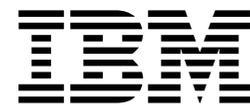


IBM FAStT500 RAID Controller
Enclosure Unit



Installation Guide





FAStT500 RAID Controller Enclosure Unit

Installation Guide

Note: Before using this information and the product it supports, be sure to read the general information in "[Appendix A. Warranty information](#)" and "[Appendix B. Notices](#)".

Second Edition (April 2002)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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 3



CAUTION:

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

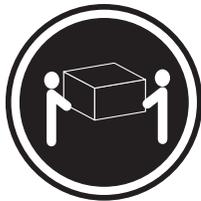
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous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

Statement 4



≥ 18 kg (37 lbs)



≥ 32 kg (70.5 lbs)



≥ 55 kg (121.2 lbs)

CAUTION:

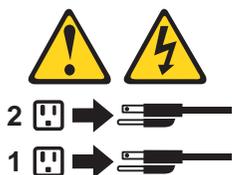
Use safe practices when lifting.

Statement 5



CAUTION:

The power control button on the device and 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.



Class 1 laser statement

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

IEC 825-11993 CENELEC EN 60 825

About this book

This book provides instructions for setting up, installing, and connecting your IBM® FAStT500 RAID Controller Enclosure Unit. 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. Getting started" introduces the controller enclosure unit and contains setup instructions. This chapter also includes an overview of the controller enclosure unit features and components.

"Chapter 2. Connecting the controller unit to the loop" provides descriptions of the components that connect the controller enclosure unit to the network, instructions for installing the interface cable, and instructions for completing the installation.

"Chapter 3. Starting the controller unit" provides information about connecting the power cords, turning on and off the power, checking the indicator lights, and completing the installation.

"Chapter 4. Getting help and technical assistance" provides information about how to obtain help, service, or technical assistance.

"Appendix A. Warranty information" provides warranty statements for the IBM FAStT500 RAID Controller Enclosure Unit.

"Appendix B. Notices" Provides product notices and trademark information.

Notices used in this book

This book contains notices to highlight information or provide safety information:

- **Note**

These notices provide important tips, guidance, or advice.

- **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.

The caution and danger statements used in this book also appear in the multilingual safety information book provided with your IBM FAStT500 RAID Controller Enclosure Unit. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety book.

Related publications

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

- *IBM FAStT500 RAID Controller Enclosure Unit Installation Guide* (this book)¹
- *IBM FAStT500 RAID Controller Enclosure Unit User's Guide*
- *IBM FAStT Storage Manager Version 7.10 for Microsoft® Windows NT® and Windows 2000 Installation and Support Guide*
- *IBM FAStT Storage Manager Version 7.10 for Novell NetWare and Red Hat Linux Installation and Support Guide*
- *IBM FAStT Storage Manager Version 7.10 Concepts Guide.*

¹ Indicates publication that is printed and comes with the IBM FAStT500 RAID Controller Enclosure Unit.

Chapter 1. Getting started

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

The IBM FAStT500 RAID Controller Enclosure Unit (referred to throughout this book as controller unit) is a high-performance unit that provides dual, redundant controllers with Fibre Channel interfaces to both the host and drive channels. The controller unit has redundant cooling, redundant power, and battery backup of the controller cache.

Designed to provide maximum host and drive side redundancy, the controller unit supports direct attachment of up to four hosts containing two host adapters each. Using external managed hubs and switches in conjunction with the RAID controller unit, you can build even larger configurations. (Throughout this book, the use of hub or external hub refers to a managed hub.)

Fibre Channel is a new technology, similar to a high-speed network, that you can use to connect large amounts of disk storage to a server or cluster of servers. Fibre Channel technology supports increased performance, scalability, availability, and distance for attaching storage subsystems to network servers. The controller unit provides for the attachment of Fibre Channel disk drives to give superior performance and redundancy.

Fibre Channel technology supports applications that require large amounts of disk storage shared by two or more servers. With Fibre Channel, you can see a higher throughput rate over longer distances than is possible with small computer system interface (SCSI) or with Serial Storage Architecture (SSA) technology.

This chapter provides descriptions of the primary components of the controller unit and contains setup instructions. The controller unit is used with rack-mounted drive enclosures (also referred to as expansion units) for Fibre Channel.

The following figure shows the IBM FASt500 RAID Controller Enclosure Unit.

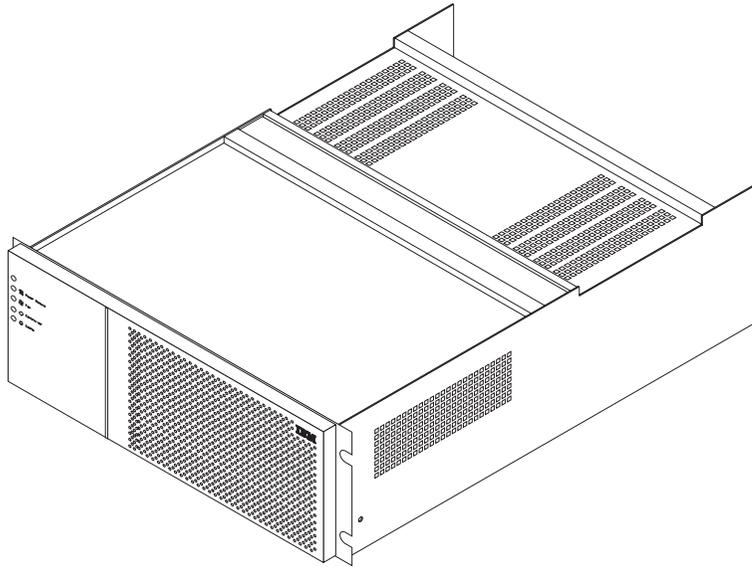


Figure 1. IBM FASt500 RAID Controller Enclosure Unit

The controller unit comes with the following items:

Hardware:

- Two RAID controllers
- Two power supplies
- Battery
- Two host mini-hubs and two drive mini-hubs
- Two power cords or two high voltage rack jumpers
- One rack-mounting hardware kit:
 - Two rails (right and left)
 - Eight black M6 hex-head screws
 - Eight clip nuts
 - Eight cage nuts

Software and documentation:

- IBM FAStT Storage Manager Version 7.10 CD including:
 - IBM FAStT Storage Manager 7.10 software
 - Publications in Adobe Acrobat PDF format

For a list of available FAStT500 publications, see ["Related publications" on page xiv](#).

- Rack Mounting Assembly including:
 - Rack Mounting Installation Instructions
 - Rack Mounting Template
 - White tape dots
- Fibre Channel Cabling Instructions

Controller unit components

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

- Bezel (front cover)
- Controller fan
- Battery
- Controller (two each)
- Power supply (two each)
- Host mini-hub (comes with two, four maximum)
- Drive mini-hub (comes with two, four maximum)
- Fan and communications module

The following figure shows the controller unit front view.

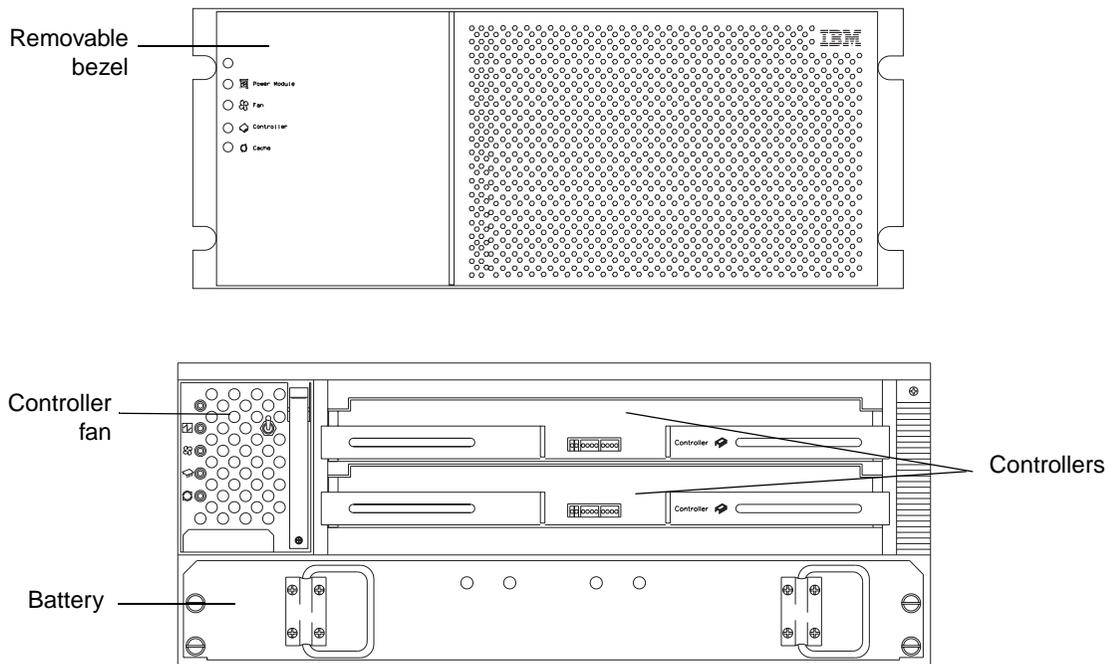


Figure 2. IBM FAST500 RAID Controller Enclosure Unit – front view

The following figure shows the controller unit back view.

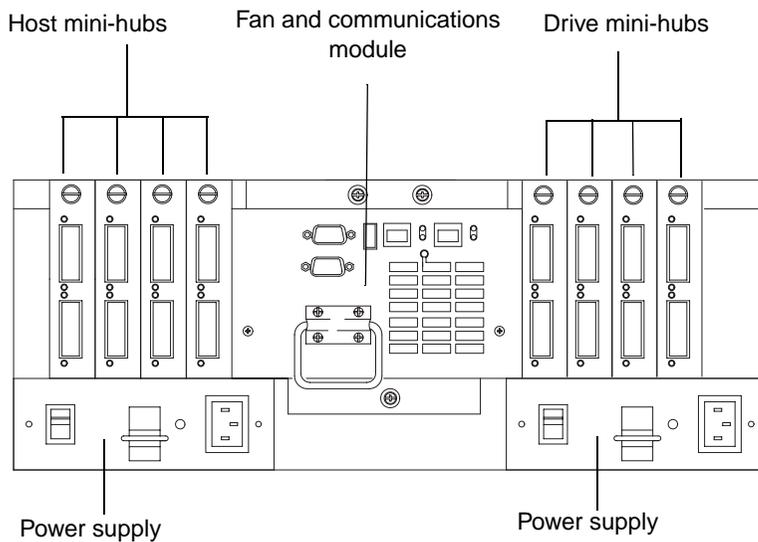


Figure 3. IBM FAST500 RAID Controller Enclosure Unit – back view

Operating specifications

The following table summarizes the operating specifications of the controller unit.

Table 1: RAID controller unit 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: 44.45 cm (17.5 in.) <p>Weight</p> <ul style="list-style-type: none"> • Typical controller unit fully configured: 38.6 kg (85 lbs) <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: 132 V ac – High range: <ul style="list-style-type: none"> - Minimum: 198 V ac - Maximum: 262 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"> – Controller unit on: <ul style="list-style-type: none"> 10° to 35°C (50° to 95°F) Altitude: 0 to 914 m (3000 ft) – Controller unit on <ul style="list-style-type: none"> 10° to 32°C (50° to 90°F) Altitude: 914 m (3000 ft) to 2133 m (7000 ft) • Humidity <ul style="list-style-type: none"> – 10% to 80% 	<p>Accoustical noise emissions values:</p> <p>For typical system configurations:</p> <ul style="list-style-type: none"> • Sound power (idling): 6.5 bels • Sound power (operating): 6.5 bels • Sound pressure (idling): 49 dBA • Sound pressure (operating): 49 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>
---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Preparing for installation

Use the following list to prepare a controller unit for installation.

- 1 Prepare the site to meet all area, environmental, power, and site requirements. For more information, see ["Operating specifications" on page 5](#) and ["Preparing the site" on page 10](#).
- 2 Move the controller unit and its rack cabinet to the site.
- 3 Remove the controller unit from its shipping container and check the contents (see the list of items 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 enclosure)
 - Screwdrivers and wrenches (various sizes)
 - Antistatic protection (such as a grounding wrist strap)
 - Fibre Channel (FC) and Ethernet interface cables and cable straps
 - Rack-mounting hardware (comes with the controller unit)
 - Storage-management software to configure the storage subsystems (comes on an Installation CD with the controller unit)
- 5 Install additional hardware, based on the method of storage subsystem management. You can manage the storage subsystems using the host-agent method, as shown in [Figure 4 on page 7](#) or the direct-managed method, as shown in [Figure 5 on page 7](#).

If you are using the:	Then:
Host-agent method (uses host-agent software installed on the host machine)	Install at least one management station and a software-agent host. When you finish, continue with Step 6 on page 8 .
Direct-managed method (uses Ethernet connections from a management station to each controller)	Install at least one management station and attach Ethernet cables to each management station – one pair per controller unit. You will connect the cables to each controller later when you install the controller unit. When you finish, continue with Step 6 on page 8 .

