IBM® TotalStorage™ FAStT700
Fibre Channel Storage Server

IBM

User's Guide

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Fibre Channel Storage Server

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User's Guide

Note: Before using this information and the product it supports, be sure to read the general information under "Appendix B. Warranty information" on page 63 and "Appendix C. Notices" on page 73.

First Edition (November 2001)

Contents

Figures

Tables

Safety

Before installing this product, read the Safety Information.

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Antes de instalar este produto, leia as Informações de Segurança.

在安裝本产品之前，请仔细阅读 Safety Information
（安全信息）。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

ix

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 2:

CAUTION:
When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser Statement

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

Statement 4:

≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
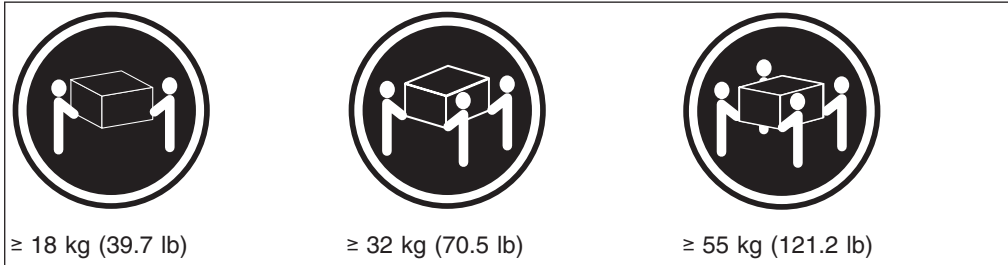
CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

2

1
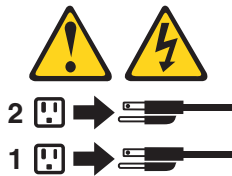
Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label atteched.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

About this book

This book provides an overview of the IBM® TotalStorage™ FAStT700 Fibre Channel Storage Server and contains information about routine operations and replacement procedures for all customer replaceable units (CRUs). This user's guide is intended for system operators and service technicians who have extensive knowledge of Fibre Channel, network technology, computer-system operation, maintenance, and repair. Use this guide to:

- Become familiar with the components of the IBM FAStT700 Fibre Channel Storage Server
- Learn how to operate the IBM FAStT700 Fibre Channel Storage Server
- Learn how to replace failed components in the IBM FAStT700 Fibre Channel Storage Server

Before using this book, install the hardware and software. For more information, refer to the *IBM TotalStorage FAStT700 Fibre Channel Storage Server Installation Guide* and the IBM FAStT Storage Manager installation guide appropriate for your operating system. For a list of publications, see "Related publications" on page xvi.

How this book is organized

"Chapter 1. Introduction" on page 1 introduces the IBM FAStT700 Fibre Channel Storage Server and its primary components.

"Chapter 2. Operating the FAStT700 Storage Server" on page 15 describes the tasks required to operate the FAStT700 Storage Server.

"Chapter 3. Replacing FAStT700 Storage Server components" on page 35 describes how to service and replace components of the FAStT700 Storage Server.

"Appendix A. Getting information, help, and service" on page 59 describes how to obtain help, service, and information about IBM products.

"Appendix B. Warranty information" on page 63 provides warranty statements.

"Appendix C. Notices" on page 73 provides product notices.

Notices and statements in this book

The caution and danger statements used in this book also appear in the multilingual *Safety Information* book provided with your IBM FAStT700 Fibre Channel Storage Server. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety book.

The following types of notices and statements are used in this book:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.

- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Related publications

The following publications are available in Adobe Acrobat Portable Document Format (PDF) on the IBM FAStT Storage Manager CD and at http://www.ibm.com/pc/support/.

- *IBM® TotalStorage™ FAStT700 Fibre Channel Storage Server User's Guide* (this book)
- *IBM® TotalStorage™ FAStT700 Fibre Channel Storage Server Installation Guide*[1]
- *IBM® FAStT700 Fibre Channel Cabling Instructions*[1]
- *IBM® FAStT Storage Manager Version 8.0 Installation and User's Guide for Microsoft® Windows NT® and Windows® 2000*
- *IBM® FAStT Storage Manager Version 8.0 Installation and User's Guide for Novell NetWare*
- *IBM® FAStT Storage Manager Version 8.0 Installation and User's Guide for Red Hat Linux®*
- *IBM® FAStT Storage Manager Version 8.0 Installation and User's Guide for HP-UX and Solaris*
- *IBM® FAStT Storage Manager Concepts Guide*
- *IBM® FAStT Storage Manager Version 8.0 FlashCopy Premium Feature Key Version 1.0*
- *IBM® FAStT700 Mini Hub Option Information*
- *IBM® Small Form-Factor Pluggable (SFP) Module Option Information*
- *IBM® LC-LC Fibre Channel Cable Option Information*
- *IBM® LC-SC Fibre Channel Cable Adapter Option Information*

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1. Printed publication that comes with the IBM FAStT700 Fibre Channel Storage Server.

Chapter 1. Introduction

The IBM TotalStorage FAStT700 Fibre Channel Storage Server (referred to throughout this book as FAStT700 Storage Server) is a high-performance unit that provides dual, redundant array of independent disks (RAID) controllers and Fibre Channel interfaces to both the host and drive channels.

FAStT700 Storage Server overview

The FAStT700 Storage Server (Machine type 1742, models 1RU and 1RX) supports direct attachment of up to four hosts containing two host adapters each, and is designed to provide maximum host-side and drive-side redundancy. Using external Fibre Channel switches in conjunction with the FAStT700 Storage Server, you can attach up to 64 hosts with two adapters each to a FAStT700 Storage Server.

Each FAStT700 Storage Server contains several removable components, called *customer replaceable units* (*CRUs*), that you can access from either the front or back of the unit. These CRUs include the battery, RAID controllers, storage server fan, power supplies, fan and communications module, mini hubs, and Small Form-Factor Pluggable (SFP) modules. The FAStT700 Storage Server also has a removable front bezel.

The FAStT700 Storage Server functions with at least one external Fibre Channel drive enclosure containing Fibre Channel hard drives. The FAStT700 Storage Server supports 224 Fibre Channel hard drives. If the Fibre Channel drives are configured in a FAStT EXP500 expansion unit, a maximum of 220 drives are supported.

Front view

Figure 1 on page 2 shows the bezel. The bezel is a removable front cover with holes for viewing the status lights and for boosting air circulation. Figure 2 on page 2 shows the FAStT700 Storage Server without the front bezel, showing the following components:

- **Storage server fan** - A removable unit that contains two cooling fans and indicator lights.
- **Battery** - A removable unit that contains the cache battery for the controllers, battery charger circuitry, and status indicator lights.
- **Controllers** - Two removable units that each contain one RAID controller with 1 Gb cache memory and status indicator lights.

Note: The illustrations in this document might differ slightly from your hardware.
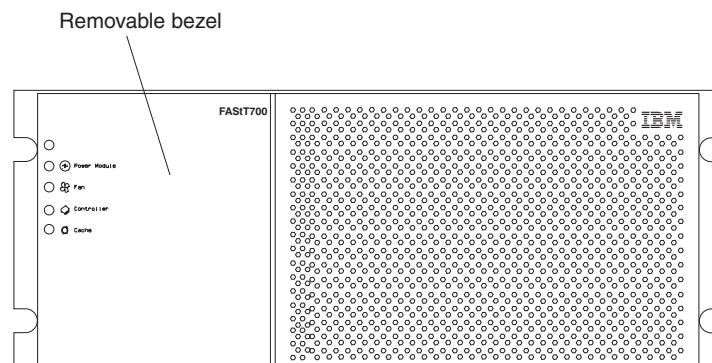
Figure 1. IBM TotalStorage FAStT700 Fibre Channel Storage Server front bezel
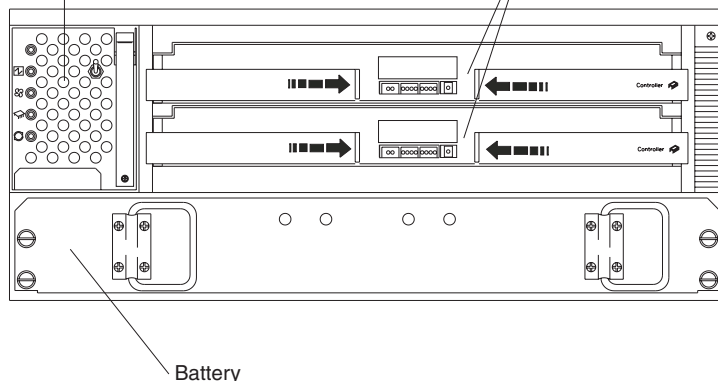
Figure 2. IBM TotalStorage FAStT700 Fibre Channel Storage Server-front view

Back view

Figure 3 shows the FAStT700 Storage Server back view and the following components:

- **Host-side and drive-side mini hubs** - Up to eight removable mini hubs with indicator lights. You can insert SFP modules into the mini hubs and connect fiber-optic host and drive interface cables to the FAStT Storage Server. (The standard FAStT700 configuration includes two host and two drive mini hubs.)
- **Power supplies** - Two removable units that each contain a power supply and an indicator light.
- **Fan and communications module** - A removable unit that contains the power supply cooling fans, an indicator light, and Ethernet ports.
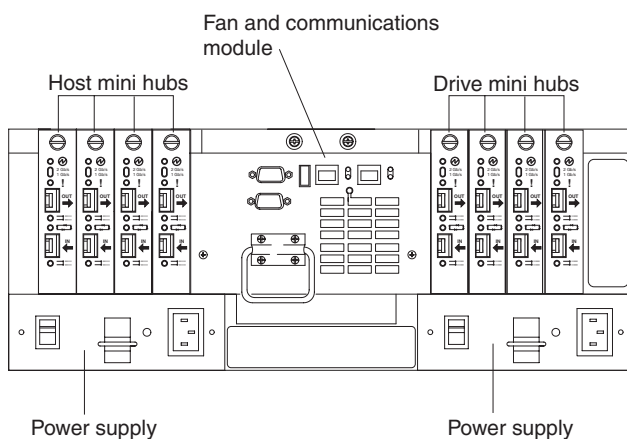
Figure 3. IBM TotalStorage FAStT700 Fibre Channel Storage Server - back view

Fibre Channel connections

When fully configured, the back of the FAStT700 Storage Server can accommodate up to four host-side and four drive-side mini hubs. Each mini hub is a single, removable unit that provides the Fibre Channel interface between a FAStT700 Storage Server, host computers, and drives. Each mini hub has two SFP module

ports. An SFP module is inserted into a mini-hub port. Figure 4 shows the Fibre Channel components.

Mini hub

Host mini-hub ports

SFP module

Fiber-optic interface cable

SFP module

Drive mini-hub ports
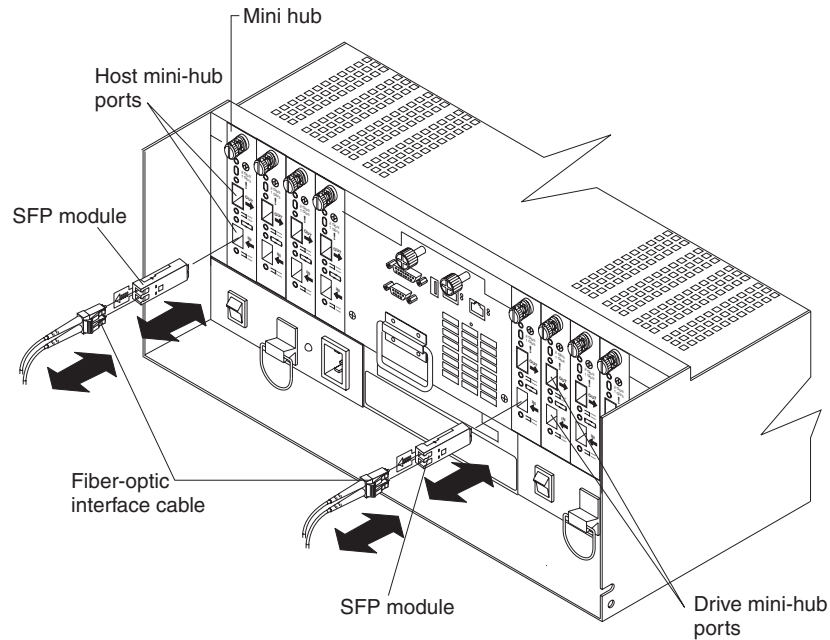
Figure 4. Fibre Channel interface connections

The FAStT700 Storage Server uses fiber-optic cables to connect to other Fibre Channel devices. The fiber-optic cables that you need depend on the type of optical connectors in the device to which you are connecting the FAStT700 Storage Server. If the device uses SFP modules or optical interface connectors, then you must use LC-LC Fibre Channel cables. If the device uses Gigabit Interface Converters (GBICs) as the optical interface connector, you must use LC-LC Fibre Channel cables and LC-SC Fibre Channel cable adapters (Part number 19K1250) to connect to the FAStT700 Storage Server.

Handling fiber-optic cables

Before using fiber-optic cables, read the following precautions.

Attention: To avoid damage to your fiber-optic cables, follow these guidelines:

- Do not route the cable along a folding cable-management arm.
- When attaching to a device on slide rails, leave enough slack in the cable so that it does not bend to a radius of less than 38 mm (1.5 in.) when extended or become pinched when retracted.
- Route the cable away from places where it can be damaged by other devices in the rack cabinet.
- Do not use plastic cable ties in place of the provided cable straps.
- Do not overtighten the cable straps or bend the cables to a radius of less than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point. Be sure that the cable is well supported.

Using LC-LC Fibre Channel cables

The LC-LC Fibre Channel cable is a fiber-optic cable that is used to connect into one of the following devices:

- SFP module installed in a FAStT700 Storage Server mini hub
- SFP module installed in an IBM Fibre Channel switch
- Optical interface connector on an IBM FAStT FC-2 Host Bus Adapter (Part Number 19K1246)

Figure 5 shows an LC-LC Fibre Channel cable.
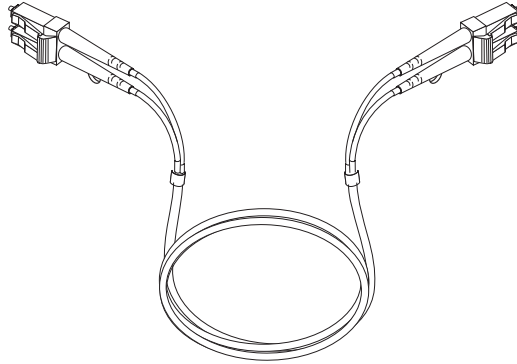
Figure 5. LC-LC Fibre Channel cable

The following sections provide the procedures for properly connecting and removing an LC-LC Fibre Channel cable.

Note: If you are connecting a FAStT700 Storage Server to a FAStT EXP500 expansion unit or to an IBM FAStT host adapter, you must also use an Fibre Channel cable adapter. For more information about using the LC-SC Fibre Channel cable adapter, see "Using LC-SC Fibre Channel cable adapters" on page 8.

Connecting an LC-LC cable to an SFP module

To connect an LC-LC Fibre Channel cable to an SFP module, complete the following steps.

