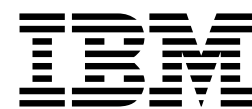


IBM® TotalStorage™ FAStT700
Fibre Channel Storage Server



Installation Guide

IBM® TotalStorage™ FAStT700
Fibre Channel Storage Server



Installation 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 47 and Appendix C, "Notices," on page 57.

First Edition (November 2001)

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Safety

Before installing this product, read the Safety Information.

مجب، يجب قراءة دات السلامة

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

在安装本产品之前，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 pečítajte Bezpečnostné predpisy.

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:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

To Disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

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

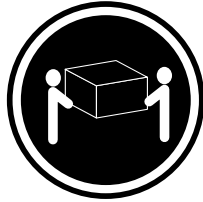
Laser Klasse 1

Laser Klass 1

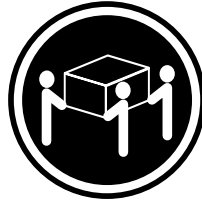
Luokan 1 Laserlaite

Appareil À Laser de Classe 1

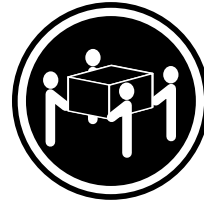
Statement 4



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



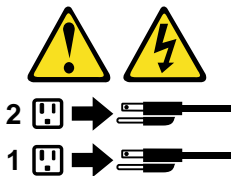
≥ 55 kg (121.2 lb)

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.



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.

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About this book

This book provides instructions for setting up, installing, and connecting your IBM® TotalStorage™ FAST700 Fibre Channel Storage Server. This installation guide is intended for system operators and service technicians who have extensive knowledge of Fibre Channel and network technology.

How this book is organized

Chapter 1, “Introduction,” on page 1 introduces the IBM FAST700 Fibre Channel Storage Server and contains set up instructions. This chapter also includes an overview of the IBM FAST700 Fibre Channel Storage Server features and components.

Chapter 2, “Connecting the FAST700 Storage Server,” on page 13 provides information about the components that connect the FAST700 Storage Server to the Fibre Channel network and instructions for connecting the FAST700 Storage Server to other Fibre Channel devices.

Chapter 3, “Starting the FAST700 Storage Server,” on page 35 provides information about connecting the power cords, turning the power on and off, checking the indicator lights, and installing the IBM FAST Storage Manager software.

Appendix A, “Getting information, help, and service,” on page 43 describes how to obtain help, service, and information about IBM products.

Appendix B, “Warranty information,” on page 47 provides warranty statements.

Appendix C, “Notices,” on page 57 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 FAST700 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 Installation Guide (this book)*¹
- *IBM® TotalStorage™ FASTT700 Fibre Channel Storage Server User's Guide*
- *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*

1. Printed publication that comes with the IBM FASTT700 Fibre Channel Storage Server.

Chapter 1. Introduction

Thank you for purchasing an IBM TotalStorage FAStT product. IBM Fibre Array Storage Technology (FAStT) solutions are designed to support the large and growing data storage requirements of business-critical applications. These scalable FAStT solutions provide data access and protection to meet your existing enterprise storage requirements and future needs.

Fibre Channel is a technology similar to a high-speed network that connects large amounts of disk storage to a server or cluster of servers. Fibre Channel technology helps increase performance, scalability, availability, and the distance that attached storage subsystems can be from network servers. The IBM FAStT700 Fibre Channel Storage Server (machine type 1742, models 1RU and 1RX) supports Fibre Channel disk drives to maximize performance and redundancy.

Fibre Channel technology supports applications that require large amounts of disk storage shared by two or more servers. With Fibre Channel, higher throughput rates over longer distances (up to 10 km) are possible than with small computer system interface (SCSI) or Serial Storage Architecture (SSA) technology.

The IBM FAStT700 Fibre Channel Storage Server (referred to throughout this book as FAStT700 Storage Server) is a high-performance unit that provides dual, redundant RAID controllers with Fibre Channel interfaces to both the host and drive loops. The FAStT700 Storage Server has redundant cooling, redundant power, and battery backup of the controller cache.

Designed to provide maximum host and drive-side redundancy, the FAStT700 Storage Server supports direct attachment of up to four hosts containing two host adapters each. 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.

This chapter provides descriptions of the primary components of the FAStT700 Storage Server and contains setup instructions. The FAStT700 Storage Server is used with rack-mounted drive enclosures (also referred to as expansion units). Figure 1 shows the IBM FAStT700 Fibre Channel Storage Server.

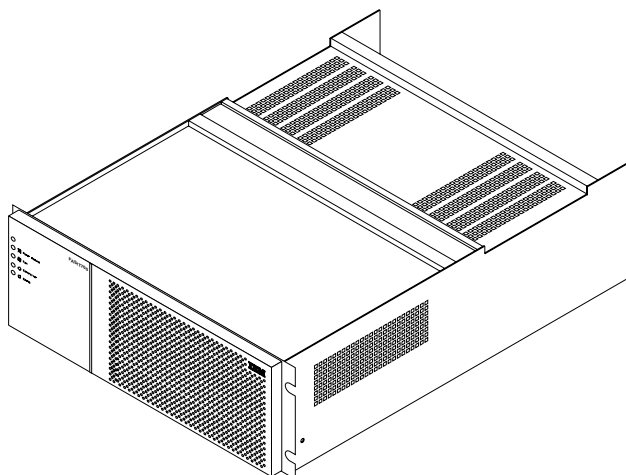


Figure 1. IBM FAStT700 Fibre Channel Storage Server

Inventory checklist

The IBM FAST700 Fibre Channel Storage Server comes with the following hardware:

- Two power cords
- One rack-mounting hardware kit:
 - Two rails (right and left)
 - Eight black M6 hex-head screws
 - Eight clip nuts
 - Eight cage nuts

The IBM FAST700 Fibre Channel Storage Server comes with the following software and documentation:

- IBM FAST Storage Manager version 8.0 CD including:
 - IBM FAST Storage Manager version 8.0
 - Publications in Adobe Acrobat Portable Document Format (PDF)
For a list of available IBM FAST700 publications, see “Related publications” on page xiv.
- Rack mounting assembly kit including:
 - *Rack Mounting Instructions*
 - *Rack Mounting Template*
 - White tape dots
- *IBM FAST700 Fibre Channel Cabling Instructions*

To connect the FAST700 Storage Server to other devices, you might need the following hardware options, which are purchased separately:

- IBM Small Form-Factor Pluggable (SFP) Module
- IBM LC-LC Fibre Channel Cable
- IBM LC-SC Fibre Channel Cable Adapter
- IBM FAST700 Mini Hub

FAST700 Storage Server components

The FAST700 Storage Server has the following removable components, called *customer replaceable units* (CRUs). All CRUs are accessible from the front or back of the FAST700 Storage Server.

- Bezel (front cover)
- RAID controller (comes with two)
- Battery
- Storage server fan
- Power supply (comes with two)
- Host mini hub (comes with two, four maximum)
- Drive mini hub (comes with two, four maximum)
- Fan and communications module
- Small Form-Factor Pluggable (SFP) module (must be purchased separately)

Figure 2 shows the FAStT700 Storage Server front bezel. The bezel is a removable front cover with holes for viewing status lights and for boosting air circulation. Figure 2 also shows the IBM FAStT700 Storage Server without the front bezel, exposing 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, battery charger circuitry, and status indicator lights for the controllers.
- **Controllers** - Two removable units that each contain one RAID controller with 1 Gb cache memory and status indicator lights.

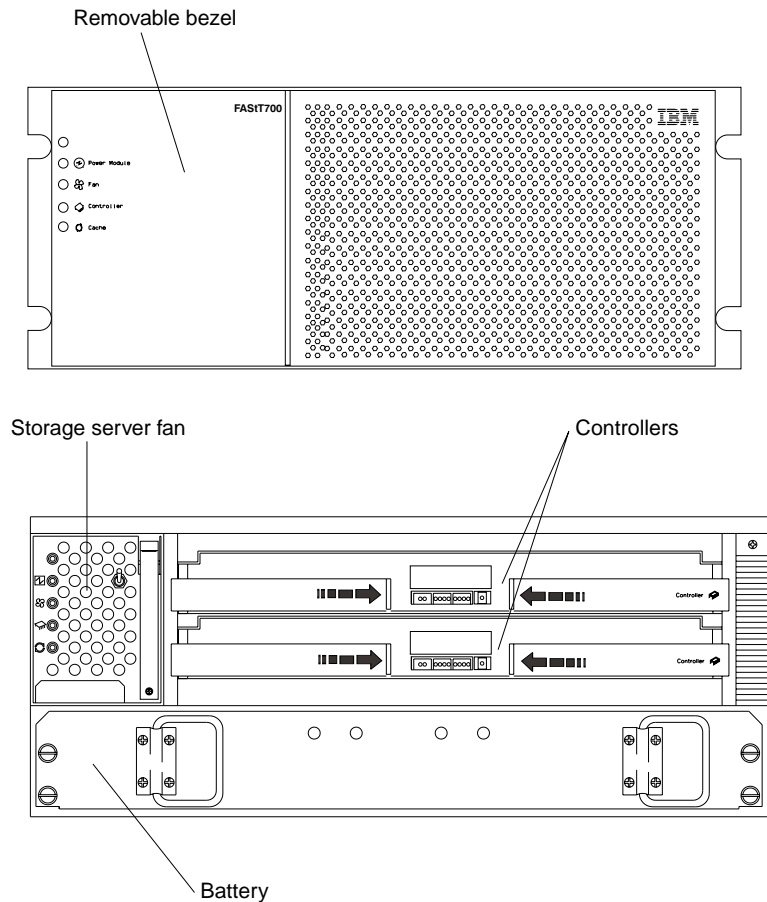


Figure 2. IBM FAStT700 Fibre Channel Storage Server - front view

Figure 3 shows the FAST700 Storage Server back view and the following components:

- **Host-side and drive-side mini hubs** - Up to eight removable mini hubs with indicator lights to which you can insert Small Form-Factor Pluggable (SFP) modules and connect fiber-optic host and drive interface cables to the FAST Storage Server (the standard FAST700 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.

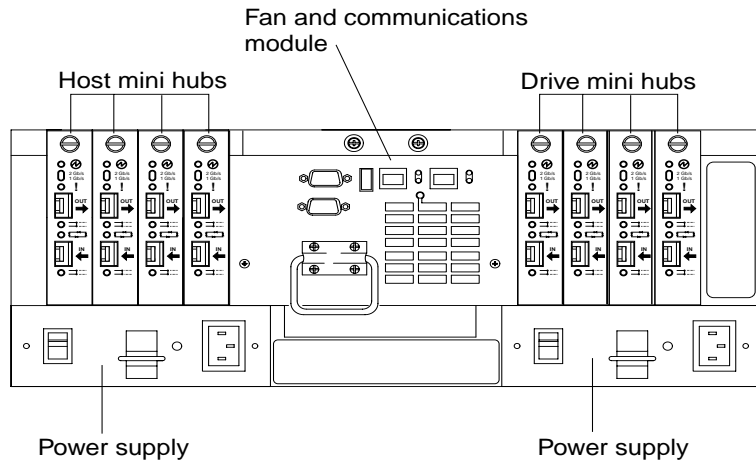


Figure 3. IBM FAST700 Fibre Channel Storage Server - back view

Operating specifications

Table 1 summarizes the operating specifications of the FAStT700 Storage Server.