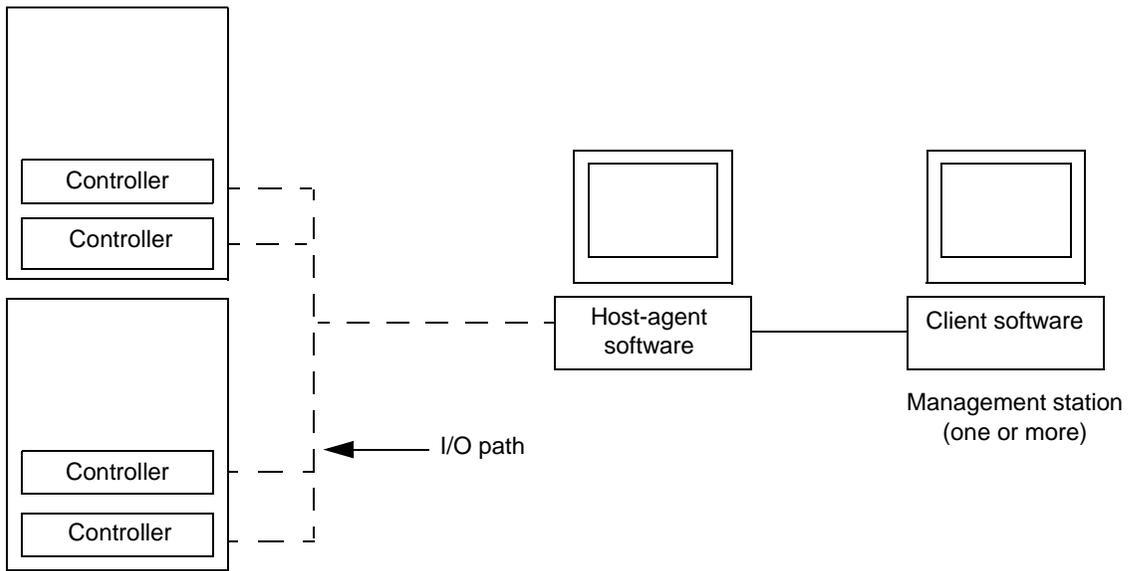


Figure 4. Host-agent managed storage subsystems

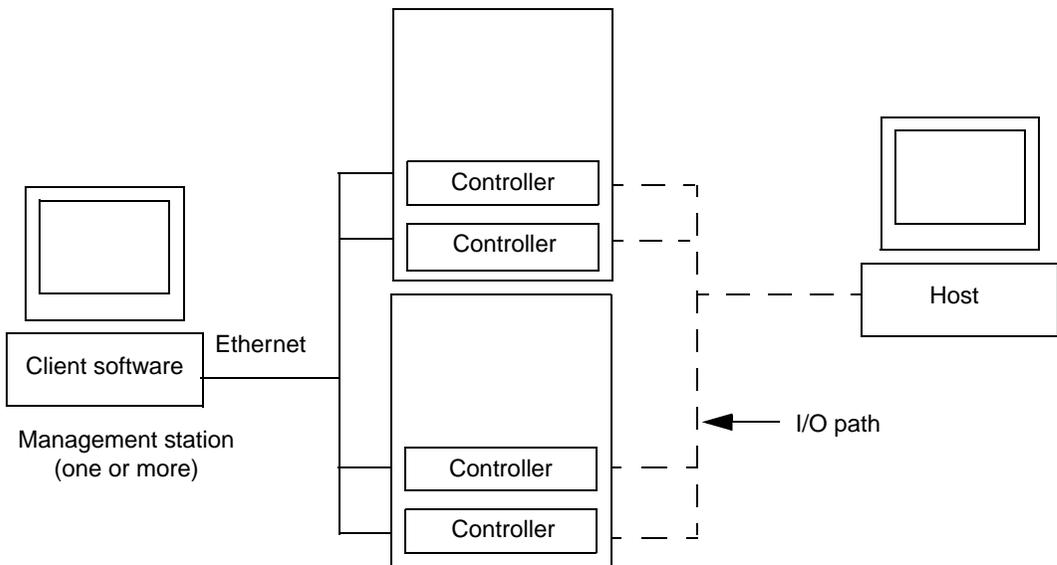


Figure 5. Direct-managed storage subsystems

- 6 Determine the type of Fibre Channel network environment into which you are installing the storage subsystem, then go to the appropriate step indicated below. Note that a cluster server, acting as a host, has two nodes for failover support.

Fibre Channel network environment:	Go to:
Cluster server	Step 7
Standard (non-cluster) server	"Handling static-sensitive devices" on page 10.

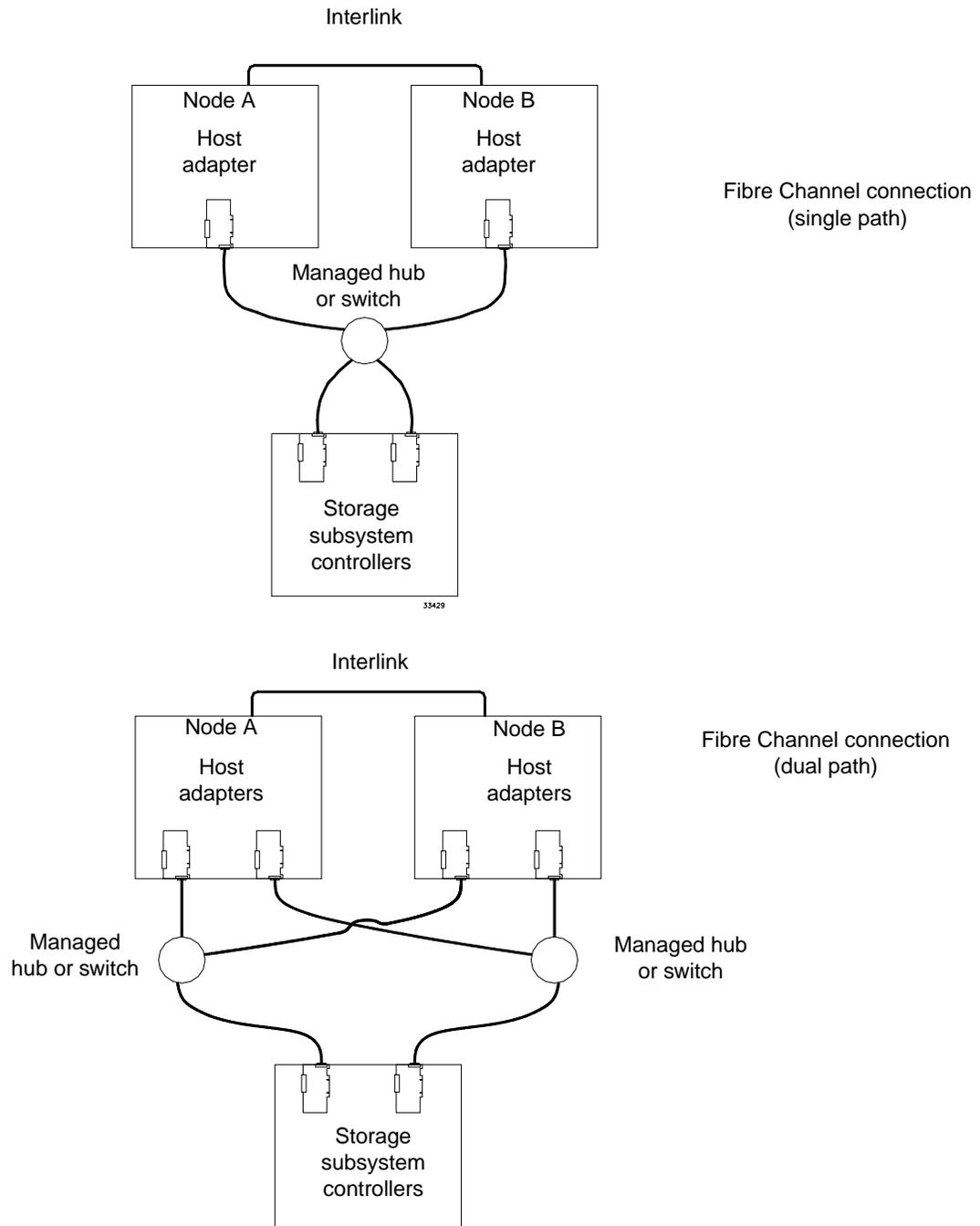
- 7 Install the applicable host adapters, based on your path configuration. See [Figure 6 on page 9](#) for an illustration of installing a storage subsystem on a Fibre Channel network in a single-path or dual-path configuration.

Path configuration:	Action:
Single-path – each node connects to only one controller	Install a single-channel host adapter on each node.
Dual-path – each node connects to both controllers, providing the greatest redundancy protection if a connection problem occurs.	Install two, single-channel host adapters in each node.

When finished, continue with [Step 8 on page 10](#).

- Refer to the documentation provided with your host adapters for installation requirements and procedures.
- Use the correct host adapter driver. Refer to the software installation guide and README file on the storage-management software installation CD for information on supported host adapters and drivers.

Note: Make sure each host adapter and controller has a unique ID.



Note: Other managed hub configurations are possible.

Figure 6. Installing the storage subsystem on a Fibre Channel network

- 8 Attach fiber-optic interface cables to each host adapter. You will connect the other end of the cables to the controller later in the installation process.
- 9 Go to "[Handling static-sensitive devices](#)".

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 storage server 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 storage server without setting it down. If it is necessary to set the device down, place it in its staticprotective package. Do not place the device on your storage server cover or any metal surface.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Preparing the site

This section lists the space requirements and weight information for the controller unit. For information on interface cables and connections, refer to "[Controller unit interface ports](#)" on page 24.

Floor space

The floor area at the installation site must provide:

- Enough stability to support the weight of the controller unit and associated equipment.
- Sufficient space to install the controller unit.

Weight

The controller unit total weight depends on the number of components installed in the chassis. The maximum weight equals a controller unit containing two RAID controllers, two power supplies, one battery, one controller fan, one fan and communications module, and eight mini-hubs. The empty weight of a controller unit with all the CRUs removed is 15.5 kg (34 lbs). Maximum weight of a controller unit equals 38.6 kg (85 lbs).

Preparing the rack

To prepare the rack for installation, review the following list and complete all applicable preparatory procedures.

- 1 Moving, unpacking, and leveling the rack at the installation site.
- 2 Removing external rack panels.
- 3 Stopping all I/O activity to the devices in the rack.
- 4 Turning off all drive enclosure and rack power, and disconnecting existing power, network, and other external cables.
- 5 Installing additional interface cables and power cables.
- 6 Installing support rails for mounting the controller unit and drive enclosures (see ["Installing the support rails" on page 15](#)).
- 7 Removing, adding, or reconfiguring drive enclosures or devices in the rack.

Important:

Before installing the controller unit in a rack, it is important that you do the following:

- Review the documentation that comes with your rack enclosure for safety and cabling considerations.
- Install the controller unit in a maximum 35°C environment.
- To ensure proper air flow, do not block the air vents; 15 cm (6 in.) of air space is sufficient.
- To ensure rack stability, load the rack starting at the bottom.
- If you install multiple components in the rack, do not overload the power outlets.
- Always connect the controller unit to a properly grounded outlet.

Preparing the drive enclosures

Prepare the drive enclosures that you are attaching to the controller unit. This could 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)
- Setting the Bridge Enable switch, as necessary

For detailed instructions on preparing the drive enclosures, refer to the hardware documentation that comes with each device. When you finish preparing the drive enclosures, continue with ["Preparing the controller unit" on page 12](#). For illustrations of connecting the controller unit to one or more drive enclosures, see ["Chapter 2. Connecting the controller unit to the loop" on page 23](#).

Preparing the controller unit

You will need an antistatic wrist strap and a cart or level surface (to hold the CRUs).

Use this procedure to prepare a controller unit for installation. These instructions assume that you have completed all applicable site, rack cabinet, and drive enclosure preparations discussed on pages [10](#) through [12](#).

It is easier to lift the controller unit and install it in a rack if you remove all CRUs first. A fully loaded controller unit with a controller fan, battery, fan and communications module, two controllers, two power supplies, and 8 mini-hubs installed weighs 38.6 kg (85 lbs). If you remove all the CRUs, you can reduce the overall weight.

To gain access to the CRUs, cables, indicator lights, and switches inside the controller unit, you must remove the bezel. [Figure 7 on page 13](#) shows how to remove the bezel.

Attention: Pulling the bezel out too far can damage the hooks at the top. To avoid damaging the plastic hooks, place the controller unit on a flat surface. Be sure the front of the controller unit extends approximately two inches beyond the edge.

- 1 Carefully pull out the bottom of the bezel to release the pins; then slide down the bezel, as shown in [Figure 7 on page 13](#).

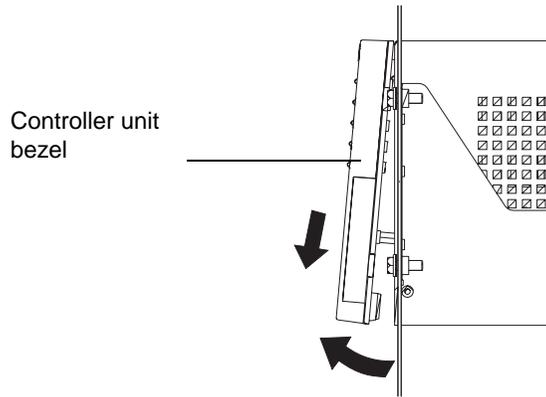


Figure 7. Removing the controller unit bezel

Note: To replace the bezel, slide the top edge under the lip on the chassis; then push the bezel bottom until the pins snap into the mounting holes.

- 2 Check the contents of the shipping container (see the list of items on page 2).

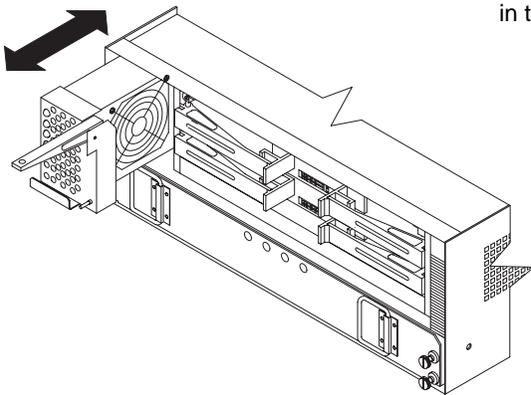
The power cords attach the controller unit to the ac power sources inside the cabinet or to an external power source.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, refer to "[Handling static-sensitive devices](#)" on page 10.

- 3 Remove the CRUs, using [Figure 8](#) through [Figure 11](#) as guides.

Controller Fan (front view)

Pull up on the fan lever to unlock; then grasp the lip handle and pull out firmly.



Controllers (front view)

Unlock and open the levers; then using the levers, pull out the controller a couple inches. Grasp both sides of the controller and remove it.

Important: To prevent data loss, replace Controller A in the upper slot and Controller B in the lower slot.

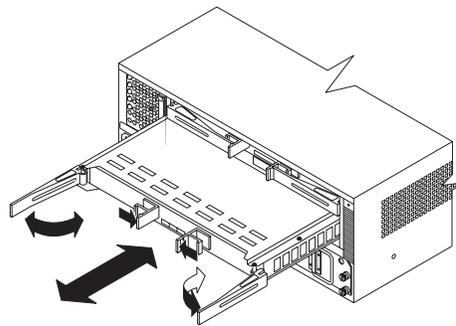
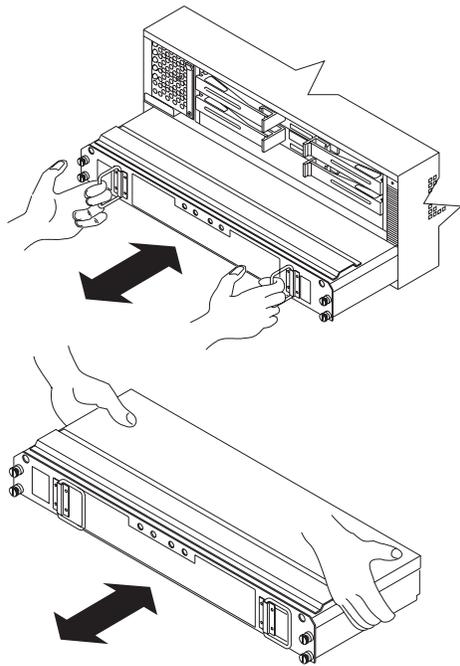


Figure 8. Removing and replacing the controller fan and controllers



Battery (front view)

Loosen the screws and pull out the battery a few inches. Grasp both sides of the battery and remove it.

