

IBM Netfinity Fibre Channel

S10L-9845-01

Hardware Maintenance Manual

May 2000

**Use this manual with the
IBM Servers
Hardware Maintenance Manuals**

**We Want Your Comments!
(Please see page 220)**

This Manual Supports:

HUB Type 3523
Long-Wave GBIC
Short-Wave GBIC
PCI Adapter (FRU 01K7354)
RAID Controller Type 3526
FAStT Adapter (FRU 09N7292)
FAStT500 RAID Controller Type 3552

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Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 219.

Second Edition (May 2000)

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About This Manual

This manual contains diagnostic and service information for the IBM Netfinity Fibre Channel products listed below:

- Fibre Channel HUB (Type 3523)
 - Fibre Channel Long-Wave GBIC
 - Fibre Channel Short-Wave GBIC
- Fibre Channel PCI Adapter
- Fibre Channel RAID Controller (Type 3526)
- Fibre Channel FAStT Adapter
- Fibre Channel FAStT500 RAID Controller (Type 3552)

This manual should be used with the Hardware Maintenance Manual for the system you are servicing.

Important

This manual is intended for trained servicers who are familiar with IBM PC Server and IBM Netfinity Server products.

Important Safety Information

Be sure to read all caution and danger statements in this book before performing any of the instructions.

Leia todas as instruções de cuidado e perigo antes de executar qualquer operação.

注意和危险声明 (简体中文)

重要事项:

本书中的所有注意和危险声明之前都有编号。该编号用于英语的注意或危险声明与 *Safety Information* 一书中可以找到的翻译版本的注意或危险声明进行交叉引用。

例如，如果一个注意声明以编号 1 开始，那么对该注意声明的翻译出现在 *Safety Information* 一书中的声明 1 中。

在按说明执行任何操作前，请务必阅读所有注意和危险声明。

注意及危險聲明 (中文)

重要資訊：

本書中所有「注意」及「危險」的聲明均以數字開始。此一數字是用來作為交互參考之用，英文「注意」或「危險」聲明可在「安全資訊」(Safety Information)一書中找到相同內容的「注意」或「危險」聲明的譯文。

例如，有一「危險」聲明以數字 1 開始，則該「危險」聲明的譯文將出現在「安全資訊」(Safety Information)一書的「聲明」1 中。

執行任何指示之前，請詳讀所有「注意」及「危險」的聲明。

Prenez connaissance de toutes les consignes de type Attention et Danger avant de procéder aux opérations décrites par les instructions.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Accertarsi di leggere tutti gli avvisi di attenzione e di pericolo prima di effettuare qualsiasi operazione.

주의 및 위험 경고문(한글)

중요:

이 책에 나오는 모든 주의 및 위험 경고문은 번호로 시작됩니다. 이 번호는 *Safety Information* 책에 나오는 영문판 주의 및 위험 경고문과 한글판 주의 및 위험 경고문을 상호 참조하는데 사용됩니다.

예를 들어 주의 경고문이 번호 1로 시작되면 *Safety Information* 책에서 이 주의 경고문은 경고문 1번 아래에 나옵니다.

지시를 따라 수행하기 전에 먼저 모든 주의 및 위험 경고문을 읽도록 하십시오.

Lea atentamente todas las declaraciones de precaución y peligro ante de llevar a cabo cualquier operación.

Online Support

Use the IBM Personal computing solutions (BBS) or the World Wide Web (WWW) to download Diagnostic, BIOS Flash, and Device Driver files.

File download address is:

<http://www.pc.ibm.com/us/files.html>

The IBM BBS can be reached at (919) 517-0001.

IBM Online Addresses:

The HMM manuals online address is:

<http://www.pc.ibm.com/us/cdt/hmm.html>

The IBM Support Page is:

<http://www.pc.ibm.com/support/>

The IBM Personal computing solutions page is:

<http://www.pc.ibm.com>

Related Publications

The following publications are available for IBM products. For more information, contact IBM or an IBM Authorized Dealer.

For Information About	See Publication
PC Servers	IBM PC Servers Hardware Maintenance Manual (S30H-2501)
PS/2 Computers	IBM Personal System/2 Hardware Maintenance Manual (S52G-9971)
PS/ValuePoint Computers	IBM PS/ValuePoint Hardware Maintenance Service and Reference (S61G-1423)
Laptop, Notebook, Portable, and ThinkPad Computers (L40, CL57, N45, N51, P70/P75, ThinkPad 300, 350, 500, 510, 710T, Expansion Unit, Dock I, Dock II)	IBM Mobile Systems Hardware Maintenance Manual Volume 1 (S82G-1501)
ThinkPad Computers (ThinkPad 340, 355, 360, 370, 700, 701, 720, 750, 755)	IBM Mobile Systems Hardware Maintenance Manual Volume 2 (S82G-1502)
ThinkPad Computers (ThinkPad 365, 760)	IBM Mobile Systems Hardware Maintenance Manual Volume 3 (S82G-1503)
Monitors (Displays) (February 1993)	IBM PS/2 Display HMM Volume 1 (SA38-0053)
Monitors (December 1993)	IBM Color Monitor HMM Volume 2 (S71G-4197)
IBM Monitors (P Series) (February 1996)	IBM Monitor HMM Volume 3 (S52H-3679)
IBM 2248 Monitor (February 1996)	IBM Monitor HMM Volume 4 (S52H-3739)
Disk Array technology overview and using the IBM RAID Configuration Program	Configuring Your Disk Array booklet (S82G-1506)
Installation Planning for Personal System/2 computers	Personal System/2 Installation Planning and Beyond (G41G-2927)
Installation Planning for Advanced Personal System/2 Servers	Advanced PS/2 Servers Planning and Selection Guide (GG24-3927)

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IBM Netfinity Fibre Channel

What is Fibre Channel?

Fibre Channel technology is outlined in the *Information Systems - Fibre Channel Protocol for SCSI (small computer system interface - FCP)* standard, revision 12, 30 May 1995. Fibre Channel is a high-speed data transport technology used for mass storage and networking. The FAS/T Host Adapter connects:

- Mainframe computers
- Super computers
- Workstations
- Storage devices
- Servers

Using a Fibre Channel arbitrated loop (FC-AL), 126 devices can be supported, compared to 15 devices with Ultra SCSI.

Fibre Channel supports data transfer rates of 100 MB per second, which is more than twice that of Ultra SCSI (40 MB per second). A multimode optical interface is used for distances up to 500 meters. With increased connectivity and performance, fibre channel is the technology preferred and used by system designers.

Diagnostics and Test Information

Important

These service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that you are familiar with the computers, functions, terminology, and service-related information provided in this manual and the appropriate IBM Netfinity Server Hardware Maintenance Manual.

Start with the General Checkout in this HMM to assist you in diagnosing the IBM Netfinity Fibre Channel products listed within this manual.

For Error Codes/Error Messages, refer to the Symptom-to-FRU Index of the server that the Fibre Channel Hub, Adapter, or RAID Controller is connected to.

Type 3523 Fibre Channel Hub and GBIC

General Checkout

Installation and operational problems in an arbitrated loop environment are typically caused by one of the following:

- Faulty cabling or cable connector
- Incorrect cable length
- Faulty GBIC
- Invalid Fibre Channel signaling from the host bus adapter (HBA) or disk array
- Device driver or microcode conflicts between the HBAs and other devices.

The following information will help you to isolate and correct the physical layer problems. For protocol-related problems, such as inoperability between devices, see the documentation that came with the individual devices.

Port Status LEDs

The hub provides two status LEDs for each port. Use these LEDs to help you quickly diagnose and recover from problems.

The upper, green LED is lit when an operational GBIC is installed. The lower, amber LED is lit when the port is in the bypass mode. In the bypass mode, a port is disabled, which prevents erratic signals or data from disrupting loop activity. The bypass mode could be triggered by the loss of valid signal or by a GBIC fault. The combination of green and amber LEDs indicate the four following states.

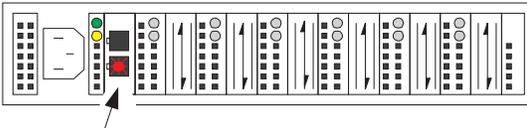
Green LED	Amber LED	Port State
Off	Off	No GBIC Installed
On	Off	Operational GBIC; Valid Signal
Off	On	Faulty GBIC; Port Bypassed
On	On	Operational GBIC; No Valid Signal; Port Bypassed

Verifying GBIC and Cable Signal Presence

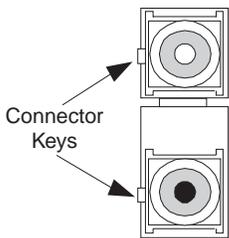
Note

Do **Not** look directly into any fiber cable or GBIC optical output. Read "Safety Information" on page 203. To view an optical signal, use a mirror to view the reflected light.

Verifying Signal Presence: In addition to verifying port LED status, you can verify signal presence by using a mirror to look for a reflected light at the fiber-optic cable ends and the GBIC transmitter. To verify signal presence at the hub end of a link, insert a GBIC into the hub and place a mirror at the bottom of the SC connector. If a signal is present, you will see a low intensity red light in the mirror reflecting from the GBIC transmitter.



Verifying Node End: To verify the integrity of the fiber optic cable at the node end of a link, make sure the cable is attached to the GBIC at the hub and the hub is turned on. Dual SC fiber-optic cable connectors are keyed and will insert into a GBIC in one direction only. Place a mirror at the node end of the link. A low intensity red light is visible in the mirror reflection of one of the SC leads, as shown in the following illustration.



If a fiber-optic cable has good transmitter output but a broken or degraded receiver lead, the end node might sense a *loop down* state. Because the transmitter is good, the hub responds to the end node valid Fibre Channel signal and adds the device to the loop. But, because the end node is not receiving Fibre Channel signals, it will stream loop-down sequences onto the loop. This prevents all data communications among the devices on the loop and will continue to do so until the condition is corrected.

Verifying Hub End: To verify the integrity of the fiber-optic cable at the hub end, make sure the fiber-optic cable is plugged into the host bus adapter at the host or into a disk-array controller and that the device is enabled on the loop. Using a mirror, examine the cable SC leads to verify that a low-intensity red light is visible on the receiver lead.

Note

Some fiber optic cables are marked with an "A" on the receiver lead and a "B" on the transmitter lead and are keyed. Some multimode cables plugged into a GBIC, HBA, or disk array controller are key-oriented with the "B" lead inserted into the device transmitter. Place a mirror on the opposite end of the cable to see the low-intensity red light on the "A" receiver lead.

Features

The Fibre Channel Hub is designed with seven modular user configurable interface ports. These seven ports comply with the GigaBit Interface Converter (GBIC) Specification. GBICs are available in two media types:

- Long-Wave optical
- Short-Wave optical

This section covers both the Fibre Channel Hub and the GBICs.

The following list summarizes the features of the Fibre Channel Hub:

- Seven configurable media-interface optical ports providing high performance.
- Plug and Play provides fault tolerance for online system configuration changes.
- Modular Gigabit Interface Converter (GBIC) transceiver design allows you to use ports when needed.
- Cascadable ports allows up to 127 connections (where one port is reserved for connection to fabric or switch active ports) or support of multiple loop implementations.
- Simplified cable management can be used for centralized storage management applications.
- Hot pluggable GBIC provides an optimal solution for entry storage interconnect needs.
- Half-rack width (1U = 1.75 in.) low profile hub packaging offers highest port density in single 1 unit height rack mount.
- Auto-sensing power-supply - supports 95 to 250 V ac and 50 to 60 Hz.

Description

The IBM Fibre Channel Hub is a 7-port central interconnection for Fibre Channel Arbitrated Loops that follow the ANSI FC-AL standard. Each Fibre Channel Hub port receives serial data from an attached node and retransmits the data out of the next hub port to the next node attached in the loop. Each reception includes data regeneration (both signal timing and amplitude) supporting full-distance optical links.

The Fibre Channel Hub detects any loop node that is missing or is inoperative and automatically routes the data to the next operational port and attached node in the loop. LED indicators provide status information to indicate whether the port is active or bypassed.

Each port requires a Gigabit Interface Converter (GBIC) to connect it to each attached node. The Fibre Channel Hub supports any combination of short-wave or long-wave optical GBICs. The GBICs are *hot-pluggable* into the Fibre

Channel Hub, which means you can add host computers, servers, and storage modules to the arbitrated loop dynamically without powering off the Fibre Channel Hub or any connected devices. If you remove a GBIC from a Fibre Channel Hub port, that port is automatically bypassed. The remaining hub ports continue to operate normally with no degradation of system performance. Conversely, if you plug a GBIC into the Fibre Channel Hub, it will automatically be inserted and become a node on the loop if valid Fibre Channel data is received from the device.

Data transfer within the Fibre Channel Hub is implemented in serial differential Positive Emitter Coupled Logic (PECL) AC coupled logic. Each Fibre Channel Hub port monitors the serial data input stream as well as the GBIC connected to it.

The following conditions will cause the Fibre Channel Hub to bypass a port:

- TX_FAULT: Detects a GBIC transmitter fault.
- RX_LOS: Detects a loss of received signal amplitude from the device.
- MOD_DEF: Detects the absence of a GBIC.

The Fibre Channel Hub circuitry detects off-frequency data, excessive jitter, or inadequate edge transition density on a per-port basis. The Fibre Channel Hub uses the standardized AMP SCA2 20-pin connector to implement hot plugging. Surge currents, caused by hot plugging, are minimized by slow-start circuitry and a pin-sequencing procedure on the GBIC. Electrostatic discharge (ESD) transients are minimized by means of sequenced connector contacts.

The Fibre Channel Hub includes a universal power supply that can operate from 95 to 250 V ac and from 50 to 60 Hz.

Fibre Channel Long-Wave GBIC

Features of the long-wave optical GBIC include:

- Full-speed: 1.0625 Gbps
- Uses single-mode 9 μm fiber
- Wavelength: 1310 nm
- Non-OFC laser
- Uses dual SC fiber optic connectors
- Fiber lengths: 2 meters minimum, 10 kilometers maximum

Fibre Channel Short-Wave GBIC

Features of the short-wave optical GBIC include:

- Compliant with Fibre Channel FC-PH-2 physical layer option 100-M5-SN-I
- Full-speed: 1.0625 Gbps

- Wavelength: 780 nm
- Non-OFC laser
- Supports multimode 50 μm fiber (2 meters/minimum, 500 meters/maximum)
- Uses dual SC fiber optic connectors

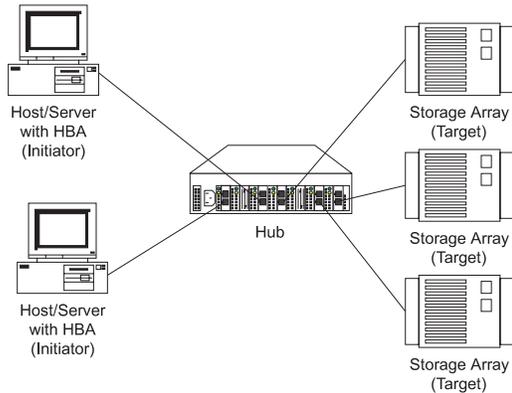
Fibre Channel-Arbitrated Loop

The Fibre Channel-Arbitrated Loop (FC-AL) is an ANSI standard (X3T11) product designed to provide shared bandwidth over low-cost media. Early adapters primarily use the SCSI protocol transported over Fibre Channel for distributed server and storage-cluster applications. The Fibre Channel Hub is a central point of interconnection designed to maintain a fault-tolerant physical loop topology. The Fibre Channel Hub can also be used to implement configurations which extend the size of the FC-AL loop to its maximum size of 127 active loop ports (includes one optional Fabric-Loop port).

Additional Service Information

Applications and Configurations

The Fibre Channel Hub modular interface provides flexibility and is upgradable to available short-wave and long-wave optical Fibre Channel product port interfaces. Fibre Channel products that are commonly interconnected to the Fibre Channel Hub are Fibre Channel host bus adapters, FC-AL storage devices, and FC-AL storage arrays. SCSI initiators (workstations and servers) set up and initiate the transfer of data to or from the storage devices. The storage devices that receive the requests made by the SCSI initiators are the SCSI targets. Initiators and targets represent individual nodes that are linked by the shared FC-AL.



Power On Systems Check - Fibre Channel Hub

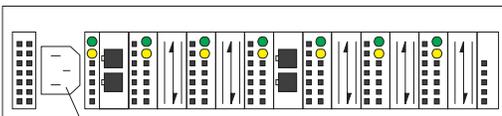
Power-on the storage modules first, then the controller and the Fibre Channel Hub, then everything else.

Note

Make sure the Fibre Channel Hub is powered on before the host adapter to insure proper loop initialization.

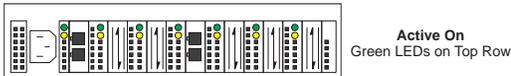
To insure proper operation:

1. Connect the power cord to the Fibre Channel Hub, then to the electrical outlet.



2. Power-on the attached FC-AL compatible nodes.

3. Check the Device Active (green) LEDs on the Fibre Channel Hub ports.

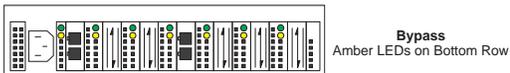


- LED On** This indicates that a GBIC is present and functioning properly.
- LED Off** This indicates a fault condition. Examples of a fault condition include: a GBIC transmitter fault, an improperly seated GBIC, an absent GBIC, or another failed device. The port will be in the bypass state, which precludes the port from participating in the FC-AL. This is the normal status of operation for Fibre Channel Hub ports in which GBICs are not installed.

Note

FC-AL compatible nodes must perform loop initialization procedures at power-on to function properly on the loop. The Fibre Channel driver software on FC-AL nodes performs the loop initialization or re-initialization depending on its prior state of operation.

4. Check the Port Bypass (amber) LEDs.



- LED On** If the Active (green) LED of the port is off, the port is nonoperational and the Bypass (amber) LED for the port is on. If a properly functioning port (the Active green LED is on) with a GBIC present also has the Bypass LED on, either the loss of signal or poor signal integrity has caused the port to go into the bypass state. When the port is in this state, it cannot participate in the FC-AL. The bypass state is also the normal status condition when no GBIC is present in the port, a GBIC is present but not attached to a FC-AL node, or a GBIC is attached to a cable assembly with nothing attached at the opposite end. Replacing such a port (or removing and reinserting the GBIC into the same port twice) is considered to be a loop configuration change which invokes the Loop Initialization Procedure.

LED Off This indicates that the Fibre Channel Hub port and device are fully operational and actively participating in the FC-AL.

5. The FC-AL should be fully operational. Check that proper loop discovery has taken place and all required devices are participating in the loop. Some host bus adapters might provide this level of functionality or it might be resident in the application software on the host operating system.

Locations

This section contains the following:

- “Fibre Channel Hub Rack Installation.”
- “Installing the GBIC” on page 14.
- “Removing the GBIC” on page 15.

Fibre Channel Hub Rack Installation

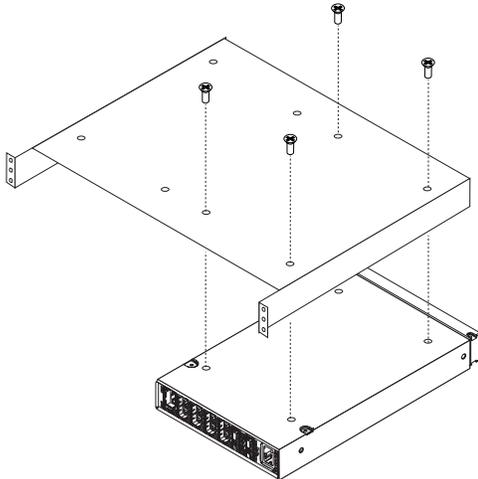
The Fibre Channel Hub comes with a tray and bezel for installation in a rack.

Note

Also use this procedure to assist in removing the Fibre Channel Hub from a rack shelf.

To install the Fibre Channel Hub in the rack:

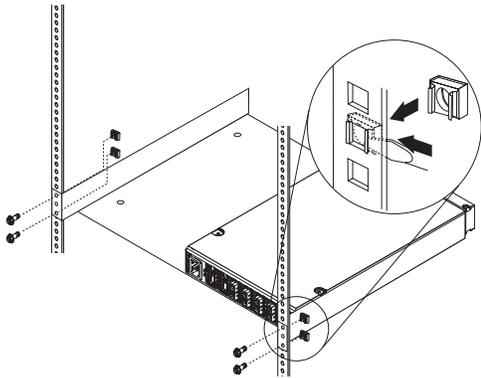
1. Turn the hub upside down and place it on a flat surface.
2. Turn the tray upside down and place it on the hub.
3. Align the four holes in the tray with the holes in the hub. Line up the back lip of the tray with the back side of the hub.
4. Using a Philips head screw driver, install the four smaller screws in the aligned holes.



