04 - Unit not ready, format in progress 04 07 - Unit not ready, operation in progress 09 00 - Track Following error 0C 00 - WRITE error 0E 03 - Invalid Field in Command Information Unit 11 00 - Unrecovered READ error 11 01 - Read retries exhausted 11 08 - Unrecovered READ error, incomplete block read 14 00 - Recorded entity not found 14 01 - Record not found 14 02 - Filemark or Setmark not found 14 03 - EOD not found 14 04 - Block sequence error 15 01 - Mechanical positioning error 17 01 - Recovered data with retries 18 00 - Recovered data with error correction applied 1A 00 - Parameter list length error 1B 00 - Synchronous data transfer error 20 00 - Invalid command Op code 24 00 - Invalid CDB field 25 00 - LUN not supported 26 00 - Parameter list error, invalid field 26 01 - Parameter not supported 26 02 - Parameter value invalid 26 03 - Threshold parameters not supported 27 00 - Write protected 28 00 - Not-ready to ready transition, medium may have changed 29 00 - Power on, reset, or Bus Device reset occurred							

Table 68. 3592 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) **Byte 12 Byte 13** **ASC ASCQ** 2A 01 - Mode parameters changed 2A 02 - Log parameters changed 2C 00 - Command sequence error 2F 00 - Commands cleared by another initiator 30 00 - Incompatible medium installed 30 01 - Cannot read medium, unknown format 30 02 - Cannot read medium, Incompatible format 30 03 - Cleaning in process 30 05 - Cannot write medium - incompatible format 31 00 - Medium format corrupted 31 01 - Format command failed 33 00 - Tape length error 37 00 - Rounded parameter 39 00 - Saving parameters not supported 3A 00 - Medium not present 3A 04 - Not Ready - Medium Auxiliary Memory Accessible 3B 00 - Sequential positioning error 3B 08 - Repositioning error 3D 00 - Invalid bits in ID message 3F 01 - Microcode has been changed 3F 02 - Changed operating definition 3F 03 - Inquiry data has changed 40 00 - Diagnostic failure 43 00 - Message error 44 00 - Internal target failure 45 00 - Select/reselect failure 47 00 - SCSI parity error 47 80 - Read internal CRC error 47 81 - Write internal CRC error 48 00 - IDE message received 49 00 - Invalid message error 4A 00 - Command Phase error 4B 00 - Data phase error 4C 00 - Logical Unit failed self-configuration 4E 00 - Overlapped commands attempted 50 01 - Write append position error (WORM) 51 00 - ERASE failure 52 00 - Cartridge fault 53 00 - Media load or eject failed 53 01 - Unload tape failure 53 02 - Media removal prevented 5A 01 - Operator medium removal requested							

Table 68. 3592 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) **Byte 12 Byte 13** **ASC ASCQ** 5B 02 - Log counter at maximum 5B 03 - Log list codes exhausted 5D 00 - Failure prediction threshold exceeded 5D FF - Failure prediction threshold exceeded (false) 80 00 - CU mode, vendor-unique 82 83 - Drive has been cleaned (old version of microcode) 83 83 - Drive has been cleaned 85 00 - Write protected because of Tape or Drive failure 85 01 - Write protected because of Tape failure 85 02 - Write protected because of Drive failure 85 03 - Write protected because of current tape position							

Table 68. 3592 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) **Byte 12 Byte 13** **ASC ASCQ** **Sense Key 0 (No Sense)** EE 13 - Encryption - Key Translate **Sense Key 3 (Medium Error)** EE 60 - Encryption - Proxy Command Error EE D0 - Encryption - Data Read Decryption Failure EE D1 - Encryption - Data Read after Write Decryption Failure EE E0 - Encryption - Key Translation Failure EE F0 - Encryption - Decryption Fenced (Read) EE F1 - Encryption - Encryption Fenced (Write) **Sense Key 4 (Hardware Error)** EE 0E - Encryption - Key Service Timeout EE 0F - Encryption - Key Service Failure **Sense Key 5 (Illegal Request)** EE 00 - Encryption - Key Service Not Enabled EE 01 - Encryption - Key Service Not Configured EE 02 - Encryption - Key Service Not Available EE 10 - Encryption - Key Required EE 20 - Encryption - Key Count Exceeded EE 21 - Encryption - Key Alias Exceeded EE 22 - Encryption - Key Reserved EE 23 - Encryption - Key Conflict EE 24 - Encryption - Key Method Change EE 25 - Encryption - Key Format Not Supported EE 26 - Encryption - Unauthorized Request - dAK EE 27 - Encryption - Unauthorized Request - dSK EE 28 - Encryption - Unauthorized Request - eAK EE 29 - Encryption - Authentication Failure EE 2A - Encryption - Invalid RDKi EE 2B - Encryption - Key Incorrect EE 2C - Encryption - Key Wrapping Failure EE 2D - Encryption - Sequencing Failure EE 2E - Encryption - Unsupported Type EE 2F - Encryption - New Key Encrypted Write Pending EE 30 - Encryption - Prohibited Request EE 31 - Encryption - Key Unknown EE 42 - Encryption - EKM Challenge Pending EE E2 - Encryption - Key Translation Disallowed EE FF - Encryption - Security Prohibited Function EF 01 - Encryption - Key Service Not Configured							

Table 68. 3592 Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	6	5	4	3	2	1	0
12–13	**Sense Key 6 (Unit Attention)** EE 12 - Encryption - Key Change Detected EE 18 - Encryption - Changed (Read) EE 19 - Encryption - Changed (Write) EE 40 - Encryption - EKM Identifier Changed EE 41 - Encryption - EKM Challenge Changed EE 50 - Encryption - Initiator Identifier Changed EE 51 - Encryption - Initiator Response Changed **Sense Key 7 (Data Protect)** EF 10 - Encryption - Key Required EF 11 - Encryption - Key Generation EF 13 - Encryption - Key Translate EF 1A - Encryption - Key Optional EF C0 - Encryption - No Operation							
14	Field Replaceable Unit (FRU)							
15	SKSV	C/D	Reserved		BPV	Bit counter		
16 –17	Field Pointer							
18	**Bit Description** 7 Vendor-Reserved (Record Sense Request) 6 Sequential Medium Loader Active - B'0': this device does not support sequential loaders. 5 Microcode Dump Available - B'0': Indicates there is no microcode dump currently available - B'1': Indicates a microcode dump is available. This information may be retrieved with the Read Buffer command, and can be used by IBM Service personnel to analyze the state of the device. The dump is lost at the next power off. 4 Tape Directory Invalid - B'0': Indicates the Tape Directory is valid - B'1': Indicates the Tape Directory is invalid **Note**: This field may not be valid if the drive is not ready or when the sense data is associated with a CHECK CONDITION status (contingent allegiance or autosense condition). The Request Sense command should be used to return unsolicited sense to insure the field is valid. An invalid Tape Directory will be automatically rebuilt using a performance optimized method during any space or locate operation. There is no need to fully read the media for directory rebuilding. 3 Vendor-Reserved (Media Test Mode) 2 EOD is in Performance Segment 1 Current location is in Performance Segment 0 Port Reporting Sense - B'0': Indicates this sense reported on port 0 - B'1': Indicates this sense reported on port 1							
19–22	Reserved							
23	Medium Status							
24	Medium Description Flags							
25–29	Reserved							
30	Failing Command							
31–32	First error code flag data							
33–34	Second error code							
35–36	Second error flag data							

Table 68. 3592 Tape Drive Sense Data (continued)

Byte	Bit Address or Name							
	7	**6**	**5**	**4**	**3**	**2**	**1**	**0**
37–38	Next to last error code							
39–40	Next to last error code flag data							
41–42	Last error code							
43–44	Last error code flag data							
45	Reserved							
46–49	Logical block number							
50–52	Data set number x'000000' to x'FFFFFF'							
53	Physical wrap number							
54–55	Partition number x'0000 - 00FF'							
56–59	Relative LPOS							
60	Logical wrap number							
61	Last speed index							
62	SARS drive relative quality (best x'01' to worst 'FF')							
63	SARS media relative quality (best x'01' to worst 'FF')							
64–69	Reserved							
70	Cleaning required indicator							
71	Reserved							
72–78	Microcode EC number (in ASCII)							
79	Reserved							
80	Volume label flags							
81–82	Volume label cartridge type							
83–88	Volume label (in ASCII or EBCDIC depending on the source)							
89–95	Reserved							
	For additional information see, "IBM System Storage Enterprise Tape System 3592 SCSI Reference," GA32–0466."							

Library Encryption Setup & Systems Assurance

Before you can use the encryption capability of 3592–E05 (TS1120), 3592–E06/EU6 (TS1130), 3592–E07 (TS1140), and LTO-4 tape drives, you must be sure that certain hardware and software requirements are met. The following information provides an overview of the library configuration prerequisites for ensuring successful implementation of encryption in a TS3500 Tape Library.

The 3584 Tape Library can have a mix of both LTO and 3592 tape drives supporting various encryption configurations across several logical libraries. The rules for setting up encryption differ based on whether your library has Advanced Library Management System (ALMS) installed or not. The rules also differ based on whether you use Library-Managed Encryption (LME), System-Managed Encryption (SME), or Application-Managed Encryption (AME).

The following table presents an overview of these rules. When implementing encryption, libraries without ALMS have very little flexibility for tape drive configuration. For this reason, it is not necessary, but is recommended, that ALMS is enabled.

Table 69. Tape drive configuration for encryption

Drive types	Library setup	
	Library with ALMS (recommended)	**Library without ALMS**
LTO Tape Drives **Note:** Feature code 1604 is required to enable encryption on LTO-4 Tape Drives running LME and SME, but not required for AME.	• Encryption can be enabled with a mix of both encryption-capable (LTO-4) drives and drives that are not encryption capable (LTO-2 and LTO-3). • Any LTO4 drives in the library can be encryption enabled with LME, AME, or SME.	• All drives in the library must be encryption enabled (LTO-4) • All drives must all be managed in the same manner (LME, SME, or AME).
3592 Tape Drives	• If using LME or AME, all drives in a logical library must be encryption capable for encryption to be enabled. • However, if using SME in a library with ALMS, it is possible for the logical library to consist of a mix of encryption-capable drives and drives that are not encryption capable.	• All drives in the library must be encryption enabled 3592–E05 (TS1120), 3592–E06/EU6 (TS1130) or 3592–E07 (TS1140) • All drives must all be managed in the same manner (LME, SME, or AME).
Mixed (LTO and 3592) Drives	• Encryption can be enabled only on all 3952 Tape Drives, only on LTO Tape Drives, or on both. • If you want to enable encryption only on 3952 drives, follow the rules above for 3952 libraries. • If you want to enable encryption only on LTO drives, follow the rules above for LTO libraries. • If you want to enable encryption on both, adhere to the rules above for each, respectively.	• LTO and 3592 drives can be managed differently • All LTO must be managed the same (see LTO only) • All 3592 must be managed the same (see 3592 only) • In LTO and 3592 logical libraries homogenous application is enforced. Therefore all drives must be encryption enabled IF encryption is used • You can use LTO encryption, but leave 3592 drives unencrypted, and vice versa.

Notes:

1. In order for encryption to be supported in the 3584 Tape Library, the rules presented in the above must be followed. Failure to adhere to these rules may result in problems when enabling encryption.
2. The following feature codes are required or recommended when setting up encryption in the 3584 Tape Library.
   - FC 9900, Encryption Configuration (required)
   - FC 1604, Transparent LTO Encryption (required to enable encryption on LTO-4 Tape Drives running LME and SME, but not required for AME.)
   - FC 1690, Advanced Library Management System (recommended)
3. If you have additional questions about configuring a 3584 Tape Library for encryption, contact your IBM Representative.

Refer to the *IBM System Storage TS3500 Tape Library Introduction and Planning Guide*, GA32-0559, for more information.

The guide for installing and setting up encryption drives can also be found in the following document:

- Go to: **http://w3-03.ibm.com/support/**
- Select **'Solution Assistance'** (from the left-hand pane)
- Select **'SAPR guides & product checklists'**
- Under 'Hardware / Systems,' select: **-► IBM System Storage**
- Select ***'SA399 IBM System Storage TS3500 Tape Library Systems Assurance Product Review (SAPR) Guide and Checklist SA00-002-13'.*** Use the documents listed to review requirements for installing and configuring encryption drives.

3592, LTO-4, and LTO-5 Encryption Problem Determination Guide

The following table only applies to 3592 E05, E06/EU6, E07 and LTO Ultrium-4 encryption-capable drives. For more detailed information on the following errors, refer to Chapter 7, "Encryption Key Manager-Reported Errors" in the *IBM Encryption Key Manager component for the Java platform, Introduction, Planning, and User's Guide*, GA76–0418–08 or later.

Table 70. Encryption Problem Determination Guide

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
5	EE 00	Encryption - Key Service Not Enabled			none - feature is not enabled (license needed)
5	EE 02	Encryption - Key Service Not Available		The tape drive has not been configured with an encryption method (Application, System, or Library managed). Note: this status is only presented by the drive. The EKM has no visibility to this.	Configure the tape drive to resolve this error.
4	EE 0E	Encryption - Key Service Timeout		The tape drive sent an encryption-related request to the EKM and the EKM reported an error back to the tape drive. See the flag data in the tape drive sense data for more specific info about the error. Potential causes: EKM software problem, problem with the key store (loss of network connection to the key store, hardware problem with the key store), or an undefined key label.	**Note:** Ensure that all encryption-enabled tape drives (LTO Ultrium and 3592) in library-managed encryption (LME) logical libraries are empty prior to starting the key path diagnostics. The tests can fail if the tape drives contain cartridges when the tests begin.Run the EKM Path Check diagnostic from the library. If the ethernet connection to the EKM server is bad, verify the correct IP address is specified and troubleshoot like any network problem. If the ethernet connection to the EKM server is good, but the EKM is not responding, ask the customer to attempt to start the EKM. If the EKM reports an error, use that error to troubleshoot the problem.

Table 70. Encryption Problem Determination Guide (continued)

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
4	EE 0F	Encryption - Key Service Failure		The tape drive sent an encryption-related request to the EKM and the EKM reported an error back to the tape drive. See the flag data in the tape drive sense data for more specific info about the error. Potential causes: EKM software problem, problem with the key store (loss of network connection to the key store, hardware problem with the key store), or an undefined key label.	Obtain the flag data from the tape drive sense data. Analyze the flag data to determine the reason for the EKM-reported problem.
7	EF 10	Encryption - Key Required	EKM	This is not an error (if the tape drive and proxy are configured correctly). It is sense data used to initiate a key generation request. Very similar to EF 10 but this is a key generation request vs a request for an existing key.	If this sense is associated with a job failure: Verify that the tape drive is set for the correct encryption method (application, system, or library managed) and that the encryption proxy is configured correctly. If this sense is NOT associated with a job failure, ignore this condition.
5	EE 10	Encryption - Key Required		This is not an error (if the tape drive and proxy are configured correctly). It is sense data used to initiate a key request. EE 10 and EF 10 have the same cause, but EE 10 is reported when the tape drive is configured for application-managed encryption key path, and EF 10 is reported when the tape drive is configured for system-managed encryption key path. Note: if the application proactively serves a key you won't see this.	If this sense is associated with a job failure: Verify that the tape drive is set for the correct encryption method (application, system, or library managed) and that the encryption proxy is configured correctly. If this sense is NOT associated with a job failure, ignore this condition.

Table 70. Encryption Problem Determination Guide (continued)

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
7	EF 11	Encryption - Key Generation	EKM	This is not an error (if the tape drive and proxy are configured correctly). It is sense data used to initiate a key generation request. Very similar to EF 10 but this is a key generation request vs a request for an existing key.	If this sense is associated with a job failure: Verify that the tape drive is set for the correct encryption method (application, system, or library managed) and that the encryption proxy is configured correctly. If this sense is NOT associated with a job failure, ignore this condition.
6	EE 12	Encryption - Key Change Detected		Information Only - SCSI Unit Attention – a key has changed.	none - key change detected (notification only) redrive command
7	EF 13	Encryption - Key Translate	EKM	This is not an error (if the tape drive and proxy are configured correctly). It is sense data used to initiate a key translation request to the library key path.	If this sense is associated with a job failure: Verify that the tape drive is set for the correct encryption method (application, system, or library managed) and that the encryption proxy is configured correctly. If this sense is NOT associated with a job failure, ignore this condition.
0	EF 13	Encryption - Key Translate	EKM	This is not an error (if the tape drive and proxy are configured correctly). It is sense data used to initiate a key translation request to the application/system key path.	none - key translation has been requested (in-band)
6	EE 18	Encryption - Changed (Read)		Information Only - SCSI Unit Attention - encryption characteristics (key, method, etc) were changed prior to a read operation.	none - retry the command if necessary.
6	EE 19	Encryption - Changed (Write)		Information Only - SCSI Unit Attention - encryption characteristics (key, method, etc) were changed prior to a write operation.	none - retry the command if necessary.

Table 70. Encryption Problem Determination Guide (continued)

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
5	EE 23	Encryption - Key Conflict	EKM	An attempt was made to reuse a previously used Data Key Index (Dki). This is also known as a 'key collision'. Note: This is expected to be a rare occurance. It is only used in a multi-key environment.	Retry the command if necessary. If the problem persists, obtain a drive dump and EKM (or application if no EKM is involved) traces, then contact your next level of support.
5	EE 25	Encryption - Key Format Not Supported	EKM	The tape drive received a corrupted or unrecognized message from the EKM. The most likely causes are an EKM code bug or incompatible code versions on the drive and EKM. Note: This is expected to be a rare occurance.	Retry the command if necessary. If the problem persists, verify the EKM and drive code versions are compatible. As an example, if the EKM code were updated to include a new function but the drive code version does not recognize the new EKM function then the code versions are incompatible. If the problem still persists, obtain a drive dump and EKM (or application if no EKM is involved) traces, then contact your next level of support.
5	EE 26	Encryption - Unauthorized Request - dAK	EKM	Key usage error. An invalid Drive Authentication Key (dAK) was used or a valid dAK was used incorrectly. This could be an unauthorized attempt to access data.	Retry the command if necessary. This sense may be reported following the service replacement of a tape drive. If so then it may be automatically corrected to support the new tape drive. If the problem persists, ensure that the Drive Authentication Keys are correct.

Table 70. Encryption Problem Determination Guide (continued)

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
5	EE 27	Encryption - Unauthorized Request - dSK	EKM	Key usage error. An invalid Drive Session Key (dSK) was used or a valid dSK was used incorrectly. This could be an unauthorized attempt to access data.	Retry the command if necessary. This sense may be reported following the service replacement of a tape drive. If so then it may be automatically corrected to support the new tape drive. If the problem persists, ensure that the Drive Session Keys are correct.
5	EE 28	Encryption - Unauthorized Request - eAK	EKM	Key usage error. An invalid External Authentication Key (eAK) was used or a valid eAK was used incorrectly. This could be an unauthorized attempt to access data. Note: a private key is needed for External Authentication.	Retry the command if necessary. If the problem persists, ensure that the External Authentication Keys are correct.
5	EE 29	Encryption - Authentication Failure	EKM	This indicates that a corrupted or incorrectly signed message was detected. Potential causes: invalid signature on a message, EKM code bug, tape drive code bug, drive hardware problem (unlikely). This could be an unauthorized attempt to access data.	Retry the command if necessary. If the problem persists, ensure that the signatures are correct. If the problem still persists, use tape drive diagnostics to ensure that the tape drive encryption hardware is functional.
5	EE 2B	Encryption - Key Incorrect		An incompatible key was written in a non-supported format. Note: This is expected to be a rare occurance.	Ensure that the encryption keys are correct, then retry the command. If the problem persists, obtain a drive dump and EKM (or application if no EKM is involved) traces, then contact your next level of support.

Table 70. Encryption Problem Determination Guide (continued)

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
5	EE 2C	Encryption - Key Wrapping Failure	EKM	The EKM has a problem which resulted in building the Session Encrypted Data Key (SEDK) incorrectly. Note: The SEDK is a structure used to wrap a key or keys to send them to the tape drive. This will typically be reported with ASC/ASCQ EE 0F, so this sense is typically only found in internal logging.	If a higher version of EKM is available, update the EKM. If the problem persists, obtain a drive dump and EKM (or application if no EKM is involved) traces, then contact your next level of support.
5	EE 2E	Encryption - Unsupported Type	EKM	The tape drive received a corrupted or unrecognized message from the EKM. The most likely causes are an EKM code bug or incompatible code versions on the drive and EKM. Note: This is expected to be a rare occurance.	Retry the command if necessary. If the problem persists, verify the EKM and drive code versions are compatible. As an example, if the EKM code were updated to include a new function but the drive code version does not recognize the new EKM function then the code versions are incompatible. If the problem still persists, obtain a drive dump and EKM (or application if no EKM is involved) traces, then contact your next level of support. Note: the byte and bit pointers may be used to indicate the first bad field in the message.
5	EE 30	Encryption - Prohibited Request		The requested operation was not allowed due to the current mode or state. As an example, a key path diagnostic was not allowed because there was a cartridge in the tape drive.	Ensure that the requirements for the requested operation have been met. As an example, before running a key path diagnostic be sure the tape drive is empty. If the problem persists, obtain a drive dump, then contact your next level of support.

Table 70. Encryption Problem Determination Guide (continued)

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
5	EE 31	Encryption - Key Unknown		A key operation was not allowed because the key was not known (not a currently tracked key).The key that was used is not a match for this tape cartridge.	Retry the command using the correct encryption key for the cartridge.
5	EE 60	Encryption - Proxy Command Error		A command resulted in a key transition that can't be handled by the application/system proxy. The proxy reports this condition - this sense combination is typically not produced by the tape drive. Note: This is only expected in test environments, not in the field.	If the problem persists, obtain a drive dump and traces from the proxy, then contact your next level of support.
3	EE D0	Encryption - Data Read Decryption Failure		The tape drive was unable to decrypt data using an application-provided key. The probable cause is use of the wrong encryption key. In rare cases this may also be caused by a failure in the tape drive encryption hardware.	Retry the command using the encryption key that was used when the cartridge was written. If the problem persists, use the tape drive diagnostics to determine whether there is a problem with the encryption hardware.
3	EE D1	Encryption - Data Read after Write Decryption Failure		The tape drive wrote encrypted data and was unable to decrypt it after reading it back. The probably cause is a tape drive code or hardware problem.	Obtain a drive dump. Use the tape drive diagnostics to determine whether there is a problem with the encryption hardware. If the diagnostics do not indicate a problem, contact your next level of support.
3	EE E0	Encryption - Key Translation Failure	EKM	A permanent error occurred during a key translation operation. The cartridge is in an indeterminate state.	The cartridge may need to be accessed with the old key or with the new key. This tape should be copied and retired.

Table 70. Encryption Problem Determination Guide (continued)

SK	ASC ASCQ	Description	Impact	Explanation	User Action Plan
5	EE E2	Encryption - Key Translation Disallowed		An encryption key translation was requested, but the encryption proxy rejected the request. Possible causes: a prior translation is pending and has not yet completed, or the Externally-Encrypted Data Key (EEDK) on the cartridge is persistently unencrypted.	Verify that the tape drive is set for the correct encryption method (application, system, or library managed) and that the encryption proxy is configured correctly.
3	EE F1	Encryption - Encryption Fenced (Write)		The EKM has set an encryption fence condition preventing further writing. This fence condition will be cleared when the cartridge is demounted. Note: this only occurs with the Library-managed encryption method. Possible causes: a mismatch between the cartridge volser and the volser ranges used for encryption policy.	Ensure that the cartridge volser is in the correct volser range, since volser ranges are associated with encryption policy.

CETool Library Error Log Display

The library error log contains up to 1000 32-byte records. When the ALMS feature is installed, an additional Trailer record will be logged following the Library Error Log to allow the service representative the ability to determine actual physical addresses and VOLSERs that were associated with a failure. Each Library Error Log entry contains the following information:

Table 71. CE Tool Library Error Log Display

Byte	Description
0-3	Time Stamp
4	SCSI Op Code (refer to *IBM 3584 UltraScalable Tape Library SCSI Reference*, GA32-0410)
5-12	SCSI PARM Data (refer to *IBM 3584 UltraScalable Tape Library SCSI Reference*, GA32-0410)
13	Sense Key/Retry Count
14	Additional Sense Code (ASC)
15	Additional Sense Code Qualifier (ASCQ)
16	FRU
17	Bit Fields
18	Field Pointer LSB
19	Hardware Error Code (HEC)
20	Hardware Error Code Qualifier (HECQ)
21	Mechanism State Bit MAP
22	Calling Frame/Device (identifies control path)
23	Failing Frame/Device (identifies frame and drive)
24	Tape Alert
25	Object ID (code object that detected problem)
26-27	Object Error (location in code object)
28	Source Element Bit MAP
29	First Destination Element Bit MAP
30	Second Source Element Bit MAP
31	Second Destination Element Bit MAP

Table 72. CE Library Error Log Trailer Record

Byte	Description
0-3	Date/Time Stamp
4	Always x'FF'
5-7	Source (Frame/Column/Row)
8–10	Destination 1 (Frame/Column/Row)
11–13	Destination 2 (Frame/Column/Row) Only applicable on Exchange Medium
14	Reserved
15	Logical Library (x'00' if represented by a physical location such as I/O or a drive.
16–23	VOLSER 1 (See Table 20 on page 103 chart to debug)
24–31	VOLSER 2 (only applicable on Exchange Medium)

CETool Error Log Display Example

Figure 164 provides an example of a typical screen you will get using CETool to view library error log data. For details on the procedure to gather the library error data, see “Viewing Library Error Log Entries by Using CETool” on page 736.

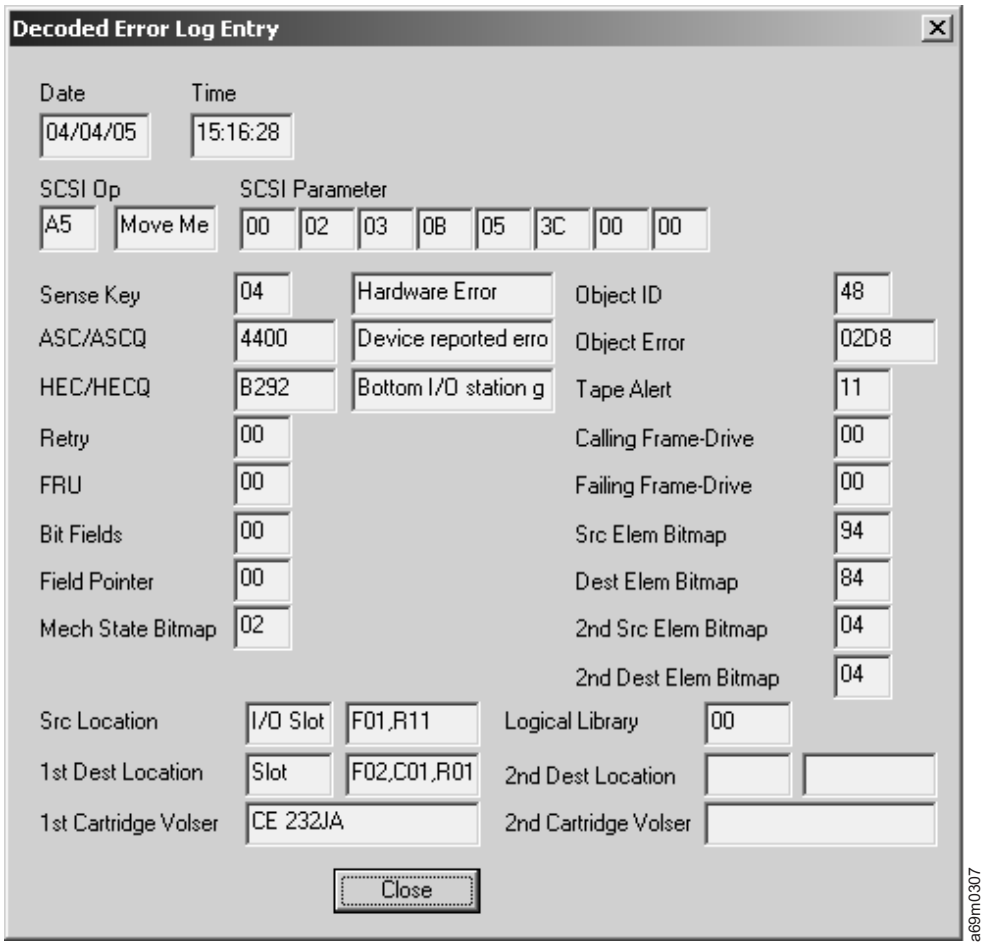


Figure 164. CETool Error Log Display Example

UseTable 73 to determine the SCSI command being executed when the error occurred.

Note: In some cases the SCSI Op code field may not in fact be a command. In this example the error was detected after the front door was opened and closed and the library automatically did an inventory. An Initialize Element Status With Range was the closest command to what really happened. In this case, you cannot determine whether it was an automatic inventory or a host initiated Initialize Element Status With Range command.

Table 73. SCSI Commands

Command in Hexadecimal	Meaning
00	Test unit Ready
01	Rezero Unit
03	Request Sense
07	Initialize Element Status
12	Inquiry
15	Mode Select

Table 73. SCSI Commands (continued)

16	Reserve Element
17	Release Element
1A	Mode Sense
1C	Receive Diagnostic Results
1D	Send Diagnostic
1E	Prevent Allow Medium Removal
2B	Position to Element
3B	Write Buffer
3C	Read Buffer
4C	Log Select
4D	Log Sense
55	Mode Select
5A	Mode Sense
A5	Move Medium
A6	Exchange Medium
B5	Request Volume Element Status
B6	Send Volume Tag
B8	Read Element Status
E7	Initialize Element Status With Range
FF	An illegal or unused command that defines a Trailer Record

Notes:

1. In the example given, the SCSI Op code was an A5, Move Medium.
2. Use “Library Sense Data” on page 604 to determine Sense Key, ASC/ASCQ, and HEC/HECQ in your specific case. In this example, the Sense Key was 04, a Hardware Error, ASC/ASCQ = 4400, Device Reported Error, and HEC/HECQ = B292, Bottom I/O Get Failure.
3. In this example, using the Library Sense Data to URC Table, “Library Sense Data to URC Table” on page 279, the URC = B148 (since the bottom I/O station in this case is for 3592).
4. You would follow the procedure under URC B148.
5. Obtain the element address of the storage slot where the first failure occurred. To do this:
   a. On libraries **without** ALMS, get the SCSI Parameter data from the library error log entry. Use CETool to display the error code, double click on the desired error record and observe the Decoded Error Log Entry. The second group of 4 hex digits (bytes 2 and 3) of the decoded SCSI Parameter field contain the element address. If using the error log entry directly from the CETool, bytes 5 through 12 contain the SCSI Parameter data. See Table 67 on page 623 for a breakdown of the error log record.
   b. On libraries **with** ALMS, the SCSI Parameter data will be virtual and will not properly lead the service representative to the physical location of the failure. Look instead at the Trailer Record that was generated along with this error record. The Trailer Record will always contain a x'FF' in the "SCSI Command" column. See Figure 164 on page 641 and locate the first destination location and first cartridge Volser. These are the physical address and Volser that were in use when the error occurred. The address is presented in a format: Frame / Column / Row.

   Examine the cartridge label in the slot, and if there is no cartridge in the slot, examine the “empty slot” bar code label in the back of the storage slot.

Locating Physical Position of Failure

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

You may be asked by IBM Support to provide the element address of the storage slot. Use these steps to acquire this information.

1. Obtain the element address of the storage slot where the first failure occurred. To do this, get the **SCSI Parameter data** from the library error log entry.
2. Once you know the element address, use the **Element Address Calculator (123)** to find the slot.

   For an **E7** command (Initialize Element Status):

   - The first four hex digits are the starting element address
   - The next four hex digits are the element address of the first bad label
   - The next four hex digits are the number of elements to be scanned

   As an example, with sense bytes X'04 00 04 15 00 8E xx xx' ...

   - X'04 00' identifies frame 1, column 1, slot 1 (starting element address)
   - X'04 15' identifies column 1, slot 28 (first bad label)
   - X'00 8E' informs you of 142 scanned elements

   For an **A5** command (Move Medium):

   - The first four hex digits are the gripper number (typically zero, since the library selects the gripper)
   - The next four hex digits are the source element address
   - The next four hex digits are the destination element address

   For an **A6** command (Exchange Medium), the first eight hex digits are the same as for an A5, but the next four digits show the second destination.

Note: On libraries **with** ALMS, the SCSI Parameter data will be virtual and will not point to an actual physical location. Look instead at the Trailer Record that was generated along with this error record. The Trailer Record will always contain a x'FF' in the "SCSI Command" column. See Table 68 on page 623 and look at bytes 5 through 13 for physical addresses of the failing elements. These elements will be presented in a format such as Frame/Column/Row.

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Power Isolation MAP

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

The Power Isolation MAP consists of multiple sections:

- Power Entry MAP - used to determine whether a failure exists, and if so which of the more detailed MAPs should handle it
- EPO MAP - used to diagnose and repair EPO failures
- MCP/MCA MAP - used to diagnose and repair failures that result in a blank two-character display on an MCP or MCA node card
- ACC, MDA, or OPC Node Cards Blank MAP - used to diagnose/repair power failures to the ACC, MDA, and OPC cards
- Blown Fuse Map - used to diagnose and replace blown fuses on the 37 V dc power busses
- Circuit Breaker MAP

The Media Changer Park (MCP) is only installed in Lx2/Dx2 frames, whereas the Media Changer Assembly (MCA) is only installed in Lx3/Dx3 frames. The MCA functions are similar to the MCP except it has two Ethernet ports and is located on the top shelf above the drives.

Note: FIC Card LEDs
If all the LEDs on one or more FIC cards in Dxx frames are off, but the 2-character display on the nodes cards are on, see **Figure 165 on page 650**. Move the "LED'S ON" switch (near **4**) to the left to turn them on. Feature Code 9003 may have directed the CE to turn off LEDs in all Dxx frames to accommodate downlevel MCP(s). After service procedures are complete, move the "LEDs ON" switch to its previous setting.

37 A, C, E - LEDs should be ON in a single accessor library. 37 A, B, C, D, E - LEDs should be ON in an HA dual-accessor library. See Table 100 on page 838 and **"37 V dc distribution throughout the 3584 Library"** information.

Power Entry MAP

Step001 ***:***

Ensure that the power-on switch is ON.

Is the front panel power indicator ON?

Yes Go to " **Step002** ."

No Go to "EPO MAP" on page 650.

Step002 ***:*** ***From " Step001 " (Yes).***

Visually check the two-character display on the MCP (in each installed FCA) or each MCA .

Is the two-character display on every installed MCP or MCA active (not blank)?

Yes Go to " Step003 ."

No Go to "MCP or MCA Node Card Display Blank MAP" on page 661.

Step003 : ***From " Step002 " on page 648 (Yes).***

Are the two-character displays on every installed MCP or MCA flashing X'00–0x' (where X'x' is the frame number)?

Yes Go to " Step004 ."

No Go to "Node Card LED Display Codes" on page 274.

Step004 : ***From " Step003 " (Yes).***

Visually check the two-character displays on all the ACC, MDA, and OPC node cards.

Is the two-character display on each ACC, MDA, and OPC active (not blank)?

Yes Go to " Step005 ."

No Go to "ACC, MDA, or OPC Node Cards Display Blank MAP" on page 664.

Step005 : ***From " Step004 " (Yes).***

Visually check the FUSE OPEN indicators **1** and **2** on each FIC card.

Are both of the FUSE OPEN indicators on each card OFF?

Yes Go to " Step006 ."

No Go to "Blown Fuse MAP" on page 667.

Step006 : ***From " Step005 " (Yes).***

No power problem has been detected.

Notes:

1. Power problems that affect only motor power are not handled by the power MAPS. These problems result in errors in the Library Error Log. They are handled the same way as any other problem that results in a Library Error Code.
2. Power problems which affect only drive power are not handled by the power MAPS. These problems result in errors in the Library Error Log if the library has tried to access the affected drives. They are handled the same way as any other problem that results in a Library Error Code. These problems may also result in SCSI errors being reported by the Host application, they are handled the same way as any other SCSI problem.
3. If you still suspect a power problem, review the Library Error Log for any power related problem, and review the Host error log for any SCSI failures.

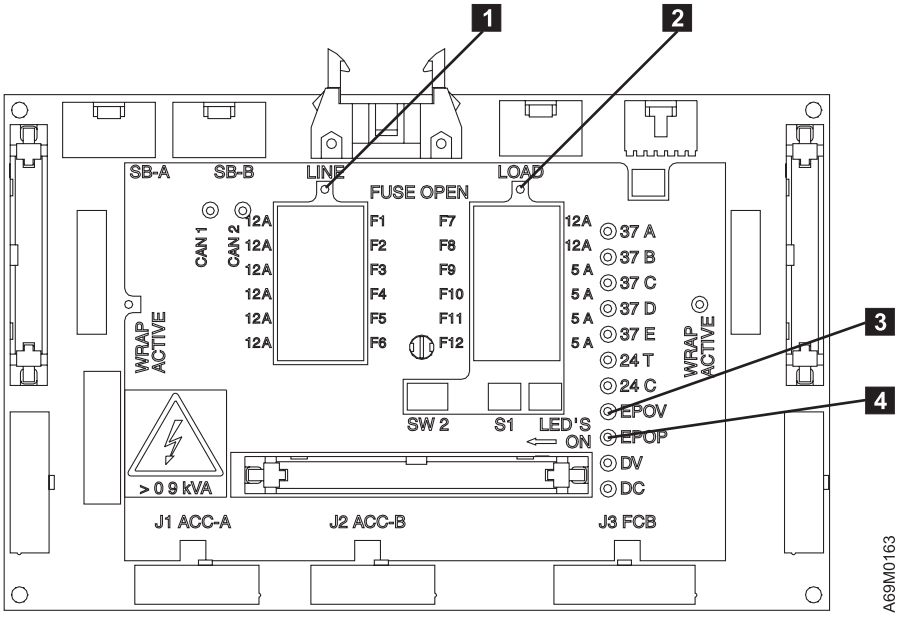


Figure 165. FIC Card Fuse Indicators

EPO MAP

Step001 *:*

1. (xx2) Ensure that all three circuit breakers **1** on the back of each installed FCA are ON (see Figure 166 on page 651) or (xx3, Enhanced FCA) that both BPC handles **1** are in the full down position (see Figure 167 on page 651).

   Note: (xx2) If an FCA circuit breaker trips again, go to “Circuit Breaker MAP” on page 670.
2. (xx2) Visually check the two 24 V dc indicators **2** on each installed FCA (see Figure 166 on page 651), or that 37v and 12v indicators and AC and DC indicators **1** are all on (see Figure 168 on page 652).

Are both 24 V dc indicator lights on each installed FCA ON, or all indicator lights on each BPC Enhanced FCA on?

Yes Go to “ **Step002** ” on page 652.

No Go to “ **Step005** ” on page 653.

Table 74. FCA and BPC Power Assemblies

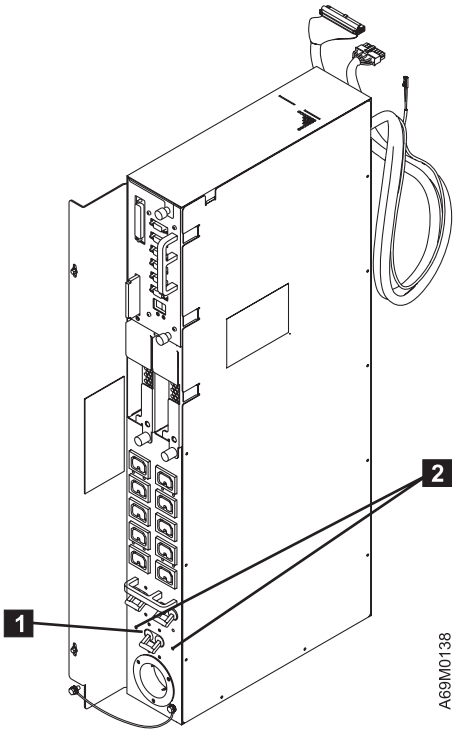


Figure 166. FCA Circuit Breakers

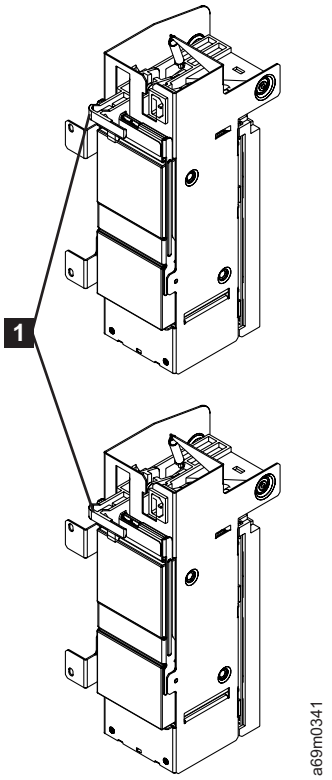


Figure 167. BPC Power Disconnect Handles

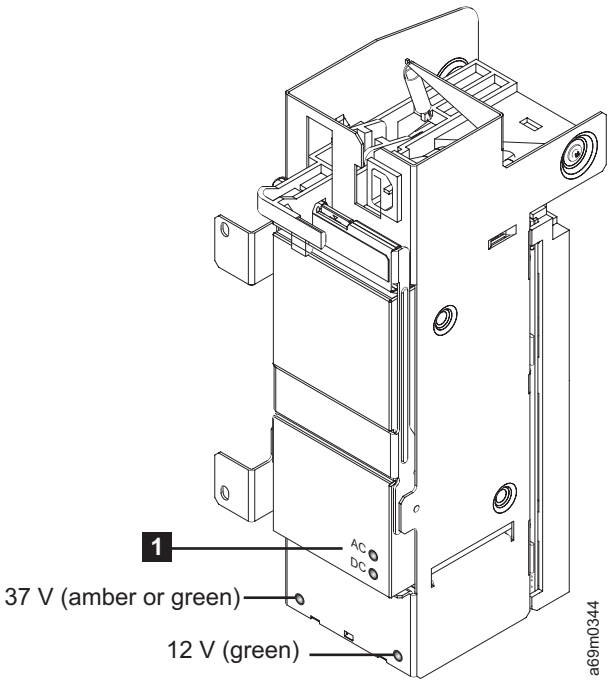


Figure 168. BPC Power LEDs

Step002 : ***From " Step001 " on page 650 and " Step005 " on page 653.***

Visually check the EPOV indicator **3** on the FIC card in each frame (see Figure 165 on page 650).

Is the EPOV indicator ON in all frames?

Yes Go to " **Step003** ."

No Go to " **Step006** " on page 653.

Step003 : ***From " Step002 " (Yes).***

Visually check the EPOP indicator **4** on the FIC card in each frame (see Figure 165 on page 650).

Is the EPOP indicator ON in all frames?

Yes Go to " **Step004** " on page 653.

No Go to " **Step007** " on page 653.

Step004 : ***From " Step003 " on page 652 (Yes).***

Since the EPOP indicator is on, the EPO circuit is good. The front panel power switch indicator should be ON. Look for any indication that the library is powered on:

Note: If even one of the following examples is true, then the library is powered on.

1. One or more drives is operational.
2. The operator panel is active (not blank).
3. The accessor moves when you open or close the front door.
4. At least one node card (MCP or MCA, ACC, MDA, or OPC) has a two-character display that is NOT blank.

Is there any indication that the library is powered on?

Yes Go to " **Step019** " on page 661.

No Contact your next level of support.

Step005 : ***From " Step001 " on page 650 (No).***

Is at least ONE of the 24 V dc indicator lights on each installed FCA ON?

Yes AC power is present at the FCA but a redundant 24 V dc power supply (part of the FCA FRU) has failed. This is not currently causing a problem, but you should schedule a future service visit to replace the FCA. See "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938 to determine the impact FRU replacement will have on availability of the library. Go to " **Step002** " on page 652 and continue as if both 24 V dc indicator lights are on.

No Go to " **Step009** " on page 656.

Step006 : ***From " Step002 " on page 652 (No).***

To reach this step, at least one 24 V dc indicator is ON, but one or more EPOV indicators is OFF. Ensure the FCA to FIC cables are securely connected in all frames containing an FCA.

Has the problem been resolved?

Yes Return to the procedure that sent you here.

No Go to " **Step007** ."

Step007 : ***From " Step003 " on page 652 and " Step006 " (No).***

To reach this step, the EPOV indicator in each frame is ON, but one or more EPOP indicators are OFF.

Verify that the FIC wrap jumpers are installed correctly (see Figure 169 on page 655):

- When viewed from the rear of the library, the right hand wrap jumper (J15) **5** must be installed ONLY on the FIC card in the base frame.
- The left hand wrap jumper (J16) **2** must be installed ONLY on the FIC card in the last expansion frame.
- All the other FIC card wrap jumpers must be disconnected and placed in the STORED position.

Verify the following cable and jumper connections:

- Ensure that the EPO cable in each frame is connected to the FIC card J12 connector **7** and to the pigtail connector coming from the FCA cable (if installed).
- Ensure that the front panel power switch cable is connected to the EPO J22 **8** connector in the base frame.
- Ensure that the EPO switch captive jumpers J22 **11** are installed on the EPO cable in all expansion frames.
- Ensure that the last frame has the captive jumper installed at (J23) **1** at the left end of the EPO cable.
- Ensure that the J23 **6** jumper on the right end of the EPO cable in the base frame is installed.
- Ensure that the J23 EPO **10** connectors in each frame are connected to the adjacent frames.

Has the problem been resolved?

Yes Return to the procedure that sent you here.

No Go to " **Step008** " on page 655.

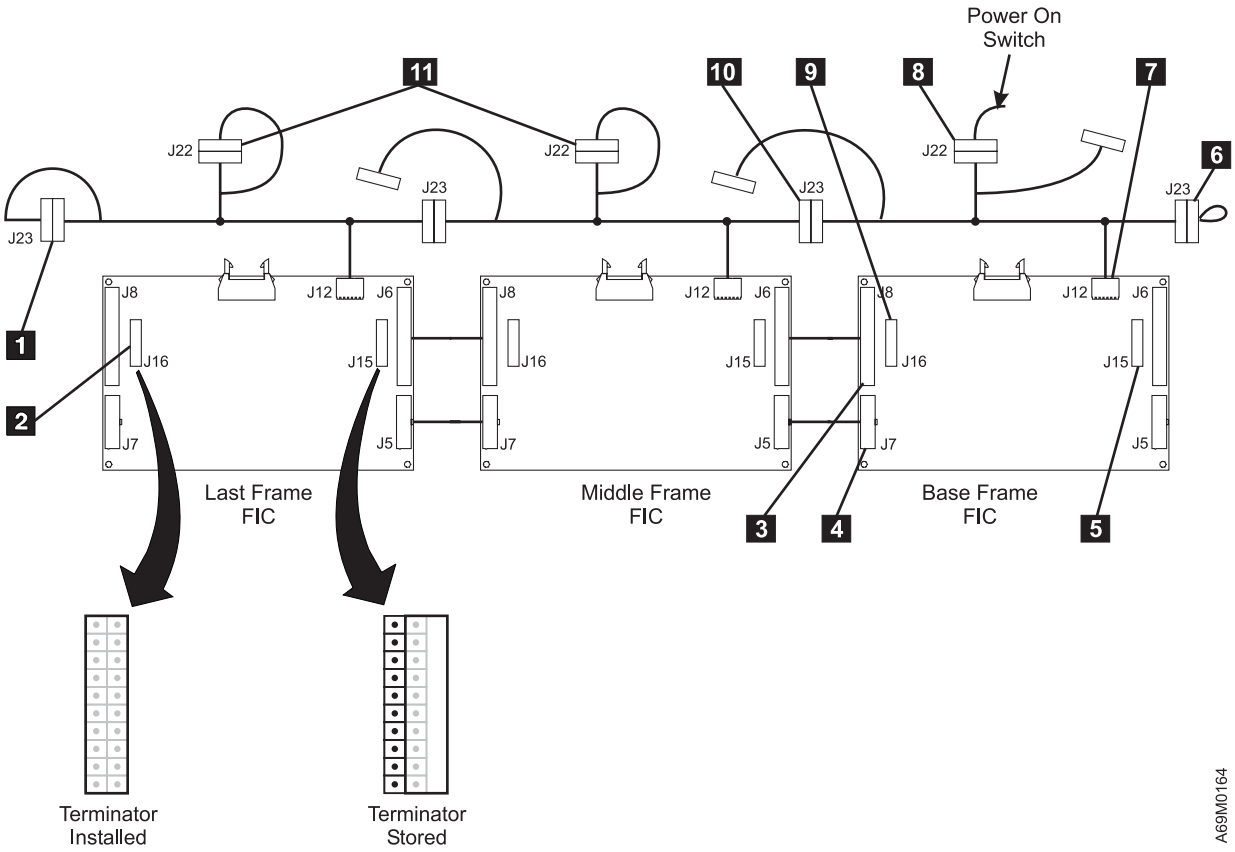


Figure 169. FIC Card Connectors and Jumpers

Step008 : ***From " Step007 " on page 653 (No).***

To reach this step, the EPOV indicator in each frame is ON, but one or more EPOP indicators are OFF. All EPO cable connections and wrap jumpers have been verified.

Unplug the front panel power switch cable **8** from the EPO cable in frame 1 and install the captive jumper in its place.

C06	**CAUTION:** **Do NOT leave the switch bypassed, as this is a safety exposure.**

Is the EPOP indicator in frame 1 ON?

Yes Replace the following FRUs:

1. The front panel power switch.
2. The front panel power switch cable.

No Go to " **Step015** " on page 658.

Step009 : ***From " Step005 " on page 653 (No).***

To reach this step, at least one FCA has both 24 V dc indicators OFF.

Perform the following steps for the FCA that has both 24 V dc indicators OFF.

Note: If more than one FCA has both 24 V dc indicators OFF, repeat that the following steps for each of the affected FCAs.

1. Ensure that the AC voltage at the customer receptacle is within the specified range (see "Branch Circuit CB Switched On Check" on page 256.
2. Disconnect both ends of the AC power cord and perform a continuity check to ensure that the AC power cord is good.
3. If the continuity check indicates a problem with the AC power cord, replace it.
4. Ensure that the AC power cord is connected at the customer receptacle and at the FCA.

Has the problem been resolved?

Yes Return to the procedure that sent you here.

No Go to " **Step010** ."

Step010 : ***From " Step009 " (No).***

To reach this step, at least one FCA has both 24 V dc indicators OFF, and the customer power receptacle and AC power cord are good.

1. Turn OFF the main circuit breaker on the affected FCA.
2. Disconnect the FCA to FIC cable for the affected FCAs.
3. Turn ON the main circuit breaker on the affected FCA.

Is at least one 24 V dc indicator on each installed FCA ON?

Yes Go to " **Step011** " on page 657.

No Go to " **Step014** " on page 658.

Step011 : ***From " Step010 " on page 656 (Yes).***

There appears to be a problem external to the FCA that is overloading the 24 V dc power supplies in the FCA. Use the following procedure to isolate the cause of the problem.

1. Turn OFF the main circuit breaker on the affected FCA.
2. Disconnect all cables from the FIC in the affected frame.
3. Reconnect the FCA to FIC cable.
4. Turn ON the main circuit breaker on the affected FCA.

Is at least one 24 V dc indicator on the affected FCA ON?

Yes Go to " **Step012** ."

No Go to " **Step013** ."

Step012 : ***From " Step011 " (Yes).***

The problem appears to be external to the FIC. Use the following procedure to isolate the cause of the problem.

1. Turn OFF the main circuit breaker on the affected FCA.
2. Reconnect one of the cables previously removed from the FIC card.

   Note: Keep track of which cable you reconnected. You may repeat this step and need to know which cable you connected last.
3. Turn ON the main circuit breaker on the affected FCA.

Is at least one 24 V dc indicator on the affected FCA ON?

Yes You have not yet found the failure. Repeat this step.

No The failure has been isolated to the cable you just reconnected. Use the following FRU list:

1. The most recently reconnected cable may be defective (shorted, grounded).
2. An electrical component attached to the cable may be (shorted, grounded).

   Note: You may be able to further isolate the failure by unplugging components from the cable to see if the failure is caused by the cable or by one of the components attached to the cable.
3. If all FRUs have been isolated or replaced, and the problem has not been resolved, contact your next level of support.

Step013 : ***From " Step011 " (No).***

The problem appears to be caused by a failing FIC.

1. Turn OFF the main circuit breaker on the affected FCA.

2. Exchange the FIC card.
3. Turn ON the main circuit breaker on the affected FCA.

Is at least one 24 V dc indicator on the affected FCA ON?

Yes The problem has been resolved. Perform the following:

1. Turn OFF the main circuit breaker.
2. Reconnect all remaining cables to the FIC card.
3. Turn ON the main circuit breaker.
4. Return to the procedure that sent you here.

No Contact your next level of support.

Step014 : ***From " Step010 " on page 656 (No).***

The problem appears to be caused by a failing FCA.

1. Turn OFF the main circuit breaker on the affected FCA.
2. Exchange the FCA.
3. Reconnect any cables previously disconnected.
4. Turn ON the main circuit breaker on the affected FCA.

Has the problem been resolved?

Yes Return to the procedure that sent you here.

No Contact your next level of support.

Step015 : ***From " Step008 " on page 655 (No).***

Is at least one expansion frame installed?

Yes Go to " **Step016** ."

No Go to " **Step018** " on page 660.

Step016 : ***From " Step015 " (Yes).***

The following procedure will help you isolate the problem by cabling the subsystem EPO, signal, and power cable as if you were working with a single frame. This is necessary to reduce the number of possible FRUs required to fix the problem.

1. Turn off the front panel power switch.

2. Turn off the main circuit breaker on each installed FCA, or lift the handles up on both BPC assemblies.
3. Refer to Figure 170. Unplug the signal cable from the J8 connector **3** on the left side (as viewed from the rear) of the FIC card in frame 1.
4. Unplug the power cable from the J7 connector **4** on the left side of the FIC card in frame 1.
5. Unplug the frame 2 EPO cable (J23 connector **10**) from the left side of the frame 1 EPO cable.
6. Install the tethered jumper on the left end of the frame 1 EPO cable **10**.
7. Install the wrap jumper block (J16) **9** on the left side of the FIC card in frame 1.

   Note: The wrap jumper block may currently be in the STORED position (on one row of pins). If the wrap jumper block is not in the STORED position you will need to use the wrap jumper block from the left side (J16) of the FIC card in the last frame in the subsystem.
8. Turn on the main circuit breaker on the FCA, or lower both BPC handles, in frame 1.

Is the frame 1 EPOV indicator ON?

Yes Go to "**Step017**" on page 660.

No Go to "**Step018**" on page 660.

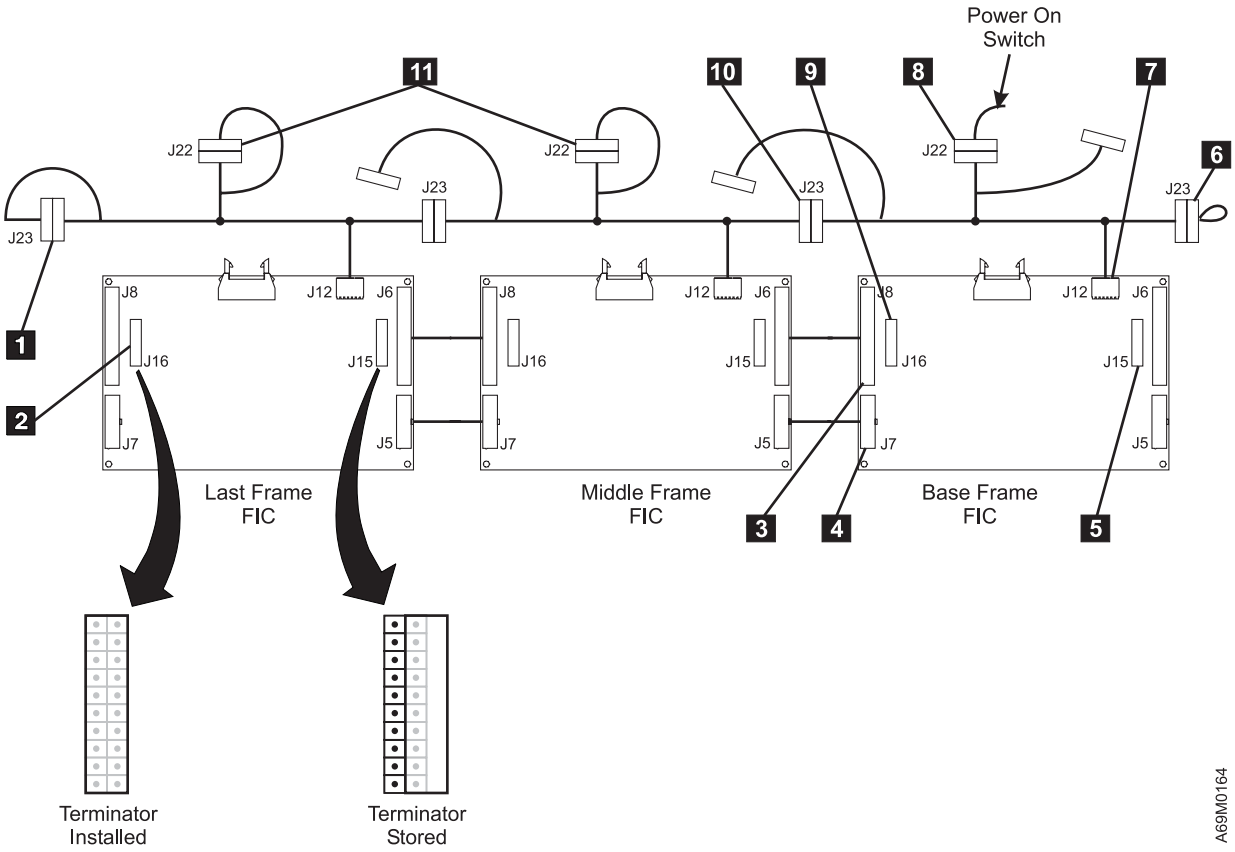


Figure 170. Placement of FIC Card when Emulating a Single Frame

Step017 : ***From " Step016 " on page 658 (Yes).***

The failure is located in a frame that you have bypassed. Continue the process of isolating the failure until you determine which frame is causing the failure.

1. Recable the library, adding one frame.

   Notes:

   a. Ensure that only one wrap jumper (J16) is installed on the FIC card at the left end expansion frame, and that only one wrap jumper (J15) is installed on the FIC card at the right end (base frame) of the frames you have cabled together.

      All other wrap jumpers should be in the STORED position.

   b. Ensure that the tethered jumper is installed on the left end of the EPO cable (J23) in the last frame you have cabled together.

2. Turn on the main circuit breaker in each FCA that is not bypassed.

Is the EPOV indicator in frame 1 ON?

Yes If some frames are still bypassed, repeat this step adding another frame. If all frames have been added, the problem has been resolved. The problem was probably a loose connection. Return to the procedure that sent you here.

No The problem is caused by a part in the last frame you added. Replace the following FRUs until the problem is resolved.

1. EPO cable
2. FIC-to-FIC signal cable
3. FIC-to-FIC power cable
4. FIC card

If all FRUs have been replaced and the problem has not been resolved, contact your next level of support.

Step018 : ***From " Step016 " on page 658 (No).***

Replace the following FRUs:

1. FIC card in frame 1.
2. FCA in frame 1.

Has the problem been resolved?

Yes Return to the procedure that sent you here.

No Contact your next level of support. The problem appears to be a bad front panel power switch indicator or J22-to-UEPO switch and LED cable.

This is not currently causing a problem. You should schedule a future service visit to replace the front panel power switch assembly and the J22-to-UEPO switch and LED cable. See Power Switch Replacement on page "Power Switch and Cable Assembly" on page 996 to determine what impact replacement will have on availability of the library. If you have any other indication of a power problem, go to "Power Isolation MAP" on page 648 and answer the questions as if the front panel power indicator is ON. If you have no other indication of a power problem, return to the procedure that sent you here.

Step019 : ***From " Step004 " on page 653 (Yes).***

Is the front panel power indicator ON?

Yes No EPO problem has been found, return to the procedure which sent you here.

No The problem appears to be a bad front panel power switch indicator or J22-to-UEPO switch and LED cable.

This is not currently causing a problem, but you should schedule a future service visit to replace the front panel power switch assembly and the J22-to-UEPO switch and LED cable. See "Power Switch and Cable Assembly" on page 996 to determine what impact replacement will have on availability of the library. If you have any other indication of a power problem, go to "Power Isolation MAP" on page 648 and answer the questions as if the front panel power indicator is ON. If you have no other indication of a power problem, return to the procedure that sent you here.

MCP or MCA Node Card Display Blank MAP

Step001 : To be here, the front panel power indicator is ON, but one or more MCP/MCA has a blank two-character display.

Note: If more than one MCP/MCA has a blank two-character display, start by troubleshooting the problem in the lowest numbered frame that contains an affected MCP/MCA. When one has been repaired, if more problems exist, return here to troubleshoot the next problem.

1. (xx2) Ensure that all three circuit breakers **1** on the back of each installed FCA are ON (see Figure 166 on page 651) or (xx3) that both BPC handles **1** are in the full down position (see Figure 167 on page 651).

   Note: (xx2) If a FCA circuit breaker trips again, go to "Circuit Breaker MAP" on page 670.
2. Visually check the two 24 V dc indicators **2** on each installed FCA (see Figure 166 on page 651), or that 37v and 12v indicators and AC and DC indicators **1** are all on (see Figure 168 on page 652).

Are both 24 V dc indicator lights on each installed FCA ON, or all indicator lights on each installed BPC on?

Yes Go to " **Step002** ."

No Go to "EPO MAP" on page 650.

Step002 : ***From " Step001 " (Yes).***

Refer to Figure 171 on page 663. Visually check the EPOV and EPOP indicators **3** and **4** on the FIC in the affected frame.

Are the EPOV and EPOP indicators both ON?

Yes Go to “ **Step003** .”

No Go to “EPO MAP” on page 650.

Step003 : ***From “ Step002 ” on page 661 (Yes).***

To reach this point the following conditions are true:

- AC power to the FCA or BPC is ON.
- At least one 24 V dc power supply in the FCA is ON.
- The EPOV and EPOP indicators on the FIC card are ON.

MCP Only:

1. Loosen the two MCP retaining screws.
2. Remove the MCP.
3. Visually check the connectors on the back of the MCP for bent or damaged pins.
4. Visually check the mating connectors in the FCA for bent or damaged pins.
5. Reinstall the MCP.
6. Tighten the two MCP retaining screws.

MCA Only:

1. Remove the MCA retaining thumbscrew.
2. Pull the MCA forward, then unplug the connectors at the back of the MCA.
3. Visually check the mating connectors for bent or damaged pins.
4. Reinstall the MCA.
5. Reinstall and tighten the MCP thumbscrew.

Is the MCP or MCA two-character display still blank?

Yes Go to “ **Step004** .”

No Return to the procedure that sent you here.

Step004 : ***From “ Step003 ” (Yes).***

Ensure that the FCA-to-FIC cable is connected securely.

Attention: If the library has only one FCA or Enhanced FCA, and if one or more drives are in use, then unplugging the FCA to FIC cable will drop power to the drives.

Ensure that you do NOT disconnect the FCA or BPC to FIC cable, unless instructed to do so.

Is the MCP or MCA two-character display still blank?

Yes Go to “ **Step005** ” on page 663.

No Return to the procedure that sent you here.

Step005 : ***From " Step004 " on page 662 (Yes).***

Replace the following FRUs, one at a time, until the problem is resolved.

1. (xx2) MCP (see "Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840) to determine what impact replacement will have on availability of the library.
2. (xx3) MCA (see "Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)" on page 844) to determine what impact replacement will have on availability of the library.
3. (xx2) FCA (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938) to determine what impact replacement will have on availability of the library.
4. (xx3) BPC (see "Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)" on page 942) to determine what impact replacement will have on availability of the library.
5. FIC (see "FIC Card" on page 835) to determine what impact replacement will have on availability of the library.

Has the problem been resolved?

Yes Return to the procedure that sent you here.

No Contact your next level of support.

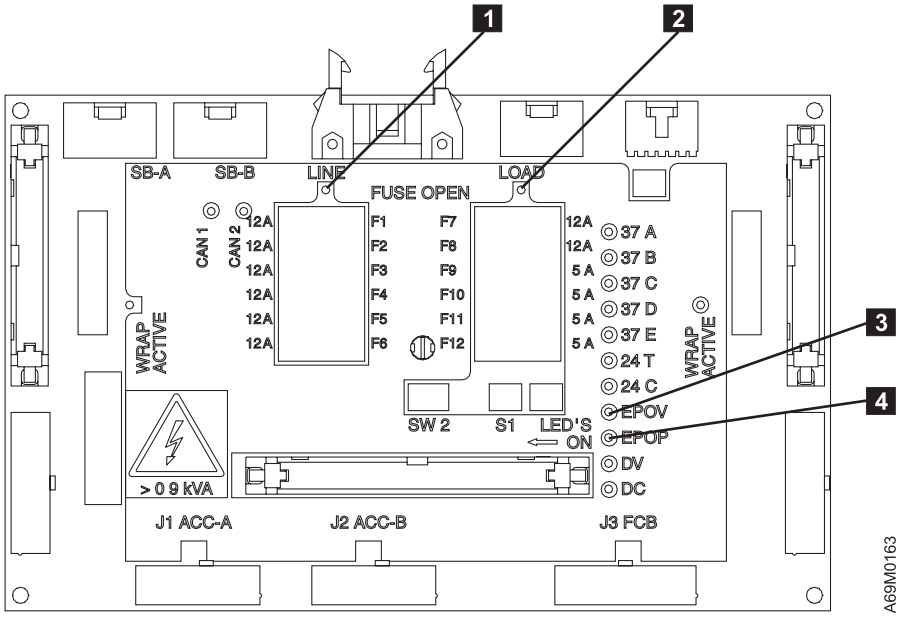


Figure 171. FIC Card EPOV and EPOP Indicators

ACC, MDA, or OPC Node Cards Display Blank MAP

Step001 **:** This procedure assumes that the library power ON indicator is ON, the MCPs are flashing error codes, and that all of the FCAs 24 V dc indicators are ON. For xx3 (Enhanced FCA) all BPC power indicators are on. If this is not true, go to “Power Isolation MAP” on page 648.

Note: Only one 24 V dc indicator on any FCA is required to operate the library.

Is the OPC node card two-character display blank?

Yes Go to “ **Step009** ” on page 666.

No Go to “ **Step002** .”

Step002 **:** ***From “ Step001 ” (No).***

Is the ACC node card two-character display blank?

Yes Go to “ **Step006** ” on page 665.

No Go to “ **Step003** .”

Step003 **:** ***From “ Step002 ” (No).***

Is the MDA node card two-character display blank?

Yes Go to “ **Step005** .”

No Go to “ **Step004** .”

Step004 **:** ***From “ Step003 ” (No).***

If you are at this step, none of the node card two-character displays are blank. Return to the procedure that sent you here.

Step005 **:** ***From “ Step003 ” (Yes).***

The MDA node card two-character display is blank, the ACC and OPC node cards two-character displays are Not blank. Replace the following FRUs:

1. AXY card (see“AXY Card (X-Axis)” on page 832).
2. MDA assembly (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846).
3. Cable, AXY to MDA.

Step006 : ***From " Step002 " on page 664 (Yes).***

The ACC node card two-character display is blank, but the OPC node card two-character display is NOT blank.

Is the MDA node card two-character display blank also?

Yes Go to " **Step008** ."

No Go to " **Step007** ."

Step007 : ***From " Step006 " (No).***

The ACC node card two-character display is blank but the MDA node card two-character display is Not blank.

1. Ensure that the XCP to ACC cable (Y-Axis Flex cable) is plugged in correctly at both ends.
2. Replace the following FRUs:
   a. Cable, Y-Axis flex
   b. ACC card (see "Accessor Controller Card (ACC, ACC-CF)" on page 828)
   c. AXY card (see"AXY Card (X-Axis)" on page 832)

Step008 : ***From " Step006 " (Yes).***

The ACC node card two-character display is blank and the MDA node card two-character display is also blank. The OPC card is NOT blank.

Note: This condition can be caused by the operator selecting "Prepare the Accessor for Service" on the FRU replacement menu. To clear this condition, select "Finish for Accessor Service" on the FRU replacement menu.

1. Check the 37 V dc power fuse "C" on the base frame FIC card. If the fuse is blown, replace the fuse. If the fuse blows again, go to "Blown Fuse MAP" on page 667.
2. Ensure that the FIC to XCP cable is plugged in correctly at both ends.
3. Ensure that the AXY to XCP cable (X-Axis Flex cable) is plugged in correctly at both ends.
4. Replace the following FRUs.
   a. Cable, X-Axis flex
   b. Cable, FIC to XCP
   c. FIC card (see "FIC Card" on page 835)
   d. AXY card (see"AXY Card (X-Axis)" on page 832)
   e. XCP card (see "XCP Card " on page 860)
   f. MCP assembly (only if this is a single MCP library) (see "Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840)
   g. MCA assembly (see "Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)" on page 844)
   h. FCA assembly (only if this is a single FCA library) (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938)
   i. Enhanced FCA assembly (see "Enhanced FCA (x23 / x53 Frames Only)" on page 940)

Step009 : ***From " Step001 " on page 664 (Yes).***

The OPC node card two-character display is blank.

1. Check the 37 V dc power fuse "E" on the base frame FIC card. If the fuse is blown, replace the fuse. If the fuse blows again, go to "Blown Fuse MAP" on page 667.
2. Ensure that the FIC to OPC cable is plugged in correctly at both ends.
3. Replace the following FRUs.
   a. OPC card (see "Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)" on page 850)
   b. FIC card in the base frame (see "FIC Card" on page 835)
   c. FIC card to OPC cable
   d. MCP assembly (only if this is a single MCP library) (see "Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)" on page 840)
   e. MCA (only if this is a single MCA library) (see "Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)" on page 844).
   f. FCA assembly (only if this is a single FCA library) (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938)
   g. Enhanced FCA assembly (see "Enhanced FCA (x23 / x53 Frames Only)" on page 940)

Blown Fuse MAP

To be here, the following conditions are true:

- The front panel power indicator is ON.
- The MCP two-character displays are NOT blank and are flashing the correct frame numbers.
- One or more fuse indicators on the FIC cards is ON.

Note: 37 A, C, E - LEDs should be ON in a single accessor library. 37 A, B, C, D, E - LEDs should be ON in an HA dual-accessor library. See **Table 100 on page 838** and **"37 V dc distribution throughout the 3584 Library"** information. Also see **“37 V dc Distribution in an HA1 Library” on page 807**

How to Identify Blown FIC Card Fuses

Blown FIC card fuses are hard to see. See **Figure 173**. When a fuse blows, a spring-loaded arm (with a colored tip) snaps into place in the clear window. You will need a flashlight to see the fuse arm which is best seen from the side. To remove a fuse, use a plier to firmly grasp the fuse, then pull gently while rocking it left and right.

The bottom fuse in both banks of fuses are spares. **Figure 174** shows both a good fuse and a blown fuse.

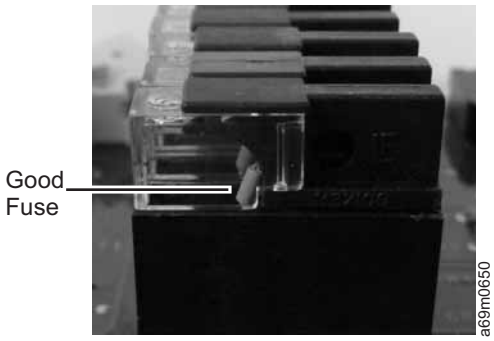


Figure 172. Good FIC Fuse

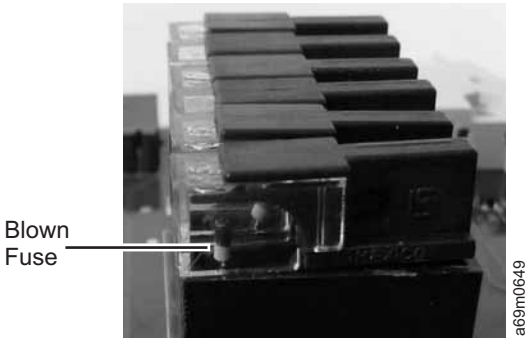


Figure 173. Blown FIC Fuse

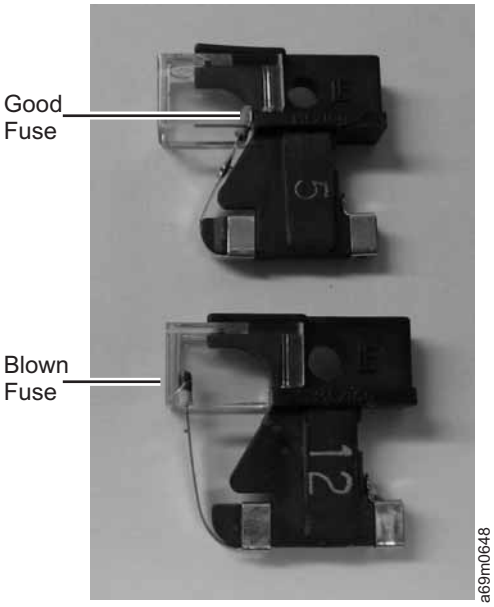


Figure 174. Good and Blown FIC Fuses

Step001 ***Are one or more fuses blown?:***

Replace the blown fuse.

Note: The fuses located in the bottom position on each bank of fuses are spare fuses (one 12A and one 5A).

Did the fuse blow again?

Yes Go to " **Step003** ."

No Go to " **Step002** ."

Step002 ***: From " Step001 Are one or more fuses blown?" (No).***

The problem has probably been fixed. If this fuse blows intermittently, go to " **Step003** ."

Step003 ***: From " Step002 " (Yes).***

Each FIC card has two banks of fuses (LOAD side, and LINE side).

1. If the LINE side fuse blows, the power bus short is to the left (as viewed from the rear) of this FIC card.
2. If the LOAD side fuse blows, the power bus short is on this FIC card or the external circuits powered from this FIC card.

Did the LOAD side fuse blow?

Yes Go to " **Step007** " on page 669.

No Go to " **Step004** " on page 669.

Step004 : ***From " Step003 " on page 668 (No).***

1. The LINE side fuse continues to blow.
2. Disconnect the J7 power connector to the FIC card in the next frame, if any.

   Note: If there is not another frame, then replace the FIC card in this frame (see "FIC Card" on page 835).
3. Replace the fuse again.

Did the fuse blow again?

Yes Go to " **Step006** ."

No Go to " **Step005** ."

Step005 : ***From " Step004 " (No).***

1. The fuse did not blow again.
2. If you replace the FIC card in the previous step, the problem is fixed. Return to the procedure that sent you here, or go to "End-of-Call" on page 794.
3. If you did not replace a FIC card in the previous step, you disconnected the power cable to the next frame. The short to ground is in the interframe power cable or the next frame FIC card.

Has the problem been resolved?

Yes Replug any cables removed and return to the procedure that sent you here.

No Replug any cables removed and contact your next level of support.

Step006 : ***From " Step004 " (Yes).***

1. The fuse has blown again.
2. Replace the FIC card in the blown fuse frame.

Has the problem been resolved?

Yes Replug any cables removed and return to the procedure that sent you here.

No Replug any cables removed and contact your next level of support.

Step007 : ***From " Step003 " on page 668 (Yes).***

1. The LOAD side fuse has blown again.

Note: See Figure 24 on page 48 which shows how the various components are cabled to the FIC card. Use this diagram to help diagnose your problem in the following steps.

2. Disconnect the following connectors from the FIC card:
   a. J1 - FIC card to XCP card
   b. J3 - FIC to MCP
   c. J8 - FIC card to J6 in the next frame
   d. J11 - FIC card to OPC card
3. Replace the fuse again.

Did the LOAD side fuse blow again?

Yes Replace the FIC card. If the problem is corrected, replug any cables removed, and go to procedure that sent you here. If the problem is not corrected, call your next level of support.

No Reconnect the cables one at a time. When the fuse blows again, the last cable connected is the path to the shorted circuity. Continue to disconnect and reconnect cables until the shorted circuity is determined. After the problem is isolated to a FRU and the FRU is replaced, replug any cables that were removed. Return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Circuit Breaker MAP

To be here, an FCA circuit breaker is tripping (will not stay in the ON position). If you have an **Enhanced FCA**, go to “Failure Isolation MAP for Enhanced FCA” on page 672.

Step001 *:*

There are three circuit breakers (CB) on each FCA. CB2 and CB3 provide ac power to the drives. CB1 provides ac power to the entire library.

Did one of the two smaller circuit breakers trip?

Yes Go to “ **Step003** ” on page 671.

No Go to “ **Step002** .”

Step002 *: From “ **Step001** ” (No).*

To be here, the main power circuit breaker for the library is tripping.

Remove the 37 V dc power supplies in this FCA. Close the main circuit breaker again.

Did the circuit breaker trip again?

Yes The short is in the FCA; replace the FCA (see “Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)” on page 938).

No One of the 37 V dc power supplies is shorted, replace the defective supply (see “Power Supply, 37 V dc (x32, x22, x52 only)” on page 994).

Step003 : ***From " Step002 " on page 670 (Yes).***

One of the two small circuit breakers is tripping. Unplug the drive power cables from the outlets above the tripping circuit breaker.

Did the circuit breaker trip again?

Yes The short is in the FCA, replace the FCA (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938).

No The short is in one of the drives or cables. Plug the drive cables back into the FCA power receptacles one at a time. When the failing drive or cable is plugged into the FCA, the circuit breaker should trip again. Replace the failing drive or cable.

Failure Isolation MAP for Enhanced FCA

Step001

You are here because there is a failure of one or both BPC power supplies. The library may still be functioning because of enhanced FCA power redundancy. You may also have only one 12v LED on at each fixed tray.

Are there any fixed trays with both 12v LEDs on?

Yes Go to "Fixed Tray Fault MAP (x23, x53)".

No Go to the following steps.

1. See Figure 168 on page 652. Check the BPS supply to ensure AC and DC LEDs **1** are ON for this specific power supply.
2. If none of the LEDs are ON, ensure the power supply is properly installed. See "Bulk Power Supply (BPS) (x23 / x53 Frames Only)" on page 940.
3. If only the AC LED is on, the BPS is not providing DC. Replace the BPS. See "Bulk Power Supply (BPS) (x23 / x53 Frames Only)" on page 940.
4. Check the 12v LED on the BPC. If the LED is NOT on, replace the BPC assembly. See "Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)" on page 942.
5. Check the 37v LED on the BPC. If the LED is NOT on, replace the BPC assembly. See "Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)" on page 942.
6. Return to the procedure that sent you here; otherwise, go to "End-of-Call" on page 794.

Fixed Tray Fault MAP (x23, x53)

Step001

You are here because either the 12v or 5v LED is not on for a fixed tray. Identify which BPC is providing power to the fixed tray.

1. Ensure the drive is fully docked in the fixed tray.
2. See if the library is reporting a drive error.
3. Check the 12v connector from the BPC to the fixed tray. Verify the 12v LED is ON.
4. If the 12v LED is on, but the 5v LED is off, the fixed tray is defective and must be replaced. See "Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models" on page 934.
5. If the 12v LED is off, and the 5v LED is off, either the cable is bad or the fixed tray is defective and must be replaced. See "Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models" on page 934.
6. Return to the procedure that sent you here; otherwise, go to "End-of-Call" on page 794.

Drive Problems

Use this procedure to correct these drive problems:

- Problems communicating with the drive over the RS-422
- Drive hangs
- Stuck tape

You may have URCs that point to a specific drive type. If the problem is with an Ultrium LTO tape drive, go to "Drive Problem - LTO Only."

Drive Problem - LTO Only

1. Ensure that the library to drive RS-422 cable is securely connected at the drive and at the MCP or MCA. Do **not** unplug the RS-422 cable from the MCP or MCA, since that will affect other drives.

2. Determine whether the problem still exists. At the front panel of the library, select **[MENU]**, **Library Status**, and **Drive Status**. Look for a **CommFail** as an indication of a problem.
   - If the failing drive is not responding, go to step 3.
   - If the failing drive is responding to the library over the RS-422 connection (that is, it does not show CommFail), then the failure is intermittent. This usually indicates a microcode problem. Capture a library dump, then attempt to capture a drive dump for possible analysis by IBM Support (see “CETool” on page 725). Do **not** replace the drive unless instructed to do so by your next level of support. Go to step 6 on page 674.
3. Verify that the drive is powered on.
   a. Ensure that the drive power cable is connected at both ends.
   b. Ensure that the circuit breakers on the FCA are ON (not tripped). Do **not** turn off any circuit breakers on the FCA. This would affect other drives, and will erase any dump information currently stored in the failing drive. For x23 / x53 frames only: See Figure 56 on page 123. Ensure the handles **1** on both Bulk Power Card assemblies (BPC) are in the fully down position. This connects the line cord to the Bulk Power Supply (BPS).
   c. Verify that the drive fan is running by holding a piece of paper next to the fan grill in the rear of the Fixed Tray. If the fan is running it will cause the paper to flutter.
   d. Verify that the customer is not using the library.
   e. To access the front of the drive, press the Pause button on the operator panel on the library, and open the front door. Look for any indication of power on the drive bezel indicators. If any indicators on the drive bezel are on, then power is good. Go to step 4. If the status indicator LED is dark and the Single Character Display (SCD) is blank, replace the Fixed Tray assembly. If this corrects the problem, go to step 6 on page 674.
   f. If the failure continues, replace the drive power cable. If this corrects the problem, go to step 6 on page 674. If replacing the drive power cable does **not** correct the problem, contact your next level of support.
4. Check for a microcode problem, indicated by a 'hung' drive.
   a. Press and hold the **[EJECT]** button for a full 20 seconds to force the drive to reset itself. The SCD will start changing when the drive resets. Release the **[EJECT]** button.
   b. Attempt to collect a drive dump (see “Creating Drive Dump by Using CETool” on page 718). If you are unable to collect a dump using CETool, ignore the failure.
   c. If the drive is empty (or has a tape in the ejected position), go to step 5. If there is a cartridge in the drive, press the eject button for 1 second.

      Note: After resetting the drive with a tape loaded, an error recovery procedure in the drive is automatically invoked. This error recovery procedure will very slowly rewind the tape to the beginning. Depending on the position of the tape at the time of the failure, this slow rewind may take up to 20 minutes. So, if the tape did not eject, do **not** power cycle the drive. Wait 20 minutes, then press the eject button for 1 second. The tape should now eject. If the tape ejects go to step 5.
   d. If there is still a tape in the drive, go to “Manually Removing Cartridge” on page 1045 to remove the tape, then replace the drive. After replacing the drive, go to step 6 on page 674.
5. Determine if the problem persists. From the Activity screen, select **[MENU]**, **Library Status**, and **Drive Status**. Look for a **CommFail** as an indication of a problem.
   a. If CommFail did not appear, the drive responded to the library, and the RS-422 connection is active. Go to step 6 on page 674.
   b. If CommFail did not appear, the drive is not responding. Replace the Fixed Tray assembly (see “Drive Tray Assembly – LTO Fibre” on page 878) or the drive canister assembly (see “Drive Canister Assembly – LTO SCSI, Removal / Replacement” on page 882). Display the drive VPD again to verify operation.

c. If the problem persists, replace the MCP- or MCA-to-drive RS-422 cable and the MCP or MCA. Display the drive status to verify that the problem has been corrected.

d. Manually load the CE cartridge into the failing drive. If the cartridge loads, the drive does not have a hang condition. Press the eject button to unload the CE cartridge, and go to step 8.

6. Run Library Verify Test to test the drive (see “Library Verify Test” on page 759). Use the option **One Drive**. When prompted about the Read/Write Test, select **Yes**.
7. If you obtained a drive dump, contact your next level of support to determine if this dump will be helpful to them. Ask them to forward the dump to the product PFEs. Analyzing this dump can reveal if this is a new problem or one for which a fix already exists.
8. Go to “End-of-Call” on page 794.

Drive Load Problems - LTO Only

1. Locate the cartridge involved with the failure (see “Locating Physical Position of Failure” on page 643).

   Note: Typically the cartridge has been returned to its home storage cell, so you will be looking for the source element address, or if ALMS feature is installed on the library, look for the physical location of the failure.

2. Record the source element address for the suspect cartridge.
3. Use the front panel of the library to move the cartridge from its home storage cell to the I/O station (**[Menu]**, **Manual Operations**, **Move Cartridge**, **By Element Address**). If ALMS feature is installed, move by physical location using information obtained from the trailer record.
4. Inspect the cartridge to determine whether there is any problem with the cartridge shell, cartridge shutter/door, or leader pin which could prevent the cartridge from loading into a drive.
   - If the cartridge is damaged or defective, give it to the customer for replacement.
   - If the cartridge is okay, continue with the next step in this procedure.
5. Pause the library by pressing the Pause button on the operator panel.
6. Open the front door of the frame containing the affected drive.
7. Attempt to manually load the cartridge into the affected drive.
   - If the cartridge loads okay then the problem is intermittent.
   - If the cartridge hits an obstruction before it is fully inserted into the drive then either the cartridge is defective/damaged, or the drive has a problem.
8. To isolate between the cartridge and the drive, attempt to load the diagnostic cartridge into the drive.
   - If the diagnostic cartridge loads then the problem was caused by the cartridge.
   - If the diagnostic cartridge doesn't load then the problem was caused by the drive.
9. Close the front door of the library.

   If you have determined that the cartridge is okay, put the cartridge into the I/O station and use the front panel of move the cartridge back to its original storage cell.

Drive Problem – 3592 Only

- AC/DC Power Problems
- Problems communicating with the drive over the RS-422
- Stuck Tape Cartridge (Hang)

Note: If you have a FID2 C1 continue with this procedure at step 1. If you have any other well defined problem FID, ATTN DRV, etc., use “Working with a Problem” on page 73 to determine the proper service action.

1. Verify that the drive is powered on.
   a. See Table 92 on page 804. Check if the Drive Power LED is on. It is located on the back of the drive. If the LED is on, the drive power is good. Continue at step 2.

b. If the Drive Power LED is Off check the indicators on the DC Power Supplies associated with the drive. Both AC and DC indicators should be On.

x32, x22, x52 only:

Visually check the status LEDs on the drive power supply. If the AC LED is on but the DC LED is off then the power supply has failed. If the AC LED is off then ensure the bifurcated power cable is securely connected to the power supply and the MCP. **Note:** Do not unplug the bifurcated power cable at the MCP unless both of the drives supplied by this cable have redundant power.

x23, x53 only:

Visually check the 12v and 5v present LEDs on the fixed tray. If the 12v LED is on but the 5v LED is off then the fixed tray has failed. If 12v LED is off from either BPC1 (J2) or BPC2 (J3), check the cable from the failing BPC to the fixed tray to ensure it is securely connected to the BPC and the fixed tray.

If a problem is found and fixed go to 4 on page 676. If no problem is found and the Drive Power LED still Off, contact your next level of support.

2. RS-422 cable problem check.
   a. Ensure that the library to drive RS-422 cable is securely connected at the drive and at the MCP or MCA. Do **not** unplug the RS-422 cable from the MCP or MCA, since that will affect other drives.
   b. To determine whether the problem still exists, at the operator panel, select **[MENU], Library Status** then **Drive Status**. Look for **CommFail** as an indication that the problem still exists.
   c. If **CommFail** did not appear the drive responded to the library and the RS-422 connection is active. If this has been an intermittent problem or possible microcode problem capture a library dump and then attempt to capture a drive dump for possible analysis by IBM Support. See “Creating Library Dump by Using CETool” on page 718 and “Creating Drive Dump by Using CETool” on page 718. Go to 4 on page 676.
   d. If **CommFail** did appear the failure was not fixed. Pull the drive canister out of the fixed tray and reseat it. This will reestablish communication over the RS-422. Replace the following FRUs in sequence, Cable RS-422 Interface, MCP (see “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840 or MCA “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844), Drive Power Supply Tray – 3592 (“Power Supply (x22/x52), Redundant – Hot Swap” on page 896) or (“Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928). Replace the 3592 drive only with your next level of support concurrence. Display **Drive Status** to verify fix and go to 4 on page 676.
3. Stuck Tape Cartridge (Drive Hang)
   a. a. If a 3592 drive has a stuck cartridge and the 3584 Library has been unable to remove the cartridge from the drive go to “3592 Drive Reset (Force POST)” on page 677. Perform the most appropriate reset procedure to reset the 3592 drive. When the 3592 drive reset procedure is complete return to this step.

      Note: After resetting the drive with a cartridge loaded, a drive internal error recovery procedure is automatically invoked. This error procedure will very slowly rewind the tape to the beginning. Depending on the position of the tape at the time of failure, this slow rewind may take up to 20 minutes. So, if the tape did not eject, do **not** power cycle the drive. Wait the 20 minutes and the cartridge should eject. If the front panel of the drive is visible it will indicate MIDTAPE* . If the Status indicator on the back of the drive is yellow after five minutes the drive has encountered a failure and cartridge unload may have failed.
   b. Drive Status indicator yellow, cartridge did not eject. Go to “From a 3592 Drive When Cartridge is Stuck in Loader” on page 1072. If a cartridge has to be manually removed from a 3592 drive canister, the 3592 drive canister must be replaced. Go to“Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887 and replace the drive.
   c. If the cartridge is ejected and the library is Online to the customer use the library operator panel and unload the cartridge from the drive to the I/O Station. From the **Activity Screen** select, [MENU], **Manual Operations, Move Cartridge** and identify the drive and I/O Station slot to move

the cartridge to. If the cartridge removed was a customer cartridge return it to the customer. If the cartridge removed was the 3592 CE cartridge reinstall it in the library.

d. d. If this is a repeat failure go to “Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887 and replace the drive, otherwise go to 4.

4. Run Library Verify to test the drive (see “Library Verify Test” on page 759). Use option **One Drive**. When prompted about the Read/Write Test, select **Yes**.
5. Go to “End-of-Call” on page 794.

3592 Drive Functions

3592 Drive Reset (Force POST)

During normal 3584 Tape Library procedures, such as drive remove/replace or the running of drive diagnostics, on the 3584 Tape Library the handling of taking drives offline and running POST are done automatically in the procedure. The following procedures are not recommended under normal circumstances.

CAUTION:
The customer needs to be notified that the drive is unavailable and must be taken offline at the Host before powering off or resetting the 3592 Tape Drive. Attempting any of the following procedures while the drive is operational may result in the loss of customer data.

Power Off then On Procedure - If the 3584 Library is Online to the Customer the drive will have to be taken offline at the Host by the customer and a power off/on done to the drive to generate a reset.

Note: Doing a power On/Off may lose valuable error data. Capture a library dump, then attempt to capture a drive dump for possible analysis by IBM Support. See “Creating Library Dump by Using CETool” on page 718 and “Creating Drive Dump by Using CETool” on page 718. Proceed as the situation requires

There are no power ON/OFF switches on the 3592 tape drive or on the power supplies but the drive is hot-pluggable. The drive will have to be unlatched and pulled back 50–76 mm (2–3 inches) far enough to undo the docking connector. Wait 5 seconds and re-dock the drive. POST will run.

Reset Button Procedure - The following procedure can only be preformed if the 3584 Tape library is Offline to the customer and the library frame front cover is opened. The 3592 Tape Drive has a reset button on the drive front panel (see Figure 13 on page 31). If this button is depressed the drive will run POST. POST runs most of the tests that normally occur when the drive is powered ON. The test checks motors, sensors, memory and the rest of the electronic circuitry in the drive. POST takes less than one minute to run.

If a failure occurs during the above procedures go to “Working with a Problem” on page 73 to troubleshoot the problem.

3592 Service Panel (Not Supported)

The 3592 Service Panel is not a suggested tool for use on 3592 Tape Drives located in a 3584 Tape Library. All necessary functions for trouble shooting the 3592 tape drive are provided for on the 3584 Operator Panel.

If the 3592 Service Panel is attached to a drive, in a 3584 library, the RS-422 connector located on the fixed power supply tray associated with the 3592 drive will have to be unplugged. See **1** in Figure 282 on page 897 to locate the RS-422 connector. The 3584 library automatically resets VPD using the RS-422 port. The connector will need to be re-plugged when activity is complete.

Use of the Service Panel on the 3584 Library should only be done with the help of your next level of support. Detailed information on the 3592 Service Panel and its use can be found in the *IBM System Storage TS1120/TS1130 Maintenance Information 3592 Models J1A, E05, E06, and EU6* manual.

LTO Drive Standalone Diagnostic Functions

Please note!

- Do NOT use these procedures for normal maintenance. Use these procedures only when instructed to do so by IBM Support.
- Maintenance functions cannot be performed concurrently with read or write operations. While in maintenance mode, the drive will **not** accept host commands over the SCSI bus or the fibre channel. The drive **will** accept RS-422 commands.

1. The drive must be varied offline at the host.
2. On the operator panel, press the [PAUSE] button on the operator panel.
3. Open the front door of the frame where the drive is located.
4. Make sure that no cartridge is in the drive.
5. Press the [UNLOAD] button 3 times within one second. The SCD should change to '0.' If an SCD other than '0' appears or continues to display, wait a few seconds and try again. The status light becomes solid amber, which indicates that the drive is in maintenance mode.
6. The function codes from which you can choose (**1** through **U**) are listed on the next pages. Choose the drive function code that you want to run.
7. Continue to press and release the [UNLOAD] button until the function code that you want appears in the single-character display. If you go past the desired code, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
8. Press and hold the [UNLOAD] button for 3 seconds. The drive performs the function that you selected.
   a. If a cartridge is required, **C** displays. You will have 60 seconds to load a cartridge.

      Note: After 60 seconds, the drive will exit maintenance mode. If this occurs, you will have to start again with maintenance mode, and reselect the function.

   b. If you load a write protected or otherwise invalid cartridge, a **7** displays, the drive unloads the cartridge and exits maintenance mode.
   c. If the function completes successfully, any cartridge that is in the drive is ejected, **0** temporarily displays, and the drive exits maintenance mode.

      Note:

      - Certain diagnostics loop may need to be terminated. To terminate a looping diagnostic but not exit maintenance mode, press and hold the [UNLOAD] button for five seconds. The drive will complete the current iteration of the test that is running and will remain in maintenance mode.
      - To terminate maintenance mode, press and hold the [UNLOAD] button for ten seconds. **0** temporarily displays, the drive will complete the test that is running and will exit maintenance mode.

   d. If the function fails, the status light flashes amber, an error code displays, and the drive exits maintenance mode. To correct the error condition, see “LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)” on page 590.

      Attention: When running any function that has you insert a cartridge, and especially if you have inserted an FMR tape cartridge, DO NOT power cycle the drive until the cartridge has been removed.

   e. To reset an error, cycle power to the Ultrium Tape Drive.

      Note: To cycle power, disconnect the tape drive power cord (at the drive), then reconnect the tape drive power cord.

Function Code 1 - Run Tape Drive Diagnostics

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the tape drive to run the following self tests:

- Electrical
- Motors
- Write data flow
- Loop-write-read
- Sensors

The drive runs comprehensive functions. This diagnostic takes approximately 20 minutes to run.

Attention: Insert only a scratch data cartridge for this test. Data on the cartridge will be overwritten.

1. Ensure 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, which indicates that the drive is in maintenance mode.

   Note: If a cartridge is in the drive, the cartridge will eject the first time that you press the [UNLOAD] button. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **1** appears in the single-character display. If you go past **1**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, the drive runs diagnostics for approximately 90 seconds, then **C** flashes. When **C** flashes, the drive is waiting for a cartridge.
5. Insert a scratch data cartridge within the next 60 seconds, to prevent the drive from exiting maintenance mode. After you insert the cartridge, **1** flashes.

   Note: Each loop takes approximately 15 minutes to run
   - If the diagnostics complete successfully, they will loop and begin again. To halt the diagnostic, press the [UNLOAD] button within the first 20 minutes of the test otherwise the diagnostic will run another 20 minutes. The diagnostic will continue to the end of its loop and then stop. The drive then displays 0, rewinds and unloads the cartridge, and exits maintenance mode.
   - If the diagnostics fail, the status light flashes amber and an error code displays. The drive unloads the tape cartridge and exits maintenance mode. To resolve the error, locate the error code in “LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)” on page 590.

Function Code 2 - Update Tape Drive Firmware From FMR Tape

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to load updated firmware from a field microcode replacement (FMR) tape.

The 3584 tape library does not use an FMR tape for this procedure. Use CETool to update drive code. FMR tapes typically are not used on this product. It is considerably faster and less expensive to use CETool than to order an FMR tape.

Attention: Do **not** power off while loading code.

1. Ensure that no cartridge is in the drive.
2. Within a 1-second interval press the [UNLOAD] button three times. The status light becomes solid amber indicating that the drive is in maintenance mode.

   Note: If a cartridge is in the drive, the drive will eject the first time you press the [UNLOAD] button. The drive will not be placed in maintenance mode. To continuing placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **2** appears in the single-character display. If you go past **2**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes. This indicates that the drive is waiting for a cartridge. Insert the FMR tape cartridge within 60 seconds or the drive will exit maintenance mode). After you insert the cartridge, **2** flashes and the drive loads the updated firmware from the FMR tape into its erasable programmable read-only memory (EPROM) area
   - If the update completes successfully, the drive rewinds and unloads the FMR tape and resets itself. The drive is ready to use the new firmware.
   - If an error is detected, the drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, see “LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)” on page 590.

Function Code 3 - Create FMR Tape

Please note!

Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to copy its field microcode replacement (FMR) data to a scratch data cartridge.

FMR tapes typically are not used on this product. It is considerably faster and less expensive to use CETool than to order an FMR tape.

Attention: If you select this function, the drive will overwrite existing data on the scratch data cartridge.

1. Ensure that no cartridge is in the drive.
2. Within a 1-second interval press the [UNLOAD] button three times. The status light becomes solid amber indicating that the drive is in maintenance mode.

   Note: If a cartridge is in the drive, the drive will eject the cartridge the first time you press the [UNLOAD] button. The drive will not be placed in maintenance mode. To continuing placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **3** appears in the single-character display. If you go past **3**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.

4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes. This indicates that the drive is waiting for a cartridge.
5. Within 60 seconds, insert a scratch data cartridge that is not write protected (or the drive exits maintenance mode). After you insert the cartridge, **3** flashes, and the drive copies the FMR data to the scratch data cartridge.
   - If the drive creates the FMR tape successfully, **0** displays. The drive rewinds the tape, unloads the new FMR tape, and exits maintenance mode.
   - If an error is detected, the drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, see "LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)" on page 590.

Function Code 4 - Force Drive Dump

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to perform a dump (save a microcode trace). The microcode trace can only be analyzed by IBM.

1. Ensure that no cartridge is in the drive.
2. Within a 1-second interval press the [UNLOAD] button three times. The status light becomes solid amber indicating that the drive is in maintenance mode.

   Note: If a cartridge is in the drive, the drive will eject the cartridge the first time that you press the [UNLOAD] button. To continuing placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **4** appears in the single-character display. If you go past **4**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **4** displays, followed by **0**. The single-character display then goes blank, and the drive exits maintenance mode.

   Note: You also can perform this operation when the drive is in normal operating mode by pressing and holding the [UNLOAD] button for 20 seconds.

Function Code 5 - Copy the Drive Dump To Tape (At Beginning of Tape)

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to copy data from a drive dump (captured in Function 4) to the beginning of a scratch data cartridge

1. Ensure that no cartridge is in the drive.
2. Within a 1-second interval press the [UNLOAD] button three times. The status light becomes solid amber indicating that the drive is in maintenance mode.

Note: If a cartridge is in the drive, the drive will eject the cartridge the first time that you press the [UNLOAD] button. To continuing placing the drive in maintenance mode, perform the preceding step.

3. Continue to press and release the [UNLOAD] button once per second to cycle through the characters until **5** appears in the single-character display. If you go past **5**, continue to press and release the [UNLOAD] button once per second as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes, which indicates that the drive is waiting for a cartridge. Insert a scratch data cartridge that is not write-protected, within 60 seconds, or the drive will exit maintenance mode.

   Note: If you insert an invalid or write-protected tape cartridge, error code **7** appears in the display. The tape drive unloads the cartridge and exits maintenance mode.

   After you insert the cartridge, **5** flashes and the drive writes the dump data to the tape, at the beginning of the tape. When the function is complete, the drive rewinds, unloads the tape, and exits maintenance mode.

Function Code 6 - Run SCSI Wrap Test

Please note!

To perform a SCSI Wrap Test, see “SCSI Wrap Test – LTO Only” on page 696. or “Smart SCSI Wrap Tool” on page 696

Function Code 6 - Run Fibre Wrap Test

Please note!

- To perform a Fibre Channel Wrap Test, see “Fibre Channel Wrap Test – LTO and 3592 drives” on page 697.
- A fibre wrap plug and duplex adapter (P/N 19P0242) are required for this procedure.

Function Code 8 - Convert FMR Tape To Scratch Tape

Please note!

Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the 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. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **8** appears in the single-character display. If you go past **8**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.

4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes, which indicates that the drive is waiting for a cartridge. Insert the FMR cartridge within 60 seconds or the drive will exit maintenance mode. After you insert the cartridge, **8** flashes, the 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 drive displays **0**, rewinds and ejects the newly converted scratch data cartridge, and exits maintenance mode.
   - If an error is detected, the drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, see “LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)” on page 590.

Function Code 9 - Display Error Code Log

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to display the last 10 error codes, one at a time. The codes are chronologically ordered, that is, the most recent is presented first and the oldest (tenth) is presented last.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **9** appears in the single-character display. If you go past **9**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three 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 three seconds after the tenth error code displays, **0** displays (if there are no errors in the log), and the drive exits maintenance mode.

Function Code A - Clear Error Code Log

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to erase the contents of the error code log.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

3. Continue to press and release the [UNLOAD] button until **A** appears in the single-character display. If you go past **A**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, the drive erases all errors from the error code log, displays **0**, then exits maintenance mode.

Function Code C - Insert Cartridge Into Tape Drive

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

This function cannot be selected by itself. It relates to other maintenance functions (such as Run Tape Diagnostics or Create FMR Tape) that require an FMR tape cartridge or scratch tape cartridge that is not write-protected to be inserted.

Function Code E - Test Cartridge and Media

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to perform a Write/Read test (on the edge bands) to ensure that the magnetic tape in a suspect cartridge is acceptable. This test takes approximately 10 minutes to run.

Attention: Data on the suspect tape will be overwritten.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **E** appears in the single-character display. If you go past **E**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes, which indicates that the drive is waiting for a cartridge. Insert the suspect customer scratch data cartridge within 60 seconds or the drive will exit maintenance mode. After you insert the cartridge, **E** flashes.
   - If no error is detected, the test will loop and begin again. To halt the diagnostic, press the **Unload** button. The diagnostic will continue to the end of its loop and stop. The drive then displays **0**, rewinds and unloads the cartridge, and exits maintenance mode.
   - If an error is detected, the drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, see “LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)” on page 590.

Function Code F - Performance Test

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to perform tests to ensure that the drive can read from and write to tape with acceptable performance. This test takes approximately three minutes to run. The Performance Test is not recommended for isolating errors between the drive and the media.

Attention: Data on the suspect tape will be overwritten.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **F** appears in the single-character display. If you go past **F**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes, which indicates that the drive is waiting for a cartridge. Insert the insert the suspect customer tape cartridge within 60 seconds or the drive will exit maintenance mode. After you insert the cartridge, **F** flashes.
   - If no error is detected, the test will loop and begin again. To halt the diagnostic, press the [UNLOAD] button. The diagnostic will continue to the end of its loop and stop. The drive then displays **0**, rewinds and unloads the tape cartridge, and exits maintenance mode.
   - If an error is detected, the drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, see “LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)” on page 590.

Function Code H - Test Head

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the 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 drive head and tape carriage mechanics are working correctly. This test takes approximately 10 minutes to run.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.

3. Continue to press and release the [UNLOAD] button until **h** appears in the single-character display. If you go past **h**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes, which indicates that the drive is waiting for a cartridge. Insert a scratch data cartridge within 60 seconds or the drive will exit maintenance mode. After you insert the cartridge, **h** flashes.
   - If no error is detected, the test will loop and begin again. To halt the diagnostic, press the [UNLOAD] button. The diagnostic will continue to the end of its loop and stop. The drive then displays **0**, rewinds and unloads the tape cartridge, and exits maintenance mode.
   - If an error is detected, the drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, see "LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)" on page 590.

Function Code J - Fast Read/Write Test

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the 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). This test takes approximately three minutes to run. The Fast Read/Write Test is not as comprehensive a test and is not recommended for isolating errors between the drive and the media.

Attention: Data on the suspect tape will be overwritten.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **J** appears in the single-character display. If you go past **J**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To select the function, press and hold the [UNLOAD] button for three seconds. After you select the function, **C** flashes, which indicates that the drive is waiting for a cartridge. Insert the insert the suspect customer tape cartridge within 60 seconds or the drive will exit maintenance mode. After you insert the cartridge, **J** flashes.
   - If no error is detected, the test will loop and begin again. To halt the diagnostic, press the [UNLOAD] button. The diagnostic will continue to the end of its loop and stop. The drive then displays **0**, rewinds and unloads the tape cartridge, and exits maintenance mode.
   - If an error is detected, the drive displays an error code, unloads the tape cartridge, and exits maintenance mode. To resolve the error, see "LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)" on page 590.

Function Code P - Post Error Reporting (PER)

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to report deferred check conditions to the host. Deferred check condition is a method to report recovered (temporary) errors to the host. Recovered errors (sense key =1 error per SCSI architecture) will result in more traffic on a SCSI interface and more errors in the error recording facility of your hosts.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **P** appears in the single-character display. If you go past **P**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To perform the function that you selected, press and hold the [UNLOAD] button for three seconds. The drive enables the PER function, displays **0** for three seconds, and exits maintenance mode.

Function Code U - Undo Post Error Reporting

Please note!
Do NOT use this procedure for normal maintenance. Use this procedure only when instructed to do so by IBM Support.

Causes the drive to turn off post error reporting. Deferred check conditions are not reported to the host.

1. Ensure 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, which indicates 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. The drive will not be placed in maintenance mode. To continue placing the drive in maintenance mode, perform the preceding step.
3. Continue to press and release the [UNLOAD] button until **U** appears in the single-character display. If you go past **U**, continue to press and release the [UNLOAD] button as the display cycles through the codes again.
4. To perform the function that you selected, press and hold the [UNLOAD] button for three seconds. The drive disables the PER function, displays **0** for three seconds, and exits maintenance mode.

Ethernet Problems

1. Ensure that the library code is at the latest available level to ensure you have all available Ethernet-related firmware fixes.

   Note: The library firmware version is displayed at the top of the operator panel Activity screen. To find the latest library code version see “Loading Library Microcode by Using CETool” on page 709.
2. Use of Certified Category 5 Ethernet cables (the cable must say Category 5 on the jacket, and the connectors must be factory installed) is recommended. If the customer is NOT using Certified Category 5 Ethernet cables then cable lengths must be reduced.
3. The Ethernet cable from the customer Ethernet gateway to the library must be wired 'straight-through' and NOT 'cross-over'. Each pin at one end of the cable should be wired to the same pin at the other end.
4. If possible, configure the Ethernet connection to 10 Mb/s to avoid potential problems which may occur if running at 100 Mb/s. If the library code version is 2250 or higher, go to the front panel of the library, press **MENU**, then select **Settings**, **Network**, **Ethernet**, **Change Settings**, and **Set Speed to 10 Half Duplex**. On earlier versions of library code the customer Ethernet gateway can be used to configure the Ethernet speed.
5. Verify that the Ethernet settings are correct for the customer network. If the customer network uses DHCP then the library Ethernet Settings must be set to DHCP. If the customer network does NOT use DHCP then the library Ethernet Settings must be set to Manual and the IP Address and Subnet mask must be manually entered.
6. Verify that the two code images on the MCP are at the same code version. Go to the front panel of the library, press **[MENU]**, then select **Vital Product Data**, and **Node Card VPD**. Use the UP button to scroll until the Medium Changer Pack (MCP) in frame 1 is displayed. Verify that the 'Firmware Version' and 'Web Version' are the same. If they are different, load the latest code onto the library to correct the problem.
7. Reset the MCP by pressing the reset button (see Figure 248 on page 841 to locate the Reset button).
8. If the problem persists, you can use an Ethernet crossover cable (such as FRU 09L0294) to connect your laptop Ethernet port to the library Ethernet port. **Note:** The laptop and the library must both have fixed IP addresses (not DHCP), and the first three segments of the IP address must be the same on both. As an example, if the library is at IP address 1.2.3.4 then the laptop might be set to 1.2.3.5. Connect the laptop to the library using the crossover cable, then start the browser program. Enter the IP address of the library in place of a URL. If the library screen appears then the library Ethernet is functional.
9. If you have completed the steps above and are still unable to connect to the library, replace the MCP (see “Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)” on page 840) or replace the MCA (see “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844).

Ethernet Connection is "Hung"

Problems have been reported where the Web Specialist is hung and/or the library does not respond to any TCP/IP requests (e.g. ping). This may be due to a failing TCP/IP stack. To try to recover in the least disruptive way, use the following procedure.

1. Disconnect and reconnect the ethernet cable in the MCA/MCP that is having network issues. **Note:** The Web Specialist connections may have to be refreshed after performing this operation.
2. Re-enter the IP settings:
   - From the Op Panel, select **MENU -►Settings -► Network**. Step through the existing settings. If the settings are correct, there is no need to change them, but continue to hit the enter key until you step through all of them and the Op Panel shows the message *"Ethernet settings updating"*. This may take up to four minutes. **Note:** This procedure will cause the TCP/IP stack to be restarted. The Web Specialist connections will have to be refreshed after performing this operation.
3. If re-entering the IP settings does not fix the "hang" condition, reset the MCA/MCP where the ethernet cable is connected.

Notes:

a. This procedure will cause the node card firmware, including the TCP/IP stack, to be restarted. This will cause a loss of communication with any drives, including control path drives, in that frame. If the MCA/MCP being reset has an active control path drive, then host moves must be quiesced prior to reset to avoid any failed jobs. Drive activity can remain active.

b. If this is happening often, move the Web Specialist ethernet connection to another frame with less traffic. If none is available, order another MCP/MCA with ethernet connection and install it in a frame with no drives and/or much less traffic. Web Specialists should avoid being connected to the frame with main traffic or a control path drive.

c. If resetting the MCA/MCP does not fix the condition, then power-cycle the library.

No Motion Allowed State (NMA)

The 'No motion Allowed' state is a condition set as a result of an accessor detecting an apparent obstruction to normal accessor movement. An obstruction can be detected in either X motion or Y motion. The detection mechanism used is the pivot motor moving during an X or Y motion when such pivot motion is not expected, or the cartridge present sensor energized when not expected.

When an ‘NMA’ condition is set, it immediately stops all motion on the affected accessor. 48A0 will be posted on the operator panel. The purpose of the NMA state is to prevent the library from further damage as a result of a detected 'hardstop'.

A ‘No Motion Allowed’ state may be the result of one or more of the following example conditions:

1. The accessor colliding with an obstacle in the accessor aisle such as a cartridge sticking out of a cell. Other possible causes include debris in the lower X-rail gear rack such as a screw, piece of plastic, or other debris which would interfere with accessor motion.
2. Gripper mis-picks or failure to put a cartridge in a slot or drive that leaves a cartridge only partially in the gripper.
3. Cartridge coming loose in the gripper during a move operation caused by a possible failed ‘get’ or ‘put’ operation.
4. Worn-out pivot motor, which would allow normal vibrations to move the pivot motor encoder even though there was no collision. Pivot motor is designed to last 2 million+ cycles.
5. Loose cartridge present sensor cable on the grippers (it may appear plugged in, but it may be loose).
6. Defective cartridge present sensor.
7. Worn, cracked, or incorrectly plugged pivot cable.
8. Worn, cracked, or incorrectly plugged Y-Axis cable.
9. An excessive gap in the lower X-rail between frames (only on a new library or frame installation) which may be detected as an obstruction.

A ‘No Motion Allowed’ detection method may already be set on newer libraries shipped from manufacturing after January 2010.

CETool version 5.2 has an additional option to "Set NMA Detection Method". CETool 5.4 or later calls this function "Set Impact Detection Method." See **Figure 175 on page 691**. Click **Set New Detection Method** as shown in **Figure 176 on page 691** to make this setting. To reset the detection method, select **Set Default Detection Method** as shown in **Figure 177 on page 691**.

What is the result if the NMA detection bit is NOT set?

- **Single Accessor Library** - Motion will continue even after the accessor hits an obstruction. Damage to the library and storage cells may result based on what caused the hardstop. However, if the cartridge present sensor is activated just as the accessor begins to move, or if the gripper is unable to clear the gripper after a ‘get’ or ‘put’ operation, the library will be put in a 'No motion Allowed' state.
- **HA1 Library** - If the accessor can be successfully pushed into a service bay, the customer will have access to all cells and drives in the library. The remaining accessor will continue to function. However, if the affected accessor cannot be pushed into a service bay, access to all cells and drives beyond the affected accessor will be prevented. In this condition, damage to the library and storage cells may result based on what caused the hardstop.

What is the result if the CETool NMA detection bit IS set?

- **Single Accessor Library** - The library is placed into a 'protective' environment. All motion will stop.
- **HA1 Library** - Access is prevented to all cells and drives beyond the failed accessor.

What are the customer recovery procedures when the CETool 'NMA detection' bit is set, and the library goes into NMA state?

The customer can open a library door to check for, and remove, any obvious obstructions. This action will remove the NMA flag and might invalidate the error logs that would be required to determine root cause. However, the library will continue operation until the next NMA. If no obvious obstructions are found, the failure may be related to one of the above listed causes. In this case, the library may once again go NMA and generate a Callhome.

Recommendations:

It is recommended to set the CETool 'NMA detection' bit ON (for both single and HA1 libraries) to protect the library from further damage.

- **Advantages (single and HA1 libraries)** - Prevent further library damage when an obstruction is detected.
- **Disadvantages (HA1 libraries only)** - Access to all cells and drives beyond the affected accessor will be prevented.

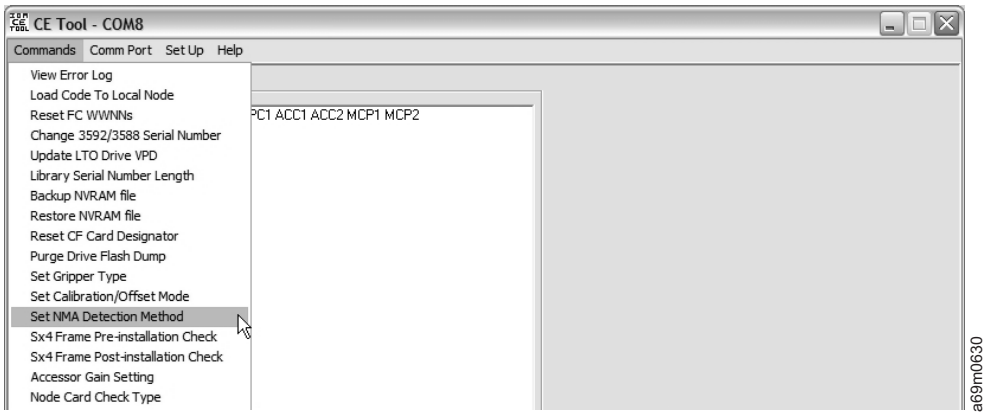


Figure 175. Set NMA Detection Method

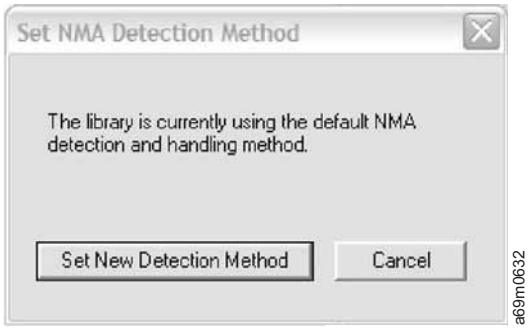


Figure 176. Set New Detection Method

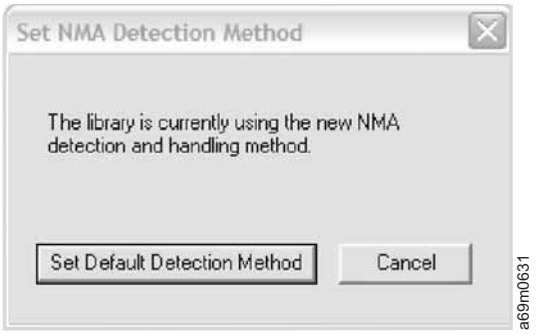


Figure 177. Set Default Detection Method

When to Run Discover Hardware Changes with ALMS Enabled

Occurrences have been reported where SSR's/CE's run Discover Hardware Changes when there is no need. See the following:

When should Discover Hardware Changes (DHC) be run?

- When adding a frame
- When removing or adding storage cells in drive locations in column 9. This occurs when adding or removing drives, and cartridge cells are either being removed or added
- When adding a second I/O station.
- When instructed to do so in an installation instruction.

Is Discover Hardware Changes required when drives are physically added or removed?

- DHC is only required if storage cells are being removed or added (as mentioned above)
- Adding or removing drives themselves is fully transparent and does not require additional steps other than assigning or unassigning them
- The library automatically detects and configures the drives without running Discover Hardware Changes.

FCA Cooling Fan Problems

Use this procedure to diagnose an FCA Cooling Fan problem. Before beginning this procedure, locate the failing frame number in the sense data or in the library error log.

This failure can be caused by loss of all 37 V dc power due to an overcurrent.

Visually check the 2-character displays on the ACC, MDA, and OPC node cards to verify that at least one of these node cards is powered on.

Note: If at least one of these node cards is powered on, then 37 V dc is present in the library. If all the node cards are powered off, the most likely cause is an overcurrent which caused all the 37 V dc power supplies to shut down.

Note: If the HA (dual accessor) feature in installed, the visual check at the two-character display can be performed on the ACC or MDA on either accessor assembly.

If at least one of the ACC, MDA, or OPC node cards has power, the likely cause of this error is a failure of the FCA Cooling Fan. Follow these steps to isolate the cause.

1. Open the front door. You will be instructed to close the front door in step 10 on page 693.
2. Ensure that the library is powered on.
3. Visually check the Fuse Open indicators on the FIC of the failing frame. Replace any open fuses.
4. Remove and re-install each 37 V dc Power Supply in the failing frame.
5. Press the RESET button on the MCP in the failing frame. The RESET button is located at the bottom of the MCP.
6. While the MCP is performing its POST, the 2-character display will count from FF down to E0. When POST is complete, the 2-character display will alternate between 00 and the frame number, or an error code will display. If an error code displays, go to “Library Sense Data to URC Table” on page 279.
7. Visually check the 37 V dc power bus indicators on the FIC in the failing frame. If at least one bus has power, then continue. If all buses do NOT have power, go to the “Power Isolation MAP” on page 648.
8. Wait for as long as five minutes for 31 80 to display on the MCP 2-character display. If 31 80 displays, the most likely cause of this URC is a faulty FCA Cooling Fan.

9. Visually check the 2-character displays on the ACC, MDA, and the OPC node cards to determine that they are powered on.
   a. If the 2-character displays on the ACC, MDA, and the OPC node cards indicate that these cards are powered on, go to step 10
   b. If the 2-character displays on the ACC, MDA, and the OPC node cards are blank, the 37 V dc power to these node cards has failed. Isolate the failure by disconnecting one node at a time and restarting this procedure at step 3 on page 692.

   Note: Do NOT hot-plug the ACC or MDA, and do NOT hot plug the OPC if the library has a lower I/O Station installed. See "Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)" on page 850 for specific details on OPC FRU replacement.

   c. Disconnect the FIC-to-OPC cable from the FIC. Repeat steps 3 on page 692 through 9. If the ACC and the MDA 2-character displays indicate that these node cards are powered up, the failure is in the FIC-to-OPC cable, the OPC, or an I/O Station cable or component connected to the OPC. If the ACC and MDA 2-character displays are still blank, reconnect the FIC-to-OPC cable and isolate the next component.
   d. Disconnect the two AXY-to-MDA cables from the AXY. Repeat steps 3 on page 692 through 9. If the OPC and ACC 2-character displays indicate that these node cards are powered up, the failure is in the AXY-to-MDA cables or the MDA. If the OPC and ACC 2-character displays are still blank, reconnect the AXY-to-MDA cables, and isolate the next component.
   e. Disconnect the Y-axis cable from the ACC. Repeat steps 3 on page 692 through 9. If the OPC and MDA 2-character displays are still blank, reconnect the Y-axis cable to the ACC, and isolate the next component.
   f. Disconnect the FIC-to-XCP cable from FIC connector J1 in frame 1. Repeat steps 3 on page 692 through 9. If the OPC display is still blank, reconnect the FIC-to-XCP cable to the FIC, and call your next level of support.
10. Close the front doors and observe the 2-character display on the ACC, MDA, and OPC cards.

Note: If you cannot see a 2-digit display, open the front door, read the value in the 2-digit display, and reclose the door.

11. Replace the failing FCA (see "Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)" on page 938).
12. Replace the failing 37 V dc Power Supply (see "Power Supply, 37 V dc (x32, x22, x52 only)" on page 994).

Fiducial Missing Problems

Calibration encountered a missing fiducial on a column. Use this procedure to diagnose a fiducial-missing problem.

Determine in which frame and column the failure occurred. To do this, find the error in the library sense data (view the library error log). The Failing Frame number indicates the frame where the failure occurred. The HECQ indicates the column where the error occurred.

If the failure occurred in column 5 or 7 of frame 1 (model Lx2), or in column 9 of any other frame (model Dx2), perform the following "Check Configuration" procedure. If the failure occurred in any other location, perform the following "Check Top Cap" on page 695 procedure.

Check Configuration

It is possible that a configuration problem is causing the library to look for the fiducial in the wrong location. It is critical that you determine whether the configuration is accurate before you continue.

1. At the library front panel, press **MENU**, then select **SETTINGS**, **CONFIGURATION**, and **DISPLAY CONFIGURATION**.

2. Find the number of cells in the affected frame (if the library contains more than 1 frame, select **DETAIL** and scroll to the affected frame).
3. Determine whether the configuration has the correct number of cells in the affected frame.

Note: To account for CE cartridges, in the case of where Ultrium 1, 2, or 3592 only drives are installed in the library, the slot counts noted in the following charts should be reduced by a count of 1. If Ultrium 1 or 2 & 3592 drives are installed in the same library, the counts listed for the first Ultrium frame, and first 3592 frame should each be reduced by one. There can be as many as two CE cartridges in one mixed media (LTO & 3592) library. If a third CE cartridge is needed, it must be inserted via the I/O station when requested.

URC B360 — Frame 1 (model L32) must have the following number of cells:

Table 75. Model L32 Cells

Drives	Cells without Expansion Feature & One I/O Station	Cells with Expansion Feature & One I/O Station	Cells with Expansion Feature & Two I/O Stations
1–4	142	282	230
5–8	114	254	202
9–12	88	228	176

URC B360 — Frame 2 or higher (model D32) must have the following number of cells:

Table 76. Model D32 Cells

Drives	Cells
0	440
1–4	423
5–8	409
9–12	396

URC B160 — Frame 1 (model L22) must have the following number of cells:

Table 77. Model L22 Cells

Drives	Cells without Expansion Feature & One I/O Station	Cells with Intermediate Expansion Feature & One I/O Station	Cells with Full Expansion Feature & One I/O Station	Cells with Full Expansion Feature & Two I/O Station
0–4	88	141	261	245
5–8	70	129	249	233
9–12	59	118	238	222

URC B160 — Frame 2 or higher (model D22) must have the following number of cells:

Table 78. Model D22 Cells

Drives	Cells
0	400
1–4	383
5–8	371
9–12	360

URC B360 — Frame 1 (model L52) must have the following number of cells:

Table 79. Model L52 Cells

Drives	Cells without Expansion Feature & One I/O Station	Cells with Intermediate Expansion Feature & One I/O Station	Cells with Full Expansion Feature & One I/O Station	Cells with Full Expansion Feature & Two I/O Station
0–4	88	153	285	269
5–8	76	141	273	257
9–12	65	130	262	164

URC B360 — Frame 2 or higher (model D52) must have the following number of cells:

Table 80. Model D52 Cells

Drives	Cells
0	440
1–4	422
5–8	408
9–12	396

4. If the configuration shows the correct number of cells in the affected frame, go to the “Check Top Cap” procedure below. If the configuration does NOT show the correct number of cells in the affected frame then the calibration failure is the result of the configuration problem - the library is looking in the wrong location for the fiducial. Use the following steps to correct the configuration.
5. Ensure that all cartridges in the affected column have valid bar code labels. If there are any cartridges that do not have bar code labels, or if the cartridges have glossy bar code labels, remove the cartridges from the affected column.

   Note: When configuring the library, the bar code scanner is used at specific locations in the 'drive' columns to determine whether cells are present. If cells are present then the bar code scanner should read either valid cartridge bar code labels or empty cell bar code labels. If it is unable to read a bar code label during configuration then the library assumes there are no cells in that location.
6. Run Configuration, then check to see if the number of cells is now correct.
   - If the number of cells is now correct, the problem has been resolved. To recalibrate the affected frame (or the entire library if you have installed any new frames, drives, or cells), perform the Calibration Procedure by selecting the **Service** menu, then the **Calibration** menu (see “Service Menus” on page 774).
   - If the number of cells is still NOT correct, there is a problem reading the bar code labels in the affected column. Visually check the empty cell bar code labels (located in the rear of the empty cells). If the labels show any sign of debris or damage, clean or replace the labels. If you are certain that the labels are readable, replace the bar code scanner FRU. Repeat this procedure (“Check Configuration” on page 693) to correct the configuration.

Check Top Cap

The problem is probably a slot top cap that has been knocked out of place. Locate the affected top cap (which contains the fiducial), and repair or replace it. Perform the Calibration Procedure by selecting the **Service** menu, then the **Calibration** menu (see “Service Menus” on page 774). If the problem persists replace the Calibration sensor (see “Calibration Sensor” on page 822).

Set/Clear Drive Trap

This option provides a means to set a drive trap to capture drive error data. Use this option only under the direction of IBM product development personnel.

Select: **MENU, Service, Tests/Tools, Tools, Set/Clear Drive Trap.**

Set Inventory Scan Speed

Some libraries may have worn or damaged barcode labels resulting in multiple scanner retries that may degrade library performance. If the problem is severe enough you may see HEC/HECQ 5B85 (URC A4C5). Library firmware version 5330 or higher allow you to change the inventory scanning speed to help alleviate the problem. The default is 100%. This can be adjusted downwards to 30%, however a setting this low will further degrade the library and is not recommended.

To change the inventory scan speed, select: **MENU, Service, Tests/Tools, Tools, Set Inventory Scan Speed.**

SCSI Wrap Test – LTO Only

1. All drives attached to the SCSI bus for the drive to be tested, must be varied offline to run this test.
2. Remove the SCSI cables from the back of the Fixed Tray.
3. Install the appropriate SCSI wrap plug onto one of the SCSI connectors and install the appropriate terminator onto the other SCSI connector of the Fixed Tray.
4. On the **Activity** screen, select **[MENU]**.
5. On the **Main Menu** screen, select **Service**.
6. On the **Service** screen, select **Drives**.
7. Select the drive to be tested, then select the **SCSI/FC Wrap Test**. Follow the instructions on the screen until the test has been completed.
8. Swap the SCSI wrap plug and the SCSI terminator, then rerun the test.

   Note: This is necessary to test both SCSI ports.
9. When testing is complete, press **[BACK]** until you return to the **Activity** screen.
10. Be sure to reconnect the customer SCSI cables that were previously disconnected.
11. Return to the procedure that sent you here; otherwise go to “End-of-Call” on page 794.

Smart SCSI Wrap Tool

The Smart SCSI Wrap Tool (SSWT) allows you to test the SCSI connection to any SCSI device in a 3584 hot-swap canister. It acts as a SCSI host, sending simple commands to the device, so it does not require any action at the library front panel. The SSWT has no internal power source; its derives SCSI Term Power from the SCSI bus.

Note: If you are connecting the SSWT to a drive canister, or to an HVD Fixed Tray, then you can also test host cables up to 25 meters reliably. But if you are connected to an LVD Fixed Tray then using a long host cable may cause the test to fail. The reason is that drive canisters and HVD Fixed Trays include either an LVD-LVD redriver or an HVD-LVD/SE converter which boosts the SCSI bus TermPwr voltage. LVD Fixed Trays don't have an integrated LVD-LVD redriver card to boost TermPwr - the only TermPwr available is provided by the drive 'brick'. TermPwr provided by the drive 'brick' is at a slightly lower voltage than that provided by a redriver or converter. The SSWT runs on TermPwr voltage from the SCSI bus, so if the TermPwr voltage is marginal then a longer cable may introduce enough voltage drop to prevent the SSWT from functioning properly. Note: Some LVD Fixed Trays were manufactured with drive jumper settings that do not apply TermPwr to

the SCSI bus. These LVD Fixed Trays will function in normal use, but since any type of SCSI Wrap Test requires TermPwr, the wrap test may fail. So if you see SCSI Wrap Test failures on an LVD Fixed Tray do not replace the Fixed Tray unless it also fails in host operation.

To use the SSWT, perform the following procedure:

1. Remove all cables from the SCSI connectors on the fixed tray.
2. Install the appropriate SCSI terminator on one connector of the fixed tray. The connectors are wired together so they are interchangeable.
3. Locate the SSWT and cable.

   Note: The cable is a SCSI (VHDCI to VHDCI drive-to-drive) 0.3 m (1 ft) cable, P/N 19P3332.
4. Connect the cable to the SSWT and to the fixed tray.
5. While observing the two LEDs on the SSWT, momentarily press the SSWT **Reset** button.
6. A single pulse of the green LED indicates that an LVD bus is sensed. A single pulse of the yellow LED indicates that an HVD bus is sensed.
7. Most often, after a delay of approximately 10 seconds, one LED will remain on and the other LED will blink. If the green LED remains on steady, the test passed. If the yellow LED remains on steady, an error occurred. Decode the LED codes using the table below. Note that blink codes will repeat. There is a 'long' ON to indicate the start of a sequence. So, if you see a 'long' ON followed by 3 'short' ONs, this indicates a 3. If you see a 'long' ON followed by a pause and another 'long' ON, this indicates a zero.

Table 81. Smart SCSI Wrap Tool LED Decoding

Green LED	Yellow LED	Description
Off	Off	No Term Power - No connection to a canister, or the canister is not providing term power. Verify the connection to the canister. If connections appear good replace the canister and/or the fixed tray.
On Steady	Blinking	The test passed. The yellow LED is blinking the SCSI ID of the device.
Blinking '1'	On Steady	Error: No response from any SCSI device. Replace the canister and/or the fixed tray.
Blinking '2'	On Steady	Error: Multiple devices responded. If you have multiple canisters daisy-chained you must disconnect the cables and test one canister at a time. If you have only one canister connected then the canister is responding on multiple SCSI IDs - replace the canister.
Blinking '3'	On Steady	Error: Communications problem with the canister. If the canister is HVD verify that the appropriate terminator is installed and rerun the test. If the failure persists, replace the canister and/or the fixed tray.
Blinking '4'	On Steady	Error: LVD canister detected wrong or missing terminator.

Fibre Channel Wrap Test – LTO and 3592 drives

Attention: Notify the customer that the devices on the fibre channel must be varied offline before this test can be performed

Notes:

1. If the fibre drive is connected to a hub, the other fibre drives on the hub must be quiesced before performing the fibre channel wrap test.
2. At the completion of the wrap test, and after reconnecting the fibre cable, the other drives on the hub may be put back into operation.
3. Some fibre devices, such as switches and hubs, require an IML to re-establish communications after a device is power-cycled or added.

4. If testing a 3592 tape drive, both ports must be tested.
__ 1. Quiesce all activity (stop all traffic) on the drives.
__ 2. Remove the cartridge from any drive you will be servicing.
__ 3. Unplug the fibre channel cable connector from the back of the fibre drive to be tested.
__ 4. Install the fibre wrap plug onto the drive port. See Figure 178 for a picture of the LC version of the fibre wrap plug for LTO (L2 & L3) and 3592 drives. **Note:** The 3592 requires two fibre wrap plugs, one in each port (0 and 1).
__ 5. On the **Activity** screen, select [MENU].
__ 6. On the **Main Menu** screen, select **Service**.
__ 7. From the **Service** screen, select **Tests**, **Diagnostics**, then **drives**.
__ 8. On the **drives** screen, select the drive you want to test.
__ 9. Select the drive to be tested, then select the **SCSI/FC Wrap Test**, and press **[Enter]**.
   a. If the wrap test fails, an error will display. Go to Chapter 2, “Start,” on page 71 to isolate the problem.
   b. If the wrap test is successful, continue with this procedure.
__ 10. Perform a wrap test from the drive canister to the bulkhead connector:
   a. Reinstall the fibre cable to the drive port.
   b. Disconnect the host fibre cable from the bulkhead.
   c. Plug the Fibre Wrap Tool into the bulkhead.
   d. Run the wrap test again.
   e. If the wrap test fails, replace the fibre cable from the drive to the bulkhead.
   f. If the wrap test passes, continue with this procedure.
__ 11. The problem is outside the library. The drive and the cable from the drive to the bulkhead are good.
__ 12. Remove the wrap plug and restore the fibre channel cabling.

   When testing is complete, press **Back** until you return to the **Activity** screen.
__ 13. Return to the procedure that sent you here; otherwise go to “End-of-Call” on page 794.

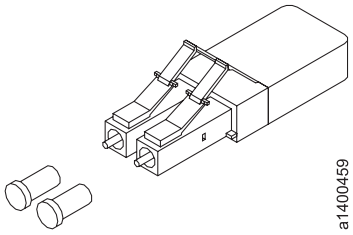


Figure 178. LC Fibre Wrap Tool

Display Library VPD (Model and Serial Number)

To display the library **Model** and **Serial** number, perform the following:

1. At the **Activity** screen, press [MENU]
2. At the **Main Menu** screen, select **Service**, and press **[Enter]**.
3. At the **Service** screen, select **Vital Product Data**, and press **[Enter]**.
4. At the **Vital Product Data Menu** screen, select **Library VPD**, and press **[Enter]**. The following screen displays.

```
Library VPD             Panel 0301


Frame 1:
  Machine Type:       3584
  Model:              L32
  Serial:             1300001


[BACK]  [ UP ]  [DOWN]
```

Display Drive VPD (Drive Type and Microcode Level)

To display the drive type and microcode level, perform the following:

1. At the **Activity** screen, press [MENU].
2. At the **Main Menu** screen, select **Service**, and press **[Enter]**.
3. At the **Service** screen, select **Vital Product Data**, and press **[Enter]**.
4. At the **Vital Product Data Menu** screen, select **Drive VPD**, and press **[Enter]**. The following screen displays the drive type and the microcode level.

```
Drive VPD               Panel 0310

Key: [F=Frame, R=Row]

[F1,R01] ULT3580-TD1 v1234
[F1,R02] ULT3580-TD1 v1234
[F1,R03] ULT3580-TD1 v1234
[F1,R04] ULT3580-TD1 v1234
[F1,R05] ULT3580-TD1 v1234
[F1,R06] ULT3580-TD1 v1234
[F1,R07] ULT3580-TD1 v1234
[F1,R08] ULT3580-TD1 v1234
[F1,R09] ULT3580-TD1 v1234
[F1,R10] ULT3580-TD1 v1234

[BACK]  [ UP ]  [DOWN]
```

Display Drive Status (Online, Offline, FAILED or CommFail)

To display Drive Status, perform the following:

1. At the **Activity** screen, press [MENU].
2. At the **Main Menu** screen, select **Library Status**, and press **[Enter]**.
3. At the **Library Status** menu, select **Drive Status**, and press **[Enter]**.
4. The following screen displays drive status:

```
Drive Status            Panel 0005

Key: L=LTO Ultrium, J=Enterprise Tape
Frame n       Media type: LTO

Drive 1   L1 Online  VOL110L1
Drive 2   L1 FAILED  Empty
Drive 3   L2 Online  Empty
Drive 4   J1 Online  VOL111J1
Drive 5   L2 Offline Empty
Drive 6   J1 L2 CommFail
Drive 7      Not Installed
Drive 8      Not Installed
Drive 9      Not Installed
Drive 10     Not Installed
Drive 11     Not Installed
Drive 12     Not Installed


[BACK]  [ UP ]  [DOWN]
```

Display Node Card VPD (Microcode Level)

To display the Node Card **Serial Number** and microcode (firmware) level, perform the following:

1. At the **Activity** screen press [MENU].
2. At the **Main Menu** screen, select **Service**, and press **[Enter]**.
3. At the **Service** screen, select **Vital Product Data**, and press **[Enter]**.
4. At the **Vital Product Data Menu** screen, select **Node Card VPD**, and press **[Enter]**. The following screen displays the serial number and the microcode level.

```
Node Card VPD              Panel 0320


Frame 1:
  Accessor Controller Card


Part Number:          1234567
Serial Number:        YN100002W123
Firmware Version:     0130



[BACK]  [ UP ]  [DOWN]
```

5. To view the VPD for the MDA's, MCP, and OPC cards, press [DOWN]. Continue to press [DOWN] to view the VPD for node cards in other frames.

Display Error Logs

There are two error log functions on machine without the ALMS feature. With this feature installed there can be as many as three.

- Library Error Logs

  In the case of a library error associated with a cartridge move command and with the ALMS feature installed, there will be two entry logs generated by the error.

  1. The first entry log will be a Trailer Record log containing Source/Destination data, the Physical Address, and Cartridge Serial number data. ALMS creates virtual addresses. The Trailer Record is designed to keep track of real physical source/destination locations to aid the CE in isolating problems. All Trailer Records contain a x'FF' in the SCSI command column.
  2. The second entry log will be a Virtual Error log containing valid data concerning the SCSI Command, Sense Key, ASC/ASCQ, HEC/HECQ, and so forth.
  3. Both logs associated with the error will have the same time stamp at the beginning of the data.

  This log records approximately 1000 error codes.

- Drive Error Logs

  This log records the last ten error codes.

The error logs can be displayed from both the customer functions and the maintenance mode functions.

To display the **Error Logs**, perform the following:

1. At the **Activity** screen, press [MENU].
2. At the **Main Menu** screen, select **Service**, and press **[Enter]**.
3. At the **Service** screen, select **Library or Drive Error Logs**, and press **[Enter]**.
4. At the **Library or Drive Error Logs** screen, make your selection, and press **[Enter]**. Follow the screen instructions to obtain the error log data that you are looking for.

Display World Wide Port / Node Names

To display WWID port / node names for fibre enabled devices, perform the following:

1. At the **Activity** screen, press [MENU].
2. At the **Main Menu** screen, select **Settings** and press **[Enter]**.
3. At the **Settings** screen, select either **World Wide Port Names** or **World Wide Node Names** as required and press **[Enter].**

```
World Wide Port Names     Panel 0125

Key: [F=Frame, R=Row, P=Port]

[F01,R01]     50050763 0059F011
[F01,R02]     50050763 0059F012
[F01,R07]     50050763 0059F017
[F01,R08]     50050763 0059F018
[F01,R09]     50050763 0059F019
[F03,R01]     50050763 0059F031
[F03,R02]     50050763 0059F032
[F03,R03, P1] 50050763 0059F033
[F03,R03, P2] 50050763 0059F033


[BACK]  [ UP ]  [DOWN]
```

```
World Wide Node Names    Panel 0126

Key: [F=Frame, R=Row, P=Port]

[F01,R01]     50050763 0019F011
[F01,R02]     50050763 0019F012
[F01,R07]     50050763 0019F017
[F01,R08]     50050763 0019F018
[F01,R09]     50050763 0019F019
[F03,R01]     50050763 0019F031
[F03,R02]     50050763 0019F032
[F03,R03, P1] 50050763 0019F033
[F03,R03, P2] 50050763 0019F033


[BACK]  [ UP ]  [DOWN]
```

Element Address to Frame, Column, Row Converter

This procedure allows you to acquire from the sense data or error log, the element address corresponding to a library failure and get it converted from a hexidecimal number to a Frame/Column/Row designation.

To display the **Element Addresses** in Frame/Column/Row format, perform the following:

1. At the **Activity** screen, press [MENU].
2. At the **Main Menu** screen, select **Service**, and press **[Enter]**.
3. At the **Service** screen, select **Test/Tools**, and press **[Enter]**.
4. At the **Test/Tools** screen, select **Tools**, and press **[Enter]**.
5. At the **Tools** screen, select **EA to FCR Converter**, and press **[Enter]**. Use the UP/DOWN arrows to scroll through all the valid Element Addresses and display the corresponding Frame, Column, Row.

Note: If the ALMS feature is installed, you may need to use the Library Error Log and Trailer Error Log to determine the actual physical Element Address associated with the failure.

Display Library Firmware Version

Refer to the upper left corner of the Activity Screen (Panel 0001) for the library microcode (firmware) version. You also could display the Node Card VPD (see “Display Node Card VPD (Microcode Level)” on page 700).

Microcode Maintenance Utilities

Note: Both library and drive code can be downloaded from either the Internet or Intranet. See the topics,“Loading Library Microcode by Using CETool” on page 709 and “Loading LTO or 3592 Drive Microcode by Using CETool” on page 711 for code locations and download procedures.

To update microcode (firmware), see one of the following procedures:

Note: When updating code in a 3592 drive attached to a VTS/J70/C06/TS7700, it is recommended you use the VTS/J70/C06/TS7700 interface to load the code. This ensures 3592 drive VPD is updated in the VTS/J70/C06/TS7700. Failure to use this procedure will result in mismatched 3592 drive VPD in the attached control unit. Loading library or drive code, using CETool or the Tape Library Specialist web interface, on a 3584 attached to an IBM AIX controller or VTS/J70 that has VM/MVS jobs running, may require host resync. For more information on using the Tape Library Specialist web interface, see "Updating Library and Drive Firmware" in the 3584 Operator Guide.

- To update the Library microcode using your laptop and CETool program, see “Loading Library Microcode by Using CETool” on page 709.
- To update the Drive microcode using your laptop and CETool program, see “Loading LTO or 3592 Drive Microcode by Using CETool” on page 711.
- To update the library or drive microcode from an RS/6000, see “Updating Microcode (Library & Drive) from RS/6000 by Using TAPEUTIL”.
- To update the drive microcode from a Sun host, see “Updating Drive Microcode from Sun System” on page 705.
- To update a library node card from another node card in the same library, see “Updating Device Microcode from Another Device in the Same Library” on page 715.
- To update a drive from another drive in the same library, see “Updating Device Microcode from Another Device in the Same Library” on page 715.
- To update drive microcode using NTUtil, see “Updating Drive Microcode Using NTUtil” on page 707.

Updating Microcode (Library & Drive) from RS/6000 by Using TAPEUTIL

Attention

Unless you are very familiar with this procedure, IBM recommends that you use the “CETool” on page 725. When updating code in a 3592 drive attached to a VTS/J70/C06/TS7700, it is recommended you use the VTS/J70/C06/TS7700 interface to load the code. This ensures 3592 drive VPD is updated in the VTS/J70/C06/TS7700. Failure to use this procedure will result in mismatched 3592 drive VPD in the attached control unit. The 3584 tape library does **not** create or use FMR tapes for this procedure. **Note:** If the original 3592 E05 or E06/EU6 encryption-capable drive had FIPS code loaded, ensure the new drive has a FIPS-certified level of drive code loaded. After the automatic code update, verify that the drive is at a FIPS code level. If not, download FIPS-certified code from the PFE website. Remember that the latest level of 3592 E05 or E06/EU6 drive code on the PFE website may NOT necessarily be FIPS-certified.

You may require assistance from the customer during this process.

This procedure downloads microcode to the tape drive from a file, via the SCSI bus or FC. The file should have been previously downloaded into a directory on the RS/6000. A suggested directory is “tmp“. The Microcode Load utility supports the IBM 3584 Ultrium tape drive.

1. Verify that the drive is unloaded. Using the operator panel, select **Menu**, **Library Status**, and **Drive Status**.

2. Verify that the drive is not in use by another host. Have the customer vary the drive offline.
3. Start the tape utility program by typing **tapeutil** at the prompt.
4. Select Tape Drive Service Aids from the menu by selecting **Tape Drive Service Aids** option, and pressing **[Enter]**.
5. Select **Microcode load** from the following panel, then press **[Enter]**.

```
IBM Tape Device Service Aid Menu                              700000


 Select One of the Service Aids to be performed

  Force Microcode Dump
    Perform a microcode dump of the system. The dump is stored in
    the device.
    After the dump is performed it must be read using Read Dump.
  Read Dump
    Transfer a dump from the tape device to a host file, diskette or
    a tape cartridge.
  Microcode load
    Download microcode from host file or diskette to tape device via
    SCSI bus.
  Error Log Analysis
    Analyze system error log for device.
F3=Cancel                           F10=Exit
```

6. Select a **Device**, and press**[Enter]**

```
IBM Tape Device Selection Menu.                               900000

 Select One of the devices listed below.

 NAME        LOCATION     TYPE

 rmt0        40-58-00-1,0  IBM 3584 Ultrium Tape Drive
 rmt2        00-05-01-10  IBM 3584 Ultrium Tape Drive
 rmt3        00-05-01-30  IBM 3584 Ultrium Tape Drive
 smc0        40-58-00-1,1  IBM 3584 Library Medium Changer
 FC-->rmt7        20-58-01  IBM 3584 Ultrium Tape Drive (FCP)
 FC-->smc3        20-58-01  IBM 3584 Library Medium Changer (FCP)




F3=Cancel           F7=Commit           F10=Exit
```

7. Enter the **path** and **filename** and press **F7=Commit**.

   Enter the filename **./xxxxxxxx.ro** in the source field where xxxxxxxxx.ro is the filename and extension of the microcode file to be loaded. For example, type **./45DHL2F.ro**.

   Important: Be sure to select the proper code file for the type of drive to be updated.
   - LTO Ultrium 1 SCSI = xxxxL1S.ro
   - LTO Ultrium 1 FC = xxxxL1F.ro
   - LTO Ultrium 2 SCSI = xxxxL2S.ro
   - LTO Ultrium 2 FC = xxxxL2F.ro
   - 3592 J1A = D3I0_825.fmr
   - 3592 E05 = D3I1_6E1.fmr

- 3592 E06/EU6 = D3I2_47A.fmr

You must press **F7=Commit** after entering the filename.

```
Prompting for Srce File for Operation on rmt3 located at 00-05-01-30
                                                                B00000

Please enter the following fields...

  Enter Filename:                                        /dev/rfd0 +/


F1=Help             F2=Refresh          F3=Cancel           F4=List
F5=Reset            F7=Commit           F10=Exit
```

8. While the microcode load takes place, the display shows:

```
   "Operation running, please stand by"
```

   The drive display shows the loading status messages at the bottom of the display.
9. When the microcode load completes, the initiator display shows:

```
Operation completed successfully!
```

   The drive performs a soft power-on reset (restart the code).
10. Press **F10** to exit the microcode load.
11. Press **q** to quit tapeutil.
12. You must have root authority to do the following step.
13. Update the VPD data in the host RS/6000 by unconfiguring the device **(Example: rmdev -l rmt3)** and reconfiguring the device **(Example: mkdev -l rmt3).**
14. Update the account FMR cartridge. See “Function Code 2 - Update Tape Drive Firmware From FMR Tape” on page 679.
15. Have the customer vary the drive online to the using application (for example, TSM) with the **update drive** command.