Figure 9. Removing and replacing the battery

Power Supply (back view)

Using the pull handle, lift up and pull to release each power supply; then, slide out the power supply.

Fan and Communications module (back view)

Loosen the captive screws; then, grasp the pull handle and pull firmly to remove the module.

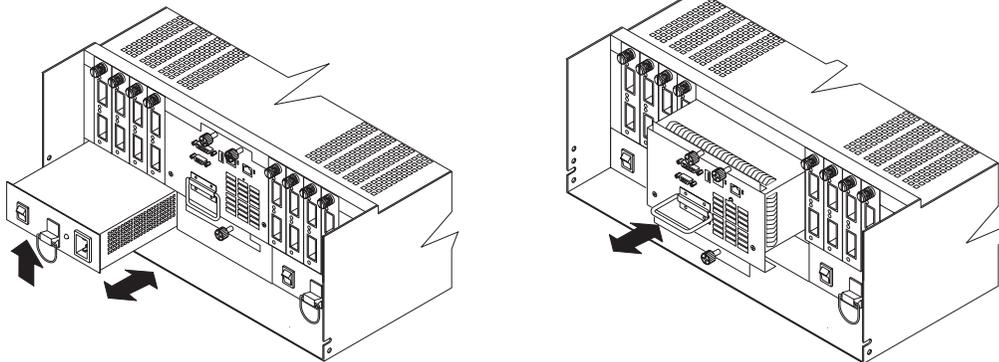


Figure 10. Removing and replacing the power supplies and fan and communications module

Mini-hubs (back view)

Loosen the captive screw; then, grasp the screw and pull the mini-hub from the chassis.

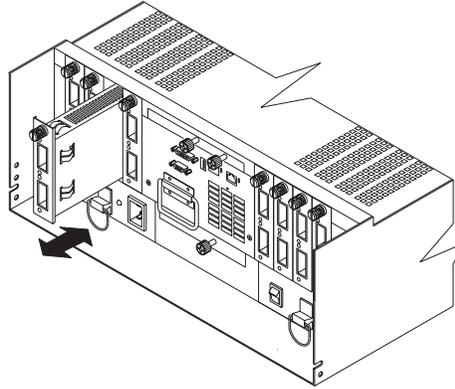


Figure 11. Removing and replacing the mini-hub

Installing the support rails

To install the controller unit in a rack, use the rails and mounting hardware supplied with your controller unit.

Where you place the support rails in or on the cabinet depends on where you intend to position the controller unit.

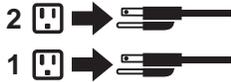
Use the rack mounting installation assembly package that comes with the controller unit to locate the rack mounting holes and install the unit into a rack. If you misplace the template installation assembly package, you can use the following steps to install the controller unit.

Statement 5

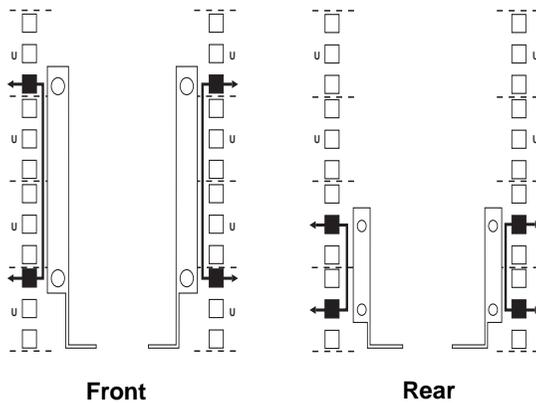


CAUTION:

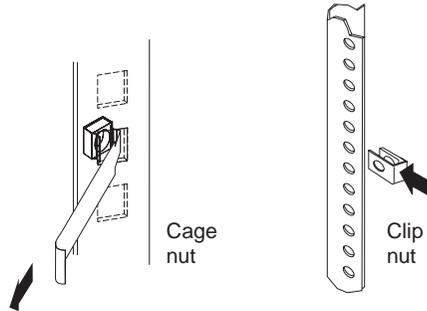
The power control button on the device and the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



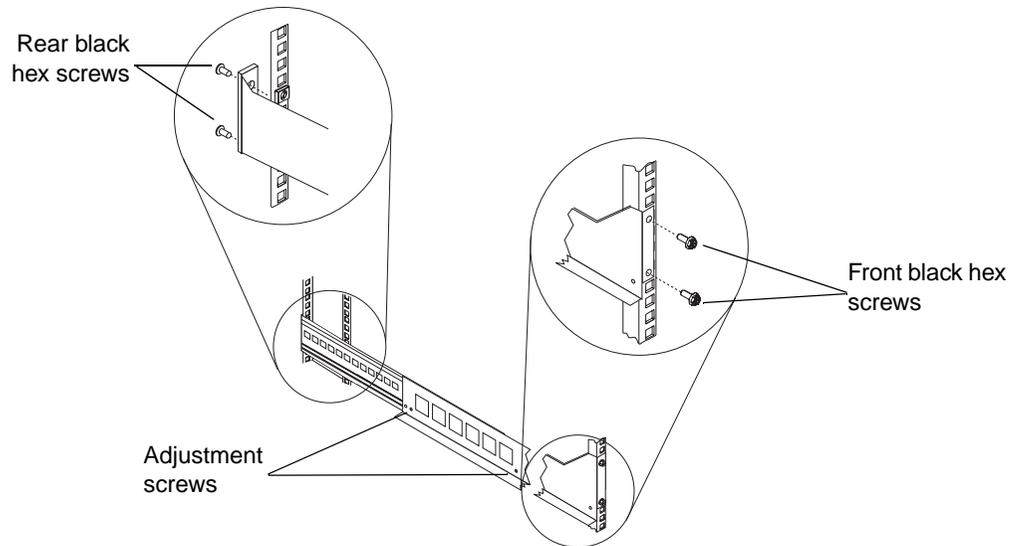
- 1 Stop all I/O activity to the devices in the rack in which you are installing the controller unit. If your rack has ac distribution boxes, turn off the power switches.
- 2 Use the following illustration of front and rear rack-mounting flanges to determine the appropriate rack-mounting holes for installing cage nuts or clip nuts to secure the controller unit rails.



Note: Use clip nuts if your rack has round holes. If your rack has square holes, you can use the cage nut insertion tool or a flat-blade screwdriver to install cage nuts.

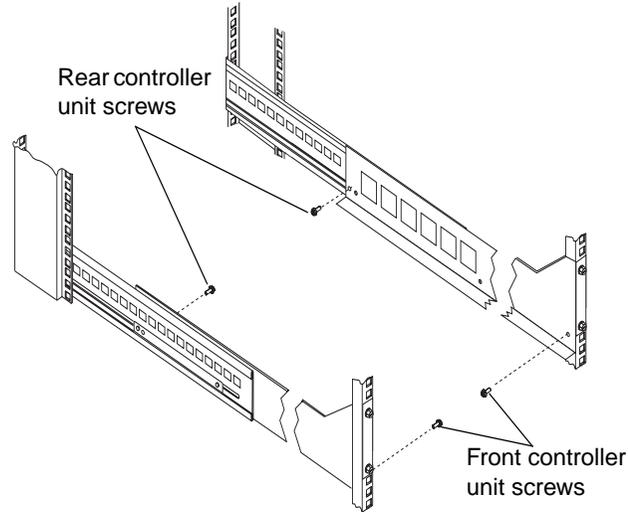


- 3 On the rail marked “R”, loosen the two adjustment screws on the inside of the rail and adjust the length of the rail to the depth of your rack.



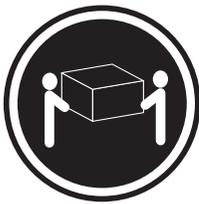
- 4 Hold the rail against the outside of the right mounting flange on the rack and loosely insert the two front black hex screws.
- 5 Extend the rail outside of the rear mounting flange on the rack; then, install and tighten the two rear black hex screws.
- 6 Tighten the two front black hex screws; then, tighten the adjustment screws on each rail.
- 7 Repeat [Step 3](#) through [Step 6](#) to install the rail marked “L” on the left side of the rack.

- 8 Using the following figure, remove the front and rear controller unit screws from the rails and save them for securing the controller unit, as described in "[Installing the controller unit in the rack](#)".



Installing the controller unit in the rack

Statement 4



≥ 18 kg (37 lbs)



≥ 32 kg (70.5 lbs)

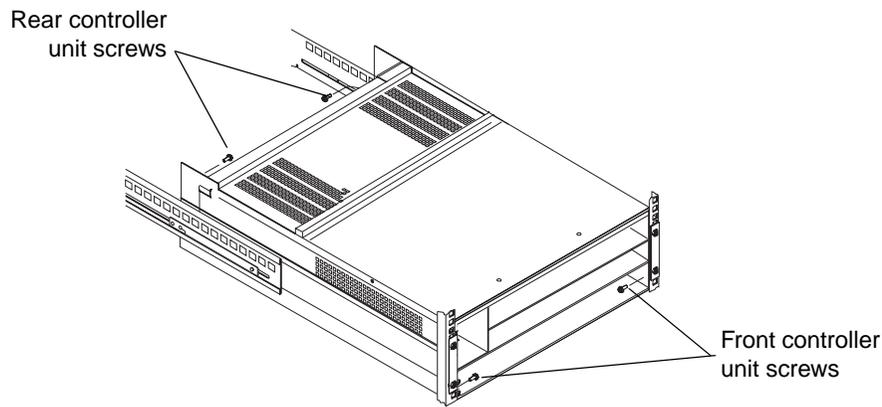


≥ 55 kg (121.2 lbs)

CAUTION:
Use safe practices when lifting.

To install the controller unit in a rack, perform the following steps.

- 1 Slide the controller unit into the rack and secure the rear of the controller unit with two of the small screws that you removed in [Step 8 on page 18](#).



- 2 Secure the front of the controller unit with the other two screws.
- 3 To install the battery, controllers, and controller fan in the front of the controller unit, reverse the instructions in [Figure 8 on page 13](#) and [Figure 9 on page 14](#).

Note: If you are installing additional cache memory in a controller, you can install it now, before you install the controller back in the controller unit. See ["Installing additional cache memory in a controller" on page 20](#).

- 4 To install the power supplies and fan and communications module in the back of the controller unit, reverse the instructions in [Figure 10 on page 14](#).
- 5 To install the mini-hubs in the back of the controller unit, reverse the instructions in [Figure 11 on page 15](#).
- 6 To replace the bezel, slide the top edge under the lip on the chassis; then, push the bezel bottom until the pins snap into the mounting holes, as shown in [Figure 12](#).

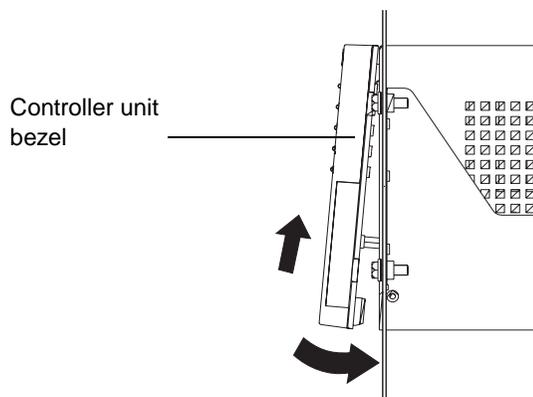


Figure 12. Replacing the controller unit bezel

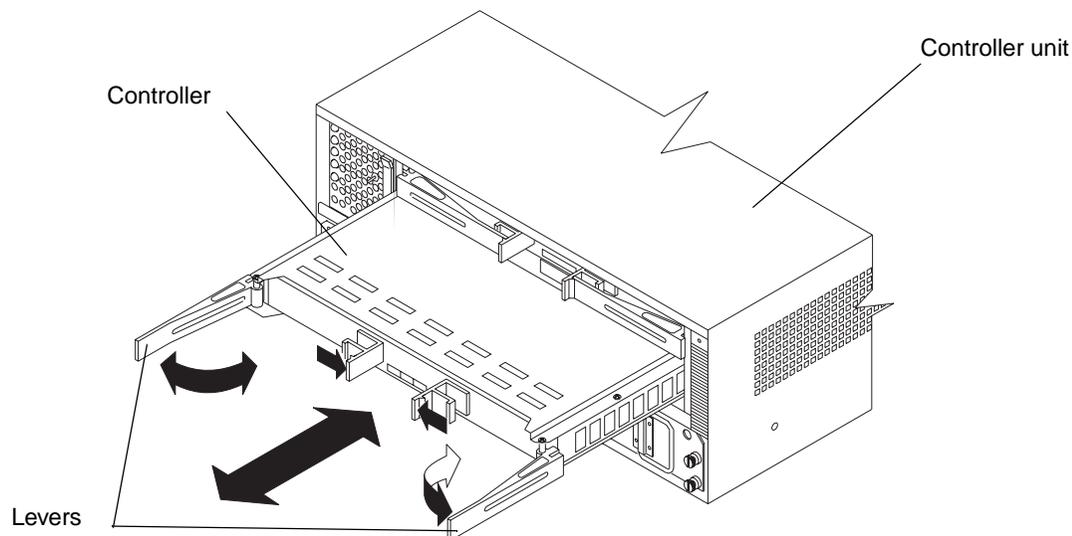
Installing additional cache memory in a controller

The controller comes with 256 MB of cache memory installed. You can add an additional 256 MB dual inline memory module (DIMM) for a total of 512 MB cache, with the IBM FASt500 256 MB Cache option.