Statement 3:

CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

> **Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following. Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

1. Read the information in "Handling fiber-optic cables" on page 3.
2. If necessary, remove the protective cap from the SFP module, as shown in Figure 47 on page 55. Save the protective cap for future use.
3. Remove the two protective caps from one end of the LC-LC cable as shown in Figure 6. Save the protective caps for future use.
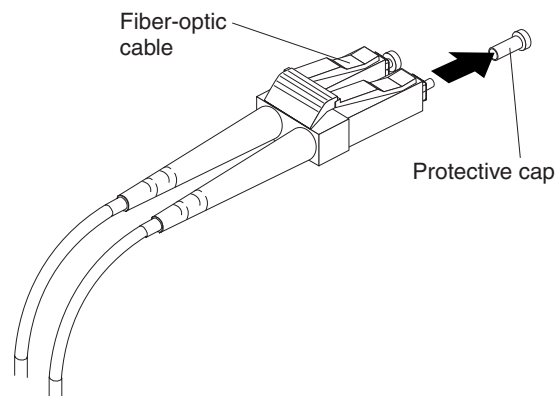
Figure 6. Removing the fiber-optic cable protective caps

4. Carefully insert that same end of the LC-LC cable into an SFP module that is installed in a FAStT700 Storage Server mini hub. The cable connector is keyed to ensure it is inserted into the SFP module correctly. Holding the connector, push in the connector until it clicks into place.
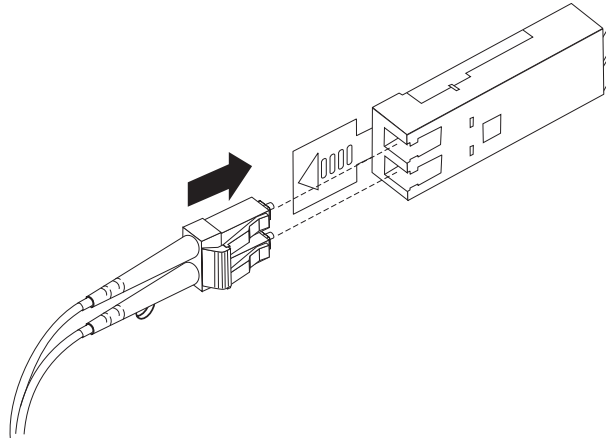
Figure 7. Inserting an LC-LC Fibre Channel cable into an SFP module

Figure 8 shows an LC-LC Fibre Channel cable connecting into an SFP module that is installed in a FAStT700 Storage Server mini hub.

SFP module

Fiber-optic cable
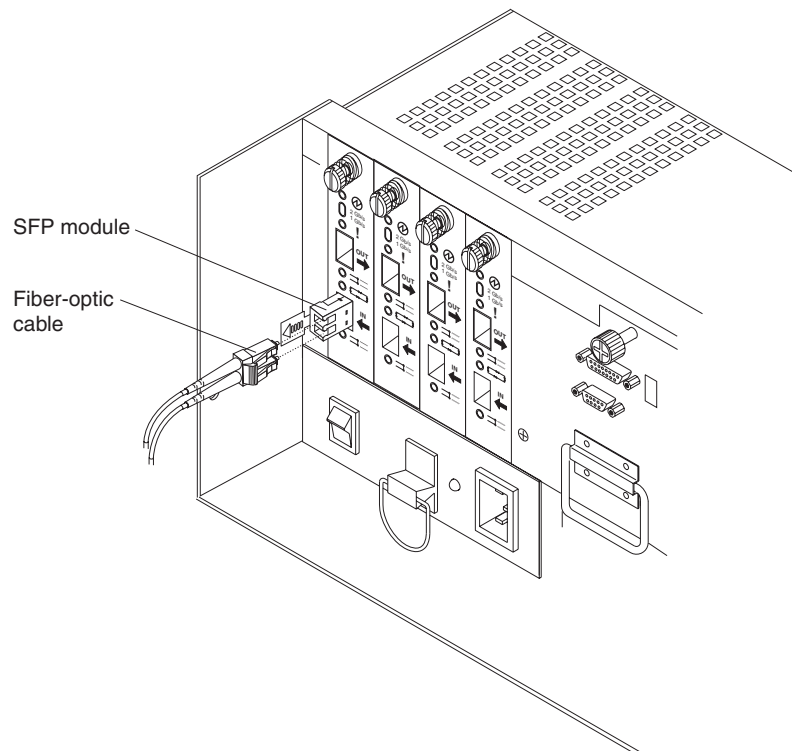
Figure 8. Inserting an LC-LC Fibre Channel cable into an installed SFP module

5. Remove the two protective caps from the other end of the LC-LC cable, as shown in Figure 6 on page 5. Save the protective cap for future use.

6. Connect the end of the LC-LC Fibre Channel cable to one of the following devices:

- SFP module that is installed in an IBM Fibre Channel switch
- Optical interface connector on an IBM FAStT FC-2 Host Bus Adapter (Part Number 19K1246)
- LC-SC Fibre Channel cable adapter (For information about using an LC-SC cable adapter, see "Using LC-SC Fibre Channel cable adapters" on page 8.)

For more information about connecting to these devices, see the documentation that comes with the device.

Removing an LC-LC Fibre Channel cable

To remove an LC-LC Fibre Channel cable, do the following:

Attention: To avoid damaging the LC-LC cable or SFP module, make sure you press and hold the lever to release the latches as you remove the cable from the SFP module.

1. On the end of the LC-LC cable that connects into the SFP module or host bus adapter, press down and hold the lever to release the latches, as shown in Figure 9. Carefully pull on the connector to remove the cable from the SFP module, (ensure that the levers are in the released position when removing the cable) as shown in Figure 10. When removing the cable, make sure you do not grasp the SFP module plastic tab.
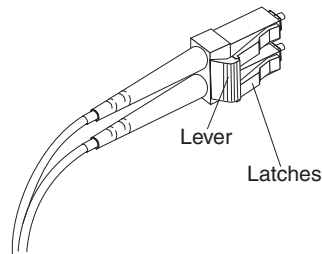
Figure 9. LC-LC Fibre Channel Cable lever and latches
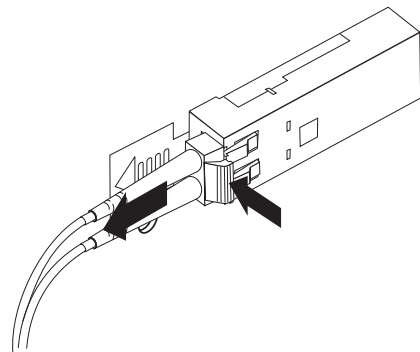
Figure 10. Removing the LC-LC Fibre Channel cable

2. Replace the protective caps on the cable ends.
3. Replace the protective cap on the SFP module.

Using LC-SC Fibre Channel cable adapters

The LC-SC Fibre Channel Cable Adapter is a fiber-optic cable that is used to connect the LC connector into one of the following devices that require SC connectors:

- FAStT host adapter (Part number 00N6881)
- FAStT EXP500 expansion unit (Machine type 3560)
- 1 Gb Fibre Channel switch (Machine type 2109)
- 1 Fibre Channel Managed hub (Machine type 3534)

For more information about connecting to these devices, see the documentation that comes with the device.

Figure 11 shows an LC-SC Fibre Channel cable adapter.

LC connector

SC connector
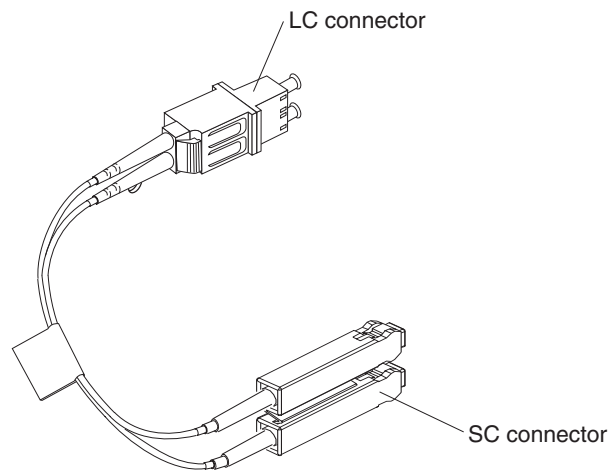
Figure 11. LC-SC Fibre Channel cable

The following sections provide the procedures for properly connecting and removing an LC-SC Fiber Channel cable adapter.

Connecting an LC-SC cable to a device

To connect an LC-SC cable adapter to a device or LC-LC cable, complete the following steps.

Statement 3:

CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following. Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

1. Read the information in "Handling fiber-optic cables" on page 3.
2. Connect an LC-LC cable to an SFP module in the FAStT700 Storage Server mini hub. For instructions, see "Connecting an LC-LC cable to an SFP module" on page 5.
3. Remove the two protective caps from the LC connector end of the LC-SC cable, as shown in Figure 12. Save the protective caps for future use.
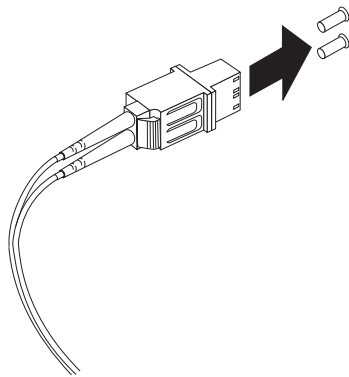
Figure 12. Removing the LC-SC cable adapter protective caps

4. Carefully insert one end of an LC-LC cable into the LC connector end of the LC-SC cable. Push in the connector until it clicks into place.
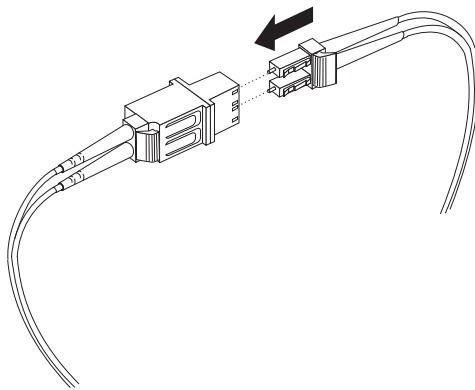
Figure 13. LC-LC cable connected into the LC-SC cable adapter

5. Connect the SC connector end of the LC-SC cable to one of the following devices:
   - Optical interface connector on an IBM FAStT Host Bus Adapter (Part number 00N6881)
   - GBIC installed in a FAStT EXP500 expansion unit (Machine type 3560)
   - 1 Gb Fibre Channel switch (Machine type 2109)
   - 1 Gb Fibre Channel managed hub (Machine type 3534)

For more information about connecting to these devices, see the documentation that comes with the device.

Removing an LC-LC cable from an LC-SC cable adapter

To remove an LC-LC cable from an LC-SC cable adapter, do the following:

Attention: To avoid damaging the LC-LC cable, make sure you press and hold the lever to release the latches while you remove the cable from an LC-SC cable adapter. Ensure that both levers on the LC-LC cable are in the released position when removing the cable.

1. On the end of the cable that connects into the LC connector end of the LC-SC cable adapter, press down and hold the lever to release the latches. Figure 14 shows the location of the lever and latches.
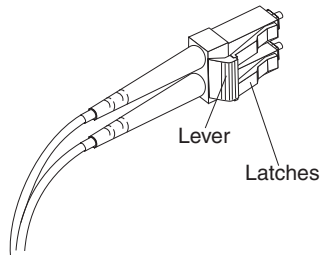
Figure 14. LC-LS Fibre Channel Cable lever and latches

2. Carefully pull on the connector to remove it. Make sure you grasp the connector and not the cable when removing the LC-LC cable from the LC-SC cable adapter, as shown in Figure 15.
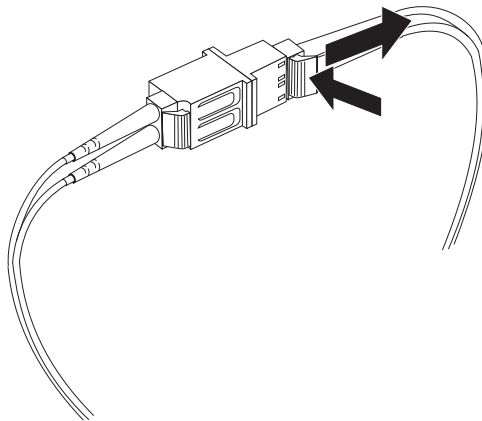
Figure 15. Removing the LC-LC Fibre Channel cable from an LC-SC Fibre Channel cable adapter

3. Replace the protective caps on the cable ends.

Interface ports

The FAStT700 Storage Server has the following interface ports:

- Host mini hub
- Drive mini hub
- Ethernet

The mini-hub ports are used for data transfer between hosts or drive enclosures and RAID controllers in the FAStT700 Storage Server. Ethernet ports are available for storage subsystem-management. The FAStT700 Storage Server interface ports are shown in Figure 16.
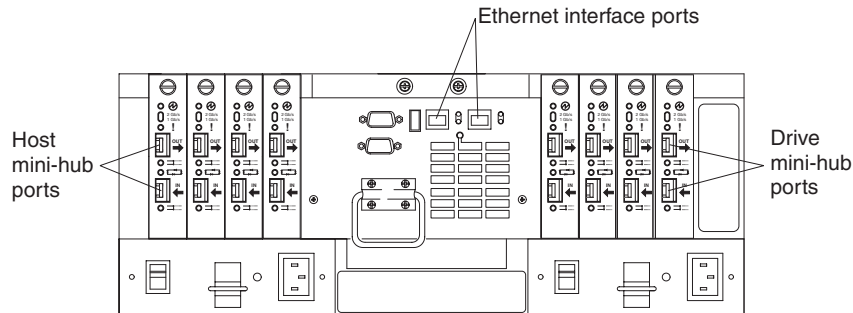
Figure 16. FAStT700 Storage Server interface ports

For more information about connecting the FAStT700 Storage Server and drive enclosures (also referred to as expansion units) using the host and drive interface ports, refer to the *IBM FAStT700 Fibre Channel Storage Server Installation Guide*.

Host interface ports

The FAStT700 Storage Server comes with host-side mini hubs 1 and 2 installed. Each mini hub provides host loop connectivity and self-diagnostic features. Host mini hubs connect to the controller in pairs. When fully configured, the FAStT700 Storage Server can accommodate four host-side mini hubs, two per controller. Mini hubs 1 and 3 connect to the top controller (Controller A) and mini hubs 2 and 4 connect to the bottom controller (Controller B), as shown in Figure 17. To ensure redundancy, you must connect each host to both controllers through the appropriate mini hub.
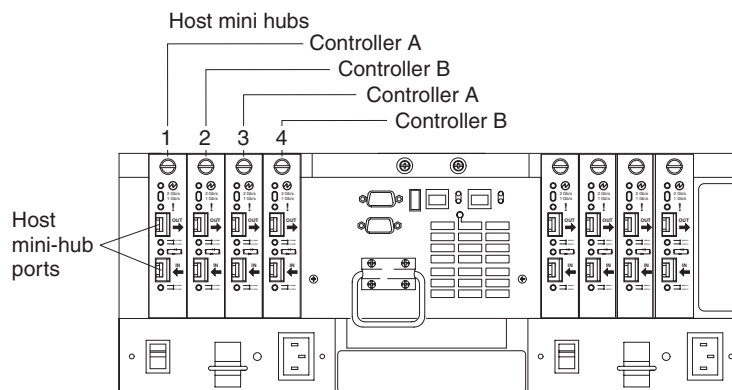
Figure 17. Host-side mini-hub interface ports

Drive interface ports

The FAStT700 Storage Server comes with drive-side mini hubs 1 and 2 installed. Each drive mini hub connects to Controller A and Controller B and represents a single drive loop. The drive loops must be set up in pairs to support redundant drive loop configurations (two data paths per drive enclosure). Each pair supports up to 11 drive enclosures, containing 10 drives each, or a maximum of 110 drives. See Figure 18.

A fully configured FAStT700 Storage Server supports a maximum of 22 drive enclosures (11 drive enclosures per drive-loop pair), or 220 drives (for Machine type 3560) using four drive loops.