Updating Drive Microcode from Sun System

Attention

Unless you are very familiar with this procedure, IBM recommends that you use the “CETool” on page 725. When updating code in a 3592 drive attached to a VTS/J70/C06/TS7700, it is recommended you use the VTS/J70/C06/TS7700 interface to load the code. This ensures 3592 drive VPD is updated in the VTS/J70/C06/TS7700. Failure to use this procedure will result in mismatched 3592 drive VPD in the attached control unit. **Note:** If the original 3592 E05 or E06/EU6 encryption-capable drive had FIPS code loaded, ensure the new drive has a FIPS-certified level of drive code loaded. After the automatic code update, verify that the drive is at a FIPS code level. If not, download FIPS-certified code from the PFE website. Remember that the latest level of 3592 E05 or E06/EU6 drive code on the PFE website may NOT necessarily be FIPS-certified.

You may require assistance from the customer during this process.

This procedure downloads microcode to the drive from a file on the host.

1. Verify that the drive is offline and unloaded.
2. Type **volcheck**, and press Return. The system prompt appears.

3. Start the tape utility program by typing **/opt/stddutil/tapesrvc**.

```
+-----------------------------------------------------+
|                   SERVICE UTILITY                   |
|        IBM SCSI Tape Device Driver for SunOS        |
+-----------------------------------------------------+
 1: Select Tape Device        5: Force Dump
 2: Query Device Type         6: Store Dump
 3: Query Serial Number       7: Download Code
 4: Format Cartridge          Q: End Service Utility

Enter Selection:
```

4. Select **1: Select Tape Device** from the Service Utility menu, and press **Return**.
5. The following prompt is returned. If **0st** is the correct device, press **Return**. Otherwise, type the path and the correct device.

```
Enter the tape device special file
[/dev/rmt/0st]:
```

   You will receive the following acknowledgment:

```
*** Tape device /dev/rmt/0st opened successfully.
```

6. Select **7: Download Code** from the Service Utility menu, and press **Return**.
7. The following prompt is returned. Enter the path and filename.

```
Enter code filepath [/vol/dev/aliases/floppy0]:
```

8. While the microcode load takes place, the initiator display shows:

```
*** Downloading ##### bytes at offset #####
```

9. When the microcode load completes, the display indicates:

```
*** Code downloaded successfully (###### bytes)
```

   The drive will perform a soft power-on reset.

   Note: A message should appear if an error occurs. Whether successful or not, **the drive will be reset** by the device microcode. To verify that the load occurred as expected, refer to “Display Drive VPD (Drive Type and Microcode Level)” on page 699.

10. Type **q**, and press **Return** to quit the Service Utility.

Updating Drive Microcode Using NTUtil

Attention

Unless you are very familiar with this procedure, IBM recommends that you use the “CETool” on page 725. When updating code in a 3592 drive attached to a VTS/J70/C06/TS7700, it is recommended you use the VTS/J70/C06/TS7700 interface to load the code. This ensures 3592 drive VPD is updated in the VTS/J70/C06/TS7700. Failure to use this procedure will result in mismatched 3592 drive VPD in the attached control unit. **Note:** If the original 3592 E05 or E06/EU6 encryption-capable drive had FIPS code loaded, ensure the new drive has a FIPS-certified level of drive code loaded. After the automatic code update, verify that the drive is at a FIPS code level. If not, download FIPS-certified code from the PFE website. Remember that the latest level of 3592 E05 or E06/EU6 drive code on the PFE website may NOT necessarily be FIPS-certified.

The following procedure describes how to update the drive microcode over the SCSI bus, using NTUtil:

1. If you have not already done so, install the IBM Ultrium Device Driver. If you are using a software application that utilizes a different device driver, you will need to stop that device driver, then start the IBM Ultrium NT Device Driver. See Installing the IBM Ultrium NT Device Driver topic in the device driver document for the details on how to perform the task.
2. Open a DOS window. At the command prompt type **ntutil** to start NTUtil. The following screen appears:

```
Command Prompt - ntutil
NTUtil - Copyright (c) 1997-2000 IBM Corporation

Main Menu:
Microsoft Window NT 4.0 version

  1. Manual tests
  2. Batch test
  3. Exit ntutil

Enter selection:
```

3. Type **1**, and press Enter. The following NTUtil main menu appears:

```
Command Prompt - ntutil
32: forward space filemark                          33: unload
34: reverse space filemark                          35: load
36: forward space record(s)                         37: return error
38: reverse space record                                39: test unit ready
43: set media parms                                             44: set dev parms(compression)
46: get device information                          47: restore data
48: get medium information                          49: inquiry
50: poll registered devices
53: space EOD                                                               54: display message
=========================================================================
70: system command

=========================================================================
80: Force Dump                                                  81: Read Dump
82: Update MicroCode                                    83: Log Sense
84: Get Last Sense                                              85: Get Version
86: Associative/Persistent WProtect     87: Read/Write Test
88: List registered devices                         89: Get MTDevice Info
=========================================================================
99: return to main menu

=========================================================================
enter selection
```

A scroll bar appears along the right edge of the window, allowing you to scroll up to the top of the menu. If no scroll bar appears, right click in Title Bar portion of the window (top of the window, usually

dark blue in color), then click on **Properties** to bring up the **"Command Prompt" Properties** window. Click on the **Layout** tab and adjust the Window Size Width and Height numbers until scroll bars appear.

4. Ensure that the firmware image file to be downloaded to the drive has the correct naming convention. It should be one to eight characters, with a file extension of **x.fmr** to **xxxxxxxx.fmr**. **Note:** If you have an LTO file you will need to rename it to this naming convention. Ensure that the image file resides in the same directory from which the NTUtil is started.
5. Enter **20** to open both the drive and media changer
6. Enter **82** (for 82: Update MicroCode) at the NTUtil selection prompt. A screen appears that prompts you to enter the microcode image name. Only enter the characters and not the "fmr" file extension:
7. After pressing the **Enter** or **Return** key, the following screen will display, and the status light located on the bezel or faceplate of the drive will flash amber. As the NTUtil screen instructs, do not touch the drive until the firmware load has completed.

```
Command Prompt - ntutil
enter selection:  82
Enter microcode imagename (1 to 8 characters). or return to
Image size = 1048576
Transferring 65536 image bytes. total bytes = 65536
Transferring 65536 image bytes. total bytes = 131072
Transferring 65536 image bytes. total bytes = 196608
Transferring 65536 image bytes. total bytes = 262144
Transferring 65536 image bytes. total bytes = 327680
Transferring 65536 image bytes. total bytes = 393216
Transferring 65536 image bytes. total bytes = 458752
Transferring 65536 image bytes. total bytes = 524288
Transferring 65536 image bytes. total bytes = 589824
Transferring 65536 image bytes. total bytes = 655360
Transferring 65536 image bytes. total bytes = 720896
Transferring 65536 image bytes. total bytes = 786432
Transferring 65536 image bytes. total bytes = 851968
Transferring 65536 image bytes. total bytes = 917504
Transferring 65536 image bytes. total bytes = 983040
Transferring 65536 image bytes. total bytes = 1048576
Waiting for tape device to write flash-prom
Do not touch drive until complete
Note:  This will take awhile (Avg 45 seconds)
```

8. After the firmware load completes, the drive Status Light will be solid green and the following message on the NTUtil screen will appear:

```
Transferring 65536 image bytes. total bytes = 917504
Transferring 65536 image bytes. total bytes = 983040
Transferring 65536 image bytes. total bytes = 1048576
Waiting for tape device to write flash-prom
Do not touch drive until complete
Note:  This will take awhile (Avg 45 seconds)
Microcode updated. please exit NTutil and reboot the drive.

analyze() called with rc 1 err 0(ERROR_SUCCESS) data 0
Total elapsed time in seconds = 684.00
```

The "rc 1 err 0 (ERROR_SUCCESS)" message displays after a successful download. An instruction appears above this message to exit NTUtil and reboot the drive.

Note: Failure to reboot (turn power off, then back on) the drive could render the drive non-functional in certain conditions.

9. If you are using a software application that utilizes a different device driver, you will need to stop the IBM Ultrium NT Device Driver, then start those being used by your software application (see Setting the IBM Drivers to Manual Startup Mode in the device driver document).

Loading Library Microcode by Using CETool

Follow this procedure to download library microcode. To setup CETool on your laptop, see “CETool” on page 725.

Note: Before you begin this procedure, ensure that you have the latest level of library microcode.

Required library firmware and drive code can be downloaded from the following websites.

For IBM service personnel with access to the Internal PFE website:

`http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

To get the library code perform the following steps:

1. Select 'Open Systems'.
2. Select '3584 library'.
3. Select the version of code you want, fill out the form and click 'submit'.

For non-IBM personnel (and those without access to the IBM intranet) the following external website provides code and support for 3584.

`http://www.ibm.com/servers/storage/support`

Select your product, or register using the "My Support" option, then follow the links to locate library and/or drive firmware.

Non-Disruptive Library Firmware Update

Library firmware 6090 or higher provides library firmware download and concurrent library update without disrupting library operations. You must also have the following drive pre-req code levels (or higher) installed on all Control Path drives as follows. If the Control Path drives are not at the following code levels (or higher), any host jobs running on those drive types will fail.

- LTO Ultrium-2: **6750**
- LTO Ultrium-3: **63A0**
- LTO Ultrium-4: **7384**
- LTO Ultrium-5: **A2C0**
- 3592-J1A: **D3I0_828**
- 3592-E05: **D3I1_6E4**
- 3592-E06/EU6: **D3I2_47E**
- 3592-E07: **D3I3_520**

Note: LTO Ultrium-1 control path drives **do not** support non-disruptive library firmware update. Any host jobs running on LTO Ultrium-1 control path drives will fail. If this is a concern, then library firmware update should only be performed when the library is not being used by host systems.

Note: If you are using the **disruptive** service procedure, continue at **step 1**. If using the **non-disruptive** service procedure, begin at **step 3**.

1. Notify the customer that the library must be varied offline before this procedure can be performed.
2. Before downloading library microcode press the [PAUSE] button on the operator panel, then open the front door to ensure that the customer is not using the library.
3. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP J1 connector.
4. Start the CETool program (see “Downloading and Installing CETool” on page 726).
5. Click on **Load Code** in the CETool library window.

6. At the Select Code Image window, select the library microcode file you want to load, and click on OPEN.
7. Verify the microcode level, and click on **YES**.
8. The library microcode load is now started. When the microcode load is complete, the PC will display a 'download complete' message on the screen.

   Notes:

   a. The process of transferring library microcode to all node cards typically takes 25 minutes. While the microcode is being transferred, the two-character display on the receiving node cards will alternate between 0x (x is the frame number) and 0E, and the two-character display on the transmitting node card will alternate between 0x and 0F.

   b. The operator panel displays **Updating Library Firmware**.
9. After the microcode is loaded into all of the node cards, the node cards will perform a POST. A series of numbers will display on each node card during the POST.
10. Click on **Quit** to end the CETool procedure.
11. At the front panel of the library, select [MENU], **Vital Product Data**, and **Node Card VPD**. Verify that each node card is now at the level you downloaded.
12. Close the front door, and return to the procedure that sent you here.

Loading LTO or 3592 Drive Microcode by Using CETool

Note: When updating code in a 3592 drive attached to a VTS/J70/C06/TS7700, it is recommended you use the VTS/J70/C06/TS7700 interface to load the code. This ensures 3592 drive VPD is updated in the VTS/J70/C06/TS7700. Failure to use this procedure will result in mismatched 3592 drive VPD in the attached control unit.

Follow this procedure to download drive code. To setup CETool on your laptop, see “CETool” on page 725.

Notes:

1. Before you begin this procedure, ensure that you have the latest level of drive microcode.

   Required library firmware and drive code can be downloaded from the following websites.

   For IBM service personnel with access to the Internal PFE website:

   `http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

   To get the library code perform the following steps:

   a. Select 'Open Systems'.

   b. Select '3584 Library/TS3500'.

   c. Scroll down and select the type of drive you are updating:
      - 'Get 3584 GEN-1 Drive microcode SCSI or Fibre'
      - 'Get 3584 GEN-2 Drive microcode SCSI or Fibre'
      - 'Get 3584 GEN-3 Drive microcode Fibre'
      - 'Get 3584 GEN-4 Drive microcode Fibre'
      - 'Get 3592 Drive microcode.'

      Note: If the existing encryption-capable drive had FIPS code loaded, ensure the replacement drive has a FIPS-certified level of drive code loaded. The latest level of 3592 drive code available may NOT necessarily be FIPS-certified.

   d. Select the version of code you want, fill out the form and click 'submit'.

   For non-IBM personnel (and those without access to the IBM intranet) the following external website provides code and support for 3584.

   `http://www.ibm.com/servers/storage/support`

   Select your product, or register using the "My Support" option, then follow the links to locate library and/or drive firmware.

2. If you are copying drive microcode to a control path drive, and it is the **only** control path available to the host, the entire Logical Library will be unavailable to the host using the control path until the microcode update is complete. **Ensure the customer is aware of this before you begin the code update procedure.**

Follow this procedure to download drive microcode:

Note: If you are doing a disruptive drive code download (i.e., 'Activate Immediately') continue at the next step. If you are doing a non-disruptive drive code download ((i.e., 'Activate on Drive Reset' or 'Activate on Drive Unload') continue at step 6.

1. Inform the customer that you are preparing to update the code.
2. Ensure that all the drives are empty.
3. Ensure that the drive(s) are NOT being used by the host.
4. Ensure that all SCSI drives are properly SCSI-terminated.
5. Ensure that all library front doors are closed.
6. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP J1 connector.
7. Start the CETool program (see “Downloading and Installing CETool” on page 726).

8. See **Figure 179.** If you are running CETool 3.7 or higher, you have three Drive Code Activation preferences. Make this choice before you continue. Not all choices are supported on LTO Ultrium-1 drives. Only Activate Immediately is available for LTO Ultrium-1 drives. Control path drives will Activate Immediately (which is disruptive) or with a customer defined reset which can be done concurrently, as it is under user control:
   - **Activate Immediately** which will load the drive code as soon as it completes downloading. Only "Activate on Drive Unload" and "Activate on Drive Reset" can be performed non-disruptively.
   - **Activate on Drive Unload** which will load the drive code after the drive is unloaded, **except** for Control Path drives which require "Activate on Drive Reset" (potentially disruptive) where the drive requires a manual power-on reset.
   - **Activate on Drive Reset** which will load the drive code after the drive goes through a power-on reset. The customer can manually reset the drive at any convenient time, when the drive is idle, thus ensuring that the reset is non-disruptive.

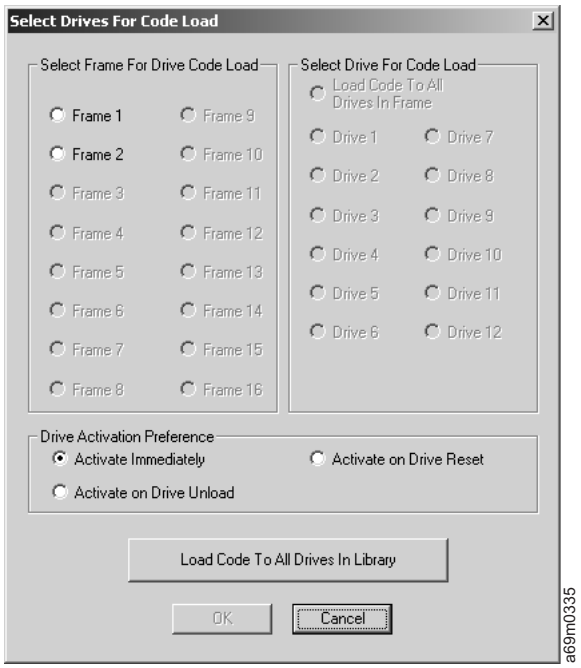


Figure 179. Select Drives for Code Load

9. Use the front panel of the library to display the drive VPD. This will ensure that all drives show the correct level of code.
10. Click on **Load Code** in the CETool Drive window.
11. Select the frame in which the drive to be updated is located. If you wish to load drive microcode to all drives, select **All Drives**. If you load microcode to all drives, proceed to step 13, otherwise proceed to the next step.

    Note: If the library contains a mixture of drive types then only drives that match the downloadable file will be updated.
12. Select the drive you want to update, then click on **OK**.
13. At the Select Code Image window, select the file, and double click on **Drive Code (*.ro, *.fmr, or *.fmrz).** You should now see the drive microcode file listed.

    Note: The drive code images for LTO SCSI, LTO fibre, and 3592 fibre are different. Ensure you download the correct image for the type of drive your are updating (model and SCSI/Fibre). If you load microcode to all drives, CETool will load the microcode level that you selected to

each drive of that type (SCSI or fibre). If the existing encryption-capable drive had FIPS code loaded, be sure to download a FIPS-certified level of drive code. The latest level of 3592 drive code available may NOT necessarily be FIPS-certified. See “Federal Information Processing Standards (FIPS)” on page 37 for more information.

14. Select the drive microcode file you want to load, and click on **OPEN**.

    Note:

    - Do not power cycle the drives or perform any other operations to the drives, including viewing drive VPD. These actions will halt the code update process, and require you to begin again.
    - The CETool will display a "Downloading Drive Code" progress indicator that takes approximately one minute to progress from 0% complete to 1% complete. The remaining time to accomplish 100% complete depends upon the size of the code load and the number of drives being loaded at one time. The 3592 code is approximately three times the size of LTO code, so it will take approximately three times longer to load.

      The CETool will display the message "File Transfer Complete." This verifies that the code image was successfully transferred from the CETool to the drives. The drives will take about 3 minutes to write the code to flash.

      In a Windows environment, when you update drive code and the drive resets, Windows will see the drive become unavailable and as a result will display an 'Unexpected drive removal' warning message. No action is necessary, the drive comes back as soon as it has completed POST.

15. Verify the new drive code level: **MENU**, **Service**, **Vital Product Data**, **Drive VPD**.
16. Display drive status to verify it is online: **MENU**, **Library Status**, **Drive Status**.
17. Return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Loading Drive Microcode by Using HyperTerminal

Notes:

- When updating code in a 3592 drive attached to a VTS/J70/C06/TS7700, it is recommended you use the VTS/J70/C06/TS7700 interface to load the code. This ensures 3592 drive VPD is updated in the VTS/J70/C06/TS7700. Failure to use this procedure will result in mismatched 3592 drive VPD in the attached control unit.
- **Note:** If the original 3592 E05 or E06/EU6 encryption-capable drive had FIPS code loaded, ensure the new drive has a FIPS-certified level of drive code loaded. After the automatic code update, verify that the drive is at a FIPS code level. If not, download FIPS-certified code from the PFE website. Remember that the latest level of 3592 E05 or E06/EU6 drive code on the PFE website may NOT necessarily be FIPS-certified.
- If there is a control unit attached, do not use this method of updating microcode.
- This procedure can take as long as twenty minutes per drive.
- If you have not already configured HyperTerminal for connection to the 3592 drive, go to “Configuring HyperTerminal for Connection to 3592 Drive” on page 758, then return here.
- This procedure requires a special null modem cable (P/N 18P9124) for connection of the laptop to the serial port on the drive. See item **3** in Figure 15 on page 33 for the location of the port. If this cable is not available, choose another method of updating microcode.
- If you are loading drive microcode to a control path drive, and it is the **only** control path available to the host, the entire Logical Library will be unavailable to the host using the control path until the microcode update is complete. **Ensure the customer is aware of this before you begin the code update procedure.**

1. Inform the customer that you are preparing to update the code.
2. Ensure that all the drives are empty.
3. Ensure that the drive(s) are NOT being used by the host.
4. Ensure that all SCSI drives are properly SCSI-terminated.

5. Ensure that all library front doors are closed.
6. Connect the special null modem cable to a serial port on your (CE Thinkpad) and to the serial port on the 3592.

   Note: To access the RS-232 port, raise the handle on the canister, but do not to pull the drive out, as that would drop power to the drive.
7. On your laptop, start the HyperTerminal program by selecting **Start**, **Programs**, **Accessories**, **Communications**, **HyperTerminal**, **3592J1A.ht**, **3592E05.ht**, or **3592E06.ht**.
8. Type **v**, and press **Enter**. The drive microcode version will be displayed (for this example, D3I0_43A). This verifies that you have established a connection to the drive.
9. Type **maint.code_update**, and press **Enter**.

   Note: If an error message is displayed, verify that the command was typed without any errors. If the command was typed correctly but resulted in an error message, this means that the version of drive microcode in the drive does not support the serial code update command.
10. Type **xfer.rxmodemc 40040000** (**xfer.rxmodemc 0804000** for Model EU6), and press Enter. CCCs will begin rolling across the screen. This verifies that the drive is ready for drive microcode to be transferred.
11. Click on the **Transfer** pulldown menu, then select **Send file**.
12. Click on **Browse**, and select the disk and microcode file you want to load (for this example, D3I0_43B.fmr). When you have selected the file, click on **Open**.
13. Set the protocol to XMODEM.
14. Click **Send**. The microcode file will be transferred from the laptop to the drive.
15. Wait for the transfer to complete. This will take as long as twenty minutes. It can take longer if you have other programs running on your laptop.
16. When transfer is complete, type **.call 40040000** (**.call 0804000** for Model EU6), and press **Enter**. This will write the transferred microcode file to flash. Status messages will display during this process.
17. When the microcode file has been successfully written to flash, the drive will reset itself. Wait for the drive to complete its Power On Self Test (POST).
18. Type **v**, and press **Enter**. The drive microcode version will display (for this example, D3I0_43B).
19. Verify that the drive microcode version is the one you loaded.
20. Exit the HyperTerminal program.
21. Perform a verify fix on all drives with updated microcode.
22. When ‘Do you want to save the connection name?’ appears, click on **Yes**.

Updating Device Microcode from Another Device in the Same Library

Attention: If you are updating drive microcode to a control path drive, and it is the **only** control path available to the host, the Logical Library will be unavailable to the host using the control path until the microcode update is complete. **Ensure the customer is aware of this before you begin the code update procedure.** It is **not** necessary to take the 'source' (from) drive offline.

1. When updating code in a 3592 drive attached to a VTS/J70/C06/TS7700, it is recommended you use the VTS/J70/C06/TS7700 interface to load the code. This ensures 3592 drive VPD is updated in the VTS/J70/C06/TS7700. Failure to use this procedure will result in mismatched 3592 drive VPD in the attached control unit.
2. **Note:** If the original 3592 E05 or E06/EU6 encryption-capable drive had FIPS code loaded, ensure the new drive has a FIPS-certified level of drive code loaded. After the automatic code update, verify that the drive is at a FIPS code level. If not, download FIPS-certified code from the PFE website. Remember that the latest level of 3592 E05 or E06/EU6 drive code on the PFE website may NOT necessarily be FIPS-certified.
3. Inform the customer that you are preparing to update the code.
4. Ensure that all the drives are empty.
5. Ensure that the drive(s) are NOT being used by the host.
6. Ensure that all SCSI drives are properly SCSI-terminated.
7. Ensure that all library front doors are closed.

The following screens will guide you through the procedures to update the library or drive microcode:

1. At the **Activity** screen, select [MENU].
2. At the **Main Menu** screen, select **Service**.
3. At the **Service** screen, **Firmware Update**.
4. The following screen is displayed.

```
Firmware Update           Panel 1300


Update Drive from a Drive
Synchronize Node Cards
Features


[BACK]       [DOWN]  [ENTER]
```

Select the desired option, and press **[Enter]**. Go to the selected item listed below, and follow the directions:

- If **Update Drive from a Drive** is selected, a menu displays a list of all drives and allows you to select the source drive. Next, you will be asked to select “Update All Drives” or “Update One Drive.” After you select the source drive and target drives, the source drive will read the drive code image and write it to the target drives. If you are running CETool 3.7 or higher, you have three Drive Activation Preferences. See “Loading LTO or 3592 Drive Microcode by Using CETool” on page 711 for options.

  Note: It may take as long as 20 minutes to read the drive code image from the source drive and write it to the destination drives.
- If **Synchronize Node Cards** is selected, the microcode determines which node card has the highest microcode level and will update any downlevel node cards to that level.
- If **Enable Features** is selected, you will be able to enable or disable features. A special 'license key' is required, and can be obtained from the feature code installation instruction, or from the label that was applied to the rear inside of the Lxx frame (above and to the left of the tape drives). Any future features that become available will be accessible through a menu that will:
  – Display a list of available features

  - Provide information about whether each feature is enabled or disabled
  - Allow you to enter a 'license key.'
- Return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Dump Maintenance Utilities

Off-loading Dumps

Off-loading Dumps to pSeries/RS6000 (AIX) System by Using TAPEUTIL

Note: Trace data is volatile and is lost if you press the Reset pushbutton or power OFF the device.

You may require assistance from the customer during this process.

This procedure reads a dump and writes it to a diskette in AIX/UNIX format.

1. At the **Activity** screen, press **[MENU]**.
2. At the **Main Menu** screen, select **Library Status**.
3. At the **Library Status** screen, select **Drive Status.**
4. At the **Drive Status** screen verify that the drive you are attempting to get a drive dump for is online and does not have a cartridge in the drive. It should show empty.
5. Verify that the drive is **not in use** by another host.
6. Insert the diskette that will be used for the dump into the system floppy diskette drive.
7. When the prompt appears, format the diskette by typing **format**, and pressing **Enter**.
8. Start the tape utility program by typing **tapeutil** at the prompt.
9. Select **Tape Drive Service Aids** option from the menu, and press **Enter.**
10. Select **Read Dump** from the following panel, and press **Enter**.

```
IBM Tape Device Service Aid Menu                              700000


 Select One of the Service Aids to be performed

  Force Microcode Dump
    Perform a microcode dump of the system. The dump is stored in
    the device.
    After the dump is performed it must be read using Read Dump.
  Read Dump
    Transfer a dump from the tape device to a host file, diskette or
    a tape cartridge.
  Microcode load
    Download microcode from host file or diskette to tape device via
    SCSI bus.
  Error Log Analysis
    Analyze system error log for device.
F3=Cancel                          F10=Exit
```

11. Select a **Device**, and press **F7=Commit** from the following panel. You must press **F7=Commit** after selecting the drive.

```
IBM Tape Device Selection Menu.                                    900000

 Select One of the devices listed below.

 NAME        LOCATION     TYPE

 rmt2        00-05-01-10  IBM 3592 Tape Drive and Medium Changer
 rmt3        00-05-01-30  IBM 3592 Tape Drive and Medium Changer









F3=Cancel           F7=Commit           F10=Exit
```

12. At the next screen press **F7=Commit** to write the file to the diskette.

```
Prompting for Srce File for Operation on rmt3 located at 00-05-01-30
                                                              B00000

Please enter the following fields...

  Enter Filename:                                        /dev/rfd0 +/


F1=Help             F2=Refresh          F3=Cancel           F4=List
F5=Reset            F7=Commit           F10=Exit
```

13. Press **F10** to exit the read dump.
14. Press **q** to quit tapeutil.
15. Remove the diskette from the diskette drive. The dump diskette created above is in AIX/UNIX format.

Off-loading Dumps to Sun System by Using TAPEUTIL

TAPEUTIL

Refer to *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, for details of the **tapeutil** program in the Sun (Solaris) system.

The 3592 supports forcing a diagnostic dump and storing that dump to a mounted tape cartridge or to a host system file via the SCSI bus.

Note: Trace data is volatile and is lost if you press the Reset pushbutton or power OFF the device.

You may require information from the customer during this process.

To force and store a diagnostic dump on these devices, perform the following steps:

1. A the **Activity** screen, press **[MENU]**.
2. At the **Main Menu** screen, select **Library Status**.
3. At the **Library Status** screen, select **Drive Status.**

4. At the **Drive Status** screen verify that the drive you are attempting to get a drive dump for is online and does not have a cartridge in the drive. It should show empty.
5. Verify that the drive is not in use by another host.
6. Enter the following command to force the dump, substituting **n** with the actual value from the device special file associated with the target device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o fdp -v
   ```

7. Determine the location for the dump to be stored (that is, floppy diskette such as /vol/dev/aliases/floppy0 or host file such as /tmp/diag_dump.file).
8. Enter the following command, substituting **file** with the actual path and filename of the dump destination file, and substituting **n** with the actual value from the device special file associated with the dump device:

   ```
   /opt/IBMtape/tapeutil -f /dev/rmt/nst -o sdp -z file -v
   ```

Note: The diagnostic dump procedure may also be performed using the menu-driven interface of the tapeutil program. To invoke the tapeutil program in this format, enter the following command, then choose option 1 to open the device, followed by option 5 to force a dump, and option 6 to store the dump:

```
/opt/IBMtape/tapeutil
```

Creating Library Dump by Using CETool

Follow this procedure to create a library dump.

1. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP J1 connector.
2. Start the CETool program.
3. Click on **Get Logs** in the CETool library window.
4. Select Path for folder (where dumps will go).
5. At the Enter Log Batch Name screen, enter the machine serial number (see barcode serial number in the Lxx frame located in the bottom left-hand side of the back wall, or under VPD Data on the operator panel) and date (YYMMDD). Click on **OK**.
6. When the dump is completed, click on **Quit** to end the CETool procedure.

Creating Drive Dump by Using CETool

Notes:

1. The drive must not be in use at the time you collect the drive dump. Stated another way, the host application must not be reading or writing to the drive while you collect the dump.

Follow this procedure to create a drive dump.

1. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP J1 connector.
2. Start the CETool program (see “Downloading and Installing CETool” on page 726).
3. Click on **Get Logs** in the CETool drive window.
4. Select Path for folder (where dumps will go).
5. Select frame and drive.
6. At the Enter Log Batch Name screen, enter the machine serial number and date (YYMMDD). Click on **OK**.
7. When the dump is completed, click on **Quit** to end the CETool procedure.

Creating Drive Dump by Using HyperTerminal

This function allows the CE to review VPD and to perform a microcode load from a CD or hard drive.

Note: If you have not already configured HyperTerminal for connection to the 3592 drive, go to "Configuring HyperTerminal for Connection to 3592 Drive" on page 758, then return here.

1. Connect a serial cable PN 18P9124 to a serial port on your laptop (or PCMCIA-to-serial cable on your laptop) and to the serial port on the 3592 drive canister.

   Note: To access the serial port on the drive, raise the handle on the canister, but do not to pull the drive out, as that would drop power to the drive.
2. On your laptop, start the HyperTerminal program by selecting **Start**, **Programs**, **Accessories**, **Communications**, **HyperTerminal**, **3592J1A.ht**.
3. Type **v**, and press **Enter**. The drive microcode version will display (for example, D3I0_43A). This verifies that you have established a connection to the drive.
4. If a drive dump does not already exist, type **maint.dump_force**, and press **Enter**. This will force a dump.

   Note: If an error message displays, verify that the command was typed without any errors. If the command was typed correctly but resulted in an error message this means that the version of drive microcode in the drive does not support the RS-232 dump commands.
5. Type **maint.dump_readx**, and press **Enter**. This prepares the drive to transmit the dump. You will get a message, 'uCode dump forced (RC=1)' which means the forced dump was successful.
6. Immediately click on the **Transfer** pulldown menu, then select **Receive file**. A delay in clicking the Transfer pulldown may result in a timeout. You will then have to go back to step 5.
7. Click on **Browse**, and select the folder where the dump file will be saved (for example, C:\3592). When you have selected the folder, click on **OK**.
8. Set the protocol to XMODEM.
9. Click **Receive**, and enter a 'Receive' file name of your choice. Click on **OK**. The microcode file will be transferred from the 3592 drive to the laptop.
10. Wait for the transfer to complete. This typically will take about one minute, but may take longer if you have other programs running on your laptop.

    Note: When the dump has been successfully transferred, it will automatically be cleared.
11. Exit the HyperTerminal program.

3592 Ethernet (Laptop) Procedures (E06 and Some EU6 Drives)

Use these procedures when you want to download a dump, or upload or copy microcode by using the ethernet port on a Model E06 drive. You need a laptop computer to perform these ethernet (laptop) procedures.

Notes:

- Though uncommon, some Model EU6 drives might have an ethernet port. This happens when a defective EU6 drive is replaced. Its replacement is an E06, but gets labeled EU6 after installation. These ethernet procedures apply to those EU6 drives.
- Though not mentioned in these procedures, Models E06 and EU6 are interchangeable in these ethernet procedures if the EU6 drive has an ethernet port.
- This ethernet port might not be available on some Model EU6 drives.
- These procedures do not apply to 3592 Model J1A or E05 drives.
- All of these ethernet procedures require a straight-through ethernet cable (patch cable) to connect your laptop to the ethernet port on the drive. If you do not have a patch cable, choose another method of downloading microcode or dumps, or updating microcode. See “Offloading Dumps by Using Ethernet Port 3592 (E06 Only)” on page 722 for downloading dumps.
- For the alphabetic characters which you will enter while using these ethernet procedures, use only lowercase characters (like **a**, **b**, or **c**) unless otherwise directed to use an uppercase character (like **A**, **B**, or **C**).

Connecting and Disconnecting Laptop From 3592 (E06 Only)

You must perform this procedure before you attempt to perform other ethernet procedures. Use this procedure to connect your laptop to a drive by using the ethernet port.

1. If the drive is connected to a control unit (i.e., J70, C06, or VTS), the drive must also be offline to the control unit and made unavailable to the Library Manager before beginning this procedure.
2. See Figure 15 on page 33. Insert an ethernet (patch) cable into the ethernet port **7** on the back of the drive by reaching under the drive handle **8** and lifting the latch 90 degrees from the locked position. Do **not** rotate the latch beyond 90 degrees or pull the drive out of position from the cradle, sled, or shelf.
3. Connect the other end of the ethernet cable to the ethernet port on your laptop.

   Eventually, after connecting to the drive, an LED on each side of the ethernet port **7** on the drive. The LEDs indicate the various conditions that are explained in Table 82.

Table 82. Drive Ethernet Port LED Indications (Model E06 Only). The LEDs are located on each side or the ethernet port depicted in Figure 15 on page 33.

Ethernet Port LED Locations and Colors	**Indications and Related Conditions**
Left (Yellow)	• On = Good ethernet port connection • Off = No ethernet port connection
Right (Green)	• Flashing = Only during ethernet port activity • Off = No current ethernet port activity
Notes: 1. The yellow LED is located to the lower left of the drive ethernet port, the green LED is located to the lower right. 2. Both ends of the ethernet patch cable must be connected to allow you to use the LEDs to analyze the drive condition.	

4. Create or change a local network connection on your laptop with the following TCP/IP settings. Be sure to record your current settings before you make the following changes.
5. Type Start -> Settings -> Control Panel. Double click on "Network Connections."
6. See **Figure 180 on page 721**. Right click on "Local Area Connection" and click Properties.
7. See **Figure 181 on page 721**. Scroll down to 'Internet Protocol (TCP/IP)" and click Properties.



Figure 180. Local Area Connection

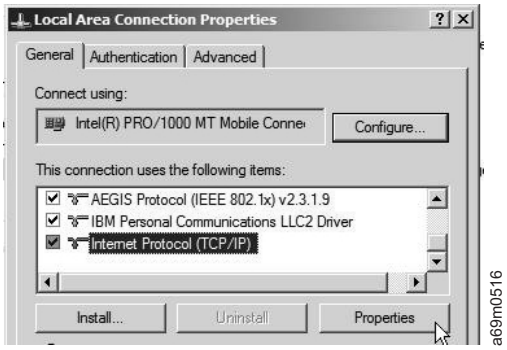


Figure 181. Internet Protocol TCP/IP

8. See **Figure 182**. Click the button "Use the following IP address."

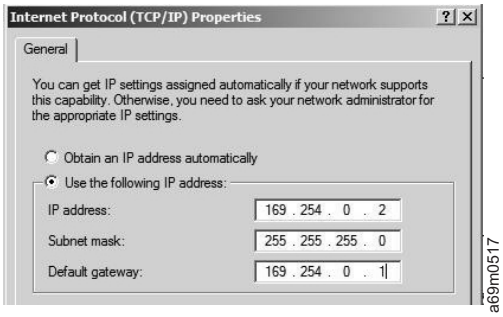


Figure 182. TCP/IP Properties

9. Enter the values shown below, then click OK and Close.
   - IP address: 169.254.0.2
   - Subnet mask: 255.255.255.0
   - Default gateway: 169.254.0.1
10. Open a DOS command prompt screen on your laptop. Change to the subdirectory where the microcode image is stored or where you want to store a dump.
11. See **Figure 183 on page 722**. Type **ftp 169.254.0.3** and press Enter to establish the communication connection to the drive and to open an FTP session. You will see a screen that provides you with the drive type, model number, serial number, and microcode level.
12. At the user prompt, type **ce** and press **Enter**. You see "User name OK. need password."
13. At "User name okay. need password" type **serv1ce** next to "Password." Use the numeral "1" in place of the letter "i" in this entry. **NOTE:** The cursor will not advance when typing the password, however it is being recorded.
14. When the login is complete, you will see the **ftp>** prompt. Type **bin** to set the communication mode to binary. **Note:** If an error message displays, verify that your command was typed without any errors. If the command was typed correctly but resulted in an error message, this could indicate a patch cable problem or a laptop configuration problem. Contact your next level of support.



Figure 183. DOS Screen

15. Perform any of these procedures, then return here:
    - "Determining Current Drive Microcode Level 3592 (E06 Only)"
    - "Determining Current Dump Status 3592 (E06 Only)"
    - "Offloading Dumps by Using Ethernet Port 3592 (E06 Only)"
    - "Updating Microcode by Using Ethernet Port 3592 (E06 Only)" on page 724
    - "Obtaining Microcode Image by Using Ethernet Port 3592 (E06 Only)" on page 724
16. After you have completed your ethernet activity, type **bye** to exit the ftp session.
17. Remove the ethernet cable from the ports at the back of the drive and from your laptop. Lower the drive latch to the locked (down) position.
18. Return to the procedure that sent you here, or go to "End-of-Call" on page 794.

Determining Current Drive Microcode Level 3592 (E06 Only)

Use this procedure to determine the current level of the drive microcode by using the ethernet port.

1. Perform the procedure "Connecting and Disconnecting Laptop From 3592 (E06 Only)" on page 720 if you have not done so already.
2. Type **ls** or **dir**. The microcode level of the drive, along with the drive dump information displays on your laptop. You might need this information in other "E06 Only" procedures.
3. Return to the departure point in Step 15 which brought you here.

Determining Current Dump Status 3592 (E06 Only)

Use this procedure to determine the current dump status by using the ethernet port.

1. Perform the procedure "Connecting and Disconnecting Laptop From 3592 (E06 Only)" on page 720 if you have not done so already.
2. Type **ls** or **dir**. The drive dump information, along with the microcode level of the drive displays on your laptop. You might need this information in other "E06 Only" procedures.

If there is **no** dump in the buffer, you receive a response on your laptop like:

0000008017_D3I2_451_000001326764_f.dmp

If there is **is** a dump in the buffer, you receive a response on your laptop like:

0000008017_D3I2_451_000001326764.dmp (← existing dump in buffer)
0000008054_D3I2_451_000001326764_f.dmp

The dump in this example that ends with "...6764.dmp" (and not with "_f.dmp") is the existing dump in the buffer.

3. Return to the departure point in Step 15 which brought you here.

Offloading Dumps by Using Ethernet Port 3592 (E06 Only)

This procedure allows the CE to transfer a microcode dump from the drive to your laptop by using the drive ethernet port. You might be asked to produce this dump for your next level of support.

1. Perform the procedure “Connecting and Disconnecting Laptop From 3592 (E06 Only)” on page 720 if you have not done so already.
2. Type **mget *.dmp** (with a space between "mget" and the asterisk) to transfer the current microcode dump that is in the drive buffer (if one exists), and the dump you want to force. If there is no dump existing in the buffer, the drive forces a dump, then it will transfers the forced dump to your laptop. The dump file appears in the current directory of your laptop. The dump remains in the drive buffer after transfer. The dump offload time can take as long as ten seconds.

If there is **no** dump in the buffer, you receive a response on your laptop like:

mget 0000120036_D3I2_448_000001365747_f.dmp?
Use Table 83 to help you understand the information in this response.

Table 83. Meaning of Response to FTP Command "mget" (Offloading Dumps)

This text...	**Refers to...**
0000120036 [1]	Dynamic time stamp (this changes with each transaction) [2]
D3I2_448	Drive microcode level
000001365747	Drive serial number
_f.dmp	Forced dump (including the letter "**f**" **forces** the dump)

Notes:

1. The characters in the filename you receive might be different than the characters in the filename that was shown when you requested the dump.
2. The value in this region can reflect an actual date stamp or it can contain a relative value like a system-created time stamp.

Type **y** for "yes." The drive forces a dump and transfers the forced dump to your laptop. After a brief pause, you see the message "Data transfer complete."

– – OR – –

If there **is** a dump in the buffer, you receive a response on your laptop like:

mget 0000000358_D3I2_448_000001365747.dmp?

This response provides information which is similar to that in Table 83.
Type **y** for "yes". This transfers the existing dump to your laptop. After a brief pause you see the message "Data transfer complete." You receive a response on your laptop like:

mget 0000000418_D3I2_448_000001365747_f.dmp?

Type **y** for "yes". This forces a dump and transfers that dump to your laptop.
After a brief pause, you see the message "Data transfer complete." See Note 1 in Table 83.

3. Return to the departure point in Step 15 on page 722 which brought you here.

Updating Microcode by Using Ethernet Port 3592 (E06 Only)

Use this procedure to update drive microcode by using the ethernet port on your laptop.

1. Perform the procedure “Connecting and Disconnecting Laptop From 3592 (E06 Only)” on page 720 if you have not done so already.
2. Ensure that the microcode image file is in the current directory of your laptop.
3. Type **put D3I2_xxx.fmr** or **put D3I2_xxx.fmrz** to transfer the microcode image to the drive. Use the same name for the microcode image as the file you have on your laptop. The drive resets automatically when the transfer is complete.

Note: When the drive resets, the FTP connection closes. You see the message "Connection closed by remote host."

4. After the drive resets, you can reestablish the FTP connection to the drive to verify the drive microcode level by issuing the command **open 169.254.0.3**. You see a screen that provides you with the drive type, model number, serial number, and microcode level.
5. Reenter your user and password information.
6. At the user prompt, type **ce** and press **Enter**.
7. At "User name okay. need password" type **serv1ce** next to "Password."
8. When the login is complete, the FTP prompt displays. Type **bin** to set the communication mode to binary.
9. Return to the departure point in Step 15 on page 722 which brought you here.

Obtaining Microcode Image by Using Ethernet Port 3592 (E06 Only)

Use this procedure to obtain drive microcode from a drive.

1. Perform the procedure “Connecting and Disconnecting Laptop From 3592 (E06 Only)” on page 720 if you have not done so already.
2. Type **ls** or **dir**. The microcode level of the drive displays.

Note: The "D3I2_xxx" is the drive microcode level that displayed after you completed Step 2.

3. Type **mget *.fmrz** (with a space between "mget" and the asterisk) to transfer the drive microcode image to your laptop. The microcode image file resides in the current directory of your laptop. You will see a response like:

   mget D3I2_xxx.fmrz?

4. Type **y** for "yes".
5. After a brief pause, you see the message "Data transfer complete."
6. Return to the departure point in Step 15 on page 722 which brought you here.

CETool

A program entitled CETool.exe is available to the customer engineer. The program is a single executable file that is compatible with most Windows workstations. This program allows the attachment of a PC or Laptop to the MCP or MCA node card. It allows you to perform the following operations:

- View Error Log
- Load Code to Local Node
- Reset FC WWNNs
- Change 3592/3588 Serial Number
- Update LTO Drive VPD
- Library Serial Number Length
- Update library and drive code
- Pull library drive logs
- Configure Call Home

FMR tapes typically are not used on this product. It is considerably faster and less expensive to use CETool than to order an FMR tape.

Attention – Serial Port Settings

1. From the Windows desktop, select Start, Settings, Control Panel, and open the System folder.
2. On a Win2000 or WinXP machine select the Hardware tab, then click the Device Manager Button. On a WinNT machine, select the Device Manager tab.
3. Click on Ports, and select the Communications Port you plan to use (usually COM1 or COM2).
4. Click on the Port Settings tab, and ensure that the following settings are enabled: Bits per second = 115200, Data bits = 8, Parity = None, Stop Bits = 1, Flow Control = None.
5. Click on the Advanced button and remove the check in the 'Use FIFO buffers' box. If failures occur then try checking the box. Click OK.

CETool v5.2 and Later

CETool v5.2 or later will compare the level of Library firmware currently installed against the current CETool version. If the version is compatible with current Library firmware, you will see **Figure 184**. **Note:** The example shows CETool 5.2 with Library firmware at 8870. 7xxx levels of Library firmware will also be compared, and display a similar window.



Figure 184. CETool Version is OK

Figure 185 on page 726 will be displayed if the current CETool version determines a new version may be available. **Note:** The example shows Library firmware at 8871. However, CETool v5.2 was created for Library firmware at 8870. Therefore you are encouraged to check the PFE website to see if a later version of CETool is available. A later version may not be available, and you will continue to see this message which is okay.



Figure 185. CETool May Need Updating

Downloading and Installing CETool

Follow this procedure to download and install the CETool.

1. Using a Web Browser, go to the intranet site

   `http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf/`

   To get CETool code, perform the following steps:
   a. Select 'Open Systems'.
   b. Select '3584 library'.
   c. Scroll down and select 'Get 3584 CE tool'.
   d. Select the version of code you want, fill out the form and click 'submit'.
   e. Record for later use the file name and the location to where you saved it.
2. Set up a Short Cut (and icon on your Windows desktop) that you can click to run the program.
   a. From the Windows desktop, select My Computer.
   b. Select drive C: (or the drive onto which you downloaded the program), then find the folder to which you downloaded the file.
   c. Right click on CETool.exe. A pulldown menu appears.
   d. Select Create Shortcut. This creates a CETool shortcut in the same folder to which you downloaded the file.
   e. Right click on this shortcut, hold down the right mouse button, drag it to the Windows desktop, and release the right mouse button.
   f. Select 'Move Here.' You now have a CETool shortcut on your desktop.
3. Using serial cable P/N 19P1061 or 23R4629, connect the PC serial port to the MCP J1 connector.

   Note: Newer CE laptops (for example, a T42) may not have a built-in serial port. Information Technology (IGS, IT) approves using a PCMCIA-to-serial port adapter, or a Port Replicator, when servicing the 3584 library. Be sure to check the Serial Port Settings as listed in the Attention box above. See “Assembly 17: Miscellaneous Cables and Tools” on page 1148 "Adapter, PCMCIA Serial Port Adapter Card" for the part number.

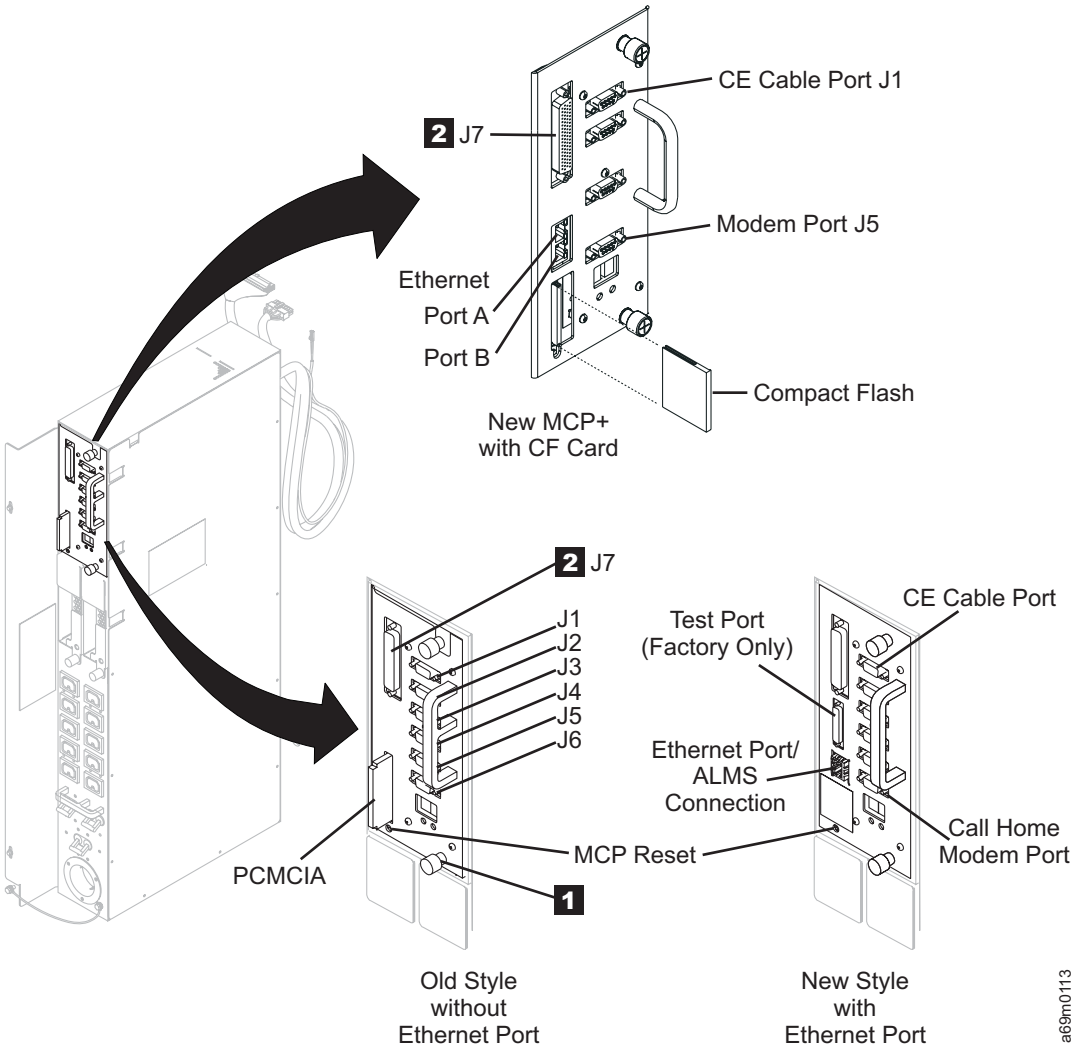


Figure 186. CETool J1 MCP Connector (x32, x22, x52)

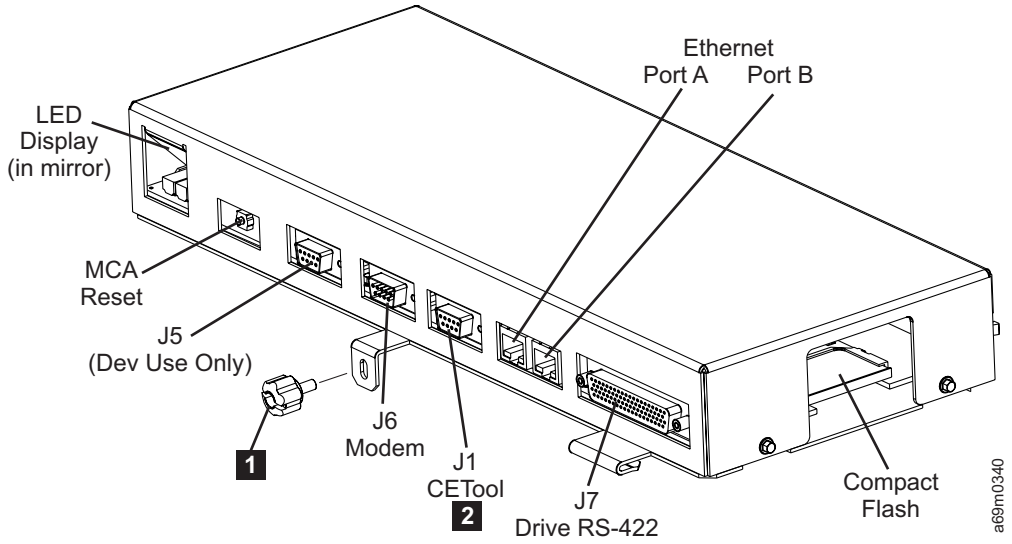


Figure 187. CETool J1 MCA Connector (x23, x53)

Note: When updating **library** microcode, you can connect to the J1 connector of **any** MCP on libraries with multiple MCPs. On libraries with multiple MCPs, you can connect to the J1 connector on any MCP, though you typically would connect it to the MCP in the base frame. On libraries with an MCA (x23, x53) you can connect to the J1 connector on any MCA, though you typically would connect it to the MCA in the base frame.

4. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP or MCA J1 connector.
5. Start the CETool by double-clicking its icon.
6. Click on **Setup**, **COMM Properties**, and set the COMM port number to match your PC COMM port.
7. Perform one of the following:
   - If you are updating library microcode, go to “Loading Library Microcode by Using CETool” on page 709.
   - If you are updating LTO or 3592 drive microcode, go to “Loading LTO or 3592 Drive Microcode by Using CETool” on page 711.
   - If you want a library dump, go to “Creating Library Dump by Using CETool” on page 718.
   - If you want a drive dump, go to “Creating Drive Dump by Using CETool” on page 718.

CETool Problems

If CETool is unable to communicate with the library or NAK errors are reported by CETool:

1. Ensure that you are using a version of CETool that is compatible with the version of library code. If the library code is 4000 or higher you should use CETool version 3.4. If the library code is below 3000 then you should use CETool version 3.1. Using CETool version 3.4 (or higher) with older levels of library code will result in problems getting library logs. **It is recommended that you download the latest version of CETool** as many other problems were also fixed in the latest version. The latest version is available on the PFE website. See “Downloading and Installing CETool” on page 726.
2. Ensure that no other applications are running on the PC at the same time. The serial port moves data at a high rate and if the PC is 'time slicing' between different applications then this is likely to cause problems. ALL applications except for CETool need to be shut down. And it may be necessary to temporarily disable the screen saver. As an example, we've seen cases where the screen saver would kick in at 30 minutes and kill the code update. Typically this was because the screen saver was running something processor intensive like a grid computing application. One way to check to see if applications running in the background are the cause is to use Ctrl+Alt+Del, start the Task Manager, and select the Performance tab. The CPU Usage should be very low - close to zero and definitely single digits. If it isn't then select the Applications tab and Processes tab until you find and kill the troublesome program.
3. Ensure that the Windows serial port settings are correct. See the Attention box on page 725.
4. If it still fails, try a different PC. Some PCs use a serial interface chip that does not work reliably at 115Kb/s speeds.
5. If you change the configuration of the library you should close and restart the CETool program. For example, if you have CETool up and running, and then you change the hardware configuration of the library (perhaps by removing a drive and reconfiguring) then any subsequent CETool action (such as updating drive code to ALL drives) will result in an error.
6. If CETool is still unable to communicate with the library, the cause may be a problem (typically a code problem) in the library MCP or MCA. If the library has multiple MCPs or MCAs then try connecting the CETool cable to an MCP or MCA in a different frame. If the library only has one MCP or MCA then you may need to reset the MCP or MCA. To reset the MCP or MCA you press the MCP or MCA reset button (see Figure 186 on page 727 and Figure 187 on page 728). Check with the customer first as this will take the library offline for about 3 minutes and may log an error 25xx.
7. If CETool connects to the library but always fails with a timeout when collecting logs, the system registry values may be incorrect. See **“Changing/Setting System Registry Values for CETool”**.

Changing/Setting System Registry Values for CETool

1. See **Figure 188 on page 731**. Click Start -► Run -► type **regedit** and click OK.
2. See **Figure 189 on page 731**. Look for the following key: **HKEY_CURRENT_USER, Software, IBM, CE Tool v3 2, Settings** folder. **Note:** "CE Tool v3 2" is always shown regardless of the CETool version currently installed.
3. The values for "CommandTimeout," "GetLogTimeout" and "ResponseTimeout" should be set to 5000. If these values are all 0000, they need to be changed to 5000.

   Note: If you don't want to manually edit the timeout settings, you can simply delete the Settings folder which will remove all subkeys from the registry. Highlight the "Settings" folder and press the "Delete" button on your keyboard. When CETool is restarted, that entry will be recreated with the correct default values.

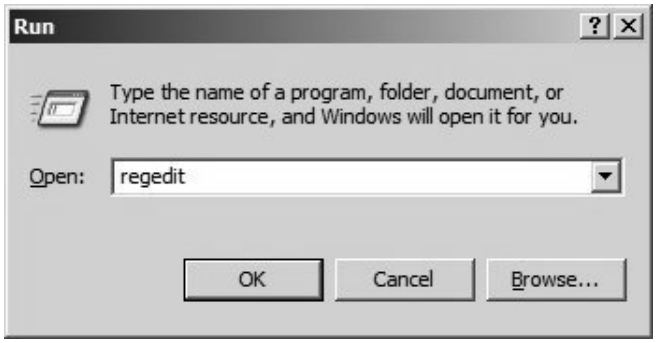


Figure 188. Regedit Screen

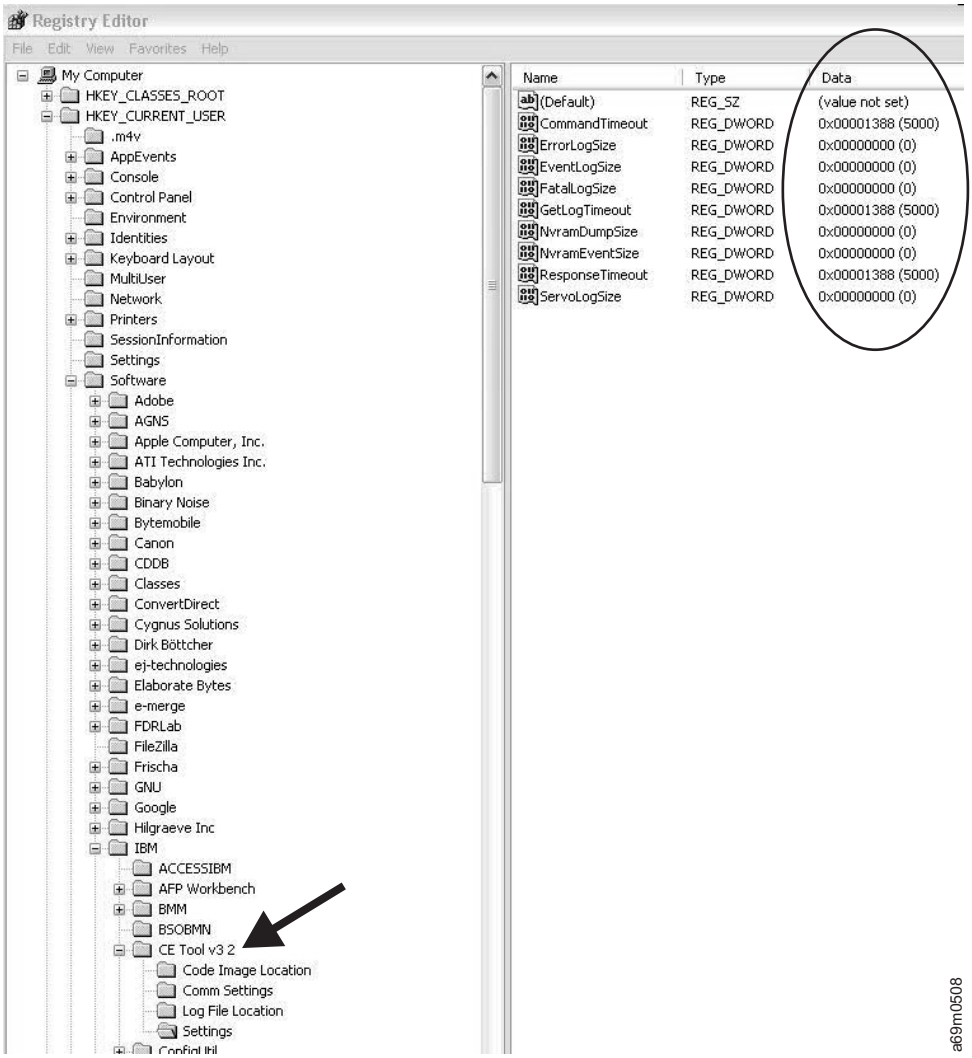


Figure 189. CETool Regedit Values

CETool Problem Using a PCMCIA-to-serial Converter

If you experience failures using CETool to pull library logs, or hangs when using CETool to get logs, use the following procedures to remove and reinstall the PCMCIA device driver.

1. Ensure the PCMCIA card is installed.
2. Right click "My Computer," and select **Properties.**
3. From the System Properties window, select the **Hardware** tab.
4. On the Hardware tab, select **Device Manager.**
5. In the Device Manager window, go down and open **"Ports (COM and LPT)"**
6. Find the **'PCMCIA RS232–550 (COMx)'** entry and record the COMx setting.
7. Right click and select **"Uninstall."** Confirm the action in the pop-up window.
8. Remove the PCMCIA card from the Laptop.
9. Reinstall the PCMCIA card and wait until the 'new hardware wizard' comes up.
10. Under the message, *"Can Windows connect to Windows Update to search for software?"* select **"No, not this time"** and click **Next >**
11. Select *"Install the software automatically (Recommended)"* option and click **Next >**.
12. Click **Finish** to close the wizard.
13. Go back to the Device Manager and verify the COMx port assignment. If a new COM port was assigned, refer to **Attention — Serial Port Settings** on page 725 to verify the COM port settings.
14. If you insert the PCMCIA-to-serial converter and the assigned COM port is beyond COM8 (which can't be used by CETool) go to **“Assigning COM Port Number to PCMCIA-to-serial Converter”**.

Assigning COM Port Number to PCMCIA-to-serial Converter

1. Start the CETool program
2. See **Figure 190**. Select Set Up -> Comm Properties

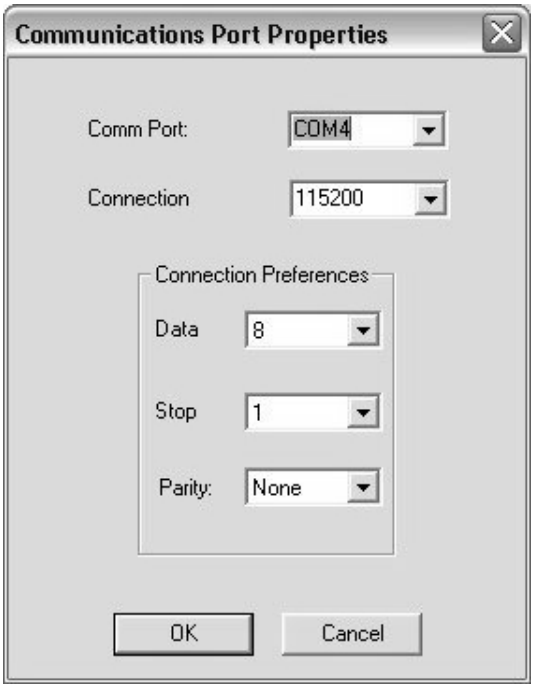


Figure 190. Communications Port Properties

3. Assign that same COM port to the PCMCIA-to-serial card using the Windows Device Manager
4. Ensure the PCMCIA is connected.

5. See **Figure 191**. Click Start -► Control Panel -► System, and select the "Hardware" Tab. Then click on "Device Manager."

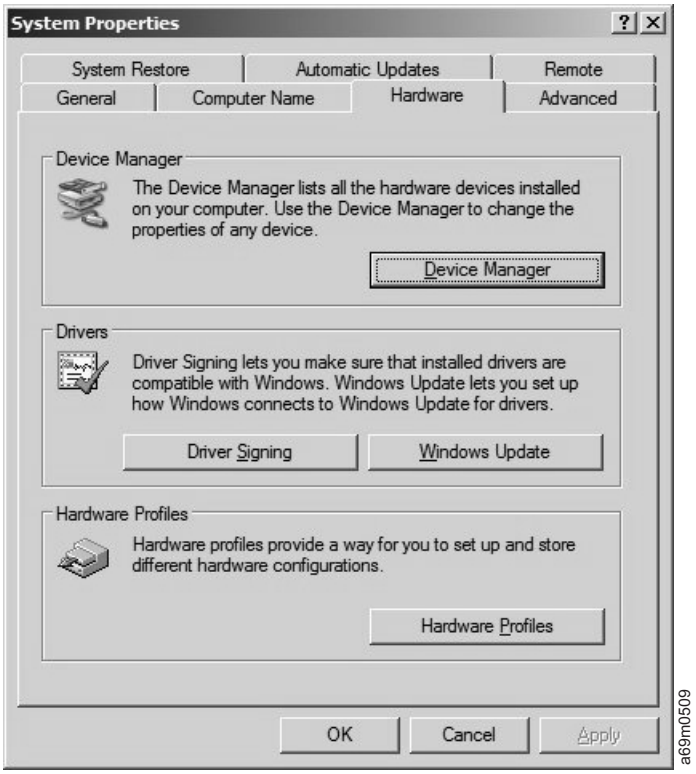


Figure 191. System Properties

6. See **Figure 192**. In Device Manager, locate the PCMCIA card.
7. See **Figure 193**. Click the right mouse button and select "Properties."

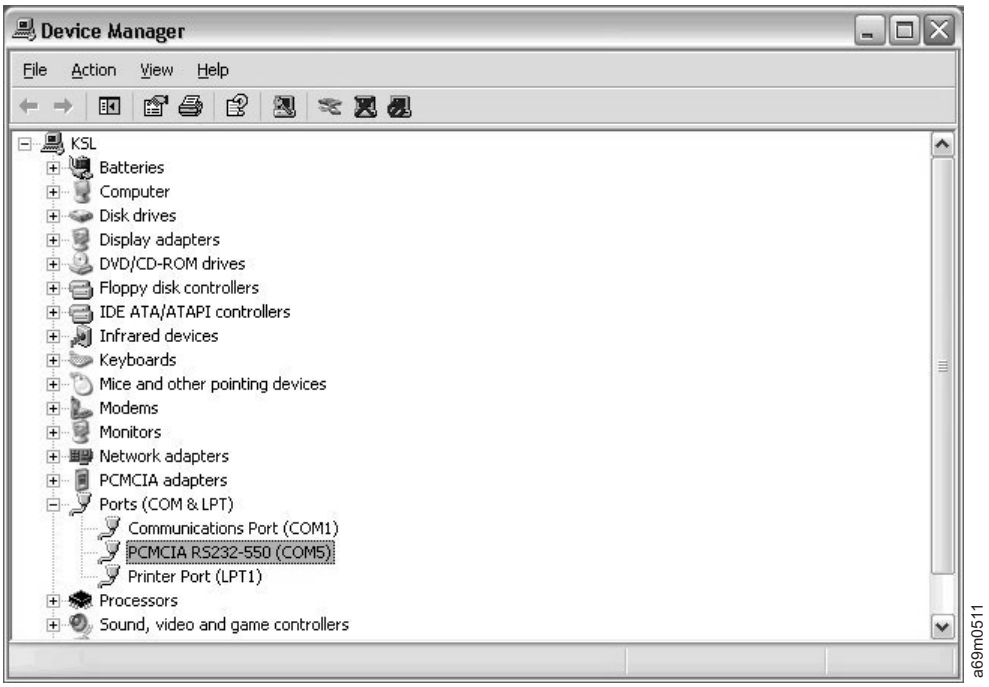


Figure 192. Device Manager

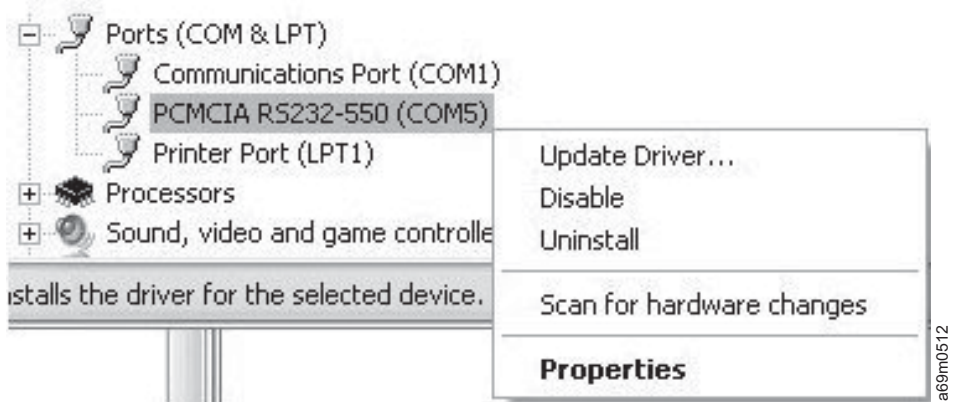


Figure 193. PCMCIA Properties

8. See **Figure 194**. Select the "Port Settings" tab and click "Advanced."
9. See **Figure 195**. Select the same COM port that is configured for CETool. **Note:** The port will show "in use" because CETool is configured for that port. You want the PCMCIA-to-serial converter configured to exactly that port.

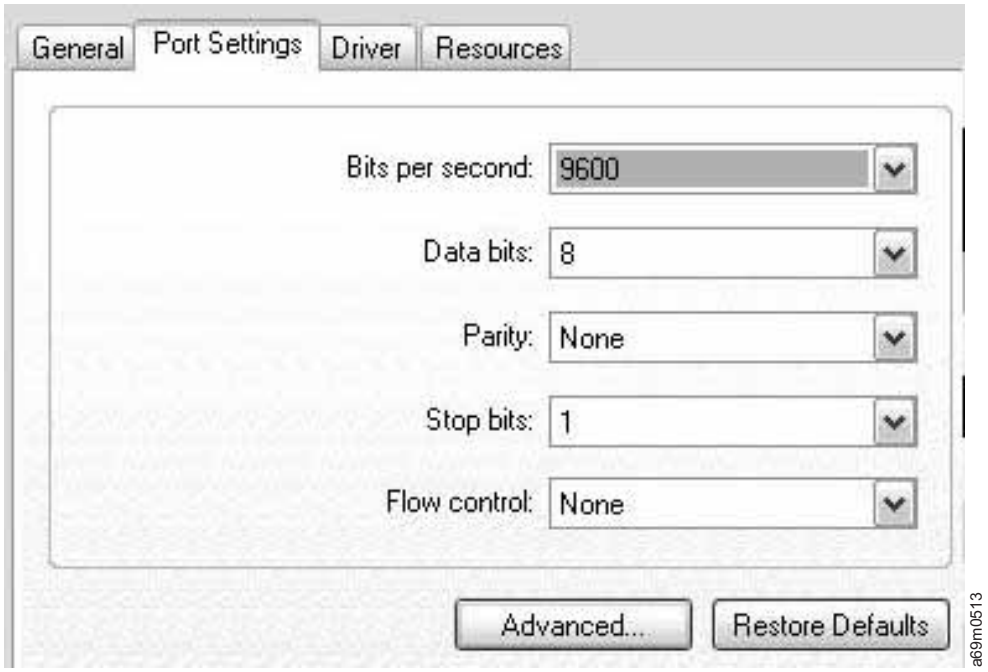


Figure 194. Port Settings

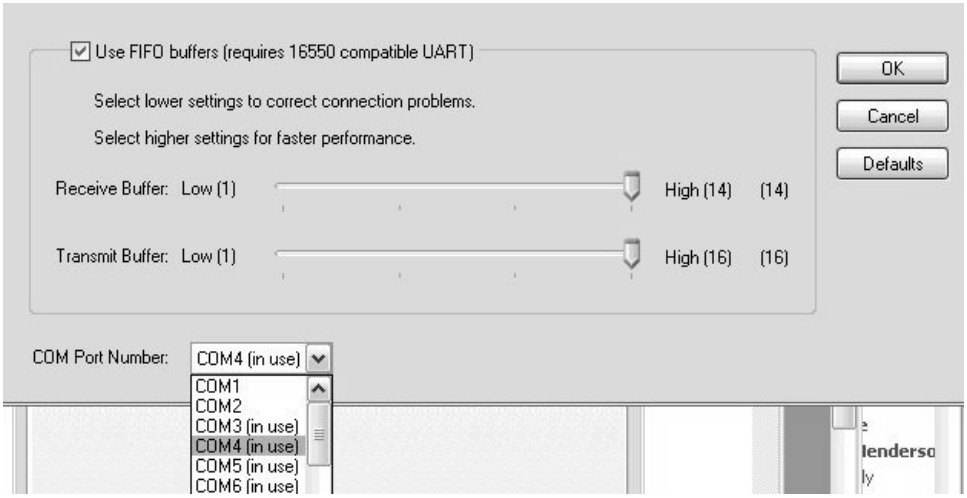


Figure 195. COM Port Assignment

CETool Compact Flash Card Reset Option

Each Compact Flash (CF) card contains a file called **cf.txt** that stores the machine serial number and the node card location (OPC, ACC, MDA, MCA). With CETool version 4.10 or later, this file can be reset. Situations where you may need to use this option are:

1. CF card gets swapped between node cards.
2. CF card gets swapped between libraries.
3. CF card from stock (for FRU replacement) has information from a different library. It may have been used earlier on another library, then returned to stock.
4. When you select this option, you will see the following screen. Select the node card CF to be reset:

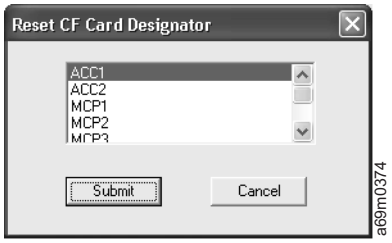


Figure 196. Compact Flash Reset Screen Example

Viewing Library Error Log Entries by Using CETool

Follow this procedure to view Library error log entries using CETool.

1. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP or MCA J1 connector.
2. Start the CETool program (see “Downloading and Installing CETool” on page 726.
3. With the CETool window open, click on **Commands**.
4. Click on **View Error Log**.
5. When the Open screen appears, highlight the error log file (i.e., xxx.errorlog.bin) you want to display, and click **Open**.

   Note: You cannot use this function to view an Event Log or a Servolog.
6. The resulting screen will display the errors in the log. The last non-zero entry is the most recent error.
7. Double click on the error log entry you wish to display.
8. The error log selected will look similar to Figure 197 on page 737.
9. For details on how to analyze the data in this screen, see “CETool Error Log Display Example” on page 641.

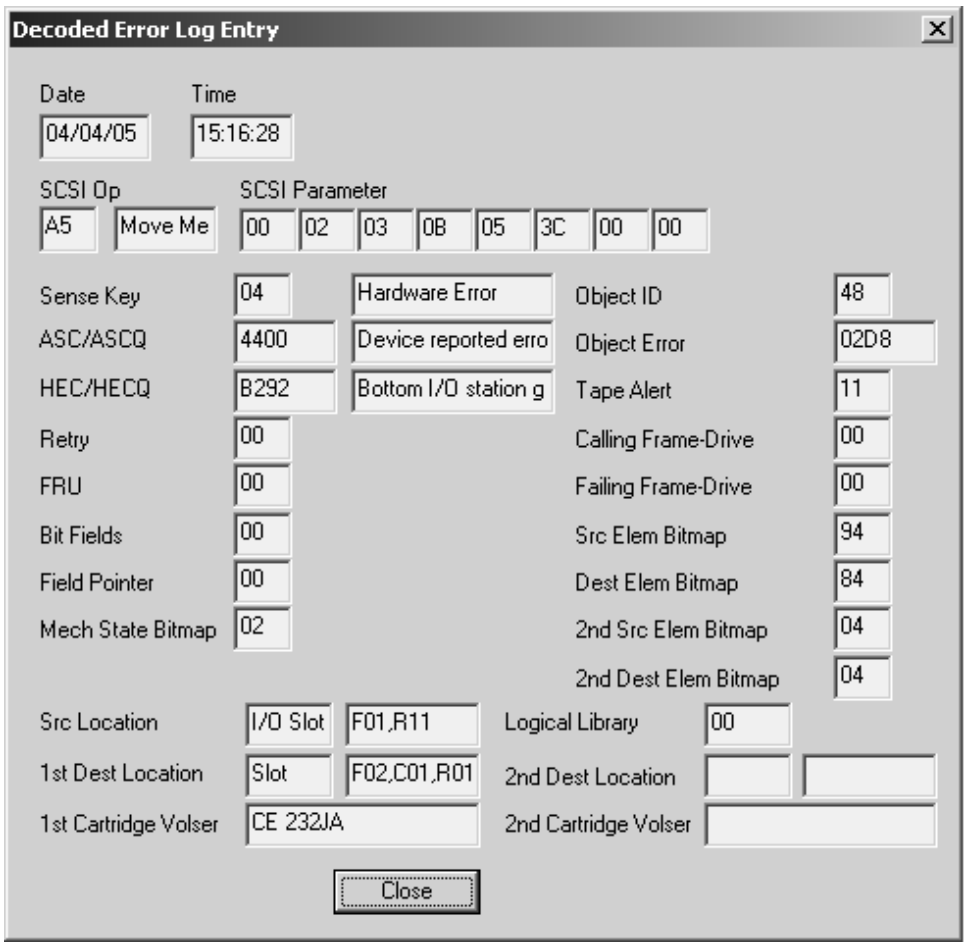


Figure 197. Error Log Screen Example

Using CETool to Change from LTO to Universal Grippers in L32 Frames

If you are running library firmware level 8xxx or higher, this procedure is not necessary. With earlier library firmware levels, use this procedure when doing a FRU replacement on an L32 frame to change the dual gripper type from LTO to Universal (LTO/3592). CETool version 4.5 or higher is required for this procedure.

Before using this procedure, the new Universal (LTO/3592) should already be installed. Use the steps listed in “Gripper Assembly, Single LTO (Old Style)” on page 956, or “Gripper Assembly, Single LTO (New Style)” on page 958 to replace your existing LTO dual grippers with the Universal (LTO/3592), then return here.

When you complete the "Finish Accessor Service" the grippers may sound erratic because the firmware does not recognize the new universal grippers. Use the following procedure to update NVRAM for the new universal grippers:

1. Start the CETool program.
2. See **Figure 198**. Click 'Commands,' and select "Set Gripper Type."
3. See **Figure 199**. The 'Select Gripper Type' dialog box will appear. Select CONTINUE.
4. See **Figure 200**. The CETool dialog box will appear. Select OK.
5. The ACC and OPC node cards will reset after the new universal gripper types are written into NVRAM.
6. The operator panel will display, "Validating Library Configuration."
7. The grippers will go through a self-test and will sound normal.
8. Run Library Verify to test gripper operation.
9. Return to the procedure that sent you here.

Table 84. CETool Commands

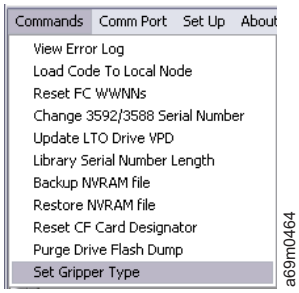


Figure 198. Select Drive for SN Change



Figure 199. Set Gripper Type Dialog Box

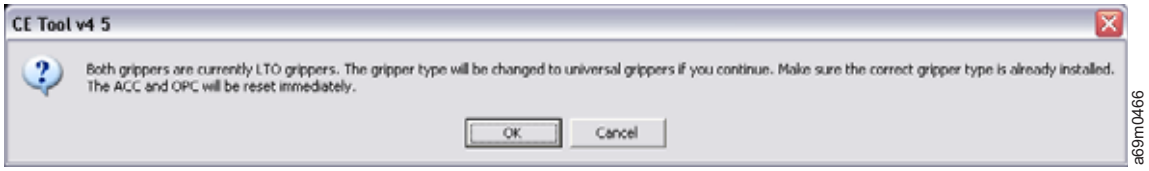


Figure 200. CETool Confirmation Screen

Changing 3592 / 3588 Serial Numbers

Follow this procedure to change a 3592 / 3588 drive serial number using CETool version 3.4 or higher.

1. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP or MCA J1 connector.
2. Disconnect the fibre cable(s) from the drive.
3. Start the CETool program. CETool version 3.4 or higher, and library firmware 4xxx or higher are required for this procedure. (See “Downloading and Installing CETool” on page 726.
4. With the CETool window open, click on **Commands**.
5. Click on **Change 3592 / 3588 Serial Number**.
6. See Figure 201. Only 3592 and 3588 (LTO Ultrium-3 and Ultrium-4) drives are shown. LTO Ultrium 1 and 2 drive serial numbers cannot be changed. Select the frame and drive location and click OK.
7. See Figure 202. Type in the new drive serial number and click OK.
8. Reconnect the fibre cable(s) to the drive.
9. Go to the Library operator panel. Select **Main Menu**, select **Vital Product VPD**, select **Drive Serial Numbers**, and verify that the drive serial number of the selected drive changed to the number you inputted from CETool.
10. Go to the back of the library. Do a drive reset on the selected drive by pulling it slightly out of the fixed tray, then re-seating the drive back into the fixed tray. This forces an update to the library copy of the drive VPD.

Table 85. Drive Serial Number Screens

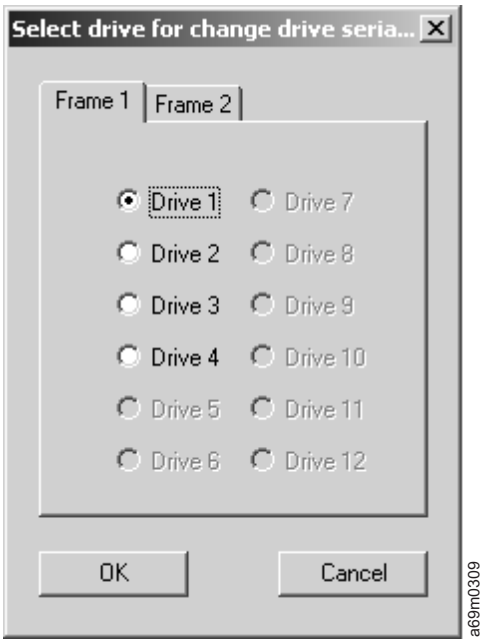


Figure 201. Select Drive for SN Change

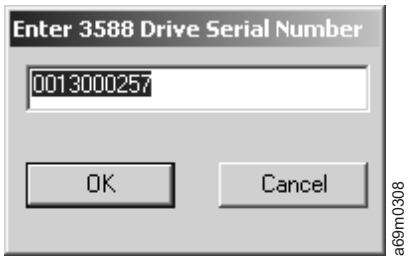


Figure 202. Drive Serial Number

Clearing a 3592 Flash Dump

Follow this procedure to clear a 3592 flash dump. **CETool version 4.3** or higher is required for this procedure.

Notes:
1. Library firmware 7050 or higher is required for this procedure.
2. 3592 J1A drive code 0A06 or higher is required for this procedure.
3. 3592 E05 drive code 1B16 or higher is required for this procedure.
4. 3592 E06/EU6 drive code D3I2 or higher is required for this procedure.

1. Use serial cable P/N 19P1061 or 23R4629 to connect the PC serial port to the MCP or MCA J1 connector.
2. Start the CETool program. CETool version 4.3 or higher is required for this procedure. (See “Downloading and Installing CETool” on page 726.
3. With the CETool window open, click on **Commands**.
4. Click on **Purge Drive Flash Dump**.
5. See Figure 203. Select the frame and drive location and click OK. **Note:** If the drive is not at one of the above listed code levels, you will get a message, *"Illegal Request."*
6. You will briefly see a screen come up as shown in Figure 204.
7. After the flash dump has been cleared, you will see a screen with a message, *"Purge drive flash dump successfully. Frame x, Drive y."*

Table 86. Flash Dump Procedure Screens

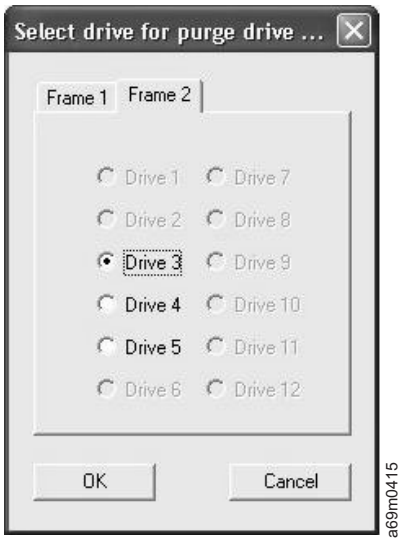


Figure 203. Flash Dump Screen

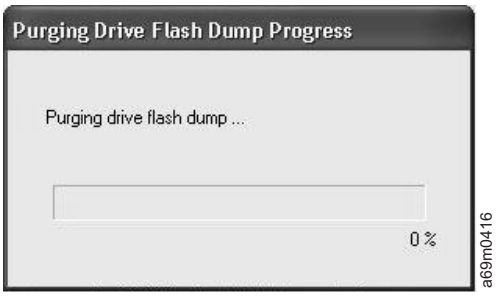


Figure 204. Purging Drive Flash Dump Progress

NVRAM Backup and Restore

NVRAM Backup

Note: The NVRAM image is stored on both the ACC and OPC node cards. In an HA1 library, the NVRAM image is also stored on the ACC cards on both accessors.

If Call Home is enabled then NVRAM is automatically backed-up each week. NVRAM is also backed-up any time a CE pulls library logs. The customer can also get a backup via the web user interface.

With CETool version 3.7 or higher, and Library firmware at 5550 or higher, NVRAM can be manually backed-up using the following procedure.

1. Start the CETool program (see “Downloading and Installing CETool” on page 726.
2. With the CETool window open, click on **Commands**.
3. Click on **Backup NVRAM file**.
4. **See Figure 205**. Create a subdirectory where you want to store the NVRAM backup and click **Select**.
5. **See Figure 206 on page 742**. Enter the name of the backup and click **OK**. There will be a delay as the backup process begins. The progress bar will show 0%. When the backup starts the screen will look like **Figure 207 on page 742**.
6. When the backup is complete you will see a screen similar to **Figure 208 on page 742.** Enter a user comment as shown in the figure.
7. Click **OK**.

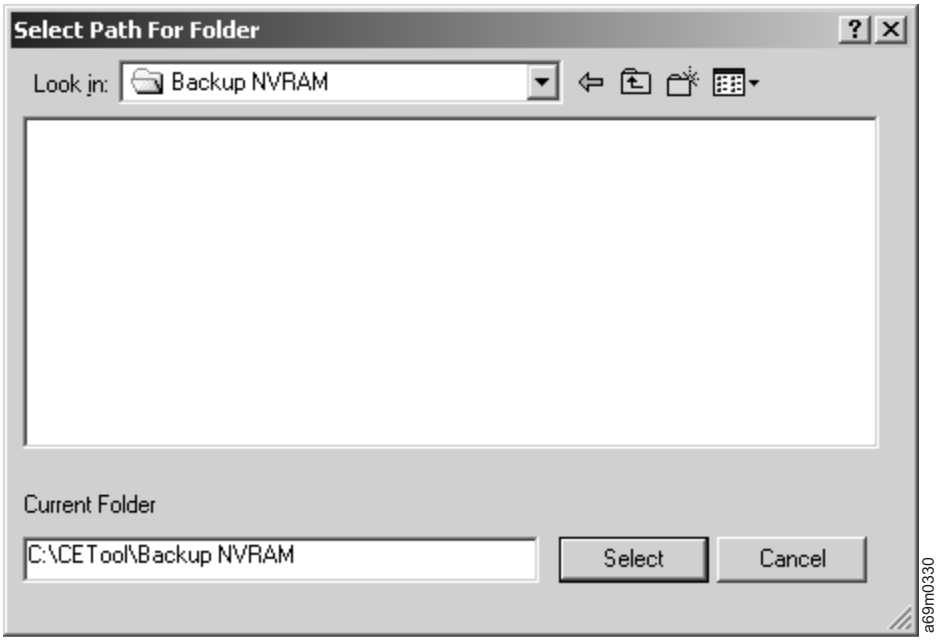


Figure 205. Select Path for Folder

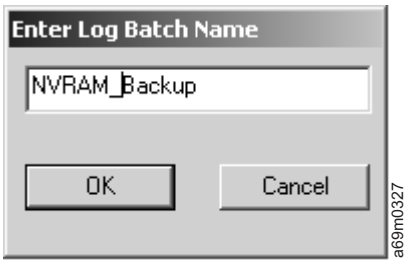


Figure 206. Enter Log Batch Name

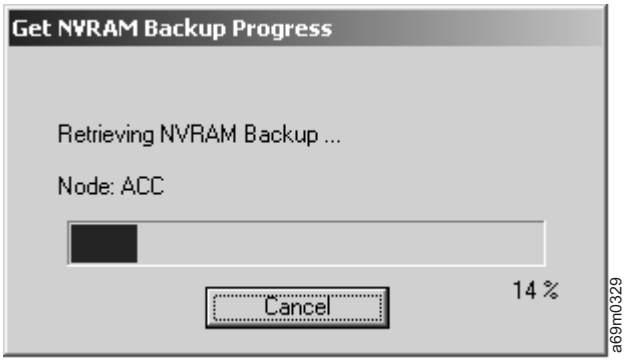


Figure 207. Get NVRAM Backup Progress

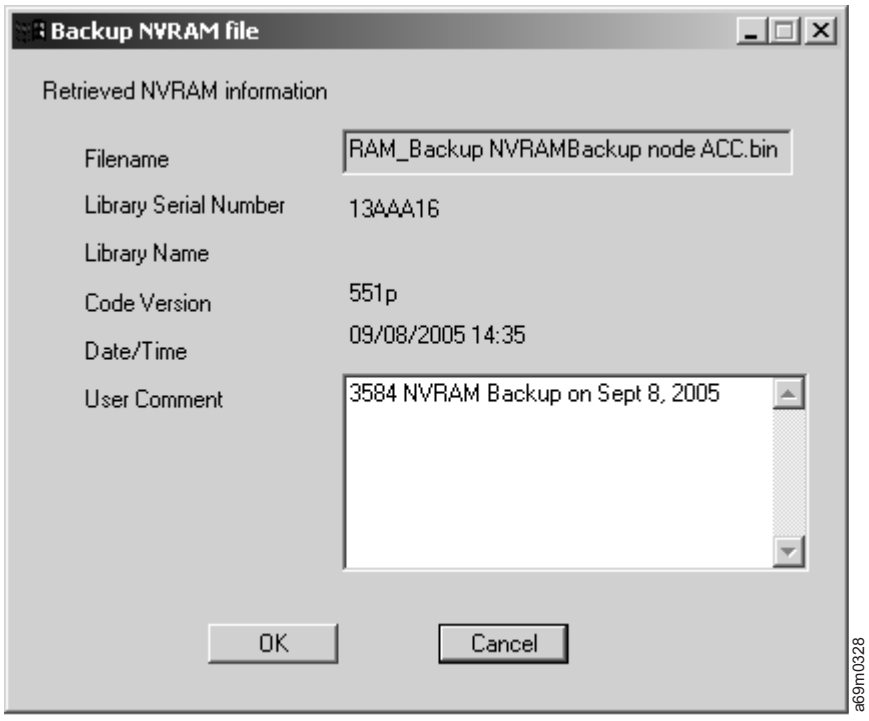


Figure 208. Backup NVRAM file

NVRAM Restore

With CETool version 3.7 or higher, NVRAM can be manually restored.

With CETool version 5.2 or higher, you will see the following screen. This screen indicates that an NVRAM restore should only be performed when directed by PFE.

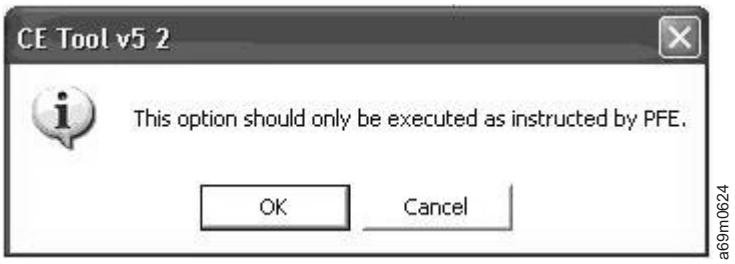


Figure 209. NVRAM Restore Warning

The NVRAM image is automatically sent to IBM through a weekly Heartbeat Call Home if this feature is installed on the library. A NVRAM backup file may be available if you stored an image using CETool. In addition, the customer has the ability of downloading an NVRAM image using the WebSpecialist. In the event none of those are available, you can use one that was sent through Call Home.

The image is available to Support personnel on the Call Home Data Access web site. If a machine has a failure that requires reloading NVRAM from a backup then Support personnel will pull a backup of the appropriate age (most recent one when the machine was still working correctly) from the Call Home web site and email it to the CE. The CE can then use CETool version 3.7 or higher to reload it using the following procedure.

1. Start the CETool program (see “Downloading and Installing CETool” on page 726.
2. With the CETool window open, click on **Commands**.
3. Click on **Restore NVRAM file**.
4. **See Figure 210 on page 744**. Locate the subdirectory where the NVRAM image is stored. Select the file, then click **Open**.

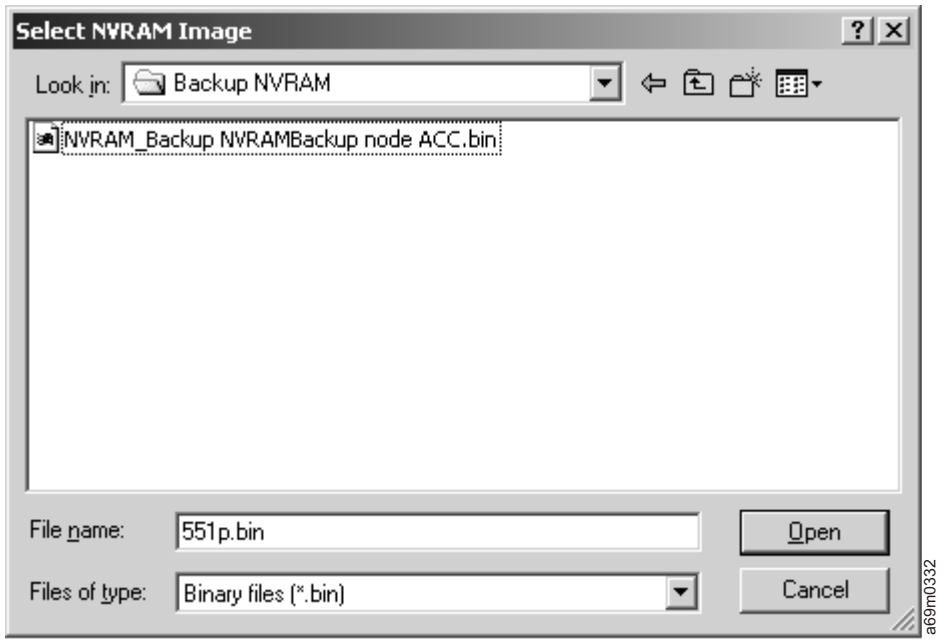
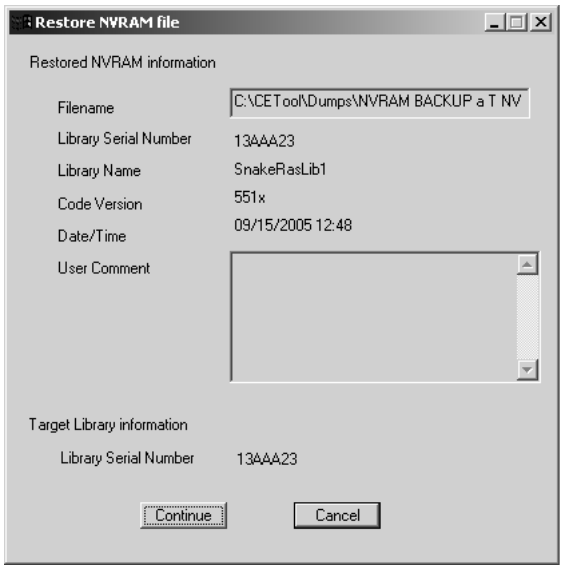


Figure 210. Select NVRAM Image

5. **See Figure 211**. Verify that both serial numbers in this window are the same. **Note:** If the serial number of the library and the serial number of NVRAM backup file do not agree, the restore will terminate.
6. Click **Continue**. The restore process will begin as shown in **Figure 212**



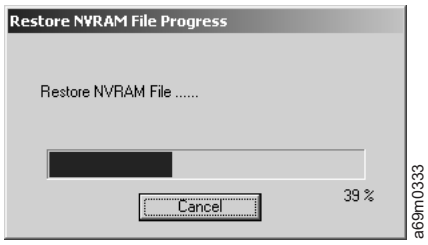


Figure 212. Restore NVRAM File Progress

Figure 211. Restore NVRAM file

7. After NVRAM has been restored the operator panel will display 'initializing' while the library performs an inventory.
8. When the inventory is complete, the library will become Ready.

CETool Shuttle Car Firmware Download

CETool is used to download and install the shuttle car firmware. The shuttle car firmware image should have already been downloaded to your laptop.

See **Figure 213 on page 746**. Click on Shuttle Car **Load Code**.

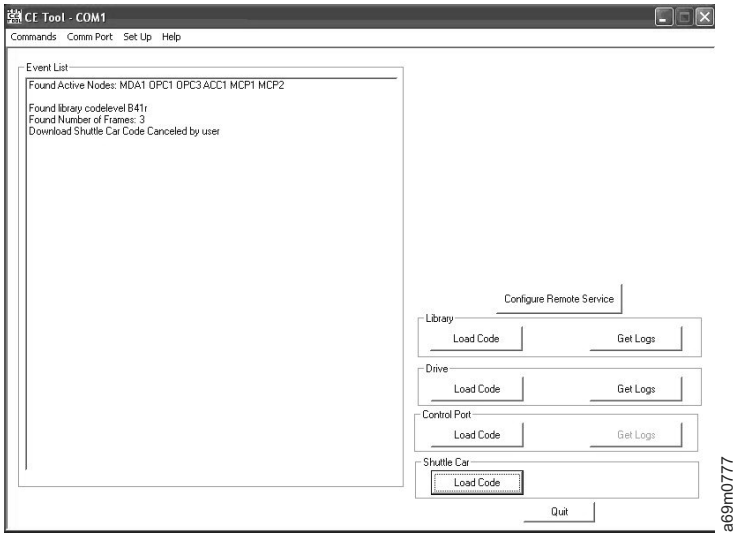


Figure 213. CETool Shuttle Car Firmware

CETool 5.7 Memory Verification/Correction Function

CETool 5.7 and later has a memory verification/correction function. This function works to clean up sections of NVRAM that may have been corrupted. This function should only be used under the guidance and direction of PFE.

Using CETool to Configure for Call Home (via Modem)

Follow this procedure to configure the library for Call Home via Modem (FC 2710). If you are configuring the library for Call Home via Master Console (FC 9217), go to “Using CETool to Configure for Call Home (via TSSC)” on page 750. 'TotalStorage Master Console' and 'TS3000 System Console' are one in the same.

Note: If you have not collected the necessary data to configure Call Home using CETool, see “Gathering Call Home Configuration Data” on page 754 before continuing with this procedure.

1. **For all countries except China:** CETool version 4.3 or later, and library firmware 7050 or later is recommended for this procedure. Start the CETool program (see “Downloading and Installing CETool” on page 726 for the procedure to download and configure CETool on your service laptop computer.
2. **For China only:** CETool version 4.4 or later, and library firmware 72xx or later is REQUIRED for this procedure. Start the CETool program (see “Downloading and Installing CETool” on page 726 for the procedure to download and configure CETool on your service laptop computer.
3. Double click the CETool icon on your desktop.
4. When the CETool screen displays, click on the **Configure Remote Service** button. **Figure 214 on page 747** will display if you are running CETool version 4.3. **Figure 215 on page 747** will display if you are running CETool version 4.4 or later, and library firmware 72xx or later. The difference is a new field called **Authentication Method** in the lower left of the screen.
5. Refer to **Table 87 on page 755** and select items from the table to insert into the Remote Serviceability Configuration screen.

   Note: "Heartbeat Interval" option was added with CETool version 4.3 or later. The interval can be set from 1 to 14 days, with 7 as the default.

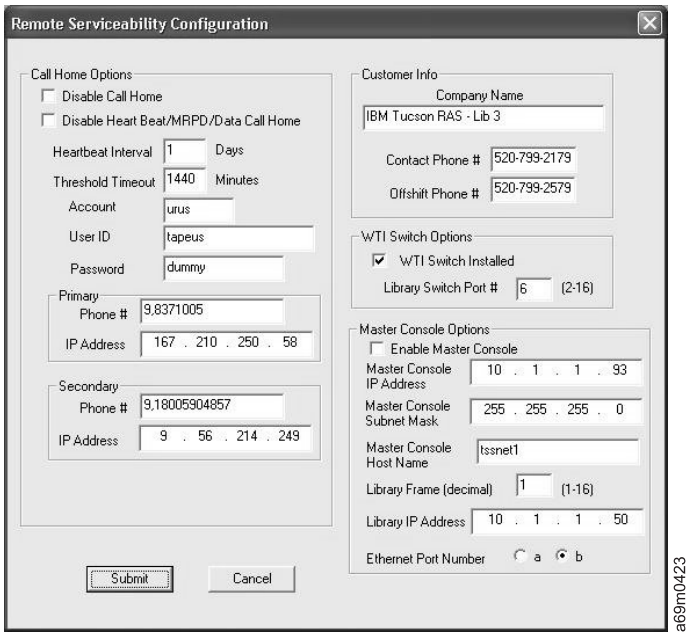


Figure 214. Remote Serviceability Configuration via Modem (CETool 4.3)

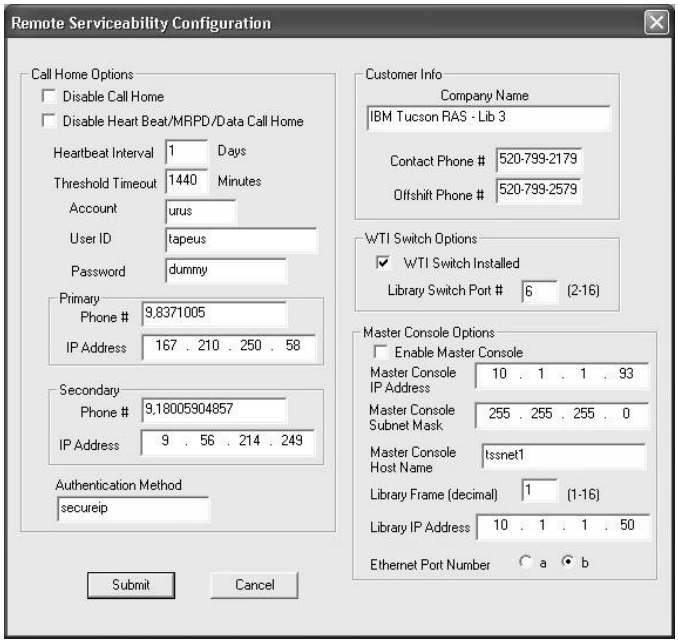


Figure 215. Remote Serviceability Configuration via Modem (CETool 4.4)

6. **For China call home only:** See Figure 216. In the 'Authentication Method' field, if you are required to use the new "fenced internet callhome" method, change the setting to *ATT/internet*. If "fenced internet callhome" method is not required, use the *secureip* setting.

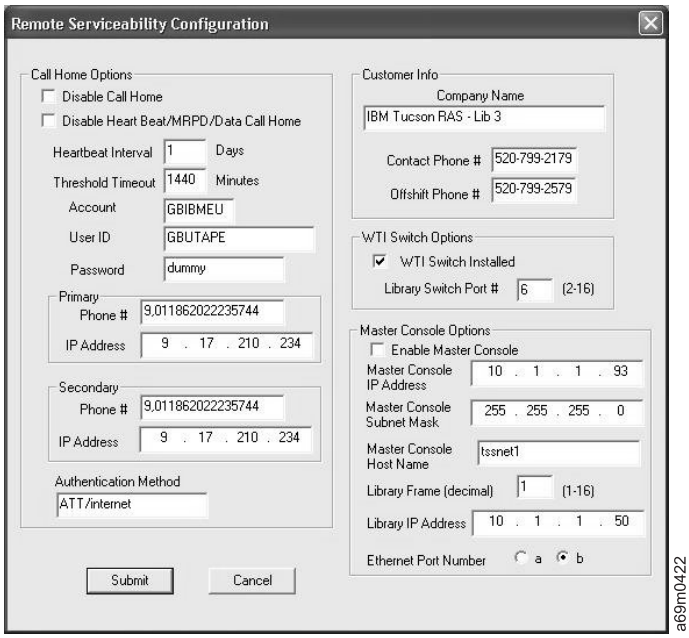


Figure 216. Remote Serviceability Configuration via Modem (China Only)

7. When the **Remote Serviceability Configuration** screen displays, enter the requested information, then click on the **Submit** button.

   Note: More information about the fields on this screen is available below.

Remote Serviceability Configuration screen details

- In the **Call Home Options** window, enter the following information:
  - The **Disable Call Home** checkbox should only be checked if the subsystem is NOT connected to a modem and phone line for use by the Remote Support facility.
  - The **Disable Heart Beat/MRPD/Data Call Home** checkbox should only be checked if the subsystem is NOT connected to a modem and phone line for use by the Remote Support facility.
  - The **Threshold Timeout** field should be set to 1440.

    Note: This is the time in minutes that must pass before the machine will call a second time if a specific error is occurring repeatedly. 1440 is 24 hours, so if a specific error occurs repeatedly, the machine will call home a second time after 24 hours, and again every 24 hours until the problem is resolved.

    Note: Call Home Configuration information (phone numbers, IP addresses, and other required information) can be found on the PFE website: **http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf**
    1. Select 'Open Systems'
    2. Select '3584 library'
    3. Scroll down and select 'Call Home Configuration'
    4. Follow the four steps listed to obtain the required information

  - The **Account** field should be set to the ACCOUNT as specified or as defined by your support group. **Note:** For example, for a library in the United States, set the **Account** field to ‘urus’.

  - The **USER ID** field should be set to the USER ID as specified or as defined by your support group. **Note:** For example, for a machine in the United States, set the **USER ID** field to ‘tapeus’

  - The **Password** field depends on whether the PASSWORD field is blank. If a blank password is specified then enter ‘dummy’ into the **Password** field.

- In the **Primary** window, enter the following information:
  - The **Phone #** field should be set to the primary phone number which you recorded earlier in this procedure. **Note:** Do not enter dashes in the phone number. For example, if the phone number is 9–1–520–461–0205, enter 915204610205.

  - The **IP Address** field should be set to IP Address of the primary Retain server for your location, which you recorded earlier in this procedure.

- In the **Secondary** window, enter the following information:
  - The **Secondary #** field should be set to the secondary phone number which you recorded earlier in this procedure. **Note:** If there is no secondary (alternate) phone number available, you may leave this field and the following fields blank. Do not enter dashes in the phone number.

  - The **IP Address** field should be set to the IP Address of the secondary Retain server for your location, which you recorded earlier in this procedure.

In the **Customer Info** window, enter the following information:

- Customer's company name
- Area code and phone number that can be used to contact the customer during normal business hours.
- Area code and phone number that can be used to contact the customer outside of normal business hours.
- Select SUBMIT.

In the **WTI Switch Options** window, enter the following information:

- If a WTI switch box is installed (FC 2711 and 2712), enter the port number of the WTI switch where the cable from the MCP or MCA RS-232 J6 is connected to. Port 1 is reserved for the Modem. Ports 2 through 16 are for additional MCP or MCA library inputs.

This ends the configuration procedure.

Using CETool to Configure for Call Home (via TSSC)

Follow this procedure to configure the library for Call Home via TSSC (FC 9217). If you are configuring the library for Call Home via Modem (FC 2710), go to “Using CETool to Configure for Call Home (via Modem)” on page 746.

Note: If you have not collected the necessary data to configure Call Home using CETool, see “Gathering Call Home Configuration Data” on page 754 before continuing with this procedure.

1. **Note:** See FC 9217 installation instructions for prerequisites and Bill of Material listing before you continue.
2. CETool version 4.3 or later, and library firmware 7050 or later is recommended for this procedure. Start the CETool program (see “Downloading and Installing CETool” on page 726 for the procedure to download and configure CETool on your service laptop computer.
3. Double click the CETool icon on your desktop.
4. When the CETool screen displays, click on the **Configure Remote Service** button.
5. Refer to Table 87 on page 755 and select items from the table to insert into the Remote Serviceability Configuration screen.

   Note: "Heartbeat Interval" option was added with CETool version 4.3 or later. The interval can be set from 1 to 14 days, with 7 as the default.
6. See **Figure 217**.

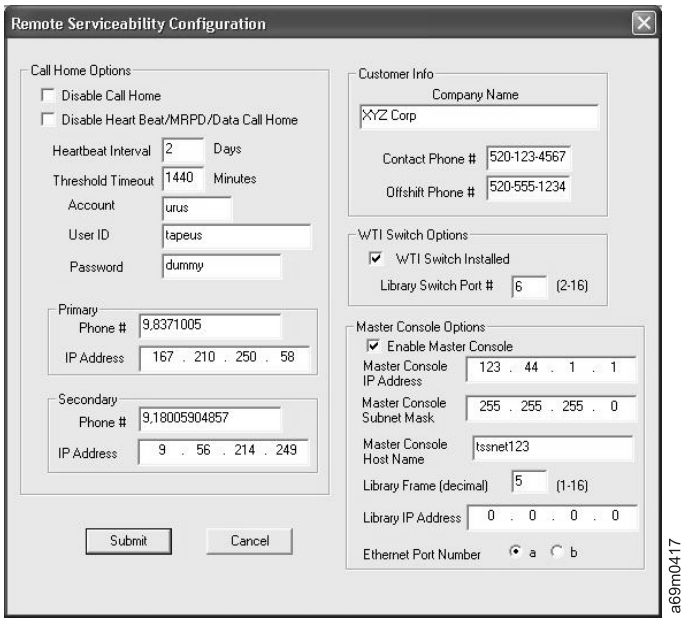


Figure 217. Remote Serviceability Configuration via TSSC

7. Use CETool to set the following fields:
   a. Ensure that the **Disable Call Home** checkbox is **not** checked.
   b. Ensure that the **Disable Heart Beat /MRPD/Data Call Home** checkbox is **not** checked.
   c. Enter a call home **Heartbeat Interval** value of 1 to 14 days. A value of 7 is the default.
   d. Ensure that the **Threshold Timeout** field is set to 1440 minutes.
   e. Enter the customer name in the **Company Name** field.
   f. Enter the customer phone number in the **Contact Phone #** field.
   g. Enter the customer off-shift phone number in the **Offshift Phone #** field.
   h. No other fields need to be set, since the other fields are only used when the 3584 calls home via a serial connection to a modem.

8. Check the box **Enable Master Console** under *"Master Console Options."*
9. Set the following fields in the "Master Console Options" screen:
   a. Set the **Master Console IP Address** field to 172.31.1.1 **Note:** This is the default IP address for the Master Console.
   b. Set the **Master Console Subnet Mask** field to 255.255.255.0
   c. Set the **Master Console Host Name** field to the host name of the Master Console. The default host name is tssnet1
   d. Determine the 3584 frame number for the frame containing the ethernet-capable MCP or MCA that will be used for the connection to the Master Console. Type that number in the **Library Frame (decimal)** field. **Note:** The Lxx frame is always frame 1, even if an HA1 frame (Service Bay A) is attached. Also note that the two-character display on the MCP or MCA will typically be flashing 00 and the frame number.
   e. Set the **Library IP Address** to 172.31.1.170

      Note: This is the default IP address for a 3584 library attached to a Master Console. If you have more than one 3584 library attached to a single Master Console then increment the last number for each additional library. As an example, the first library would have IP address 172.31.1.17**0**, the second library would have IP address 172.31.1.17**1**, the third library would have IP address 172.31.1.17**2**, and so forth.
10. Click on **SUBMIT**.
11. Click the **Configure Remote Service** button again, and review the configuration data entered above. When the data has all been set correctly exit the CETool program.
12. The 3584 library should now be configured to call home via the Master Console. Initiate a test call home to verify this. At the 3584 operator panel, press the **MENU** button, then select **Service**, **Tests/Tools**, **Diagnostics**, **Call Home**.

Using Web Specialist to Configure for Call Home (via TSSC)

In the past, when setting up call home for either modem call home or via TSSC, you had to use CETool. With firmware level 8xxx, it is now possible to setup call home via TSSC from the Web Specialist.

Note: At this time the Heartbeat Interval (default = 7 days) and the Threshold Timeout (default = 1440 minutes) can not be modified via the Web Specialist. If these fields need to be modified, CETool must be used.

From the Web Specialist, go to the **Access -►Library IP Addresses** web page. Select to modify port 2 of the frame where the TSSC is connected. The following window will display:

1. Select **Use IPv4**.
2. Select **Use static IP address**.
3. Fill in the IP address for port 2 of the library and the Net Mask.
4. For the Gateway, an IP address of 0.0.0.0 should work, but the library web page does not allow that value at this time. So just enter in the value for the TSSC (172.31.1.1).
5. Check the box **Use this port for Master Console**.

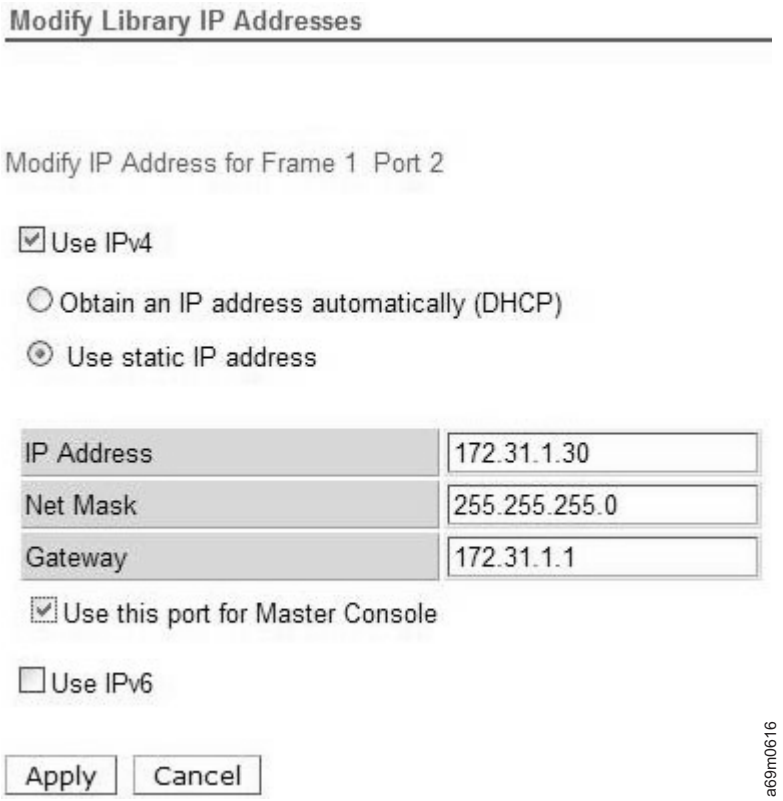


Figure 218. Modify Library IP Addresses Screen

Next, from the Web Specialist, go to the **Service -► Master Console** web page.

1. Enable **Master Console**.
2. Leave **Heartbeat Call Home** enabled if desired.
3. Fill in the **Customer Name**.
4. Fill in the **Master Console IP address** and **Master Console Subnet Mask** of the TSSC.
5. Type in the **Host Name** of the TSSC.

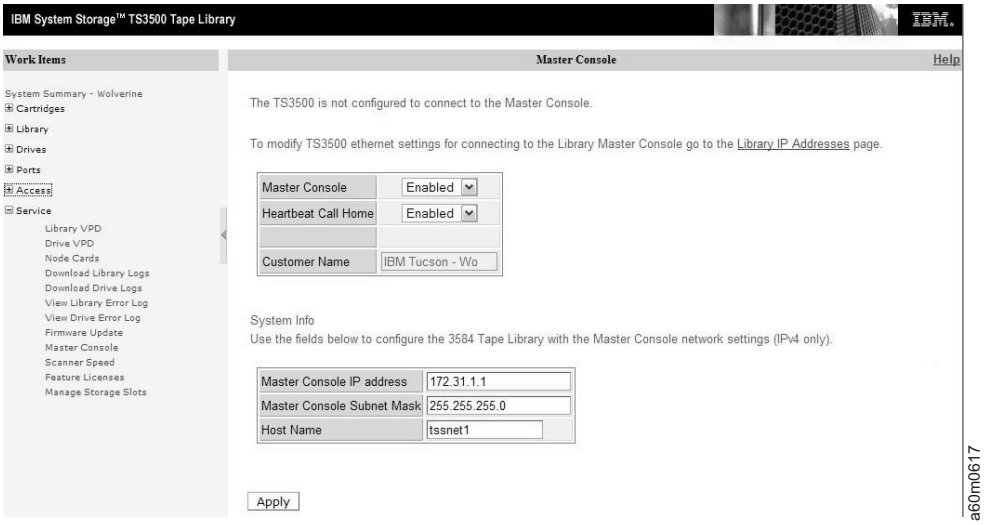


Figure 219. TS3500 Master Console Screen

Call Home Facility Configuration

TSSC (TS3000) Master Console Connectivity

With the introduction of the L23/L53, three new feature codes were provided that allow Call Home through the TSSC TS3000 Master Console. Since the MCA card now comes standard with two Ethernet ports, the Master/System Console can be connected to any new 3584 library. As a result, there are new feature codes for ordering the Master/System Console as an alternative remote support option for any 3584, and will no longer be limited to mainframe environment via 3953 Master/System Console.

Figure 220 shows a diagram of these three new feature codes.

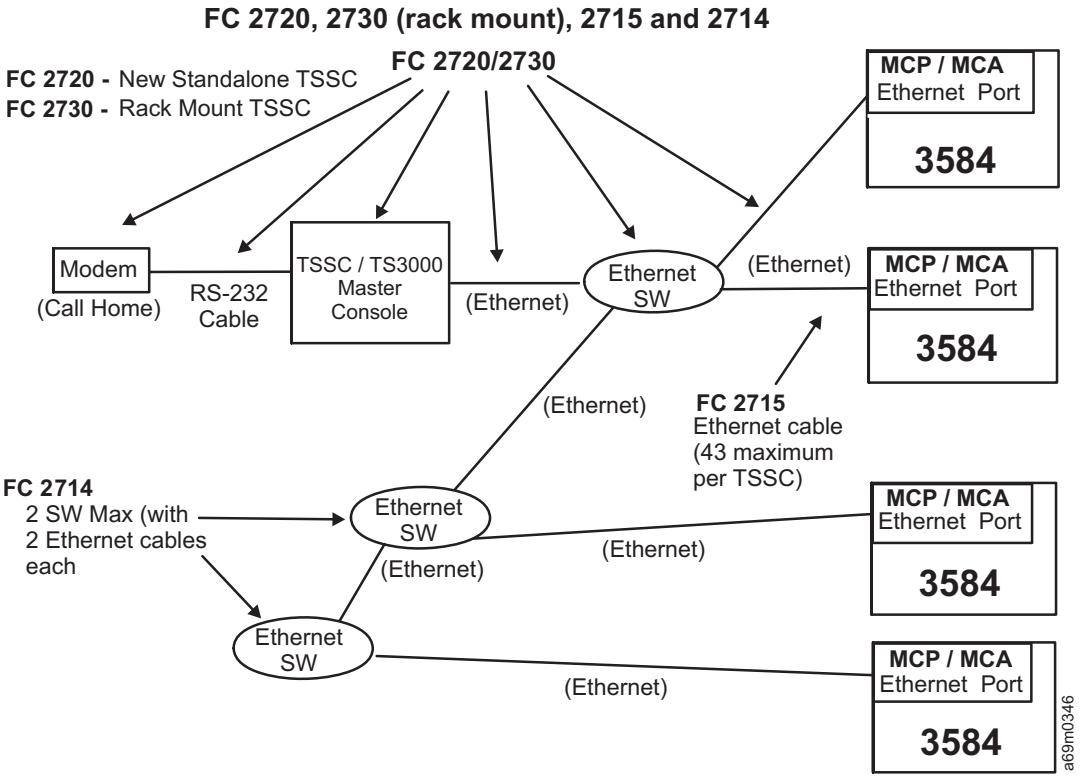


Figure 220. FC 2720, 2715, & 2714

Gathering Call Home Configuration Data

The following data will be necessary before you can complete Call Home facility configuration using the CETool. For necessary configuration data listed below, call your nearest 3584 Support Center for inputs. When you talk with the support center, provide to them the country, region/state/province, and city where the library is installed. If you cannot determine this information, call the support center for assistance. The support center can provide you with the appropriate configuration information for your country, region/state/province, and city. Write these inputs into Table 87 on page 755 for future reference. Numbers already recorded in the **Entry** column are the recommended values. Blank entries in the table are location or customer specific.

Record your customer location information and the information provided by your support center in Table 87 for future reference.

Table 87. Call Home Configuration Data

Configuration Item	Example	Your Entry
Your Customer's Location		
ISO Country Code	US	_____
Region/State/Province	AZ (Arizona)	_____
Location/City	Tucson	_____
Call Home Options		
Uncheck Disable Call Home	N/A	N/A
Uncheck Heartbeat/MRPD/Data Call Home	N/A	N/A
Heartbeat Interval	7 (default value)	
Threshold Timeout Minutes	1440	1440
Account	IBM	_____
User ID	TAPE	_____
Password	password	_____
Primary Phone #	94610205	_____
Primary IP Address	123.456.789.01	_____
Secondary Phone #	98371005	_____
Secondary IP Address	123.456.789.02	_____
Authentication Method	secureip or ATT/internet (China only)	_____
Customer Info		
Company Name	XYZ Corp	_____
Contact Phone #	8005551234	_____
Offshift Phone #	8005555678	_____

Notes:

1. Hyphens '-' in phone numbers are depicted in these notes to provide clarity. There is no hyphen available on your telephone.
2. Since there are two numbers listed for Tucson, use the first number as primary and the second number as secondary. For locations with only a single entry, you may use a nearby location, use a distant location requiring a toll call, or leave this field blank.
3. If a phone number is a local call, leave off the area code. For example, for a machine located in Tucson, AZ, the numbers listed are local calls, so record 461-0205 as the primary number and 547-0678 as the secondary number. If a phone numbers is NOT a local call, you must use '1-' followed by the area code, then the number. If the machine is located near Tucson but outside the Tucson local calling area, the primary number is 1-520-461-0205 and the secondary number is 1-520-547-0678.
4. If the phone line used for the Call Home modem requires a dial-out prefix (such as dialing a '9' before the phone number), include this prefix with the phone number. For example, in Tucson, AZ, if you must dial 9 for an outside line, record 9-461-0205 as the primary number and 9-547-0678 as the secondary number.
5. Before you use these phone numbers to configure Call Home, if possible you should attempt to call them with a telephone to ensure the number and dial-out prefix are correct. If you can not place a call using a normal telephone, the modem will not be able to place the call either. If a modem picks up on

the other end of the phone, you will hear a modem beep which indicates your call did reach the modem. This indicates that the phone number you have selected is working. Hang up the phone.

6. In some areas, after dialing a dial-out prefix such as '9', there is a short delay before you get a dial tone. In this case you need to add a 'W' to the dial-out prefix to force the modem to wait for a dial tone before dialing the rest of the phone number. In the example of a machine in Tucson, AZ, the primary number would be 9W-461-0205 and the secondary number would be 9W-547-0678.
7. The 3584 Remote Support Facility (Call Home) defaults to Tone dialing. The following modifiers can be added within the phone number specified during the Call Home Configuration.

Table 88. Call Home Phone Number Modifiers for Dial Tone

Phone Number Modifier	Description	Usage Notes
P	Pulse Dial	When using the modem on a phone system requiring Pulse dialing, enter phone number 1234567 as P1234567
T	Tone Dial	Not required. The 3584 defaults to Tone dialing.
W	Wait for Dial Tone	When using the modem on a phone system that requires waiting for another dial tone before dialing additional numbers, insert a **W** in the phone number at the place where you must wait. For example, if you dial 123 and wait for a dial tone, then dial 456789, you can enter the phone number as 123**W**456789.
, (comma)	Delay for 2 seconds before dialing next digit	When using the modem on a phone system that requires a brief pause before dialing additional numbers, insert a **,** (comma) in the phone number at the place where you must pause. For example, if you dial 123 and pause, then dial 456789, enter the phone number as 123**,**456789. The pause is approximately 2 seconds. For a longer pause, enter more than one comma.

8. Configuring a modem may require different phone number dial-prefixes in some areas. If you are unable to determine a working primary phone number for Call Home, contact your next level of support for assistance.

Operator Panel Security

There is a security option on the Tape Library Specialist web interface to enable a password for the operator panel. There is more information on operator panel security in Chapter 3 of the ***3584 Tape Library Operator Guide***.

The default pre-programmed password for Service personnel is: **ser001**. To unlock the operator panel, perform the following steps:

1. On the Activity screen, press the UNLOCK button.
2. The Password Entry screen displays. The screen initially displays without any asterisks or characters in the line above the keypad.
3. Press the first character of the password. Then press the next character. The first character is added as an asterisk to the line above the keypad. As you press each character, the previously entered character displays as an asterisk. When you type the last character (and press ENTER) it displays not as an asterisk but as the character that you entered.
4. When you have finished entering the password, press ENTER. The Activity panel redisplays with the LOCK, MENU, and PAUSE buttons.

Web User Interface Security

If the customer is using a Web User Interface (Web UI) there are options that allow the CE access the library through the interface:

- If the customer has not enabled web security, anyone will have full access through the Web UI.
- If the customer has enabled web security, the CE will have limited access to the library via the Web UI.
- If the customer has enabled web security, and is willing to grant selective access to the CE, the customer can assign a special logon and password.

See Figure 221. For general (but limited) Service access, select the Logon screen:

- User ID: **service**
- Password: **service**



Figure 221. Service Login Screen

See **Figure 222**. These are the Web UI items available to the CE when logged in as 'Service'.

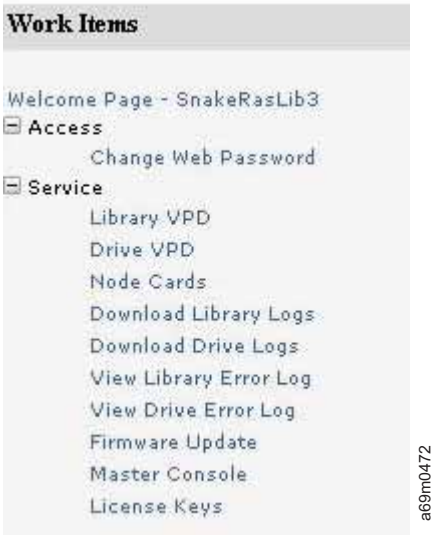


Figure 222. Service Login Items Available to the CE

HyperTerminal (Laptop)

Configuring HyperTerminal for Connection to 3592 Drive

Use this procedure the first time you connect the mobile service terminal laptop to a 3592 drive.

Note: You may use any terminal emulator program. If using a terminal emulator other than HyperTerminal, review the following steps to obtain the settings needed to communicate with the 3592 drive.

1. On your laptop, start the HyperTerminal program. Select **Start**, **All Programs**, **Accessories**, **Communications**, and **HyperTerminal**. If you don't have a HyperTerminal icon on the Accessories drop down menu, go to Communications first.
2. If the 'New Connection' screen is displayed, you must select a name and an icon for this connection. Type **3592J1A**, **3592E05**, or **3592E06** in the name field, and select an icon from the list. Click on **OK**.
3. If the 'Connect to 3592J1A' 'Connect to 3592E05' or 'Connect to 3592E06' screen is displayed, ensure that the 'Connect Using' field is set to the appropriate serial port on your laptop, (for example, COM1). Click on **OK**.
4. If the 'COM1 Properties' screen is displayed, select the following settings:

Bits per Second	115200
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	None

5. Click on the **File** pulldown menu, then click on **Properties**. Click on the **Settings** tab. Click on the **ASCII Setup** button. Ensure that the 'Echo Typed Characters Locally' field is checked. Click on **OK** (twice).
6. Exit the HyperTerminal program.
7. If the 'You are currently connected. Are you sure you want to disconnect now?' screen is displayed, click on **YES**.
8. If the 'Do you want to save session 3592J1A?' screen is displayed, click on **YES**.

Library Verify Test

Library Verify will ensure that the library and selected drives are operating correctly, without the need for host interaction. While Library Verify **does not verify the SCSI or fibre channel connection** between the drives and the host, most other areas of the library are verified. If a failure is detected, an appropriate error code is displayed. Library Verify is run from the library operator panel.

If Library Verify is selected to run using an accessor that is not behind a barrier door, it will run the normal tests as selected. If both accessors are selected after the full verify tests are run on accessor A, a subset of tests will be run on accessor B. If the selected accessor is behind a barrier door then a modified version of Library Verify will be run called 'accessor verify.'

Library Firmware version 6090 or higher incorporates a door safety interlock open/close test. You will see the following message. This example shows the result of running this test on a 3-frame HA (dual-accessor) library. This routine should be run on every new library installation, when adding new library frames, or whenever you suspect a door interlock problem (such as URC A285):

```
Open one door, leave it open at least 2 seconds, then close it.
Repeat this process for each door to be tested.
When finished review the door open/close sequence below to determine whether it
accurately reflects the test sequence performed.
Press ENTER when you have completed this test.
CAUTION: Do not disturb cartridges. The test needs to be
completed within 6 minutes.

Door currently open: None
Door open/close sequence: SBA 1  2  3  SBB
```

To bypass this test, press CANCEL.

1. There are several options available when running Library Verify. The options listed below can only be run on an accessor that is not behind the barrier door:
   - If you are running Library Verify on a dual accessor library, you will be given the option to include **Both Accessors**, **Accessor A**, or **Accessor B**.
   - Verify the library, but select **no drives**. If you are servicing the accessor, you will usually select **no drives**. If **no drives** is selected, the customer can continue to use the entire library.
   - Verify the library and only **one drive** (see notes below). If you are servicing a drive, you will usually select **one drive**. If **one drive** is selected, the customer can use everything except the selected drive.
   - Verify the library and only **RANGE of drives** (see notes below). If you are servicing a range of drives, you can select **RANGE of drives**. If **RANGE of drives** is selected, the customer can use everything except the drives in the selected range. **Note:** this option is only available with library firmware 50xx or higher.
   - Verify the library and **all drives** (see notes below). If you have just installed the machine, you will usually select **all drives**. If **all drives** is selected, the customer cannot use the library.

     Notes:

     a. The required CE cartridge should be located in the upper left corner of the first drive frame of LTO or 3592.

     b. If you are verifying one or all drives, you have the option to verify read/write capability. **See "Read/Write capabilities among LTO Ultrium-1, 2, and 3 data cartridges" on page 52.**

     c. If the diagnostic cartridge is NOT compatible with the drive being tested, then the library code will prompt you to put the necessary diagnostic cartridge in the I/O station. The gripper will get the cartridge and load it from there. After testing is complete the cartridge will be moved back to the I/O station. You then remove it and store it in the back of the Lxx frame.

     d. To run specific stand-alone drive diagnostics, select **MENU**-> **Service**-> **Tests/Tools**-> **Diagnostics**-> **Drives**. Make a test selection from the Drives menu.

2. Ask the customer to use their host application to unload and put away any cartridges that are located in the drives that you will be selecting.

   Notes:

   a. If a failure makes it impossible to unload and put away a cartridge from the host, you may need to remove the cartridge manually before you test a drive, refer to “Manually Removing Cartridge” on page 1045.

   b. Do not use the customer's data cartridges for this test. Use only the Diagnostic Cartridge. This is a normal scratch tape cartridge, except that the bar code label identifies it as the diagnostic cartridge.

3. At the **Activity** screen, press [MENU].
4. At the **Main Menu** screen, select **Service**, and press **[Enter]**.
5. At the **Service** screen, select **Library Verify**, and press **[Enter]**.
6. You are given the choice to test **no drives**, **one drive**, **all drives** or **range of drives**. Make your choice, and press **[Enter]**.
   - If you are servicing a drive, you will usually select **one drive**. If **one drive** is selected, the customer can use everything except the selected drive.
   - If you are servicing the accessor, you will usually select **no drives**. If **no drives** is selected, the customer can continue to use the entire library.
   - If you have just installed the machine, you may select **RANGE of drives**. If **RANGE of drives** is selected, the customer can use the library but cannot use any drive in the selected test range.
   - If you have just installed the machine, you will usually select **all drives**. If **all drives** is selected, the customer cannot use the library.
7. Follow the instructions on the screen.

   Allow Library Verify to complete before proceeding. Library Verify can take as long as 10 minutes to run the Read Write test on a single drive, and longer when testing multiple drives. Do not assume that the test has failed unless you see no sign of activity, such as no operator panel activity or accessor movement for 10 minutes. If Library Verify fails and no message is posted, attempt to capture the library logs (see “Creating Library Dump by Using CETool” on page 718) and contact Support.

   Note: If you are running **all drives** and you get a failure in a non-critical area (such as one drive), you may wish to continue testing the rest of the library and repair that drive later.

8. If Library Verify **failed**, do the following:
   a. If you have a **library error code**, go to “Library Sense Data to URC Table” on page 279. Use 04 44 00 and the Error Code to determine the URC. Go to “URC Table With Descriptions, Actions, and FRUs” on page 375, and follow the instructions.

   b. If you have a **drive error code** for an LTO Ultrium-1 drive, locate the FSC in “LTO Ultrium-1 Drive FSC to URC Table” on page 364, and perform the action suggested in “URC Table With Descriptions, Actions, and FRUs” on page 375. For an LTO Ultrium-2, Ultrium-3, or Ultrium-4 drive go to “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315. For a 3592 drive, go to “3592 Drive FID to URC Table” on page 357.

9. If the Library Verify test **did not fail**, the machine may be operating correctly. If you feel that there is still a problem, do one of the following:
   a. Try rerunning Library Verify.

   b. Review the logs and other error data.

   c. If you cannot resolve the problem, call your next level of support.

10. If the Library Verify Test does not fail, return to the procedure that sent you here or go to “End-of-Call” on page 794.

Library Configuration - ALMS Not Enabled

Note: In the following procedures, if the ALMS feature is installed, you cannot configure the library using "Configure Library" or "Advanced Configuration" as these two menu items will not exist. Instead, you must ask your customer to use the Specialist web interface to perform adds or deletes.

Notes:

1. By default, the library subsystem is configured as one logical library. If necessary, the subsystem can be configured as multiple logical libraries. The maximum number of logical libraries is the number of drives, although IBM recommends at least two drives per logical library.
2. If you have made a change to the configuration of the library subsystem, and if the library is connected to a SAN, it may be necessary to reset various components of the SAN so they will recognize the changes. As an example, a 2108 SAN Data Gateway may need to be reset or IPLed to recognize that new devices have been added. In addition, if ALMS in installed, to get the library to recognize changes (except for drive adds or removals), you must select "Discover Hardware Changes" before any hardware changes are made. After changes have been made, close the door. The op panel should post a message, "Detecting Hardware."

For more detailed information about configuration, see the *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560).

1. If the customer wants to define multiple logical libraries, ask whether they want to install logical library bar code labels or whether they need to use **Advanced Configuration**.

   Note: Most customers will use logical library bar code labels. However, if the customer needs to configure logical libraries in ways that cannot be accomplished using logical library bar code labels, they can use Advanced Configuration. As an example, for a customer who needs to define logical libraries that are smaller than one column (or smaller than two columns if the Capacity Expansion Feature is enabled), you must use Advanced Configuration.
2. If the customer wants to use logical library bar code labels, open the front doors, install the logical library bar code labels as required by the customer, then close the front doors.

   Note: Logical library bar code labels can be installed at the top of each column on the rear (drive side) of the library, and on the bezel of each drive. As an example, if the customer wants to split an L32 that contains four drives into two logical libraries, you can install the following logical library bar code labels:

   - Logical Library 1 bar code labels at the top of columns 1 and 3, and on the bezels of drives 1 and 2.
   - Logical Library 2 bar code labels at the top of columns 5 and 7, and on the bezels of drives 3 and 4.
3. At the **Activity** screen, press [MENU].
4. At the **Main Menu** screen, using the [DOWN] button, select **Settings**, and press **[ENTER]**.
5. At the **Settings** screen, select **Configuration**, and press **[ENTER]**.
6. At the **Configuration** screen, select **Configure Library** if the customer used logical library bar code labels, or select **Advanced Configuration**, and press **[ENTER]**.
7. Follow the instructions on the screens to complete the configuration.

   Note: When the configuration has been completed, the library will be calibrated automatically, if necessary.

Attention: When the library displays the physical configuration information, review it carefully. If the physical configuration information is incorrect, do NOT accept the configuration. As an example, if the physical configuration shows the wrong number of cells or drives in a frame, you must NOT accept the configuration. As long as you do not accept the configuration the 'old' configuration will remain in effect. But, if you accept an invalid configuration, it can lead to other problems, such as calibration failures or inventory failures.

Protecting ESD-Sensitive Parts

Attention: Follow these guidelines to prevent damage to ESD-sensitive circuits:

- Keep ESD-sensitive parts in a grounded, metal case, if possible.
- Keep the ESD-sensitive part in its original shipping container until you are ready to install the part.
- Make the least-possible movement to minimize static electricity.
- Touch the metal frame of the machine to discharge static electricity in your body just before touching an ESD-sensitive part you are installing into or removing from the machine or from the antistatic container. Additionally, consider touching the antistatic container to the frame. Maintain physical contact with the machine while plugging the part.

  Note: Cables might connect to logic cards or boards that are ESD-sensitive. Use care when working with connectors.
- Your body can build up a 2000-volt static charge from you walking across carpet or handling plastics. As little as 100 volts can weaken or destroy a junction of a CMOS module on a logic card. The resultant failure may not appear for several days.
- To avoid creating a static buildup, do not shuffle your feet on carpet or touch Styrofoam or plastic objects while you are holding an ESD-sensitive part. If you are handling a part while you are away from the machine (for example, at a desk), touch the antistatic bag to a metal screw on an electrical outlet cover or a light switch cover.
- Hold the ESD-sensitive part by the edges, being mindful not to touch any components, pins, or connectors. Use the correct tool when removing a plug-in module. If possible, keep one hand on the frame when inserting or removing a logic card.
- Do not place an ESD-sensitive part on anything that can provide a discharge path from your body through the ESD-sensitive part. If you need to set aside an ESD-sensitive part, place it into or on top of the anti-static package in which it was shipped.
- Prevent ESD-sensitive parts from being touched by other persons. Reinstall machine covers when you are not working on the machine.
- Use care when working with ESD-sensitive parts when the humidity is low, as low humidity increases static potential.

Using ESD Kit

The ESD kit contains a wrist band that, when worn by you, can eliminate the static potential that can damage a card.

1. Power off the library before you put on the ESD wrist band.
2. Connect the wrist band to an unpainted, frame-ground point of the machine.
3. Remove the ESD wrist band when working on any part of the machine that has power switched on.
4. Do not put the ESD mat near any electrical circuit that is powered on.

   The internal resistance (1 megohm) in the ESD cable limits the current if it touches a high voltage source.
5. Do not put the ESD mat near a grounded surface. Ground the ESD mat only through the ESD cable. The ESD cable supplies a high resistance to ground for your safety. If the ESD mat touches a grounded surface, the high resistance in the ESD cable is bypassed, which causes the ESD mat not to work correctly.

CAN Bus Errors – Failure Isolation

Library Verify can fail with CAN bus errors even though the library runs without error. The reason is that Library Verify tests each CAN bus individually, whereas normal library operations use both CAN buses concurrently. Therefore if one CAN bus fails during normal library operations, the other CAN bus automatically takes over without reporting an error. See **Figure 223 on page 765** for a simplified diagram of CAN bus communication paths for both a single and dual-accessor (HA) library. This figure can be used to help isolate CAN bus problems.

CAN bus problems can sometimes be visually detected by observing the CAN bus LEDs:

- In idle mode, with no library activity, you should see: Two quick flashes, short pause, two quick flashes, short pause (then repeat this sequence).
- With activity, or while pulling error logs, both LEDs will be on almost solid.
- If one LED is always ON/OFF, erratic, or both not showing the same intensity, there could be a problem on the CAN bus.
- Pull library logs while observing both CAN LEDs. Both CAN LEDs should be on almost solid with the same LED intensity (brightness).

Note: Do NOT use the CAN bus LEDs on the FIC cards when troubleshooting CAN bus errors. CAN bus LEDs will only show activity in the frames with a terminator installed. FIC card LEDs between terminated frames will not be lit.

If Library Verify still fails after following the service procedures for a particular URC, or if the CAN bus failure must still be isolated:

1. Power off the library.
2. Reduce the library frame size by one half by installing a FIC terminator in the middle of the library on the left side if the FIC (J16).
3. Leave the Lxx frame front door open then power on the library.
4. Watch the CAN bus LEDs. They should blink together with the same LED intensity (brightness) in this sequence:

- Two quick flashes, short pause, two quick flashes, short pause (then repeat this sequence).
- If one LED is always OFF, always ON, erratic, or not the same intensity as the other one, there is still a CAN bus problem.
- If the CAN bus LEDs blink normally the failing component is in the part of the library that was isolated. Begin by adding frames back into the library until the failing frame is identified.
- When a single frame has been found, begin removing cards in the frame, one at a time, until the CAN bus LEDs flash normally. If the failure is in the Lxx frame, first remove the OPC. Then disconnect the ACC and MDA cards one at a time.

Multiple CAN bus Errors:

Node cards that share a common CAN bus can result in multiple CAN bus errors. For example, **A423** (ACC CAN bus error) and **A424** (MDA CAN bus error). The ACC and MDA share common CAN bus hardware (based on the logic flow as shown in **Figure 223**). The following is only an example. Actual failure isolation procedures and FRU lists are located in the URC section for CAN bus errors.

- Cables on AXY card at J2 and J3
- AXY card
- X-track cable
- XCP card in Lxx. **Note:** On HA1 libraries the XCP card is located either in Service Bay "A" for accessor "A" failures, or in Service Bay "B" for accessor "B" failures. **Check the XCP card(s) for bent pins which will cause CAN bus errors**.
- Cable from XCP to FIC in the Lxx frame. **Note:** On HA1 libraries the FIC card is located either in Service Bay "A" for accessor "A" failures, or in Service Bay "B" for accessor "B" failures
- FIC card fuse (if the ACC and MDA two-character displays are blank)
- FIC cards in frames between failing Dxx frame and Lxx frame.

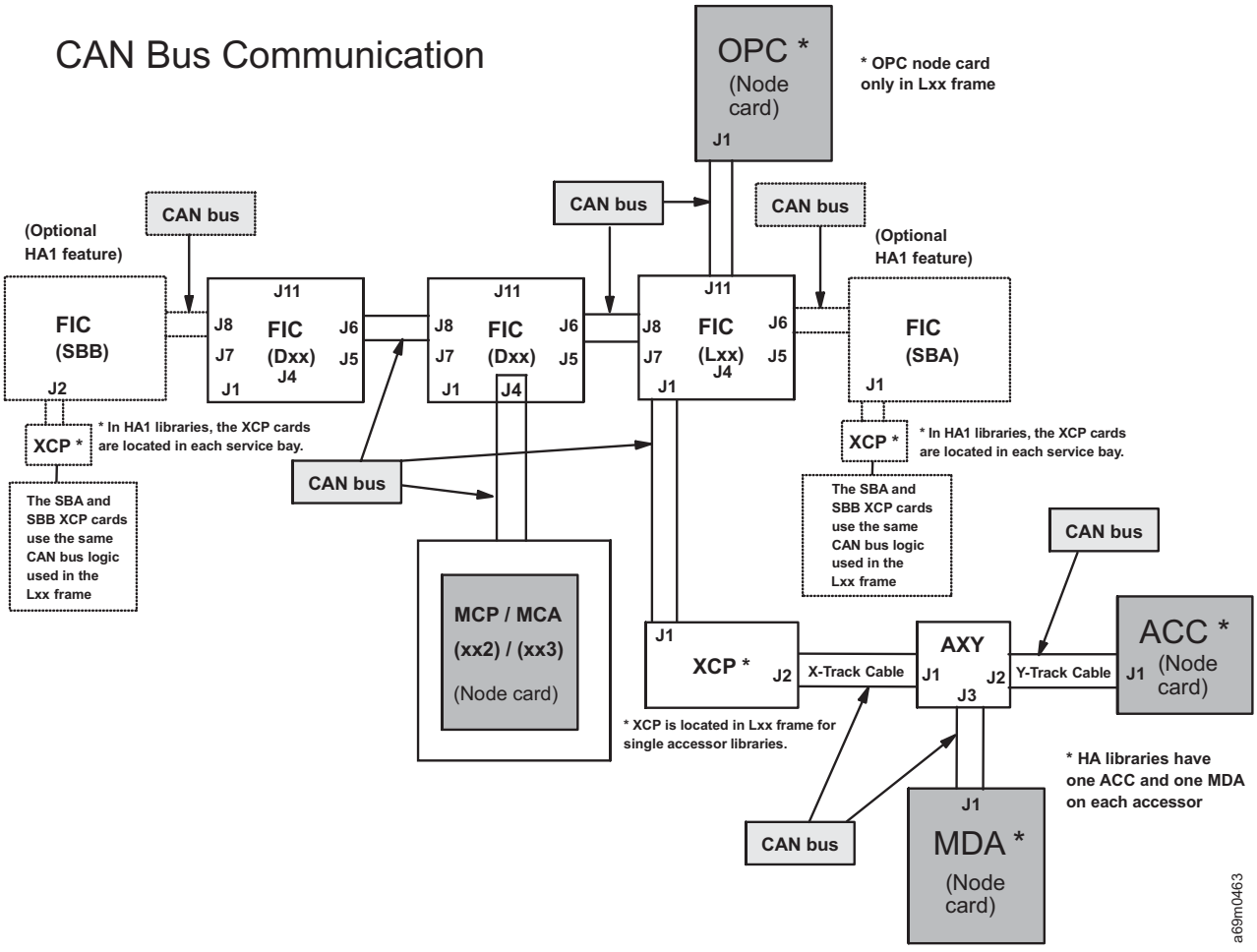


Figure 223. CAN Bus Logic Flow Diagram

Worn Universal Gripper Cage

A worn universal gripper cage may cause a variety of problems including calibration errors, get/put errors, library verify failures, or unexpected hardstop while extending.

See **Figure 224**. Remove both universal grippers and inspect the cage for wear. If the wear is 1 mm (.04 in) or greater, the cage must be replaced. See Cage, Universal Gripper (FRU Kit) on page 1141 which provides parts and instructions.

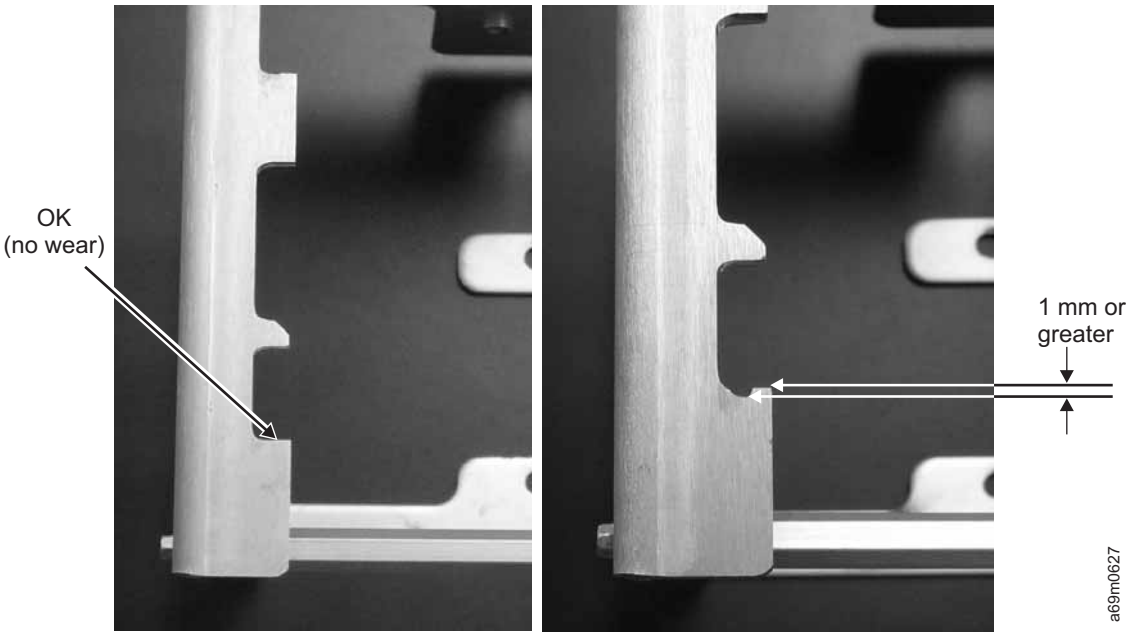


Figure 224. Universal Gripper Cage Wear

Loose X-Access Pinion Gear

A loose X-access pinion gear on the shaft could result in X motion position-related failures. See **Figure 225**. The arrow points to the pinion gear whose pin could possibly shear causing it to loosen on the shaft, resulting in hard-to-diagnose X-positioning errors.

To test for this condition, hold the accessor tightly against the end stop, then grab the pinion (shown by the arrow) and try to twist it back and forth. If any 'play' (beyond the backlash of the pinion gear in the rack) is detected, replace the pinion gear assembly. See **7–3 on page 1129**.

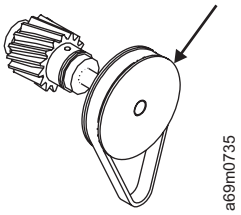


Figure 225. Pinion Gear & Shaft

SCSI Bus Problems

If this is a new installation, or the customer has updated their host hardware or software, verify that the SCSI device driver is installed properly. Refer to device driver documentation.

Attention

In the following procedures you need to know the frame and row numbers of the failing drives. The customer may provide this information or you may need to trace the SCSI cables from the host to the drives.

Table 89. SCSI Bus Problems

For Error Type....	See...
Solid Error – One LTO Drive	"Solid Error – One LTO Drive on the SCSI Bus"
Solid Error – Multiple LTO Drives	"Solid Error – Multiple LTO Drives on the SCSI Bus" on page 768
Intermittent Error – One Drive on the SCSI Bus	"Intermittent Error – One Drive on the SCSI Bus" on page 769
Intermittent Error – Multiple Drives on the SCSI Bus	"Intermittent Error – Multiple Drives on the SCSI Bus" on page 770

Solid Error – One LTO Drive on the SCSI Bus

1. Ensure that the power is on to the LTO drive:
   a. Ensure that the library is powered on. If the library power switch is on but the power indicator is off, go to "Power Isolation MAP" on page 648.
   b. Ensure that all the circuit protectors on the FCA (in the frame containing the failing drive) are on.
   c. Ensure that the MCP or MCA two-character display (in the frame containing the drive) is alternating 00 and frame number (see "Node Card LED Display Codes" on page 274).
   d. Ensure that the drive power cord is plugged in (at the FCA and the fixed tray or canister).
2. Determine if the drive is experiencing a hang condition.
   a. If a tape cartridge is in the drive, press the unload button. If the cartridge ejects, the drive does not have a hang condition, go to step 5. If the cartridge does not eject, go to step 3.
   b. Manually load the LTO diagnostic cartridge into the failing drive. If the cartridge loads, the drive does not have a hang condition. Press the unload button to unload the LTO diagnostic cartridge, and go to step 5.
3. Press and hold the unload button for 20 seconds. The drive will save a dump and go into a reboot, which allows communication to the drive. Do not cycle power (power on and power off) or you will lose the dump contents.
4. Obtain a drive dump (see "Creating Drive Dump by Using CETool" on page 718). Contact your next level of support to determine if they can use this dump. Go to "End-of-Call" on page 794.
5. Ensure that the SCSI cables are plugged in and tightened.
6. Ensure that the drive SCSI address is the same as the SCSI address being used by the host system. From the operator panel, select **[MENU]**, **Settings**, **SCSI IDs**. View the SCSI ID for the affected drive. If the SCSI ID is different than expected, you must either change the drive SCSI ID or reconfigure the host.
7. If this is a drive **tray** model, run the SCSI wrap test (see "SCSI Wrap Test – LTO Only" on page 696). If this is a drive **canister** model, go to "Smart SCSI Wrap Tool" on page 696.

Note: The “Smart SCSI Wrap Tool” is available to test the SCSI circuitry the LTO drives. This tool speeds-up and enhances the ability to isolate SCSI bus problems, and will handle the case where multiple SCSI devices are set to the same SCSI ID. This tool can display the SCSI ID of any drive in a canister.

a. If the test fails, replace the following:

On Fixed Tray Models

- Fixed Tray including the internal Y cable (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
- SCSI terminator
- Drive power cable

On Hot Swap Models

- Drive canister assembly (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
- Fixed tray assembly (contains the drive power supply)
- SCSI terminator
- Drive power cable

b. If the test runs successfully, replace the following:

- SCSI terminator
- SCSI host to drive cable
- Interposer (if installed)

If the failure still exists, it probably is caused by the host system hardware or software. Refer to the service documentation for the host system.

Solid Error – Multiple LTO Drives on the SCSI Bus

Attention

Only one HVD drive is allowed on each SCSI bus when attached to an AS/400 host.

1. Ensure that the power is on to the drives:
   a. Ensure that the library is powered on (O). If the library is powered on but the library power indicator is off, go to “Power Isolation MAP” on page 648.
   b. Ensure that all the circuit breakers on the FCA (in the frame containing the failing drives) are on.
   c. Ensure that the MCP or MCA two-character display (in the frame containing the drives) is alternating 00 and frame number (see “Node Card LED Display Codes” on page 274).
   d. Ensure that the power cords are plugged into all of the drives (at the FCA and the Fixed Tray or canister).
2. Ensure that the SCSI cables are plugged in and tightened.
3. Ensure that the drive SCSI addresses are the same as the SCSI addresses being used by the host system. From the operator panel, select **[MENU]**, **Settings**, **SCSI IDs**. View the SCSI IDs for the affected drives. If the SCSI IDs are different than expected, you must either change the drive SCSI IDs or reconfigure the host.
4. If only one drive is failing on this SCSI bus, go to step 5. If more than one drive is failing on this SCSI bus, go to step 6 on page 769.
5. Replace the following FRUs:

On Fixed Tray Models

   a. Fixed Tray (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
   b. Drive power cable

On Hot Swap Models

a. Drive canister assembly (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
b. Fixed tray assembly (contains the drive power supply)
c. Drive power cable

If the problem is corrected, return to the procedure that sent you here or go to “End-of-Call” on page 794. If the failure still exists, go to step 6.

6. Ensure that the SCSI cable from the host system to the first drive is connected.
7. Disconnect the drive-to-drive SCSI cable from the first drive and replace with the terminator.
8. Run a utility (such as tapeutil) to determine whether you can communicate with the first drive.
   - If you cannot communicate with the drive, and this is a drive **tray** model, run the SCSI wrap test (see “SCSI Wrap Test – LTO Only” on page 696). If this is a drive **canister** model, go to “Smart SCSI Wrap Tool” on page 696. If the SCSI wrap test runs successfully, replace the following:
     – SCSI terminator
     – SCSI host-to-drive cable
     – Interposer (if installed)
     – Drive-to-drive SCSI cable (except for the first drive)

     If the failure still exists, it probably is caused by the host system hardware or software, refer to the service documentation for the host system.
   - If the SCSI wrap test fails or the Smart SCSI wrap tool does not correct the problem, replace the following:

     On Fixed Tray Models

     – Fixed Tray including the internal Y cable (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
     – SCSI terminator
     – Drive power cable

     On Hot Swap Models

     – Drive canister assembly (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
     – Fixed tray assembly (contains the drive power supply)
     – SCSI terminator
     – Drive power cable

     If the problem still exists, contact your next level of support.
   - If the error does not occur, reconnect one drive at a time back to the SCSI bus, and repeat step 8 for each drive.

     Note: Ensure that the SCSI terminator is always on the last drive on the failing SCSI bus.

Intermittent Error – One Drive on the SCSI Bus

1. Ensure that the latest level microcode is installed on the drive (to display drive microcode level, see “Vital Product Data (VPD) Menu” on page 785). See the website for the latest level of microcode. Update the microcode level, if necessary.

   Required library firmware and drive code can be downloaded from the following websites.

   For IBM service personnel with access to the Internal PFE website:

   `http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

   To get the library code perform the following steps:

   a. Select 'Open Systems'.
   b. Select '3584 library'.

c. Select the version of code you want, fill out the form and click 'submit'.

For non-IBM personnel (and those without access to the IBM intranet) the following external website provides code and support for 3584. Update Library and Drive Firmware by using the procedure in chapter 3 of the *IBM System Storage TS3500 Tape Library Operator Guide*

`http://www.ibm.com/servers/storage/support`

2. Check host error logs to determine if a specific cartridge is causing the problem. Replace the cartridge that is listed as being faulty.
3. If the problem still exists, replace the following FRUs:

For LTO Fixed Tray Installations

a. SCSI terminator
b. SCSI host cable
c. Fixed Tray, including the internal Y cable or (see “Drive Types, Fixed Trays, and Power Supplies” on page 874)
d. Drive power cable

For LTO Drive Canister Hot Swap Installations

a. SCSI terminator
b. SCSI host cable
c. Drive canister assembly (see “Drive Types, Fixed Trays, and Power Supplies” on page 874)
d. Fixed tray assembly (contains the drive dc power supply)
e. Drive power cable

If the failure still exists, it probably is caused by the host system hardware or software. Refer to the service documentation for the host system.

Intermittent Error – Multiple Drives on the SCSI Bus

Attention

Only one HVD drive is allowed on each SCSI bus when the library is attached to an AS/400 host.

1. Ensure that the latest level microcode is installed on the drives (to display drive microcode level, see “Vital Product Data (VPD) Menu” on page 785). See and the web site at URL for the latest level of microcode. Update the microcode level, if necessary.

   Required library firmware and drive code can be downloaded from the following websites.

   For IBM service personnel with access to the Internal PFE website:

   `http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`

   To get the library code perform the following steps:

   a. Select 'Open Systems'.
   b. Select '3584 Library/TS3500'.
   c. Scroll down and select the type of drive you are updating:
      - 'Get 3584 GEN-1 Drive microcode SCSI or Fibre'
      - 'Get 3584 GEN-2 Drive microcode SCSI or Fibre'
      - 'Get 3588 LTO GEN-3 Drive microcode SCSI or Fibre'
      - 'Get 3584 GEN-4 Drive microcode Fibre'
      - 'Get 3592 Drive microcode here'

Note: If the existing encryption-capable drive had FIPS code loaded, ensure the replacement drive has a FIPS-certified level of drive code loaded. The latest level of 3592 drive code available may NOT necessarily be FIPS-certified.

d. Select the version of code you want, fill out the form and click 'submit'.

For non-IBM personnel (and those without access to the IBM intranet) the following external website provides code and support for 3584. Update Library and Drive Firmware by the procedure in chapter 3 of the *IBM System Storage TS3500 Tape Library Operator Guide*

`http://www.ibm.com/servers/storage/support`

2. Check host error logs to determine if a specific cartridge is causing the problem. Replace any cartridge that has been isolated.
3. If the problem still exists, replace the following FRUs:

For LTO Fixed Tray Installations

a. SCSI terminator
b. SCSI host cable
c. SCSI drive-to-drive cables
d. Fixed Tray, including the internal Y cable (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
e. Drive power cables

For LTO Drive Canister Hot Swap Installations

a. SCSI terminator
b. SCSI host cable
c. SCSI drive-to-drive cables
d. Drive canister assembly (refer to “Drive Types, Fixed Trays, and Power Supplies” on page 874)
e. Fixed tray assembly (contains the drive dc power supply)
f. Drive power cables

If the failure still exists, it probably is caused by the host system hardware or software. Refer to the service documentation for the host system.

Fibre Channel Problems

Use the “Solid Error – Fibre Channel” procedure or the “Intermittent Error – Fibre Channel” procedure to correct a fibre channel problem.

Attention: Notify the customer that the devices on the fibre channel must be varied offline before this problem determination procedure can be performed. You need to understand whether the problem is with the drive, drive cable, or the device to which the cable is attached. Use switch, hub, or other fibre product service guides as appropriate. Refer to *IBM System Storage TS3500 Tape Library Operator Guide* to verify that the configuration and software levels are supported.

Note: Ensure that all the fibre channel cables are installed correctly.

Solid Error – Fibre Channel

1. Ensure that the drive is powered on.
2. Ensure that the Operator Fibre Channel address is set correctly.
3. Ensure that the drive is seeing light and is communicating.
4. Ensure that all of the fibre channel cables are installed correctly.
5. Run the fibre channel wrap test (see “Fibre Channel Wrap Test – LTO and 3592 drives” on page 697).
   a. If the fibre channel wrap test fails, replace the drive.
   b. If the fibre channel wrap test runs successfully, test the fibre cable. See “Fibre Channel Wrap Test – LTO and 3592 drives” on page 697. If the wrap test fails, replace the fibre cable.
6. If the fibre wrap test runs successfully on the drive and on the cable, inform the customer that the fault is probably with the host hardware or software.
7. When the problem is corrected (or determined to be a host problem), restore all of the fibre channel cables to their correct position, then return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Note: If a single drive is not recognized on the fibre channel, it could be caused by one of the following:

1. Another drive has the same serial number as the failing drive. This can occur after a drive FRU replacement procedure was performed, but the problem was elsewhere, and the drive was re-used on the same fibre channel network.
2. A drive has been added, but a switch or hub may need to be "reset" before the drive will be recognized.
3. The host varied a drive offline and has not placed it back online.

Intermittent Error – Fibre Channel

1. Verify the following:
   a. The maximum cable length has not been exceeded
   b. Configuration and software levels are supported. Refer to the *IBM System Storage TS3500 Tape Library Operator Guide*
   c. All fibre cables are installed correctly
2. Gather all possible error information, including the errors reported by the drive to the host. Refer to Message Section for details. For example, if the drive is attached to a RS/6000, run tapeutil. Select option 9, Error Log Analysis.
3. Refer to other fibre product documentation to isolate which part of the storage area network (SAN) is experiencing problems. Verify SAN configurations are correct, such as switch zoning for drive sharing.

   Note: If you have made a change to the configuration of the library subsystem, and if the library is connected to an SAN, it may be necessary to reset various components of the SAN so they will

recognize the changes. As an example, a 2108 SAN Data Gateway may need to be reset or IPLed to recognize that new devices have been added.

4. Start a device driver trace to capture more information. For example, if you are using the AIX Tape Device driver, type **atrc** to start the trace (see “Fibre Channel Device Drivers” on page 242 for information on the various drivers).
5. On the next failure, get a drive dump. Be prepared to provide a dump, if requested by your Support Center for analysis.

Service Menus

To get to the **Service** screen Panel 1000, perform the following:

1. At the **Activity** screen, press **[MENU]**.
2. At the **Main Menu** screen, select **Service**, and press **[ENTER]**.