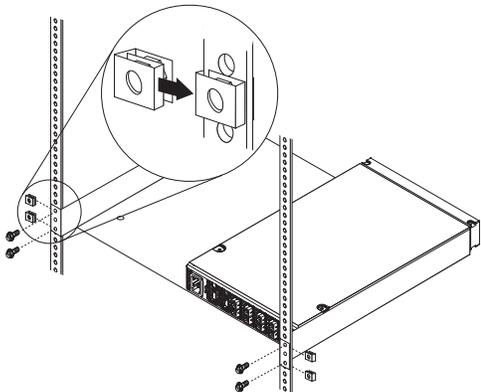
5. Turn the tray over so that the hub is on top of the tray.

6. Find the rack position into which you are installing the Fibre Channel Hub; then, take four clip nuts and install them in the rear of the rack. Make sure you have installed one in each screw hole you will be using for the tray installation.

If the rack has square holes, snap the M6 clip nuts into place on the rear of the rack.



If the rack has round holes, slide the 10-32 clip nuts into place on the rear of the rack.



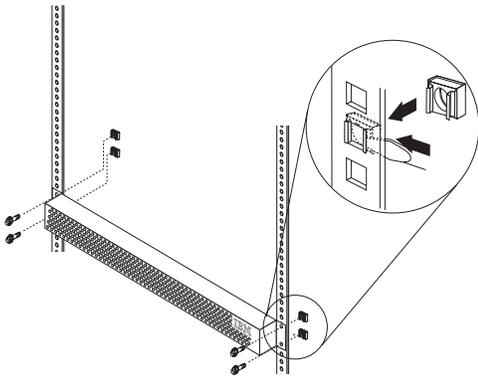
7. Pick up the tray and line up the top and bottom screw holes with the clip nuts on the rack. While holding the tray in place, install four of the larger screws.

If the rack has square holes and you used the M6 clip nuts, use the M6 hex washer headed screws.

If the rack has round holes and you used the 10-32 clip nuts, use the 10-32 hex washer headed screws.

8. Install the remaining four nut clips in the front of the rack. Be sure to line them up opposite the hub and tray.

9. Line up the top and bottom bezel screw holes with the clip nuts on the rack. While holding the bezel in place, install four of the larger screws.

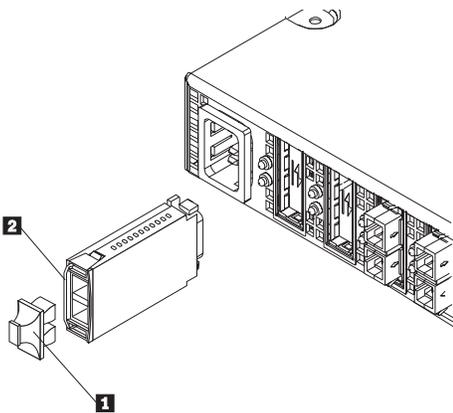


If the rack has round holes, use the 10-32 clip nuts and hex washer headed screws.

Installing the GBIC

There are several different types of GBICs available. You can insert any type of GBIC into any available hub port.

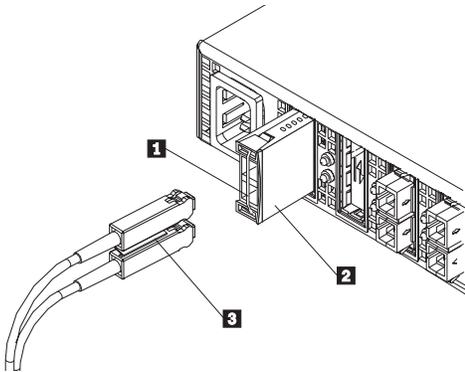
1. Remove the plastic cover **1** from the GBIC **2**.



2. Insert the cables into the GBIC.

If the GBIC you are installing has a metal latch, move the latch to the unlocked (center) position **1**. Slide the GBIC **2** into the port, then move the GBIC latch back to the locked position (flush with the rear of the GBIC). Connect the fibre optic cable **3** to the installed GBIC.

If the GBIC you are installing does not have a metal latch, slide the GBIC **2** into the port. Connect the fibre-optic cable **3** to the installed GBIC.



For cable management information, go to <http://www.pc.ibm.com/support/> on the World Wide Web.

Removing the GBIC

To remove a GBIC that does not have a metal latch from the hub port:

1. Press the opposing tabs on the GBIC toward each other while slowly removing the module from the hub (with the fiber optic cables still installed).
2. Remove the cable assembly from the GBIC.

To remove a GBIC that has a metal latch from the hub port: (Refer to the artwork shown in "Installing the GBIC" on page 14.)

1. Remove the fiber optic cable assembly from the GBIC.
2. Move the latch to the unlocked (center) position.
3. Press the opposing tabs on the GBIC toward each other while slowly removing it from the port.

Symptom-to-FRU Index

This index supports Type 3523 Fibre Channel Hub and GBICs.

The Symptom-to-FRU lists symptoms, error, and the possible causes. The most likely cause is listed first.

Note

Always start with the "General Checkout" on page 3. For IBM devices not supported by this index, refer to the manual for that device.

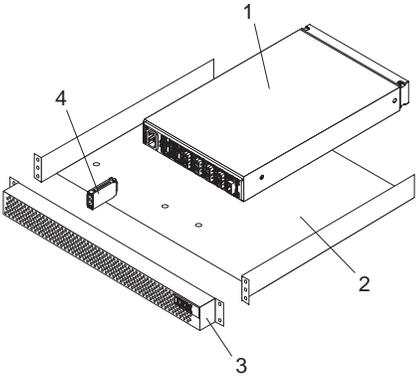
Note

Do **Not** look directly into any fiber cable or GBIC optical output. Read "Safety Information" on page 203. To view an optical signal, use a mirror to view the reflected light.

Problem	FRU/Action
GBIC installed in one or more ports but no LED is lit.	<ol style="list-style-type: none">1. Power cord2. Power source
GBIC installed but only the amber LED is lit.	<ol style="list-style-type: none">1. Reseat GBIC2. GBIC
GBIC installed and both green and amber LEDs are lit.	<p>The hub is not receiving a valid Fibre Channel signal from the end node. Do the following:</p> <ol style="list-style-type: none">1. Unplug the fiber cable from the node and, using a mirror, verify that an optical signal is present on the cable receiver lead. If no red light is visible, replace the cable.2. Using a mirror, examine the SC connectors on the HBA or disk controller. If no red light is visible on the transmitter lead, do one of the following:<ol style="list-style-type: none">a. Restart the device.b. Reinstall the device drivers.c. Check the HBA or disk controller.3. If a light is present on both the cable lead and the end node, check the HBA or the disk controller.

Problem	FRU/Action
<p>GBIC is installed, only the green LED is lit, but no communications occurs between the devices.</p>	<p>The hub is receiving a valid Fibre Channel signal from the end device, but no upper-level protocols are active.</p> <ol style="list-style-type: none"> 1. Verify that the proper HBA device drivers are loaded for the appropriate operating system and that the host has been configured to recognize the attached disk devices. 2. Unplug the fiber cable from the end node and verify that an optical signal is present on the cable receiver lead. If no signal is present, the receiver lead of the cable might be defective and the device is streaming loop-down sequences to the hub. Replace the cable.

Parts Listing (Type 3523 Fibre Channel Hub & GBIC)



Type 3523 Fibre Channel Hub & GBIC

Index	Fibre Channel Hub (Type 3523)	FRU
1	Port Fiber Hub Assembly	01K6738
2	HUB Tray Assembly	10L7042
3	HUB Tray Bezel	10L7041
4	Short-Wave GBIC	03K9206
	Long-Wave GBIC (option)	03K9208
	Misc. Hardware Kit	01K6739

Fibre Channel Adapter (FRU 01K7354)

General Checkout

There are three basic types of problems that can cause the adapter to function incorrectly:

- Hardware problems
- System configuration problems
- Fibre Channel problems

Hardware Problems

The following is an itemized list to help you determine if a problem is caused by the hardware:

- Are all of the adapters installed securely in the computer?
- Are all of the cables connected securely to the correct connectors? Be sure that the SC connectors that attach from the J1 connector on the adapter to the device are connected correctly.
- Is the adapter installed correctly in the expansion slot? Is it seated firmly in the slot?
- Are all peripheral devices properly powered on? See "Scan Fibre Channel Devices" on page 26 for information about displaying attached devices.

System Configuration Problems

To find out if a problem was caused by system configuration, check the system board to make sure it is configured properly (see "Installation Procedures" on page 28).

Fibre Channel Problems

To verify if a problem is caused by the Fibre Channel, determine if all of the FC devices were powered on before you powered on the server.

Features

Fibre Channel adapter features include:

- Compliance with Fibre Channel Physical and Signaling Interface - 3 (FC-PH-3), revision 9.2
- Compliance with Fibre Channel Arbitrated Loop (FC-AL), revision 4.5
- Compliance with Intel® PCI version 2.1 specification
- Compliance with U.S. and international safety and emissions standards
- Support for bus master DMA
- Fast!UTIL basic input/output system (BIOS) utility program to customize the configuration parameters on

the Netfinity Fibre Channel PCI Adapter and attached drives

Mixed peripheral support includes:

- Simultaneous mixed-peripheral configurations and startable device support for FC devices that meet the following standards:
- FC-PLDA, revision 1.10, 17 February 1997
- FC-FLA, revision 2.1, 12 July 1997

Additional Service Information

Fast!UTIL

The adapter can be configured using Fast!UTIL. Access Fast!UTIL by pressing ALT + Q during the adapter BIOS initialization (it might take a few seconds for the Fast!UTIL menu to appear). If there are more than one Netfinity Fibre Channel PCI Adapter, Fast!UTIL asks you to select the adapter you want to configure. After changing the settings, Fast!UTIL restarts the system to load the new parameters.

Note

If the configuration settings are incorrect, the Netfinity Fibre Channel PCI Adapter will not function properly.

Each host adapter has a unique serial number. Write down the serial number of the Netfinity Fibre Channel PCI Adapter in the event that the nonvolatile random access memory (NVRAM) is damaged (see "Scan Fibre Channel Devices" on page 26). If the NVRAM is damaged, you will be prompted for the PCI adapter serial number.

Fast!UTIL Options: The following section describes the Fast!UTIL options.

Configuration Settings: The first selection on the Fast!UTIL Options menu is Configuration Settings. These settings configure the FC devices and the PCI adapter to which they are attached.

Host Adapter Settings: From the Configuration Settings menu in Fast!UTIL, select Host Adapter Settings. The current default settings for the host adapter are listed in following table and described in the following paragraphs.

Note

The host adapter settings and default values will vary based on the version of BIOS code installed for the adapter.

Setting	Options	Default
Host adapter BIOS	Enabled or Disabled	Disabled
Enable LUNs	Yes or No	Yes
Execution throttle	1, 4, 8, 16, 32, 64, 128, 255	255
Drivers load RISC code	Enabled or Disabled	Enabled
Frame size	512, 1024, 2048	2048
IOCB allocation	1–512 buffers	256 buffers
Loop reset delay	0–15 seconds	5 seconds
Extended error logging	Enabled or Disabled	Disabled
Port down retry count	0–255	0

- **Host adapter BIOS:** When this setting is disabled, the ROM BIOS on the Netfinity Fibre Channel PCI Adapter is disabled, freeing space in upper memory. The default is Disabled.
- **Enable LUNs:** When this setting is yes, multiple logical unit numbers (LUNs) are supported. When this setting is no, multiple LUNs are not supported. LUN support is typically required for CD-ROM changers or redundant array of independent disks (RAID) boxes that use LUNs to map drives. The default is Yes.
- **Execution throttle:** This setting specifies the maximum number of commands executing on any one port. When a port's execution throttle is reached, no new commands are executed until the current command finishes executing. The valid options for this setting are: 1, 4, 8, 16, 32, 64, 128, and 255. The default is 255.
- **Drivers load RISC code:** When this setting is enabled, the host adapter uses the RISC firmware that is embedded in the device driver. When this setting is disabled, the device driver loads the latest version of RISC firmware found on the system. The default is Enabled.

Note

In order for the embedded device driver software to be loaded, the driver being loaded must support this setting. If the driver does not support this setting, the result is the same as if the setting were disabled, regardless of the setting. Leaving this option enabled guarantees a certified combination of software driver and RISC firmware.

- **Frame size:** This setting specifies the maximum frame length supported by the Netfinity Fibre Channel PCI Adapter. The default size is 2048.
- **IOCB allocation:** This setting specifies the maximum number of buffers from the firmware buffer pool that are allocated to any one port. The default is 256 buffers.
- **Loop reset delay:** After resetting the loops, the firmware refrains from initiating any loop activity for the number of seconds specified in this setting. The default is 5 seconds.
- **Extended error logging:** This setting provides additional error and debug information to the operating system. The default is Disabled.
- **Port down retry count:** This setting specifies the number of times the software retries a command to a port returning port down status. The default is 0 retries.

Selectable Boot Settings: The Selectable Boot Settings option is accessed from the Configuration Settings menu. If you enable this option, you can select the node name from which you want to start up (boot). Once enabled, this option forces the system to start up from the selected FC drive, ignoring any IDE drives attached to the system. If you disable this option, the system looks for an IDE drive from which to start. If an IDE drive is not found, the system looks for the first startable FC drive. When this setting is disabled, the boot ID and boot LUN parameters have no effect.

Note

This option applies only to disk devices; it does not apply to CD-ROMs, tape drives, and other nondisk devices.

Adapter Hard ID Settings: The Adapter Hard ID Settings option from the Configuration Settings menu forces the Netfinity Fibre Channel PCI Adapter to use the selected hard ID (0–125).

Restore Default Settings The Restore Defaults option from the Configuration Settings menu restores the PCI adapter default settings.

Raw NVRAM Data: This option displays the adapter nonvolatile random access memory (NVRAM) contents in hexadecimal format. Data cannot be modified.

Scan Fibre Channel Devices: This option scans the FC loop and lists all the connected devices by loop ID. Information about each device is listed, for example, vendor name, product name, and revision. This information is useful when configuring the Netfinity Fibre Channel PCI Adapter and attached devices.

Fibre Channel Disk Utility: This option scans the FC loop bus and lists all the connected devices by loop ID. You can select a disk device and perform a low-level format or verify the disk media.

Note

Performing a low-level format destroys all data on the disk.

Specifications

The Netfinity Fibre Channel PCI Adapter operating environment and specification information are as follows:

Environment	Minimum	Maximum
Operating temperature	0°C (32°F)	55°C (131°F)
Storage temperature	-20°C (-4°F)	70°C (158°F)
Relative humidity (noncondensing)	10%	90%
Storage humidity (noncondensing)	5%	95%

Type	Specification
Host bus	Conforms to PCI Local Bus Specification, revision 2.1
PCI signaling environment	3.3 V and 5.0 V buses supported
PCI transfer rate	264 MB per second maximum burst rate for 33 MHz operation (ISP2100 chip)

Type	Specification
Fibre Channel specifications	Bus type: fibre optic media (QLA2100F) Bus transfer rate: 100 MB per second maximum
Central processing unit (CPU)	Single chip design that includes a RISC processor, Fibre Channel protocol manager, PCI DMA controller, and 1-gigabit transceivers
Host data transfer	64-bit, bus master DMA data transfers to 264 MB per second
RAM	128KB of SRAM
BIOS ROM	128KB of flash ROM in two 64KB, software selectable banks. The flash is field programmable.
NVRAM	256 bytes, field programmable
Onboard DMA	Three independent DMA channels: two data and one command. Integrated 4KB frame buffer FIFO for each data channel
Connectors (external)	SC-style connector that supports non-OFC, multimode fibre optic cabling using 1 x 9 fibre optic transceiver module. Total cable length cannot exceed 500 meters.
Form factor	17.78 cm x 10.67 cm (7.0 in. x 4.2 in.)
Operating power	Less than 15 watts

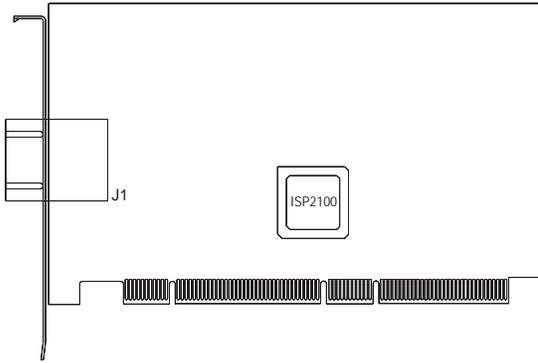
Locations

This section contains the following:

- “Adapter Layouts.”

Adapter Layouts

The following figure identifies the adapter components referenced throughout this chapter.



Installation Procedures

Note

To avoid damage to the 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 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 over tighten the cable ties or bend the cables to a radius smaller than 3 inches.
- Do not put excess weight on the cable at the connection point and be sure it is well supported.

Follow these steps to install the Netfinity Fibre Channel PCI Adapter. Also refer to these steps for removal and replacement.

1. Check the system board and make any configuration changes necessary to accommodate the Netfinity Fibre Channel PCI Adapter if the system requires it.
2. Power-off the peripheral devices, then the computer.
3. Disconnect the power cords.
4. Remove the computer cover, saving the screws.
5. The adapter can be installed in any PCI bus slot that supports 32 or 64-bit adapters.

6. Line up the adapter with the expansion slot. Carefully press the adapter into the slot until it seats firmly.
7. Secure the adapter in place.
8. Connect one end of the fiber cable from the devices to the **J1** connector on the adapter.
9. Carefully reinstall the computer cover and secure it.
10. Connect the power cables.
11. Power-on all external FC devices; then, power-on the PC and observe the monitor. The BIOS lists all FC devices attached to the PCI adapter,

QLogic Corporation
 QLA21xx PCI Fibre Channel ROM BIOS Version X.XX
 Copyright (C) QLogic Corporation 1998 All rights reserved.

Press <Alt-Q> for Fast!UTIL

ISP2100 Firmware Version X.XX
 QLogic adapter using IRQ number X

Device Number	Device Type	Adapter Number	Loop ID	Loop LUN	Vendor ID	Product ID	Product Revision
81	Disk	0	0	0	SEAGATE	ST32550	7394

Note

If there is not a hard-disk drive attached to the computer, a read-only memory basic input/output system (ROM BIOS) NOT INSTALLED message displays after the device listing.

All installed devices should be listed on the monitor.

See the *Netfinity Fibre Channel PCI Adapter Software Installation Guide* for detailed instructions on how to install the device drivers.

If the information displayed is not correct and you have checked the adapter configuration, go to “General Checkout” on page 21.

IBM Netfinity FAStT Host Adapter (FRU 09N7292)

The IBM Netfinity FAStT Host Adapter is a high-performance, direct memory access (DMA), bus-master, host adapter designed for high-end systems. The function and performance are derived from the ISP2200A chip, making this FAStT Host Adapter a leading-edge host adapter.

The ISP2200A chip combines a powerful RISC processor, a fibre protocol module (FPM) with gigabit transceivers, and a 64-bit peripheral component interconnect (PCI) local bus interface in a single-chip solution. The FAStT Host Adapter supports all Fibre Channel (FC) peripheral devices that support private-loop direct attach (PLDA) and fabric-loop attach (FLA).

General Checkout

There are three basic types of problems that can cause the adapter to function incorrectly:

- Hardware problems
- System configuration problems
- Fibre Channel problems

Hardware problems

The following is a list to help you determine if your installation problem is caused by the hardware:

- Verify that all adapters are installed securely.
- Verify that all cables are attached securely to the correct connectors. Be sure that the FC connectors that attach from the J1 connector on the adapter to the device are connected securely.
- Verify that the adapter is installed correctly and fully seated in the expansion slot. Check for interference due to nonstandard PCI connectors.
- Verify that all peripheral devices are turned on. See "Scan Fibre Channel devices" on page 45 for information about displaying attached devices.

System configuration problems

To find out if your installation problem was caused by the system configuration, check your system board to ensure that it is configured properly (see "Installation procedures" on page 49).

Fibre Channel problems

To determine if your installation problem is caused by the FC, verify that all of the FC devices were turned on before you turned on the server. Also, ensure that all cables are connected properly.