Table 1. IBM FAStT700 Fibre Channel Storage Server operating specifications.

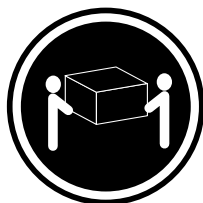
<p>Size (with front panel and without mounting rails):</p> <ul style="list-style-type: none"> Depth: 63.5 cm (25 in.) Height: 17.45 cm (6.87 in.) Width: 48.2 cm (18.97 in.) <p>Weight:</p> <p>Typical FAStT700 Storage Server fully configured: 43.99 kg (97 lbs)</p> <p>Electrical input:</p> <ul style="list-style-type: none"> Sine-wave input (50 to 60 Hz) is required Input voltage: <ul style="list-style-type: none"> Low range: <ul style="list-style-type: none"> Minimum: 90 V ac Maximum: 136 V ac High range: <ul style="list-style-type: none"> Minimum: 198 V ac Maximum: 257 V ac Input kilovolt-amperes (kVA) approximately: 0.214 kVA 	<p>Environment:</p> <ul style="list-style-type: none"> Air temperature: <ul style="list-style-type: none"> Altitude: 0 to 914 m (3000 ft): 10° to 35° C (50° to 95° F) Altitude: 914 m (3000 ft) to 2133 m (7000 ft): 10° to 32° C (50° to 90° F) Humidity: 10% to 80% 	<p>Acoustical noise emissions values:</p> <p>For typical system configurations:</p> <ul style="list-style-type: none"> Sound power (idling and operating): 6.5 bels Sound pressure (idling and operating): 65 dBA <p>These levels are measured in controlled acoustical environments according to ISO 7779 and are reported in accordance with ISO 9296. The declared sound power levels indicate an upper limit, below which a large portion of machines operate. Sound pressure levels in your location might exceed the average 1-meter values stated because of room reflections and other nearby noise.</p>
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Preparing for installation

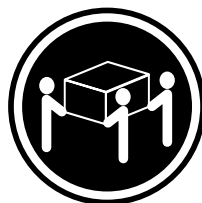
Use the following procedure to prepare the FAStT700 Storage Server for installation into a rack cabinet.

1. Prepare the site to meet all area, environmental, power, and site requirements. For more information, see “Operating specifications” on page 5.
2. Move the FAStT700 Storage Server and its rack cabinet to the site.

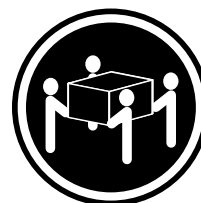
Statement 4



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

Use safe practices when lifting.

3. Remove the FAStT700 Storage Server from its shipping container and check the contents (see “Inventory checklist” on page 2). If any items are missing, contact your IBM reseller before proceeding.
4. Assemble the tools and equipment you will need for installation. These might include:
 - Power cords (comes with the FAStT700 Storage Server)
 - Number two Phillips and medium flat-blade screwdrivers
 - Antistatic protection (such as a grounding wrist strap)
 - Fibre Channel (FC) and Ethernet interface cables and cable straps
 - Rack-mounting hardware (comes with the FAStT700 Storage Server)
 - IBM FAStT Storage Manager software to configure the storage subsystems (comes with the FAStT700 Storage Server)

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.

Installing the FAStT700 Storage Server in a rack cabinet

The FAStT700 Storage Server comes with a rack-mounting hardware kit for installation into a rack cabinet. It is easier to lift the FAStT700 Storage Server and install it in a rack cabinet if you remove all CRUs first. A fully loaded FAStT700 Storage Server with a storage server fan, battery, fan and communications module, two RAID controllers, two power supplies, and eight mini hubs installed weighs 43.99 kg (97 lbs). If you remove all the CRUs, you reduce the overall weight.

For detailed instructions about removing the CRUs and installing the FAStT700 Storage Server in a rack cabinet, refer to the *Rack Mounting Template* and *Rack Mounting Instructions* that come with the FAStT700 Storage Server. If you have not already done so, read “Preparing for installation” on page 6 before you begin.

Installing additional hardware

You might need to install additional hardware if your Fibre Channel network is configured for the following:

- Host-agent (in-band) management of storage subsystem
- Direct (out-of-band) management of storage subsystem
- Cluster server environment

Use the information in the following sections to determine the additional hardware that you need.

Installing hardware for host-agent (in-band) management

If you are using the host-agent (in-band) method to manage storage subsystems, the host-agent software is installed on the host computer. You must install at least one management station and host computer; then, attach the Ethernet cables from the host computer to the management station. Figure 4 shows host-agent (in-band) managed storage subsystems.

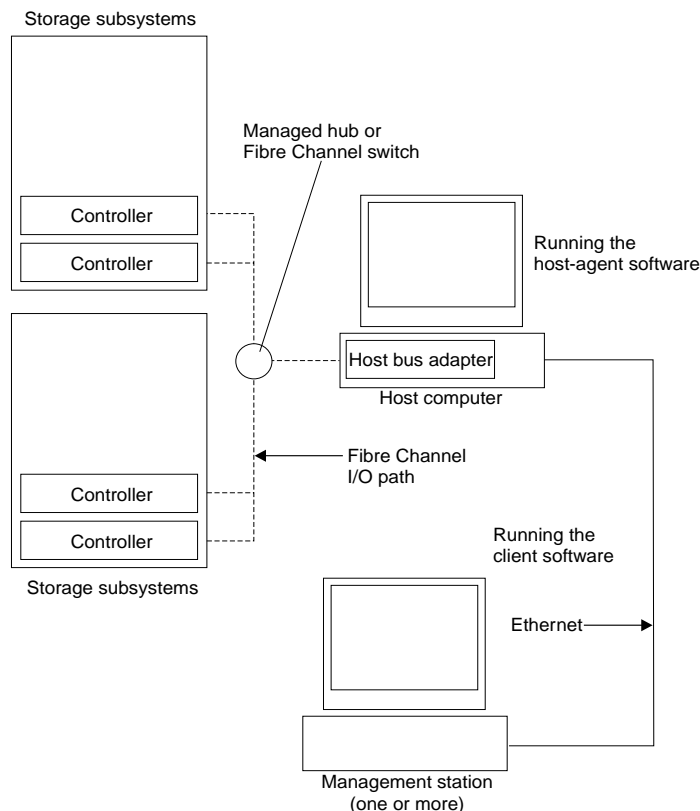


Figure 4. Host agent (in-band) managed storage subsystems

You will connect fiber-optic cables to each controller later in the installation process.

After you install the hardware, if your Fibre Channel network environment is configured for cluster servers, go to “Installing hardware for cluster servers” on page 9.

If you are installing drive enclosures in a rack cabinet, go to “Installing drive enclosures in a rack cabinet” on page 11. Otherwise, go to Chapter 2, “Connecting the FAStT700 Storage Server,” on page 13.

Installing hardware for direct (out-of-band) management

If you are using the direct (out-of-band) method to manage storage subsystems, use Ethernet connections from a management station to each controller. You must install at least one management station and then attach Ethernet cables to each management station and two Ethernet cables per FASi700 Storage Server. Figure 5 shows direct (out-of-band) managed storage subsystems.

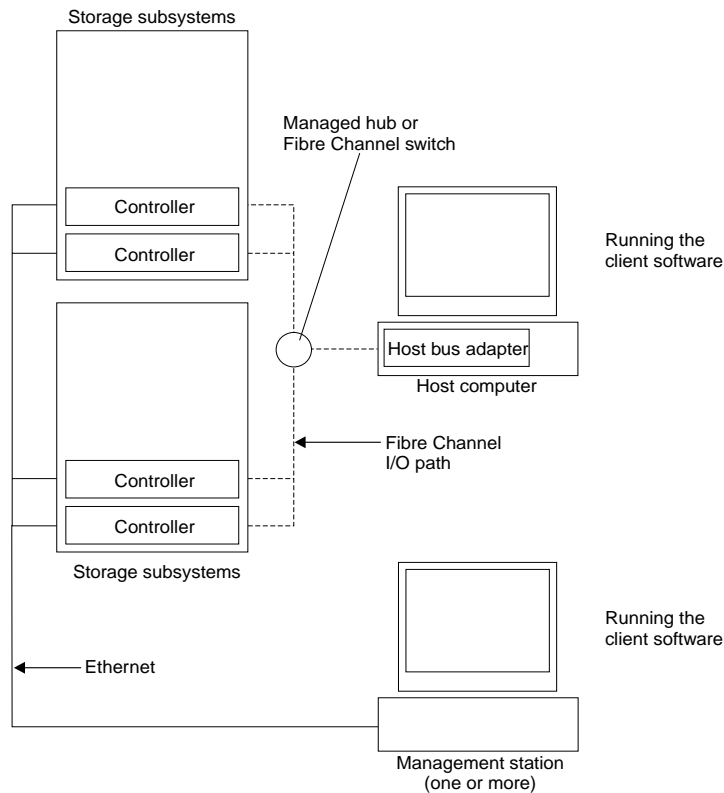


Figure 5. Direct (out-of-band) managed storage subsystems

You will connect fiber-optic and Ethernet cables to each controller later in the installation process.

After you install the hardware, if your Fibre Channel network environment is configured for cluster servers, go to “Installing hardware for cluster servers”.

If you are installing drive enclosures in a rack cabinet, go to “Installing drive enclosures in a rack cabinet” on page 11. Otherwise, go to Chapter 2, “Connecting the FASi700 Storage Server,” on page 13.

Installing hardware for cluster servers

If the Fibre Channel network environment into which you are installing the storage subsystem is configured for cluster servers, you must install two host bus adapters per cluster node. Figure 6 on page 10 shows Fibre Channel connections using a dual-path configuration for fully redundant environments.

Note: The interlink is used as the clustering heartbeat path.