```
Service            Panel 1000

 Library Verify ]
Library Error Logs
Drive Error Logs
Tests/tools
Calibration
Vital Product Data
Firmware Update
FRU Replacement
Insert Diag Cartridge
Remove Diag Cartridge

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

Press [UP] or [DOWN] to scroll through the Service screens and to locate one of the items in the following list. Press **[ENTER]** to highlight that item and to make that item active.

- If you selected **Library Verify**, go to “Library Verify Test” on page 759.
- If you selected **Library Error Logs**, go to Panel 1050, “Library Error Logs Menu.”
- If you selected **Drive Error Logs**, go to Panel 1060 “Drive Error Logs Menu” on page 776.
- If you selected **Tests/Tools**, go to Panel 1100, “Tests/Tools Menu” on page 778.
- If you selected **Calibration**, go to Panel 1200, “Library and Drive Calibration Procedures” on page 784.
- If you selected **Vital Product Data**, go to Panel 0300, “Vital Product Data (VPD) Menu” on page 785.
- If you selected **Firmware Update**, go to Panel 1300.
- If you selected **FRU Replacement**, go to “Service Procedures” on page 790.
- If you selected **Insert Diag Cartridge**, the message “Insert Diagnostic Cartridge into I/O Station. Do you want to continue?” displays. In response to the user pressing [YES], the microcode will locate the I/O station for the diagnostic cartridge and move it to a reserved place within the library. Messages are displayed to keep the user informed. If no diagnostic cartridge was found in the I/O Station, the user is notified and returned to this menu.
- If you selected **Remove Diag Cartridge**, the message “Do you really want to remove the diagnostic cartridge?” is displayed. A user who presses [NO] is returned to this menu. If the user presses [YES] in response to the question, the microcode will scan the inventory to verify that a diagnostic cartridge is present. If a cartridge is found, it will be ejected into the I/O station. Messages are displayed to keep the user informed as to the operation. If no cartridge was found in the inventory, the user is notified and returned to this menu.

Library Error Logs Menu

```
Library Error Logs         Panel 1050

 Error Detail
Error/Usage Counts

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

If the user presses **[ENTER]**, another panel will display, as follows:

- If **Error Detail** is selected, a list will be built from the library error log, listing all logged Errors, sorted by time stamp with the most recent error first. The user is taken to Panel 1051, “Library Error Detail” on page 775.

- If **Error/Usage Counts** is selected, Panel 1052 displays, “Error/Usage Counts.”

The user may scroll using the [UP] and [DOWN] buttons.

Library Error Detail

```
Library Error Detail     Panel 1051

Date:                 2001 06 30
Time:                 19:33:10
URC:
Command:              Move Media
SK/ASC/ASCQ:          04 44 00
HEC/HECQ/MSB:         B8 81 8C
SEB/Source:           80 0085
DEB/Dest:             A0 0032
Obj#/ObjErr:          1234/56
Frame/Drive:          F1, R02

Log 0027 of 0027

[BACK]  [ UP ]  [DOWN]
```

If the user presses [UP] or [DOWN], the previous or next error will be displayed. The user may scroll through the selections using the [UP] and [DOWN] buttons.

- SK=byte 2 of the SCSI sense data (see Chapter 9, “Sense,” on page 603)
- ASC=byte 12
- ASCQ=byte 13
- HEC=byte 18
- HECQ=byte 19
- MSB=byte 23
- SEB=byte 35
- Source=bytes 36–37
- DEB=byte 38
- Destination=bytes 39–40

To decode the SK, ASC, ASCQ, HEC, HECQ, and obtain a URC, see “Library Sense Data to URC Table” on page 279.

Error/Usage Counts

```
Error/Usage Counts              1052

Accessor A:     Usage     Errors
 Pivots:        0000002   0000
 Gripper 1:
  Gets:         0003024   0005
  Puts:         0003026   0001
 Gripper 2:
  Gets:         0000001   0000
  Puts:         0000001   0000
  Scans:        0000010   0001

[BACK]
```

Drive Error Logs Menu

Note: You need to select a drive before you can see the following screen.

```
Drive Error Logs   Panel 1060

Key: [F=Frame, R=Row]

Drive [F1,R3]

 Drive Error Detail
SCSI Detail
Usage/Error Counts

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

If the user presses **[ENTER]**, Panel 0210 will display to allow you to select the drive.

- If **Drive Error Detail** is selected, a list of all entries in the drive Engineering Log displays, sorted by time stamp. The most recent error is listed first. At Panel 1062, go to "Drive Error Detail - LTO."
- If **SCSI Detail** is selected, a list of all entries in the drive SCSI Log displays, sorted by time stamp. The most recent error is listed first. At Panel 1063, go to "Drive SCSI Detail Menu" on page 777.
- If **Usage/Error Counts** is selected, Panel 1064 displays, showing usage and error counts. See "Drive Errors/Usage" on page 778.

The user may scroll through the selections using the [UP] and [DOWN] buttons.

Drive Error Detail - LTO

```
Drive Error Detail      Panel 1062

 Key: [F=Frame, R=Row]

Drive [F1,R3]        Log Entry 01

Legend:    yyyy/mm/dd hh:mm:ss
Date/Time: 2005/07/22 15:20:54
Error Code:          7
1st FSC:             8340:1234
2nd FSC:             8750:5678
Cartridge:           VOL001L1
EC Level:            C14028
HW Level:            10002001

[BACK]  [ UP ]  [DOWN]
```

Notes:

1. Before you reach this panel, you should have selected a drive. The data shown is extracted from that selected drive. In the example, the numbers in **BOLD** are the drive Error Code SCD **7** and the FSC **1234**.
2. When this publication was released, the date/time shows only which error occurred first, and the number of hours between errors. A future microcode release will synchronize the library with the drive clocks, thus providing more meaningful date/time information.
3. When this publication was released, the cartridge identifier was the internal serial number of the cartridge. The identifier is used only to show whether repeated errors occurred on the same or multiple cartridges. A future microcode release will allow the bar code label information to appear in the display.
4. Later drive code levels will display the most current error log entry. If the user presses [DOWN], the display will decrement to the next error.

For error summary table, see "LTO Ultrium-1 Drive FSC to URC Table" on page 364.

For Ultrium-2, Ultrium-3, or Ultrium-4, use the Error Code SCD, see "LTO Drive Single-Character Display (SCD) Codes (LTO-1, 2, 3, 4, and 5)" on page 590.

Drive Error Detail - 3592

```
Drive Error Detail      Panel 1062

Key: [F=Frame, R=Row]

Drive [F1,R3]       Log Entry nn

Legend:    yyyy/mm/dd hh:mm:ss
Date/Time: 2005/07/22 15:20:54
Severity:           02
FID:                AD
1st FSC:            9082
2nd FSC:            0000
Cartridge:          VOLxxxxx

[BACK]  [ UP ]  [DOWN]
```

Notes:

1. Before you reach this panel, you should have selected a drive. The data shown is extracted from that selected drive. In the example, the numbers in **BOLD** are the Severity **02** and the FID **AD**. For a description of the FID Severity codes see Table 51 on page 357.
2. Later drive code levels will display the most current error log entry. If the user presses [DOWN], the display will decrement to the next error.

For error summary table, see “3592 Drive FID to URC Table” on page 357.

Drive SCSI Detail Menu

```
Drive SCSI Detail      Panel 1063

KEY: [F=Frame, R=Row]

Drive [F1,R3]        Log Entry nn
Legend:              yyyy/mm/dd hh:mm:ss

Date/Time:           2006/03/10 19:33:10
  Command:                  00
  Sense Key:                3
  ASC/ASCQ:                 5300
  FSC/URC:                  2E02/5C2C
  Volser:                   N/A
  SCSI ID/Loop ID:          CC
Header Info:  09C193B9 01010200

CDB: 00000000 00000000 00000000
     00000000

Sense:        71000300 00000000
    00000000 00000000 00000000
    00000000 00000000 00000000
    00000000

[BACK]  [ UP ]  [DOWN]
```

Note: Before you reach this panel, you should have selected a drive. The data shown is extracted from that selected drive (drive SCSI log).

If you press [UP] or [DOWN], the display will show the next or previous error with the information shown.

To decode the SK, ASC, ASCQ, and to obtain a URC, see “LTO Drive Sense Data (SK, ASC, ASCQ) to URC Table” on page 315.

Drive Errors/Usage

```
Drive Errors/Usage         Panel 1064

Key: [F=Frame, R=Row]

Drive [F1,R1]:
  Library          Statistics:
                       Usage:
    Loads:             0003024
    Unloads:           0003024

  Drive            Statistics:
                       Usage:
    Loads:             0002024
    Unloads:           0000001
    MB Written:        0000001
    MB Read:           0000001
    Cleanings:         0000000

[BACK]  [ UP ]  [DOWN]
```

Tests/Tools Menu

```
Tests                Panel 1100

 Library Verify
Diagnostics
Exercisers
Tools

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

If you press **[ENTER]**, the next panel will reflect the item selected, as follows:

- If you select **Library Verify**, the library verify test will be run. See “Library Verify Test” on page 759 for details of the test.
- If you select **Diagnostics**, panel 1110 “Diagnostics Menu” displays.
- If you select **Exercisers**, panel 1120 “Exercisers Menu” on page 783 displays.

Diagnostics Menu

Note: When running the following test, ensure the drive does NOT have a tape cartridge loaded. The test will fail if the tape drive contains a cartridge when the test begins.

```
Diagnostics            Panel 1110

 Sensors
Motors & Solenoids
Motor Encoders
Drives
Call Home
Test Encryption Key Path/Setup

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

If you press **[ENTER]**, the next panel will reflect the item selected, as follows:

- Select **Sensors** to display panel 1111 “Sensor Menu” on page 779.
- Select **Motors & Solenoids** to display panel 1112 “Motor & Solenoid Tests Menu” on page 779.
- Select **Motor Encoders** to display panel 1114 “Encoder Tests Menu” on page 781.
- Select **Drives** to display panel 0210. This selection will allow you to select a drive; panel 1113 “Drive Tests Menu” on page 780 displays.

- Select **Call Home**. This selection will allow you to call home. With library firmware level 5510 or higher you will have the option to send a drive dump using the Call Home menu item.
- Select **Test Encryption Key Path/Setup**. This selection will test key manager IP addresses and the connections. Select a drive to test. The test will ping all defined key manager addresses. If the ping was successful, it will do a connection test. A configuration check is run on all IP addresses that were successful to ensure the drive you selected is correctly configured at the EKM.

Sensor Menu

```
Sensor Tests              Panel 1111

 X Home
Y Home
Gripper 1 Cartridge Present
Gripper 2 Cartridge Present
I/O Station Door Open
I/O Station Lock
Frame Door Interlock
Service Bay Sensors

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

If you press **[ENTER]**, the next panel will reflect the item selected, as follows:

- If a sensor test is selected, display panel 1116 will show the particular test being run and the current status of the test. See “Sensor Status” on page 782. The test will run continuously until you press the [BACK] button.
- A “Frame n Door Interlock Sensor” entry will be listed for each frame located in the library.

Motor & Solenoid Tests Menu

```
Motor & Solenoid Tests              Panel 1112

 X Motor
Y Motor
Pivot Motor
Gripper 1 Motor
Gripper 2 Motor
I/O Solenoid

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

If you press **[ENTER]**, the next panel will reflect the item selected as follows:

- Motor Test – Will first verify the presence of 37 V dc. If the voltage is not available, a message displays. If the voltage is available, panel 1118 “Motor Test” on page 782 displays.
- Solenoid Test – The results of a solenoid test display on panel 1119, “Solenoid Test” on page 782.

Drive Tests Menu

Note: You need to select a drive before you can see the following screen.

```
Drive Tests               Panel 1113

Key: [F=Frame, C=Column, R=Row]

Drive [Fx,Rxx]

 Self Test
Read/Write Test
Long Read/Write Test
SCSI/FC Wrap Test
Head Test
Tape Test


[BACK]  [ UP ]  [DOWN]  [ENTER]
```

You should have selected a drive to be tested before you reached this menu.

Press **[ENTER]**, and select one of the panels below. The results for each test will be reported as successful or reported with an Error Code.

- **Self Test** – The drive will be told to run its self test (similar to POST but without having to power off the drive).
- **Read/Write Test** – The library will move a Diagnostic Cartridge from its storage position to the drive, and will instruct the drive to run its read/write test. If the drive and the cartridge are compatible then everything works as usual (See Note below). An activity messages will display during the operations. Results will be reported at the end of the test. The library will unload and store the cartridge. If an error occurs while loading or unloading the cartridge, the error will be reported.

  Note:

  The required CE cartridge should be located in the back of the Lxx frame. If the diagnostic cartridge is NOT compatible with the drive being tested, then the library code will prompt you to put the necessary diagnostic cartridge in the I/O station. The gripper will get the cartridge and load it from there. After testing is complete the cartridge will be moved back to the I/O station. You then remove it and store it in the back of the Lxx frame.
- **SCSI/FC Wrap Test** – You are instructed to install the SCSI Wrap Test Plug, the Smart SCSI Wrap Tool, or Fibre Wrap Tool, before the test begins. See “SCSI Bus Problems” on page 767 and “Fibre Channel Problems” on page 772 for more details.
- **Head Test** – Will move a test cartridge from its storage position to the drive, and instruct the drive to run a Head Test. An activity messages will display during the operations. Results will be reported at the end of the test. The library will unload and store the cartridge, and will report any error that occurs while loading or unloading the cartridge
- **Tape Test** – The library will request that a specific scratch tape that needs to be tested is placed in I/O slot 1. This cartridge will be moved to a specific drive, and the library will instruct the drive to run its Tape Test (which checks out the media by writing on the outer edges of the tape, then reading it back). An activity messages will be displayed during operation. Results will be reported at the end of the test. The library will unload and store the cartridge. An error that occurs during cartridge loading or unloading will be reported.

Encoder Tests Menu

```
Encoder Tests:          Panel 1114

 X Motor Encoder
Y Motor Encoder
Pivot Motor Encoder
Gripper 1 Motor Encoder
Gripper 2 Motor Encoder

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

Use the [UP] and [DOWN] buttons to select the encoder you wish to test. When you press [ENTER], the selected encoder test displays on panel 1117. The encoder tach count displays as it changes. The test will run continuously until you press [BACK]. See “Encoder Status” on page 782.

Sensor Status

```
Sensor Status:               Panel 1116

Sensor name will be displayed here.

Sensor Status: BLOCKED

[BACK]
```

This screen will show “BLOCKED” if the sensor is blocked, or “OPEN” if the sensor is not blocked.

Encoder Status

```
Encoder Status:             Panel 1117

Encoder name will be displayed here.

Encoder Tach Count: 1043

[BACK]
```

This panel displays with the appropriate text string to indicate the tach count and the status of a motor encoder.

Motor Test

```
Motor Test               Panel 1118

(A text string passed in from the microcode will be displayed)

Use the UP and DOWN button to run the motor in both directions.

[BACK]  [ UP ]  [DOWN]
```

Press the [UP] or [DOWN] button to run the motor in the direction you requested. Press [BACK] to stop the motor test.

Solenoid Test

```
Solenoid Test               Panel 1119

(A text string passed in from the microcode will be displayed)

Use the ACTIVATE button to activate the solenoid.

[BACK]  [ACTIVATE]
```

The solenoid will pick once, each time you press the [ACTIVATE] button. Press the [ACTIVATE] button to activate the solenoid.

Exercisers Menu

```
Exercisers            Panel 1120

 Cycle X
Cycle Y
Cycle Pivot
Cycle Gripper 1
Cycle Gripper 2
Cycle X/Y Pivot
Cycle Both Grippers

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

Press **[ENTER]** to go to the next panel. Panel 1121, “Exerciser Running” displays. This continuously cycles the motor for the full length of travel until you press [BACK] to stop the test. The cycle count is updated on the screen.

Note: The Cycle X/Y/Pivot exerciser will perform random X, Y, and Pivot motions until you press [BACK]. The Cycle Both Grippers exerciser will alternately cycle gripper 1, then cycle gripper 2, until you press [BACK].

Exerciser Running

```
Exerciser Running...        Panel 1121

Text string stating which exerciser is running

Exerciser Cycle Count: nn

[BACK]
```

The Exerciser Cycle Count is a measure of the number of cycles that have been completed.

Library and Drive Calibration Procedures

Use the Calibration menu to calibrate the library.

```
Calibration           Panel 1200

 Calibrate Library
Calibrate Frame
Calibrate Drive
Calibrate I/O Station
Calibrate Accessor
Calibrate Service Bay
[BACK]  [ UP ]  [DOWN]  [ENTER]
```

Press **[ENTER]**, and go to the menu corresponding to the highlighted selection:

- **Calibrate Library** – A confirmation screen displays. Press **[ENTER]** to start a calibration of the entire library. A time duration will be displayed, and at the end of the calibration, a completion message will appear. When the completion message is displayed, pressing **[ENTER]** will return the user to this menu. Pressing [BACK] will return the user to this menu.
- **Calibrate Frame** – Panel 0013 displays, press **[ENTER]** to continue, then panel 0007 displays. This panel allows you to select a frame. A confirmation screen displays. Press **[ENTER]**. The selected frame will begin to calibrate. A time duration displays. At the end of the frame calibration, a completion message appears. When the completion message displays, press **[ENTER]** to return to this menu. Press [BACK] to return the user to this menu.
- **Calibrate Drive**. This panel allows you to select a drive. Drives are listed. Select drive and Press **[ENTER]**. The selected drive will begin to calibrate. At the end of the drive calibration, a completion message appears. When the completion message displays, press **[ENTER]** to return to this menu. Press [BACK] to return the user to this menu.
- **Calibrate I/O Station** – A confirmation screen displays. Press **[ENTER]** to start the calibration of the I/O station. A time duration displays. A completion message appears at the end of the calibration.
- **Calibrate Accessor**. Accessor is displayed. If your library is HA, two accessors are listed. Select the accessor and Press **[ENTER]**. The selected accessor will begin to calibrate. At the end of the accessor calibration, a completion message appears. When the completion message displays, press **[ENTER]** to return to this menu. Press [BACK] to return the user to this menu.
- **Calibrate Service Bay**. A confirmation screen displays. Press **[ENTER]**. The selected service bay frame will begin to calibrate. A time duration displays. At the end of the frame calibration, a completion message appears. When the completion message displays, press **[ENTER]** to return to this menu. Press [BACK] to return the user to this menu.

Vital Product Data (VPD) Menu

```
Vital Product Data Menu             Panel 0300

 Library VPD
Drive VPD
Node Card VPD
Drive Serial Numbers
World Wide Node Names
World Wide Port Names

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

Use the [UP] and [DOWN] buttons to scroll through the selections. Press **[ENTER]**, and the panel for the selected item appears, as follows:

- If **Library VPD** is selected, go to "Library VPD."
- If **Drive VPD** is selected, go to "Drive VPD."
- If **Node Card VPD** is selected, go to "Node Card VPD" on page 786.
- If **Drive Serial Numbers** is selected, go to "Changing 3592 / 3588 Serial Numbers" on page 739.
- If **World Wide Node Names** or **World Wide Port Names** is selected, go to "Display World Wide Port / Node Names" on page 701.

Library VPD

```
Library VPD             Panel 0301

Frame 1:
  Machine Type:     3584
  Model:            L12
  Serial:           1300001

[BACK]  [ UP ]  [DOWN]
```

Use the [UP] and [DOWN] buttons to scroll through the frame numbers.

Drive VPD

```
Drive VPD               Panel 0310

Key: [F=Frame, R=Row]

[F1,R01] ULT3580-TD1 v1234
[F1,R02] ULT3580-TD1 v1234
[F1,R03] ULT3580-TD1 v1234
[F1,R04] ULT3580-TD1 v1234
[F1,R05] ULT3580-TD1 v1234
[F1,R06] ULT3580-TD1 v1234
[F1,R07] ULT3580-TD1 v1234
[F1,R08] ULT3580-TD1 v1234
[F1,R09] ULT3580-TD1 v1234
[F1,R10] ULT3580-TD1 v1234

[BACK]  [ UP ]  [DOWN]
```

Use the [UP] and [DOWN] buttons to scroll through the frame and drive numbers.

Note: A "Please wait..." message (using Panel 0011) displays for a few seconds. The drive type/model and firmware version information is being gathered from the drives.

Node Card VPD

```
Node Card VPD            Panel 0320

Frame 1:
  Accessor Controller Card

  Part Number:       1234567
  Serial Number:     YN100002W123
  Firmware Version:  1000

[BACK]  [ UP ]  [DOWN]
```

You can review vital product data about the node cards. Scroll up or down through each card in the displayed frame using the [UP] and [DOWN] buttons. When all the cards have displayed, the next frame will be displayed. The frames and cards display, as follows:

- Frame 1, Accessor Controller Card (ACC), Motor Driver Assembly (MDA), Media Changer Pack (MCP), Media Changer Assembly (MCA) and Operator Panel Assembly (OPC)
- Frame 2–6, Media Changer Pack (MCP) (if installed) or Media Changer Assembly (MCA).

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Service Procedures

You can exchange a failing library FRU without taking the entire library offline.

Operator Panel Security

Note: If the operator panel is locked, see “Operator Panel Security” on page 756 to unlock it before you continue with these procedures.

1. Unless otherwise directed in the following maintenance activities, it may **not** be necessary to take the entire library “offline” to attached hosts. If the library must be taken offline, ask the customer to perform this task.
2. At the Operator Panel **Activity** screen:
   a. Press **Menu**.
   b. At the **Main MENU** screen, select **Service**.
   c. At the **Service** menu screen, select **FRU Replacement**.
   d. At the **FRU Replacement** menu screen, select one of the following:
      - **Prepare for Drive Replacement** (see “Prepare for Drive Replacement”)
      - **Finish Drive Replacement** (see “Finish Drive Replacement” on page 791)
      - **Prepare for Accessor Service** (see “Prepare for Accessor Service (Single Accessor Library)” on page 791, or see “Prepare for Accessor Service (Dual Accessor Library)” on page 791)
      - **Finish Accessor Service** (see “Finish Accessor Service (Single Accessor Library)” on page 792, or see “Finish Accessor Service (Dual Accessor Library)” on page 793)
      - **Prepare for FCA Replacement** (see “Prepare for FCA Replacement (Not used for Enhanced FCA)” on page 793)
      - **Finish FCA Replacement** (see “Finish FCA Replacement (Not used for Enhanced FCA)” on page 793)
      - **Prepare for FIC Replacement** (see “Prepare for FIC Replacement” on page 794)
      - **Finish FIC Replacement** (see “Finish FIC Replacement” on page 794)
3. Follow the instructions on the screens.

Prepare for Drive Replacement

1. If you replacing a control path drive, and it is the **only** control path available to the host, the entire Logical Library will be unavailable to the host using the control path until the drive replacement is complete. **Ensure the customer is aware of this before you begin the drive replacement procedure.**
2. Making this selection allows the microcode to perform the following activities:
   - The microcode displays a screen to allow drive and frame selection.
   - The microcode puts the drive offline to the host.
   - If there is a cartridge in the drive, the microcode will try to remove it.
   - **Note:** This procedure will automatically copy a dump to 'flash' if the drive has that capability.
   - The microcode displays a message that the drive has been prepared for replacement.
3. Now follow the specific drive replacement procedures for the type of drive you are replacing.

Finish Drive Replacement

Note: Use this procedure **ONLY** after you have completed the specific drive code replacement procedures for the drive just replaced.

1. Making this selection allows the microcode (code) to perform the following activities:
   - The code ensures that the drive is present.
   - The code uses the RS-422 to configure the drive.
   - The code ensures that the drive is offline to the host through the rest of this procedure.
   - The code gets the drive serial number, updates the drive VPD and determines the drive code level.
   - The code determines the highest code level in the other non-control path drives.
   - The code does a single-drive calibration.
   - Drive code is updated to the latest level.
   - The code moves the CE diagnostic cartridge into the drive and performs a read/write self-test (RECOMMENDED), or a load/unload test is run if no read/write diagnostic was selected. **Note:** If the read/write failed, or was not selected, the drive may be offline to the host. If this is the case, it is necessary to manually run the read/write test successfully to bring the drive back online. See “Service Menus” on page 774.
   - The code moves the CE diagnostic cartridge back into its storage slot.
   - Verify that the drive is “online” to the host **or** control unit.
2. Return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Prepare for Accessor Service (Single Accessor Library)

This option will make the accessor not-ready to the host.

1. If possible, the library will move the accessor into the base frame and automatically remove power to the accessor motors and logic.
2. The library code displays a wait message, 'The Accessor is now ready for service' that states the device has been prepared for service.
3. You can open the library front door and perform the necessary service.
4. For ease of service, raise the dual gripper assembly about halfway up the Y-axis mast assembly and secure it by inserting a hex wrench or screwdriver through the Y-axis mast access hole.

Attention: After completing these steps, ensure you remove the hex wrench or screwdriver, and lower the dual gripper assembly **before you close the library front door**. When the library detects that the front door has been closed for 10 seconds, and it verifies that no other door is opened, it will try to become operational. Close the door only when you are ready for the library to begin normal operation.

Prepare for Accessor Service (Dual Accessor Library)

This option will make both accessors not-ready to the host. If possible, the library code will move both accessors into their respective service bays, then remove power to the accessor motors and circuitry.
NOTE: When Accessor A is made unavailable, node cards will flash 2701 which is normal. When Accessor B is made unavailable, node cards will flash 27 02. Also, see **Note** below.

1. Locate the service barrier (it is typically stored in the rear of the HA1 frame). You will need the service barrier in the following steps.
2. At the library operator panel, press MENU, then select **Service**, **FRU Replacement**, **Prepare for Accessor Service.**
3. You will see the message, "No service barrier is installed. Normal accessor service requires the service barrier to be installed. Do you want to continue?" Select YES.
4. Select the accessor from the following menu selection:
   - Both Accessors
   - Accessor A
   - Accessor B
5. You will see "Pause is Progress" followed by 'The Accessor is now ready for service' indicating the device has been prepared for service.
6. Open the service bay door of the accessor you are going to work on.

7. Install the service barrier (at the right side lower frame of service bay A or the left side lower frame of service bay B). Plug the tethered jumper (attached to the service barrier) into the service bay cable. Once the tethered jumper has been connected then the other accessor will automatically resume processing of host jobs.
8. For ease of service, raise the dual gripper assembly about halfway up the Y-axis mast assembly and secure it by inserting a hex wrench or screwdriver through the Y-axis mast access hole.

   Note: If during this service procedure you run Library Verify on the other accessor (the accessor that is NOT in the service bay) you will see the following sequence of errors displayed on the operator panel. Press **CONT** to all these errors to bypass and continue running Library Verify:
   - 2701, 2801, 2701 (if running Library Verify on accessor "B" with accessor "A" in the service bay).
   - 2702, 2802, 2702 (if running Library Verify on accessor "A" with accessor "B" in the service bay).
9. Replace the FRU, then continue at “Finish Accessor Service (Dual Accessor Library)” on page 793.

Finish Accessor Service (Single Accessor Library)

1. From the Display screen, press **Enter**.
2. The OPC card communicates with the ACC card (if it cannot communicate, it will display an error code).
   - If the ACC or MDA card firmware is at a lower level than the firmware on the OPC card, the microcode will automatically update the firmware on the ACC/MDA cards to the level of the OPC card. If a new ACC/MDA card firmware is at a higher level than the firmware on the OPC a message will display notifying you of this fact.
   - A message will display asking of any accessor x hardware was replaced. If you answer YES, you will be taken to another menu to reset usage counters. See “Resetting Usage Counters” on page 795 for more information.
   - The library code will perform a rezero, followed by a calibration.
3. Return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Finish Accessor Service (Dual Accessor Library)

Attention: After completing these steps, ensure you remove the hex wrench or screwdriver, and lower the dual gripper assembly **before you close the service bay door. Also, pivot the dual gripper assembly in a detented position facing either the front or the back of the library**. Failure to do this can result in the dual gripper assembly hitting the end cover as the accessor 'homes' itself.

1. Close the service bay door (leaving the service barrier installed). Press ENTER.
2. At the library operator panel, select **Finish Accessor Service**. The library will power on the accessor. The accessor will automatically synchronize code (update) if its ACC or MDA was replaced. It will then rezero within the service bay, calibrate the service bay test slots, and perform a subset of the Library Verify test to ensure that the accessor is fully functional. When the *Finish Accessor Service* procedure has been completed, if no problems have been found, the operator panel will display a message, 'Accessor Replacement is complete.' Press ENTER.
3. A message will display asking of any accessor x hardware was replaced. If you answer YES, you will be taken to another menu to reset usage counters. See “Resetting Usage Counters” on page 795 for more information.
4. Press BACK until you reach the activity screen.
5. At the library operator panel, press PAUSE, then ENTER. The other accessor will move to its service bay.
6. Open the service bay door.
7. Remove the service barrier.
8. Close the service bay door. The accessor that was serviced will automatically calibrate its offsets in relation to the rest of the library (this takes about 2 minutes). Both accessors will automatically resume processing of host jobs.
9. Return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Prepare for FCA Replacement (Not used for Enhanced FCA)

If the library has only a single FCA, the entire library must be powered off (O). The following steps occur if multiple FCAs are available.

1. A screen is displayed that allows you to select a frame.
   - If possible, the library code will ensure that all drives in the failing frame are not in use.
   - If possible, the library code puts all drives in the failing frame offline to the host.
   - If there are cartridges in the drives, the library code attempts to put them away, if possible.
2. The operator panel will display a message, 'The FCA is now ready for service.'

Finish FCA Replacement (Not used for Enhanced FCA)

1. When FCA power is turned ON, the MCP library code will perform its normal POST. The drives will remain offline.
2. The library code will display a message that, 'The FCA Replacement Procedure is complete.'
3. Return to the procedure that sent you here, or go to “End-of-Call” on page 794.

Prepare for FIC Replacement

1. Select MENU, Service, FRU replacement, Prepare for FIC replacement.
2. The library code will display a message which informs you that continuing with this procedure will deactivate the operator panel.
3. If you select to continue, the library code makes the accessor not-ready to all hosts.
4. The library code instructs all MCPs and MCAs to power OFF all 37 V dc power supplies.
5. The service representative should now verify that the 37 V dc power indicators are OFF on all FIC cards (A, B, C, D, E, busses). For x32, x22, x52 only, If the power is not OFF, the service representative should remove 37 V dc power supplies until all 37 V dc power indicators are OFF. Error 2980 will appear. This is normal; Ignore the error.
6. Open all the front doors and leave them open. Press ENTER.

   Note: In a dual-accessor library, both service bay doors can remain closed.
7. Replace the failing FIC card (see “FIC Card” on page 835).
8. Continue with “Finish FIC Replacement.”

Finish FIC Replacement

1. Reinstall any 37 V dc power supplies removed.
2. The front doors should still be open.
3. Manually press the MCP or MCA reset button on all MCPs and MCAs in the library (for reset button locations, see Figure 248 on page 841) for the MCP or Figure 249 on page 845) for the MCA.
4. The OPC card communicates with the all node cards (if it can not communicate, it then displays an error code).

   Note: If a node card can not communicate, you may have a problem with:
   - The frame counting circuity on the FIC card
   - FIC card cabling
   - FIC card wrap terminator jumpers
5. The operator panel displays, ***"Validating Library Configuration,"*** then ***"Door Open,"*** in a Not Ready state.
6. Close the front doors on all frames. The library code verifies that all front doors are closed.
7. The operator panel displays, ***"Initializing."***
8. Select MENU, Service, FRU replacement, Finish FIC replacement.
9. Operator panel will display a message (even if all doors have been closed), ***"The following doors are open. Please close them and continue with the FIC replacement procedures."***
10. Operator panel will display a message, ***"The replacement procedure is complete. Press Enter to put the device 'online' to the host."***
11. Press BACK until the main activity screen is displayed.
12. Ensure that all MCPs are flashing the correct frame number on their character display.
13. Close the rear doors.
14. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
15. Return to the procedure that sent you here; otherwise, go to “End-of-Call.”

End-of-Call

1. If any cartridges were removed from the library, give them to the customer.
2. Close all doors. The library will perform an 'Initialization' procedure then come 'Ready.'
3. Reinstall all communications cables and terminators removed during repair.
4. Record your activity in Chapter 12, “History,” on page 1087.
5. If you just replaced a 3592 or 3588 tape drive that it is attached to an external device or control unit (J70, C06, VTS, TS7700, TS7700, 3953), then also follow any drive replacement 'end of call' procedures for that device.
6. Refer to **“Preventive Maintenance (PM)” on page 1085** to see if any PM is required. Return the library to the customer.

Resetting Usage Counters

See the following screen for information on resetting usage counters after an accessor FRU has been replaced. If you answered YES to the question, "Was any accessor X hardware replaced?" You will see the following screen. **Note:** The DOWN selection is not visible at this time:

```
Replaced Hardware
_____________________________________

Accessor X
Use UP or DOWN to change
highlighted value

X motor:       [Not Replaced]
Y motor:       [Not Replaced]
Pivot Motor:   [Not Replaced]
Gripper 1:     [Not Replaced]
Gripper 2:     [Not Replaced]
Scanner:       [Not Replaced]
               [Commit Changes]