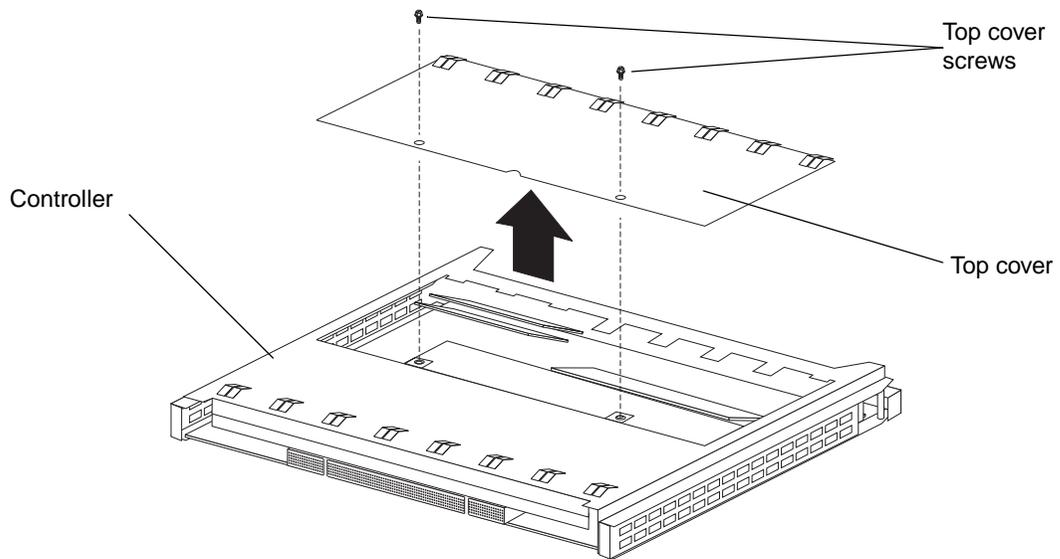
Use the following procedure to upgrade your controller cache memory. If you are installing the controller unit in a rack and have already removed the RAID controller, skip [Step 1](#).

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, refer to ["Handling static-sensitive devices" on page 10](#).

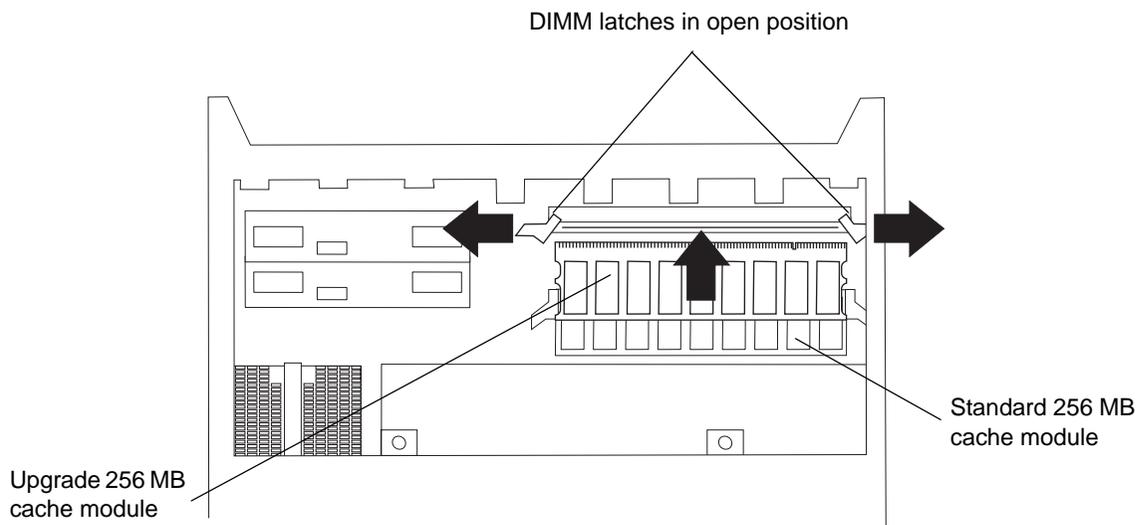
- 1 Unlock and open the levers on the controller; then, use the levers to pull the controller out of the controller unit a few inches. Grasp both sides of the controller to completely remove it from the controller unit.



- 2 Remove both screws from the top cover of the controller; then, lift the cover and set it aside to install after you upgrade your cache.

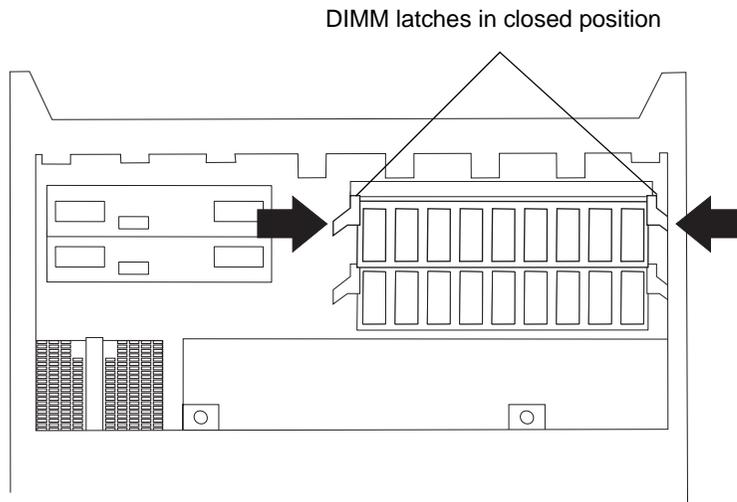


- 3 Locate the empty DIMM socket in front of the populated one that contains the standard 256 MB cache memory module. Make sure that both DIMM latches are open to their outermost position before inserting the new memory module.



- 4 Carefully insert the DIMM into the empty socket, making sure that the left and right edges of the module slide inside the grooves in the DIMM latches. As you push the DIMM into place, the DIMM latches slowly close around the new module.

- 5 Once the DIMM is fully seated in the socket, press firmly inward on the left and right DIMM latches until they lock and secure the DIMM into place.



- 6 Install the top cover that you removed in [Step 2 on page 21](#).
- 7 Install the controller back in the controller unit by reversing the procedure in [Step 1 on page 20](#).

Chapter 2. Connecting the controller unit to the loop

This chapter provides brief descriptions of the components that connect the controller unit to the Fibre Channel Arbitrated Loop (FC-AL) and instructions for installing the interface cables.

Mini-hub interface connections

The interfaces that connect the controller and drive enclosures to the storage subsystem are called mini-hubs. When fully configured, the back of the controller unit 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 hosts and drives. Each mini-hub has two ports. One Gigabit Interface Converter (GBIC) connects into each mini-hub port; then, a host or drive fiber-optic cable connects into the GBIC. The following figure shows the mini-hub interface connections.

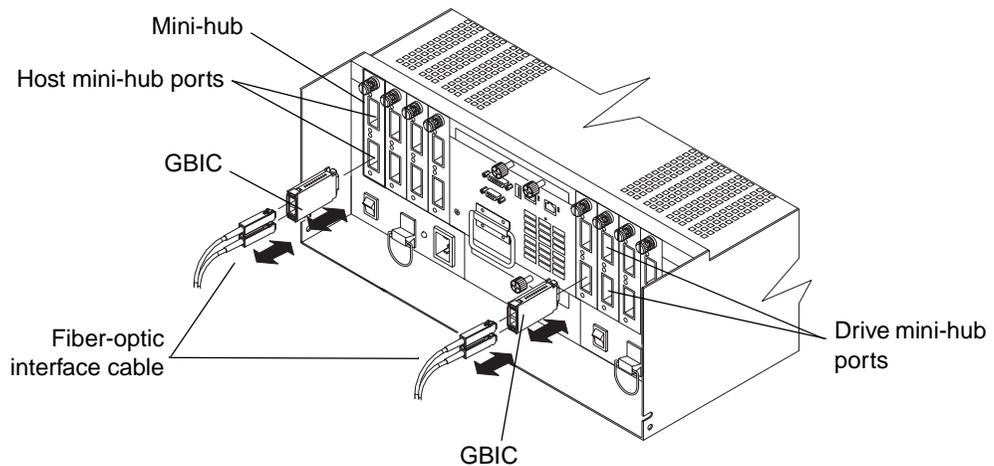


Figure 13. Mini-hub interface connections

Controller unit interface ports

The host and drive GBIC mini-hub ports are used to attach cables from the controller and drive enclosures to the storage subsystem. There are also Ethernet ports for storage subsystem- management and RS-232 (serial) ports for diagnostic services. The controller unit interface ports are shown in the following figure.

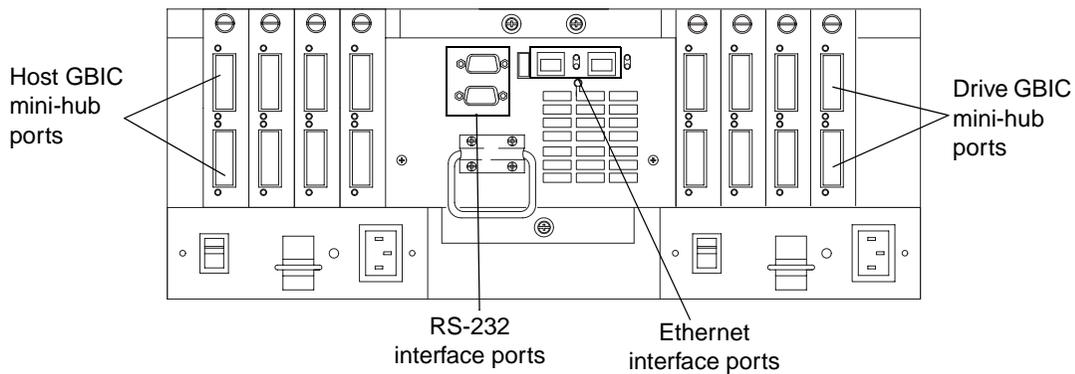


Figure 14. Controller unit interface ports

Host interface ports

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 15 on page 25](#). To ensure redundancy, you must connect each host to both controllers through the appropriate mini-hub.

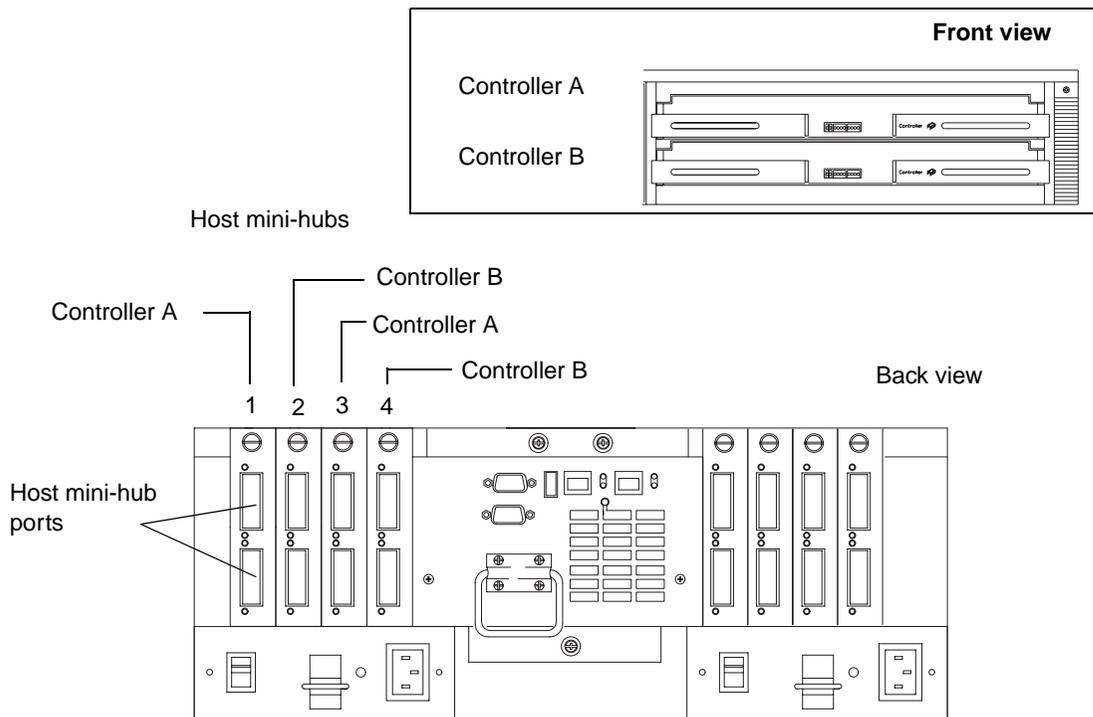


Figure 15. Controller unit host mini-hubs

Drive mini-hubs

Each drive mini-hub connects to Controller A and Controller B and each drive mini-hub represents a single drive channel. The drive channels 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 controller unit supports a maximum of 22 drive enclosures (11 drive enclosures per channel pair), or 220 drives.

Important: These large configurations are for capacity purposes and might not provide the best performance.

The drive channel cables connect to GBICs, which connect to either the upper or lower port on each mini-hub. Leave the remaining port on each mini-hub unoccupied for future upgrades, as shown in [Figure 16 on page 26](#).

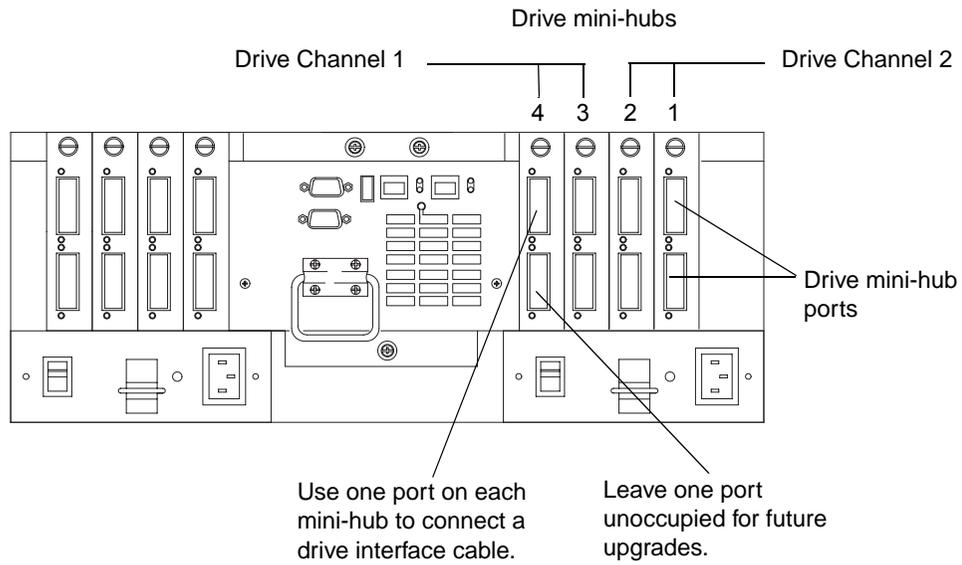


Figure 16. Controller unit drive mini-hubs

Ethernet and RS-232 ports

There is one Ethernet port and one RS-232 (serial) port on each controller (Controller A and Controller B). Use the Ethernet ports if you want to directly manage storage subsystems and use the RS-232 ports for diagnostic services. The following figure shows the location of these ports.