Important: These large configurations are for capacity purposes and might not provide the best performance. FAStT700 Storage Servers use only redundant drive-loop configurations.
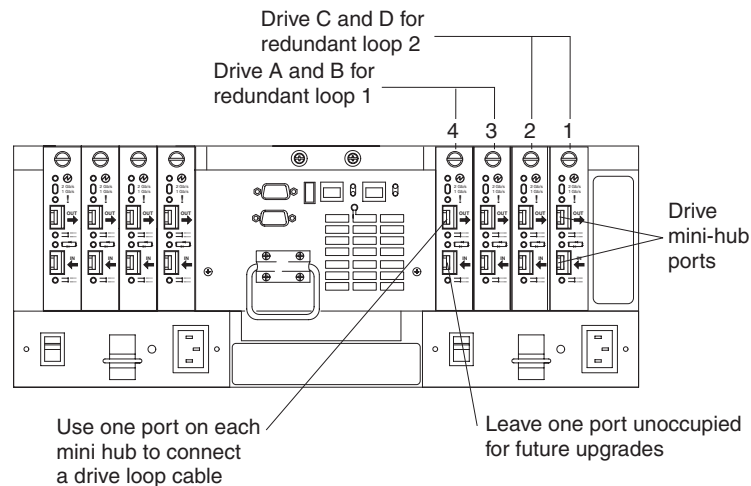
Figure 18. Drive-side mini-hub interface ports

Ethernet interface ports

There are two Ethernet interface ports, one for each controller (Controller A and Controller B). Use the Ethernet ports to directly manage storage subsystems. Figure 19 on page 14 shows the location of the interface ports.
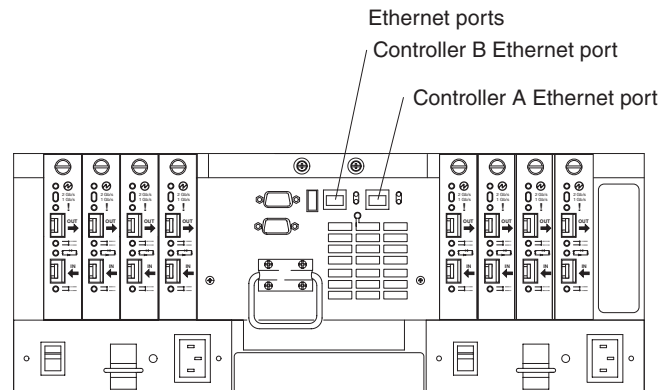
Figure 19. Ethernet interface ports

Chapter 2. Operating the FAStT700 Storage Server

This chapter describes the tasks required to operate the FAStT700 Storage Server.

Tasks overview

Perform the tasks shown in Table 1 to maintain the FAStT700 Storage Server after it is installed.

Table 1. Tasks overview

Task	Description	See
Accessing the FAStT700 Storage Server components and indicator lights	To access the controller CRUs, battery, storage server fan, and indicator lights, remove the FAStT700 Storage Server bezel.	"Removing the front bezel to access the FAStT Storage Server components" on page 16
Turning on or off the power	The FAStT700 Storage Server usually runs continuously. However, you might need to turn off the power to move the FAStT700 Storage Server or to perform maintenance procedures.	"Turning on the power" on page 18 and "Turning off the power" on page 19
Monitoring FAStT700 Storage Server status through software	Run the storage-management software continuously. This software checks the storage subsystem for failures and displays messages indicating the types of failures and the recovery procedures.	"Monitoring status through software" on page 21
Checking fault indicator lights for component failures	Component failures are indicated by lights on the front and back of the FAStT700 Storage Server and are monitored by the storage-management software. **Note:** The indicator lights identify problems with the FAStT700 Storage Server components, but you might need more information to thoroughly diagnose and repair the unit. Therefore, it is important to use the storage-management software to continuously monitor the status of the FAStT700 Storage Server.	"Checking the indicator lights" on page 21
Restoring power after a power supply shutdown	When the FAStT700 Storage Server shuts down because of a power supply overtemperature condition, take special care restarting it.	"Overtemperature condition and power supply shutdown" on page 30
Checking the battery service date	Periodically check the battery service date information. Replace the battery whenever it fails to hold a charge or every three years. **Note:** Using the FAStT700 Storage Server in a hot environment (above 35° C or 95° F), lowers the battery life expectancy. Environmental conditions that are not in the specified range is not supported.	"Checking the battery service date" on page 31

Table 1. Tasks overview (continued)

Task	Description	See
Preparing to move the FAStT700 Storage Server	You might need to move the FAStT700 Storage Server to a new location or remove the chassis from its rack cabinet.	"Preparing to move the FAStT700 Storage Server" on page 32

Removing the front bezel to access the FAStT Storage Server components

To access the controllers, battery, storage server fan, and indicator lights, you must remove the FAStT700 Storage Server bezel, as shown in Figure 20.

Attention: Pulling the cover out too far can damage the plastic hooks at the top. To avoid damaging the hooks, place the FAStT700 Storage Server on a flat surface. Be sure the front of the FAStT700 Storage Server extends beyond the edge approximately 5 cm (2 in.).

1. Carefully pull the bottom of the bezel out to release the pins; then slide the bezel down, as shown in Figure 20.
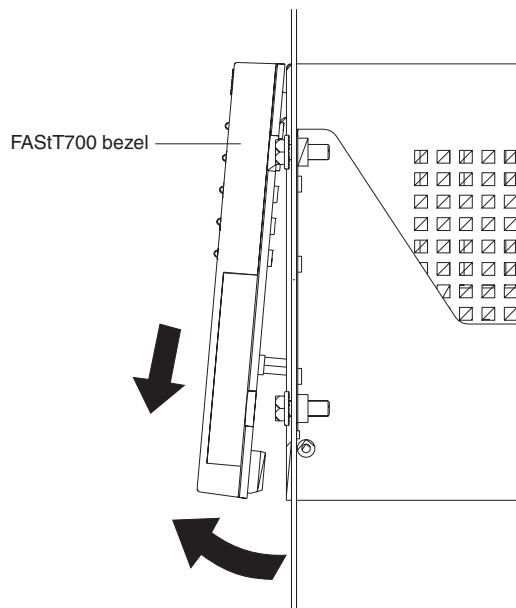
Figure 20. Removing the FAStT700 Storage Server bezel

2. To replace the bezel, slip the top edge of the bezel under the lip on the chassis, then push the bottom of the bezel until the pins snap into the mounting holes,

as shown in Figure 21.
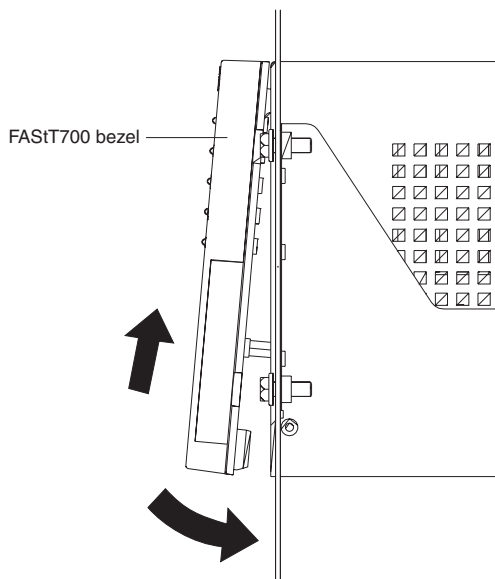
FAStT700 bezel

Figure 21. Replacing the FAStT700 Storage Server bezel

Turning on the power

Important: You must turn on the drive enclosures *before* the FAStT700 Storage Server. The controllers might not recognize the correct configuration if the hard disk drives are turned on after the FAStT700 Storage Server. For instructions on turning on the drive enclosures, refer to the drive enclosure documentation.

Note: Always wait at least 30 seconds between the time you turn off a power switch and the time you turn on the power again.

Check the system documentation for the hardware devices that you intend to turn on, and then determine the proper startup sequence. Turn on the power to each device in the following order:

- Supporting devices
- Drive enclosures
- FAStT700 Storage Server
- Host

If you are restoring power to the FAStT700 Storage Server after an emergency shutdown or power outage, go to "Overtemperature condition and power supply shutdown" on page 30.

Use the following procedure to turn on the FAStT700 Storage Server and connected devices:

1. Turn on the power to the supporting devices (for example, Ethernet switches, Fibre Channel switches, and management stations).
2. Turn on the drive enclosure. The controllers might not recognize the correct configuration if the drives are powered up after the storage server. For instructions on turning on the drive enclosures, refer to the drive enclosure documentation.
3. Turn on the power to the FAStT700 Storage Server, as follows:

   a. Verify that all communication and power cables are plugged into the back of the FAStT700 Storage Server and to a properly grounded ac electrical outlet.

   b. Turn on the power-supply switches on the back of the FAStT700 Storage Server (see Figure 22 on page 19). You must turn on both power-supply

switches to take advantage of the redundant power supplies.

Power switch

ac power cord

Power switch
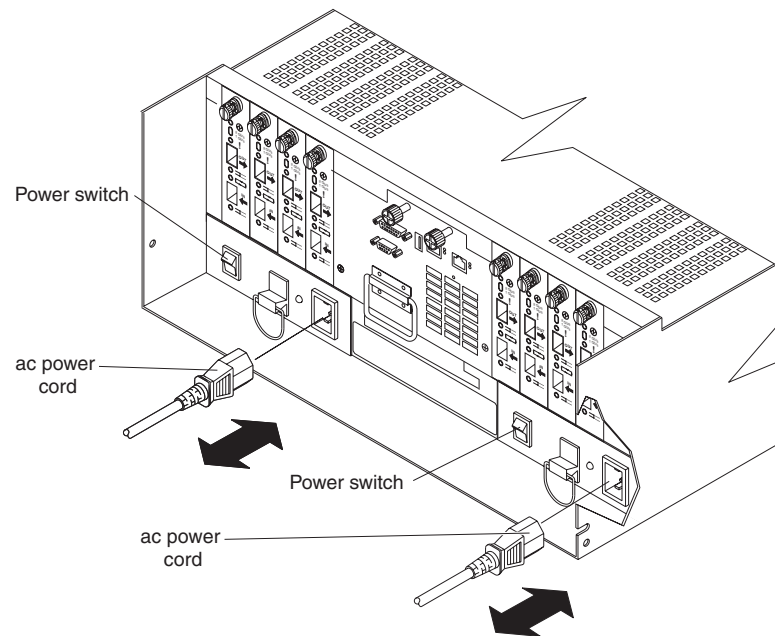
ac power cord

Figure 22. Connecting the power cords and power switch locations

    c. Use the storage-management software and the Fault indicator lights to check the overall status of the FAStT700 Storage Server and its components. See "Checking the indicator lights" on page 21.

4. Restart or turn on the power to the host.

Turning off the power

Attention: The FAStT700 Storage Server is designed to run continuously, 24 hours a day. Except in an emergency, never turn off the power even if any FAStT700 Storage Server fault indicator lights are lit. Use the proper troubleshooting or servicing procedure to correct the fault before turning off the power. This ensures that the FAStT700 Storage Server powers up correctly later.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

Use the following procedure to turn off power to the FAStT700 Storage Server.

1. Make sure that all amber fault indicator lights on the FAStT700 Storage Server are off. If any fault indicator lights are on, use the storage-management software to determine the status of the system components and correct any problems before turning off the power. For more information, see "Monitoring status through software" on page 21 and "Checking the indicator lights" on page 21.

2. Perform any required procedures that are indicated by the operating-system software.

3. Prepare the FAStT700 Storage Server for shutdown, as follows:

   a. Stop all I/O activity to the FAStT700 Storage Server and attached drive enclosures.

      Note: If a parity check is in progress, it might take a long time for the drive indicator lights to stop blinking.

   b. Use the operating-system software to disconnect the FAStT700 Storage Server logical drives from the host before the storage server is powered off.

   c. Make sure that the fast write cache indicator light on each FAStT700 Storage Server front panel and all drive active indicator lights on each drive enclosure front panel are off (not blinking).

   Attention: To turn off all power to the storage server, you must turn off both power-supply switches and disconnect both power cords. Use the procedure in step 4 for the proper shutdown sequence.

4. Turn off the power to the FAStT700 Storage Server or turn off the power to each device using the following shutdown sequence.

   a. Turn off power to the host before the storage server. If the host must stay powered on to support an existing network, refer to the operating system documentation for information about disconnecting the storage server logical drives from the host before the storage server is powered off.

   b. Turn off power to the storage server *before* you turn off power to the drive enclosures. Turn off both power supply switches on the back of the storage server. See Figure 22 on page 19.

   c. Turn off power to other supporting devices (for example, management stations, Fibre Channel switches, or Ethernet switches).

Monitoring status through software

To monitor FAStT700 Storage Server status, always run the storage-management software and check it frequently. Be sure to enable the management alerts that you need. The storage-management software provides the best way to diagnose and repair FAStT700 Storage Server failures. This software can help you:

- Determine the nature of a failure
- Locate a failed component
- Provide recovery procedures to repair a failure

Although the FAStT700 Storage Server has fault indicators, these lights are summary indicators and might not identify the specific component that has failed or needs replacing, or which type of recovery procedure you must perform. In some cases (such as loss of redundancy in FAStT700 Storage Server drive loops), the fault light does not come on. Only the storage-management software can detect the failure.

Recovering from a FAStT700 Storage Server failure might require you to perform procedures other than replacing the component. The storage-management software gives these procedures when you are using the Recovery Guru menu.

Note: Always follow the software recovery procedures to prevent data loss.

For more information about the storage-management software, refer to the Online help or publications that are appropriate for your operating system (see "Related publications" on page xvi).

Checking the indicator lights

The FAStT700 Storage Server indicator lights display the status of the FAStT700 Storage Server and its components. Green indicator lights mean normal operating status; amber indicator lights mean a possible failure.

It is important that you check all the indicator lights on the front and back of the FAStT700 Storage Server a few minutes *after* you turn on the power. After you turn on the power, the indicator lights might blink intermittently. Wait until the FAStT700 Storage Server completes its power up before checking for faults. It can take up to 15 minutes for the battery to complete its self-test and up to 24 hours to fully charge, particularly after an unexpected power loss of more than a few minutes.

The indicator lights for the components of the FAStT700 Storage Server are described in the following sections.

Storage server indicator lights

The storage server has five indicator lights, as shown in Figure 23 on page 22. To view the storage server indicator lights, you do not have to remove the FAStT700

Storage Server bezel.

Power
Green light indicates power is on.
Normal status: On
Problem status: Off

Power supply
Amber light indicates a power supply fault.
Normal status: Off
Problem status: On

Fan
Amber light indicates a fan fault.
Normal status: Off
Problem status: On

Controller
Amber light indicates a controller fault.
Normal status: Off
Problem status: On

Fast Write Cache
Green light indicates data in cache.
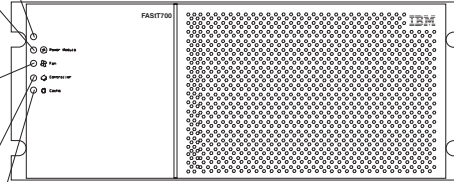
Figure 23. Storage server indicator lights

Table 2 on page 23 describes the storage server indicator lights.

Table 2. Storage server indicator lights

Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator[1]
Power	Green	On	Off	• No power to FAStT700 Storage Server • Power supply cables are loose or the switches are off • Both power supplies have failed, are missing, or are not fully seated in FAStT700 Storage Server • Overtemperature condition
Power supply fault	Amber	Off	On	• One of the redundant power supplies has failed or the power supply is turned off, disconnected, or is not fully seated in the FAStT700 Storage Server • Overtemperature condition • If both power supplies have failed, are turned off, or disconnected (all of the indicator lights will not be lit)
Storage server fan fault	Amber	Off	On	• Storage server fan has failed • Fan and communications module is missing, unplugged, or has failed • Storage server fan circuitry failure • Overtemperature condition
Controller fault	Amber	Off	On	• RAID controller is restarting • RAID controller has failed • One or more controller memory modules have failed
Fast write cache	Green	Steady or blinking[2]	Software dependent[1]	During normal operation, the indicator light is not lit in the following conditions: • RAID controller cache is not enabled • Battery is not ready

[1] Always use the storage-management software to identify the failure. [2] The fast write cache indicator light is on when there is data in cache and blinks during a fast write operation.

RAID controller indicator lights

Each RAID controller has ten indicator lights: one power, one fault, and eight status lights, as shown in Figure 24 on page 24.

Note: To view the RAID controller indicator lights, remove the FAStT700 Storage Server bezel, as shown in Figure 20 on page 16.

Fault-B
Amber light indicates controller fault.
Normal status: Off
Problem status: On

Heartbeat
Green light indicates that the controller is working.
Normal status: On (blinking)
Problem status: On

Power
Green light indicates that power is on.
Normal status: On
Problem status: Off

Status
(8 lights including the Heartbeat)
Green lights indicate controller status.