[BACK]  [ UP ]  [DOWN]  [ENTER]
```

1. Press ENTER to go down the list.
2. When the FRU you replaced is highlighted (selected) press UP to change the status from [Not Replaced] to [Replaced].
3. If more than one FRU was replaced, continue pressing ENTER (to go down the list) or BACK (to go up the list).
4. Press UP to change from [Not Replaced] to [Replaced]. **Note:** If you make an error and need to change a selection, press ENTER (to go down the list) or BACK (to go up the list). When the selection to be changed is highlighted, press DOWN to change from [Replaced] to [Not Replaced].
5. Continue to press ENTER until you reach [Commit Changes], then press ENTER again to submit changes.
6. Usage counters for the selected [Replaced] FRU(s) will now reset to zero.
7. Press ENTER to continue.
8. You can view and verify the usage counters by selecting **Menu**, **Usage Statistics**, **Accessor Usage**. The first screen shows "Cumulative for Life of Library Accessor X." Press DOWN. The next screen shows "For Life of Component Accessor X" counters. This is where you will see actual usage/life counters for accessor FRUs shown in the above screen picture.

Shuttle Diagnostics, Exercisers, and Verification Procedures

Shuttle Diagnostics

Note: Refer to the **"IBM System Storage TS3000 System Console (TSSC) 27th Edition"** (or later), Chapter 2. "Adding a 3584 Model SC1 Complex System" for specific details on the following procedures.

The diagnostic tests will be under the service option on the Web Specialist. They will be executed from TSSC. There will be a delay for some of the diagnostic tests entered by the CE via the Web Specialist when the test is selected to give the CE time to walk to the desired station to observe the diagnostic test. The SMC 7-segment displays of the selected station will count down the delay so that the CE's know when the test is about to begin.

Connection Verify

1. There is no delay option needed for connection verify. The verification will occur as soon as the command is issued from the TSSC.
2. The connection must be physically and logically configured before issuing a Connection Verify operation.
3. This test is executed from TSSC for either an individual connections or for all connections.
4. A Command line interface goes to each library string to set connection offline.
5. Confirm that the shuttle is empty
   - After a timeout post an error notification
6. Command line interfaces go to each station in the connection
   - Command line interfaces move diagnostic cartridge to remote shuttle station
   - The TSSC will request a diagnostic cartridge from library and then determine which diagnostic cartridge to use and send move medium commands.
   - Command line interfaces move a diagnostic cartridge from shuttle station.
   - Verifies all sensors
   - Verifies power/communication with each shuttle station and car
   - Verifies the configuration of the connection
7. CLI that goes to each library string to set connection online

Span Verify

Span Verify is similar to connection verify test, but to be run for adjacent spans. If problem encountered with connection verify isolates to a span, don't want to have to rerun connection verify to further isolate. Need to go full speed like move command. Need option to enter in time delay

Station Verify

1. The gripper places a CE diagnostic cartridge into the station car.
2. The station car moves up, then travels a short distance down the span.
3. The station car returns; the gripper puts the CE diagnostic cartridge away.

Station Fiducial Calibration

1. Executed from Library Op Panel.
2. Will calibrate the shuttle stations fiducial for the cartridge tray.
3. Can select individual or all for shuttle stations attached to that library.
4. Triggers:

- Calibrate Frame
- Calibrate Library
- On ERP for failed access to station tray
- Finish Service

Diagnostics/Exercisers

These diagnostics tests require the TSSC to place the connection offline. These tests will also call the car to the requesting station.

- Executed from Web Specialist
- Need option to enter in time delay at Web Specialist
- Diagnostic is one operation of cycle car test below
- Exerciser is continuous operation of the cycle car test:
  - Need count of iterations and ability to stop the exerciser
  - TSSC will perform the looping and keep track of the count.

Check Procedures

Bar Code Label

Before you begin...:

The bar code scanner contains a Class II laser.



C04	**CAUTION:** **Because of laser radiation, do not stare into the beam.**

Each data and cleaning cartridge used by the tape library is identified by a volume serial number (VOLSER) and is identified with a bar code that appears on a label that is placed on the tape cartridge. See *IBM System Storage TS3500 Tape Library Operator Guide*, GA32-0560, for bar code requirements.

1. At the operator panel **Activity** screen, press [PAUSE] button on the operator panel.
2. When the library message indicates that the pause is activated, open the front door.
3. Check the cartridge labels for folds, missing pieces, tears or any extraneous markings, including smears or smudges along the length of the label.
4. If the labels are dirty or marked, clean the labels.
5. If a cartridge label needs to be replaced, the customer can order a kit containing enough replacement labels for 10 cartridges.
6. Clean the window of the bar code scanner **2**, using a lint-free cloth moistened with water. Two or three passes over the window area should clean the sensor. See Figure 235 on page 819 for a picture of the new style barcode scanner.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

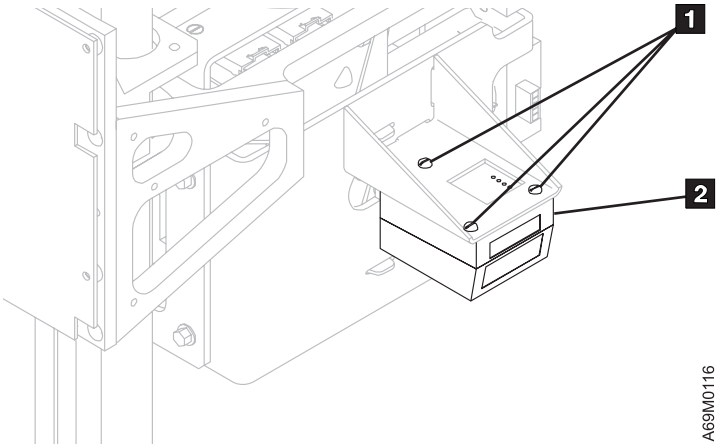


Figure 226. Bar Code Scanner Window – LTO style Shown

Bar Code Scanner

Before you begin...

The bar code scanner contains a Class II laser.



C04	**CAUTION:** **Because of laser radiation, do not stare into the beam.**

FRU List

- 80% Bar Code Labels
- 15% “Bar Code Scanner (Old Style)” on page 818
- 3% “Pivot Flex Cable” on page 992
- 2% “Y-Axis Cable” on page 1032

1. Perform “Library Verify Test” on page 759, with **no drives** selected.
   a. If library verify runs with no errors, go to step 2.
   b. If library verify fails, go to Chapter 2, “Start,” on page 71, and correct the problem.
2. Perform an inventory of the library or selected frames. This also provides a very good checkout of the bar code scanner. To perform an inventory:
   a. On the **Activity** screen, press **Menu**.
   b. On the **Main Menu** screen, select **Manual Operations**.
   c. On the **Manual Operations** screen, select **Inventory,** select **Accessor A** or **Accessor B**, and follow the instructions on the screens.
3. When the inventory is complete, run Cartridge Location:
   a. On the **Activity** screen, press **Menu**.
   b. On the **Main Menu** screen, select **Manual Operations**.
   c. On the **Manual Operations** screen, select **Move Cartridge**.
   d. Press **Back**.
   e. Check for blank VOLSERs.
4. If you are having problems with specific cartridges:
   a. Insert the problem cartridges into the I/O station.
   b. Open and close the I/O station door. The library will scan the I/O station.
   c. On the **Activity** screen, press **Menu**.
   d. On the **Main Menu** screen, select **Library Status**.
   e. On the **Library Status** screen, select **I/O Station Status**, and check for blank or incorrect VOLSERs.
5. For the Bar Code Scanner replacement procedure, see “Bar Code Scanner (Old Style)” on page 818 or “Bar Code Scanner (New Style)” on page 820.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Cables

Before you begin...

Attention: Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762.

See “Functional Block and Cable Diagrams” on page 48.

1. Inform the customer that you will be servicing the library.
2. Use Table 90 and “Service Procedures” on page 790 to prepare the library for service.
3. Open the doors and remove any necessary covers or shields.
4. Disconnect both ends of the cable that you are checking.

   Note: Observe which connectors the cable was connected to, and its orientation before removal.
5. Inspect the connectors for broken, bent, or dirty pins and contacts.
6. Inspect the cable for worn or broken wires.
7. If tests indicate that the cable is defective, exchange the defective cable.
8. If no problems are found, reseat the cable connectors and test the library again.
9. Use the proper procedure to return the library from service, depending on which procedure you used in the table below.
10. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Table 90. Cable Service Procedures

Cable Description	Service Procedure
Bifurcated Power Cord (Y-Power cord to drives)	Drive Procedure
Cable, EPO	To remove any EPO cable, the entire library must be powered off (O).
Cable, FIC-to-Door Safety Switch	Accessor Procedure
Cable, FIC-to-FIC Power	FIC Procedure
Cable, FIC-to-FIC Signal	FIC Procedure
Cable, FIC-to-OPC Card	Accessor Procedure
Cable, FIC-to-XCP	Accessor Procedure
Cable, FIC-to-Barrier Door tether	Accessor A or B barrier door assembly
Cable, Gripper Cartridge Sensors-to-PDC Card	Accessor Procedure
Cable, I/O Station-to-OPC	Accessor Procedure
Cable, MDA-to-AXY	Accessor Procedure
Cable, MDA-to-Home Sensor	Accessor Procedure
Cable, Pivot Flex	Accessor Procedure
Cable, SCSI Drive-to-Drive	The Host must stop using this SCSI cable addresses.
Cable, SCSI-to-Host	The Host must stop using this SCSI cable addresses.
Cable, X-Axis Flex	Accessor Procedure
Cable, Y-Axis Flex	Accessor Procedure
FCA Power Cord	FCA Procedure
FCA (RS-422) to Drives (12)	FCA Procedure

Drive Canister LED Display (LTO)

Before you begin...

Attention: Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762.

See “Functional Block and Cable Diagrams” on page 48.

Each hot-swap drive canister has a row of LEDs at the rear of the device. Figure 227 depicts the layout of the LEDs, and Figure 227 highlights the information you can learn from the LEDs. You can determine at a glance if a device is functioning correctly. If you determine that a service check points to a problem, consult with your customer before disrupting the job stream.

1. This service check may be performed without interrupting the customer job stream.
2. See Figure 227. View the LEDs on the rear of the canister. Locate the meanings of the LEDs in Table 91. The LEDs will mean something different for LTO SCSI and LTO fibre drives.

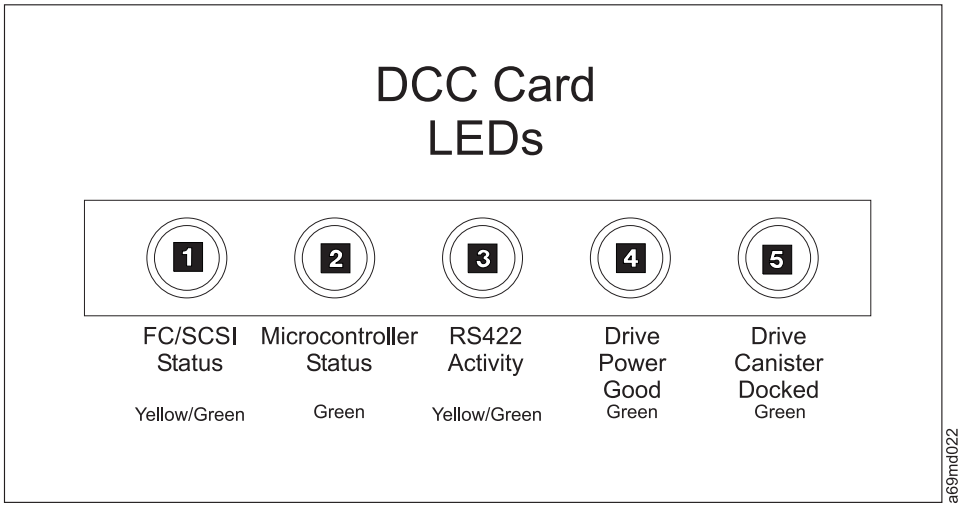


Figure 227. Drive Canister LED Displays

3. If problems are found with a drive, consult with your customer before continuing repair.
4. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Table 91. Canister LED Assignments

LED	LED Name	Meaning
	LTO SCSI	
1	FC/SCSI Status	• Green: FC/SCSI Activity. • Yellow: FC/SCSI on but not active.
2	Microcontroller Status	• Blinks Green during Power-Up. • Solid Green when up and running.
3	RS-422 Activity	Blinks Yellow/Green when activity on bus.

Table 91. Canister LED Assignments (continued)

LED	LED Name	Meaning
		LTO SCSI
4	Drive Power Good	• Solid Green; drive power is good. • No LED; may have power problem or may be controlled by DCC card. **Note:** This LED is also used on some fibre canisters to verify that the canister is docked.
		LTO Fibre
1	FC/SCSI Status (See Note below)	• No LED - No light and No LIP • Yellow - Light and No LIP • Green - Light and LIP
2	Microcontroller Status	• Blinks Green during Power-Up. • Solid Green when up and running.
3	RS-422 Activity	Blinks Yellow/Green when activity on bus.
4	Drive Power Good	• Solid Green; drive power is good. • No LED; may have power problem or may be controlled by DCC card. **Note:** This LED is also used on some fibre canisters to verify that the canister is docked.
5	Drive Canister Docked	• Solid Green; canister is properly plugged. • No LED; reseat canister. **Note:** This LED may not be present on some fibre canisters. In this case, if the Drive Power Good LED is on then the canister is considered docked.
Note: "LIP" is an acronym for "loop initiated primitive." When installing LTO Ultrium-2 Fibre drives, the LED may turn Green as soon as the drive is installed in the fixed tray. This is a drive code problem that occurs only with LTO Ultrium-2 drives, and will be fixed in an upcoming drive code release. Do not change any FRUs to resolve this problem unless you are working on a Fibre Channel connectivity problem and the Fibre Channel Wrap Test fails.		

Drive Canister LED Display (3592)

Before you begin...

Attention: Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762.

See “Functional Block and Cable Diagrams” on page 48.

Each hot-swap drive canister has a row of LEDs at the rear of the device. Figure 228 depicts the layout of the LEDs, and Table 92 on page 804 describes each one. You can determine if a drive is functioning correctly. If you determine that a service check points to a problem, consult with your customer before disrupting the job stream.

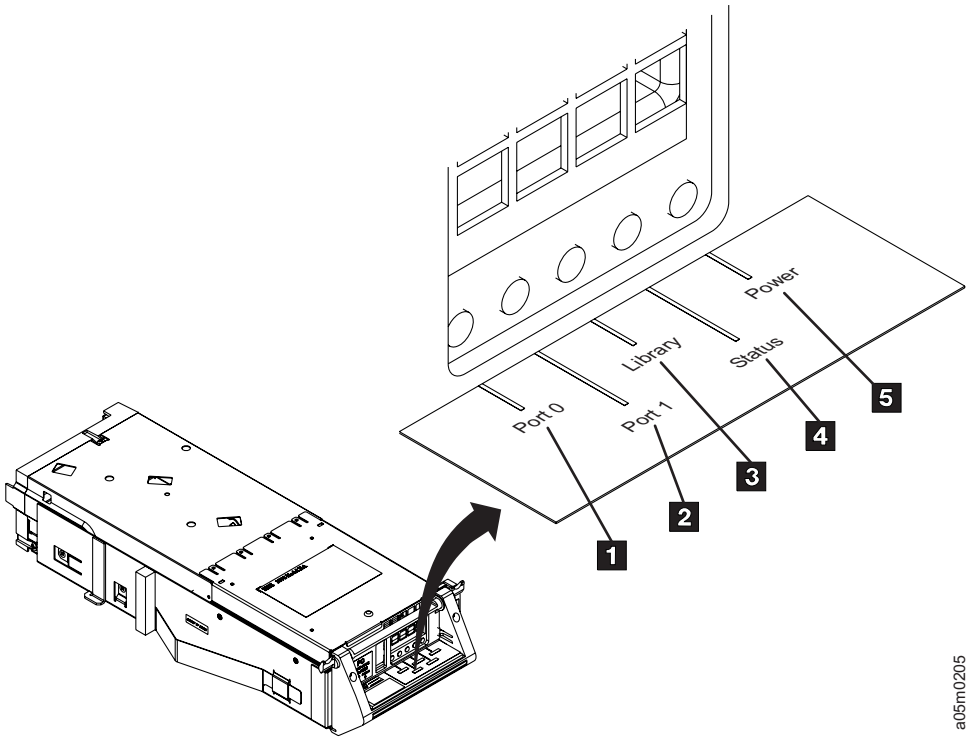


Figure 228. LEDs – Locations

Table 92. 3592 Canister LED Assignments

LED Number	Purpose	Color	LED-on indicates:	Blinking LED indicates:	No LED indicates:
1	**Port 0** – Fibre channel activity	Yellow	N/A	Fibre channel connections are good; not ready to transmit	No light is detected through fibre channels. The fibre channel cable is disconnected or the port is not in use.
2	**Port 1** – Fibre channel activity	Green	Fibre channel connections are detecting light, but no data is being transferred. The wrap plugs are installed or the drive canister is offline to the control unit or host.	Fibre channel connections are good; data is being transferred	
3	**Library** – RS-422 connection to the 3584	Yellow	N/A	N/A	No communications since last POST of drive
		Green	At least one message received since POST	RS-422 communication activity	
4	**Status** – Drive status	Yellow	Power-on started or library code soft reset began	Status message is available at the Op panel.	Drive completed POST
		Green	N/A	N/A	
5	**Power** – Drive power status	Yellow	N/A	N/A	+5 V dc and/or +12 V dc is missing
		Green	+5 V dc and +12 V dc is present at drive	N/A	

37 V dc Power Supply (x32, x22, x52 only)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

FRU List

- 51% “Power Supply, 37 V dc (x32, x22, x52 only)” on page 994.
- 49% FCA

There are two 37 V dc power supplies located within the base frame (Model Lxx) FCA, unless one was moved earlier in step 2e on page 122. There may be one 37 V dc power supply in the FCA of an expansion frame (Model Dxx) unless FC 1902 (Redundant 37 V dc power supply) has been installed.

Not all expansion frames will contain an FCA. Usually, if no drives are installed in an expansion frame, no FCA will be installed.

- Only one 37 V dc power supply is required to run a single accessor library with no redundancy. A second 37 V power supply is required for true redundancy. Dual accessor libraries (model HA1) require a **minimum** of two 37 V dc power supplies, one for each accessor. Two additional 37 V power supplies are recommended for true power redundancy. If possible, install only one 37 V dc power supply in each frame that has an FCA. **See page 838** for a list of how 37 V dc is distributed in the library. Also see **“37 V dc Distribution in an HA1 Library” on page 807** for information on where 37 V dc power supplies must be installed in a single or dual accessor library to optimize full 37 V dc redundancy.
- The base frame FCA contains two 37 V dc power supplies. If both supplies are working properly, the library will power on both supplies.
- If an expansion frame FCA contains a 37 V dc power supply, the library will power on the two supplies in the base frame and the power supply in the expansion frame.
- If more than three 37 V dc power supplies are available, the library will power on only three of the available supplies.
- If one of the three supplies fails, and there are additional supplies, the library will turn on one of the additional supplies.
- The supplies are designed to be “hot-pluggable” (replaceable with the library running) in case one fails.

See Figure 229 on page 806 for the location of these supplies.

1. If the customer is still using the library (at least one 37 V dc power supply is functional), you MUST NOT remove the functioning supply in the following steps.
2. If only one supply seems to be defective, unplug the supply then plug the supply back in. As soon as the power supply is unplugged, the MCP will flash 34 xx. The MCP in the FCA that you are working on will power on the supply and check the power supply output. If the power supply is NOT functional, the MCP will post an error to the Error Log and flash error code 34 xx. If the library code is 3060 or higher it will go back to normal 00 frame-number display as soon as the power supply has been checked out and found to be good. But if the library code is lower than 3060 then the 34 xx won't clear from the MCP two-character display until you reset the MCP - whether or not the power supply is good.

   If the power supply is functional, and the library has only two supplies, the MCP will leave the power supply ON. If the power supply is functional, and the library **has** three supplies, the MCP will turn the power supply Off. This third supply will only come on (under library firmware control) if one of the other two fail.

   The green LED indicates that AC power is applied to the power supply. The yellow LED indicates that the power supply is not supplying DC. Note that a yellow LED does not necessarily indicate a problem. Never attempt to fix a problem with redundant power supplies unless the problem results in 34xx errors in the library error log.

LED indicator info for redundant 37 V dc power supplies that are **not being used** (typically applies to subsystems with more than 3 power supplies) function as follows:

- If there is a single power supply in the FCA (typical case for the model D32), then the power supply LEDs will be off. If you unplug the power supply for a minute and then reinstall it, the green LED will turn on for one minute while the power supply is being tested, then it will turn off. The yellow LED will turn on briefly when the power supply is turned on for testing, and again when it is turned off after testing has completed.
- If there are two power supplies in the FCA (typical case for the model L32), and if one of the power supplies is being used, then the unused power supply will have both the green and orange LEDs turned on. If you unplug the unused power supply for a minute and then reinstall it, the green LED will turn on for one minute while the power supply is being tested, then the green LED will remain on and the yellow LED will turn on.

Note: The reason these two cases are different is that the AC input power to both power supply bays in the FCA is tied together - the library code must either turn on AC power to both power supply bays or turn off AC power to both power supply bays. If there is only a single power supply in the FCA then the library code disables a power supply by turning off its AC power. But if there are two power supplies in the FCA, and one of them is being used, the unused power supply must have AC power applied (green LED). But the library code disables the output from the unused power supply, causing the yellow LED to turn on.

3. If both 37 V dc power supplies have failed, suspect the FCA.
4. Try swapping the two power supplies with each other. If the failure moves, suspect the 37 V dc power supply.
5. If the 37 V dc power supply failure remains in the original position after swapping the supplies, suspect the FCA.

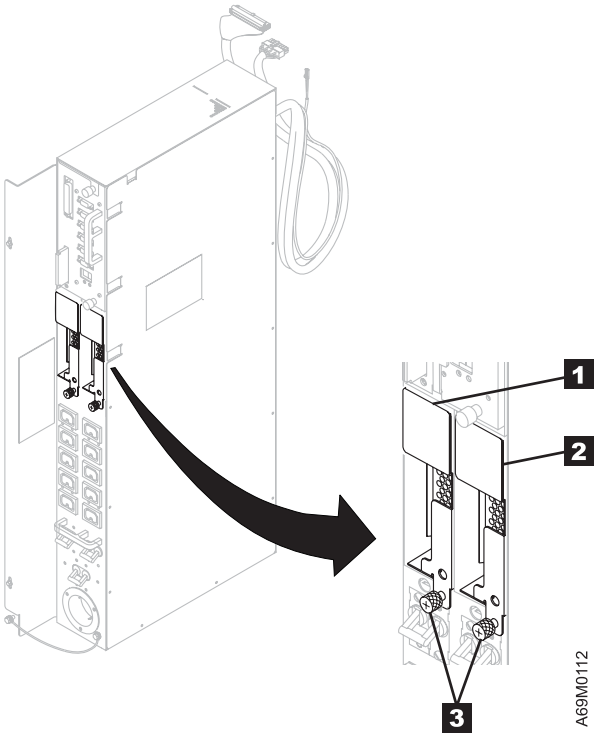


Figure 229. 37 V dc Power Supply Locations

37 V dc Distribution in an HA1 Library

The following tables illustrate how 37V dc power supplies installed in L/Dx2 frames affect power redundancy in an HA library. L/Dx3 frames with Enhanced FCAs installed are not as affected because 37V is generated and distributed differently.

This tables are shown from the **rear** of the library. Accessors are first powered by the primary 37V power supply. An optional secondary power supply can be installed (FC 1902) for each accessor. If primary 37V is lost (either due to power supply failure or power supply removal) the 37V secondary power supply will automatically take over to provide uninterrupted accessor power. For full power redundancy in HA1 libraries with L/Dx2 frames, you must have four 37V power supplies installed as shown in **Table 93**.

The four 37V power supplies should be installed in four separate frames in order to achieve maximum redundancy. Power supply assignments (shown in the following tables) are defined as follows:

- **Ap** - Accessor "A" primary voltage
- **As** - Accessor "A" secondary voltage
- **Bp** - Accessor "B" primary voltage
- **Bs** - Accessor "B" secondary voltage

Notes:
For the following bulleted list:

1. 37V power supplies installed in the same frame can't provide **primary** power to both accessors. The second power supply will only provide another primary power source to the same accessor.
2. 37V power supplies installed in the same frame can't provide **secondary** power to both accessors. The second power supply will only provide another secondary power source to the same accessor.

- **Ap1, Ap2** - Both 37 V power supplies provide Accessor "A" primary power
- **As1, As2** - Both 37 V power supplies provide Accessor "A" secondary power
- **Bp1, Bp2** - Both 37 V power supplies provide Accessor "B" primary power
- **Bs1, Bs2** - Both 37 V power supplies provide Accessor "B" secondary power

► 37V power supply distribution in HA1 libraries with FOUR or more 'active' frames (with FCA)

Table 93. **Four or more Frames Example** *Viewed from the Rear of the Library*

Dx2 Frame	Dx2 Frame	Dx2 Frame	Dx2 Frame	Lx2 Frame	Redundancy Status
One 37V ps installed **(Bs)**		**One** 37V ps installed **(As)**	**One** 37V ps installed **(Bp)**	**One** 37V ps installed **(Ap)**	**Full redundancy** if any of the four 37V dc power supplies fail or are removed, and if one entire frame loses power.

Notes:
1. Frames with 37V power supplies must have an FCA installed.
2. The four individual power supplies can be installed in any 'active' frame in the library that has an FCA installed.

► 37V power supply distribution in HA1 libraries with only THREE 'active' frames (with FCA)

Note: The following table applies to HA1 libraries with three 'active' frames (assuming both frames have an FCA installed). This also applies to longer libraries that only have three active frames (with an FCA installed).

Table 94. **Three Frame Example** *Viewed from the Rear of the Library*

Second Dx2 Frame	First Dx2 Frame	Lx2 Frame	Redundancy Status
One 37V ps installed **(As)**	**Two** 37V ps installed **(Bp1)** & **(Bp2)**	**One** 37V ps installed **(Ap)**	**Improved redundancy**. Full redundancy for A, simple redundancy for B (Bp1 and Bp2) where a 37V power failure will be recovered. But a loss of frame 2 (middle frame) will cause a loss of accessor B.
One 37V ps installed **(As)**	**One** 37V ps installed **(Bp)**	**Two** 37V ps installed **(Ap1)** & **(Ap2)**	**Reduced redundancy**. There is no secondary backup for B, just primary.
One 37V ps installed **(Bp)**	**None**	**One** 37V ps installed **(Ap)**	**No redundancy**. If either 37V dc power supply fails or is removed, or an entire frame loses power, 37V will be lost to either the A or B accessors.
None	**Two** 37V ps installed **(Ap1)** & **(Ap2)**	**None**	**No redundancy**. Accessor B does not have any power.

Notes:

1. You must have four 37V power supplies installed for optimum redundancy.
2. Frames with 37V power supplies must have an FCA installed.
3. The four power supplies shown in the top row provide the best redundancy.
4. The bottom three rows show 37V power supply installations that would **NOT** provide redundancy.

► 37V power supply distribution in HA1 libraries with only TWO 'active' frames (with FCA)

Note: The following table applies to HA1 libraries with only two 'active' frames (assuming both frames have an FCA installed). This also applies to longer libraries that only have two frames (with FCA).

Table 95. **Two Frame Example** *Viewed from the Rear of the Library*

Dx2 Frame	Lx2 Frame	Redundancy Status
Two 37V ps installed **(Bp1)** & **(Bp2)**	**Two** 37V ps installed **(Ap1)** & **(Ap2)**	**Simple redundancy** for both A and B, where a single 37V power failure will be recovered. However, loss of a frame will result in a loss of an accessor.

► 37V power distribution in Lx3/Dx3 HA1 libraries with only TWO 'active' frames (with Enhanced FCA)

An Lx3/Dx3 HA1 library with two active frames provides full power redundancy regardless of failing power supplies. Up to two power supplies can fail without causing any impact.

Table 96. **Two Frame Example** *Viewed from the Rear of the Library*

Dx3 Frame	Lx3 Frame	Redundancy Status.
Failing upper BPS	Failing upper BPS	**Full redundancy.** Lower BPS provide power to both accessors.
Failing lower BPS	Failing lower BPS	**Full redundancy** Upper BPS provide power to both accessors.
Both BPS fail	Both BPS operational	**Full redundancy.** Remaining frame powers both accessors.
Both BPS operational	Both BPS fail	**Full redundancy.** Remaining frame powers both accessors.
Failing lower BPS	Failing upper BPS	**Full redundancy.** Remaining BPSs power both accessors.
Failing upper BPS	Failing lower BPS	**Full redundancy.** Remaining BPSs power both accessors.

Note: An HA1 library with four active frames (Lxx and 3 Dxx) may have **all** 37 V LEDs (total of 8) on in **all** four frames. Earlier BPS power supplies had an amber LED for 37 V. Later BPS power supplies have a green LED. There is no functional difference between the two colors.

BPS power supplies will provide 37V (two per frame) in the order the frames were powered on. For example, if you have six active frames, the first four frames that power-up will supply 37V. The others will not provide 37V (37V LED will be off), however they remain in a 'ready' state. In the event of a 37V failure the assigned backup supply will provide power.

► Modifying 37V Power Supply Distribution

Warning: Changing 37V power supply distribution is disruptive to customer operations, as it requires a power-cycle of the library.

Warning: A library without ALMS activated will need to be reconfigured.

Note: If the 37V power supply configuration needs to be modified, in order to accommodate the recommended configuration, 34A1 and/or 34A2 error will be posted. In order for the library to accept this new power configuration the following additional steps are required:

(Continued on the following page)

With ALMS:

- Select **Settings**, **Configuration**, **Discover Hardware Changes**, then press ENTER
- Open all doors where 37V power supplies were changed or modified
- Power off the library
- Change 37V power supplies to desired positions
- Power on the library
- Resume **Discover Hardware Changes** and close doors.

Static Configuration:

- Power off the library
- Change 37V power supplies to desired positions
- Power on the library
- Configure the library: Select **Settings**, **Configuration**, **"Configure Library"** or **"Advanced Configure"**.

Gripper Assembly

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

FRU List

- 94% “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954, “Gripper Assembly, Single LTO (Old Style)” on page 956, or “Gripper Assembly, Single LTO (New Style)” on page 958.
- 6% “Pivot Flex Cable” on page 992

The bar code scanner contains a Class II laser.



C04 **CAUTION:**
Because of laser radiation, do not stare into the beam.

1. Determine which accessor (A or B) requires service. Prepare for accessor service. See “Service Procedures” on page 790.
2. At the operator panel **Activity** screen, press [PAUSE] button on the operator panel.
3. When the library message indicates that the pause is activated, open the front door.
4. Observe the gripper as you manually move it in and out of its housing using the gripper belt. Check the gripper belt for wear and tension.
5. Move the gripper housing up and down to ensure it is securely latched in place. A dislodged gripper housing can cause gripper errors. Also check for a loose or broken gripper mounting pad. See Figure 336 on page 959.
6. Close the front door and run library verify with NO drives selected (see “Library Verify Test” on page 759). Observe the operation of the gripper assembly as it gets and puts cartridges.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Logical Library Label

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

FRU List

- 60% Logical Library Label
- 40% Label Holder

Note: Early machines (libraries shipped before March, 2001) may contain labels that are too glossy to be read by the bar code reader. Labels should have a matte (flat) finish. If you encounter this problem, do not replace the bar code reader. Contact IBM Support for a set of replacement labels. You can replace the labels with clean, photocopied labels (do not use glossy paper), or you can cover the glossy labels with frosted, cellophane tape. This can reduce the reflectivity of the label, making it possible for the bar code scanner to scan it successfully. Use this technique until the customer can acquire proper label material.

The customer may use logical library bar code labels to designate the physical breakout of logical libraries. Each library comes with one sheet of 18 labels for each of five logical libraries and six holders for logical library labels. A sample label and holder are shown in Figure 230.

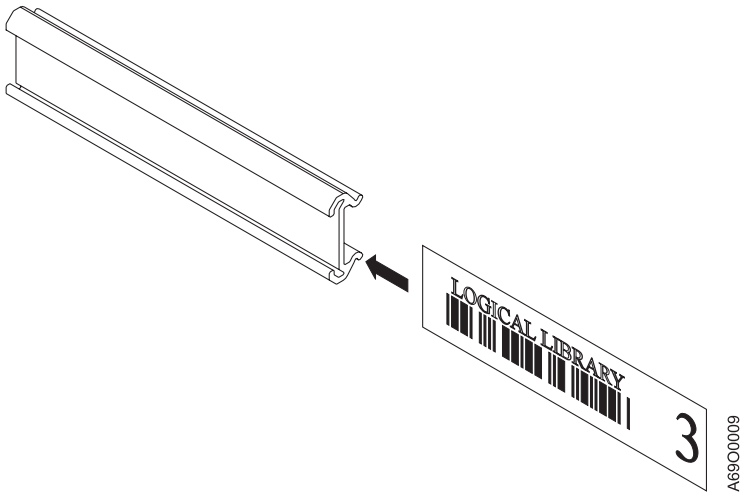


Figure 230. Sample Label and Holder

Label Check

1. At the operator panel **Activity** screen, press [PAUSE] button on the operator panel.
2. When the library message indicates that the pause is activated, open the front door.
3. Check the logical library labels **1** and **2** for folds, missing pieces, tears or any extraneous markings, including smears or smudges along the length of the label (see Figure 231 on page 813).
4. If the labels are dirty or marked, clean the labels.
5. If a label needs to be replaced, see Chapter 14, “Parts Catalog,” on page 1093 for the part number.
6. If the labels are not damaged or dirty, clean the bar code scanner window with a lint-free cloth moistened with water. Two or three wipes over the window area should clean the sensor. For bar code scanner location, see “Bar Code Scanner (Old Style)” on page 818.

7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

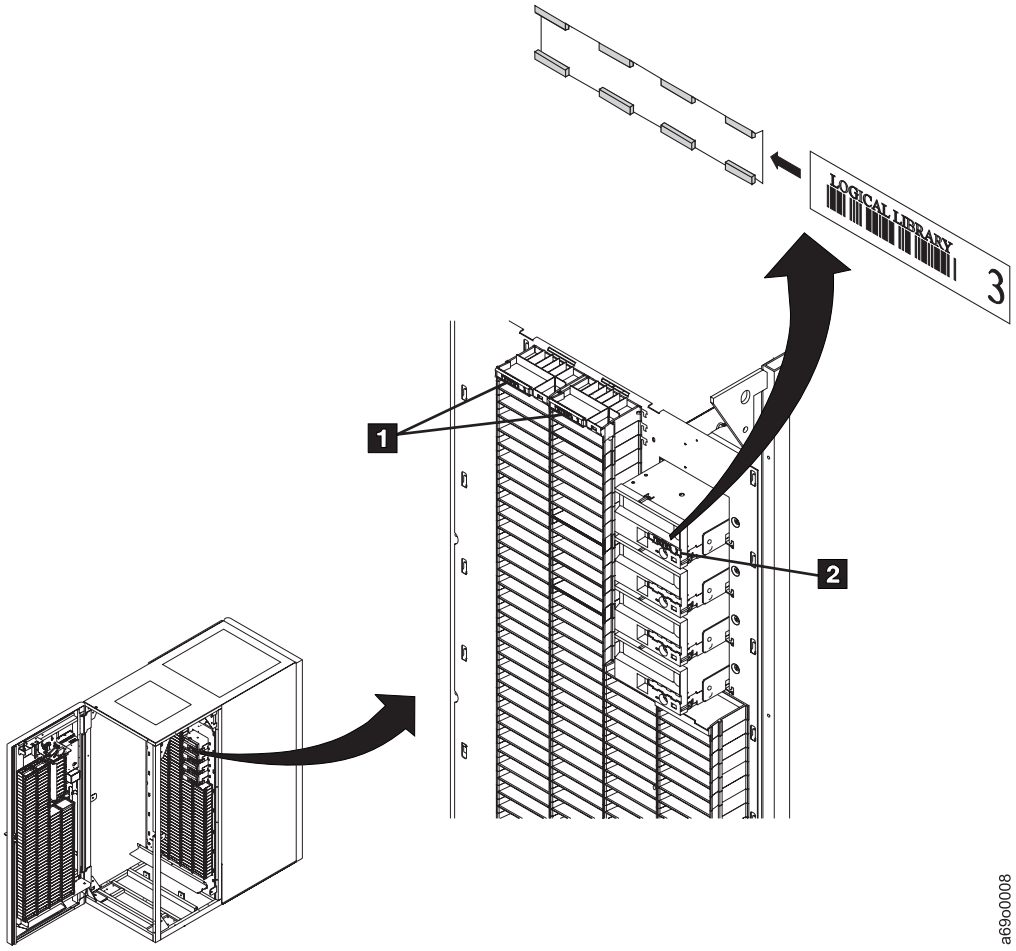


Figure 231. Sample Label and Holder Placement

Pivot Assembly

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

FRU List

- 50% “Pivot Belt and Motor Assembly” on page 988
- 20% “Pivot Flex Cable” on page 992
- 5% “Pivot Detent Arm and Spring” on page 990
- 4% “Pivot Assembly” on page 986
- 1% Bumper, Pivot (see Assembly 5, Item 1D in Chapter 14, “Parts Catalog,” on page 1093)

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Check the pivot flex cable for wear or damage.
3. Check for loose or damaged connectors.
4. Check the pivot belt for wear and tension. The belt tension is correct if light finger pressure (in the center of the belt between the two pulleys) deflects the belt 3 to 5 mm (1/8 to 3/16 in.).
5. Operate the pivot assembly manually and ensure that it works smoothly without binding.
6. If you find a problem, use the FRU list at the beginning of this check. Exchange FRUs one at a time.
7. Close the front door.
8. Complete the accessor servicing (see “Service Procedures” on page 790).
9. Perform the “Library Verify Test” on page 759.
10. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

X-Axis Assembly

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

FRU List
- 35% X-Axis Belt
- 30% X-Axis Motor
- 18% “X-Axis Track Cable” on page 1014
- 15% “X-Axis Rail Assembly” on page 1030
- 2% “X-Axis Home Sensor” on page 1022

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Check the X-axis motor belt for wear and tension. The belt tension is correct if light finger pressure (in the center of the belt between the two pulleys) deflects the belt 3 to 5 mm (1/8 to 3/16 in.).
3. Manually move the X-axis assembly back and forth over the X-rails while checking for binding conditions. Check for defective pinion shaft bearings by using feel and sound.
4. Manually move the X-axis assembly back and forth over the X-rails between frames to check for accessor binds. If binds are noticed, the problem could be caused by X-rail expansion of older style X-rails caused by the moisture content of the air. The problem only occurs when two older style X-rails are side-by-side in two adjacent frames. Refer to Figure 232 to determine the type of X-rails you have in the library. See “X-Axis Rail Assembly” on page 1030 for removal and replacement procedures if necessary. Refer to the parts catalog for the new X-rail part numbers (Lxx and Dxx).
5. Check the X-axis track cable for wear or damage.
6. If you find a problem, use the FRU list at the beginning of this check. Exchange FRUs one at a time.
7. Close the front door.
8. Complete the accessor servicing (see “Service Procedures” on page 790).
9. Perform the “Library Verify Test” on page 759.
10. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

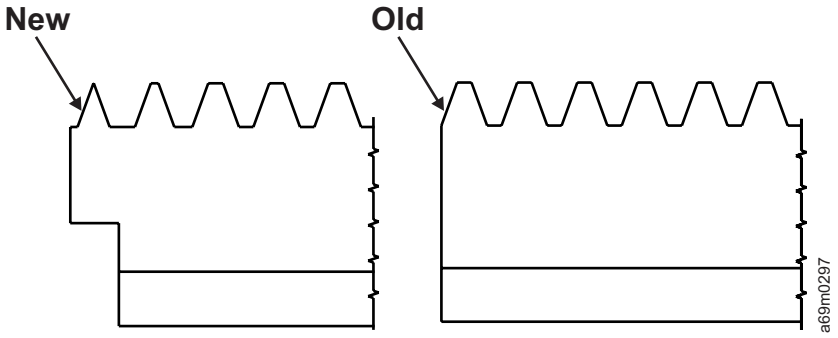


Figure 232. New and Old Style X-Rails

Y-Axis Assembly

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU..

FRU List
- 35% Y-Axis Belt
- 30% Y-Axis Motor
- 18% “Y-Axis Cable” on page 1032
- 13% “Y-Axis Mast Assembly” on page 1040
- 2% “Y-Axis Guide Rollers” on page 1036
- 2% “Y-Axis Home Sensor” on page 1038

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Check the Y-axis urethane rollers for wear. Ensure that the tension spring is not broken.
3. Check the Y-axis motor belt for wear and tension. The belt tension is correct if light finger pressure (in the center of the belt between the two pulleys) deflects the belt 3 to 5 mm (1/8 to 3/16 in.).
4. Manually move the pivot assembly up and down the Y-axis mast while checking for binding conditions.
   a. Lift the accessor assembly up the Y-axis lead screw.
   b. Ensure that no binds exist in the upper Y-bearing or the lower Y-bearing.
   c. If either bearing has become unseated, use a soft mallet (plastic or rubber) to tap it back into place.
5. Check the Y-axis flex cable for wear or damage.
6. Check the screws to ensure they are tight. The bolts and screws that secure the Y-axis mast assembly to the X-axis carrier must be tightened in the correct sequence.

   Attention: The Y-axis mast will be deformed if the screws **1** are over tightened.

   a. Snug, but do not tighten the four screws.
   b. Carefully tighten the two screws on the left side **1**.
   c. Tighten the two bolts on the front **2**.
7. If you find a problem, use the FRU list at the beginning of this check. Exchange FRUs one at a time.
8. Close the front door.
9. Complete the accessor servicing (see “Service Procedures” on page 790).
10. Perform the “Library Verify Test” on page 759.
11. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

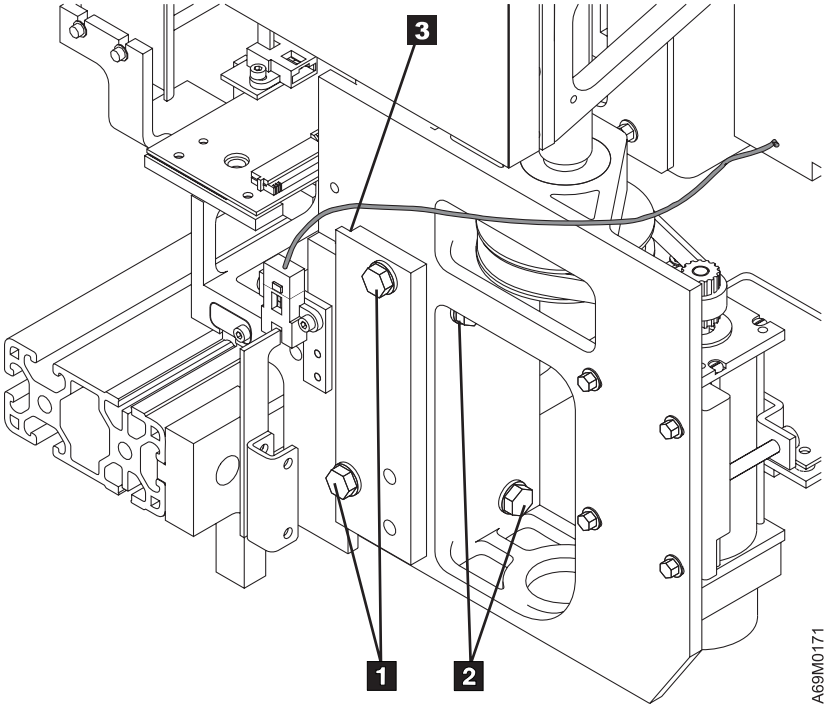


Figure 233. Y-Axis Mast – Bolts

Removal and Replacement Procedures

Bar Code Scanner (Old Style)

Before you begin...

The bar code scanner contains a Class II laser.



If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

Attention: There are two types of barcode scanner mountings (for both old style and new style scanners) depending on whether the scanner is mounted on the original LTO dual gripper assembly or the newer Universal (LTO/3592) gripper assembly. In the following steps be sure to follow the procedure that applies to the type of dual gripper assembly installed in the library. See “Bar Code Scanner (New Style)” on page 820 for the new style barcode scanner.

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).

LTO/LTO dual gripper: (old style scanner)

Note: The new barcode scanner FRU may have come with a plastic housing and three screws. The housing and screws can be discarded if not needed for reinstall.

2. See Figure 234 on page 819. Remove the screws **1** that hold the bar code scanner assembly to the dual gripper assembly housing.
3. Disconnect the cable that connects the bar code scanner to the PDC card.
4. Remove bar code scanner **2**.

Universal (LTO/3592) dual gripper: (old style scanner)

Note: The new barcode scanner FRU may have come with a plastic scanner mounting bracket and three screws. The bracket and screws can be discarded if not needed for reinstall.

1. See Figure 235 on page 819. Disconnect the cable **1** that connects the bar code scanner to the PDC card.
2. Lift the retaining tab **2** and pull the scanner **3** out of the housing.
3. **Note:** To remove the barcode scanner mounting bracket, firmly slide it to the left and pull it out of the dual gripper assembly. To install the barcode bracket, position the three tabs into the dual gripper assembly and slide it firmly to the right until it locks in place.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

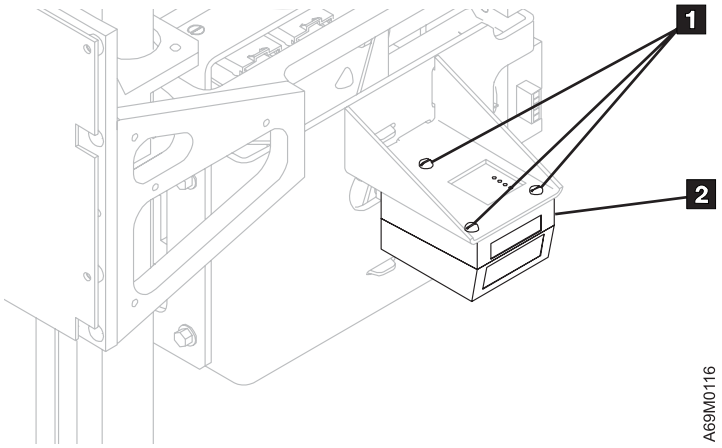


Figure 234. Bar Code Scanner (LTO Dual Gripper)

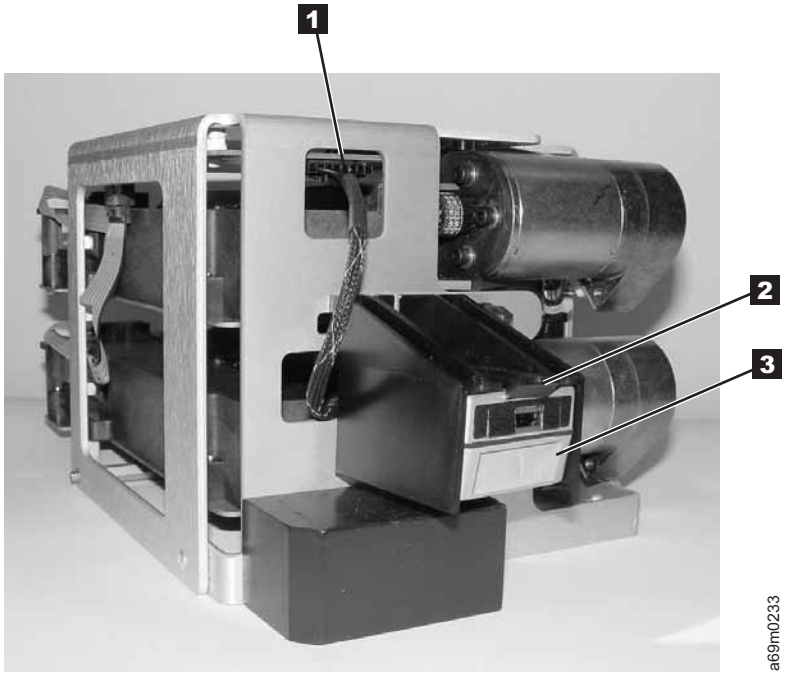


Figure 235. Bar Code Scanner (Universal LTO/3592 Dual Gripper)

Bar Code Scanner (New Style)

Before you begin...

The bar code scanner contains a Class II laser.



If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

Attention: There are two types of barcode scanner mountings (for both new style and old style scanners) depending on whether the scanner is mounted on the original LTO dual gripper assembly, the Universal (LTO/3592) gripper assembly, or HD gripper assembly. In the following steps be sure to follow the procedure that applies to the type of dual gripper assembly installed in the library. See “Bar Code Scanner (Old Style)” on page 818 for the old style barcode scanner.

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).

LTO/LTO dual gripper: (new style scanner)

2. See Figure 236 on page 821 and Figure 237 on page 821. Remove the nuts **1** that hold the bar code scanner assembly to the dual gripper assembly housing.
3. Disconnect the cable that connects the bar code scanner to the PDC card.
4. Remove bar code scanner.

Universal (LTO/3592) dual gripper: (new style scanner)

1. See Figure 238 on page 821. Disconnect the cable **1** that connects the bar code scanner to the PDC card.
2. Lift the retaining tab **2** and pull the scanner **3** out of the housing.
3. **Note:** If you are replacing an old style scanner with a new style scanner on a universal gripper (LTO/3592), you must first remove the old style scanner mounting bracket and replace it with the new style mounting bracket before installing the new style barcode scanner. To remove the barcode scanner mounting bracket, firmly slide it to the left and pull it out of the dual gripper assembly. To install the barcode bracket, position the three tabs into the dual gripper assembly and slide it firmly to the right until it locks in place.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

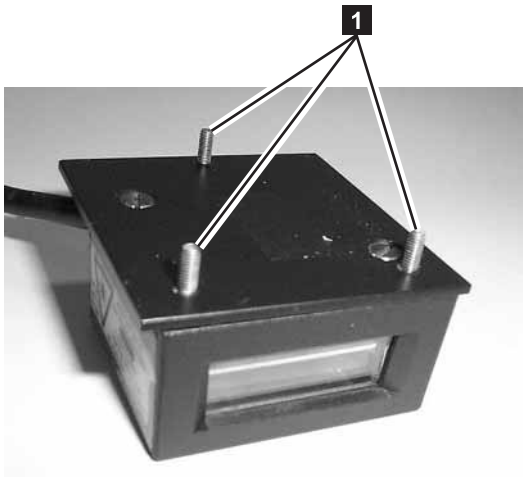


Figure 236. Bar Code Scanner (LTO FRU)

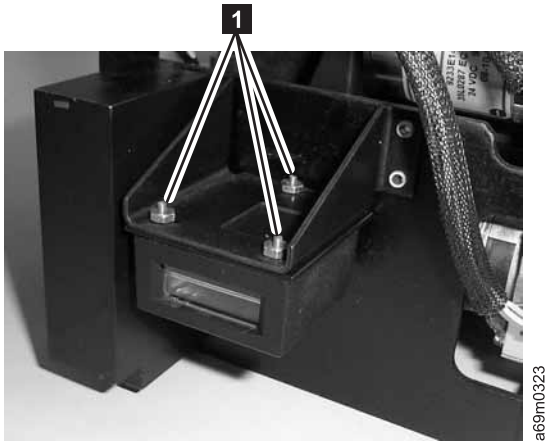


Figure 237. Bar Code Scanner (LTO Dual Gripper)

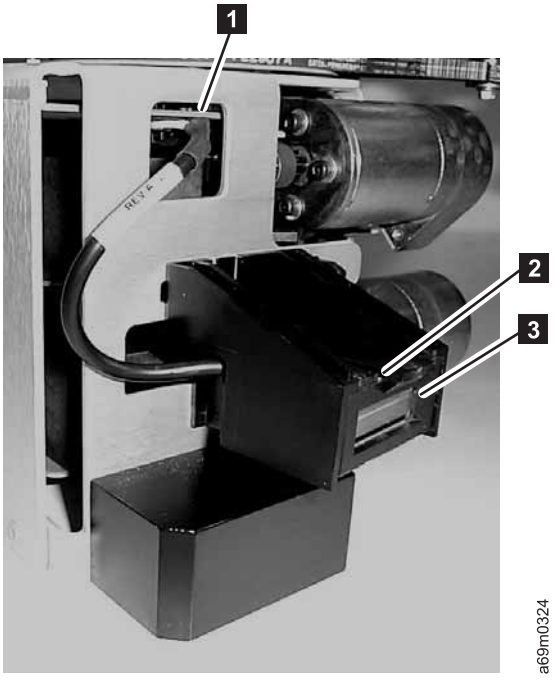


Figure 238. Bar Code Scanner (Universal LTO/3592 or HD Dual Gripper)

Calibration Sensor

Before you begin...

The bar code scanner contains a Class II laser.



C04 **CAUTION:**
Because of laser radiation, do not stare into the beam.

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

Attention: The calibration sensor is mounted under the top LTO gripper on the original LTO dual gripper assembly, and on top of the lower gripper on the Universal (LTO/3592) gripper assembly. In the following steps be sure to follow the procedure that applies to the type of dual gripper assembly installed in the library.

Prepare the accessor for servicing (see “Service Procedures” on page 790).

Original LTO dual gripper:

1. Remove the upper gripper assembly, see “Gripper Assembly, Single LTO (New Style)” on page 958.
2. See Figure 239 on page 823. Turn the upper gripper assembly **1** on its side to expose the calibration sensor **2**.
3. Disconnect the connector **4**.
4. Remove the two screws **3** holding the calibration sensor to the upper gripper housing.
5. Remove the calibration sensor assembly.

   Note: This FRU is factory-adjusted. The complete assembly must be replaced.

Universal (LTO/3592) dual gripper:

1. Disconnect the calibration sensor cable from the PDF card.
2. See Figure 240 on page 823. While holding the gripper firmly in place, slide the calibration sensor **3** forward out of the mounting rails **2** and out of the front of the gripper **1**.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform a library calibration (see “Library and Drive Calibration Procedures” on page 784).
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

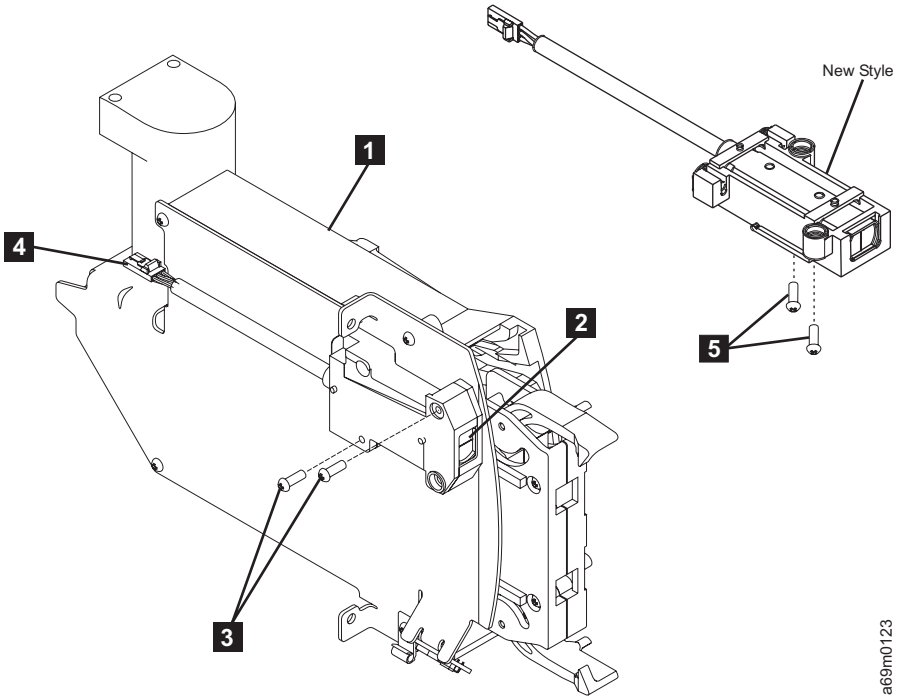


Figure 239. Calibration Sensor (LTO Dual Gripper)

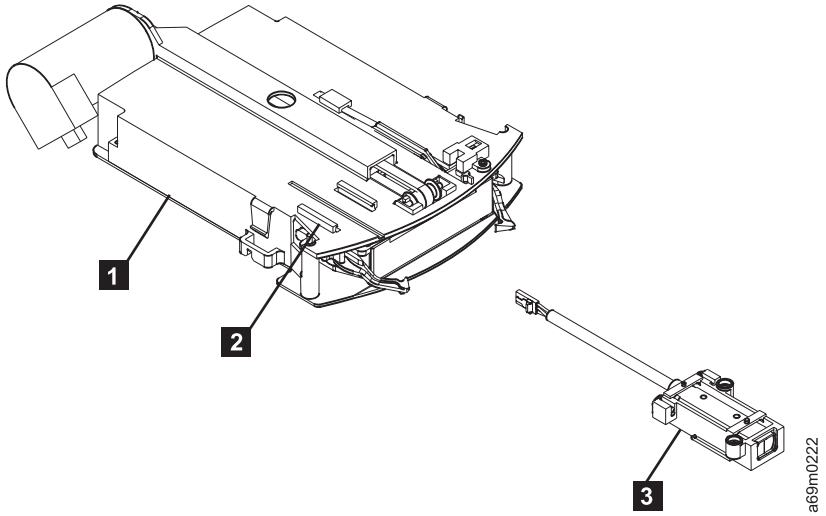


Figure 240. Calibration Sensor (Universal Dual Gripper)

Compact Flash (CF) Card Replacement Procedures

New style node cards (ACC, MCA, MDA, OPC) for x23 or x53 frames have a compact flash (CF) card installed. Specific compact flash card removal and replacement procedures for each of these new style node cards can be found in the following CARR procedures:

Table 97. Compact Flash Card Removal and Replacement Procedures

Node Card	Removal and Replacement Procedure
ACC	See, “Accessor Controller Card (ACC, ACC-CF)” on page 828.
MCA	See, “Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)” on page 844.
MDA	See, “Motor Driver Assembly (MDA, MDA-CF)” on page 846.
OPC	See, “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850.

Node Cards in the Library

Node Card Designations and Descriptions

3584 library node cards have evolved and changed over the past few years. Based on these changes we are now providing additional descriptions to help eliminate confusion when replacing and/or identifying the various node cards. Cards with a Compact Flash cards are identified with a 'CF' suffix. See Table 98.

Table 98. Node Card Descriptions

Node Card	Information
OPC	Used in Lx2 frames. Basic OPC node card without a compact flash (CF) card.
OPC-CF	Used in Lx3/L22/L52. Enhanced OPC node card with a compact flash (CF) card (originally introduced in L23, L53).
OPC+ w/CF	Used only in L32 frames in libraries. Enhanced OPC node card with a compact flash (CF) card.
MCP	Used in Lx2/Dx2 frames. Basic MCP node card without a compact flash (CF) card.
MCA-CF	Used in Lx3/Dx3 frames. Enhanced MCA node card with a compact flash (CF) card (originally introduced in L23, L53).
MCP+ w/CF	Used in Lx2/Dx2 frames. Enhanced MCP node card with a compact flash (CF) card used in any frame with an FCA.
ACC	Used in Lx2/Dx2 frames. Basic ACC node card without a compact flash (CF) card.
ACC-CF	Enhanced ACC node card with a compact flash (CF) card (originally introduced in L23, L53). Can be used in L32, L22, L52.
MDA	Used in Lx2/Dx2 frames. Basic MDA node card without a compact flash (CF) card.
MDA-CF	Enhanced MDA node card with a compact flash (CF) card (originally introduced in L23, L53). Can be used in L32, L22, L52.

Accessor Controller Card (ACC, ACC-CF)

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- The ACC is **not** a hot-pluggable FRU.
- Before you replace the ACC card, backup NVRAM. See “NVRAM Backup and Restore” on page 741.

Also see “Battery Return Program” on page 251.

Library Firmware Upgrade Notice

See Figure 242 on page 830. The latest style ACC node card has a Compact Flash (CF) card slot **8** . This style card requires library firmware level 6130 or higher. **Note:** Only later style x23 or x53 frames will have a CF card installed in this slot. If this is the first node card in the library with a CF card slot, you must first upgrade library firmware to 6130 or higher before you install the new ACC. The current library firmware level is displayed in the upper left-hand corner of the Activity screen. The latest library firmware can be downloaded from the PFE website.

Note: If the library contains any x23 or x53 frames with an MCA node card, and library firmware 77xx or higher will be installed, the **initial** MCA code load **might** fail but will then recover **automatically**. To avoid this recoverable problem you could **first** update the library to firmware 'fixpack' level 7350 or 7360, then update to 77xx or higher.

Notes:

1. If the ACC card FRU is an old style (with a battery) remove the battery from the **new** ACC and leave it out for approximately 10 minutes. This clears residual NVRAM data from the manufacturing test process or from an ACC that may have been returned to stock after being installed in another library.
2. Before you replace the ACC card, backup NVRAM. See “NVRAM Backup and Restore” on page 741. Library firmware must be at 5550 or higher, and CETool must be at 4.0 or higher.
3. Do not exchange both the OPC card and the ACC card in the same operation. Exchange one card, then if the problem persists reinstall the original card before exchanging the other card. This is necessary to avoid loss of all configuration settings and library VPD.
4. Step 3 below applies **only** if you are replacing the Lithium battery on an ACC card that does not have a CF card slot (old style ACC node card). See **“Node Card Designations and Descriptions” on page 826** for a description of the different types of node cards used in the 3584 library.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Move the X-axis assembly to a convenient position, then raise the lift mechanism and support the mechanism by inserting a hex wrench or screwdriver into the Y-axis access hole located halfway up the assembly.
3. If you are **only** replacing the Lithium battery, make note of how it is installed. Then take a small-bladed screwdriver to carefully pry the old battery out. Install the new battery by carefully inserting one edge, then pressing the battery firmly in place. Continue with the **Replacement Procedure**.

   Attention: Dispose of the old battery in accordance with local laws and regulations.
4. If you are **only** replacing the Compact Flash (CF) card, see **"Installing the CF Card"** on the following page to remove the old CF card and install the new CF card. Continue with the **Replacement Procedure**.

5. **See Figure 242 on page 830.** The latest style ACC cards have a Compact Flash card slot **8** . It does not have a removable Lithium battery. If the old node card has a compact flash card installed, remove the compact flash (CF) card from the old ACC and install it in the new ACC. See, **"Installing the CF Card"** on the following page. **Note:** Not all new style ACC cards (with a CF card slot) will have a CF card installed. The CF card is not required on early libraries with the original FCA.
6. Remove the ACC card cover **1** by unsnapping it from the card (see Figure 242 on page 830).
7. Remove the following cables from the ACC card:
   - **2** Y-Axis flex cable
   - **3** Pivot motor power cable
   - **4** Pivot motor encoder cable
   - **5** Pivot flex cable
8. Remove the screws **6** to remove the ACC card **7** .

Replacement Procedure

1. Reverse the removal procedure.
2. Ensure that the hex wrench or screwdriver inserted into the Y-axis access hole is removed.
3. Close the front door.
4. Finish accessor service (see “Service Procedures” on page 790).
5. If the new ACC firmware is at a lower level than the MCP, the firmware in the ACC will be updated automatically.
6. Starting with Library FW 6090, if the ACC firmware is at a higher level, then it will be downleveled to the firmware level of the other node cards in the library. Wait for this process to complete before you continue. The ACC 2-character display will flash 0E 0x while library code is being synchronized.

   Note: If the code update fails to complete successfully, temporarily remove the CF card and press the reset button on the ACC card (see **3A** in Figure 242 on page 830) to restart the code update. Once the node card update completes successfully, reinstall the CF card.

   After the code update has completed, display Node Card VPD to ensure that all node cards (and all web flashes) are at the same code level. If not, then use CETool to load the latest code available on the PFE website.

   In most cases, NVRAM data (Configuration, Calibration, and Vital Product Data) will be automatically restored from the OPC. This process may take up to 15 minutes. **Warning:** If the operator panel displays a "Run Config" message, **you should NOT configure the library**. If the "Run Config" message does not go away within 15 minutes, perform the following procedure to force a restore of the Configuration and Vital Product Data:

   a. Open the front door of the library.
   b. Remove the cover **1** from the ACC card.
   c. Reset the ACC by pushing the ACC card RESET button **3A** .

      Note: When you reset the ACC it will momentarily stop responding to CAN messages from the other node cards. This may result in 27 01 on the other node card two-character displays, and in an 'unable to communicate' message on the operator panel. These errors are expected and should be ignored unless they persist for more than 5 minutes.

   d. Close the front door of the library.
   e. Wait up to 15 minutes for the library to restore the Configuration and Vital Product Data before you continue.
7. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
8. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Installing the CF Card

See Figure 241. The compact flash (CF) card can only be installed one way as show in the figure. The lip on the card **1** must face up. The card should slide into the slot easily. Never force the CF card, as this could damage the pins on the node card or damage the CF card.

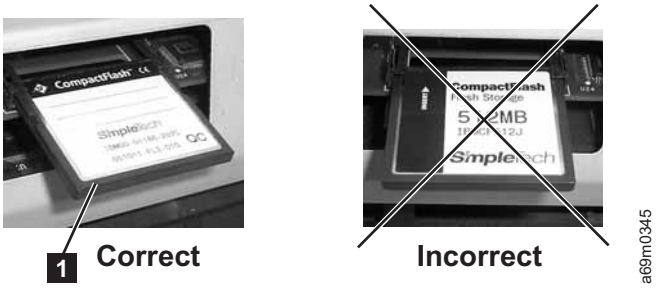


Figure 241. CF Card Installation

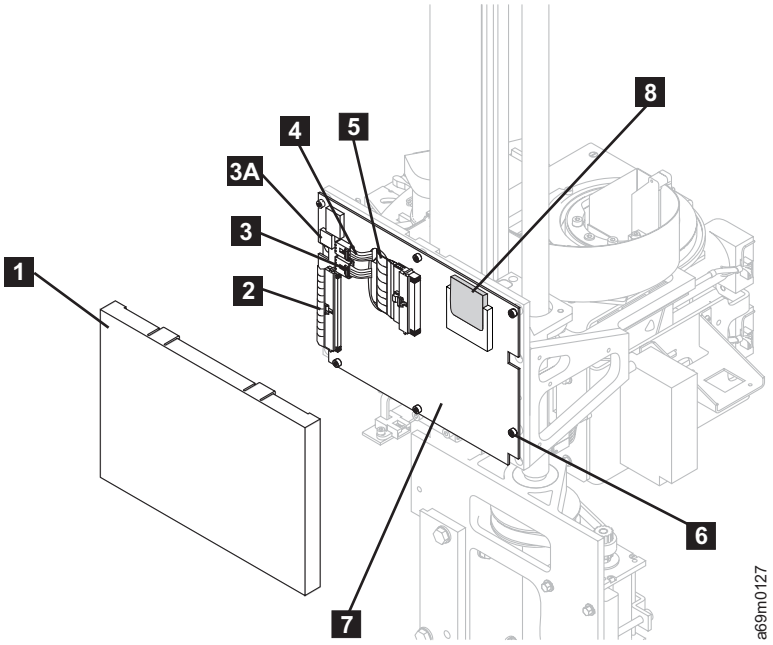


Figure 242. ACC Card

AXY Card (X-Axis)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedures

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Move the X-axis assembly to a convenient position, then raise the lift mechanism. To support the mechanism, insert a hex wrench or screwdriver into the Y-axis mast access hole located halfway up the assembly.
3. Remove the X-axis cable trough cover (see **1** on Figure 71 on page 144).

Old Style AXY Card Removal Procedure

1. Refer to Figure 243 on page 833 and locate the AXY card **2**, which is mounted on the X-axis assembly.
2. Locate the flat cable clamp **4**. Remove the two center screws that secure the clamp to the AXY card and in turn to the X-axis. Remove the four screws that secure the clamp to the flat cable.
3. Remove the four cables **3** through **7**.
4. Remove the four screws **1** (two shown).
5. Remove the AXY, card and any insulator found below the card (if installed). **See Figure 244 on page 833.**

New Style AXY Card Removal Procedure

1. Perform steps 1 through 3 above.
2. See Figure 245 on page 834.
3. Remove two screws **8** that fasten the mounting plate **6** to the X-track cable.
4. Disconnect the X-track cable from the AXY card **7** by depressing the cable locking tab on the cable.
5. See Figure 243 on page 833 to remove the four cables **3** through **7** from the AXY card.
6. Remove four AXY card mounting screws (not shown).
7. Remove the AXY card, and any insulator found below the card (if installed). **See Figure 244 on page 833.**

Replacement Procedure

1. Reverse the removal procedure. Be sure to install any plastic insulator (if one was found under the old AXY card).
2. Ensure that the hex wrench or screwdriver inserted into the Y-axis access hole is removed.
3. Close the front door.
4. Complete the accessor servicing (see “Service Procedures” on page 790).
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Table 99. FCA and BPC Power Assemblies

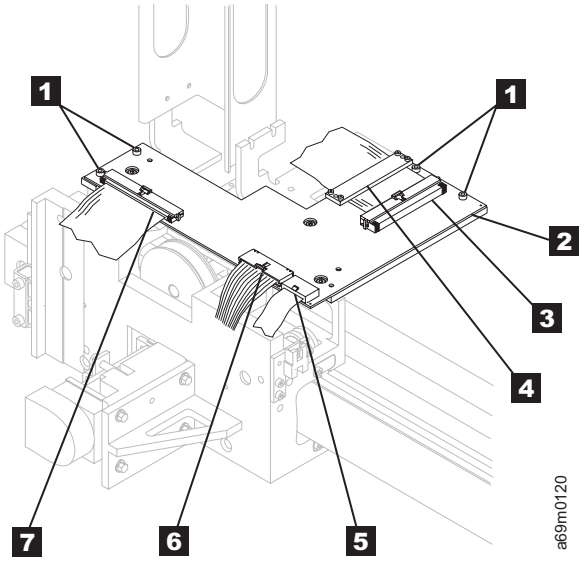


Figure 243. AXY Card – Old Style

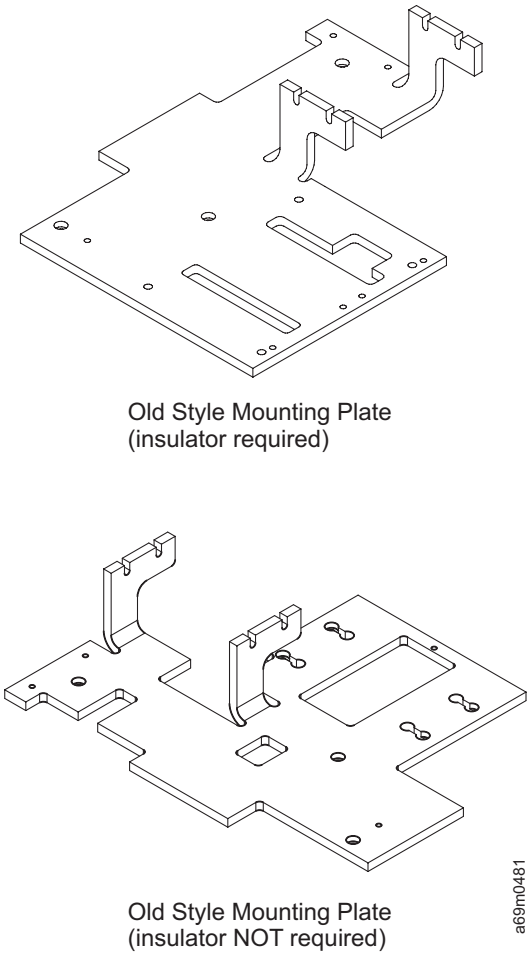


Figure 244. Old and New Style AXY Mounting Plates

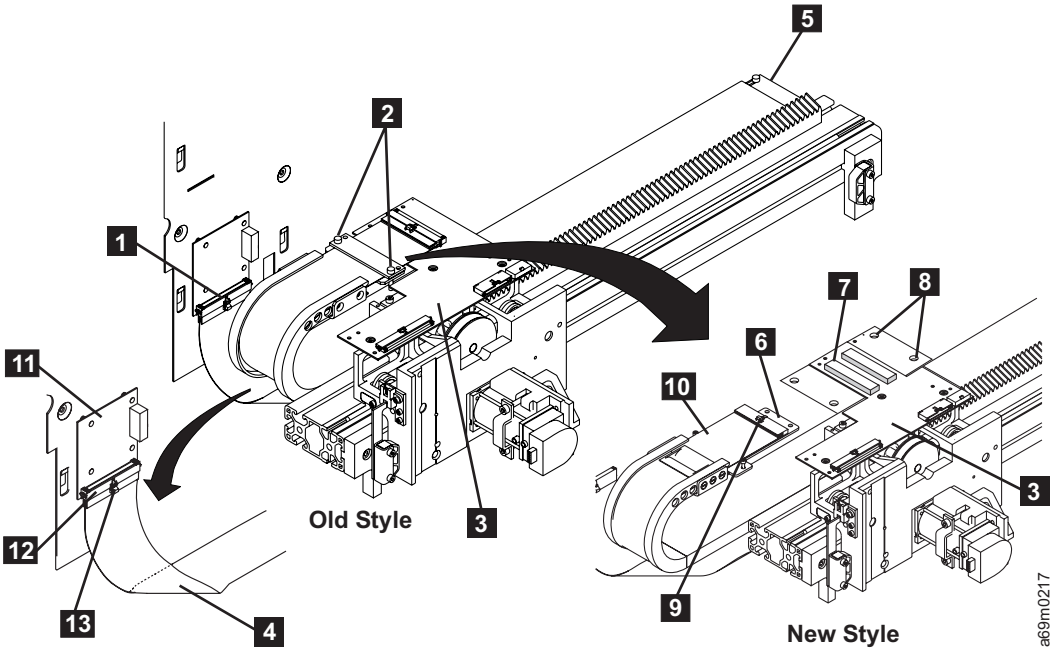


Figure 245. AXY Card – New Style

FIC Card

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: The FIC card (frame interconnect card) is located on the upper, back wall to the right of the fixed trays, as viewed from the rear of any frame.

Note: Spare fuses (one 12A and one 5A) are located in the bottom position on each bank of fuses.

Note: If all the LEDs on one or more FIC cards in Dxx frames are off, but the 2-character display on the nodes cards are on, see **Figure 165 on page 650**. Move the "LED'S ON" switch (near **4**) to the left to turn them on. Feature Code 9003 may have directed the CE to turn off LEDs in all Dxx frames to accommodate downlevel MCP(s). After service procedures are complete, move the "LEDs ON" switch to its previous setting.

Note: For more details on FIC card connectors, see Figure 24 on page 48.

Removal Procedure

1. Perform the procedure in “Prepare for FIC Replacement” on page 794.
2. Refer to Figure 246 on page 837 (for single accessor libraries). Ensure that jumpers **1** and **4** are installed on each end of the EPO cable. Refer to Figure 247 on page 837 (for dual accessor libraries). Ensure that jumpers **1** and **2** are installed on each end of the EPO cable. **NOTE:** These jumpers must remain in place, and should not be removed after the FIC card has been replaced.
3. If you are going to replace a cable, refer to Figure 246 on page 837 and Table 100 on page 838. Replace the cable.
4. From the rear of the frame that contains the FIC card you want to replace, remove the cables that are plugged into that FIC card. Table 100 on page 838 shows which connectors are used and where each cable goes.

   Note: Not all FIC card connector positions are used in all frame configurations.
5. Remove the center screw that holds the black FIC card overlay to the FIC card.
6. The FIC card is secured by four silver-colored standoffs. Use a pliers to squeeze each standoff as you carefully remove the FIC card.

FIC Card Jumper Settings

Following are the initial jumper and switch settings when the FIC card is replaced. For more detail on FIC card connectors, see Figure 24 on page 48.

The jumpers, J15 and J16, should be set as follows:
- If the FIC is in the first frame (L Frame), J15 should be jumpered.
- If the FIC is in the last frame, J16 should be jumpered.
- If the FIC card is in a frame between the first and last frame, J15 and J16 should not be jumpered.
- If the library is a single frame library, both J15 and J16 should be jumpered.
- If the library has SBA and SBB service bay frames, the FIC cards in these frames should NOT be terminated.

Switches S1 and SW2 settings are not critical and can be set to any position. SW4 (LEDs On Switch) should be left in the ON position so that the LEDs will display for service and troubleshooting purposes.

Replacement Procedure

1. Reverse the removal procedure.
2. Go to “Finish FIC Replacement” on page 794.
3. Ensure that all MCPs and MCAs are flashing the correct frame number on their character display.
4. Close the rear doors.
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

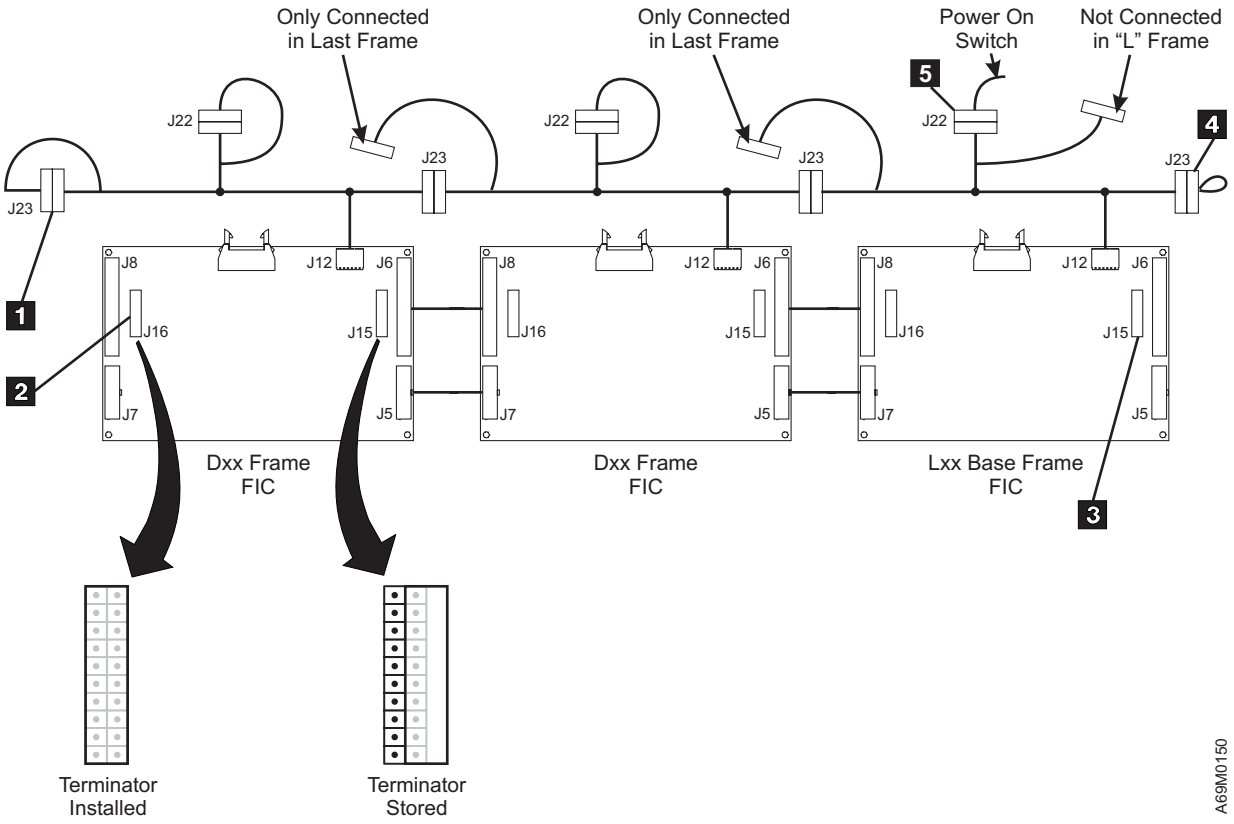


Figure 246. FIC Card Power Cable Tethered Jumper (Single Accessor Library)

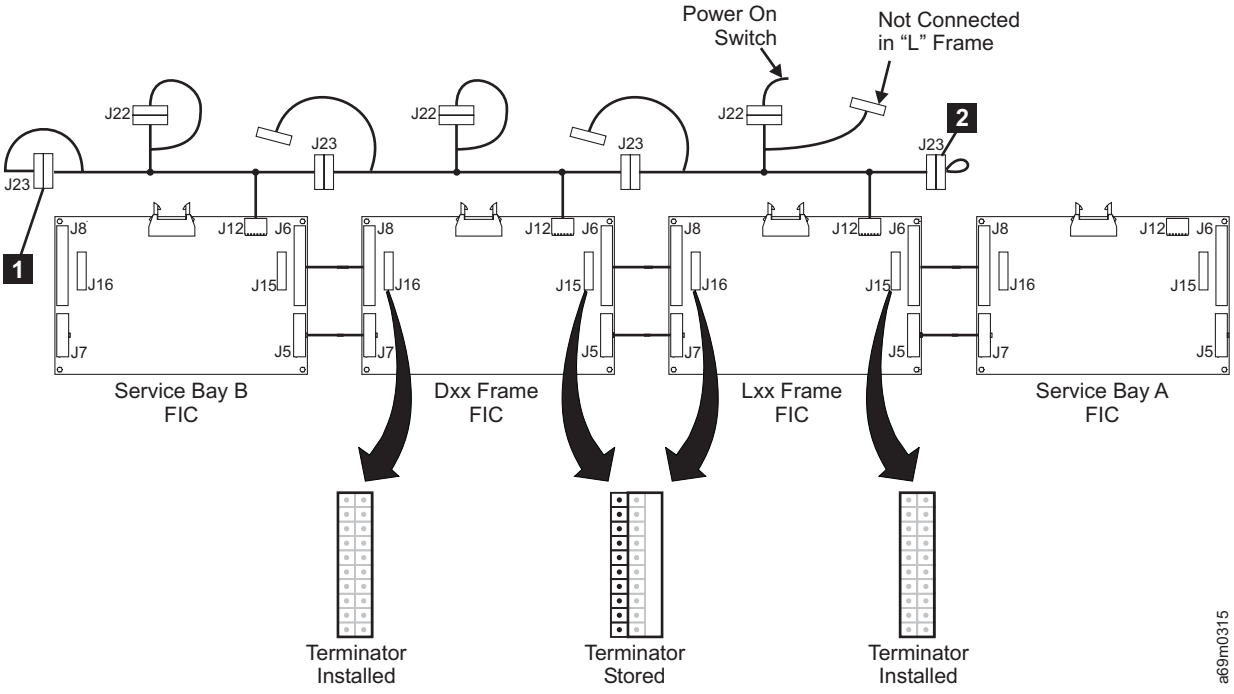


Figure 247. FIC Card Power Cable Tethered Jumper (Dual Accessor HA Library)

Table 100. FIC Card Connector/Cable Connections

Connector #	Cable Information
J1	FIC to XCP card (base frame only)
J2	Not used
J3	FIC to FCA (MCP power)
J4	FIC to FCA (MCP signal)
J5	FIC to FIC Power (expansion frames only)
J6	FIC to FIC Signal (expansion frames only)
J7	FIC to FIC Power (connects to next frame J5 connector)
J8	FIC to FIC Signal (connects to next frame J6 connector)
J9	Not used
J10	Not used
J11	To J1 on OPC card on operator panel (base frame only)
J12	FIC to UEPO cable
J13	Not used
J14	Front door switch
J15	Terminator (base frame only) Remove terminator if this is an SBA service bay frame.
J16	Terminator (last frame in the string) Remove terminator if this is an SBB service bay frame.

37 V dc distribution throughout the 3584 Library

Note: There are five 37V buses used in the library as follows:

- 37A - Accessor A Motor Voltage
- 37B - Accessor B Motor Voltage
- 37C - Accessor A Logic Voltage
- 37D - Accessor B Logic Voltage
- 37E - Op Panel Logic Voltage

If a library door is opened the 37A and 37B voltage buses are disabled. This removes the 37V from the Accessor A and Accessor B motors. Motor encoders use logic power.

Media Changer Pack (MCP, MCP+ w/CF) (x32, x22, x52 Frames Only)

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- The MCP is a hot-pluggable FRU.
- Before you replace the MCP, backup NVRAM. See “NVRAM Backup and Restore” on page 741.
- **Do Not** use “Prepare for Accessor Service (Single Accessor Library)” on page 791 and “Finish Accessor Service (Single Accessor Library)” on page 792 procedures.

Notes:

1. Before you replace the MCP, backup NVRAM. See “NVRAM Backup and Restore” on page 741. Library firmware must be at 5550 or higher, and CETool must be at 4.0 or higher.
2. Do not exchange two different node cards in the same operation. Exchange one card, then if the problem persists reinstall the original card before exchanging the other card.
3. See **“Node Card Designations and Descriptions” on page 826** for a description of the different types of node cards used in the 3584 library. If you received an 'MCP+ w/CF' FRU, read the **errata sheet** that came with it before you continue.

Removal Procedure

1. If your library has only one MCP, inform the customer that the library will be unavailable to the host. Go to step 5.
2. If your library has more than one MCP, inform the customer that you will be taking offline any control path drives in this frame. Any logical library with a control path drive in this frame may be affected (the accessor may become non-ready).
3. If you have a dual-accessor library, with an MCP (with an FCA and at least one 37V PS) in frame 1 and frame 3, accessor 'A' receives 37 V dc from frame 1 and frame 3. If you have an MCP (with an FCA and at least one 37V PS) in frame 2 and frame 4, then accessor 'B' receives 37 V dc from frame 2 and frame 4. You must have at least four active frames with an MCP (and at least one 37V dc power supply in each frame) to provide redundant 37 V dc to both accessors. If you have less than four frames as stated, then removing an MCP in one of the frames will remove 37 V dc from one of the accessors. See **“37 V dc Distribution in an HA1 Library” on page 807** for details.
4. If you have the Enhanced FCA installed in each frame of a dual-accessor library, frame 1 provides 37 V dc to both accessor A and B. Frame 2 also provides 37 V dc to both accessor A and B. Therefore, only two active frames with the Enhanced FCA are required to provide redundant 37 V dc to both accessors. See **“37 V dc Distribution in an HA1 Library” on page 807** for details.

   Notes:

   a. Concurrent maintenance of a control path drive may require a logical library to be offline
   b. If the Control Path Failover feature is enabled and each affected logical library has a redundant control path in a different frame, then the library can remain operational.
   c. The drives will remain online, only the library is affected.
5. Refer to Figure 248 on page 841 and loosen the two knurled screws **1** that hold the MCP or (MCP+ w/CF) to the FCA.

6. Slide the MCP or (MCP+ w/CF) out about 50 mm (2.0 in.).
7. Remove all cables from the MCP.
   - RS-422 connector **2** at J7
   - CE cable at J1 (if cable is present)
   - Modem at J6 (or J5 on (MCP+ w/CF)) if installed
   - Ethernet (on new style MCP or [MCP+ w/CF])
8. Remove the MCP from the FCA.

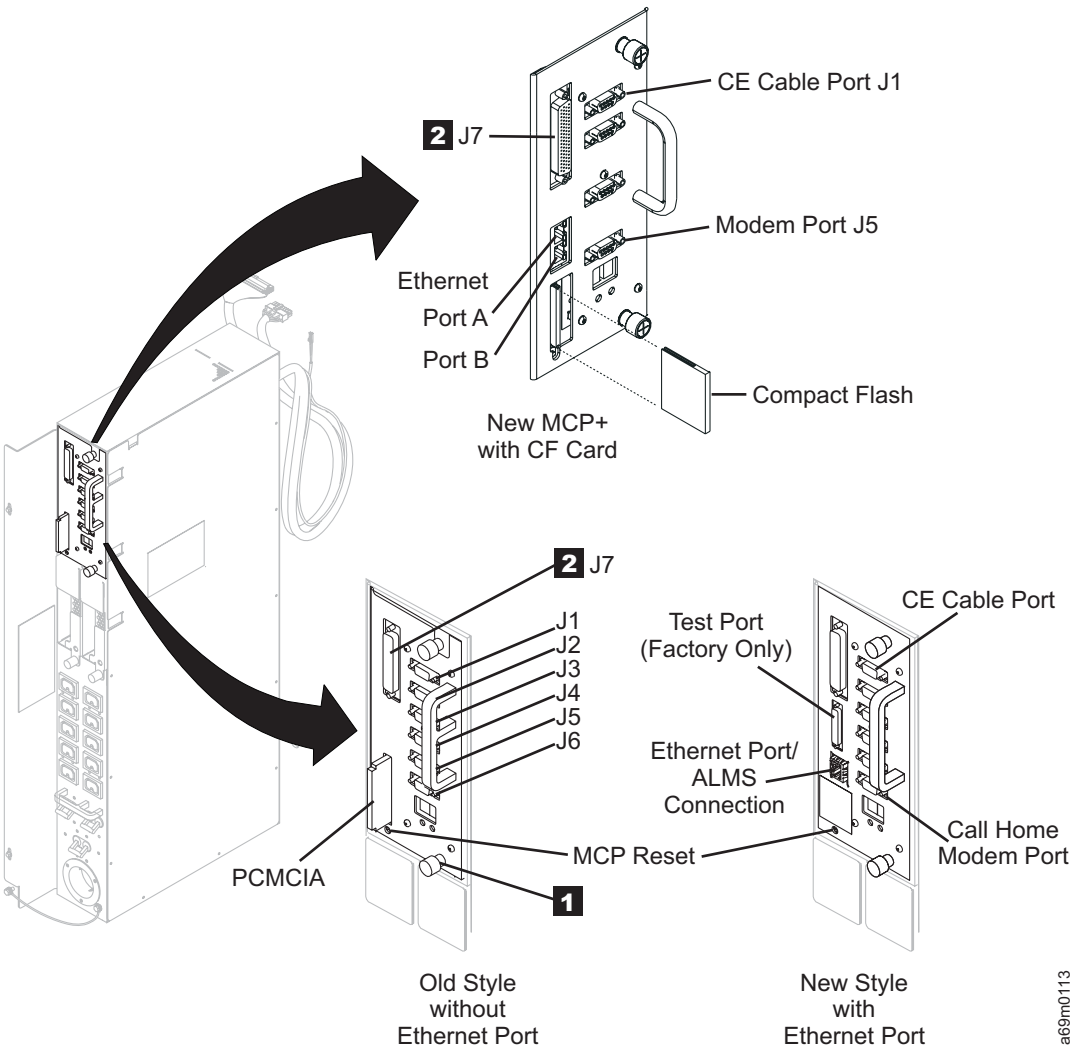


Figure 248. Media Changer Pack

Replacement Procedure

1. Reverse the removal procedure. **Note:** If you are replacing an MCP with an MCP+, the MCP+ has two 10/100 Ethernet ports. **Port A** can be used for the customer's Web User interface, and **Port B** can be used for TSSC / TS3000 (System Console) if necessary.
2. MCP POST will run automatically after the new MCP is plugged in.
3. When post is complete the MCP display will begin flashing 00 0x (where x=frame number).
4. Starting with Library FW 6090, if the new MCP firmware is at a lower level than the rest of the node cards, the firmware in the MCP will be updated automatically. If the MCP firmware is at a higher level,

then it will be downleveled to the firmware level of the other node cards in the library. Wait for this process to complete before you continue. The MCP 2-character display will flash 0E 0x or 0F 0x while library code is being synchronized.

After the code update has completed, display Node Card VPD to ensure that all node cards (and all web flashes) are at the same code level. If not, then use CETool to load the latest code available on the PFE website.

5. If you replace an 'old style' MCP (with a PCMCIA slot) with a 'new style' MCP or (MCP+ w/CF) (with an Ethernet port), or if there is only one 'newer style' MCP in the library, you must use CETool to update the library code on all nodes to the latest available level before you return the machine to the customer. Wait until the automatic update is complete before you use the CETool to update the library to the latest available level. You can determine that an automatic update is in process by observing the two-character display on the MCP. If the information in the display alternates between 0F and the frame number or 0E and the frame number, a library code update is in progress.
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Media Changer Assembly (MCA-CF) (x23 / x53 Frames Only)

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- The MCA is a hot-pluggable FRU.
- Before you replace the MCA, backup NVRAM. See “NVRAM Backup and Restore” on page 741.
- **Do Not** use “Prepare for Accessor Service (Single Accessor Library)” on page 791 and “Finish Accessor Service (Single Accessor Library)” on page 792 procedures.
- See **“Node Card Designations and Descriptions” on page 826** for a description of the different types of node cards used in the 3584 library.

Removal Procedure

1. Before you replace the MCA, backup NVRAM. See “NVRAM Backup and Restore” on page 741. Library firmware must be at 5550 or higher, and CETool must be at 4.0 or higher.
2. If your library has only one MCA, inform the customer that the library will be unavailable to the host. By removing and replacing the only MCA, this will cause the library to power cycle. Go to step 5.
3. If your library has more than one MCA, inform the customer that you will be taking offline any control path drives in this frame. Any logical library with a control path drive in this frame may be affected (the accessor may become non-ready).

   Notes:
   a. Concurrent maintenance of a control path drive may require a logical library to be offline
   b. If the Control Path Failover feature is enabled and each affected logical library has a redundant control path in a different frame, then the library can remain operational.
   c. The drives will remain online, only the library is affected.
4. **Note:** If you are **only** replacing the Compact Flash (CF) card, see **"Installing the CF Card"** on the following page to remove the old CF card and install the new CF card.
   a. If this is the only MCA in the library, you will have to reload library firmware to reinstall the web code image on the new CF card.
   b. If there is another MCA in the library, the web code image will be copied from the other MCA's CF card to the new CF card.

   Continue at Step 8 on page 845 under Replacement Procedure.
5. Refer to Figure 249 on page 845.
6. Remove all cables at the front of the MCA.
   - Drive RS-422 connector at J7
   - CE cable at J1 **2** (if cable is present)
   - Modem at J6 (if installed)
   - Ethernet cable(s).
7. Remove the thumbscrew **1** .
8. Pull the MCA forward to clear the shelf.
9. Remove the rubber cable retainer, then disconnect the cables at the rear in the following order:
   a. **J10** FIC (middle cable) that provides MCA power and CAN communication.
   b. **J8** BPC1, **J11** BPC2 (outside cables) to both BPCs).
   c. **J9** XIO (only present if the 4-I/O door feature is installed).

   Note: On a single frame library, the operator panel will go dark. On a multi-frame library 250x (where 'x' = frame) and 3880 will be displayed. Also, 34A1, 34A2, or other power-related errors may be displayed. **Ignore these errors.**

Replacement Procedure

1. Remove the compact flash (CF) card from the old MCA and install it in the new MCA. See, **"Installing the CF Card"** on the following page.
2. Reconnect the rear left and right cables first, then reconnect the middle cable, and reinstall the rubber cable retainer.

3. MCA POST will run after the MCA power cable (middle cable) is reconnected.
4. Slide the MCA back onto the shelf. Ensure the bracket (below the RS-422 connector) hooks into the shelf, then reinstall the thumbscrew and reconnect the cables at the front.
5. When POST completes, the MCA display (as viewed in the mirror) will flash 00 0x (where x=frame number).
6. If the MCA firmware is at a higher level, then another node card in the library will automatically downlevel the code to match the rest of the node cards. Wait for this process to complete before you continue. The MCA 2-character display (as viewed in the mirror) will flash 0E 0x or 0F 0x while library code is being updated from another node card. Update via another CF card is also possible.

   After the code update has completed, display Node Card VPD to ensure that all node cards (and all web flashes) are at the same code level. If not, then use CETool to load the latest code available on the PFE website.
7. Check the fixed trays in the frame to ensure the 12v LEDs for both BPC1 (J2) and BPC2 (J3), and the 5v LED are on. Refer to Figure 315 on page 935.
8. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
9. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

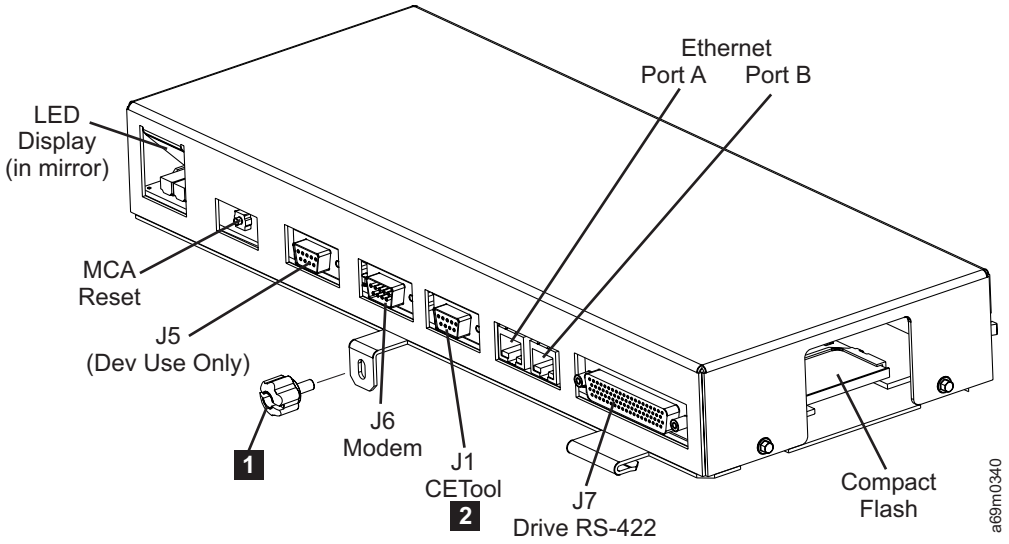


Figure 249. Media Changer Assembly

See Figure 250. The compact flash (CF) card can only be installed one way as show in the figure. The lip on the card 1 must face up. The card should slide into the slot easily. Never force the CF card, as this could damage the pins on the node card or damage the CF card.

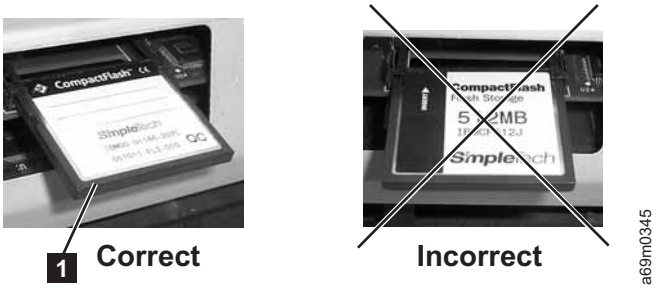


Figure 250. CF Card Installation

Motor Driver Assembly (MDA, MDA-CF)

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- The MDA is **not** a hot-pluggable FRU.
- Before you replace the MDA, backup NVRAM. See “NVRAM Backup and Restore” on page 741.
- See **“Node Card Designations and Descriptions” on page 826** for a description of the different types of node cards used in the 3584 library.

Note: The motor driver assembly (MDA) is mounted on the bottom of the accessor, and contains the dynamic brake card, the XY controller, and the XY motor amps. The MDA controls X and Y motor movement, dynamic braking, and other motor controls. The entire MDA is a FRU and cannot be broken down any further to individual components.

MDA Code level for Accessor B in an HA Library

Some MDA FRUs may have a non-HA version of library code. When the MDA on accessor B is installed, it should show 00 02 after it finishes POST. If it shows 00 01 then it is necessary to swap the MDA on accessor A with the MDA from accessor B, and let the automatic code update complete.

Library Firmware Upgrade Notice

See Figure 252 on page 848. The latest style MDA node card has a Compact Flash (CF) card slot **3** . This style card requires library firmware level 6130 or higher. **Note:** Only later style x23 or x53 frames will have a CF card installed in this slot. If this is the first node card in the library with a CF card slot, you must first upgrade library firmware to 6130 or higher before you install the new MDA. The current library firmware level is displayed in the upper left-hand corner of the Activity screen. The latest library firmware can be downloaded from the PFE website.

Note: If the library contains any x23 or x53 frames with an MCA node card, and library firmware 77xx or higher will be installed, the **initial** MCA code load **might** fail but will then recover **automatically**. To avoid this recoverable problem you could **first** update the library to firmware 'fixpack' level 7350 or 7360, then update to 77xx or higher.

Note: Before you replace the MDA, backup NVRAM. See “NVRAM Backup and Restore” on page 741. Library firmware must be at 5550 or higher, and CETool must be at 4.0 or higher. Do not exchange two different node cards in the same operation. Exchange one card, then if the problem persists reinstall the original card before exchanging the other card.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Raise the dual gripper assembly up the Y-axis mast and insert a hex wrench or screwdriver through the Y-axis mast access hole.
3. The MDA is located on the X-axis assembly, near the bottom of the assembly.
4. **Note:** If you are **only** replacing the Compact Flash (CF) card, see **"Installing the CF Card"** on the following page to remove the old CF card and install the new CF card. Continue at 'Replacement Procedure.'
5. Refer to Figure 251 on page 848 and remove five cables **1** though **5**, attached to the MDA.

   Note: Remove only those cables that leave the MDA. You need not remove cables that go from one area of the MDA to another. The new assembly will contain those cables.
6. Refer to Figure 252 on page 848. Remove bolt **1** and bolt **2** to remove the MDA from the Y-axis assembly.
7. **See Figure 252 on page 848.** The latest style MDA cards have a Compact Flash card slot **3**. It does not have a removable Lithium battery. If the old node card has a compact flash card installed, remove the compact flash (CF) card from the old MDA and install it in the new MDA (see **Figure 250 on page 845**). **Note:** Not all new style MDA cards (with a CF card slot) will have a CF card installed. When this FRU is used in a library with the old style node cards, the CF card is not used.

Replacement Procedure

1. Reverse the removal procedure.
2. Ensure that the hex wrench or screwdriver inserted into the Y-axis access hole is removed.
3. Close the front door.
4. Finish accessor service (see “Service Procedures” on page 790).
5. Starting with Library FW 6090, if the new MDA firmware is at a lower level than the rest of the node cards, the firmware in the MDA will be updated automatically. If the MDA firmware is at a higher level, then it will be downleveled to the firmware level of the other node cards in the library. Wait for this process to complete before you continue. The MDA 2-character display will flash 0E 0x while library code is being synchronized.

   After the code update has completed, display Node Card VPD to ensure that all node cards (and all web flashes) are at the same code level. If not, then use CETool to load the latest code available on the PFE website.
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

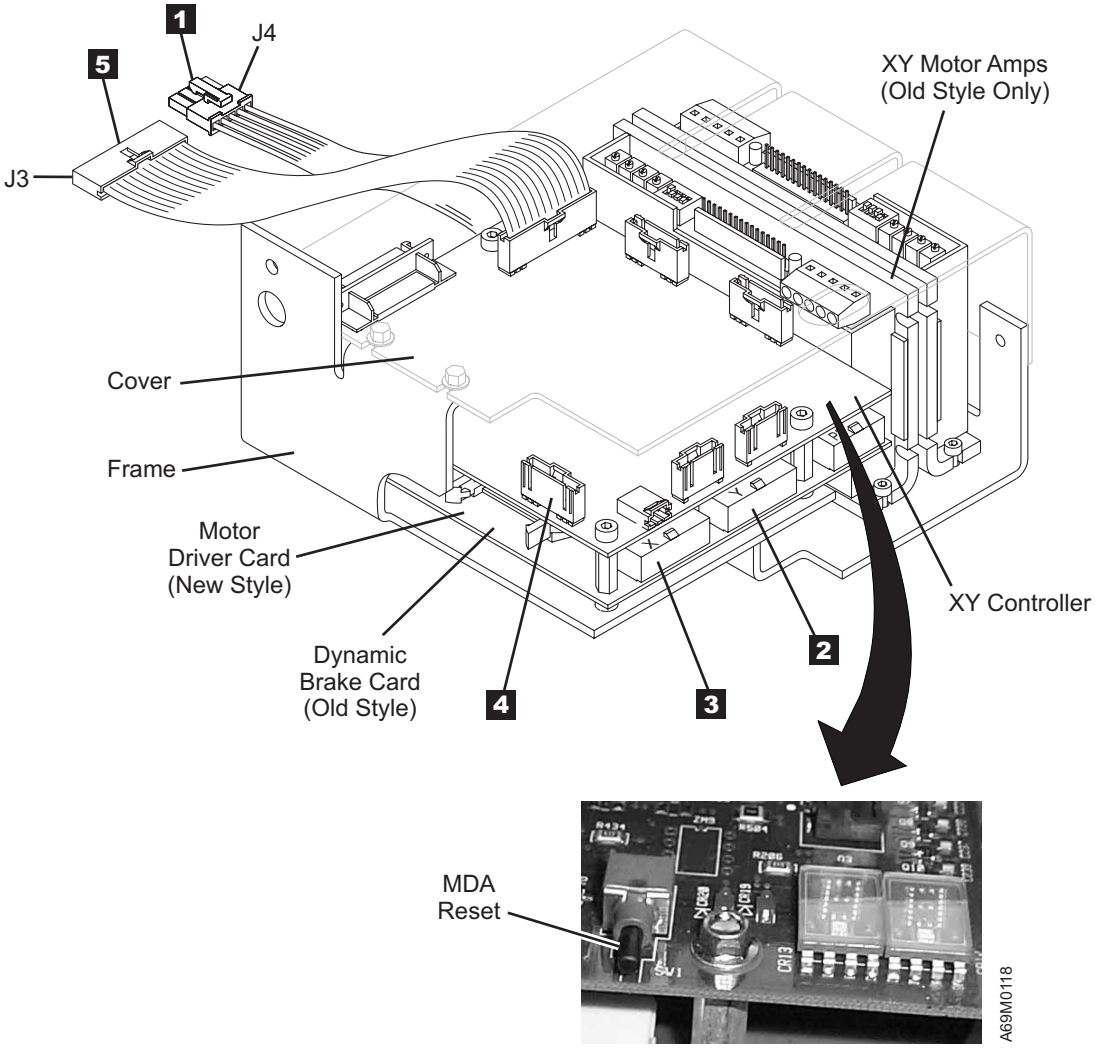


Figure 251. MDA Cabling. (Shown from front, with phantom view of cover, for clarity)

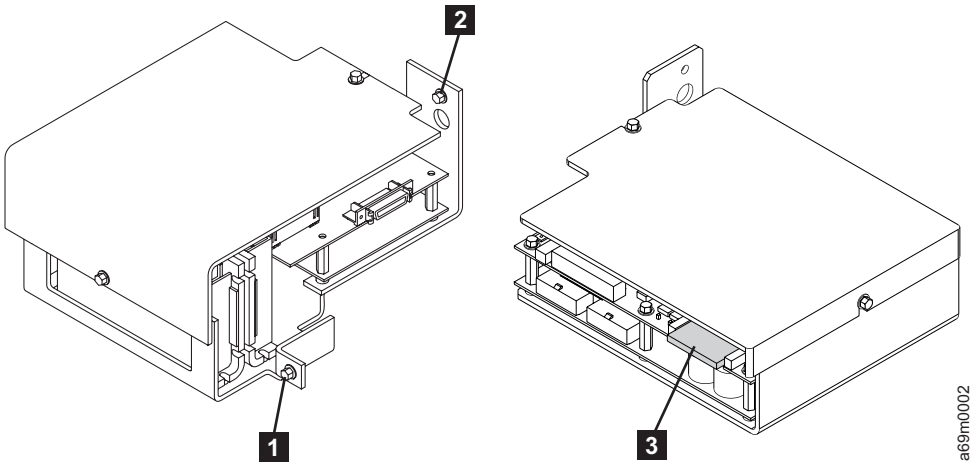


Figure 252. Motor Driver Assembly (MDA) with Compact Flash card shown

Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)

Before you begin...

Attention: Use correct ESD procedures when working in areas sensitive to electrostatic discharge (ESD). Refer to “Protecting ESD-Sensitive Parts” on page 762. When installing the replacement OPC, touch the metal frame at the OPC opening to discharge any static electricity in your body (this area is painted with conductive paint).

- Also see “Battery Return Program” on page 251 and “Operator Panel Flat Panel Display” on page 254.
- Before you replace the OPC card, backup NVRAM. See “NVRAM Backup and Restore” on page 741.
- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- See **“Node Card Designations and Descriptions” on page 826** for a description of the different types of node cards used in the 3584 library.

Library Firmware Upgrade Notice

See Figure 254 on page 854. The latest style OPC node card has a Compact Flash (CF) card slot **7** . This style card requires library firmware level 6130 or higher. **Note:** Only later style x23 or x53 frames will have a CF card installed in this slot. If this is the first node card in the library with a CF card slot, you must first upgrade library firmware to 6130 or higher before you install the new OPC. The current library firmware level is displayed in the upper left-hand corner of the Activity screen. The latest library firmware can be downloaded from the PFE website.

Note: If the library contains any x23 or x53 frames with an MCA node card, and library firmware 77xx or higher will be installed, the **initial** MCA code load **might** fail but will then recover **automatically**. To avoid this recoverable problem you could **first** update the library to firmware 'fixpack' level 7350 or 7360, then update to 77xx or higher.

Note:

- The OPC card is integral to the operator panel assembly. You must replace the operator panel assembly to replace the OPC card.
- Before you replace the OPC card, backup NVRAM. See “NVRAM Backup and Restore” on page 741. Library firmware must be at 5550 or higher, and CETool must be at 4.0 or higher.
- Do not exchange both the OPC card and the ACC card in the same operation. Exchange one card, then if the problem persists reinstall the original card before exchanging the other card. This is necessary to avoid loss of all configuration settings and library VPD.
- **Brightness / Contrast adjustment:** Some later style operator panels (see **9** in **Figure 253 on page 853** or **Figure 254 on page 854**) have a pot to adjust display brightness and contrast. On older style Op panels the Lxx door must be opened to make this adjustment. Newer style op panels can be removed from the front without opening the Lxx frame door. However, be sure to touch the metal plate on the back of the OPC before completely removing the panel from the frame, or use current ESD procedures, to prevent OPC card damage. Adjust the pot using a finger or small screwdriver.
- Step 6 on page 851 below applies **only** if you are replacing the Lithium battery.

Removal Procedures

Attention: The Operator Panel Assembly in an L22/L23/L52/L53 frame is different from the one in L32. The L22/L23/L52/L53 version is removed from the front of the library without having to open the front door. Follow the appropriate removal procedure for the Lxx frame you are working with.

The operator panel assembly consists of the OPC card, LCD display and touchscreen assembly, bezel, and internal cables. The operator panel assembly can be exchanged without taking the drives offline. In an L32 frame, the library accessor must be taken offline because you will open the front door.

For L32 Only:

1. Inform your customer that you need to make the accessor not-ready (offline) for service.
2. If the operator panel is working, press the [PAUSE] button on the operator panel and wait for **"The library is now paused"** message to display.
3. If the operator panel is not working, ask your customer to vary the accessor offline from the host.
4. After the library accessor is offline, open the front door.
5. Refer to **Figure 253 on page 853** and remove the connector **1** at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure.
6. **Note:** If you are **only** replacing the Lithium battery, make note of how it is installed. Then take a small-bladed screwdriver to carefully pry the old battery out. Install the new battery by carefully inserting one edge, then pressing the battery firmly in place. Dispose of the old battery in accordance with local laws and regulations.
7. Remove three screws **4** from the power switch **5**.
8. Disconnect the connector to the power indicator inside of the power switch box. Remove the power switch **5** and allow it to rest on its cable **7**.
9. Remove two knurled screws **2**.
10. While holding the cover assembly **3** with one hand, and the operator panel assembly **6** with the other hand (from the front of the door), remove the rear panel **3**.

    Note: Only one of the two cables **10**, which is still connected, is preventing the operator panel from falling free.
11. Remove the remaining cable **10** located on the left side but near the top of the operator panel assembly **6**.
12. Remove the operator panel assembly.
13. **Replacement Procedure:** When installing the replacement OPC, touch the metal frame at the OPC opening to discharge any static electricity in your body (this area is painted with conductive paint). Then reverse the removal procedure.

For L22/L23/L52/L53 Only:

1. The library does **NOT** have to be powered off for this procedure.
2. The operator panel assembly can be removed and replaced without having to pause the library or take it offline to the host.
3. **See Figure 254 on page 854.**
4. Press up on the release lever at **2** to unlock the operator panel assembly from the left side of the door.
5. Swing the left side of the operator panel outward approximately 45 degrees.
6. Carefully pull the panel out of the library far enough to reach the cables.
7. **Note:** If you are **only** replacing the Compact Flash (CF) card, see **"Installing the CF Card"** on page 854 to remove the old CF card and install the new CF card. Continue at 'Replacement Procedure.'
8. **First** remove the connector **3** at the top of the operator panel. This cable goes to the FIC card and **must** be removed before you unplug other cables as part of the removal/replace procedure.
9. Disconnect the cable going to the I/O station **4**.

10. Loosen (but do not remove) two screws **6** and slide the power switch assembly away from the OPC. Allow the power switch assembly to rest on its cable.
11. Remove the operator panel assembly from the library.
12. If you are **only** replacing the Lithium battery, make note of how it is installed. Then take a small-bladed screwdriver to carefully pry the old battery out. Install the new battery by carefully inserting one edge, then pressing the battery firmly in place. Dispose of the old battery in accordance with local laws and regulations.
13. The latest style OPC cards have a Compact Flash card **7** . It does not have a removable Lithium battery. If the old node card has a compact flash card installed, remove the compact flash (CF) card from the old OPC and install it in the new OPC. See, **"Installing the CF Card"** on page 854. **Note:** Not all new style OPC cards (with a CF card slot) will have a CF card installed. When this FRU is used in a library with the old style node cards, the CF card is not used.

Replacement Procedure

1. Reverse the removal procedure.

   Note: Be sure to plug the top cable **3** which supplies power from the FIC card **last**.
2. Insert the right side of the operator panel into the door, ensuring the three metal grounding spring clips **5** fit INSIDE the frame assembly.
3. While holding pressure to the right, swing the operator panel back into the frame enclosure.
4. While holding the panel tightly into the frame, press UP on the lever at **1** as shown to lock the operator panel into the frame.
5. Starting with Library FW 6090, if the new OPC firmware is at a lower level than the rest of the node cards, the firmware in the OPC will be updated automatically. If the OPC firmware is at a higher level, then it will be downleveled to the firmware level of the other node cards in the library. Wait for this process to complete before you continue. If the OPC has a compact flash (CF) card (as installed in all xx3 libraries) the code will be updated from this CF card which is a much faster process. Also, you will not see a code-update progress screen on the op panel. Initially you will see the old code level. After the CF code update, the new code level will be displayed. If the OPC is an older version (without a CF card) code update will be done from another node card in the library. In this case, the OPC 2-character display will flash 0E 0x while library code is being synchronized.

   After the code update has completed, display Node Card VPD to ensure that all node cards (and all web flashes) are at the same code level. If not, then use CETool to load the latest code available on the PFE website.
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
7. Make the library **Ready** to the host.
8. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

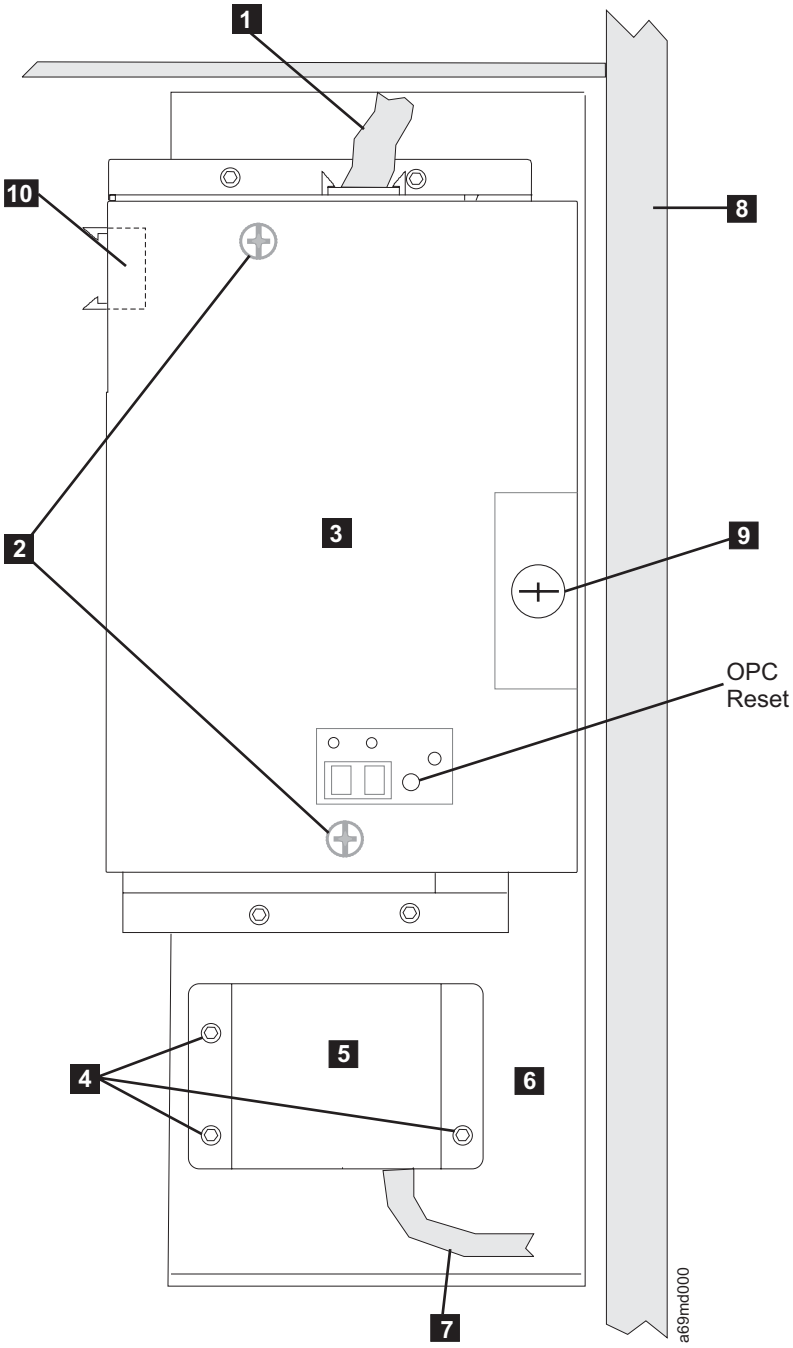


Figure 253. Operator Panel L32. (Viewed from rear of front door)

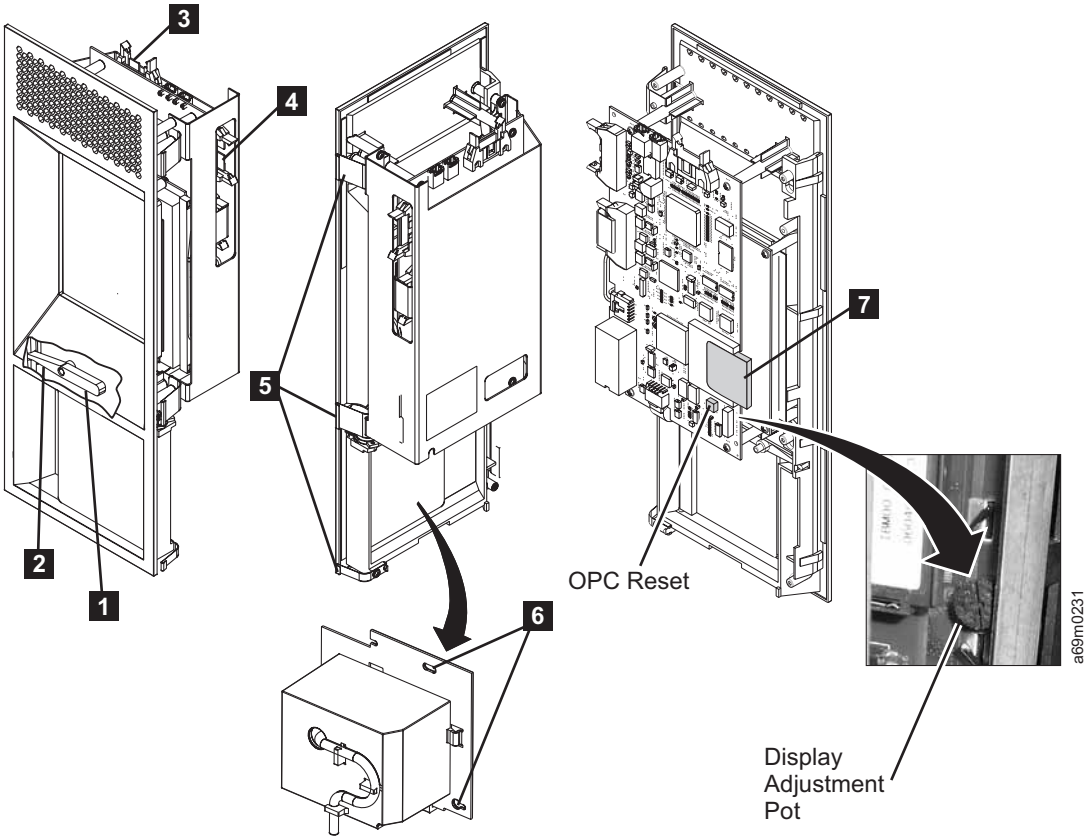


Figure 254. Operator Panel L22/L23/L52/L53

Installing the CF Card

See Figure 255. The compact flash (CF) card can only be installed one way as show in the figure. The lip on the card **1** must face up. The card should slide into the slot easily. Never force the CF card, as this could damage the pins on the node card or damage the CF card.

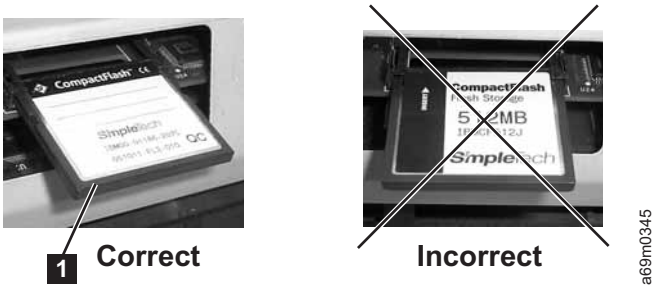


Figure 255. CF Card Installation

PDC Card

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Attention: The PDC card is different on the Universal (LTO/3592) dual gripper assembly than on the original LTO dual gripper assembly. In the following steps be sure to follow the procedure that applies to the type of dual gripper assembly installed in the library.

Note: If you order a replacement PDC card for the original LTO dual gripper assembly, and this PN is no longer in stock, you will receive a **Dual Universal Gripper FRU Kit** which will replace your current LTO grippers and PDC with new LTO/3592 universal grippers and PDC.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Turn the gripper assembly to a convenient position.
3. Remove the dual gripper assembly. See “Gripper Asm, Dual, LTO/LTO, LTO/3592 (Universal), & HD” on page 952, then return here.
4. Remove the upper gripper assembly. See “Gripper Assembly, Single LTO (New Style)” on page 958 or , “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954 then return here.

Original LTO dual gripper:

1. Refer to Figure 256 on page 857 to remove any remaining cables **1** through **6** on the PDC card.
2. Refer to Figure 258 on page 858, and remove five screws **2**.
3. Remove the PDC card **1**.

Universal (LTO/3592) dual gripper:

1. Refer to Figure 257 on page 857 to remove any remaining cables on the PDC card.
2. Refer to Figure 259 on page 859, and carefully disengage the five plastic standoffs at the top of the dual gripper assembly **2**.
3. Remove the PDC card with the standoffs **1**

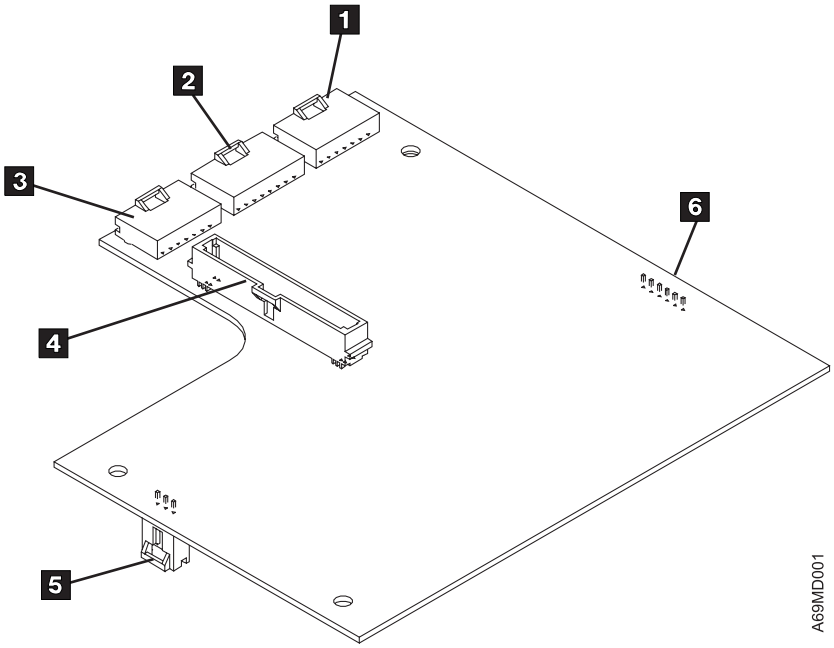


Figure 256. PDC Card Cables (LTO Dual)

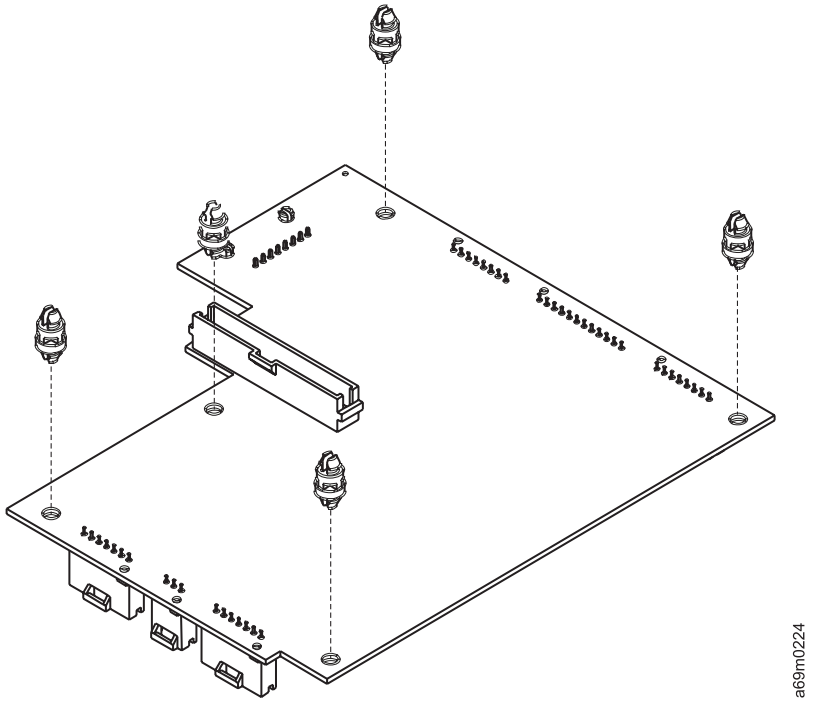


Figure 257. PDC Card Cables (Universal Dual)

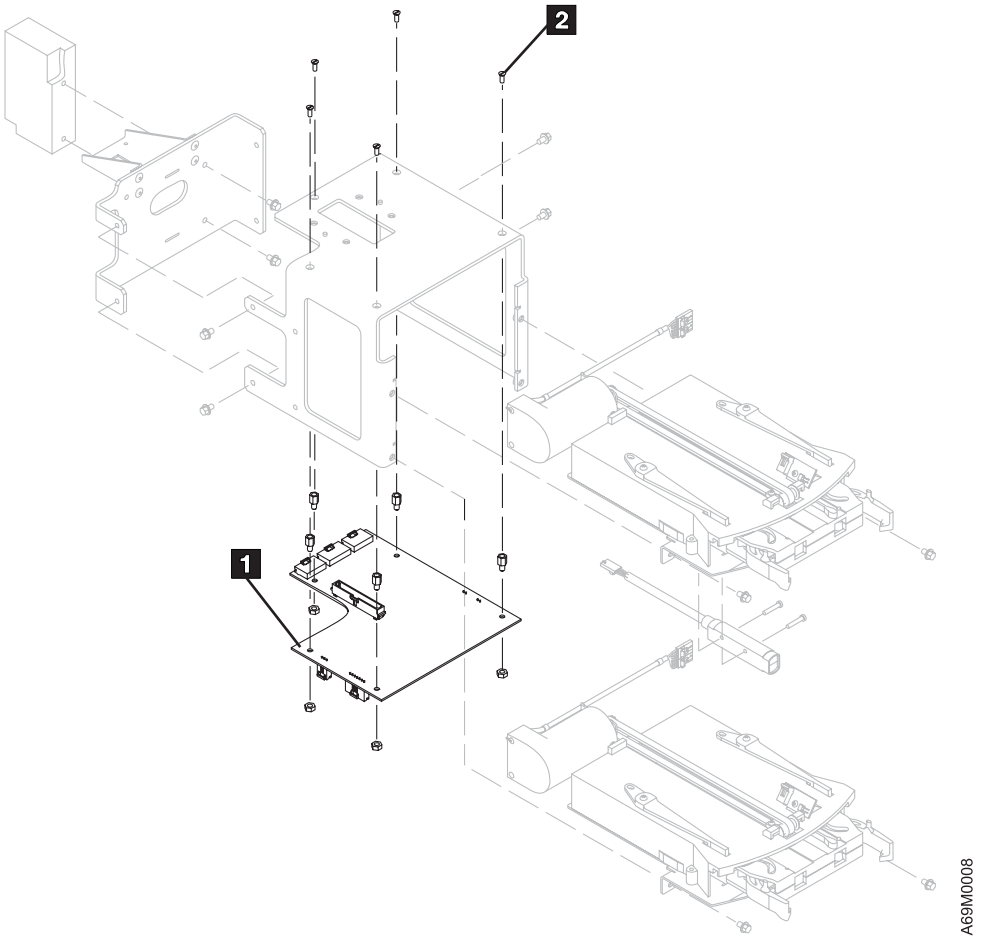


Figure 258. PDC Card (LTO Dual)

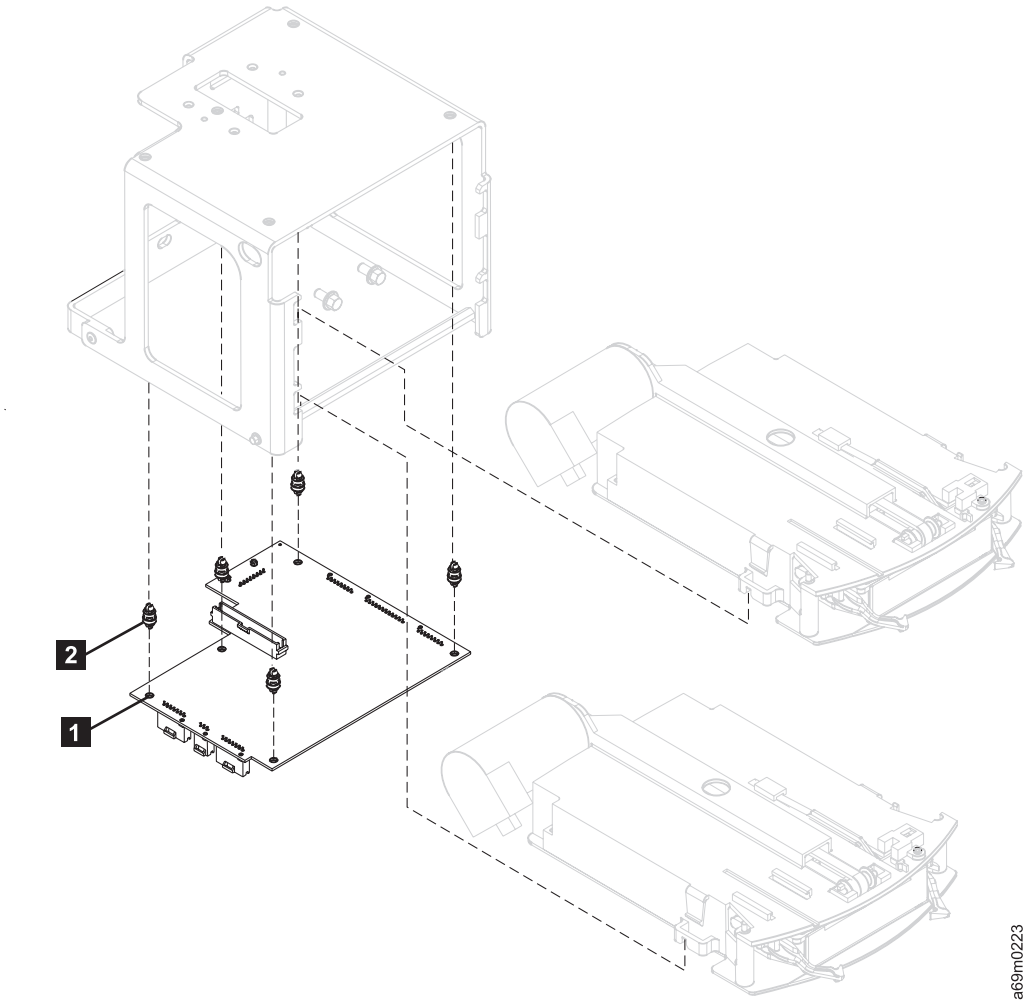


Figure 259. PDC Card (Universal Dual)

Replacement Procedure

Note: There are five plastic standoffs provided with the PDC card for the new Universal gripper assembly. Using proper ESD procedures, carefully snap the five standoffs into the PDC card. Install the completed assembly making sure the standoffs are firmly seated in the universal gripper housing frame.