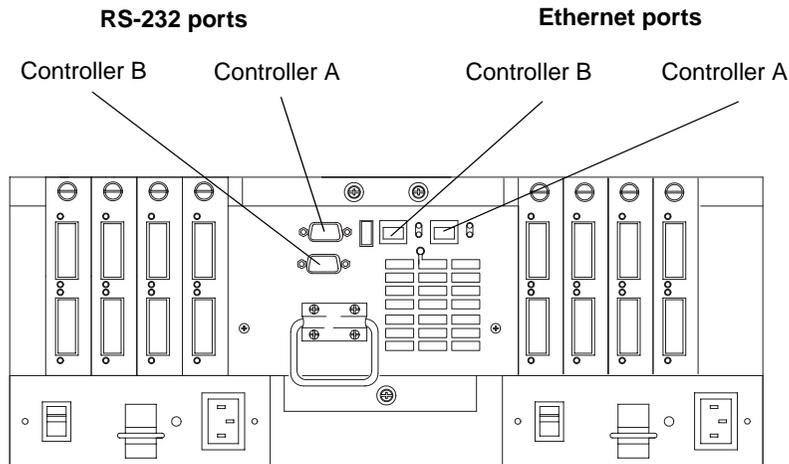


Figure 17. Controller unit Ethernet and RS-232 ports

Installing GBICs and fiber-optic cables

A Gigabit Interface Converter (GBIC) is used to connect each mini-hub port to hosts and drives.

Installation tips:

- The GBIC module housing has an integral guide key designed to prevent you from inserting the GBIC improperly.
- Use minimal pressure when inserting the GBIC into a port. Forcing the GBIC into a port could cause damage to the GBIC or the port.
- GBICs are hot pluggable. You can insert or remove the GBIC while the port is powered on.
- The operational loop performance is not affected when you install or remove a GBIC.
- You must connect the fiber-optic interface cable to the GBIC module after you insert the GBIC into the port.

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.**



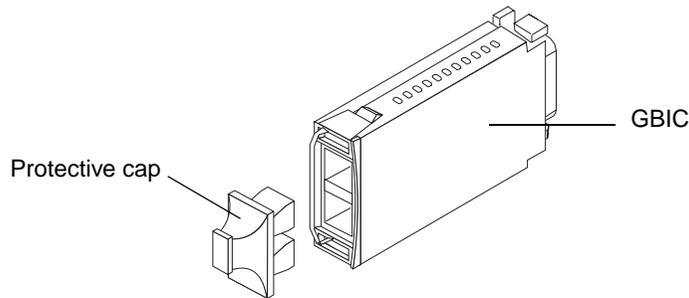
DANGER

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.

To install a GBIC, do the following:

- 1 Remove the protective cap from the GBIC, as shown in the following illustration.



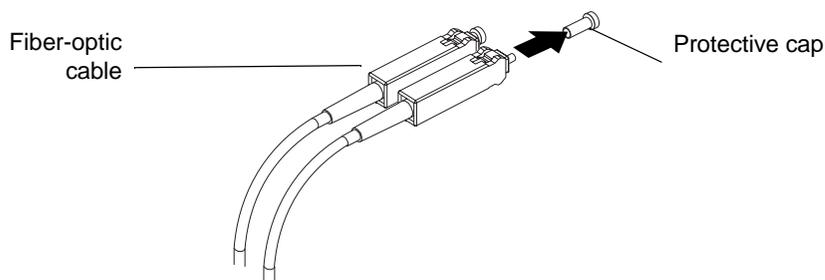
- 2 If the GBIC you are installing has a metal latch, move the latch to the unlocked (center) position. Slide the GBIC into the port; then, rotate the latch outward to the locked position (flush with the rear of the GBIC).

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

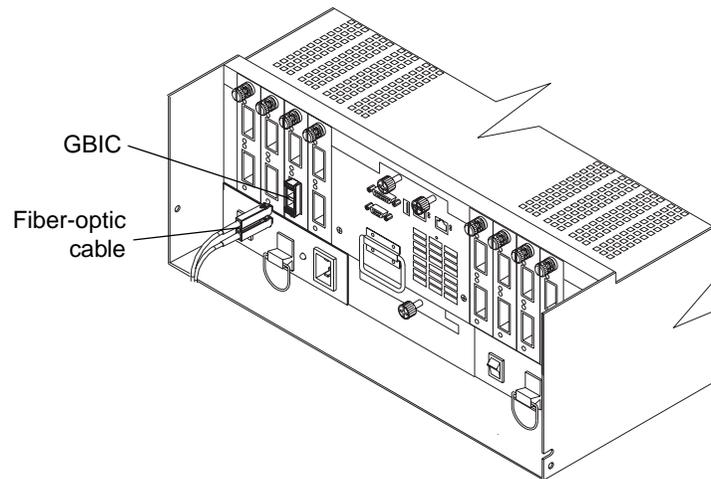
- Do not route the cable along a folding cable-management arm.
- When attaching to a device on slides, leave enough slack in the cable so that it does not bend to a radius smaller than 76 mm (3 inches) when extended or become pinched when retracted.
- Route the cable away from places where it can be snagged by other devices in the rack.
- Do not overtighten the cable straps or bend the cables to a radius smaller than 76 mm (3 inches).
- Do not put excess weight on the cable at the connection point and be sure that it is well supported.

To connect the fiber-optic cables, do the following.

- 1 Remove the two protective caps from one end of the fiber-optic cable.



- 2 Connect the fiber-optic cable to a GBIC that is installed in a mini-hub.



After you install the cables, the Fibre Channel Arbitrated Loop is operational.

To remove the fiber-optic cables and GBIC, do the following:

- 1 Remove the fiber-optic cables from the GBIC; then, replace the protective caps.
Note: If you are using IBM GBICs, you must remove the fiber-optic cables from the GBIC *before* you can remove the GBIC from the mini-hub port.
- 2 Move the metal latch on the GBIC to the unlocked (center) position.
- 3 Pull the GBIC out of the port.
- 4 Insert the protective cap on the GBIC.

Controller unit and drive enclosure cabling overview

The controller unit supports redundant drive loops. A redundant drive loop consists of one or more drive enclosures connected to a controller using two sets of data cables. If one data path fails, the controller uses the other data path to maintain I/O to the drive group.

Figure 18 shows a storage subsystem containing one controller enclosure unit and two drive groups with four drive enclosures each. Each drive group uses redundant drive loops to connect to the controller unit. 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, cable the drive enclosures as shown in the following figure.

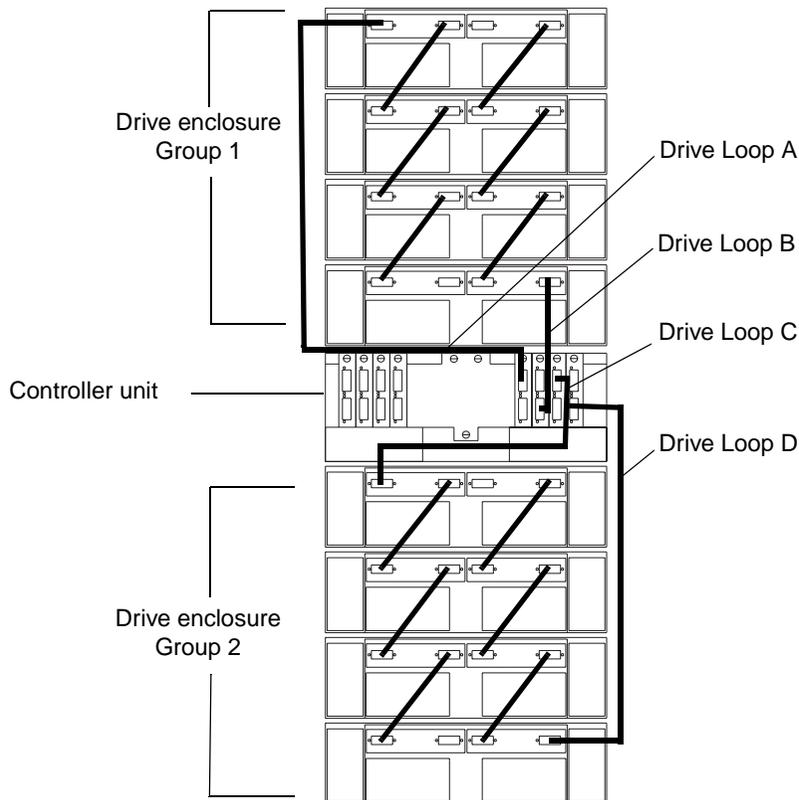


Figure 18. Redundant drive loop cabling overview

Configuring the drive loops

The procedure and illustrations in this section show an example of cabling a group of drive enclosures into a redundant drive loop. For an example of a drive loop that has only one drive enclosure, skip this procedure and go to ["Connecting drive cables to the controller unit"](#) on page 33.

Attention: To complete this procedure, you will need two Fibre Channel interface cables. Handle and install fiber-optic cables properly to avoid degraded performance or loss of communications with devices. When working with fiber-optic cables, do not pinch them, step on them, or locate them in aisles or walkways. Do not overtighten the cable straps or bend the cables to a radius smaller than 76 mm (3 in.).

- 1 Connect the first two drive enclosures to drive Loop A, as shown in [Figure 19](#).

Starting with the first drive enclosure, connect an interface 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.

- 2 Connect the same first two drive enclosures to drive Loop B, as shown in [Figure 19](#).

Starting with the first drive enclosure, connect an interface 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. If you want to cable more drive enclosures into Loops A and B, continue with [Step 3 on page 32](#); otherwise, go to ["Connecting drive cables to the controller unit"](#) on page 33.

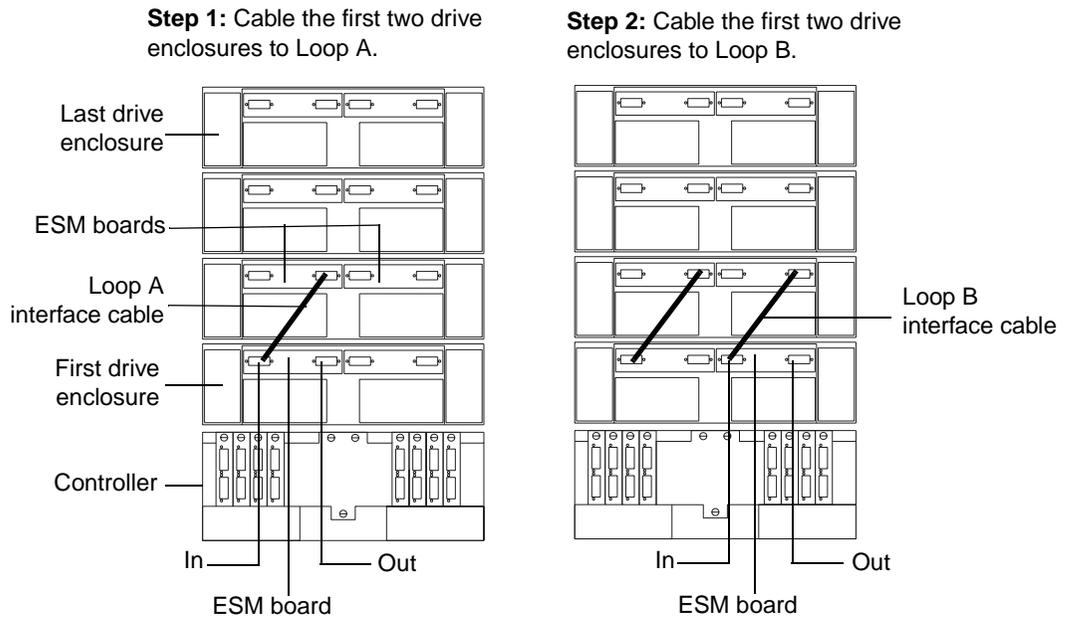


Figure 19. Example of connecting two drive enclosures into a redundant drive loop

- 3 Connect additional drive enclosures to drive Loops A and B, as shown in [Figure 20](#).

Starting with the second drive enclosure, cable each additional drive enclosure into Loops A and B in the same manner. Leave unoccupied the In ports on the last drive enclosure in the loop and the Out ports on the first drive enclosure. If you want to cable a second drive group, go to [Step 4](#); otherwise, go to ["Connecting drive cables to the controller unit" on page 33](#).

- 4 Repeat [Step 1 on page 31](#) through [Step 3](#) to cable a second drive group (Loop C and Loop D on Drive Group 2) in the same manner, as shown in [Figure 20](#). When you finish, go to ["Connecting drive cables to the controller unit" on page 33](#).