Features

Fibre Channel adapter features include:

- Compliance with Third Generation Fibre Channel Physical and Signaling Interface - 3 (PC-PH-3), revision 9.2
- Compliance with Fibre Channel Arbitrated Loop (FC-AL-2) standard
- Compliance with Intel® PCI version 2.2 specification
- Compliance with U.S. and international safety and emissions standards
- Support for bus-master DMA
- Fast!UTIL basic input/output system (BIOS) utility program to customize the configuration parameters on the FASiT Host Adapter and attached drives
- Supports Fibre Channel SCSI (FCP-SCSI) and internet protocol (IP) protocols
- Supports point-to-point fabric connection (F-PORT FABRIC LOGIN)
- Supports Fibre Channel service (Classes 2 and 3)
- 32 bit or 64 bit, 66 or 33 MHz operation
- Simultaneous mixed-peripheral configurations and startable device support for Fibre Channel devices that meet the following standards:
 - Fibre Channel — Private Loop Direct Attach Technical Report (FC-PLDA) revision 1.10, 17 February 1997
 - Fibre Channel — Fabric Loop Attachment Technical Report (FC-FLA) revision 2.1, 12 July 1997

Additional Service Information

The following information supports the IBM Netfinity FAStT Host Adapter

- "Troubleshooting."
- "Software installation."
- "Installing the Windows NT and Windows 2000 device drivers" on page 34.
- "Installing the NetWare device driver" on page 37.
- "Fast!UTIL" on page 38.
- "Fibre Channel disk utility" on page 45.
- "Specifications" on page 45.

Troubleshooting

There are three types of installation problems that might cause your adapter to function incorrectly.

- Hardware problems
- System configuration problems
- Fibre Channel (FC) problems

If you are having problems, use the following information to help you determine the cause of the problem and the action to take.

Software installation

After successfully installing your IBM® Netfinity® FAStT Host Adapter, you are ready to install the device drivers you need.

Device drivers for the following supported operating systems are provided with your FAStT Host Adapter. Other downloadable drivers are available from the web at: <http://www.ibm.com/pc/support>.

- Windows 2000 Version 1.0
- Windows NT Version 4.0
- Novell NetWare Version 4.1X or 5.X

Note

The latest versions of the device drivers, utilities, and documentation are available on the following IBM Web site:

<http://www.ibm.com/pc/support>

Before you begin

- Locate and make backup copies of the following driver diskettes included with the FAStT Host Adapter.
 - *Netfinity FAStT Host Adapter for Windows 2000*
 - *Netfinity FAStT Host Adapter for Windows NT and NetWare*
- Read through the software installation chapters to determine which device driver you want to install.

If you have device drivers, Microsoft® Windows NT®, Windows 2000, or Novell NetWare already installed on your system, you can check the device driver versions by performing the following procedure in the DOS environment.

1. Place the device driver diskette for Windows NT and NetWare or Windows 2000 in the diskette drive.
2. Copy the QLVER.EXE file from the diskette into the directory that contain the QLogic device drivers. For example, type:
`COPY A:\QLVER.EXE C:\QLC\QLVER.EXE`
3. Change directories to the subdirectory containing the QLogic drivers. For example, type:
`CD \QLC`
4. At the prompt type:
`QLVER *.*`

A QLogic banner appears, followed by the drivers and their corresponding version numbers. For more information about QLVER.EXE, use the following /h (help) parameter:

```
QLVER /h
```

Installing the Windows NT and Windows 2000 device drivers

This section provides instructions for installing the Windows NT and Windows 2000 device drivers under the following operating system conditions:

- Initial installation of the operating system and the device driver
- Installation of the device driver in an already installed operating system
- Installing an updated device driver in an already installed operating system that has an older version of the device driver

The following files on the Netfinity FAStT Host Adapter Device Drivers for Windows NT and NetWare diskette are provided for the installation of the **Windows NT** device driver:

- TXTSETUP.OEM: Driver installation script for initial Windows NT text setup
- QLOGIC: Identification file for Windows NT setup program
- \NT\OEMSETUP.INF: Driver installation script for the Windows NT setup program
- \NT\QL2200.SYS: Windows NT 4.0 device driver
- \NT\README.TXT: Helpful hints about the Windows NT device driver
- \NT\RELEASE.TXT: History of release fixes

The following files on the Netfinity FASt Host Adapter Device Driver for Windows 2000 diskette are provided for the installation of the **Windows 2000** device driver:

- TXTSETUP.OEM: Driver installation script for initial Windows 2000 text setup
- QLOGIC: Identification file for Windows 2000 setup program
- \WK2\OEMSETUP.INF: Driver installation script for the Windows 2000 setup program
- \WK2\QL2200.SYS: Windows 2000 1.0 device driver
- \WK2\README.TXT: Helpful hints about the Windows 2000 device driver
- \WK2\RELEASE.TXT: History of release fixes

Be sure to review the new and changed information in the README.TXT file for the device driver you install.

To install Windows NT 4.0 or Windows 2000 on your system, perform the installation procedures in "Installing Windows NT and Windows 2000."

If Windows NT 4.0 is already installed on your system, perform the installation procedures in "Adding the Windows NT driver" on page 36.

If Windows 2000 is already installed on your system, perform the installation procedures in "Adding the Windows 2000 driver" on page 36.

If Windows NT 4.0 and an older Windows NT device driver are already installed on your system, perform the update procedures in "Updating the Windows NT device driver" on page 36.

If an older Windows 2000 device driver is installed on your system, perform the update procedures in "Updating the Windows 2000 device driver" on page 37.

Installing Windows NT and Windows 2000:

Perform the following steps to install Windows NT 4.0 or Windows 2000 on the drive attached to the QLA2200F adapter.

1. Start the Windows NT or Windows 2000 installation procedure using the Windows NT or Windows 2000 setup diskette or start the procedure by inserting the

Windows NT or Windows 2000 CD into the CD-ROM drive.

2. After the standard devices have been detected and configured, use the **S** option to **Specify Additional Device**.
3. Select **Other**; then, press **Enter**.
4. Insert the appropriate Netfinity FAS*T* Host Adapter device driver diskette (Windows NT and NetWare or Windows 2000), then press **Enter**.
5. Select **QLogic QLA2200**; then, press **Enter**.
6. Continue with the standard installation procedure.

Adding the Windows NT driver: Perform the following steps to add the Windows NT device driver to a previously installed Windows NT 4.0 system.

1. Select **My Computer** from your desktop.
2. Select **Control Panel**.
3. Select **SCSI Adapters**.
4. Select the **Drivers** tab and click **Add**.
5. Select **QLogic** from the list of manufacturers and click **Have Disk**.
6. Insert the Netfinity FAS*T* Host Adapter Device Driver for Windows NT and NetWare diskette, type `a:\nt` at the prompt, and click **OK**.
7. Select **IBM Netfinity QLA2200 PCI Fibre Channel Adapter** and click **OK**.
8. Click **Yes** to reboot your server so the driver settings can take effect now. Click **No** to reboot at a later time.

Adding the Windows 2000 driver: Perform the following steps to add the Windows 2000 device driver to a previously installed Windows 2000 system.

1. Install the QLA2200F adapter.
2. Restart Windows 2000.
3. The system searches for the newly installed device. If the system finds the new device, it indicates that the device has been detected.
4. If prompted to insert the device driver diskette, insert the Netfinity FAS*T* Host Adapter Device Driver for Windows 2000 diskette and follow the prompt instructions that appear on the screen.

If you want to update an already installed version of the device driver, following the procedures in "Updating the Windows 2000 device driver" on page 37 below.

Updating the Windows NT device driver:

Perform the following steps if you want to replace an existing Windows NT device driver with an updated version.

1. Open a DOS command prompt window.
2. Change the current directory to the Windows NT device driver directory. For example, type:

```
CD \WINNT\SYSTEM32\DRIVERS
```

3. Make a backup copy of the old device driver. You can copy the file into the same directory with a .SAV extension, indicating that it is the saved file. For example, type:

```
COPY QL2200.SYS QL2200.SAV
```
4. Insert the Netfinity FAStT Host Adapter Device Drivers for Windows NT and NetWare diskette into your diskette drive.
5. Copy the new device driver over the old device driver. For example, type:

```
COPY A:\NT\QL2200.SYS
```
6. Remove the Netfinity FAStT Host Adapter Device Drivers for Windows NT and NetWare diskette.
7. Restart your system to load the device driver.

Updating the Windows 2000 device driver:

Perform the following steps if you want to replace the existing Windows 2000 device driver with an updated version.

1. From **Start**, select **Settings -> System -> Hardware -> Device Manager -> SCSI and RAID Controllers**.
2. Next, select the QLogic adapter you want to update.
3. Click on the adapter and select **Properties**.
4. Select the **Driver** tab.
5. Click the **Update driver** button and follow the instructions that appear on the screen.

Installing the NetWare device driver

This section provides instructions for installing the NetWare device driver in an installed Novell NetWare system.

NetWare device driver files and

parameters: The following files on the Netfinity FAStT Host Adapter Device Drivers for Windows NT and NetWare diskette are provided for installation of the NetWare 4.1X or 5.X device drivers:

- NETWARE\QL2200.HAM: Driver for NetWare 4.1X and 5.X
- NETWARE\QL2200.DDI: Installation information file for QL2200.HAM driver
- NETWARE\README.TXT: Helpful hints about the device driver and setting options for NetWare 4.1X and 5.X
- NETWARE\RELEASE.TXT: History of release fixes

Be sure to review the README.TXT file for both new and changed information.

To customize the interface between the device driver and Novell NetWare, load the QL2200.HAM device driver with the following parameters.

Parameter	Description
SLOT	Provides support for multiple QL2200F adapters and loads the device driver for each adapter individually. This parameter is mandatory if you have more than one adapter.
/LUN	Enables support for multiple LUN (logical unit number) devices. This parameter is optional.

Installing the NetWare 4.1X or 5.X device driver:

The QL2200.HAM device driver might not be compatible with NetWare versions earlier than 4.1X or 5.X.

Note

You can enter the LOAD command lines in your NetWare STARTUP.NCF file to load the driver automatically when your system starts.

Perform the following steps to install the NetWare 4.1X or 5.X device driver in a previously installed NetWare system.

1. Place the Netfinity FASTT Host Adapter Device Drivers for Windows NT and NetWare diskette in the diskette drive.
2. Copy the QL2200.HAM device driver file from the diskette to the server root directory. For example, type:

```
COPY A:\NETWARE\QL2200.HAM C:\NWSERVER\
```

3. Load the device driver at the NetWare server prompt (:) by typing the LOAD command with the SLOT parameter.

The following LOAD example works for a default (factory setting) QL2200/2200F adapter.

```
LOAD QL2200.HAM SLOT=X
```

Replace the X in the load line example with the slot identification number of the slot in which the adapter is installed.

4. If you are attaching multiple LUN devices, such as tape changers, add the /LUN switch to the LOAD line. For example, type:

```
LOAD QL2200.HAM SLOT=X /LUN
```

Fast!UTIL

This appendix provides detailed configuration information for advanced users who want to customize the configuration of the FASTT Host Adapter and the connected devices. You can configure the adapter using the Fast!UTIL utility. Access Fast!UTIL by pressing Alt+Q during the adapter BIOS initialization (it might take a few seconds for the Fast!UTIL menu to appear). If you have

more than one FAStT Host Adapter, Fast!UTIL prompts you to select the adapter you want to configure. After changing the settings, Fast!UTIL restarts your system to load the new parameters.

Attention: If the configuration settings are incorrect, your FAStT Host Adapter will not function properly.

Each host adapter has a unique serial number. Take a minute to write down the serial number of the FAStT Host Adapter. In the unlikely event that the nonvolatile random access memory (NVRAM) is damaged (see "Scan Fibre Channel devices" on page 45), you will be prompted for the FAStT Host Adapter serial number.

Fast!UTIL options: This section describes the Fast!UTIL options.

Configuration settings: This is the first option on the Fast!UTIL Options menu. These settings configure the Fibre Channel (FC) devices and the FAStT Host Adapter to which they are attached.

Host adapter settings: You can access this option from the Configuration Settings menu. The current default settings for the host adapter are listed in Table 1 and are described immediately following the table.

Note

The host adapter settings and default values will vary, based on the version of BIOS installed for the adapter.

Table 1. Host adapter settings

Setting	Options	Default
Host adapter BIOS	Enabled or Disabled	Disabled
Frame size	512, 1024, 2048	2048
Loop reset delay	0–15 seconds	5 seconds
Adapter hard loop ID	Enabled or Disabled	Enabled
Hard loop ID	0–125	125

- **Host adapter BIOS:** When this option is set to Disabled, the ROM BIOS on the FAStT Host Adapter is disabled, freeing space in upper memory. The default is Disabled.
- **Frame size:** Specifies the maximum frame length supported by the FAStT Host Adapter. The default size is 2048. If you are using F-Port (point-to-point) connections, the default is best for maximum performance.

- **Loop reset delay:** After resetting the loops, the firmware does not initiate any loop activity for the number of seconds specified in this setting. The default is 5 seconds.
- **Adapter hard loop ID:** Forces the adapter to use the ID specified in the Hard Loop ID setting. The default is Enabled.
- **Hard loop ID:** When the Adapter Hard Loop ID is set to Enabled, the adapter uses the ID specified in this setting. The default ID is 125.

Selectable boot settings: You can access this option from the Configuration Settings menu. When this option is set to Enabled, you can select the node name from which you want to start up (boot). When this option is set to Disabled, the Boot ID and Boot LUN parameters have no effect.

Note

This option applies only to disk devices; it does not apply to CD-ROMs, tape drives, and other nondisk devices.

Adapter hard ID settings: You can access this option from the Configuration Settings menu. It forces the FASiT Host Adapter to use the selected hard ID (0–125).

Restore default settings You can access this option from the Configuration Settings menu. It restores the FASiT Host Adapter default settings.

Raw NVRAM data: This option displays the adapter nonvolatile random access memory (NVRAM) contents in hexadecimal format. This is a troubleshooting tool; you cannot modify the data.

Advanced adapter settings: You can access this option from the Configuration Settings menu. The default settings for the host adapter are listed in Table 2 on page 41 and are described immediately following the table.

Table 2. Advanced adapter settings

Setting	Options	Default
Execution throttle	1–256	256
Fast command posting	Enabled or Disabled	Enabled
>4GByte addressing	Enabled or Disabled	Disabled
LUNs per target	0, 8, 16, 32, 64, 128, 256	8
Enable LIP reset	Yes or No	No
Enable LIP full login	Yes or No	Yes
Enable target reset	Yes or No	Yes
Login retry count	0–255	30
Port down retry count	0–255	30
Drivers load RISC code	Enabled or Disabled	Enabled
Enable database updates	Yes or No	No
Disable database load	Yes or No	No
IOCB allocation	1–512 buffers	256 buffers
Extended error logging	Enabled or Disabled	Disabled

- **Execution throttle:** Specifies the maximum number of commands executing on any one port. When a port reaches its execution throttle, Fast!UTIL does not execute any new commands until the current command is finish executing. The valid options for this setting are 1–256. The default (optimum) is 16.
- **Fast command posting:** Decreases command execution time by minimizing the number of interrupts. The default is Enabled.
- **>4GByte addressing:** Enable this option when the system has more than 4 GB of memory available. The default is Disabled.
- **LUNs per target:** Specifies the number of LUNs per target. Multiple logical unit number (LUN) support is typically for redundant array of independent disks (RAID) enclosures that use LUNs to map drives. The

default is 8. If you do not need multiple LUN support, set the number of LUNs to 0.

- **Enable LIP reset:** Determines the type of loop initialization process (LIP) reset that is used when the operating system initiates a bus reset routine. When this option is set to Yes, the device driver initiates a global LIP reset to clear the target device reservations. When this option is set to No, the device driver initiates a global LIP reset with full login. The default is No.
- **Enable LIP full login:** Instructs the ISP chip to log in to all ports after any LIP. The default is Yes.
- **Enable target reset:** Enables the drivers to issue a Target Reset command to all devices on the loop when a SCSI Bus Reset command is issued. The default is No.
- **Login retry count:** Specifies the number of times the software tries to log in to a device. The default is 30 retries.
- **Port down retry count:** Specifies the number of times the software retries a command to a port that is returning port-down status. The default is 30 retries.
- **Drivers load RISC code:** When this option is set to Enabled, the host adapter uses the RISC firmware that is embedded in the software device driver. When this option is set to Disabled, the software device drive loads the RISC firmware found on the system. The default is Enabled.

Note

To load the embedded device driver software, the device driver being loaded must support this setting. If the driver does not support this setting, the result is the same as if this option is set to Disabled, regardless of the setting. Leaving this option enabled ensures a certified combination of software driver and RISC firmware.

- **Enable database updates:** When this option is set to Enabled, it allows the software to save the loop configuration information in flash memory as the system powers down. The default is No.
- **Disable database load:** When this option is set to Enabled, the device database is read from the Registry during driver initialization. When this option is set to Disabled, the device database is created dynamically during device driver initialization. The default is No.

Note

This option usually applies to the Windows NT and Windows 2000 operating environments.

- **IOCB allocation:** Specifies the maximum number of buffers from the firmware buffer pool that is allocated to any one port. The default is 256 buffers.
- **Extended error logging:** Provides additional error and debug information to the operating system. When this option is set to Enabled, events are logged into the Windows NT Event Viewer or Windows 2000 Event Viewer (depending on the environment you are in). The default is Disabled.

Extended firmware settings: You can access this option from the Configuration Settings menu. The default settings for the host adapter are listed in Table 3 and described are immediately following the table.

<i>Table 3. Extended firmware settings</i>		
Setting	Options	Default
Extended control block	Enabled or Disabled	Enabled
RIO operation mode	0, 1, 2, 3, 4	0
Connection options	0, 1, 2, 3	3
NonParticipating hard ID	Enabled or Disabled	Disabled
Class 2 service	Enabled or Disabled	Disabled
ACK0	Enabled or Disabled	Disabled
Fibre Channel tape support	Enabled or Disabled	Disabled
Fibre Channel confirm	Enabled or Disabled	Disabled
Command reference number	Enabled or Disabled	Disabled
Read transfer ready	Enabled or Disabled	Disabled
Response timer	0–255	0
Interrupt delay timer	0–255	0

- **Extended control block:** Enables all other extended firmware settings. The default is Enabled.
- **RIO operation mode:** Specifies the reduced interrupt operation (RIO) modes, if supported by the

software device driver. RIO modes enable posting multiple command completions in a single interrupt (see Table 4 on page 44). The default is 0.

Table 4. RIO operation modes

Option	Operation mode
0	No multiple responses
1	Multiple responses, 16-bit handles, interrupt host
2	Multiple responses, 32-bit handles, interrupt host
3	Multiple responses, 16-bit handles, delay host interrupt
4	Multiple responses, 32-bit handles, delay host interrupt

- **Connection options:** Defines the type of connection (loop or point-to-point) or connection preference (see Table 5). The default is 3.

Table 5. Connection options

Option	Type of connection
0	Loop only
1	Point-to-point only
2	Loop preferred; otherwise, point-to-point
3	Point-to-point; otherwise, loop

- **NonParticipating hard ID:** This setting is reserved. The default is Disabled.
- **Class 2 service:** Enables Class 2 service parameters to be provided during all automatic logins (loop ports). The default is Disabled.
- **ACK0:** Determines the type of acknowledgment (ACK) used. When this option is set to Enabled, sequence ACK is used. When this option is set to Disabled, frame ACK is used. The default is Disabled.

Note

You must enable the Class 2 service setting to use the ACK0 setting.

- **Fibre Channel tape support:** This setting is reserved for Fibre Channel tape support. The default is Disabled.
- **Fibre Channel confirm:** This setting is reserved for Fibre Channel tape support. The default is Disabled.
- **Command reference number:** This setting is reserved for Fibre Channel tape support. The default is Disabled.
- **Read transfer ready:** This setting is reserved. The default is Disabled.
- **Response timer:** Contains the value (in 100-microsecond increments) used by a timer to limit the wait time for accumulating multiple responses. For example, if this field is 8, the time limit is 800 microseconds. The default is 0.
- **Interrupt delay timer:** Contains the value (in 100-microsecond increments) used by a timer to set the wait time between accessing (DMA) a set of handles and generating an interrupt. The default is 0.