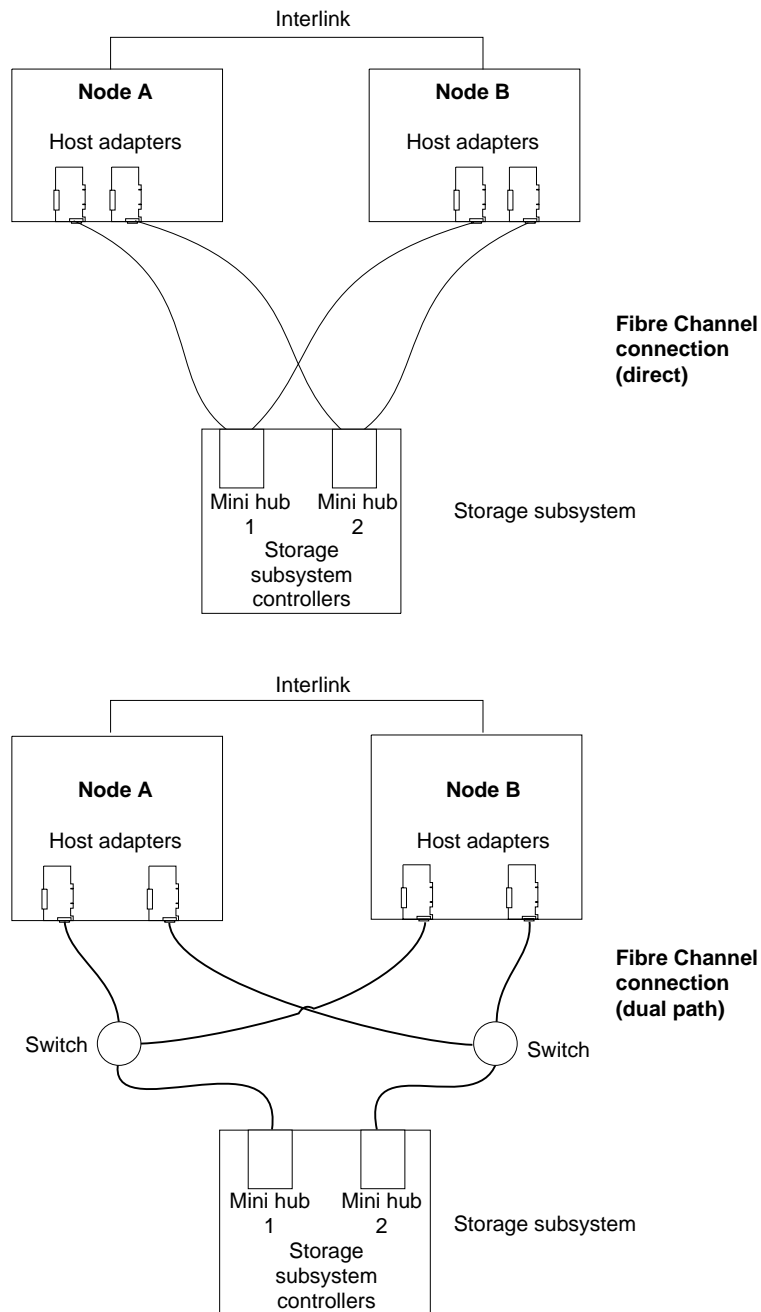


Figure 6. Installing host adapters in storage subsystems on a Fibre Channel network

Before you install the host adapters, note the following about the cluster server Fibre Channel network environment:

- When using a dual-path configuration, each node has two paths to the storage server providing greater redundancy protection if a connection problem occurs. Install two single-channel host adapters in each node.
- Use the correct host adapter device driver. Refer to the FAStT Storage Manager Installation Guide that is appropriate for your operating system and refer to the README file for information on supported host adapters and device drivers. This information is found on the *IBM FAStT Storage Manager* installation CD or at <http://www.ibm.com/pc/support/>.

Make sure each host adapter and controller has a unique Fibre Channel ID.

Refer to the documentation provided with your host adapters for installation requirements and procedures.

After you install the cluster server hardware, continue with “Installing drive enclosures in a rack cabinet” or go to Chapter 2, “Connecting the FAStT700 Storage Server,” on page 13.

Installing drive enclosures in a rack cabinet

Install the drive enclosures that you are attaching to the FAStT700 Storage Server in a rack cabinet. Preparing the drive enclosures for installation in a rack cabinet might involve any or all of the following tasks:

- Moving the drive enclosures to the installation site
- Unpacking the drive enclosures from their shipping cartons
- Checking the shipping contents
- Removing all customer replaceable units (CRUs)

For detailed instructions on installing the drive enclosures in a rack cabinet, refer to the documentation that comes with each device. After you install the drive enclosures, go to Chapter 2, “Connecting the FAStT700 Storage Server,” on page 13.

Chapter 2. Connecting the FAStT700 Storage Server

This chapter provides information about connecting the FAStT700 Storage Server to other Fibre Channel devices. It contains information about the interface connections and installing SFP modules and fiber-optic cables. This chapter also provides detailed information about configuring drive loops and connecting the FAStT700 Storage Server to hosts and drive enclosures.

FAStT700 Storage Server mini-hub interface connections

The interfaces that connect the host computers and drive enclosures to the storage server are called mini hubs. When fully configured, the back of the FAStT700 Storage Server can accommodate four host mini hubs and four drive mini hubs. Each mini hub is a removable unit. A mini hub provides the Fibre Channel interface between a controller and a host or drive enclosure. Each mini hub has two ports. A Small Form-Factor Pluggable (SFP) module connects into each mini-hub port; then, a fiber-optic cable connects into the SFP module. Figure 7 shows the mini-hub interface connections.

Note: The illustrations in this document might differ slightly from your hardware.

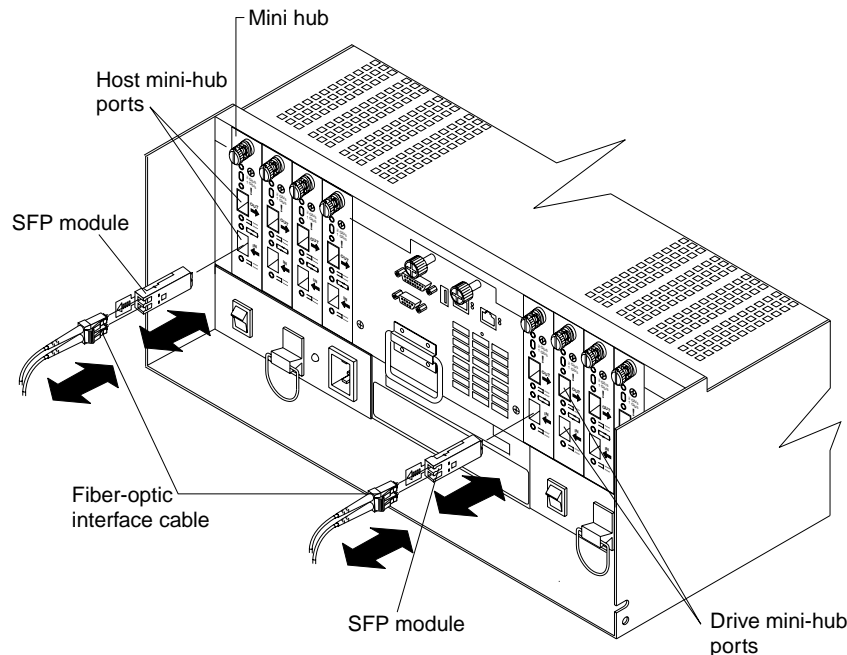


Figure 7. FAStT700 mini-hub interface connections

FAStT700 Storage Server interface ports

The SFP 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 8 on page 14.

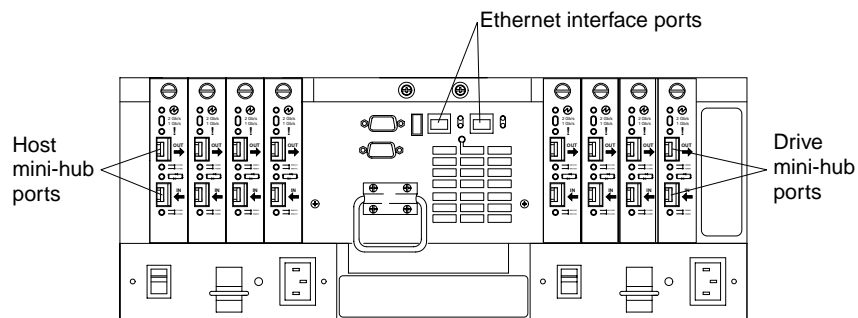


Figure 8. FASTt700 Storage Server interface ports

Host interface ports

The FASTt700 Storage Server comes with host-side mini hubs 1 and 2 installed. Host mini hubs connect to the controller in pairs. 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 9. To ensure redundancy, you must connect each host to both controllers through the appropriate mini hub.

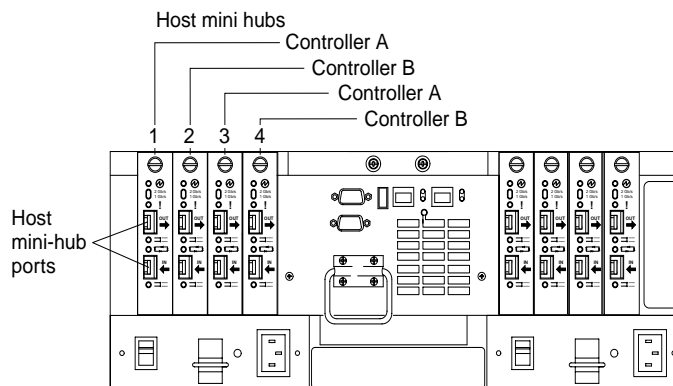


Figure 9. Host mini-hub ports

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 are 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. 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).

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 10 on page 15 shows the drive mini-hub ports.

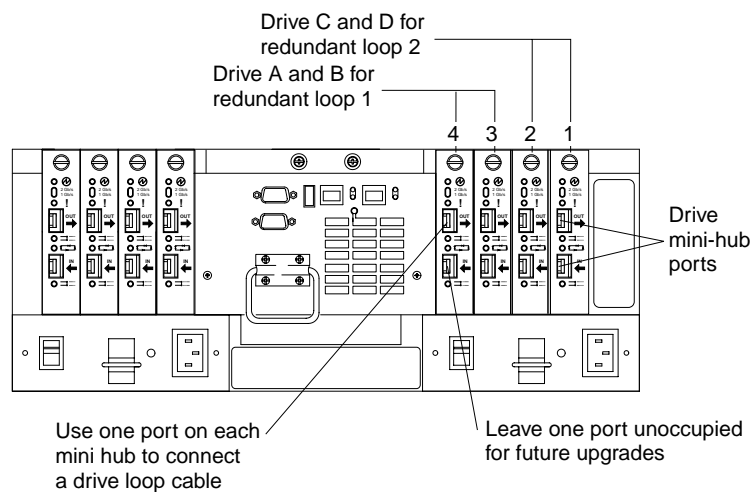


Figure 10. Drive mini-hub ports

Fibre Channel cables connect to either the upper or lower port on each drive-side mini hub through SFP modules. The remaining port on each mini hub should remain unoccupied for future upgrades.

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 11 shows the location of these ports.

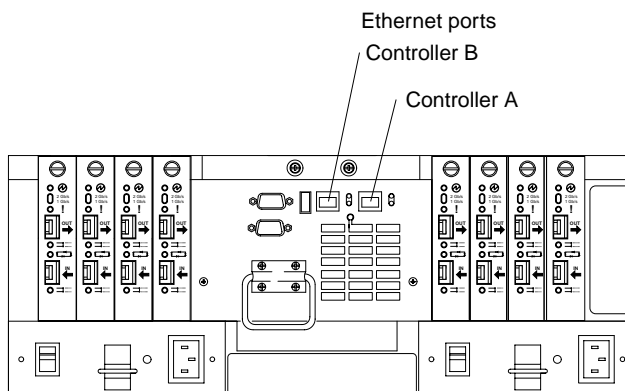


Figure 11. Ethernet ports

Installing SFP modules

The FAST700 Storage Server mini hubs require Small Form-Factor Pluggable (SFP) Modules. SFP modules are used to convert electrical signals to optical signals that are required for Fibre Channel transmission to and from RAID controllers. After you install the SFP modules, you will use fiber-optic cables to connect the FAST700 Storage Server to other Fibre Channel devices.

Before installing SFP modules and fiber-optic cables, read the following information:

- 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 port 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. Refer to “Removing SFP modules” on page 17 for more information.