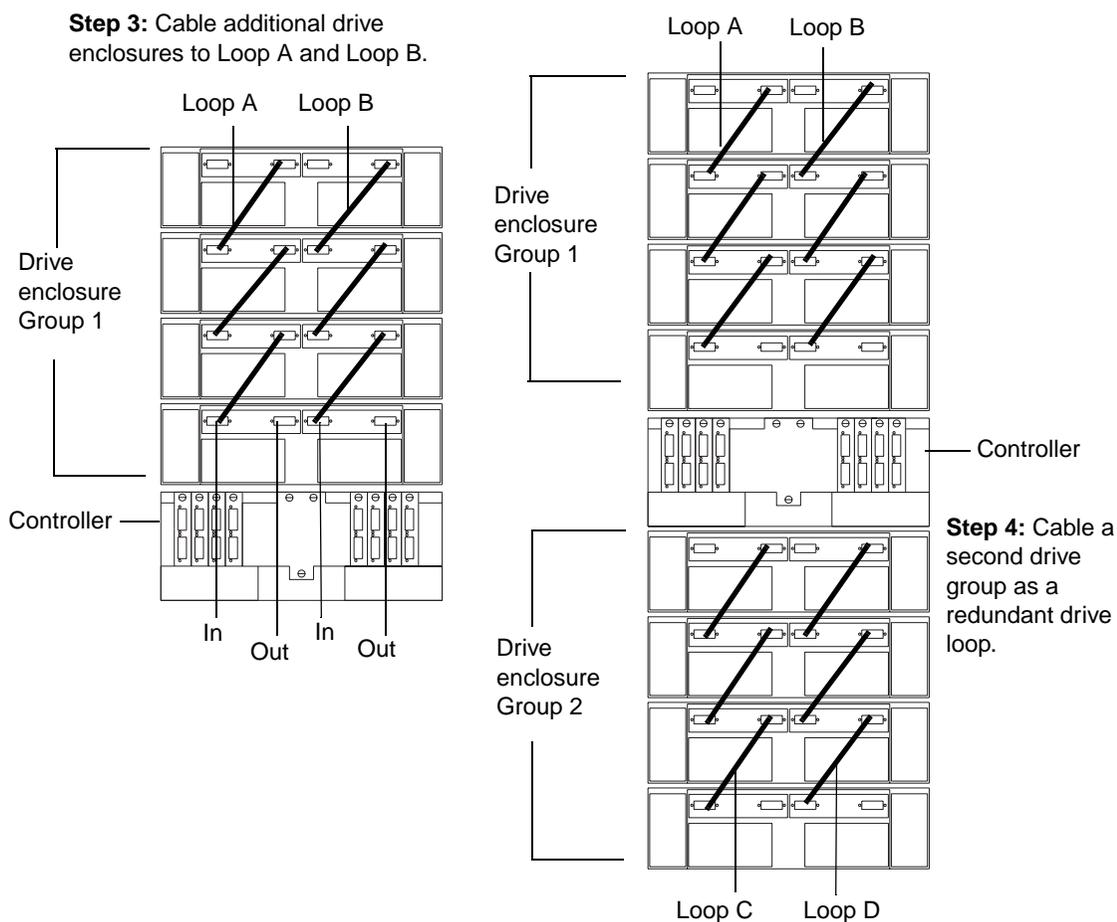


Figure 20. Connecting a second redundant drive loop

Connecting drive cables to the controller unit

Use the following procedure to connect a redundant drive loop to the controller unit. You will need two Fiber Channel interface cables for each redundant pair of loops (for example, Loop A and Loop B) that you are connecting to the controller unit.

- 1 Connect drive Loop A to the controller unit, as shown in [Figure 21](#).

Starting with the last drive enclosure in Loop A, cable the In port on the left ESM board to the Out (upper) port on drive mini-hub 4 on the controller unit.

Leave the In port on the right ESM board on the last drive enclosure and the In (lower) connector on drive mini-hub 4 unoccupied.

- 2 Connect drive Loop B to the controller unit, as shown in [Figure 21](#).

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

Leave the Out port on the left ESM board and the Out (upper) port on drive mini-hub 3 unoccupied.

To connect a second redundant drive enclosure group to the controller unit, continue with [Step 3 on page 34](#); otherwise, go to "[Connecting hosts directly to the controller unit](#)" on page 35.

Step 1: Connect drive Loop A to the controller unit.

Step 2: Connect drive Loop B to the controller unit.

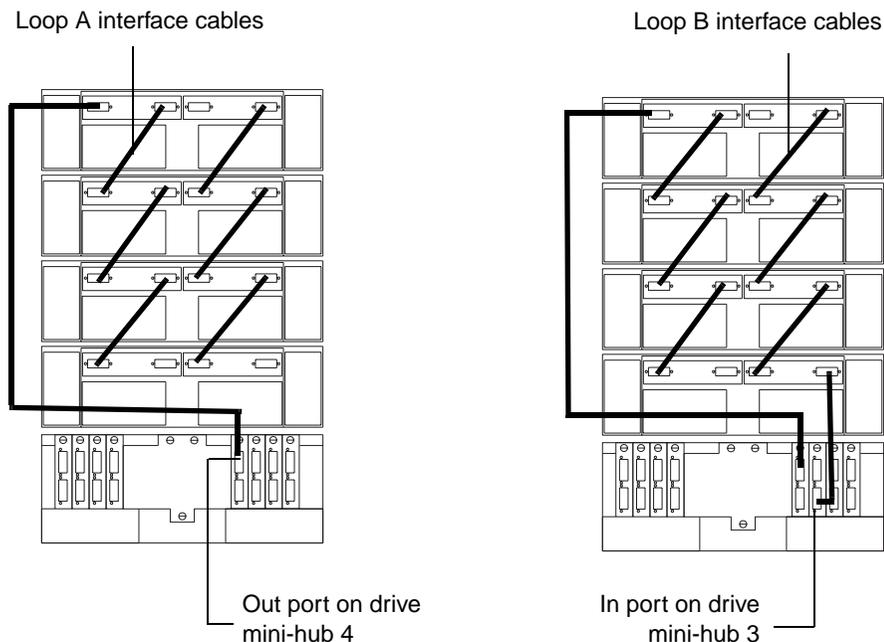


Figure 21. Cabling redundant drive enclosure loops to the controller unit

- 3 Connect drive Loop C to the controller unit, as shown in [Figure 22](#).

Starting with the first drive enclosure, cable the In port on the left ESM board to the Out (upper) port on drive mini-hub 2.

Leave the In port on the right ESM board and the In (lower) port on the drive mini-hub 2 unoccupied.

- 4 Connect drive Loop D to the controller unit, as shown in [Figure 22](#).

Starting with the last drive enclosure, cable the Out port on the right ESM board to the In (lower) port on mini-hub 1.

Leave the Out port on the left ESM board on the last drive enclosure and the Out (upper) port on drive mini-hub 1 unoccupied.

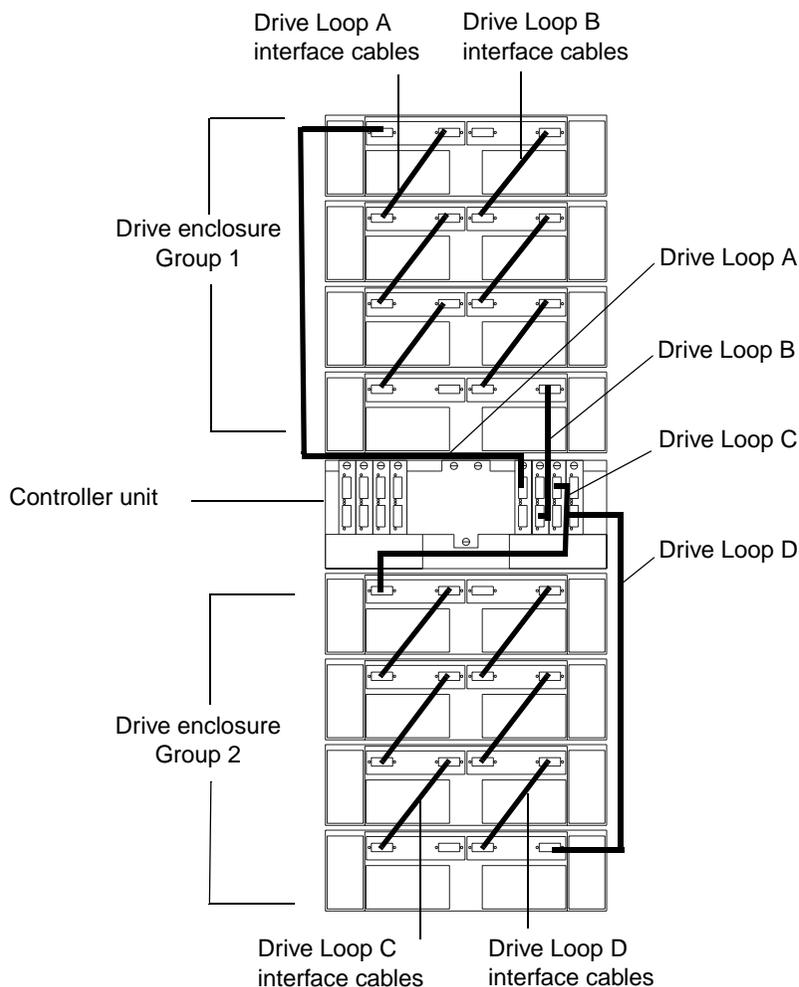


Figure 22. Two redundant drive enclosure groups

- 5 Go to "[Connecting hosts directly to the controller unit](#)" on page 35.

Connecting hosts directly to the controller unit

Use this procedure to connect up to four hosts, with two host adapters each, directly to the controller unit. If you are connecting five or more hosts to the controller unit, go to ["Connecting hosts using external devices" on page 36](#).

Before proceeding, make sure that you connect Fiber Channel interface cables to all host adapters that you are connecting to the controller unit.

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 controller unit, as shown in [Figure 23 on page 36](#).
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 ["Connecting secondary interface cables" on page 39](#).
- 2 Connect a second host (Host 2) to the controller unit, as shown in [Figure 23 on page 36](#).
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 ["Connecting secondary interface cables" on page 39](#).
- 3 Connect a third host (Host 3) to the controller unit, as shown in [Figure 23 on page 36](#).
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 ["Connecting secondary interface cables" on page 39](#).
- 4 Connect a fourth host (Host 4) to the controller unit, as shown in [Figure 23 on page 36](#).
Attach HA1 and HA2 from Host 4 to the two unoccupied ports on mini-hub 3 and mini-hub 4.
- 5 Go to ["Connecting secondary interface cables" on page 39](#).

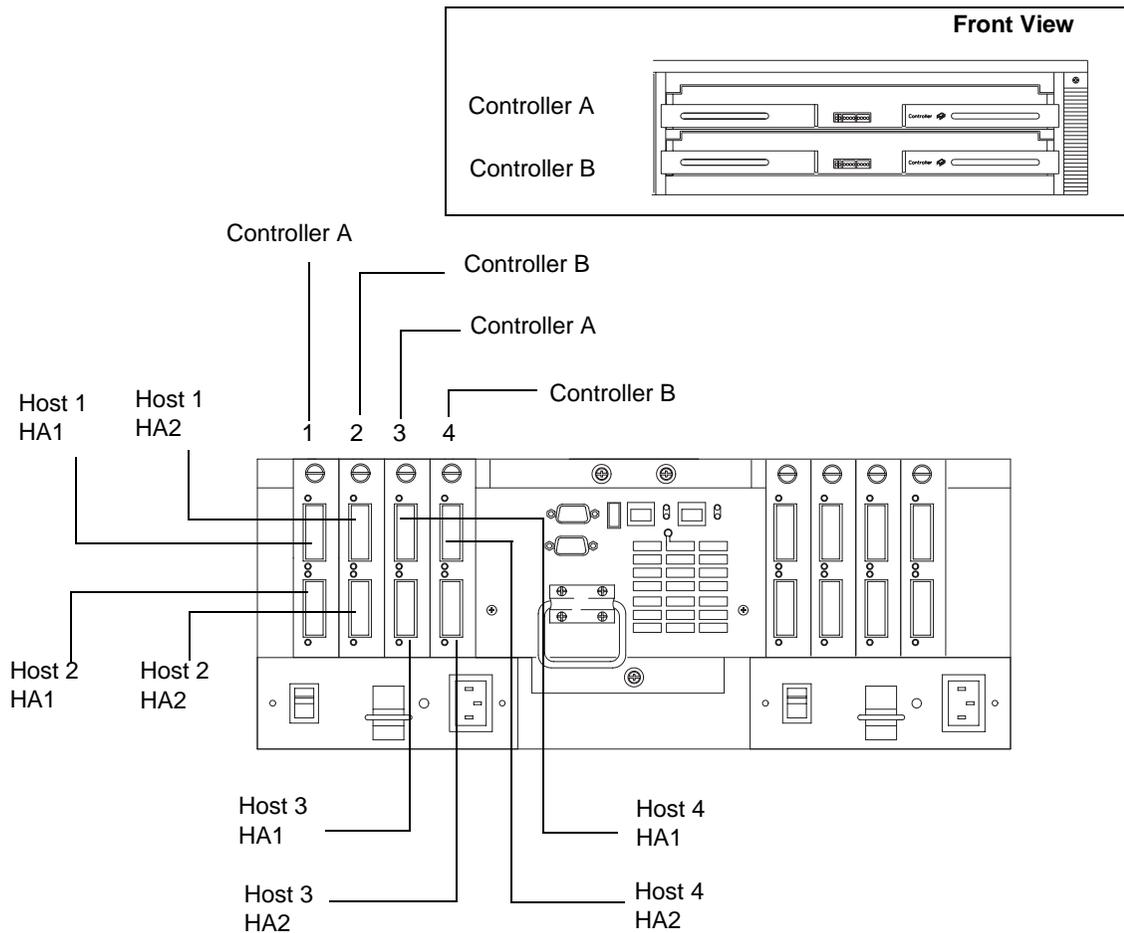


Figure 23. Connecting hosts directly to the controller

Connecting hosts using external devices

Use this procedure to connect five or more hosts to the controller unit. Using external managed hubs, the controller unit supports up to 32 hosts (64 host adapters) per controller or up to 64 hosts (128 host adapters) for redundant controllers. Before starting, make sure to connect each host to its respective mini-hub.

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.

Note: Throughout this book, the use of hub or external hub refers to a managed hub.

- 1 Connect the first host (Host 1) to the controller unit, as shown in [Figure 24](#).

Connect Host Adapter 1 (HA1) from Host 1 (through Hub 1) to host mini-hub 1.
Connect HA2 from Host 1 (through Hub 2) to mini-hub 2.