Scan Fibre Channel devices: Use this option to scan the FC loop and list all the connected devices by loop ID. Information about each device is listed, for example, vendor name, product name, and revision. This information is useful when configuring your FAStT Host Adapter and attached devices.

Fibre Channel disk utility

Use this option to scan the FC loop bus and list all the connected devices by loop ID. You can select a disk device and perform a low-level format or verify the disk media.

Caution

Performing a low-level format destroys all data on the disk.

Select host adapter: Use this option to select a specific adapter if you have multiple adapters in your system.

Specifications

This appendix contains the FAStT Host Adapter operating environment and specification information.

Table 6. Adapter operating environment

Environment	Minimum	Maximum
Operating temperature	0°C (32°F)	55°C (131°F)
Storage temperature	-20°C (-4°F)	70°C (158°F)
Relative humidity (noncondensing)	10%	90%
Storage humidity (noncondensing)	5%	95%

Table 7 (Page 1 of 2). Adapter specifications

Type	Specification
Host bus	Conforms to PCI Local Bus Specification, revision 2.2
PCI signaling environment	3.3 V and 5.0 V buses supported
PCI transfer rate	<ul style="list-style-type: none"> • 264 MB per second maximum burst rate for 33 MHz operation (ISP2200A chip) • Supports dual address bus cycles
Fibre Channel specifications	<ul style="list-style-type: none"> • Bus type: fibre optic media (shortwave 50 micron) • Bus transfer rate: 100 MB per second maximum (200 full-duplex) • Supports both FCP-SCSI and IP protocols • Supports point-to-point fabric connection: F-Port Fabric Login • Supports FCAL public loop profile: FL-Port Login • Supports Fibre Channel services class 2 and 3 • FCP SCSI initiator and target operation • Full-duplex operation
Processor	Single chip design that includes a RISC processor, Fibre Channel protocol manager, PCI DMA controller, and 1-gigabit transceivers
Host data transfer	64-bit, bus master DMA data transfers to 528 MB per second
RAM	128 KB of SRAM
BIOS ROM	128 KB of flash ROM in two 64 KB, software selectable banks. The flash is field programmable.
NVRAM	256 bytes, field programmable

Table 7 (Page 2 of 2). Adapter specifications

Type	Specification
Onboard DMA	Three independent DMA channels: two data and one command. Integrated 4 KB frame buffer FIFO for each data channel
Connectors (external)	<ul style="list-style-type: none">• SC-style connector that supports non-OFC, multimode fibre optic cabling using 1 x 9 fibre optic transceiver module• Total cable length cannot exceed 500 meters• Two three-position, point-to-point cable (internal)
Form factor	17.8 cm x 10.7 cm (7.0 in. x 4.2 in.)
Operating power	Less than 15 watts
Other compliance	<ul style="list-style-type: none">• PCI 98, including ACPI• Less than 28% processor utilization as measured in a TPCC benchmark• Operation system support for Windows NT version 4, Windows 2000 version 1, NetWare version 4.x and 5.x, SCO UnixWare version 7.x• Worldwide agency compliance as defined for IBM Netfinity products• 100% Plug and Play compatibility with our existing Netfinity Fibre Channel RAID Controller

Locations

The following information supports the IBM Netfinity FAS*T* Host Adapter.

- “Adapter preinstallation procedures.”
- “Adapter layouts” on page 49.
- “Installation procedures” on page 49.

Adapter preinstallation procedures

Use the following instructions for preparing and installing the FAS*T* Host Adapter.

Handling static-sensitive devices: Static electricity, though harmless to you, can seriously damage adapter components or options.

Note

When you are adding an internal option, do not open the static-protective package containing the option until you are instructed to do so.

When you handle options and other adapter components, take these precautions to avoid damage from static electricity:

- Limit your movement. Movement can cause static electricity to build up around you.
- Always handle components carefully. Never touch any exposed circuitry.
- Prevent others from touching components.
- When you are installing a new option, touch the static-protective package containing the option to a metal expansion-slot screw or other unpainted metal surface on the adapter for at least two seconds. (This reduces static electricity from the package and from your body.)
- When possible, remove the option and install it directly into the adapter without setting the option down. When this is not possible, place the static-protective package that the option comes in on a smooth, level surface and place the option on it.
- Do not place the option on the adapter's covers or any metal surface.

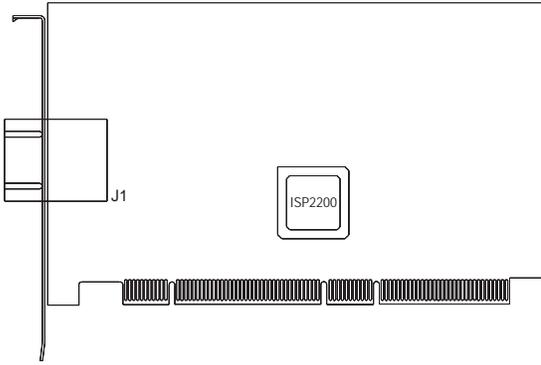
What you need for the installation: To install the FAStT Host Adapter in your server, you need an optical, multimode cable with an SC-style duplex connector.

- A screwdriver (usually a Phillips #1)
- Two three-position, point-to-point, internal FC cables for the FAStT Host Adapter, if you are using an internal connector

See “Adapter layouts” on page 49; then, continue with “Installation procedures” on page 49 to install the adapter.

Adapter layouts

The following figure identifies the adapter components referred to in this chapter.



Installation procedures

Before you begin the installation, write down the serial number of the FAS*t*T Host Adapter. In the unlikely event that the nonvolatile random access memory (NVRAM) is damaged, the system will prompt you for the FAS*t*T Host Adapter serial number.

Attention

To avoid damage to your fibre optic cables, follow these guidelines:

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

Follow these steps to install the FAS*t*T Host Adapter in your server:

1. Check the system board and make any configuration changes needed to accommodate the FAS*t*T Host Adapter.
2. Turn off the peripheral devices, then the server.
3. Disconnect the power cords.
4. Remove the server cover.
5. Remove the slot cover.
6. Choose any PCI bus slot that supports 32 or 64-bit adapters. You can install the adapter in a 64-bit PCI

- slot if one is available. If a 64-bit slot is not available, then you can use a 32-bit PCI slot.
7. Align the adapter with the expansion slot. Carefully press the adapter into the slot until it is fully seated. adapter in place.
 8. Connect one end of the fiber cable from the devices to the **J1** connector on the adapter.
 9. Carefully reinstall and secure the server cover.
 10. Connect the power cables.
 11. Turn on all external FC devices; then, turn on the server and observe the monitor. You will not see the devices because the adapter BIOS is set to Disabled by default. Instead, you will see the information below. To see the devices, press **Alt+Q**; then, use the utility program. See "Fast!UTIL" on page 38 for details about the utilities.

The BIOS lists all FC devices attached to the FASiT Host Adapter.

Note

You will see this information only if you have the BIOS set to Enabled. Otherwise, you will see a portion of this information on your monitor because BIOS is set to Disabled by default.

QLogic Corporation
QLA2xxx PCI Fibre Channel ROM BIOS Version X.XX
Copyright (C) QLogic Corporation 1998 All rights reserved.
www.q1c.com

Press <Alt+Q> for Fast!UTIL

BIOS for Adapter X is disabled.

ROM BIOS not installed.

Device Number 81

Device Type Disk

Adapter Number 0

Loop ID 0

Loop LUN 0

Vendor ID SEAGATE

Product ID ST32550

Product Revision 7394

Note

If you do not have a hard disk drive attached to your computer, a read-only memory basic input/output system (ROM BIOS) NOT INSTALLED message displays after the device listing.

If the information displayed is correct (all installed devices are listed), you have successfully installed the FAStT Host Adapter in your computer.

See the “Software installation” on page 33 for detailed instructions on how to install the device drivers.

If the information displayed is not correct and you have checked the adapter configuration, see “Troubleshooting” on page 33 for troubleshooting information.

Type 3526 Fibre Channel RAID Controller

General Checkout

Use the status LEDs, Symptom-to-FRU list, and the connected server HMM to diagnose problems.

Using the Status LEDs

The LEDs of the control unit indicate the hardware status:

- Green LED indicate normal operation
- Amber LED indicates a hardware problem

The LEDs on the controller unit indicate the status of the controller unit and its individual components. The green LEDs indicate a normal operating status; amber LEDs indicate a hardware fault. Check all of the LEDs on the front and back of the controller unit when it is powered on.

Notes

- If power was just applied to the controller unit, the green and amber LEDs might turn on and off intermittently. Wait until the controller unit finishes powering up before you begin checking for faults.
- To view the controller Customer Replaceable Unit (CRU) LEDs, the front cover must be removed from the controller unit. See "Front Cover Removal" on page 71.

Also use LEDs on the front cover, controller CRUs, and drive units (if applicable) to determine if the controllers and drives are responding to I/O transmissions from the host.

The list below describes LED activities:

- If a Fast Write Cache operation or other I/O activity is in progress to the controller unit (or attached drive units), you might see several green LEDs blinking, including: the Fast Write Cache LED (on the front cover), controller CRU status LEDs, or applicable drive activity LEDs.
- The green Heartbeat LEDs on the controller CRUs blink continuously. The number and pattern of green status LEDs lit on the controllers depend on how the system is configured. An active controller will not have the same status LEDs lit as a passive controller. See "Controller CRU and Battery LEDs" on page 74.

Features

The following list summarizes the features of the Type 3526 Fibre Channel RAID Controller:

- Redundant fail-over
- Hot Swap components
- 128 MB cache per controller CRU as shipped
- Supports up to six Netfinity EXP 15 Expansion Units
- Supports Ethernet, Fiber, and Serial communications to each controller CRU.

Additional Service information

Powering on the Controller

Note

All drive modules must be powered on before you power-on the Controller.

The controller might take from three to 10 seconds to power-up. During this time, the amber and green LEDs on the controller unit will flash.

After power-on, check all fault LEDs to make sure they are off. If a fault LED is on, refer to the "Symptom-to-FRU Index" on page 80.

Recovering from a Power Supply Shutdown

Both power supplies have a built-in temperature sensor designed to prevent the power supplies from overheating. If a temperature sensor detects an over-temperature condition, ambient air temperature of 70° C (158° F) or above, the "overheated" power supply will automatically shut down. The other power supply remains on as long as its temperature remains below 70° C (158° F). If not, the second power supply will shut down, which turns off all power to the controller unit.

Once the air temperature cools to below 70° C (158° F), the power supplies automatically restart. An automatic restart resets the controllers, attempts to spin up the drives (which has no effect on the drives if they are already running), and returns the controller unit to a normal operating state. Typically, you will not need to perform recovery procedures after an automatic power supply shutdown and restart.

After a power supply shutdown, check all controller LEDs.

If the power supply power LED is off, or the amber power supply LED on the front cover is on, go to "Symptom-to-FRU Index" on page 80.

Connectors and Host IDs

The host ID switches and connectors for interface cables are on the connector plate located on the back of the controller unit.

Host and Drive ID Numbers

Each controller must have a unique Fibre Host ID number. The host ID numbers assigned to each controller are based on two elements:

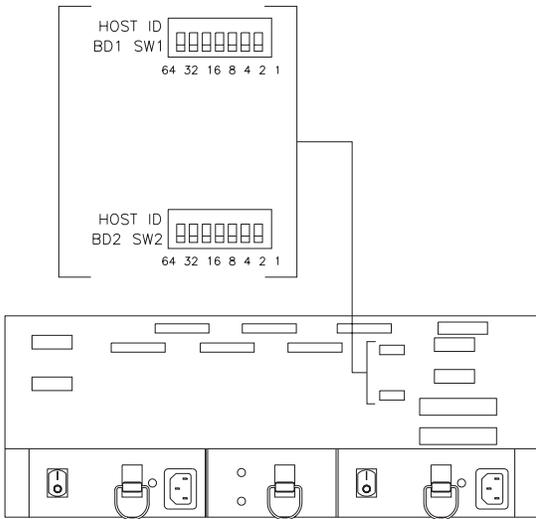
- Host ID numbers set through hardware switches on the controller unit. There are five Host ID switches

that allow you to set ID numbers 0 through 127 for each controller. The factory default settings are ID #5 for Controller A and ID #4 for controller B.

- Software algorithms that calculate the actual Fibre Channel address, based on the controller unit's hardware settings and position on the loop or hub.

Note

This is the preferred ID that will be assigned on the Fibre Channel loop unless it is already being used. If the ID is already in use, a soft ID will be assigned.

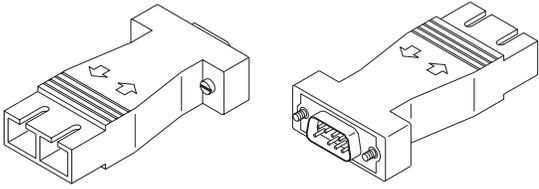


Fibre Channel Host Cable Requirements

For the Type 3526 Fibre Channel RAID Controller, you must use multi-mode, 50 micrometer fiber optic cable and a Media Interface Adapter (MIA).

Cable	Media Type	Data Size	Transfer Speed	Range
Fiber optic (multi-mode, 50 micrometer)	Short-wave laser	100 MB/sec	1062.5 Mbaud	up to 500 m

Media Interface Adapter (MIA)



LVD-SCSI Drive Cable Requirements

To connect the controller unit to a drive module, you must use 68-pin, VHDCI (very high density cable interface) LVD, Ultra 2 SCSI cables. The controller unit has six drive connectors that support 16-bit interface protocols. Each connector represents a single drive channel that supports up to 10 drives per channel for a total of 60 drives. Refer to "LVD-SCSI Drive Cable Routing Examples" on page 72 for examples of connecting the controller unit to one or more LVD-SCSI drive modules.

Specifications

Size

- With front panel:
 - Depth: 610 mm (24 in.)
 - Height: 174 mm (6.8 in.)
 - Width: 482 mm (19 in.)

Weight

- Controller unit maximum weight: 34.5 kg (76 lb)
- Controller unit empty: 14.3 kg (31.6 lb)
- Battery: 9.7 kg (21.4 lb)

Electrical Input

- Sign-wave input (50 to 60 Hz)
 - Low range:
 - Minimum: 90 V ac
 - Maximum: 127 V ac
 - High range:
 - Minimum: 198 V ac
 - Maximum: 257 V ac
- Input Kilovolt-amperes (kVA) approximately:
 - Minimum configuration:
0.06 kVA
 - Maximum configuration:
0.39 kVA

Environment

- Air temperature:
 - hub on:
 - 10° to 35° C
(50° to 95° F)
 - Altitude: 0 to 914 m (3000 ft.)
 - hub on:
 - 10° to 32° C
(50° to 90° F)
 - Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)
- Humidity:
 - 8% to 80%

Heat Output

- Approximate heat output in British Thermal Units (BTU) per hour:
 - Maximum configuration: 731.8 BTU (214 watts)

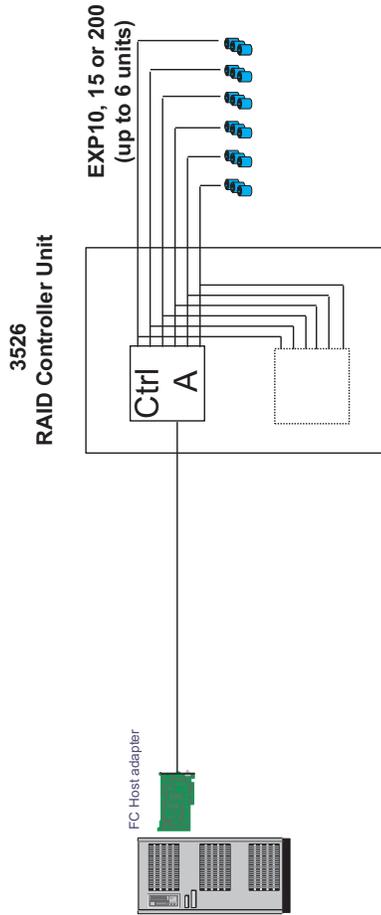
Acoustical Noise Emissions Values

- Sound Power (idling and operating):
 - 6.4 bels
- Sound Pressure (idling and operating):
 - 50 dBA

Basic Configuration

Tested Configurations

The following configurations are for the Type 3526 Fibre Channel RAID Controller.

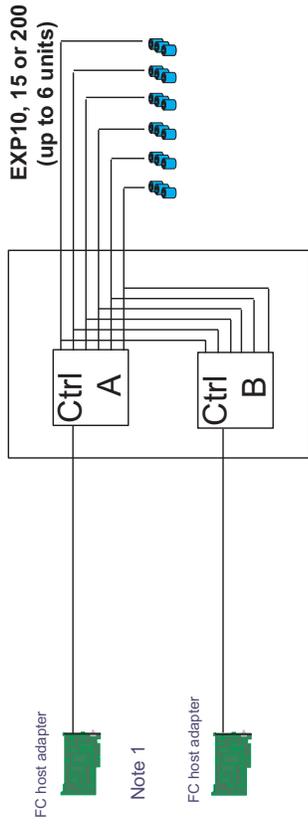


Note: Basic as shipped, single controller, no hubs or switches

Basic Dual Controller Configuration

3526

RAID Controller Unit



FC host adapter

Note 1

FC host adapter

Note 1: Adapters can be in the same or different systems; choice affects total redundancy

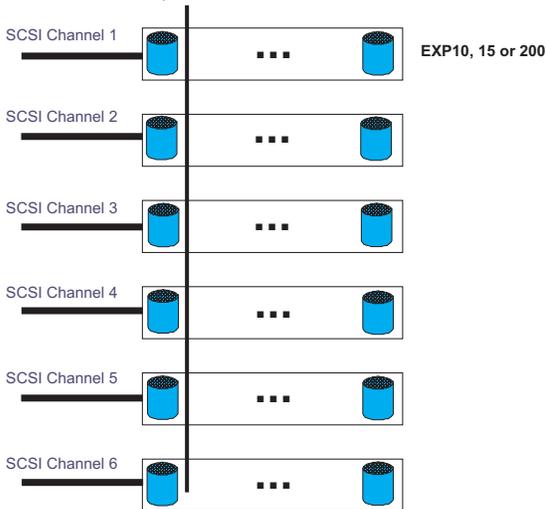
Note 2: No hubs or switches

Note 3: For max redundancy on the drive side use orthogonal striping (see orthogonal striping chart)

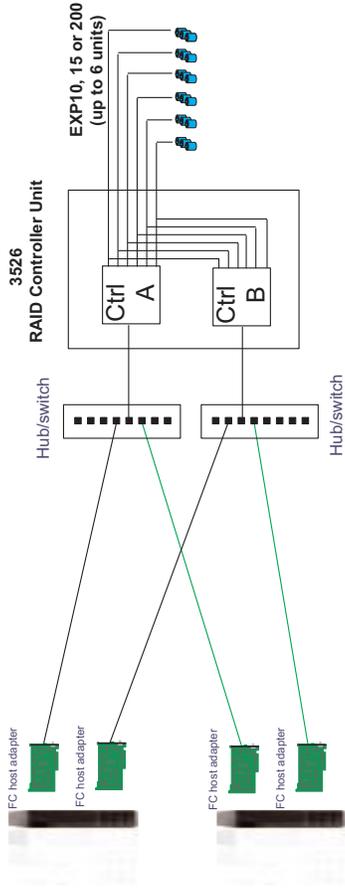
Note 4: This config does not provide for "NO single point of failure"

Orthogonal Data Striping

Data striped across channels



Simple Fully Redundant



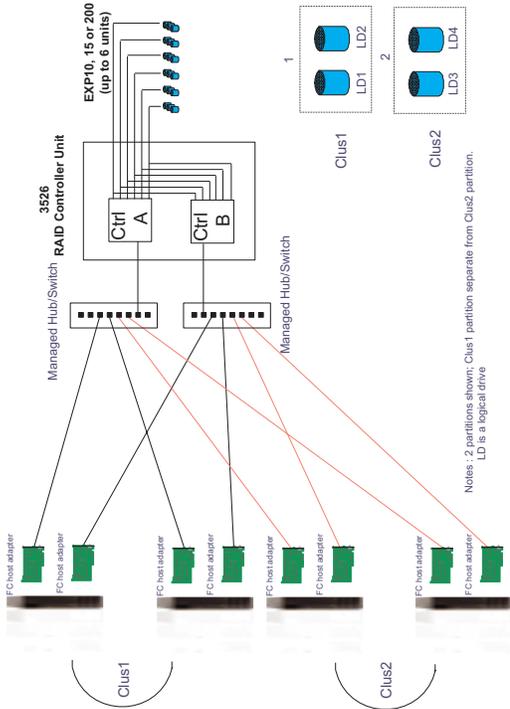
Redundant Servers

Note 1: Since disks are seen from multiple places some form of protection such as MSCS, storage partitioning, Sanergy, Oracle etc **must** be used.