To install 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.

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 6.

1. Remove the SFP module from its static-protective package.
2. Remove the protective cap from the SFP module, as shown in Figure 12 on page 17. Save the protective cap for future use.

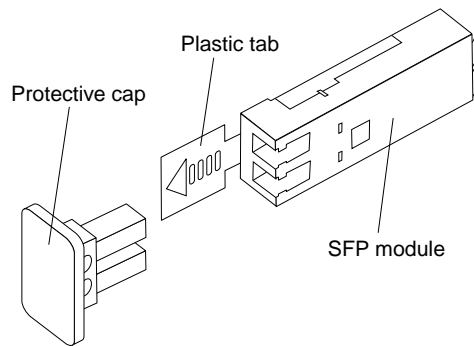


Figure 12. Small Form-Factor Pluggable (SFP) Module

3. Remove the protective cap from the mini-hub port. Save the protective cap for future use.
4. Insert the SFP module into the mini-hub port until it clicks into place.

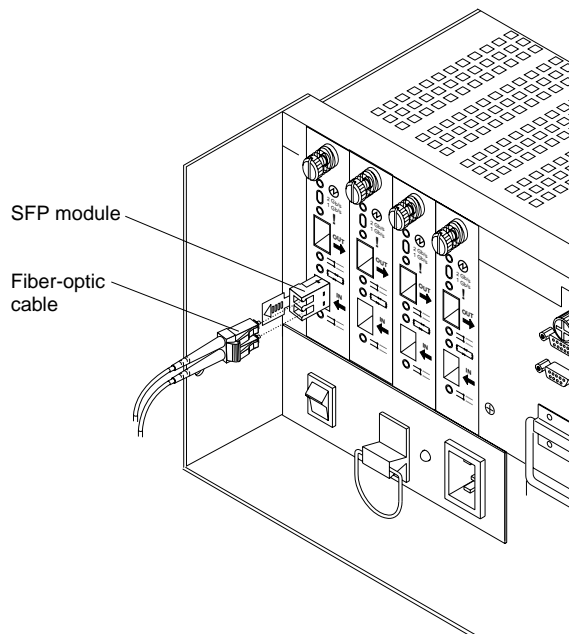


Figure 13. Installing an SFP module in a mini hub

5. Connect an LC-LC Fibre Channel cable. For information about the LC-LC cable, see “Using LC-LC Fibre Channel cables” on page 18.

Removing SFP modules

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.

1. Remove the LC-LC Fibre Channel cable from the SFP module. For more information, see “Handling fiber-optic cables” on page 18 and “Using LC-LC Fibre Channel cables” on page 18.
2. Unlock the SFP module latch by pulling the plastic tab outward 10°, as shown in Figure 14 on page 18.

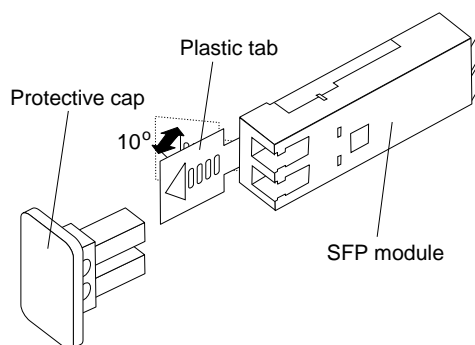


Figure 14. Unlocking the SFP module latch

3. With the SFP latch in the unlocked position, slide the SFP module out of the mini-hub port.
4. Replace the protective cap on the SFP module.
5. Place the SFP module into a static-protective package.
6. Replace the protective cap on the mini-hub port.

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 snagged by other devices in the rack.
- 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 FAST700 Storage Server mini hub
- SFP module installed in an IBM Fibre Channel switch
- Optical interface connector on an IBM FAST FC-2 Host Bus Adapter (Part number 19K1246)

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

Figure 15 on page 19 shows an LC-LC Fibre Channel cable.

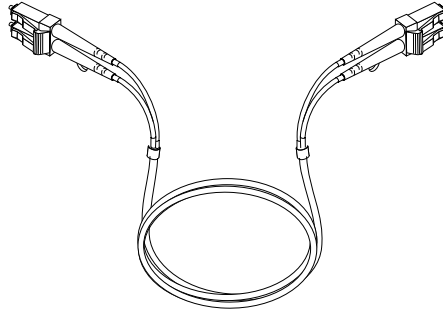


Figure 15. LC-LC Fibre Channel cable

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

Note: If you are connecting a FAST700 Storage Server to a FAST EXP500 expansion unit or to an IBM FAST host adapter, you must also use an LC-SC Fibre Channel cable adapter. For more information about using the Fibre Channel cable adapter, see “Using LC-SC Fibre Channel cable adapters” on page 22.

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 18.
2. If necessary, remove the protective cap from the SFP module, as shown in Figure 12 on page 17. 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 16. Save the protective caps for future use.

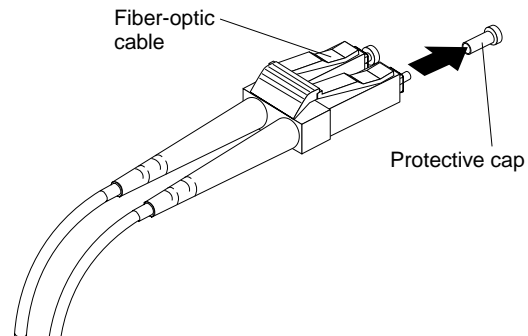


Figure 16. Removing fiber-optic cable protective caps

4. Carefully insert that same end of the LC-LC cable into an SFP module that is installed in a FAST700 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 cable until it clicks into place.

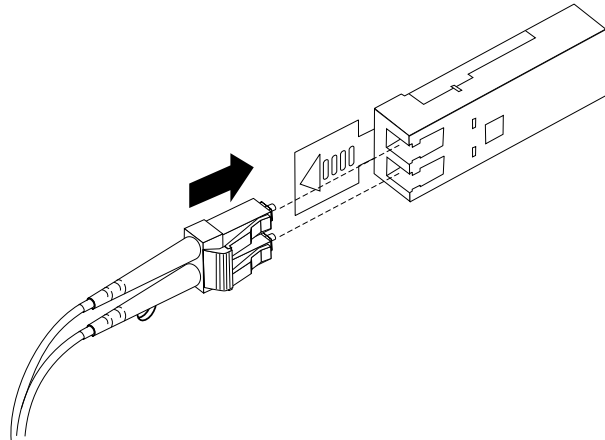


Figure 17. Inserting an LC-LC Fibre Channel cable into an SFP module

Figure 18 on page 21 shows an LC-LC Fibre Channel cable connecting into an SFP module that is installed in a FAST700 Storage Server mini hub.

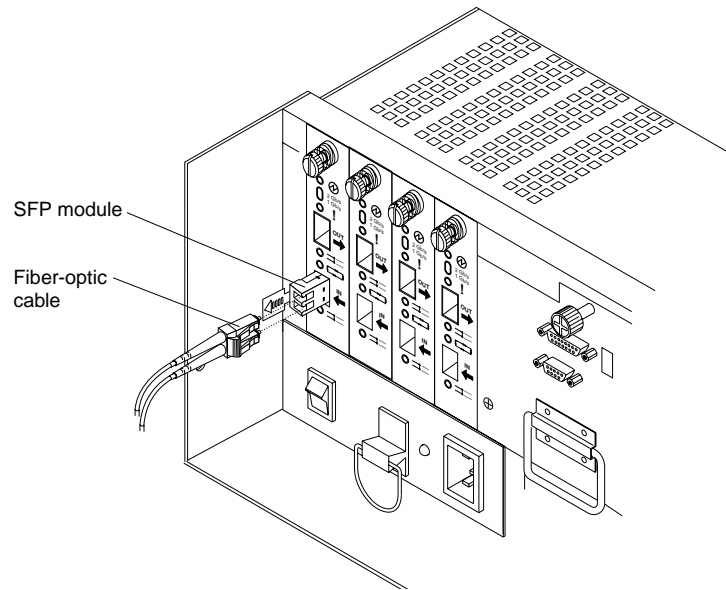


Figure 18. Inserting an LC-LC Fibre Channel cable into an installed SFP module

5. Remove the two protective caps from the other end of the LC-LC cable, as shown in Figure 16 on page 20. Save the protective caps for future use.
6. Connect 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 22.)

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 before you remove the cable from the SFP module. Ensure that the levers are in the released position when removing the cable. When removing the cable from the SFP module, make sure you do not grasp the SFP module plastic tab.

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 19 on page 22. Carefully pull on the connector to remove the cable from the SFP module, as shown in Figure 20 on page 22.

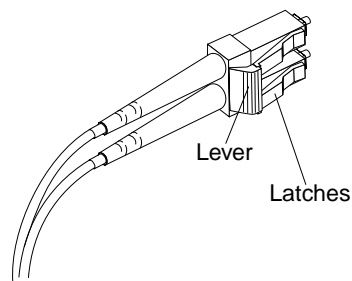


Figure 19. LC-LC Fibre Channel Cable lever and latches

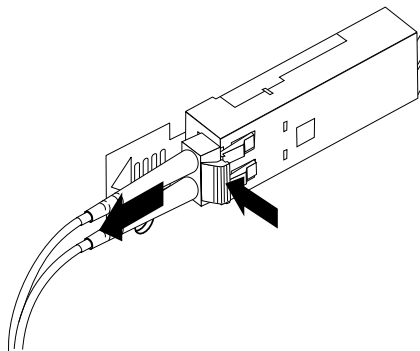


Figure 20. Removing the LC-LC Fibre Channel cable

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)
- Managed hub (Machine type 3534)

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

Figure 21 on page 23 shows an LC-SC Fibre Channel cable.

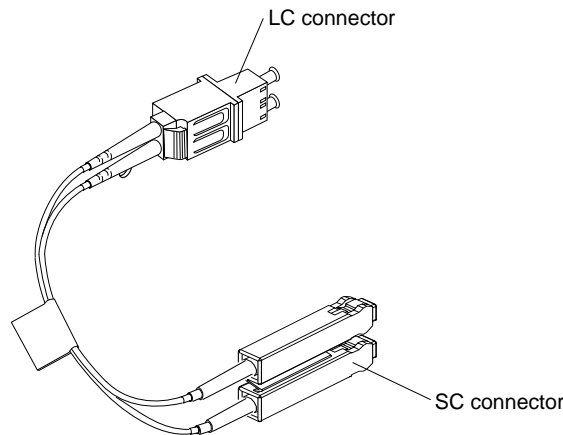


Figure 21. LC-SC Fibre Channel cable

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

Connecting an LC-SC cable to a device

To connect an LC-SC cable to a device, 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 18.
2. Connect an LC-LC cable to an SFP module in the FAST700 Storage Server mini hub. For instructions, see "Connecting an LC-LC cable to an SFP module" on page 19.

3. Remove the two protective caps from the LC connector end of the LC-SC cable, as shown in Figure 22. Save the protective caps for future use.