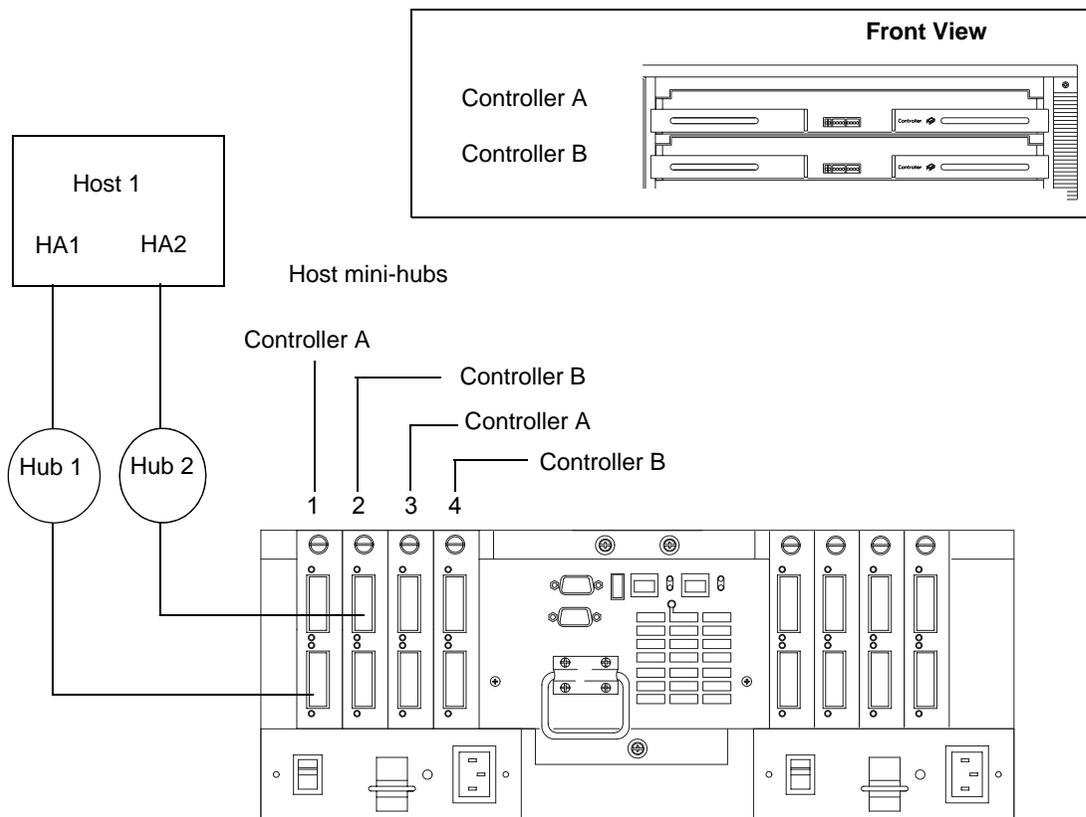


Figure 24. Using managed hubs to connect a host

- 2 Connect additional hosts to the controller unit, using and method shown in [Figure 25 on page 38](#).
- 3 Go to "[Connecting secondary interface cables](#)" on page 39.

Method 1

Connect a new managed hub to an available port on each hub that you connected in Step 1.

Method 2

Connect a new managed hub to either port on each remaining host mini-hub.

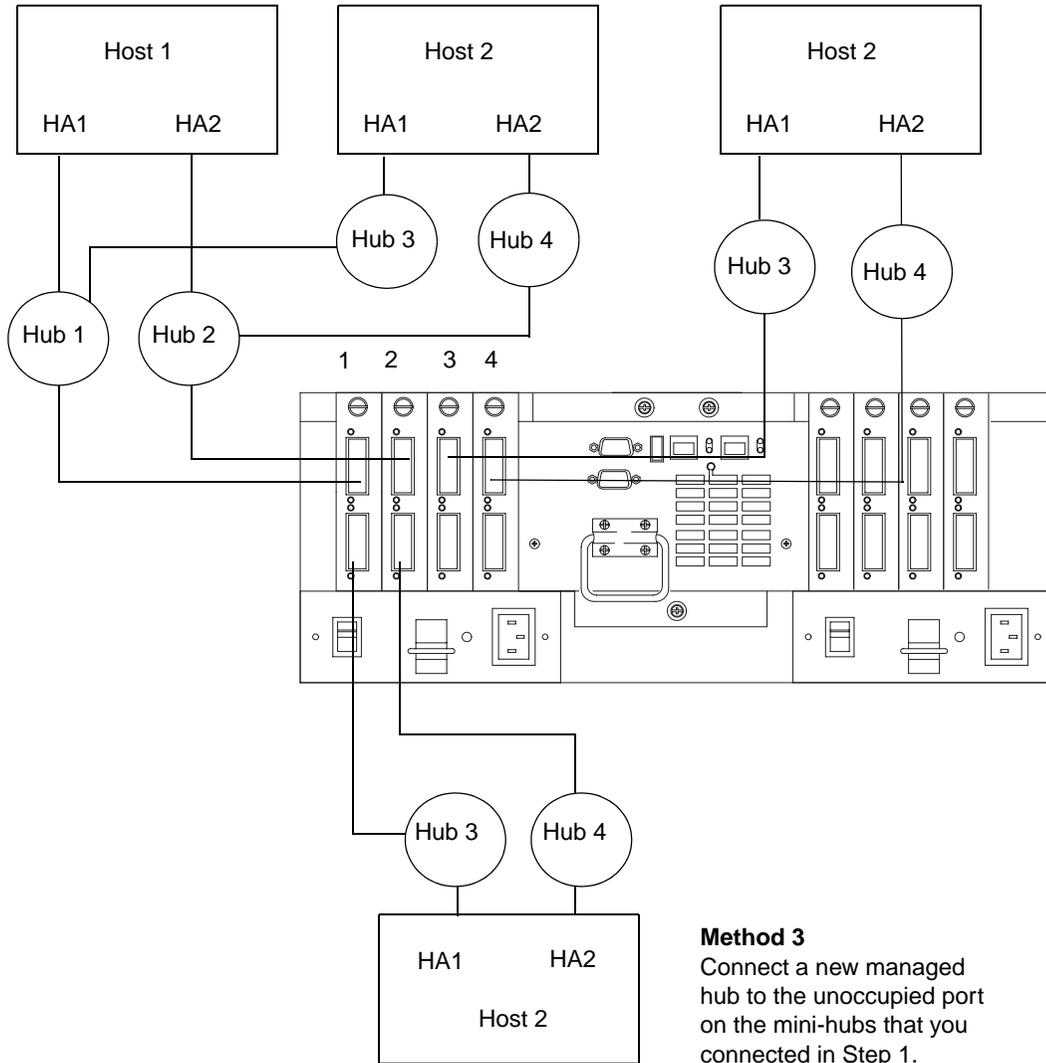


Figure 25. Using managed hubs to connect multiple hosts

Connecting secondary interface cables

Use this procedure to connect Ethernet or RS-232 (serial) interface cables to the controller unit.

- 1 To directly manage a storage subsystem, 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 controller unit, as shown in [Figure 26](#). For more information, see [Figure 5 on page 7](#).

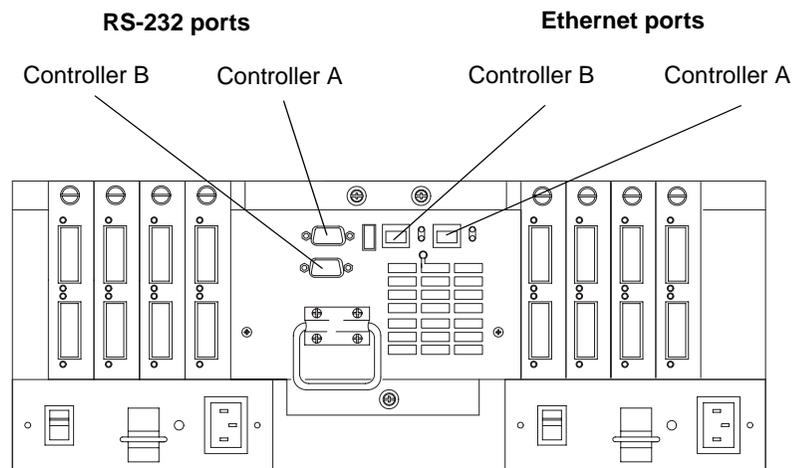


Figure 26. Connecting Ethernet and RS-232 interface cables

- 2 To perform diagnostic procedures, connect an RS-232 interface cable to an RS-232 port (see [Figure 26](#) for the location of these ports).

Chapter 3. Starting the controller unit

After you install the controller unit in a rack 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 complete the installation.

Turning on the power

Use this procedure to connect the power cords to the controller unit and to the ac power source.

- 1 Make sure both power switches on the controller unit are off.
- 2 Plug both controller unit power cords into the controller unit, as shown in [Figure 27](#).
- 3 Plug both controller unit power cords into the ac outlets.

To maintain power redundancy, plug each power cord into an independent power source, such as the ac distribution box inside a cabinet or an external receptacle. For details about power requirements, see "[Operating specifications](#)" on [page 5](#).

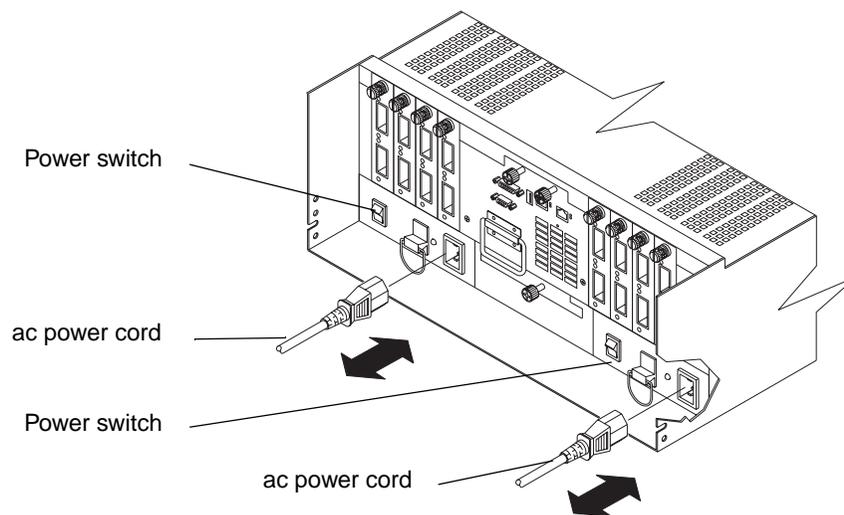


Figure 27. Connecting the power cords and turning on and off the power

Use the following procedure to turn on power to the controller unit.

Important: *You must turn on the drive enclosures before, or at the same time as, the controller unit.* The controllers might not recognize the correct configuration if the drives are powered up after the controller unit. If you plan to use the main breaker to turn on all enclosures at the same time, make sure that the switches on each drive enclosure and each controller unit are on before turning on the main breaker. 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.

Turn on both power switches on the back of the controller unit (see [Figure 27 on page 41](#) for the location of the switches). You must turn on both switches to take advantage of the redundant power supplies.

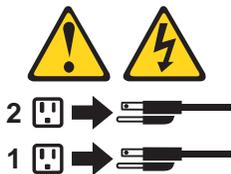
Turning off the power

Statement 5



CAUTION:

The power control button on the device and 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.



Attention: The controller unit is designed to run continuously, 24 hours a day. Except in an emergency, never turn off the power if any controller unit 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 controller unit powers up correctly later.

Use the following procedure to turn off power to the controller unit.

- 1 Prepare the controller unit for shutdown, as follows:
 - a Stop all I/O activity to the controller unit and attached drive enclosures. Logically disconnect the controller and drive enclosures from the hosts. Make sure that the fast write cache indicator light on each controller unit front panel and all applicable drive active indicator lights on each drive enclosure front panel are off (not blinking).

Note: If a parity check is in progress, it might take a long time for the drive indicator lights to stop blinking.
 - b Make sure that all amber fault indicator lights on the controller unit are off. If any fault indicator lights are on, correct the problem before turning off the power.
- 2 Turn off the power switches on the back of the controller unit (see [Figure 27 on page 41](#) for the location of the switches).
- 3 Turn off any drive enclosures attached to the controller unit.

Turning on the controller unit alarm

You can arm the alarm that is located on the controller fan by setting the switch in the up position, as shown in [Figure 28](#). When the switch is armed, the alarm sounds when a hardware problem occurs.

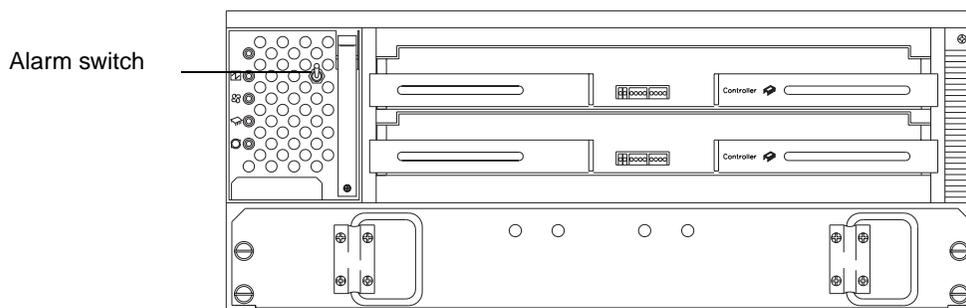


Figure 28. Controller unit alarm switch

Controller unit indicator lights

The indicator lights on the front of the controller unit are shown in [Figure 29](#) through [Figure 31](#) on page 46.

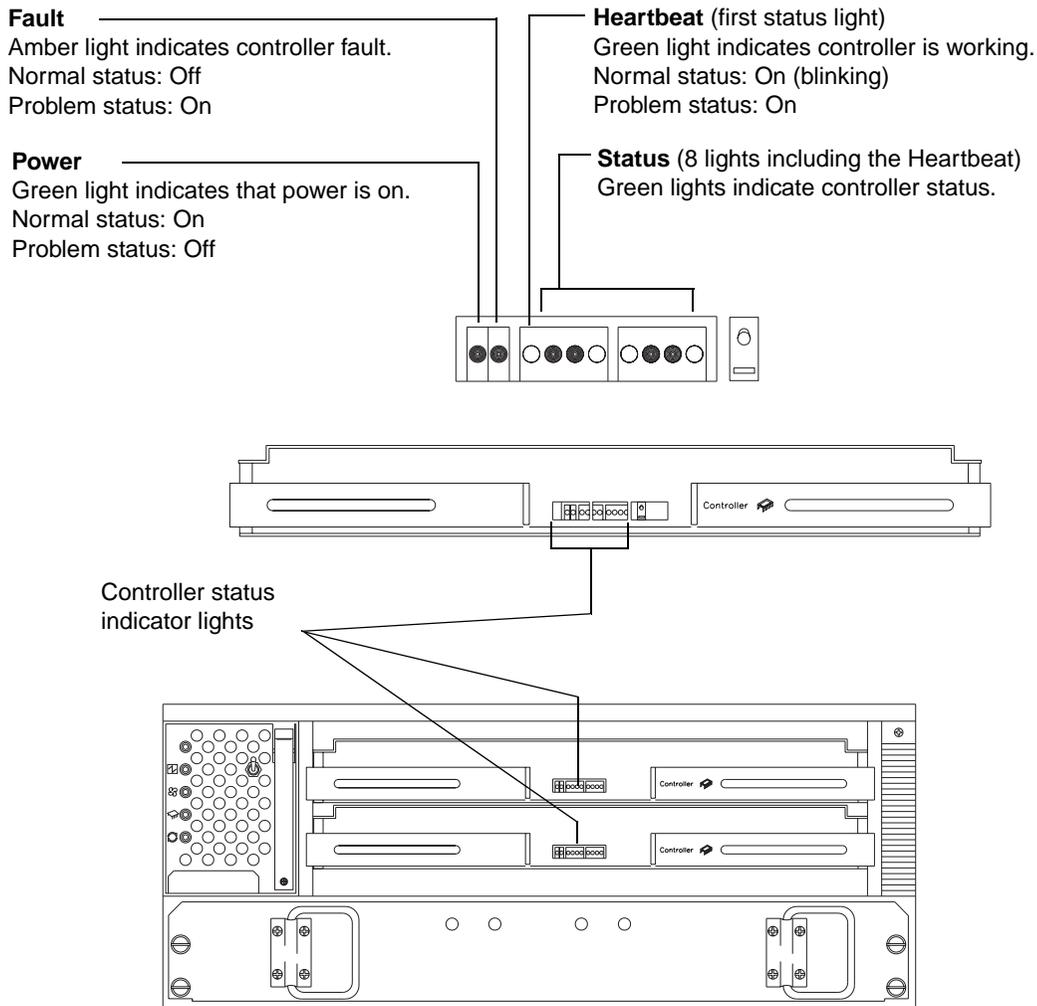


Figure 29. Controller indicator lights — front view

Note: 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 or passive (offline). For more information, refer to *IBM FAST500 RAID Controller Enclosure Unit User's Guide* and *IBM FAST Storage Manager Version 7.10 Installation and Support Guide*.