1. Reverse the removal procedure.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Wait until library inventory completes, then continue at the next step
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

XCP Card

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Open the front door of the frame that contains the XCP card. If this is a dual accessor library, the XCP card will be located in one of the service bay frames.
3. Move the accessor out of the way.
4. Remove the cable trough cover **4**.
5. Disconnect the cables **1** and **3** from the XCP card **2**.
6. Remove the XCP card **2**.

Replacement Procedure

1. Reverse the removal procedure. Use care when aligning the X-axis track cable connectors to avoid bending the pins. Remove the XCP card from the rear firewall, then carefully align and fully connect the cable in the XCP card. Reinstall the XCP card on the rear firewall.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

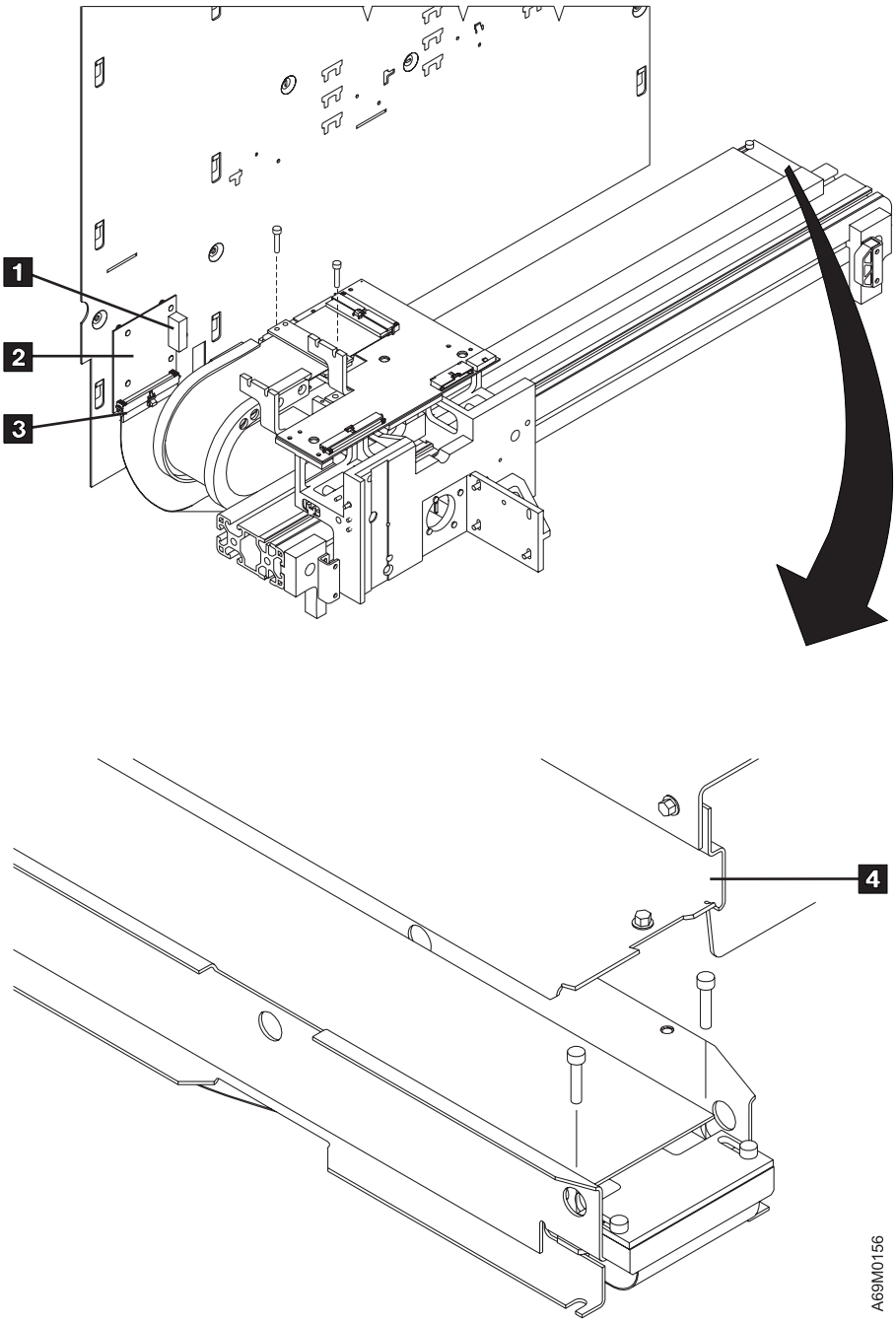


Figure 260. XCP Card

XIO Card (Lxx Frame Only)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: This FRU is only present if your library has two I/O stations in the Lxx frame.

Attention:

When working with the XIO card, always remove the operator panel assembly cable first or attach it last to prevent damaging the operator panel (see item 1 in Figure 253 on page 853).

Removal Procedure

Note: These procedures apply to all Lxx models. There are two types of XIO cards as shown in **Figure 261 on page 863** and **Figure 262 on page 863**. Determine which one you have, and use the appropriate figure in the following steps.

1. Open the door of the base frame (Lxx).
2. From the back side of the base frame front door, disconnect the cable from the operator panel assembly (see 1 in **Figure 253 on page 853**).
3. See **Figure 261 on page 863** (for both old and new style). Remove the three screws 3 to remove the plastic cover 2 .
4. On the **old style** XIO card, first disconnect the cables at 4 .
5. On the **new style** XIO card (See **Figure 262 on page 863**), disconnect three cables 1 (to OPC), 2 (to upper I/O), and 3 (to lower I/O) from the XIO card.
6. Remove any screws holding the XIO card, then lift the card 1 off the pins to remove it from the door.

Replacement Procedure

Note: When reattaching cables to the XIO card, ensure you reconnect the cable from the operator panel to the XIO card **last** (see 1 in Figure 253 on page 853).

1. Reverse the removal procedure, noting the following. (See the correct figures for the XIO card you are installing). On the new style XIO card (Figure 262 on page 863), connect the cables as follows:
   - Lower I/O station cable 3 to J8 (bottom left connector) on XIO card.
   - Upper I/O station cable 2 to J7 (outside connector) on XIO card.
   - The cable from the operator panel 1 connects to the (top left) connector on the XIO card.
2. Reconnect the three XIO card cables listed above.
3. Reconnect the cable at the operator panel.
4. Reinstall the plastic cover 2 using three screws 3 .
5. Close the front door and wait for the library to finish initializing.
6. Perform the “Library Verify Test” on page 759. Select the I/O station diagnostic test, and the **no drives** selection.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

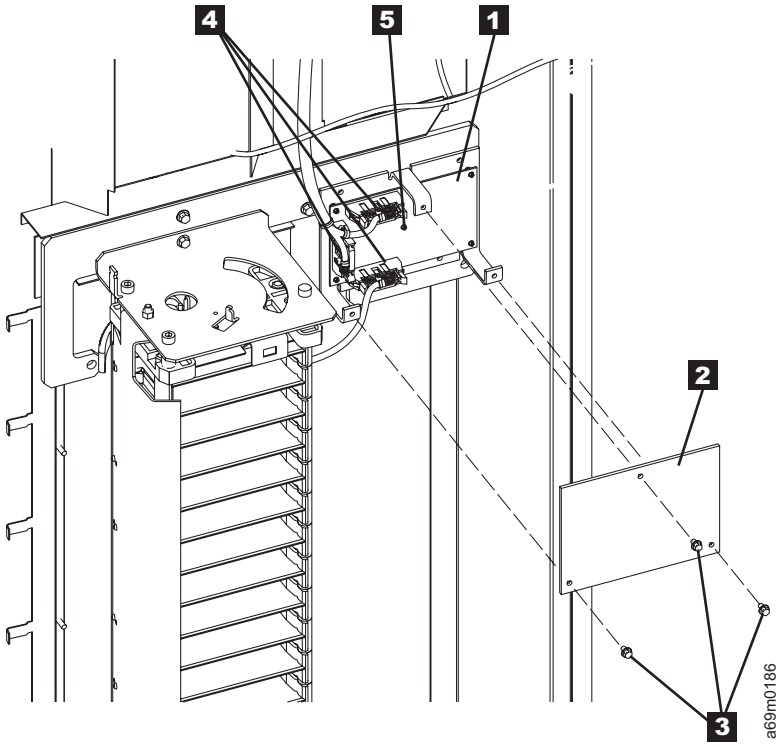


Figure 261. XIO Card (old style)

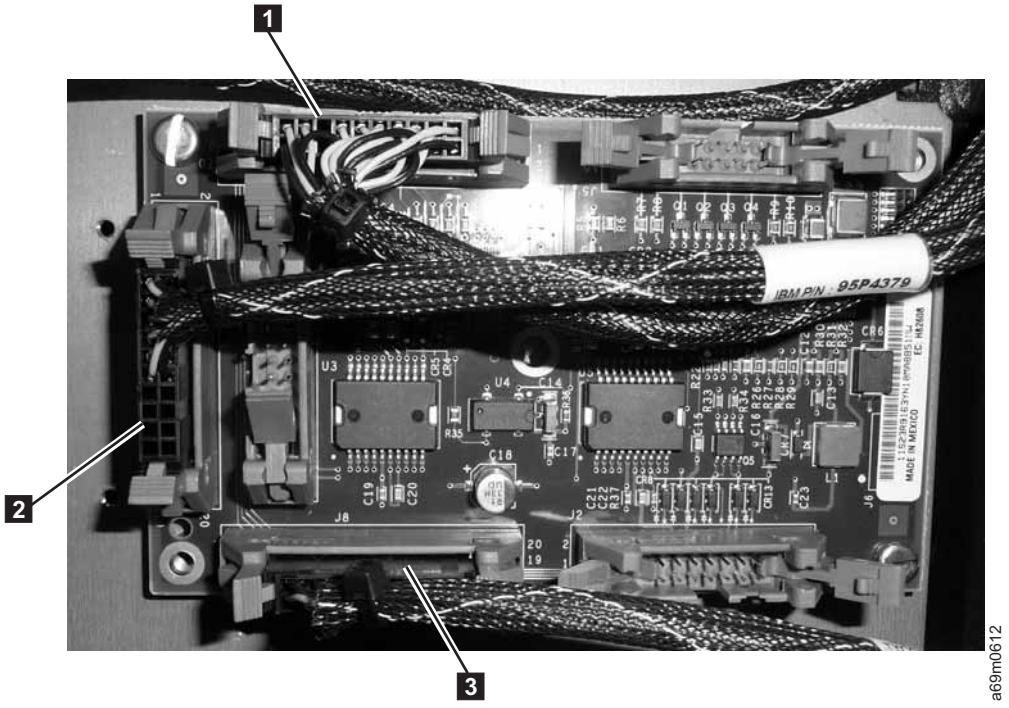


Figure 262. XIO Card (new style)

XIO Cards (4-I/O Frame Only)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: This FRU is present if the library has the 4-I/O door (FC 1655 or 1656) installed.

Attention:

Before removing either XIO card, MCA cable **J9 X1O** must be disconnected **first** to prevent damaging the MCA node card.

Removal Procedure

1. Pause the library and open the front door of the 4-I/O door frame.
2. Open the rear door of the 4-I/O door frame. Remove the thumbscrew that secures the MCA to the shelf.
3. Do **NOT** disconnect the RS-422 cable (J7) from the MCA, but loosen any ties holding this cable (and others) to the frame to allow the MCA to be pulled forward in the following steps.
4. Pull the MCA forward to clear the shelf, then disconnect MCA cable **J9 X1O**.
5. See **Figure 263 on page 865** and **Figure 264 on page 865**.
   - Disconnect cables **1** through **4** to remove the **left** XIO card.
   - Disconnect cables **5** through **8** to remove the **right** XIO card.
6. Remove one screw on the gray cover that holds the XIO card, then carefully lift the card off the pins.

Replacement Procedure

1. Refer to **Figure 265 on page 865** for a diagram of how the two XIO cards are cabled.
2. Reverse the removal procedure.
3. Ensure all cables are firmly snapped in place.
4. Pull the MCA forward to clear the shelf, then reconnect MCA cable **J9 X1O**.
5. Slide the MCA back into place and reinstall the thumbscrew securing the MCA to the shelf.
6. Fasten any frame cable ties (holding the RS-422 and other cables) that were loosened earlier.
7. Close the front and rear doors and wait for the library to finish initializing.
8. Perform the “Library Verify Test” on page 759. Select the I/O station diagnostic test, and the **no drives** selection.
9. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

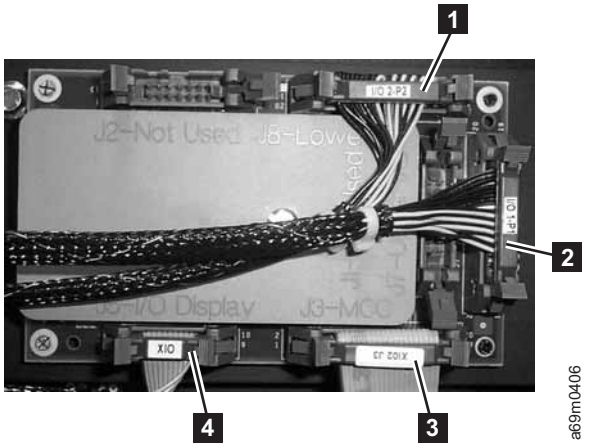


Figure 263. XIO Card (Left Side)

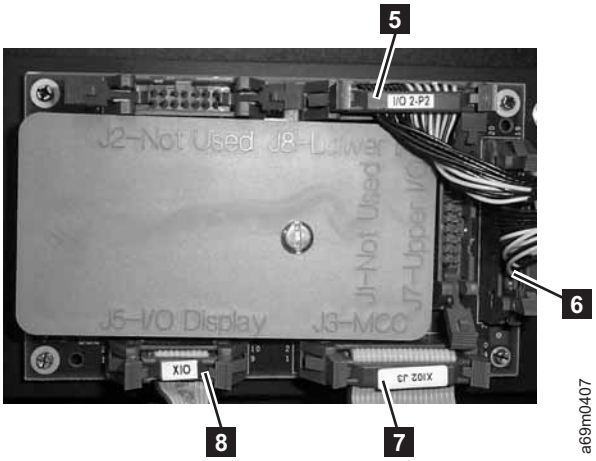


Figure 264. XIO Card (Right Side)

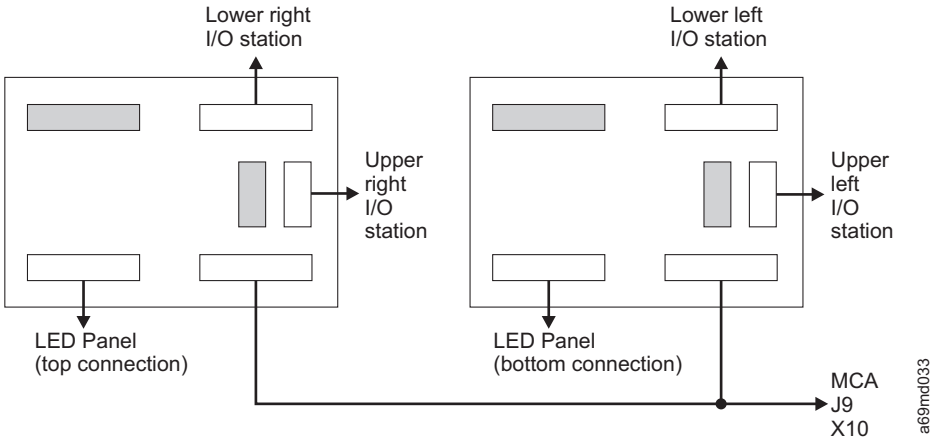


Figure 265. XIO Cards Cable Diagram

LED Panel (4-I/O Frame Only)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: This FRU is present if the library has the 4-I/O door (FC 1655 or 1656) installed.

Removal Procedure

1. Pause the library and open the front door of the 4-I/O door frame.
2. See **Figure 266 on page 867**. Disconnect cables **1** from the LED panel.
3. Remove two nuts **3** that hold the LED panel, then remove it from the frame.
4. See **Figure 267 on page 867**. To remove the LED panel, bend mounting tab **1** down enough to release the card from the assembly.

Replacement Procedure

1. See **Figure 268 on page 867**. Align the locator pin on the new LED panel **1** as shown.
2. Insert one end of the LED panel **2** into the assembly, then bend the mounting tab just enough to secure the card.
3. See **Figure 266 on page 867**. Mount the LED panel assembly in the frame (pin **2** facing right) and **loosely** reinstall the two nuts.
4. Look at the front of the door to ensure the assembly is inside the door cutout. Then hold the panel firmly in place while you tighten the two nuts.
5. Reinstall the top and bottom cables, and snap them firmly into place.
6. Close the front door and wait for the library to finish initializing.
7. Perform the “Library Verify Test” on page 759. Select the I/O station diagnostic test, and the **no drives** selection.
8. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

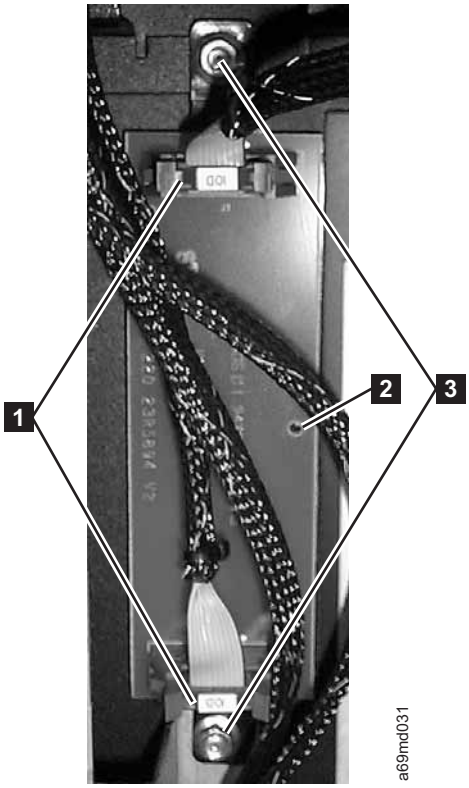


Figure 266. LED Panel

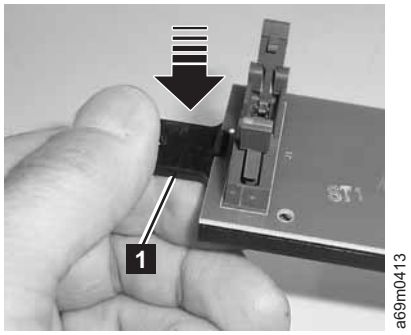


Figure 267. Removing LED Panel

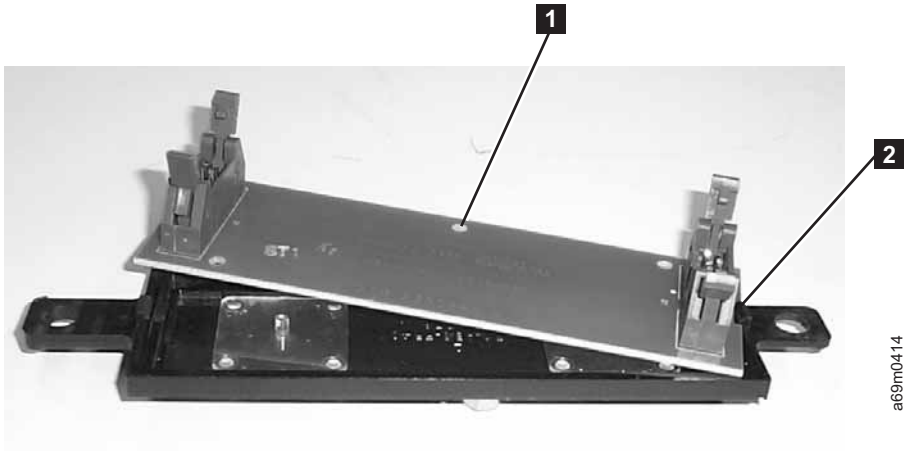


Figure 268. Installing LED Panel

I/O Stations (4-I/O Frame Only)

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: The I/O station FRUs are present if the library has the 4-I/O door (FC 1655 or 1656) installed.

Removal Procedure

1. Pause the library and open the front door of the 4-I/O door frame.
2. See **Figure 269**. Disconnect the cable at the XIO card for the I/O station you are replacing.

   Note: References to upper right, lower right, upper left, or upper right are as viewed from the **front** of the 4-I/O door, not from the inside.
3. Refer to “I/O Station Door (L22, L23, L52, L53)” on page 964 for procedures to remove any of the four I/O stations in the frame.

Replacement Procedure

1. Reverse the removal procedure.
2. Refer to “I/O Station Door (L22, L23, L52, L53)” on page 964 for procedures to the I/O station.
3. Reconnect the cable at the XIO card for the I/O station you just replaced, and snap it firmly in place.
4. Close the front door and wait for the library to finish initializing.
5. Perform the “Library Verify Test” on page 759. Select the I/O station diagnostic test, and the **no drives** selection.

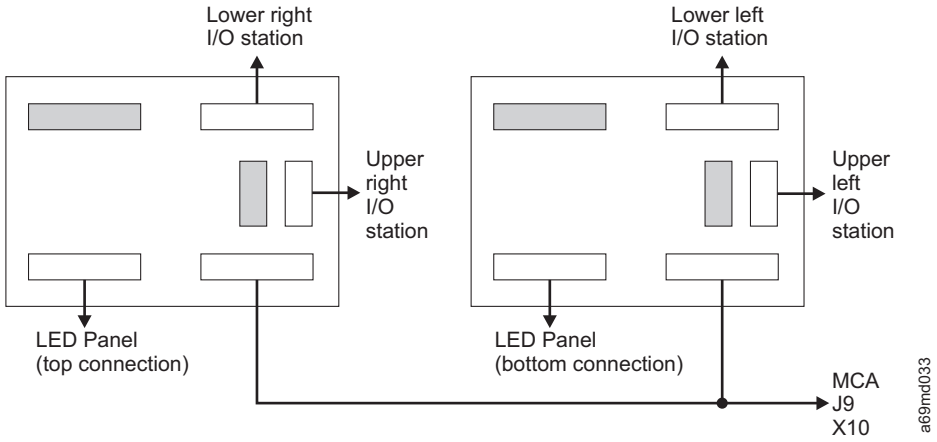


Figure 269. XIO Cards Cable Diagram

Covers, Right and Left End

Removal Procedure

1. At the operator panel **Activity** screen, press [PAUSE] button on the operator panel.
2. When the library message indicates that the pause is activated, open the front door of the right or left frame.
3. Remove the screws holding the end cover to the frame.
4. Remove the end cover **1** by lifting up the cover.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

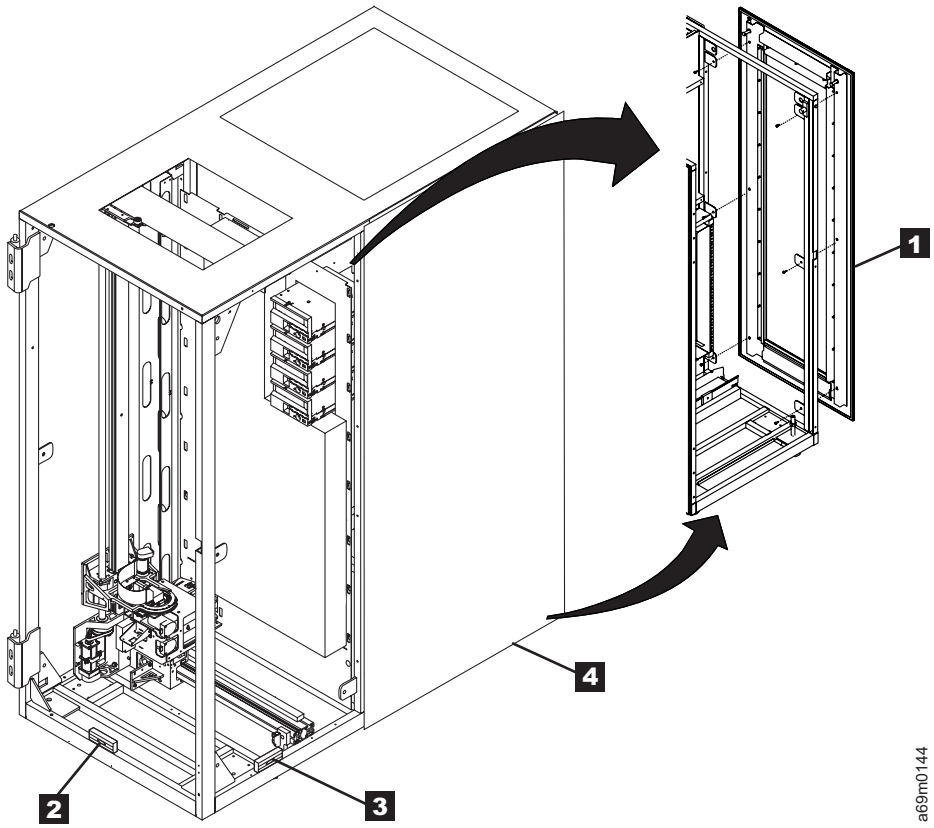


Figure 270. End Cover

Door Interlock Switch and Actuator

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Locate the door interlock actuator assembly **2** on the inside of the front door.
3. Remove the screws **3** that secure the door interlock actuator assembly to the front door.
4. Locate the door interlock switch assembly **4** and its two holding screws **5**.
5. Disconnect the door interlock cable at the J14 connector on the FIC card.
6. Remove the screws and the interlock switch assembly.

Replacement Procedure

1. Reverse the removal procedure.
2. When replacing this assembly it must be adjusted so that the actuator **1** enters the door interlock switch assembly fully, without binds or interference. Tighten the holding screws **3** so that the door closes easily without any binds or interference with the door interlock switch assembly.
3. Close and lock the front door.
4. From inside an adjacent frame, check for a 1.5mm gap between the actuator plate **3A** and the door interlock switch **6**. Loosen the switch mounting screws **5** to make this adjustment. If you have a single frame library, you will have to remove the end cover to gain access to the inside of the library to make this adjustment.
5. Close all doors and complete accessor servicing (see “Service Procedures” on page 790).
6. Ensure that the door interlock is working by running Library Verify (see “Library Verify Test” on page 759), and performing the door safety interlock open/close test.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

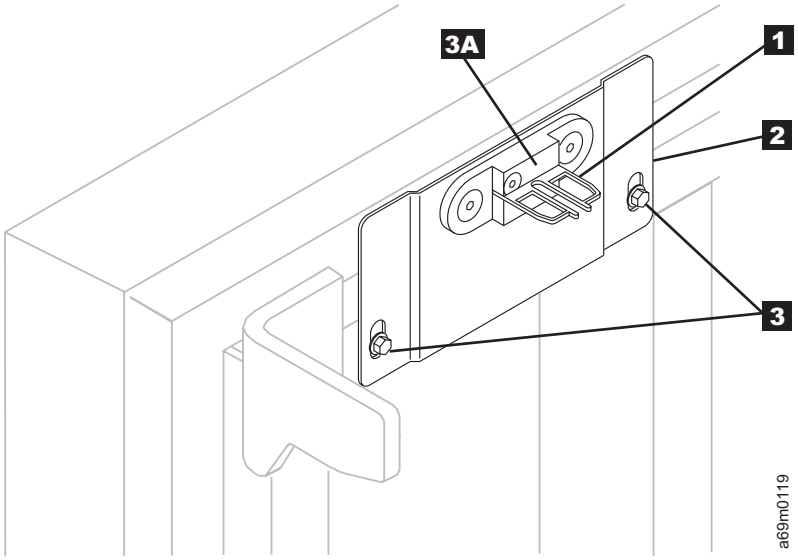


Figure 271. Door Interlock Actuator

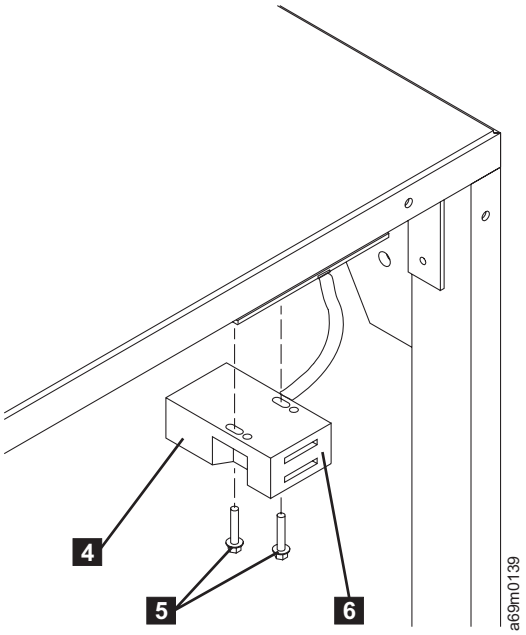


Figure 272. Door Interlock Switch

Drive Types, Fixed Trays, and Power Supplies

Table 101 lists the combinations of replacement procedures that the service representative may encounter. In most cases, the failing FRU will be replaced by a similar FRU. In a few cases, an older fixed tray assembly may be replaced by newer “hot swap” drive hardware. Several combinations of procedures are listed in the table. Follow the procedure that best fits your particular situation.

Table 101. Drive Type Replacement Procedures

Current Drive Type	Replacement Drive Type	Use Procedure
Drive Tray Assembly — LTO SCSI	Same	“Drive Tray Assembly – LTO SCSI” on page 876
Drive Tray Assembly — LTO Fibre	Same	“Drive Tray Assembly – LTO Fibre” on page 878
Drive Canister Assembly — LTO SCSI Hot Swap	Same	“Drive Canister Assembly – LTO SCSI, Removal / Replacement” on page 882
Drive Canister Assembly — LTO Fibre Hot Swap	Same	“Drive Canister Assembly – LTO Fibre, Removal / Replacement” on page 884
Drive Canister Assembly — 3592 Fibre Hot Swap	Same	“Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement” on page 887
Fixed Tray Assembly — LTO SCSI	LTO SCSI Hot Swap	“LTO SCSI Tray to LTO SCSI Hot Swap Canister (conversion)” on page 898
Fixed Tray Assembly — LTO Fibre	LTO Fibre Hot Swap	“LTO Fibre Tray to LTO Fibre Hot Swap Canister (conversion)” on page 908
Fixed Tray Assembly (L32/D32) — All Hot Swap Models	Fixed Tray Assembly (L32/D32) — All Hot Swap Models	“Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models” on page 918
Fixed Tray Assembly (L22/D22/L52/D52) — All Hot Swap Models	Fixed Tray Assembly (L22/D22/L52/D52) — All Hot Swap Models	“Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models” on page 928
Fixed Tray Assembly (L23/D23/L53/D53) — All Hot Swap Models	Fixed Tray Assembly (L23/D23/L53/D53) — All Hot Swap Models	“Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models” on page 934

Drive Tray Assembly – LTO SCSI

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- If there is a cartridge in the drive, go to “Manually Removing Cartridge” on page 1045.

Removal Procedure

Note: When updating an LTO drive, be aware of the following:

- If the drive that is being replaced is a control path drive, all host communications with the library through the affected control path drive (but not host communications with other drives in the library) will be disabled until the drive replacement (which may include automatically updating the drive microcode from another drive) has been completed.
- If an automatic drive-microcode update must read drive microcode from a control path drive (because the only available drive is a control path or because a control path drive has a higher level of microcode than any other drive in the library) the host will be unable to perform control path functions using that control path drive until the automatic drive microcode update has completed.

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline all the drives on the same SCSI bus.
2. Prepare for drive replacement (see “Service Procedures” on page 790).
3. Open the rear door in the frame containing the drive.
4. Refer to Figure 273 on page 877. Unplug the AC power cable **1** from the back of the drive tray.

   Note: Do not unplug the power cord at the FCA, as two drives are powered from this cord.
5. Unplug the RS-422 cable **2** from the back of the drive tray.
6. Unplug the SCSI cables (and terminator, if installed) from the back of the drive tray.
7. Loosen the screws **3** .
8. Remove the drive tray.
9. If there is a stuck cartridge in the drive, go to “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051. If not, complete the drive replacement.

Replacement Procedure

1. The replacement procedure is the reverse of the removal procedure.

   Attention:

   - When connecting cables, connect the power cable last.
   - Ensure the drive tray is completely seated at both tabs before tightening the screws. Each tab should be flush to the frame. To prevent deforming the tabs, ensure the drive tray is not skewed before you begin to tighten the screws. If the tabs are bent because the drive tray is skewed, the gripper assembly cannot pick a cartridge.

   Note:

   - If a logical library label holder is attached to the old drive, remove it and install it on the new drive.
   - The drive safety flaps must **NOT** be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

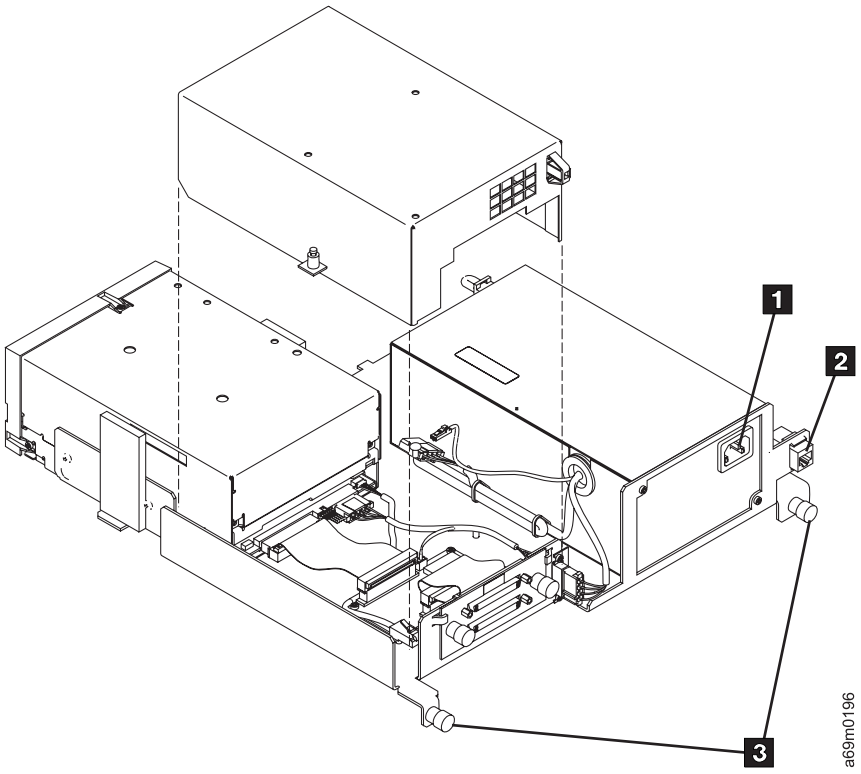


Figure 273. SCSI drive Tray Assembly – Rear View

2. After installing a replacement drive canister, wait at least 3 minutes before continuing. This will ensure that the library has time to automatically configure and calibrate the drive.

   Note: If a drive microcode is automatically updated, the update may take as long as 20 or 30 minutes. Wait until the 'Firmware Update' screen shows the update is complete or that an error has occurred.
3. Reinstall all communications cables and terminators removed during repair.
4. Finish drive replacement (see “Service Procedures” on page 790).
5. At the **Activity** screen, press **Menu**.
6. At the **Main Menu** screen, select **Vital Product Data**. Press **Enter**.
7. At the **Vital Product Data** screen, select **Drive VPD**. View the drive microcode version for all drives in the library.
8. If the microcode in the drive you replaced is correct, continue at the next step. If the drive microcode is downlevel on the drive you replaced, update the drive microcode using CETool see “CETool” on page 725.
9. **Note:** If the drive is connected to an eServer iSeries (AS/400) host, then you may have to IPL the host IOP before it will recognize the replacement drive.
10. If you just replaced a 3592 tape drive that it is attached to an external device or control unit (J70, C06, VTS, TS7700, TS7700, 3953), then also follow any drive replacement 'end of call' procedures for that device.
11. At the completion of the tests, inform your customer that the drive may be placed “online” to the host.

Drive Tray Assembly – LTO Fibre

C05	**CAUTION:** **These products comply with the performance standards set by the U.S.A. Code of Federal Regulations (CFR) and IEC825 for a Class 1 Laser Product.**

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- If there is a cartridge in the drive, go to “Manually Removing Cartridge” on page 1045.
- If you are relocating a drive within the same or a different library, you must use the appropriate feature code (see “Feature Codes & Model Conversions” on page 227):

Removal Procedure

Note: When updating an LTO drive, be aware of the following:

- If the drive that is being replaced is a control path drive, all host communications with the library through the affected control path drive (but not host communications with other drives in the library) will be disabled until the drive replacement (which may include automatically updating the drive microcode from another drive) has been completed.
- If an automatic drive-microcode update must read drive microcode from a control path drive (because the only available drive is a control path or because a control path drive has a higher level of microcode than any other drive in the library) the host will be unable to perform control path functions using that control path drive until the automatic drive microcode update has completed.

1. Notify the customer that you will be taking a drive out of operation. Ask the customer to vary the drive offline.
2. Prepare for drive replacement (see “Service Procedures” on page 790).
3. Open the rear door in the frame containing the drive.
4. Refer to Figure 274 on page 879. Unplug the AC power cable **1** from the back of the drive tray.

   Note: Do not unplug the power cord at the FCA, as two drives are powered from this cord.
5. Unplug the RS-422 cable **2** from the back of the drive tray.
6. Unplug the fibre cable **4**.
7. Loosen the screws **3**, and remove the drive tray from the library.
8. If there is a stuck cartridge in the drive, go to “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051. If not, complete the drive replacement.

Replacement Procedure

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

Attention:
- The RS/422 cable must be plugged in before the power cable is plugged in.
- Ensure the drive tray is completely seated at both tabs before tightening the screws. Each tab should be flush to the frame. To prevent deforming the tabs, ensure the drive tray is not skewed before you begin to tighten the screws. If the tabs are bent because the drive tray is skewed, the gripper assembly cannot pick a cartridge.

Note:
- If a logical library label holder is attached to the old drive, remove it and install it on the new drive.
- The drive safety flaps must **NOT** be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.
- If you are copying drive microcode either **to** or **from** a control path drive, the drive and its entire logical library string of drives will be unavailable to the library until the microcode update is complete.

  Note: Concurrent maintenance of a control path drive may require a logical library to be offline.

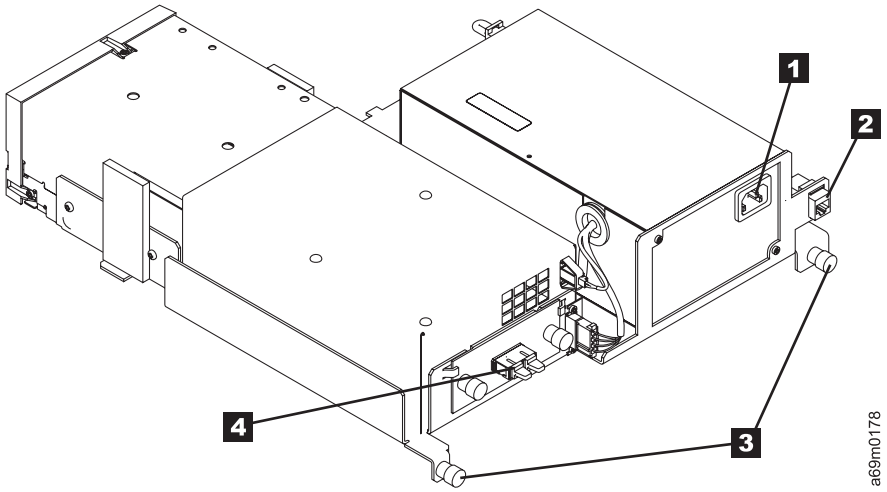


Figure 274. Drive Tray Assembly – LTO Fibre

1. The replacement procedure is the reverse of the removal procedure.
2. After installing a replacement drive canister, wait at least 3 minutes before continuing. This will ensure that the library has time to automatically configure and calibrate the drive.

   Note: If a drive microcode is automatically updated, the update may take as long as 20 or 30 minutes. Wait until the 'Firmware Update' screen shows the update is complete or that an error has occurred.
3. Reinstall all communications cables and terminators removed during repair.
4. Finish drive replacement (see “Service Procedures” on page 790).
5. At the **Activity** screen, press **Menu**.
6. At the **Main Menu** screen, select **Vital Product Data**. Press **Enter**.
7. At the **Vital Product Data** screen, select **Drive VPD**. View the drive microcode version for all drives in the library.
8. If the microcode in the drive you replaced is correct, continue at the next step. If the drive microcode is downlevel on the drive you replaced, update the drive microcode using CETool see “CETool” on page 725.
9. Reconnect the fibre cable.

10. **Note:** If the drive is connected to an eServer iSeries (AS/400) host, then you may have to IPL the host IOP before it will recognize the replacement drive.
11. If you just replaced an LTO tape drive that it is attached to an external device or control unit (J70, C06, VTS, TS7700, 3953), then also follow any drive replacement 'end of call' procedures for that device.
12. At the completion of the tests, inform your customer that the drive may be placed “online” to the host.

Drive Canister Assembly – LTO SCSI, Removal / Replacement

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- If there is a cartridge in the drive, go to “Manually Removing Cartridge” on page 1045.

Removal Procedure

Note: When updating an LTO drive, be aware of the following:

- If the drive that is being replaced is a control path drive, all host communications with the library through the affected control path drive (but not host communications with other drives in the library) will be disabled until the drive replacement (which may include automatically updating the drive microcode from another drive) has been completed.
- If an automatic drive-microcode update must read drive microcode from a control path drive (because the only available drive is a control path or because a control path drive has a higher level of microcode than any other drive in the library) the host will be unable to perform control path functions using that control path drive until the automatic drive microcode update has completed.
- If you are relocating a drive within the same or a different library, you must use the appropriate feature code (see “Feature Codes & Model Conversions” on page 227):
  - FC 1663 - LTO & 3592 Field Drive Removal
  - FC 1674 - 3592 Drive Field Reinstall
  - FC 1665 - LTO Drive Field Reinstall

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline all the drives on the SCSI bus.
2. Prepare for drive replacement (see “Service Procedures” on page 790).
3. Open the rear door of the frame containing the drive.
4. While holding up the locking lever **2**, grasp the drive canister handle **3**. Firmly pull back on the handle enough to disengage the drive canister.
5. Use your other hand to support the drive canister from the underside, as you remove the drive canister from the fixed tray assembly.
6. If there is a stuck cartridge in the drive, go to “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051. If not, complete the drive replacement.

Replacement Procedure

Note:

- If a logical library label **1** is attached to the old drive, remove it from the old drive and attach it to the new drive.
- The drive safety flaps must **not** be removed when installing the drive. The safety flaps will pivot up, out of the path when the drive is installed.
- If you are copying drive microcode either **to** or **from** a control path drive, the drive and its entire logical library string of drives will be unavailable to the library until the microcode update is complete.

  Note: Concurrent maintenance of a control path drive may require a logical library to be offline.

The replacement procedure is the reverse of the removal procedure.

1. Carefully slide the drive canister into the fixed tray assembly.
2. Hold the locking lever **2** up to ensure the tabs on both sides of the lever will clear the frame.

3. Grasp the drive canister handle **3**, and carefully but firmly push the drive into position. Ensure that the connectors to the right correctly align and fully engage with the fixed tray connectors.
4. Lower the locking lever **2** until it snaps into place.

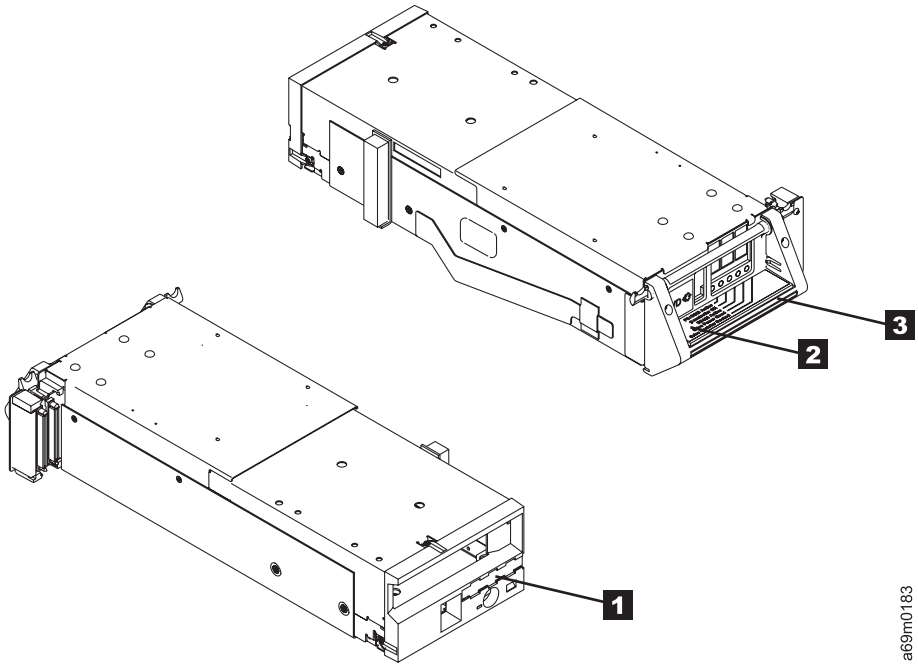


Figure 275. Drive Canister Assembly– LTO SCSI Hot Swap

5. Refer to “Drive Canister LED Display (LTO)” on page 801 for canister LED displays.
6. After installing a replacement drive canister, wait at least 3 minutes before continuing. This will ensure that the library has time to automatically configure and calibrate the drive.

   Note: If a drive microcode is automatically updated, the update may take as long as 20 or 30 minutes. Wait until the 'Firmware Update' screen shows the update is complete or that an error has occurred.
7. Reinstall all communications cables and terminators removed during repair.
8. Finish drive replacement (see “Service Procedures” on page 790).
9. At the **Activity** screen, press **Menu**.
10. At the **Main Menu** screen, select **Vital Product Data**. Press **Enter**.
11. At the **Vital Product Data** screen, select **Drive VPD**. View the drive microcode version for all drives in the library.
12. If the microcode in the drive you replaced is correct, continue at the next step. If the drive microcode is downlevel on the drive you replaced, update the drive microcode using CETool see “CETool” on page 725.
13. **Note:** If the drive is connected to an eServer iSeries (AS/400) host, then you may have to IPL the host IOP before it will recognize the replacement drive.
14. If you just replaced an LTO tape drive that it is attached to an external device or control unit (J70, C06, VTS, TS7700, 3953), then also follow any drive replacement 'end of call' procedures for that device.
15. At the completion of the tests verify the drive is ONLINE, then inform your customer that the drive may be placed “online” to the host **or** control unit.

Drive Canister Assembly – LTO Fibre, Removal / Replacement

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU. For 3588 (LTO-3, LTO-4, and LTO-5) refer to "Changing 3592 / 3588 Serial Numbers" on page 739 to restore the drive serial number to its original state in the event the original serial number is incorrect.**
- If there is a cartridge in the drive, go to "Manually Removing Cartridge" on page 1045.
- If you are relocating a drive within the same or a different library, **OR** if you are replacing a drive with an upgraded model, you **must** use the appropriate feature code (see "Feature Codes & Model Conversions" on page 227):
  - **FC 1663** - LTO & 3592 Field Drive Removal, **FC 1674** - 3592 Drive Field Reinstall, **FC 1665** - LTO Drive Field Reinstall.

Removal Procedure

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline the drive to all hosts. If the drive is connected to a control unit (i.e., J70, C06, or VTS), the drive must also be offline to the control unit and made unavailable to the Library Manager.
2. Prepare for drive replacement (see "Service Procedures" on page 790).
3. Open the rear door of the frame containing the drive.
4. Refer to Figure 276 on page 885. Unplug the fibre cable **4** .
5. While holding up the locking lever **2** , grasp the drive canister handle **3** . Firmly pull back on the handle enough to disengage the drive canister.
6. Use your other hand to support the drive canister from the underside, as you remove the drive canister from the fixed tray assembly.
7. If there is a stuck cartridge in the drive, go to "From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader" on page 1051. If not, complete the drive replacement.

Replacement Procedure

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

Note:

- If a logical library label **1** is attached to the old drive, remove it from the old drive and attach it to the new drive.
- The drive safety flaps must **not** be removed when installing the drive. The safety flaps will pivot up, out of the path when the drive is installed.
- If you are copying drive microcode either **to** or **from** a control path drive, the control path function from the source or destination drive may be unavailable to the library until the microcode update is complete, which is not an issue if Control Path Failover is installed and properly enabled.

LTO Ultrium 3, Ultrium-4, and Ultrium-5 (3588) drive serial number preservation:

- When an LTO Gen-3, -4, or -5 drive canister is replaced, the FRU will come with a RID tag. You must write the serial number of the original drive on the RID tag and place it over the serial number label on the back of the FRU canister. It is also important that you use "Prepare for Drive Replacement" on page 790 and "Finish Drive Replacement" on page 791 procedures to ensure that the library will write the serial number of the original drive into VPD in the replacement drive. **Note:** Concurrent maintenance of a control path drive may require a logical library to be offline.

The replacement procedure is the reverse of the removal procedure.

1. Carefully slide the drive canister into the fixed tray assembly.

2. Hold the locking lever **2** up to ensure the tabs on both sides of the lever will clear the frame.
3. Grasp the drive canister handle **3**, and carefully but firmly push the drive into position. Ensure that the connectors to the right correctly align and fully engage with the fixed tray connectors.
4. Lower the locking lever **2** until it snaps into place.

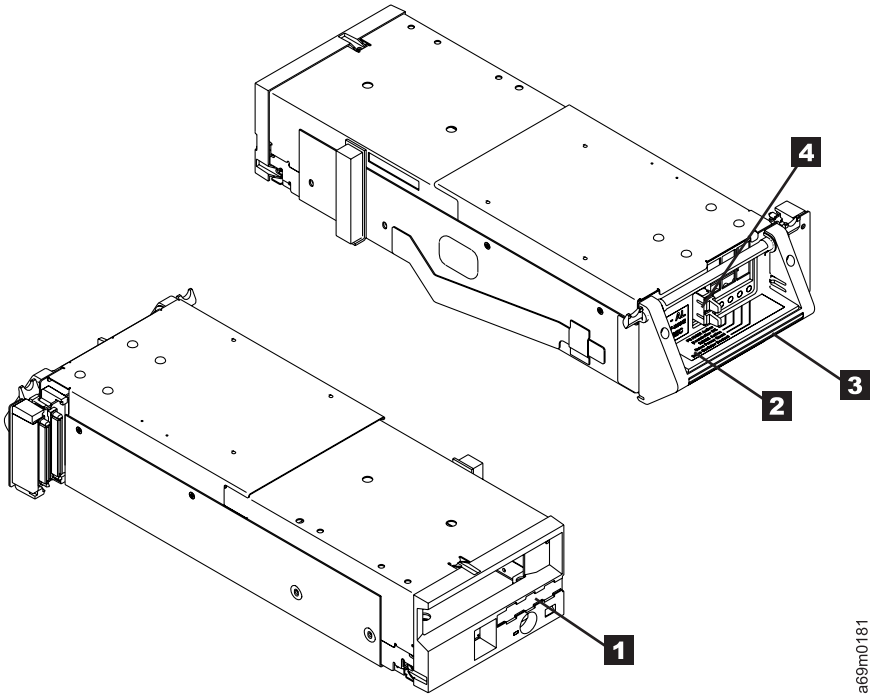


Figure 276. Drive Canister Assembly– LTO Fibre Hot Swap

5. Refer to “Drive Canister LED Display (LTO)” on page 801 for canister LED displays.

   Note: When installing LTO Ultrium-2 Fibre drives, the LED may turn Green as soon as the drive is installed in the fixed tray. This is a drive code problem that occurs only with LTO Ultrium-2 drives, and will be fixed in an upcoming drive code release. Do not change any FRUs to resolve this problem unless you are working on a Fibre Channel connectivity problem and the Fibre Channel Wrap Test fails.
6. After installing a replacement drive canister, wait at least 3 minutes before continuing. This ensures the library has time to automatically configure and calibrate the drive. **Note:** If a drive microcode is automatically updated, the update may take as long as 20 or 30 minutes. Wait until the 'Firmware Update' screen shows the update is complete or that an error has occurred.
7. Reinstall all communications cables and terminators removed during repair. Finish drive replacement (see “Service Procedures” on page 790.)
8. At the **Activity** screen, press **Menu, Vital Product Data** and press **Enter**. Select **Drive VPD**. View the drive microcode version for all drives in the library.
9. If the microcode in the drive you replaced is correct, continue at the next step. If the drive microcode is downlevel on the drive you replaced, update the drive microcode using CETool see “CETool” on page 725. Allow at least three minutes to reset the configuration of the drive before you attaching the fibre cable.
10. Reinstall all communications cables and terminators removed during repair. **Note:** If the drive is connected to an eServer iSeries (AS/400) host, then you may have to IPL the host IOP before it will recognize the replacement drive. If the drive is connected to an IBM control unit (J70 or C06) follow the steps in the J70 or C06 MI to put the drive back online to the control unit. For VTS, the 'end of call' procedure should be followed for that device. Verify the drive is ONLINE, then inform the customer that the drive may be placed “online” to the host.

Drive Canister Assembly – 3592 (J1A, E05, E06/EU6 & E07), Removal / Replacement

Before you begin...

- If you exchange a FRU and the problem is not corrected, reinstall the original FRU. Refer to "Changing 3592 / 3588 Serial Numbers" on page 739 to restore the drive serial number to its original state in the event the original serial number is incorrect.
- If the drive you are replacing is a 3592 E05, E06/EU6, or E07 encryption-capable drive, be sure the replacement drive is also encryption-capable. See item 1–51 on page 1115 for the correct part number. If the existing drive encryption-capable drive had FIPS code loaded, ensure the replacement drive has a FIPS-certified level of drive code loaded. The latest level of 3592 drive code available may NOT necessarily be FIPS-certified.
- If you are replacing a 3592 model EU6 drive with a 3592 model E06 drive, see **"Replacing Model EU6 Drive" on page 890** before you install the new drive.
- If there is a cartridge in the drive, go to "Manually Removing Cartridge" on page 1045.
- If you are relocating a drive within the same or a different library, **OR** if you are replacing a drive with an upgraded model, you must use the appropriate feature code (see "Feature Codes & Model Conversions" on page 227):
  - **FC 1663** - LTO & 3592 Field Drive Removal, **FC 1674** - 3592 Drive Field Reinstall, **FC 1665** - LTO Drive Field Reinstall, **FC 1675** - 3592 E07 Drive Field Reinstall

Removal Procedure

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline the drive to all hosts. If the drive is connected to a control unit (i.e., J70, C06, or VTS), the drive must also be offline to the control unit and made unavailable to the Library Manager.

   Attention: You must complete this process on one drive before starting it on another drive. Performing this procedure on multiple drives at the same time can result in the new drives having incorrect serial numbers!
2. Prepare for drive replacement (see "Service Procedures" on page 790).
3. Open the rear door of the frame containing the drive.
4. Refer to Figure 277 on page 888. Unplug the fibre cable(s) **2** .
5. Push up on the locking lever **3** , grasp the drive canister handle **4** . Firmly pull back on the handle enough to disengage the drive canister.
6. Use your other hand to support the drive canister from the underside, as you remove the drive canister from the fixed tray assembly.
7. If there is a stuck cartridge in the drive, go to "From a 3592 Drive When Cartridge is Stuck in Loader" on page 1072. If not, complete the drive replacement.

Replacement Procedure

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

Note:

- If a logical library label **1** is attached to the old drive, remove it from the old drive and attach it to the new drive.
- The drive safety flaps must **not** be removed when installing the drive. The safety flaps will pivot up, out of the path when the drive is installed.
- If you are copying drive microcode either **to** or **from** a control path drive, the control path function from the source or destination drive may be unavailable to the library until the microcode

update is complete, which is not an issue if Control Path Failover is installed and properly enabled.

3592 drive serial number preservation:

- When a 3592 drive canister is replaced, the FRU will come with a RID tag. You must write the serial number of the original drive on the RID tag and place it over the serial number label on the back of the FRU canister. It is also important that you use the 'Prepare for Drive Replacement' and 'Finish Drive Replacement' procedures to ensure that the library will write the serial number of the original drive into VPD in the replacement drive.

The replacement procedure is the reverse of the removal procedure.

1. Carefully slide the drive canister into the fixed tray assembly.
2. Hold the locking lever **3** up to ensure the tabs on both sides of the lever will clear the frame.
3. Grasp the drive canister handle **4**, and carefully but firmly push the drive into position. Ensure that the connectors to the right correctly align and fully engage with the fixed tray connectors.
4. Lower the locking lever **3** until it snaps into place.

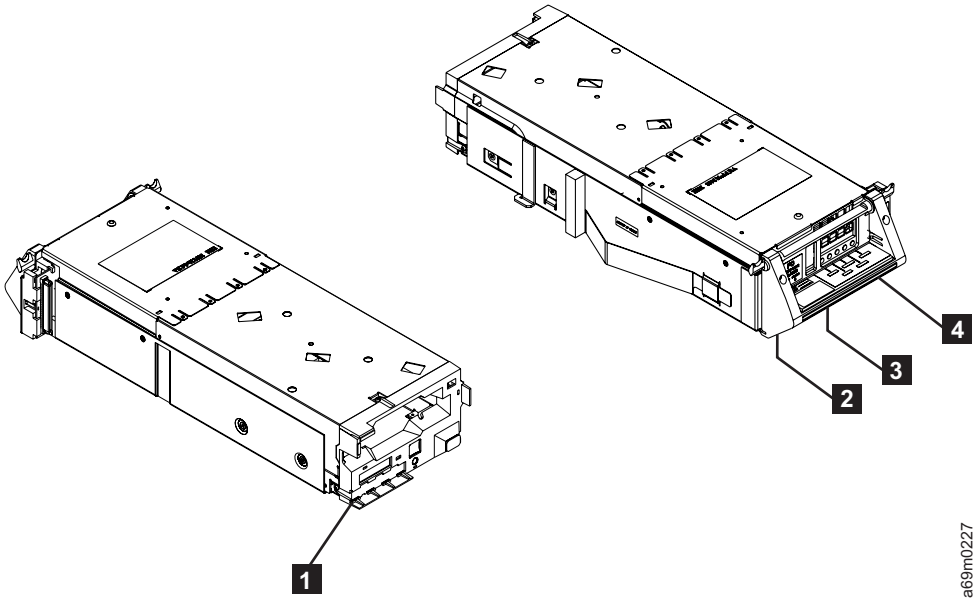


Figure 277. Drive Canister Assembly– 3592 Fibre Hot Swap

5. Refer to “Drive Canister LED Display (3592)” on page 803 for canister LED displays.
6. After installing a replacement drive canister, wait at least 3 minutes before continuing. This will ensure that the library has time to automatically configure and calibrate the drive.
7. Finish drive replacement (see “Service Procedures” on page 790).

   Note: If a drive microcode is automatically updated, the update may take as long as 20 or 30 minutes. Wait until the 'Firmware Update' screen shows the update is complete or that an error has occurred.
8. At the **Activity** screen, press **Menu**.
9. At the **Main Menu** screen, select **Vital Product Data**. Press **Enter**.
10. At the **Vital Product Data** screen, select **Drive VPD**. View the drive microcode version for all drives in the library.
11. **Note:** If you just performed a drive dummy FRU replacement, you will have a drive dump in memory. The drive will show FID ED which must be cleared. You can check for a FID ED from the Op Panel. Select **Library Status -►Drive Display** option. To clear the drive dump from flash memory see “Clearing a 3592 Flash Dump” on page 740.

12. If the microcode in the drive you replaced is correct, continue at the next step. If the drive microcode is downlevel on the drive you replaced, update the drive microcode using CETool see “CETool” on page 725.
13. Give the library at least three minutes to reset the configuration of the replacement drive before you attached the fibre cable.
14. Reinstall all communications cables and terminators removed during repair. **Note:** If the drive is connected to an eServer iSeries (AS/400) host, then you may have to IPL the host IOP before it will recognize the replacement drive. If the drive is connected to an IBM control unit (J70 or C06) follow the steps in the J70 or C06 MI to put the drive back online to the control unit. For VTS, the 'end of call' procedure should be followed for that device.
15. At the completion of the tests verify the drive is ONLINE, then inform your customer that the drive may be placed “online” to the host **or** control unit.
16. Complete the report failure information label for use by the IBM repair center when they repair the 3592 drive. Figure 278 provides an example of this label.

Notes:

- The Machine Type and Model are 3592 J1A, 3592 E05, or 3592 E06/EU6.
- The Original S/N line on this label is for the serial number of the drive you just removed.
- After completing the form, you must remove the backing from this label, and affix the label to the top of the drive, near the bezel.

IBM Drive Failure Replacement Form
To assist drive repair, please complete this form.

Machine Type & Model _____ Original S/N _____

Customer Reported Failure: _____
Dump to Flash completed successfully? __Yes __No

Reason for drive replacement

Reported Error _____(e.g., FID 85) ATTN DRV Message _____(e.g., Unload Error)

Additional Information, FIDs, or Symptoms: _____
_____

Platform __AIX© __Linux© __HP© __Sun© __Windows© __z/OS©
Application __TSM© __Veritas© __Legato© __CA© __Other _____

QSAR, PMH, or problem number, if applicable: _____

Peel off this label and place it on the top edge of the removed drive, near the bezel.

Thanks for your input.
© Copyright IBM Corp. 2003 P/N 18P9956

Figure 278. Drive Failure Replacement Form Label

Replacing Model EU6 Drive: Use the following procedure if you are replacing a failed Model EU6 drive canister with a Model E06 drive canister.

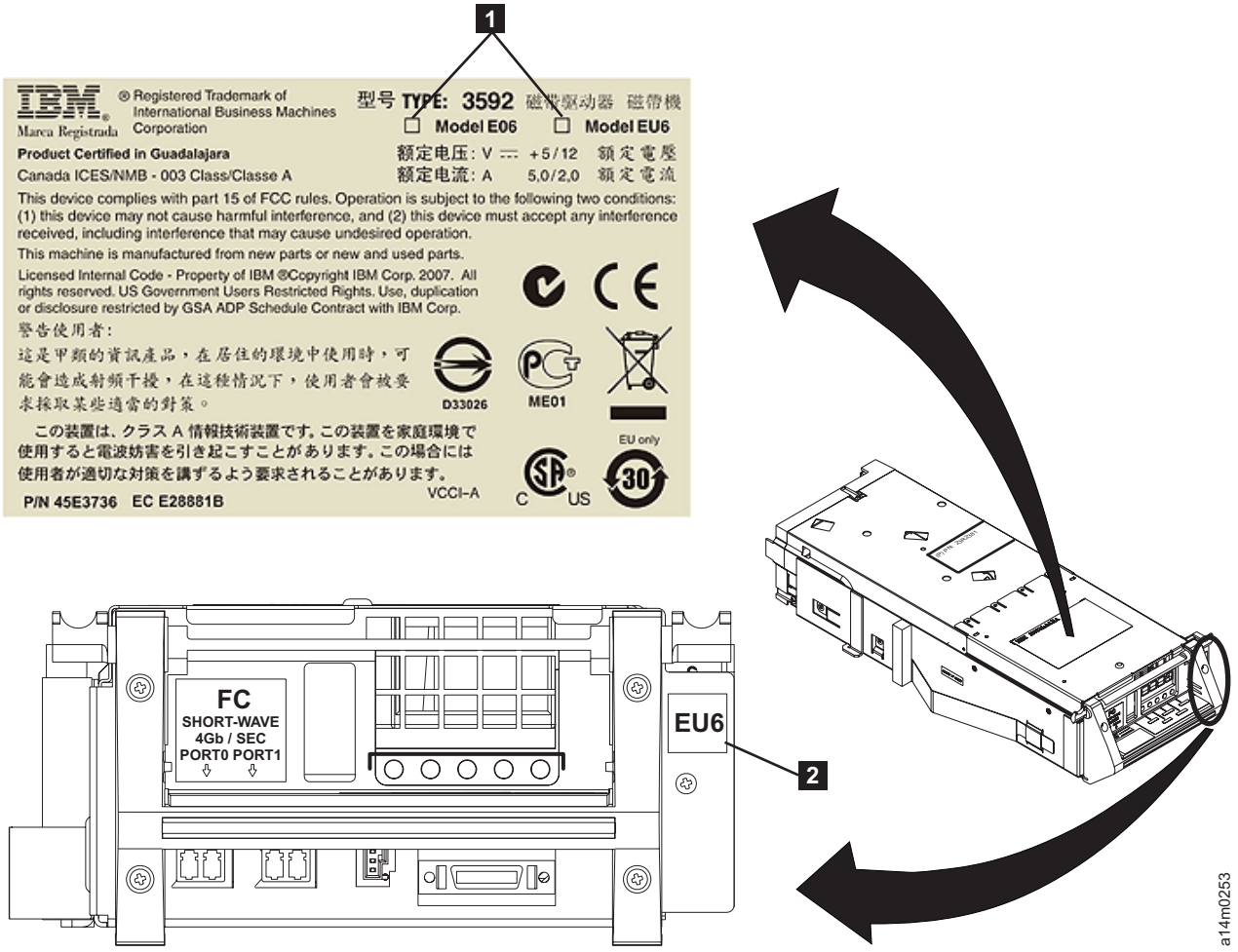


Figure 279. Model EU6 Drive - Labels

Item Number	Description
1	Model numbers on agency label
2	Model number label

__ 1. Remove the failed E**U**6 drive canister.

__ 2. See Figure 279. Locate the agency label located on top of the new E06 drive canister.

__ 3. Using a permanent marker, identify this drive canister by check the EU6 box on the agency label 1 on the new drive canister.

__ 4. Install an "EU6" label 2 over the E06 label on the back of the new drive canister.

Power Supply (x32), Redundant – Hot Swap

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: There are two types of fixed trays and power supplies used in x32 frames. See Figure 280 on page 893 and Figure 281 on page 895 to determine which fixed tray and power supply is installed in your x32 frame, and follow the appropriate removal/replacement procedures.

If the have the old style fixed tray and power supply, continue at the next step. If you have the new style fixed tray and power supply, go to page 894.

Removal Procedure (old style power supply)

CAUTION:
One drive power supply provides power to two drives. However, you will ONLY have redundant drive power if there is a redundant drive power cable connected to an adjacent drive position. If a redundant drive cable (N+1) is properly installed, the power supply can be removed and replaced without affecting drive operation. If not, removing the power supply could take the drive down.

1. Open the rear door of the frame containing the power supply.
2. Use your thumb and index finger to pinch together the locking arms **1** of the power supply.
3. Pivot outward the entire locking arm assembly **2** to release it from the fixed tray assembly.
4. Grasp the locking arm and firmly pull it back enough to release it from the fixed tray assembly.
5. Use your other hand to support the end of the power supply as you remove the power supply canister **3** from the fixed tray assembly **4**.

Replacement Procedure (old style power supply)

The replacement procedure is the reverse of the removal procedure.

1. Carefully slide the power supply canister **3** into the fixed tray assembly **4**.
2. Pinch together the locking arms **1** and slide in the power supply **3**, as you use the locking arm assembly **2** as a lever to move the power supply canister **3** into the locked position.

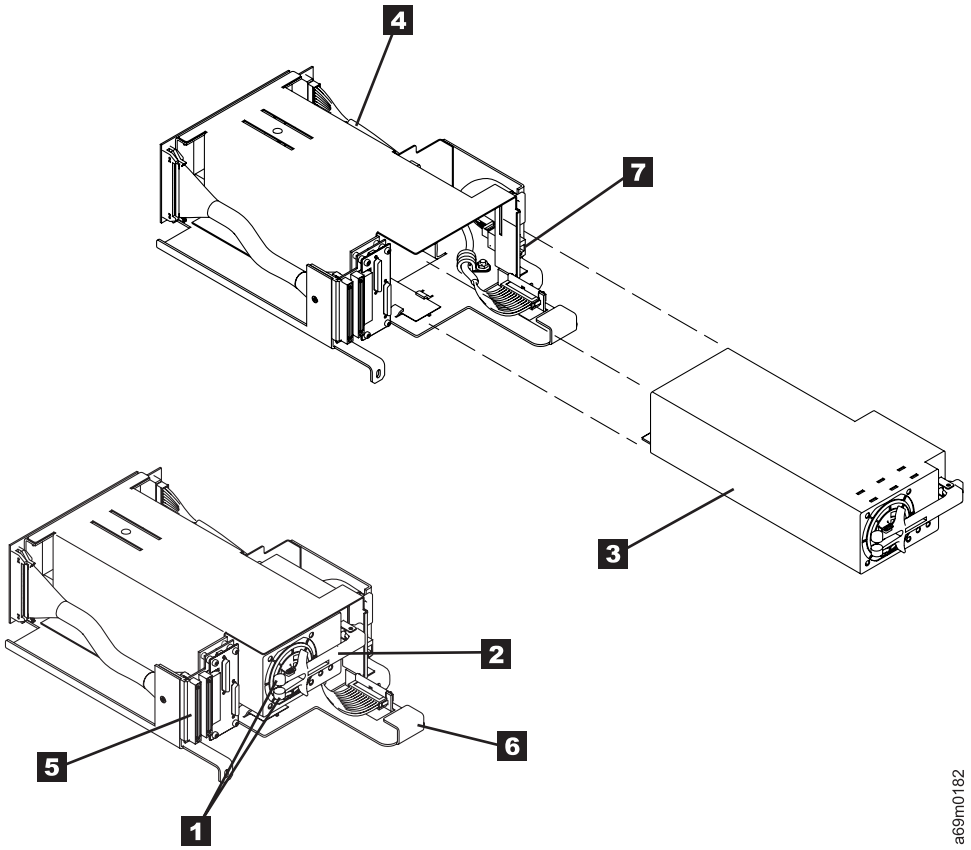


Figure 280. Redundant Power Supply – x32 (Old Style)

Removal Procedure (new style power supply)

CAUTION:
One drive power supply provides power to two drives. However, you will ONLY have redundant drive power if there is a redundant drive power cable connected to an adjacent drive position. If a redundant drive cable (N+1) is properly installed, the power supply can be removed and replaced without affecting drive operation. If not, removing the power supply could take the drive down.

1. Open the rear door of the frame containing the power supply canister.
2. Disconnect the power cable **4** from the rear of the power supply.
3. Press the colored tab on the side of the locking arm **3** and pivot the arm outward to release the power supply **2** from the fix tray assembly **1** and the frame **2**.
4. Hold the locking arm and firmly pull it back far enough to release it from the fixed tray assembly, while using your other hand to support the end of the power supply as you remove it from the fixed tray assembly.

Replacement Procedure (new style power supply)

The replacement procedure is the reverse of the removal procedure.

1. With the locking arm in the outward position, carefully slide the power supply canister **2** into the fixed tray assembly **1** as far as it will go.
2. Pivot the locking arm **3** in, making sure it engages in fixed tray frame as you snap the arm into a locked position.
3. Reconnect the power cable **4** to the power supply

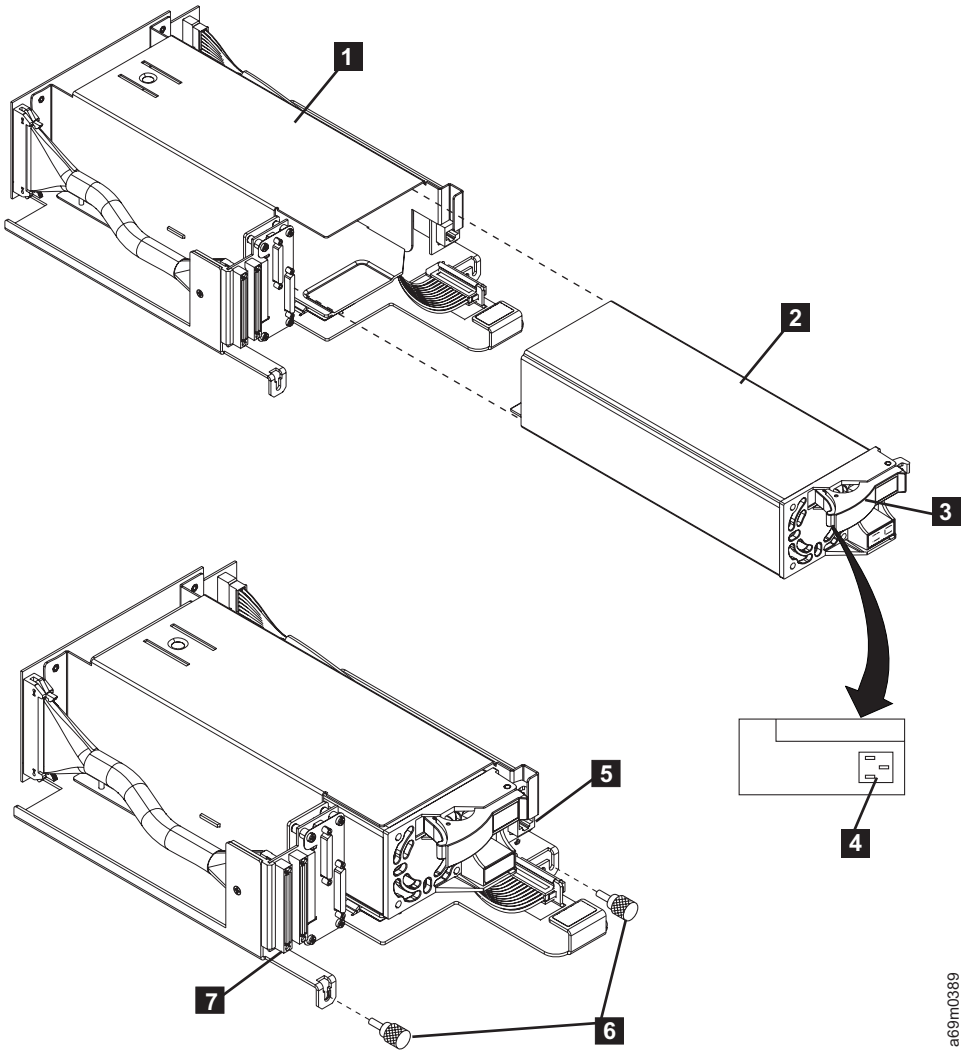


Figure 281. Redundant Power Supply – x32 (New Style)

Power Supply (x22/x52), Redundant – Hot Swap

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

CAUTION:
One drive power supply provides power to two drives. However, you will ONLY have redundant drive power if there is a redundant drive power cable connected to an adjacent drive position. If a redundant drive cable (N+1) is properly installed, the power supply can be removed and replaced without affecting drive operation. If not, removing the power supply could take the drive down.

1. Open the rear door of the frame containing the power supply canister.
2. Disconnect the power cable **8** from the rear of the power supply.
3. Press the colored tab on the side of the locking arm **7** and pivot the arm outward to release the power supply **6** from the fix tray assembly **5** and the frame **2**.
4. Hold the locking arm and firmly pull it back far enough to release it from the fixed tray assembly, while using your other hand to support the end of the power supply as you remove it from the fixed tray assembly.

Replacement Procedure

The replacement procedure is the reverse of the removal procedure.

1. With the locking arm in the outward position, carefully slide the power supply canister **6** into the fixed tray assembly **5** as far as it will go.
2. Pivot the locking arm **7** in, making sure it engages in fixed tray frame **2** as you snap the arm into a locked position.
3. Reconnect the power cable **8** to the power supply

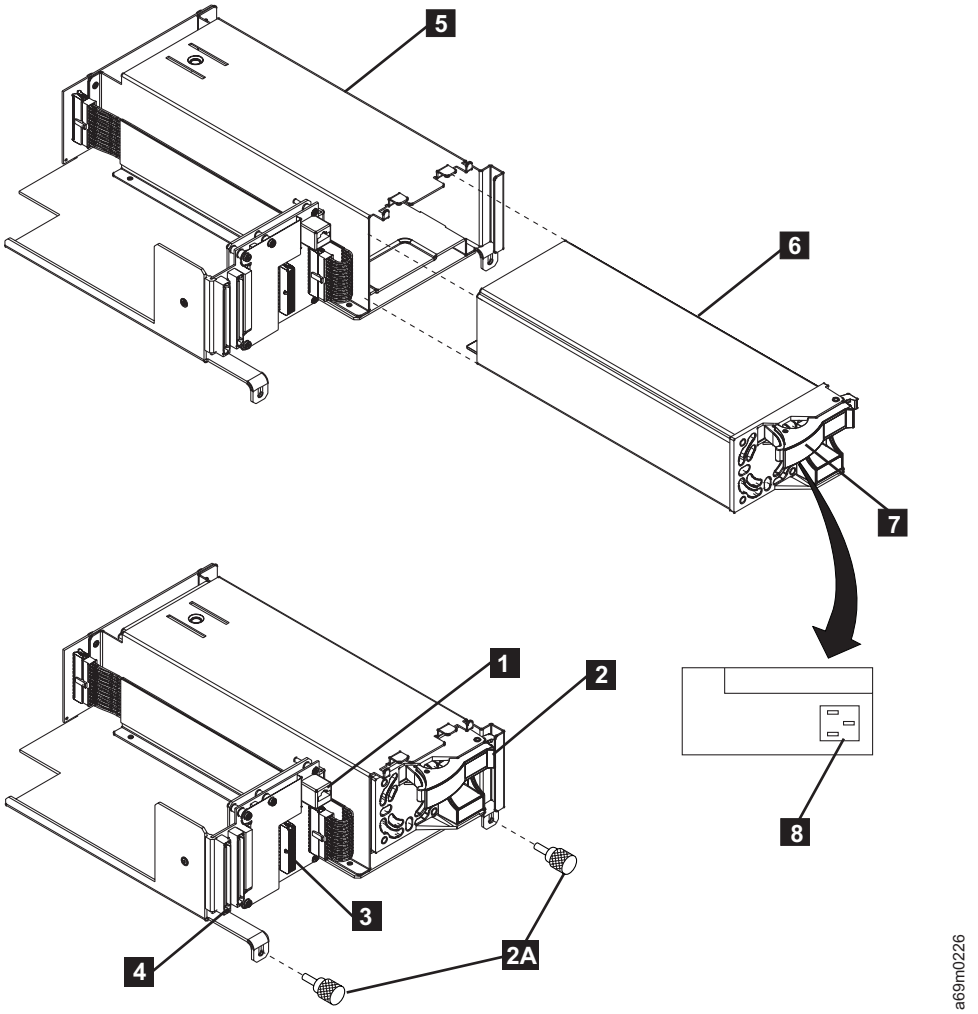


Figure 282. Redundant Power Supply – L22/L52 Hot Swap

Table 102. Redundant Power Supply – L22/L52 Descriptions

Item Number	Description
1	RS-422 Connection
2	Frame member that secures the power supply latch
2A	Thumbscrews that secure the fixed tray assembly to the frame
3	Redundant drive power connector
4	Drive canister docking connectors
5	Fixed tray assembly
6	Drive power supply canister
7	Drive power supply locking handle
8	Drive power supply bifurcated power cable attachment

LTO SCSI Tray to LTO SCSI Hot Swap Canister (conversion)

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- If there is a cartridge in the drive, go to “Manually Removing Cartridge” on page 1045.

Removal Procedure

Note: When updating an LTO drive, be aware of the following:

- If the drive that is being replaced is a control path drive, all host communications with the library through the affected control path drive (but not host communications with other drives in the library) will be disabled until the drive replacement (which may include automatically updating the drive microcode from another drive) has been completed.
- If an automatic drive-microcode update must read drive microcode from a control path drive (because the only available drive is a control path or because a control path drive has a higher level of microcode than any other drive in the library) the host will be unable to perform control path functions using that control path drive until the automatic drive microcode update has completed.

A conversion kit is now available. See Chapter 14. Parts Catalog for "Tray-to-Canister" FRU kit part numbers. The following parts are included in the kit:

- LTO hot swap drive canister (LVD or HVD, same type you are replacing)
- Fixed Tray Assembly (with power supply)
- Two VHCDI-to-HD68 interposer cables (to connect new drive VHDCI SCSI connectors to existing HD68 SCSI bus)
- Redundant drive power supply power cable (only used if this new drive is being installed above or below an existing hot-swap drive assembly that is currently **not** connected to an existing redundant drive power supply power cable.
- SCSI Terminator
- Install Instructions
- Ensure that you have the latest drive microcode file available in case you need to update the drive after you install it. See '“Downloading and Installing CETool” on page 726 for assistance in obtaining drive code.

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary all the drives on the same SCSI bus offline, and to quiesce the bus.
2. Prepare for drive replacement (see “Service Procedures” on page 790).
3. Open the rear door in the frame containing the drive.
4. Unplug the AC power cable **1** from the back of the fixed tray.

   Note: Do not unplug the power cord at the FCA, as two drives are powered from this cord.

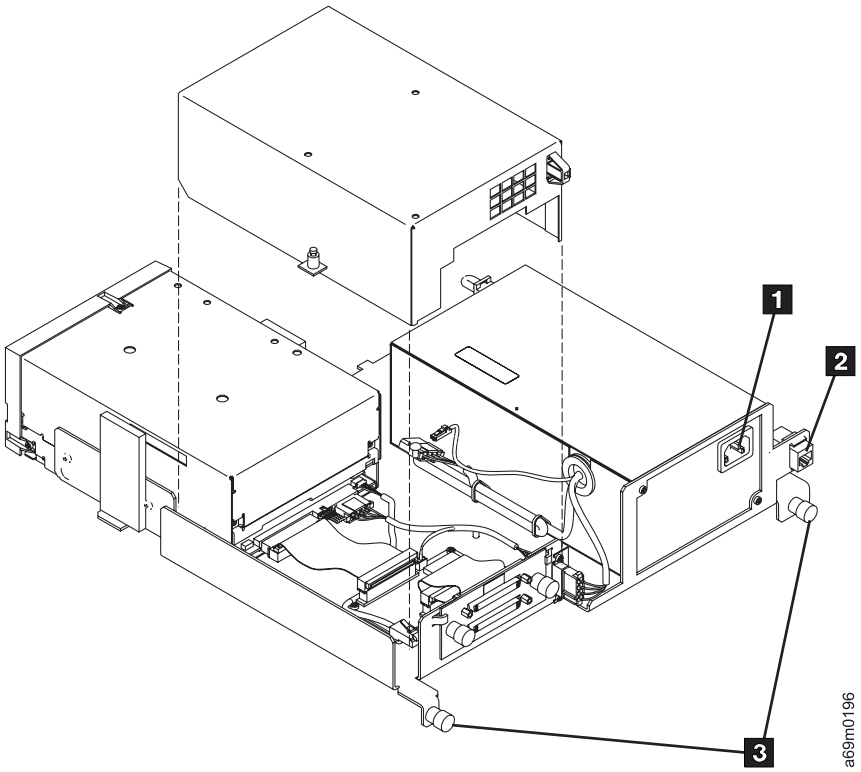


Figure 283. Unplugging AC Power Cables

5. Unplug the RS-422 cable **2** from the back of the fixed tray.
6. Unplug the SCSI cables (and terminator, if installed) from the back of the fixed tray.
7. Loosen the screws **3** to remove the fixed tray.
8. If there is a stuck cartridge in the drive, go to “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051. If not, complete the drive replacement.

Replacement Procedure

Note: If you are copying drive microcode either **to** or **from** a control path drive, the drive and its entire logical library string of drives will be unavailable to the library until the microcode update is complete. Concurrent maintenance of a control path drive may require a logical library to be offline.

Note: There are two types of fixed trays and power supplies used in x32 frames. See Figure 284 on page 900 and Figure 285 on page 901 to determine which fixed tray and power supply is installed in your x32 frame, and follow the appropriate install procedure.

Installing the Fixed Tray (old style)

1. See Figure 284 on page 900. Slide in the fixed tray assembly, keeping it toward the right side. Ensure the front locating tab **1** on the tray assembly slides securely into the front slot in the frame.

   Note: As the front locating tab seats into the slot in the frame, the indicator slide will move to partially cover the indicator hole **3**. If you see the indicator slide move toward the indicator hole (partially covering it), then the locating tab is positioned in the slot. If the indicator slide does **not** move, slide the front of the fixed tray assembly left or right until the locating tab slides into the slot.
2. Tighten both thumbscrews **2** to be **fingertight only**. Do not overtighten these screws.

3. Thumbscrew caps **6** are used for shipping only, and do not need to be installed.

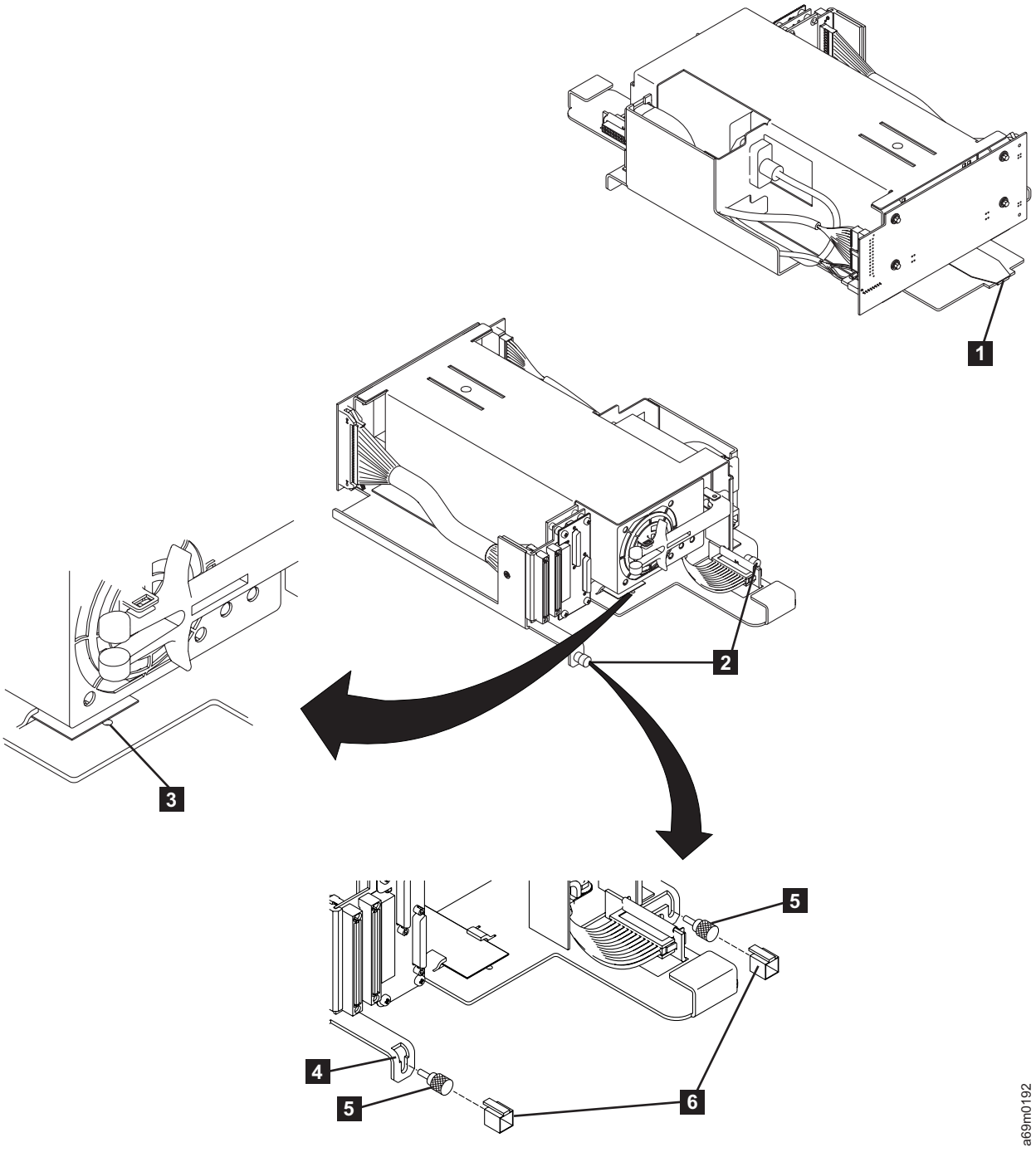


Figure 284. Fixed Tray (old style)

Installing the Fixed Tray (new style)

a. See Figure 285. Slide in the fixed tray assembly, keeping it toward the right side. Ensure the front locating tab **1** on the tray assembly slides securely into the front slot in the frame.

b. Tighten both thumbscrews **2** to be **fingertight only**. Do not overtighten these screws.

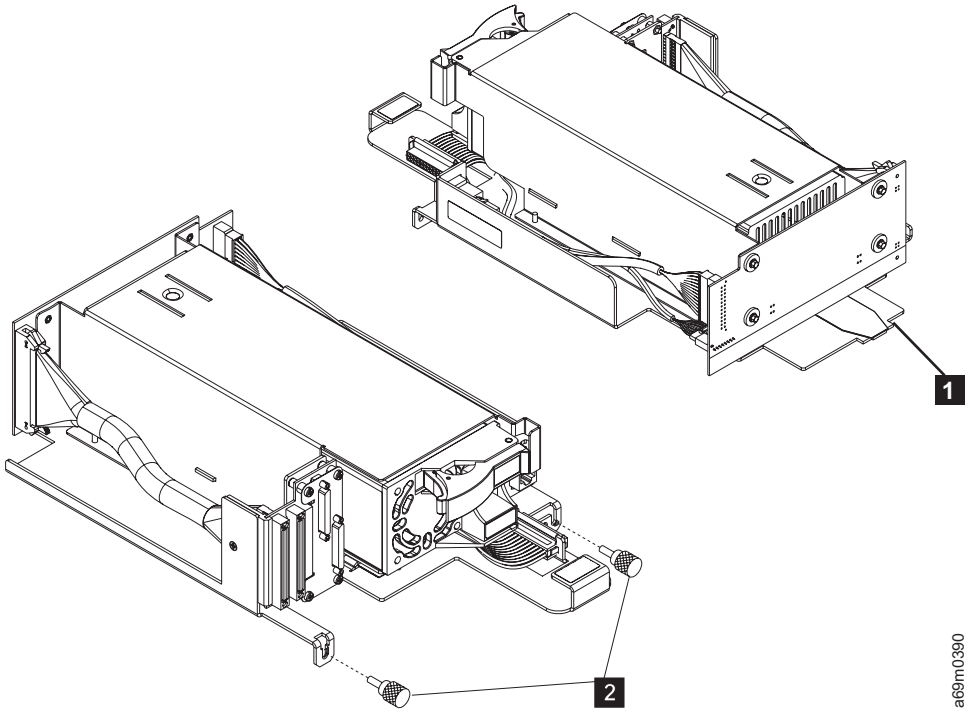


Figure 285. Fixed Tray (new style)

Installing the Drive Canister

Note:

- If a logical library label **1** is installed on the old drive, remove it and install it on the new drive.
- The drive safety flaps must NOT be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

4. See Figure 286). Carefully slide the drive canister into the left side of the fixed tray assembly.
5. Hold the locking lever **2** **up** to ensure the tabs on both sides of the lever will clear the frame.
6. Grasp the drive canister handle **3**, and carefully but firmly push the drive into position. Ensure the connectors to the right correctly align and fully engage with the fixed tray connectors.
7. Lower the locking lever **2** until it snaps in place.

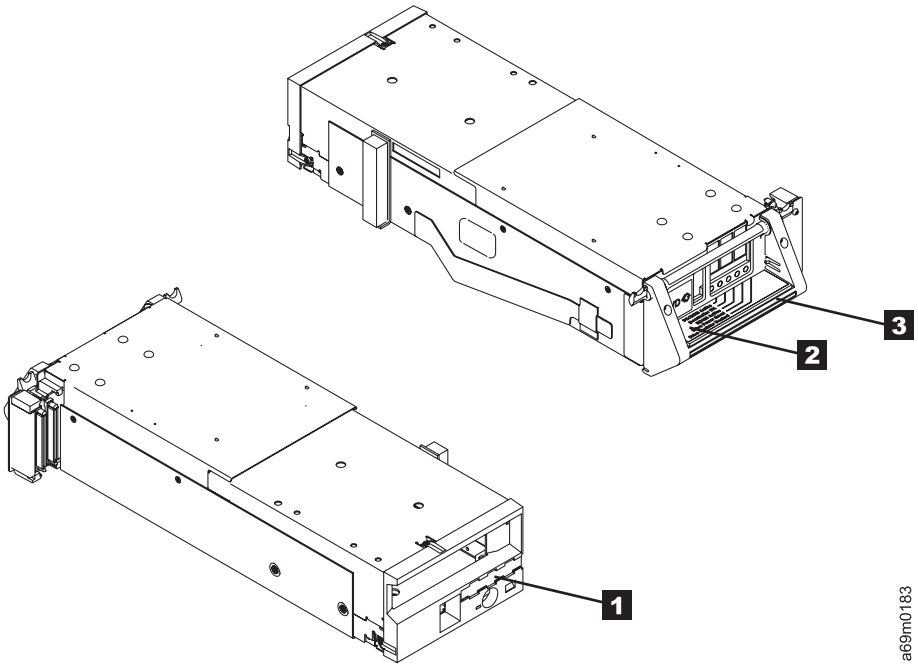


Figure 286. LTO SCSI Drive Canister

Installing the Hot Swap Power Supply

8. **Note:** You may have either an old style or a new style fixed tray and power supply. See Figure 287 and Figure 288 on page 904.
9. Pivot locking arm assembly **2** (old style) or **3** (new style) outward.
10. Firmly slide the power supply into the fixed tray assembly.
11. Swing the locking arm to the left while you pinch the two locking tabs **1** (old style) together, or swing the arm **3** (new style), securing the arm in place.

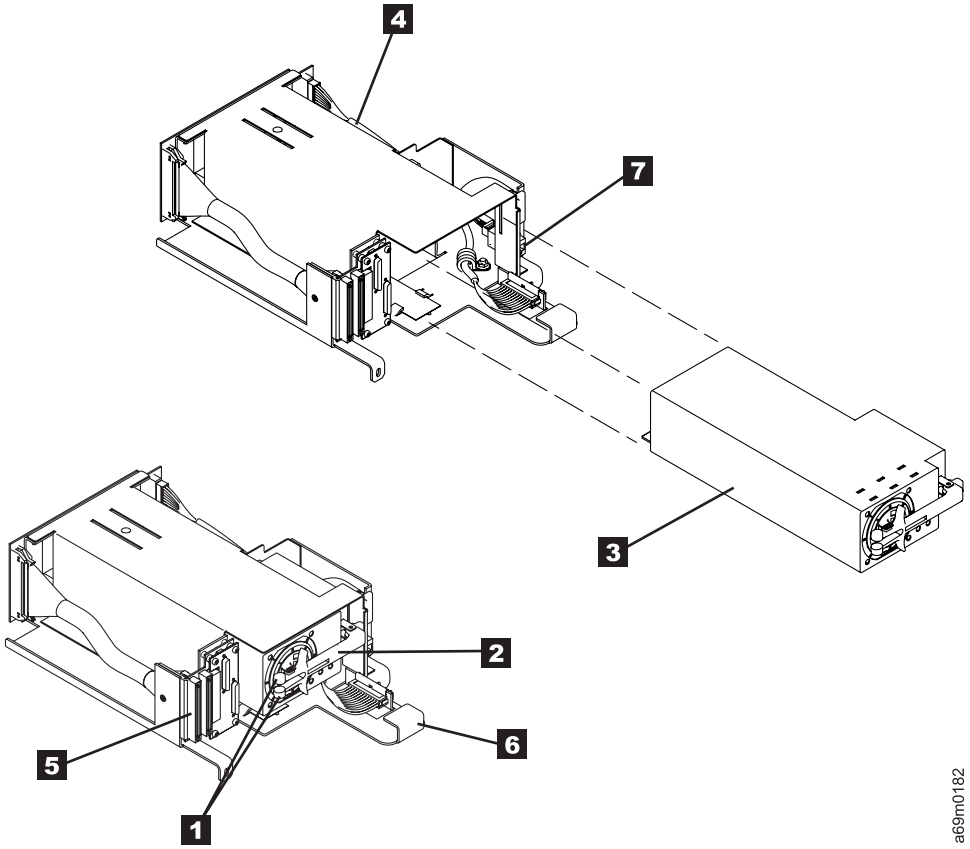


Figure 287. Hot Swap Power Supply (old style)

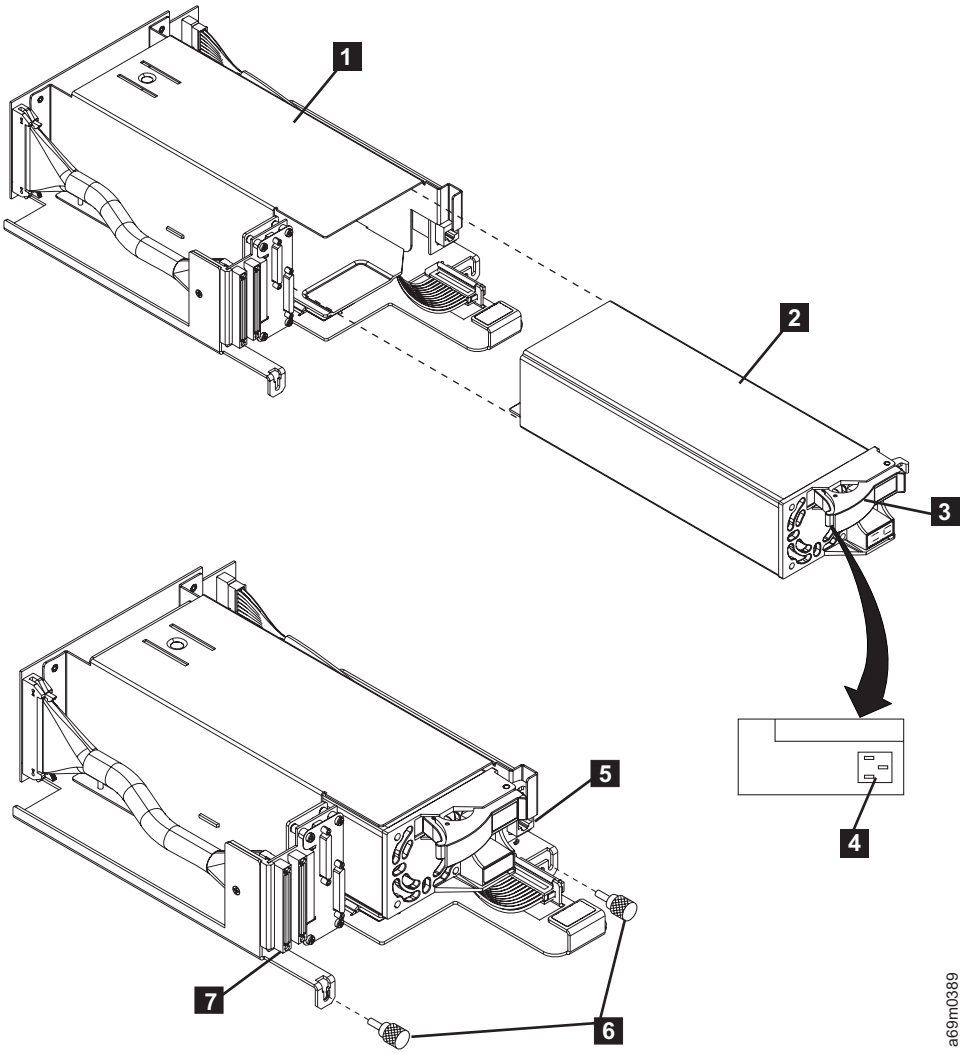


Figure 288. Hot Swap Power Supply (new style)

Installing Interposers and SCSI Cables

12. Install a SCSI VHCDI-to-HD68 interposer cable on each SCSI receptacle **5** , and tighten the screws.
13. Re-install the existing SCSI cables (or terminator, if this was the end of the SCSI bus) to the interposer cables just installed, and tighten the thumbscrews securely. Route the SCSI cables onto the strain-relief bracket **6** to provide support.
14. Reconnect the RS-422 connector **7** on the right side of the new fixed tray assembly.

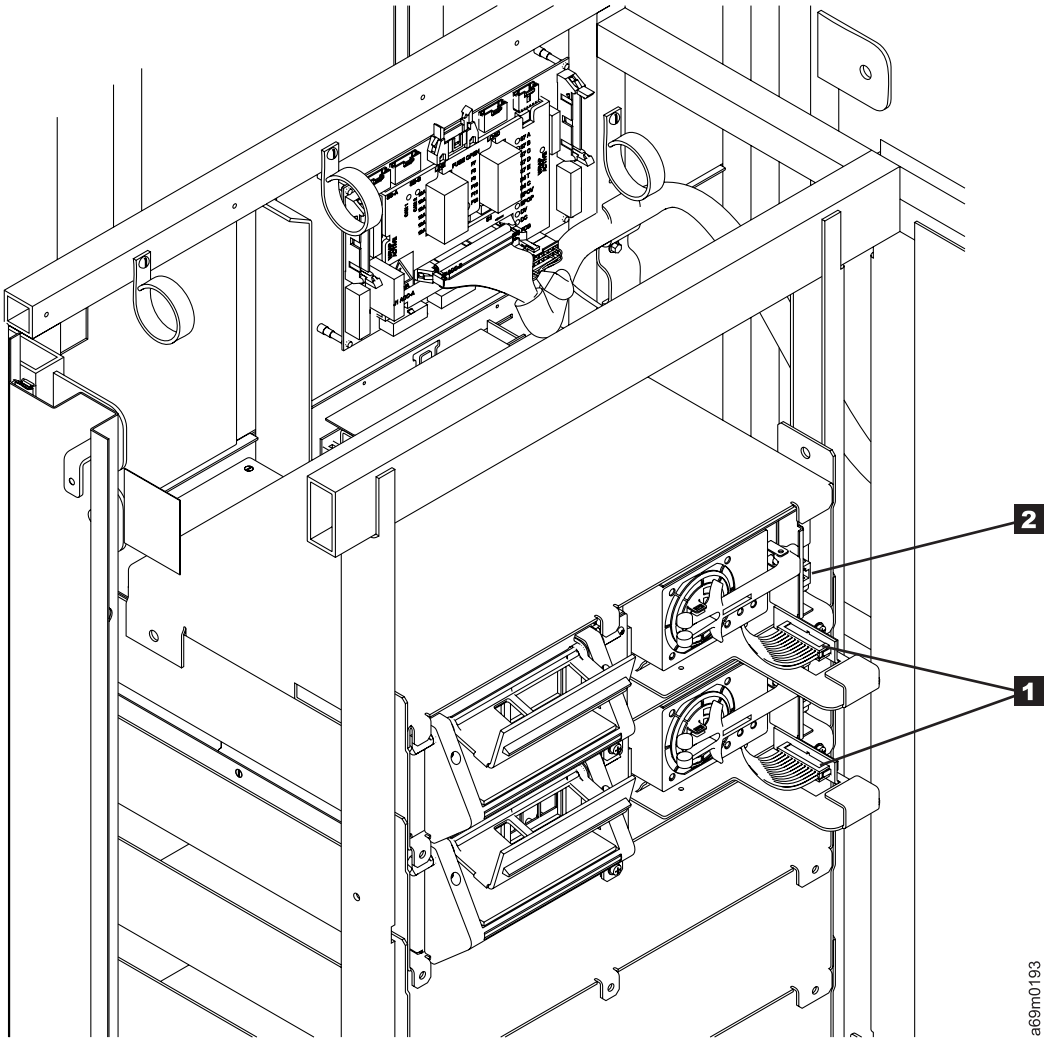


Figure 289. Cables and Power Cord

15. If there is another hot swap drive in a position adjacent to this newly-installed drive, install a Redundant Power Supply power cable between the two hot swap fixed trays **1** , as shown.
16. Reconnect the bifurcated power cord on the right side **2** of the new fixed tray assembly.
17. After applying power to a drive canister, wait at least 3 minutes before continuing. This will ensure that the library has time to automatically configure and calibrate the drive.

    Note: If a drive microcode is automatically updated, the update may take as long as 20 or 30 minutes. Wait until the 'Firmware Update' screen shows the update is complete or that an error has occurred.
18. Finish drive replacement (see “Service Procedures” on page 790).
19. At the **Activity** screen, press **Menu**.
20. At the **Main Menu** screen, select **Vital Product Data**. Press **Enter**.
21. At the **Vital Product Data** screen, select **Drive VPD**. View the drive microcode version for all drives in the library.
22. If the microcode in the drive you replaced is correct, continue at the next step. If the drive microcode is downlevel on the drive you replaced, update the drive microcode using CETool see “CETool” on page 725.

23. **Note:** If the drive is connected to an eServer iSeries (AS/400) host, then you may have to IPL the host IOP before it will recognize the replacement drive.
24. If the drive is connected to an IBM control unit or VTS, the 'end of call' procedure for that device should be followed.
25. At the completion of the tests, inform your customer that the drive may be placed “online” to the host.
26. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

LTO Fibre Tray to LTO Fibre Hot Swap Canister (conversion)

Before you begin...

- **If you exchange a FRU and the problem is not corrected, reinstall the original FRU.**
- If there is a cartridge in the drive, go to “Manually Removing Cartridge” on page 1045.

Removal Procedure

Note: When updating an LTO drive, be aware of the following:

- If the drive that is being replaced is a control path drive, all host communications with the library through the affected control path drive (but not host communications with other drives in the library) will be disabled until the drive replacement (which may include automatically updating the drive microcode from another drive) has been completed.
- If an automatic drive-microcode update must read drive microcode from a control path drive (because the only available drive is a control path or because a control path drive has a higher level of microcode than any other drive in the library) the host will be unable to perform control path functions using that control path drive until the automatic drive microcode update has completed.

A conversion kit is now available. See Chapter 14. Parts Catalog for "Tray-to-Canister" FRU kit part numbers. The following parts are included in the kit:

- LTO hot swap fibre drive canister
- Fixed Tray Assembly (with power supply)
- Redundant drive power supply power cable (only used if this new drive is being installed above or below an existing hot-swap drive assembly that is currently **not** connected to an existing redundant drive power supply power cable.
- Install Instructions
- New LTO fibre hot-swap drive microcode (if this is the first and only LTO fibre hot-swap drive in your library). Ensure you have the latest drive microcode installed on the new hot-swap drive canister. You can obtain the new microcode from the PFE website, and you can download the new microcode by using the CETool procedure.

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline all the drives on the same fibre hub.
2. Prepare for drive replacement (see “Service Procedures” on page 790).
3. Open the rear door in the frame containing the drive.
4. Unplug the AC power cable **1** from the back of the fixed tray.

   Note: Do not unplug the power cord at the FCA, as two drives are powered from this cord.

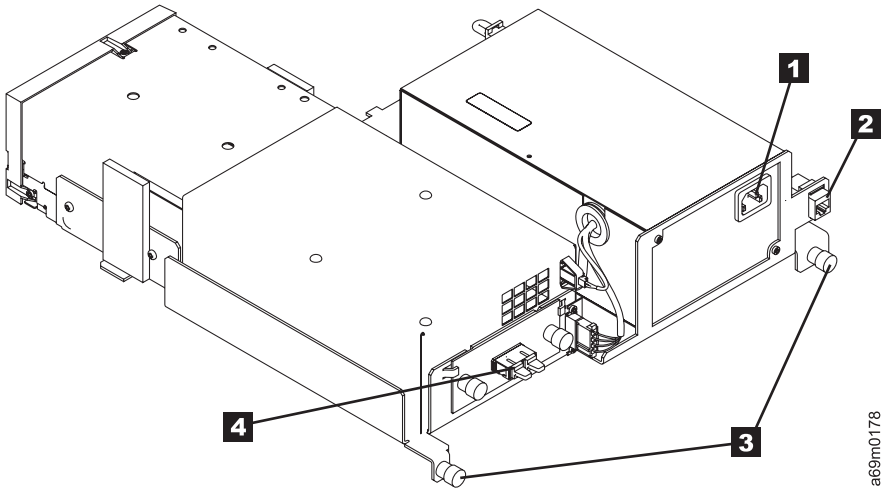


Figure 290. Fixed Tray Assembly—LTO Fibre

5. Unplug the RS-422 cable **2** from the back of the fixed tray.
6. Unplug the fibre cable **4** .
7. Loosen the screws **3** to remove the fixed tray.
8. If there is a stuck cartridge in the drive, go to “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051. If not, complete the drive replacement.

Replacement Procedure

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

Note: There are two types of fixed trays and power supplies used in x32 frames. See Figure 291 on page 910 and Figure 292 on page 911 to determine which fixed tray and power supply is installed in your x32 frame, and follow the appropriate install procedure.

Installing the Fixed Tray (old style)

1. See Figure 291 on page 910. Slide in the fixed tray assembly, keeping it toward the right side. Ensure the front locating tab **1** on the tray assembly slides securely into the front slot in the frame.

   Note: As the front locating tab seats into the slot in the frame, the indicator slide will move to partially cover the indicator hole **3** . If you see the indicator slide move toward the indicator hole (partially covering it), then the locating tab is positioned in the slot. If the indicator slide does **not** move, slide the front of the fixed tray assembly left or right until the locating tab slides into the slot.
2. Tighten both thumbscrews **2** to be **fingertight only**. Do not overtighten these screws.
3. Thumbscrew caps **6** are used for shipping only, and do not need to be installed.

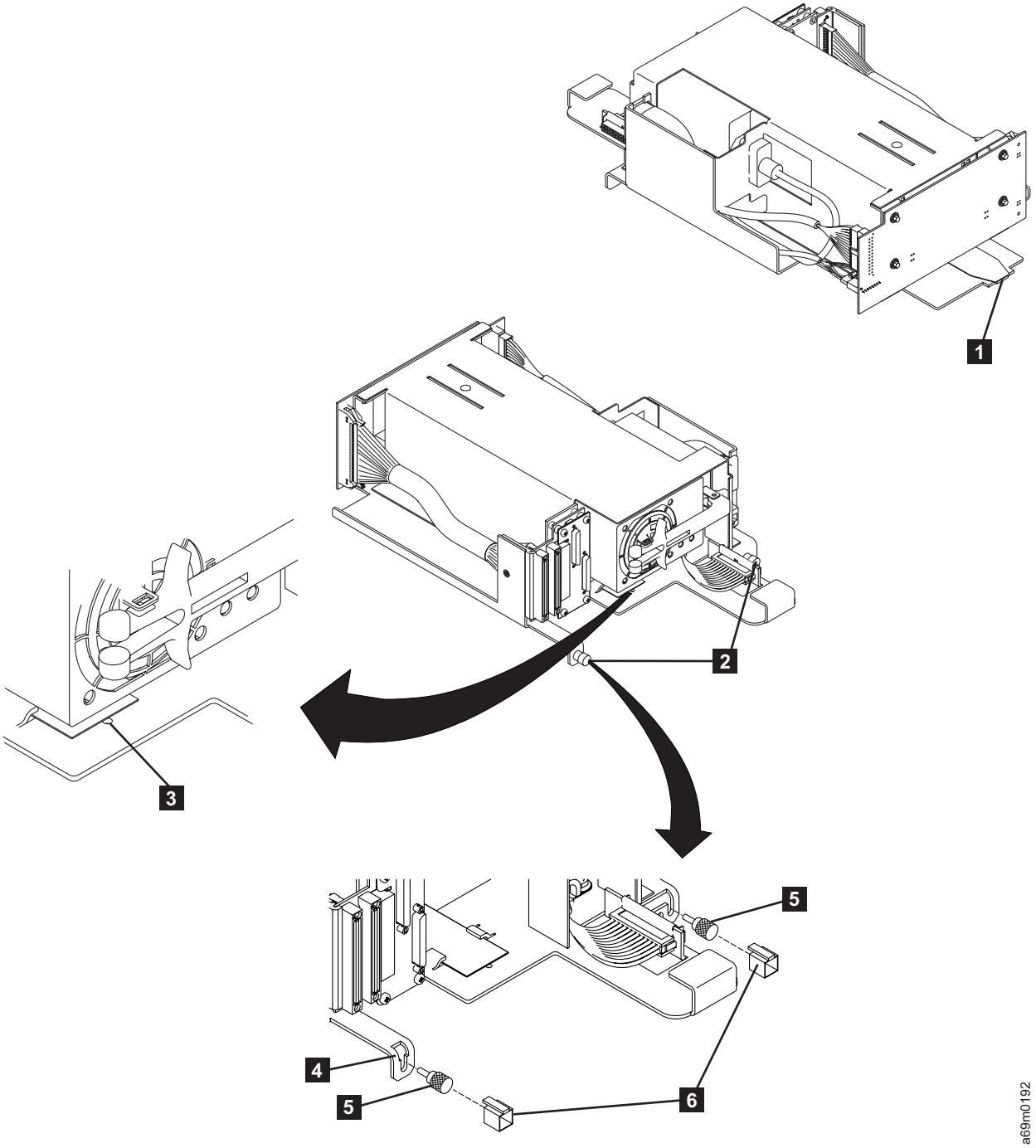


Figure 291. Fixed Tray (old style)

Installing the Fixed Tray (new style)

a. See Figure 292. Slide in the fixed tray assembly, keeping it toward the right side. Ensure the front locating tab **1** on the tray assembly slides securely into the front slot in the frame.

b. Tighten both thumbscrews **2** to be **fingertight only**. Do not overtighten these screws.

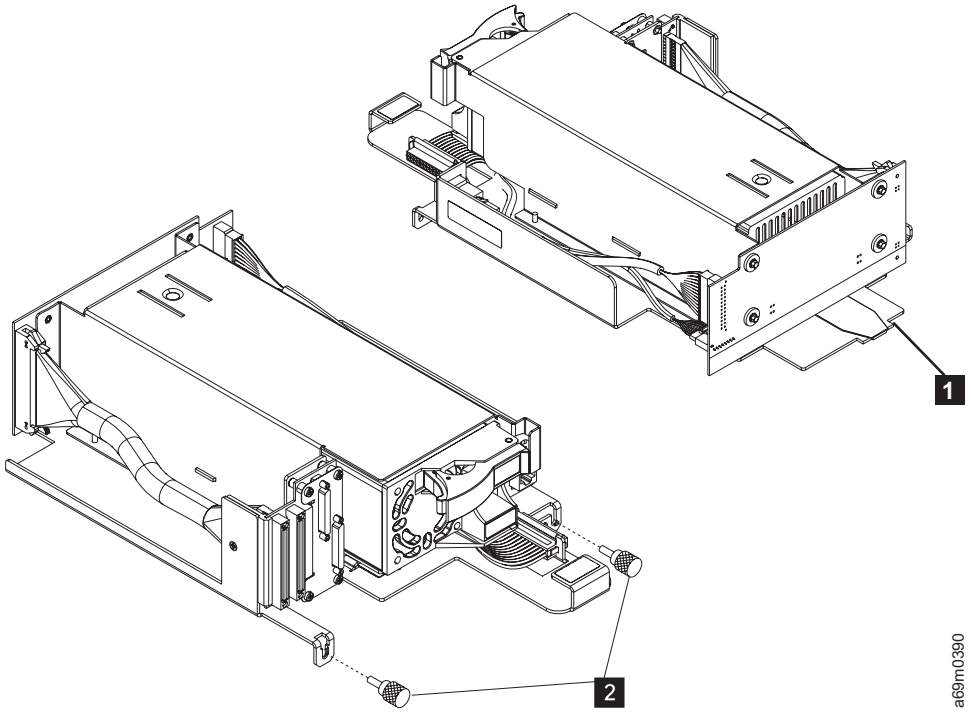


Figure 292. Fixed Tray (new style)

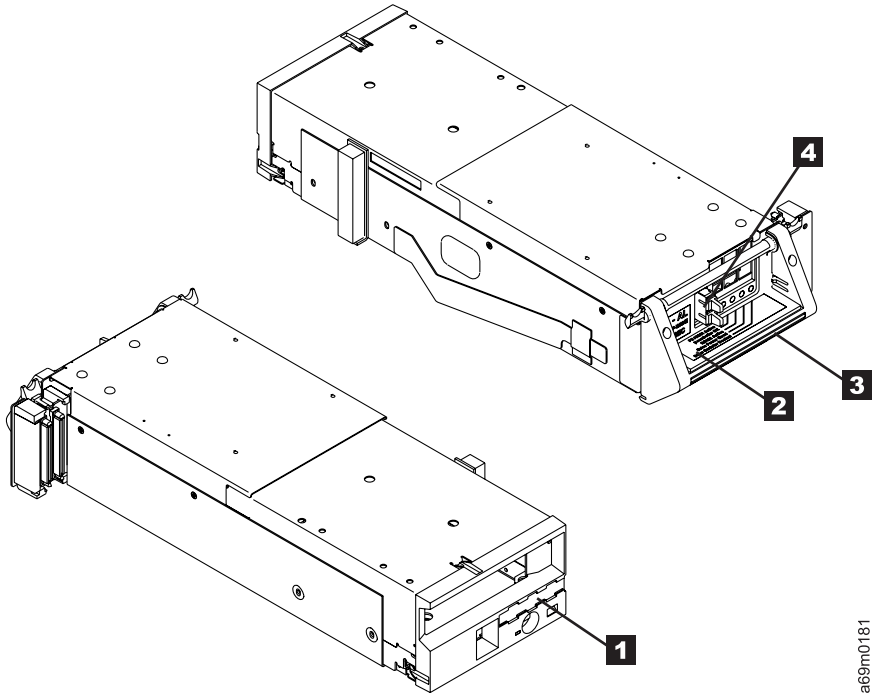


Figure 293. LTO Fibre Drive Canister

Installing the Drive Canister

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

Note:

- If a logical library label **1** is installed on the old drive, remove it and install it on the new drive (see Figure 293 on page 911).
- The drive safety flaps must NOT be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

4. Carefully slide the drive canister into the left side of the fixed tray assembly.
5. Hold the locking lever **2** **up** to ensure the tabs on both sides of the lever will clear the frame (see Figure 293 on page 911).
6. Grasp the drive canister handle **3**, and carefully but firmly push the drive into position. Ensure the connectors to the right correctly align and fully engage with the fixed tray connectors.
7. Lower the locking lever **2** until it snaps in place.

Installing the Hot Swap Power Supply

8. **Note:** You may have either an old style or a new style fixed tray and power supply. See Figure 294 on page 913 and Figure 295 on page 914.
9. Pivot locking arm assembly **2** (old style) or **3** (new style) outward.
10. Firmly slide the power supply into the fixed tray assembly.
11. Swing the locking arm to the left while you pinch the two locking tabs **1** (old style) together, or swing the arm **3** (new style), securing the arm in place.

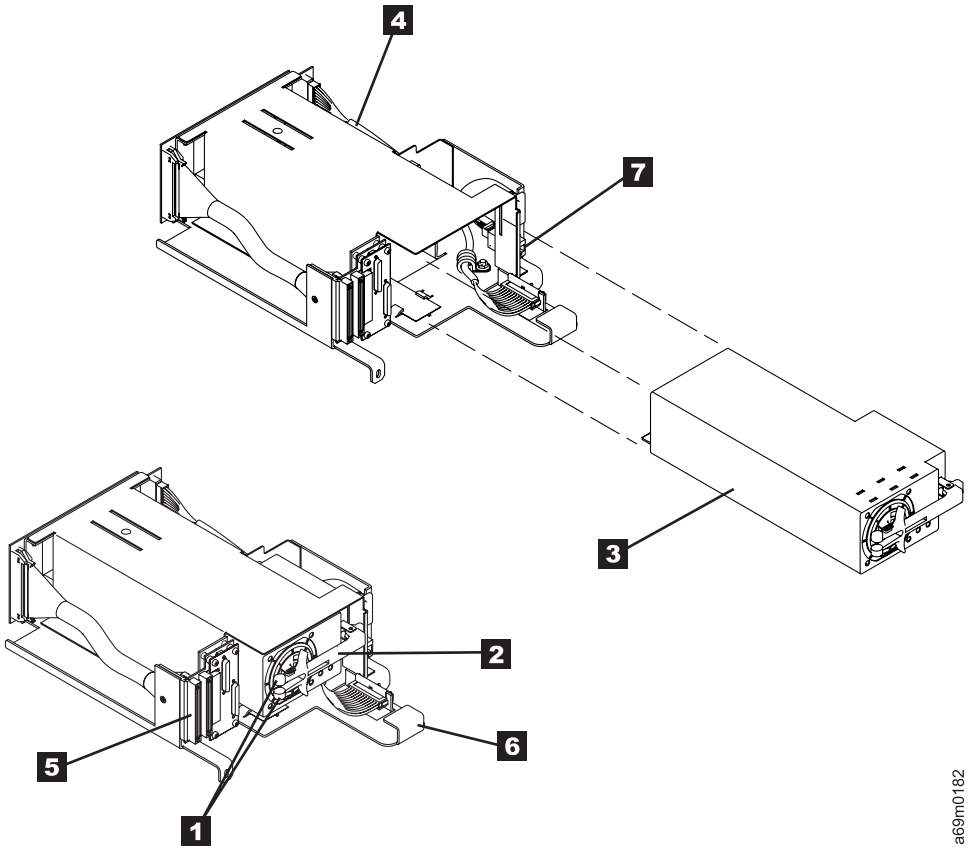


Figure 294. Hot Swap Power Supply (old style)

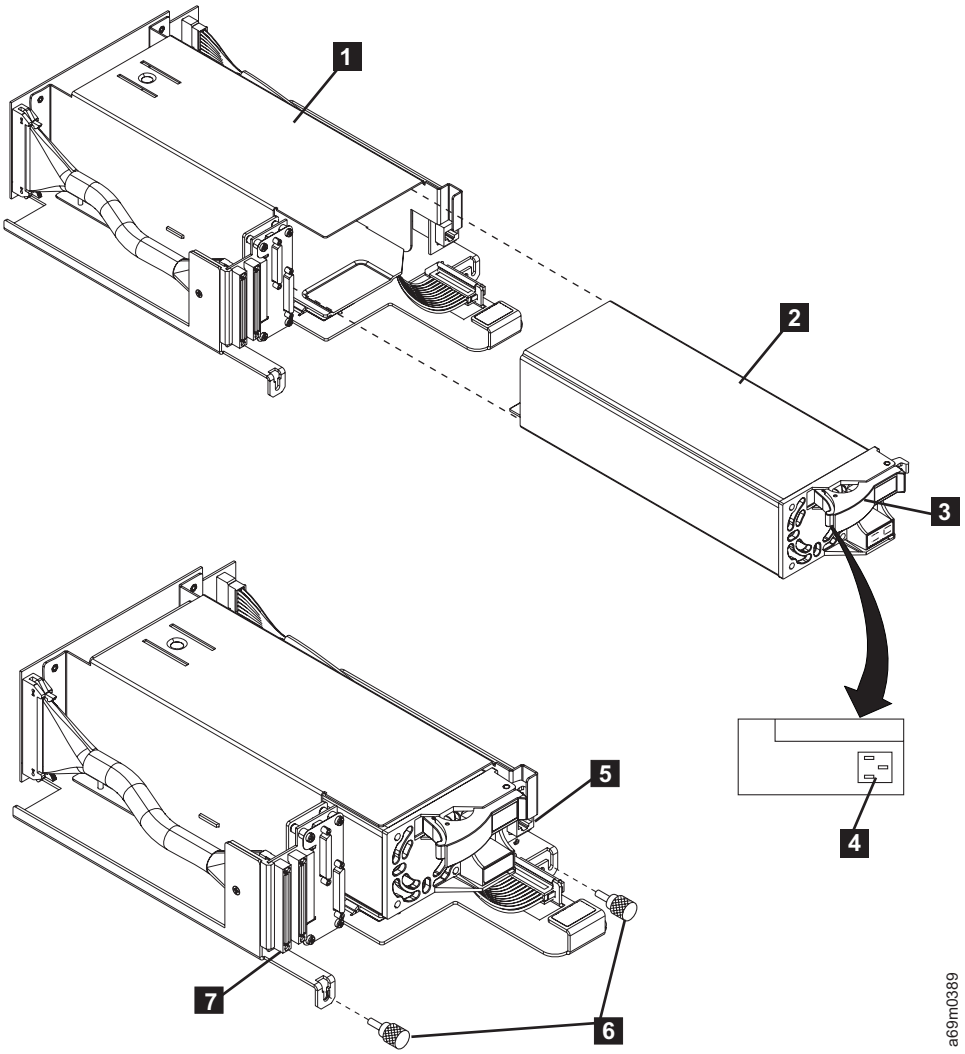


Figure 295. Hot Swap Power Supply (new style)

12. Firmly slide the power supply **3** into the fixed tray assembly.
13. Swing the locking arm to the left while you pinch the two locking tabs **1** together, securing the arm in place.

Installing Cables

14. Reconnect the fibre cable **4** (see Figure 293 on page 911).
15. Reconnect the RS-422 connector **7** on the right side of the fixed tray assembly (see Figure 294 on page 913).

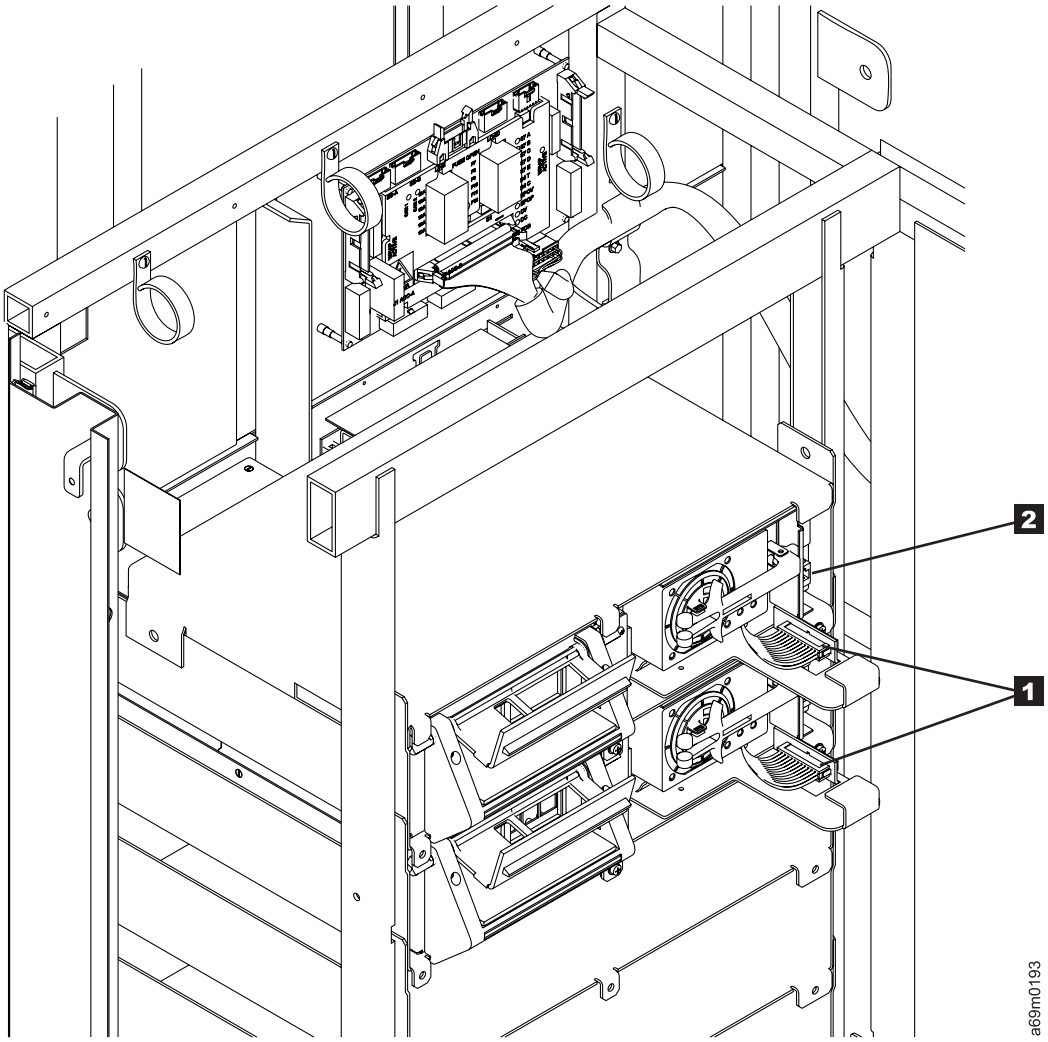


Figure 296. Cables and Power Cord

16. If there is another hot-swap drive in a position adjacent to this newly-installed drive, install a Redundant Power Supply power cable between the two hot-swap fixed trays **1** , as shown (see Figure 296).
17. Reconnect the bifurcated power cord on the right side **2** of the new fixed tray assembly.
18. After applying power to a drive canister, wait at least 3 minutes before continuing. This will ensure that the library has time to automatically configure and calibrate the drive.

    Note: If a drive microcode is automatically updated, the update may take as long as 20 or 30 minutes. Wait until the 'Firmware Update' screen shows the update is complete or that an error has occurred.
19. Reinstall all communications cables and terminators removed during repair.
20. Finish drive replacement (see “Service Procedures” on page 790).
21. At the **Activity** screen, press **Menu**.
22. At the **Main Menu** screen, select **Vital Product Data**. Press **Enter**.
23. At the **Vital Product Data** screen, select **Drive VPD**. View the drive microcode version for all drives in the library.

24. If the microcode in the drive you replaced is correct, continue at the next step. If the drive microcode is downlevel on the drive you replaced, update the drive microcode using CETool see “CETool” on page 725.
25. At the completion of the tests, inform your customer that the drive may be placed “online” to the host.
26. **Note:** If the drive is connected to an eServer iSeries (AS/400) host, then you may have to IPL the host IOP before it will recognize the replacement drive.
27. If the drive is connected to an IBM control unit or VTS, the 'end of call' procedure for that device should be followed.
28. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: There are two types of fixed trays and power supplies used in x32 frames. See Figure 298 on page 919 and Figure 299 on page 920 to determine which fixed tray and power supply is installed in your x32 frame, and follow the appropriate install procedure.

Removal Procedure

You will need the following parts for this procedure:

- Hot swap fixed tray assembly (without drive or power supply)
- Removed hot swap power supply from old fixed tray to be reused
- Removed redundant drive power supply power cable to be reused

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline all the drives on the same SCSI bus or fibre channel for LTO or 3592 drives.
2. Prepare the drive for replacement (see “Service Procedures” on page 790).
3. Open the rear door in the frame containing the drive. Unplug the AC power cable from the back of the fixed tray (see **1** in Figure 273 on page 877).

   Note: Do not unplug the power cord at the FCA, as two drives are powered from this cord.
4. While holding up the locking lever **2**, grasp the drive canister handle **3**. Firmly pull back on the handle enough to disengage the drive canister (see Figure 297).

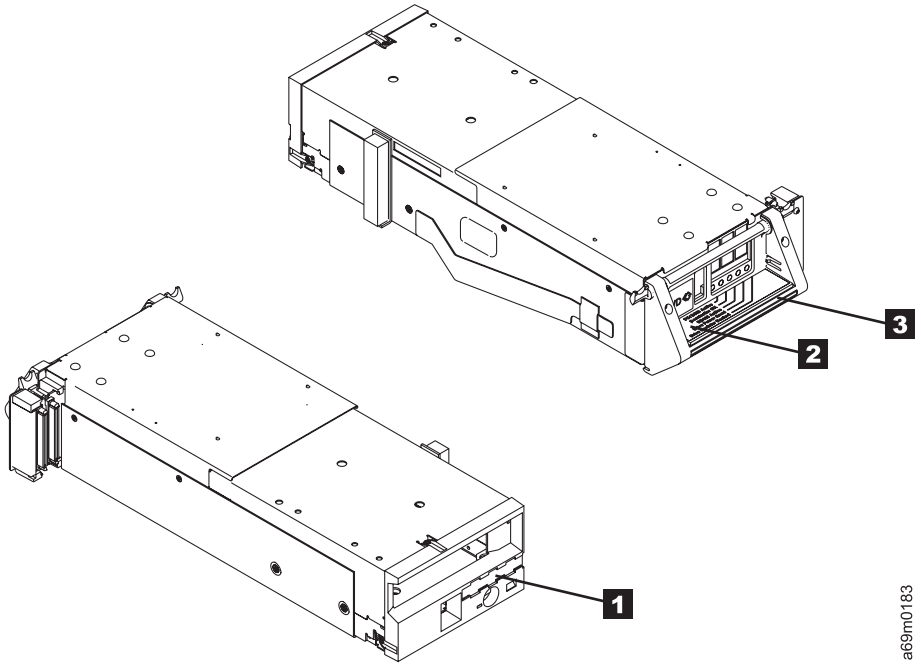


Figure 297. Drive Canister

Fixed Tray and Power Supply (old style)

5. Remove the hot swap power supply by pinching the locking tabs **1** together, and pivot the locking arm **2** outward (see Figure 298).
6. Use the locking arm to remove the power supply.
7. Unplug the SCSI cables (and terminator, if installed) or fibre channel cables.
8. Disconnect the RS-422 and power cable from the fixed tray assembly.
9. Refer to Figure 300 on page 921. Slide both thumbscrew locks **6** (if present) to the rear and remove them. Then loosen both thumbscrews **2** on the fixed tray assembly and slide it out of the machine.

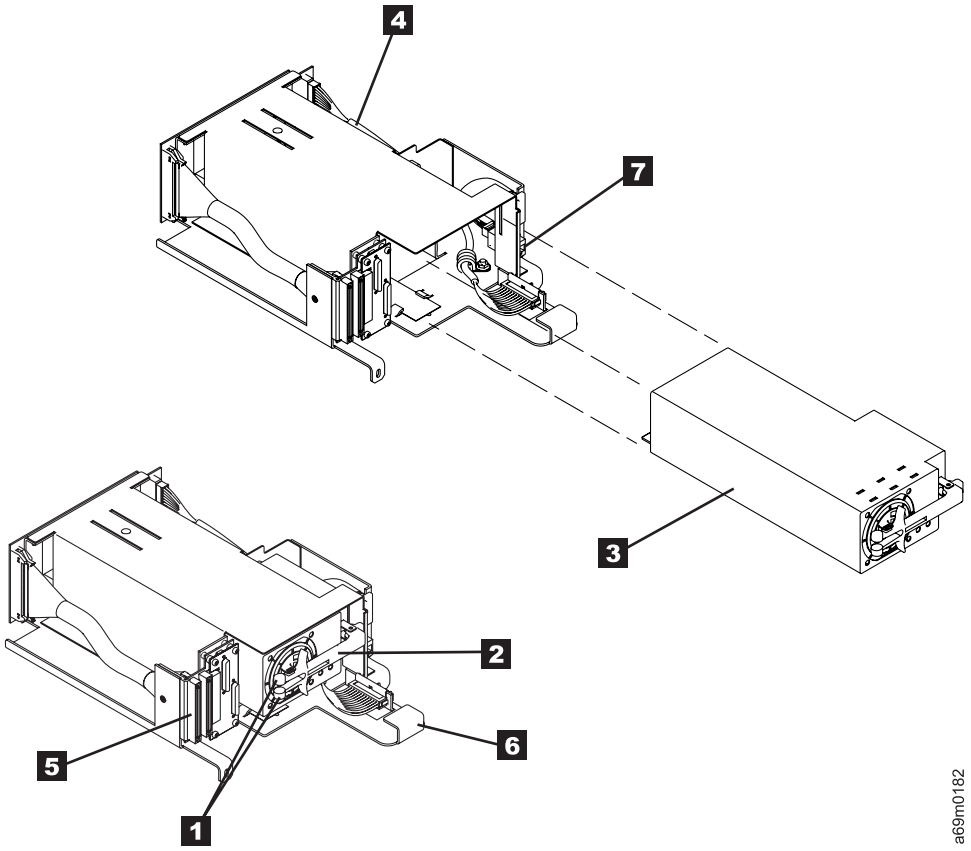


Figure 298. Hot Swap Power Supply (old style)

Fixed Tray and Power Supply (new style)

1. See Figure 299. Disconnect the power cord from the drive power supply **4** .
2. Pivot the power supply locking arm **3** outwards and remove the power supply **2** from the fixed tray.

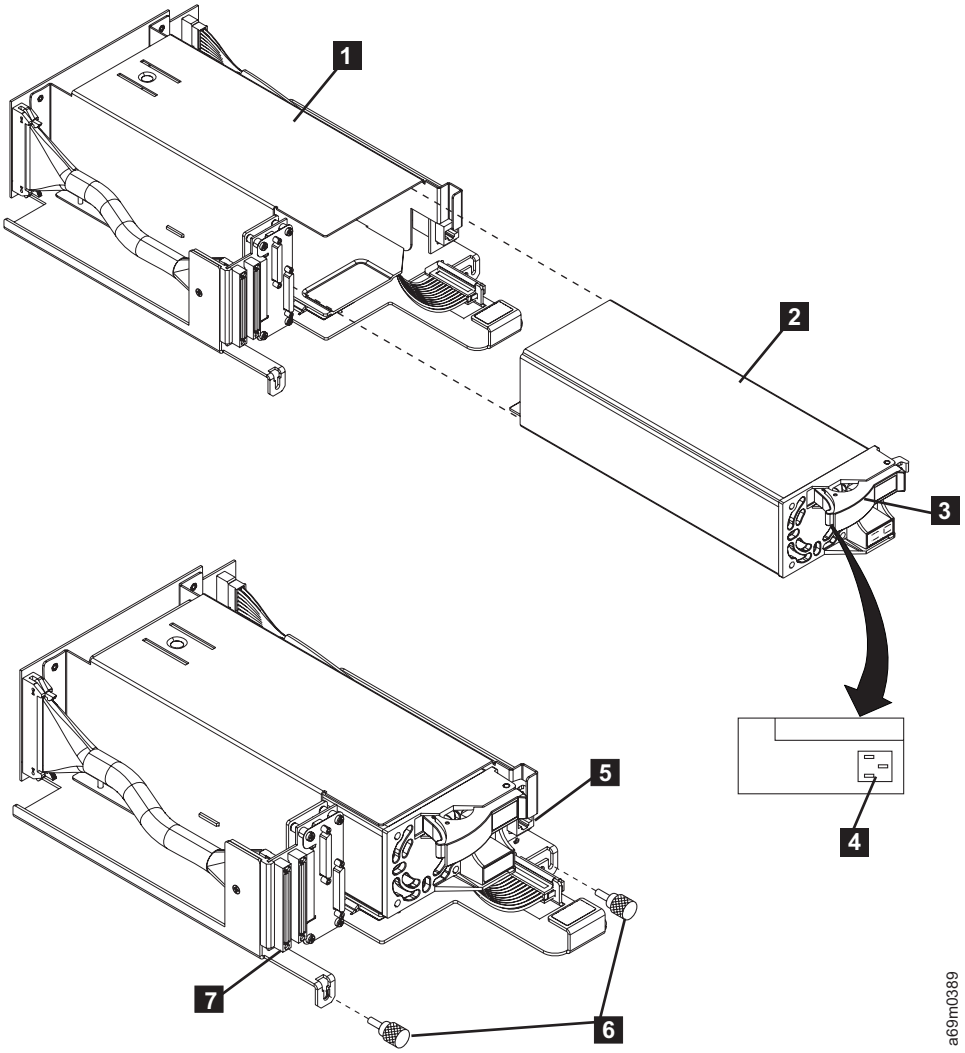


Figure 299. Hot Swap Power Supply (new style)

Replacement Procedure

The replacement procedure is the reverse of the removal procedure.

Installing the Fixed Tray (old style)

1. Slide in the fixed ray assembly, keeping it toward the right side. Ensure the front locating tab **1** on the tray assembly slides securely into the front slot in the frame (see Figure 300 on page 921).

   Note: As the front locating tab seats into the slot in the frame, the indicator slide will move to partially cover the indicator hole **3** . If you see the indicator slide move toward the indicator hole (partially covering it), then the locating tab is positioned in the slot. If the indicator slide does not move, slide the front of the fixed tray assembly left or right until the locating tab slides into the slot.
2. Tighten both thumbscrews **2** to be **fingertight, only**. Do not overtighten these screws.

3. Thumbscrew caps **6** are used for shipping only, and do not need to be installed.

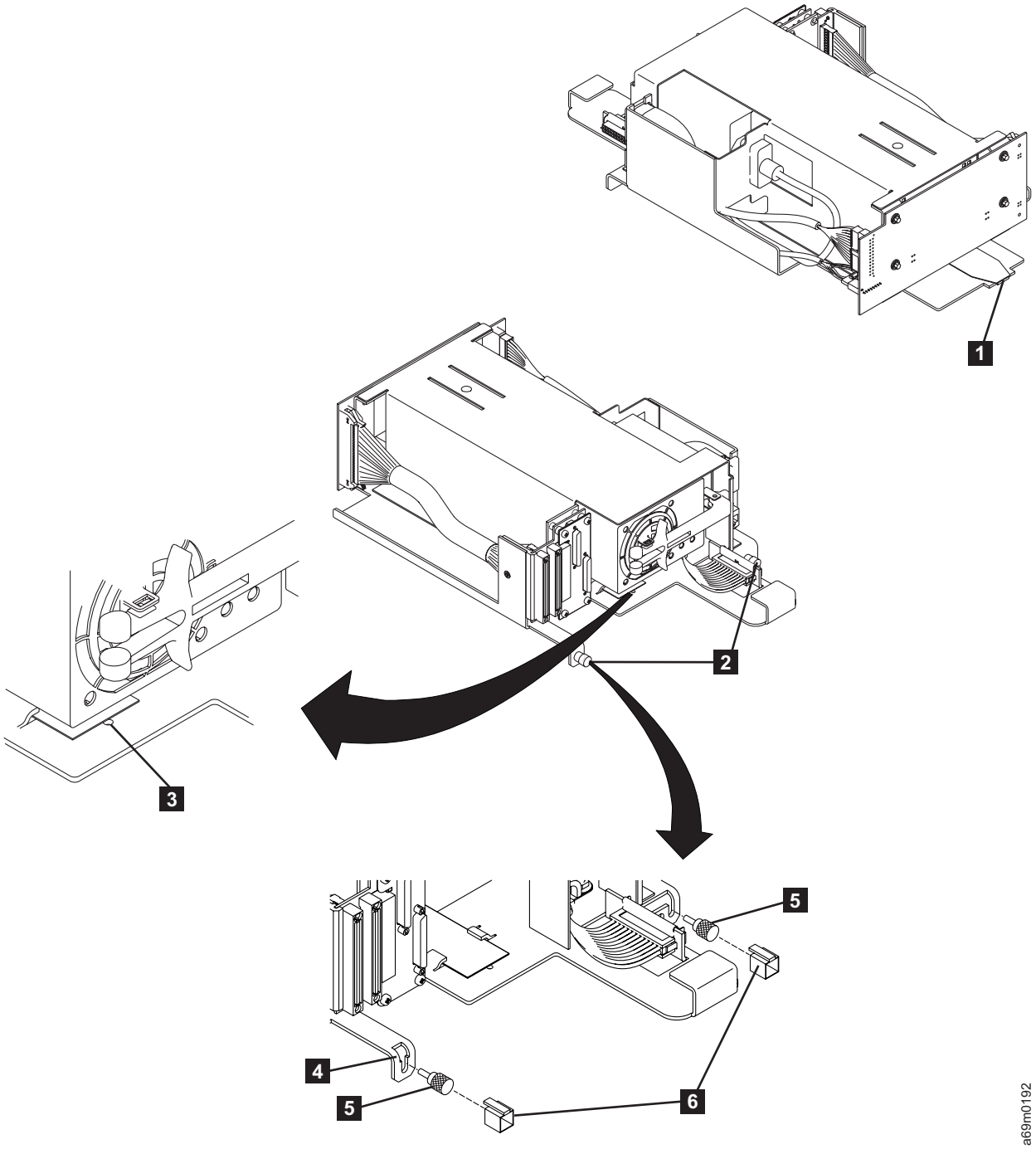


Figure 300. Fixed Tray (old style)

Installing the Fixed Tray (new style)

4. See Figure 301. Slide in the fixed tray assembly, keeping it toward the right side. Ensure the front locating tab **1** on the tray assembly slides securely into the front slot in the frame.
5. Tighten both thumbscrews **2** to be fingertight only. Do not overtighten these screws.

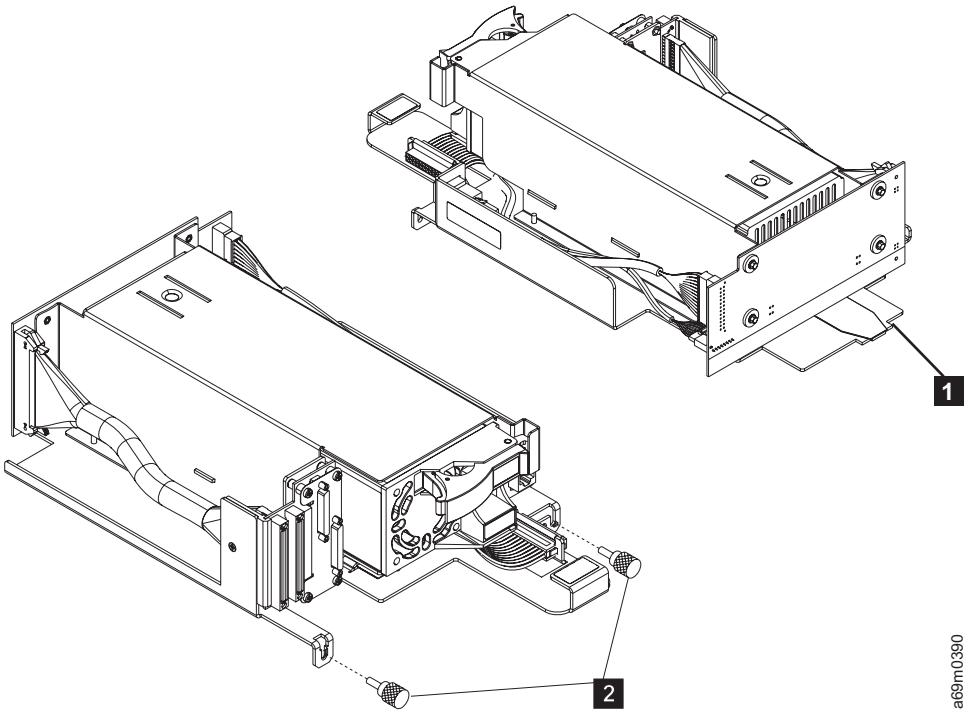


Figure 301. Fixed Tray (new style)

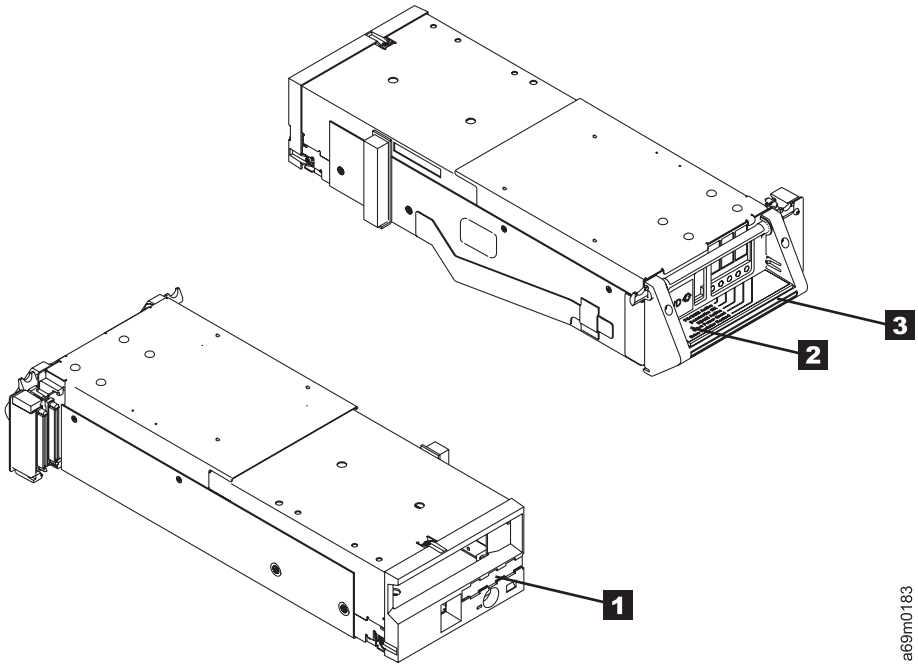


Figure 302. Drive Canister

Installing the Drive Canister

Note:

- If a logical library label **1** is installed on the old drive, remove it and install it on the new drive.
- The drive safety flaps must NOT be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

6. Carefully slide the drive canister into the left side of the fixed tray assembly (see Figure 302).
7. Hold the locking lever **2** **up** to ensure the tabs on both sides of the lever will clear the frame.
8. Grasp the drive canister handle **3**, and carefully but firmly push the drive into position. Ensure the connectors to the right correctly align and fully engage with the fixed tray connectors.
9. Lower the locking lever **2** until it snaps in place.

Installing the Power Supply

10. **Note:** You may have either an old style or a new style fixed tray and power supply. See Figure 303 and Figure 304 on page 925.
11. Pivot locking arm assembly **2** (old style) or **3** (new style) outward.
12. Swing the locking arm to the left while you pinch the two locking tabs **1** together, securing the arm in place.
13. Firmly slide the power supply into the fixed tray assembly.
14. Swing the locking arm to the left while you pinch the two locking tabs **1** (old style) together, or swing the arm **3** (new style), securing the arm in place.

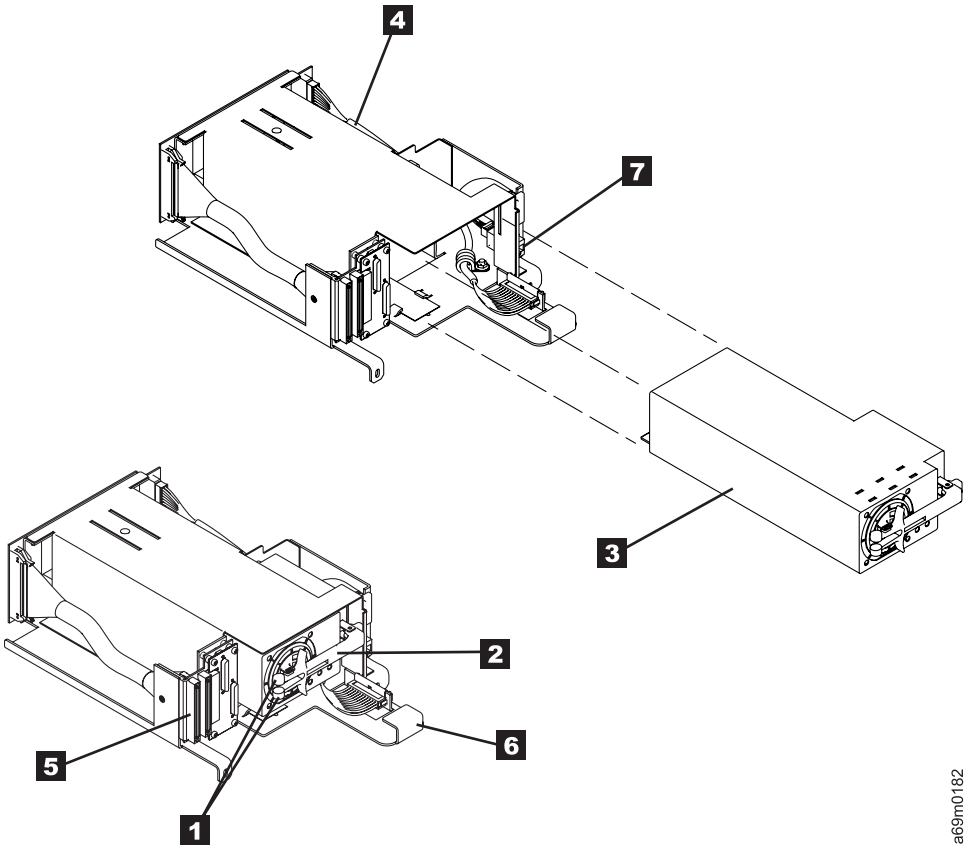


Figure 303. Hot Swap Power Supply (old style)

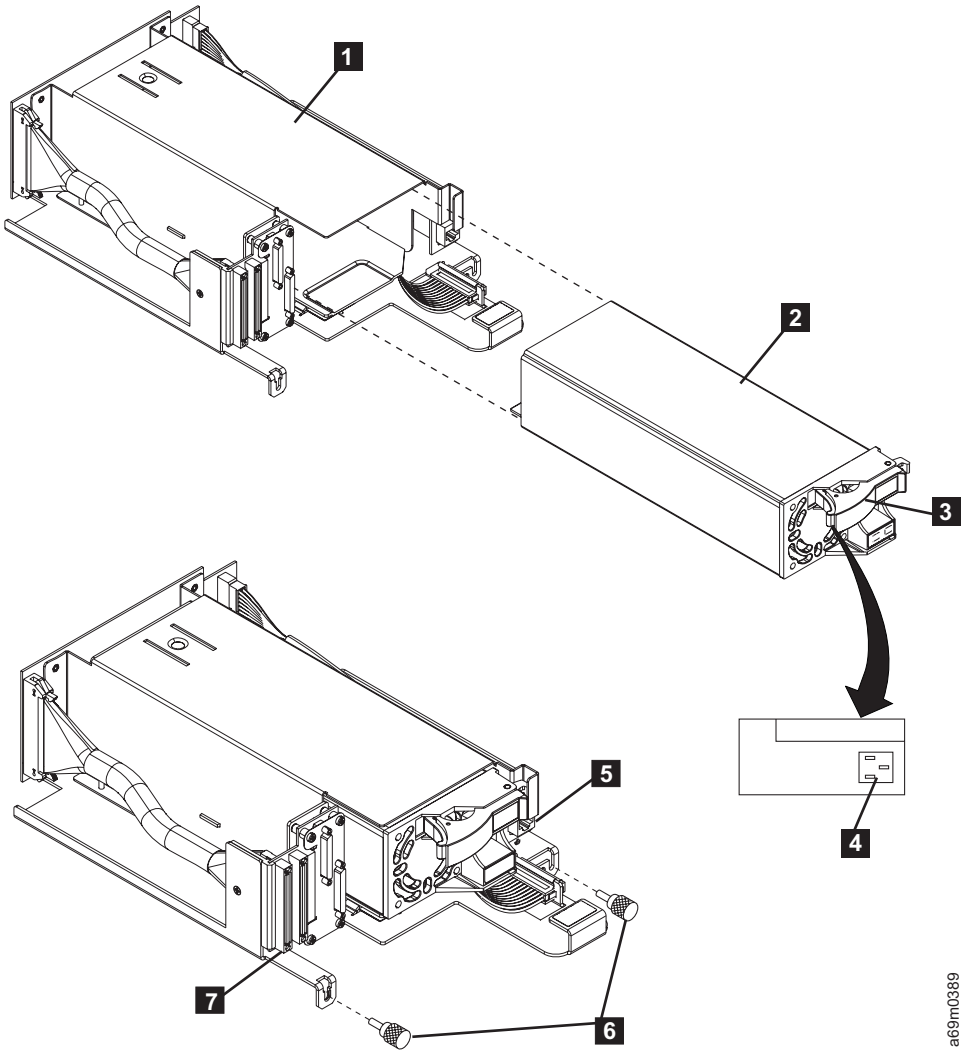


Figure 304. Hot Swap Power Supply (new style)

Installing Cables

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

15. Reinstall the SCSI or fibre channel cables that were removed earlier (see Figure 305 on page 926).
16. If this is a SCSI installation, re-install any terminator or interposer removed earlier.
17. Reroute all cables into their appropriate strain-relief brackets to provide support.
18. Reconnect the RS-422 connector **7** on the right side of the new fixed tray assembly.

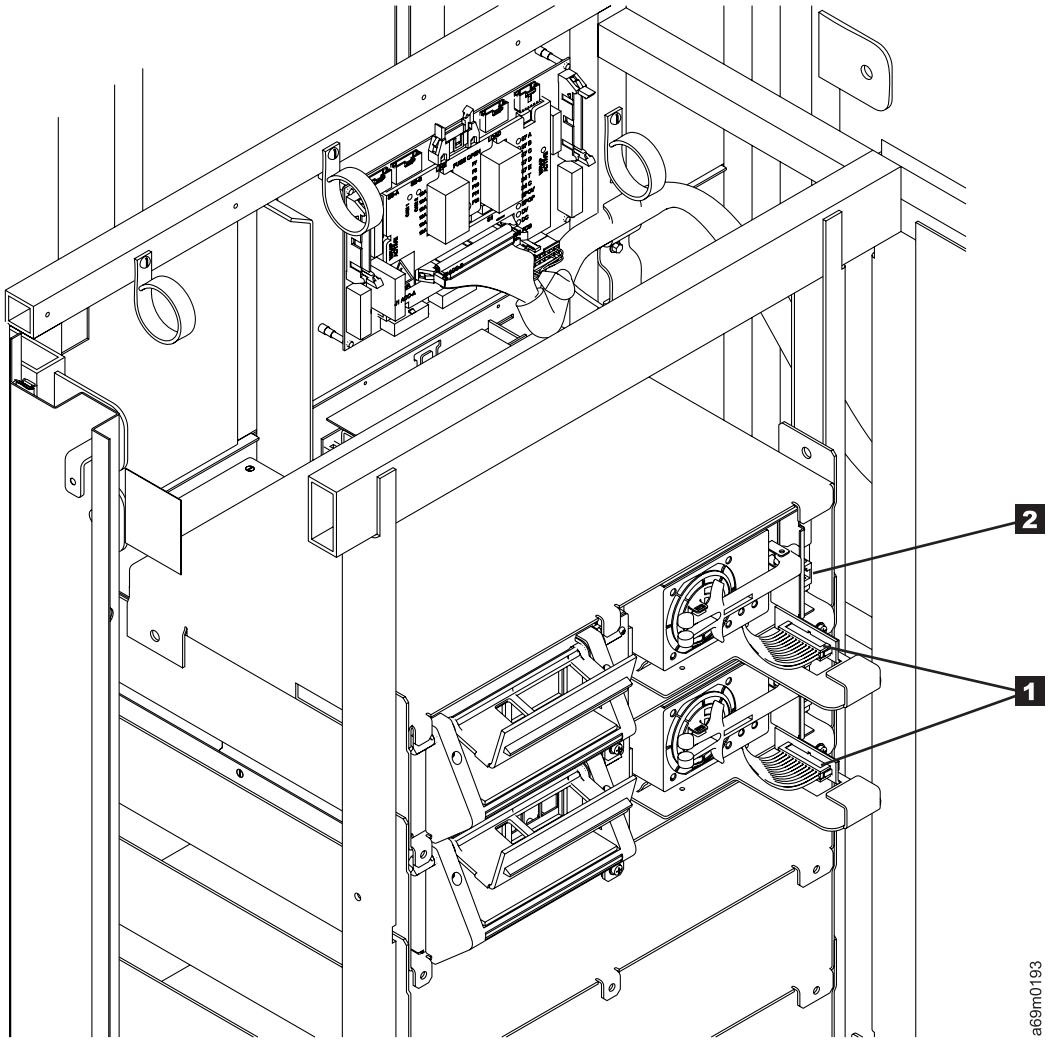


Figure 305. Cables and Power Cord

19. If there is another hot swap drive in a position adjacent to this newly-installed drive, install a Redundant Power Supply power cable between the two hot swap fixed trays **1** , as shown.
20. Reconnect the bifurcated power cord on the right side **2** of the new fixed tray assembly.
21. Refer to “Drive Canister LED Display (LTO)” on page 801 for canister LED displays.
22. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Fixed Tray Assembly - (L22/D22/L52/D52) Hot Swap Canister Models

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

Important Note
The new x22 / x52 'universal' tray comes with SCSI connections which are not currently supported in these models. This tray is okay for use on Fibre drives.

You will need the following parts for this procedure:

- Hot swap fixed tray assembly (without drive or power supply)
- Removed hot swap power supply from old fixed tray to be reused
- Removed redundant drive power supply power cable to be reused

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline all the drives on the same fibre channel for LTO or 3592 drives.
2. Prepare the drive for replacement (see “Service Procedures” on page 790).
3. Open the rear door in the frame containing the drive. Unplug the AC power cable from the back of the drive power supply.

   Note: Do not unplug the power cord at the FCA, as two drives are powered from this cord.
4. Disconnect the fibre cables **2** .

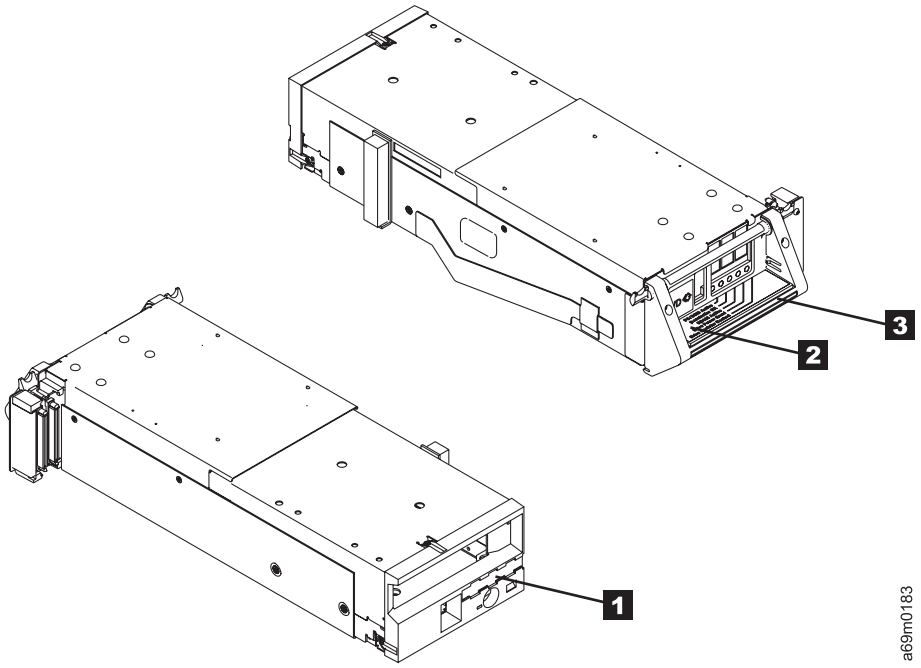


Figure 306. Drive Canister – LTO

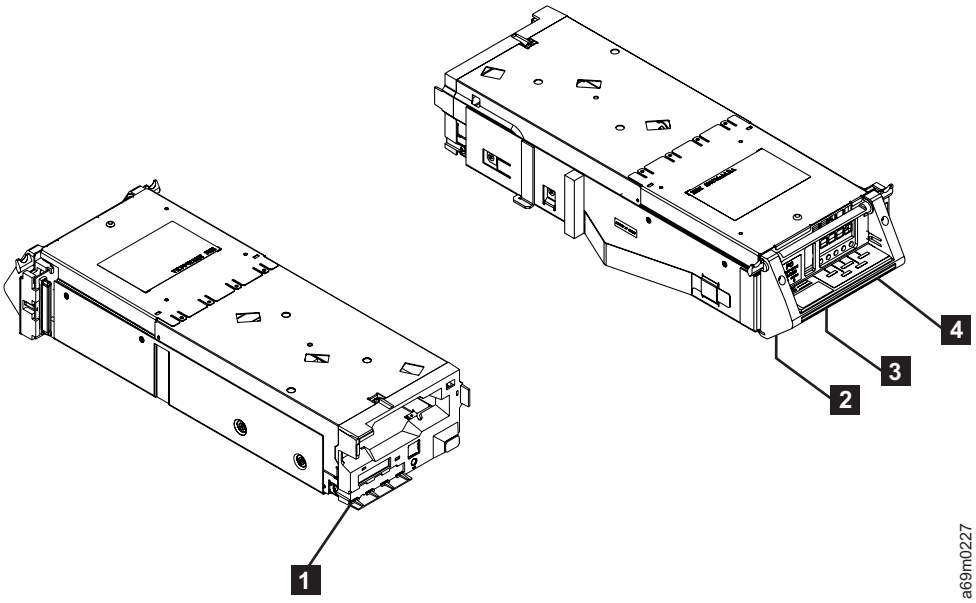


Figure 307. Drive Canister – 3592

5. **See Figure 306 on page 928** and **Figure 307**. While holding up the locking lever, grasp the drive canister handle **3** . Firmly pull back on the handle enough to disengage the drive canister.
6. Press the colored tab on the side of the locking arm **7** and pivot the arm outward to release the power supply **6** from the fix tray assembly **5** and the frame **2** .
7. Hold the locking arm and firmly pull it back far enough to release it from the fixed tray assembly, while using your other hand to support the end of the power supply as you remove it from the fixed tray assembly.
8. Unplug the SCSI cables (and terminator, if installed) or fibre channel cables.
9. **See Figure 308 on page 930.** Disconnect the redundant power cable near **3** (if installed).
10. Disconnect the RS-422 cable **1** from the fixed tray assembly.
11. Remove both thumbscrews **2A** on the fixed tray assembly and slide it out of the machine.

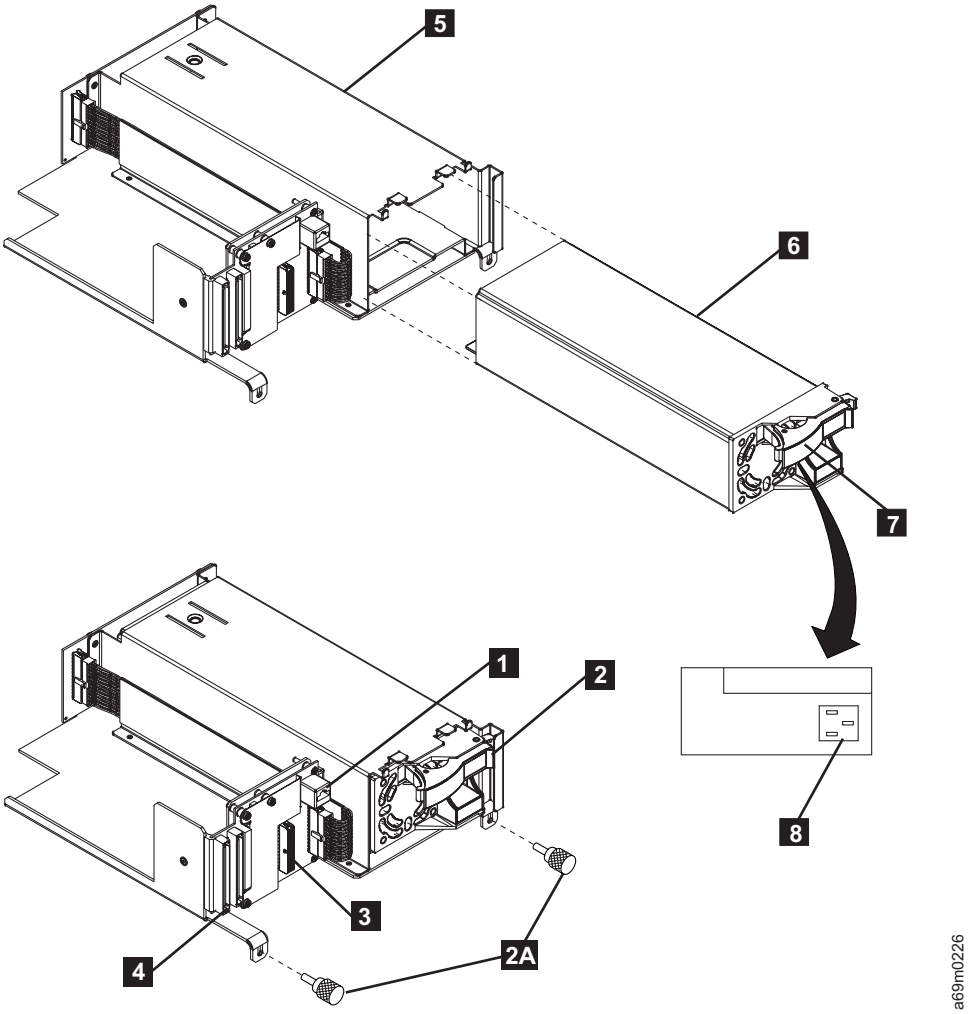


Figure 308. Hot Swap Power Supply – L22/D22/L52/D52

Replacement Procedure

The replacement procedure is the reverse of the removal procedure.

Installing the Fixed Tray

1. Slide in the fixed tray assembly, keeping it toward the right side. **Note:** If the fixed tray assembly does not seat all the way forward, use a long screwdriver to bend the two holding tabs (at the front of the fixed tray mounting shelf) slightly upward.
2. Reinstall and tighten both thumbscrews **2A** .

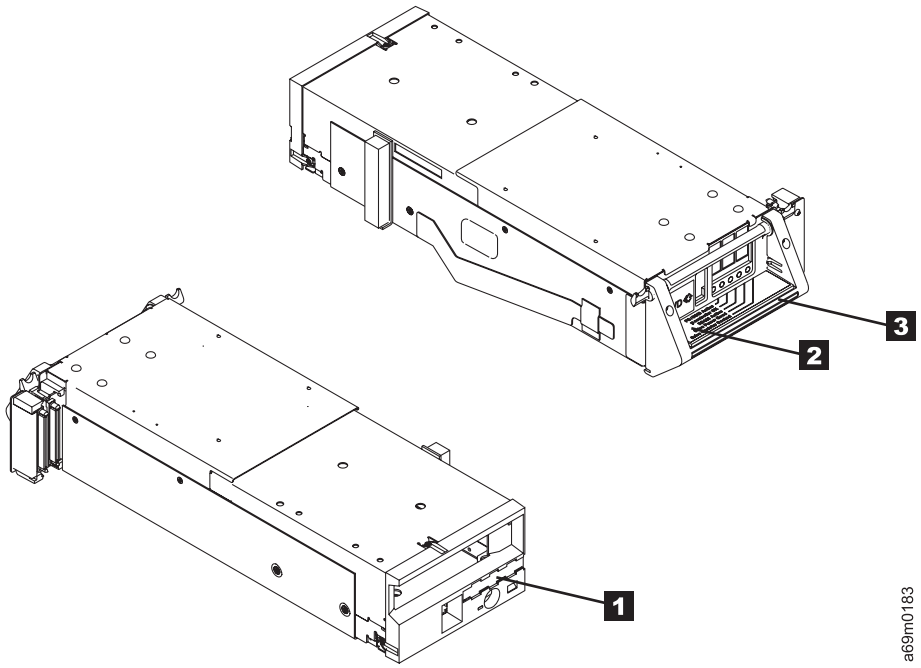


Figure 309. Drive Canister – LTO

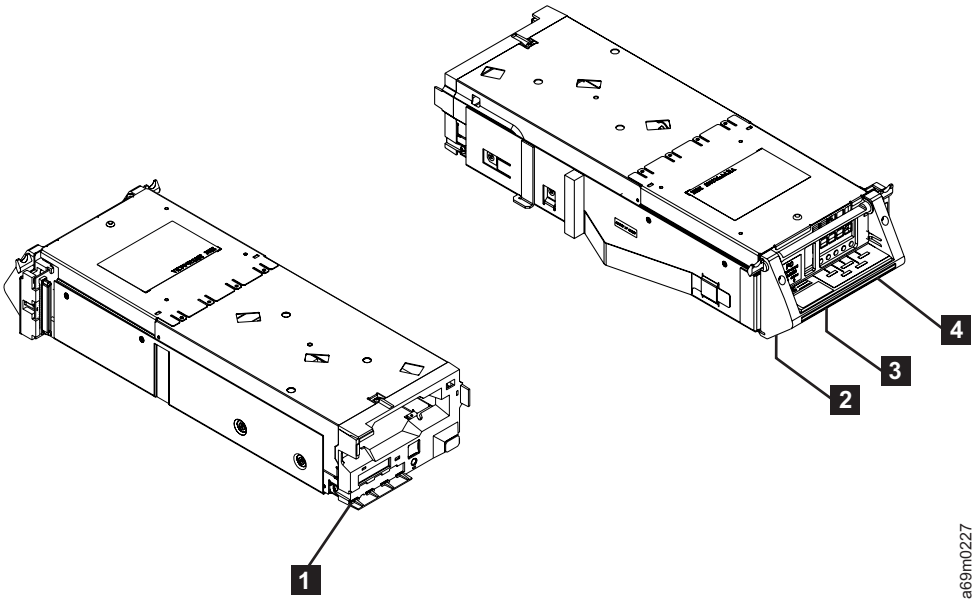


Figure 310. Drive Canister – 3592

Re-Installing the Drive Canister

Note:

- The drive safety flaps must NOT be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

3. Carefully slide the drive canister into the left side of the fixed tray assembly.
4. Hold the locking lever **up** to ensure the tabs on both sides of the lever will clear the frame.
5. Grasp the drive canister handle **3** , and carefully but firmly push the drive into position.

6. Lower the locking lever **2** until it snaps in place.

Installing the Hot Swap Power Supply

7. See Figure 311. Pivot locking arm assembly **7** outward.

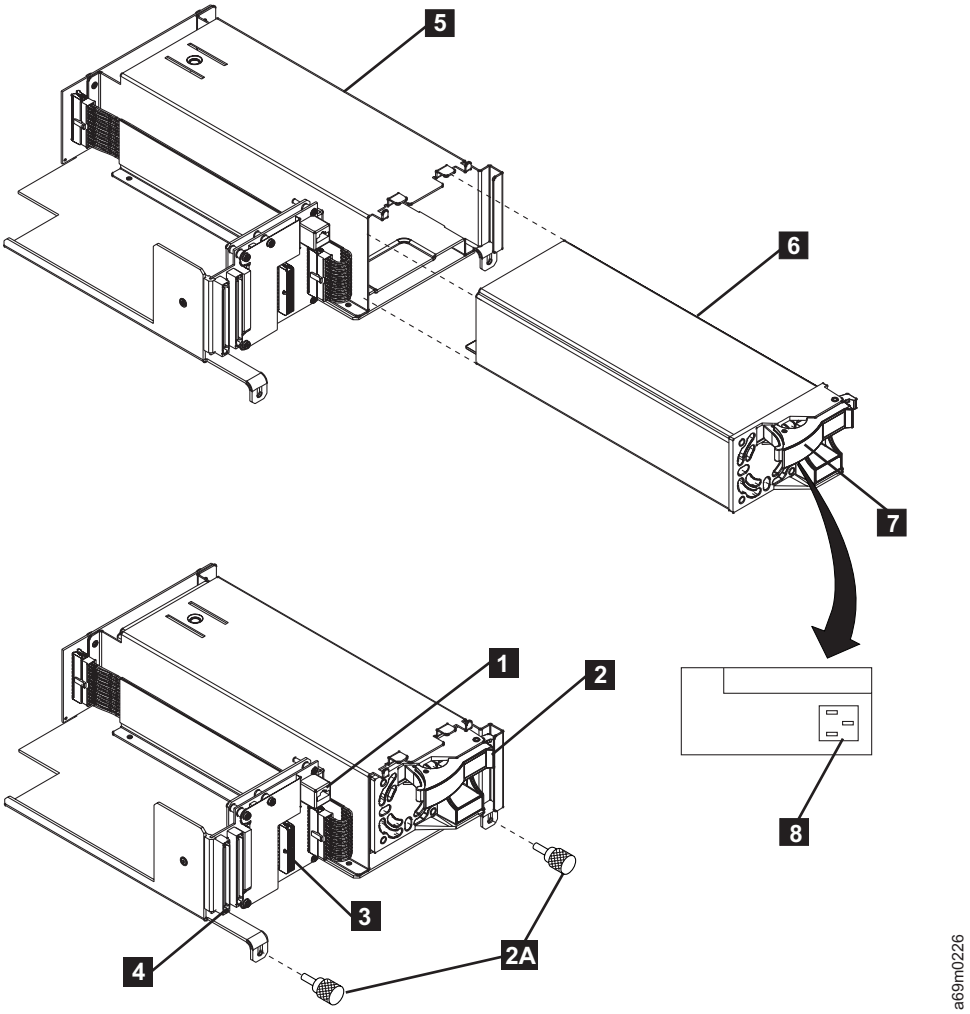


Figure 311. Hot Swap Power Supply

8. Firmly slide the power supply **6** into the fixed tray assembly.
9. With the locking arm in the outward position, carefully slide the power supply canister **6** into the fixed tray assembly **5** as far as it will go.
10. Pivot the locking arm **7** in, making sure it engages in fixed tray frame **2** as you snap the arm into a locked position.
11. Reconnect the power cable **8** to the power supply.

Installing Cables

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

12. Reinstall the SCSI or fibre channel cables that were removed earlier (see Figure 312 on page 933).
13. If this is a SCSI installation, re-install any terminator or interposer removed earlier.

14. Reroute all cables into their appropriate strain-relief brackets to provide support.
15. Reconnect the RS-422 connector **2** on the fixed tray assembly.

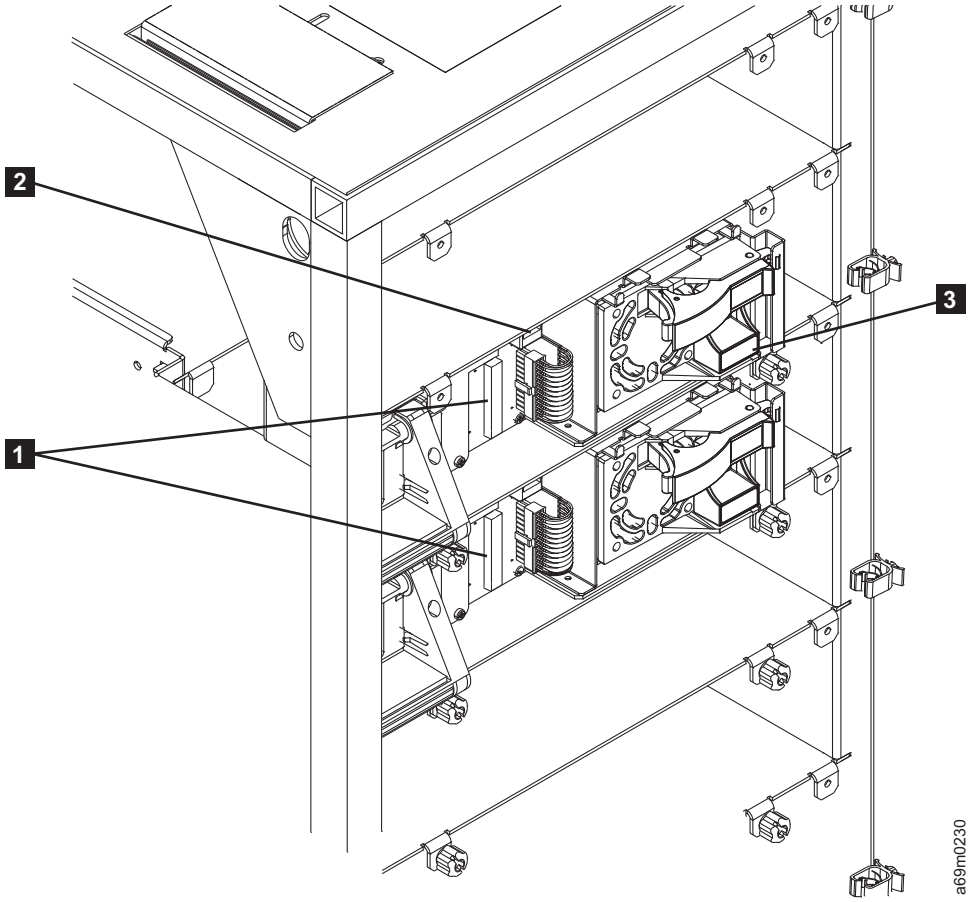


Figure 312. Cables and Power Cord

16. If there is another hot swap drive in a position adjacent to this newly-installed drive, install a Redundant Power Supply power cable between the two hot swap fixed trays **1**, as shown.
17. Reconnect the bifurcated power cord to the power supply **3**.
18. Refer to “Drive Canister LED Display (LTO)” on page 801 for canister LED displays.
19. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Fixed Tray Assembly - (L23/D23/L53/D53) Hot Swap Canister Models

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

You will need the following parts for this procedure:

- Hot swap fixed tray assembly

1. Notify the customer that you will be taking a drive or drives out of operation. Ask the customer to vary offline all the drives on the same fibre channel for LTO or 3592 drives.
2. Prepare the drive for replacement (see “Service Procedures” on page 790).
3. Disconnect the fibre cables **2** .

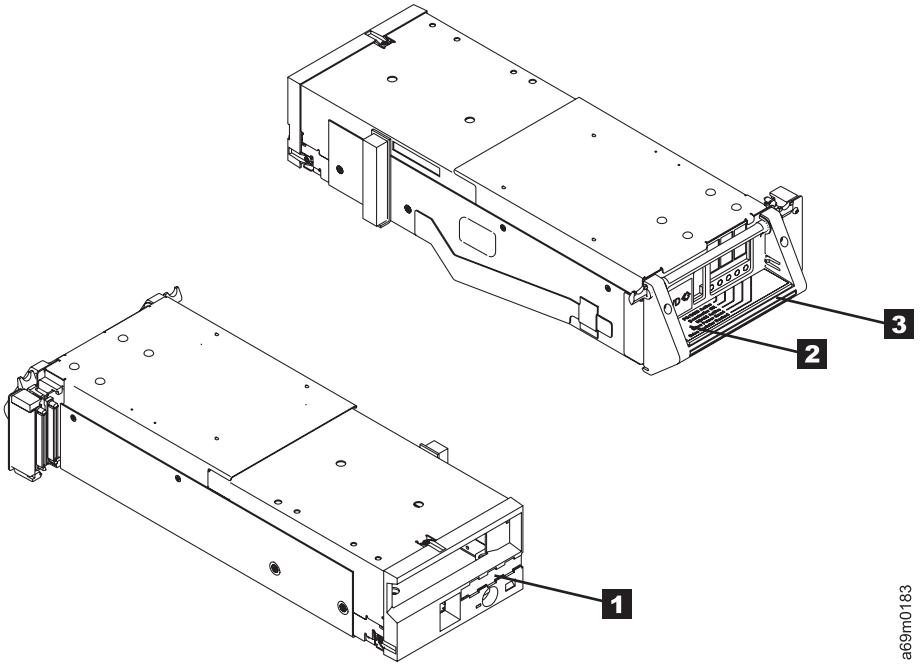


Figure 313. Drive Canister – LTO

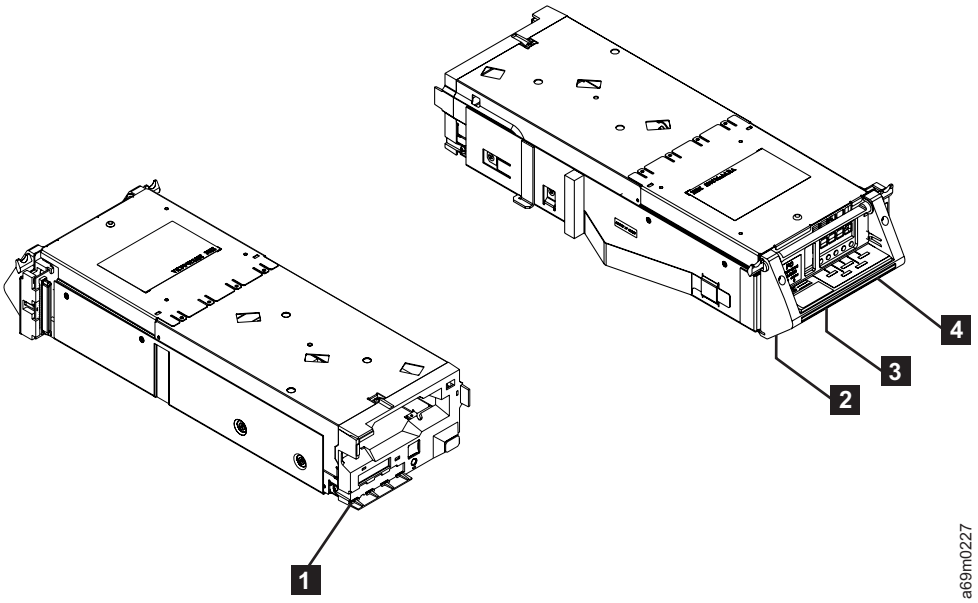


Figure 314. Drive Canister – 3592

4. **See Figure 313 on page 934** and **Figure 314**. While holding up the locking lever **3** , grasp the drive canister handle **4** . Firmly pull back on the handle to disengage and remove the drive canister.
5. See **Figure 315**.
6. Disconnect the RS-422 cable (J6) **1** , drive power cables (J2) **2** and (J3) **3** from the fixed tray assembly and from the cable restraint **4** .
7. Remove the thumbscrew **6** on the fixed tray and slide it out of the frame.

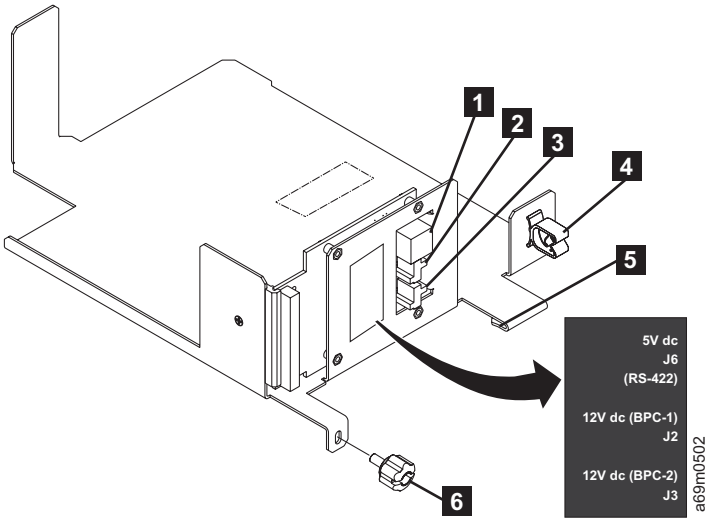


Figure 315. Fixed Tray - L23/D23 - L53/D53

Replacement Procedure - Installing the Fixed Tray

The replacement procedure is the reverse of the removal procedure. **Note:** See **Figure 315**. Newer style fixed trays have a black label with white letters. This fixed tray must be used for E06/EU6 drives. It can also be used for earlier drive models.

1. Slide in the fixed tray assembly ensuring the tab **5** hooks onto the shelf.

2. Reinstall and tighten the thumbscrew **6** .

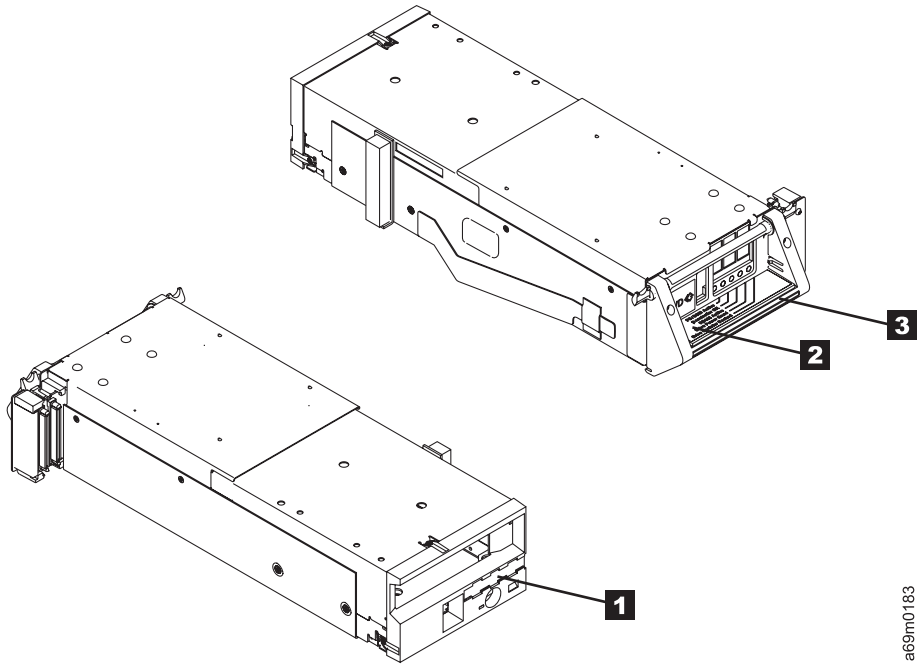


Figure 316. Drive Canister – LTO

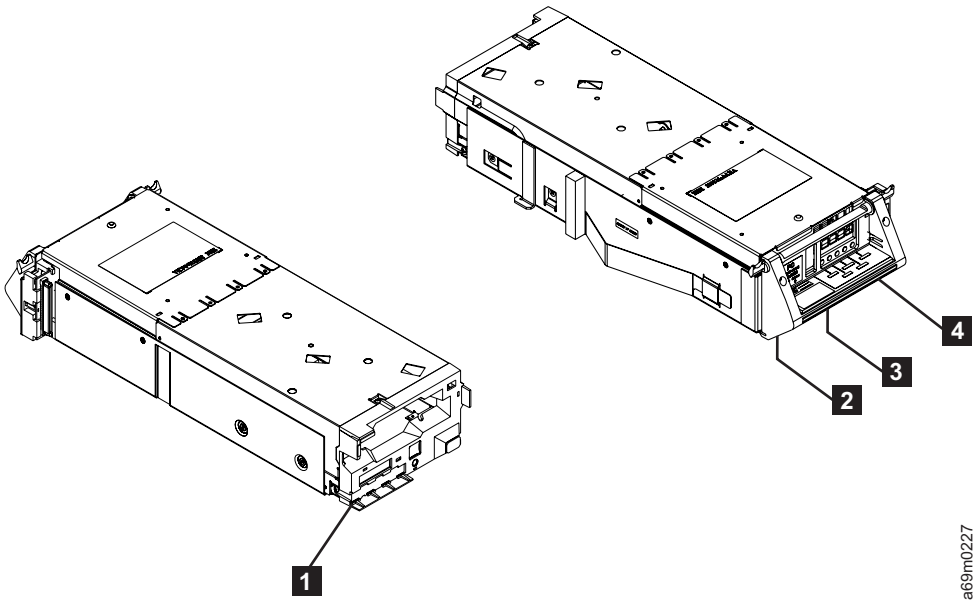


Figure 317. Drive Canister – 3592

Re-Installing the Drive Canister

Note:

- The drive safety flaps must NOT be removed when installing the drives. The safety flaps will pivot up out of the way when the drive is installed.

3. Carefully slide the drive canister into the left side of the fixed tray assembly.
4. Hold the locking lever **up** to ensure the tabs on both sides of the lever will clear the frame.
5. Grasp the drive canister handle **3**, and carefully but firmly push the drive into position.
6. Lower the locking lever **2** until it snaps in place.

Installing Cables

CAUTION:
Do not plug in the host fibre cable until after the "Finish Drive Replacement" process is complete, and the drive has had its code updated, finished its POST, and Library Verify completed. If not, a temporary incorrect Loop ID and/or World Wide Node Name may result.

7. See Figure 315 on page 935.
8. Reconnect the RS-422 connector **1**, drive power cables **2** and **3** on the fixed tray.
9. Reroute all cables into their appropriate strain-relief brackets to provide support.
10. Wait for the drive to complete its POST and calibration.
11. Finish Drive Replacement (see “Service Procedures” on page 790).
12. Reinstall the fibre channel cables removed earlier.
13. Notify the customer that the drive can now be put back into operation.
14. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Frame Control Assembly (FCA) (x32, x22, x52 Frames Only)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Replacement of a failed frame control assembly (FCA) requires taking out of service all drives in the frame that contains the failed FCA. The accessor can remain operational provided there is more than one FCA in the library. If the library only has a single FCA, then the entire library must be powered off (O) during FCA replacement.

Dual accessor libraries (Model HA1) require at least two FCAs with a minimum of three 37 V dc power supplies.

Note: This procedure assumes that the 37 V dc power supplies and MCP assembly will be removed from the failed FCA and reinstalled in the new FCA. For this reason, there is no concern about the level of firmware or the VPD data within the MCP.

Note: You may see error **25xx** during this procedure. This error should be ignored unless it persists after the FCA has been replaced and the MCP has completed its POST.

Removal Procedure

1. If your library has only one FCA, then the entire library must be powered off (O). If your library has more than one FCA, ask the customer to use the host application to unload cartridges from the drives, then vary the drives offline in the failing FCA.
2. If you have a dual-accessor library, with an FCA (with at least one 37V PS) in frame 1 and frame 3, accessor 'A' receives 37 V dc from frame 1 and frame 3. If you have an FCA (with at least one 37V PS) in frame 2 and frame 4, then accessor 'B' receives 37 V dc from frame 2 and frame 4. You must have at least four active frames with an FCA (each having at least one 37V dc power supply) to provide redundant 37 V dc to both accessors. If you have less than four frames as stated, then removing an FCA in one of the frames will remove 37 V dc from one of the accessors.
3. Prepare for FCA replacement (see “Service Procedures” on page 790).
4. Power off (O) the FCA main circuit protector.
5. Power off (O) the FCA at the customer power source.

   Note: If your customer has FC 1901 installed (Dual AC Line Cords), then power off **both** of the customer's power sources before proceeding.
6. Disconnect the power cable located at the bottom of the FCA.
7. Disconnect the power and signal cables connecting the FCA to the FIC card and EPO cable.
8. Disconnect ground jumper **4** at the FCA.
9. Remove the power cables (from the FCA end) that go to the drives.
10. Loosen and remove the two knurled screws to remove the MCP Assembly **1**.
11. Remove the one or two 37 V dc power supplies **2** and **3** from the FCA.

    Note: Single accessor libraries may have only two 37 V dc power supplies in the entire library – one in the L32 base frame, and another in the Dxx frame. Your library could have either one or two 37 V dc power supplies located in the base frame, and only one 37 V dc power supply in the FCA of an expansion frame unless FC 1902 (Redundant 37 V dc Power Supply) is installed.
12. Remove the two screws **5** securing the FCA to the machine frame.
13. Carefully remove the FCA from the frame.

Replacement Procedure

1. Reverse the removal procedure.
2. Complete FCA replacement (see “Service Procedures” on page 790).
3. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

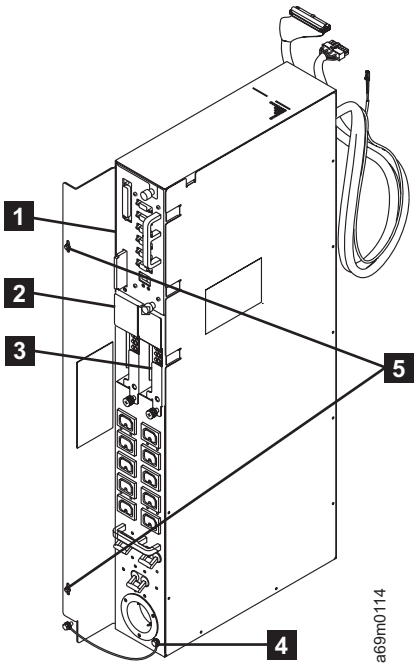


Figure 318. Frame Control Assembly

Enhanced FCA (x23 / x53 Frames Only)

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Replacement of individual Enhance FCA power components (i.e., one BPS or one BPC) does NOT affect drive power in the frame that contains the failed component. The accessor and all drives will remain operational because the redundant Enhanced FCA power supply will continue to provide both library and drive power.

The Enhanced FCA contains two Bulk Power Card Assemblies (BPC). Each BPC assembly contains a quick-disconnect Bulk Power Supply (BPS).

Bulk Power Supply (BPS) (x23 / x53 Frames Only)

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Replacement of the Bulk Power Supply (BPS) does NOT affect drive power in the frame. The accessor and all drives will remain operational because the other redundant Bulk Power Card assembly (BPC) will continue to provide both library and drive power.

Removal Procedure

1. See Figure 319 on page 941.
2. Lift the handle **1** to release the BPS **5**. This mechanically disconnects power to the BPS at **2**.
3. Remove line cord from the BPC assembly (near **1**).
4. Pull handle **3** down to horizontal position as shown.
5. Support the BPS while pulling forward to remove from the BPC assembly **7**.

Replacement Procedure

1. The BPS slides in on two brackets **6** located on each side of the BPC. **Push and hold firm pressure** on the **bottom front** **4** of the BPS while raising the handle **3** to lock the BPS in place. **Do NOT force the handle, as this will cause the BPS to bind inside the BPC assembly making it difficult to remove.**
2. Reconnect the line cord, then lower the handle to reconnect power to the BPS and lock it in place.
3. See **Figure 320 on page 941**. Ensure the AC and DC LEDs **1** are on. The bottom 37 V LED may be on or off. It may have either an amber or green LED. The 12 V green LED should be on. Check the fixed trays in the frame to ensure the 12v LEDs for both BPC1 (J2) and BPC2 (J3), and the 5v LED are on.
4. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

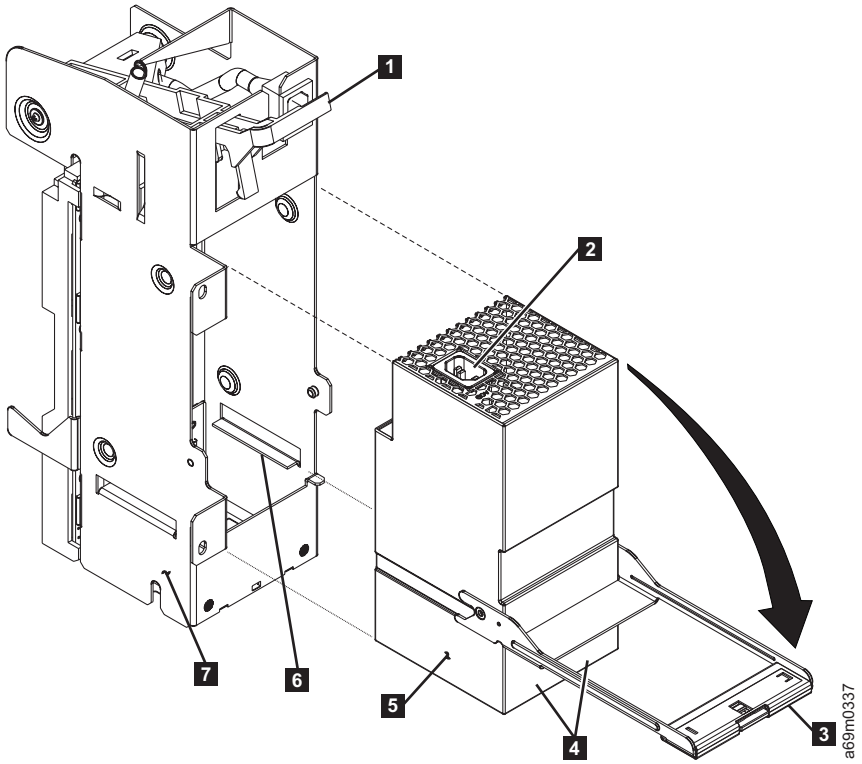


Figure 319. Bulk Power Supply (BPS)

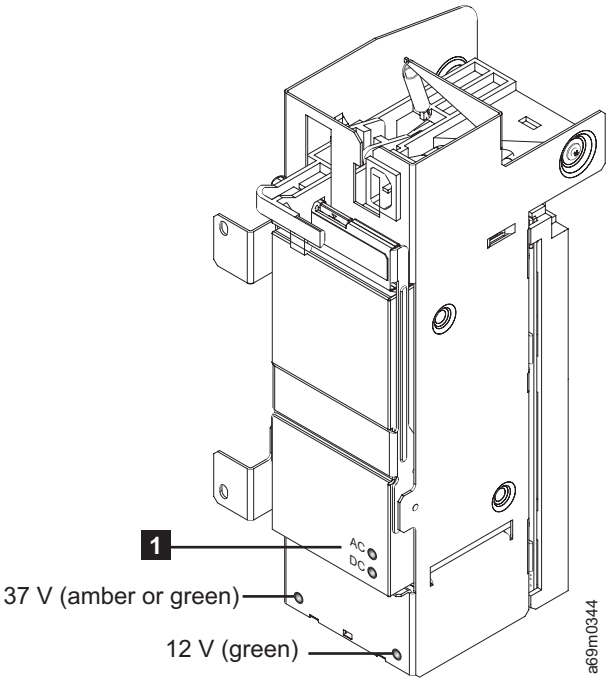


Figure 320. BPC Power LEDs

Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Replacement of the Bulk Power Card assembly (BPC) does NOT affect drive power in the frame. The accessor and all drives will remain operational because the other redundant Bulk Power Card assembly (BPC) will continue to provide both library and drive power.

Removal Procedure

1. Remove the BPS from the BPC assembly. See “Bulk Power Supply (BPS) (x23 / x53 Frames Only)” on page 940 for the procedures.
2. See Figure 321 on page 943. Disconnect the power cord **6** from the BPC. **Note:** The upper BPC is shown being removed in the figure, however this procedure is the same for either the upper or the lower BPC.
3. Remove two screws **3** that secure the BPC **5** to the frame.
4. Lift straight up on the BPC to free the lock slot **7** from the lock button **1**.
5. Swing the BPC down (in an almost horizontal position) and allow it to hook on the tab **4** on the frame near the bottom of the BPC. This will support the BPC while you remove cables in the next step.
6. Disconnect the cables at the rear of the BPC (J2, J3, J4, J5).
7. Pivot the BPC up just enough to free it from the lower tab, then lift it up and off the pivot slot **8** to remove it from the frame.

Replacement Procedure

1. Reverse the removal procedure. Ensure the top flange of the new BPC goes inside the tab **2** on the side panel.
2. See Figure 168 on page 652. Verify the AC and DC LEDs **1**, and the 37 V (amber) and 12 V (green) LEDs are on.
3. Check the fixed trays in the frame to ensure the 12v LEDs for both BPC1 (J2) and BPC2 (J3), and the 5v LED are on. **Note:** Based on system power requirements, library firmware may turn the 37 V LED off.
4. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

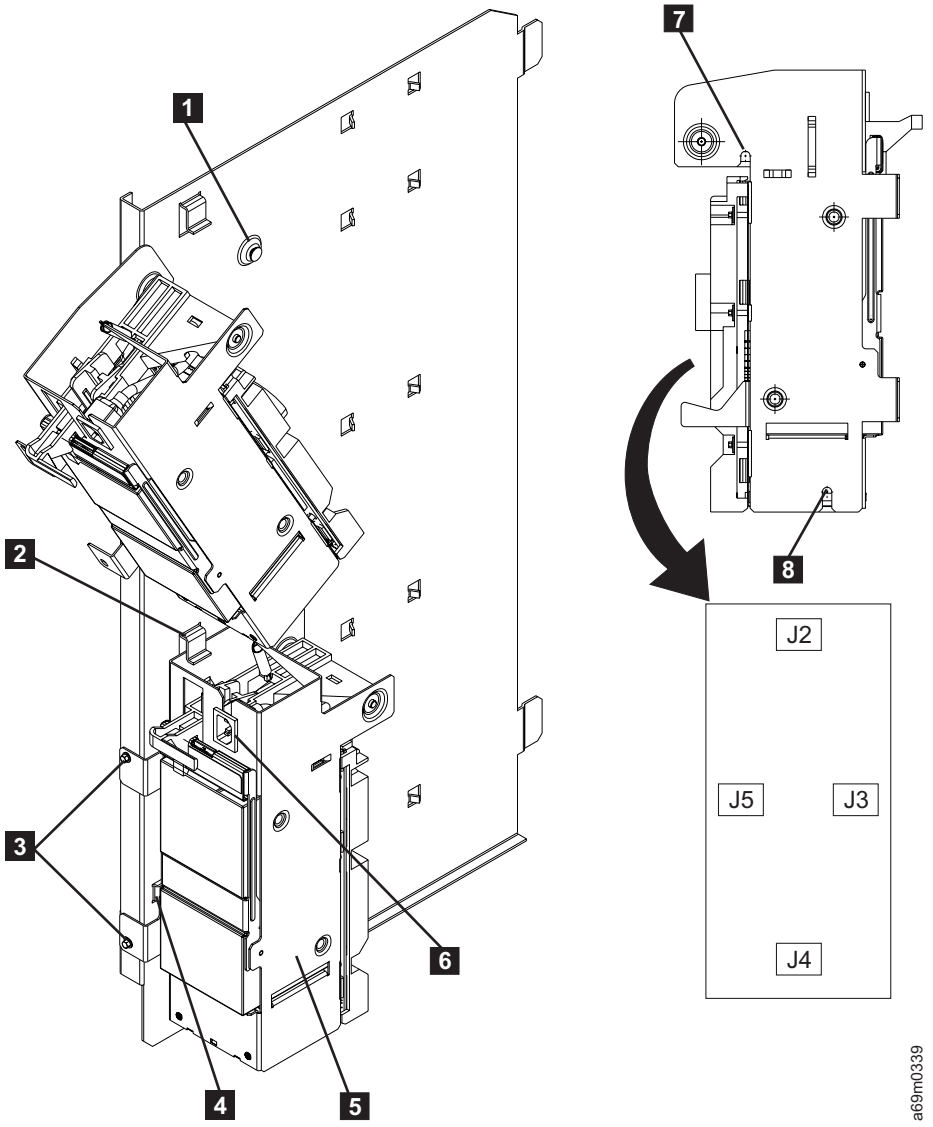


Figure 321. Bulk Power Card Assembly (BPC)

Dual AC Line Cords and PDU (FC 1901)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Replacement of a failed Power Distribution Unit (PDU) on libraries with the Dual ac Line Cord feature installed (FC 1901), requires taking out of service all drives in the frame that contains the failed PDU assembly. The accessor can remain operational provided there is more than one FCA in the library. If the library only has a single FCA, then the entire library must be powered off (O) during the PDU replacement in the affected FCA.