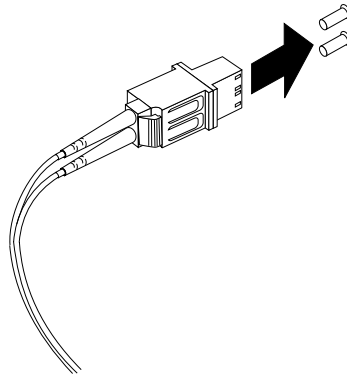


Figure 22. Removing the LC-SC cable adapter protective caps

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

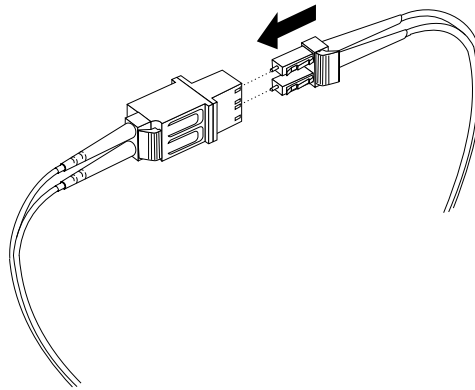


Figure 23. Connecting an LC-LC cable into the LC-SC cable adapter

5. Connect the SC connector end of the LC-SC cable to one of the following devices:
 - Optical interface connector on an IBM FASTT FC-2 Host Bus Adapter (Part number 19K1246)
 - GBIC installed in a FASTT EXP500 expansion unit (Machine type 3560)
 - 1 Gb Fibre Channel switch (Machine type 2109)

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 before you remove the cable from an LC-SC cable adapter. Ensure that both levers are in the released position when removing the cable. When removing the cable from the SFP module, make sure you do not grasp the SFP module plastic tab.

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 24 on page 25 shows the location of the lever and latches.

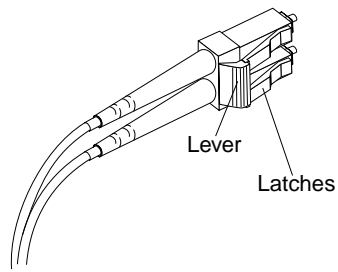


Figure 24. LC-LS Fibre Channel Cable lever and latches

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.

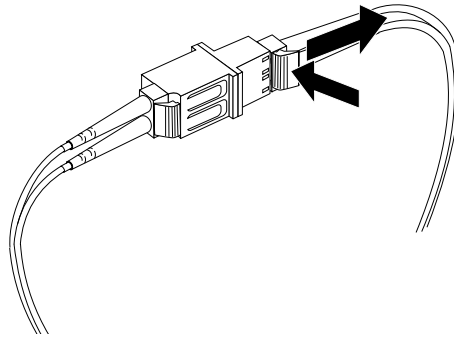


Figure 25. Removing the LC-LC Fibre Channel cable from an LC-SC Fibre Channel cable adapter

3. Replace the protective caps on the cable ends.

FAStT700 Storage Server and drive enclosure cabling overview

The FAStT700 Storage Server supports two redundant drive loops. A redundant drive loop consists of one or more drive enclosures connected to a controller using two sets of Fibre Channel cables. If one data path fails, the controller uses the other data path to maintain the connection to the drive group.

Figure 26 on page 26 shows a storage subsystem containing one storage server and two redundant drive loops with four drive enclosures each. Each drive enclosures group uses redundant drive loops to connect to the FAStT700 Storage Server. Loop A and loop B make up one redundant pair of drive loops. Loop C and loop D make up a second redundant pair.

Attention: To prevent loss of drive enclosure redundancy, connect the drive enclosures as shown in Figure 26 on page 26.

Note: The illustrations in this document might differ slightly from your hardware.

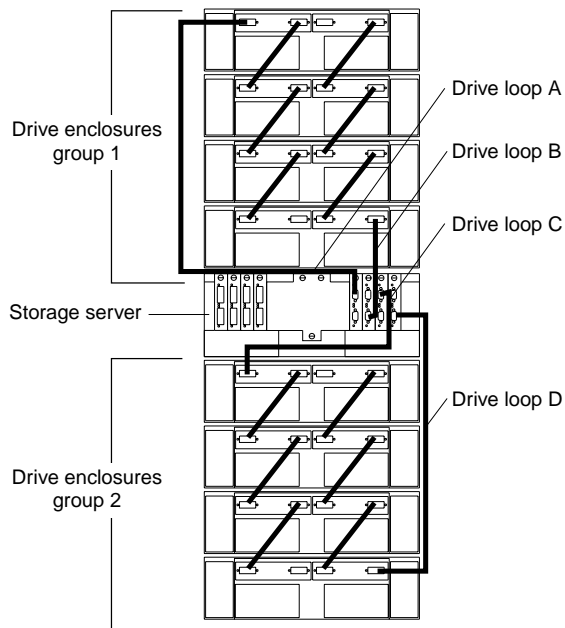


Figure 26. Redundant drive loop cabling overview

Configuring the drive loops

The procedure and illustrations in this section show an example of how to connect one drive enclosure group of four drive enclosures into a redundant drive loop. Instructions for how to connect a second redundant drive enclosure group of four drive enclosures into a redundant drive loop are also included in this procedure.

To complete this procedure, you will need two fiber-optic cables per drive enclosure. Handle and install fiber-optic cables properly to avoid degraded performance or loss of communications with devices. Do not overtighten the cable straps or bend the cables to a radius less than 38 mm (1.5 in.).

1. Connect the first two drive enclosures to drive loop A, as shown in Figure 27.

Starting with the first drive enclosure, connect a fiber-optic cable from the In port on the left environmental services monitor (ESM) board to the Out port on the left ESM board in the second (next) drive enclosure.

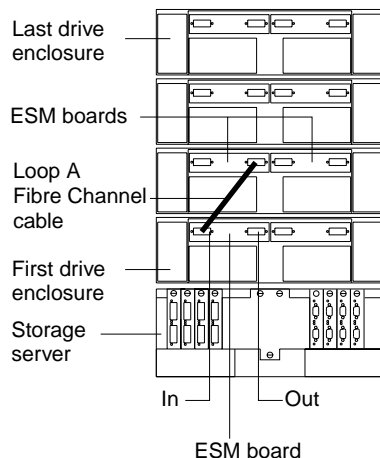


Figure 27. Connecting two drive enclosures into drive loop A

For the location of the ports on the drive enclosure ESM board, see Figure 28.

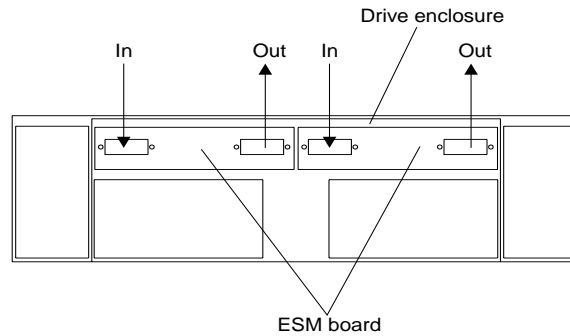


Figure 28. Drive enclosure environmental services monitor (ESM) board in and out ports

2. Connect the same first two drive enclosures to drive loop B, as shown in Figure 29.

Starting with the first drive enclosure, connect a fiber-optic cable from the In port on the right ESM board to the Out port on the right ESM board in the second (next) drive enclosure.

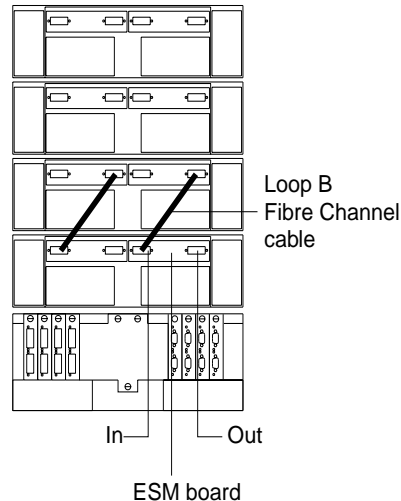


Figure 29. Connecting two drive enclosures into redundant drive loop B

If you want to connect more drive enclosures into drive loops A and B, continue with Step 3; otherwise, go to “Connecting a redundant drive loop to the FAST700 Storage Server” on page 29.

3. Connect additional drive enclosures to drive loops A and B, as shown in Figure 30 on page 28.

Starting with the second drive enclosure, connect each additional drive enclosure into drive loops A and B in the same manner. Leave the In port on the last drive enclosure in the loop and the Out port on the first drive enclosure unoccupied.

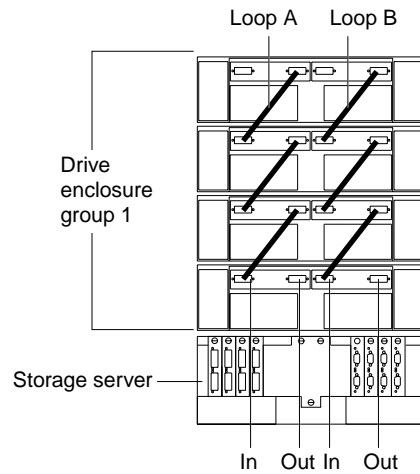


Figure 30. Connecting additional drive enclosures to drive loops A and B

If you want to connect a second drive enclosure group, go to Step 4; otherwise, go to “Connecting a redundant drive loop to the FASi700 Storage Server” on page 29.

4. Repeat Step 1 on page 26 through Step 3 on page 27 to connect a second redundant drive enclosure group. Figure 31 shows a second redundant drive enclosure group (loop C and loop D on drive enclosure group 2).

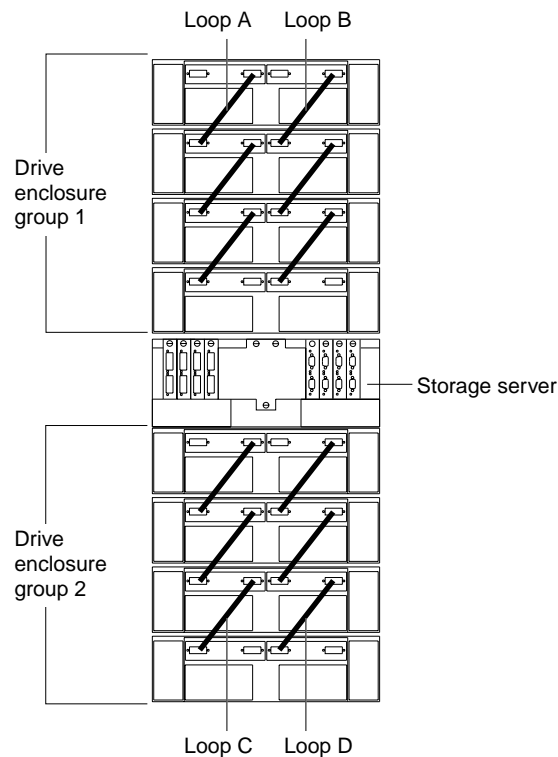


Figure 31. Connecting a second redundant drive enclosure group (loops C and D)

5. Continue with “Connecting a redundant drive loop to the FASi700 Storage Server” on page 29.

Connecting a redundant drive loop to the FAStT700 Storage Server

Use the following procedure to connect a redundant drive loop to the FAStT700 Storage Server. You will need two fiber-optic cables for each redundant pair of loops (for example, loop A and loop B) that you are connecting to the FAStT700 Storage Server.

1. Connect drive loop A to the FAStT700 Storage Server, as shown in Figure 32.

Starting with the last drive enclosure in loop A, connect the In port on the left ESM board to the Out (upper) port on drive mini hub 4 on the FAStT700 Storage Server.