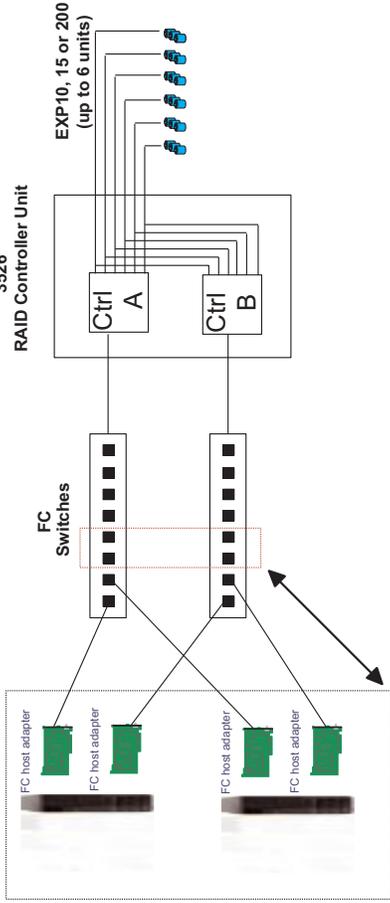
Note 2: For best performance and manageability a managed hub or switch is preferred

Note 3: Always try to keep connections to hub on adjacent ports and unplug all unused GBICs

Multi-MSCS No External Hubs



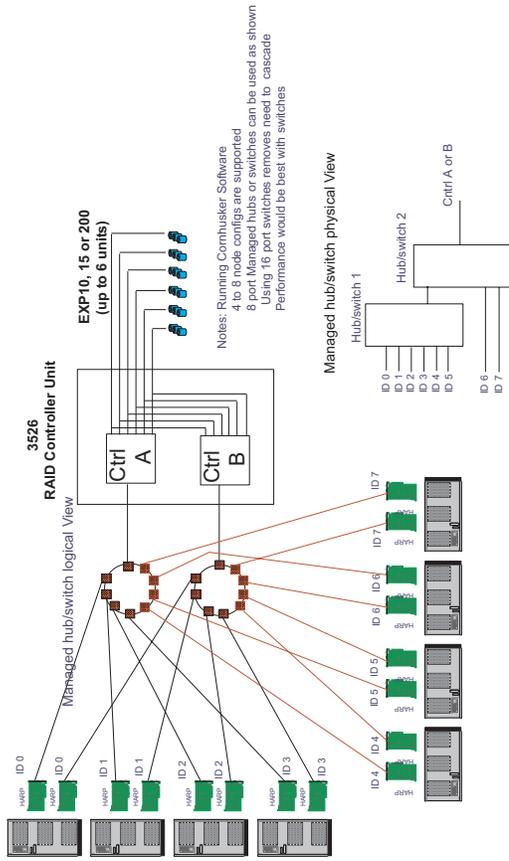
Multi-MSCS extended



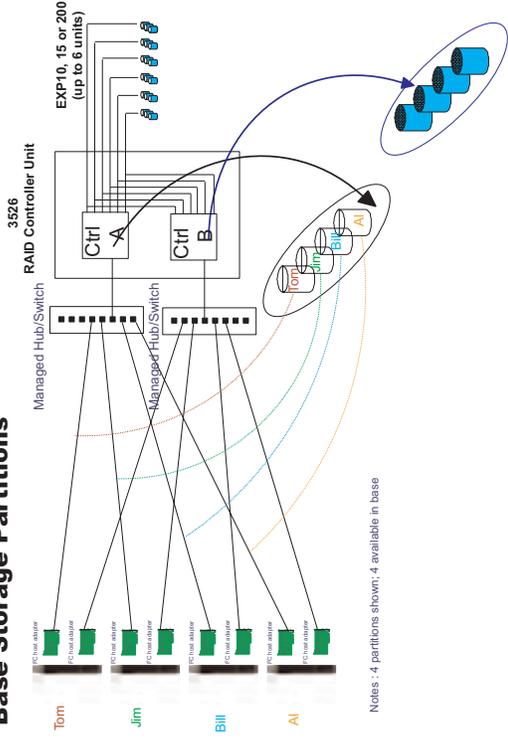
Notes :

- Each group of 4 ports on the switches (red dash box) can support one cluster element (black dash box)
- Storage partitioning is used to separate clusters
- Match performance needs of servers to max. I/O available from 60 drives
- You may use some the switch ports to add 3526 units rather than hosts. Extending this to 16 port switches allows more of both

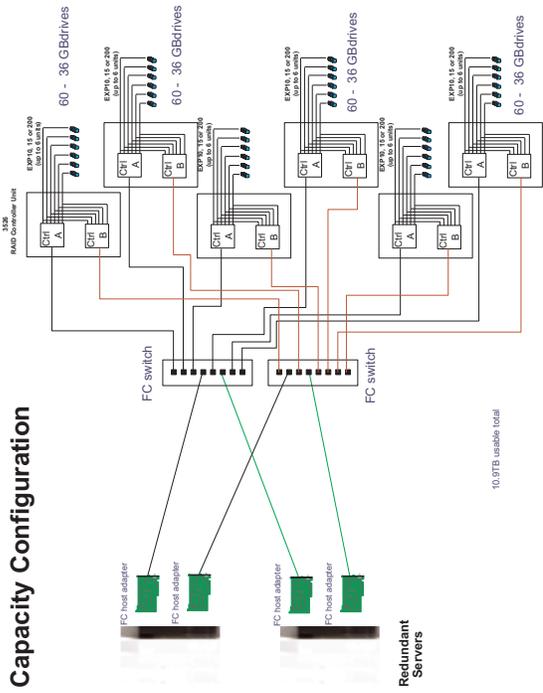
Cornhusker configuration



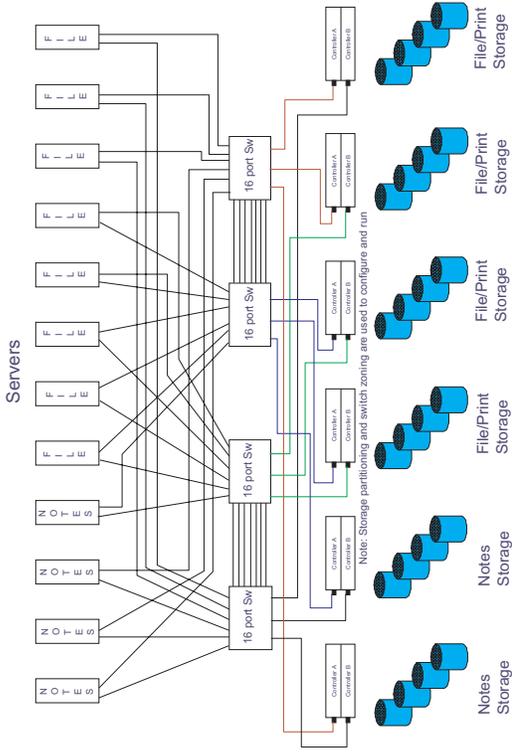
Base Storage Partitions



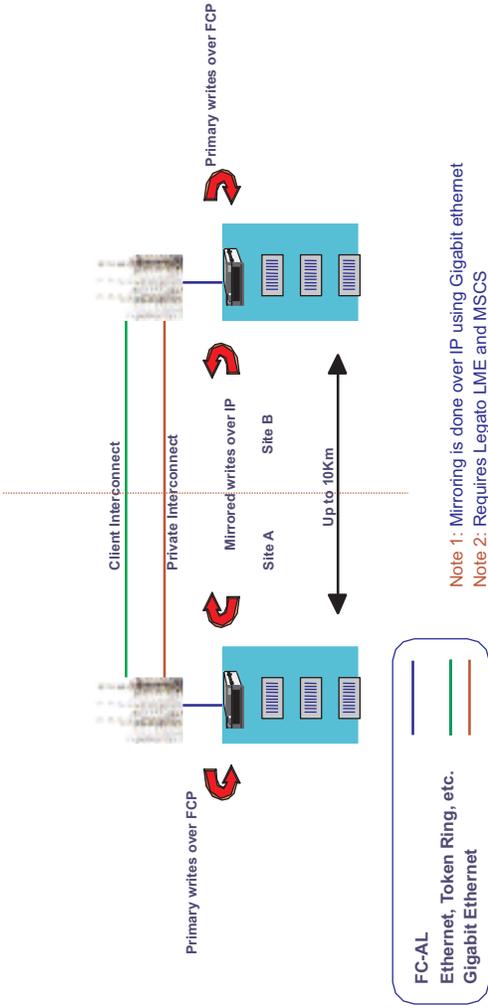
Capacity Configuration



SAN - Using Partitions of Clusters



Legato HA/Replication for MSCS

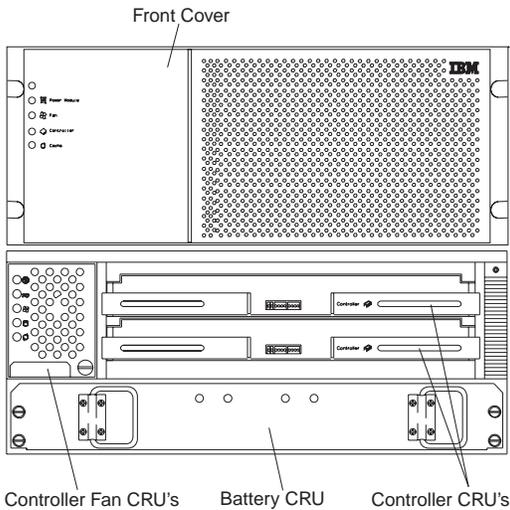


Locations

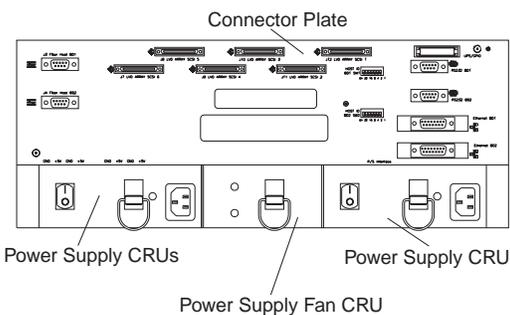
This section contains the following:

- “Controller Unit Front View.”
- “Controller Unit Back View.”
- “Air Flow” on page 71.
- “Front Cover Removal” on page 71.
- “Front LEDs” on page 72.
- “Rear LEDs” on page 72.
- “Controller CRU Removal” on page 72.
- “Controller CRU and Battery LEDs” on page 74.
- “Controller CRU Fan Removal” on page 75.
- “Interface Connections” on page 75.
- “Power Supply Removal” on page 76.
- “Power Supply Fan Removal” on page 76.
- “Battery Replacement” on page 77.
- “Rack Installation” on page 79.

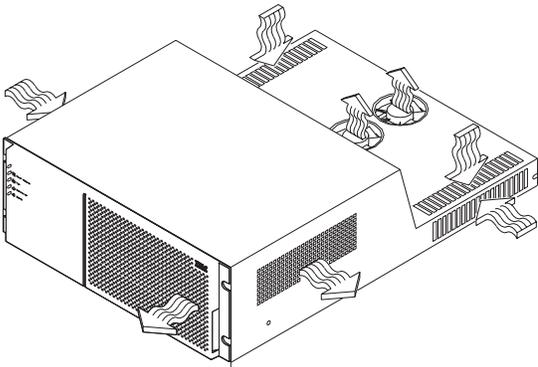
Controller Unit Front View



Controller Unit Back View

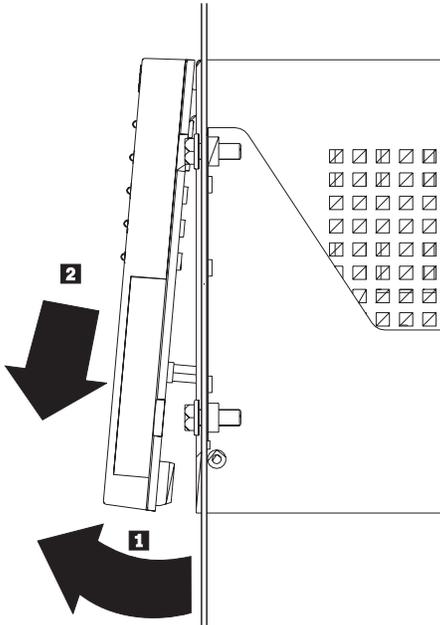


Air Flow



The controller unit must have proper air circulation throughout the chassis. To boost air circulation, the chassis has air vents along its top and sides. These vents serve as air intake and exhaust passages. Assure that vents are clean and free of obstruction.

Front Cover Removal

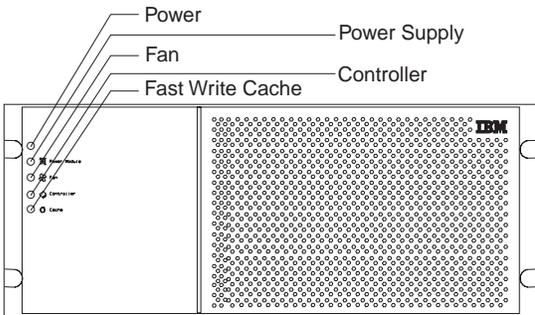


Removing the Front Cover:

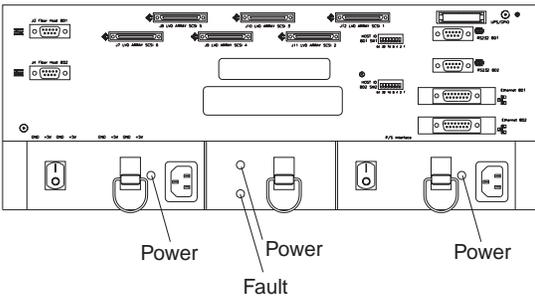
1. Pull out on the bottom to release pins, then slide cover down.

- To replace front cover, slide top edge of cover under lip of chassis, then push bottom of cover until pins snap into mounting holes.

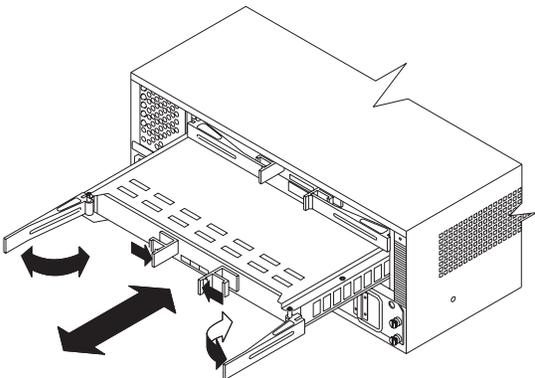
Front LEDs



Rear LEDs



Controller CRU Removal



Note

Keep track of which controller CRU belongs in each slot. To prevent data loss, you must replace each controller (A or B) in their original slot.

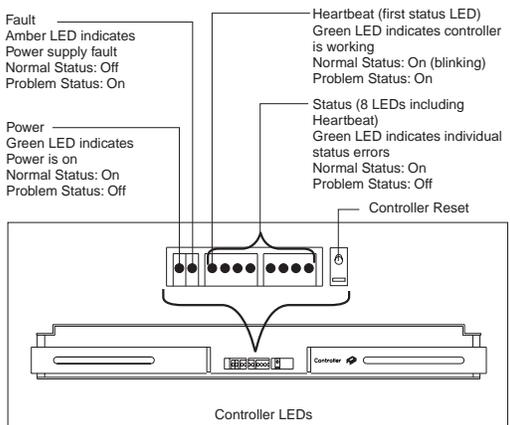
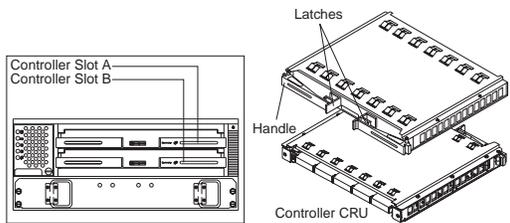
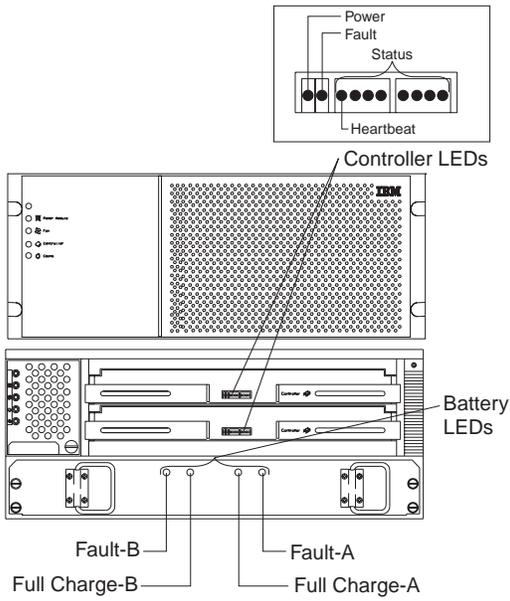
Removing a Controller CRU:

1. Unlock the levers of the controller you want to remove.
2. Open both levers **at the same time**.
3. Pull out the controller.

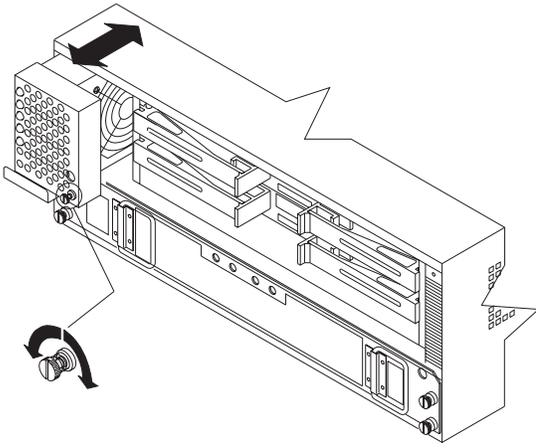
Installing a Controller CRU:

1. Make sure both levers are straight out as shown above.
2. Carefully push the Controller CRU into the slot making sure both levers swing inward **at the same time**.
3. Close and lock both levers at the same time.

Controller CRU and Battery LEDs



Controller CRU Fan Removal



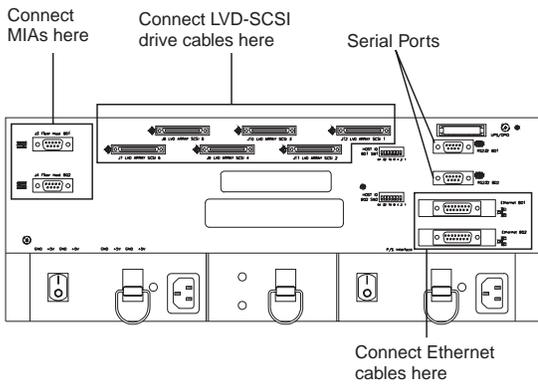
Removing the Controller CRU Fan:

1. Loosen captive screw.
2. Pull firmly on handle to remove CRU

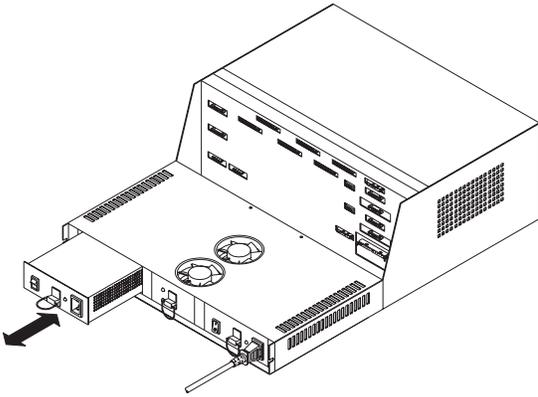
Installing the Controller CRU Fan:

1. Push Controller CRU Fan firmly into slot and tighten the captive screw.

Interface Connections



Power Supply Removal



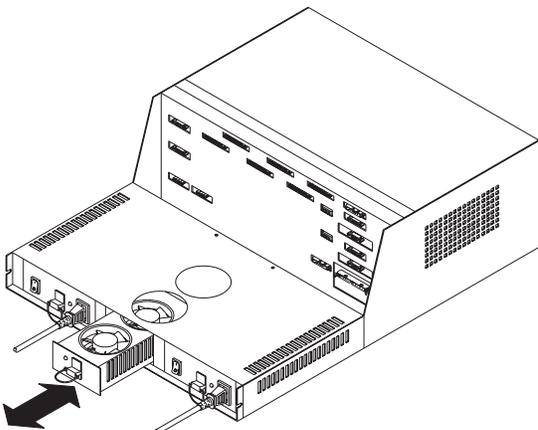
Removing the power supply CRU:

1. Power-off the power supply CRU.
2. Disconnect the power cord from the power supply CRU.
3. Pull the pull ring lever up to unlatch the CRU.
4. Pull the CRU out of the controller unit.