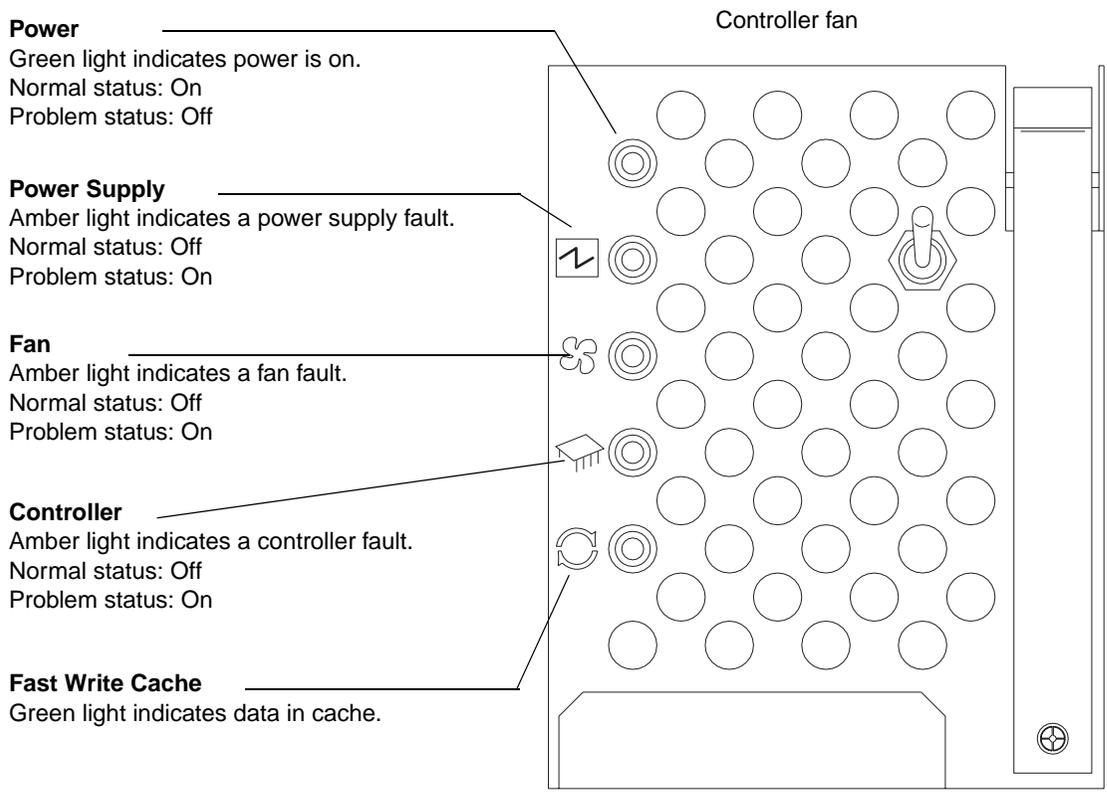
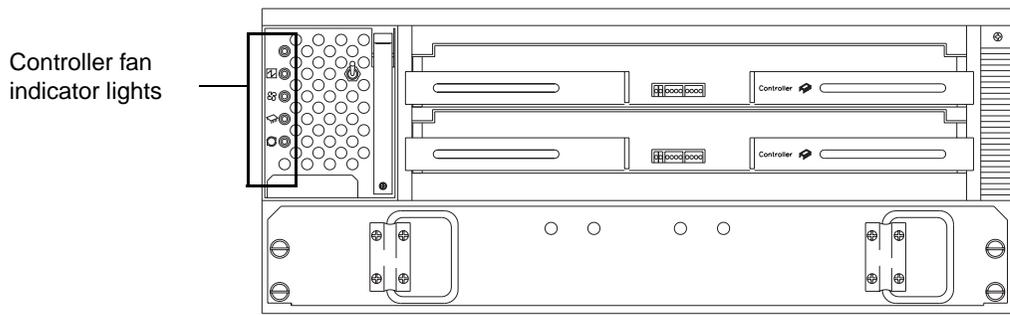


Figure 30. Controller fan indicator lights — front view

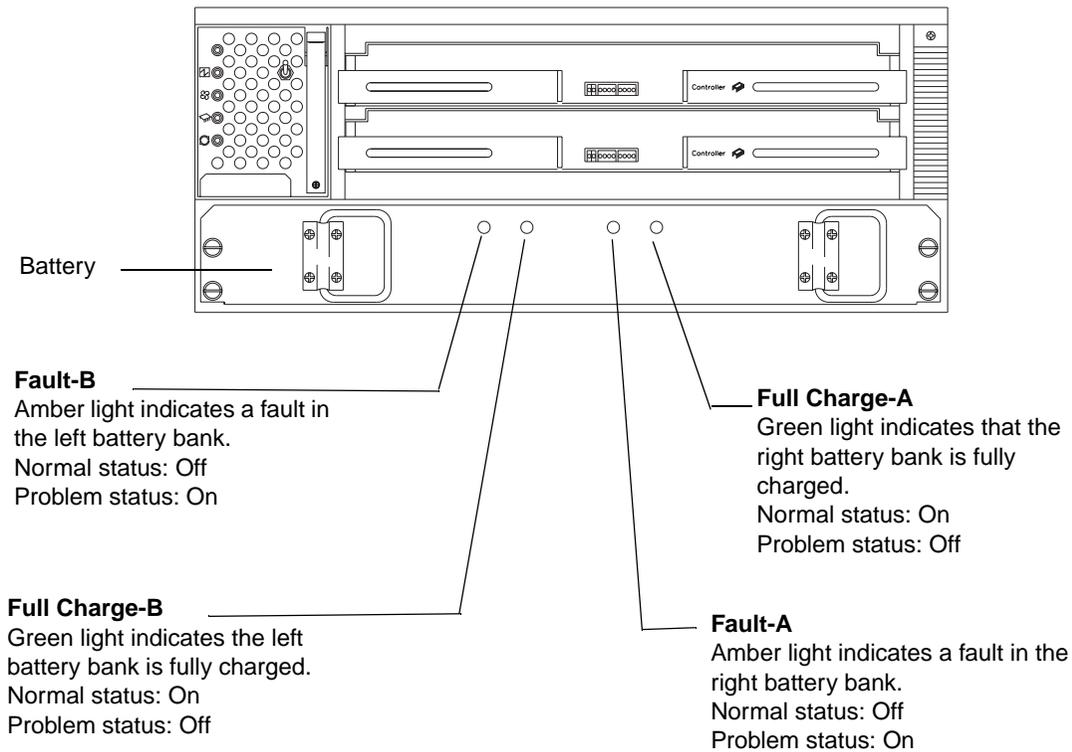


Figure 31. Battery indicator lights — front view

The indicator lights on the back of the controller unit are shown in [Figure 32](#) and [Figure 33](#) on page 47.

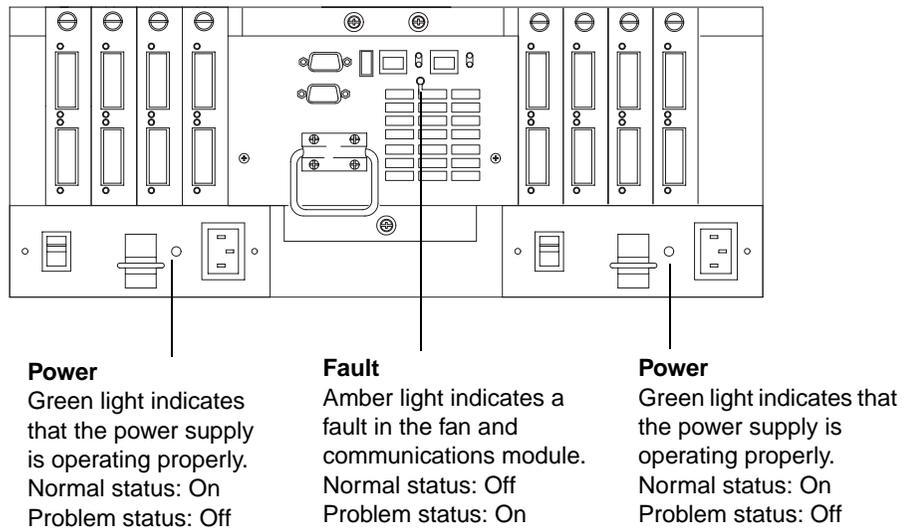


Figure 32. Controller unit indicator lights — back view

The mini-hub indicator lights on the back of the controller unit are shown in the following figure and described in [Table 2](#).

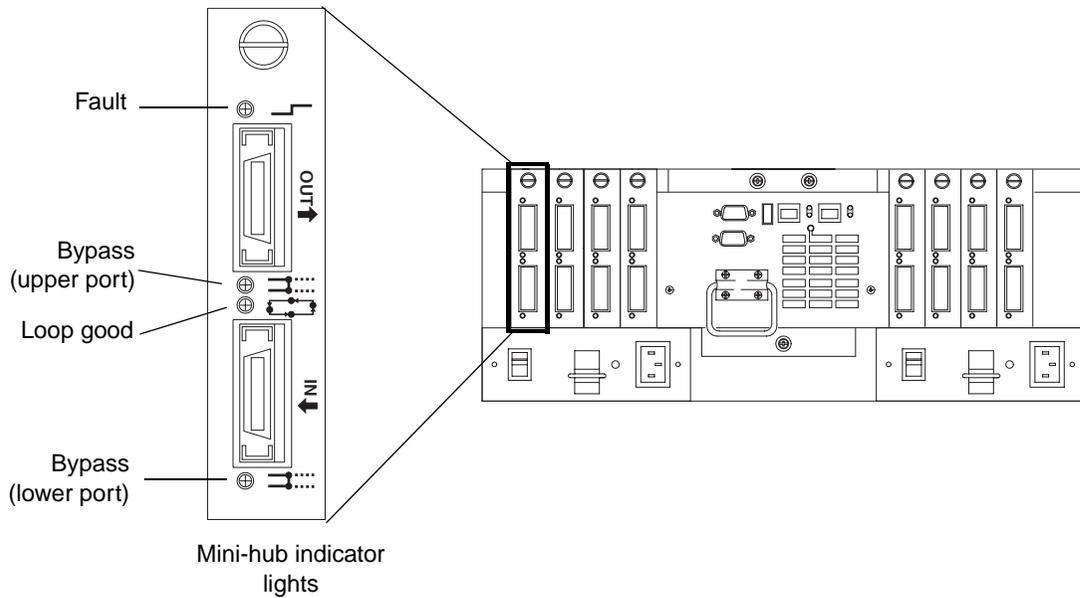


Figure 33. Mini-hub indicator lights

The following table describes the mini-hub indicator lights.

Table 2: Mini-hub indicator lights

Icon	Indicator light	Color	Normal operation	Problem indicator	Condition indicated
	Fault	Amber	Off	On	There is a fault in the mini-hub.
	Bypass (upper port)	Amber	Off	On	The upper mini-hub port is bypassed. Note: If the port is unoccupied, the light is on.
	Loop good	Green	On	Off	The drive loop is operational.
	Bypass (lower port)	Amber	Off	On	The lower mini-hub port is bypassed. Note: If the port is unoccupied, the light is on.

Completing the installation

Use the following procedure to check the controller unit for problems.

- 1 Check the indicator lights on the front of the controller for faults. For the locations of the indicator lights, see ["Controller unit indicator lights" on page 44](#).
- 2 When all status indicators show “normal status,” replace the controller unit front cover.

For operating instructions, refer to the IBM FAStT500 RAID Controller Enclosure Unit *User's Guide*.

Chapter 4. Getting help and technical assistance

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 appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries or IntelliStation system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM Support Web site at <http://www.ibm.com/pc/support/> to check for technical information, hints, tips, and new device drivers.
- Use an IBM discussion forum on the IBM Web site to ask questions.

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 system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, README files, and help files. See the troubleshooting information in your system documentation for instructions for 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/](http://www.ibm.com/pc/support/) and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at [http://www.elink.ibm.com/ public/applications/publications/cgibin/pbi.cgi](http://www.elink.ibm.com/public/applications/publications/cgibin/pbi.cgi).

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>. If you click Profile from the support page, you can create a customized support page. The support page has many sources of information and ways for you to solve problems, including:

- Diagnosing problems, using the IBM Online Assistant
- Downloading the latest device drivers and updates for your products
- Viewing Frequently Asked Questions (FAQ)
- Viewing hints and tips to help you solve problems
- Participating in IBM discussion forums
- Setting up e-mail notification of technical updates about your products

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to <http://www.ibm.com/services/sl/products/>.

For more information about Support Line and other IBM services, go to <http://www.ibm.com/services/>, or go to <http://www.ibm.com/planetwide/> for support telephone numbers.

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to <http://www.ibm.com/planetwide/> for support telephone numbers.

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

Appendix A. 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 FASt500 RAID Controller Enclosure Unit

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

For more information about getting help from IBM, see ["Chapter 4. Getting help and technical assistance"](#).

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

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

Part 1 - General Terms

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

The IBM Warranty for Machines

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

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

Extent of Warranty

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

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

Items Not Covered by Warranty

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

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

Warranty Service

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

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

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

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

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

You also agree to

3. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
4. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
5. 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-IBMSERV (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:*

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When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

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Avis de conformité à la réglementation d'Industrie Canada

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Notice to Customers

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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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Part Number: 59P6244



Printed in the United States of America
on recycled paper containing 10%
recovered post-consumer fiber.

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