Leave the Out port on the left ESM board on the first drive enclosure and the In (lower) connector on drive mini hub 4 unoccupied.

Loop A Fibre Channel cables

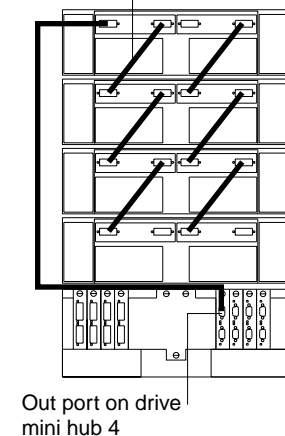


Figure 32. Connecting drive loop A to the FAStT700 Storage Server

2. Connect drive loop B to the FAStT700 Storage Server, as shown in Figure 33.

Starting with the first drive enclosure in the loop, connect the Out port on the right ESM board to the In (lower) port on drive mini hub 3.

Leave the In port on the right ESM board on the last drive enclosure and the Out (upper) port on drive mini hub 3 unoccupied.

Loop B Fibre Channel cables

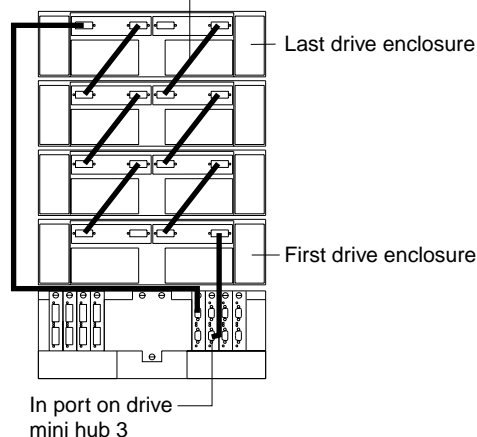


Figure 33. Connecting redundant drive loops to the FAStT700 Storage Server

To connect a second redundant drive enclosure group to the FAStT700 Storage Server, continue with Step 3; otherwise, go to “Connecting hosts directly to the FAStT700 Storage Server”.

3. Connect drive loop C to the FAStT700 Storage Server, as shown in Figure 34.
Starting with the first drive enclosure in drive enclosure group 2, connect the In port on the left ESM board to the Out (upper) port on drive mini hub 2.
Leave the Out port on the left ESM board on the last drive enclosure in drive enclosure group 2 and the In (lower) port on the drive mini hub 2 unoccupied.
4. Connect drive loop D to the FAStT700 Storage Server, as shown in Figure 34.
Starting with the last drive enclosure in drive enclosure group 2, connect the Out port on the right ESM board to the In (lower) port on mini hub 1.
Leave the In port on the right ESM board on the first drive enclosure in drive enclosure group 2 and the Out (upper) port on drive mini hub 1 unoccupied.

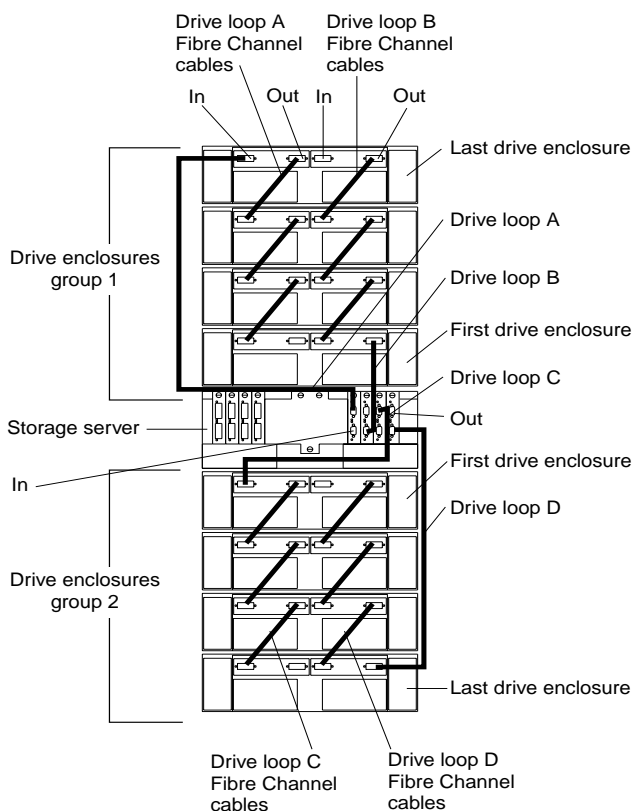


Figure 34. Connecting two redundant drive enclosure groups

Connecting hosts directly to the FAStT700 Storage Server

Use this procedure to connect up to four hosts, with two host adapters each, directly to the FAStT700 Storage Server. If you are connecting five or more hosts to the FAStT700 Storage Server, go to “Connecting hosts using external devices” on page 31.

Before proceeding, make sure that you connect fiber-optic cables to all host adapters that you are connecting to the FAStT700 Storage Server.

Important: Host mini hub 1 and mini hub 3 correspond to Controller A (top) and mini hub 2 and mini hub 4 correspond to Controller B (bottom). To ensure redundancy,

connect each host to both controllers. You can use either the upper or lower ports on either mini hub.

The example in the following procedure uses the upper ports for Hosts 1 and 4 and the lower ports for Hosts 2 and 3.

1. Connect the first host (Host 1) to the FASSt700 Storage Server, as shown in Figure 35.
Connect Host Adapter 1 (HA1) from Host 1 to a port on host mini hub 1. Connect HA2 from Host 1 to mini hub 2.
To connect a second host, continue with Step 2; otherwise, go to “Setting the Link Rate Interface switch” on page 33.
2. Connect a second host (Host 2) to the FASSt700 Storage Server, as shown in Figure 35.
Attach HA1 from Host 2 to the unoccupied port on mini hub 1. Attach HA2 from Host 2 to the unoccupied port on mini hub 2.
To connect a third host, continue with Step 3; otherwise, go to “Setting the Link Rate Interface switch” on page 33.
3. Connect a third host (Host 3) to the FASSt700 Storage Server, as shown in Figure 35.
Attach HA1 from Host 3 to mini hub 3. Attach HA2 from Host 3 to mini hub 4.
To connect a fourth host, continue with Step 4; otherwise, go to “Setting the Link Rate Interface switch” on page 33.
4. Connect a fourth host (Host 4) to the FASSt700 Storage Server, as shown in Figure 35.
Attach HA1 and HA2 from Host 4 to the two unoccupied ports on mini hub 3 and mini hub 4.

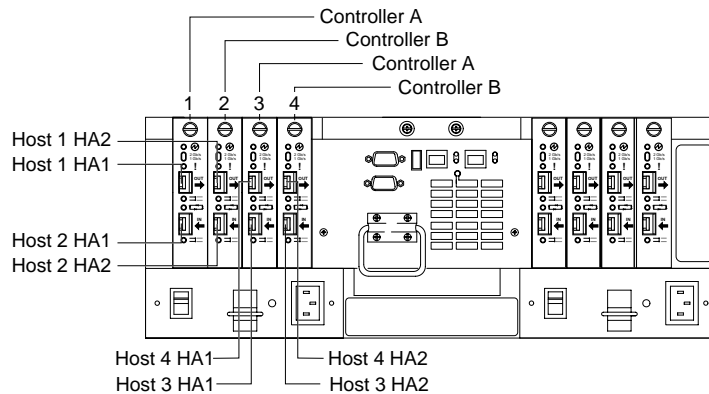


Figure 35. Connecting hosts directly to the controller

5. Go to “Setting the Link Rate Interface switch” on page 33.

Connecting hosts using external devices

Use the information in this section to connect five or more hosts to the FASSt700 Storage Server. When you use external Fibre Channel switches, the FASSt700 Storage Server supports up to 64 hosts (128 host adapters, 64 host adapters per controller) and two host adapters for each host.

Important: Host mini hub 1 and host mini hub 3 correspond to Controller A (top). Mini hub 2 and mini hub 4 correspond to Controller B (bottom). To ensure redundancy, connect each host to both controllers. You can use either the upper or lower connectors on either mini hub.

You connect additional hosts to the FAST700 Storage Server by adding host-side mini hubs and Fibre Channel switches, (one Fibre Channel switch for each mini hub).

Figure 36 shows an example of dual path configuration using Fibre Channel switches. Host 1 contains two host bus adapters that are connected to host mini hubs. To configure a host with dual path redundancy, connect the first host bus adapter (HA1) to SW1 and connect the second host bus adapter (HA2) to SW2. Then, connect SW1 to host mini hub 1 and SW2 to host mini hub 2.

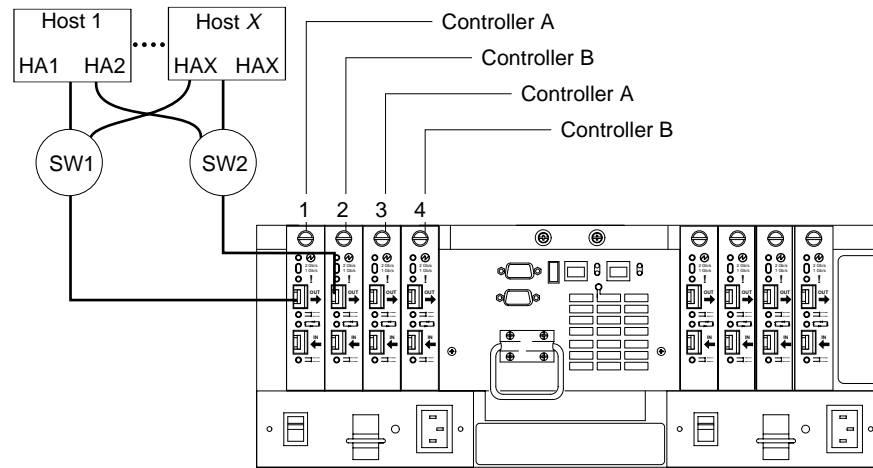


Figure 36. Using two Fibre Channel switches to connect a host

You can directly attach up to four Fibre Channel switches (one per mini hub) to a FAST700 Storage Server. Figure 37 shows an example of attaching four Fibre Channel switches.

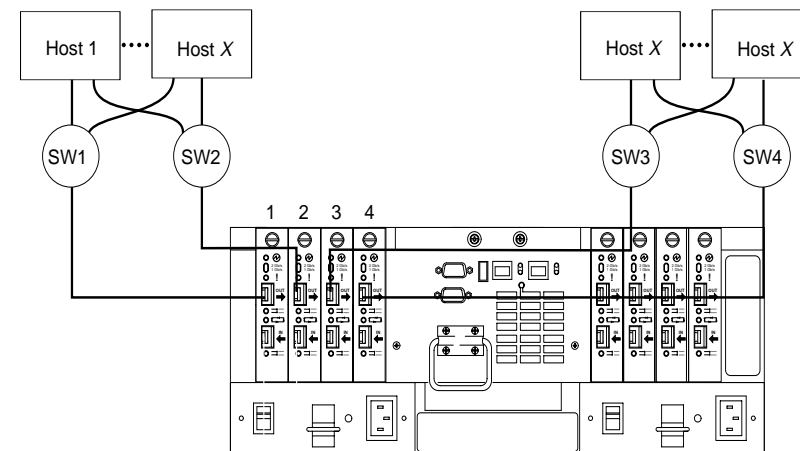


Figure 37. Using four Fibre Channel switches to connect multiple hosts

Most Fibre Channel switches support eight to sixteen hosts. If your configuration requires more hosts than four Fibre Channel switches can support, you must add cascading switches, as shown in Figure 38.