Reset switch

Controller status indicator lights

Controller A
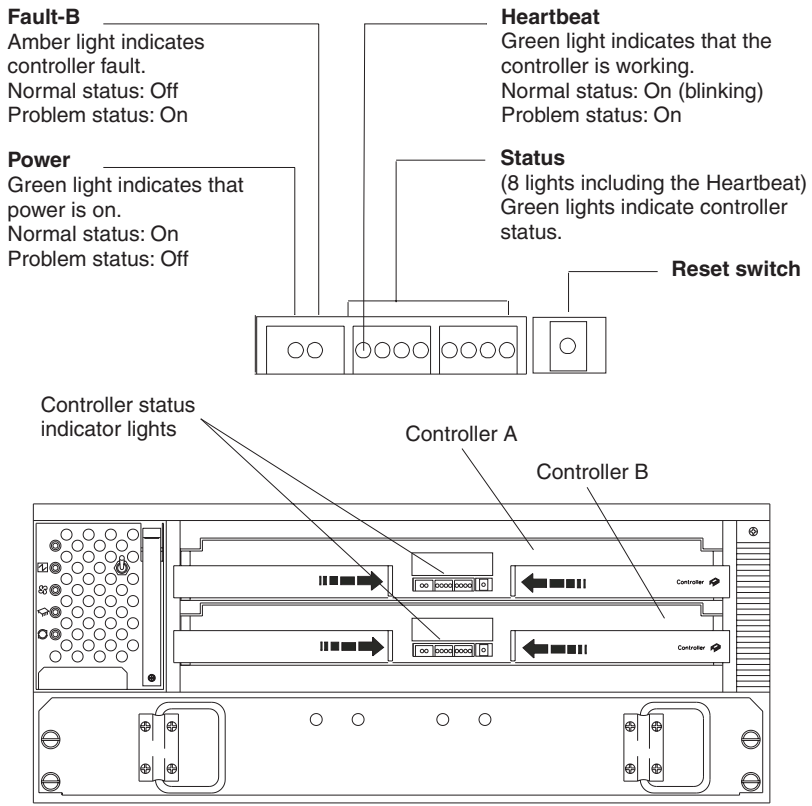
Controller B

Figure 24. RAID controller indicator lights

Table 3 on page 25 describes the FAStT700 RAID controller indicator lights.

Table 3. RAID controller indicator lights

Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator[1]
Power	Green	On	Off	• No power to storage subsystem • Cables are loose or the switches are off • Power supply has failed, is missing, or is not fully seated • Overtemperature condition
Fault[3]	Amber	Off	On	• Controller failure
Heartbeat	Green	Blinking	Not blinking	No controller activity
Status (seven[3] lights not including Heartbeat)	Green	All indicator lights are off except the heartbeat[2]	Various patterns depending on the condition[2]	If any status indicator lights are lit and the controller is not offline, there is a memory fault indicating that the controller CRU has failed.

[1] Always use the storage-management software to identify the failure. [2] There are eight indicator lights (the Heartbeat and seven others) the seven others are lit in various patterns, depending on the controller status. [3]If the controller is offline, all of the indicator lights will be lit. This does not indicate failure.

Battery indicator lights

The battery has four indicator lights, as shown in Figure 25.

Note: To view the battery indicator lights, remove the FAStT700 Storage Server bezel, as shown in Figure 20 on page 16.

Fault-B
Amber light indicates a fault in the left battery bank.
Normal status: Off
Problem status: On

Full Charge-B
Green light indicates the left battery bank is fully charged.
Normal status: On
Problem status: Off
Charging status: Blinking

Full Charge-A
Green light indicates the right battery bank is fully charged.
Normal status: On
Problem status: Off
Charging status: Blinking

Fault-A
Amber light indicates a fault in the right battery bank.
Normal status: Off
Problem status: On

Figure 25. Battery indicator lights

Table 4 on page 26 describes the battery indicator lights.

Table 4. Battery indicator lights

Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator[1]
Fault-A or Fault-B	Amber	Off	On	• Left or right battery bank has failed • Battery is either discharged or defective
Full Charge-A or Full Charge-B	Green	On[2]	Off	The left or right battery bank has failed.

[1] Always use the storage-management software to identify the failure. [2] If the Full Charge-A or Full Charge-B indicator light is blinking, the battery is in the process of charging.

Fan and communications module indicator light

The fan and communications module has one indicator light, as shown in Figure 26.

Fault
Amber light indicates a fault in the fan and communications module.
Normal status: Off
Problem status: On
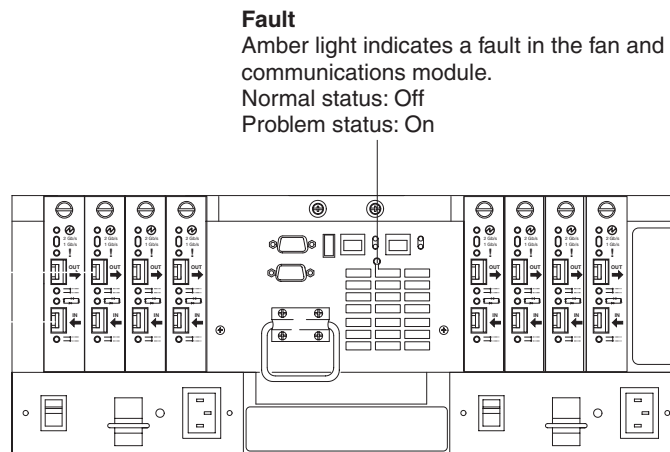
Figure 26. Fan and communications module indicator light

Table 5 describes the fan and communications module indicator light.

Table 5. Fan and communications module indicator light

Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator[1]
Fan and communications fault	Amber	Off	On	• Fan and communications module has failed or is installed incorrectly • Overtemperature condition

[1] Always use the storage-management software to identify the failure.

Power supply indicator light

The power supply has one indicator light, as shown in Figure 27.

Power supply
Green light indicates
that the power supply
is operating properly.
Normal status: On
Problem status: Off

Power supply
Green light indicates
that the power supply
is operating properly.
Normal status: On
Problem status: Off
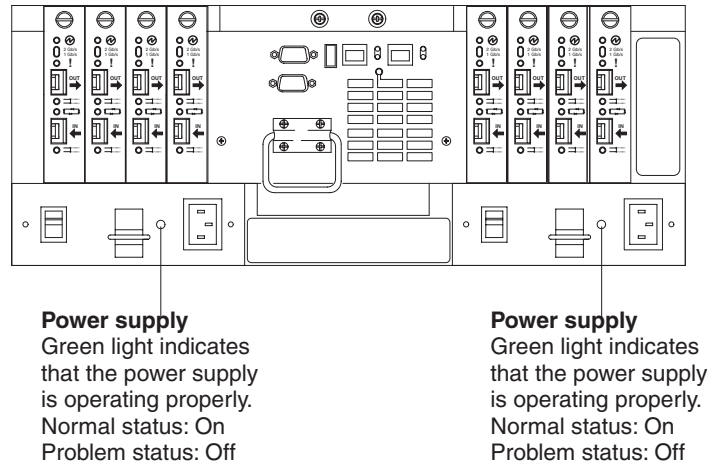
Figure 27. Power supply indicator light

Table 6 describes the power supply indicator light.

Table 6. Power supply indicator light

Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator[1]
Power supply	Green	On	Off	• Power supply has failed or is turned off • Overtemperature condition

[1] Always use the storage-management software to identify the failure.

Mini-hub indicator lights

There are five indicator lights on each mini hub. Figure 28 shows the host-side indicator lights. The drive side indicator lights are the same; however, the possible conditions indicated by the problem indicators (described in Table 7 on page 28) might be different.
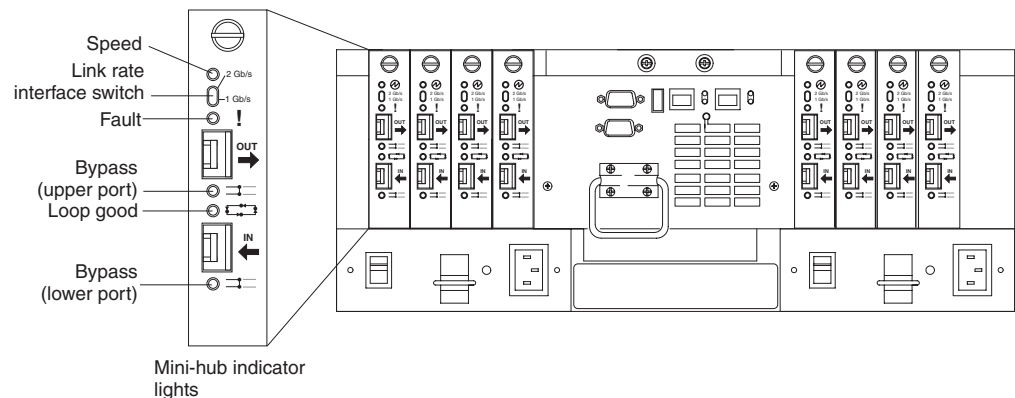
Figure 28. Mini-hub indicator lights

Table 7 describes the indicator light status when there are Fibre Channel connections to devices between host-side and drive-side mini hubs.

Table 7. Host-side and drive-side mini-hub indicator lights

Icon	Indicator light	Color	Normal operation	Problem indicator	Possible condition indicated by the problem indicator
None	Speed	Green	On for 2 Gb Off for 1 Gb	not applicable	Light on indicates data transfer rate of 2Gb/s. Light off indicates data transfer rate of 1Gb/s.
!	Fault	Amber	Off	On	Mini hub has failed **Note:** If a host-side mini hub is not connected to a controller, this fault light is always lit.
▭▬⠆⠆	Bypass (upper port)	Amber	Off	On	• Upper mini-hub port is bypassed • Mini hub port or SFP module has failed or is loose • Fiber-optic cables are damaged **Note:** When there are two functioning SFP modules installed into the mini hub ports and there are no Fibre Channel cables connected to them, the bypass indicator light is lit. If there is only one functioning SFP module installed in a host-side mini hub port and there are no Fibre Channel cables connected to it, the indicator light will not be lit. However, the drive-side mini hub bypass indicator light will be lit when there is one SFP module installed in the mini hub and the mini hub has no Fibre Channel cable connection.

Table 7. Host-side and drive-side mini-hub indicator lights (continued)

Icon	Indicator light	Color	Normal operation	Problem indicator	Possible condition indicated by the problem indicator
	Loop good	Green	On	Off	• The loop is not operational, no devices are connected • Mini hub has failed or a faulty device is connected to the mini hub • If there is no SFP module installed, the indicator will be lit • If one functioning SFP module is installed in the host-side mini hub port and there is no Fibre Channel cable connected to it, the loop good indicator light will not be lit. If one functioning SFP module is installed in the drive-side mini hub port and there is no Fibre Channel cable connected to it, the loop good indicator light will be lit. • Drive enclosure has failed (drive-side mini hub only)
	Bypass (lower port)	Amber	Off	On	• Lower mini-hub port is bypassed; there are no devices connected • Mini hub port or SFP module has failed or is loose • Fiber-optic cables are damaged **Note:** When there are two functioning SFP modules installed into the mini hub port and there are no Fibre Channel cables connected to them, the bypass indicator light is lit. If there is only one functioning SFP module installed in a host-side mini hub port and there are no Fibre Channel cables connected to it, the indicator light is not lit. However, the drive-side mini hub bypass indicator light will be lit when there is one functioning SFP module installed in the mini hub port and the mini hub has no Fibre Channel cables connected to it.

Overtemperature condition and power supply shutdown

If the fan and communications module fails or is unable to maintain an internal temperature below 70° C (158° F), one or both of the power supplies in the FAStT700 Storage Server might shut down (see Figure 29). If both power supplies shut down, the FAStT700 Storage Server is not operational.

Fault
Amber light indicates a fault in the fan and communications module.
Normal status: Off
Problem status: On

Power Supply
Green light indicates that the power supply is operating properly.
Normal status: On
Problem status: Off

Power Supply
Green light indicates that the power supply is operating properly.
Normal status: On
Problem status: Off
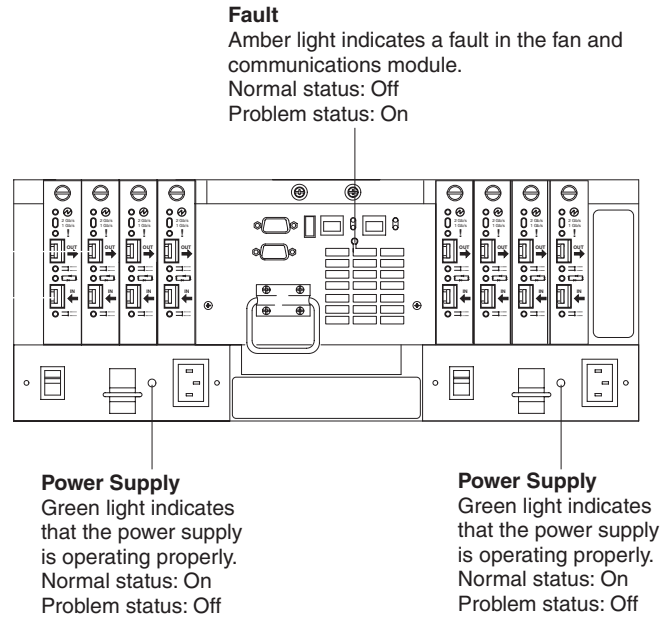
Figure 29. Fan and communications and power supply fault indicators

The storage-management software causes the fan and communications module fault indicator and storage server fan indicator to light before the temperature has risen sufficiently to shut down the power supplies. The storage server fan indicator light, shown in Figure 30, is lit when the FAStT700 Storage Server temperature exceeds 45° C (113° F). The FAStT700 Storage Server shuts down if the temperature rises to 70° C (158° F). If both power supplies shut down, the fault indicator cannot light.

Storage server fan indicator light
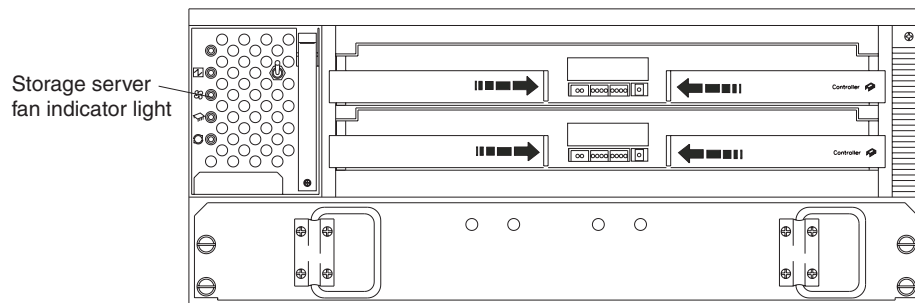
Figure 30. Storage server fan indicator

Turning on the power after an overtemperature shutdown

If your FAStT700 Storage Server shuts down unexpectedly, use the storage-management software to determine if the FAStT700 Storage Server is overheated. If an overtemperature shutdown is indicated, use the following procedure to regain normal system operation.

1. Turn off the power switches to allow the FAStT700 Storage Server to cool.
2. When the room temperature is below the upper operating temperature of 35° C (95° F), turn on the power switches.
3. Check the FAStT700 Storage Server for faults or damage. Use the storage-management software to check the overall status of the FAStT700 Storage Server and its components. Correct any problems indicated.

Turning on the power after an emergency shutdown

Use this procedure to regain normal system operation after a power failure or emergency shutdown.

1. Check all components and cables for damage. If there is no visible damage, continue with Step 2; otherwise, service the system.
2. Make sure the power cords are plugged in.
3. Make sure that the circuit breaker, drive enclosures, and storage server power switches are in the off position.
4. Turn on the circuit breakers in the rack cabinet, and turn on the power switches on all drive enclosures attached to the FAStT700 Storage Server.