PDU FRU Kit

When the Power Distribution Unit (PDU) is replaced, you will receive a kit containing the PDU, cable retaining bracket clip, PDU-to-FCA Power Cord with plastic spacer pre-installed, and an install instruction. You must replace any existing parts with those provided in the FRU kit.

Removal Procedure

1. If your library has only one FCA, then the entire library must be powered off (O). If your library has more than one FCA, ask the customer to use the host application to unload cartridges from the drives, then vary offline the drives and accessor in the affected FCA.
2. Prepare for FCA replacement (see **"Service Procedures" on page 790**).
3. Power off (O) the FCA main circuit protector.
4. Power off (O) the FCA at the customer power source. With FC 1901 installed (Dual AC Line Cords), power off **both** of the customer's power sources before proceeding.
5. See **Figure 323 on page 945**. Open both power cord cable clamps **3** and unplug the MAIN and BACKUP power cords **4**. (Be sure to label which one is which).
6. Open the PDU-to-FCA cable clamp **1**, and disconnect the power cord **6** from the POWER OUT #1 position.
7. Remove screw **2** and slide the PDU/bracket assembly out of the frame.
8. Remove the screws holding the PDU to the mounting bracket.

Replacement Procedure

1. Reverse the removal procedure. Make sure the tab **7** on the rear of the bracket slides into the notch **8** in the frame as shown. Place both power cables in the restraining clamps **1A**.
2. Complete FCA replacement (see **"Service Procedures" on page 790**).
3. Return to the procedure that sent you here; otherwise, go to **"End-of-Call" on page 794**.

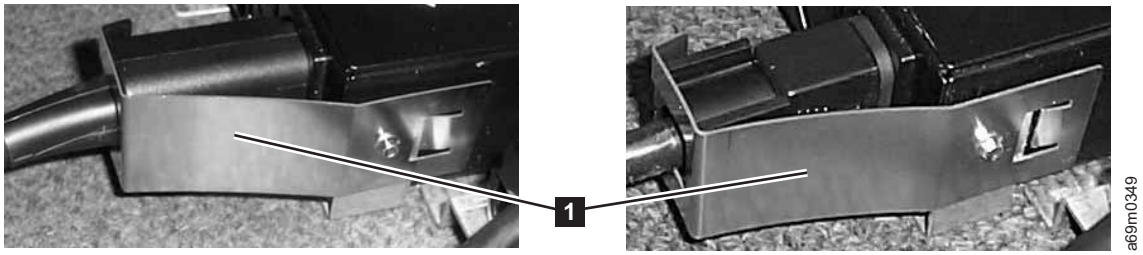


Figure 322. PDU Power Cord Retention Bracket (showing Old and New style cord)

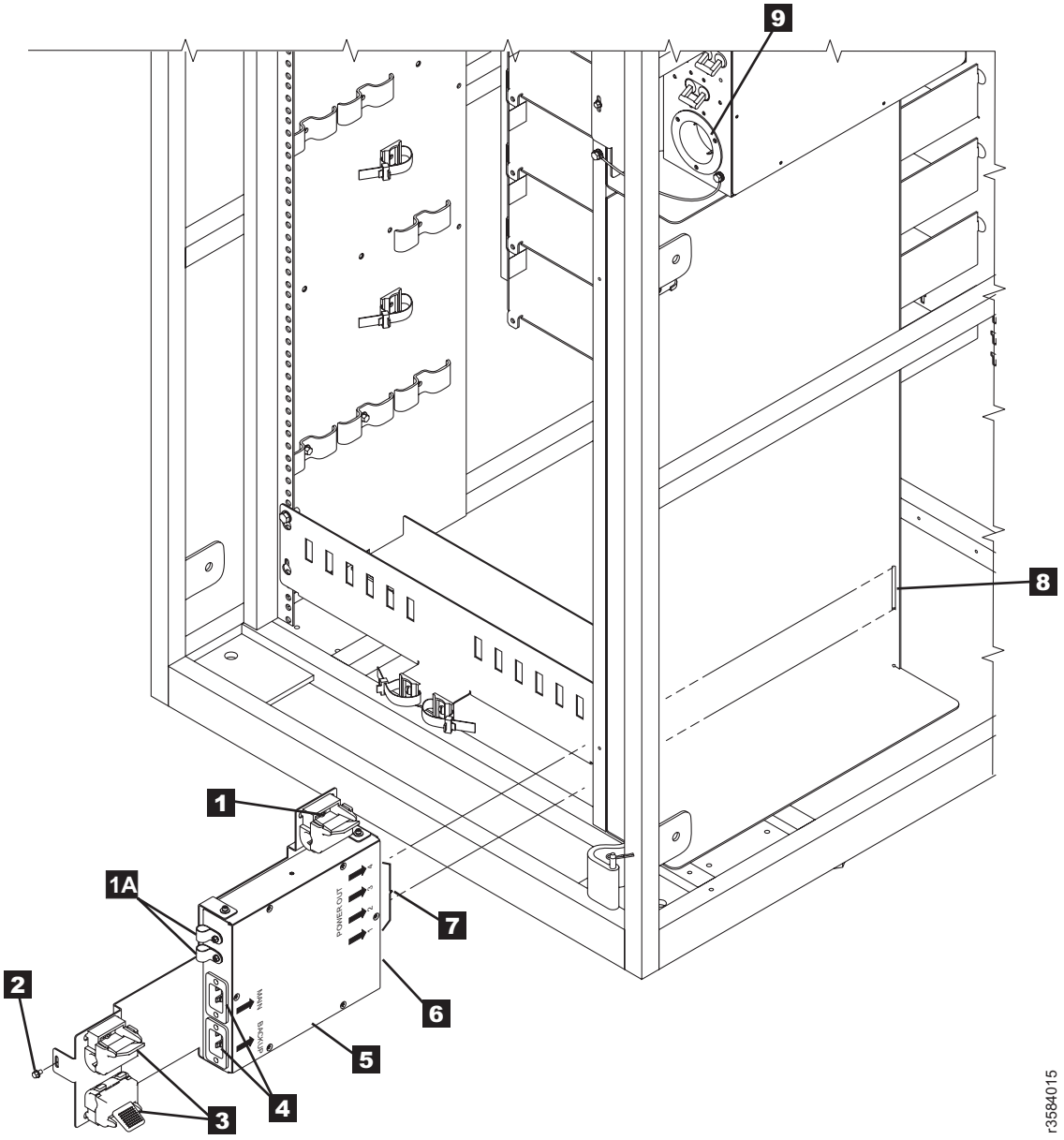


Figure 323. Power Distribution Unit

4Gb/8Gb Fibre Switch, Power Supply, & SFP Transceivers (FC 487x)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Replacement of a failed 4Gb/8Gb fibre switch requires taking out of service all drives in the frame connected to the switch.

4Gb/8Gb Switch Removal Procedure

1. Advise the customer that drives connected to the failed 4Gb/8Gb will have one port unavailable during this replacement procedure. If this is an issue, the port must be taken offline from all host-attached systems. Open the rear door of the frame.
2. Disconnect the fiber cables from the switch, then remove the ties holding the fibre bundle to the switch.
3. See **Figure 324**. Slide both switches out as shown. Disconnect the power cords **2** and **3** from the defective switch then remove the Velcro© tie **1** .
4. See **Figure 325 on page 947**. Depress the release button on both sides of the switch to remove it from the frame.
5. Remove the slider from each side of the switch and reinstall on the new switch.

4 GB Switch Replacement Procedure

1. Reverse the removal procedure. You must depress both slider buttons to slide the 4Gb/8Gb switch back into the frame.
2. Return to the procedure that sent you here; otherwise, go to **"End-of-Call" on page 794**.

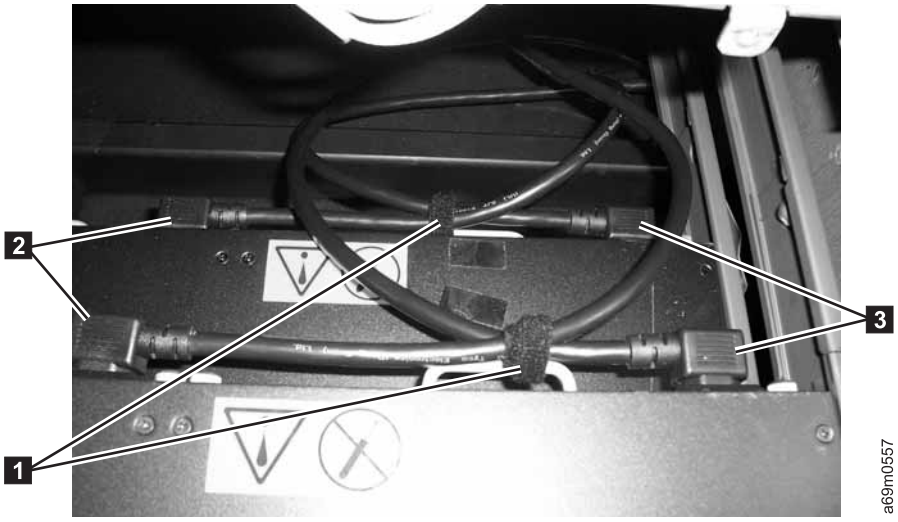


Figure 324. Bifurcated Cables to Switches



Figure 325. Switch Release Buttons

Switch Power Supply Removal Procedure

1. Drives fibre cables do not have to be removed if only one switch power supply is being replaced. However, use care not to disturb the fibre cables in the following procedure.
2. Open the rear door of the frame.
3. See **Figure 324 on page 946**. Slide both switches out as shown. Disconnect the power cord **2** or **3** from the defective power supply.
4. See **Figure 326**. Loosen screws **1** then use handle **2** to pull the power supply from the switch.

Switch Power Supply Replacement Procedure

1. Reverse the removal procedure.
2. Return to the procedure that sent you here; otherwise, go to **"End-of-Call" on page 794**.

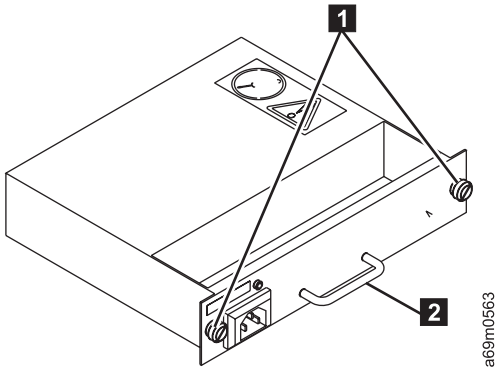


Figure 326. 4Gb/8Gb Switch Power Supply

SFP Optical Transceiver Removal Procedure

Attention: Use correct electrostatic discharge (ESD) procedures when removing and replacing this unit. See “Protecting ESD-Sensitive Parts” on page 762).

1. Disconnect the fibre cable from the failing position.
2. See **Figure 327**. Lift the handle **1** and pull forward **2** to remove.

SFP Optical Transceiver Replacement Procedure

1. Using the correct ESD procedures, slide the new SFP transceiver into the switch, push it firmly in place, then lower the handle.
2. Return to the procedure that sent you here; otherwise, go to **“End-of-Call” on page 794**.

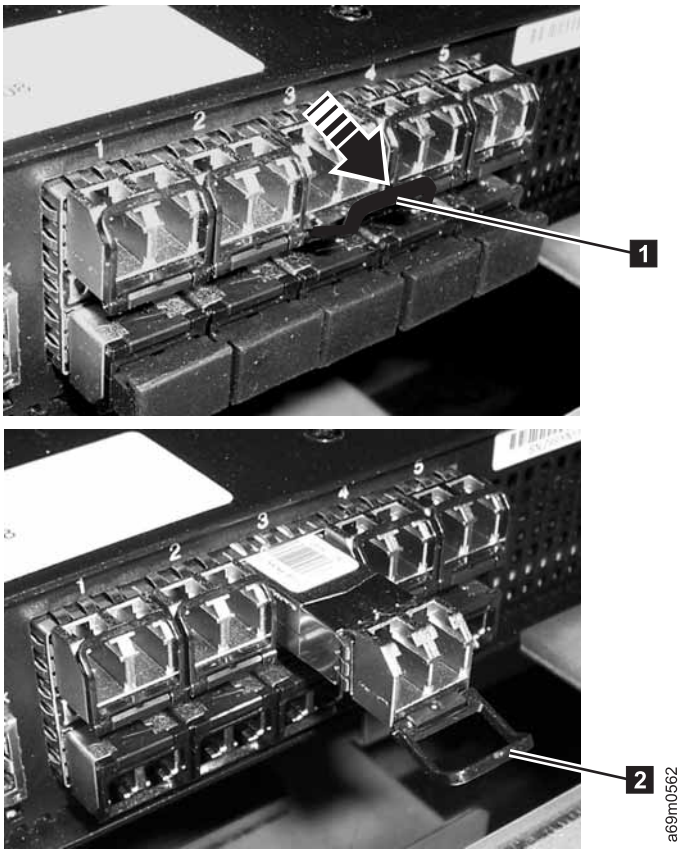


Figure 327. SFP Optical Transceiver

PDU for 4Gb/8Gb Fibre Switches (FC 1950)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Replacement of the Power Distribution Unit (PDU) does NOT affect 4Gb/8Gb fibre switch power in the frame. The 4Gb/8Gb switches will remain operational because the other redundant Power Distribution Unit (PDU) will continue to provide frame and 4Gb/8Gb fibre switch power even though one BPC will be temporarily powered off.

Removal Procedure

1. Determine which PDU is failing, then disconnect the customer power cord from the PDU. **Note:** This will also result in loss of power to one BPC assembly. You can ignore the following errors, as the library will continue to function:
   - If BPC 1 is powered off you will see a 3491 on the operator panel.
   - If BPC 2 is powered off you will see a 3492 on the operator panel.
2. See **Figure 328 on page 951**.
3. Label and disconnect all the cables from the PDU.
4. Remove screws securing the PDU and slide it out of the frame.

Replacement Procedure

1. Reverse the removal procedure.
2. Reconnect the power cord to the customer receptacle.
3. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

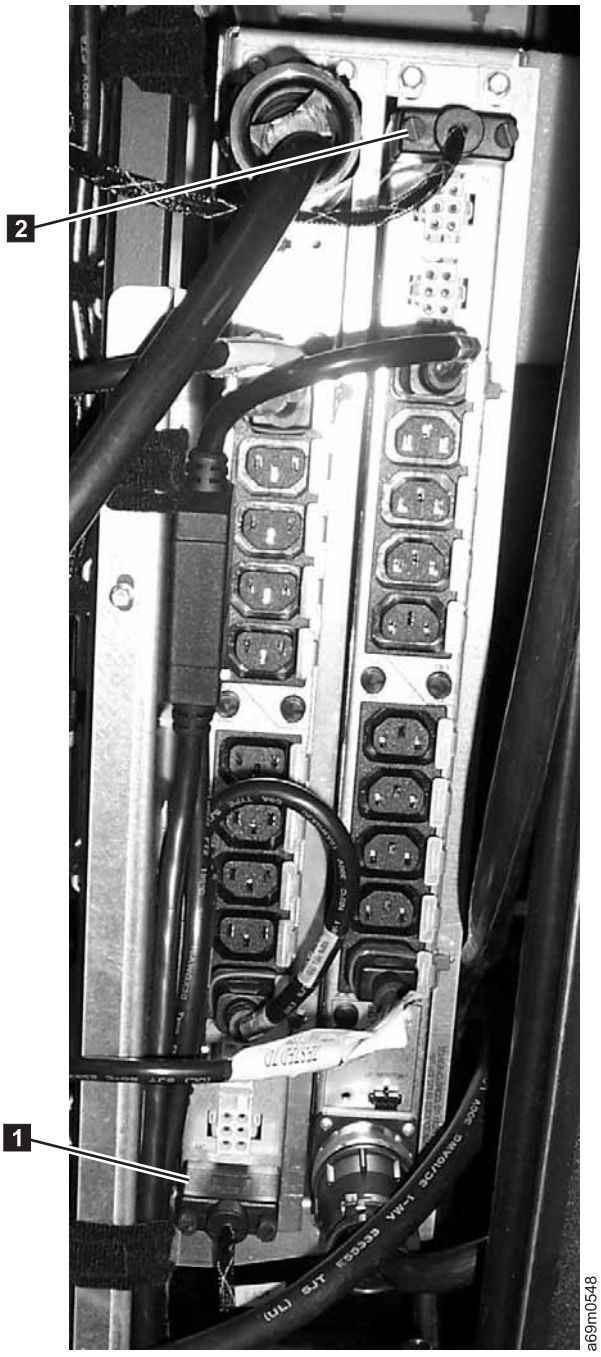


Figure 328. SFP Optical Transceiver

Gripper Asm, Dual, LTO/LTO, LTO/3592 (Universal), & HD

Before you begin...

Attention: Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762).

Note:

- You can remove one gripper assembly without removing the dual gripper assembly. See “Gripper Assembly, Single LTO (New Style)” on page 958, “Gripper Assembly, Single LTO (Old Style)” on page 956, or “Gripper Assembly, Single, LTO/3592 (Universal), & HD” on page 954.
- Your library may contain two LTO grippers, two Universal (LTO/3592) grippers or two HD grippers.
- The LTO dual gripper assembly is shown in this procedure. The removal of a Universal or HD gripper is the same.
- Library FW 7363 or higher fixes Universal Gripper problems. This level should be installed and tested before replacing the Universal Gripper (unless it is physically broken).
- **Do not mix** Universal and HD grippers in the same dual gripper assembly. HD grippers are primarily used in libraries with Sx4 High Density frames. Library FW 8870 or higher is required for HD grippers. Never disassemble or swap parts between grippers.
- Gripper 1 is the upper gripper. Gripper 2 is the lower gripper.
- Check the gripper for a stuck cartridge. If a cartridge is found, Refer to **“Manually Removing Cartridge” on page 1045** for stuck cartridge removal procedures, then return here.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).

   Note: The original LTO dual gripper, the LTO/3592 Universal dual gripper, and HD gripper assemblies are removed using the same procedure.

2. Refer to Figure 329 on page 953. Remove the two screws **1**, and unplug the cable between the pivot assembly and the PDC card.

   Note:

   - The cable connector has a locking tab. Press IN on the tab and gently rock the connector to remove it.
   - In the next step, the dual gripper assembly will fall free when you remove the four screws **2**.

   Note: **Do not** loosen or remove the two recessed screws **3**.

3. The dual gripper assembly will fall free as you remove the four screws **2**. To prevent damage, firmly grasp the dual gripper assembly as you remove the four screws **2**, to free and remove the dual gripper assembly **4** from the pivot assembly.
4. Remove the barcode scanner from your old dual gripper assembly and install it on the new dual gripper assembly. See “Bar Code Scanner (New Style)” on page 820 for barcode scanner removal and replacement procedures.

Replacement Procedure

1. Reverse the removal procedures.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform a library calibration (see “Library and Drive Calibration Procedures” on page 784).
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

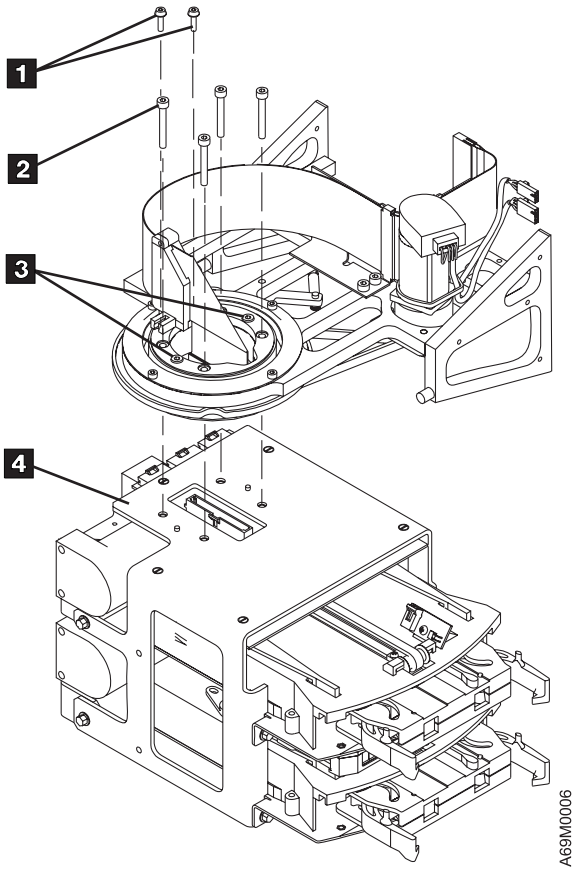


Figure 329. Dual Gripper Assembly

Gripper Assembly, Single, LTO/3592 (Universal), & HD

Before you begin...

- Library FW 7363 or higher fixes Universal Gripper problems. This level should be installed and tested before replacing the Universal Gripper (unless it is physically broken).
- **Do not mix** Universal and HD grippers in the same dual gripper assembly. HD grippers are primarily used in libraries with Sx4 High Density frames. Library FW 8870 or higher is required for HD grippers. The gripper types can be positively identified by the barcode label on the right side of each gripper (as you face the gripper). See **"Assembly 13: Dual Gripper Assembly (Universal LTO/3592)" on page 1140** and **"Assembly 14: Dual Gripper Assembly (HD) Required if Sx4 HD frames are installed" on page 1142** for pictures of the labels. Never disassemble or swap parts between grippers.
- Gripper 1 is the upper gripper. Gripper 2 is the lower gripper.
- Check the gripper for a stuck cartridge. If a cartridge is found, Refer to **"Manually Removing Cartridge" on page 1045** for stuck cartridge removal procedures, then return here.

Removal Procedure

1. Prepare the accessor for servicing (see "Service Procedures" on page 790).
2. See **Figure 330 on page 955**. Unplug the cable 4 from the cartridge present sensor on the gripper being removed.
3. Unplug the calibration sensor cable 3 from the PDC card.
4. Unplug the gripper motor cable from the PDC card.
5. See **Figure 331 on page 955**. If gripper clips 1 are installed, continue at the next step. If not, skip to step 7.
6. See **Figure 332 on page 955**. On both sides of the gripper, push in on each gripper clip until they disengage as shown at 1 in **Figure 334 on page 955**.
7. See **Figure 330 on page 955**. Press both gripper release tabs 1, raise the gripper up out of the slots 2 on both sides, and slide it out of the machine.
8. If this is the lower gripper assembly, remove the calibration sensor 3 by sliding it forward and set it aside. It will be re-installed later.

Replacement Procedure

1. If the lower gripper is being replaced, re-install the calibration sensor 3 on the new gripper assembly.
2. Install the new gripper. Ensure the tab on the back of the gripper goes into the slot at the rear of the gripper housing assembly, and the gripper slots 2 go into the housing as the gripper release tabs 1 snap into place (**Figure 330 on page 955** shows older style grippers without clips).
3. See **Figure 334 on page 955** to ensure the clips (if installed) are in the UNLOCKED position before installing. If gripper clips are installed, push in on both clips **Figure 333 on page 955** until they snap in place.
4. Reconnect the connectors for the gripper motor, cartridge present sensors, (and the calibration sensor if this is the lower gripper assembly).
5. Ensure that both grippers are firmly seated in the gripper housing.
6. Ensure that the cables are not exposed to damage from other library components.

   Attention: After completing these steps, ensure you remove the hex wrench or screwdriver, and lower the dual gripper assembly **before you close the door**.
7. Close the front door.
8. Complete the Finish Accessor Service procedure (see "Service Procedures" on page 790).
9. Perform a library calibration (see "Library and Drive Calibration Procedures" on page 784).
10. Perform the "Library Verify Test" on page 759, using the **no drives** selection. Note: This does not apply to dual accessor libraries when the accessor is inside the service bay.

11. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

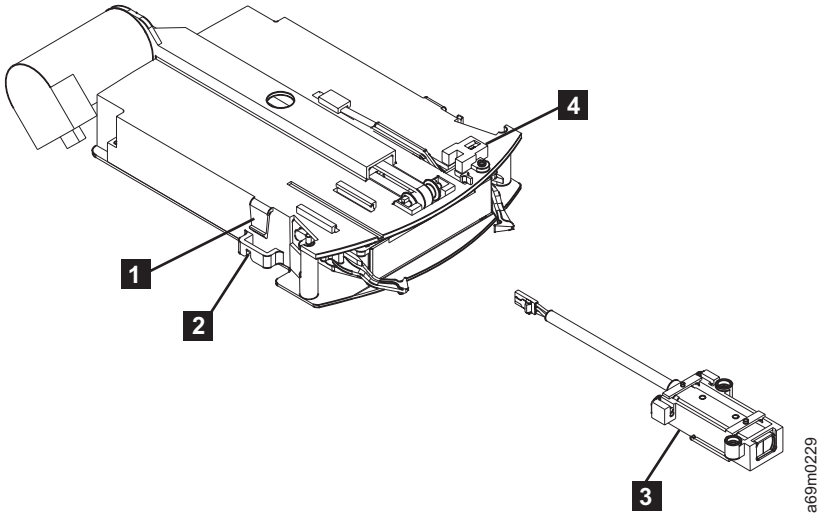


Figure 330. Single Gripper Assembly (Universal) Older Style without Clips

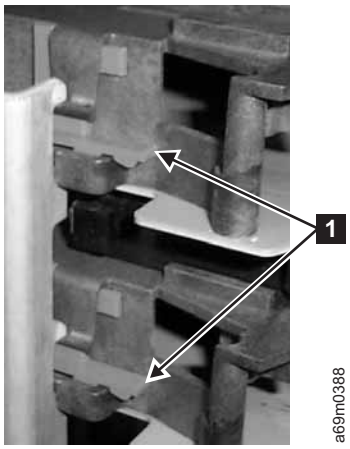


Figure 331. Gripper Clips LOCKED in Place

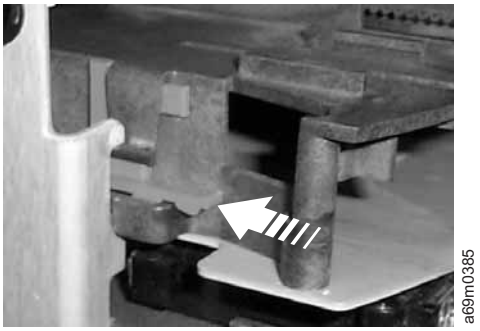


Figure 332. Shown LOCKED – Push BACK to Unlock

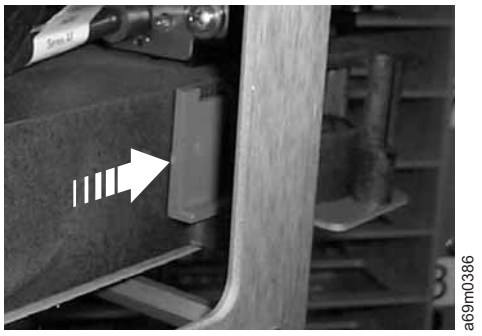


Figure 333. Push FORWARD to Lock

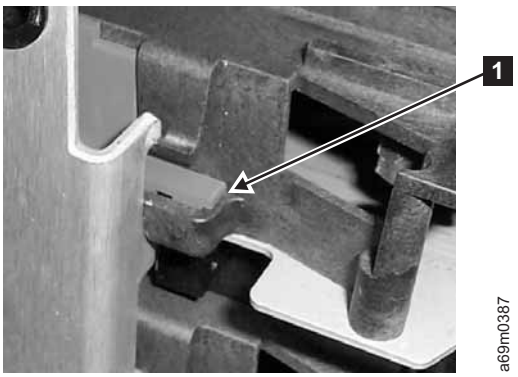


Figure 334. Gripper Clip Shown UNLOCKED

Gripper Assembly, Single LTO (Old Style)

Before you begin...

The bar code scanner contains a Class II laser.



C04 CAUTION:
Because of laser radiation, do not stare into the beam.

Attention: Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762).

Note: The LTO gripper assembly is shown in this procedure. Never disassemble or swap parts between grippers.

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: If you ordered a single LTO gripper, but received a new **Dual Universal Gripper FRU Kit,** follow the instructions that came with the FRU. If not, continue with the following procedure. Also see **“Using CETool to Change from LTO to Universal Grippers in L32 Frames” on page 738** which may be required based on your current library firmware level.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the two screws **1** holding the gripper assembly to the dual gripper assembly housing.
3. If this is the upper gripper assembly, unplug the calibration sensor cable from the PDC and remove the sensor from the old gripper.
4. Unplug the cable from the single gripper assembly motor to the PDC.
5. Partially slide out the single gripper from the dual gripper assembly.

   Note: In the next step, release the cartridge present sensor cables from the cable clamps. Do **not** pull on the wires to disconnect the cartridge present sensor connectors.
6. Unplug the cartridge present sensor connectors **2** from the single gripper assembly.
7. Remove the single gripper assembly. You will need to tilt the gripper assembly slightly and hold cables out of the way to remove the gripper assembly out the front of the dual gripper assembly.

Replacement Procedure

1. If the upper gripper is being replaced, re-install the calibration sensor on the new gripper assembly.
2. Reverse the removal procedures.
3. Close the front door.
4. Complete the accessor servicing (see “Service Procedures” on page 790).
5. Perform a library calibration (see “Library and Drive Calibration Procedures” on page 784).
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.

7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

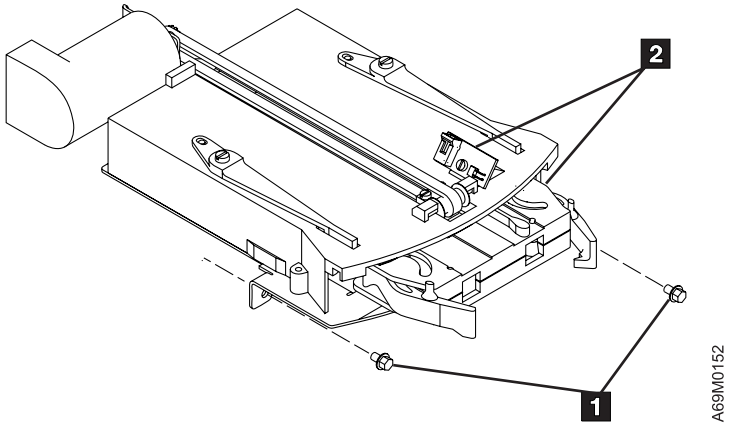


Figure 335. Single Gripper Assembly (Old Style)

Gripper Assembly, Single LTO (New Style)

Before you begin...

The bar code scanner contains a Class II laser.



Attention: Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762).

Notes:

1. The LTO gripper assembly is shown in this procedure. The removal of a Universal gripper is quite different. Never disassemble or swap parts between grippers.
2. Gripper 1 is the upper gripper. Gripper 2 is the lower gripper.

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

Note: If you ordered a single LTO gripper, but received a new **Dual Universal Gripper FRU Kit,** follow the instructions that came with the FRU. If not, continue with the following procedure. Also see **“Using CETool to Change from LTO to Universal Grippers in L32 Frames” on page 738** which may be required based on your current library firmware level.

If your library has the old style gripper (refer to Figure 335 on page 957), and you are replacing it with another old style gripper, use the procedure at “Gripper Assembly, Single LTO (Old Style)” on page 956. If your library has the new style gripper (refer to Figure 336 on page 959), continue with this procedure.

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Loosen the two screws **1** that hold the left **2** and right **3** gripper mounting blocks that hold the gripper assembly to the dual gripper assembly housing.
3. Rotate the left gripper mounting block **2** counterclockwise.
4. Rotate the right gripper mounting block **3** clockwise.
5. If this is the upper gripper assembly, unplug the calibration sensor cable from the PDC and remove and set aside the sensor **6** from the old gripper. It will be re-installed later.
6. Unplug the cable from the single gripper assembly motor to the PDC.
7. Partially slide out the single gripper from the dual gripper assembly.

   Note: In the next step, release the cartridge present sensor cables from the cable clamps. Do **not** pull on the wires to disconnect the cartridge present sensor connectors.
8. Unplug the cartridge present sensor connectors from the single gripper assembly.
9. Remove the single gripper assembly. You will need to tilt the gripper assembly slightly and hold the cables out of the way to remove the gripper assembly out the front of the dual gripper assembly.

Replacement Procedure

Note: Each set of blocks is designed to be used on either side of the gripper. See Figure 336 on page 959.

1. If the upper gripper is being replaced, re-install the calibration sensor 6 on the new gripper assembly. The right mounting block 3 must have the tab (the line from the item number 3 points to the tab) facing outward. The left mounting block 2 must have the tab facing inward.
2. Install the new gripper. Ensure the tab on the back of the gripper goes into the slot at the rear of the gripper housing assembly, and the lower gripper plate 5 slides in the slots on either side of the housing 4 .
3. Rotate counterclockwise and tightly hold the **right** mounting block 3 against the gripper plate 5 as you securely tighten the screw 1 .
4. Rotate clockwise and tightly hold the **left** mounting block 2 against the gripper plate 5 as you securely tighten the screw 1 .
5. Reconnect the connectors for the gripper motor, cartridge present sensors, and if this is the upper gripper assembly, the calibration sensor.
6. Ensure that the cables are not exposed to damage from other library components.
7. Close the front door.
8. Complete the accessor servicing (see “Service Procedures” on page 790).
9. Perform a library calibration (see “Library and Drive Calibration Procedures” on page 784).
10. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
11. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

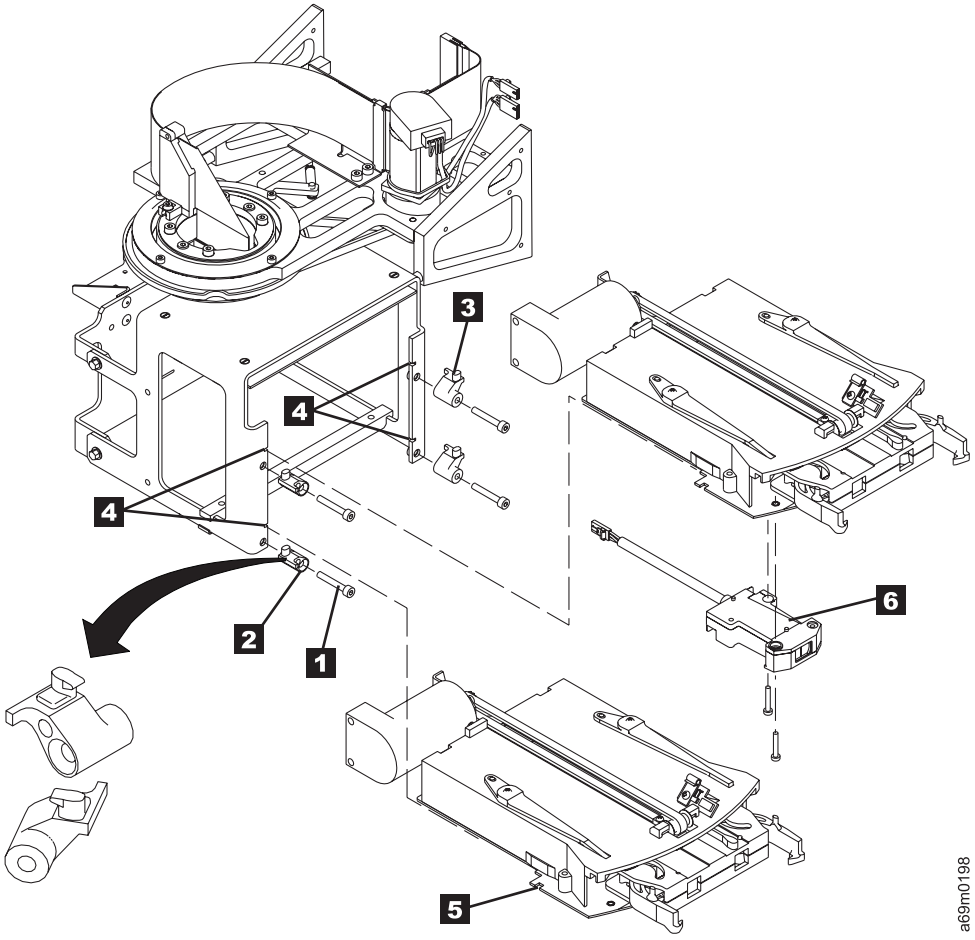


Figure 336. Single Gripper Assembly (New Style)

I/O Station, Upper (L32, L22, L23, L52, L53)

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Pause the Library by pressing the [PAUSE] button on the operator panel.
2. Depending on the model number of your base frame, use the appropriate removal procedure:
   - **For L32 Only:**
   a. Refer to Figure 253 on page 853 and remove the connector **1** at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure.
   b. Refer to Figure 337 on page 961. Disconnect the I/O station cable **2** that leads to either the operator panel assembly or the XIO card.
   c. Remove the mounting screws **3** to remove the I/O station **1** from the front door.
   - **For L22/L23/L52/L53 Only:**
   a. Refer to Figure 254 on page 854. Remove the connector **3** at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure.
   b. Disconnect the I/O station cable that leads to either the operator panel assembly or the XIO card.
   c. See Figure 338 on page 961. Disconnect the Door Open Sensor (DOS) cable **2** from the bottom of the I/O station.
   d. Remove the mounting screws **1** to remove the I/O station from the front door.

Replacement Procedure

1. Reverse the removal procedure.

   Note: It is important that you connect the cable from the I/O station (or the XIO card) to the Op Panel last.
2. Open and close the I/O station several times to ensure that there is no interference between the front door and the I/O station. Ensure there is no binding.
3. Close the base frame front door and wait for the frame inventory to finish.
4. Perform an I/O station calibration (see “Library and Drive Calibration Procedures” on page 784).
5. Perform the “Library Verify Test” on page 759 using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

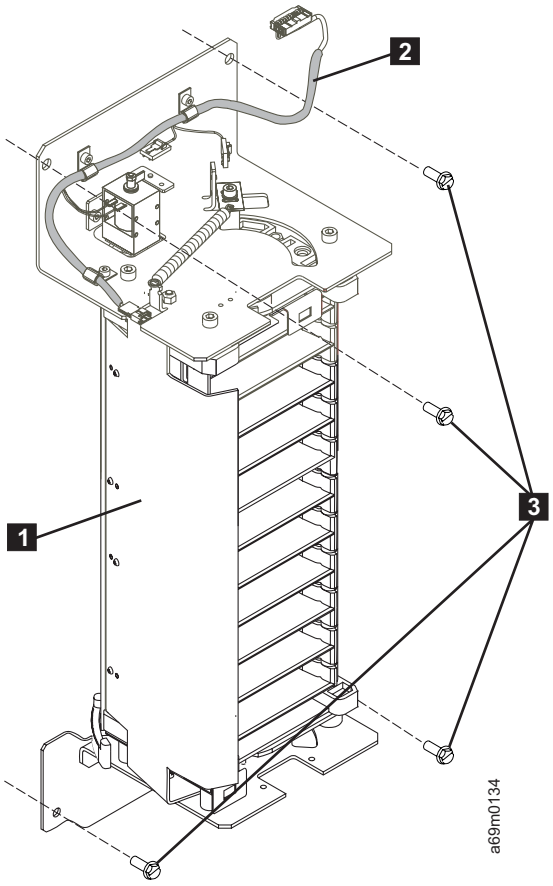


Figure 337. I/O Station – L32 LTO 10 Only

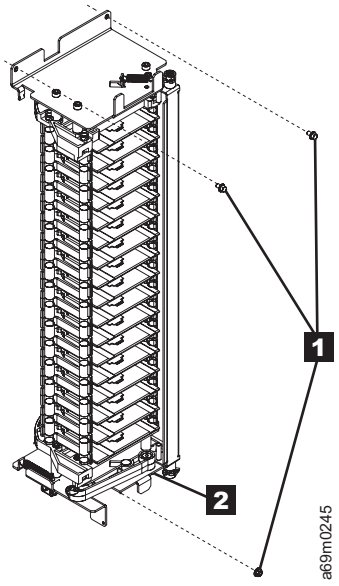


Figure 338. I/O Station – L22/L23 (LTO) or L52/L53 (3592) Only

I/O Station, Lower (L32, L22, L23, L52, L53)

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Pause the Library by pressing the [PAUSE] button on the operator panel.

L32 Only:

2. Refer to Figure 253 on page 853 and remove the connector 1 at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure.
3. See Figure 339 on page 963. Remove the plastic shield that covers the XIO card.
4. Disconnect the cable 1 that leads to the XIO card.
5. Remove the mounting screws 2 to remove the lower I/O station 3 from the base frame front door.

L22/L23/L52/L53 Only:

1. Refer to Figure 253 on page 853 and remove the connector 1 at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure.
2. See Figure 340 on page 963. Remove the screw 2 and plastic shield 1 that covers the XIO card.
3. Disconnect the cable that leads from the lower I/O station to the XIO card.
4. Disconnect the Door Open Sensor (DOS) cable from the bottom of the I/O station.
5. Remove the mounting screws 3 to remove the I/O station from the front door.

Notes:

1. With a single I/O station, the I/O station cable directly connects to the operator panel card.
2. With multiple I/O stations, both I/O stations connect to the XIO card, and the XIO card is cabled to the operator panel card.

Replacement Procedure

1. Reverse the removal procedure.
2. Open and close the I/O station several times to ensure that there is no interference between the front door and the I/O station. Ensure there is no binding.
3. Close the base frame front door and wait for the frame inventory to finish.
4. Perform an I/O station calibration (see “Library and Drive Calibration Procedures” on page 784).
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

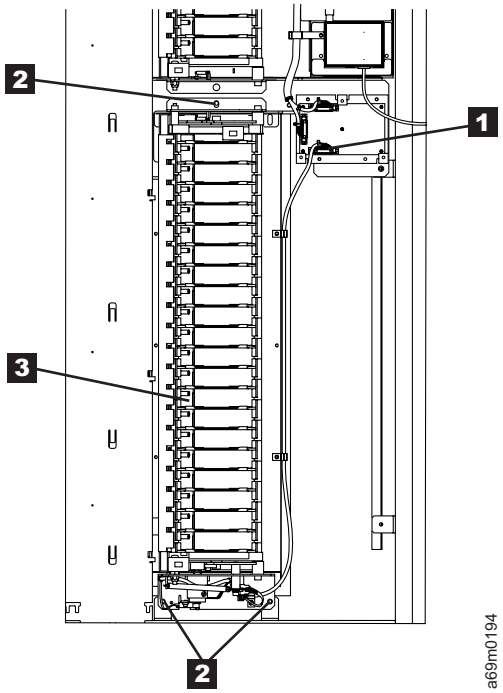


Figure 339. I/O Station, L32 Only

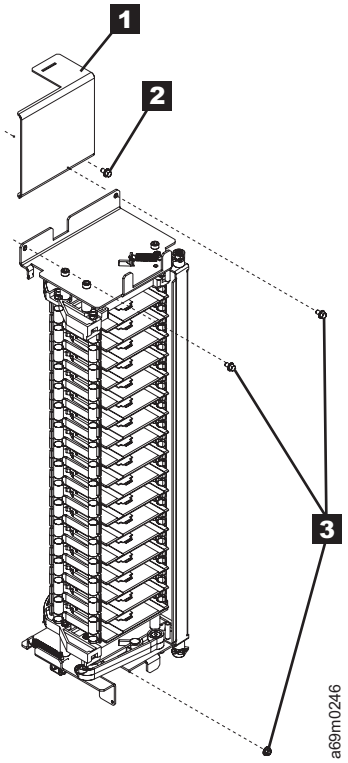


Figure 340. I/O Station – L22/L52 LTO or 3592 Only

I/O Station Door (L22, L23, L52, L53)

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Pause the Library by pressing the [PAUSE] button on the operator panel.
2. See “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960 or “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962 to first remove the I/O station from the Lxx frame.
3. Refer to Figure 341 on page 965.
4. Pull the metal flag **13** on the solenoid assembly UP (unlocked position) before continuing.
5. Unplug in the connector labeled "DLS" (Door Locked Sensor) at **14** . The "DOS" (Door Open Sensor) terminal should have already been disconnected in Step 2 above.
6. Carefully unplug wires on the cable assembly on the solenoid. The wires are labeled "1" and "2" **12** and stamped "1" and "2" on the solenoid bracket.
7. Remove M5 nuts **10** on the studs at the top, bottom, left, and right sides.
8. Remove the I/O door assembly from the opening.

Replacement Procedure

1. Reverse the removal procedure.
2. See “I/O Station, Upper (L32, L22, L23, L52, L53)” on page 960 or “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962 to reinstall the I/O station in the Lxx frame.
3. Close the base frame
4. Close the Lxx front door and wait for the frame inventory to finish.
5. Perform an I/O station calibration (see “Library and Drive Calibration Procedures” on page 784).
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

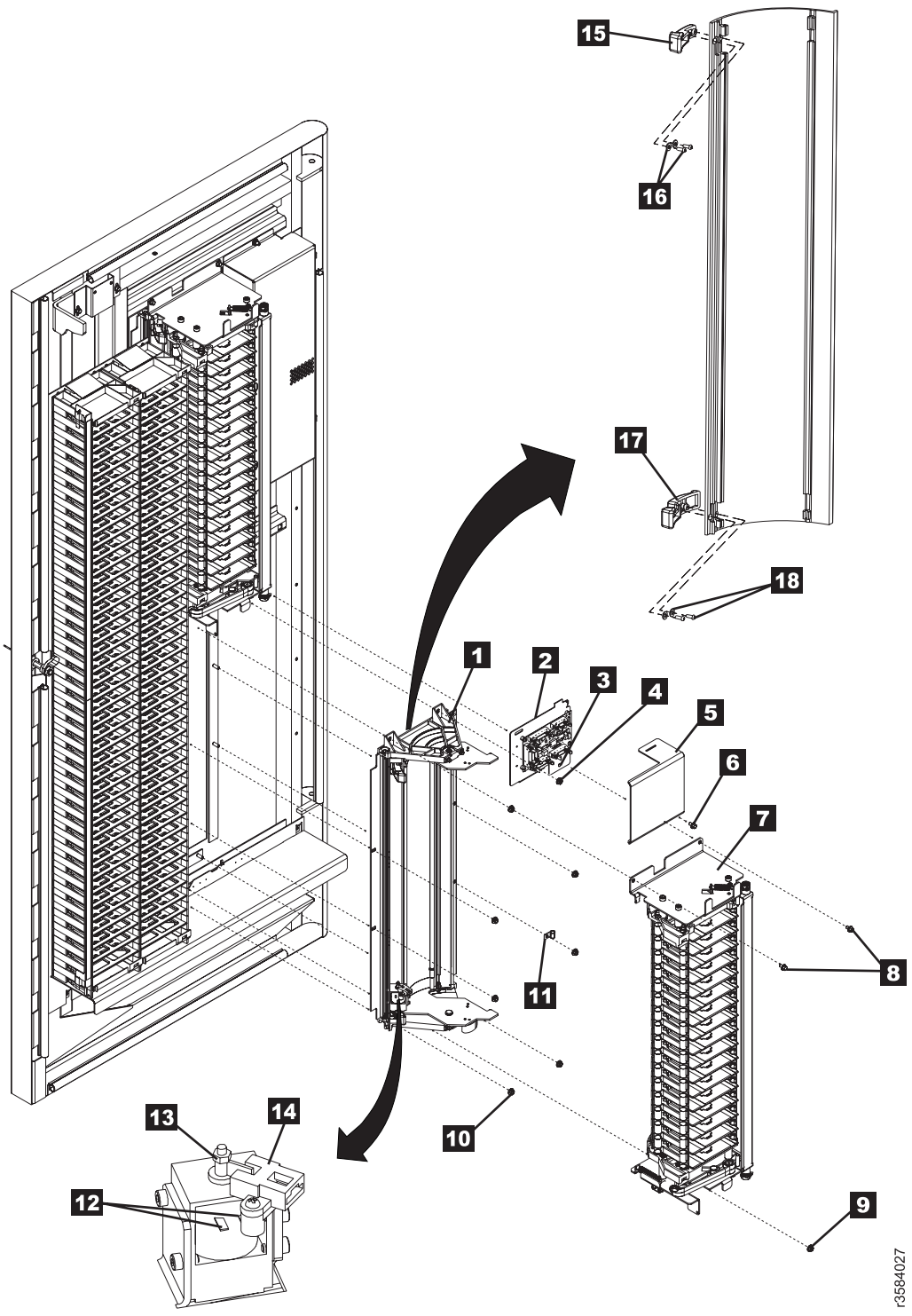


Figure 341. I/O Station Door Mounting

I/O Station Door, 3592 (L32)

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Pause the Library by pressing the [PAUSE] button on the operator panel.
2. See “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962 to first remove the lower I/O station from the L32 frame.
3. Refer to Figure 342 on page 967.
4. Remove the ten nuts **4** and washers **3** (if present) on the top, bottom, left, and right sides.
5. Remove the I/O door assembly from the opening.

Replacement Procedure

1. Reverse the removal procedure.
2. See “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962 to reinstall the I/O station in the L32 frame.
3. Close the base frame
4. Close the L32 front door and wait for the frame inventory to finish.
5. Perform an I/O station calibration (see “Library and Drive Calibration Procedures” on page 784).
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

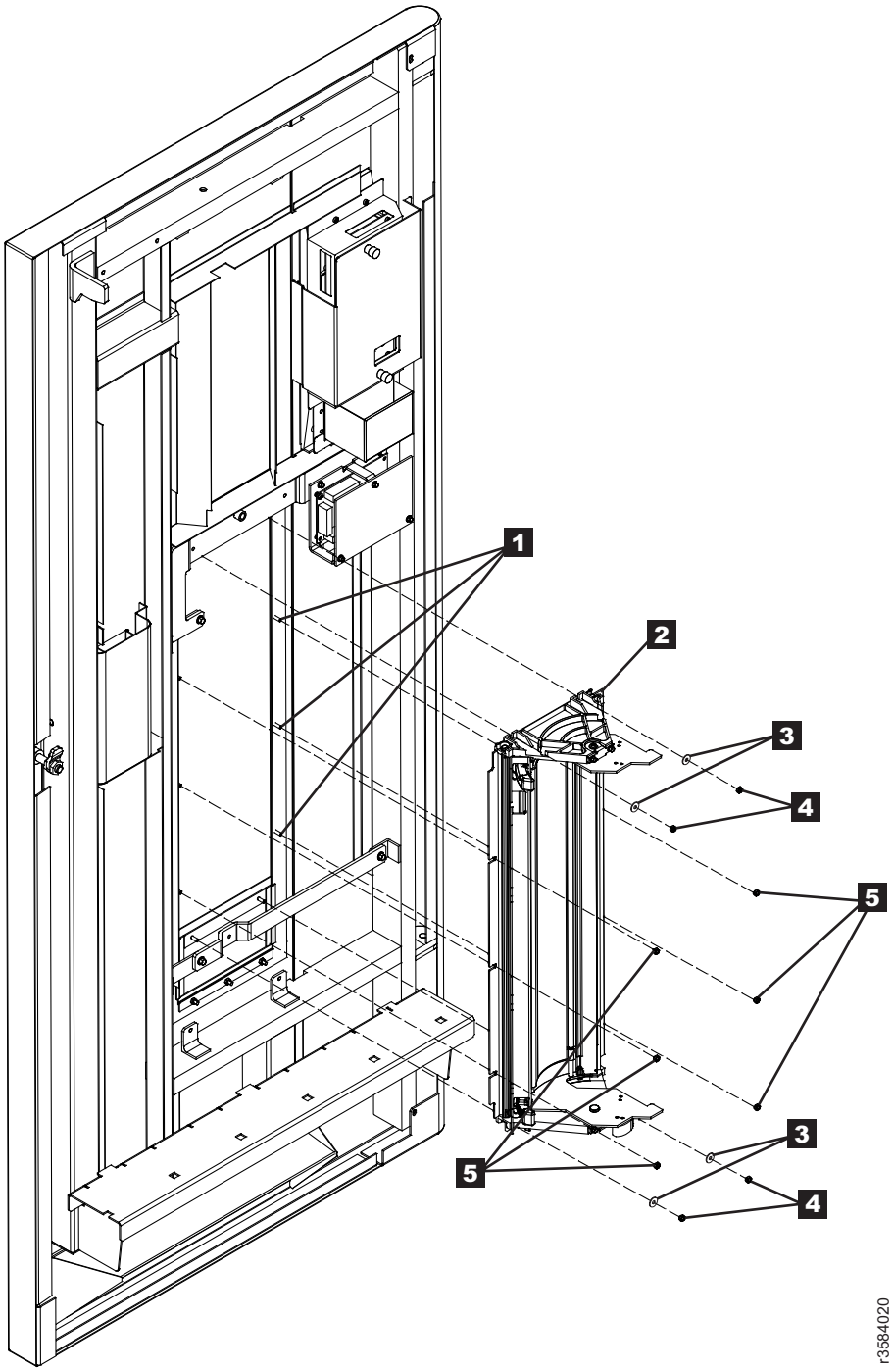


Figure 342. I/O Station Door Mounting

I/O Station Door Locked Solenoid (L32)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Pause the Library by pressing the [PAUSE] button on the operator panel.
2. Refer to Figure 253 on page 853 and remove the connector 1 at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure. **Note:** The operator panel will go dark, as power has been removed.

L32 Only:

3. Refer to Figure 343 on page 969. Remove the screw 6 that holds the Door Locked sensor 4 to the Door Solenoid mounting bracket. It will hang loose for now, and will be reinstalled later.

   Note: When you replace these wires, make sure that they are put back the same way they were removed. The wires should be marked with numbers that match the connectors that they go on.
4. Remove the two twisted-pair wire connectors 1 (a pair of yellow and a pair of black) from the solenoid 3.
5. Remove the two screws 2 holding the door locked solenoid bracket to the front door to remove this assembly.

3592 Lower I/O Station in L32 Only:

1. Remove the I/O station. See “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962 and Figure 340 on page 963.
2. See Figure 344 on page 970.
3. Remove the two wires 1 from the solenoid 2.
4. Disconnect the cable from the Door Locked Sensor 3.
5. Remove the mounting screws from the side of the solenoid.

Replacement Procedure

1. Reverse the removal procedure.

L32 Only:

2. Ensure that the I/O station door locked solenoid flag 7 will move within the slot of the I/O station door locked sensor 4 when the solenoid is active (door locked). To check, close the I/O station door and manually move the solenoid flag **down**, simulating a locked position. Also, ensure the solenoid locking plunger 8 fits into the locking cavity 9 without binding. Return the solenoid flag to the **up** position. It should detent into the locked sensor slot without making contact with the sensor. Adjust the sensor, as needed.
3. **Note:** When the operator panel top connector is connected, the card will power up and go through its POST process. Wait until this process is completed before you continue.
4. Close the front door and wait for the frame inventory to complete.
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

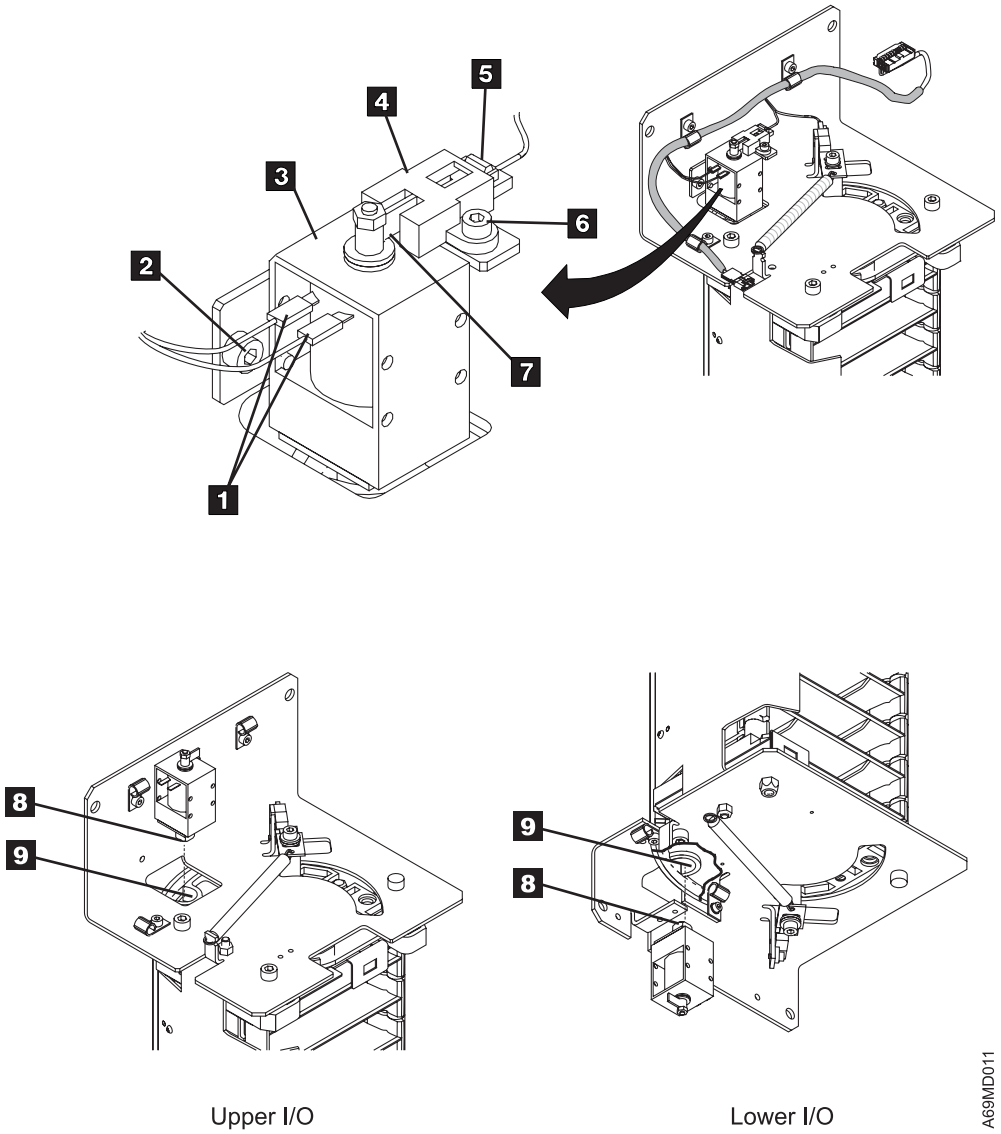


Figure 343. I/O Station Locked Solenoid (L32 Only)

3592 Lower I/O Station in L32 Only – See next page

3592 Lower I/O Station in L32 Only:

1. See Figure 344.
2. Mount the solenoid using the two mounting screws.
3. Reconnect the two wires **1** to the solenoid.
4. Reconnect the cable to the Door Locked Sensor **3** .
5. Pull the solenoid flag up (in the unlocked position).
6. Reinstall the I/O station assembly.
7. **Note:** When the operator panel top connector is connected, the card will power up and go through its POST process. Wait until this process is completed before you continue.
8. Close the front door and wait for the frame inventory to complete.
9. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
10. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

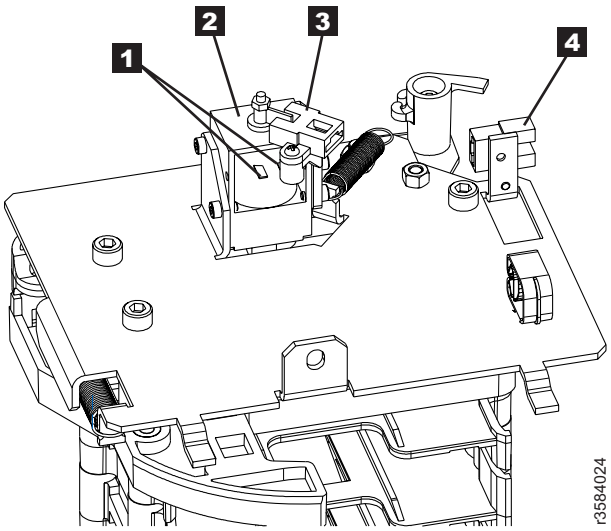


Figure 344. Lower I/O Station Locked Solenoid (3592 in L32 Only)

I/O Station Door Open Sensor

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Pause the Library by pressing the [PAUSE] button on the operator panel.
2. Refer to Figure 253 on page 853 and remove the connector **1** at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure.
3. Remove the connector to the I/O door closed sensor **3** .
4. Remove the screw **4** to remove the sensor **2** .

Replacement Procedure

1. Reverse the removal procedure.
2. Adjust the sensor **2** so that the flag **1** is positioned midway in the sensor slot, and does not contact the sensor when the door is closed.
3. Close the front door.
4. Close the base frame front door and wait for the frame inventory to finish.
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

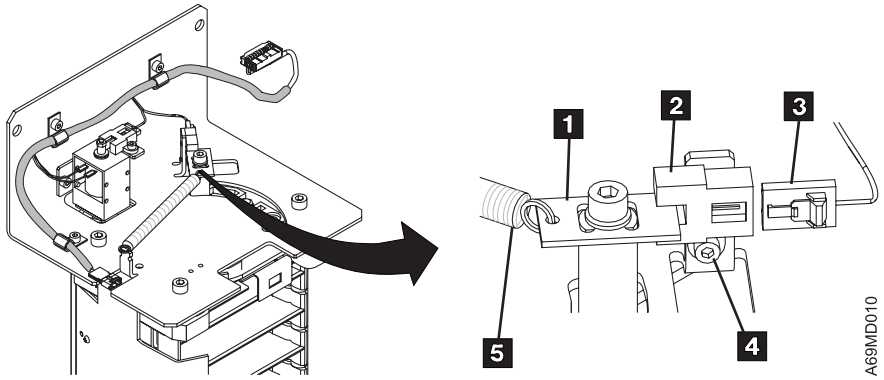


Figure 345. I/O Station Door Sensor

I/O Station Door Locked Solenoid and Sensor (L32, L22, L23, L52, L53)

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure
L32 Only:

1. Pause the Library by pressing the [PAUSE] button on the operator panel.
2. Refer to Figure 253 on page 853 and remove the connector **1** at the top of the Operator Panel. This cable goes to the FIC card and must be removed before you unplug other cables as part of the removal/replace procedure.
3. See Figure 346 on page 975.
4. Remove the connector **5** from the I/O door sensor **4**.
5. Remove the screw **6** to remove the sensor **4**.

L22/L23/L52/L53 Only:

1. Remove the I/O station. See “I/O Station, Lower (L32, L22, L23, L52, L53)” on page 962 and Figure 340 on page 963.
2. See Figure 347 on page 977.
3. Remove the two wires from the solenoid **8**.
4. Disconnect the cable from the Door Locked Sensor **5**.
5. Remove the solenoid mounting screws **3** and washers **2**.
6. Remove the Door Locked Sensor **5** by removing two screws **7**.

Replacement Procedure
L32 Only:

1. Reverse the removal procedure.
2. Adjust the sensor so that the flag **7** is positioned midway in the sensor slot, and does not contact the sensor when the door is locked.
3. Close the front door.
4. Close the base frame front door and wait for the frame inventory to finish.
5. Perform the “Library Verify Test” on page 759, with **no drives** selected.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

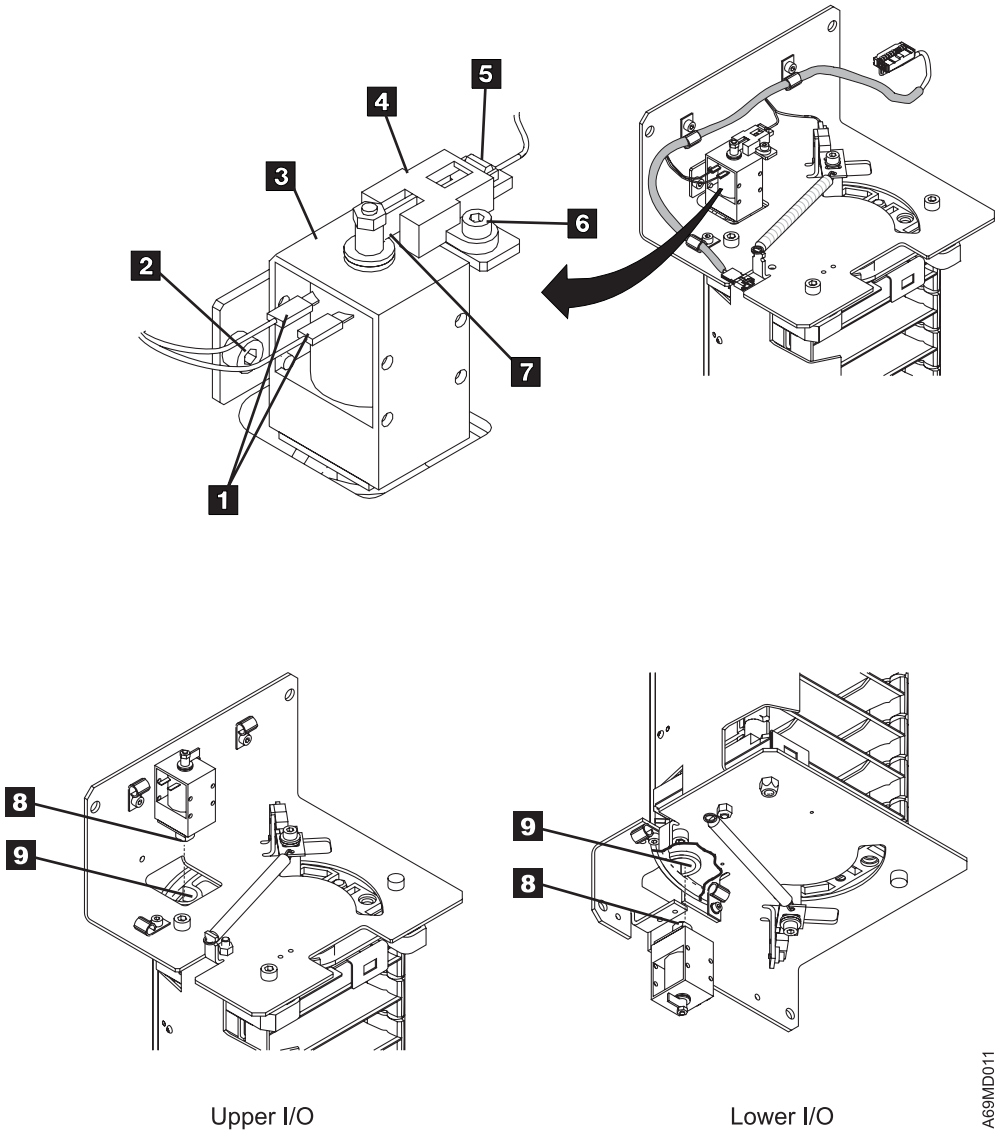


Figure 346. I/O Station Door Solenoid Sensor (L32 Only)

L22/L23/L52/L53 – See next page

L22/L23/L52/L53 Only:

1. See Figure 347 on page 977.
2. Mount the Door Locked Sensor on the new solenoid.
3. Mount the solenoid on the I/O door, but leave the solenoid mounting screws **3** loose for now.
4. Close the I/O door and push the flag on the solenoid **8** down to lock the door.
5. Adjust the solenoid for a 1mm (+/- .5mm) gap **1** between the plunger and the door handle. Then tighten the solenoid mounting screws securely.
6. Reconnect the cable to the Door Locked Sensor **5** .
7. Pull the solenoid flag up (in the unlocked position).
8. Reconnect the two wires to the solenoid **8** .
9. Reinstall the I/O station assembly.
10. **Note:** When the operator panel top connector is connected, the card will power up and go through its POST process. Wait until this process is completed before you continue.
11. Close the front door and wait for the frame inventory to complete.
12. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
13. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

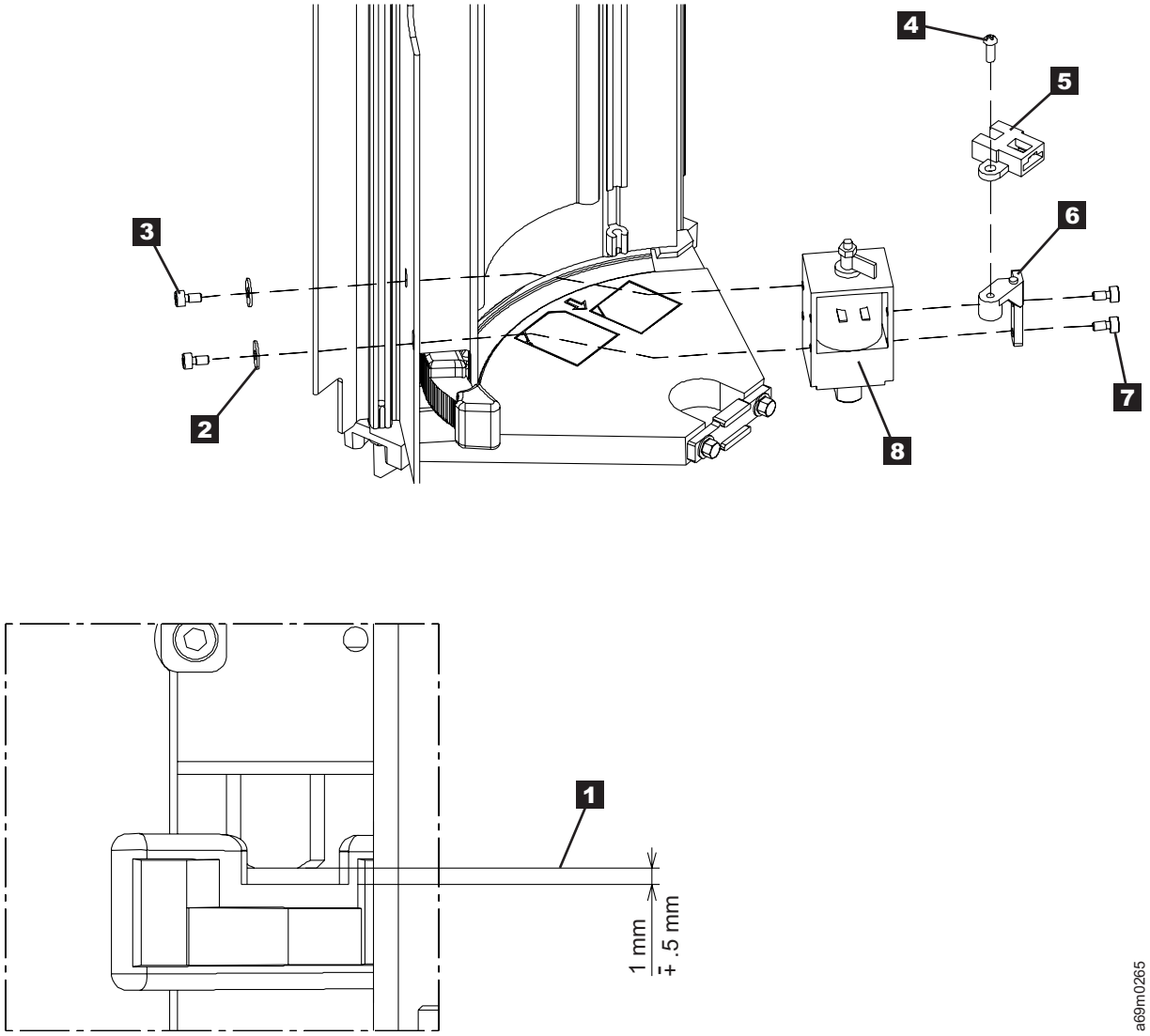


Figure 347. I/O Station Locked Solenoid (L22/L52 Only)

Gate and Spring Assembly (High Density Frames)

Before you begin...

Spring Hook Tool PN 45E2050 is required for this procedure. Safety glasses PN 45E6227, included in the Sx4 ship group, MUST be worn when performing these procedures. See the Caution statement in Step 5 below!

The purpose of this procedure is to remove and replace a defective gate and spring assembly from an S24 (3592) or S54 (LTO) frame. The old assembly is removed by using the special heavy-duty spring hook to bend open two tabs that hold the assembly in the HD slot.

Both 3592 and LTO assemblies are removed and installed using the same basic procedures. The Figures below may only show one gate/spring type. The 3592 and LTO gate/spring part numbers are different. The 3592 gate/spring hooks to the right of the cell, and LTO gate/spring hooks to the left of the cell.

Removal Procedure

1. Take the HD slot offline by selecting Menu, Service, Tests/Tools, Tools, Manage Storage Slots, All HD Slots. Select the cell then select 'Set HD Slot Offline.'
2. Pause the library and open the frame door where the gate and spring assembly will be replaced.
3. Remove any cartridges from the cell and give them to the customer for later insertion into the library via the I/O station.

   Note: 3592 latch assemblies clamp into the cell on the right-hand side. LTO latch assemblies clamp into the cell on the left-hand side. The following figures may only show one type of gate and spring assembly, however both are removed and installed using the same procedures.
4. See **Figure 348** (LTO shown). Insert the spring hook tool and pry-open (in the direction shown) to bend both the upper and the lower retaining tabs.
5. See **Figure 349**. Remove the gate and spring assembly by pulling it forward and out of the HD slot. **Caution:** Do not pull the spring all the way out of either the new **or** the old assembly, because the end of the spring is not secured to the housing and injury can result when the end of the spring comes off the gate/spring assembly.



Figure 348. Prying Cell Out (LTO shown)

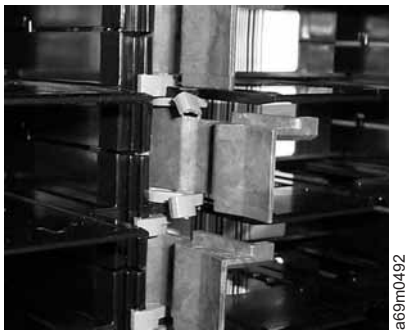


Figure 349. Gate and Spring Asm Disengaged from Cell (LTO shown)

Replacement Procedure

1. See **Figure 350** (LTO) and **Figure 351** (3592). Each storage cell has a **slot** **1** for the gate and spring assembly **tab**. See **Figure 352** (LTO) and **Figure 353** (3592). Each gate and spring assembly has a **tab** **2** that must go into this slot as you install the new assembly.
2. See **Figure 354 on page 980** (LTO shown). Pull the spring out slightly as you slide the new gate and spring assembly into the HD slot holding the gate and spring assembly at a slight angle to guide the **tab** on the gate and spring assembly into the **slot** in the HD slot.
3. See **Figure 355 on page 980** (LTO shown). Insert the HD slot tool into the slot and push it firmly against the retaining tabs to snap each tab in place.
4. Manually insert a cartridge or two to ensure the gate and spring assembly is properly installed.
5. Close the frame door. Use Step 1 in the Removal Procedure to place the HD slot online.
6. Run library verify to test the new cell.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

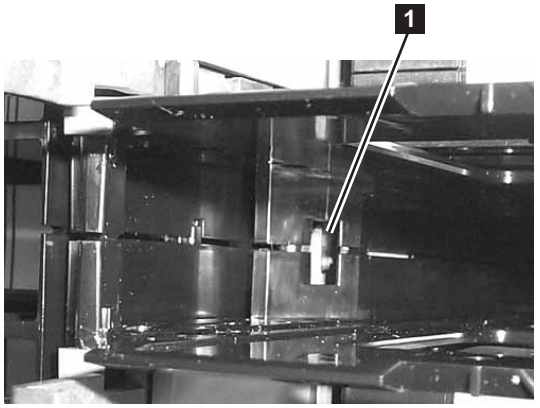


Figure 350. Cell Locating Tab (LTO shown)

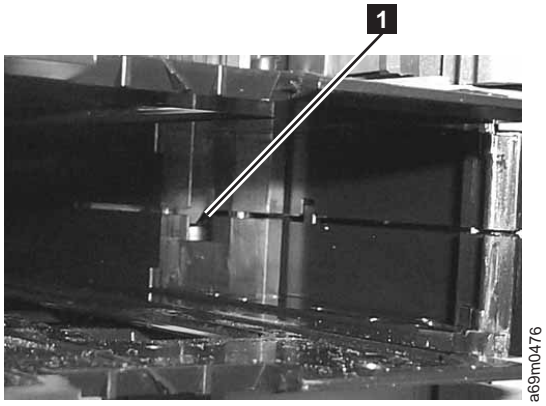


Figure 351. Cell Locating Tab (3592 shown)

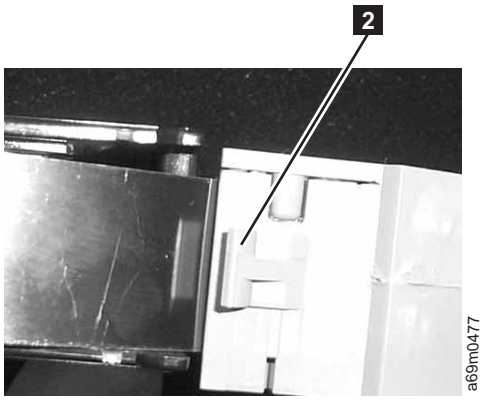


Figure 352. Tab on Spring Asm (LTO shown)

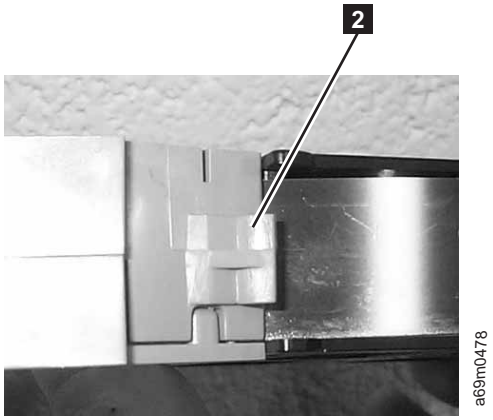


Figure 353. Tab on Spring Asm (3592 shown)

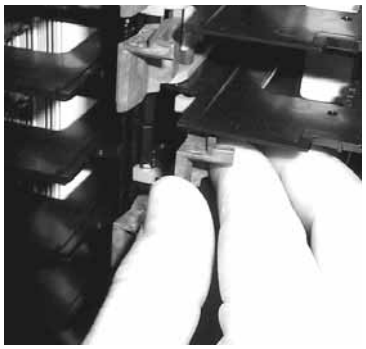


Figure 354. Inserting Tab into Slot (LTO shown)

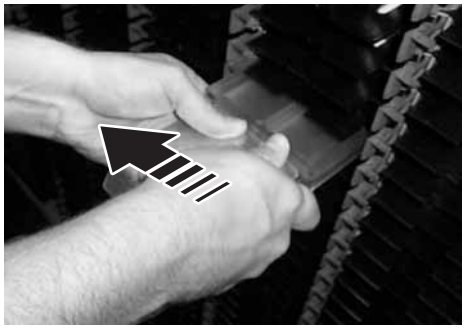


Figure 355. Snapping New Spring in Place (LTO shown)

HD Slot Removal and Replacement

Before you begin...

The purpose of this procedure is to remove and replace a defective or broken HD slot from an S24 (3592) or S54 (LTO) frame.

Both 3592 and LTO HD slots are removed and installed using the same basic procedures. The Figures below show LTO. The main difference is the 3592 gate/spring hooks to the right of the cell, and LTO gate/spring hooks to the left of the cell.

When removing 3592 HD slots the entire stack must be pulled out much further to allow removal of the upper cell and gate/spring assembly.

Removal Procedure

__ 1. Use the Web User Interface to take the cells in the row offline. Select **Service** -> **Manage Storage Slots**. Select the frame. In the 'Select Action' dropdown menu select **Set Offline**. Select the 'Frame,' 'Column,' and 'Row' (All Rows) and click **Apply**.

__ 2. Pause the library and open the frame door where the HD slot will be replaced.

__ 3. The entire column of data cartridges must be removed before you continue. See **Figure 356 on page 983.** Starting at the top of the column, use one hand to release the spring/gate **1** slightly to allow the first cartridge to be released into your other hand. Allow the spring/gate to retract before first cartridge is fully removed. **Note:** Failing to release the spring gate before each cartridge is fully removed will cause other cartridges in the cell to fly out and possibly damage the media. Give the media to the customer.

__ 4. See **Figure 357 on page 983.** Remove the column springs at both the front and rear of the cell stack by squeezing and removing the spring as shown. **Note:** In the next step, if removing a 3592 stack, you must pull the entire stack out far enough to enable you to first remove the upper slot and upper gate/spring assembly. This provides enough room to remove the stack before you continue.

__ 5. See **Figure 358 on page 983.** Insert the HD slot tool, with the fingers pointing up, below the cell stack at the bottom then push down on the tool (as shown by the arrow) to release the stack from the firewall and pulling it back slightly.

__ 6. See **Figure 359 on page 983.** Support the cell stack with one hand then pull the entire column out slightly using your other hand.

__ 7. See **Figure 360 on page 984** and **Figure 361 on page 984.** Grab the cell stack at the top and at the bottom (above the defective cell) then lift up (to separate the stack). Remove the gate and spring assembly then pull out to remove the stack from the frame.

__ 8. See **Figure 362 on page 984.** Remove the gate and spring assembly **1** from the cell, then remove the defective cell **2** .

Replacement Procedure

__ 1. Install the new cell, then reinstall the removed cell stack on top of the entire stack. **Note:** If this is a 3592 stack, reinstall the top cell.

__ 2. See **Figure 363 on page 984.** The cell stack must be positioned on the locating studs **1** . **Figure 364 on page 984** shows rear cells properly aligned. Ensure the cells are aligned vertically at both the front and rear.

__ 3. Reinstall the entire stack by supporting the it with one hand while lifting up at the bottom, pushing it in towards the firewall, then setting it down in place. Ensure the cells line-up horizontally with cells in adjacent columns.

__ 4. Reinstall column springs at the front and rear.

__ 5. See **“Gate and Spring Assembly (High Density Frames)” on page 978** to reinstall the gate and spring assemblies. **Note:** A 3592 stack requires reinstallation of two gate/spring assemblies, one at the top and one at the replaced cell. **Then return here.**

__ 6. Close the front door.

__ 7. Use the Web User Interface to put the cells in the row online. Select **Service** -> **Manage Storage Slots**. Select the frame. In the 'Select Action' dropdown menu select **Set Online**. Select the 'Frame,' 'Column,' and 'Row' (All Rows) and click **Apply**.

__ 8. Reset HD slot usage counts through the operator panel by selecting Menu, Service, Tests/Tools, Tools, Manage Storage Slots, All HD Slots. Select the HD slot just replaced then select 'Reset HD Slot Counts.' **Note:** The HD slot usage counter will automatically roll over to zero after the counter reaches 131,072.

__ 9. Have the customer reinsert the media back into the library using the I/O station.

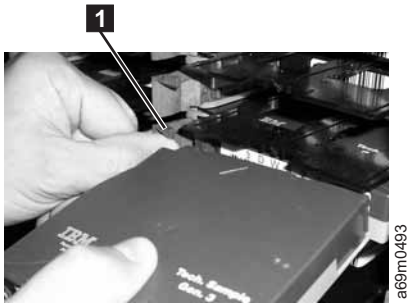


Figure 356. Removing Data Cartridge (LTO shown)

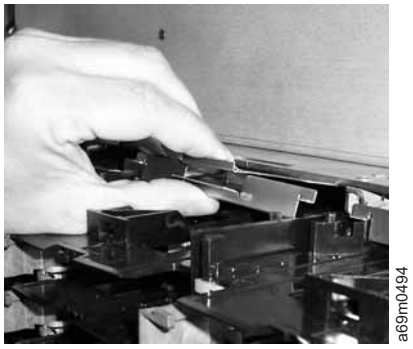


Figure 357. Removing Column Spring (LTO shown)

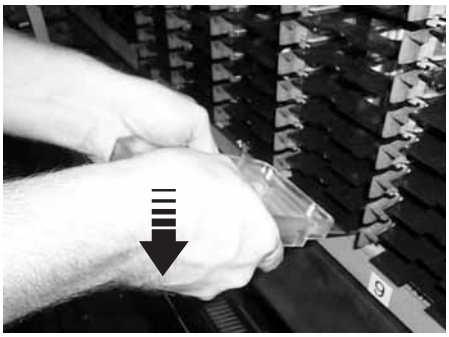


Figure 358. Prying Up Column Stack (LTO shown)



Figure 359. Prying Stack Out (LTO shown)

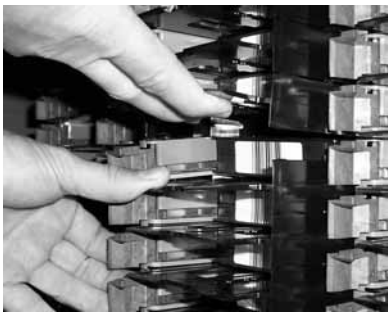


Figure 360. Separating Stack (LTO shown)

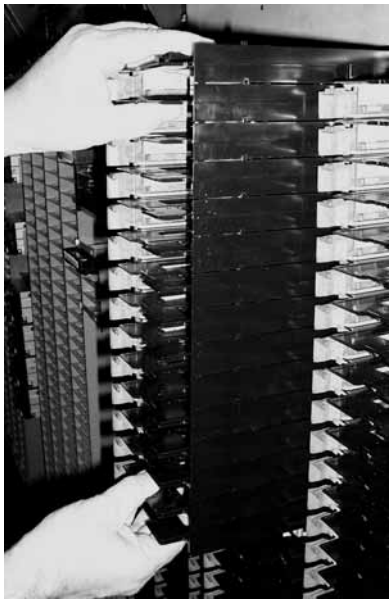


Figure 361. Lifting Cell Stack Out (LTO shown)

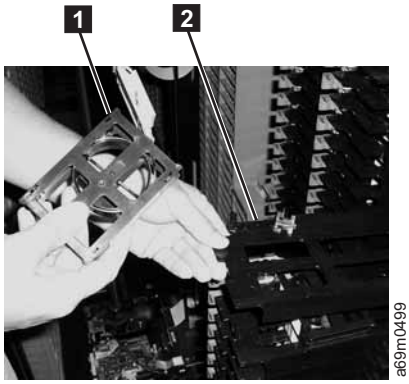


Figure 362. Remove Gate/Spring Assembly & Single Cell (LTO shown)

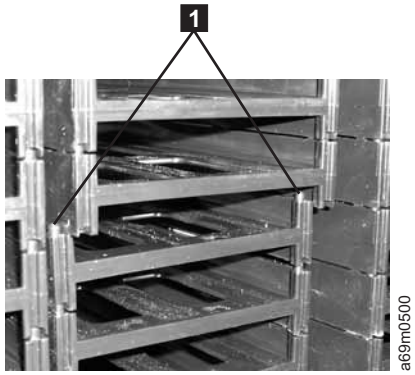


Figure 363. Cell Stack Rear Shown Misaligned



Figure 364. Cell Stack Rear Shown Aligned

Pivot Assembly

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the dual gripper assembly. Refer to “Gripper Asm, Dual, LTO/LTO, LTO/3592 (Universal), & HD” on page 952.
3. Unplug the cables from the pivot assembly at the ACC card.
4. Remove the two screws to remove the Y-axis flex cable from the pivot assembly.

   Note: In the next step, when removing screws **2**, hold the pivot assembly to prevent it from falling free.
5. Remove the screws **2** to remove the pivot assembly **1** from the Y-axis assembly.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform the “Library Verify Test” on page 759.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

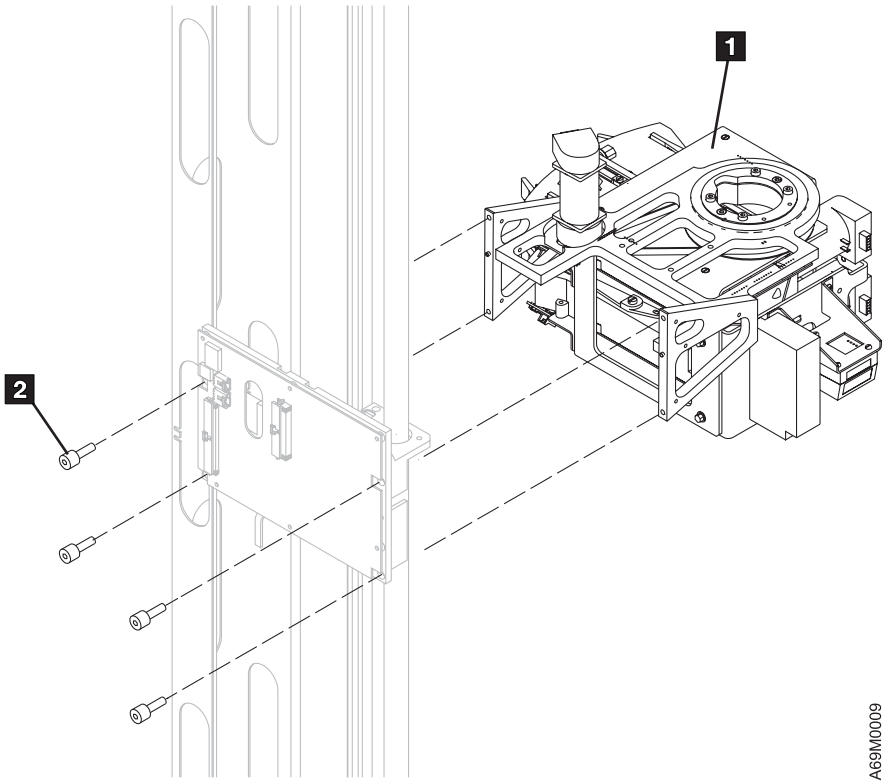


Figure 365. Pivot Assembly

Pivot Belt and Motor Assembly

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: New style pivot motor assemblies include a captured pivot belt. These older style pivot motors and belts are separate FRUs.

Warning!

This procedure involves removing a highly-tensioned spring. Safety glasses **MUST** be worn during this procedure. Keep your face away from the direct path of the spring tension in the event it slips off the long-nosed plier. A flashlight is also recommended.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the Dual Gripper Assembly (see “Gripper Asm, Dual, LTO/LTO, LTO/3592 (Universal), & HD” on page 952).
3. Disconnect the motor cable connector at the ACC card.
4. See **Figure 366 on page 989** or **Figure 368 on page 989** which show pivot assemblies with and without a captured belt.
5. Use a long-nose plier (instead of a spring hook) to remove the belt tension spring **3** by firmly grabbing one of the turns on the spring near the loop that hooks onto the stud closest to the gripper assembly.
6. Loosen belt tension plate screws **2** .
7. Remove the pivot belt **1** .

Replacement Procedure (New style pivot with a captured belt)

1. See **Figure 366 on page 989**. (**Figure 367 on page 989** shows the HD gripper pivot).
2. Reverse the removal procedure.
3. Adjust the motor belt tension. Loosen two screws **2** one turn.
4. Reinstall the belt tension spring **3** by firmly grabbing one of the turns on the spring near the hook on the spring.
5. Rotate the pivot **1** to seat the belt into the ring gear teeth.
6. Tighten the two screws **2** securely.
7. Close the front door.
8. Complete the accessor servicing (see “Service Procedures” on page 790).
9. Perform the “Library Verify Test” on page 759.
10. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Replacement Procedure (Old style pivot)

1. See Figure 368 on page 989. Reverse the removal procedure.
2. Reinstall the belt tension spring **3** by firmly grabbing one of the turns on the spring near the hook on the spring.
3. Rotate the pivot **1** to seat the belt into the ring gear teeth.
4. Tighten the two screws **2** securely.
5. Close the front door.
6. Complete the accessor servicing (see “Service Procedures” on page 790).
7. Perform the “Library Verify Test” on page 759.
8. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

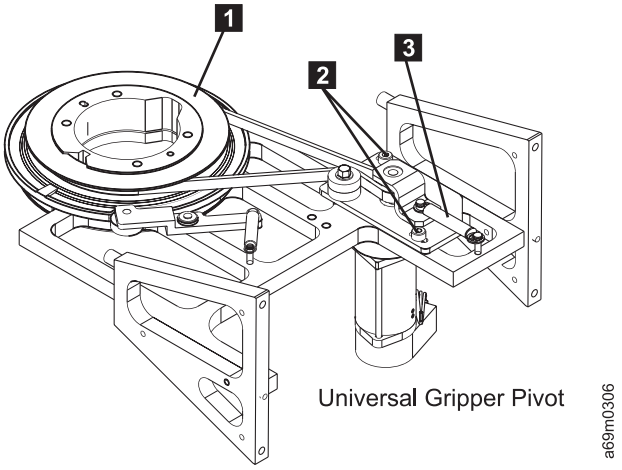


Figure 366. Pivot Belt – New Style. (Used on Universal Grippers)

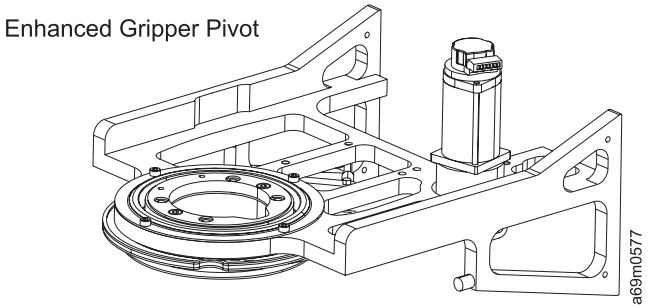


Figure 367. HD Gripper Pivot. (Used on HD Grippers)

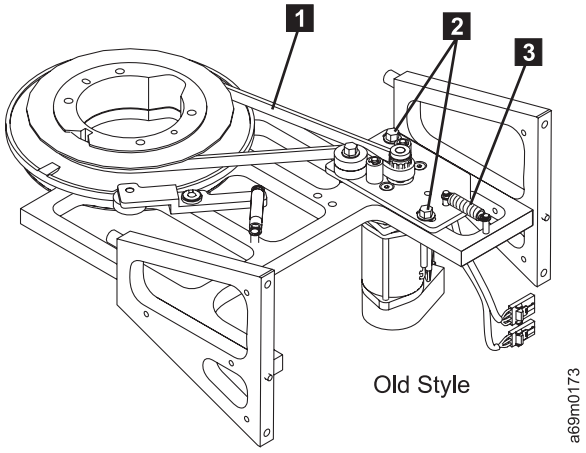


Figure 368. Pivot Belt – Old Style. Old style viewed from bottom)

Pivot Detent Arm and Spring

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the Dual Gripper Assembly (see “Gripper Asm, Dual, LTO/LTO, LTO/3592 (Universal), & HD” on page 952).
3. Remove the detent arm spring **3**.
4. Remove the detent arm C-clip **2**.
5. Remove the detent arm **1**.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform the “Library Verify Test” on page 759.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

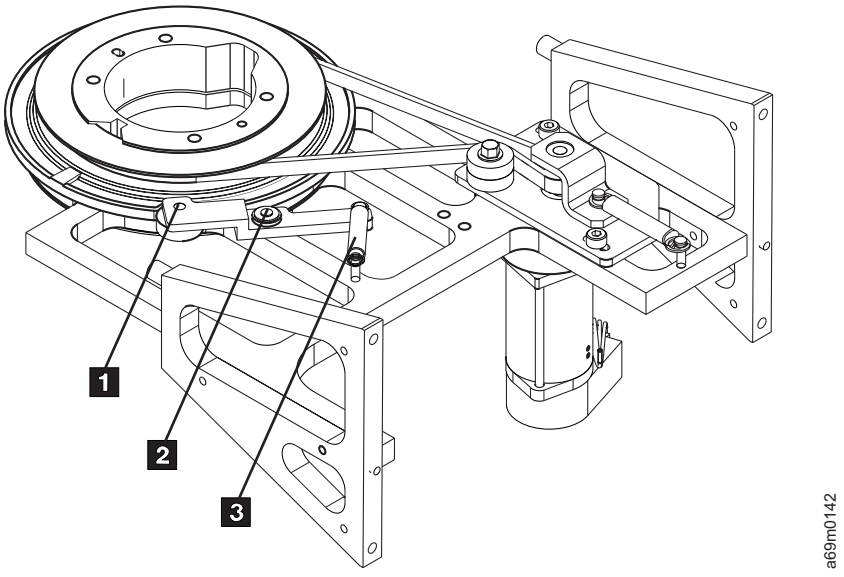


Figure 369. Pivot Detent Arm and Spring. (New style - viewed from bottom)

Pivot Flex Cable

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure
1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the two screws **1** to disconnect the cable connector from the PDC card on the pivot assembly.

   Note: The cable connector has a locking tab.
3. Disconnect the cable connector from the ACC card.
4. Remove two screws **2**.
5. See Figure 371. Remove two screws **1**. The bracket **2**, Y-cable **3**, and plate **4** will come loose. Make careful note of the positions of the bracket, cable, and plate for reinstallation later. The angle cut on the plate must match the angle of the Y-cable fold.

Note:

Replacement Procedure
1. Reverse the removal procedure. **Note:** Support the PDC card from below while re-plugging the cable on the pivot assembly.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform the “Library Verify Test” on page 759.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

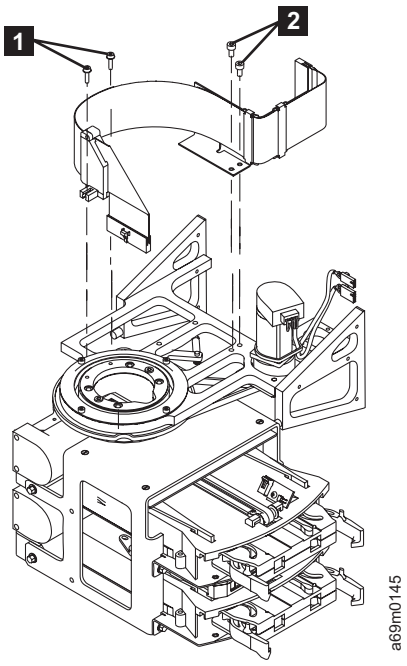


Figure 370. Pivot Flex Cable

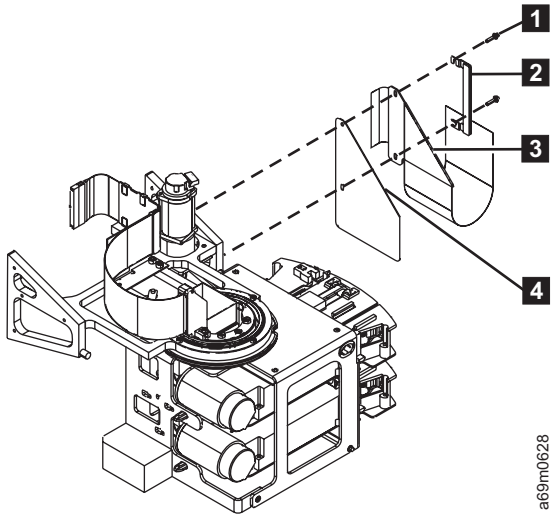


Figure 371. Y-Cable, Bracket & Plate

Power Supply, 37 V dc (x32, x22, x52 only)

Note: This section only applies to replacing the 37 V dc power supply in x32, x22, x52 frames. In new style x23 and x53 frames, the 37 V dc power supply is part of the BPC. See “Bulk Power Card Assembly (BPC) (x23 / x53 Frames Only)” on page 942 for removal and replacement information.

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Attention: Before you continue, see “37 V dc Power Supply (x32, x22, x52 only)” on page 805 for important information on how library firmware controls turning on and off 37 V dc power supplies.

The 37 V dc power supply supplies DC voltages to the library and is located within the frame control assembly (FCA). The 37 V dc supplies are 'hot pluggable.' **See page 995** for a list of how 37 V dc is distributed in the library. Also see **“37 V dc Distribution in an HA1 Library” on page 807** for information on where 37 V dc power supplies must be installed in an HA library to ensure full redundancy for both accessors.

Removal Procedure

1. If you have at least one functioning 37 V dc power supply, you can remove any failing supply without affecting the library operations (hot pluggable). In a dual-accessor library, you must have at least **two** good 37 V dc power supplies before you can remove any failing supply without affecting the library operations.
2. Loosen the knurled screw **3** that secures the failing 37 V dc power supply **1** (PS#1) or **2** (PS#2).
3. Pull the 37 V dc power supply out of the FCA.

Replacement Procedure

1. Reverse the removal procedure.
2. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

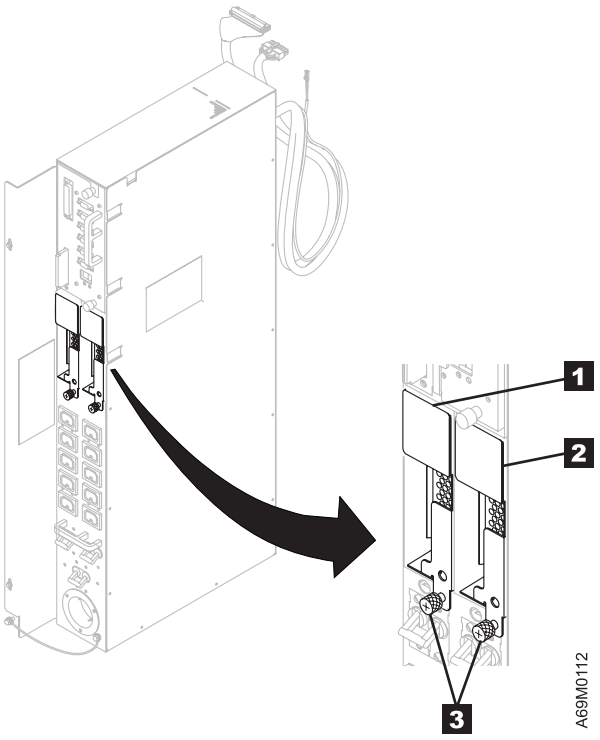


Figure 372. 37 V dc Power Supply

37 V dc distribution throughout the 3584 Library

Note: There are five 37V buses used in the library as follows:

- 37A - Accessor A Motor Voltage
- 37B - Accessor B Motor Voltage
- 37C - Accessor A Logic Voltage
- 37D - Accessor B Logic Voltage
- 37E - Op Panel Logic Voltage

If a library door is opened the 37A and 37B voltage buses are disabled. This removes the 37V from the Accessor A and Accessor B motors. Motor encoders use logic power.

Power Switch and Cable Assembly

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Ask the customer to vary the library offline to **ALL** attached controllers and hosts.
2. Power off (O) the library.

   Note: With a failure of the power switch, it is likely that library power is already off. Ensure that the switch is in the **off** or **O** position.
3. Open the front and rear doors.

L32 frame only:

4. Refer to Figure 373 on page 997. Disconnect cable connector J22 **5** (in the base frame) that leads to the back of the power switch **7** on Figure 374 on page 998.
5. Remove the cable from the clamps.
6. Refer to Figure 374 on page 998 to remove the three mounting screws **4**.
7. Remove the power switch **5**.

L22 & L52 frames only:

1. Refer to Figure 373 on page 997. Disconnect cable connector J22 **5** (in the base frame) that leads to the back of the power switch **6** on Figure 375 on page 999.
2. Remove the cable from the clamps.
3. See “Operator Panel Assembly (OPC, OPC-CF, OPC+ w/CF)” on page 850 to removed the operator panel from the library.
4. Refer to Figure 375 on page 999 to loosen (but not remove) the two mounting screws **6**.
5. Remove the power switch.

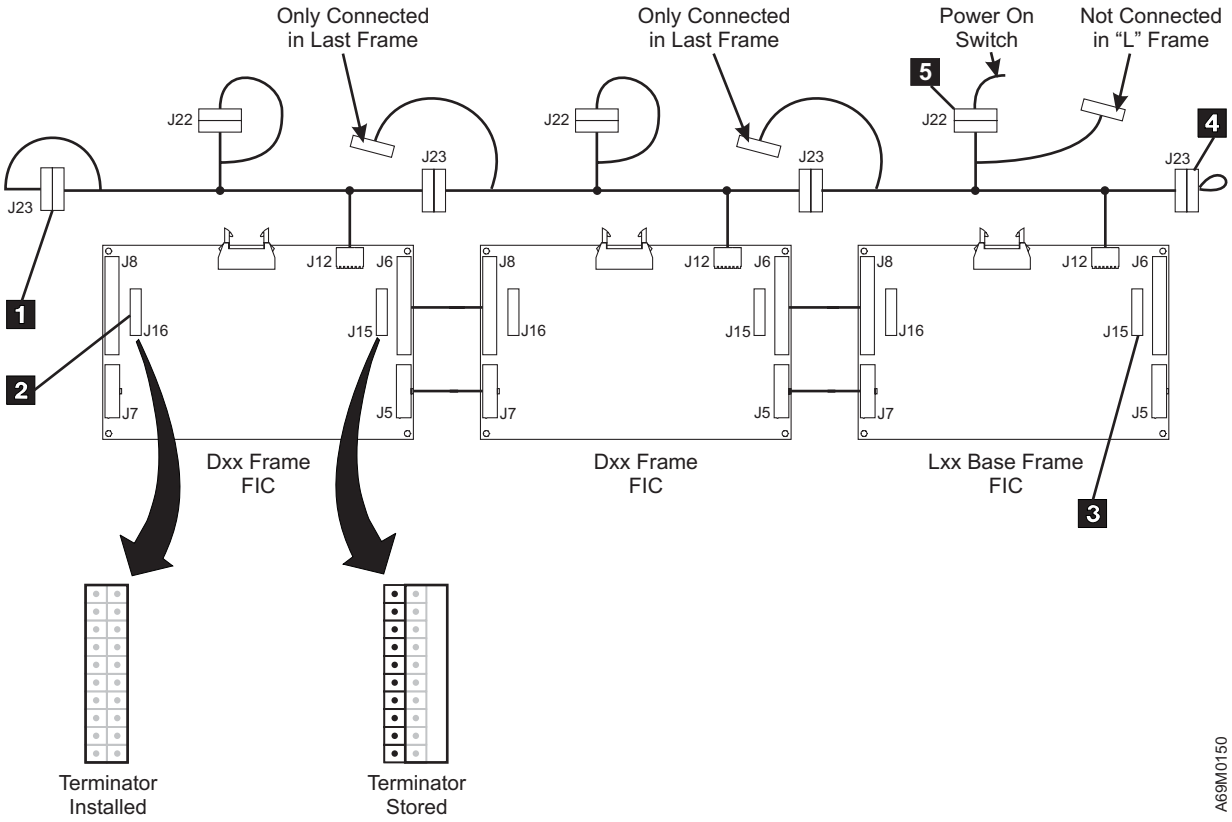


Figure 373. Frame Interconnect Cables

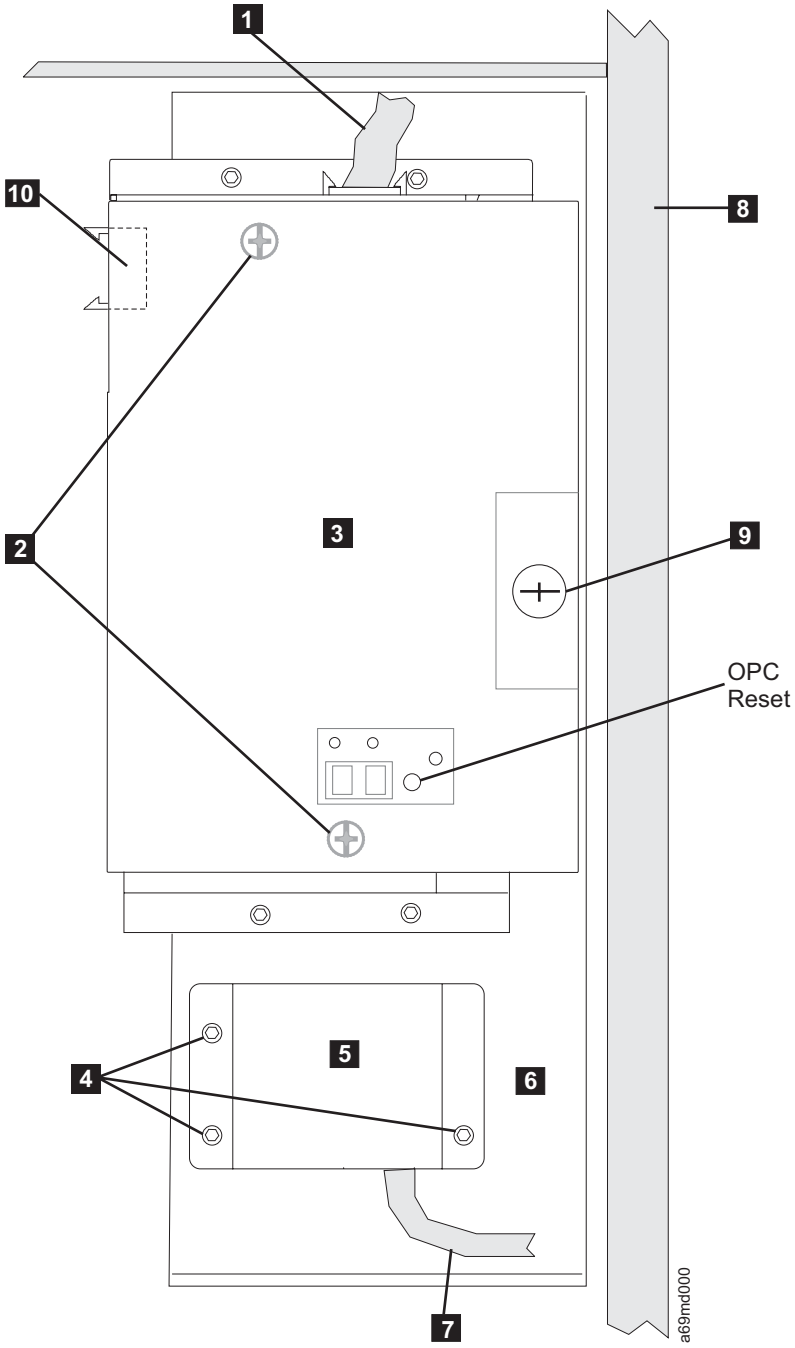


Figure 374. L32 Power Switch and Cable Assembly. (Viewed from rear of operator panel)

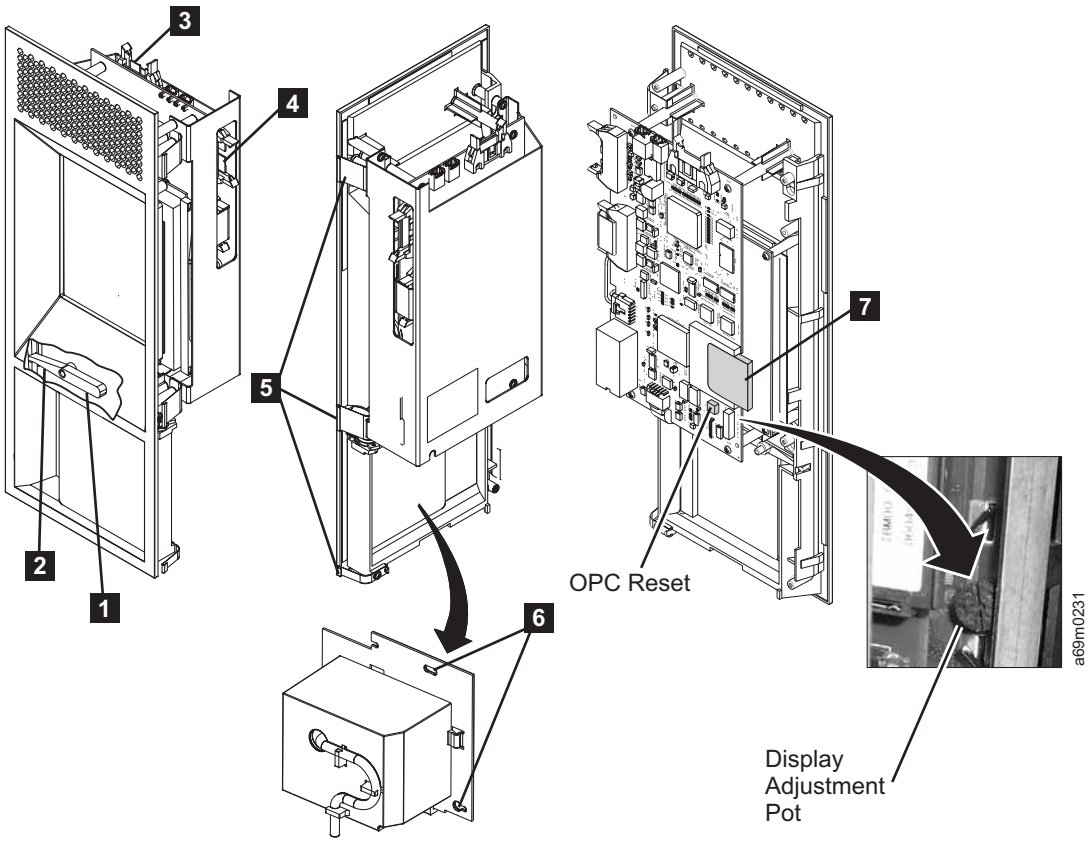


Figure 375. L22/L52 Power Switch and Cable Assembly. (Viewed from rear of operator panel)

Replacement Procedure

1. Reverse the removal procedure.
2. Power on (|) the library.
3. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Storage Slot Section

Before you begin...

Customer's Cartridges: If customer cartridges must be removed, the customer should use the host software to eject the cartridges through the I/O station.

If manual cartridge removal is necessary, refer to "From a Storage Slot" on page 1047.

When the repair procedure is complete, have the customer insert the cartridges through the I/O Station.

Removal Procedure

1. Have the customer remove the cartridges from the storage slot sections that are to be removed.
2. Refer to Figure 376 on page 1001 for the pictorial of a top cell tray **3** and a cartridge cell tray **2**. Each tray is held in place by two tabs **4** on the rear of each tray and by holes in the frame firewall **1**. The spring **5** and the foam pad **6** at the top of the top cell tray applies pressure on the entire cell tray column to keep them in place during normal operation. The portions of Figure 376 on page 1001 marked Front View and Rear View show how the spring must be installed to retain tension on the top tray.
3. **LTO and 3592 Cells**

   If the top cell tray **3** needs to be changed, lift up the spring **5** about 4.8 mm (3/16 in.), taking tension off the spring. Remove the foam pad **6**. Lift the top cell so that its two tabs clear the holding slots in the frame firewall enough to be removed. Gently pull forward to remove the tray.
4. If a cartridge cell tray **2** needs to be changed, remove the top cell tray, and set it aside for now. Next, remove all of the cartridge cell trays above the damaged cartridge cell, one at a time, working from the top to the bottom. Finally, remove the damaged cartridge cell tray **2**.

Replacement Procedure

1. Reverse the removal procedure.
2. See Figure 376 on page 1001. Ensure the cartridge retention finger **9** faces left when reinstalling the cell. 3592 cells have words "THIS SIDE UP" molded into the front edge of the cell.
3. Slide the new storage section into position until it locks into place.
4. If the customer removed cartridges, have the customer insert the cartridges through the I/O Station.
5. Close the front door.
6. Complete the accessor servicing (see "Service Procedures" on page 790).
7. Perform the calibration procedure on the frame you worked on (see "Service Menus" on page 774).
8. Perform the "Library Verify Test" on page 759, using the **no drives** selection.
9. Return to the procedure that sent you here; otherwise, go to "End-of-Call" on page 794.

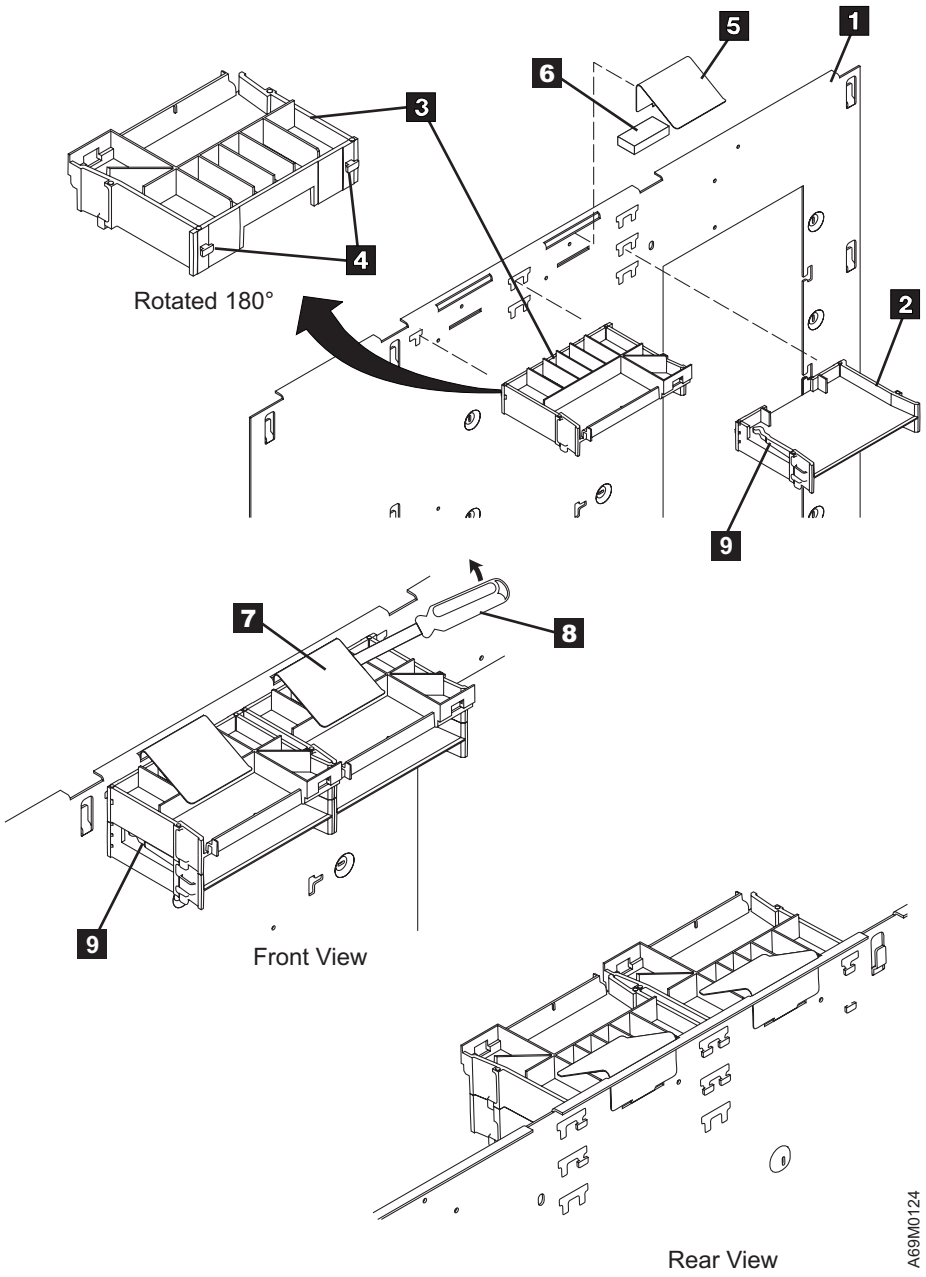


Figure 376. Top Cell Tray and Cartridge Cell Tray

Shuttle Car

Before you begin...

Safety Warning: The shuttle car has large capacitors that are charged from a 37 VDC source. Follow these procedures **very carefully** to ensure the shuttle car and station voltage have been removed before removing the car from the span. Span covers do not have safety interlocks. If library power is removed, the shuttle car capacitors are still charged. The car can move unexpectedly if a move command is issued before the car is placed into service mode. Removing and replacing the shuttle car also requires a ladder. See **"Shuttle Complex (Model SC1) Safety" on page 268**.

Removal Procedure

1. From the TSSC Shuttle complex view, under Connections, click **Execute Command** dropdown box for the connection for the car, and select **Prepare Car for Service**. This will result in:
   - Car is sent to the front-most in the connection (station 1)
   - The beacon LED will 'blink'on' station selected for service, and 'turn on' for all other stations in the connection
   - Power will be removed to the charging pads on all SSC cards in the span
2. If the shuttle car is **unable** to move to station 1, manually locate the shuttle, remove span covers if it is in the middle of a span, and move the discharge switch to the off position for one minute, or until the LED goes out. This ensures the capacitors are discharged. Once capacitors are discharged, remove shuttle car from track by supporting the car while removing the thumbscrew **1** and rollers as shown in **Figure 377 on page 1003**, **Figure 378 on page 1003**, and **Figure 379 on page 1003**.
3. If the shuttle car is **able** to move to station 1, Remove the end cover, and move the discharge switch to the off position for one minute, or until the LED goes out. This ensures the capacitors are discharged. See **Figure 380 on page 1003**. Once capacitors are discharged, remove the screw on the end stop, remove the end stop, then slide the shuttle car off the end of the track.

Replacement Procedure

1. Ensure the power switch on the car is in the OFF position.
2. See **Figure 381 on page 1004**. Install the shuttle car in station 1 in contact with the station brushes. Carefully guide the car onto the rail **1** on either end, ensuring the bottom gear **2** and bearing **3** fits into the groove on the station track.
3. Reinstall the end stop and screw.
4. Move the switch to the ON position.
5. Finish Car for Service. Logs will be offloaded.
6. Backup/Restore of the car configuration is automatically retained by the library. This check is also done each time a car arrives at a station.
7. The TSSC will check the car firmware version and update it if necessary.
8. The TSSC will perform the connection verify routine.
9. Reinstall any removed span covers.
10. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

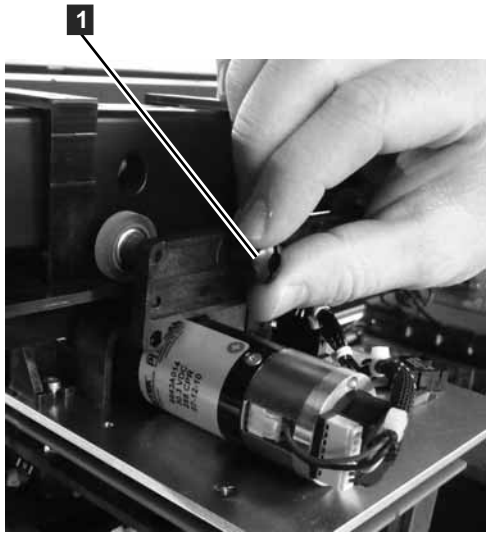


Figure 377. Thumbscrew on Shuttle Car

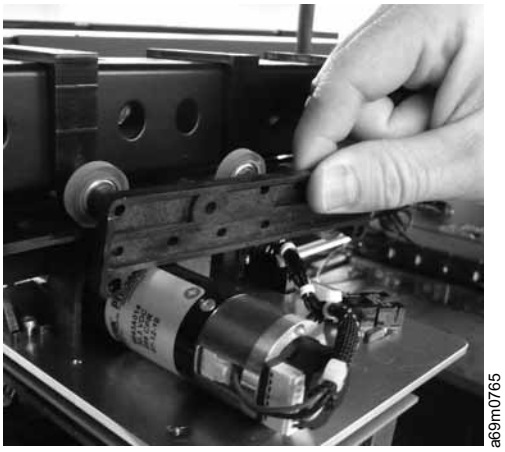


Figure 378. Shuttle Car Rollers Removed

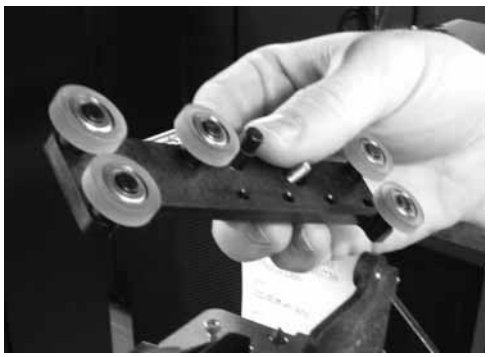


Figure 379. Shuttle Car Rollers

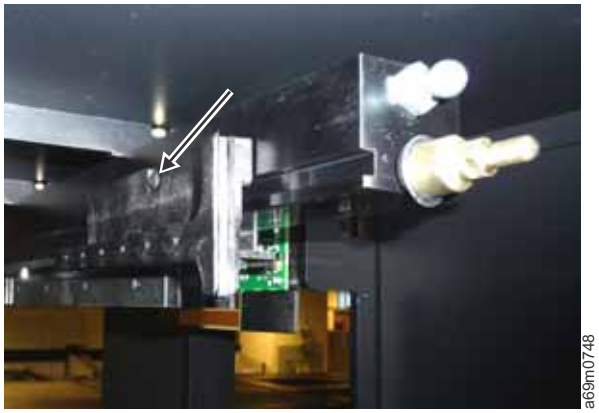


Figure 380. End Stop Screw in Place

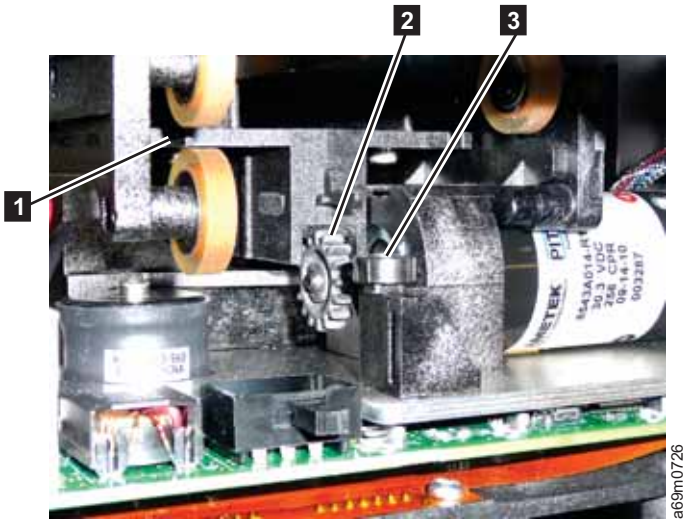


Figure 381. Installing Shuttle Car on Track

Station Management Card (SMC)

Before you begin...

Attention: Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762). Follow all safety procedures when working in this area. Also see **“Shuttle Complex (Model SC1) Safety” on page 268**.

Removal Procedure

1. From the TSSC Shuttle complex view, under Connections, click **Execute Command** dropdown box for the connection for the car, and select **Prepare Station for Service**.
2. Under the **Select System** select the library for the station with the SMC to be serviced.
3. Under **Select Station** select the station (with the SMC to be serviced) to be taken offline and click **Execute** and **OK**.
4. Car will be sent to the station selected for service
5. The beacon LED will blink on station selected for service and turn on for all other stations in connection

   Note: In the following step, removing the FIC connectors also removes power from the Op Panel. When the connector is reconnected later the Op Panel will be reset.
6. See **Figure 382 on page 1007**. Disconnect the cable on the SMC **FIRST** at "J1 FIC" and then "J10 SSC"
7. See **Figure 383 on page 1007**. Remove the cover from the SMC and remove the card from the four standoffs.

Replacement Procedure

1. Install the new SMC by pressing it firmly onto the four standoffs.
2. Reinstall the cover and snap it firmly in place.
3. Reconnect cable "J10 SSC" **FIRST**, the reconnect cable at "J1 FIC"
4. Close the rear door of the frame.
5. Put the station back online. From the TSSC Shuttle complex view, in the Station Commands box, from the **Execute Command** dropdown box, select **Set Station Online**.
6. Under the **Select System** select the library for the station just serviced.
7. Under **Select Station** select the station to put online and click **Execute** and **OK**.
8. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.



Figure 382. SMC Cables

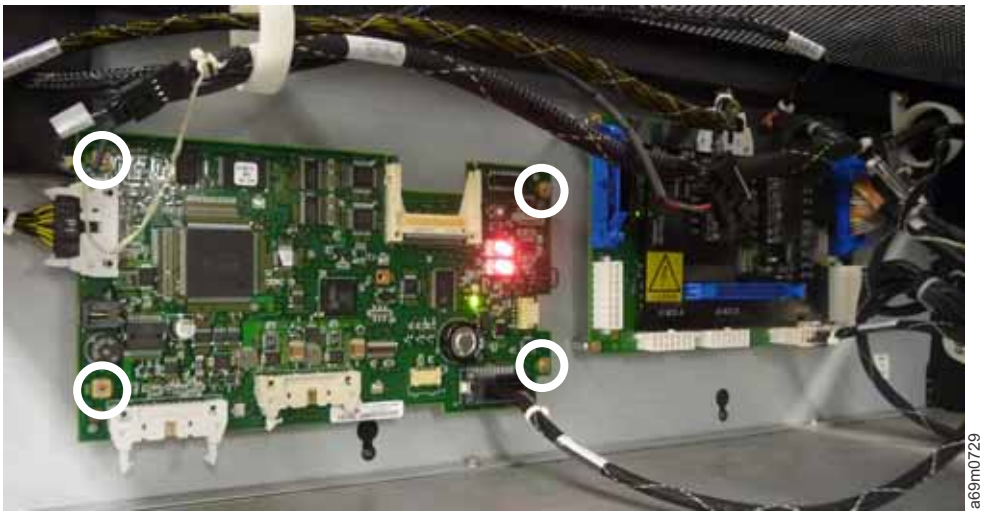


Figure 383. SMC Card with Cover Removed

Shuttle Station Card (SSC)

Before you begin...

Safety Warning: The station card contacts contain a hazardous voltage. Follow these procedures **very carefully** to ensure the station card has been disconnected before attempting to remove it from the station. Span covers do not have a safety interlock. Use correct electrostatic discharge (ESD) procedures when working in areas sensitive to ESD. See “Protecting ESD-Sensitive Parts” on page 762). Removing and replacing the station card also requires a ladder. See **“Shuttle Complex (Model SC1) Safety” on page 268**.

Note:

Removal Procedure

1. From the TSSC Shuttle complex view, in the Station Commands box, from the **Execute Command** dropdown box, select **Set Station Offline**.
2. Under the **Select System** select the library for the station to be serviced.
3. Under **Select Station** select the station to be taken offline and click **Execute** and **OK**.
4. Car will be sent to the station selected for service.
5. The beacon LED will blink on station selected for service and turn on for all other stations in connection.
6. Power will be removed to the charging pads of all SSC cards in the connection.
7. See **Figure 384**. Disconnect the cable **1** at FIC "J3 FCB".
8. Remove the cover at the station to gain access to the station card.
9. See **Figure 385 on page 1009**. Disconnect both cables **1** from the station card.
10. See **Figure 386 on page 1009** . Remove the station card by pressing both retaining clips inward, while pulling the station card down and out of the frame.

Replacement Procedure

1. Install the new station card by following the above procedures in reverse order.
2. Put the station back online. From the TSSC Shuttle complex view, in the Station Commands box, from the **Execute Command** dropdown box, select **Set Station Online**.
3. Under the **Select System** select the library for the station just serviced.
4. Under **Select Station** select the station to put online and click **Execute** and **OK**.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

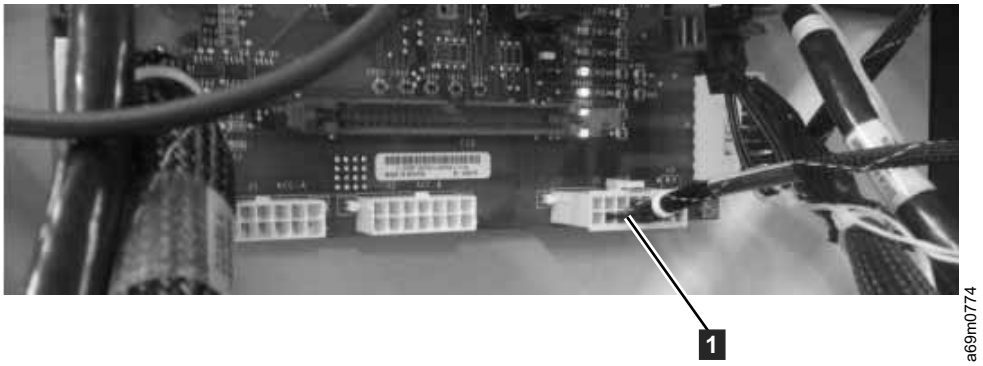


Figure 384. Disconnect FIC J3

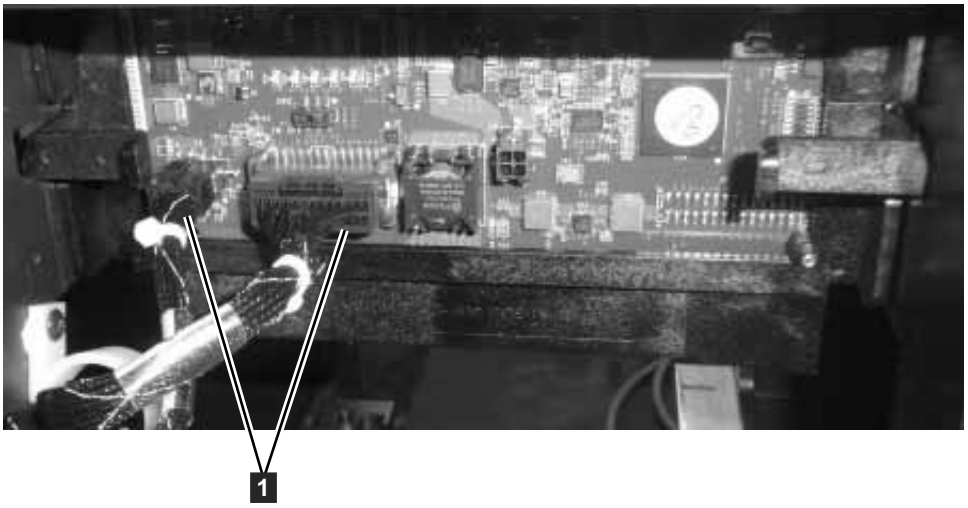


Figure 385. Disconnect Cables from Station Card

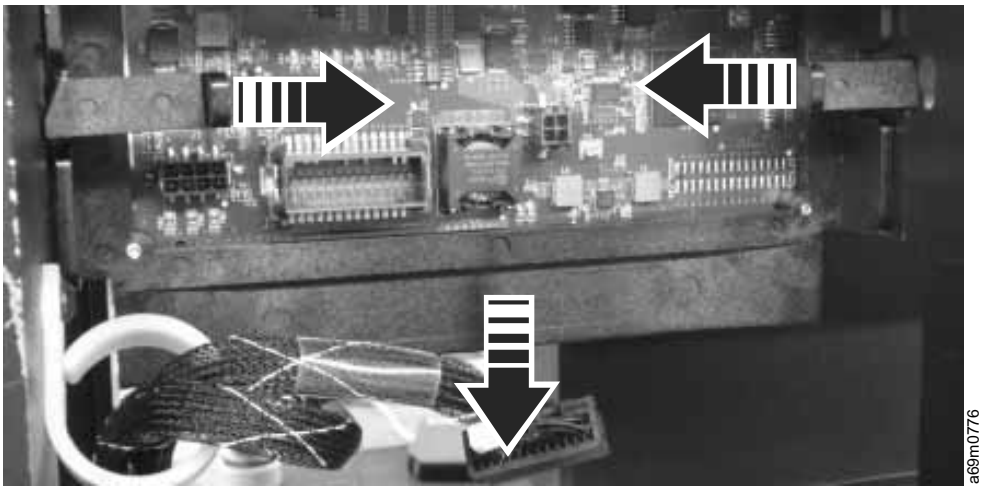


Figure 386. Disconnect Cables from Station Card

X-Axis Assembly

Before you begin...
If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

Please allow approximately 1.5 hours to complete this procedure.

Note: If you are working on a machine with dual accessors you must not swap the A and B accessors. In many cases the A accessor has an X axis assembly that is not capable of functioning as a B accessor.

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the Y-axis mast assembly (see “Y-Axis Mast Assembly” on page 1040).
3. Refer to Figure 387 on page 1011. Remove the screws **3** , and move the AXY card and Y-axis cable trough out of the way.
4. Remove the right side door (the right end window panel).
5. Remove the right side X-axis bumper and bracket assembly **4** .
6. Slide the X-axis assembly to the right — off the end of the X-axis rail.

Note: If you are replacing an **L32 X-Axis assembly** you will receive a new style X-axis assembly (with support for two X-track cables). You will need to perform the following steps:

a. See “AXY Card (X-Axis)” on page 832 to remove the AXY card from the OLD X-axis assembly.
b. Remove the AXY card mounting plate from the OLD X-axis assembly.
c. Remove the AXY card mounting plate from the NEW X-axis assembly. This plate is not needed and can be discarded.
d. Mount the OLD AXY card mounting plate on the NEW X-axis using the screws previously removed.
e. Mount the OLD AXY card on the mounting plate using the screws previously removed.
f. Continue with the replacement procedure that follows.

Replacement Procedure

Note: The new X-axis assembly FRU comes installed on an L-frame X rail. This rail is provided for shipping purposes only. Slide the new X-axis assembly **off** this shipping rail. The shipping rail will not be installed in the library.

1. If you are replacing an X-axis assembly on accessor B, you must remove the lower bumper and upper guide, and reinstall both on the new X-axis assembly before continuing.
2. Install the X-axis assembly onto the X-axis rails.

   Attention: When sliding the X-axis assembly onto the X-rail use a screwdriver to lift the (four) felt wiper pads **5** as they slide onto the guide rods on the top and bottom surfaces of the X-rail. If you do not guide the felt wipers they will be damaged, leading to corrosion of the rail rods.
3. Move the X-axis back and forth to ensure that the cable moves smoothly without binds or interference anywhere along the X-axis rail, and that it is centered in the track. If the X-track cable is rubbing against the cable trough cover, or not centered in the track, do the following:
   a. Remove the trough cover to expose the AXY card.
   b. Loosen the X-track cable mounting screws and move the X-track cable mounting plate either towards the front or towards the back, then retighten the screws. Reinstall the trough cover and check the cable operation.

c. You can also adjust the cable where it mounts to the frame. Reinstall the trough cover and check the cable operation.

4. Reverse the rest of the removal procedure.
5. Close the front door.
6. Complete the accessor servicing (see “Service Procedures” on page 790).
7. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
8. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

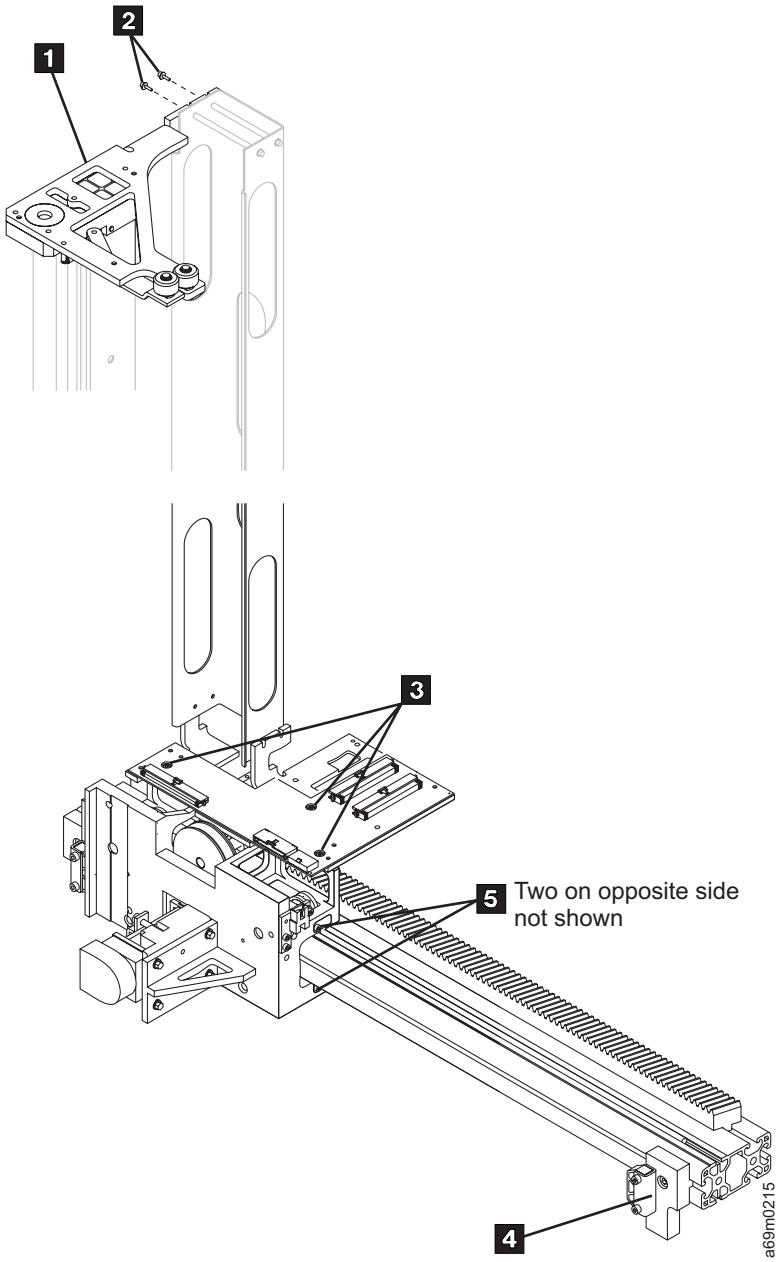


Figure 387. X-Axis Assembly

X-Axis Bumper

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Note: The style of end stop may vary from the figure below. See Table 21 on page 116 for different types of end stops.

Removal Procedure

1. At the operator panel **Activity** screen, press the [PAUSE] button on the operator panel.
2. When the library message indicates that the pause is activated, open the front door.
3. Remove the two screws **1** to remove the bumper **2**.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

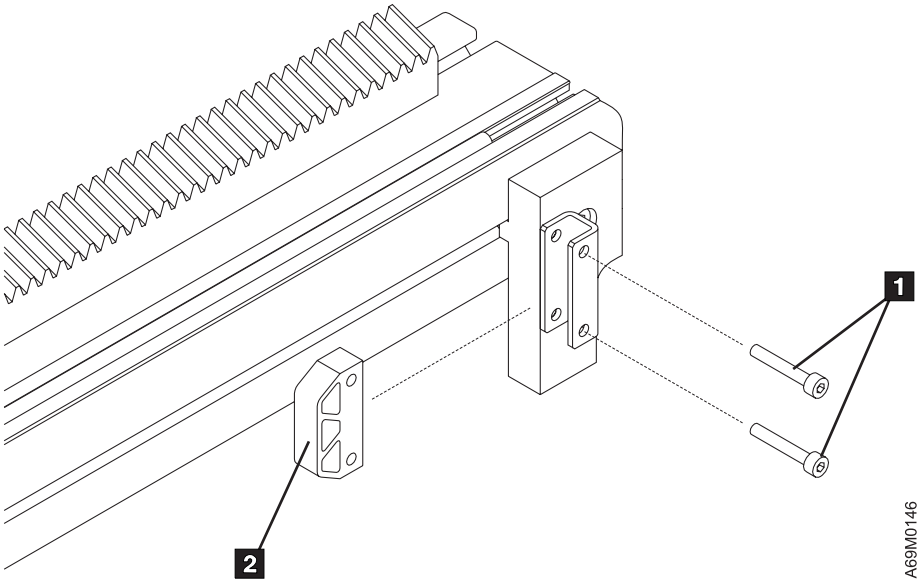


Figure 388. X-Axis Bumper

X-Axis Track Cable

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. There are four X-axis track cables available in a single accessor library:
   - 1–2 frames
   - 3–6 frames (see notes)
   - 7–10 frames (see notes)
   - 11–16 frames (see notes)

   Notes:

   a. Libraries with 5 to 10 frames can also use the 7 to 10 frame cable.

   b. Libraries with 8 to 16 frames can also use the 11 to 16 frame cable.

   c. There are 15 sets of X-axis track cables available for dual accessor libraries to support from 2 to 16 active frames. **Active frames** are defined as the Lxx and all Dxx frames in the library, excluding the two service bays on either end. See Figure 389 on page 1015 for cable routing and installation information.

   Refer to the cable list in Table 113 on page 1095 or "Assembly 17: Miscellaneous Cables and Tools" on page 1148 in Chapter 14, "Parts Catalog," on page 1093 for the correct cable for your machine configuration. Also see step 60 on page 139 for information on OLD and NEW style cables.

   Note: See **Figure 392 on page 1017**. If you are replacing an old style X-track cable with a new style X-track cable, you must first remove and discard the old style cable mounting bracket **3** before you install the new style X-track cable. The new style X-track cable comes with a new mounting bracket and screws.
2. Prepare the accessor for servicing (see "Service Procedures" on page 790).
3. See Figure 71 on page 144 and the Note that appears on that page. Remove the trough covers on either side of the mid-point where the X-cable is mounted. In a single frame library, there is only one trough cover to remove.
4. Remove the trough cover in the Lxx (or SBA/SBB in a dual-accessor library) to gain access to the XCP card on the left-hand side. In a single frame library, this cover is already removed.
5. Refer to Figure 390 on page 1016.
6. Move the accessor to the left of where the X-cable mid point is mounted at the base of the frame, and remove the screws **4** that secure the X-cable mid point to the bottom frame. **Note:** Also see **1** in Figure 392 on page 1017 for both types of track cable mounting.
7. Pivot the grippers to the front.
8. **Old Style AXY Card**

   a. **See Figure 390 on page 1016**. Remove two screws **1** and unplug the X-cable from the AXY card **3**.

   b. Disconnect the X-track cable from the AXY card **2** by depressing the cable locking tab on the cable.

   c. Unplug the X-track cable from the XCP card **2** in the Lxx. The cable has a retention clip that must be depressed to disconnect the cable.

   d. Remove the X-track cable.

9. **New Style AXY Card**
   a. **See Figure 391 on page 1016**. Remove two screws 8 that fasten the mounting plate 6 to the X-track cable.
   b. Disconnect the X-track cable 10 from the AXY card 3 by depressing the cable locking tab 9 on the cable.
   c. Unplug the X-track cable 12 from the XCP card 11 in the Lxx by depressing the cable locking tab 13 on the cable.
   d. Remove the X-cable from the right-hand side.
10. **Dual Accessor Track Cables**
   a. Refer to Figure 389 to see how the cables are routed when you are a dual accessor library.

      Note: The track cable on accessor 'A' 1 plugs into the AXY card at 2 . The track cable on accessor 'B' 4 plugs into the AXY card at 3 .

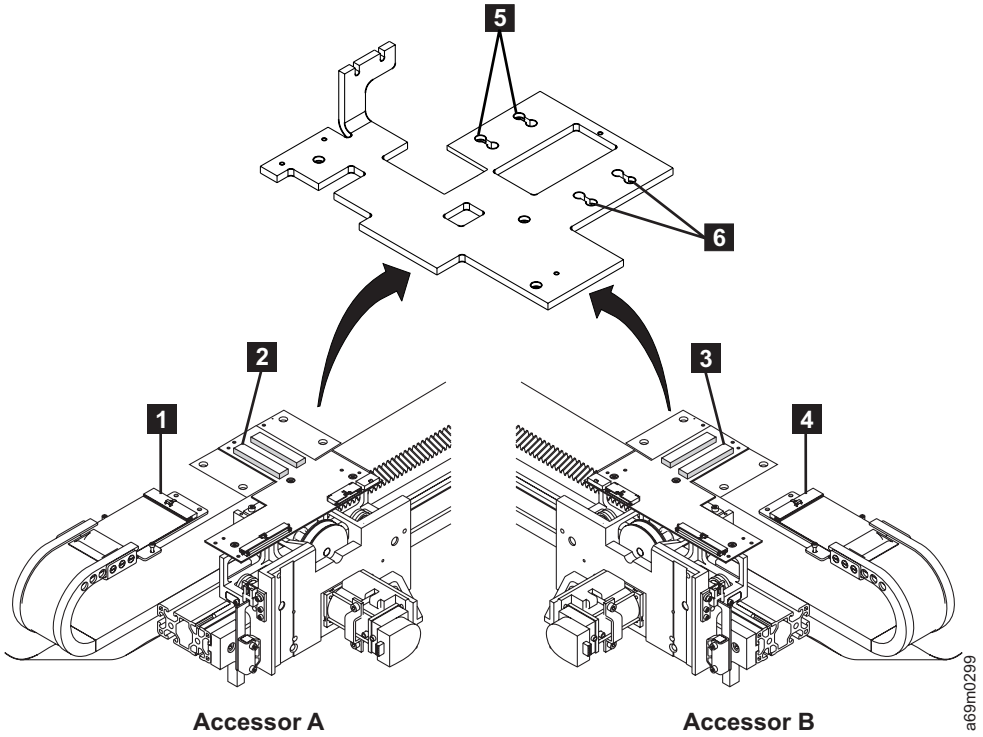


Figure 389. Accessor A and Accessor B X-track Cabling

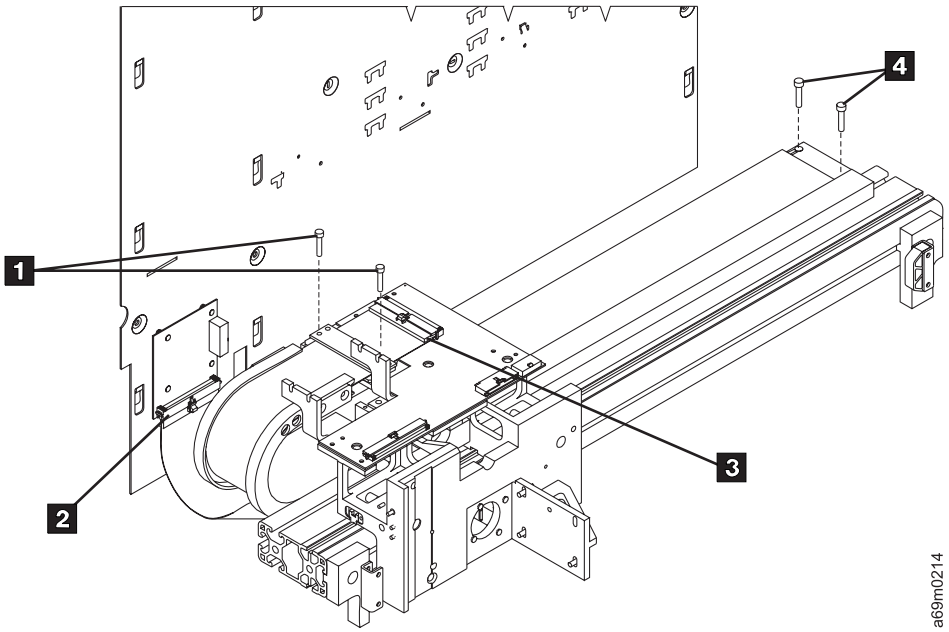


Figure 390. X-Axis Track Cable Removal – Old Style AXY Card

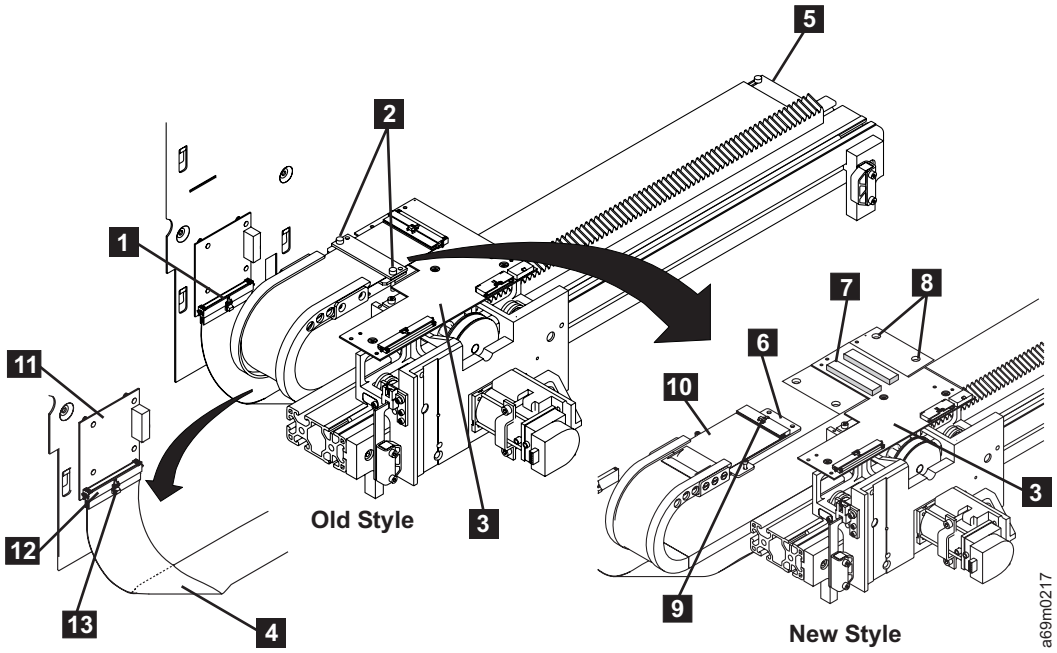


Figure 391. X-Axis Track Cable Removal – New Style AXY Card

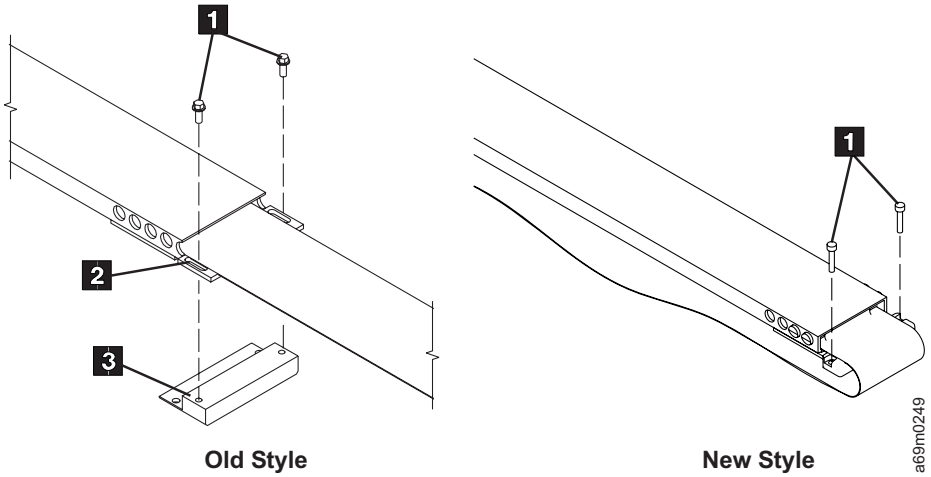


Figure 392. Track Cable Mounting (Old and New Style)

Replacement Procedure

1. Reverse the removal procedure. Use care when aligning the X-axis track cable connectors to avoid bending the pins. Remove the XCP card from the rear firewall, then carefully align and fully connect the cable in the XCP card. Reinstall the XCP card on the rear firewall.

   Note: There are OLD style and NEW style track cables. If you are replacing an OLD with an OLD, or a NEW with a NEW, continue with this replacement procedure at step 2. If you are replacing an OLD style track cable with a NEW style track cable, you will need to modify the NEW track cable as listed in the following steps.

   a. See Figure 393 on page 1019.
   b. Lay the new X-axis track cable fully open on the floor.
   c. Loosen the CENTER screw **5** on both sides of the clamp.
   d. Hold the plastic track **1** firmly in one hand (just behind the clamp **4**).
   e. Slowly pull the white cable **3** in the direction shown by the arrow until the clamp **4** is aligned in the center of the two black bars **2** as shown. **Do not** pull the cable too far, as it is difficult to pull it back in the opposite direction.
   f. Tighten the center screw **5** on both sides of the clamp.
   g. **Note:** Figure 394 on page 1019 shows the reworked cable.
   h. The X-axis track cable can now be installed in the library. **Note:** If you are installing a NEW style track cable on an OLD style AXY card (with one connector) see Figure 395 on page 1020. Plug the track cable into the connector into the AXY card **2** , then install two screws through the AXY card mounting plate holes **1** into the threaded holes in the new x-track cable bracket as seen in Figure 393 on page 1019 near **3** . **Note:** When the X-track cable is securely plugged into the AXY card, there should be a slight 'hump' in the X-track cable between where it's clamped to the plastic track and where it plugs into the AXY card. This ensures enough slack in the cable to fully and securely plug into the AXY card.
   i. Continue at step 2.
2. Move the X-axis back and forth to ensure that the cable moves smoothly without binds or interference anywhere along the X-axis rail, and that it is centered in the track. If the X-track cable is rubbing against the cable trough cover, or not centered in the track, do the following:
   a. Remove the trough cover to expose the AXY card.
   b. Loosen the X-track cable mounting screws and move the X-track cable mounting plate either towards the front or towards the back, then retighten the screws. Reinstall the trough cover and check the cable operation.
   c. You can also adjust the cable where it mounts to the frame. Reinstall the trough cover and check the cable operation.
3. Close the front door.
4. Complete the accessor servicing (see “Service Procedures” on page 790).
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

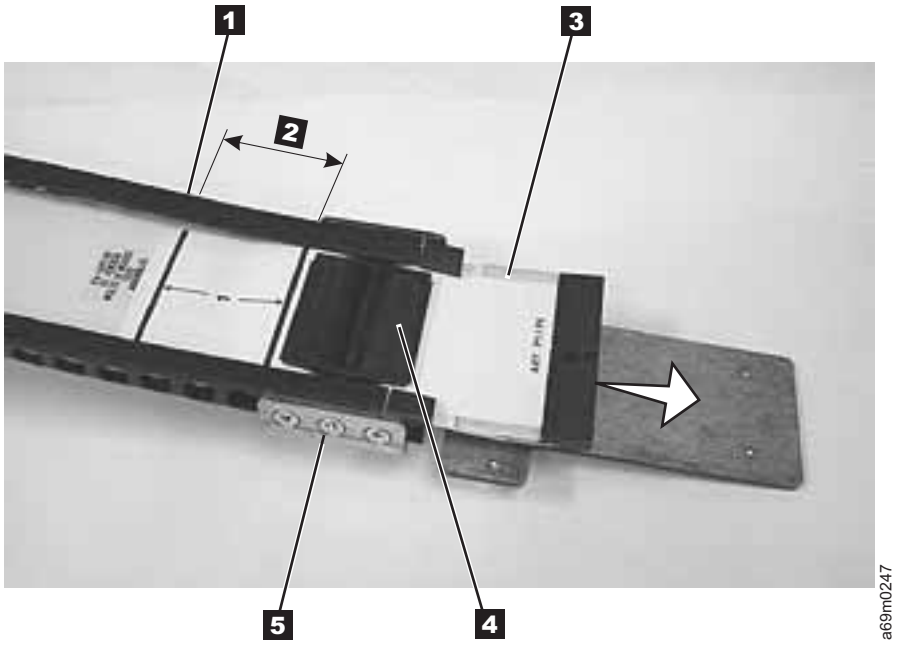


Figure 393. X-Axis Track Cable Rework

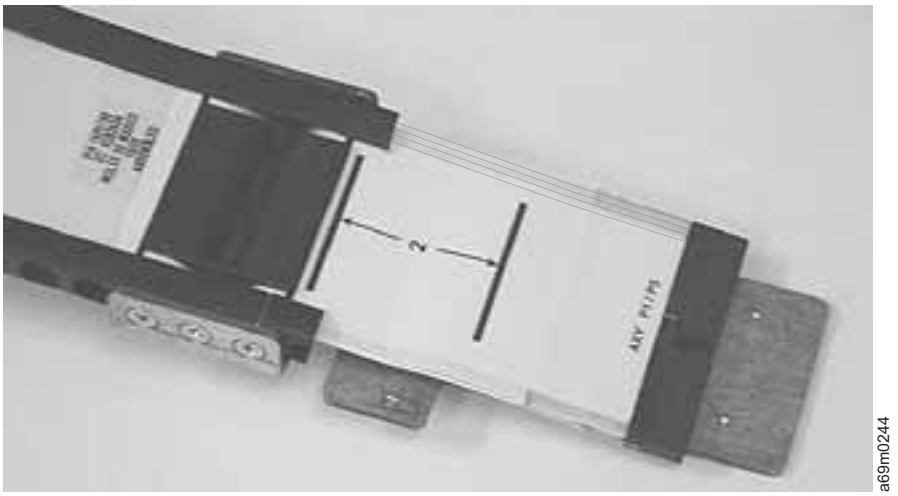


Figure 394. X-Axis Track Cable AFTER Rework

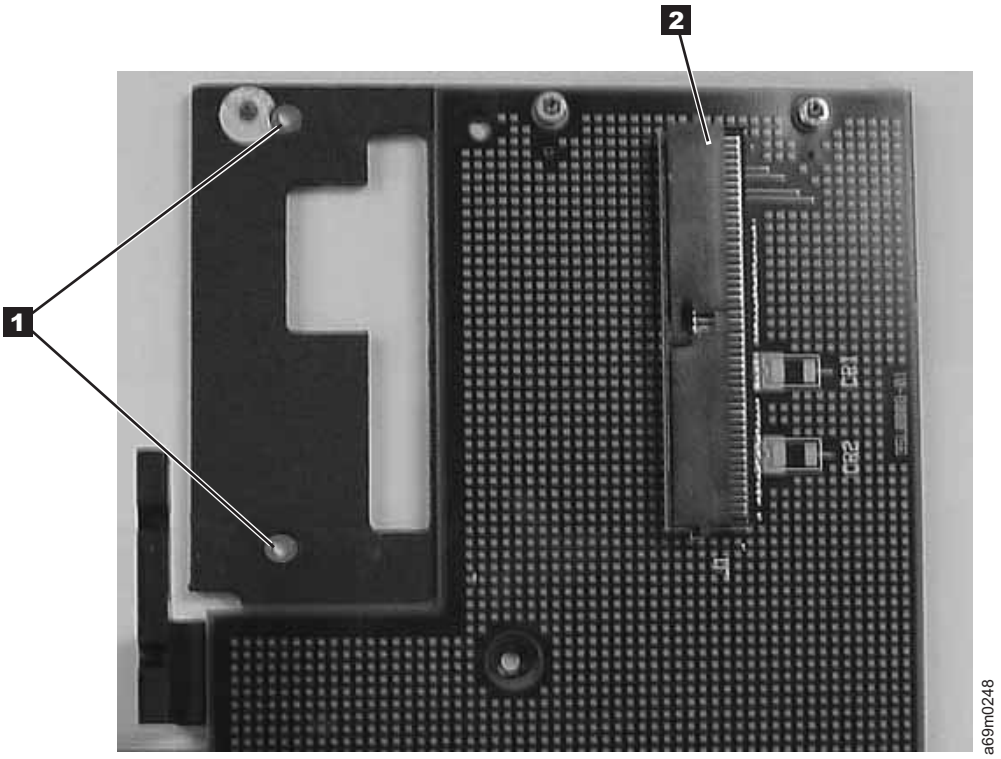


Figure 395. Old Style AXY Card Mounting Bracket

X-Axis Home Sensor

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
   - **Figure 396 on page 1023** shows an accessor in either a single accessor library or accessor "A" in an HA library, with the home sensor on the **left-hand** side (as viewed from the front).
   - **Figure 397 on page 1023** shows accessor "B" in an HA library with the home sensor on the **right-hand** side (as viewed from the front).
2. Disconnect the X-axis home sensor cable **1**.
3. Remove the X-axis home sensor holding screw **2** to remove the sensor **3**.

Replacement Procedure

1. Reverse the removal procedure.
2. Close the front door.
3. Complete the accessor servicing (see “Service Procedures” on page 790).
4. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
5. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

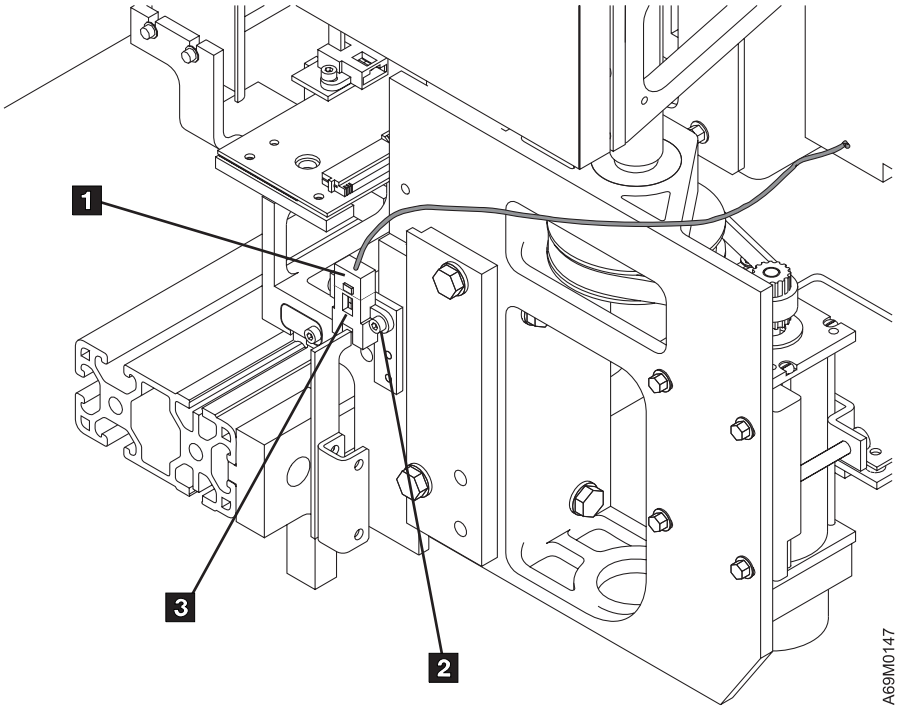


Figure 396. X-Axis Home Sensor (Single Accessor or Accessor "A" in HA library)

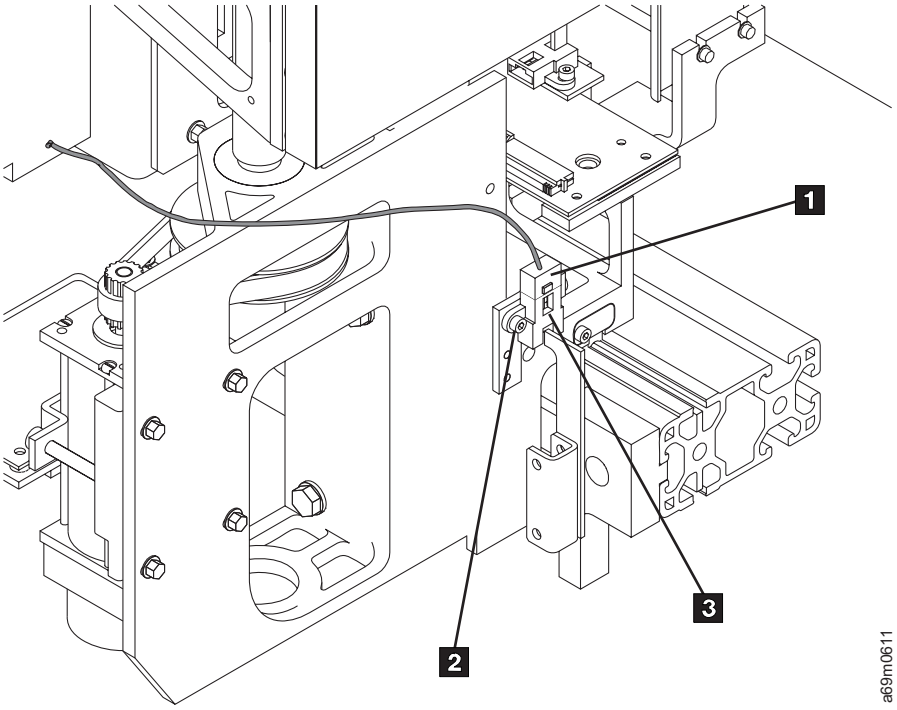


Figure 397. X-Axis Home Sensor (Accessor "B" in HA library)

X-Axis Motor and Drive Belt

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

The X-Axis Motor drive belt should be replaced along with the new X-Axis motor.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the MDA (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846).
3. Refer to Figure 399 on page 1025. Remove the four screws **4** to remove the motor and its mounting bracket.
4. Refer to Figure 398 on page 1025. Remove the two screws **2** to remove the bracket **1**.
5. Remove the X-axis motor **3** from the mounting and from the X-axis belt.
6. Remove the X-axis belt by working the belt past the pinion shaft pulley.

Note: To save time, cut away the old belt **only** if you are replacing the belt or if you ordered the new FRU which includes both the X-motor and the drive belt.

Replacement Procedure

1. Reverse the removal procedure.

Early Style: without automatic belt tensioner

2. Adjust the X-axis belt tension by pulling the X-axis motor away from the X-axis pinion shaft.

   The belt tension is correct if light finger pressure (in the center of the belt between the two pulleys) deflects the belt 3 to 5 mm (1/8 to 3/16 in.).
3. Adjust the X-axis belt tension by pulling the motor away from the X-axis drive shaft.

   The belt tension is correct when light finger pressure applied to the center of the belt **1**, between the two pulleys, deflects the belt 3 to 5 mm (1/8 to 3/16 in.).

Later Style: with automatic belt tensioner

4. See Figure 400 on page 1026. Push on the X-motor **1** (in the direction shown by the arrow) to compress the spring-loaded belt tensioner **2** while tightening the four holding screws.
5. Work the belt onto the X-motor pulley and release the motor. X-axis belt tension is automatically set.

Either Style: with or without automatic belt tensioned

6. Close the front door.
7. Complete the accessor servicing (see “Service Procedures” on page 790).
8. If you replaced the motor or belt due to URC A499 "X motion failure - re-zero detected positioning drift," perform a library calibration. (see “Library and Drive Calibration Procedures” on page 784).
9. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
10. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

Note: Because of insufficient access, you may not be able to check the pulley adjustment using your finger From the right side, slide an end wrench into the channel (shown at **5** in Figure 399 on page 1025), between the X-axis casting and the front of the X-axis rail. Use the end wrench to press on the belt. Observe the travel of the end wrench to determine if belt tension is correct.

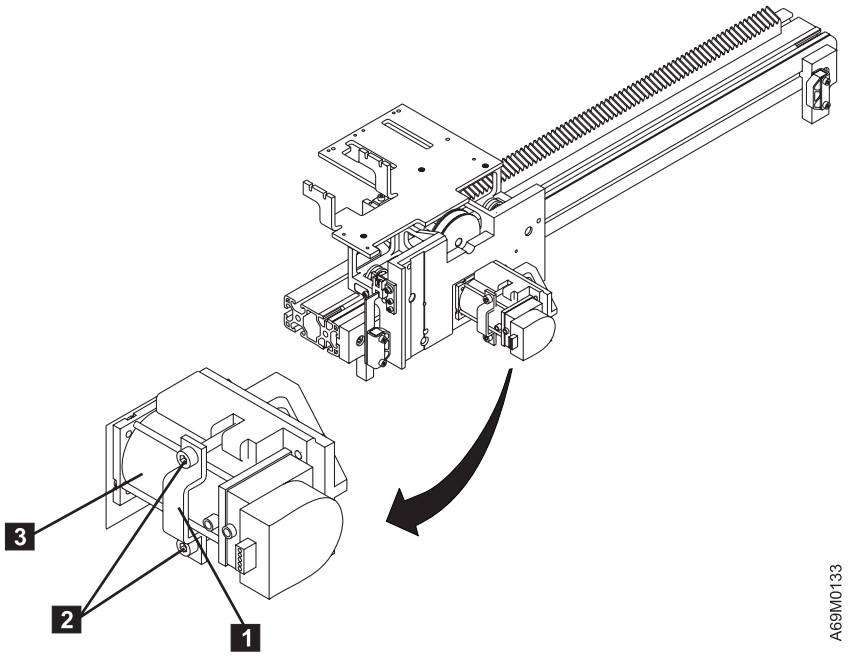


Figure 398. X-Axis Motor

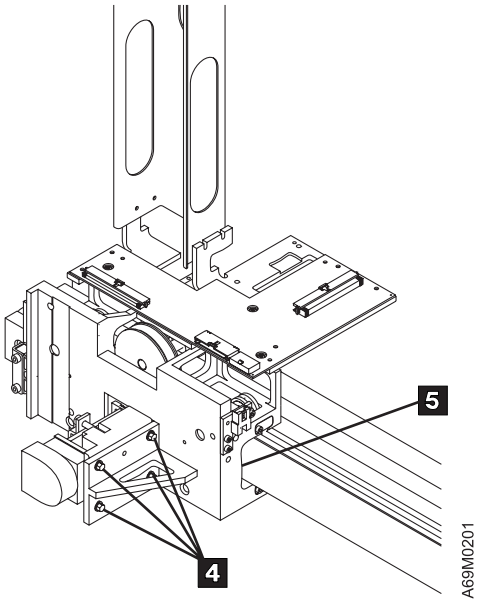


Figure 399. X-Axis Assembly (Motor) – Early Style

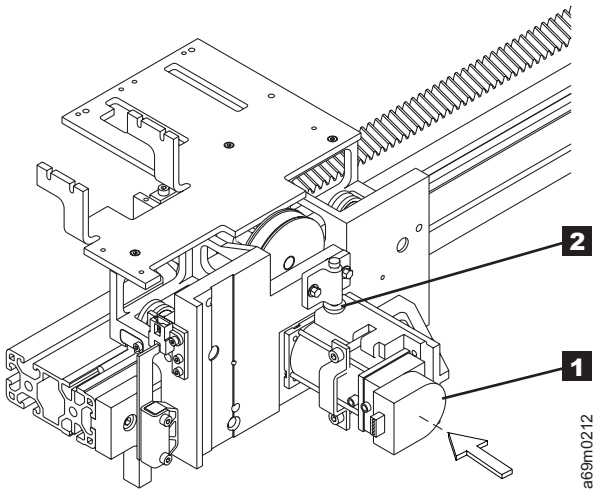


Figure 400. X-Axis Assembly – Later Style

X-Axis Pinion Shaft

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Raise the dual gripper assembly about halfway up the Y-axis mast assembly and secure it in place by inserting a hex wrench or screwdriver through the Y-axis access hole.
3. Remove the Y-axis trough holding screws **1** (see Figure 401 on page 1029).
4. Disconnect the Y-axis cable connector **6**.
5. Disconnect cable connectors **5**.
6. Remove the AXY card holding screws **4**.
7. Slide the X-axis assembly out from under the AXY card.
8. Remove four screws **2** to remove the holding brackets **3**.
9. Remove the pinion shaft.

Replacement Procedure

1. Inspect the belt for wear before putting in the new pinion shaft assembly. Replace the belt if necessary.
2. Reverse the removal procedure.
3. Adjust the X-axis motor belt tension by pulling the motor away from the X-axis pinion shaft.

   The belt tension is correct if light finger pressure (in the center of the belt between the two pulleys) deflects the belt 3 to 5 mm (1/8 to 3/16 in.).
4. Ensure that the hex wrench or screwdriver inserted into the Y-axis access hole is removed.
5. Close the front door.
6. Complete the accessor servicing (see “Service Procedures” on page 790).
7. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
8. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

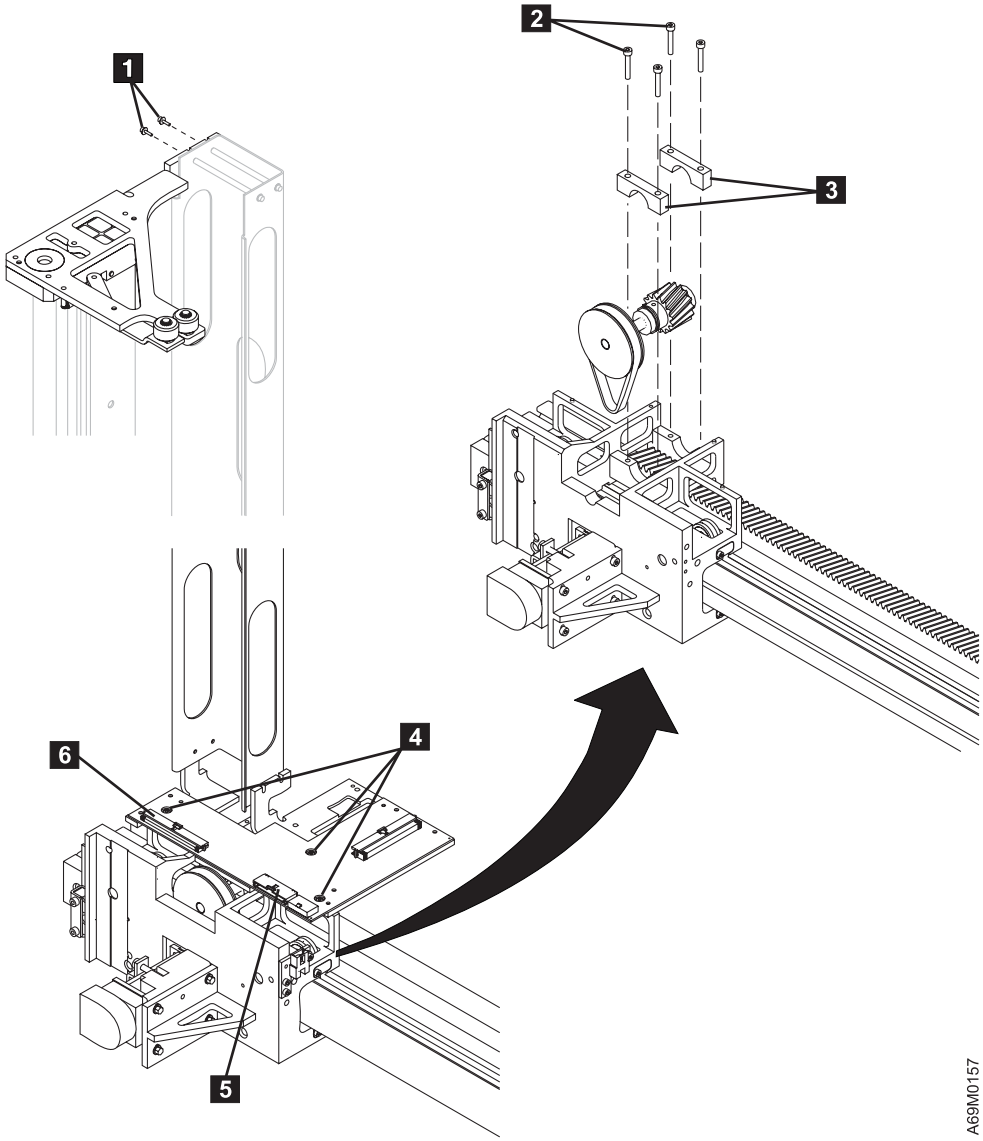


Figure 401. X-Axis Pinion Shaft

X-Axis Rail Assembly

Removal Procedure

Please allow approximately 1.0 hour to complete this procedure.

Removing the X-Axis Rail Assembly from a Single-Frame (L32) Library

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the left side cover of the base unit.
3. Remove the X-axis track cable clamp screws, and disconnect the X-axis track cable **2** from the AXY card **1**.
4. Remove the X-axis left bumper **8**.
5. Remove the X-axis right bumper **4**.
6. Slide the cartridge accessor assembly off the X-axis rail assembly, and set it aside.
7. Remove the screws **3** to remove the X-axis rail assembly.

Removing the X-Axis Rail Assembly from a Multi-Frame Library

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Push the cartridge accessor to the left or the right end of the library depending on the location of the rail to be replaced.
3. Remove the appropriate frame end cover.
4. Start at the end of the library that has the end cover removed. Loosen the screws **3** of each X-axis rail assembly up to, but not including the rail to be replaced.
5. Loosen the set screws **6** in the long T-nuts (front and back) in the rail that is being replaced.
6. Slide the loosened rail assemblies away from the rail to be removed until the long T-nuts are clear of the rail to be removed.

   Note: Use a screwdriver or bar to gently separate the rail assemblies.
7. Loosen the set screws **6** in the long T-nuts (front and back) on the other end of the rail that is being replaced (not required if this is the base frame).
8. Remove the screws **3** and remove the X-axis rail assembly.

Replacement Procedure

1. Remove the rods **7** from the old rail assembly.
2. Install the new rail assembly into the frame and install the holding screws **3**. Slide the rail towards the previous frame. Tighten the T-nuts **6** just slightly.
3. Put the rack alignment tool **5** on the junction of the two gear racks.
4. Tap the tool on the racks until the tool is fully seated in the gear teeth on both X-rail assemblies. Ensure no gap exists between the tool teeth and the rail teeth.
5. Keep the alignment tool in place for the next step.
6. Hold downward pressure on the left-hand side of the rack while you tighten the left-hand short T-nut **3** in the expansion frame.
7. Hold downward pressure on the right-hand side of the rack while you tighten the right-hand short T-nut **3**. Recheck the track alignment.
8. Tighten the setscrews on the long T-nut **6**.
9. Reinstall the rods **7** from the old rail into the new rail.
10. Press the shafts in place with the bearing shaft clamp tool. **Ensure the bearing shafts are tight from end-to-end**. The bearing shafts fit tightly in the X-rails, so start on the left side and clamp the shafts in place about every 50 mm (2 in.), to the fully-seated position.

If the bearing shafts do not seat fully, adjust the bearing shaft clamp tool.

11. Repeat steps 3 on page 1030 through 8 on page 1030 until all rails are aligned and tightened.
12. If this is a single frame library, when you are sliding the X-axis assembly back onto the rails, lift the four wiper pads **9** with a screwdriver.
13. Move the cartridge accessor across the junction of the X-rail. If you can feel any binds, correct the alignment before continuing.
14. Reverse the removal procedure. If the rail was installed correctly, the Y-mast should still be vertical with respect to the new X-axis rail. You can verify this if necessary, but if any adjustments are made, **ensure** the Y-mast is still vertical in the adjacent frames as well.
15. Close the front door.
16. Complete the accessor servicing (see “Service Procedures” on page 790).
17. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
18. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

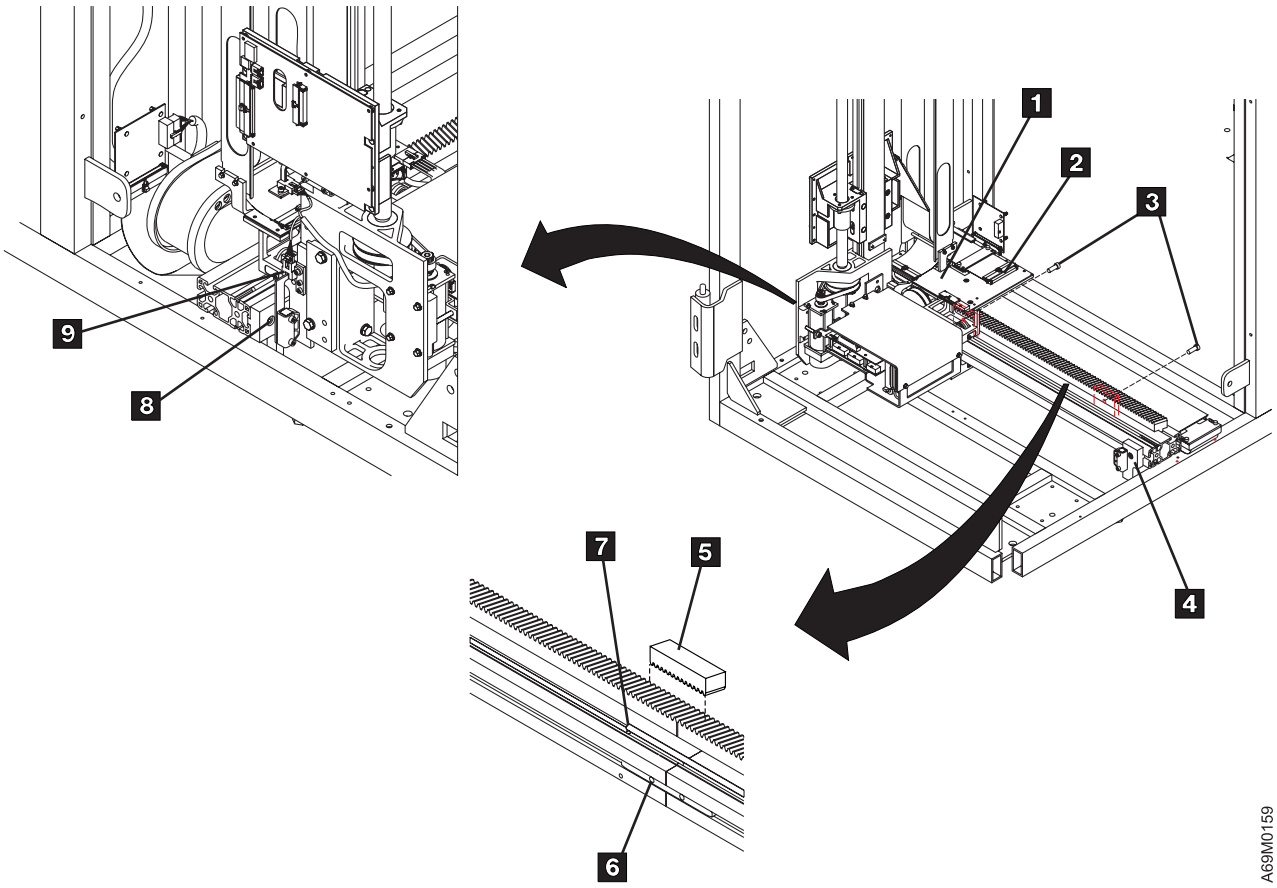


Figure 402. X-Axis Rail Assembly

Y-Axis Cable

The Y-axis mast assembly does not have to be removed to replace the Y-axis cable.

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. See **Figure 404 on page 1034.** Loosen (but do **NOT** remove) two screws **5** on the cable retention bracket **6** and remove the bracket from the machine. If the screws are removed by mistake, see **Figure 403 on page 1033.** to ensure the plate **4** is reinstalled in the correct position. The angle on the plate should match the fold on the Y-cable.

   Note: In the following step make a note of how the cable is routed through the support bars **9** and **10** before you remove the cable.
3. Disconnect the cable **7** from the ACC card.
4. Disconnect the cable **4** from the AXY card **8**.
5. Loosen the screws **2** and **3**, and slide the cable out of the trough.
6. Remove the Y-axis cable.

Replacement Procedure

1. Reverse the removal procedure. **Note:** Position cable retention bracket with the foam strip facing the cable, then slide the top of the bracket under the top screw. Pivot the bottom of the bracket under the bottom screw. Tighten both screws securely.
2. Move the Y-axis assembly up and down to ensure that the assembly does not bind and that the cable moves smoothly without binds or interference anywhere along the Y-axis.
3. Close the front door.
4. Complete the accessor servicing (see “Service Procedures” on page 790).
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

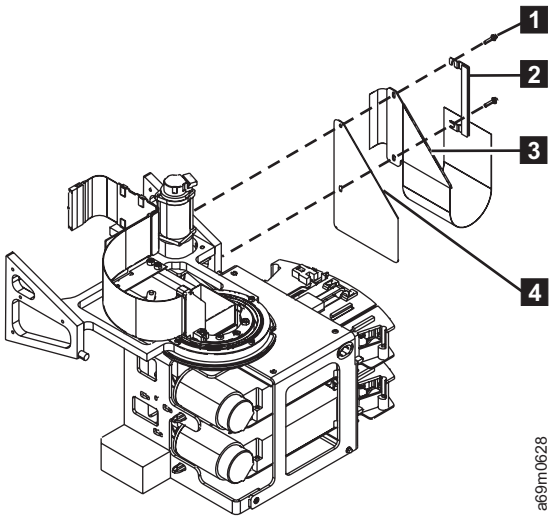


Figure 403. Y-Cable, Bracket & Plate

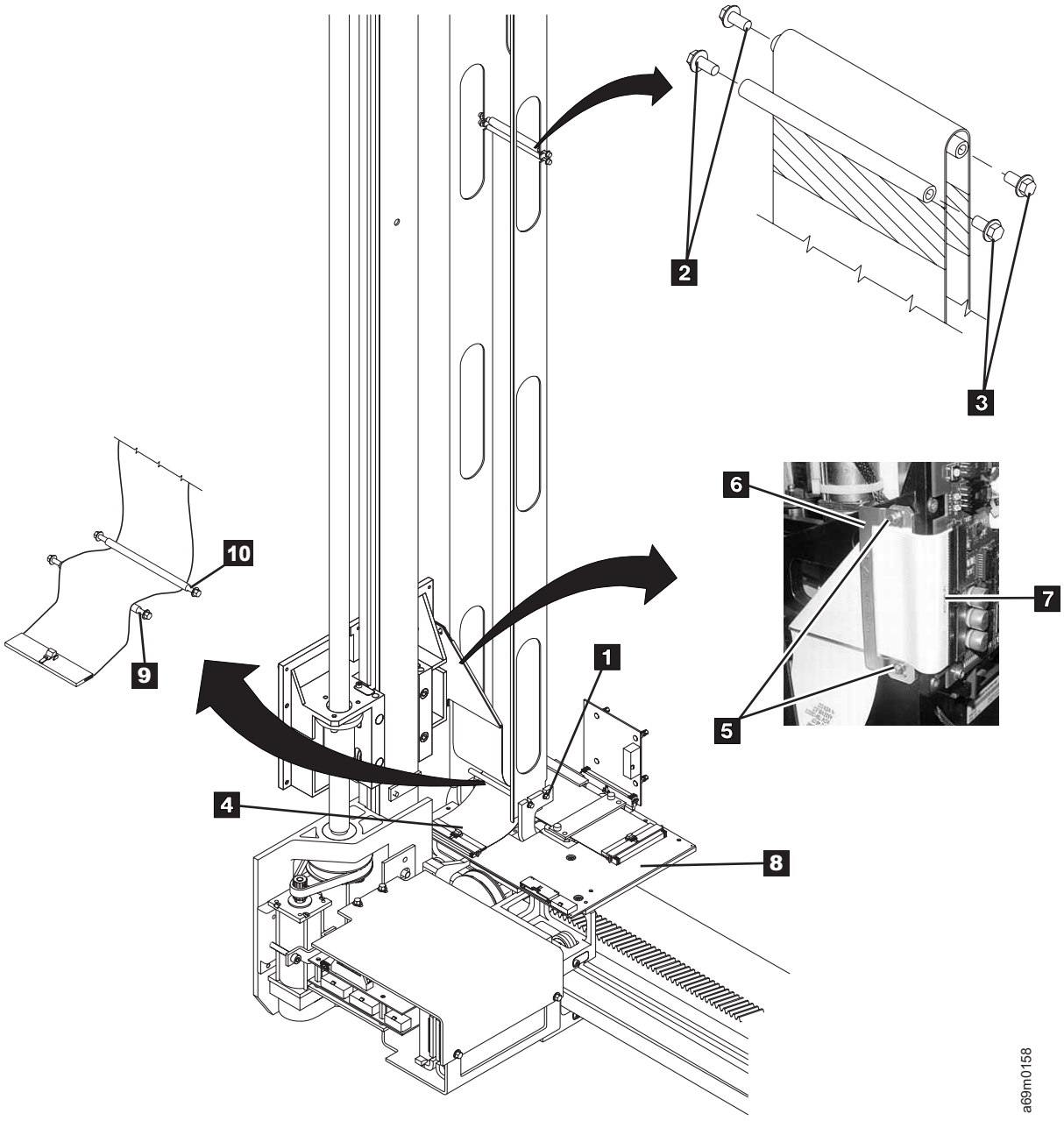


Figure 404. Y-Axis Cable

Y-Axis Guide Rollers

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Remove the right side cover (see “Covers, Right and Left End” on page 870).
3. Remove the right X-axis bumper assembly.
4. Move the accessor off of the X rails enough to access the top of the Y-axis rollers.

   Note: DO NOT run the X-axis assembly completely off the X rails.
5. Remove the C-clip from the roller you want to replace, and remove the roller.

Replacement Procedure

1. When moving the X-axis assembly onto the X rails, use a screwdriver to compress the felt wipers on the X-axis assembly.
2. The replacement procedure is the reverse of the removal procedure.
3. Close the front door.
4. Complete the accessor servicing (see “Service Procedures” on page 790).
5. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
6. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

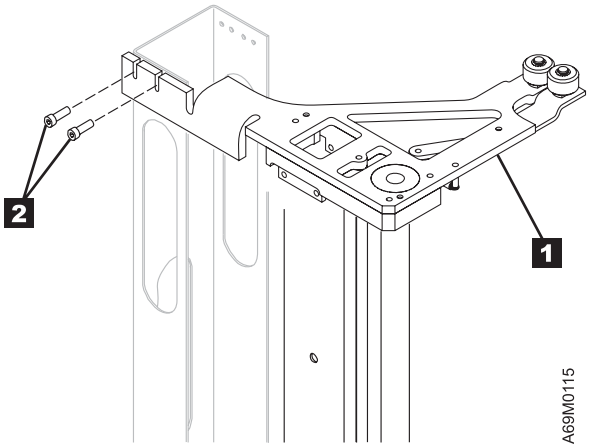


Figure 405. Y-Axis Guide Roller, Urethane

Y-Axis Home Sensor

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Move the X-axis assembly to a convenient position, then raise the lift mechanism, and support the mechanism by inserting a hex wrench or screwdriver inserted into the Y-axis access hole (located halfway up the assembly). The home sensor is activated by a small tab located just below the ACC card. The sensor rides up and down with the dual gripper and pivot assemblies.
3. Disconnect the Y-axis home sensor cable.
4. Remove the Y-axis home sensor screw **2** to remove the sensor **1**.

Replacement Procedure

1. Reverse the removal procedure.
2. Ensure that the hex wrench or screwdriver inserted into the Y-axis access hole is removed.
3. Close the front door.
4. Complete the accessor servicing (see “Service Procedures” on page 790).
5. Invoke the X-Y Axis Sensor Test to ensure that the new sensor works correctly.
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

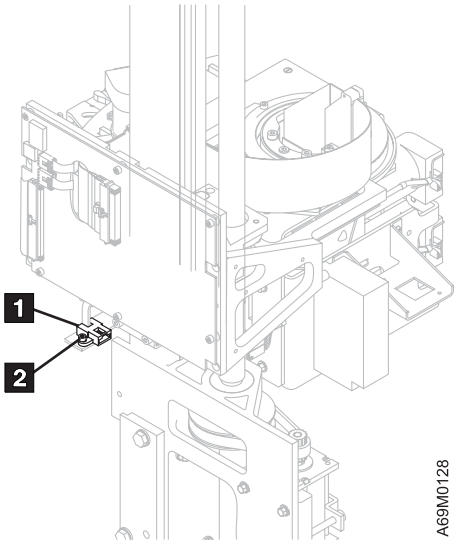


Figure 406. Y-Axis Home Sensor

Y-Axis Mast Assembly

Note on Improved Y-Mast Bracket / Stiffener Plate

There is a heavier style Y-mast bracket/stiffener plate (3 in Figure 409 on page 1041) which should be ordered and installed. See Y-mast Stiffener Plate FRU Kit on page 1131.

Removal Procedure

Please allow approximately 1.0 hour to complete this procedure.

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. If you are replacing the Y-axis mast assembly, remove the following:

   Note: If you are removing the Y-axis mast assembly but NOT replacing it, the following FRUs do NOT have to be removed.

   a. Remove the dual gripper assembly (see “Gripper Asm, Dual, LTO/LTO, LTO/3592 (Universal), & HD” on page 952).
   b. Remove the pivot assembly (see “Pivot Assembly” on page 986).
   c. Remove the ACC card (see “Accessor Controller Card (ACC, ACC-CF)” on page 828).
3. If you are not replacing the Y-axis mast assembly, you may still want to remove the dual gripper assembly to lighten the weight of the assembly.