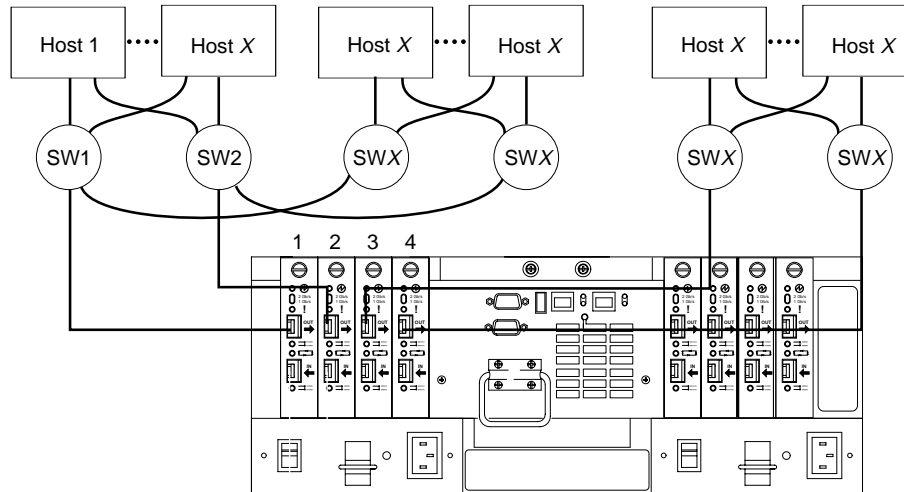


Figure 38. Adding hosts using cascading switches

Setting the Link Rate Interface switch

Each FASTT700 Storage Server mini hub has a Link Rate Interface switch that is used to select the host-side or drive-side mini-hub data transfer rates. The switch settings are labeled 2 Gb per second and 1 Gb per second. Use a device with a point such as a small flat-blade screwdriver or ballpoint pen to set the host-side or drive-side mini-hub Link Rate Interface switch. See Figure 39.

The Speed indicator light is green when the data transfer rate of the Fibre Channel loop is 2 Gb per second. The Speed indicator light is off when the data transfer rate is 1 Gb per second. Figure 39 shows the location of the Link Rate switch and indicator light.

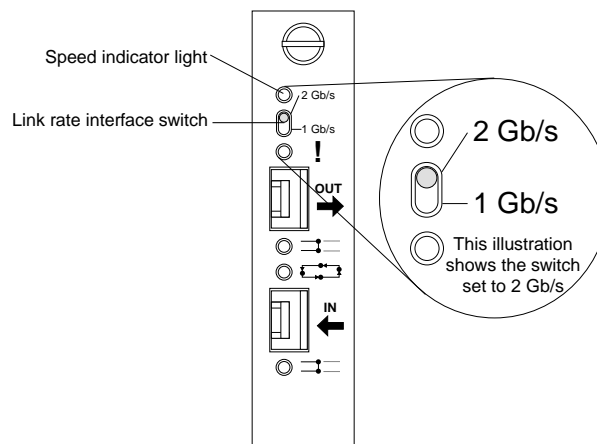


Figure 39. Mini-hub Link Rate Interface switch and Speed indicator light

Setting data transfer rates on host-side mini hubs

To set the Link Rate Interface switch on the host-side mini hubs, complete the following steps.

Note: Host-side mini-hub ports must be connected to devices that have the same data transfer rate.

1. Verify the data transfer rate of the devices on the loop or the Fibre Channel switch port.
2. Set the data transfer rate on the host bus adapter based on the data transfer rate of the devices on the loop or the Fibre Channel switch port.
3. Set the Link Rate Interface switch to match the data transfer rate of the host bus adapter.

Setting data transfer rates on drive-side mini hubs

On the drive-side mini hubs, set the Link Rate Interface switch to 2 Gb per second or 1 Gb per second based on the data transfer rate of the drive enclosures.

Note: All drive enclosures on the loop and drive-side mini-hub ports must be connected to devices that have the same data transfer rate.

To set the data transfer rate on drive-side mini hubs, do the following:

1. Verify the data transfer rate of the drive enclosure on the loop.
2. Set the link rate interface switch to match the data rate of the drive enclosure.

Connecting Ethernet cables

To manage a storage subsystem using the direct (out-of-band) method, connect a pair of Ethernet cables from the management station to the Ethernet ports for Controller A or Controller B on the back of the FAST700 Storage Server. For an illustration of direct (out-of-band) management, see Figure 5 on page 9.

Figure 40 shows the location of the Ethernet ports.

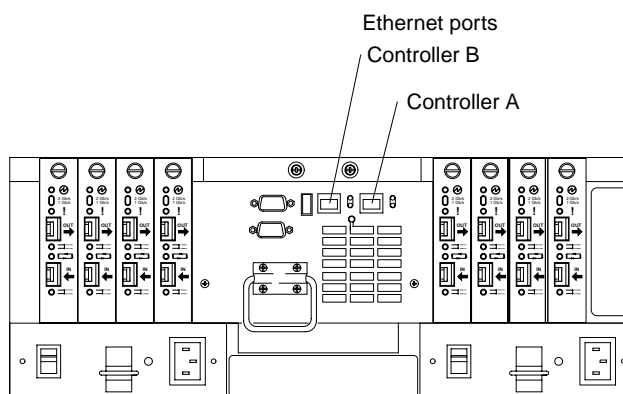


Figure 40. Ethernet port locations

Chapter 3. Starting the FAStT700 Storage Server

After you install the FAStT700 Storage Server in a rack cabinet and connect it to the Fibre Channel Arbitrated Loop, you are ready to complete the installation. This chapter describes how to connect the power cords, turn on and off the power, check the indicator lights, and install the FAStT Storage Manager software.

Connecting the power cords

To connect the power cords to the FAStT700 Storage Server and to the ac power source, complete the following steps.

1. Make sure both power switches on the FAStT700 Storage Server are off.
2. Plug both FAStT700 Storage Server power cords into the FAStT700 Storage Server, as shown in Figure 41.

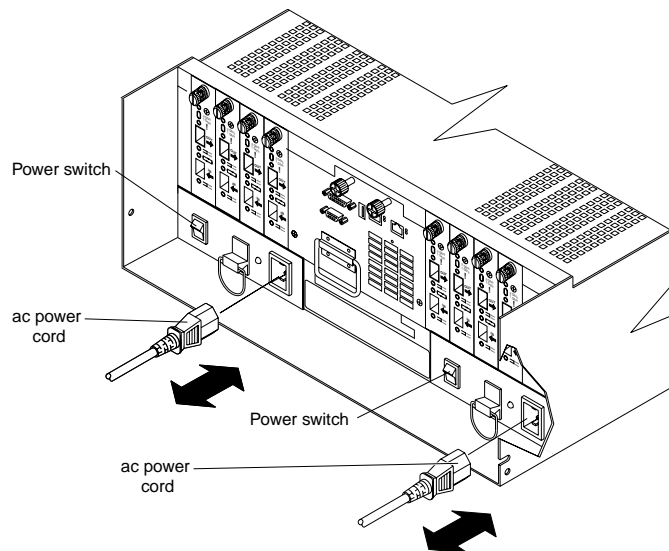


Figure 41. Connecting the power cords and turning the power on and off

3. Plug both FAStT700 Storage Server power cords into the ac outlets.

To maintain power redundancy, plug each power cord into an independent power source, such as the ac distribution unit inside a rack cabinet or an external receptacle. For details about power requirements, see “Operating specifications” on page 5.

Turning on the power

Important: You must turn on the drive enclosures *before* you turn on the FAStT700 Storage Server. The controllers might not recognize the correct configuration if the hard disk drives are powered up after the FAStT700 Storage Server. For instructions on powering up 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.

Use the following procedure to turn on the power for the FAStT700 Storage Server.

1. 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.

2. Check the system documentation for the hardware devices that you intend to power up, and then determine the proper startup sequence. Use the following power-on sequence, where applicable:
 - a. Turn on the power to the supporting devices (for example, Ethernet switches, Fibre Channel switches, and management stations) *before* the storage server.
 - b. You must turn on the drive enclosures *before* the FAST700 Storage Server. The controllers might not recognize the correct configuration if the drives are powered up after the storage server. For instructions on powering up the drive enclosures, refer to the drive enclosure documentation.
 - c. Turn on the power to the storage server.
 - d. Restart or turn on the power to the host.
3. Turn on the power to each device, use the following power-on sequence. To turn on power to the FAST700 Storage Server, turn on the power-supply switches on the back of the FAST700 Storage Server. You must turn on both power-supply switches to take advantage of the redundant power supplies.
4. Use the storage-management software and the Fault indicator lights to check the overall status of the FAST700 Storage Server and its components.

Turning off the power

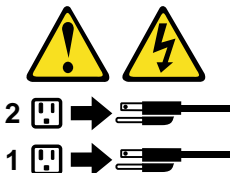
Attention: The FAST700 Storage Server is designed to run continuously, 24 hours a day. Except in an emergency, never turn off the power even if any FAST700 Storage Server fault indicator lights are lit. Use the proper troubleshooting or servicing procedure to correct the fault before turning off the power. This ensures that the FAST700 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 FAST700 Storage Server.

1. Make sure that all amber fault indicator lights on the FAST700 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.
2. The operating system software might require you to perform other procedures before you turn off the power. Use the storage-management software to check the

status of the storage server. Correct problems that are reported before you turn off the power.

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).
- d. Disconnect the FAStT700 Storage Server and drive enclosures from the hosts.

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. To turn off the power to each device, use the following shutdown sequence.

Note: You do not need to perform this step if you are servicing only the FAStT700 Storage Server.

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

Turning on the FAStT700 Storage Server alarm

The FAStT700 Storage Server has an audible alarm. This alarm is controlled by a switch that is located on the storage server fan. You can enable this alarm by removing the bezel and setting the switch in the up position, as shown in Figure 42.

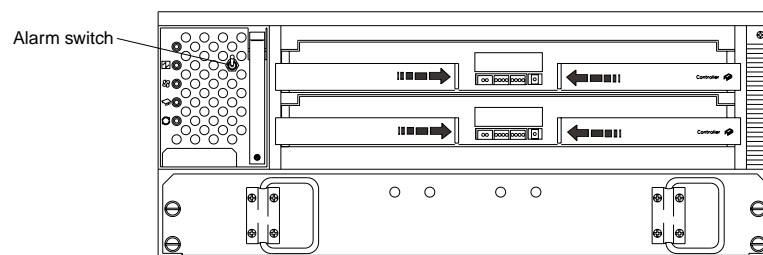


Figure 42. FAStT700 Storage Server alarm switch

FAStT700 Storage Server indicator lights

The indicator lights on the front of the FAStT700 Storage Server are shown in Figure 43 through Figure 46 on page 39.