Installing the power supply CRU:

1. Install the new power supply CRU into the controller unit.
2. The lever will snap down when the CRU is seated properly in the chassis. If the lever remains up, push on the power supply CRU until the lever snaps into place.
3. Connect the power cord, power-on the controller unit and check all LEDs.

Power Supply Fan Removal



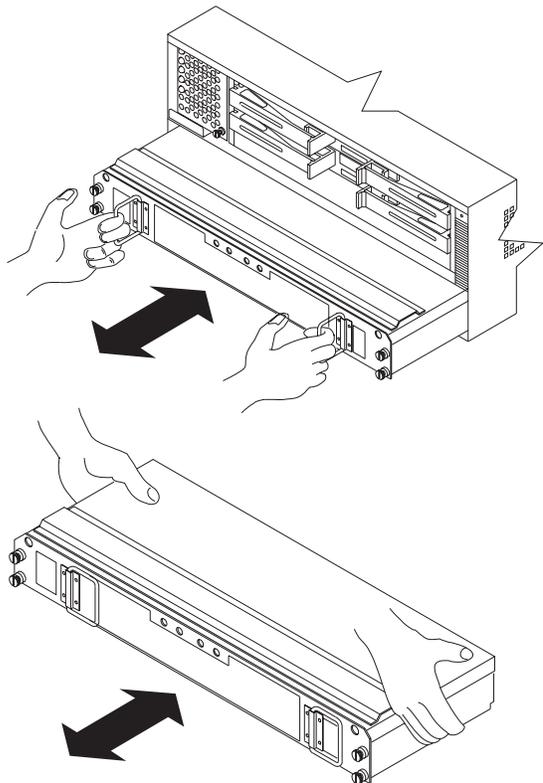
Removing the power supply fan:

1. Pull the pull ring lever up to unlatch the CRU.
2. Pull the CRU out of the controller unit.

Installing the power supply fan:

1. Install the new power supply fan CRU into the controller unit.
2. The lever will snap down when the CRU is seated properly in the chassis. If the lever remains up, push on the power supply fan CRU until the lever snaps into place.

Battery Replacement



Removing the Battery CRU:

Unpack the battery CRU. Save the shipping material for transporting the used battery CRU. Find the "Battery Support Information" label on the front of the new battery CRU.

1. Record today's date on the blank line next to "Date of Installation".
2. Remove the front cover of the controller unit.

Important

The battery CRU weighs approximately 24 lb. Make sure you are prepared to support its weight when you remove it from the chassis.

3. Turn the captive screws on the battery CRU counterclockwise. If they are too tight, use a flat blade screwdriver to loosen the screws.
4. Pull battery CRU out about 2-inches.
5. Grasp the battery sides with **both hands** and slide out.

Installing the Battery CRU:

1. Slide the battery CRU into the slot and tighten all captive screws.
2. Replace the front cover.
3. Allow the system to run for at least 24 hours in order to properly charge the batteries.

When properly charged, both Full Charge LEDs will be lit on the front of the battery CRU.

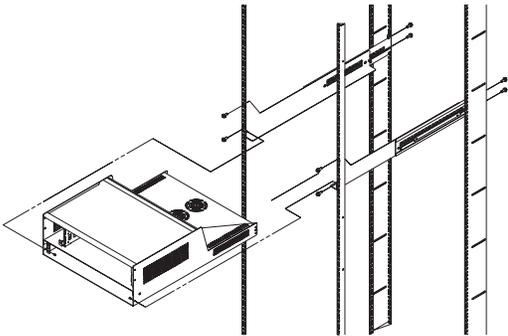
Important

Dispose of the used battery CRU according to local and federal regulations, which may include hazardous material handling procedures.

Important

If the used battery CRU is leaking electrolyte gel, DO NOT ship it to a recycling center. Handle damaged batteries according to your local regulations, which may include procedures for handling batteries as hazardous waste.

Rack Installation



Note

Before removing or placing the controller unit in the rack, carefully remove the battery from the controller unit. See "Battery Replacement" on page 77.

1. Loosen the adjustment screws on both side rails and adjust to fit the rack.
2. Secure the side rails to the rack cabinet using eight M6 screws and eight rack mounting nuts. Make sure both side rails are parallel and level to one another in the rack cabinet.
3. Tighten the rail adjustment screws.
4. Once the side rails are secured to the rack, carefully slide the controller unit onto the side rails.
5. Secure the controller unit with two screws on the front sides of the battery compartment.

Symptom-to-FRU Index

This index supports Type 3526 Fibre Channel RAID Controller.

The Symptom-to-FRU lists symptoms and the possible causes. The most likely cause is listed first.

Note

Always start with the "General Checkout" on page 53. For IBM devices not supported by this index, refer to the manual for that device.

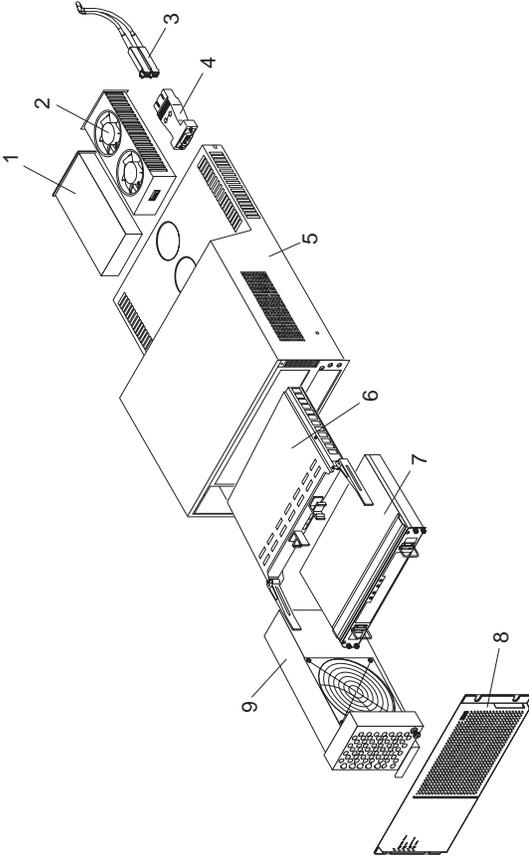
Note

Do **Not** look directly into any fiber cable or GBIC optical output. Read "Safety Information" on page 203. To view an optical signal, use a mirror to view the reflected light.

Problem	FRU/Action
Controller LED (front cover) is on.	<ol style="list-style-type: none"> 1. Reseat Controller CRU 2. Controller CRU
Software issued a controller error message.	<ol style="list-style-type: none"> 1. Check Controller Fan 2. Controller CRU
Software errors occur when attempting to access controllers or drives.	<ol style="list-style-type: none"> 1. Check appropriate software and documentation to make sure the system is set up correctly and the proper command was executed 2. Power to the Controller 3. Interface cables 4. ID settings 5. Controller 6. Drive 7. Controller backpanel
Fan LED (front cover) is on.	<ol style="list-style-type: none"> 1. Power supply fan CRU 2. Controller fan CRU
Controller and Fan fault LEDs (front cover) are on.	<ol style="list-style-type: none"> 1. Check both Fan and Controller CRUs for fault LED and replace faulty CRU
Fault-A or Fault-B LED (battery CRU) is on.	<ol style="list-style-type: none"> 1. Battery CRU

Problem	FRU/Action
Full Charge-A or Full Charge-B LED (battery CRU) is off.	<ol style="list-style-type: none"> 1. Power-on Controller and allow batteries to charge for 24 hours until the Full Charge LEDs are on. 2. Battery CRU 3. Both power supplies
No power to controller (all power LEDs off)	<ol style="list-style-type: none"> 1. Check power switches and power cords 2. Power supplies
Power Supply LED is off.	<ol style="list-style-type: none"> 1. Check and reseal power supply 2. Check for overheating. Wait ten minutes for the power supply CRU to cool down. See "Recovering from a Power Supply Shutdown" on page 55. 3. Power supply CRU
Power Supply CRUs LED are on, but all other CRU LEDs are off.	<ol style="list-style-type: none"> 1. DC power harness

Parts Listing (Type 3526 Fiber Channel RAID Controller)



Index	Fibre Channel RAID Controller (Type 3526)	FRU
1	350-Watt Power Supply	01K6743
2	Rear Fan Assembly (Power Supply Fan)	01K6741
3	Optical Cable - 5 Meters (option)	03K9202
3	Optical Cable - 25 Meters (option)	03K9204
4	Media Interface Adapter (MIA)	03K9280
5	Frame Assembly with Midplane	10L6981
6	Controller Assembly with 32 MB memory/128 MB cache	10L6993
7	Battery Backup Assembly	01K6742
8	Bezel Assembly	10L7043
9	Front Fan Assembly (Controller CRU Fan)	01K6740
	128 MB cache module	10L5862
	Battery Cable	03K9285
	Fan Cable	03K9281
	Power Cable	03K9284
	Miscellaneous Hardware Kit	01K6739
	Rail Kit	10L6982

Type 3552 Netfinity FASt500 RAID Controller Enclosure Unit

The following information is for the Netfinity FASt500 RAID Controller Enclosure Unit

General Checkout

Use the indicator lights, Symptom-to-FRU list, and the connected server HMM to diagnose problems.

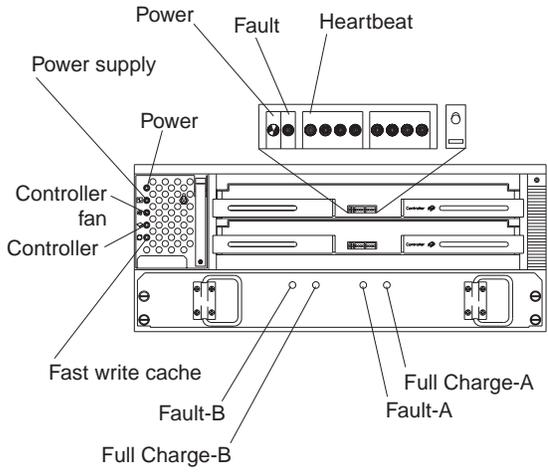
Checking the indicator lights

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

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

Use the following procedure to check the controller unit indicator lights and operating status.

1. To view the indicator lights, remove the controller unit bezel.
2. Check the indicator lights on the front of the controller unit.
3. Check the indicator lights on the back of the controller unit.
4. Check the indicator lights on the mini-hubs.
5. If all indicator lights show a normal status, replace the bezel; otherwise, run the storage-management software to diagnose and repair the problem.



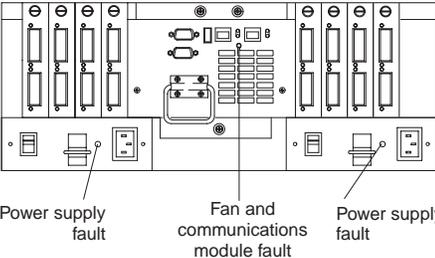
Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator 1
Component: controller CRU				
Power	Green	On	Off	<ul style="list-style-type: none"> No power to controller unit No power to storage subsystem Cables are loose or the switches are off Power supply has failed, is missing, or is not fully seated Overtemperature condition
Fault	Amber	Off	On	Controller failure; controller fault condition
Heartbeat	Green	Blinking ²	Not blinking ²	No controller activity
Status (eight lights including Heartbeat)	Green	Various patterns depending on the condition	Various patterns depending on the condition	If the second, third, sixth, and seventh lights are on or if all eight lights are on, there is a memory fault indicating that the controller CRU has failed.
Component: controller fan				
Power	Green	On	Off	<ul style="list-style-type: none"> No power to controller unit No power to storage subsystem Cables are loose or the switches are off Power supply has failed, is missing, or is not fully seated in controller unit Overtemperature condition

Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator ¹
Power supply fault	Amber	Off	On	<ul style="list-style-type: none"> Power supply has failed Overtemperature Power supply is turned off, disconnected, or not fully seated in controller unit No power to controller unit or storage subsystem (all indicator lights are off)
Controller fan fault	Amber	Off	On	<ul style="list-style-type: none"> Controller fan has failed Fan and communications module is missing, unplugged, or has failed Circuitry failure Overtemperature condition.
Controller fault	Amber	Off	On	Controller has failed; one or more memory modules failed (SIMMs or DIMMs)
Fast write cache	Green	Steady or blinking ³	Software dependent ³	Normal operation is off if: <ul style="list-style-type: none"> Cache is not enabled Battery is not ready
Component: battery				
Fault-A or Fault-B	Amber	Off	On	<ul style="list-style-type: none"> Left or right battery bank has failed Battery is either discharged or defective

Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator 1
Full Charge-A or Full Charge-B	Green	On ⁴	Off	<ul style="list-style-type: none"> • Left or right battery bank is not fully charged • Power has been off for an extended period and has drained battery power • Batteries are weak

1. Always use the storage-management software to identify the failure.
2. There are eight status lights (the Heartbeat and seven others) that glow in various patterns, depending on the controller status.
3. The fast write cache indicator light is on when there is data in cache and blinks during a fast write operation.
4. If either Full Charge-A or Full Charge-B indicator light blink, the battery is in the process of charging.

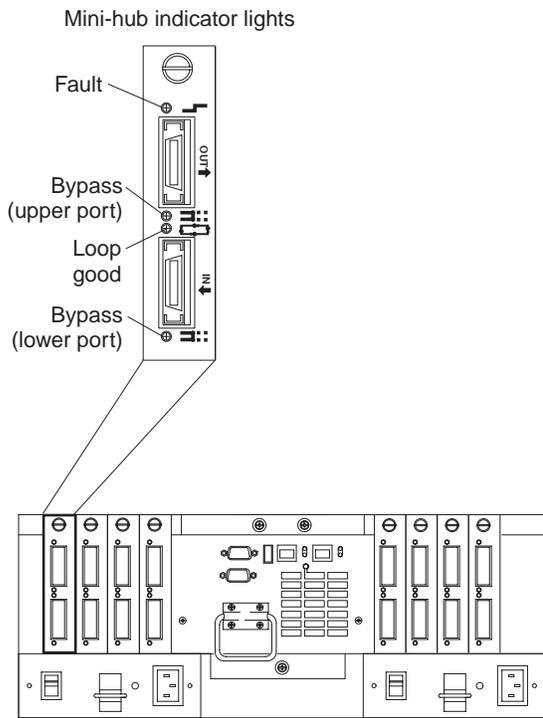
The indicator lights are located on the back of the controller unit



Indicator light	Color	Normal operation	Problem indicator	Possible conditions indicated by the problem indicator ¹
Fan and communications module				
Fan and communication fault	Amber	Off	On	<ul style="list-style-type: none"> Fan and communications module has failed or is installed incorrectly Overtemperature condition
Power supply				
Power supply	Green	On	Off	<ul style="list-style-type: none"> No power to controller unit No power to storage subsystem Power supply has failed Overtemperature condition

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

The mini-hub indicator lights on the back of the controller unit are shown in the following illustration.



The following table describes the mini-hub indicator lights.

Icon	Indicator light	Color	Normal operation	Problem indicator	Possible condition indicated by the problem indicator
Component: mini-hub (host-side)					
	Fault	Amber	Off	On	Mini-hub or GBIC has failed. Note: If a host-side mini-hub is not connected to a controller, this fault light is always on.
	Bypass (upper port)	Amber	Off	On	<ul style="list-style-type: none"> Upper mini-hub port is bypassed Mini-hub or GBIC has failed, is loose, or is missing Fiber-optic cables are damaged Note: If the port is unoccupied, the light is on.
	Loop good	Green	On	Off	<ul style="list-style-type: none"> The loop is not operational Mini-hub has failed or a faulty device might be connected to the mini-hub Controller has failed Note: If a host-side mini-hub is not connected to a controller, the green light is always off and the fault light is always on.

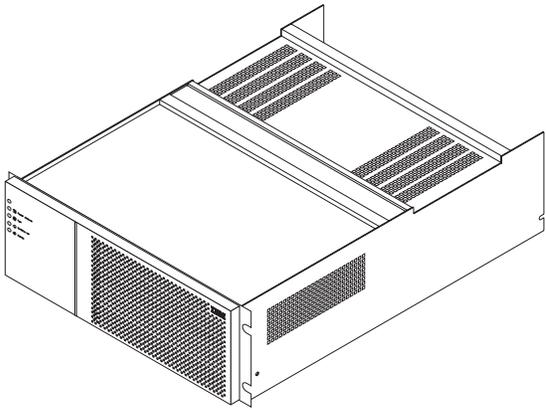
Icon	Indicator light	Color	Normal operation	Problem indicator	Possible condition indicated by the problem indicator
	Bypass (lower port)	Amber	Off	On	<ul style="list-style-type: none"> Lower mini-hub port is bypassed Mini-hub or GBIC has failed, is loose, or is missing Fiber-optic cables are damaged Note: If the port is unoccupied, the light is on.
Component: mini-hub (drive-side)					
	Fault	Amber	Off	On	Mini-hub or GBIC has failed. Note: If a drive-side mini-hub is not connected to a controller, this fault light is always on.
	Bypass (upper port)	Amber	Off	On	<ul style="list-style-type: none"> Upper mini-hub port is bypassed Mini-hub or GBIC has failed, is loose, or is missing Fiber-optic cables are damaged Note: If the port is unoccupied, the light is on.

Icon	Indicator light	Color	Normal operation	Problem indicator	Possible condition indicated by the problem indicator
	Loop good	Green	On	Off	<ul style="list-style-type: none"> The loop is not operational Mini-hub has failed or a faulty device might be connected to the mini-hub Drive has failed <p>Note: If a drive-side mini-hub is not connected to a controller, the green light is always off and the fault light is always on.</p>
	Bypass (lower port)	Amber	Off	On	<ul style="list-style-type: none"> Lower mini-hub port is bypassed Mini-hub or GBIC has failed, is loose, or is missing Fiber-optic cables are damaged <p>Note: If the port is unoccupied, the light is on.</p>

Features

The following list summarizes the features of the Type 3552 Fibre Channel RAID Controller. The controller unit is used with rack-mounted drive enclosures (also referred to as expansion units) for Fibre Channel.

The following illustration shows the Netfinity 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 Netfinity FASt Storage Manager Version 7.01 CD including:
 - Netfinity FASt Storage Manager 7.01
 - Publications and online help in Adobe Acrobat PDF format
- 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.

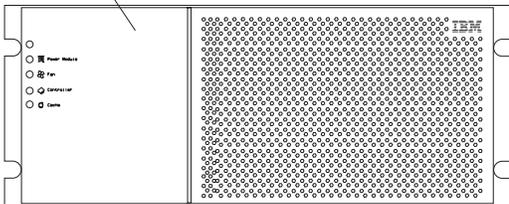
- Bezel (front cover)
- Controller fan
- Battery
- Controller (two each)
- Power supply (two each)
- Host mini-hub (comes with two, four maximum)
- Drive mini-hub (comes with two, four maximum)
- Fan and communications module

Controller Installation Instructions.

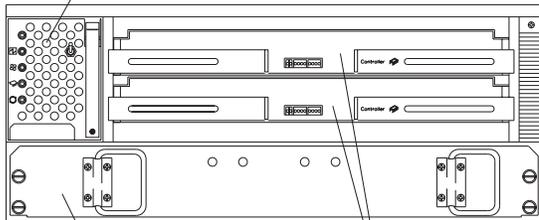
The following information provides descriptions of the primary components of the controller unit and contains setup instructions.

The following illustration shows the controller unit front and back views.