   Important: You must turn on the drive enclosures *before* the FAStT700 Storage Server. The controllers might not recognize the correct configuration if the attached drives are powered up after the FAStT700 Storage Server. For instructions on powering up the drive enclosures, refer to the drive enclosure documentation.
5. Turn on both power switches on the back of the FAStT700 Storage Server. For the location of the power switches, see Figure 22 on page 19.
6. Check the status of the FAStT700 Storage Server and other devices. Make sure all fault indicator lights are off on the front and back of the FAStT700 Storage Server. For more information, see "Checking the indicator lights" on page 21.
7. When all the devices are powered up, check the overall system status using the storage-management software.

Checking the battery service date

Note: Replace the battery whenever it fails to hold a charge or every three years. Operating the FAStT700 Storage Server in a hot environment (above 35° C or 95° F) lowers the battery life expectancy.

To check the battery service date, do the following:

1. Remove the FAStT700 Storage Server bezel, as shown in Figure 20 on page 16.

2. Check the Battery Support Information label, as shown in Figure 31.

Battery Support Information
Information del Soporte de la batería
Information sur le maintien de l'accumulateur
Auskunft zur Batterieerhaltung

Date of manufacture:
Fecha de Instalación:
Date de fabrication: _____/_____/_____
Herstellungsdatum:

                            Date of installation:
                            Fecha de Instalación:
_____/_____/_____   Date d'installation:
                            Installationsdatum:

Replacement date:
Fecha de reemplazo:
Date de remplacement: _____/_____/_____
Ersatzdatum:

Figure 31. Checking the battery service date

The Battery Support Information label on the front of the battery has three dates:

- **Date of Manufacture** - Date the battery was built at the factory
- **Date of Installation** - Date the battery was installed in the FAStT700 Storage Server
- **Replacement Date** - Battery replacement date (see the note at the beginning of this section)

3. Do one the following:
- If it is time to replace the battery, install a new battery using the procedure described in "Replacing a failed battery" on page 39.
- If it is not time to replace the battery, replace the FAStT700 Storage Server bezel, as shown in Figure 21 on page 17.

Preparing to move the FAStT700 Storage Server

Remove each component CRU before moving the FAStT700 Storage Server to a new location or before removing the chassis from its rack cabinet. This helps safeguard the equipment and ensures a smoother transition to the new environment.

If you are moving the FAStT700 Storage Server a short distance, and you have sufficient assistance or equipment, you might be able to move the FAStT700 Storage Server without removing each component CRU. If you do not have sufficient assistance or equipment, use the procedure in "Moving or relocating the FAStT700 Storage Server" on page 33 to safely move the equipment to its new location.

If you are moving the FAStT700 Storage Server a significant distance, be sure to pack it in its original shipping container.

Moving or relocating the FAStT700 Storage Server

Use the following procedure to remove all component CRUs before moving or relocating the FAStT700 Storage Server.

1. Prepare the FAStT700 Storage Server for shutdown. Refer to "Turning off the power" on page 19.

2. Label the host Fibre Channel and interface cables and disconnect them.

   Attention: Handle and install fiber-optic cables properly to avoid degraded performance or loss of communications with devices. When working with fiber-optic cables, do not pinch them, step on them, or locate them in aisles or walkways. Do not bend the cables to a radius of less than 38 mm (1.5 in.).

3. Disconnect all remaining cables from the FAStT700 Storage Server and label them so that you can correctly reconnect them later.

   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

4. Remove all CRUs from the FAStT700 Storage Server. For information about removing and replacing CRUs, see "Chapter 3. Replacing FAStT700 Storage Server components" on page 35.

5. Remove the two screws from the inside rear of the FAStT700 Storage Server; then, remove the two screws from the inside front of the FAStT700 Storage Server. Save the screws for later. For detailed information, see the *Rack Mounting Instructions* that come with the storage server.

   Attention: Do not remove the black hex head screws. These secure the rails that support your FAStT700 Storage Server.

   Statement 4:

   | ≥ 18 kg (39.7 lb) | ≥ 32 kg (70.5 lb) | ≥ 55 kg (121.2 lb) |
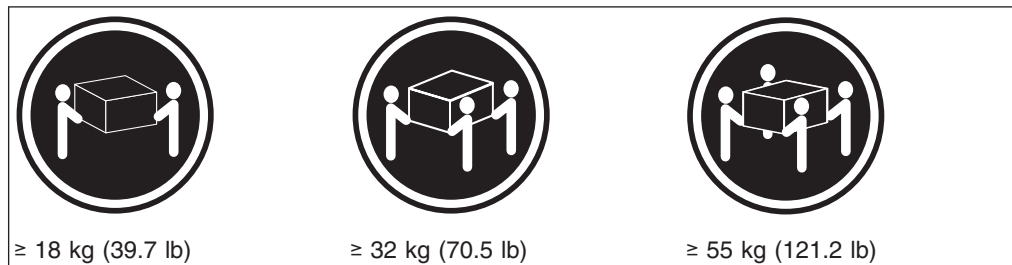
   CAUTION:
   Use safe practices when lifting.

6. Slide the FAStT700 Storage Server out of the rack cabinet and set it on a level, dry surface.

7. Do one of the following:

   • If you are shipping the FAStT700 Storage Server to another location, replace all CRUs in the FAStT700 Storage Server. Carefully pack the unit in its original shipping container. You are finished with this procedure.

   • If you are moving the FAStT700 Storage Server to another rack cabinet, remove the support rails and power cords from the old rack cabinet and install them in the new one.

8. To install the FAStT700 Storage Server into a rack cabinet in the new location, do the following:

   a. Slide the FAStT700 Storage Server into the rack cabinet.

   b. Insert and tighten two of the screws that you removed in Step 5, on the inside front of the FAStT700 Storage Server.

   c. Insert and tighten the remaining two screws that you removed in Step 5, on the inside rear of the FAStT700 Storage Server.

9. Replace all CRUs in the FAStT700 Storage Server.

10. Connect the interface cables and host Fibre Channel cables that you labeled in Step 3 on page 33.

11. Connect the remaining cables to the FAStT700 Storage Server.

12. Turn on power to the FAStT700 Storage Server. Use the procedure in "Turning on the power" on page 18.

13. Replace the FAStT700 Storage Server bezel.

Chapter 3. Replacing FAStT700 Storage Server components

The FAStT700 Storage Server contains two RAID controllers, a cooling system containing four fans, mini hubs, SFP modules, and a power system. This chapter includes detailed instructions on replacing these components.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective package until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least two seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

FAStT700 Storage Server controller

The FAStT700 Storage Server supports RAID technology. The FAStT700 Storage Server contains two RAID controllers.

Each controller comes in a removable, portable unit, called a controller CRU, as shown in Figure 33 on page 37. Each controller CRU slides into one of two controller slots on the front of the FAStT700 Storage Server and attaches to hosts through Fibre Channel connections. Two handles lock the controller in place. Each controller slot has a controller slot designation that identifies the physical location of the controller in the chassis: controller slot A (top) or controller slot B (bottom). Each controller CRU has ten indicator lights: one power, one fault, and eight status indicator lights, as shown in Figure 32 on page 36.

Attention: If you are removing both controllers (controller A and controller B) from the FAStT700 Storage Server, label controllers A and B with the white tape dots that are included in the rack mounting assembly kit. To prevent data loss, the controllers must be installed into their original location.

Fault-B
Amber light indicates
controller fault.
Normal status: Off
Problem status: On

Power
Green light indicates that
power is on.
Normal status: On
Problem status: Off

Heartbeat
Green light indicates that the
controller is working.
Normal status: On (blinking)
Problem status: On

Status
(8 lights including the Heartbeat)
Green lights indicate controller
status.

Reset switch

Controller status
indicator lights

Controller A

Controller B

Figure 32. Controller status indicator lights

Servicing notes

Consider the following when servicing the controllers in the FAStT700 Storage Server:

- The FAStT700 Storage Server supports two controller CRUs, which attach to hosts through Fibre Channel connections.
- You can hot swap or replace a failed controller while the FAStT700 Storage Server is in operation as long as the host has a Fibre Channel connection to the functioning controller and is in a "passive" or "offline" status in the storage-management software.
- If cache mirroring is enabled in redundant controllers and one controller fails, the second controller assumes processing functions without data loss. However, some or all data might be lost if cache mirroring is disabled and a failure occurs before data is written from cache memory to disk.
- If you replace the controller CRU and still experience problems, the FAStT700 Storage Server might have other defective components or connections. Check the storage-management software for indications of other component failures.
- When a controller CRU fails, the fault light on the affected controller is lit. For more information about indicator lights, see "RAID controller indicator lights" on page 23.

- The two controllers are automatically synchronized when you replace a failed controller. The storage-management software automatically synchronizes the firmware between the existing controller and the new controller.

Replacing a failed controller

When instructed by the storage-management software, replace a controller CRU using the following procedure.

Attention: After replacing a controller, always use the storage-management software to verify the firmware levels.

1. Remove the FAStT700 Storage Server bezel, as shown in Figure 20 on page 16.

   Attention: Removing a controller that is operating normally (not failed) can result in data loss. Only remove a controller that:
   - Has a fault indicator light that is lit
   - Is marked as "Failed" (offline) through the storage-management software

2. Using Figure 33 as a guide, remove the controller that has failed.
   a. Squeeze the two center tabs and pull both controller handles outward.
   b. Using both handles, pull out on the controller to remove it.
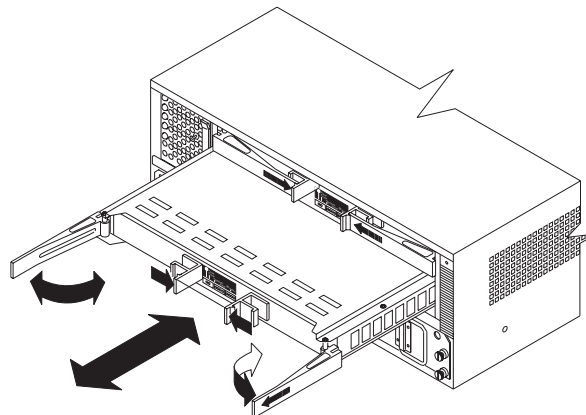
Figure 33. Removing and replacing a failed controller CRU

   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

3. Unpack the new controller. Using the proper handling precautions, remove the new controller from the packing material.

   Check the shipping invoice and the controller to make sure that it has the same memory size as the controller that you just removed.

4. Using Figure 33 as a guide, install the new controller as follows:
   a. Squeeze the two center tabs and pull both controller handles outward.
   b. Using the handles, slide the controller into the slot until the back edge of both handles hooks onto the frame.
   c. Close both handles and snap into place.

5. Using Figure 34 as a guide, check the controller indicator lights.

Power
Power supply
Controller fan
Controller
Fast write cache

FAStT700

Power Module
Fan
Controller
Cache

IBM
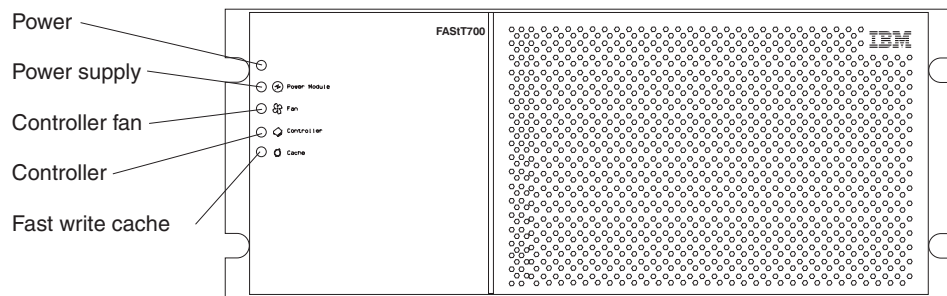
Figure 34. Indicator lights on the FAStT700 Storage Server bezel

- If the green power indicator is on and the amber fault indicator is off, go to Step 8.
- If the green power indicator remains off or the fault indicator is on after a few seconds, make sure that the controller CRU is locked into place. If the fault indicator remains on, go to Step 6.

6. Use the storage-management software to check the status of both controllers. If applicable, perform the recovery procedures required by the software. If this corrects the fault and the FAStT700 Storage Server is operating without error, go to Step 8. If not, go to Step 7.

7. Reinsert the controller CRU. Then, if there are no error messages or controller faults, go to Step 8 If there is still a problem, call for service.

8. Replace the FAStT700 Storage Server bezel, as shown in Figure 21 on page 17.

Battery

The battery CRU contains rechargeable batteries and a battery-charger board. The battery CRU plugs into the front of the FAStT700 Storage Server (see Figure 35 on page 41) where it provides backup power to the cache memory in both controllers. During a power outage, a properly charged battery CRU maintains electrical current to the controllers for up to five days with 1 Gb cache memory installed. All data stored in memory is preserved as long as the batteries can sustain power to the cache memory. However, the battery does not provide power to the rest of the system during a power outage. Therefore, the system is not able to write data to hard disk drives without a backup power source.

Servicing notes

Consider the following when servicing the battery in the FAStT700 Storage Server:

- The battery has a three-year life expectancy. Replace the battery every three years or whenever it fails to hold a charge. Operating the FAStT700 Storage Server in an unsupported environment (above 35° C or 95° F) lowers the life expectancy of the battery.
- The service label on the battery provides a blank line for recording the date on which the battery was last serviced (see Figure 36 on page 42). Check this label to determine when to replace the battery. For information about using the software to track battery age, refer to the IBM FAStT Storage Manager documentation and online help.
- When a battery fails, the fault light on the battery is lit. For more information about indicator lights, see "Battery indicator lights" on page 25.

- If you replace the battery and still experience battery problems (for example, loss of battery power to the controllers or batteries not charging properly), the FAStT700 Storage Server might have defective components or connections. Check the storage-management software for indications of other component failures.

Replacing a failed battery

When instructed by the storage-management software, replace the battery.

Attention: Because the battery CRU is a sealed unit, you must replace the entire CRU (not just the batteries) in order to keep the battery backup system in working order. Opening the battery CRU voids your warranty.

1. Use the storage-management software to disable caching. Caching is disabled when the Fast write cache indicator light is off. Data in cache is unprotected if a power outage occurs while the battery CRU is out of operation.

   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

2. Remove the FAStT700 Storage Server bezel, as shown in Figure 20 on page 16.

   Attention: Be careful when removing the battery. The battery weighs approximately 6.4 kg (14 lb.).

3. Using Figure 35 on page 41 as a guide, remove the battery.

   a. Loosen the four captive screws on the battery. If necessary, use a flat blade screwdriver to loosen the screws.

   b. Using both pull handles, slide out the battery about 5 cm (2 in.).

   c. Using both hands, grasp the sides of the battery and pull out.
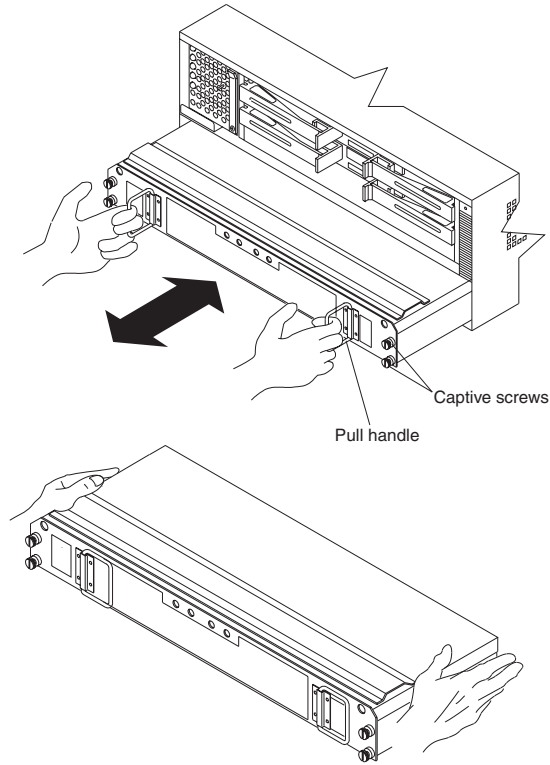
Figure 35. Removing and installing a battery

4. This product contains a sealed lead acid battery. The battery must be recycled or disposed of properly.
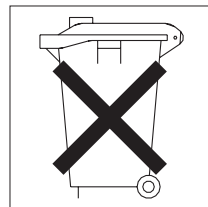
CONTAINS SEALED LEAD BATTERY. BATTERY MUST BE RECYCLED.