4. Remove the MDA (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846).

   Note: See Figure 408 on page 1041. When two screws 1 are removed, the bracket 2 , Y-cable 3 , and plate 4 will come loose. Make careful note of the positions of the bracket, cable, and plate for reinstallation later. The angle cut on the plate must match the angle of the Y-cable fold.
5. If you have not removed the pivot assembly or the ACC card, remove the screws holding the Y-axis flex cable to the pivot assembly, and unplug the cable from the ACC card.
6. Refer to Figure 407 on page 1041 and remove the screws 2 holding the top portion of the Y-axis mast assembly 1 to the top rail assembly.
7. Refer to Figure 409 on page 1041. Loosen the two screws 1 on the left side of the Y-axis mast assembly (see Figure 409 on page 1041).
8. Remove the two bolts and washers 2 that secure the bottom of the Y-axis mast assembly to the X-axis carrier.

   Note: Grasp the Y-axis mast assembly as you remove the two bolts, to prevent the Y-axis mast assembly from falling.

Replacement Procedure

1. If you are replacing a Y-mast assembly on accessor B, you must remove the upper rail guide and reinstall it on the new Y-mast assembly before continuing.
2. Reverse the removal procedure.

   Attention: The Y-axis mast will be deformed if the screws 1 are over tightened.

   Notes:

   a. Ensure the Y-mast is fully seated into the X-axis 'V block' assembly before you continue.
   b. The bolts and screws that secure the Y-axis mast assembly to the X-axis carrier must be tightened in the correct sequence.
   c. Snug, but do not tighten the four screws. Ensure the lip on the stiffener plate 3 is pushed back firmly against the accessor.
   d. Tighten the front screws 2 just enough to pull the mast against the accessor.

e. Tighten the side screws **1** sequentially top and bottom. Now firmly-tighten the front screws **2**. Verify the mast is straight.

3. Close the front door.
4. Complete the accessor service (see “Service Procedures” on page 790).
5. Perform a library calibration (see “Library and Drive Calibration Procedures” on page 784).
6. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
7. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

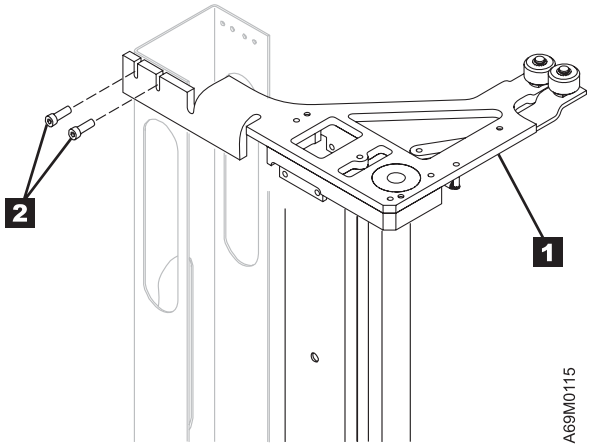


Figure 407. Y-Axis Mast – Top

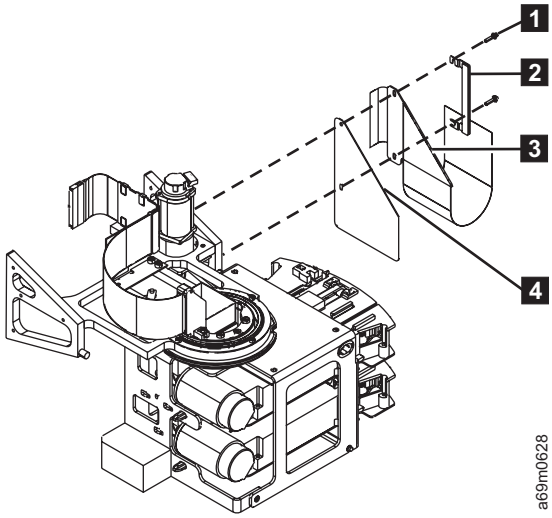


Figure 408. Y-Cable, Bracket & Plate

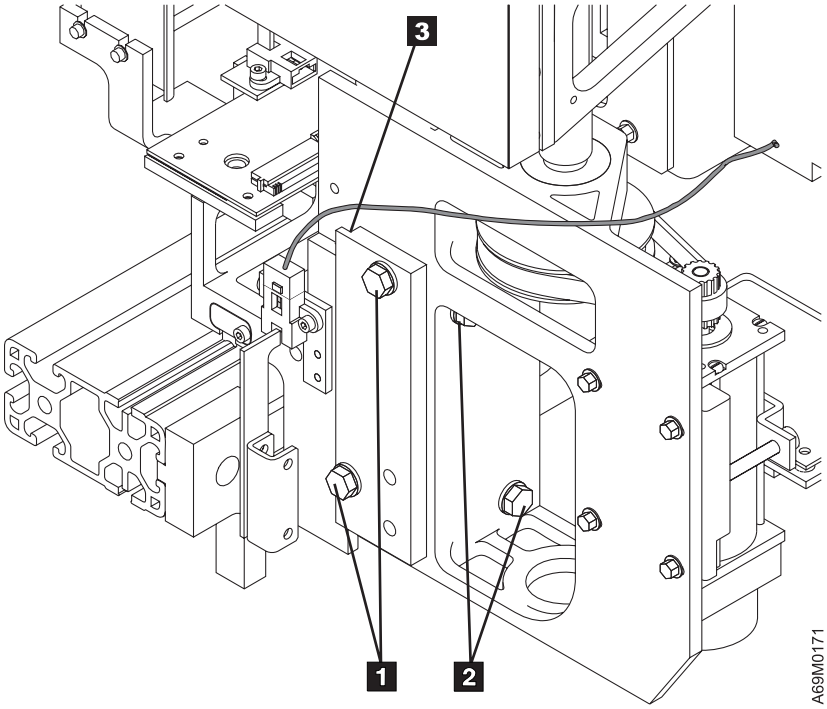


Figure 409. Y-Axis Mast – Bottom

Y-Axis Motor and Drive Belt

Before you begin...

If you exchange a FRU and the problem is not corrected, reinstall the original FRU.

The Y-Axis Motor drive belt should be replaced along with the new Y-Axis motor.

Removal Procedure

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. Move the X-axis assembly to a convenient position. Raise the lift mechanism to be above the Y-axis access hole located halfway up the assembly. Insert a hex wrench or screwdriver into the access hole to support the mechanism.
3. Remove the MDA (see “Motor Driver Assembly (MDA, MDA-CF)” on page 846).
4. Refer to Figure 410 on page 1043.
5. Remove the screws **4**, from motor mount on the Y-axis assembly.
6. Remove the belt **1** and the bracket **3**.
7. Remove the Y-axis motor **2**.

Replacement Procedure

1. Reverse the removal procedure.

   Note: Whenever you replace the motor, you must also replace the belt. If you ordered the new FRU which includes both the Y-motor and the drive belt, then both were provided.

   Early Style: without automatic belt tensioner
2. Adjust the Y-axis belt tension by pulling the motor away from the Y-axis drive shaft.

   The belt tension is correct when light finger pressure applied to the center of the belt **1**, between the two pulleys, deflects the belt 3 to 5 mm (1/8 to 3/16 in.).

   Later Style: with automatic belt tensioner
3. See Figure 411 on page 1043. Push on the motor **1** to compress the spring-loaded belt tensioner **2**.
4. Work the belt onto the Y-motor pulley and release the motor. Y-axis belt tension is automatically set.

   Either Style: with or without automatic belt tensioner
5. Ensure that you remove the hex wrench or screwdriver that you inserted into the Y-axis access hole.
6. Close the front door.
7. Complete the accessor servicing (see “Service Procedures” on page 790).
8. Perform a library calibration if you replaced the motor or belt due to URC A4A9 "Y motion failure - re-zero detected positioning drift," (see “Library and Drive Calibration Procedures” on page 784).
9. perform a library calibration.
10. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
11. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

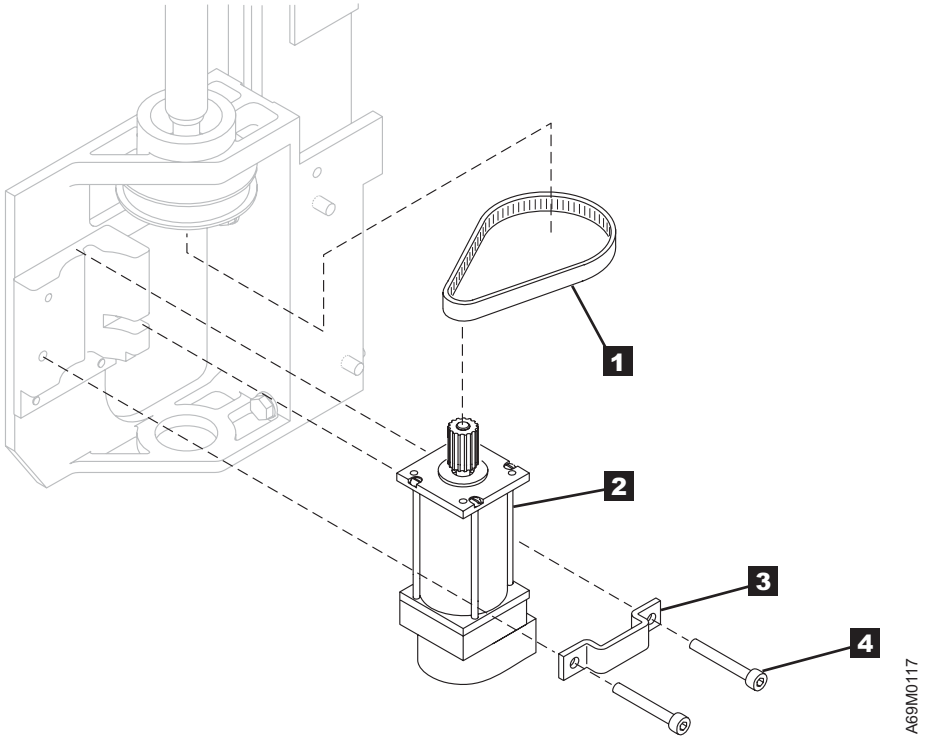


Figure 410. Y-Axis Motor

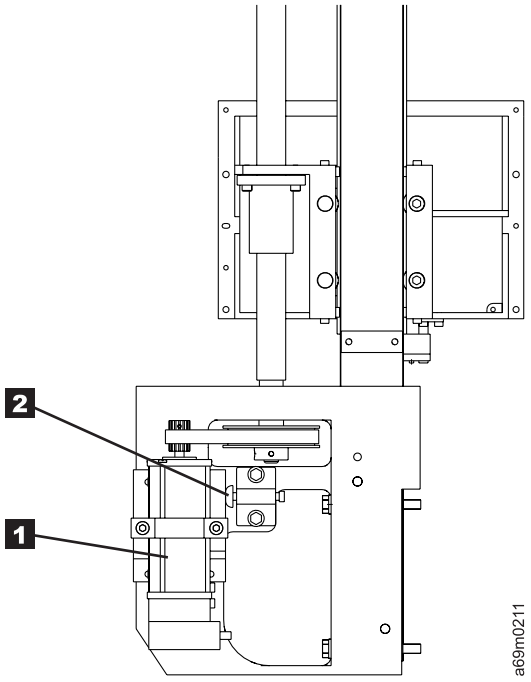


Figure 411. Y-Axis Motor Belt Tensioner (Later Style)

When Cartridge is Dropped or Stuck in Gripper

When a cartridge is dropped, gets stuck in a gripper, or is found laying in the accessor aisle, do **NOT** put the cartridge back in through the I/O station until after the following steps are performed. If a cartridge is reinserted into the library, duplicate volsers can occur and the inventory will be incorrect.

1. Refer to **"Manually Removing Cartridge" on page 1045** for stuck cartridge removal procedures, then return here.
2. After removing the cartridge from the library close the door and allow the library to inventory.
3. Record the volser of the cartridge that was found in the aisle or stuck in the gripper.
4. Use the Web Specialist or Op Panel to check if that volser is currently listed in the inventory of the library.
5. If the volser is listed in the inventory, record the Frame, Column, Row and Tier of where it is listed.
6. If the cartridge is located in an HD slot (Tier 1-5) open the door of the frame listed in the above step and remove all cartridges from the HD slot listed in the above step. If the cartridge is located in a standard slot (Tier 0) just open the door of that frame.
7. Close the door and allow the library to inventory.
8. Insert the cartridge into the I/O Station that was dropped, stuck in the gripper, or any cartridges that were removed.
9. Inform the customer they may need to assign newly-imported cartridges to the correct logical library.

Manually Removing Cartridge

Note: When a cartridge is manually removed from the library, first follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer so it can be put back into library and *reassigned* to the correct logical library.

Manually removing a cartridge will require opening a library front door which will take the library offline to all hosts and cause any queued library commands to fail. The following steps should be used before manually removing the cartridge to avoid any unnecessary impact:

1. Attempt to view the grippers through the library end cover window. If you see that a cartridge is stuck partially into a gripper, do not perform the remaining steps in this procedure. Go to "From a Dual Gripper Assembly" on “From a Dual Gripper Assembly” on page 1083.
2. Determine the location of the cartridge to be removed. The location may be provided by the customer, or by a Call Home PMH, or by an error in the library error log. You need to determine one of the following:
   - the location of the cartridge in frame, column, row. As an example, drive [F1,R1] or storage slot [F1, C1, R2].
   - the bar code label volser of the cartridge.
3. Use the operator panel to attempt to move the cartridge from its current location. Press MENU, then select 'Manual Operations', then select 'Move Cartridge'.
4. Select the source by either the volser or the location in frame, column, row.
5. Select the destination for the cartridge. It is recommended that the cartridge be moved to the I/O station so it can be removed from the library and examined for any damage.
6. If the cartridge was successfully removed then there is no need to open a door and take the library offline.
7. If the cartridge was removed from a drive, run the Library Verify test to ensure that the drive is functioning properly.
8. If the library was not able to remove the cartridge (an error occurred while attempting to move the cartridge), use the following steps to manually remove the cartridge.

Important

- Opening a library front door will take the library offline to all hosts. Notify the customer of this before you open a library front door.
- Resetting, power cycling, unplugging, or removing a control path drive can impact the host. Before any of these actions are performed on a drive you should determine whether the drive is a control path drive. At the library operator panel, press **MENU**, then select **Settings**, **Control Paths**, **Display Control Paths** to determine whether the affected drive is a control path. If it is a control path drive then notify the customer of the potential impact before you continue. **Note:** If the customer has the Control Path Failover feature enabled then an alternate control path may prevent any impact to the host even if you do disrupt a control path drive.

- To remove a stuck cartridge from the I/O station, go to “From the I/O Station” on page 1046.
- To remove a stuck cartridge from a storage slot, go to “From a Storage Slot” on page 1047.
- To remove a cartridge from a drive, go to:
  - “From an LTO Drive” on page 1048
  - “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051
  - “From an LTO Drive (Ultrium-3 through Ultrium-5) When Cartridge is Stuck in Loader” on page 1056
  - “From a 3592 Drive” on page 1070
  - “From a 3592 Drive When Cartridge is Stuck in Loader” on page 1072
- To remove a cartridge from the gripper, go to “From a Dual Gripper Assembly” on page 1083.

From the I/O Station

Before you begin...

Customer's Cartridges

If a customer's cartridge must be removed, inform the customer.

Follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer. When the procedure is complete, have the customer reinstall the cartridge through the I/O station.

This procedure assumes that the I/O Station door is locked and the customer is unable to remove cartridges.

1. At the operator panel **Activity** screen, press [PAUSE] button on the operator panel.
2. When the library message indicates that the pause is activated, open the front door.
3. Remove the cartridge from the interior side of the I/O station, and close the door.
4. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

From a Storage Slot

Before you begin...

Have the customer remove the cartridges from the storage slot sections that are to be removed.

Note: When a cartridge is manually removed from the library, the customer must put it back into library and *reassign* to the correct logical library.

1. Prepare the accessor for servicing (see “Service Procedures” on page 790).
2. If the cartridge is partially in the gripper and partially in a storage slot, continue with step 3; otherwise, go to step 6.
3. Try to slide the cartridge all the way into the gripper.

   If you can move the cartridge into the gripper, go to “From a Dual Gripper Assembly” on page 1083 and remove the cartridge from the gripper, then return here to step 7.
4. If you cannot move the cartridge into the gripper, slide the cartridge into the storage slot.
5. Move the lift assembly to a suitable position for service.
6. Have the customer remove the cartridge from the storage slot.
7. Check the storage slot for contamination, wear, or damage.
8. Compare the suspected slot with a good slot by inserting and removing the diagnostic tape cartridge. If a slot is damaged, you should notice a difference.
9. If the storage slot is defective, replace it (see “Storage Slot Section” on page 1000).
10. If you did not determine why the library could not successfully insert or remove the cartridge, and you did not exchange a FRU, perform the library calibration procedure to ensure that the gripper is properly aligned with the slots.
11. If the customer manually removed any cartridges, they will have to put them back into the library using their procedures.
12. Close the front door.
13. Complete the accessor servicing (see “Service Procedures” on page 790).
14. Perform the “Library Verify Test” on page 759, using the **no drives** selection.
15. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

From an LTO Drive

Before you begin...

If a customer's cartridge must be removed, inform the customer and have them remove the cartridges.

Care Considerations: With critical customer data, you may not want to attempt to remove the cartridge in the field and risk damaging the media. Using local geography procedures, you may want to return the drive to IBM, with the tape still loaded in the drive, for cartridge/data recovery. If the customer has granted you permission to return the cartridge with the drive to IBM, contact your next level of support for advice and instructions about returning the drive to IBM.

In this procedure, you will remove a stuck tape cartridge, and visually check for any damage to the tape or the leader pin. If the inspection finds a problem, and it can't be resolved, the cartridges should be considered bad. However, if there is no obvious damage, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer.

Unless the you determine that the drive is damaged, it can be re-installed (if removed) and the drive read / write test run to verify operations before returning the drive to the customer.

Note: When a cartridge is manually removed from the library, the customer must put it back into library and *reassign* to the correct logical library.

LTO Data Recovery for Broken Tapes

If the tape has broken inside the drive and needs to be recovered, do not try to remove the tape from the drive. Follow normal data recovery procedures and ship the drive with the tape still inside. Follow the procedures at: **http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf/pages/TapeRecovery**

1. Prepare for drive replacement (see “Service Procedures” on page 790).
2. Open the front door. If the cartridge is partially in the gripper and in the drive, continue at step 6 on page 1049. If the cartridge is in the drive, continue with the next step.
3. Verify that the drive is powered on.
   a. Ensure that the drive power cable is connected at both ends.
   b. Ensure that the circuit breakers on the FCA are ON (not tripped). Do **not** turn off any circuit breakers on the FCA. For x23 / x53 frames only: See Figure 56 on page 123. Ensure the handles **1** on both Bulk Power Card assemblies (BPC) are in the fully down position. This connects the line cord to the Bulk Power Supply (BPS). This would affect other drives, and will erase any dump information currently stored in the failing drive.
   c. Verify that the drive fan is running by holding a piece of paper next to the fan grill in the rear of the fixed tray. If the fan is running it will cause the paper to flutter.
   d. Verify that the customer is not using the library.
   e. To access the front of the drive, open the front door. Look for any indication of power on the drive bezel indicators. If any indicators on the drive bezel are on, then power is good. Go to step 5 on page 1049. If the status indicator LED is dark and the Single Character Display (SCD) is blank, replace the fixed tray assembly. If this corrects the problem, go to step 11 on page 1049.

      Note: The SCSI bus for this particular drive should be quiesced before continuing with this procedure.

   f. If the failure continues, replace the drive power cable. If this corrects the problem, go to step 11 on page 1049. If replacing the drive power cable does **not** correct the problem, contact your next level of support.

4. Press and release the drive unload button **2**, and wait two minutes. If the cartridge unloads, remove it, and go to step 12 in this procedure. If the cartridge does not unload, proceed to the next step.
5. Check for a microcode problem, indicated by a 'hung' drive.
   a. Press and hold the unload button for a full 10 seconds to force the drive to reset itself. The SCD will start changing when the drive resets. Release the unload button.
   b. Attempt to collect a drive dump (see “CETool” on page 725). If you are unable to collect a dump using CETool, ignore the failure.
   c. If you obtained a drive dump, contact your next level of support to determine if this dump will be helpful to them. Ask them to forward the dump to the product PFEs. Analyzing this dump can reveal if this is a new problem or one for which a fix already exists.
   d. If the drive is empty (or has a tape in the ejected position), go to step 12. If there is a cartridge in the drive, press the unload button for 1 second.

      Note: After resetting the drive with a tape loaded, an error recovery procedure in the drive is automatically invoked. This error recovery procedure will very slowly rewind the tape to the beginning. Depending on the position of the tape at the time of the failure, this slow rewind may take as long as 20 minutes. So, if the tape did not eject, do **not** power cycle the drive. Wait 20 minutes, then press the unload button for 1 second. The tape should now eject. If the tape ejects go to 5e.
   e. If the cartridge does not unload, go to “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051.
6. Try to slide the cartridge all the way into the gripper.

   If you can move the cartridge into the gripper, go to “From a Dual Gripper Assembly” on page 1083, remove the cartridge from the gripper, then return to step 12 in this procedure.

   If you cannot move the cartridge into the gripper, slide the cartridge into the drive and continue with the next step.
7. Move the lift and gripper assembly away from the drive.
8. Push the drive unload button **3**. If the cartridge unloads, go to step 12. If the cartridge does not unload, go to “From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader” on page 1051.
9. Reinstall all communications cables and terminators removed during repair.
10. Finish Drive Replacement (see “Service Procedures” on page 790).
11. Run Library Verify Test to test the drive (see “Library Verify Test” on page 759). Use the option **One Drive**. When prompted about the Read/Write Test, select **Yes**.
12. If the customer manually removed any cartridges, they will have to put them back into the library using their procedures. Advise the customer to install the cartridges using the I/O station.
13. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

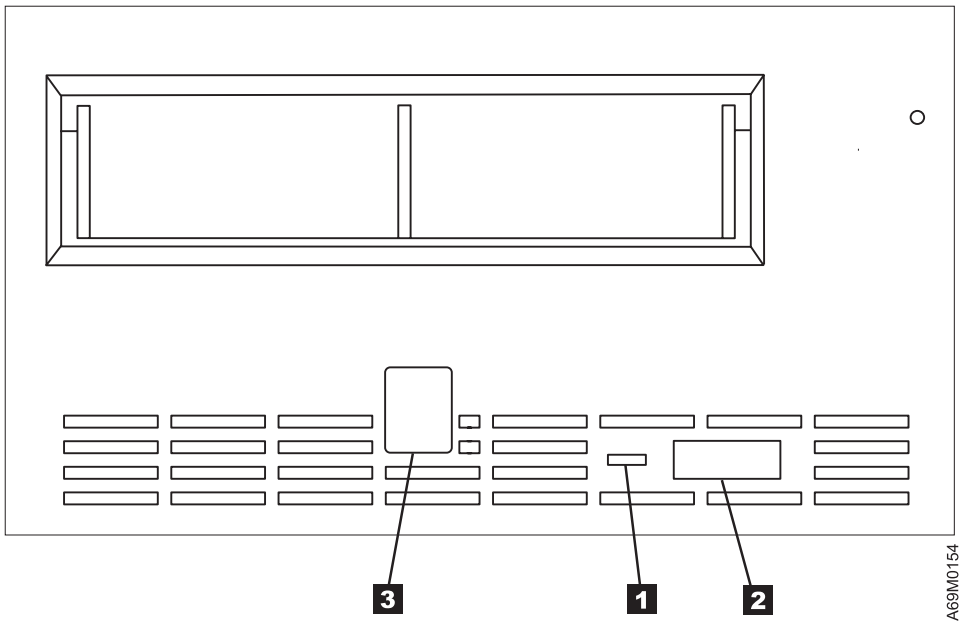


Figure 412. LTO Drive – Front View

From an LTO (Ultrium-1 or 2) Drive When Cartridge is Stuck in Loader:

Note: If you are removing a cartridge from an LTO Ultrium-3 drive, go to “From an LTO Drive (Ultrium-3 through Ultrium-5) When Cartridge is Stuck in Loader” on page 1056.

Before you begin...

If problem-determination procedures identify the drive as the source of a problem, replace the entire unit. Do not attempt to open the drive for repairs. Opening the drive and attempting a repair **other than manually removing a tape cartridge** will void the drive warranty.

LTO Data Recovery for Broken Tapes

If the tape has broken inside the drive and needs to be recovered, do not try to remove the tape from the drive. Follow normal data recovery procedures and ship the drive with the tape still inside. Follow the procedures at: **http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf/pages/TapeRecovery**

Attention:

- If a tape cartridge becomes stuck in the drive and must be manually removed by opening up the drive, visually check for damage to the leader and leader pin in the tape cartridge. If the leader is damaged it must be repaired using a Leader Pin Replacement Kit before attempting to recover the data from the cartridge. If there is no other visible damage to the tape, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer.

  DO NOT use a power screwdriver to perform this procedure, as it could destroy the tape.
- Unless the you determine that the drive is damaged, it can be reinstalled (if removed) and the drive read / write test run to verify operations before returning the drive to the customer.

  Note: When a cartridge is manually removed from a drive, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer so it can be put back into library and *reassigned* to the correct logical library.

Please allow approximately 1 hour for this procedure.

Follow this procedure to manually remove a tape cartridge.

1. Remove the drive. See “Drive Canister Assembly – LTO Fibre, Removal / Replacement” on page 884 to remove the drive from the library.

   Note: When running "Prepare for Drive Replacement," you may get a message that the library is "Unable to unload the drive(s)." Ignore the error and continue with the rest of this procedure.
2. Place the drive on a nonslip, sturdy work surface.
3. Ground yourself to the drive by using an ESD Kit.
4. See Figure 413 on page 1052.
5. Remove the fan cover housing by removing four screws **1** (two on each side on the housing).
6. Disconnect the fibre cable from the drive my depressing the tab on top of the connector and carefully pulling the cable out.
7. Disconnect the three other connectors from the back of the drive canister making careful note of where they were connected.
8. Remove four screws **2** (two on each side on the canister) and remove the canister from the assembly.

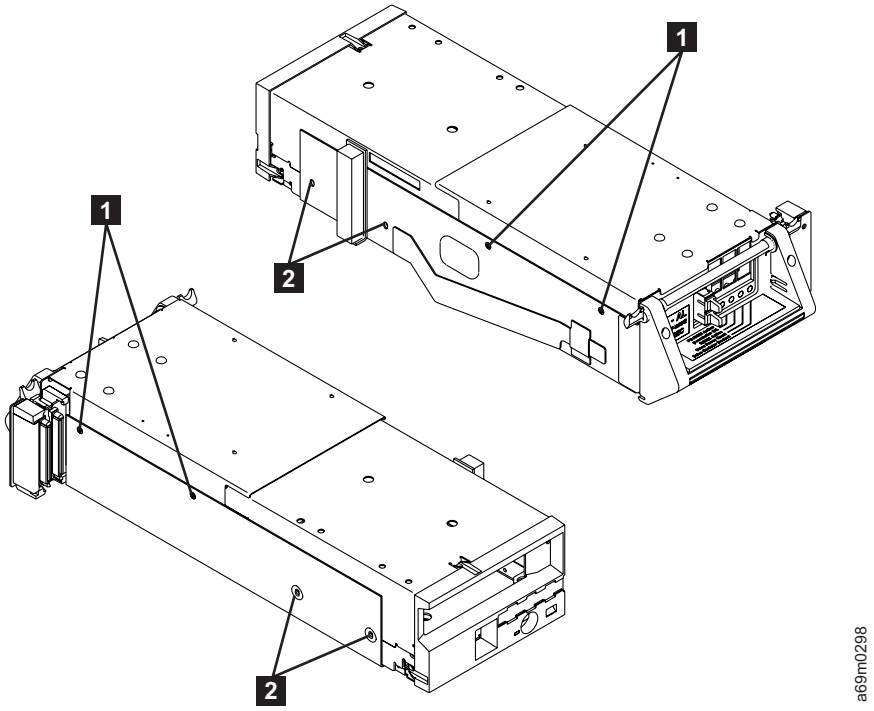


Figure 413. Removing the drive from the enclosure

9. Remove the four drive mounting screws **4** (see Figure 414).
10. Remove the three screws and washers **1** to remove the bezel **2**.
11. Remove the four screws and washers **3** to remove the top cover from the drive.

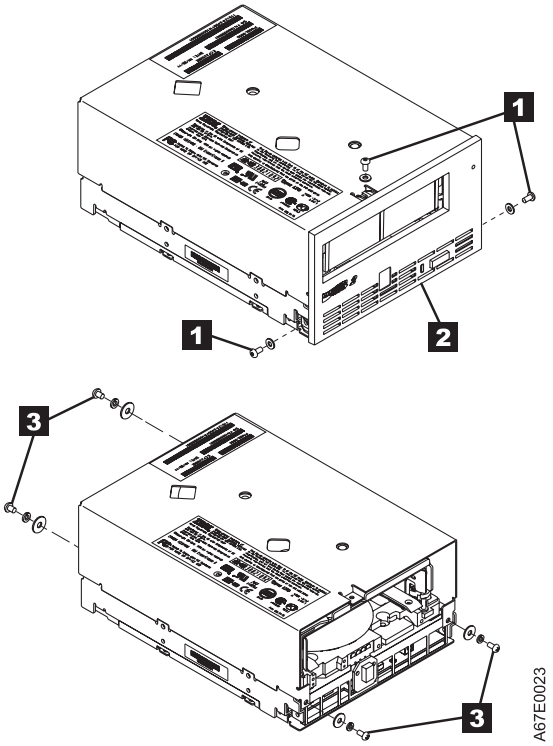


Figure 414. Removing Drive Top Cover

Attention: To avoid contamination and damage caused by electrostatic discharge (ESD), never touch the head or the electronic components within the tape drive.

12. Position the drive with the front facing you, then tilt the drive on its left side (see Figure 415).
13. Locate the access hole **1** at the bottom of the drive, (see Figure 415) and the advance screw within the hole. The advance screw is attached to the supply reel motor.

Attention: In step 14, rotate the advance screw clockwise only, not counterclockwise. A counterclockwise motion would damage the tape.

14. Insert a 2.5 mm hex wrench into the access hole **1** , and rotate the advance screw clockwise. The tape rewinds inside the cartridge, from the take-up reel **2** to the supply reel **3** . As it rewinds onto the supply reel, ensure the tape stays taut by gently pressing your finger against the take-up reel. Stop rotating the screw when you feel resistance. The tape has been rewound as far as it can go.

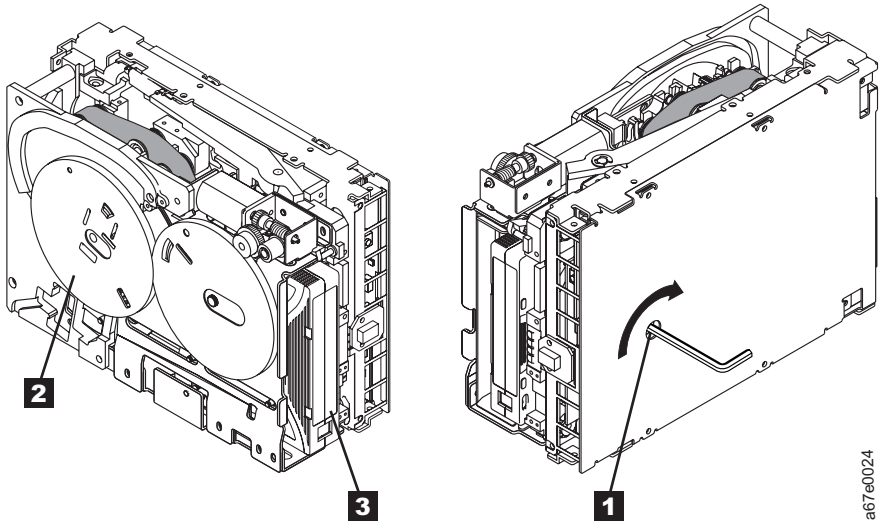


Figure 415. Rewinding Tape from Take-up Reel to Cartridge Supply Reel. Rotate the advance screw **clockwise** *only.*

15. Locate the loader motor gear **1** (see Figure 416 on page 1054). While applying just enough clockwise torque to the advance screw **1** (see Figure 415) to keep the tape tight, rotate the loader motor gear in the unload direction (see arrow **1** in Figure 416 on page 1054). The rotation of the loader motor gear causes the leader-pin block **2** to move from the take-up reel towards the supply reel. When the leader-pin block reaches the cartridge, it should disengage from the leader pin, then rotate away from the cartridge:
    a. If the leader pin disengages from the leader-pin block **2** , rotate the hex wrench clockwise to rewind the tape until the leader pin snaps into the retaining clips in the cartridge. Remove the hex wrench and go to step 19 on page 1055.
    b. If the leader pin does not disengage, go to step 16 on page 1054.

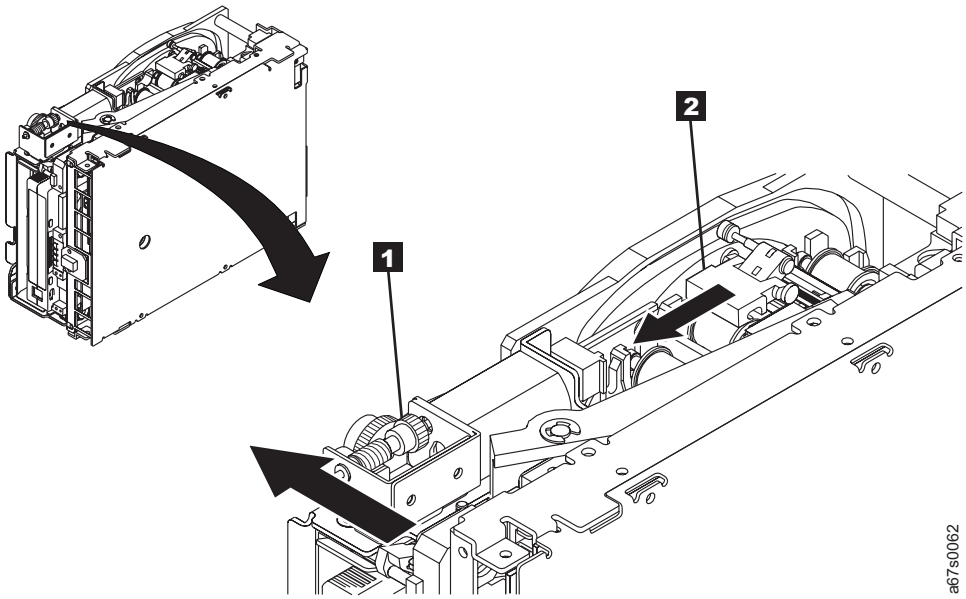


Figure 416. Moving Leader-Pin Block from Take-up Reel to Supply Reel. When the leader-pin block reaches the cartridge, it disengages the leader pin, then rotates away from the cartridge.

Attention: In the next step, do not allow the leader-pin block **2** to touch the head. Damage can result to the head.

16. Being careful not to allow the leader-pin block to contact and damage the head, use clean, needle-nose pliers to grasp the end of the leader pin, if necessary. Pull the leader pin out of the leader-pin block so that you can grip it with your fingers (see **1** in Figure 417 on page 1055).
17. Use your fingers to keep the tape taut, as you rotate the hex wrench **2** **clockwise** 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.
18. Remove the hex wrench.

Note: Do not attempt to seat the leader pin into the cartridge clips. This will interfere with the motion of the leader pin block.

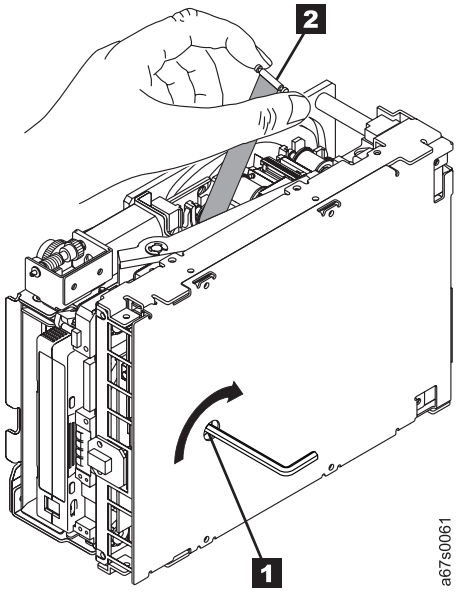


Figure 417. Rewinding Leader Pin into Tape Cartridge

19. Manually rotate the loader motor gear (see **1** in Figure 418 on page 1056) in the unload direction until the leader pin block **2** reaches the last roller **3** .
20. To prevent the leader pin block from jamming, press down on the linkage of the leader block **4** to force up the hinged section of the block.
21. While manually rotating the loader motor gear in the unload direction, guide the end of the leader pin block **5** into the block guide **6** .
22. Continue to rotate the loader motor gear counterclockwise until you feel resistance, and the cartridge rises and ejects.
23. Remove the stuck tape cartridge, and visually check for any damage to the tape or the leader pin. If there is no obvious damage, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer. Ask the customer to copy the data from the tape to another cartridge, and ask them to discard this potentially-damaged cartridge.

    Note: A stuck cartridge should be thoroughly inspected for any damage. If no damage is found, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer so it can be put back into library and *reassigned* to the correct logical library.
24. Unless the you determine that the drive is damaged, it can be re-installed (if removed) and the drive read / write test run to verify operations before returning the drive to the customer.
25. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

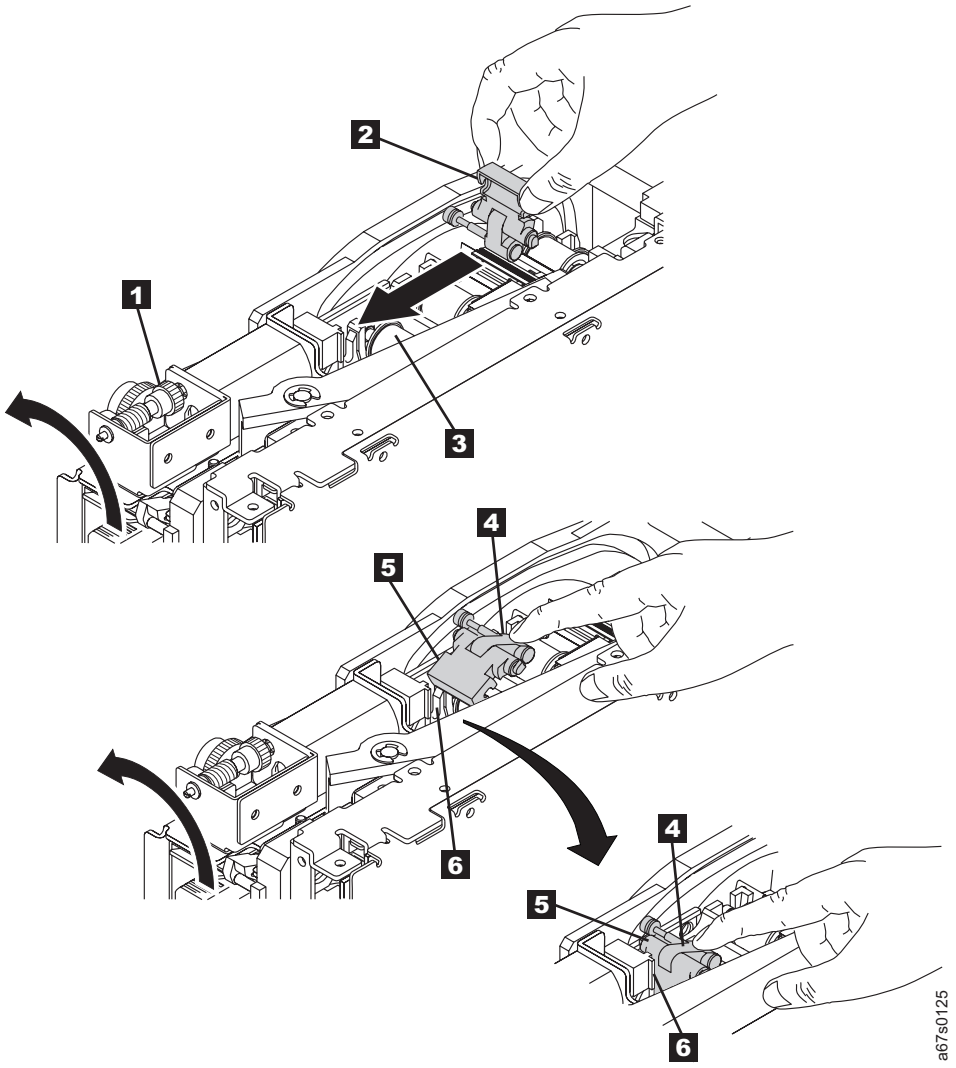


Figure 418. Guiding Leader Pin into Tape Cartridge

From an LTO Drive (Ultrium-3 through Ultrium-5) When Cartridge is Stuck in Loader

Before you begin...

If problem-determination procedures identify the drive as the source of a problem, replace the entire unit. Do not attempt to open the drive for repairs. Opening the drive and attempting a repair **other than manually removing a tape cartridge** will void the drive warranty.

LTO Data Recovery for Broken Tapes

If the tape has broken inside the drive and needs to be recovered, do not try to remove the tape from the drive. Follow normal data recovery procedures and ship the drive with the tape still inside. Follow the procedures at: **http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf/pages/TapeRecovery**

Attention

- Before using this procedure, you must have exhausted all other means of removing the tape cartridge from the drive. Use this procedure **only** if you cannot remove the tape cartridge by using any other means.
- Determine from the customer if the cartridge contains **critical customer data**. If the cartridge contains sensitive data that cannot leave the site, inform the customer that certain failure conditions diagnostics will be performed to test the drive for continued use.
- The following removal procedures **can destroy** customer data! Use **extreme care** when handling or removing the customer's tape cartridges to minimize tape damage and lost data.
- **DO NOT TOUCH** the magnetic tape or tape path. Both are extremely sensitive to the oil and salt from your skin. Use clean, lint-free gloves when working around magnetic tape or the tape path components.
- Electrostatic-sensitive components: Consider using an ESD Kit.
- After you remove the tape cartridge, advise the customer to copy the data to another cartridge and to remove this tape cartridge from service.
- If a tape cartridge becomes stuck in the drive and must be manually removed by opening up the drive, visually check for damage to the leader and leader pin in the tape cartridge. If the leader is damaged it must be repaired using a Leader Pin Replacement Kit before attempting to recover the data from the cartridge. If there is no other visible damage to the tape, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer.
- Do not use power tools or magnetic tools to perform this procedure.
- To avoid contamination and electrostatic-discharge damage to the drive, never touch the head or electronic components inside the drive.
- Unless the you determine that the drive is damaged, it can be re-installed (if removed) and the drive read / write test run to verify operations before returning the drive to the customer.
- If you cannot remove the cartridge from the drive using the following procedures, contact your next level of support.

Please allow approximately 1 hour for this procedure.

Follow this procedure to manually remove a tape cartridge.

Before You Begin:

1. If you have not already done so, attempt to remove the cartridge with the device power ON and using library manager, a host application, or the Unload Button.
2. If you have not already done so, attempt to remove the cartridge by power cycling the drive. Look for the drive to attempt a mid-tape recovery.

   Note: It can take as long as five minutes for the cartridge to rewind and unload.
3. If the cartridge unloads, inform the operator that the cartridge is unloaded. If the cartridge does not unload, continue with this procedure.

Recommended Tools:

- 2.5 mm offset hex wrench (do not use magnetized wrench)
- #1 Phillips screwdriver
- ESD Kit
- Flashlight (optional)

Beginning Procedure:

__ 1. Remove the drive. See “Drive Canister Assembly – LTO Fibre, Removal / Replacement” on page 884 to remove the drive from the library.

Note: When running "Prepare for Drive Replacement," you may get a message that the library is "Unable to unload the drive(s)." Ignore the error and continue with the rest of this procedure on the following page.

__ 2. Place the drive on a nonslip, sturdy work surface.

__ 3. Ground yourself to the drive by using an ESD Kit.

__ 4. See Figure 419.

__ 5. Remove the fan cover housing by removing four screws **1** (two on each side on the housing).

__ 6. Disconnect the fibre cable from the drive my depressing the tab on top of the connector and carefully pulling the cable out.

__ 7. Disconnect the three other connectors from the back of the drive canister making careful note of where they were connected.

__ 8. Remove four screws **2** (two on each side on the canister) and remove the canister from the assembly.

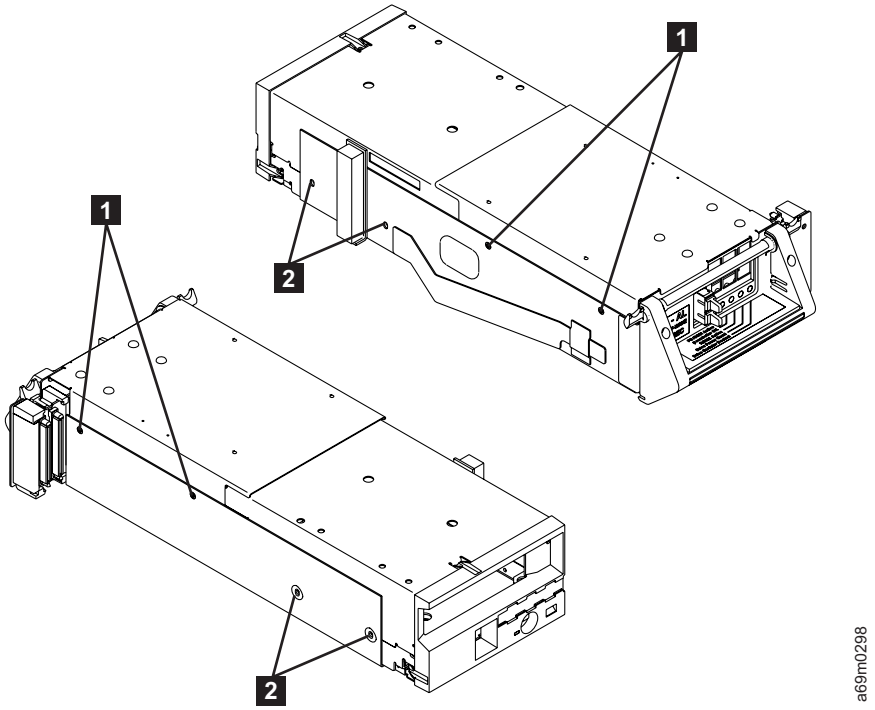


Figure 419. Removing the drive from the enclosure

__ 9. Remove the cover of the drive by performing the following steps:

a. Using a Phillips screwdriver, remove the three screws and washers (see **1** in Figure 420 on page 1059) that secure the bezel **2** to the internal drive, then remove the bezel.

b. Remove the cover of the internal drive by performing the following steps:

1) Remove the four cover-mounting screws and washers **3** .

2) Remove the cover by lifting it up.

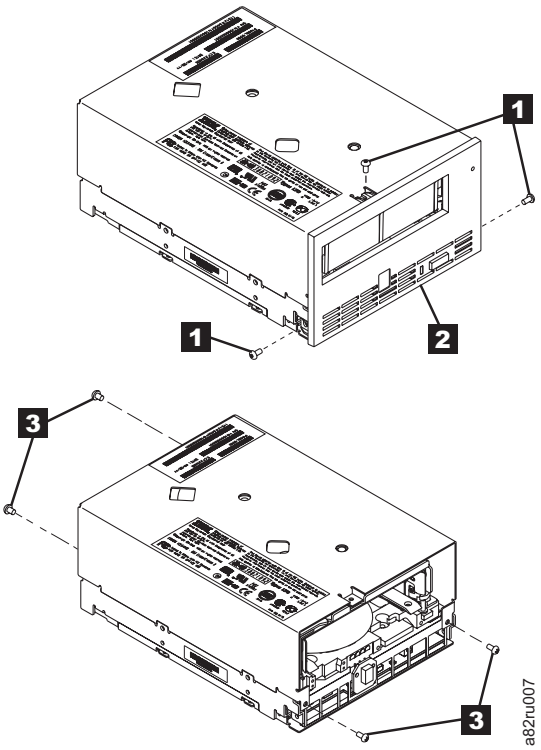


Figure 420. Removing the cover from the internal drive

__ 10. Inspect the drive to decide which of the following conditions most closely matches the symptom on the drive:

- **Tape spooled off the supply reel** - All the tape appears to be on the take up reel and no tape is on the supply reel (inside the cartridge). Test the drive after the procedure is completed.
- **Tape pulled from leader pin (or broken at the front end)** - All the tape appears to be on the supply reel (inside the cartridge) and very little or no tape appears to be on the take up reel. The leader block is positioned in the take up reel. Return the drive after the procedure is completed.
- **Tape broken in mid-tape** - Tape appears to be on both the supply reel (inside the cartridge) and take up reel. Test the drive after the procedure is completed.
- **Tape tangled along tape path** - Tape appears to be tangled and damaged but in tact. Return the drive after the procedure is completed.

  -- OR --

  No damage to tape (or no apparent failure) - There appears to be no damage or slack to the tape. Return the drive after the procedure is completed.

Tape Spooled off Supply Reel:

__ 1. With the front of the drive facing you, pull an arm's length of tape out of the take up reel from the left side of the drive.

__ 2. From the take up reel, thread tape around the rear of the tape path and over the head and rollers on the left side of the drive.

__ 3. Set the drive on its left side with the head and tape path facing up.

__ 4. Moisten a cotton swab with water and wet approximately 13 mm (0.5 in.) of the tape end and feed it onto the supply reel (inside the cartridge).

__ 5. From the bottom of the drive, insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle.

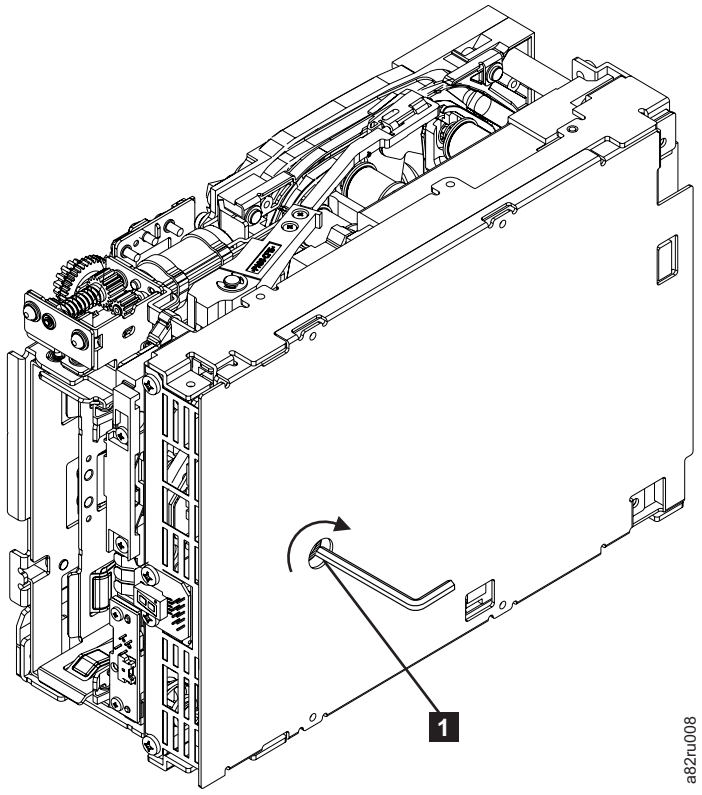


Figure 421. Using hex wrench to rewind tape into cartridge

__ 6. Turn the supply reel clockwise, allowing the moistened tape to adhere to the hub as it winds around the supply reel (inside the cartridge).

__ 7. Continue spooling into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.

__ 8. Reassemble the drive, reversing the steps in “Beginning Procedure” on page 1058.

__ 9. Allow the drive to perform mid-tape recovery. This takes several minutes. When this activity completes, the cartridge ejects automatically.

__ 10. Test the drive to determine if it is operational or must be replaced:

- Reinstall the drive in the original position.
- Perform the "Finish Drive Replacement" in “Service Procedures” on page 790.
- Select the drive you replace or reinstalled.
- The operator panel displays the message, "Do you want to perform the read/write test on the drive." Select YES.

- The operator panel displays the message, "Returning the drive to normal operation" followed by "The replacement procedure is complete. Press ENTER to put the device 'online' to the host."
- Press BACK until the Activity screen is displayed.

Tape Pulled from or Broken near Leader Pin:

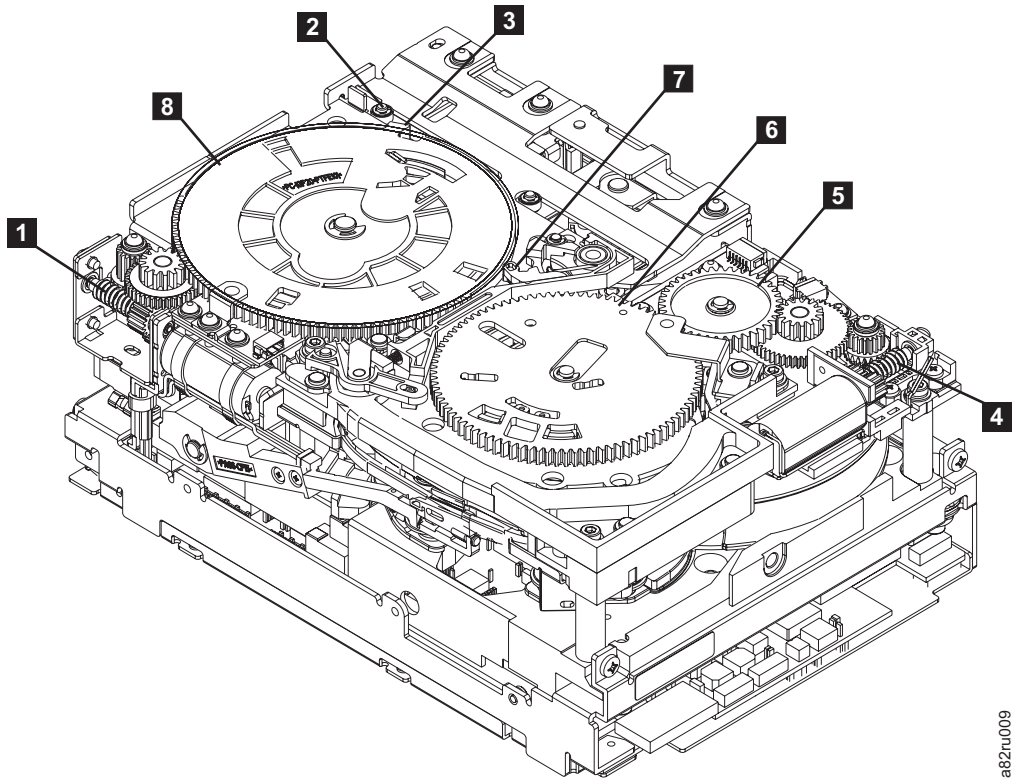


Figure 422. Drive with cover removed to reveal gear train.

1	Loader motor worm gear	6	Threader mechanism gear
2	Cartridge loader tray guide bearing	7	Lever
3	Rotator stub	8	Loader mechanism gear
4	Threader motor worm gear		
5	Threader intermediate gear		

__ 1. From the left side of the drive, pull out tape from the take up reel.

Note: If there is more than approximately 0.6 m (2 ft.) of tape on the take up reel, go to “Tape Broken in Mid-tape” on page 1062.

__ 2. If there is less than approximately 0.6 m (2 ft.) of tape on the take up reel, cut off the excess tape as close to the leader pin, as possible.

__ 3. Locate the threader motor worm gear (4 in Figure 422) the rear of the drive. Use your finger to rotate the threader motor worm gear and slowly rotate the threader mechanism gear (6 in Figure 422) clockwise. This rotates the threader motor worm gear (4 in Figure 422) clockwise, drawing the tape leader block assembly (LBA) into the cartridge.

__ 4. As the LBA is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear (4 in Figure 422) stops. The LBA is in the correct position.

Note: Be sure to keep tension on the tape as the LBA is drawn into the cartridge by using a hex wrench as shown in Figure 417 on page 1055.

__ 5. Notice the following:

a. Loader mechanism gear (**8** in Figure 422 on page 1061) nearest the front of the drive that actuates the cartridge loader mechanism

b. Position of the rotator stub (**3** in Figure 422 on page 1061).

c. Front loader motor worm gear (**1** in Figure 422 on page 1061). Rotating this gear allows the loader mechanism gear (**8** in Figure 422 on page 1061) to turn.

__ 6. Rotate the loader motor worm gear (**1** in Figure 422 on page 1061) to turn the loader mechanism gear (**8** in Figure 422 on page 1061) counterclockwise. Continue turning until the rotator stub (**3** in Figure 422 on page 1061) loses contact with the lever (**7** in Figure 422 on page 1061). This releases the LBA leader pin.

__ 7. Rotate the threader motor worm gear (**4** in Figure 422 on page 1061) to turn the threader mechanism gear (**6** in Figure 422 on page 1061) counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the rear of the drive (**1** in Figure 423).

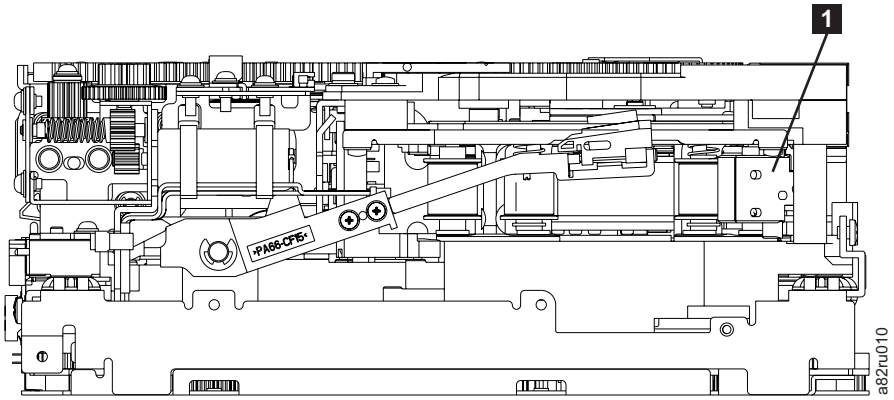


Figure 423. Leader Block Assembly (LBA)

__ 8. Continue rotating the loader motor worm gear (**1** in Figure 422 on page 1061) until the rotate stub (**3** in Figure 422 on page 1061) is positioned as shown. Notice that the rotator stub (**3** in Figure 422 on page 1061) is nearly aligned with the cartridge loader tray guide bearing (**2** in Figure 422 on page 1061).

__ 9. Remove the cartridge from the cartridge loader tray.

__ 10. Reassemble the drive by reversing the procedure in Step 9 on page 1058 in Beginning Procedure.

__ 11. Refer to the appropriate procedure to install the new drive and return the failed drive.

Tape Broken in Mid-tape:

__ 1. With the front of the drive facing you, pull an arm's length of tape out of the take up reel from the left side of the drive.

Note: If there is less than approximately 5 cm (2 in.) of tape on the take up reel, go to “Tape Pulled from or Broken near Leader Pin” on page 1061.

__ 2. From the supply reel inside the cartridge, pull approximately 0.3 m (1 ft.) of tape.

__ 3. From the take up reel, thread tape around the rear of the tape path and over the head rollers on the left side of the drive.

__ 4. Moisten a cotton swab with water, and wet approximately 13 mm (0.5 in.) of the tape end. Overlap the tape ends, loosely mending them together.

__ 5. Set the drive on its left side with the head and tape path facing up.

__ 6. From the bottom of the drive, locate the access hole (**1** in Figure 424) in the bottom cover. Insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle. begin spooling tape back into the cartridge by turning the hex wrench clockwise.

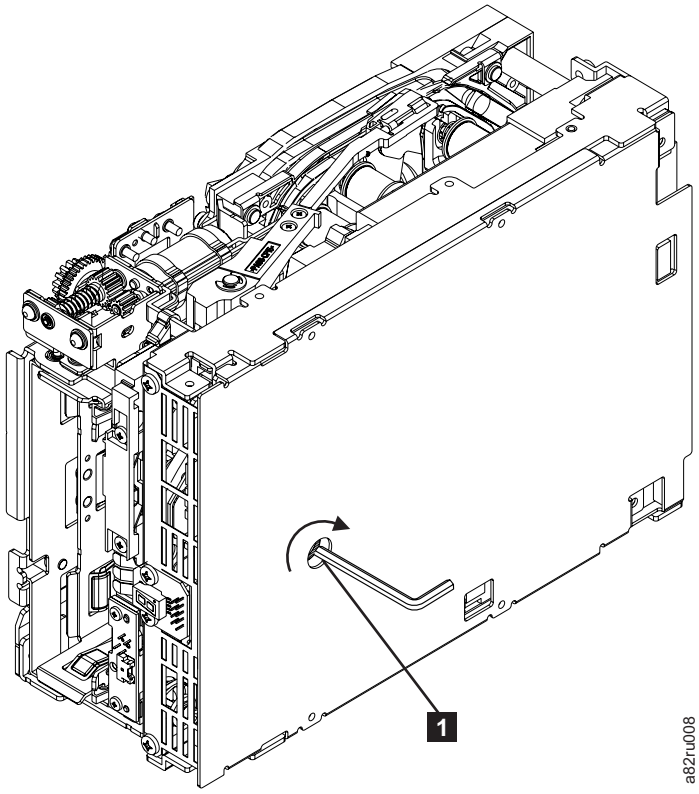


Figure 424. Using hex wrench to rewind tape into cartridge

__ 7. Turn the supply reel clockwise, carefully guiding the mended portion of the tape to wind around the hub of the supply reel located inside the cartridge. Continue spooling into the cartridge until the tape is taut. The tape must remain within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.

__ 8. Reassemble the drive by reversing the procedure in Step 9 on page 1058 in Beginning Procedure.

__ 9. Allow the drive to perform mid-tape recovery. This takes several minutes. When this activity completes, the cartridge ejects automatically.

__ 10. Test the drive to determine if it is operational or must be replaced:

- Reinstall the drive in the original position.
- Perform the "Finish Drive Replacement" in “Service Procedures” on page 790.
- Select the drive you replace or reinstalled.
- The operator panel displays the message, "Do you want to perform the read/write test on the drive." Select YES.
- The operator panel displays the message, "Returning the drive to normal operation" followed by "The replacement procedure is complete. Press ENTER to put the device 'online' to the host."
- Press BACK until the Activity screen is displayed.

- Tape Tangled along Tape Path

__ 1. Carefully pull out excess tape and untangle.

Note: If you find the tape to be broken, go to one of the following appropriate procedures:

- “Tape Spooled off Supply Reel” on page 1060
- “Tape Pulled from or Broken near Leader Pin” on page 1061

--OR--

“Tape Broken in Mid-tape” on page 1062

__ 2. Set the drive on its left side with the head and tape path facing up.

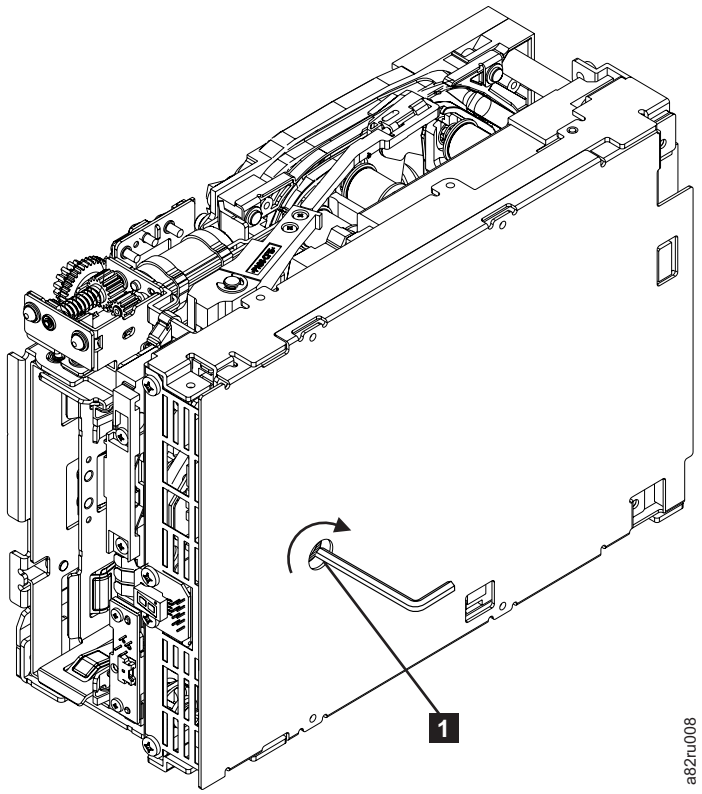


Figure 425. Using hex wrench to rewind tape into cartridge

__ 3. From the bottom of the drive, locate the access hole (**1** in Figure 425).

__ 4. Insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle. Begin spooling the tape back into the cartridge by turning the hex wrench clockwise.

__ 5. Continue spooling into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.

__ 6. Locate the threader motor worm gear (**4** in Figure 426 on page 1065) on the rear of the drive. Use your finger to rotate the treader motor worm gear and slowly rotate the threader mechanism gear (**6** in Figure 426 on page 1065) clockwise. This rotates the threader motor worm gear (**4** in Figure 426 on page 1065) clockwise, drawing the LBA into the cartridge.

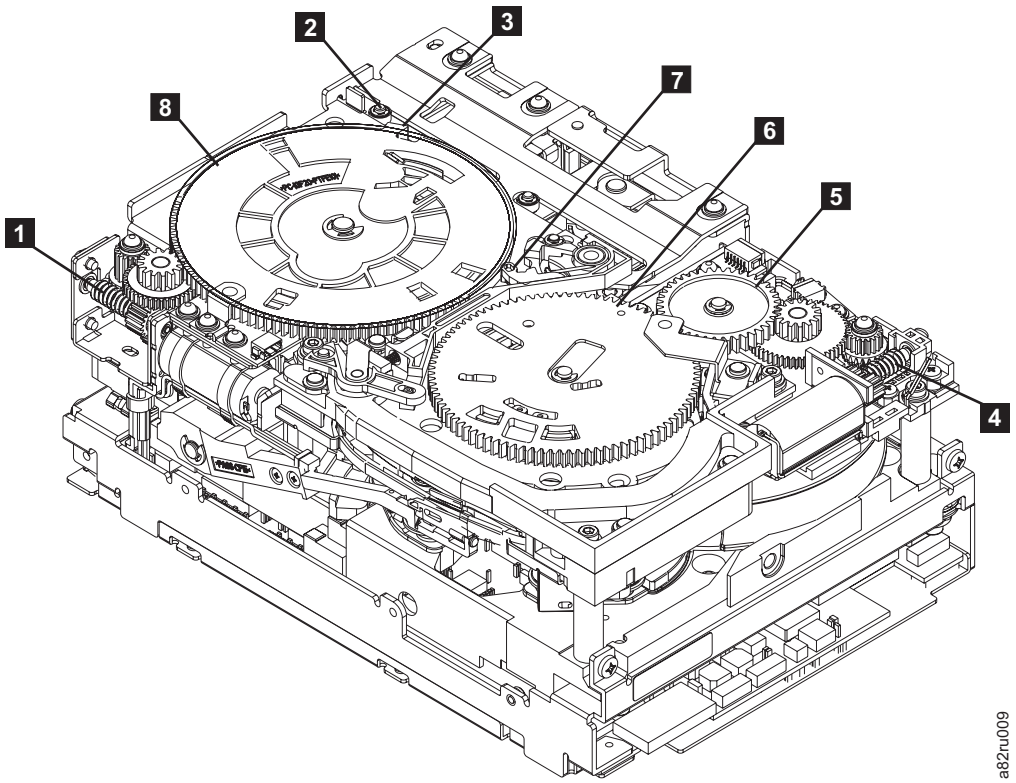


Figure 426. Drive with cover removed to reveal gear train.

1	Loader motor worm gear	6	Threader mechanism gear
2	Cartridge loader tray guide bearing	7	Lever
3	Rotator stub	8	Loader mechanism gear
4	Threader motor worm gear		
5	Threader intermediate gear		

__ 7. As the tape leader block assembly (LBA) is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear (4 in Figure 426) stops. The LBA is in the correct position.

Note: Be sure to keep tension on the tape as the LBA is drawn into the cartridge by using a hex wrench as shown in Figure 425 on page 1064.

__ 8. Notice the:

a. Loader mechanism gear (8 in Figure 426) nearest the front of the drive that actuates the cartridge loader mechanism.

b. Position of the rotate stub (3 in Figure 426).

c. Front loader motor worm gear (1 in Figure 426). Rotating this gear allows the loader mechanism gear (8 in Figure 426) to turn.

__ 9. Rotate the loader motor worm gear (1 in Figure 426) to turn the threader mechanism gear (6 in Figure 426) counterclockwise. Continue turning until the rotator stub (3 in Figure 426) loses contact with the lever (7 in Figure 426). This releases the LBA leader pin.

__ 10. Rotate the threader motor worm gear (4 in Figure 426) to turn the threader mechanism gear (6 in Figure 426) counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the rear of the drive

shown as 1 Figure 427.

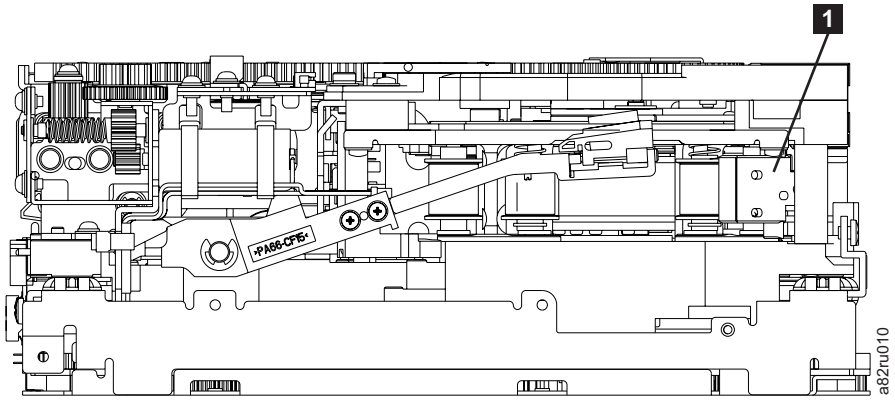


Figure 427. Leader Block Assembly (LBA)

__ 11. Continue rotating the loader motor worm gear (1 in Figure 426 on page 1065) until the rotator stub (3 in Figure 426 on page 1065) is positioned as shown. Notice that the rotator stub (3 in Figure 426 on page 1065) is nearly aligned with the cartridge loader tray guide bearing (2 in Figure 426 on page 1065).

__ 12. Remove the cartridge from the cartridge loader tray.

__ 13. Reassemble the drive by reversing the procedure in Step 9 on page 1058 in Beginning Procedure.

__ 14. Refer to the appropriate procedure to install the new drive and return the failed drive.

- No Apparent Failure or Damage to Tape

__ 1. Set the drive on its left side with the head and tape path facing up.

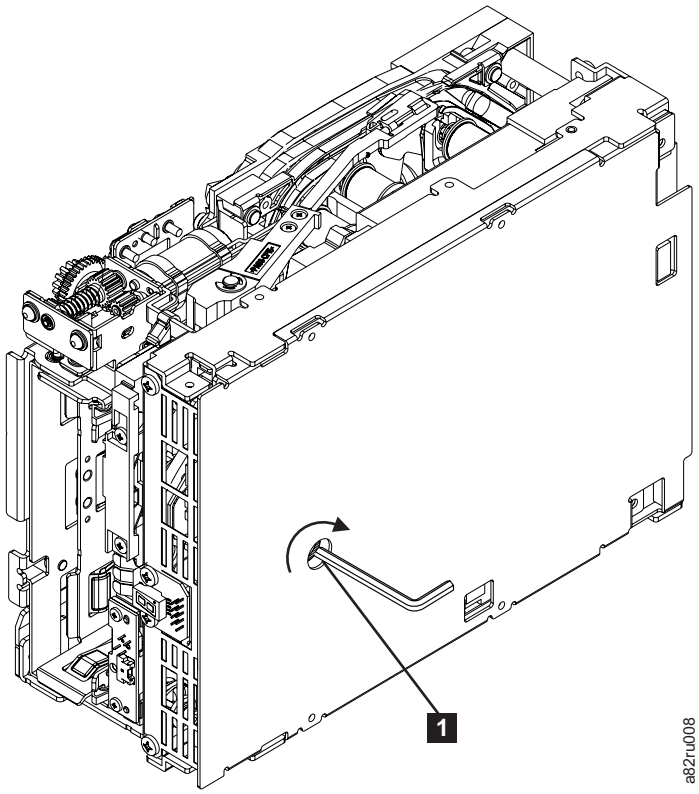


Figure 428. Using hex wrench to rewind tape into cartridge

__ 2. From the bottom of the drive, locate the access hole (**1** in Figure 428).

__ 3. Insert a 2.5 mm offset hex wrench through the bottom cover access hole and into the reel motor axle. Begin spooling the tape back into the cartridge by turning the hex wrench clockwise.

__ 4. Continue spooling into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.

__ 5. Locate the threader motor worm gear (**4** in Figure 429 on page 1068) on the rear of the drive. Use your finger to rotate the threader motor worm gear and slowly rotate the threader mechanism gear (**6** in Figure 429 on page 1068) clockwise. This rotates the threader motor worm gear (**4** in Figure 429 on page 1068) clockwise, drawing the LBA into the cartridge.

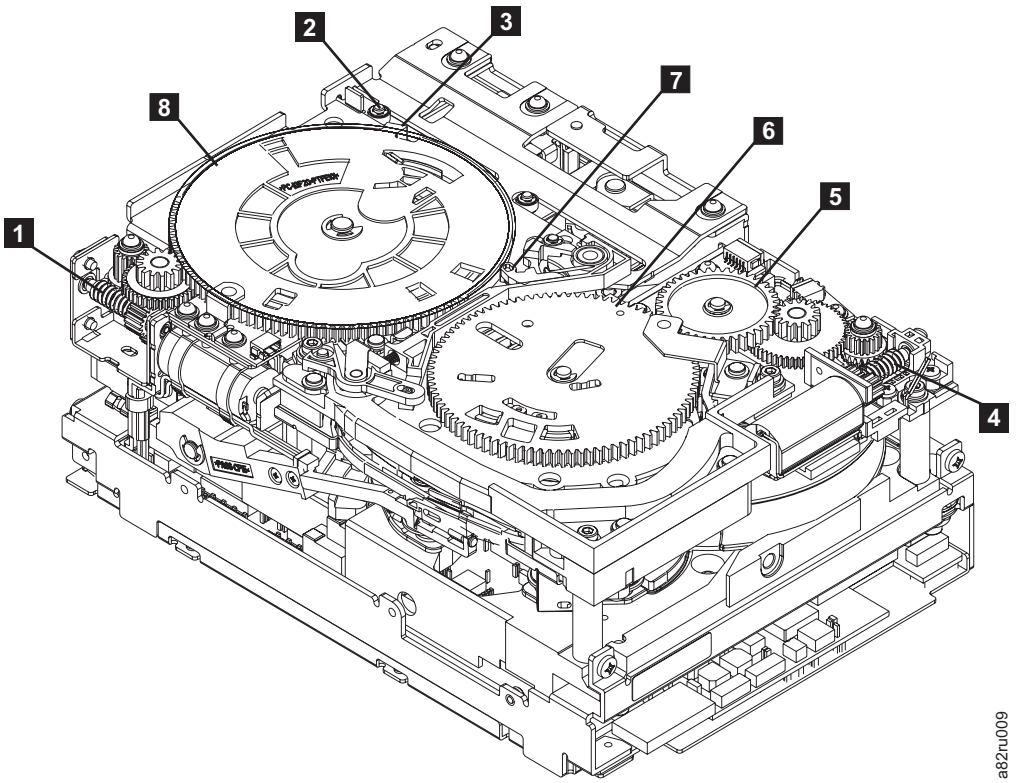


Figure 429. Drive with cover removed to reveal gear train.

1	Loader motor worm gear	6	Threader mechanism gear
2	Cartridge loader tray guide bearing	7	Lever
3	Rotator stub	8	Loader mechanism gear
4	Threader motor worm gear		
5	Threader intermediate gear		

__ 6. As the tape leader block assembly (LBA) is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear (4 in Figure 426 on page 1065) stops. The LBA is in the correct position.

Note: Be sure to keep tension on the tape as the LBA is drawn into the cartridge by using a hex wrench as shown in Figure 425 on page 1064.

__ 7. Notice the:

a. Loader mechanism gear (8 in Figure 429) nearest the front of the drive that actuates the cartridge loader mechanism.

b. Position of the rotate stub (3 in Figure 429).

c. Front loader motor worm gear (1 in Figure 429). Rotating this gear allows the loader mechanism gear (8 in Figure 429) to turn.

__ 8. Rotate the loader motor worm gear (1 in Figure 429) to turn the threader mechanism gear (6 in Figure 429) counterclockwise. Continue turning until the rotator stub (3 in Figure 429) loses contact with the lever (7 in Figure 429). This releases the LBA leader pin.

__ 9. Rotate the threader motor worm gear (4 in Figure 429) to turn the threader mechanism gear (6 in Figure 429) counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the rear of the drive

shown as 1 Figure 430.

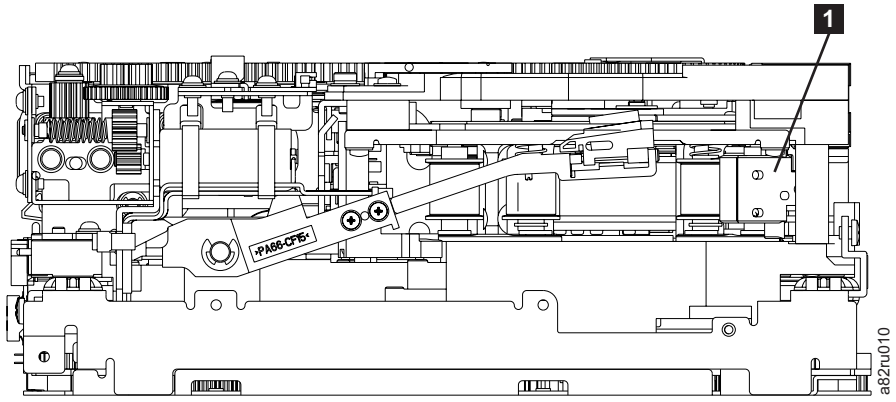


Figure 430. Leader Block Assembly (LBA)

__ 10. Continue rotating the loader motor worm gear (1 in Figure 429 on page 1068) until the rotator stub (3 in Figure 429 on page 1068) is positioned as shown. Notice that the rotator stub (3 in Figure 429 on page 1068) is nearly aligned with the cartridge loader tray guide bearing (2 in Figure 429 on page 1068).

__ 11. Remove the cartridge from the cartridge loader tray.

__ 12. Reassemble the drive by reversing the procedure in Step 9 on page 1058 in Beginning Procedure.

__ 13. Refer to the appropriate procedure to install the new drive and return the failed drive.

From a 3592 Drive

Before you begin...

If a customer's cartridge must be removed, inform the customer.

Care Considerations: With critical customer data, you may not want to attempt to remove the cartridge in the field and risk damaging the media. Using local geography procedures, you may want to return the drive to IBM, with the tape still loaded in the drive, for cartridge/data recovery. If the customer has granted you permission to return the cartridge with the drive to IBM, contact your next level of support for advice and instructions about returning the drive to IBM.

In this procedure, you will remove a stuck tape cartridge, and visually check for any damage to the tape or the leader pin. If the inspection finds a problem, and it can't be resolved, the cartridges should be considered bad. However, if there is no obvious damage, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer so it can be put back into library and *reassigned* to the correct logical library.

Caution: Some components of the drive canister such as the sheet metal case and the canister side spring may have sharp edges. Carefully handle the bare edges of the drive canister, the canister top cover, and the canister (retention) side spring.

If the 3592 drive is disassembled for any reason, replace the drive.

1. Prepare for drive replacement (see “Service Procedures” on page 790).
2. Open the front door. If the cartridge is partially in the gripper and in the drive, continue at step 6 on page 1071. If the cartridge is in the drive, continue with the next step.
3. Verify that the drive is powered on.
   a. Ensure that the drive power cable is connected at both ends.
   b. Ensure that the circuit breakers on the FCA are ON (not tripped). Do **not** turn off any circuit breakers on the FCA. For x23 / x53 frames only: See Figure 56 on page 123. Ensure the handles **1** on both Bulk Power Card assemblies (BPC) are in the fully down position. This connects the line cord to the Bulk Power Supply (BPS). This would affect other drives, and will erase any dump information currently stored in the failing drive.
   c. Verify that the drive fan is running by holding a piece of paper next to the fan grill in the rear of the fixed tray. If the fan is running it will cause the paper to flutter.
   d. Verify that the customer is not using the library.
   e. To access the front of the drive, open the front door. Look for any indication of power on the drive bezel indicators. If any indicators on the drive bezel are on, then power is good. Go to step 5. If the status indicator LED is dark and the Single Character Display (SCD) is blank, replace the fixed tray assembly. If this corrects the problem, go to step 11 on page 1071.
   f. If the failure continues, replace the drive power cable. If this corrects the problem, go to step 11 on page 1071. If replacing the drive power cable does **not** correct the problem, contact your next level of support.
4. Press and release the drive unload button **2**, and wait two minutes. If the cartridge unloads, remove it, and go to step 12 on page 1071 in this procedure. If the cartridge does not unload, proceed to the next step.
5. Check for a microcode problem, indicated by a 'hung' drive.
   a. Press and hold the unload button for a full 10 seconds to force the drive to reset itself. The SCD will start changing when the drive resets. Release the unload button.
   b. Attempt to collect a drive dump (see “CETool” on page 725). If you are unable to collect a dump using CETool, ignore the failure.

c. If you obtained a drive dump, contact your next level of support to determine if this dump will be helpful to them. Ask them to forward the dump to the product PFEs. Analyzing this dump can reveal if this is a new problem or one for which a fix already exists.

d. If the drive is empty (or has a tape in the ejected position), go to step 12. If there is a cartridge in the drive, press the unload button for 1 second.

Note: After resetting the drive with a tape loaded, an error recovery procedure in the drive is automatically invoked. This error recovery procedure will very slowly rewind the tape to the beginning. Depending on the position of the tape at the time of the failure, this slow rewind may take as long as 20 minutes. So, if the tape did not eject, do **not** power cycle the drive. Wait 20 minutes, then press the unload button for 1 second. The tape should now eject. If the tape ejects go to 5e.

e. If the cartridge does not unload, go to “From a 3592 Drive When Cartridge is Stuck in Loader” on page 1072.

6. Try to slide the cartridge all the way into the gripper.

   If you can move the cartridge into the gripper, go to “From a Dual Gripper Assembly” on page 1083, remove the cartridge from the gripper, then return to step 12 in this procedure.

   If you cannot move the cartridge into the gripper, slide the cartridge into the drive and continue with the next step.
7. Move the lift and gripper assembly away from the drive.
8. Push the drive unload button **2** . If the cartridge unloads, go to step 12. If the cartridge does not unload, go to “From a 3592 Drive When Cartridge is Stuck in Loader” on page 1072.
9. Reinstall all communications cables and terminators removed during repair.
10. Finish Drive Replacement (see “Service Procedures” on page 790).
11. Run Library Verify Test to test the drive (see “Library Verify Test” on page 759). Use the option **One Drive**. When prompted about the Read/Write Test, select **Yes**.
12. If you manually removed any cartridges, give them to the customer. Advise the customer to install the cartridges using the I/O station.
13. Return to the procedure that sent you here; otherwise, go to “End-of-Call” on page 794.

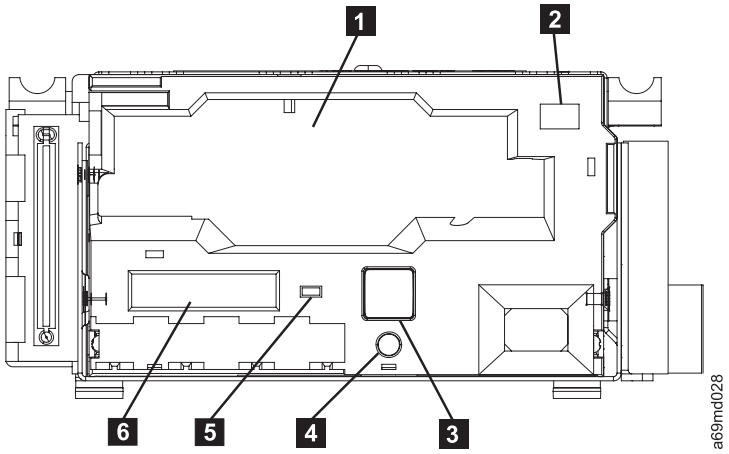


Figure 431. 3592 Drive – Front View

From a 3592 Drive When Cartridge is Stuck in Loader:

Before you begin...

If a machine-initiated rewind and unload fails to recover the tape cartridge, the cartridge must be removed manually by removing the top cover/blower assembly, and removing the drive from the canister housing. If any additional parts are removed or disassembled, it may will void the drive warranty.

Caution: Some components of the drive canister such as the sheet metal case and the canister side spring may have sharp edges. Carefully handle the bare edges of the drive canister, the canister top cover, and the canister (retention) side spring.

If the 3592 drive is disassembled for any reason, replace the drive.

Attention:

- If a tape cartridge becomes stuck in the drive and must be manually removed by opening up the drive, visually check for damage to the leader and leader pin in the tape cartridge. If the leader is damaged it must be repaired using a Leader Pin Replacement Kit before attempting to recover the data from the cartridge. If there is no other visible damage to the tape, follow the procedures in “When Cartridge is Dropped or Stuck in Gripper” on page 1044, then give the cartridge to the customer.

  DO NOT use a power screwdriver to perform this procedure, as it could destroy the tape.
- Unless the you determine that the drive is damaged, it can be re-installed (if removed) and the drive read / write test run to verify operations before returning the drive to the customer.
- Before using this procedure, you must have exhausted all other means of removing the tape cartridge from the drive. Use this procedure **only** if you cannot remove the tape cartridge by using any other means. Use this procedure to recover a tape cartridge that fails to unload from a drive canister.
- If you cannot remove the cartridge from the drive using the following procedure, contact your next level of support.
- Determine from the customer if the cartridge contains **critical customer data**. The following removal procedures **can destroy** customer data! Use **extreme care** when handling or removing the customer's tape cartridges to minimize tape damage and lost data.
- **Do Not Touch** the magnetic tape or tape path. They are extremely sensitive to the oil and salt from your skin. Use clean, lint-free gloves when working around magnetic tape or the tape path components.
-  Electrostatic-sensitive components. Consider using an ESD Kit.
- After you remove the stuck tape cartridge, advise the customer to copy the data to another cartridge and to remove this tape cartridge from service.
- Do not use power tools or magnetic tools to perform this procedure.
- To avoid contamination and electrostatic-discharge damage to the drive, never touch the head or electronic components inside the drive.

The purpose of this section is to assist you to determine the condition of the cartridge or the magnetic tape and to direct you to the procedure you must follow to remove the cartridge.

Before You Begin

If you have not already done so, attempt to remove the cartridge with power ON the device.

1. Display the Options menu on the service panel.
2. Select **Unload Drive** from the Options menu, and press **Enter**. The cartridge should unload and return to the priority cell or to the magazine.

Note: It can take as long as five minutes for the cartridge to rewind and unload.

3. If the cartridge unloads, inform the operator that the cartridge is unloaded. If the cartridge does not unload, continue with this procedure.

Recommended Tools

- 2.5 mm offset hex wrench (do not use magnetized wrench)
- #1 Crosspoint screwdriver
- ESD Kit (see “Protecting ESD-Sensitive Parts” on page 762)
- Flashlight (optional)

Begin Procedure

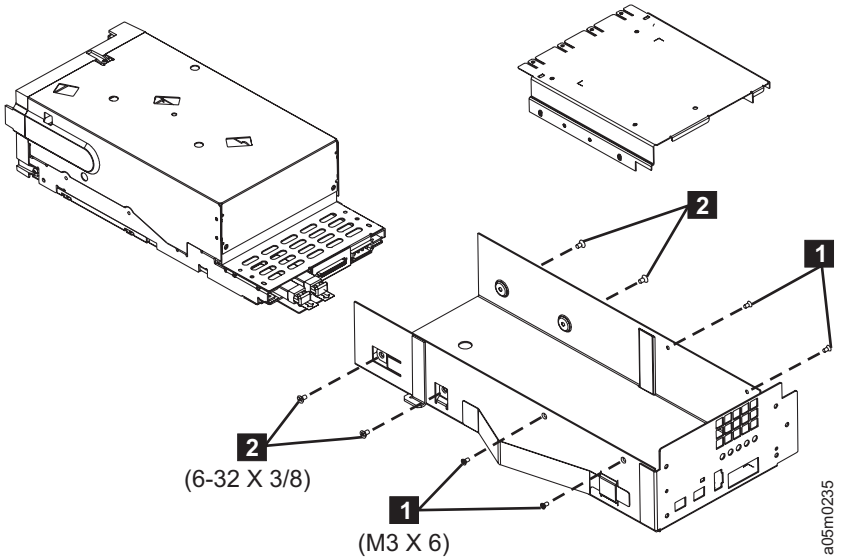


Figure 432. Drive Canister – Cradle Screws

1. Remove the drive canister from the library.
2. Remove the drive from the canister housing by performing the following steps:
   a. Remove four screws to remove the canister top cover and blower **1** .
   b. Unplug the blower power connector.
   c. Remove the four drive mounting screws **2** .
   d. Unplug the power cable, the flex cable, and the fibre pigtail cables. **Note:** Push down on the locking tab on the fibre pigtails to remove. If necessary, slide the drive forward to provide access to the cables.
   e. Remove the drive from the canister housing.
3. Place the drive on a non-slip work surface.
4. Ground yourself to the drive using the ESD Kit.

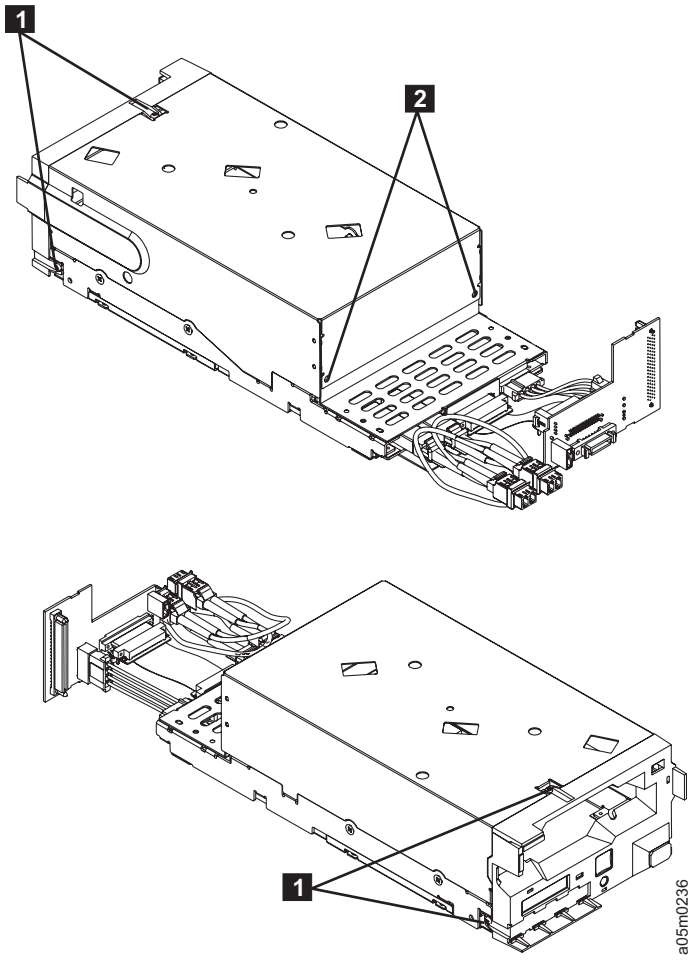


Figure 433. Drive Canister – Bezel Screws

5. See Figure 433. Remove the cover of the drive by performing the following steps:
   a. Remove the three screws that secure the bezel **1** (one on each side and one on top).
   b. Unplug the bezel cable and remove the bezel.
   c. Remove the four cover-mounting screws (two at the rear **2**, and two at the front under the bezel - not shown).
   d. Remove the cover by lifting it up. Set the cover aside.
6. With the front (operator bezel end) of the drive facing you, tilt the drive on its left side, with the head facing up.
7. From the bottom of the drive, locate the access hole (in the bottom cover) for the cartridge reel motor screw.
8. See Figure 434 on page 1076. Insert a 2.5-mm offset hex wrench through the bottom cover access hole **1**, and into the reel motor axle. Begin spooling tape back into the cartridge by the turning the hex wrench clockwise. Ensure that you do not stretch the tape. The tape must remain within the flanges of the tape guiding rollers.

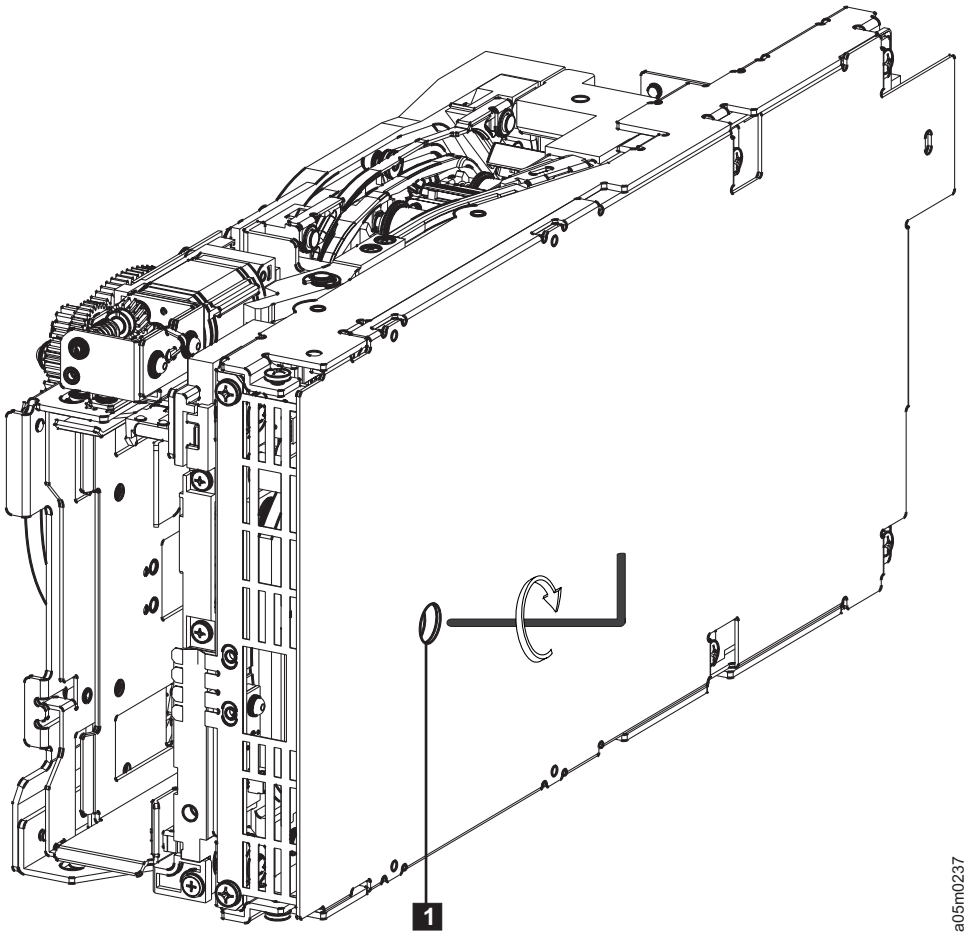


Figure 434. Using Hex Wrench to Rewind Tape Into Cartridge

9. Continue unspooling the tape until all the tape is unwound from the take-up reel. The tape should still be captured by the leader block assembly (LBA), which is held within the take-up reel hub.
10. If the tape was not broken and the tape has been rewound into the tape cartridge, go to “Leaving Threader Gear in Place” on page 1077.

– – OR – –

If the tape was broken or could not be rewound into the tape cartridge, go to “Removing Threader Gear” on page 1078.

Leaving Threader Gear in Place: Use this procedure if the tape was respooled into the tape cartridge.

1. Locate the threader motor worm gear **4** on the rear end of the drive. With the tape respooled into the tape cartridge, you can use your finger to rotate the worm gear **4** and slowly drive the threader mechanism gear **6**.
2. Hold the hex wrench in place to keep a small amount of tension on the tape as you rotate the threader motor worm gear **4**. Rotate the threader motor worm to drive the threader gear clockwise. This draws the LBA (and tape) into the cartridge.
3. As the tape leader pin assembly (LPA) is secured in the cartridge, you should hear the LPA retention spring clips click into place. If you do not hear the click, continue rolling until the gear **4** stops. The LPA is in the correct position.
4. Remove the hex wrench and turn the drive to a horizontal position (gears facing up). Notice the:
   - Loader gear **8** nearest the front of the drive that actuates the cartridge loader mechanism
   - Position of the rotator stub **3**
   - Front loader motor worm gear **1**. Rotating this gear allows the loader mechanism gear **8** to turn.
5. Rotate the loader motor worm gear **1** to turn the gear **8** counterclockwise. Continue turning until the rotator stub **3** passes under the aluminum bracket **7**. This releases the LBA leader pin.
6. Rotate the threader motor worm gear **4** to turn the threader mechanism gear **6** counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the drive rear end, as shown in Figure 436 on page 1078, item **1**.

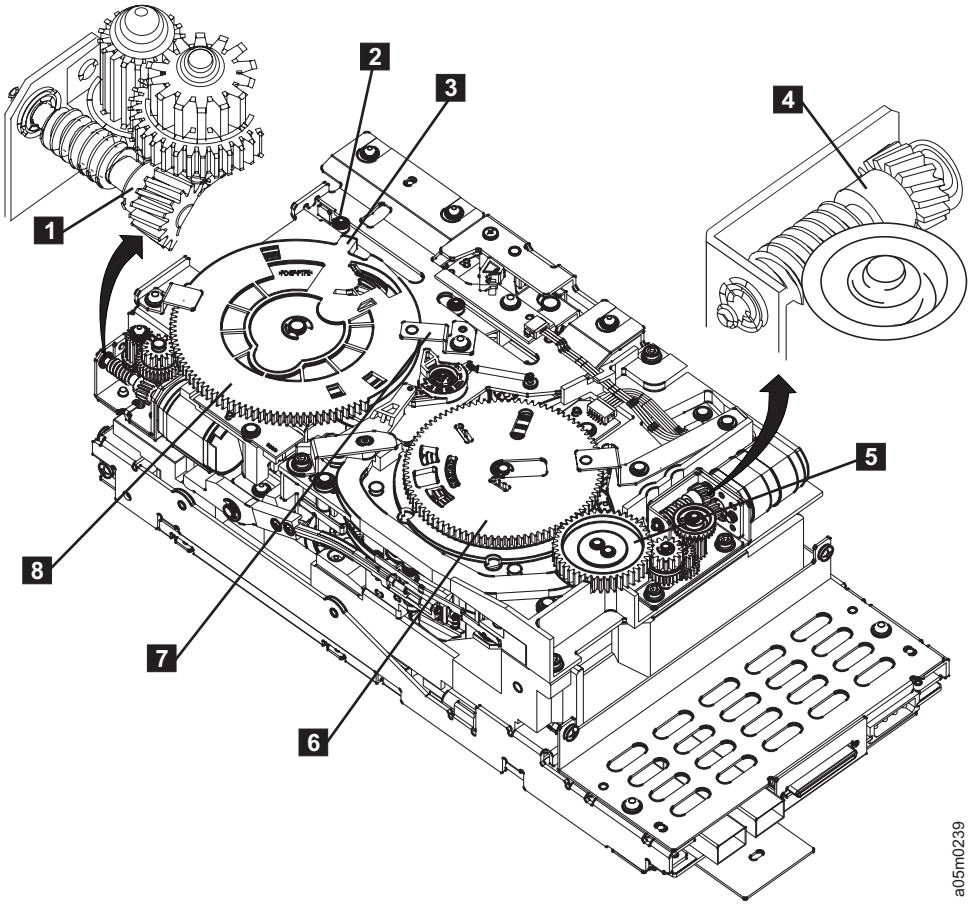


Figure 435. Drive Canister With Cover Removed

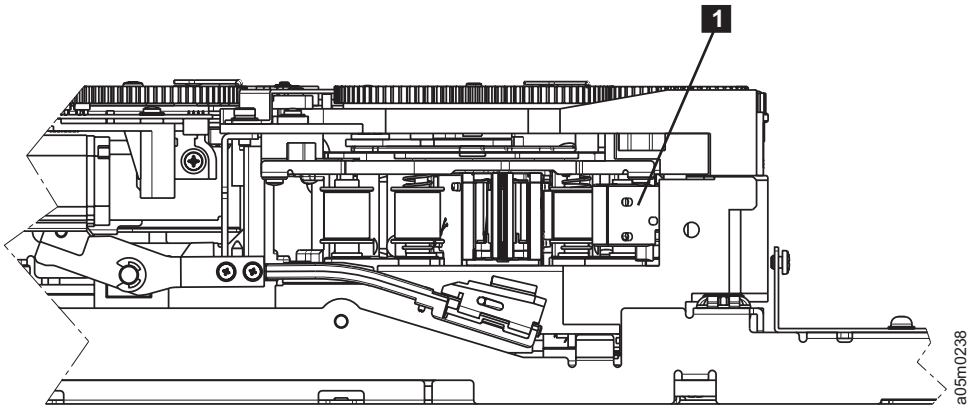


Figure 436. Leader Block Assembly (LBA)

7. Continue rotating the loader motor worm gear **1** until the rotator stub **3** is positioned, as shown Figure 435 on page 1077. Notice that the rotator stub **3** is nearly aligned with the cartridge loader tray guide bearing **2**.
8. Remove the cartridge from the cartridge loader tray.

Removing Threader Gear: Use this procedure if the all the tape could not be respooled into the tape cartridge or the tape cartridge will not unload from the drive canister.

1. See Figure 435 on page 1077. Turn the drive to a horizontal position, with the gears facing up.
2. Locate and remove two screws that capture the threader gear **5** at the rear of the drive. Removing this gear allows manual actuation of the threader mechanism gear **6**.
3. Tilt the drive on its left side, with the head facing up.
4. While holding the threader gear **2** to provide a small amount of tension, insert the 2.5-mm hex wrench into the cartridge reel motor access hole (see Figure 434 on page 1076) and rotate the reel motor axle clockwise to draw the LBA (and tape) back into the cartridge.
5. When the tape leader pin assembly (LPA) is returned to the cartridge, the LPA retention spring clips will make a "click" sound. If you do not hear the "click" sound, continue turning until the gear stops. This indicates that the LPA is in the correct position.
6. Turn the drive to the horizontal orientation. (gears facing up)
7. Notice the following parts:
   - The large gear nearest the front of the drive, which actuates the cartridge loader mechanism.
   - The position of the rotator stub (see **1** in Figure 435 on page 1077).
   - The front loader motor worm gear **1** near the loader motor. Rotating this gear with your finger slowly turns the loader mechanism gear.
8. Rotate the loader motor worm gear **1** to turn the loader gear **8** in a counterclockwise direction. Continue turning until the rotator stub passes under the aluminum bracket **7**.
9. Rotate counterclockwise the larger threader gear **2** to move the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the drive rear end, as shown in Figure 436, item **1**.
10. See Figure 435 on page 1077. Reinstall the threader gear **4** to engage the large threader gear **6** and the gear in the threader geartrain.
11. Continue rotating the loader motor worm gear **1** until the rotator stub **3** is positioned. Notice that the rotator stub **3** is nearly aligned with the cartridge loader tray guide bearing **2**.
12. Remove the cartridge from the cartridge loader tray.

- Tape Broken in Midtape

Note: The term 'midtape' refers to tape that was not in the first or final 1.8 m (6 ft) of tape.

Use this procedure if the tape is broken in midtape, and not near either end. Use Figure 434 on page 1076, as you follow this procedure.

1. With the front of the drive facing you, pull 0.6 m (2 ft) of tape out of the drive, from the take-up reel on the left side of the drive.
2. From the supply reel inside the cartridge, pull approximately 0.3 m (1 ft) of tape.
3. From the take-up reel, thread tape around the rear of the tape path and over the head rollers on the left side of the drive.
4. Using a cotton swab moistened with water, wet approximately 13 mm (0.5 in.) of the tape end. Overlap the tape ends, loosely mending them together.
5. Set the drive on its left side with the head and the tape path facing up.
6. See Figure 434 on page 1076. From the bottom of the drive, locate the access hole **1** in the bottom cover. Insert a 2.5-mm offset hex wrench through the bottom cover access hole and into the reel motor axle. Begin spooling tape back into the cartridge by turning the hex wrench clockwise.
7. Turn the supply reel clockwise, carefully guiding the mended portion of the tape to wind around the hub of the supply reel located inside the cartridge. Continue spooling tape into the cartridge until the tape is taut. The tape must remain within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.
8. Reassemble the drive.
9. Reassemble the drive canister.
10. Reinstall the drive canister into the library.
11. Allow the drive to perform midtape recovery; messages may appear for several minutes while this occurs. When this activity completes, the cartridge ejects automatically.

- Tape Tangled Along Tape Path

Use this procedure if the tape has become tangled in the tape path. Use Figure 435 on page 1077, as you follow this procedure.

1. Carefully pull out and untangle unspooled tape until both the take-up reel and the supply reel contain untangled tape.
2. Set the drive on its left side with the head and the tape path facing up.
3. See Figure 434 on page 1076. From the bottom of the drive, locate the access hole **1** in the bottom cover. Insert a 2.5-mm offset hex wrench through the bottom cover access hole and into the reel motor axle. Begin spooling tape back into the cartridge by turning the hex wrench clockwise.
4. Continue spooling tape into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch or scratch the tape.
5. See Figure 435 on page 1077. Locate the threader motor worm gear **4** on the rear end of the drive. Use your finger to rotate the threader motor worm gear and slowly drive the threader mechanism gear **6**. Rotating the threader motor worm gear clockwise, draws the LBA into the cartridge.
6. As the tape leader block assembly (LBA) is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear **4** stops. The LBA is in the correct position.
7. Notice the following:
   - Loader mechanism gear **8** nearest the front of the drive that actuates the cartridge loader mechanism
   - Position of the rotator stub **3**
   - Front loader motor worm gear **1**. Rotating this gear allows the loader mechanism gear **8** to turn.
8. Rotate the loader motor worm gear **1** to turn the loader mechanism gear **8** counterclockwise. Continue turning until the rotator stub **3** passes under the aluminum bracket **7**. This releases the LBA leader pin.
9. Rotate the threader motor worm gear **4** to turn the threader mechanism gear **6** counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the drive rear end (see **1** in Figure 436 on page 1078).
10. See Figure 435 on page 1077. Continue rotating the loader motor worm gear **1** until the rotator stub **3** is positioned. Notice that the rotator stub **3** is nearly aligned with the cartridge loader tray guide bearing **2**.
11. Remove the cartridge from the cartridge loader tray.
12. Reassemble the drive.
13. Reassemble the drive canister.
14. Install a new drive canister.
15. Repack and return the failed drive through your IBM parts network.

No Apparent Failure or Damage to Tape

Use this procedure if you cannot see a failure or there does not seem to be any damage to the tape. Use Figure 435 on page 1077, as you follow this procedure.

1. Set the drive on its left side with the head and the tape path facing up.
2. See Figure 434 on page 1076. From the bottom of the drive, locate the access hole **1** in the bottom cover. Insert a 2.5-mm offset hex wrench through the bottom cover access hole and into the reel motor axle. Begin spooling tape back into the cartridge by turning the hex wrench clockwise.
3. Continue spooling tape into the cartridge until the tape is taut and remains within the flanges of the tape guiding rollers. Ensure that you do not stretch the tape.
4. See Figure 435 on page 1077. Locate the threader motor worm gear **4** on the rear end of the drive. Use your finger to rotate the threader motor worm gear and slowly drive the threader mechanism gear **6**. Rotating the threader motor worm gear clockwise draws the leader block assembly (LBA) into the cartridge.
5. As the LBA is secured in the cartridge, you should hear the LBA retention spring clips click into place. If you do not hear the click, continue rolling until the threader motor worm gear **4** stops. The LBA is in the correct position.
6. Notice the following:
   - Loader mechanism gear **8** nearest the front of the drive that actuates the cartridge loader mechanism
   - Position of the rotator stub **3**
   - Front loader motor worm gear **1**. Rotating this gear allows the loader mechanism gear **8** to turn.
7. Rotate the loader motor worm gear **1** to turn the loader mechanism gear **8** counterclockwise. Continue turning until the rotator stub **3** passes under the aluminum bracket **7**. This releases the LBA leader pin.
8. Rotate the threader motor worm gear **4** to turn the threader mechanism gear **6** counterclockwise. This moves the LBA out of the cartridge and past the read/write head. Stop this rotation when the LBA is near the tape guide roller nearest the drive rear end (see **1** in Figure 436 on page 1078).
9. See Figure 435 on page 1077. Continue rotating the loader motor worm gear **1** until the rotator stub **3** is positioned. Notice that the rotator stub **3** is nearly aligned with the cartridge loader tray guide bearing **2**.
10. Remove the cartridge from the cartridge loader tray.
11. Reassemble the drive.
12. Reassemble the drive canister.
13. Install a new drive canister.
14. Repack and return the failed drive through your IBM parts network.

From a 3592 Drive After Read/Write Cartridge Eject Failure

If you ran 3592 drive diagnostics, and you had to manually eject the diagnostic cartridge from the drive after the test, do the following.

1. Manually eject the cartridge from the drive by pressing the unload button for 1 second. Depending on the position of the tape at the time of the failure, this slow rewind may take as long as 20 minutes.
2. Place the diagnostic cartridge back in its home cell. You can either do this manually or by using the operator panel by selecting **Service**, **Insert Diagnostic Cartridge**. You will see a message asking if you want to continue. Insert the diagnostic cartridge into the I/O station and press **YES**. See “3592 and LTO Diagnostic Cartridge Locations” on page 55.
3. Reset the drive from the Web user interface: Manage Drives -> Drive Summary -> Power Cycle, or do a power-on reset to the drive by pulling it out slightly from the fixed tray and then pushing it back in.

From a Dual Gripper Assembly

Before you begin...

Consider a cartridge that is stuck between the gripper and the I/O station, a storage slot, or a drive to be in the I/O station, the storage slot, or the drive, **not in the gripper**.

If a customer's cartridge must be removed, inform the customer.

When a cartridge is manually removed from the library, follow the procedures in "When Cartridge is Dropped or Stuck in Gripper" on page 1044, then give the cartridge to the customer so it can be put back into library and *reassigned* to the correct logical library.

1. Prepare the accessor for service (see "Service Procedures" on page 790).
2. Open the door nearest the gripper.
3. Move the Y-axis on the rail until it is at a convenient position for you to remove the cartridge.
4. Rotate the gripper assembly until the cartridge is facing you.
5. Refer to Figure 437 on page 1084 and move belt **3** in a direction toward the gripper exit while manually guiding the cartridge **4** toward you.
6. Remove the cartridge from the gripper **2** .
7. If you manually removed any cartridges, give them to the customer.
8. Close the front door.
9. Complete the accessor servicing (see "Service Procedures" on page 790).
10. Perform the "Library Verify Test" on page 759.
11. Return to the procedure that sent you here; otherwise, go to "End-of-Call" on page 794.

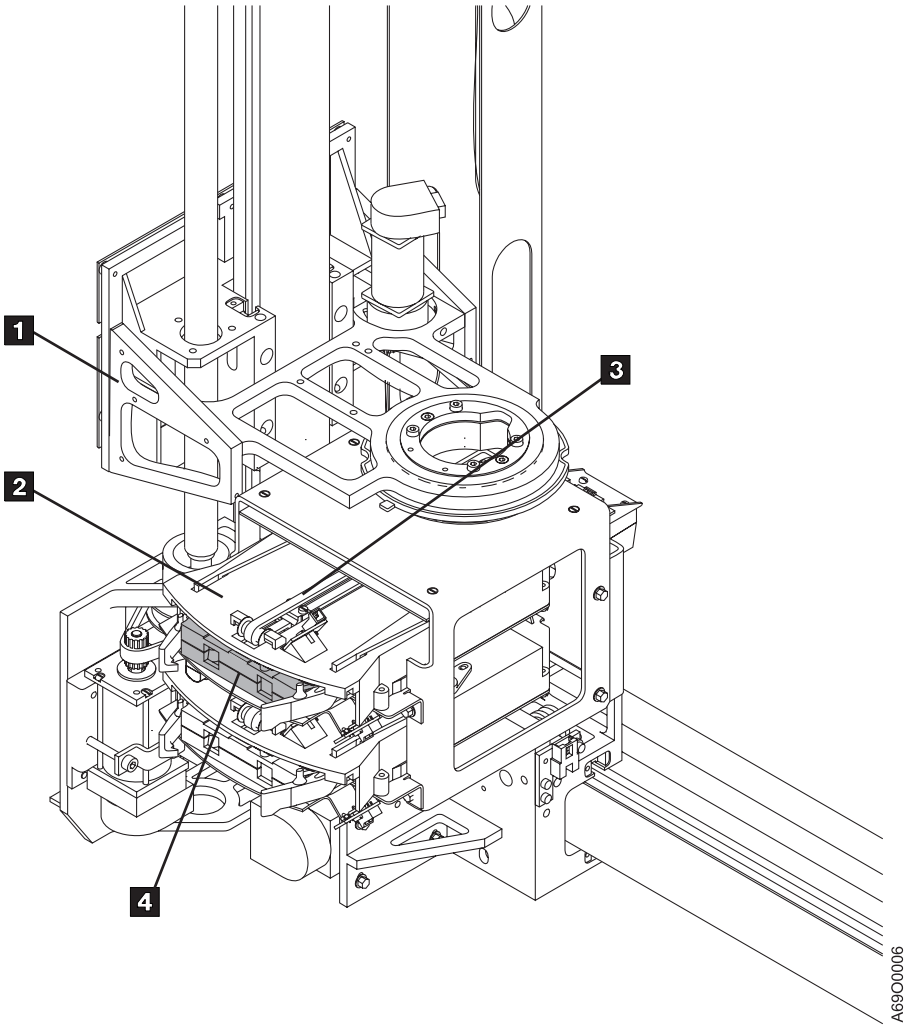


Figure 437. Manually Removing Cartridge from Dual Gripper Assembly

Preventive Maintenance (PM)

Preventive Maintenance (PM) should be reviewed after every service call. Perform the following steps:

1. Update your Library firmware to the latest level posted on the PFE website:
   `http://snjlnt02.tucson.ibm.com/tape/tapetec.nsf`
2. Inspect the wiper pads on the accessor. See Figure 438.
   - Inspect the wiper pads **1** on the top Y-axis (shown) and two on the bottom (not shown). Also locate the wiper pads **2** (two on each side of the X-axis). There are a total of 8 wipers.
   - If the wipers are made of **plastic** (instead of felt) **no** further action is required.
   - If the wipers are made of **felt** order PN 45E6178 (kit containing 8 plastic wipers) and replace the felt wipers on the next service call.

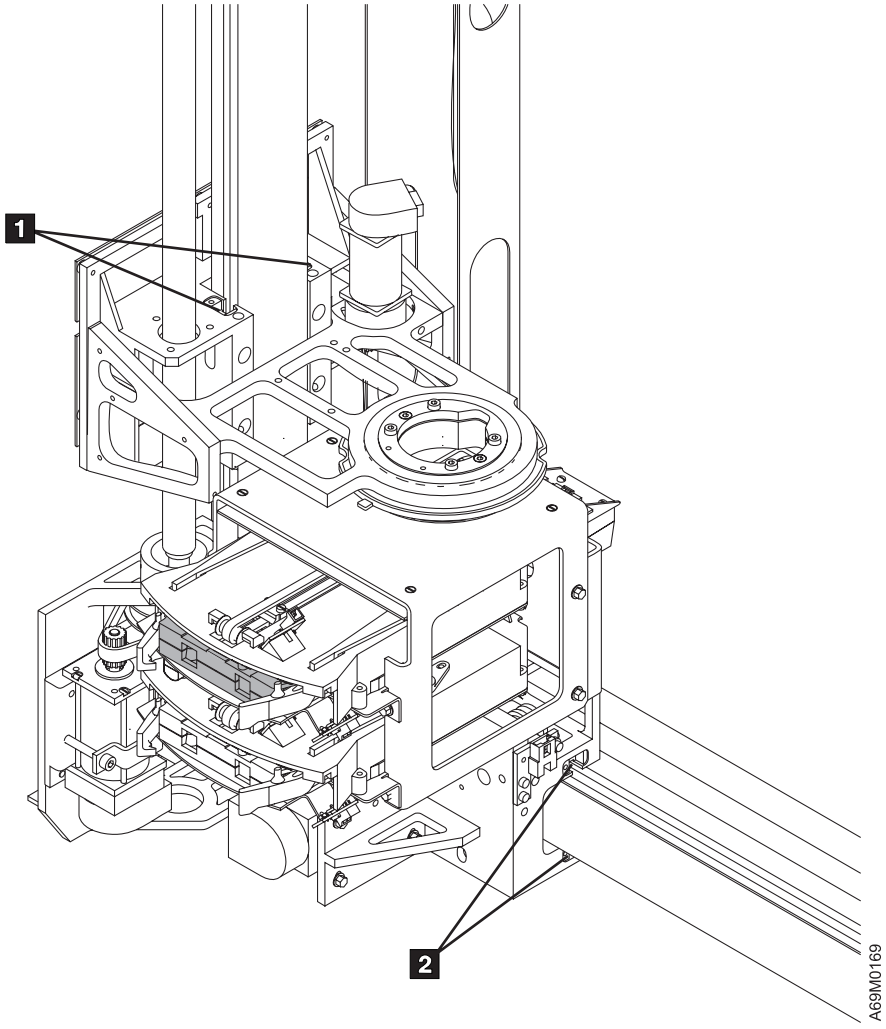


Figure 438. Accessor Wiper Locations

Chapter 12. History

Service Activity

Table 103. FRU Exchange and EC History

Date	URC	FRU Exchanged	Service Representative Name	Safety Inspection (Safety Problems Found, Corrected), EC Number, Problem Number, Comments

Table 103. FRU Exchange and EC History (continued)

Date	URC	FRU Exchanged	Service Representative Name	Safety Inspection (Safety Problems Found, Corrected), EC Number, Problem Number, Comments

Chapter 13. Metric Conversion Tables

Use this section to convert values between the metric and the US standards. To convert other values that are not shown in the tables:

- From millimeters to inches, multiply millimeters by 0.03937 (Table 104)
- From millimeters to feet, multiply millimeters by 0.00328
- From centimeters to inches, multiply centimeters by 0.3937
- From centimeters to feet, multiply centimeters by 0.0328
- From meters to inches, multiply meters by 39.37
- From meters to feet, multiply meters by 3.2808 (Table 105 on page 1090)
- From inches to millimeters, multiply inches by 25.4
- From inches to centimeters, multiply inches by 2.54 (Table 106 on page 1090)
- From inches to meters, multiply inches by 0.0254
- From feet to millimeters, multiply feet by 304.801
- From feet to centimeters, multiply feet by 30.48 (Table 106 on page 1090)
- From feet to meters, multiply feet by 0.3048 (Table 107 on page 1090)
- From millimeters to centimeters, multiply millimeters by 0.10
- From centimeters to millimeters, multiply centimeters by 10.0
- From kilograms to pounds, multiply kilograms by 2.2046 (Table 108 on page 1091)
- From pounds to kilograms, multiply pounds by 0.45359 (Table 109 on page 1091)
- From Celsius to Fahrenheit, multiply degrees by 1.8, and add 32 (Table 110 on page 1091)
- From Fahrenheit to Celsius, subtract 32, and multiply by .555 (Table 111 on page 1092)

Table 104. Millimeters to Inches Conversion

MM	IN.	MM	IN.	MM	IN.	MM	IN.	MM	IN.
1	0.039	11	0.433	21	0.827	31	1.220	41	1.614
2	0.078	12	0.472	22	0.866	32	1.259	42	1.653
3	0.118	13	0.512	23	0.905	33	1.299	43	1.693
4	0.157	14	0.551	24	0.945	34	1.338	44	1.732
5	0.196	15	0.590	25	0.984	35	1.378	45	1.771
6	0.236	16	0.629	26	1.024	36	1.417	46	1.811
7	0.275	17	0.669	27	1.063	37	1.456	47	1.850
8	0.315	18	0.708	28	1.102	38	1.496	48	1.889
9	0.354	19	0.748	29	1.142	39	1.535	49	1.929
10	0.3937	20	0.787	30	1.180	40	1.575	50	1.968

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Table 105. Meters to Feet Conversion

M	FT	M	FT.	M	FT.	M	FT.
1	3.28	11	36.09	21	68.9	35	114.83
2	6.56	12	39.37	22	72.2	40	131.23
3	9.84	13	42.65	23	75.4	45	147.63
4	13.12	14	45.93	24	78.7	50	164.04
5	16.40	15	49.21	25	82	60	196.85
6	19.68	16	52.49	26	85.3	75	246.06
7	22.96	17	55.77	27	88.6	100	328.08
8	26.25	18	59.05	28	91.9	200	656.16
9	29.52	19	62.34	29	95.1	500	1640
10	32.81	20	65.61	30	98.42	1000	3280

Table 106. Inches/Feet to Centimeters Conversion. For millimeters, after converting inches to centimeters, move the decimal point one place to the right; so 1.0 in. = 25.4 mm. For meters, after converting inches to centimeters, move the decimal point two places to the left; so 48 in. = 1.2 m.

IN.(FT)	CM	IN.(FT)	CM	IN.(FT)	CM	IN.(FT)	CM
1	2.54	13	33.02	25	63.50	48(4)	121.92
2	5.08	14	35.56	26	66.04	60(5)	152.4(
3	7.62	15	38.10	27	68.58	72(6)	182.88
4	10.16	16	40.64	28	71.12	84(7)	213.36
5	14.34	17	43.18	29	73.66	96(8)	243.84
6	15.24	18	45.72	30	76.20	100(8.3)	254
7	17.78	19	48.26	31	78.74	108(9)	274.32
8	20.32	20	50.80	32	81.28	120(10)	304.8
9	22.86	21	53.34	33	83.82	132(11)	335.28
10	25.40	22	55.88	34	86.36	144(12)	365.76
11	27.94	23	58.42	35	88.90	156(13)	396.24
12(1)	30.48	24(2)	60.96	36(3)	91.44	168(14)	426.72

Table 107. Feet to Meters Conversion

FT	M	FT	M	FT	M	FT	M	FT	M
1	0.30	11	3.3	21	6.4	31	9.4	41	12.5
2	0.60	12	3.6	22	6.7	32	9.7	42	12.8
3	0.91	13	3.9	23	7.0	33	10	43	13.1
4	1.2	14	4.3	24	7.3	34	10.4	44	13.4
5	1.5	15	4.6	25	7.6	35	10.7	45	13.7
6	1.8	16	4.9	26	7.9	36	10.9	50	15.2
7	2.1	17	5.2	27	8.2	37	11.3	100	30.5
8	2.4	18	5.5	28	2.4	38	11.6	200	60.9
9	2.7	19	5.8	29	8.8	39	86	500	152.4
10	3.04	20	6.1	30	9.1	40	88	1000	304.8

Table 108. Kilograms to Pounds Conversion

KG	LB	KG	LB	KG	LB	KG	LB	KG	LB
1	2.2	11	24.3	21	46.3	31	68.3	45	99.2
2	4.4	12	26.5	22	48.5	32	70.5	50	110.2
3	6.6	13	28.6	23	50.7	33	72.7	75	165.3
4	8.8	14	30.8	24	52.9	34	74.9	100	220.5
5	11.0	15	33.0	25	55.1	35	77.2	200	440.9
6	13.2	16	35.3	26	66.1	36	79.4	250	551
7	15.4	17	37.5	27	77.2	37	81.6	500	1102
8	17.6	18	39.7	28	88.2	38	83.8	1000	2205
9	19.8	19	41.9	29	99.2	39	86	2000	4409
10	22.0	20	44.0	30	110.2	40	88.1	5000	11023

Table 109. Pounds to Kilograms Conversion

LB	KG	LB	KG	LB	KG	LB	KG
1	0.45	11	4.9	21	9.5	35	15.9
2	0.9	12	5.4	22	9.9	40	18.1
3	1.4	13	5.9	23	10.4	45	20.4
4	1.8	14	6.3	24	10.9	50	22.7
5	2.3	15	6.8	25	10.9	75	34.0
6	2.7	16	7.2	26	11.8	100	45.4
7	3.2	17	7.7	27	12.2	250	113.4
8	3.6	18	8.2	28	12.7	500	226.8
9	4.1	19	8.6	29	13.1	1000	453.6
10	4.5	20	9.1	30	13.6	2000	907.2

Table 110. Celsius to Fahrenheit Conversion

°C	°F	°C	°F	°C	°F	°C	°F	°C	°F
-40	-40	9	48.2	19	66.2	29	84	39	102.2
0	32	10	50	20	68	30	86	40	104
1	33.8	11	51.8	21	69.8	31	87.8	41	105.8
2	35.6	12	53.6	22	71.6	32	89.6	42	107.6
3	37.4	13	55.4	23	73.4	33	91.4	43	109.4
4	39.2	14	57.2	24	75.2	34	93.2	44	111.2
5	41	15	59	25	77	35	95	45	113
6	42.8	16	60.8	26	79	36	96.8	50	122
7	44.6	17	62.6	27	81	37	98.6	100	212
8	46.4	18	64.4	28	82	38	100.4	180	356

Table 111. Fahrenheit to Celsius Conversion

°F	°C	°F	°C	°F	°C	°F	°C
-40	-40	40	4.4	80	26.6	105	40.5
-30	-34.4	45	7.2	85	29.4	110	43.3
-20	-28.9	50	10	90	32.2	115	46.1
-10	-23.3	55	12.8	95	35	120	48.8
0	-17.7	60	15.5	98.6	36.96	125	51.6
10	-12.2	65	18.3	100	37.7	130	54.4
20	-6.7	68	20	101	38.3	135	57.2
30	-1.1	70	21.1	102	38.9	140	60
32	0	72	22.2	103	39.4	212	100
35	1.7	75	23.9	104	40	355	179.2

Table 112. Mathematical Power to Common Term Conversion (American System)

Prefix Term	Equivalent (American) Ordinal Number	Mathematical Power
yotta	septillion	10^{24}
zetta	sextillion	10^{21}
exa	quintillion	10^{18}
peta	quadrillion	10^{15}
tera	trillion	10^{12}
giga	billion	10^{9}
mega	million	10^{6}
kilo	thousand	10^{3}
____	____	10
milli	thousandth	10^{-3}
micro	millionth	10^{-6}
nano	billionth	10^{-9}
pico	trillionth	10^{-12}

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How to Use This Parts Catalog

- SIMILAR ASSEMBLIES: If two assemblies contain a majority of identical parts, they are broken down on the same list. Common parts are shown by one index number. Parts peculiar to one or the other of the assemblies are listed separately and identified by description.
- AR: (As Required) in the Units column indicates the quantity of the part is used as required.
- NP: (Non-Procurable) in the Units column indicates that the part is non-procurable and that the individual parts or the next higher assembly should be ordered.
- NR: (Not Recommended) in the Units column indicates that the part is procurable but not recommended for field replacement, and that the next higher assembly should be ordered.
- R: (Restricted) in the Units column indicates the part has a restricted availability.
- INDENTURE: The indenture is marked by a series of dots located before the parts description. The indenture indicates the relationship of a part to the next higher assembly. For example:

Indenture	Relationship of Parts (Description Column)
(No dots)	MAIN ASSEMBLY
(One dot)	• Detail parts of a main assembly
(One dot)	• Subassembly of the main assembly
(Two dots)	•• Detail part of a one-dot subassembly
(Two dots)	•• Subassembly of a one-dot subassembly
(Three dots)	••• Detail part of a two-dot subassembly

Assembly 1: Cover Assembly (Sample)

Asm-Index	Part Number	Units	Description
1–	2512667	1	Cover Assembly, Rear, Red
-	2512668	1	Cover Assembly, Rear, Yellow
-	2512669	1	Cover Assembly, Rear, Blue
-	2512670	1	Cover Assembly, Rear, Gray
-	2513714	1	Cover Assembly, Rear, White
			For next higher assembly, see 1–2 on page 15
-1	5373637	1	• Seal, Top
-2	5356429	2	• Clip, Retaining
-3	2513013	3	• Liner, Cover
-4	5373727	1	• Seal, Left Side
-5	5356429	3	• Clip, Retaining
-6	513668	2	• Catch, Cover
-7	81693	4	• Screw, Mach Bind Hd- 6–32, X 0.375 in.
-8	1847630	R	• Finger Stock Assembly
-9	1847602	NR	•• Channel, Finger Stock
-10	1847604	NR	•• Finger Stock, 2.0 in.
-11	5373639	AR	• Seal, Bottom
-12	5356429	2	• Clip, Retaining
-13		NP	• Cover, Rear (Without paint)

Note: See **"Part Number Index"** at the end of this chapter for assembly number location.

Table 113. Alphabetic Listing of Parts

Part Name	FRU Number
Adapter, Fibre Optic Bulkhead (SC-SC)	19P0913
Adapter, Fibre Optic Bulkhead (LC-LC)	95P2794
Adapter, Fibre Bulkhead Spacer (rubber) (LC-LC)	95P3005
Adapter (Interposer), SC-LC (x32, x22, x52)	11P1373
Adapter (Interposer), SC-LC (x23, x53)	12R9321
Alignment Rod	95P1886
Barcode Scanner	(See Scanner, Bar Code)
Battery, Lithium (3 V dc)	33F8354
Belt, Gripper	35L0283
Belt, X-Axis	34G9629
Bezel, Drive, FRU Replacement Kit **(LTO-1 through LTO-4 only)**. Kit consists of the following parts: (x32, x52, x53) • Bezel - Qty 1, PN 45E6555 • Screws - Qty 3, PN 35L0430 • Label sheet - Qty 1, PN 95P4146 (for new bezel) • Install Instructions - Qty 1, PN 95P1938	46X1773
Bezel, Drive, FRU Replacement Kit **(LTO-1 through LTO-5)**. Kit consists of the following parts: (x32, x52, x53) • Bezel - Qty 1, PN 46X5608 • Screws - Qty 3, PN 35L0430 • Label sheet - Qty 1, PN 46X2538 (for new bezel) • Install Instructions - Qty 1, PN 95P1938	46X2537
Blocks, LTO Gripper Mounting **Note:** If this PN is no longer in stock, you will receive a **Dual Universal Gripper FRU Kit** PN 45E0951 which will replace your current LTO/LTO grippers and PDC with new LTO/3592 universal grippers and PDC. Library firmware 4090 or higher will be required to support the new universal grippers.	19P4454
Bracket, Frame-to-Frame	05H7832
Bracket, Operator Panel	35L0554
Bracket, PDU power cord (FC 1901)	23R7619
Bumper	61G9841
Bumper Assembly, Left End Stop, L22/L52/Lx3/SBA	18P9492
Bumper Assembly, Right End Stop, L22/L52/Lx3	18P9494
Bumper Assembly, Left End Stop, L32	24R0906
Bumper Assembly, Right End Stop, L32	24R0907
Bumper, Door	94F6813
Bumper, Pivot	34G9352
Cable, AXY-to-XYC	34L3629
Cable, EPO	35L1209
Cable, Fibre Channel (SC-SC) [5 m (16.4 ft)]	03K9202
Cable, Fibre Channel (SC-SC) [13 m (42.7 ft)]	54G3386
Cable, Fibre Channel (SC-SC) [25 m (81 ft)]	03K9204

Table 113. Alphabetic Listing of Parts (continued)

Cable, Fibre Channel (SC-SC) [61 m (200 ft)] (for use in non-European Union countries)	54G3390
Cable, Fibre Channel (SC-SC) [61 m (200 ft)] (must be used in European Union countries)	12R9634
Cable, Fibre Channel (LC-SC) [7 m (23 ft)]	12R9593
Cable, Fibre Channel (LC-SC) [13 m (43 ft)]	12R9594
Cable, Fibre Channel (LC-SC) [22 m (72 ft)]	12R9595
Cable, Fibre Channel (LC-SC) [61 m (200 ft)]	12R9598
Cable, Fibre Channel (LC-LC) [5 m (16.4 ft)]	12R9914
Cable, Fibre Channel (LC-LC) [13 m (43 ft)]	12R9559
Cable, Fibre Channel (LC-LC) [25 m (81 ft)]	12R9915
Cable, Fibre Channel (LC-LC) [61 m (200 ft)]	12R9563
Cable, Fibre Drive-to-Bulkhead SC-SC [2 m (6 ft)] (62.5 micron)	12R9628
Cable, Fibre Drive-to-Bulkhead LC-LC [2 m (6 ft)] (50 micron)	12R9557
Cable, LC-LC Fibre Drive-to-4Gb FC Switch [(2.2m) (7.2 ft] 50 micron	45E4492
Cable, FIC J1-to-XCP	95P3183
Cable, FIC J12-to-UEPO Switch and LED (L32, L22, L52)	08L9695
Cable, FIC J12-to-UEPO Switch and LED (L23, L53 Only)	95P3178
Cable, FIC-to-FIC Power (x32, x22, x52)	08L9698
Cable, FIC-to-FIC Power (x23, x53 Only)	95P3181
Cable, FIC-to-FIC Signal	08L9699
Cable, FIC-to-OPC Card (L32 Only)	08L9697
Cable, FIC-to-OPC Card (L22/L52 & L23/L53 Only)	95P4382
Cable, FIC to Service Barrier and Door Interlock, D22/D23, D52/D53, S24/S54 (used in HA Service Bay Frames Only)	95P3258
Cable, Gripper Cartridge Sensors-to-PDC Card (L32 Only)	35L1350