Removable
bezel



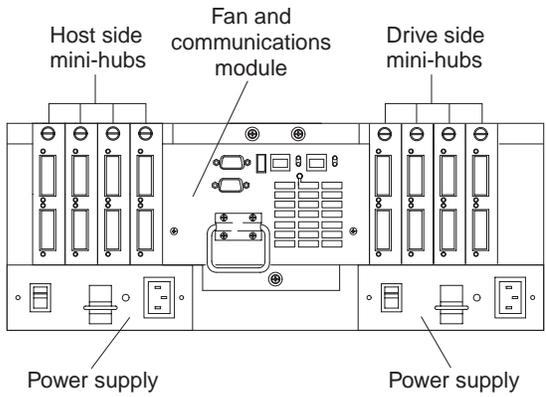
Controller fan



Battery

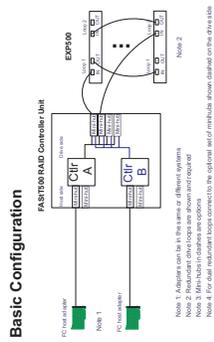
Controllers

The following illustration shows the controller unit back view.

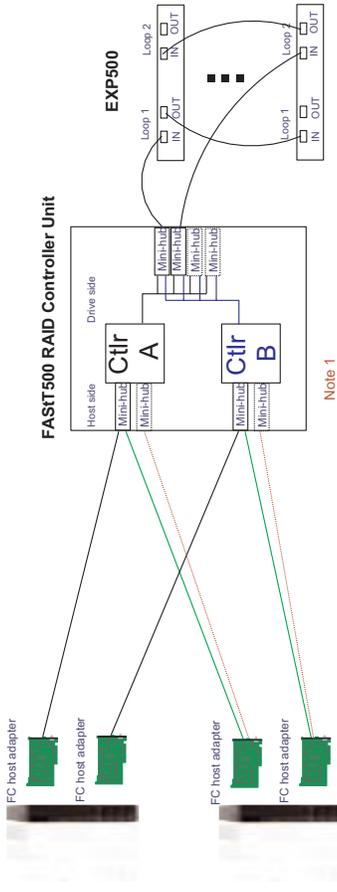


Tested Configurations

The following configurations are for the Type 3552 Netfinity FAST500 RAID Controller.



Simple Fully Redundant

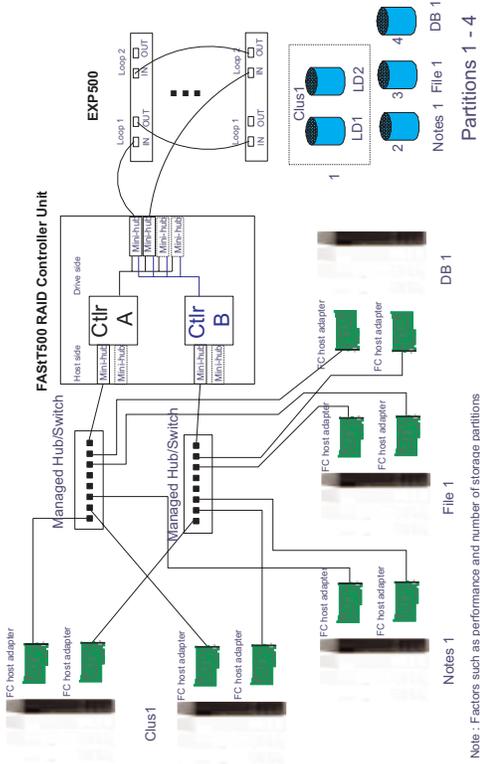


Redundant Servers

Note 1: Since disks are seen from multiple places some form of protection such as MSCS, storage partitioning, Sanergy, Oracle etc **must** be used.

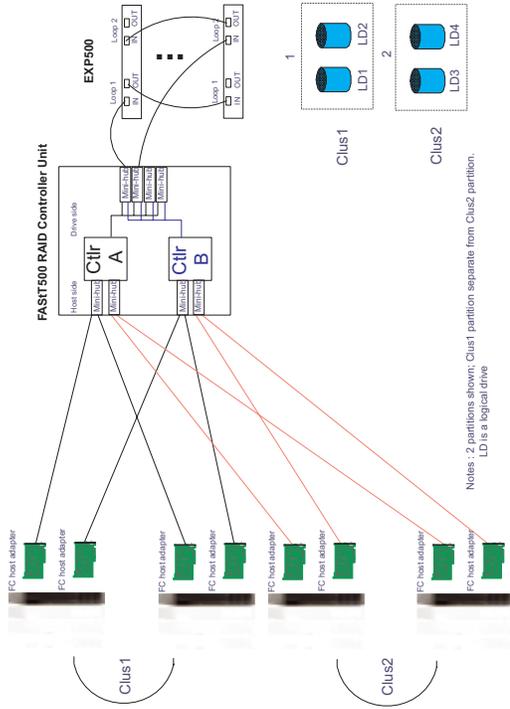
Note 2: For max bandwidth wire **dotted red lines** instead of green

Cluster/Non-Cluster Share

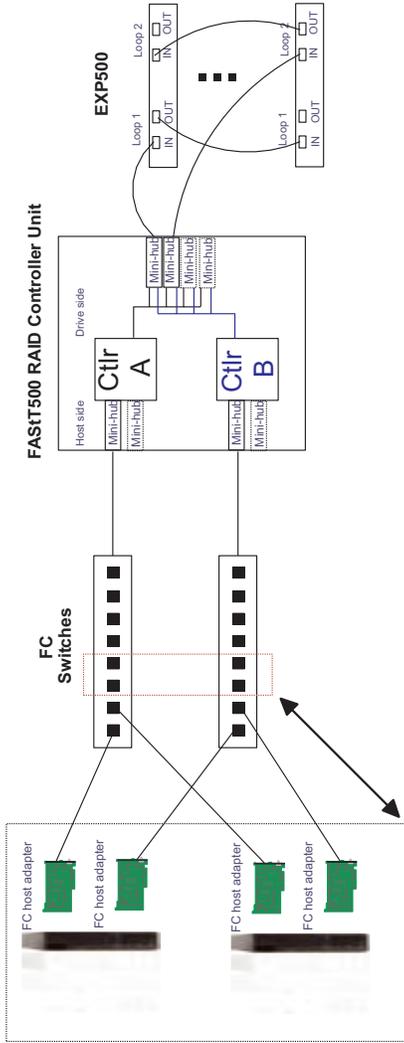


Note : Factors such as performance and number of storage partitions influence the number and type of nodes.

Multi-MSCS No External Hubs



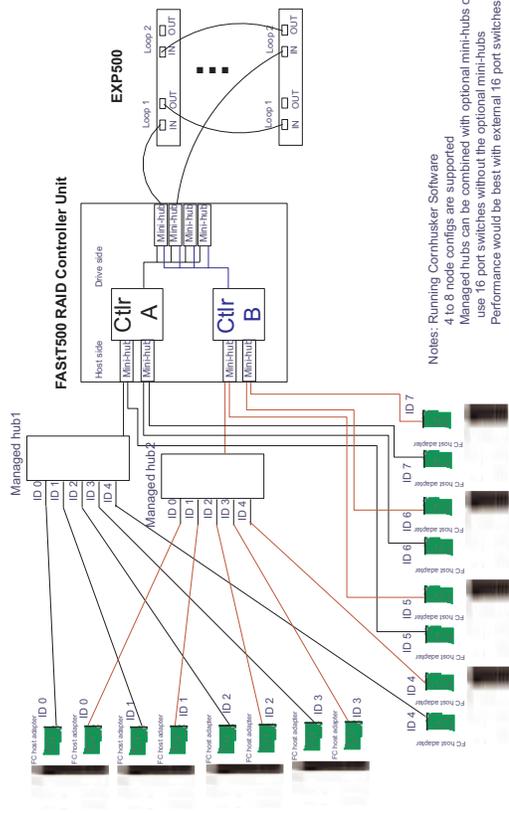
Multi-MSCS extended



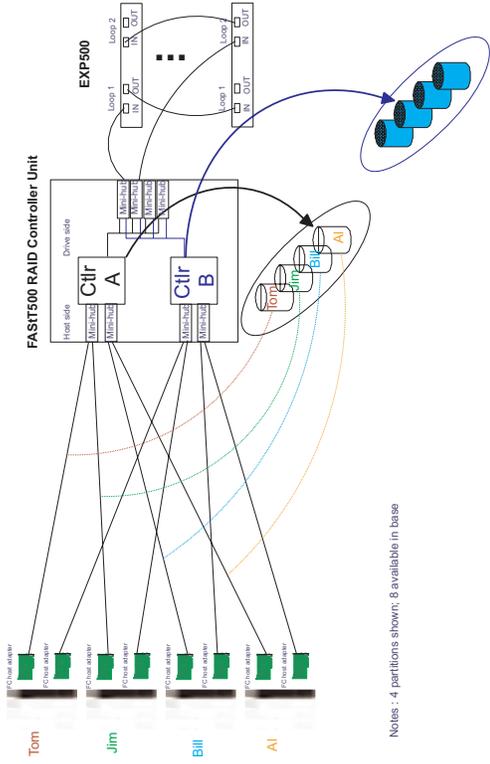
Notes :

- Each group of 4 ports on the switches (red dash box) can support one cluster element (black dash box)
- Storage partitioning is used to separate clusters
- 16 port switches allow more clusters but this has to be within performance needs and available partitions

Cornhusker configuration

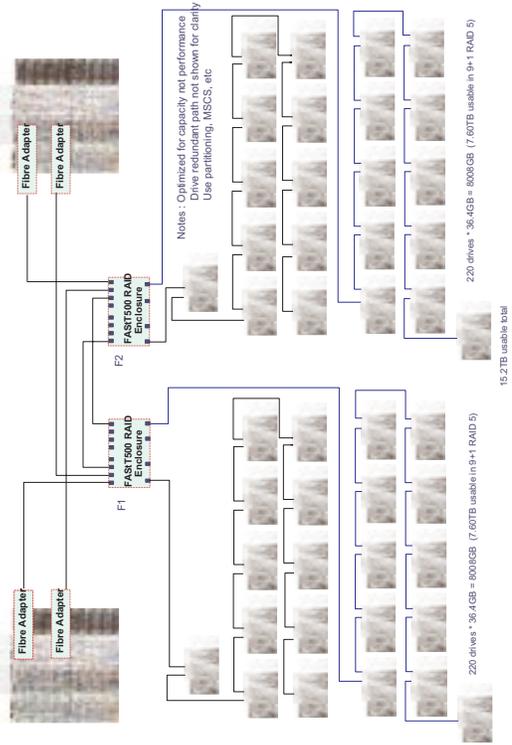


Base Storage Partitions

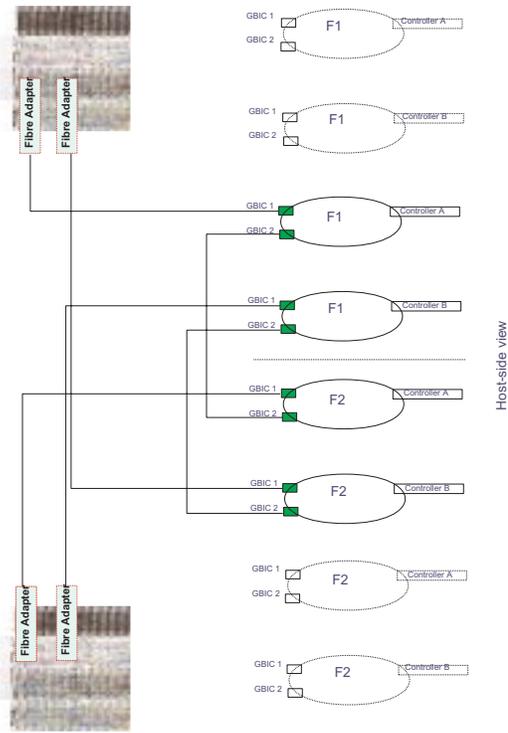


Notes : 4 partitions shown; 8 available in base

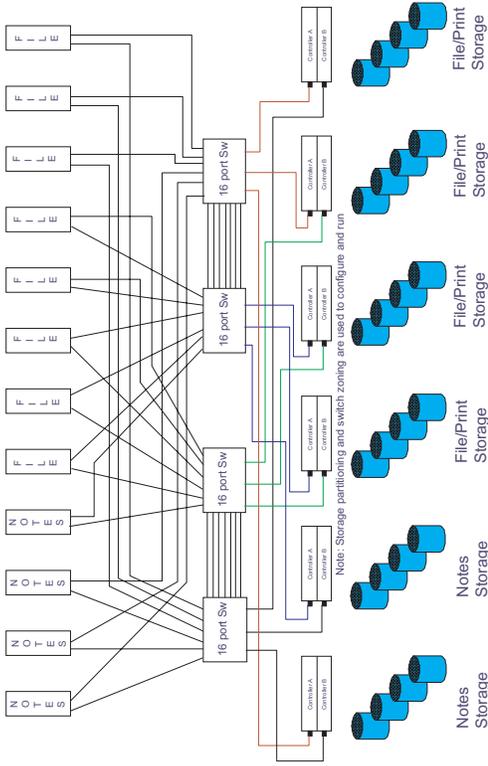
Capacity Configuration



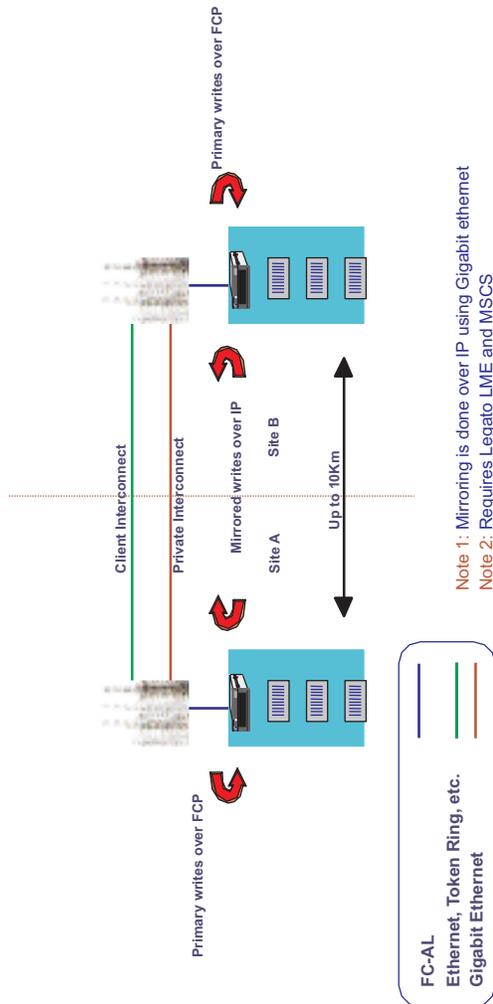
Capacity Configuration - host detail



SAN - Using Partitions of Clusters Servers



Legato HA/Replication for MSCS



Preparing for installation

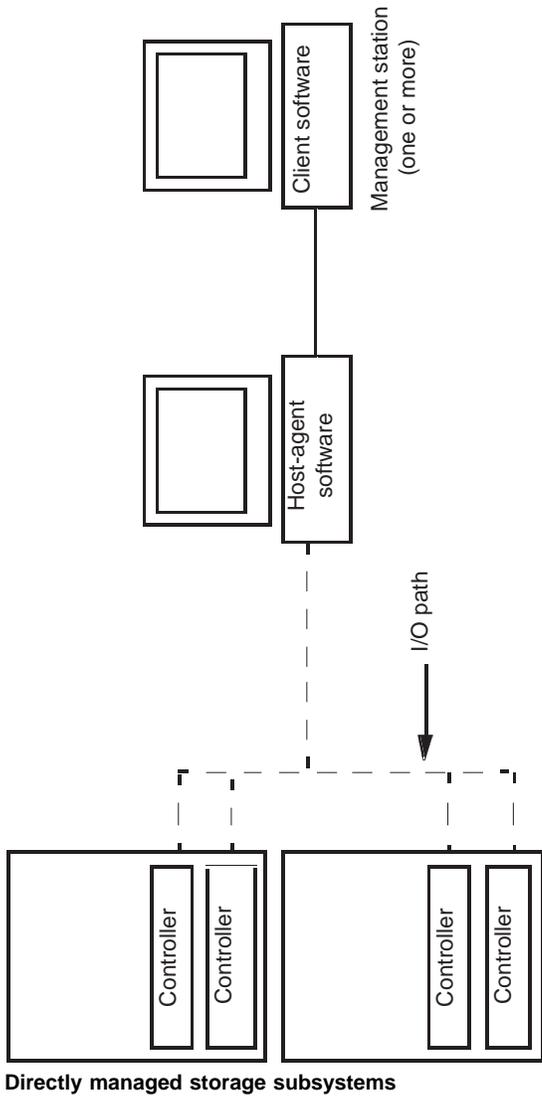
Use the following list to prepare a controller unit for installation.

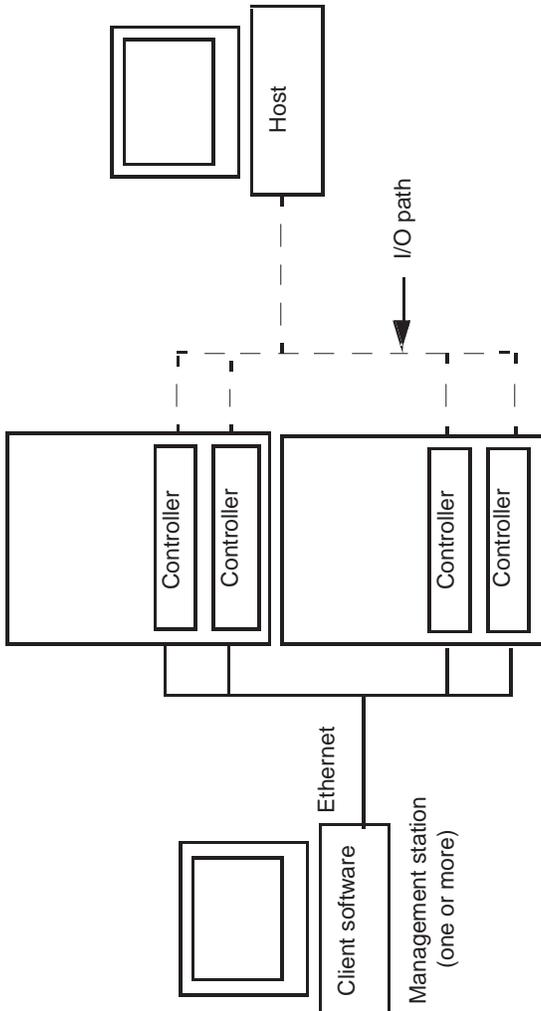
1. Prepare the site to meet all area, environmental, power, and site requirements.
2. Move the controller unit and its rack cabinet to the site.
3. Remove the controller unit from its shipping container and check the contents. If any items are missing, contact your IBM reseller before proceeding.
4. 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 109.

If you are using:	Then:
Host-agent method (uses host-agent software installed on the host machine)	Install at least one management station and a software-agent host.
Direct manage 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 ù 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 6 on page 111.

Host-agent managed storage subsystems





- 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	6.
Standard (non-cluster) server	"Safety Information" on page 203.

- Install the applicable host adapters, based on your path configuration. See the following illustration (Installing the storage subsystem on a Fibre Channel network) for an example 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.

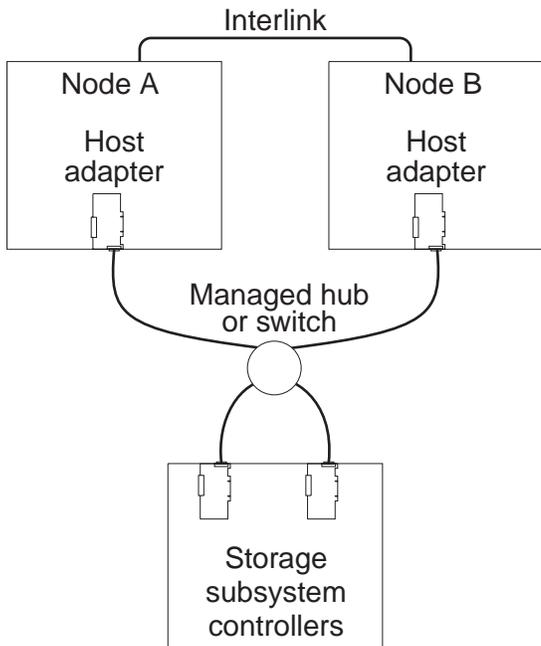
When finished, continue with 8 on page 113.