Pb

Recycling facilities may not be available in all areas.

In the United States, IBM has established a collection process for reuse, recycling, or proper disposal of used IBM sealed lead acid batteries. For information on proper disposal of these batteries, please contact IBM at 1-800-426-4333. Please have the IBM part number listed on the battery available prior to your call.

For information on disposal of sealed lead acid batteries outside the United States, contact your local waste disposal facility.

5. Prepare the new battery. Unpack the battery CRU. Save the packing material for shipping the used battery CRU to a disposal facility.

6. Find the "Battery Support Information" label on the front of the new battery CRU, as shown in Figure 36.
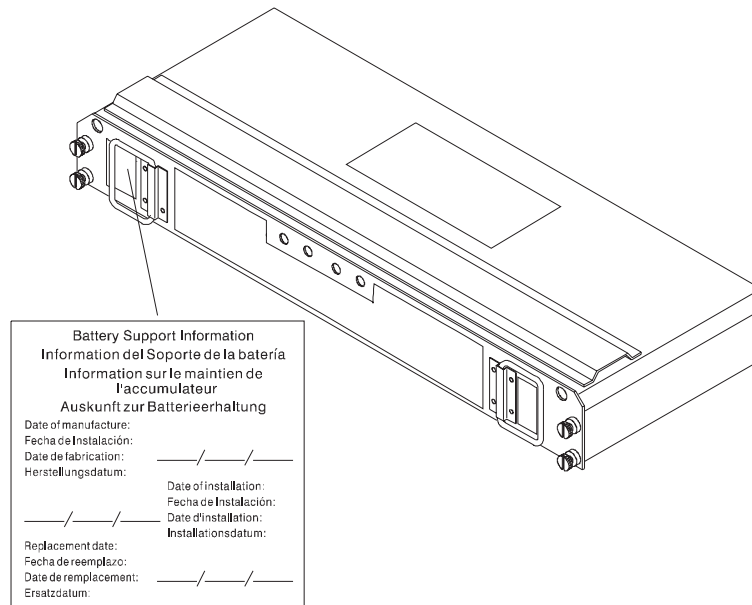
Figure 36. Recording the battery support information

Fill in the following information:

- Date of Installation - Record today's date on the blank line
- Replacement Date - Record the expiration date (three years from today's date) on the blank line

7. Install the new battery.

   a. Using both hands, slide the battery about 5 cm (2 in.) into the slot.

   b. Using the pull handles, slowly push the battery completely into the slot.

   c. Tighten the four captive screws.

8. Replace the FAStT700 Storage Server bezel, as shown in Figure 21 on page 17.

9. Run the system for at least 24 hours to properly charge the batteries. The battery might take up to 15 minutes to complete its self-test and up to 24 hours to fully charge, especially after a power loss of more than a few minutes. When properly charged, both full-charge indicator lights on the front of the battery are lit.

10. Check the battery indicator lights, as shown in Figure 37.

Fault-B
Amber light indicates a fault in
the left battery bank.
Normal status: Off
Problem status: On

Full Charge-B
Green light indicates the left
battery bank is fully charged.
Normal status: On
Problem status: Off
Charging status: Blinking

Full Charge-A
Green light indicates the right
battery bank is fully charged.
Normal status: On
Problem status: Off
Charging status: Blinking

Fault-A
Amber light indicates a fault
in the right battery bank.
Normal status: Off
Problem status: On

Figure 37. Battery CRU indicator lights

Note: If the Full Charge-A and the Full Charge-B indicator lights are blinking,
the battery is in the process of charging.

11. After your battery has completed the self test, reset the battery installation date
using the storage-management software. The software continues to issue
battery-related errors if the installation date is not reset.

Storage server fan

The storage server fan is a single, removable unit containing two cooling fans and
temperature monitoring circuitry. The storage server fan plugs directly into a slot on
the front of the FAStT700 Storage Server, to the left of the controllers (see
Figure 39 on page 45). Five indicator lights provide overall system status
information (see Figure 40 on page 46). The dual fans in the storage server fan unit
provide a redundant cooling system to both controller CRUs. If one fan fails, the
other continues to operate, providing sufficient air circulation to prevent the
controllers from overheating until you can replace the entire storage server fan.

To prevent cooling problems, the FAStT700 Storage Server must have proper air
circulation throughout the chassis. Cooling problems include any malfunctions or
obstructions that impede air flow and cause one or more components in the
FAStT700 Storage Server to overheat. Make sure that the ambient air temperature
around the FAStT700 Storage Server is within the environmental requirements. To
boost air circulation, the FAStT700 Storage Server chassis has air vents along its
top and sides. These vents serve as air intake and exhaust passages. Always keep
vents clean and free of obstructions (*Refer to the IBM FAStT700 Fibre Channel
Storage Server Installation Guide* for operating specifications).

Figure 38 on page 44 shows the FAStT700 Storage Server air flow. Make sure your
installation site allows adequate ventilation to the FAStT700 Storage Server during
operation.

> **Note:** Allow at least 60 cm (2 ft) of clearance in front of and behind the FAStT700 Storage Server for proper ventilation.
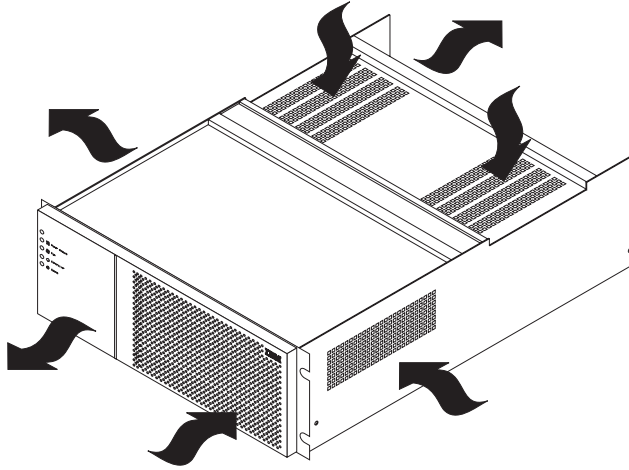
Figure 38. FAStT700 Storage Server airflow

Servicing notes

Consider the following when servicing the storage server fan:

- The storage server fan and the fan and communications module cooling system failing simultaneously in the storage server is unlikely. Such a failure will cause either one or both controllers to overheat. Under these circumstances, the amber controller light on the front panel might be lit. If this occurs, shut down the FAStT700 Storage Server immediately and let the unit cool to room temperature and then replace the storage server fan.

- You can hot swap, or replace, the storage server fan, as long as you complete the exchange within 15 minutes. The time limit applies to the total time that the fan is out of the chassis. The time begins when you remove the failed storage server fan and ends when you install the new one. This does not include the time it takes to perform the entire procedure (for example, checking the indicator lights).

- When a storage server fan fails, the fault light on the storage server fan is lit. For more information about indicator lights, see "Storage server indicator lights" on page 21.

- If you replace the storage server fan and still experience problems, the FAStT700 Storage Server might have defective components or connections. Check the storage-management software for indications of other component failures.

- The storage server fan indicator light is also used to indicate a fan and communications module failure. Be sure to check the storage server fan and fan and communications module before calling for service.

Replacing a failed storage server fan

When instructed by the storage-management software, replace the storage server fan.

1. Remove the FAStT700 Storage Server bezel, as shown in Figure 20 on page 16.

Attention: To prevent damage to the FAStT700 Storage Server components, do not operate the FAStT700 Storage Server without adequate ventilation to the controllers. If it will take longer than 15 minutes to replace the storage server fan, you must shut down the FAStT700 Storage Server to prevent it from overheating. The time limit applies to the total time that the fan is out of the chassis. For more information, see "Turning off the power" on page 19.

2. Remove the failed storage server fan, as shown in Figure 39.

   a. Lift up the lever on the storage server fan.

   b. Pull firmly on the bottom lip to remove the fan.
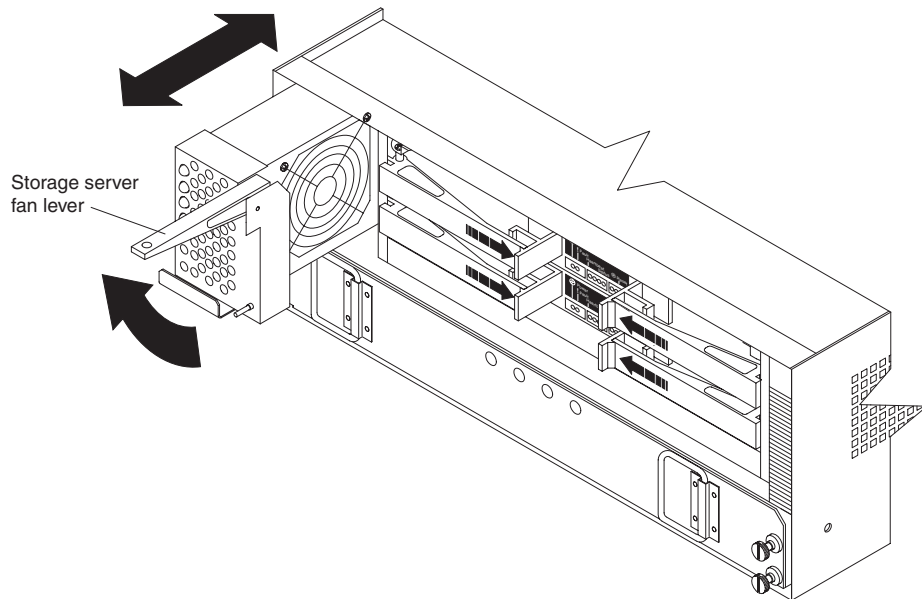
Figure 39. Removing and installing the storage server fan

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

3. Unpack the new storage server fan.

4. Install the new storage server fan.

   a. Slide the new storage server fan all the way into the slot.

   b. Press down on the lever and snap the lever into place.

5. Using Figure 40 as a guide, check the storage server indicator lights on the fan.

Fan

Power
Green light indicates power is on.
Normal status: On
Problem status: Off

Power supply
Amber light indicates a power supply fault.
Normal status: Off
Problem status: On

Fan
Amber light indicates a fan fault.
Normal status: Off
Problem status: On

Controller
Amber light indicates a controller fault.
Normal status: Off
Problem status: On

Fast Write Cache
Green light indicates data in cache.

Figure 40. Storage server indicator lights

- When the storage server fan is operating properly, the green power indicator is lit and the amber fan indicator is off.
- If the amber fan indicator is lit or the green power indicator remains off, make sure that the storage server fan is seated securely in the slot and that the lever is snapped into place. Check the storage server fan or the fan and communications module status.
- If the storage server fan indicator remains on, it might indicate a problem with the new storage server fan or the fan and communications module (both components share the same indicator light). Replace the storage server fan with a spare, if available. Otherwise, turn off the FAStT700 Storage Server to prevent it from overheating until you can replace the fan.

6. Replace the FAStT700 Storage Server bezel, as shown in Figure 21 on page 17.

Fan and communications module

The fan and communications module is a single, removable unit containing two cooling fans and two Ethernet ports. This module plugs into a slot at the center back of the FAStT700 Storage Server, just above the power supplies (see Figure 42 on page 48). It has a locking lever and a pull handle for securing and removing the fan and communications module. The module contains dual fans that provide a redundant cooling system to both power supplies. If one fan within the module fails, the other continues to operate. A single fan provides sufficient air circulation to prevent the power supplies from overheating until you can replace the entire fan and communications module.

Servicing notes

Consider the following when servicing the fan and communications module:

- The fan and communications module contains two Ethernet connections used for direct network-management.
- You can hot swap the fan and communications module as long as you complete the exchange within 15 minutes from when you remove the failed unit until you install the new one.
- It is unlikely that the storage server fan and the fan and communications module cooling system will fail simultaneously. Such a failure will cause one or both power supplies to overheat. In these circumstances, the amber power supply indicator light on the bezel is lit and the overheated power supply automatically shuts down (the green power indicator light on the power supply turns off). Once the ambient air temperature cools below 70° C (158⁝ F), the power supply automatically turns on. Replace the failed fan and communications module; then, check the power supply indicator lights (fault indicator light on the front and power indicator light on the back). If the power supply fault indicator light remains on, replace the power supply. For more information about indicator lights, see "Fan and communications module indicator light" on page 26 and the Figure 27 on page 27.
- If you replace the fan and communications module and still experience problems, the FAStT700 Storage Server might have defective components or connections. Check the storage-management software for indications of other component failures.

Replacing a failed fan and communications module

When instructed by the storage-management or diagnostic software, replace the fan and communications module.

Attention: To prevent damage to the FAStT700 Storage Server circuitry, do not operate the FAStT700 Storage Server without adequate ventilation to the power supplies and mini hubs. If it will take longer than 15 minutes to replace the fan and communications module, you must shut down the FAStT700 Storage Server to prevent it from overheating. The time limit applies only to the total time that the fan and communications module is out of the chassis. The time begins when you remove the failed module and ends when you install the new one. This does not include the time it takes you to perform this entire procedure (for example, checking the indicator lights).

1. Disconnect all Ethernet interface cables from the failed fan and communications module. The locations of the ports are shown in the following figure.
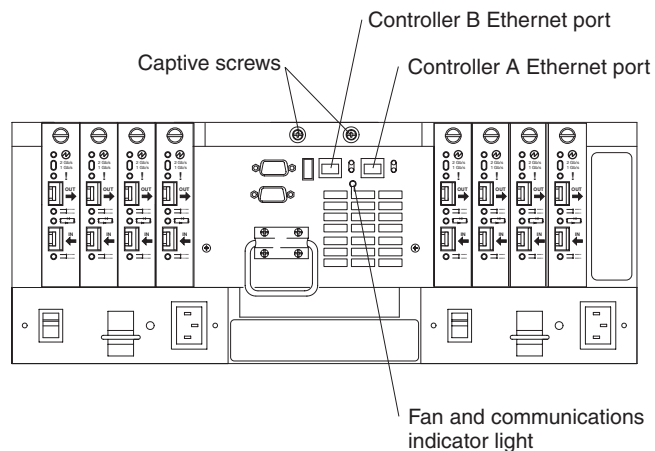
Figure 41. Fan and communications module ports and indicator light

2. Using Figure 42 as a guide and use the following steps to remove the failed fan and communications module from the FAStT700 Storage Server.
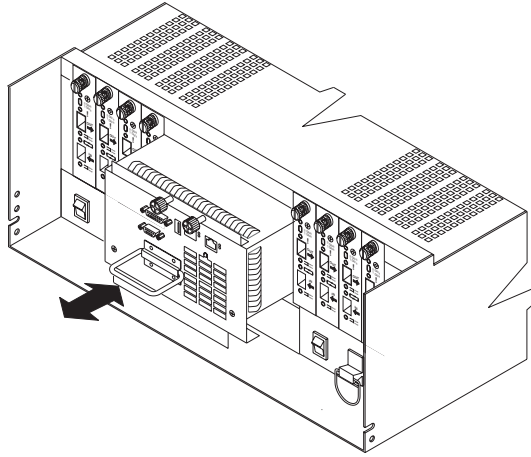
Figure 42. Removing and installing a fan and communications module

   a. Using a flat-blade screwdriver, loosen the two captive screws on the fan and communications module.

   b. Use the pull handle to slide the module out of the slot a few inches.

   c. Grasp the sides of the module with both hands and remove it from the FAStT700 Storage Server.

   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

3. Unpack the new fan and communications module.

4. To install the new fan and communications module do the following:

   a. Push the new fan and communications module all the way into its chassis slot.

   b. Use a flat-blade screwdriver to tighten the two captive screws on the new module, securing it into place.