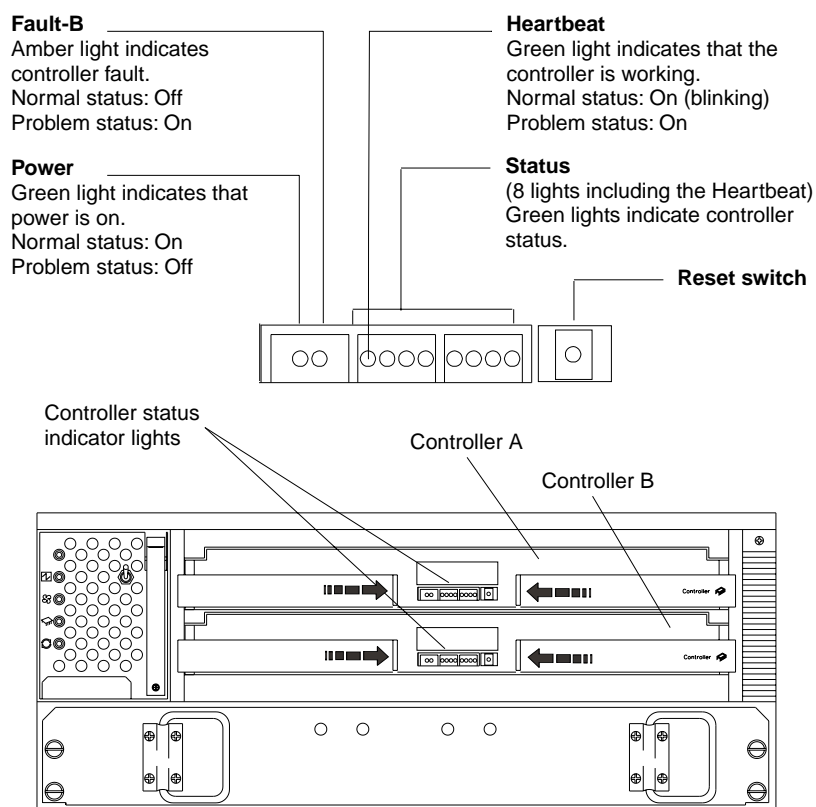


Figure 43. RAID controller indicator lights

The RAID controller status lights might blink when I/O activity is in progress. If the Heartbeat light blinks continuously, then the other status lights will glow in various patterns to show the status or an error condition. The pattern shown depends on whether the controller is active (online) or passive (offline). For more information, refer to *IBM FAStT700 TotalStorage Fibre Channel Storage Server User's Guide* and the *IBM FAStT Storage Manager Installation and Support Guide* for your operating system.

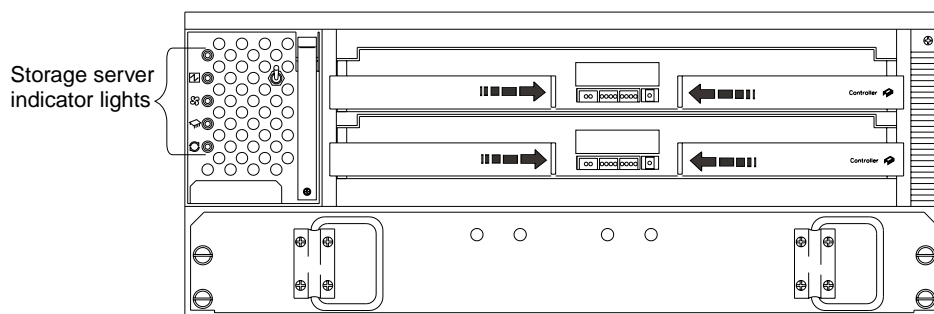


Figure 44. FAStT700 Storage Server indicator lights

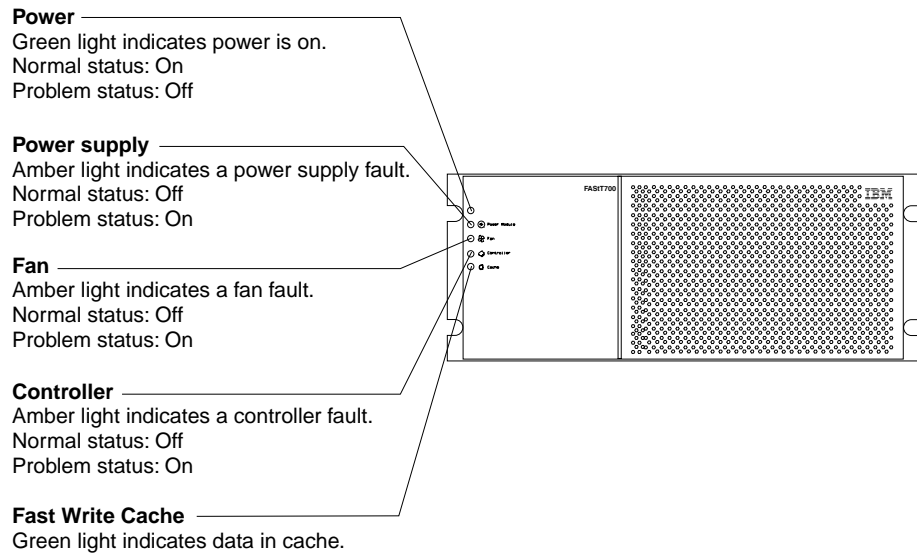


Figure 45. FAST700 Storage Server indicator lights

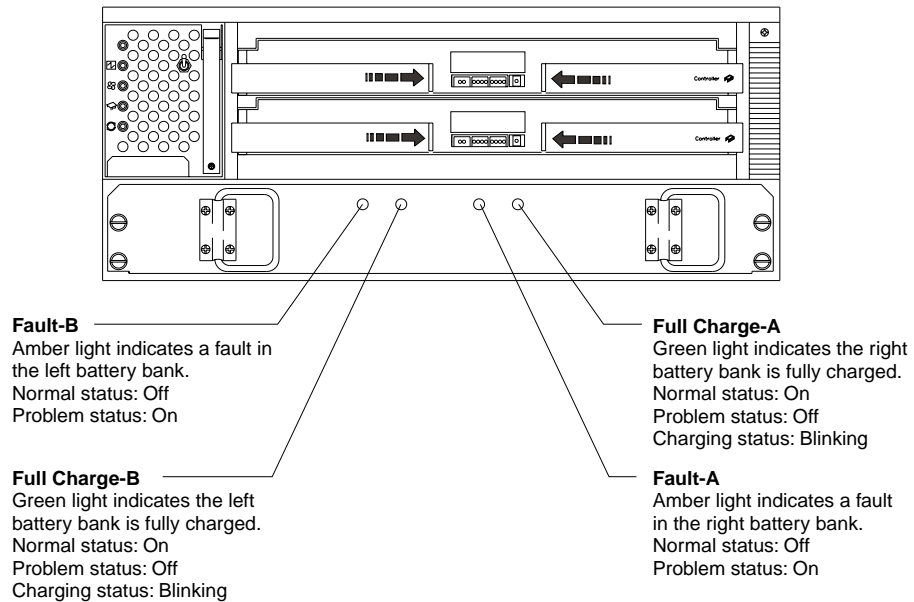


Figure 46. Battery indicator lights

The indicator lights on the back of the FAST700 Storage Server are shown in Figure 47 on page 40 and Figure 48 on page 40.

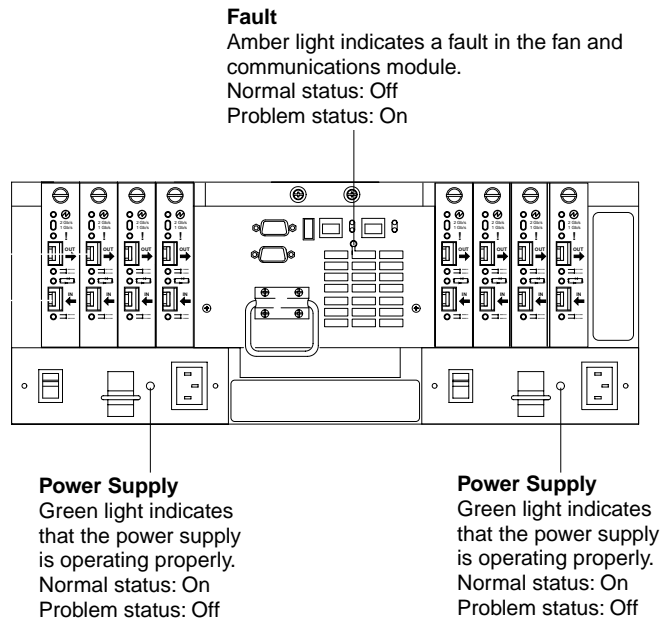


Figure 47. Power supply and fan and communications module indicator lights

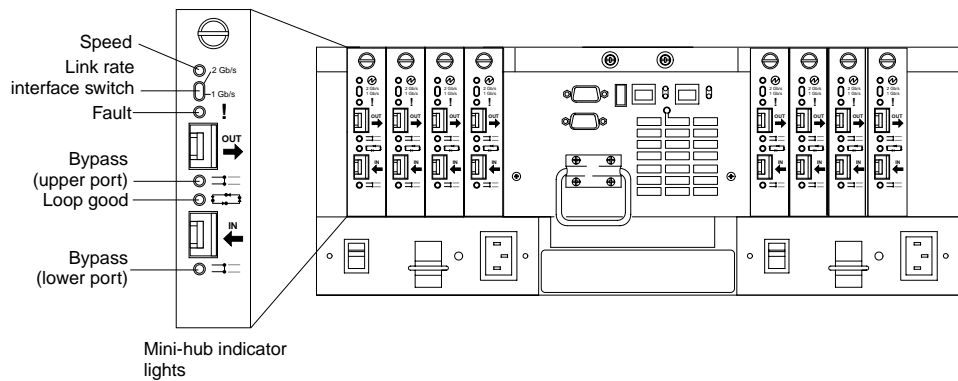




Figure 48. Mini-hub indicator lights

Table 2 describes the mini-hub indicator lights.

Table 2. Mini-hub indicator lights.

Icon	Indicator light	Color	Normal operation	Problem indicator	Condition indicated
None	Speed	Green	On for 2 Gb Off for 1 Gb	None	Light on indicates data transfer rate of 2 Gb per second. Light off indicates data transfer rate of 1 Gb per second.
!	Fault	Amber	Off	On	There is a fault in the mini hub.
⇌	Bypass	Amber	Off	On	The upper mini-hub port is bypassed.

Table 2. Mini-hub indicator lights.

Icon	Indicator light	Color	Normal operation	Problem indicator	Condition indicated
	Loop good	Green	On	Off	The drive loop is operational.
	Bypass (lower port)	Amber	Off	On	The lower mini-hub port is bypassed.

Installing the FAStT Storage Manager software

You can now install the FAStT Storage Manager software that is provided on an installation CD that comes with the FAStT700 Storage Server. Install the software using the procedures in the FAStT Storage Manager Installation and Support Guide for your operating system. Use that book and the online help to configure the logical drives, partitions, and so on for the RAID controllers. Use your operating system documentation to make the new logical drives accessible to the operating system.

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.ibm.link.ibm.com/public/applications/publications/cgi-bin/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 Appendix A, "Getting information, help, and service," on page 43.

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.

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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.

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven[®], including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

Unless otherwise stated, IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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

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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

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