Cable, Gripper Cartridge Sensors-to-PDC Card (L22 / L52 / Lx3 / Sx4 Only)	18P9180
Cable, HD68-to-HD68 0.5 m (2 ft) SCSI	23R3595
Cable, HD68-to-HD68 5 m (16.5 ft) SCSI	23R3596
Cable, HD68-to-HD68 10 m (32.8 ft) SCSI	23R3597
Cable, HD68-to-HD68 18 m (59 ft) SCSI	19P0097
Cable, HD68-to-HD68 25 m (82 ft) SCSI	19P0054
Cable, I/O Station (for Single LTO I/O Station, L32)	35L1006
Cable, I/O Station (for Single LTO and 3592 I/O Station, L22/L52 Only)	18P9181
Cable, I/O Station (for Single LTO and 3592 I/O Station, L23/L53)	95P4379
Cable, I/O Station Upper LTO (used when a Lower I/O Station is installed)	95P3224
Cable, I/O Station Lower to XIO Card (L52/L53, L22/L23, L32)	95P3225
Cable, I/O Station Upper (in 4 I/O Door frame) to XIO card	95P5059
Cable, I/O Station Upper (in 4 I/O Door frame) to XIO card	95P5060
Cable, Upper XIO card Interposer (L23/L53, L22/L23)	95P3248
Cable, Lower XIO card Interposer (L52/L53, L22/L23)	95P3249
Cable, Jumper, EPO (Lxx frame only)	95P3217

Table 113. Alphabetic Listing of Parts (continued)

Cable, Modem, 9-Pin to 25-Pin (for Remote Switch)	05H3352
Cable, OPC J7-to-I/O Station (for Single Station I/O)	35L1006
Cable, Operator Panel to XIO Card (L32 / D22 / D23)	95P4380
Cable, Operator Panel to XIO Card (L22 / L52 / L23 / L53)	95P4381
Cable, Pivot Flex	23R2700
Cable, Redundant EPO	35L1209
Cable, Redundant Power (N+1) x32 Only	95P2141
Cable, Redundant Power (N+1) x22/x52 Only	18P9176
Cable, 15.2 m (50 ft), RS-232 Null Modem — Library to Switch (DB9F-to-DB9F) x32, x22, x32	19P4693
Cable, 15.2 m (50 ft), RS-232 Null Modem — Library to Switch (DB9F-to-DB9F) x23, x53 Only	23R4631
Cable, 15.2 m (50 ft), RS-232 —Library or Switch to Modem (DB9F-to-DB25M) x32, x22, x32	19P4692
Cable, 15.2 m (50 ft), RS-232 —Library or Switch to Modem (DB9F-to-DB25M) x23, x53 Only	23R4630
Cable, RS-232 Serial 9-Pin to 9-Pin (male and female) (CE tool) x32, x22, x32	19P1061
Cable, RS-232 Serial 9-Pin to 9-Pin (male and female) (CE tool) x23, x53 Only	23R4629
Cable, RS-422, CE Test	19P1077
Cable, RS-422 Interface, MCP-to-Drives (x32 Only)	19P0055
Cable, RS-422 Interface, MCP-to-Drives (x22 / x52 / Lx3)	23R2975
Cable, RS-422 Interface, MCA-to-Drives (x23 / x53 Only)	95P2422
Cable, SCSI Host Interface (VHDCI to VHDCI) 4.5 m (14.8 ft)	19P2499
Cable, SCSI Host Interface (VHDCI to VHDCI) 10 m (32.8 ft)	19P0881
Cable, SCSI Host Interface (VHDCI to VHDCI) 20 m (66 ft)	19P1904
Cable, SCSI Host Interface (VHDCI to VHDCI) 25 m (82 ft)	19P2500
Cable, SCSI (VHDCI to VHDCI, Daisy Chain, or Drive-to-Drive) 0.3 m (1 ft)	19P3332
Cable, Serial 9-Pin to 9-Pin for Remote Switch (female-to-female) (x32, x22, x52)	19P1001
Cable, Serial 9-Pin to 9-Pin for Remote Switch (female-to-female) (x23, x53 Only)	23R4628
Cable, VHDCI-to-HD68 10 m (32.8 ft) SCSI	23R3593
Cable, VHDCI-to-HD68 20 m (65.6 ft) SCSI	19P0049
Cable, VHDCI-to-HD68 25 m (82 ft) SCSI	35L1977
Cable, VHDCI-to-HD68 4.5 m (14.8 ft) SCSI	23R3594
Cable, VHDCI-to-HD68 0.3 m (1 ft) SCSI Cable/Interposer	19P0482
Cable, VHDCI-to-VHDCI 10 m (32.8 ft) SCSI	09L0881
Cable, X-Axis Track (1 or 2 frames) Single Accessor	23R2684
Cable, X-Axis Track (3 to 6 frames) Single Accessor	23R2687
Cable, X-Axis Track (7 to 14 frames) Single Accessor	23R2695
Cable, X-Axis Track (8 to 16 frames) Single Accessor	23R2697
Cable, X-Axis Track (2 Active frames in HA1) Dual Accessor	23R2685
Cable, X-Axis Track (3 Active frames in HA1) Dual Accessor	23R2686
Cable, X-Axis Track (4 Active frames in HA1) Dual Accessor	23R2687

Table 113. Alphabetic Listing of Parts (continued)

Cable, X-Axis Track (5 Active frames in HA1) Dual Accessor	23R2688
Cable, X-Axis Track (6 Active frames in HA1) Dual Accessor	23R2689
Cable, X-Axis Track (7 Active frames in HA1) Dual Accessor	23R2690
Cable, X-Axis Track (8 Active frames in HA1) Dual Accessor	23R2691
Cable, X-Axis Track (9 Active frames in HA1) Dual Accessor	23R2692
Cable, X-Axis Track (10 Active frames in HA1) Dual Accessor	23R2693
Cable, X-Axis Track (11 Active frames in HA1) Dual Accessor	23R2694
Cable, X-Axis Track (12 Active frames in HA1) Dual Accessor	23R2695
Cable, X-Axis Track (13 Active frames in HA1) Dual Accessor	23R2696
Cable, X-Axis Track (14 Active frames in HA1) Dual Accessor	23R2697
Cable, X-Axis Track (15 Active frames in HA1) Dual Accessor	23R2698
Cable, X-Axis Track (16 Active frames in HA1) Dual Accessor	23R2699
Cable, XYC-to-Home Sensor	23R2767
Cable, Y-Axis Flex (L32, L22, L52)	61G9685
Cable, Y-Axis Flex (L23, L53 Only)	23R2664
Cables associated with the "Enhanced Frame Control Assembly" (E-FCA)	
Cable, BPC1 to drives	95P2320
Cable, BPC2 to drives	95P2362
Cable group, MCA, (Three cables (combined into one) from the back of the MCA): • MCA J10 to FIC (J4) • MCA J8 to BPC-2 (J2) • MCA J11 to BPC-2 (J2)	23R5974
Cable, BPC1 & BPC2 (dual power) to FIC Card	95P2421
Cable, BPC1 to EPO	95P2420
Cable, RS-422, MCA to Drives	95P2422
Card, ACC (L32, L22, L52). See **"Node Cards in the Library" on page 826** for more information.	23R5882
Card, ACC-CF (L23, L53, and any L32, L22, L52 that have enhanced node cards already installed). See **"Node Cards in the Library" on page 826** for more information.	23R8283
Card, AXY (L32 Only) Old Style with one X-track cable connector	35L0007
Card, AXY (L22 / L52 / L32) New Style with two X-track cable connectors	19P5503
Card, AXY (L23 / L53 Only) New Style with two X-track cable connectors	95P1875
Card, FIC (Lxx)	95P1876
Card, (MCA) Media Changer Assembly with 2 Ethernet Ports (used in Lx3, and in Dx3 frames **without** the 4-I/O door feature). See **"Node Cards in the Library" on page 826** for more information.	23R8805
Card, (MCA) Media Changer Assembly with 2 Ethernet Ports (used in Dx3 frames **with** the 4-I/O door feature). See **"Node Cards in the Library" on page 826** for more information.	95P4884
Card, (MCP) Media Changer Pack with Ethernet support (L32. L22, L52) for IBM Specialist web user interface. See **"Node Cards in the Library" on page 826** for more information.	19P5350

Table 113. Alphabetic Listing of Parts (continued)

Card, (MCP) Media Changer Pack without Ethernet support (D32, D22, D52 frames only) **Note:** If the Dxx frame has an MCP with Ethernet support, order the part number with Ethernet. This part number will be obsoleted, and will automatically sub to the Ethernet version. See **"Node Cards in the Library" on page 826** for more information.	18P8865
Card, (MCP+ w/CF) Media Changer Pack Used in Lx2/Dx2 frames. See **"Node Cards in the Library" on page 826** for more information.	45E2621
Card, (MDA) Motor Driver Assembly (L32, L22, L52) for accessors in either a single or dual accessor library. See **"Node Cards in the Library" on page 826** for more information.	19P5067
Card, (MDA-CF) Motor Driver Assembly (L23, L53, and any L32, L22, L52 that have enhanced node cards already installed) for accessors in either a single or dual accessor library. See **"Node Cards in the Library" on page 826** for more information.	23R8830
Card, (OPC) Operator Panel Assembly (L32 Only) See **"Node Cards in the Library" on page 826** for more information.	19P5354
Card, (OPC+ w/ CF) Operator Panel Assembly (L32 Only). See **"Node Cards in the Library" on page 826** for more information.	45E2374
Card, (OPC) Operator Panel Assembly (L22, L52) See **"Node Cards in the Library" on page 826** for more information.	24R1223
Card, (OPC-CF) Operator Panel Assembly (L23, L53, and any L32, L22, L52 that have enhanced node cards already installed). See **"Node Cards in the Library" on page 826** for more information.	95P5054
Card, (PDC) with standoffs – L32 without Universal Grippers (LTO/3592) **Note:** If you order a replacement PDC card for the original LTO dual gripper assembly, and this PN is no longer in stock, you will receive a **Dual Universal Gripper FRU Kit** PN 45E0951 which will replace your current LTO/LTO grippers and PDC with new LTO/3592 universal grippers and PDC. Library firmware 4090 or higher will be required to support the new universal grippers.	35L0822
Card, (PDC) with standoffs (Card, PDC with standoffs L23/L53, L32/L22/L52, with Universal Grippers, and with HD Grippers)	23R3551
Card, XCP (L32, L22, L52 Only)	35L0832
Card, XCP (L23, L53)	95P1879
Card, XIO (L22, L52 L23, L53)	95P6575
Card, XIO (L32 Only)	19P3544
Cartridge, CE Diagnostic, LTO (for use on L1 & L2)	19P0405
Cartridge, CE Diagnostic, LTO (for use on L2 & L3)	96P1236
Cartridge, CE Diagnostic, LTO (for use on L3 & L4)	95P4657
Cartridge, CE Diagnostic, LTO (for use on L4 & L5)	46X2031
Cartridge, CE Diagnostic, 3592	24R1060
Caster, Machine (x22, x32, x52)	31L7521
Caster, Machine (x23, x53 Only)	12R9478
Clamp, Bar Support Mounting	19P3665
Cord, Bifurcated FCA-to-Drive Power Supply (L32, D32 Only)	09L5361
Cord, Bifurcated FCA-to-Drive Power Supply (x22 / x52 Only)	18P9715
Cord, Line, 1.8 m (6 ft) Chicago 250 V ac (water tight)	23R3230
Cord, Line, 4.3 m (14 ft) U.S.A. and World Trade (250 V ac, 30A, twistlock)	41V2003
Cord, Line, 4.3 m (14 ft) U.S.A. and World Trade 250 V ac (water tight)	23R3231

Table 113. Alphabetic Listing of Parts (continued)

Cord, Line, World Trade (hard-wired) 250 V ac	46F6063
Cord, Line, 4.3 m (14 ft) U.S.A. and Canada Only (non-water tight) 110 V ac	19P5903
Cord, Line, 1.8 m (6 ft) Chicago (non-water tight) 110 V ac	19P5904
Cord, Line, 4.3M (14 ft) 220V Watertight Connector (with FC 1901)	86F2646
Cord, Line, 4.3M (14 ft) 220V NON-Watertight Connector (with FC 1901)	14F1550
Cord, Line, 4.3M (14 ft) 110V Line Cord (with FC 1901)	12J5117
Cord, Line, 1.8M (6 ft) 220V Watertight Connector (Chicago) (with FC 1901)	86F2645
Cord, Line, 1.8M (6 ft) 110V Non-Watertight Connector (Chicago) (with FC 1901)	12J5115
Cord, Line, 4.3M (14 ft) 220V NON-Connector (with FC 1901, WTC ONLY)	36L8823
Cords, Line, (L23, D23, L53, D53)	See “Assembly 4: Enhanced FCA (x23 / x53 Only)” on page 1122.
Cord, Power, PDU-to-FCA (with FC 1901)	45E1225
Cord, Bifurcated Power, Enhanced FCA only (with FC 1909)	95P4473
Cover, Cable Trough, X-Axis Dxx	35L0185
Cover, Cable Trough, X-Axis Lxx	35L0192
Cover, Front Side, x22/x52, (quick disconnect version. Also order two wing screws, PN 24R1260)	23R3302
Cover, Rear Side, x22/x52, (quick disconnect version. Also order two wing screws, PN 24R1260)	23R3317
Cover, Rear Side, with IBM Super Logo, L22, L23, L52, L53,	46X9933
Cover, Front Side, L32/D32	35L1938
Cover, Rear Side, L32/D32	35L2015
Cover, Short Side, x32 to x22/x52	24R0065
Liner, Trough	05H7979
Damper, Door	61G9923
Door Interlock Switch	23R4406
Detent Arm Assembly	34G9360
Drive Canister, 3592 - J1A (Fibre)	24R1127
Drive Canister, 3592 - E05 4Gb (Fibre)	23R3691
Drive Canister, 3592 - E05 4Gb Encryption Capable (Fibre)	23R9206
Drive Canister, 3592 - E06/EU6 Encryption Capable (Fibre)	45E6608
Drive Canister, 3592 - E07 Encryption Capable (Fibre)	46X9615
Drive Canister, LTO Ultrium-1 (L1) (Fibre)	24R1549
Drive Canister, LTO Ultrium-1 (L1) HVD (SCSI)	24R1548
Drive Canister, LTO Ultrium-1 (L1) LVD (SCSI)	24R1547
Drive Canister, LTO Ultrium-2 (L2) (Fibre)	18P6510
Drive Canister, LTO Ultrium-2 (L2) HVD (SCSI)	18P6508
Drive Canister, LTO Ultrium-2 (L2) LVD (SCSI)	18P6506
Drive Canister, LTO 3588 Ultrium-3 (F3A) (2 Gbps Fibre)	96P0896
Drive Canister, LTO 3588 Ultrium-3 (F3B) (4 Gbps Fibre)	23R5147
Drive Canister, LTO 3588 Ultrium-4 (F4A) (4 Gbps Fibre)	95P3987

Table 113. Alphabetic Listing of Parts (continued)

Drive Canister, LTO 3588 Ultrium-5 (F5A) (4 Gbps Fibre)	45E9084
Drive Tray, LTO Ultrium-1 (L1) Fibre Channel	24R1563
Drive Tray, LTO Ultrium-1 (L1) HVD	24R1562
Drive Tray, LTO Ultrium-1 (L1) LVD	24R1561
Drive Tray-to-Canister Kit, LTO Ultrium-1 (L1) LVD	18P7354
Drive Tray-to-Canister Kit, LTO Ultrium-1 (L1) HVD	18P7355
Drive Tray-to-Canister Kit, LTO Ultrium-1 (L1) Fibre Channel	18P7356
FCA (220V only)	35L0121
FCA (110V or 220V)	35L2092
Power Distribution Unit (PDU) FRU Kit. (Lxx/Dxx) only used with FC 1901. The kit contains the following parts: • PDU Assembly • Cable retention bracket clip • PDU-to-FCA Power Cord with plastic spacer pre-installed • Installation Instructions	45E2302
Fixed Tray, SCSI LVD/HVD & Fibre (L32, D32 Only). Early style. Will sub to 95P5182 when Field Stock is Depleted. **Note:** See CARR chapter, "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" to determine which style is currently installed.	19P5572
Fixed Tray, SCSI LVD/HVD & Fibre without power supply (L32, D32 Only). Early style. Uses power supply PN 23R4750. **Note:** See CARR chapter, "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" to determine which style is currently installed.	95P5183
Fixed Tray, SCSI LVD/HVD & Fibre with power supply PN 23R4750 (L32, D32 Only) **Note:** See CARR chapter, "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" to determine which style is currently installed.	95P5182
Fixed Tray, Fibre (x23/x53 Only) Used for all drive types **except** 3592 E06/EU6/E07.	23R5973
Fixed Tray, Fibre (x23/x53 Only) Used for all drive types **including** 3592 E06/EU6/E07.	45E3353
Fixed Tray Fibre (L22, D22 / L52, D52 Only) This tray assembly can be used for both SCSI & Fibre channel. A later version of this FRU will soon be provided with Fibre only, as SCSI is not supported on L22, D22 / L52, D52.	18P9620
Fuse, FIC, 12 A (x32/x22/x52)	35L1255
Fuse, FIC, 12 A (x23/x53 Only)	77P3186
Fuse, FIC, 5 A (x32/x22/x52)	35L1254
Fuse, FIC, 5 A (x23/x53 Only)	77P3188
Gripper Assembly FRU Kit, (LTO/LTO Only) Not used in dual-accessor libraries. **Note:** When stock is depleted on this PN, it will automatically sub to PN 45E0951 (listed below). Library firmware 4090 or higher will be required to support the new universal grippers.	24R0385
Gripper Assembly FRU Kit, Dual Universal (LTO/3592), replacement for LTO/LTO single gripper (L32 only). Also see “Using CETool to Change from LTO to Universal Grippers in L32 Frames” on page 738.	45E0951
Gripper Assembly, Single, Universal (LTO/3592)	45E0947
Gripper Assembly, Dual, Universal (LTO/3592)	45E0950
Gripper Assembly, Single, HD	45E4721
Gripper/Pivot Assembly (L32/L22/L52)	24R1019
Gripper/Pivot Assembly (L23/L53 Only)	23R3547
Gripper Clips FRU Kit	95P5109

Table 113. Alphabetic Listing of Parts (continued)

Holder, Logical Library Label	19P0325
I/O Station, Lower (20 Cartridge), LTO	19P4470
I/O Station, Upper (10 Cartridge), LTO	19P5576
I/O Station, 3592 Door Assembly, (L32 Only)	24R1089
I/O Station, LTO or 3592 Door Assembly, (L22, L52)	24R1090
I/O Station, LTO or 3592 Door Assembly, (L23, L53 Only)	23R7911
I/O Station, (16 Cartridge), LTO (L22, L52)	95P3111
I/O Station, (16 Cartridge), LTO (L23, L53 & 4-I/O D23, D53 frames Only)	23R5972
I/O Station, (16 Cartridge), 3592 (L22, L52)	96P0822
I/O Station, (16 Cartridge), 3592 (L23, L53 & 4-I/O D23, D53 frames Only)	23R5982
I/O Station, Lower (16 Cartridge), (L32 Only), 3592	96P0824
Jackscrew, Leveling	35L0401
Key, Front Door	61G9870
Key, Rear Door	62G1580
Key, Door Interlock Switch	34G8910
Label, Caution, Current Leakage	50G1043
Label, Caution, Power Cord	05H1825
Label, Logical Library Barcode	19P0035
Label, Bar Code - Empty Cell / Scanner Calibration	19P0476
Latch, Front Door	61G9869
Latch, Rear Door	62G1557
Level, Frame (bubble)	35L1514
Modem (FC 2710)	The FRU PN is located on the label on the modem.
Motor/Tach Assembly, Gripper	35L0287
Motor, X-Axis & Drive Belt (L32, L22, L52, L23, L53	46X7108
Motor, Y-Axis & Drive Belt (L32, L22, L52,L23, L53)	46X7109
Nut, Leveling Jackscrew	50G0401
Overlay, FIC Card	35L0494
Pad, Carpet	05H7004
Pad, Leveling Jackscrew	05H2179
Pinion Shaft Assembly	35L0240
Power Supply, Drive (L32, D32 LTO Only) Will sub to 95P5182 when Field Stock is Depleted.	37L0311
Power Supply, Drive (L22, D22, L52, D52 Only) Also used with newer x32 Fixed Tray PN 95P5183	23R4750
Power Supply, 37 V dc	08L9691
Relocation Kit • Main Component • X-Y Picker Anchor • LTO Packing Kit (one per drive if drive removal label is present in your L32 or D32) • D22, D32, D52 Only - Foam Bumpers and Cable Ties	 • 7334847 • 05H1869 • 7354441 • 7354056

Table 113. Alphabetic Listing of Parts (continued)

Rod, X-Axis Bearing Way (L22, L32, L52, SBA frames only)	24R0004
Rod, X-Axis Bearing Way (Dxx expansion frame only)	05H8105
Roller, Guide (urethane)	34G9599
Scanner, Bar Code (kit consisting of scanner, bracket, and screws) (L32 Only) **Note:** If the library has Universal Grippers installed, you must order the following part number (for L32, L22, L52 Only) instead of this one.	23R6229
Scanner, Bar Code (kit consisting of scanner and bracket) (L32, L22, L52 Only)	23R6149
Scanner, Bar Code (kit consisting of scanner and bracket) (L32/L22/L52/L23/L53)	23R4651
Screws Kit (kit consisting of various screws used in LTO drive canisters) • Lid - Qty 4, PN 19P4261, M3x6 Phillips Flat Head • Mounting - Qty 4, PN 35L0429, 6/32 x 3?16 Phillips Pan Head • Bezel - Qty 4, PN 35L0430, M3x6 Phillips Cheese Head • Drive Cover - Qty 4, PN 08L9319, M3x3 Phillips Pan Head	96P0855
Sensor, Calibration Sensor and Bracket (This PN is **Required** for HD Grippers used in libraries with Sx4 HD frames installed)	95P5145
Sensor, I/O Door or I/O Solenoid (L32 / L22 / L52)	05H8407
Sensor, I/O Door or I/O Solenoid (L23 / L53)	19P5915
Sensor, Home, X-Axis or Y-Axis (L32 / L22 / L52)	05H8407
Sensor, Home, X-Axis or Y-Axis (L23 / L53)	19P5915
Sensor, I/O Door Closed/Locked	05H8407
Sensor, RCP3 Cartridge Present	
Sensor, TCP3 Cartridge Present	
Service Barrier, Dual Accessor Libraries	24R1187
Service Barrier (Jumper), Part of Service Barrier used on Dual Accessor Libraries	95P3254
Solenoid, Door Locked	94F6802
Solenoid, I/O (L32 Only)	94F6802
Solenoid, I/O (L22, L52 Only)	18P8957
Spacer Bar	19P3664
Spring (X-axis, only)	34G9363
Spring (X-axis and Y-axis)	61G9699
Spring Clip, Storage Cell Tray	19P0254
Spring, Detent Arm	34G9363
Spring, Door	35L1491
Spring, Toggle Stop, LTO	35L0778
Spring Clip Kit, L1, LTO	18P7835
Storage Cells	See "Tray"
Switch, Door Interlock	23R4406
Switch, Power On with Cable (L32 Only)	35L0560
Switch, Power On with Cable (L22, L52, Lx3 Only)	23R4392
Terminator, FIC Card	NP - order Card, FIC
Terminator, Inline SCSI	19P0378
Terminator, HD68 SCSI HVD	61G8324

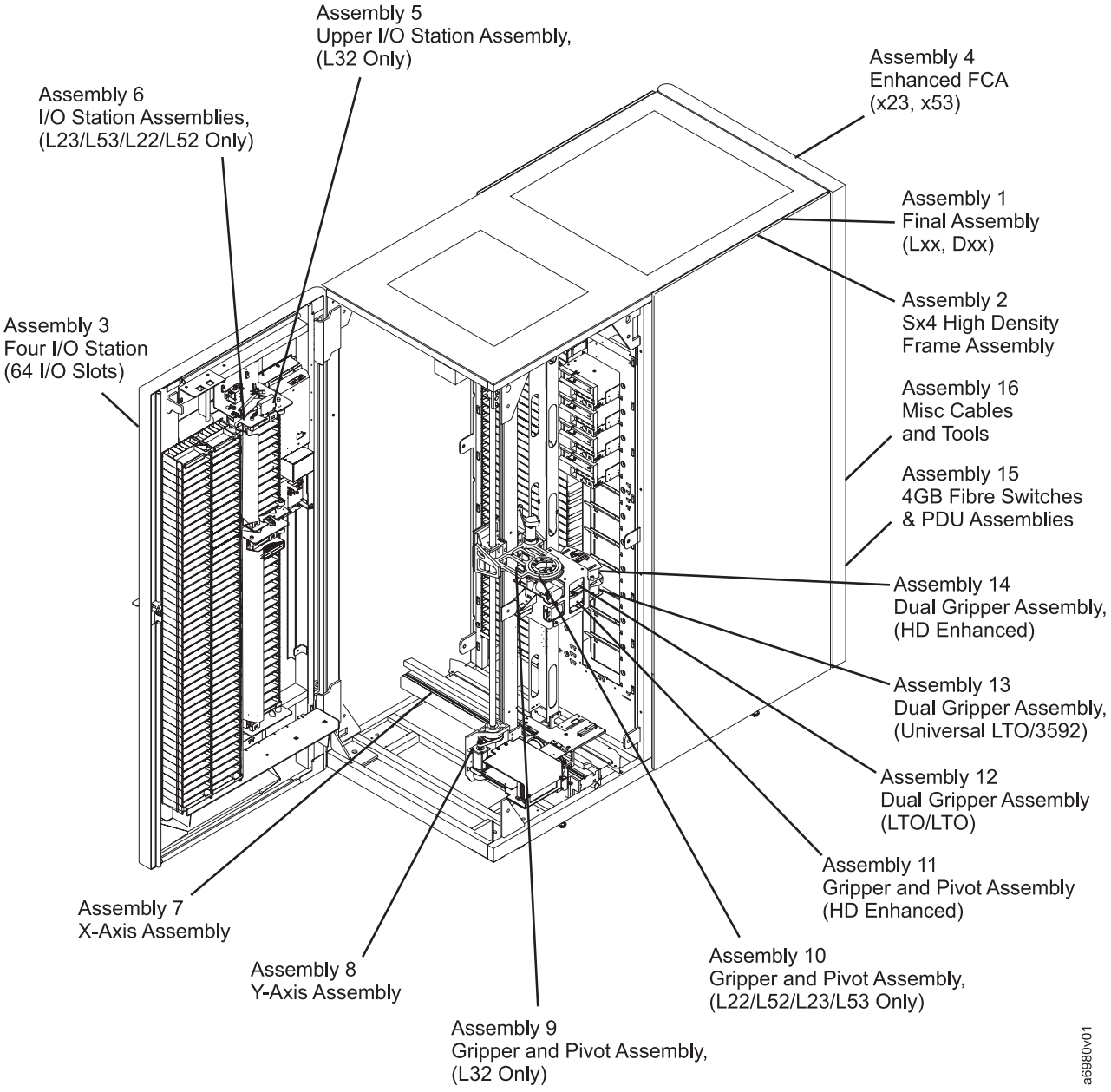
Table 113. Alphabetic Listing of Parts (continued)

Terminator, HD68 SCSI LVD/SE	09L5067
Terminator, VHDCI (HVD)	09L0877
Terminator, VHDCI (LVD)	34L3926
Thumbscrew (x32 fixed tray Only)	19P4641
Thumbscrew (x22/x52 fixed tray Only)	24R0059
Toroid, Power Cable top frame access	24R0982
Tray, Storage Cell (LTO) L32/D32	35L0170
Tray, Top Cap (LTO) calibration cell L32/D32	35L0180
Tray, Storage Cell, (LTO) **Qty-5**, L52/D52	46X7027
Tray, Top Cap (LTO) calibration cell L52/D52/L53/D53	18P8596
Tray, Storage Cell, (3592) **Qty-5**, L22/D22, L23/D23	46X7028
Tray, Top Cap (3592) (calibration cell) L22/D22, L23/D23	95P2107
Tray, Cell Foam Spacer (All Frames)	19P0404
Wiper, Accessor (Lxx)	24R0318
Wiper, FRU Kit, Quantity of 8 (Lxx)	45E6178
Wrap Plug, HVD SCSI (Trays Only)	19P1213
Wrap Plug, LVD SCSI (Trays Only)	19P0481
Wrap Plug, RS-422	19P0519
Wrap Tool, Smart SCSI	19P5020
Wrap Plug, Fibre (SC)	08L9459
Wrap Plug, Fibre (LC)	12R9314
XCP Card	35L0832
X-Axis Assembly L32, L22/L52, L23/L53, S24/S54	23R3554
X-Rail, Lower (L32, L22/L52, L23/L53)	24R0002
X-Rail, Lower (D22/D52, D23/D53, S24/S54) with 2 rods; Newer style with bottom cutouts	95P1889
X-Rail, Lower (HA1 Service Bay A Only)	24R1695
X-Rail, Upper (L32)	35L0169
X-Rail, Upper (L23, L53)	45E1016
X-Rail, Upper (D23, D53)	45E1018
X-Rail, Upper (HA1)	45E1019
Y-Axis Assembly (L22, L32, L52)	24R0008
Y-Axis Assembly (L23, L53 Only)	23R3555

Assemblies List

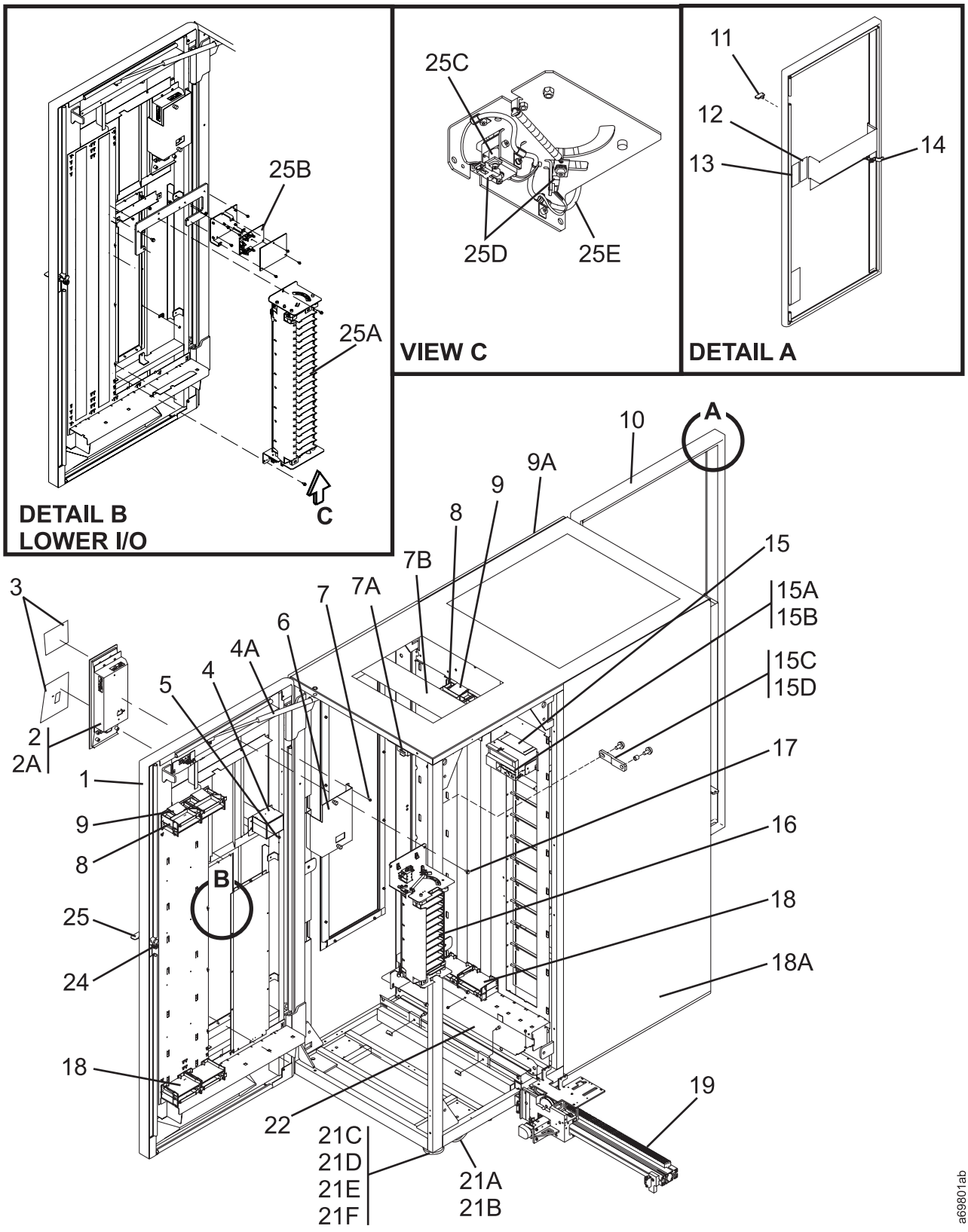
4Gb/8Gb Fibre Switches and PDU Assemblies 1144
Dual Gripper Assembly (HD) Required if Sx4 HD frames are installed 1142
Dual Gripper Assembly (LTO/LTO) 1138
Dual Gripper Assembly (Universal LTO/3592) 1140
Enhanced FCA (x23 / x53 Only) 1122
Final Assembly, Lxx/Dxx 1108
Four I/O Station (64 I/O Slots) Assembly 1120
Gripper and Pivot Assembly (HD). 1136
Gripper and Pivot Assembly (L22/L52/L23/L53 Only). 1134
Gripper and Pivot Assembly (L32 Only) 1132
I/O Station Assemblies (L22 / L23 / L52 / L53 Only) 1126
Miscellaneous Cables and Tools 1148
Shuttle Complex Model SC1 FRUs 1146
Sx4 High Density Frame Assembly 1118
Upper I/O Station Assembly (L32 Only) 1124
X-Axis Assembly 1128
Y-Axis Assembly 1130

Visual Index I Model Lxx/Dxx



Catalog Section

Assembly 1: Final Assembly, Lxx/Dxx

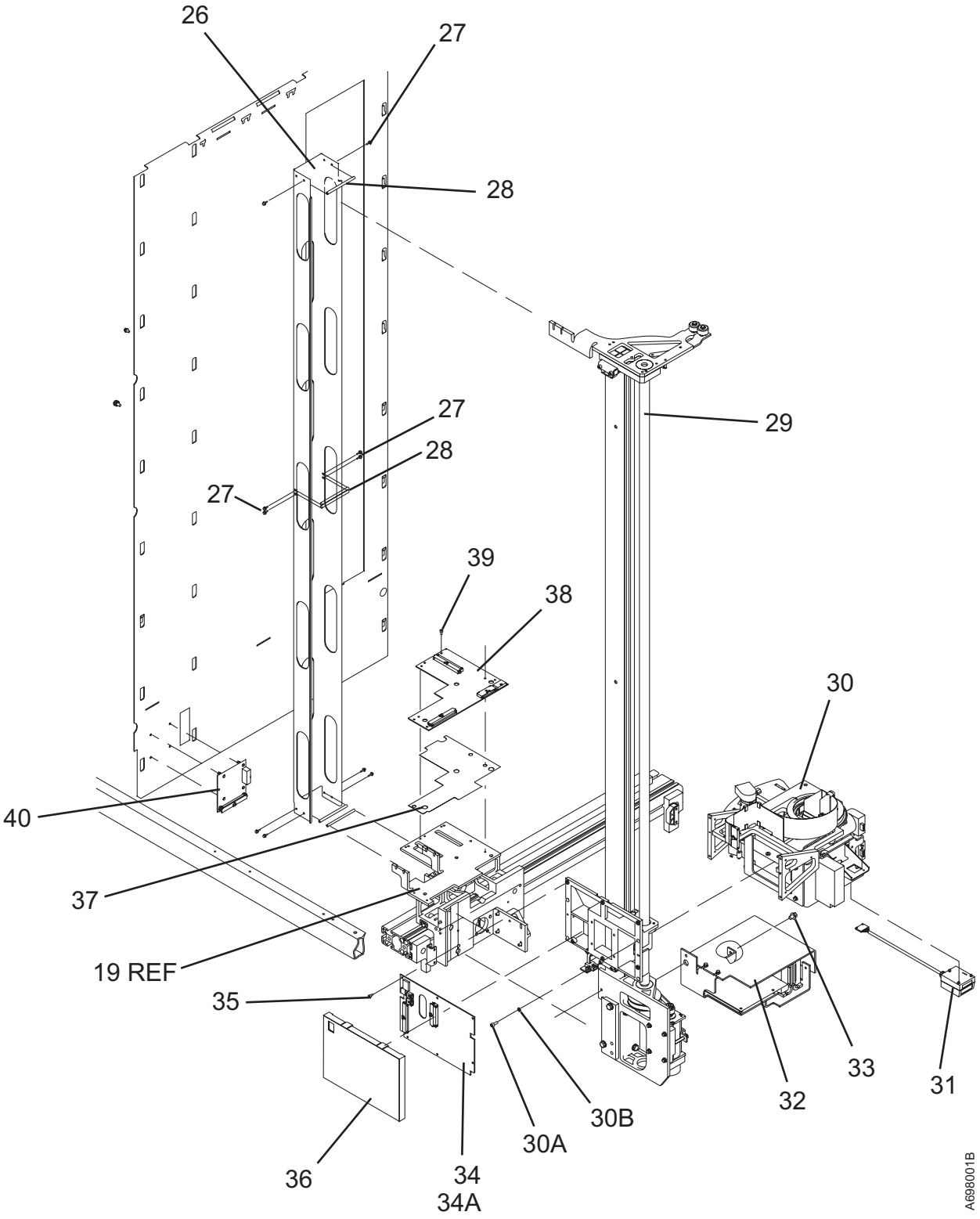


Asm–Index	Part Number	Units	Description
1–		NP	Final Assembly, Lxx/Dxx (Sheet 1 of 3)
–1	23R3274	AR	• Door, Front (Lx2/Lx3)
–1	23R3275	AR	• Door, Front (Dx2/Dx3/HA1)
–2	19P5354	1	• Operator Panel Assembly (L32 Only)
–2	45E2374	1	• Operator Panel Assembly (OPC+ w/ CF) (L32 Only).
–2	95P5532	1	• Operator Panel Assembly (L22, L52, L23, L53) This FRU does not come with a compact flash (CF) card. CF can be ordered using PN 77P6126
–2A	33F8354	1	• Battery, Lithium (3 V dc) (used on OPC) Used on PN 19P5354 Operator Panel Assembly (L32 Only)
–	77P6126	1	• Compact Flash Memory Card, (not shown), OPC (L23, L53 Only)
–3		NP	• Label, Operator Panel
–4	35L0560	1	• Switch, Power On with Cable (L32 Only)
–4	23R4392	1	• Switch, Power On with Cable (L22, L52, Lx3 Only)
–4A	61G9923	AR	• Damper, Door
–4A	61G9924	AR	• Ball Stud
–4A	35L0410	AR	• Ball Stud Nut
–5	1624764	3	• Screw, Flng Hd Hex, M4 X 6 mm
–6	35L0554	NP	• Bracket, Operator Panel
–7	1624764	3	• Screw, Flng Hd Hex, M4 X 6 mm
–7A	23R4406	AR	• Switch, Door Interlock
–7A	34G8910	AR	• Key, Door Interlock Switch
–7B	35L0169	AR	• Upper X-Rail (L32)
–7B	45E1016	AR	• Upper X-Rail (L23, L53 Only)
–7B	35L0182	AR	• Upper X-Rail (D32) (not shown)
–7B	35L0169	AR	• Upper X-Rail (L22/L52)
–7B	45E1018	AR	• Upper X-Rail (D23, D53 Only)
–7B	35L0182	AR	• Upper X-Rail (D22/D52) (not shown)
–7B	45E1019	AR	• Upper X-Rail (HA) Service Bay A
–7B	45E2410	AR	• Screw, M4 x 18 with captive washer to secure upper X-rails (not shown)
–8	35L0180	AR	• Top Cap, (LTO) calibration cell L32/D32 Only
–8	45E1640	AR	• Top Cap, (LTO) calibration cell L52/D52, L53/D53 Only
–8	45E1641	AR	• Top Cap, (3592) calibration cell L22/D22, L23/D23 Only
–9	19P0254	AR	• Spring Clip, Storage Cell Tray (LTO and 3592)
–9A		AR	• Cover, Rear Side See “Cover” in table *Alphabetic Listing of Parts* on page 1100.
–10		NP	• Door, Rear
–11	62G1580	1	• Key, Rear Door
–12	05H1825	1	• Label, Caution, Power Cord
–13	50G1043	1	• Label, Caution, Current Leakage
–14	62G1557	1	• Latch, Rear Door
–15		AR	• Fixed Tray or Canister For detail breakdown, see items 48 and 51.
–15A	19P0325	AR	• Holder, Logical Library Label
–15B	19P0035	AR	• Barcode Label, Logical Library (sheet of all IDs)
–15B	19P0476	AR	• Label, Bar Code - Empty Cell / Scanner Calibration
–15C	05H7832	AR	• Bracket, Frame-to-Frame
–15D	1624790	AR	• Screw, M6 x 12 mm
–16	19P2527	1	• I/O Station, Upper (10 Cartridge), LTO For detail breakdown, see “Assembly 5: Upper I/O Station Assembly (L32 Only)” on page 1124.

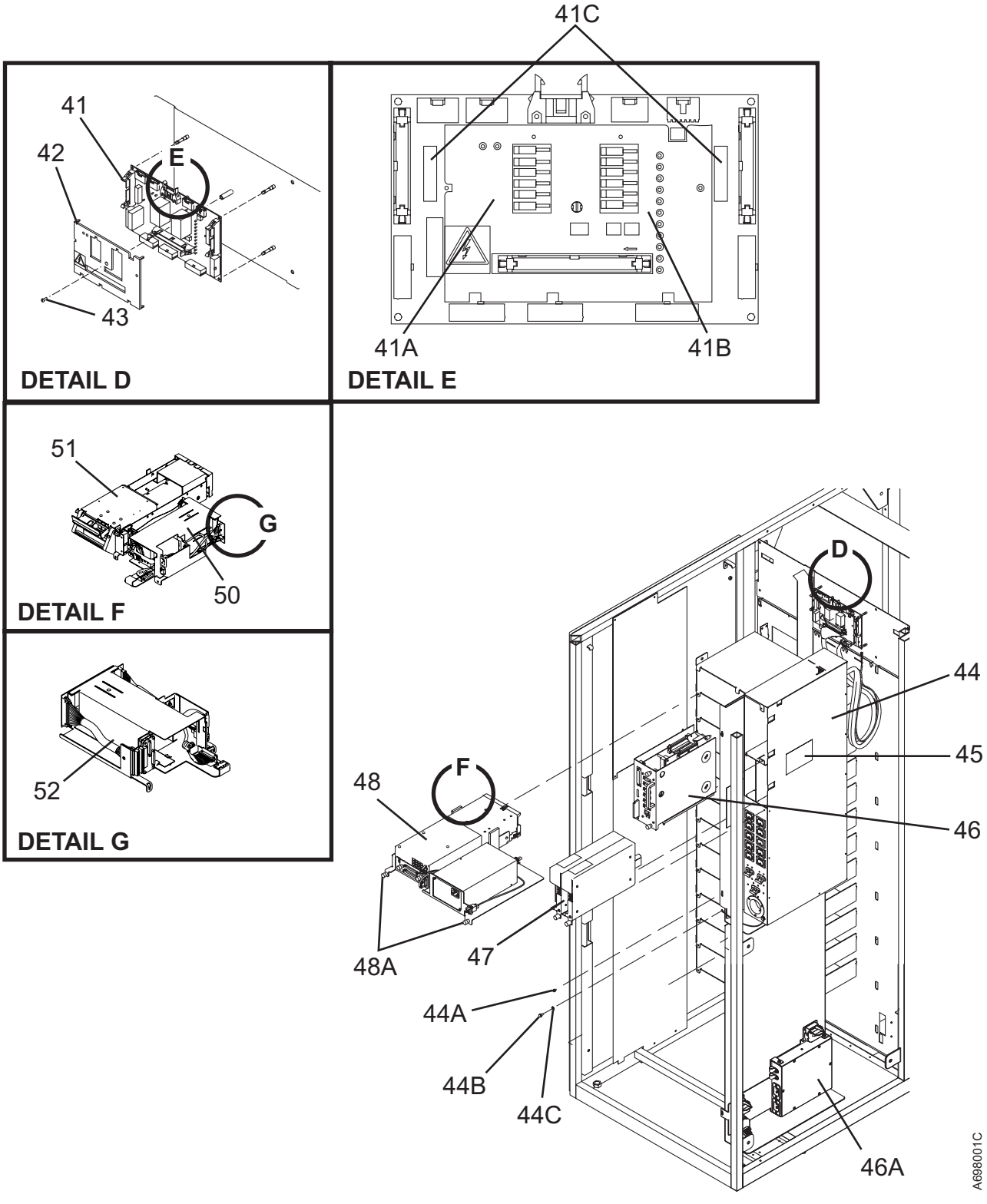
Assembly 1: (continued)

Asm–Index	Part Number	Units	Description
–16	19P4470	1	• I/O Station, Lower (20 Cartridge), LTO, L32 Only. For detail breakdown, use “Assembly 5: Upper I/O Station Assembly (L32 Only)” on page 1124 to locate common parts.
–16	24R1714	AR	• I/O Station, (16 Cartridge), LTO, L22/L52 Only. For detail breakdown, see “Assembly 6: I/O Station Assemblies (L22 / L23 / L52 / L53 Only)” on page 1126.
–16	24R1713	AR	• I/O Station, (16 Cartridge), 3592 L22/L52 Only. For detail breakdown, see “Assembly 6: I/O Station Assemblies (L22 / L23 / L52 / L53 Only)” on page 1126.
–16	24R1715	AR	• I/O Station, (16 Cartridge), 3592 L32 Only. For detail breakdown, see “Assembly 6: I/O Station Assemblies (L22 / L23 / L52 / L53 Only)” on page 1126.
–17	1624788	4	• Screw, Flng Hd Hex, M6 X 8 mm
–18	35L0170	AR	• Tray, Storage Cell (LTO) L32/D32 Only
–18	46X7027	AR	• Tray, Storage Cell (LTO), **Qty-5**, L52/D52, L53/D53 Only
–18	46X7028	AR	• Tray, Storage Cell (3592), **Qty-5**, L22/D22, L23/D23 Only
–18	35L0180	AR	• Bottom Cap, (LTO) calibration cell L32/D32 Only
–18	45E1640	AR	• Bottom Cap, (LTO) calibration cell L52/D52, L53/D53 Only
–18	45E1641	AR	• Bottom Cap, (3592) calibration cell L22/D22, L23/D23 Only
–18	46X7025	AR	• Storage Cells, LTO column. Contains the following parts: (2X) 45E1640 - LTO Cap Cells (44X) 18P8595 - LTO Storage Cells (1X) 19P0254 - Spring, Cell Retention (1X) 24R1107 - Spacer, Cell Spring
–18	46X7026	AR	• Storage Cells, 3592 column. Contains the following parts: (2X) 45E1641 - 3592 Cap Cells (40X) 95P2106 - 3592 Storage Cells (1X) 19P0254 - Spring, Cell Retention (1X) 24R1107 - Spacer, Cell Spring
–18A		AR	• Cover, Rear Side See “Cover” in table *Alphabetic Listing of Parts* on page 1100.
–19	23R3554	1	• X-Axis Assembly (L32, L22/L52, L23/L53, S24/S54) For detail breakdown, see “Assembly 7: X-Axis Assembly” on page 1128.
–21A	31L7521	AR	• Caster, Machine (x22, x32, x52)
–21A	12R9478	AR	• Caster, Machine (x23, x53 Only)
–21B	1621832	NP	• Screw, M6 x 16 (with washers)
–21C	35L0401	AR	• Jackscrew, Leveling
–21D	50G0401	AR	• Nut, Leveling Jackscrew
–21E	05H2179	AR	• Pad, Leveling Jackscrew
–21F	05H7004	AR	• Pad, Carpet
–22	35L0192	NP	• Cover, Cable Trough, X-Axis Lxx
–22	35L0185	NP	• Cover, Cable Trough, X-Axis Dxx
–22	05H7979	NP	• Liner, Trough
–24	61G9869	1	• Latch, Front Door
–25	61G9870	1	• Key, Front Door
–25A	19P4470	1	• I/O Station, Lower (20 Cartridge), LTO
–25B	95P6575	1	• Card, XIO (L22, L52, L23, L53 Only)
–25B	19P3544	1	• Card, XIO (L32 Only)
–25C	94F6802	1	• Solenoid, I/O
–25D	05H8407	1	• Sensor, I/O Door Closed/Locked (x32, x22, x52)
–25D	19P5915	1	• Sensor, I/O Door Closed/Locked (x23, x53 Only)
–25E	19P1762	1	• Cable, Upper I/O Station to XIO Card

Assembly 1: (continued)



Asm–Index	Part Number	Units	Description
1–		NP	Final Assembly, Lxx/Dxx (Sheet 2 of 3)
–26	35L0835	1	• Channel, Y-Cable
–27		NP	• Screw, Flng Hd Hex, M3 X 8 mm
–28		NP	• Spacer, Channel, Y-Cable
–29	24R0008	1	• Y-Axis Assembly (L32, L22, L52)
–29	23R3555	1	• Y-Axis Assembly (L23, L53 Only) For detail breakdown, see “Assembly 8: Y-Axis Assembly” on page 1130
–30		NP	• Gripper/Pivot Assembly For detail breakdown, see “Assembly 9: Gripper and Pivot Assembly (L32 Only)” on page 1132
–30A		NP	• Screw, Soc Hd Hex, M4 X 10 mm
–30B		NP	• Lockwasher, M4
–31	23R6229	1	• Scanner, Bar Code, Kit consisting of scanner, bracket, and screws (L32 Only) **Note:** If the library has Universal Grippers installed, you must order the following part number (for L32, L22, L52 Only) instead of this one.
–31	23R6149	1	• Scanner, Bar Code, Kit consisting of scanner and bracket (L32, L22, L52 Only)
–31	23R4651	1	• Scanner, Bar Code, Kit consisting of scanner and bracket (L32/L22/L52/L23/L53)
–31	96P0871	1	• Bracket, Bar Code Scanner, (not shown) (L22/L52/L23/L53 Only) Calibration Label PN follows
–31X	19P0476	AR	• Scanner Barcode Label Calibration Strip (Lxx Frame above Drive 1)
–32	19P5067	1	• Motor Driver Assembly (MDA) (L32, L22, L52) for accessors in either a single or dual accessor library.
–32	23R8830	1	• Motor Driver Assembly (MDA-CF) (L23, L53, and any L32, L22, L52 that have enhanced node cards already installed) for accessors in either a single or dual accessor library.
–	77P6126	1	• Compact Flash Memory Card, (not shown), MDA (Only used in Enhanced node cards)
–33		NP	• Screw, Flng Hd Hex, M5 X 8 mm
–34	23R5882	1	• Card, ACC (L32, L22, L52) See **“Node Cards in the Library” on page 826** for more information.
–34	23R4648	1	• Card, ACC-CF (L23, L53, and any L32, L22, L52 that have enhanced node cards already installed). See **“Node Cards in the Library” on page 826** for more information.
–	77P6126	1	• Compact Flash Memory Card, (not shown), ACC (Only used in Enhanced node cards)
–34A	33F8354	1	• Battery, Lithium (3 V dc) (Used on ACC)
–35		NP	• Screw, Soc Hd Hex, M3 X 6 mm
–36	23R6393	1	• Cover, ACC Card (Lxx)
–37		NP	• Insulator, AXY Card * * Used on earlier L32 single accessor libraries to keep the pins from shorting to the mounting plate. Later style AXY card mounting plates have a rectangular hole, and the insulator is not required. This is true for HA1 libraries and any AXY card with two X-track cable connectors.
–38	35L0007	AR	• Card, AXY2 (L32 Only) Old style with one X-Track cable connector
–38	19P5503	AR	• Card, AXY3 (L22/L32/L52 Only) New style with two X-Track cable connectos If used in an L32 library, the new style X-track cable is required
–38	95P1875	AR	• Card, AXY3 (L23/L53) New style with two X-Track cable connectos
–39		8	• Screw, Flng Hd Hex, M3 X 6 mm
–40	35L0832	1	• Card, XCP (L32, L22, L52)
–40	95P1879	1	• Card, XCP (L23, L53 Only)

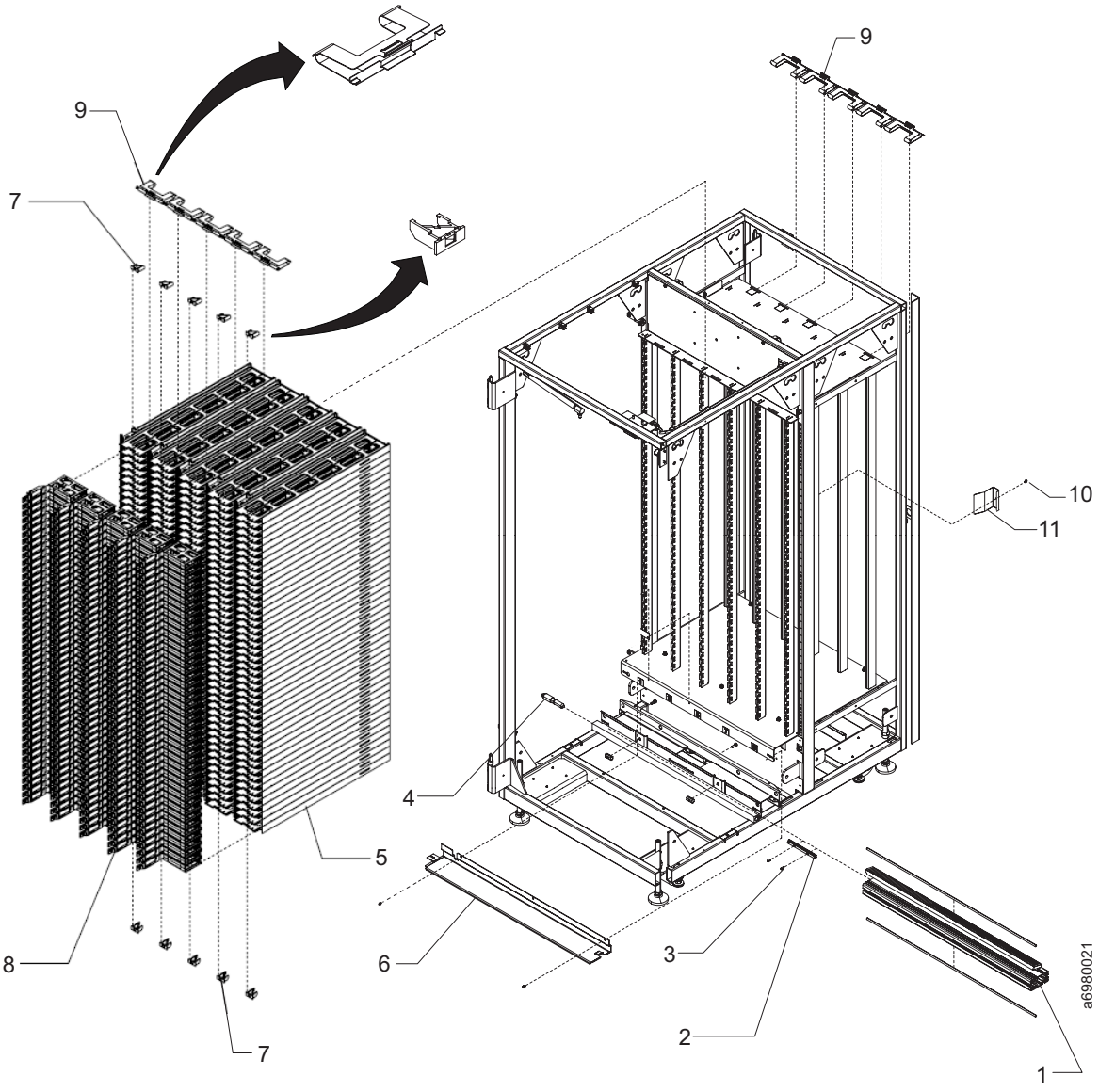

41C
41
42
E
43
41A
41B
DETAIL D
DETAIL E
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G
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DETAIL F
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DETAIL G
D
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45
46
F
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48A
47
44A
44B
44C
46A
A698001C

Asm–Index	Part Number	Units	Description
1–		NP	Final Assembly, Lxx/Dxx (Sheet 3 of 3)
–41	35L1207	1	• Card, FIC (x32, x22, x52)
–41	95P1876	1	• Card, FIC (x23, x53 Only)
–41A	35L1255	8	• Fuse, 12 A (x32, x22, x52)
–41A	77P3186	8	• Fuse, 12 A (x23, x53 Only) (Used in all 6 positions of fuse block F2, and the top 2 positions of block F1)
–41B	35L1254	4	• Fuse, 5 A, (x32, x22, x52) - (Used in bottom 4 positions of fuse block F1)
–41B	77P3188	4	• Fuse, 5 A, (x23, x53 Only) - (Used in bottom 4 positions of fuse block F1)
–41C		NP	• Terminator, FIC (One on each end of FIC card) **Order FIC Card**
–42	35L0494		• Overlay, FIC Card
–43		4	• Screw, Slotted Pan Hd, M3 X 8 mm
–44	35L0121	1	• FCA (220V only)
–44	35L2092	1	• FCA (110V or 220V) (Without MCP and 37 V dc power supplies)
–46	19P5350	1	• Media Changer Pack (MCP) See **“Node Cards in the Library” on page 826** for more information. with Ethernet support (Lxx) for IBM Specialist web user interface
–46	45E2621	1	• Media Changer Pack (MCP+ w/ CF) See **“Node Cards in the Library” on page 826** for more information.
–46	18P8865	1	• Media Changer Pack (MCP) See **“Node Cards in the Library” on page 826** for more information. without Ethernet support (Dxx frames only) Note: If the Dxx frame has an MCP with Ethernet support, order the part number with Ethernet. This part number will be obsoleted, and will automatically sub to the Ethernet version.
–46A	45E2302	1	• Power Distribution Unit (PDU) FRU Kit, Only used on Lxx/Dxx frames with FC 1901 (Dual AC Line Cords). PDU FRU Kit contains the following parts:
–			• • PDU Assembly
–			• • Cable retention bracket clip
–			• • PDU-to-FCA Power Cord with plastic spacer pre-installed
–			• • Install Instructions
–47	08L9691	AR	• Power Supply, 37 V dc
–48	24R1563	AR	• Drive Tray, LTO Ultrium-1 (L1) Fibre Channel
–48	24R1562	AR	• Drive Tray, LTO Ultrium-1 (L1) HVD
–48	24R1561	AR	• Drive Tray, LTO Ultrium-1 (L1) LVD
–48A	19P4641	2	• Thumbscrew, Fixed Tray (x32 Only)
–48A	24R0059	2	• Thumbscrew, Fixed Tray (x22/x52 Only)
–	96P0855	AR	• Screws Kit, LTO (x32/x52 Only)
–	46X1773	AR	• Bezel FRU Replacement Kit, LTO Used on LTO-1 through LTO-4 Only
–	46X2537	AR	• Bezel FRU Replacement Kit, LTO Used on LTO-1 through LTO-5
–50	37L0311	AR	• Power Supply (x32 Only) Early style. (Will sub to 95P5182 when Field Stock is Depleted) **Note:** See CARR chapter, "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" to determine which style is currently installed.
–50	23R4750	AR	• Power Supply (x22/x52) (Used with L22/D22/L52/D52 **and** with newer L32/D32 fixed tray PN 95P5183)
–51	24R1127	AR	• Drive Canister, 3592 - J1A (Fibre)
–51	23R3691	AR	• Drive Canister, 3592 - E05 4Gb (Fibre)
–51	23R9206	AR	• Drive Canister, 3592 - E05 4Gb Encryption Capable (Fibre)
–51	45E6608	AR	• Drive Canister, 3592 - E06/EU6 Encryption Capable (Fibre)
–51	46X9615	AR	• Drive Canister, 3592 - E07 Encryption Capable (Fibre)
–51	24R1549	AR	• Drive Canister, LTO Ultrium-1 (L1) (Fibre)

Assembly 1: (continued)

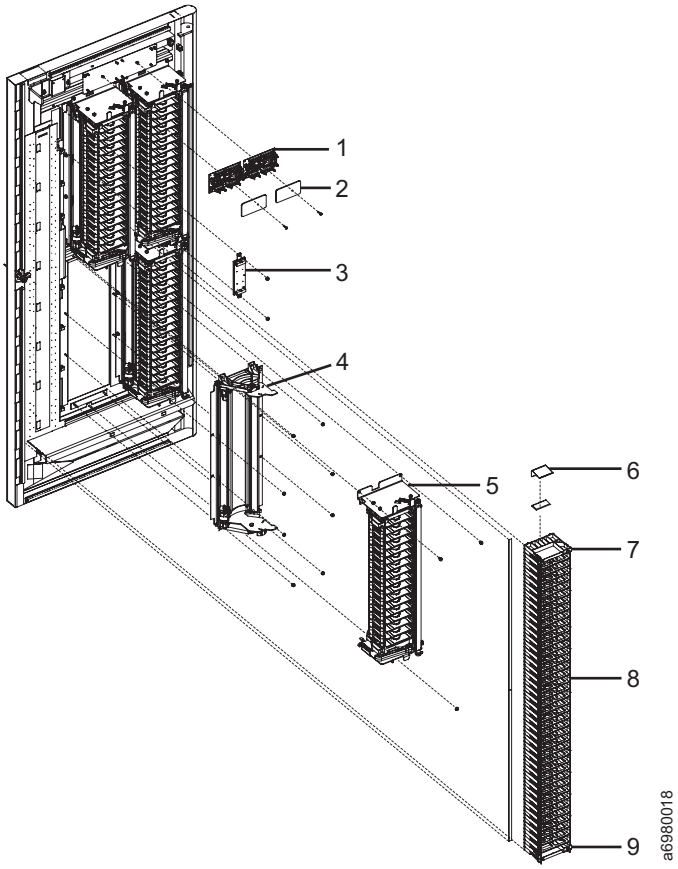
Asm–Index	Part Number	Units	Description
–51	24R1548	AR	• Drive Canister, LTO Ultrium-1 (L1) HVD (SCSI)
–51	24R1547	AR	• Drive Canister, LTO Ultrium-1 (L1) LVD (SCSI)
–51	18P6510	AR	• Drive Canister, LTO Ultrium-2 (L2) (Fibre)
–51	18P6508	AR	• Drive Canister, LTO Ultrium-2 (L2) HVD (SCSI)
–51	18P6506	AR	• Drive Canister, LTO Ultrium-2 (L2) LVD (SCSI)
–51	96P0896	AR	• Drive Canister, LTO 3588 Ultrium-3 (F3A) (2 Gbps Fibre)
–51	23R5147	AR	• Drive Canister, LTO 3588 Ultrium-3 (F3B) (4 Gbps Fibre)
–51	95P3987	AR	• Drive Canister, LTO 3588 Ultrium-4 (F4A) (4 Gbps Fibre)
–51	45E9084	AR	• Drive Canister, LTO 3588 Ultrium-5 (F5A) (4 Gbps Fibre)
–51	18P7354	AR	• Drive Kit (Tray-to-Canister), LTO Ultrium-1 (L1) LVD (SCSI) (Drive Canister LVD, Fixed Tray Asm with power supply, HD68–to–VHCDI interposer cable (2x), Redundant Pwr Cable, SCSI Terminator, Instruction sheet)
–51	18P7355	AR	• Drive Kit (Tray-to-Canister), LTO Ultrium-1 (L1) HVD (SCSI) (Drive Canister HVD, Fixed Tray Asm with power supply, HD68–to-VHCDI interposer cable (2x), Redundant Pwr Cable, SCSI Terminator, Instruction sheet).
–51	18P7356	AR	• Drive Kit (Tray-to-Canister), LTO Ultrium-1 (L1) (Fibre) (Drive Canister FIBRE, Fixed Tray Asm with power supply, Redundant Pwr Cable, Instruction sheet).
–52	19P5572	AR	• Fixed Tray (without PS), SCSI LVD/HVD & Fibre (L32, D32 Only) Early style. (Will sub to 95P5182 when Field Stock is Depleted). **Note:** See CARR chapter, "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" to determine which style is currently installed.
–52	95P5182	AR	• Fixed Tray (with xx2 PS), SCSI LVD/HVD & Fibre (L32, D32 Only) **Note:** See CARR chapter, "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" to determine which style is currently installed.
–52	95P5183	AR	• Fixed Tray (without PS), (L32, D32 Only), SCSI LVD/HVD & Fibre. Uses power supply PN 23R4750. **Note:** See CARR chapter, "Fixed Tray Assembly - (L32/D32) Hot Swap Canister Models" to determine which style is currently installed.
–52	18P9620	AR	• Fixed Tray (without PS), Fibre (L22, D22 / L52, D52 Only) This tray assembly can be used for both SCSI & Fibre channel. A later version of this FRU will soon be provided with Fibre only, as SCSI is not supported on L22, D22 / L52, D52. Uses power supply PN 23R4750
–52	23R5973	AR	• Used for all drive types **except** 3592 E06/EU6/E07.
–52	45E3353	AR	• Used for all drive types **including** 3592 E06/EU6/E07.

Assembly 2: Sx4 High Density Frame Assembly



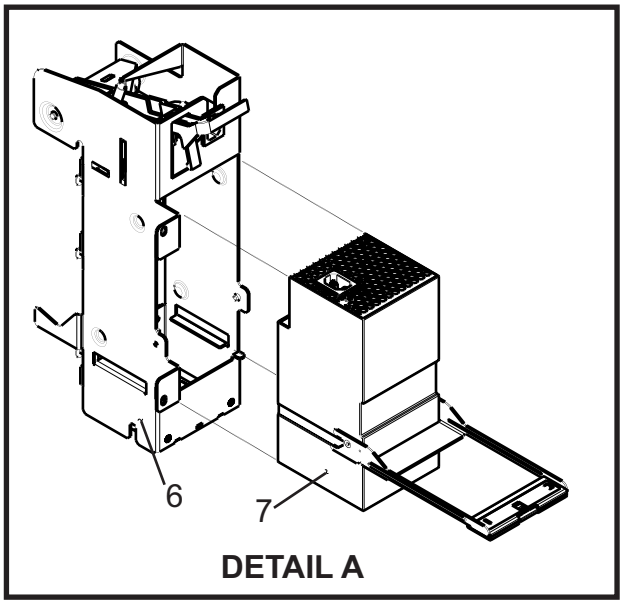
Asm–Index	Part Number	Units	Description
2–			Following parts are for the S24 (3592) and S54 (LTO) High Density Frame Assemblies For other parts not shown in this assembly, see “Assembly 11: Gripper and Pivot Assembly (HD)” on page 1136 and “Assembly 14: Dual Gripper Assembly (HD) Required if Sx4 HD frames are installed” on page 1142.
–1	95P1889	1	• X-Rail, Lower (D22/D52, D23/D53, S24/S54) with 2 rods; Newer style with bottom cutouts
–2	23R2334	1	• T-Nut, Long, M6
–3	23R4661	2	• Setscrew
–4	95P1886	1	• Alignment Rod
–5	95P6887	AR	• LTO Cell, Five HD Slot
–5	45E0772	AR	• 3592 Cell, Four HD Slot
–6	35L0185	1	• Cover, Cable Trough, X-Axis /Dxx
–7	45E0759	AR	• Calibration Target
–8	45E0777	AR	• Latch and Constant Force Spring Asm, 3592
–8	95P6893	AR	• Latch and Constant Force Spring Asm, LTO
–9	95P7084	AR	• Spring Clamp, HD Slot (front and back)
–10	1624764	2	• Screw, M4 x 6 Hex Flange Hd
–11	45E4862	2	• Spring, Cell Mid Column
–	45E4720	1	• Frame Lighting LED Asm (not shown)
–	45E6660	1	• Test Canister, HD Slot 3592 (not shown) Used in S24 frames when the Dxx frame is a Service Bay B
–	45E6659	1	• Test Canister, HD Slot LTO (not shown) Used in S54 frames when the Dxx frame is a Service Bay B

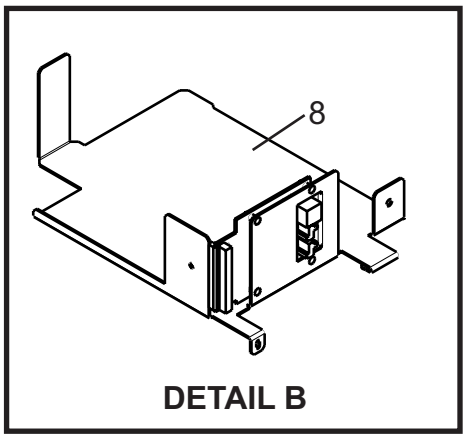
Assembly 3: Four I/O Station (64 I/O Slots) Assembly

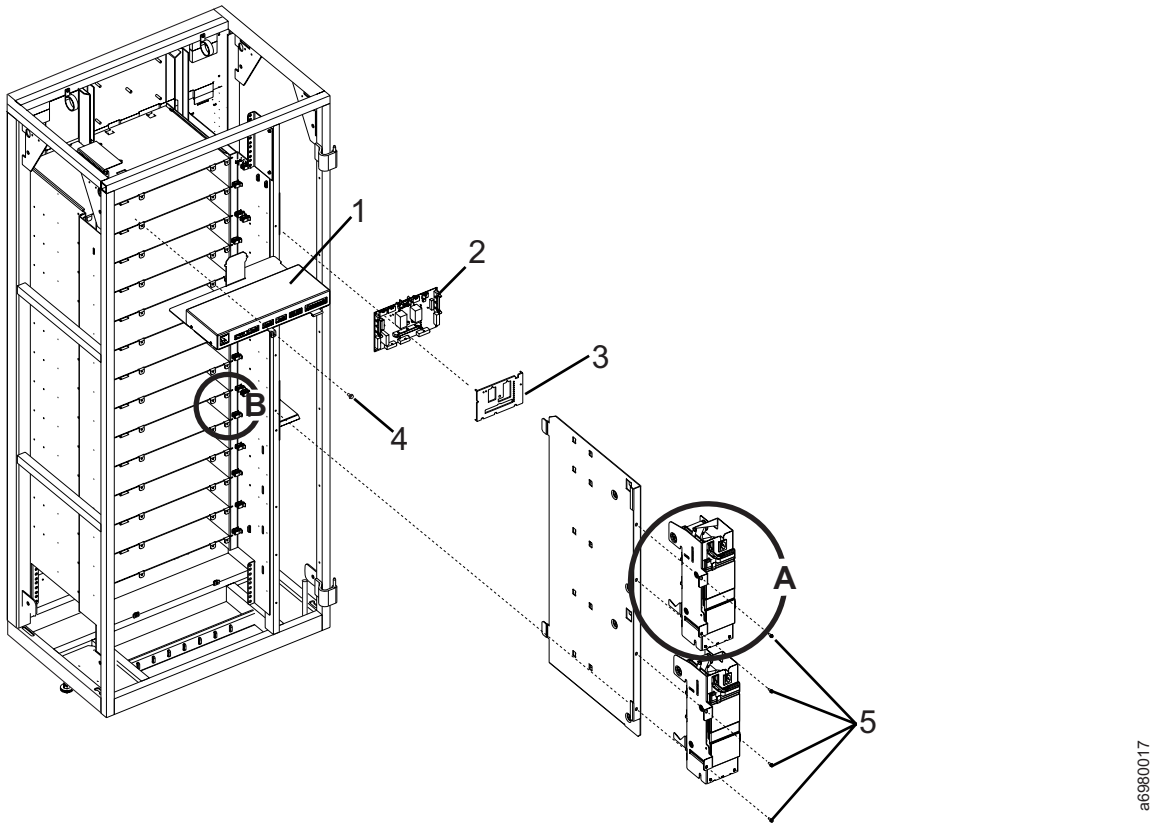


Asm–Index	Part Number	Units	Description
3–			Following parts are for the Expanded 64 Additional I/O slot in four I/O Station Frame assembly for D23 and D53 For I/O station detail parts not shown in this assembly, see “Assembly 6: I/O Station Assemblies (L22 / L23 / L52 / L53 Only)” on page 1126
–1	23R9163	2	• Card, XIO
–2	23R3173	2	• Cover, LED Panel assembly
–3	23R5893	1	• LED Panel and IOD assembly
–4	23R7911	4	• I/O Door Assembly, LTO & 3592, (used in x23/x53 Only)
–4	46X0922	4	• I/O Door Assembly, Locking, LTO & 3592 * * Only used with RPQ 8B3562. Non-stocked. Orders will be referred to Plant with 4-6 week lead time.
–5	23R5972	2	• I/O Station, 16-cartridge LTO
–5	23R5982	2	• I/O Station, 16-cartridge 3592
–6	19P0254	1	• Spring Clip, Storage Cell Tray (LTO and 3592)
–7	18P8596	AR	• Tray, Top Cap (LTO) (calibration cell)
–7	95P2107	AR	• Tray, Top Cap (3592) (calibration cell)
–8	46X7027	AR	• Tray, Storage Cell (LTO) **Qty-5**,
–8	46X7028	AR	• Tray, Storage Cell (3592) **Qty-5**,
–9	18P8596	AR	• Tray, Bottom Cap (LTO) (calibration cell)
–9	95P2107	AR	• Tray, Bottom Cap (3592) (calibration cell)
–	95P2843	2	• Cable, XIO cards to MCA (not shown)
–	23R3184	2	• Cable, XIO cards to IOD/LED panel (not shown)
–	95P5059	2	• Cable, Upper I/O Stations to XIO Card (not shown)
–	95P5060	2	• Cable, Lower I/O Stations to XIO Card (not shown)

Assembly 4: Enhanced FCA (x23 / x53 Only)

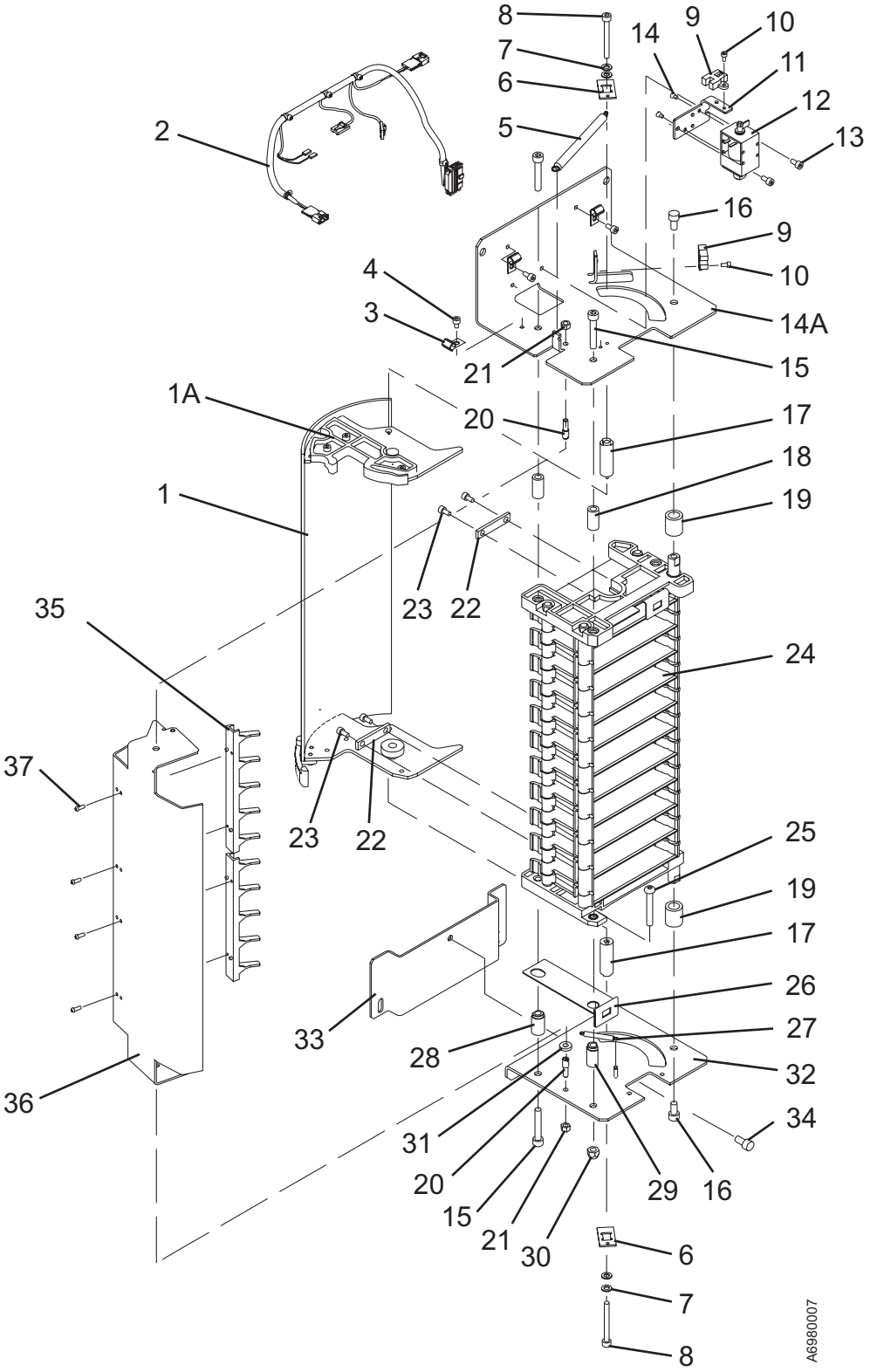






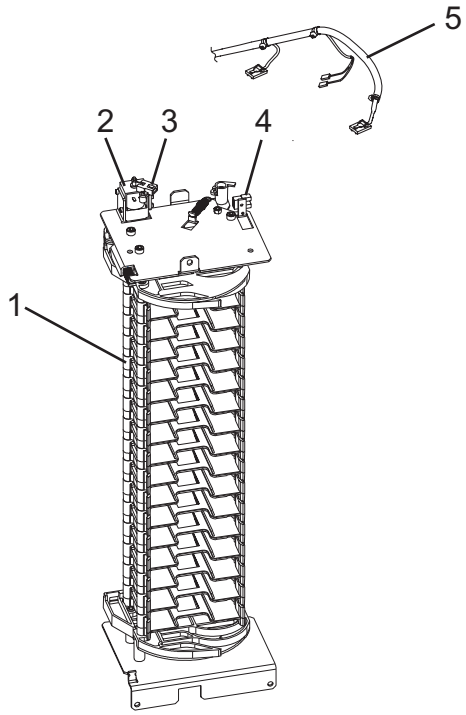
Asm–Index	Part Number	Units	Description
4–		NP	Enhanced FCA (x23 / x53) Power components, MDA, and Fixed Tray Component parts listed below. For next higher assembly, see “Assembly 5: Upper I/O Station Assembly (L32 Only)” on page 1124
–1	23R8805	1	• MCA with 2 Ethernet Ports (used in Lx3, and in Dx3 frames **without** the 4-I/O door feature)
–1	95P4884	1	• MCA with 2 Ethernet Ports (used in Dx3 frames **with** the 4-I/O door feature)
–	77P6126	1	• Compact Flash Memory Card, (not shown), MCA
–2	95P1876	1	• Card, FIC (L23, L53)
–3	35L0494	1	• Overlay, FIC Card
–4	24R0059	AR	• Thumbscrew, MCA & fixed tray
–5	1624767	AR	• Screw, Hex Flange Head M5x12
–6	95P1920	2	• Bulk Power Card Assembly (BPC), combined bulk power card and enclosure
–7	24R2723	2	• Bulk Power Supply (BPS),
–8	23R5973	AR	• Fixed Tray (x23, x53 only) Used for all drive types **except** 3592 E06/EU6E07.
–8	45E3353	AR	• Fixed Tray (x23, x53 only) Used for all drive types **including** 3592 E06/EU6/E07.
–	39M5114	2	• Cord, Line, (220v) North America (not shown)
–	45E2699	2	• Cord, Line, (220v) International (not shown)
–	39M5066	2	• Cord, Line, 4.3m, with 10 Amp/250 Vac (Argentina)
–	39M5238	2	• Cord, Line, 4.3m, with 15 Amp/250 Vac (Brazil)
–	39M5100	2	• Cord, Line, 4.3m, with 10 Amp/250 Vac, (Australia/New Zealand)
–	39M5184	2	• Cord, Line, 4.3m, with 15 Amp/250 Vac, (Japan)
–	39M5204	2	• Cord, Line, 4.3m, with 10 Amp/250 Vac (China)
–	39M5217	2	• Cord, Line, 4.3m, with 15 Amp/250 Vac (Korea)
–	39M5252	2	• Cord, Line, 4.3m, with 10 Amp/250 Vac (Taiwan)
–	39M5142	2	• Cord, Line, 4.3m, with 16 Amp/250 Vac (South Africa)
–	95P2320	1	• Cable, BPC1 to drives (not shown)
–	95P2362	1	• Cable, BPC2 to drives (not shown)
–	23R5974	1	• Cable group, MCA, (not shown) Three cables (combined into one) from the back of the MCA: - MCA J10 to FIC (J4) - MCA J8 to BPC-2 (J2) - MCA J11 to BPC-2 (J2)
–	95P2421	1	• Cable, BPC1 & BPC2 (dual power) to FIC Card (not shown)
–	95P2420	1	• Cable, BPC1 to EPO (not shown)
–	95P2422	1	• Cable, RS-422, MCA to Drives (not shown)
–	95P4474	1	• Cable, Bifurcated Power, Enhanced FCA only (with FC 1909)

Assembly 5: Upper I/O Station Assembly (L32 Only)

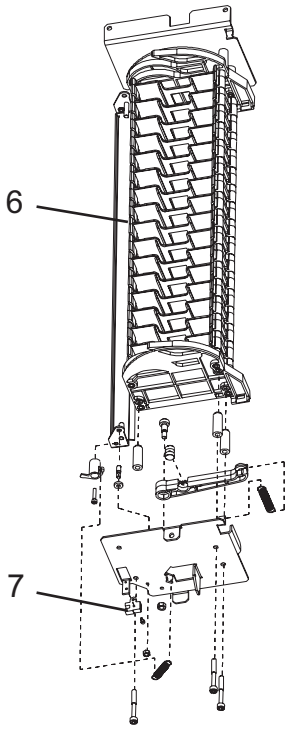


Asm–Index	Part Number	Units	Description
5–	19P5576	1	Upper I/O Station Assembly (10 Cartridge) LTO For next higher assembly, see “Assembly 5: Upper I/O Station Assembly (L32 Only)” on page 1124
–1		NP	• Door Assembly
–1A	46X4436	AR	• Cam, Toggle FRU Kit (used to replace a broken cam on both LTO 10 and LTO 20 I/O stations)
–2	35L1006	1	• Cable, I/O Station (used with Single I/O Station)
–2	19P1762	1	• Cable, I/O Station (used on Upper I/O Station with XIO Card)
–3		NP	• P-Clamp, Cable Mounting
–4		NP	• Screw, Soc Hd Cap, M4 X 8 mm
–5	35L1491	1	• Spring, Door
–6		NP	• Flag, Door Sensor
–7		NP	• Washer, Flat, M5
–8		NP	• Screw, Soc Hd Cap, M5 X 45 mm
–9	05H8407	2	• Sensor, Door or Solenoid (L32, L22, L52)
–9	19P5915	2	• Sensor, Door or Solenoid (L23, L53 Only)
–10		NP	• Screw, Soc Hd Cap, M3 X 8 mm
–11		NP	• Bracket, Solenoid Mounting
–12	94F6802	1	• Solenoid, Door Locked
–13		NP	• Screw, Soc Hd Cap, M4 X 8 mm
–14		NP	• Screw, Slotted Flat Hd, M3 X 6 mm
–14A		NP	• Bracket, Upper Mounting
–15		NP	• Screw, Soc Hd Cap, M6 X 35 mm
–16		NP	• Screw, Soc Hd Cap, M6 X 12 mm
–17		NP	• Spacer, Door Flag
–18		NP	• Spacer, Bracket/Cells
–19	94F6813	2	• Bumper, Door
–20		NP	• Pin, Toggle
–21		NP	• Nut, Hex, M5
–22		NP	• Clamp, Door Mounting, LTO
–23		NP	• Screw, Soc Hd Cap, M4 X 8 mm
–24		NP	• I/O Cells, 10-Cartridge (LTO)
–25		NP	• Screw, Button Hd, M6 X 40 mm
–26		NP	• Bracket, Lower Fiducial
–27	35L0778	1	• Spring, Toggle Stop, LTO
–28		NP	• Spacer, Shoulder
–29		NP	• Spacer, Flat
–30		NP	• Locknut, M6
–31		NP	• Washer
–32		NP	• Bracket, Lower Mounting
–33		NP	• Bracket, Bottom Adapter
–34		NP	• Screw, Soc Hd Cap, M6 X 12 mm
–35		NP	• Fingers, Toggle
–36		NP	• Bracket, Toggle Stop
–37		NP	• Screw, M3 X 8 mm

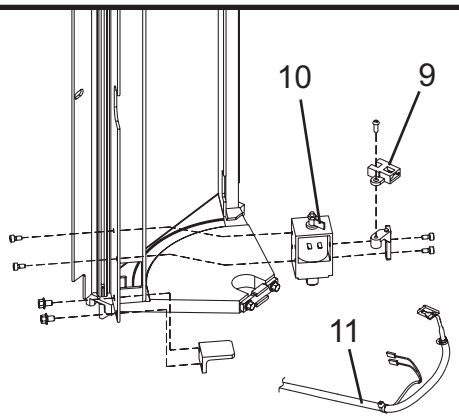
Assembly 6: I/O Station Assemblies (L22 / L23 / L52 / L53 Only)



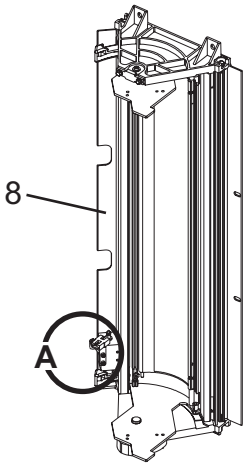
3592 16 CARTRIDGE I/O
IN L32 ONLY



3592 OR LTO 16 CARTRIDGE I/O
IN L22/L23/L52/L53 ONLY



DETAIL A

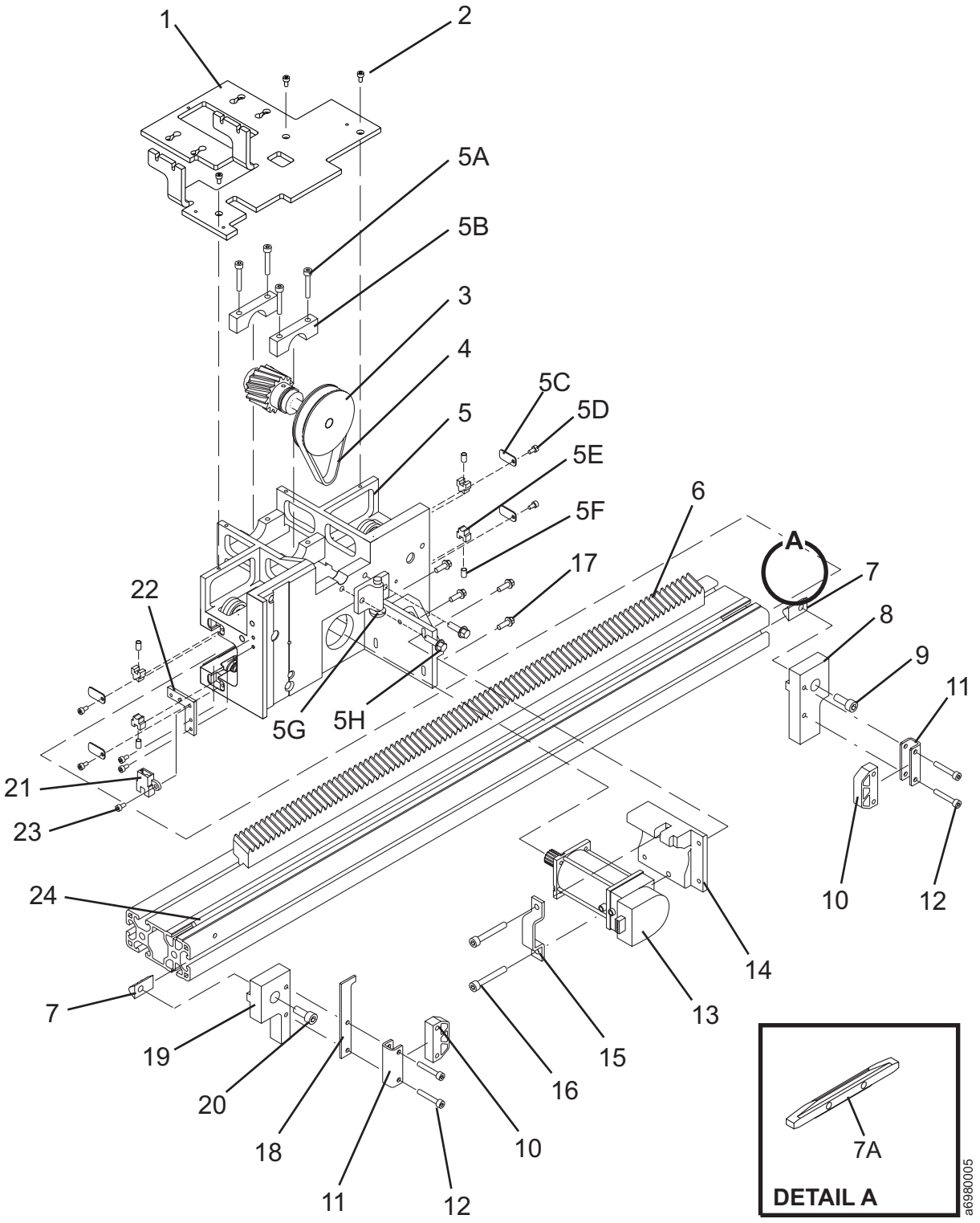


I/O DOOR (LTO and 3592)
IN L22/L23 OR L52/L53 ONLY

a6980015

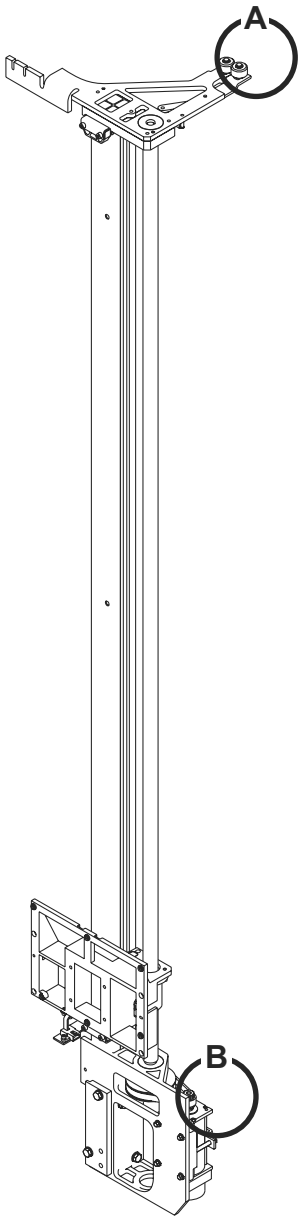
Asm–Index	Part Number	Units	Description
6–			Following parts are the I/O station assemblies for 3592 and L22/L52 frames For next higher assembly, see “Assembly 5: Upper I/O Station Assembly (L32 Only)” on page 1124
–1	96P0824	1	• I/O Station, 16-cartridge 3592 (used in L32 with FC 1608 installed)
–2	18P8957	1	• • Solenoid, Door Locked (Lxx)
–3	05H8407	1	• • Sensor, Door Locked (DLS) L32, L22, L52
–3	19P5915	1	• • Sensor, Door Locked (DLS) L23/L53 Only
–4	05H8407	1	• • Sensor, Door Open (DOS) L32, L22, L52
–4	19P5915	1	• • Sensor, Door Open (DOS) L23/L53 Only
–5	19P1763	1	• • Cable, I/O station to XIO Card (used in L32 with FC 1608 installed)
–6	96P0822	1	• I/O Station, 16-cartridge 3592 (used in L22/L52 Only)
–6	23R5982	1	• I/O Station, 16-cartridge 3592 (used in L23/L53 Only)
–	46X1187	1	• FRU Kit, 3592 Spring & Lockout Lever Used to replace bent or damaged 3592 I/O station slot spring and cartridge lockout lever.
–6	95P3111	1	• I/O Station, 16-cartridge LTO (used in L22/L52 Only)
–6	23R5972	1	• I/O Station, 16-cartridge LTO (used in L23/L53 Only)
–7	05H8407	1	• • Sensor, Door Open (DOS) L32, L22, L52
–7	19P5915	1	• • Sensor, Door Open (DOS) L23/L53 Only
–8	24R1090	1	• I/O Door Assembly, LTO & 3592, (used in L22/L52)
–8	23R7911	1	• I/O Door Assembly, LTO & 3592, (used in L23/L53 Only)
–8	46X0922	4	• I/O Door Assembly, Locking, LTO & 3592 * * Only used with RPQ 8B3562. Non-stocked. Orders will be referred to Plant with 4-6 week lead time.
–8	24R1089	1	• I/O Door Assembly, 3592, (used in L32 Only)
–9	05H8407	1	• • Sensor, Door Locked (DLS) L32, L22, L52
–9	19P5915	1	• • Sensor, Door Locked (DLS) L23/L53 Only
–10	18P8957	1	• • Solenoid, Door Locked (Lxx)
–11	18P9181	1	• • Cable, I/O station (used in L22/L52)
–11	95P4379	1	• • Cable, I/O station (used in L23/L53 Only)

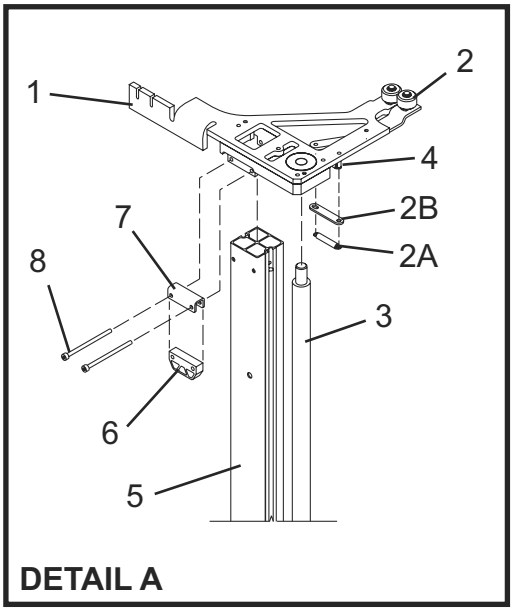
Assembly 7: X-Axis Assembly

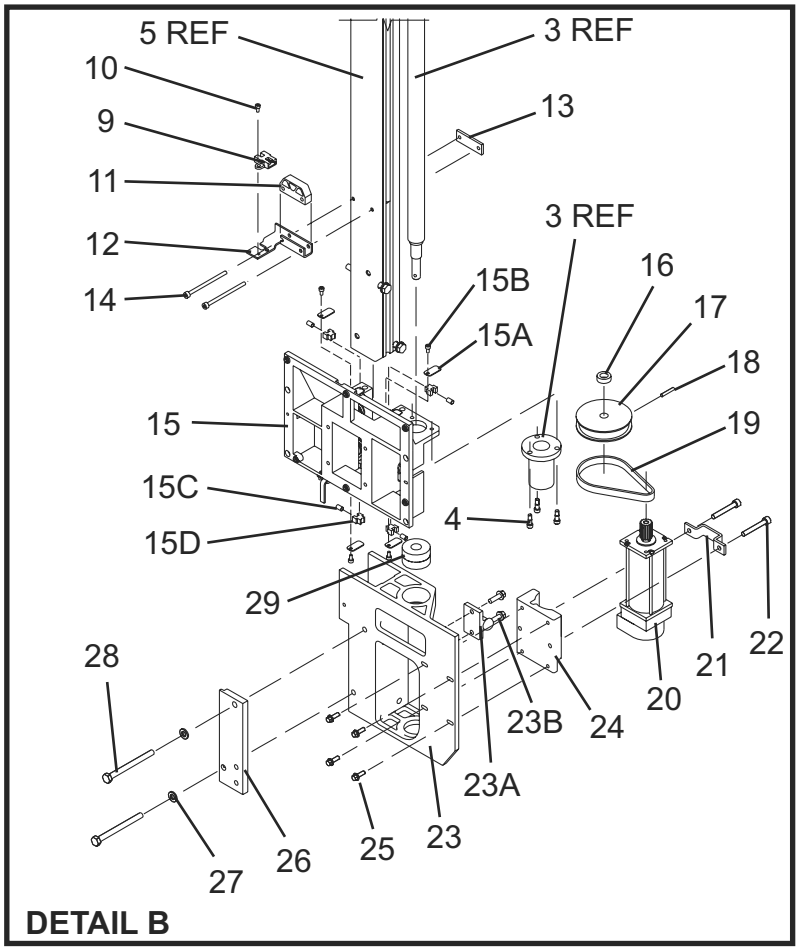


Asm–Index	Part Number	Units	Description
7–	24R1785	1	X-Axis Assembly For next higher assembly, see 1–19 on page 1110.
–1		NP	• Plate, Card Support
–2	50G0108	6	• Screw, Soc Hd Cap, M3 X 6 mm
–3	35L0240	1	• Pinion Shaft Assembly
–4	34G9629	1	• Belt, X-Axis
–5		NP	• X-Axis Bearing Assembly
–5A		NP	• • Block
–5B		NP	• • Screw, Soc Hd Cap, M4 X 25 mm
–5C		NP	• • Plate
–5D		NP	• • Screw
–5E	24R0318	1	• • Wiper, Accessor Lxx
–5E	45E6178	8	• • Wiper, FRU Kit (Lxx) Contains 8 wipers PN 24R0318
–5F	61G9699	4	• • Spring
–5G		NP	• • Tensioner, Spring
–5H		NP	• • Screw, Hex Flat Head, M5 X 16
–6	95P1889	1	• X-Rail, Lower (D22/D52, D23/D53, S24/S54) with 2 rods; Newer style with bottom cutouts
–6	24R0002	1	• X-Rail, Lower (L32, L22/L52, L23/L53)
–6	24R1695	1	• X-Rail, Lower (HA1 Service Bay A Only)
–7	34G9647	2	• T-Nut, Short, M6
–7A	23R2334	1	• T-Nut, Long, M6
–8	24R0907	1	• End Stop Assembly, (Right) L32
–8	18P9494	1	• End Stop Assembly, (Right) L22 / L52 / Lx3
–9	1621527	1	• • Screw, Soc Hd Cap, M6 X 16 mm
–10	61G9841	AR	• Bumper
–11		NP	• Bracket
–12		NP	• Screw, Flat Hd Cap, M4 X 25 mm
–13	46X7108	1	• Motor, X-Axis & Drive Belt (L32, L22, L52, L23, L53)
–14		NP	• Bracket, Motor Mounting
–15		NP	• Clamp, Motor
–16		NP	• Screw, Soc Hd Cap, M5 X 35 mm
–17		NP	• Screw, Flng Hd Hex, M4 X 12 mm
–18		NP	• Bracket, EOT Flag
–19		NP	• Block, EOT Mounting (Left)
–19	24R0906	1	• End Stop Assembly, (Left) L32
–19	18P9492	1	• End Stop Assembly, (Left) L22/L52/Lx3/SBA
–20	1621527	1	• • Screw, Soc Hd Cap, M6 X 16 mm
–21	05H8407	1	• Sensor, Home, X-Axis L32, L22, L52
–21	19P5915	1	• Sensor, Home, X-Axis L23/L53 Only
–22		NP	• Bracket, Sensor
–23		NP	• Screw, Soc Hd Cap, M3 X 6 mm
–24	24R0004	2	• Rod, X-Axis Bearing Way (Used on L22, L32, L52, SBA)
–24	05H8105	2	• Rod, X-Axis Bearing Way (Used on Dxx Expansion Frames only)

Assembly 8: Y-Axis Assembly

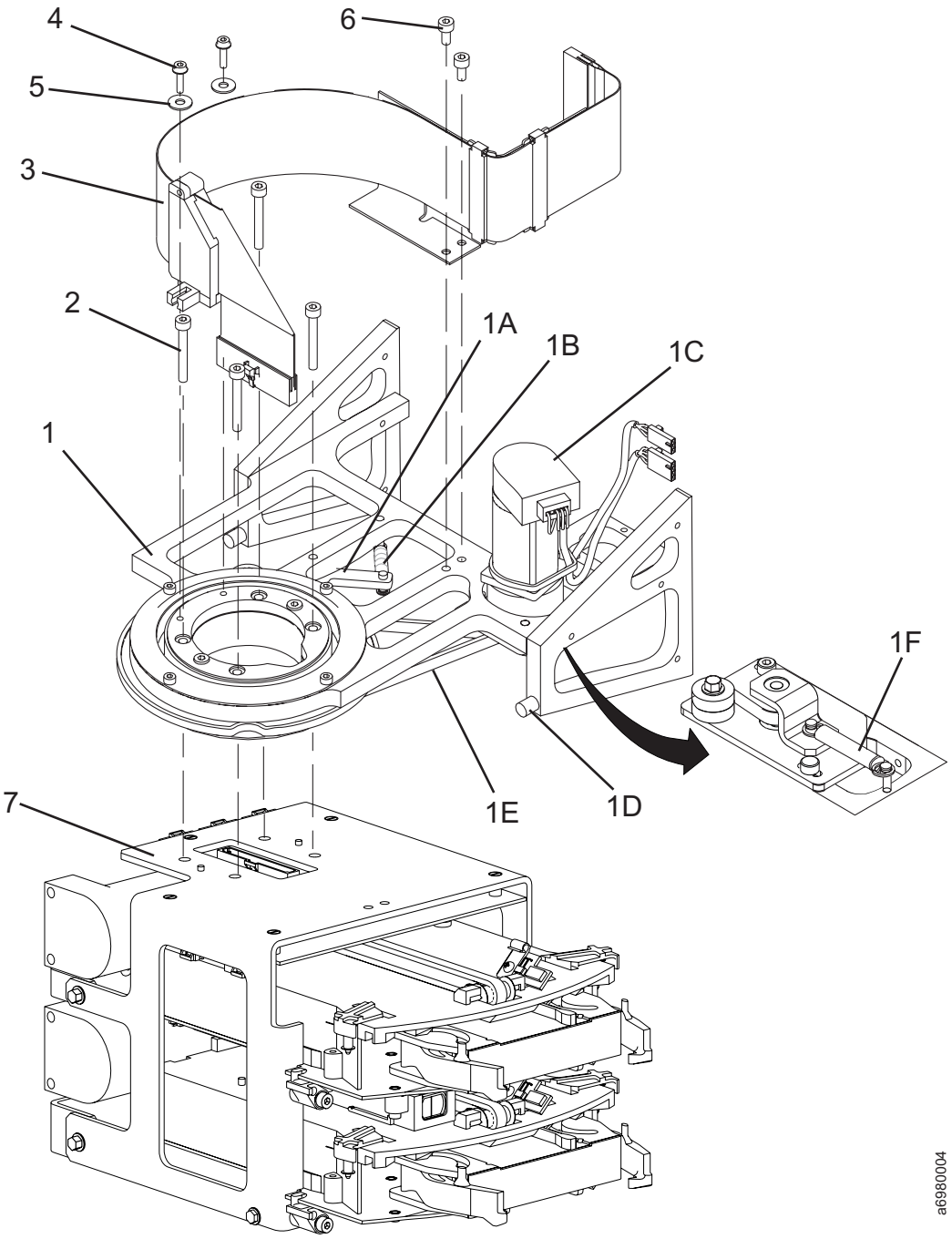






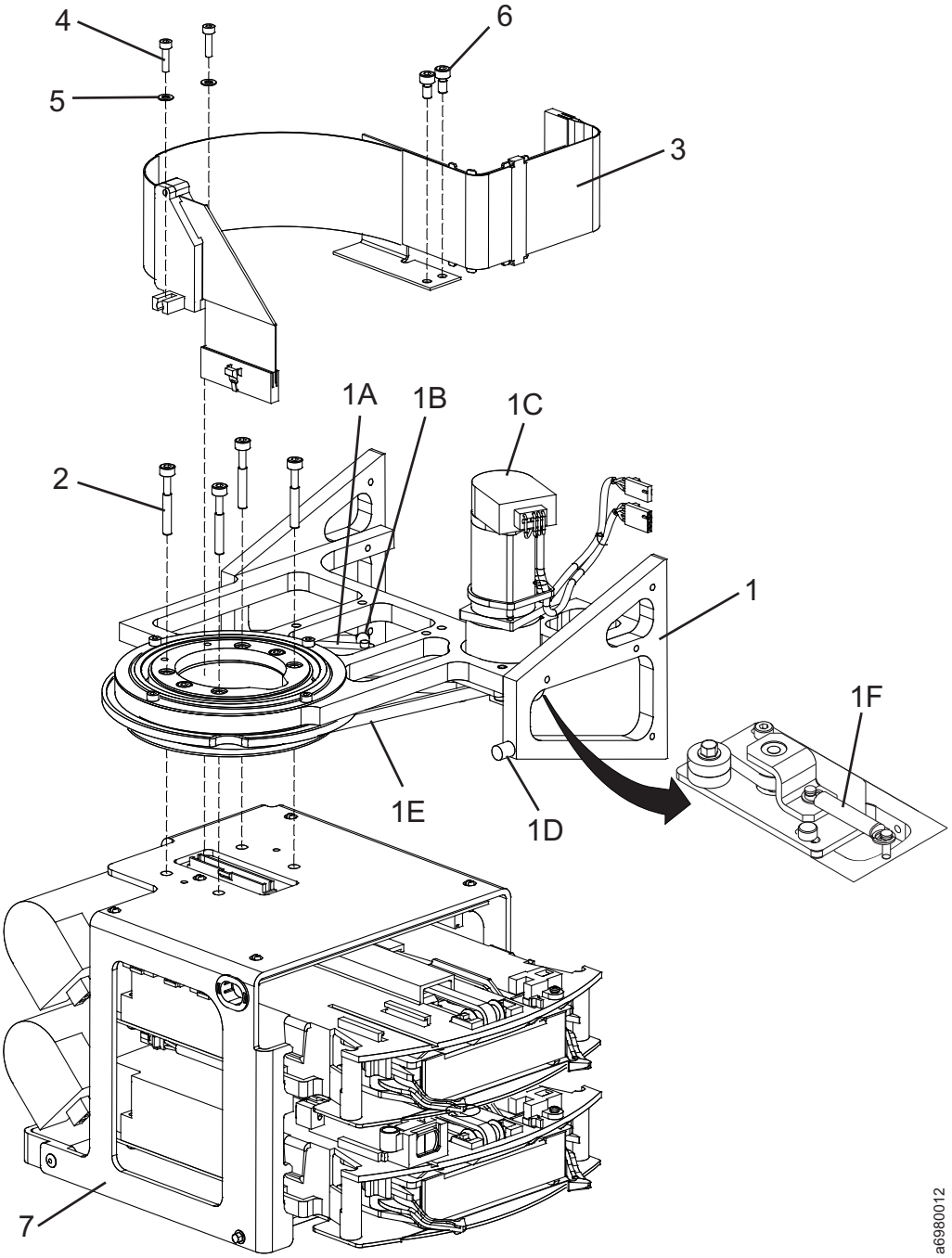
Asm–Index	Part Number	Units	Description
8–	35L0238	1	Y-Axis Assembly For next higher assembly, see 1–29 on page 1113
–1		NP	• Y-Axis Guide Assembly
–2	34G9599	2	• Roller, Guide (Urethane)
–2A	34G9363	1	• Spring
–2B	19P4203	1	• Spring Retainer
–3		NP	• Lead Screw and Bearing Nut
–4	4441581	1	• Screw, Shoulder
–5		NP	• Y-Rail Assembly
–6	61G9841	1	• Bumper
–7		NP	• Bracket, Y-Bumper
–8		NP	• Screw, Soc Hd Cap, M4 X 65 mm
–9	05H8407	1	• Sensor (L32, L22, L52)
–9	19P5915	1	• Sensor (L23, L53 Only)
–10		NP	• Screw, Soc Hd Cap, M3 X 6 mm
–11	61G9841	1	• Bumper
–12		NP	• Bracket, Y-Bumper/Sensor Mount
–13		NP	• Nut Plate, Bumper/Sensor Bracket
–14		NP	• Screw, Soc Hd Cap, M4 X 60 mm
–15		NP	• Y-Bearing Assembly
–15A		NP	• Plate
–15B		NP	• Screw
–15C	61G9699	4	• Spring
–15D	24R0318	4	• Wiper, Accessor Lxx
–15D	45E6178	8	• Wiper, FRU Kit (Lxx) Contains 8 wipers PN 24R0318
–16		NP	• Spacer, Lead Screw
–17		NP	• Pulley, 60 Groove
–18		NP	• Roll Pin, Diameter 3.2 mm Dia. X 19 mm
–19	34G9629	1	• Belt, Y-Axis
–20	46X7109	1	• Motor, Y-Axis & Drive Belt (L32, L22, L52, L23, L53)
–21		NP	• Clamp, Y-Axis Motor Mount
–22		NP	• Screw, Soc Hd Cap, M5 X 35 mm
–23		NP	• Block, Y-Mounting
–23A		NP	• Tensioner, Spring
–23B		NP	• Screw, Hex Flat Head, M5 X 16
–24		NP	• Block, Y-Motor Mount
–25		NP	• Screw, Flng Hd Hex, M4 X 12 mm
–26	45E5950	1	• Plate, Y-Axis Stiffener Plate
–26	46X4043	1	• Plate, Y-Axis Stiffener Plate FRU Kit **Required** on accessor assemblies with HD grippers. Can be used on any Y-mast. Comes with a removal & replacement procedures.
–27		NP	• Washer, Flat, M6
–28		NP	• Screw, Hex Hd Cap, M6 X 70 mm
–29		NP	• Y-Bearing

Assembly 9: Gripper and Pivot Assembly (L32 Only)



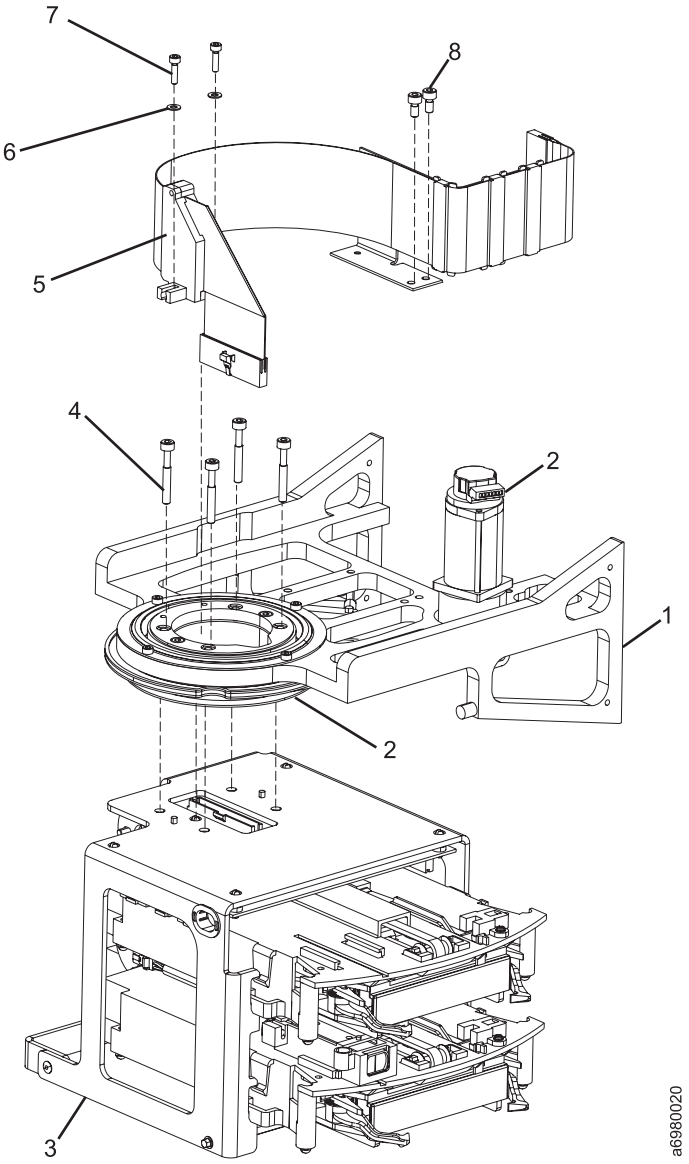
Asm–Index	Part Number	Units	Description
9–		NP	Gripper and Pivot Assembly For next higher assembly, see 1–30 on page 1113
–1	24R1019	1	• Pivot Assembly (L32, L22, L52)
–1	23R3547	1	• Pivot Assembly (L23, L53 Only)
–1A	34G9360	1	• • Detent Arm Assembly
–1B	34G9363	1	• • Spring, Detent Arm
–1C	19P0953	NP	• • Pivot Motor (order Pivot Motor and Belt Assembly)
–1D	34G9352	2	• • Bumper, Pivot
–1E	35L0277	NP	• • Belt, Pivot (order Pivot Motor and Belt Assembly)
–1E	19P0745	1	• • Pivot Motor and Belt Assembly (with captive pivot belt) (L32, L22, L52)
–1E	23R3546	1	• • Pivot Motor and Belt Assembly (with captive pivot belt) (L23, L53 Only)
–1F	34G9363	1	• • Spring, Belt Tensioning
–2		NP	• Screw, Soc Hd Cap, M4 X 30 mm
–3	23R2700	1	• Cable, Pivot Flex
–4		NP	• Screw, Soc Hd Cap, M3 X 12 mm
–5		NP	• Washer, Flat, M3
–6		NP	• Screw, Soc Hd Cap, M4 X 8 mm
–7		NP	• Dual Gripper Assembly (LTO/LTO) For detail breakdown, see “Assembly 12: Dual Gripper Assembly (LTO/LTO)” on page 1138
–7		NP	• Dual Gripper Assembly (LTO/3592) For detail breakdown, see “Assembly 10: Gripper and Pivot Assembly (L22/L52/L23/L53 Only)” on page 1134

Assembly 10: Gripper and Pivot Assembly (L22/L52/L23/L53 Only)



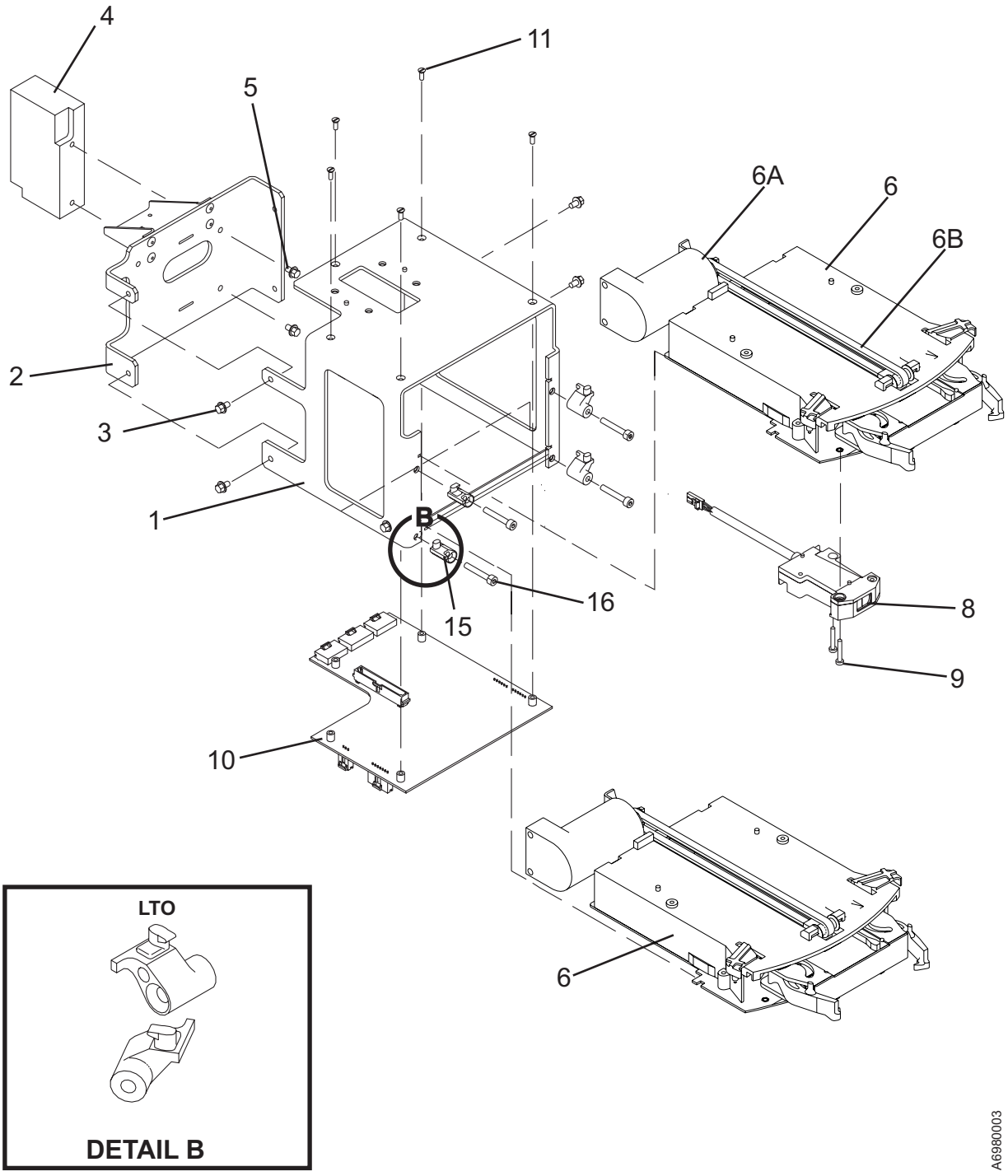
Asm–Index	Part Number	Units	Description
10–		NP	Gripper and Pivot Assembly (L22/L52/L23/L53 Only) For next higher assembly, see 1–30 on page 1113
–1	24R1019	1	• Pivot Assembly (L32, L22, L52)
–1	23R3547	1	• Pivot Assembly (L23, L53 Only)
–1A	34G9360	1	• • Detent Arm Assembly
–1B	34G9363	1	• • Spring, Detent Arm
–1C	18P9243	NP	• • Pivot Motor, Universal Gripper Asm Only (Order "Pivot Motor and Belt Assembly" listed below)
–1D	34G9352	2	• • Bumper, Pivot
–1E	35L0277	1	• • Belt, Pivot
–1E	19P0745	1	• • Pivot Motor and Belt Assembly (with captive pivot belt) (L32, L22, L52)
–1E	23R3546	1	• • Pivot Motor and Belt Assembly (with captive pivot belt) (L23, L53 Only)
–1F	34G9363	1	• • Spring, Belt Tensioning
–2	1621515	NP	• Screw, Soc Hd Cap, M4 X 30 mm
–3	23R2700	1	• Cable, Pivot Flex
–4	50G0107	NP	• Screw, Soc Hd Cap, M3 X 12 mm
–5	1622302	NP	• Washer, Flat, M3
–6	1621509	NP	• Screw, Soc Hd Cap, M4 X 8 mm
–7	45E0950	1	• Dual Universal Gripper (LTO/3592) Assembly (Lxx) For detail breakdown, see “Assembly 13: Dual Gripper Assembly (Universal LTO/3592)” on page 1140

Assembly 11: Gripper and Pivot Assembly (HD)



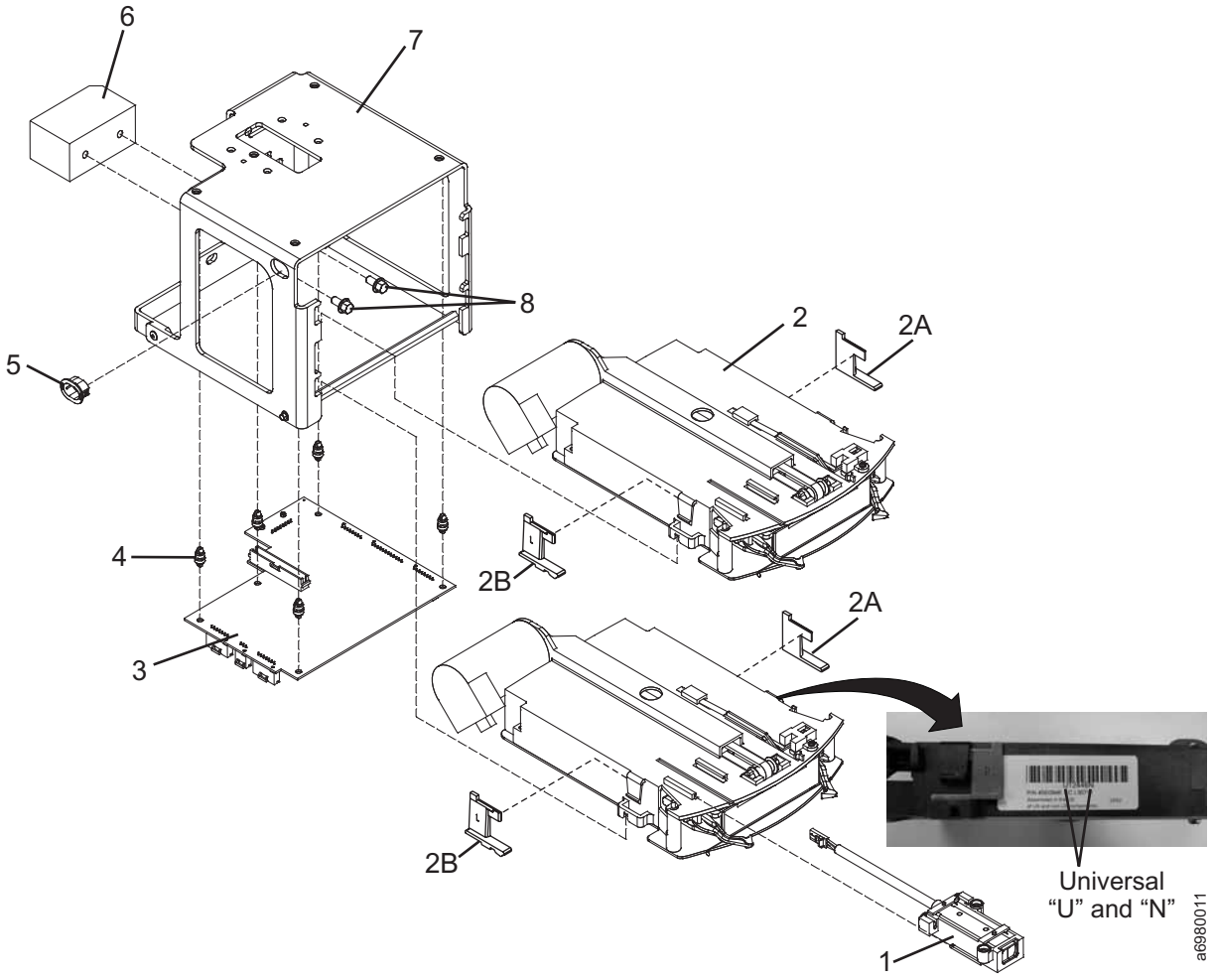
Asm–Index	Part Number	Units	Description
11–		NP	Gripper and Pivot Assembly (HD) For next higher assembly, see 1–30 on page 1113
–1	46Y0061	1	• Pivot Assembly (HD Grippers)
–2	23R3546	1	• Pivot Motor and Belt Assembly (with captive pivot belt)
–3	45E4722	1	• Dual HD Gripper Assembly When Field Stock is depleted, order component parts. See “Assembly 14: Dual Gripper Assembly (HD) Required if Sx4 HD frames are installed” on page 1142
–4	1621515	NP	• Screw, Soc Hd Cap, M4 X 30 mm
–5	23R2700	1	• Cable, Pivot Flex
–6	1622302	NP	• Washer, Flat, M3
–7	50G0107	NP	• Screw, Soc Hd Cap, M3 X 12 mm
–8	1621509	NP	• Screw, Soc Hd Cap, M4 X 8 mm

Assembly 12: Dual Gripper Assembly (LTO/LTO)



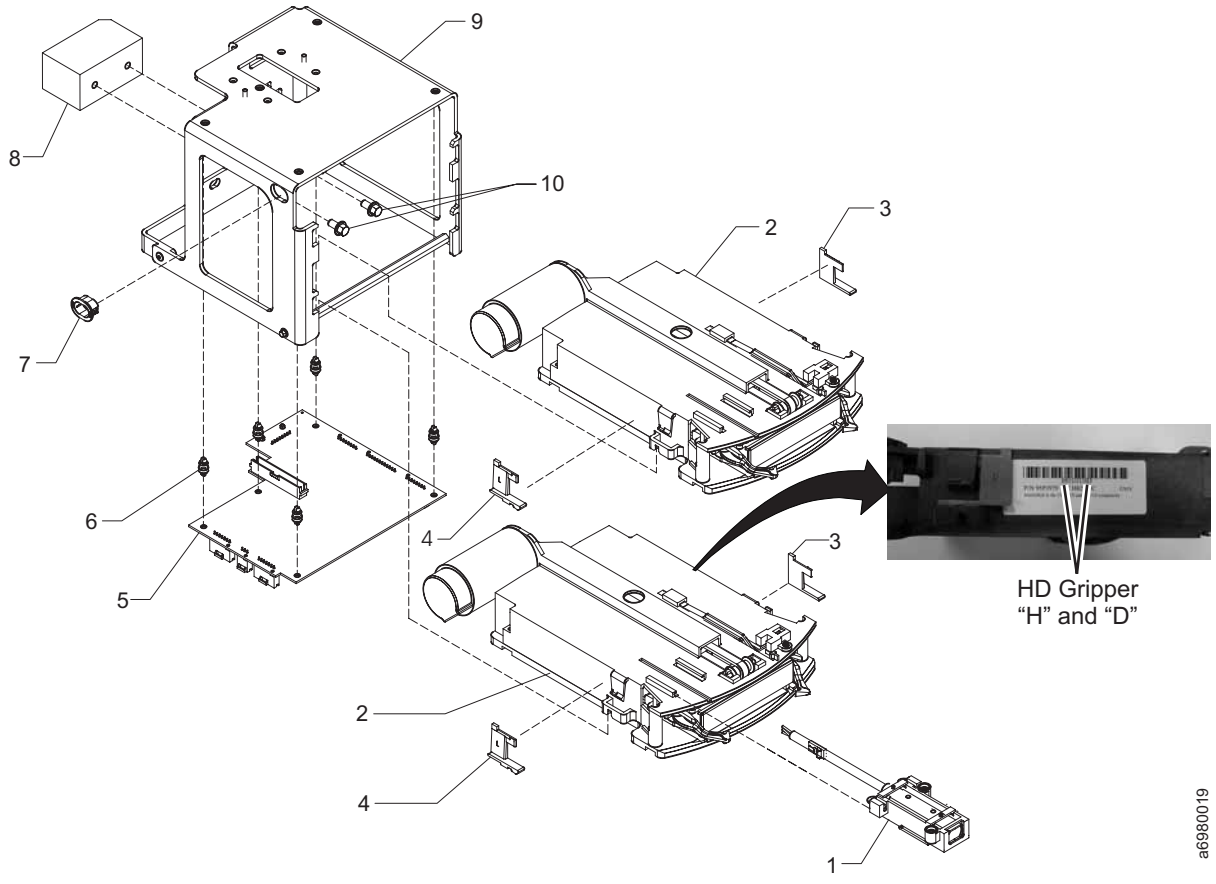
Asm–Index	Part Number	Units	Description
12–		NP	Dual Gripper Assembly For next higher assembly, see 9–7 on page 1133
–1		NP	• Bracket, Gripper Pivot Mount
–2		NP	• Bracket, Bar Code Scanner Support
–3		NP	• Screw, Flng Hd Hex, M4 X 6 mm
–4		NP	• Block, Counterbalance
–5		NP	• Screw, Flng Hd Hex, M4 X 6 mm
–6	24R0385	AR	• Gripper Assembly FRU Kit, (LTO/LTO Only) Not used in dual-accessor libraries. **Note:** When stock is depleted on this PN, it will automatically sub up to PN 45E0951 (listed below).
–6	45E0951	AR	• Gripper Assembly FRU Kit, Dual Universal (LTO/3592), replacement for LTO/LTO single gripper (L32 only).
–			• • Dual Universal (LTO/3592) Gripper Assembly
–			• • Bracket, Barcode Scanner Mount (Old Style)
–			• • Bracket, Barcode Scanner Mount (New Style)
–6A	35L0287	NP	• Motor-Tach Assembly, Gripper
–6B	35L0283	NP	• Belt, Gripper
–6C		NP	• Sensor, RCP3 Cartridge Present
–6D		NP	• Screw, Self Tapping Pan Hd, M3.5
–6E		NP	• Sensor, TCP3 Cartridge Present
–6F		NP	• Screw, Cheese Hd, M3 X 4 mm
–8	95P5145	1	• Sensor, Calibration Sensor and Bracket
–9		NP	• Screw, Pan Hd, M3 X 8 mm
–10	35L0822	1	• Card, PDC (L32) – Without Universal Grippers (LTO/3592) If you order a replacement PDC card for the original LTO dual gripper assembly, and this PN is no longer in stock, you will receive a **Dual Universal Gripper FRU Kit** PN 45E0951 which will replace your current LTO/LTO grippers and PDC with new LTO/3592 universal grippers and PDC.
–10	23R3551	1	• Card, PDC with standoffs (L23/L53, L32/L22/L52, with Universal Grippers, and with HD Grippers)
–	18P9180	1	• Cable, Cartridge Present Sensors to PDC, L22 / L52 / Lx3 / Sx4 Only (not shown)
–	35L1350	1	• Cable, Cartridge Present Sensors to PDC, L32 Only (not shown)
–11		NP	• Screw, Slotted, M3 X 8 mm
–15	19P4454	4	• Blocks, LTO Gripper Mounting (with support pad)
–16	1621490	4	• Screw, Soc Hd Cap, M4 X 25 mm Long

Assembly 13: Dual Gripper Assembly (Universal LTO/3592)



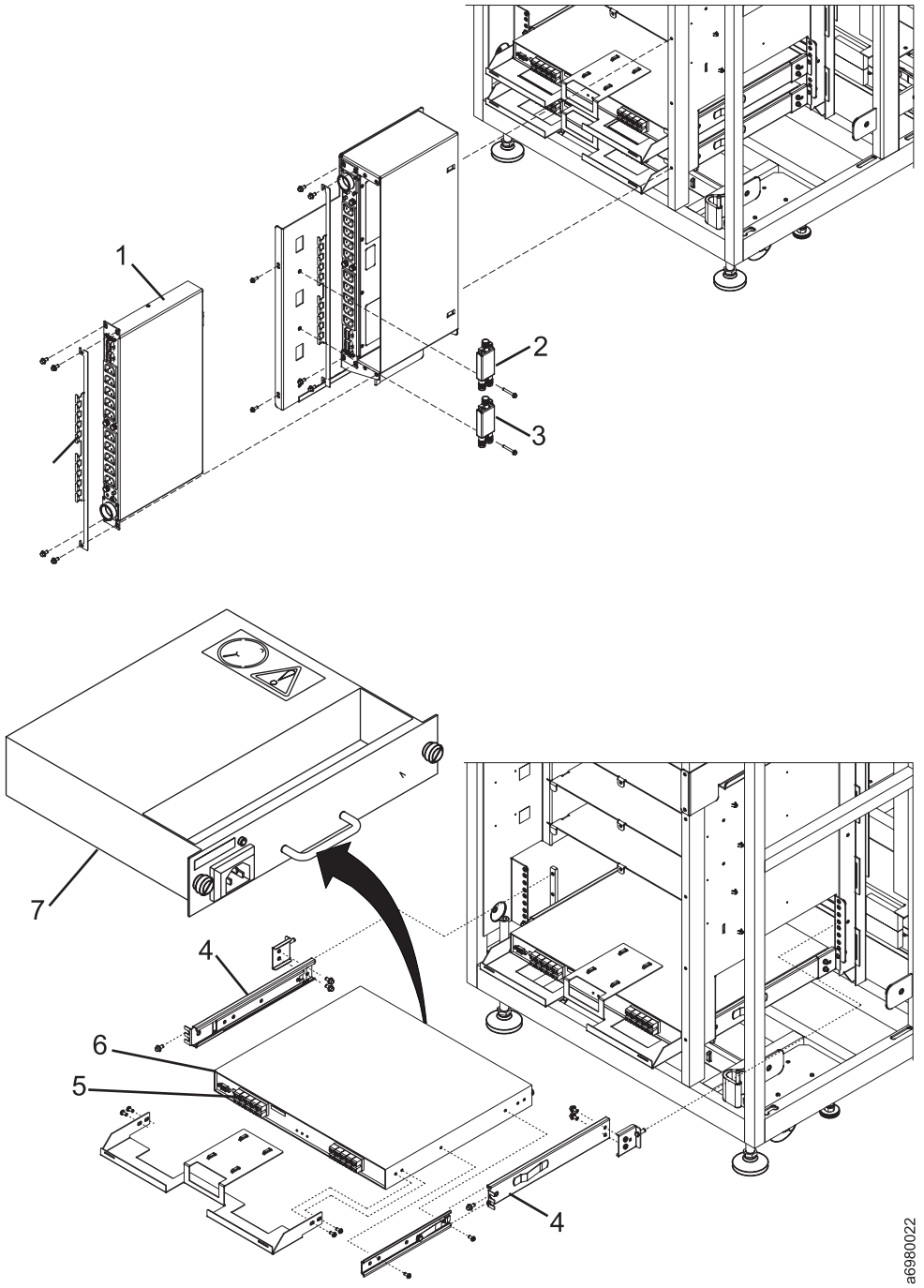
Asm–Index	Part Number	Units	Description
13–	45E0950	1	Dual Universal Gripper (LTO/3592) Assembly (Lxx) This FRU will be removed in the future. Order component parts as required. See Barcode Label (U & N) to Identify Universal vs HD (HD only used with Sx4 frames).
–	24R0385	AR	Gripper Assembly FRU Kit, (LTO/LTO Only) Not used in dual-accessor libraries. **Note:** When stock is depleted on this PN, it will automatically sub up to PN 45E0951 (listed below).
–	45E0951	AR	Gripper Assembly FRU Kit, Dual Universal (LTO/3592), replacement for LTO/LTO single gripper (L32 only) For next higher assembly, see 9–7 on page 1133
–1	95P5145	1	Sensor, Calibration Sensor and Bracket
–2	45E0947	AR	Gripper Assembly, Universal (L32, L22, L52, L23, L53 Only) Library FW 7363 fixes Universal Gripper problems. This level should be installed and tested before replacing the Universal Gripper (unless it is physically broken).
–2A	95P4351	2	Clip, Gripper, Right
–2B	95P4350	2	Clip, Gripper, Left
–	95P5109	AR	Kit, Gripper Clips FRU Kit includes two right and two left gripper clips with instruction sheet
–3	35L0822	1	• Card, (L32) – Without Universal Grippers (LTO/3592) If you order a replacement card for the original LTO dual gripper assembly, and this PN is no longer in stock, you will receive a **Dual Universal Gripper FRU Kit** PN 45E0951 which will replace your current LTO/LTO grippers and with new LTO/3592 universal grippers and PDC.
–3	23R3551	5	• Card, PDC with standoffs (L23/L53, L32/L22/L52, with Universal Grippers, and with HD Grippers)
–4	NP	5	• Standoffs, PDC Card (only available by ordering PDC card PN 35L0822 or 23R3551)
–	18P9180	1	• Cable, Cartridge Present Sensors to PDC, L22 / L52 / Lx3 / Sx4 Only (not shown)
–	35L1350	1	• Cable, Cartridge Present Sensors to PDC, L32 Only (not shown)
–5		NP	• Cage Plug
–6		NP	• Block, Counterbalance
–7	46X0356	1	• Cage, Universal Gripper (FRU Kit) This FRU kit includes the following items: ► Qty 1 - Black-colored gripper cage ► Qty 1 - Cage plug ► Qty 5 - PDC card mounting standoffs ► Instruction sheet
–8		NP	• Screw, M5 X 10mm

Assembly 14: Dual Gripper Assembly (HD) Required if Sx4 HD frames are installed



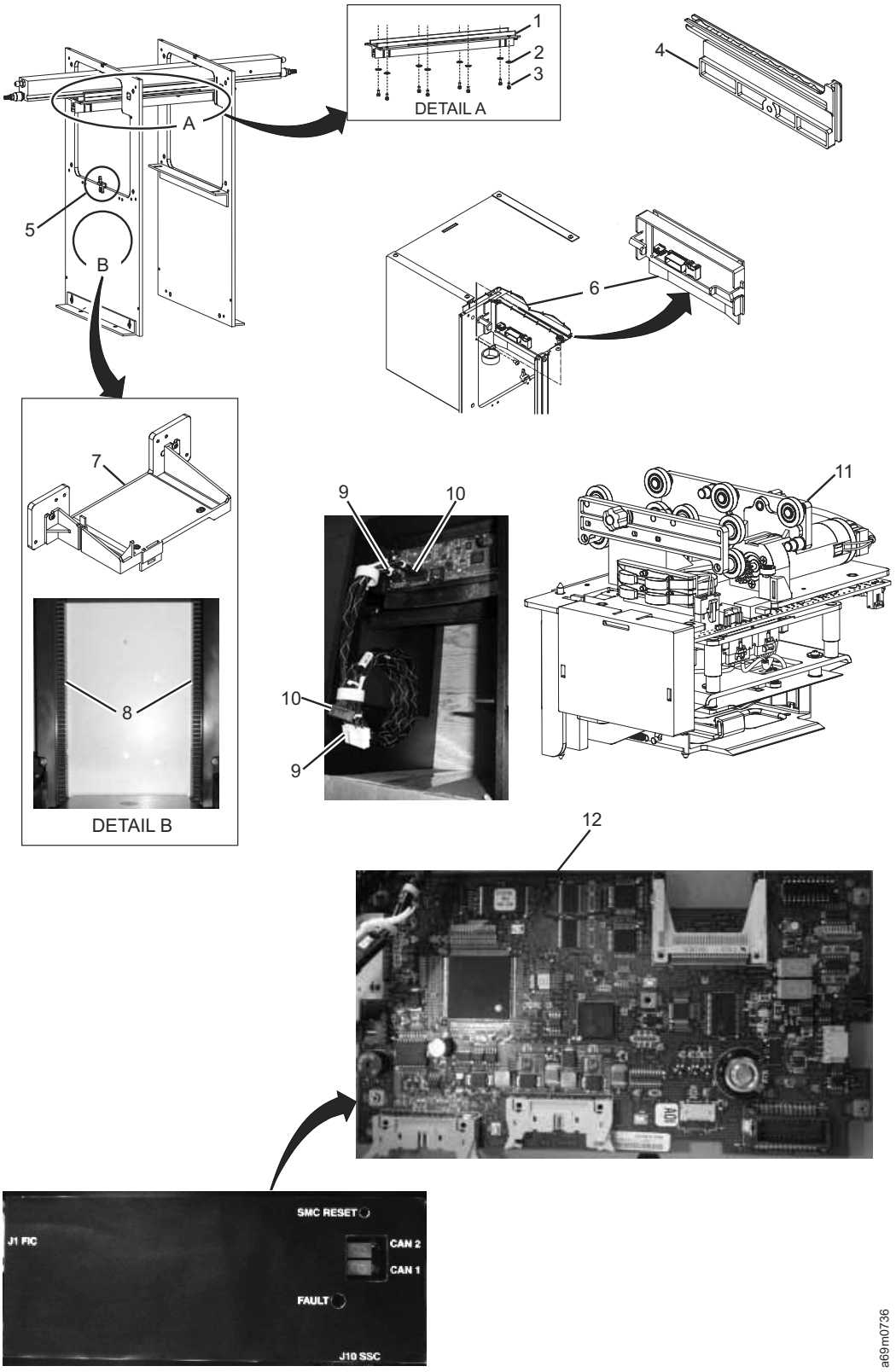
Asm–Index	Part Number	Units	Description
14–		NP	Dual Gripper Assembly (HD). See Barcode Label (H & D) to Identify HD vs Universal. Order component parts as required. For next higher assembly, see “Assembly 11: Gripper and Pivot Assembly (HD)” on page 1136.
–1	95P5145	1	Sensor, Calibration Sensor and Bracket
–2	45E4721	AR	Gripper Assembly, Single, HD
–3	95P4351	2	Clip, Gripper, Right
–4	95P4350	2	Clip, Gripper, Left
–5	23R3551	5	Card, PDC with standoffs (L23/L53, L32/L22/L52, with Universal Grippers, and with HD Grippers)
–6	NP	5	Standoffs, PDC Card (only available by ordering PDC card PN 23R3551)
–7		NP	Cage Plug
–8		NP	Block, Counterbalance
–9	46X0356	1	Cage, HD & Universal Gripper (FRU Kit) This FRU kit includes the following items: ► Qty 1 - Black-colored gripper cage ► Qty 1 - Cage plug ► Qty 5 - PDC card mounting standoffs ► Instruction sheet
–10	1624777	2	Screw, M5 X 10mm
–	18P9180	1	Cable, Cartridge Present Sensors to PDC, L22 / L52 / Lx3 / Sx4 Only (not shown)
–	35L1350	1	Cable, Cartridge Present Sensors to PDC, L32 Only (not shown)

Assembly 15: 4Gb/8Gb Fibre Switches and PDU Assemblies



Asm–Index	Part Number	Units	Description
15–1	24R1840	1	Power Supply, PDU
–2	45E2774	1	Bifurcated Cable, PDU-2 (right)
–3	45E2812	1	Bifurcated Cable, PDU-1 (left)
–4	45E2299	2	Slide, 4Gb switch mounting
–5	23R2770	20	4Gb SFP, optical transceiver
–6	23R2550	2	Switch, 4Gb Fibre Optic
–6	46X4134	2	Switch, 8Gb Fibre Optic
–7	95P2824	2	Power Supply, 4Gb Switch
–	45E2775	2	Cable, PDU to BPC (not shown)
–	45E4492	AR	Cable, LC-LC Fibre Drive-to-4Gb FC Switch 2.2m (7.2 ft) Used as single FRU replacement in fibre cable bundle (drives to switch)
–	45E3638	AR	Cable, LC-LC 5.0m (16.4 ft) Used as single FRU replacement in adjacent frame support (FC 4874)
–	39M5416	2	Cord, Line, 4.3m, Nema L6-30 Power Cord - non watertight
–	39M5418	2	Cord, Line, 4.3m, RS 3750DP Power Cord - watertight
–	39M5414	2	Cord, Line, 4.3m, IEC 309 Power Cord - EMEA
–	39M5419	2	Cord, Line, 4.3m, Australia/NZ - Australia, new Zealand
–	39M5420	2	Cord, Line, 4.3m, Korean Power Cord - North and South Korea
–	23R7324	2	Cord, Line, 4.3m, Unterminated Power Cord - Argentina and Taiwan
–	23R9543	2	Cord, Line, 4.3m, Unterminated Power Cord (China CCC Cert) - China

Assembly 16: Shuttle Complex Model SC1 FRUs



Asm–Index	Part Number	Units	Description
16–	46X7127	1	• Station Track Kit. Includes:
–1		1	• • Plastic station track
–2		8	• • Washers
–3		8	• • Screws
–4	46X1416	AR	• Shuttle End Stop
–5	46X1374	1	• Station Home Flag
–6	46X1414	1	• Station Card
–7	46X2578	1	• Station Base Tray Asm with Fiducial
–8	46X7124	1	• Station Y-Rack Kit. Includes both Left & Right Station Y-Racks
–	46X7123	1	• Station Cables Kit. Includes:
–9		1	• • FIC to SSC (Shuttle Station Card)
–		1	• • FIC to SMC (Shuttle Management Card) (Not Shown)
–10		1	• • SMC to SSC (Shuttle Station Card)
–11	46X5579	1	• Shuttle Car Assembly
–12	46X9668	1	• Shuttle Management Card (SMC)
–	46X7125	1	• Short Track and Hangers FRU Kit. (Not Shown) Includes:
–			• • Six round hangers
–			• • Six square hangers
–			• • Three track segments
–	46X7126	AR	• Screws, Shuttle Station, M4 x 8 Black Button Head Kit (Qty 10). (Not Shown)
–	46X2657	AR	• Cover, End Panel (Not Shown)
–	46X4565	AR	• Cover, Station Side Asm (Not Shown)
–	46G5947	1	• Ladder (Not Shown)
–	46X7128	1	• Shuttle Tool Kit. (Not Shown) Includes:
–		1	• • Thin wrench (to connect spans to shuttle stations)
–		1	• • Track removal tool (to disconnect span segments)

Assembly 17: Miscellaneous Cables and Tools

Asm–Index	Part Number	Units	Description
17–		NP	Miscellaneous Cables and Tools
–		AR	• Relocation Kit
–	7334847	1	• • Main Component (includes corner beads, sealing kit, stretch wrap, tape)
–	05H1869	1	• • X-Y Picker Anchor (use this to secure X-Y Picker)
–	7354441	AR	• • LTO Packing Kit (1 per drive in each logical library)
–	7354056	AR	• • D22, D32, D52 Only - Foam Bumpers and Cable Ties (to fasten to the locating pins)
–	19P0913	AR	• Adapter, Fibre Bulkhead (SC-SC)
–	95P2794	AR	• Adapter, Fibre Bulkhead (LC-LC)
–	95P3005	AR	• Adapter, Fibre Bulkhead Spacer (rubber) (LC-LC)
–	11P1373	AR	• Adapter (Interposer), Fibre (SC-LC) x32, x22, x52
–	12R9321	AR	• Adapter (Interposer), Fibre (SC-LC) x23, x53 only
–	39X8939	AR	• Adapter, PCMCIA Serial Port Adapter Card (for use with CETool program)
–	34L3629	AR	• Cable, AXY-to-MDA
–	35L1209	AR	• Cable, EPO
–	12R9628	AR	• Cable, SC-SC Fibre Drive-to-Bulkhead [(2m) (6.6 ft)] 62.5 micron
–	12R9557	AR	• Cable, LC-LC Fibre Drive-to-Bulkhead [(2m) (6.6 ft] 50 micron
–	45E4492	AR	• Cable, LC-LC Fibre Drive-to-4Gb FC Switch [(2.2m) (7.2 ft] 50 micron
–	03K9202	AR	• Cable, SC-SC Fibre Channel [5 m (16.4 ft)]
–	54G3386	AR	• Cable, SC-SC Fibre Channel [13 m (43 ft)]
–	03K9204	AR	• Cable, SC-SC Fibre Channel [25 m (81 ft)]
–	54G3390	AR	• Cable, SC-SC Fibre Channel [61 m (200 ft)] (for use in non-European Union countries)
–	12R9634	AR	• Cable, SC-SC Fibre Channel [61 m (200 ft)] (must be used in European Union countries)
–	12R9593	AR	• Cable, LC-SC Fibre Channel 7 m (23 ft)
–	12R9594	AR	• Cable, LC-SC Fibre Channel 13 m (43 ft)
–	12R9595	AR	• Cable, LC-SC Fibre Channel 22 m (72 ft)
–	12R9598	AR	• Cable, LC-SC Fibre Channel 61 m (200 ft)
–	12R9914	AR	• Cable, LC-LC Fibre Channel 5 m (16.4 ft)
–	12R9559	AR	• Cable, LC-LC Fibre Channel 13 m (43 ft)
–	12R9915	AR	• Cable, LC-LC Fibre Channel 25 m (81 ft)
–	12R9563	AR	• Cable, LC-LC Fibre Channel 61 m (200 ft)
–	95P3183	AR	• Cable, FIC J1-to-XPC
–	08L9698	AR	• Cable, FIC-to-FIC Power (x32, x22, x52)
–	95P3181	AR	• Cable, FIC-to-FIC Power (x23, x53 Only)
–	08L9699	AR	• Cable, FIC-to-FIC Signal
–	95P3258	AR	• Cable, FIC to Service Barrier and Door Interlock (used in HA Service Bay Frames Only)
–	08L9697	AR	• Cable, FIC-to-OPC Card (L32 Only)
–	95P4382	AR	• Cable, FIC-to-OPC Card (L22/L52 & L23/L53 Only)
–	18P9180	1	• Cable, Cartridge Present Sensors to PDC, L22 / L52 / Lx3 / Sx4 Only (not shown)
–	35L1350	1	• Cable, Cartridge Present Sensors to PDC, L32 Only (not shown)
–	23R3595	AR	• Cable, HD68-to-HD68 0.5 m (2 ft) SCSI
–	23R3596	AR	• Cable, HD68-to-HD68 5 m (16.5 ft) SCSI
–	23R3597	AR	• Cable, HD68-to-HD68 10 m (32.8 ft) SCSI
–	19P0097	AR	• Cable, HD68-to-HD68 18 m (59 ft) SCSI
–	19P0054	AR	• Cable, HD68-to-HD68 25 m (82 ft) SCSI
–	35L1006	AR	• Cable, I/O Station-to-OPC Card J7 (only for machines **without** two I/O stations)

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–	19P1762	AR	• Cable, I/O Upper Station to XIO Card, L32, L22, L52 (for machines **with** two I/O stations)
–	19P1763	AR	• Cable, I/O Lower Station to XIO Card, L32, L22, L52 (for machines **with** two I/O stations)
–	95P3224	AR	• Cable, I/O Upper Station to XIO Card, L23, L53 (for machines **with** two I/O stations)
–	95P5059	AR	• Cable, I/O Upper Station to XIO Card, D23, D53 (for machines **only with 4-I/O door**
–	95P3225	AR	• Cable, I/O Lower Station to XIO Card, L23, L53 (for machines **with** two I/O stations) Can also be used on (L52/L22/L32)
–	95P5060	AR	• Cable, I/O Lower Station to XIO Card, D23, D53 (for machines **only with 4-I/O door**
–	95P2843	AR	• Cable, XIO Card to MCA, D23, D53 (for machines **only with 4-I/O door**
–	24R0120	AR	• Cable, Upper XIO card Interposer (L32,L22,L52)
–	95P3248	AR	• Cable, Upper XIO card Interposer (L23/L53, L22/L23)
–	24R0121	AR	• Cable, Lower XIO card Interposer (L32, L22,L52)
–	95P3249	AR	• Cable, Lower XIO card Interposer (L52/L53, L22/L23)
–	95P3217	AR	• Cable, EPO Jumper, (Lxx frame only)
–	35L1006	AR	• Cable, OPC J7-to-I/O Station (for single station I/O)
–	95P4380	AR	• Cable, Operator Panel to XIO Card (L32 / D22 / D23)
–	95P4381	AR	• Cable, Operator Panel to XIO Card (L22 / L52 / L23 / L53)
–	23R2700	AR	• Cable, Pivot Flex
–	35L1209	AR	• Cable, Redundant EPO
–	95P2141	AR	• Cable, Redundant Power (N+1) x32 Only
–	18P9176	AR	• Cable, Redundant Power (N+1) x22/x52 Only
–	19P4692	AR	• Cable, 15.2 m (50 ft), RS-232 —Library or Switch to Modem (DB9F-to-DB25M) (x32, x22, x52)
–	23R4630	AR	• Cable, 15.2 m (50 ft), RS-232 —Library or Switch to Modem (DB9F-to-DB25M) (x23, x53)
–	19P4693	AR	• Cable, 15.2 m (50 ft), RS-232 Null Modem — Library to Switch (DB9F-to-DB9F) (x32, x22, x52)
–	23R4631	AR	• Cable, 15.2 m (50 ft), RS-232 Null Modem — Library to Switch (DB9F-to-DB9F) (x23, x53)
–	19P1061	AR	• Cable, RS-232 Serial 9-Pin to 9-Pin (male-to-female) (CE tool) (x32, x22, x52)
–	23R4629	AR	• Cable, RS-232 Serial 9-Pin to 9-Pin (male-to-female) (CE tool) (x23, x53 Only)
–	19P0055	AR	• Cable, RS-422 Interface, MCP-to-Drives (L32, D32)
–	23R2975	AR	• Cable, RS-422 Interface, MCP-to-Drives (L22, D22 / L52, D52 / L23, L53)
–	95P2422	AR	• Cable, RS-422 Interface, MCA-to-Drives (L23, D23 / L53, D53 Only)
–	19P3332	AR	• Cable, SCSI (VHDCI-to-VHDCI, daisy chain, or drive-to-drive) 0.3 m (1 ft)
–	19P2499	AR	• Cable, SCSI Host Interface (VHDCI to VHDCI) 4.5 m (14.8 ft)
–	09L0881	AR	• Cable, SCSI Host Interface (VHDCI to VHDCI) 10 m (32.8 ft)
–	19P1904	AR	• Cable, SCSI Host Interface (VHDCI to VHDCI) 20 m (66 ft)
–	19P2500	AR	• Cable, SCSI Host Interface (VHDCI to VHDCI) 25 m (82 ft)
–	19P1001	AR	• Cable, Serial 9-Pin to 9-Pin for Remote Switch (female-to-female)
–	19P0482	AR	• Cable, VHDCI-to-HD68 0.3 m (1 ft) SCSI Cable/Interposer
–	23R3594	AR	• Cable, VHDCI-to-HD68 4.5 m (14.8 ft) SCSI
–	23R3593	AR	• Cable, VHDCI-to-HD68 10 m (32.8 ft) SCSI
–	19P0049	AR	• Cable, VHDCI-to-HD68 20 m (65.6 ft) SCSI
–	35L1977	AR	• Cable, VHDCI-to-HD68 25 m (82 ft) SCSI
–	61G9685	AR	• Cable, Y-Axis Flex (L32, L22, L52)
–	23R2664	AR	• Cable, Y-Axis Flex (L23, L53 Only)
–	34L3625	AR	• Cable, XYC-to-Home Sensor

Assembly 17: (continued)

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–	19P0405	AR	• Cartridge, CE Diagnostic, LTO (for use on L1 & L2)
–	96P1236	AR	• Cartridge, CE Diagnostic, LTO (for use on L2 & L3)
–	95P4657	AR	• Cartridge, CE Diagnostic, LTO (for use on L3 & L4)
–	46X2031	AR	• Cartridge, CE Diagnostic, LTO (for use on L4 & L5)
–	24R1060	AR	• Cartridge, CE Diagnostic, 3592
–	09L5361	AR	• Cord, Bifurcated FCA-to-Drive Power (x32 Only)
–	18P9715	AR	• Cord, Bifurcated FCA-to-Drive Power (x22, x52 Only)
–	41V2003	AR	• Cord, Line, 4.3 m (14 ft) U.S.A. and World Trade (250 V ac, 30A, twistlock)
–	23R3231	AR	• Cord, Line, 4.3 m (14 ft) U.S.A. and World Trade (250 V ac, water tight)
–	23R3230	AR	• Cord, Line, 1.8 m (6 ft) Chicago (250 V ac, water tight)
–	19P5904	AR	• Cord, Line, 1.8 m (6 ft) Chicago (110 V ac non-water tight)
–	19P5903	AR	• Cord, Line, 4.3 m (14 ft) U.S.A. and Canada Only (non-water tight) 110 V ac
–	46F6063	AR	• Cord, Line, World Trade (hardwired)
–	86F2646	AR	• Cord, Line, 4.3M (14 ft) 220V Watertight Connector (with FC 1901)
–	14F1550	AR	• Cord, Line, 4.3M (14 ft) 220V NON-Watertight Connector (with FC 1901)
–	12J5117	AR	• Cord, Line, 4.3M (14 ft) 110V Line Cord (with FC 1901)
–	86F2645	AR	• Cord, Line, 1.8M (6 ft) 220V Watertight Connector (Chicago) (with FC 1901)
–	12J5115	AR	• Cord, Line, 1.8M (6 ft) 110V Non-Watertight Connector (Chicago) (with FC 1901)
–	36L8823	AR	• Cord, Line, 4.3M (14 ft) 220V NON-Connector with (FC 1901)
–	45E1225	AR	• Cord, Power, PDU-to-FCA (with FC 1901)
–	95P4473	AR	• Cord, Bifurcated Power, Enhanced FCA only (with FC 1909)
–	24R0183	AR	• E-Shaped frame alignment tool (used to align storage frames)
–	73G5518	AR	• ESD Kit
–	35L1514	AR	• Level, Frame
–		AR	• Modem (FC 2710)The FRU PN is located on the label on the modem.
–	18P9496	AR	• Rail Tool (to assist reinstalling accessor on lower rail)
–	18P7835	AR	• Spring Clip Kit, L1, LTO
–	45E6227	AR	• Safety Glasses Used when removing or replacing the gate/spring assembly in HD frames
–	45E2050	AR	• Spring Hook Tool, HD Frames This is part is included with the HD Slot tool PN 45E6139
–	45E6139	AR	• HD Slot tool This part includes the HD Spring Hook Tool PN 45E2050
–		NP	• Terminator, FIC (Order FIC card)
–	19P0378	AR	• Terminator, Inline SCSI
–	61G8324	AR	• Terminator, HD68 HVD SCSI
–	34L3926	AR	• Terminator, VHDCI (LVD)
–	09L5067	AR	• Terminator, HD68 LVD/SE SCSI
–	09L0877	AR	• Terminator, VHDCI (HVD)
–	1159519	AR	• Tie, Cable
–	24R0982	AR	• Toroid, Power Cable top frame access
–	19P1213	AR	• Wrap Plug, HVD SCSI
–	19P0481	AR	• Wrap Plug, LVD SCSI
–	19P0519	AR	• Wrap Plug, RS-422
–	19P5020	AR	• Wrap Tool, Smart SCSI
–	08L9459	AR	• Wrap Plug, Fibre (SC)
–	12R9314	AR	• Wrap Plug, Fibre (LC)

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Tel: 919-499-1900

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Taiwan Class A Electronic Emission Statement

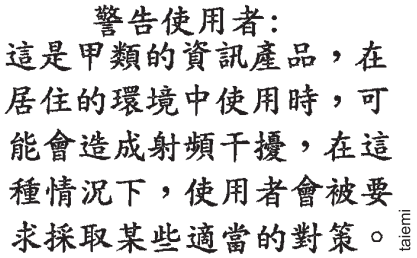


Figure 439. Taiwan EMI statement

Taiwan Contact Information

IBM Taiwan Product Service Contact Info:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd., Taipei Taiwan
Tel: 0800-016-888

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台灣國際商業機器股份有限公司
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State of New Jersey

For information about recycling covered electronic devices in the State of New Jersey, go to the New Jersey Department of Environmental Protection web site at:

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Electromagnetic Interference—Japan VCCI

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Taiwanese Communications Statement

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Regulatory Approvals

The library systems are designed to meet the following:

Safety

- UL1950
- CUL950
- EN60950

Emissions

- FCC Class A
- CISPR 22 Class A

Immunity

- EN50082-1

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Tivoli
UNIX
Veritas
Windows
Windows NT
Windows 95
Windows 98
Windows 2000
WTI
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Glossary

Definitions of Terms and Acronyms

Some cross-references are used in this glossary.

Contrast with
This refers to a term that has an opposed or substantively different meaning.

Synonym for
This indicates that the term has the same meaning as a preferred term, which is defined elsewhere in the glossary.

Synonymous with
This highlights that you are using the preferred term, and points backward to a less-desirable term that is used elsewhere in this glossary.

This glossary defines the special terms, abbreviations, and acronyms used in this publication and other related publications. If you do not find the term you are looking for, see the *IBM Glossary of Computing Terms*, located at the following Web site: **www.ibm.com/ibm/terminology**

A

AAP. Authorized Assembler Program. This program is available to selected IBM Business partners that go through training and are able to purchase incomplete machines and parts, and have the knowledge to then assemble them together into a final configured product for sale to end user customers.

ACC. Accessor control card

Active frames. Defined as the Lxx and all Dxx frames in the library, excluding the two service bays on either end.

AIX. Advanced Interactive Executive. IBM's implementation of the UNIX operating system. The RS/6000 system, among others, runs the AIX operating system.

ALMS. Advance Library Management System (ALMS). An extension of IBM s patented MultiPath Architecture. ALMS enables logical libraries to consist of unique drives and ranges of VOLSERs, instead of fixed locations. It offers the ability to assign tape drives to any logical library by using the UltraScalable Tape Library Specialist web interface. Logical libraries can also be added, deleted, or easily changed without disruption. ALMS is optional and requires a license key.

ANSI. American National Standards Institute

ASC. Additional sense code

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

ASCQ. Additional sense code qualifier

asynchronous. Pertains to two or more processes that do not depend upon the occurrence of specific events such as common timing signals

attention notice. A notice in a publication that informs you of a risk to a program, device, system, or data. Contrast with *caution notice* and *danger notice*.

AXY. Accessor XY axis card. This card controls accessor X-Y movements.

B

backhitch. Magnetic tape that makes a slight backward motion just prior to moving forward

base frame. The first frame in a multiple string of frames, or the one and only frame in a one-frame library. The base frame contains the accessor, frame control assembly, storage cells, tape drives, I/O station, and operator panel. The 3584 Model Lxx is a base frame.

beginning of tape (BOT). The location on a magnetic tape that indicates the start of the permissible recording area

BHC. Block hardware code

bit. (1) Either of the digits 0 or 1 when used in the binary numeration system. (2) **B**inary digi**t**

BMA. Brushless motor amp; there is one each for the X and Y axis. These are located on the MDA.

BOM. Beginning of media block hardware code

BOT. *Beginning of tape*

BPC. Bulk Power Card assembly. This is the power supply structure for x23 and x53 frames with Enhanced FCA. There are two BPCs per x23 and x53 frame.

BPS. Bulk Power Supply. This is the 12v power supply housed within a BPC for x23 and x53 frames with Enhanced FCA. There is one BPS per BPC for x23 and x53 frames.

BPV. Bit pointer valid

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byte. Eight adjacent binary bits

C

Call Home. Communication with a data processing facility through a data link. Synonymous with *remote access*.

CAN. Controller area network

CARR. Abbreviation of (acronym for) the Checks, Adjustments, Removal, and Replacement chapter of this *MI*

caution notice. A notice in a publication that informs you of a personal risk. Contrast with *attention notice* and *danger notice*

CB. Circuit breaker

CDB. Command descriptor block

CDPOP. Card populated

CE. *Customer engineer*

CIO. Cartridge input/output

control path. Logical path into the library through which a server sends standard SCSI Media Changer commands to control the logical library

CP. Circuit protector

customer engineer (CE). IBM person who services your IBM equipment. Synonymous with *service representative*

cycle power. To power off, then immediately power on a device such as a tape drive or a library. Occasionally this method is used as a way to reset some function or to reset the microcode.

D

daisy chaining. The practice of directly connecting a device to a similar device, thus bypassing a connection to a switch, host, or another dissimilar device. This is not allowed with a fibre channel connection.

danger notice. A notice in a publication that directs you to the possibility of a potentially lethal condition. Contrast with *attention notice* and *caution notice*.

DBC. Dynamic brake card, located on the MDA

DCC. Drive control card, which is contained in the drive canister

DEB. Destination Element Bitmap

diagnostic cartridge. This is a normal scratch tape cartridge except that the bar code label identifies it as the diagnostic cartridge

direct access storage device (DASD). A storage device in which the access time is independent of the location of the data

DRAM. Dynamic random access memory

DT. Drive tray

DTE. Drive Transport Elements = Drives

E

EEROM. Electrically erasable read only memory

Enhanced FCA. Refers to the complete new power structure for x23 and x53 frames (Also see BPC and BPS)

EKM. External Key Manager

EOD. End of data electrically erasable read only memory

EOM. End of media

EOT. End of tape

EPO. Emergency power off

EPOV. Emergency power off voltage

EPROM. Erasable programmable read-only memory

error log. A dataset or file in a product or system where error information is stored for later access

ESCON. Enterprise Systems Connection - A set of IBM products and services that provides a dynamically connected environment within an enterprise. The ESCON channel connection allows the library to communicate directly with a system.

ESD. Electrostatic discharge

exa. Prefix for 'quintillion' (10^{18})

expansion frame. The second frame (or any subsequent frame) which is an expansion of the *base frame*. This frame contains storage cells, optional frame control assembly, and optional tape drives. This term only applies to multiple frame libraries. The 3584 Model Dxx is an expansion frame.

F

FC. (1) Fibre channel. (2) Feature code

FCA. Frame control assembly which contains the MCC, redundant 37 V dc power supplies, and tape drive AC voltage source

FCAL. Fibre cable arbitrated loop

Federal Information Processing Standards. See *FIPS*

FIC. Frame interconnect card; the communication link between frames on a multiple frame library

FID. Used in 3592 drives. (1) FRU identifier (may be more than one FRU); (2) Failure identifier

fiducial. A standard for reference

FIPS. (1) Synonym for Federal Information Processing Standards (2) Standards and guidelines developed and issued by the Information Technology Laboratory of the U.S. Department of Commerce's National Institute of Standards and Technology (NIST) and approved for Federal computer systems by the Secretary of Commerce. When no acceptable industry standards or solutions exist, NIST develops FIPS to satisfy compelling Federal government requirements, such as for interoperability and for security measures like encryption. (3) The pertinent standard for this publication is FIPS PUB 140-2, Security Requirements for Cryptographic Modules

field replaceable unit (FRU). An assembly that is replaced in its entirety at the customer's location when any one of its components fails

firmware. Synonym for *microcode*

FM. File mark

FMR tape. Field microcode replacement tape

FRU. See *field replaceable unit*

FSC. Fault symptom code

G

GB. Gigabyte (one billion bytes)

giga. Prefix for 'billion' (10^9)

gripper assembly (dual). The assembly that moves on the Y-axis, includes two grippers, the bar code scanner, and calibration sensor. Each gripper (two per pivot assembly) gets and puts cartridges. Formerly referred to as “picker”

H

HA. High Availability. Term used for a dual accessor library with service bays on each end of the library string. (Also see SBA & SBB)

HA1. In a High Availability library, this is the model number associated with Service Bay A. (Also see SBA)

HBA. Host Bus Adapter

HEC. Hardware error code

HECQ. Hardware error code qualifier

hot pluggable. Synonym for *hot pluggable*

hot swap. Describes the capability of a component to be replaced while the library is powered on and running

HVD. High voltage differential

I

ILI. Incorrect length indicator

IEE. Import/Export Elements

IEEA. Import/Export Element Addresses (Virtual I/O slots)

IML. Initial microprogram load

interposer. The part used to convert a 68-pin connector to a 50-pin D-shell connector

I/O. Input/output

I/O Station. The assembly that provides inputting and outputting of tape cartridges into the library

iSCSI. Internet small-computer system interface

K

KB. Kilobyte (one thousand bytes)

kilo. Prefix for 'thousand' (10^3)

L

LAN. Local area network

LCD. Liquid crystal display

LED. Light emitting diode

LIP. Loop initiated primitive

LSB. Least significant bit

LTO. Linear tape open

LTO-CM. Linear tape open cartridge memory

LUN. Logical unit number

LVD. Low voltage differential

M

MAP. Maintenance analysis procedure

MAQ. Maintenance agreement qualification

MB. Megabyte (one million bytes)

MCA. Media Changer Assembly used in x23 and x53 frames only. The MCA controls the drive-to-library communications, provides two Ethernet ports, and controls other external communications

MCP. Media changer pack, which controls the drive-to-library communications, as well as other external communications

MDA. Motor driver assembly, which is mounted on the accessor

mega. Prefix for 'million' (10^{6})

MI (or MIs). (1) Maintenance Information. (2) A generic term for a maintenance document

micro. Prefix for 'millionth of' ($10^{-6)}$

microcode. (1) Synonymous with firmware. (2) One or more micro instructions (3) A code representing the instructions of an instruction set, implemented in a part of storage that is not program-addressable (4) To design, write, and test one or more micro instructions

milli. Prefix for 'thousandth of' ($10^{-3)}$

mixed media. Describes the presence of both LTO media and 3592 media in the same library

mm. Millimeter; 1 mm equals 0.39 in.

MSB. Most significant bit

MSBF. Mean swaps between failures

MTBF. Mean time between failures

MTE. Media Transport Elements = Grippers

MTTR. Mean time to recovery

N

nano. Prefix for 'billionth of' (10^{-9})

NAS. Network attached storage. A stand-alone storage system that can bridge with a SAN, to make data stored on NAS servers appear as if it is stored on a single, ordinary file server

non-recoverable error. An error condition that does not allow the continued execution of a program or job

NVM. Non-volatile memory

NVRAM. Non-volatile random access memory

NVS. Non-volatile storage

N+1. Industry term for a concept that indicates that a machine has the **N**umber of power supplies you need, **plus 1** more for redundancy

O

offline. Pertains to the operation of a functional unit without the continual control of a computer

online. Pertains to the operation of a functional unit that is under the continual control of a computer

OPC. Operator panel controller card

P

PCMCIA. Personal Computer Memory Card International Association

PDC card. The interface card from the gripper assembly to the ACC. Located on the gripper assembly

PER. Post error reporting

peta. Prefix for 'quadrillion' (10^{15})

pico. Prefix for 'trillionth of' (10^{-12})

PM. Preventive maintenance

P/N. Part number

POR. Power on reset

POST. Power-on self test. A series of diagnostic tests that run automatically when a device is powered on

power cycle. To power off, then power on a device such as a tape drive or a library. Occasionally this method is used as a way to reset some function or to reset the microcode.

PROM. Programmable read-only memory

PTF. Program temporary fix

Q

quiesce. (1) Describes a condition you create for the library that prevents any communications or traffic to occur into or out of a drive or the library. (2) To end a process by allowing operations to complete normally. (3) To request that a node stop sending synchronous-flow messages.

R

RAM. Random access memory

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

remote access. Communication with a data processing facility through a data link. Synonym for *Call Home*.

RISC. Reduced instruction set computing. A type of microprocessor design that focuses on rapid and efficient processing of a relatively small set of instructions

ROM. Read-only memory

RPQ. Request for price quotation

RS-422. A communications network between the tape drives and the MCP

S

SAN. Storage area network

SBA. Service Bay A. Also referred to as a model HA1 frame in a dual accessor library. This frame is located to the left of the Lxx frame as you face the library

SBB. Service Bay B. In a model HA1 dual accessor library, this frame is located to the right of the last Dxx frame as you face the library

SCD. Single-character display

SCSI. Small computer system interface

SEB. Source Element Bitmap

service representative. Synonym for *customer engineer (CE)*

SIM. Service information message

SK. Sense Key

sled. Synonym for *drive tray*

Smart SCSI wrap tool. Wrap tool that can detect and become the type of wrap tool that is needed for the line to which you have attached it.

snug. To make slightly tight or secure

SRAM. Static random access memory (RAM). A form of semiconductor memory (RAM). Static RAM storage is based on the flip-flop logic circuit which retains the information stored in it as long as there is enough power to run the device. A static RAM chip can store only about one-fourth as much data as a dynamic RAM chip of the same complexity, but static RAM does not require refreshing and is usually faster than dynamic RAM. Static RAM is more expensive and is usually reserved for use in cache.

SSR. (1) Subsytem service representative. (2) Service support representative. (3) Synonym for customer engineer.

STEs. Storage Elements

synch. Synchronous, synchronize. Occurring with a regular or predictable time relationship

T

tachometer, tach. A device that emits or senses pulses which are used to measure or check speed

TapeAlert. A patented technology from Hewlett-Packard that monitors the status of a tape device and media, and detects problems as they occur.

TapeAlert flags. Status and error messages that are generated by the TapeAlert utility and display on the host console. The messages indicate the type of problem and tell how to resolve it.

TB. Terabyte (one trillion bytes)

TCP/IP. Transmission Control Protocol/Internet Protocol. A communication protocol standard for transmitting data over networks with internet uses

tera. Prefix for 'trillion' (10^{12})

TLB. Translation lookaside buffer

U

Universal Gripper Assembly. Dual gripper assembly capable of getting and putting both LTO and 3592 data cartridges

URC. Unit reference code

V

VHDCI. Very High Density Centronics Interface

VOLSER. Volume serial number

VPD. Vital product data

W

WORM. Write once, read many

X

XCP. A card that provides communications between the FIC and the AXY

XYC. XY controller card and cable, located within the MDA

Y

yotta. Prefix for 'septillion' (10^{24})

Z

zetta. Prefix for 'sextillion' (10^{21})

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Special characters

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