5. Check the fan and communications indicator light. See Figure 41 for the location of the fan and communications indicator light.

   • If the amber fault indicator light is on, make sure that the fan and communications module is inserted all the way into the chassis and secured in place.

   • If the fault indicator light remains on, one or both fans inside the fan and communications module might be malfunctioning. Replace the failed fan and communications module with a spare, if available. Otherwise, shut down the FAStT700 Storage Server until you can replace the failed fan and communications module with a new one.

6. Reconnect the interface cables that you disconnected in Step 1 on page 47 to the new fan and communications module.

Power supply

The FAStT700 Storage Server power system consists of two power supplies. The power supplies slide into either of the two slots on the back of the FAStT700 Storage Server. The power supplies provide power to the internal components by converting incoming ac voltage to dc voltage. The power supplies are interchangeable and redundant. Each power supply uses one power cord. You can plug both power cords into a common power source or plug each cord into a separate circuit for power redundancy. One power supply can maintain electrical power to the FAStT700 Storage Server if the other power supply is turned off or malfunctions.

Servicing notes

Consider the following when servicing the power supplies:

- Each power supply has a built-in sensor that detects the following conditions:
  - Overvoltage
  - Overcurrent
  - Overtemperature

  If any of these conditions occur, one or both power supplies enter shutdown mode. All power remains off until one of the following occurs:
  - You cycle the power switches (turn off the power switches, wait at least 30 seconds, then turn on the power switches). For more information, see "Overtemperature condition and power supply shutdown" on page 30.
  - The power supplies automatically resume operation when the ambient air temperature cools to below 70° C (158⁞ F). When the power supplies automatically resume operation, the FAStT700 Storage Server also resumes operation.
- You can hot swap (replace) a power supply because the two power supplies provide redundancy.
- Both power supplies have built-in temperature sensors designed to prevent the power supplies from overheating. If a temperature sensor detects an ambient air temperature greater than 70° C (158° F), the "overheated" power supply automatically shuts down. The second power supply remains on as long as its temperature remains below 70° C (158° F). If the second power supply overheats, it turns off all power to the FAStT700 Storage Server.

  Note: There is a serious problem if the air temperature inside the rack cabinet is hot enough to cause the power supplies to shut down.
- The FAStT700 Storage Server is capable of power-up recovery without operator intervention. Once the air temperature cools to below 70° C (158° F), the power supplies automatically restart. An automatic restart resets the controllers, attempts to restart the hard disk drives, which has no effect on the hard disk drives if they are already running, and returns the FAStT700 Storage Server to normal operation.
- When a power supply fails, the green power indicator light on the power supply goes off and the amber power supply fault light is lit on the front of the FAStT700 Storage Server. For more information, see "Power supply indicator light" on page 27 and "Storage server indicator lights" on page 21.
- If you replace the power supply CRU and still experience problems, the FAStT700 Storage Server might have defective components or connections. Check the storage-management software for indications of other component failures.

Replacing a failed power supply

When instructed by the storage-management software, replace a power supply.

1. Check the power supply indicator light on the back of the FAStT700 Storage Server, as shown in Figure 43. Be sure that the green power indicator light on the failed power supply is off.

Fault
Amber light indicates a fault in the fan and communications module.
Normal status: Off
Problem status: On

AC power connector

Power switch

Power switch

AC power connector

Power supply
Green light indicates that the power supply is operating properly.
Normal status: On
Problem status: Off

Power supply
Green light indicates that the power supply is operating properly.
Normal status: On
Problem status: Off

Figure 43. Power supply switch, ac power connectors, and indicator lights

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.

2. Turn off the power switch and unplug the power cord from the failed power supply (see Figure 43 on page 50).

    Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

3. Using Figure 44 on page 52 as a guide, remove the failed power supply. Lift up and pull out on the pull handle to release the power supply; then, slide the unit

out.
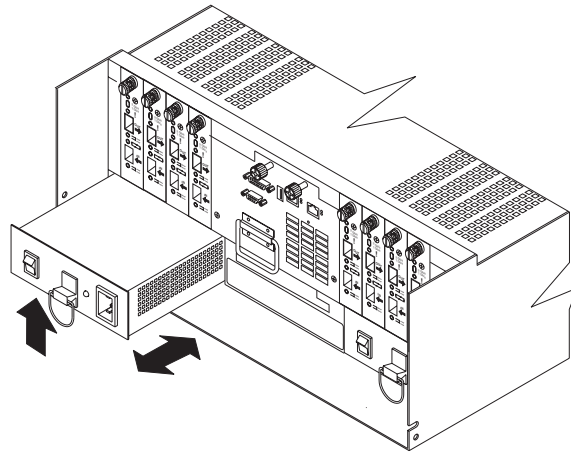
Figure 44. Removing and installing a power supply CRU

> **Attention:** When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

4. Unpack the new power supply.

5. Install the new power supply, as shown in Figure 44. Using the pull handle, push the power supply into the slot until it locks into place.

6. Plug in the power cord and turn on the power supply switch.

7. Check the new power supply and other FAStT700 Storage Server indicator lights for faults. For more information, see "Checking the indicator lights" on page 21.

Small Form-Factor Pluggable (SFP) Modules

Small Form-Factor Pluggable (SFP) modules are used to connect mini-hub ports to attached nodes. An SFP module slides into a mini-hub port on the back of the FAStT700 Storage Server and then a host or drive-interface cable connects into the SFP module. For more information, see "Fibre Channel connections" on page 2 and "Mini hubs" on page 56.

Servicing notes

Consider the following when servicing SFP modules:

- The SFP module housing has an integral guide key designed to prevent you from inserting the SFP module improperly.
- Use minimal pressure when inserting the SFP module into a mini-hub port. Forcing the SFP module into a port could cause damage to the SFP module or the port.
- You can insert or remove the SFP module while the storage server is powered on.
- The operational loop performance is not affected when you install or remove an SFP module.
- You must insert the SFP module into a mini-hub port *before* you connect the fiber-optic cable.

- You must remove the fiber-optic cable from the SFP module before you remove the SFP module from the mini hub.
- Four indicator lights on a mini hub provide status information. If an SFP module fails, the corresponding SFP port bypass indicator will be lit on the mini-hub. For more information about indicator lights, see "Mini-hub indicator lights" on page 27.
- If you replace the SFP module and still experience problems, the FAStT700 Storage Server might have defective components or connections. Check the storage-management software for indications of other component failures.

Replacing a failed SFP module

When instructed by the storage-management software, complete the following steps to replace an SFP module from the mini hub.

Statement 3:

CAUTION:

When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

> **Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following. Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

Attention: To avoid damage to the cable or SFP module, make sure you remove the LC-LC Fibre Channel cable before you remove the SFP module.

1. Remove the LC-LC Fibre Channel cable from the SFP module that has failed. For more information, see "Handling fiber-optic cables" on page 3 and "Removing an LC-LC Fibre Channel cable" on page 8.

2. Replace the protective caps on the LC-LC Fibre Channel cables.
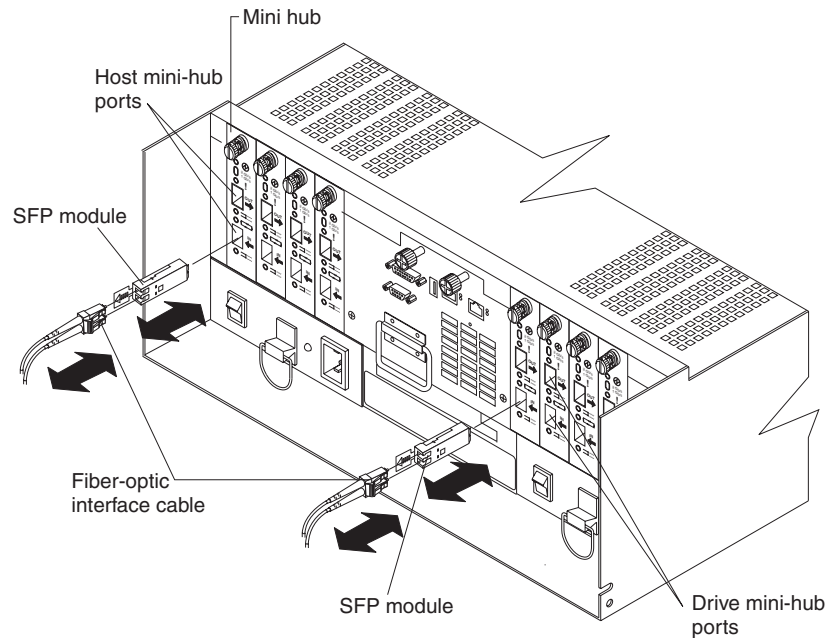
Figure 45. Replacing a failed SFP module

3. To remove the SFP module from the mini hub, do the following:

   Attention: To avoid damage to the cable or SFP module, make sure you unplug the LC-LC Fibre Channel cable *before* you remove the SFP module.

   a. Unlock the SFP module latch by pulling the plastic tab outward 10°, as shown in Figure 46. Pull the failed SFP module from the mini hub.

   b. With the SFP latch is in the unlocked position, slide the SFP module out the mini-hub port.
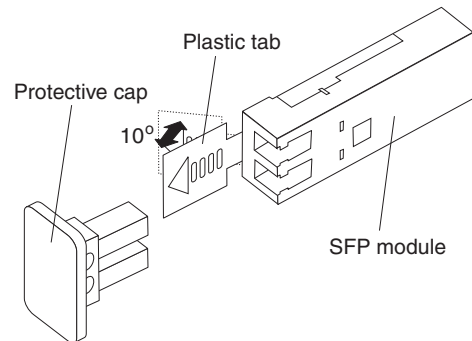
Figure 46. Unlocking the SFP module latch

   c. Replace the protective cap on the SFP module.

   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

4. Unpack the new SFP module.

5. Remove the protective cap from the SFP module, as shown in Figure 47 .
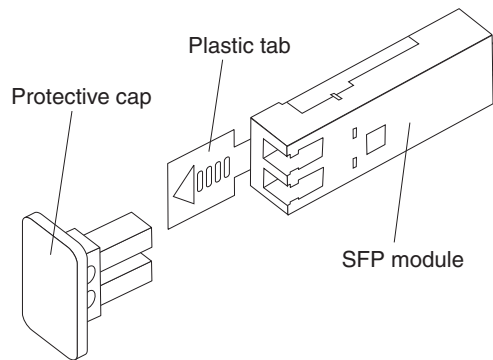
Figure 47. Small Form-Factor Pluggable (SFP) Module

6. Insert the SFP module into the mini-hub port until it clicks into place.
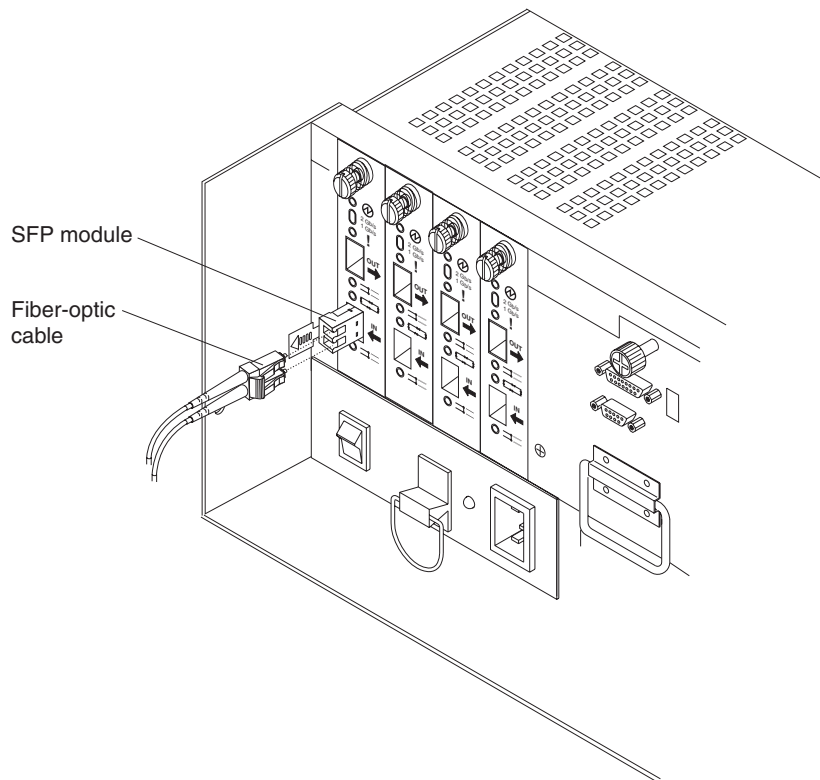
Figure 48. Installing an SFP module in a mini hub

7. Reconnect the fiber-optic cables that you removed in Step 1 on page 53.
8. Check the indicator lights on the mini hub.

   When the mini hub is operating properly, the green loop good light is lit and the fault light is not lit. If the mini-hub port is in normal operation, the amber port bypass light is not lit. If a problem is indicated, use the storage-management software to check the FAStT700 Storage Server status. For more information, see "Mini-hub indicator lights" on page 27.

Mini hubs

The mini hubs are located on the back of the FAStT700 Storage Server (see Figure 50 on page 57). A mini hub is a single, removable unit that provides the Fibre Channel interface between a FAStT700 Storage Server and hosts or drives. The back of the FAStT700 Storage Server can accommodate eight mini hubs: up to four host-side and up to four drive-side mini hubs. Each mini hub has two ports. An SFP module is installed in a mini-hub port; then, a fiber-optic interface cable is connected into the SFP module. For more information, see "Fibre Channel connections" on page 2 and "Small Form-Factor Pluggable (SFP) Modules" on page 52.

Servicing notes

Consider the following when servicing mini hubs:

- You can hot swap (replace) a failed mini hub while the FAStT700 Storage Server is in operation.
- Four indicator lights provide status information. If a mini hub fails, the interface fault and the bypass indicator lights on the mini hub are lit and the loop good indicator light is off. For more information about indicator lights, see "Mini-hub indicator lights" on page 27.
- If you replace the mini hub and the SFP modules in them and still experience problems, the FAStT700 Storage Server might have defective components or connections. Check the storage-management software for indications of other component failures.

For more information, see "Fibre Channel connections" on page 23 and "Interface ports" on page 125.

Replacing a failed mini hub

When instructed by the storage-management software, replace a mini hub. Use the following procedure to replace either a failed host-side or drive-side mini hub.

Attention: To prevent possible data loss, do not remove cables from a mini hub that has not failed.

Note: You *must* remove the fiber-optic cable from the SFP module before you can remove the SFP module from the mini-hub port.

1. On the mini hub that has failed, remove the fiber-optic cables from the SFP modules, as shown in Figure 49 on page 57.

   For proper handling of fiber-optic cables, see "Handling fiber-optic cables" on page 3.
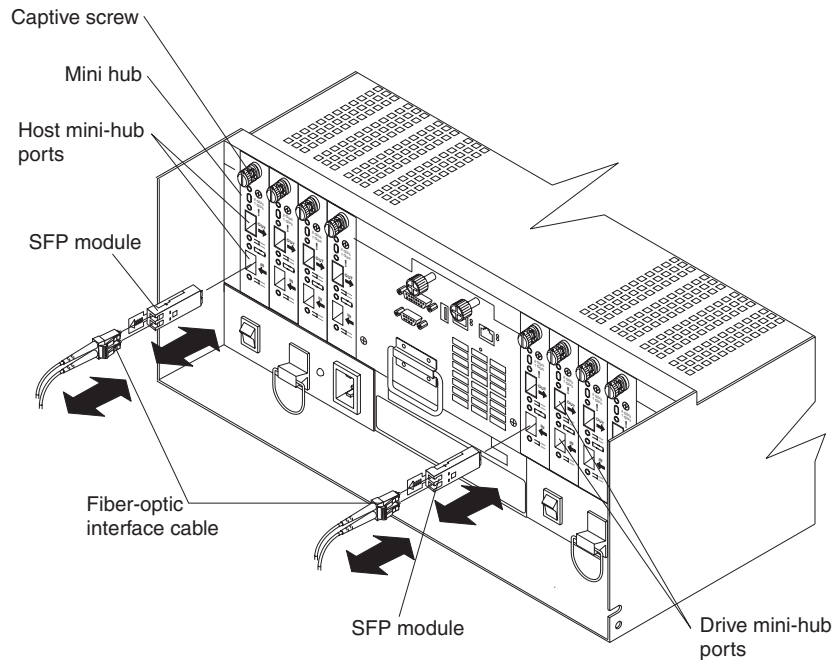
Figure 49. Removing the fiber-optic cable from the SFP module

2. Replace the protective caps on the cables.
3. Remove the SFP modules from the mini hub as follows:
   a. Unlock the SFP module latch by pulling the plastic tab outward 10° and slide the SFP module out of the mini-hub port.
   b. Replace the protective cap on the SFP module.
   c. Place the SFP modules into their static-protective packages.
4. Loosen the captive screw on the mini hub; then, grasp the screw and remove the mini hub from the chassis, as shown in Figure 50.
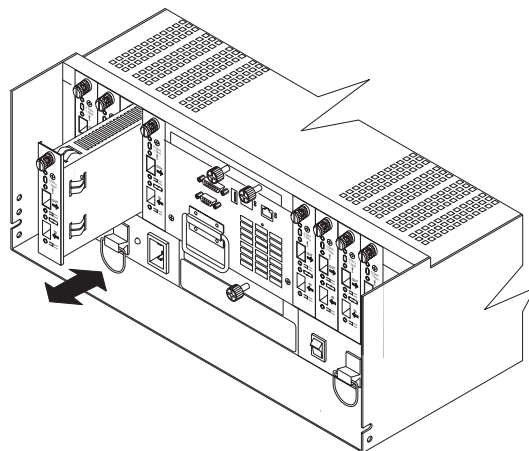
Figure 50. Removing and installing a mini hub

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling static-sensitive devices" on page 35.

5. Unpack the new mini hub and slide it into the appropriate slot; then, tighten the captive screw.

6. Install the SFP modules that you removed in Step 3a on page 54 as follows:

    a. Remove the SFP modules from their static-protective packages.

    b. Remove the protective caps from the SFP modules.

    c. Slide the SFP modules into the mini-hub ports.

7. Replace the fiber-optic cables that you removed in Step 1 on page 56.

8. Check the indicator lights on the mini hub.

    When the mini hub is operating properly, the green loop good light is lit and the fault light is off. If the mini-hub port is active, the amber port bypass light is not lit. For more information see "Mini-hub indicator lights" on page 27. If a problem is indicated, use the storage-management software to check the FAStT700 Storage Server status.

Appendix A. Getting information, help, and service

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your computer, and whom to call for service should it be necessary.

Getting information

Information about your IBM server product and preinstalled software, if any, is available in the documentation that comes with your server. That documentation includes printed books, online books, README files, and help files. In addition, information about IBM products is available on the World Wide Web and through the IBM Automated Fax System.

Using the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM products and support. The address for the IBM Personal Computing home page is http://www.ibm.com/pc/.

You can find support information for your IBM products at http://www.ibm.com/pc/support/.

If you click **Profile** from the support page, you can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable Files. In addition, you can choose to receive e-mail notifications whenever new information becomes available about your registered products.

You also can order publications through the IBM Publications Ordering System at http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

Getting information by fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada, you can receive, by fax, marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs).

You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine. In the U.S. and Canada, to access the IBM Automated Fax System, call 1-800-426-3395.

Getting help and service

If you have a problem with your server product, you will find a wide variety of sources available to help you.

Using the documentation and diagnostic programs

Many problems can be solved without outside assistance. If you experience a problem with your server product, the first place to start is the troubleshooting

information in your IBM documentation. If you suspect a software problem, see the documentation, including README files and online help, that comes with the operating system or application program.

Most IBM server products come with a set of diagnostic programs that you can use to help you identify hardware problems. See the troubleshooting information in your IBM documentation for instructions on using the diagnostic programs.

The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/pc/support/ and follow the instructions.

Calling for service

If you have tried to correct the problem yourself and still need help, during the warranty period, you can get help and information by telephone through the IBM HelpCenter®. The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make selected Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts. All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources.
- Configuration of BIOS as part of an installation or upgrade.
- Changes, modifications, or upgrades to device drivers.
- Installation and maintenance of network operating systems (NOS).
- Installation and maintenance of application programs.

Refer to your IBM Statement of Limited Warranty for a full explanation of IBM warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.

Note: Response times vary; may exclude some holidays.

In addition, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface adapters
- Installing and configuring network adapters

Please have the following information ready when you call:

- Machine type and model

- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

Telephone numbers

Phone numbers are subject to change without notice. For the most up-to-date phone numbers, go to http://www.ibm.com/pc/support/ and click **Support Phone List**.

Country		Telephone number
Austria	Österreich	01-24 592 5901
Belgium - Dutch	Belgie	02-210 9820
Belgium - French	Belgique	02-210 9800
Canada	Toronto only	416-383-3344
Canada	Canada - all other	1-800-565-3344
Denmark	Danmark	45 20 82 00
Finland	Suomi	09-22 931 840
France	France	02 38 55 74 50
Germany	Deutschland	07032-1549 201
Ireland	Ireland	01-815 9202
Italy	Italia	02-7031 6101
Luxembourg	Luxembourg	298-977 5063
Netherlands	Nederland	020-514 5770
Norway	Norge	23 05 32 40
Portugal	Portugal	21-791 51 47
Spain	España	91-662 49 16
Sweden	Sverige	08-477 4420
Switzerland	Schweiz/Suisse/Svizzera	058-333 0900
United Kingdom	United Kingdom	01475-555 055
U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-772-2227

In all other countries or regions, contact your IBM reseller or IBM marketing representative.

International Warranty Service

If you travel with your server product or relocate it to a country where your server machine type is sold and serviced by IBM or by IBM resellers who are authorized to perform warranty service, International Warranty Service is available for your server product.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your server product is eligible for International Warranty Service and to view a list of the countries where service is available, go to http://www.ibm.com/pc/support/, and click **Warranty Lookup**. Eligible IBM server products are identified by their four-digit machine types. For more information about International Warranty Service, see Service Announcement 601-034 at http://www.ibm.com/. Click **Support & downloads**, click **Announcement letters**, and click **Announcements search**. In the **Search by letter number only** field, type 601-034, and click **Search**.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region.

For more information about these services, contact your IBM marketing representative.

Appendix B. Warranty information

This appendix contains the warranty period for your product, information about obtaining warranty service and support, and the IBM Statement of Limited Warranty.

Warranty period

Contact your place of purchase for warranty service information. Some IBM Machines are eligible for on-site warranty service depending on the country or region where service is performed.

> **Machine** - IBM TotalStorage FAStT700 Fibre Channel Storage Server
>
> **Warranty period** - Three years

Warranty service and support

With the original purchase of an IBM server product, you have access to extensive support. During the IBM Machine warranty period, you may call IBM or your reseller for problem-determination assistance under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered under warranty service:

- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of non-IBM software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of machine code or licensed internal code that is designated as customer installable.

If you do not register your server with IBM, you might be required to present proof of purchase to obtain warranty service.

Before you call for service

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your server and software.

Most computers, operating systems, and application programs come with information that contains troubleshooting procedures and explanations of error

messages and error codes. The information that comes with your server also describes the diagnostic tests that you can perform.

If you suspect a software problem, refer to the information for the operating system or application program.

Calling for service

Please have the following information ready:
- Machine type, model, and serial number
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

To find the telephone number for the HelpCenter nearest you, see "Telephone numbers" in the "Getting information, help, and service" chapter.

IBM Statement of Limited Warranty Z125-4753-06 8/2000

This warranty statement consists of two parts: Part 1 and Part 2. Be sure to read Part 1 and the country-unique terms in Part 2 that apply to your country or region.

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications"). The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded.

Extent of Warranty

The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE
ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED,
INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR
CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR
PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND
YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO
JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR
LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE
EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH
WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO
WARRANTIES APPLY AFTER THAT PERIOD.

Items Not Covered by Warranty

IBM does not warrant uninterrupted or error-free operation of a Machine.

Any technical or other support provided for a Machine under warranty, such as
assistance via telephone with "how-to" questions and those regarding Machine
set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

Warranty Service

To obtain warranty service for a Machine, contact IBM or your reseller. If you do not
register your Machine with IBM, you may be required to present proof of purchase.

During the warranty period, IBM or your reseller, if approved by IBM to provide
warranty service, provides without charge certain types of repair and exchange
service to keep Machines in, or restore them to, conformance with their
Specifications. IBM or your reseller will inform you of the available types of service
for a Machine based on its country of installation. At its discretion, IBM or your
reseller will 1) either repair or exchange the failing Machine and 2) provide the
service either at your location or a service center. IBM or your reseller will also
manage and install selected engineering changes that apply to the Machine.

Some parts of IBM Machines are designated as Customer Replaceable Units
(called "CRUs"), e.g., keyboards, memory, or hard disk drives. IBM ships CRUs to
you for replacement by you. You must return all defective CRUs to IBM within 30
days of your receipt of the replacement CRU. You are responsible for downloading
designated Machine Code and Licensed Internal Code updates from an IBM
Internet Web site or from other electronic media, and following the instructions that
IBM provides.

When warranty service involves the exchange of a Machine or part, the item IBM or
your reseller replaces becomes its property and the replacement becomes yours.
You represent that all removed items are genuine and unaltered. The replacement
may not be new, but will be in good working order and at least functionally
equivalent to the item replaced. The replacement assumes the warranty service
status of the replaced item. Many features, conversions, or upgrades involve the
removal of parts and their return to IBM. A part that replaces a removed part will
assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all
features, parts, options, alterations, and attachments not under warranty service.

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
   a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides;
   b. secure all programs, data, and funds contained in a Machine;
   c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations; and
   d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

Limitation of Liability

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

   This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST SAVINGS, EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Governing Law

Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Part 2 - Country-unique Terms

AMERICAS

BRAZIL

Governing Law: *The following is added after the first sentence:*Any litigation arising from this Agreement will be settled exclusively by the court of Rio de Janeiro.

NORTH AMERICA

Warranty Service: *The following is added to this Section:* To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

The IBM Warranty for Machines: *The following paragraph is added to this Section:* The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this Section:* Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws of the State or Territory.

CAMBODIA, LAOS, AND VIETNAM

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*laws of the State of New York.

The following is added to this Section: Disputes and differences arising out of or in connection with this Agreement shall be finally settled by arbitration which shall be held in Singapore in accordance with the rules of the International Chamber of Commerce (ICC). The arbitrator or arbitrators designated in conformity with those rules shall have the power to rule on their own competence and on the validity of the Agreement to submit to arbitration. The arbitration award shall be final and

binding for the parties without appeal and the arbitral award shall be in writing and set forth the findings of fact and the conclusions of law.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator.

The two arbitrators appointed by the parties shall appoint a third arbitrator before proceeding upon the reference. The third arbitrator shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the ICC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

The English language version of this Agreement prevails over any other language version.

HONG KONG AND MACAU

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws of Hong Kong Special Administrative Region.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this Section:*
1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence;
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

JAPAN

Governing Law: *The following sentence is added to this Section:*Any doubts concerning this Agreement will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

NEW ZEALAND

The IBM Warranty for Machines: *The following paragraph is added to this Section:* The warranties specified in this Section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this Section:* Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces this Section:* Both you and IBM consent to the application of the laws of the State of New York (except when local law requires otherwise) to govern, interpret, and enforce all your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Any disputes arising from or in connection with this Agreement will first be resolved by friendly negotiations, failing which either of us has the right to submit the dispute to the China International Economic and Trade Arbitration Commission in Beijing, the PRC, for arbitration in accordance with its arbitration rules in force at the time. The arbitration tribunal will consist of three arbitrators. The language to be used therein will be English and Chinese. An arbitral award will be final and binding on all the parties, and will be enforceable under the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958).

The arbitration fee will be borne by the losing party unless otherwise determined by the arbitral award.

During the course of arbitration, this Agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES: The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

Warranty Service:

If you purchase an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM. If you purchase an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase an IBM Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM authorized service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM authorized service provider.

Governing Law:

The applicable laws that govern, interpret and enforce rights, duties, and obligations of each of us arising from, or relating in any manner to, the subject matter of this Statement, without regard to conflict of laws principles, as well as Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided, except that in 1) Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Former Yugoslav Republic of Macedonia, Romania, Slovakia, Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, the laws of Austria apply; 2) Estonia, Latvia, and Lithuania, the laws of Finland apply; 3) Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Mali, Mauritania, Morocco, Niger, Senegal, Togo, and Tunisia, this Agreement will be construed and the legal relations between the parties will be determined in accordance with the French laws and all disputes arising out of this Agreement or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 4) Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe, this Agreement will be governed by English Law and disputes relating to it will be submitted to the exclusive jurisdiction of the English courts; and 5) in Greece, Israel, Italy, Portugal, and Spain any legal claim arising out of this Statement will be brought before, and finally settled by, the competent court of Athens, Tel Aviv, Milan, Lisbon, and Madrid, respectively.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

The IBM Warranty for Machines: *The following replaces the first sentence of the first paragraph of this Section:* The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this Section:

The minimum warranty period for Machines is six months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

Extent of Warranty: *The second paragraph does not apply.*

Warranty Service: *The following is added to this Section:* During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this Section:* The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2: IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this Section:* as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this Section:*In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: *(items 1 and 2 unchanged).*

IRELAND

Extent of Warranty: *The following is added to this Section:* Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces items one and two of the first paragraph of this Section:*1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and 2. the amount of any other actual direct damages, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY

Limitation of Liability: *The following replaces the second sentence in the first paragraph:*In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than: 1. *(unchanged)* 2. as to any other actual damage arising in all situations involving nonperformance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim. *Applicability of suppliers and resellers (unchanged).*

The following replaces the third paragraph of this Section: Unless otherwise provided by mandatory law, IBM and your reseller are not liable for any of the following: *(items 1 and 2 unchanged)* 3) indirect damages, even if IBM or your reseller is informed of their possibility.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this Section:* IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces items 1 and 2 of the first paragraph of this Section:*
1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;
2. the amount of any other actual direct damages or loss, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim;

The following item is added to this paragraph: 3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

Appendix C. Notices

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Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1000000 bytes, and GB stands for approximately 1000000000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

Maximum memory may require replacement of the standard memory with an optional memory module.

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Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Electronic emission notices

Federal Communications Commission (FCC) statement

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

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference caused by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The Limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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

Taiwan electrical emission statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

IBM power cord part number	Used in these countries and regions
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa
13F9979	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0033	Antigua, Bahrain, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Ethiopia, Italy, Libya, Somalia
14F0087	Israel
1838574	Thailand
6952301	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

Index

loop good   29

M

mini hub
    indicator light   27
mini hub indicator light
    drive side   29
    host side   28, 29
mini hubs   35
    drive side   2
    host side   2

N

notes, important   74
notes, servicing   36, 38
notices   73
    electronic emission   75
    FCC, Class A   75
    used in this book   xv

O

overtemperature
    shutdown   30
overtemperature condition   30

P

period   63
power cords   76
power-on sequence   18
power supply   2
    indicator light   27
    shutdown   30
power system   35
powering off the storage server   19

R

RAID controller
    indicator lights   23
        fault   25
        heartbeat   25
        power   25
        status   25
    replacing a failed   37
RAID controllers   1, 35

S

service and support   63
service summary   59
SFP module
    removing protective cap   55
SFP modules   35
    important information about   52
shutdown sequence   20
speed   28, 29

startup sequence   18
static-sensitive devices, handling   35
storage server fan   1
storage server indicator lights   21

T

trademarks   74
turning on the power after   30, 31
turning power off   20
turning power on   18

U

United States electronic emission Class A notice   75
United States FCC Class A notice   75

W

warranty
    information   63

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