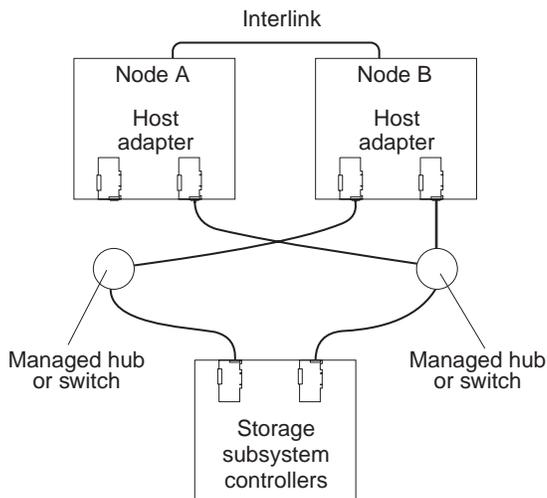
- Refer to the documentation provided with your host adapters for installation requirements and procedures.
- Use the correct host adapter driver. Refer to the software installation guide and README file on the storage-management software installation CD for information on supported host adapters and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

Note

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

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. Continue with "Handling static sensitive devices".

Handling static sensitive devices

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

Preparing the site

This section lists the space requirements and weight information for the controller unit.

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.
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 degree 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 115.

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 previously discussed.

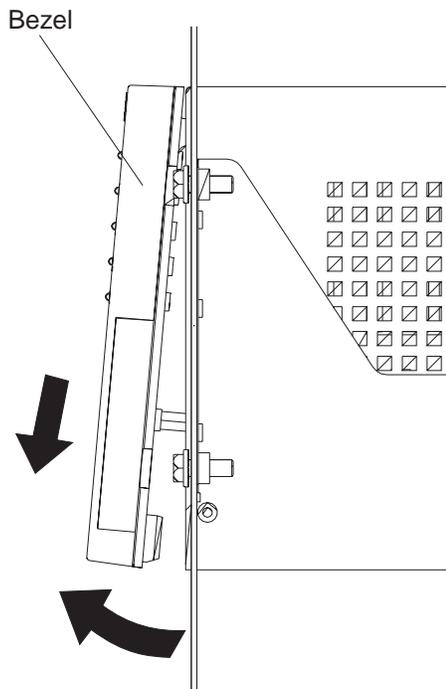
It is easier to lift the controller unit and install it in a rack if you remove all CRUs first. A fully loaded controller unit with a controller fan, battery, fan and communications module, two controllers, two power supplies, and 8 mini-hubs installed weighs 38.6 kg (85 lbs). If you remove all the CRUs,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



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.

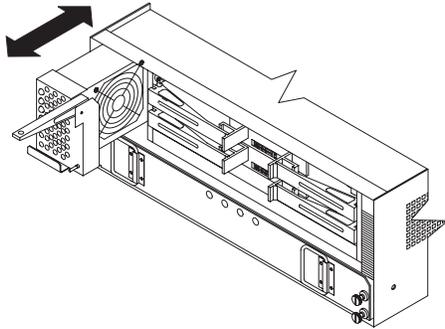
2. Check the contents of the shipping container.

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

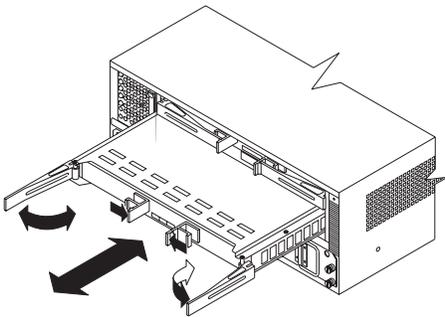
Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

3. Use the following information to remove the controller fan controllers, battery, power supply, fan and communication module, and Mini hubs.
 - a. Pull up on the fan lever to unlock the fan; then, grasp the lip handle and pull out firmly.



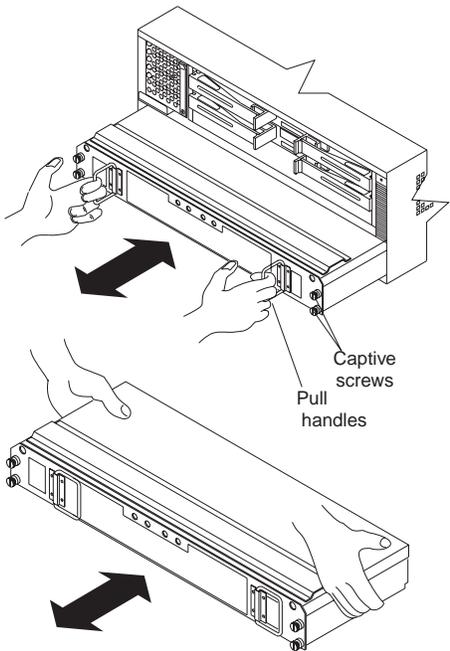
- b. Unlock and open the controller levers; then, using the levers, pull the controller out a couple of inches. Grasp both sides of the controller and remove it.



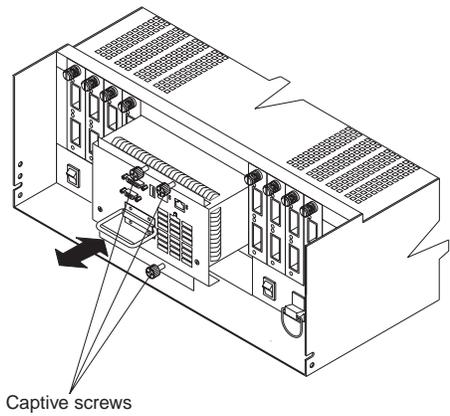
Important

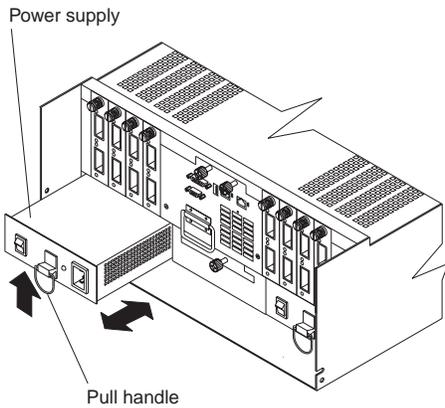
To prevent data loss, replace controller A in the upper slot and controller B in the lower slot.

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

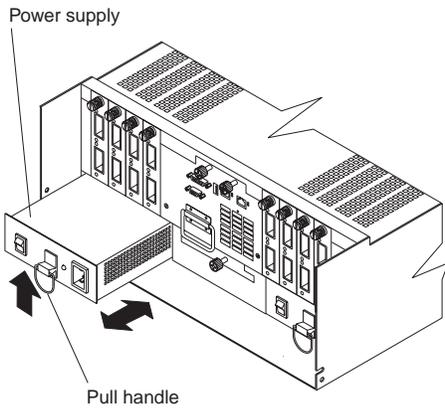


Using the pull tab handle, lift up and pull to release each power supply; then, slide out the power supply.





- d. Loosen the captive screws; then, grasp the screw and pull the mini-hub form the chassis.



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.

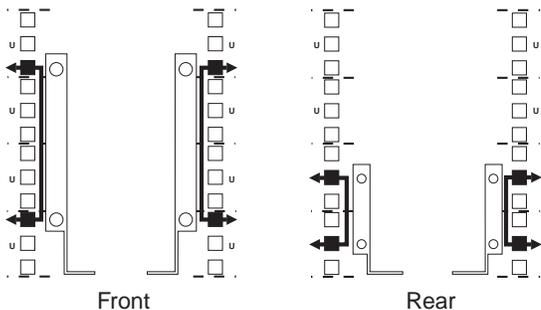


Caution

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

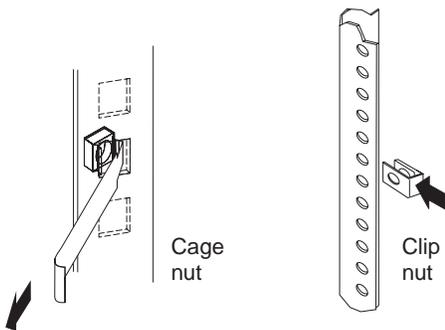


1. Stop all I/O activity to the devices in the rack in which you are installing the controller unit. If your rack has ac distribution boxes, turn off the power switches.
2. Use the following illustration of front and rear rack-mounting flanges to determine the appropriate rack-mounting holes for installing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

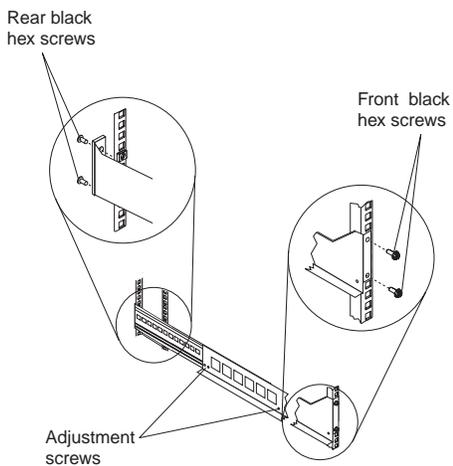


Note

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.



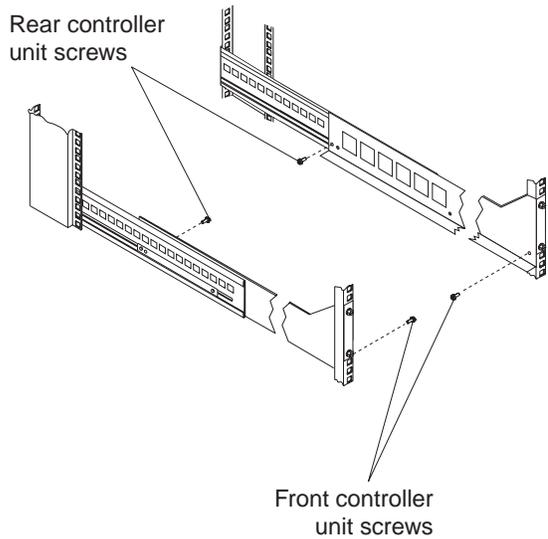
3. On the rail marked $\delta R\ddot{o}$, loosen the two adjustment screws on the inside of the rail and adjust the length of the rail to the depth of your rack.



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 $\delta L\ddot{o}$ on the left side of the rack.

- Using the following illustration, 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



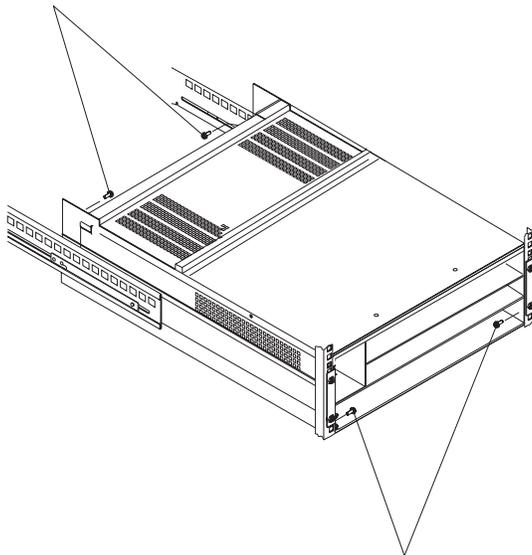
Caution

Use safe practices when lifting.

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

- Slide the controller unit into the rack and secure the rear of the controller unit with two of the small screws.

Rear controller
unit screws



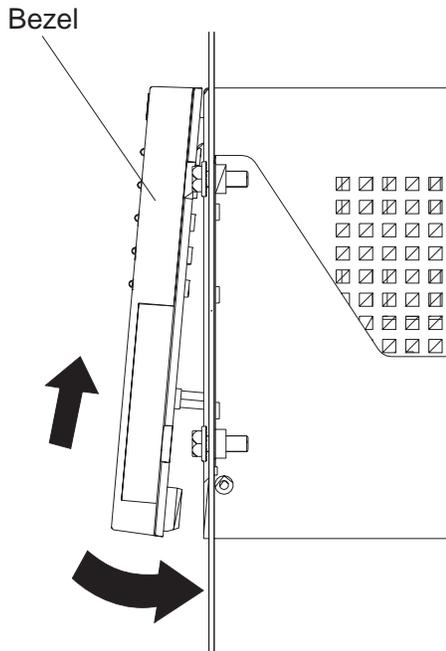
Front controller
unit screws

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.

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".

4. To install the power supplies and fan and communications module in the back of the controller unit.
5. To install the mini-hubs in the back of the controller unit.
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



Installing additional cache memory in a controller

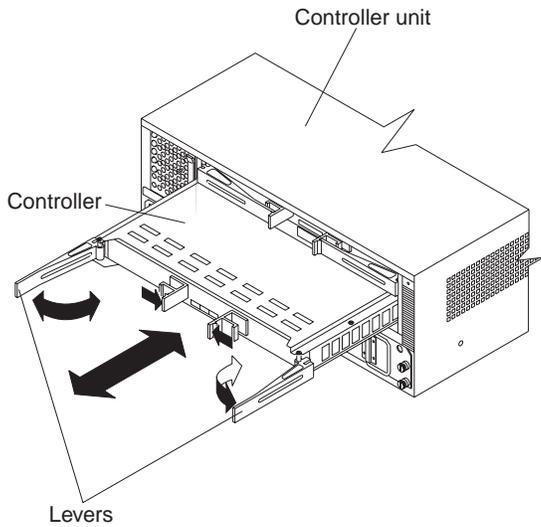
The controller comes with 256 MB of cache memory installed. You can add an additional 256 MB dual inline memory module (DIMM) for a total of 512 MB cache, with the IBM Netfinity FAStT500 256 MB Cache option.

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.

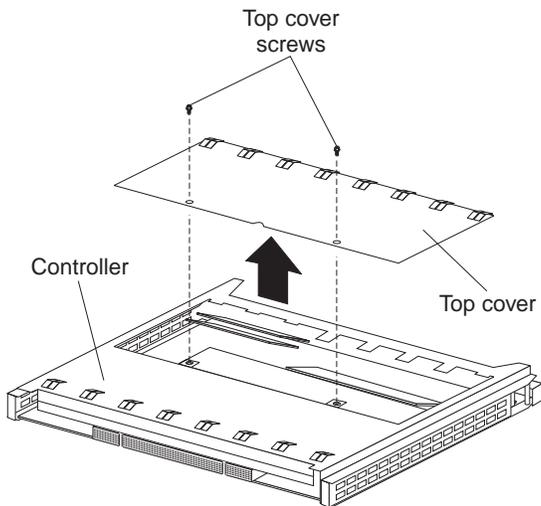
Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

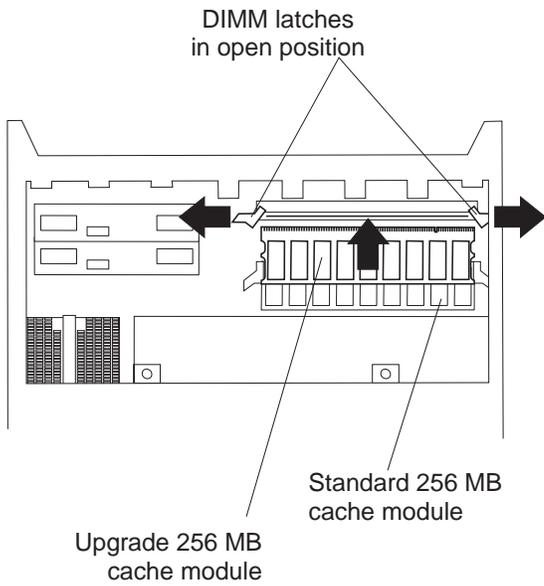
1. Unlock and open the levers on the controller; then, use the levers to pull the controller out of the controller unit a few inches. Grasp both sides of the controller to completely remove it from the controller unit.



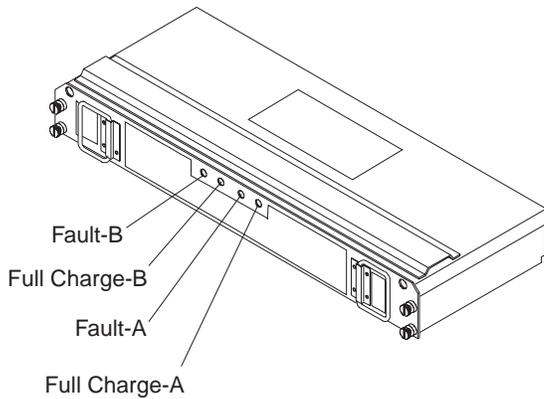
2. Remove both screws from the top cover of the controller; then, lift the cover and set it aside to install after you upgrade your cache.



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.

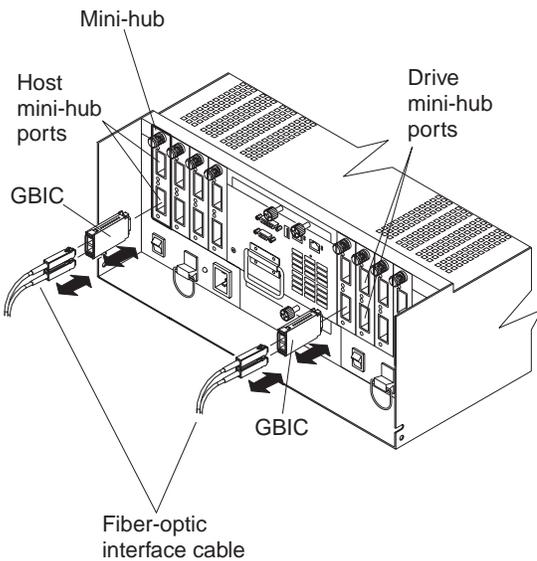


6. Install the top cover.

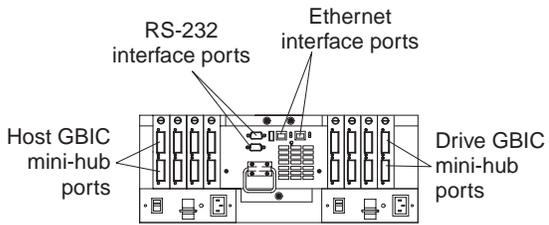
Connecting the controller unit to the loop

The following is a 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.

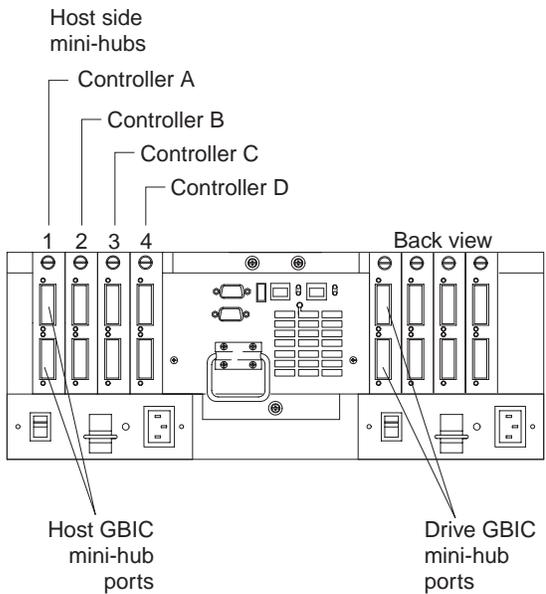
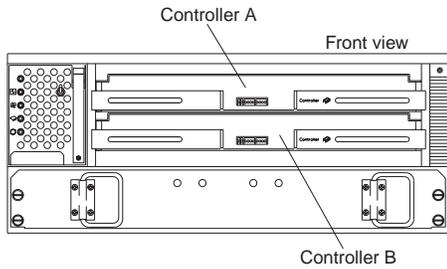
Mini-hub interface connections: The interfaces that connect the controller and drive enclosures to the storage subsystem are called mini-hubs. When fully configured, the back of the controller unit can accommodate four host mini-hubs and four drive mini-hubs. Each mini-hub is a removable unit. A mini-hub 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 illustration shows the 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 illustration.



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). To ensure redundancy, you must connect each host to both controllers through the appropriate mini-hub.

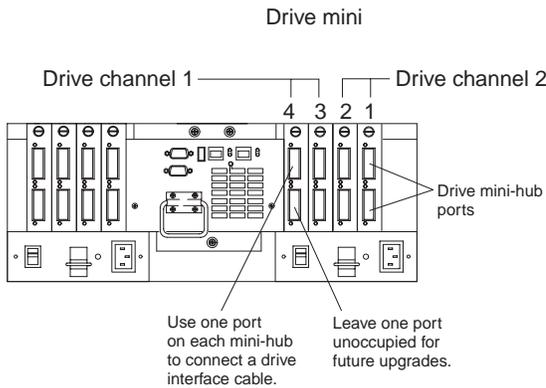


Drive mini-hubs: Each drive mini-hub connects to Controller A and Controller B and each drive mini-hub represents a single drive channel. The drive channels are set up in pairs to support redundant drive loop configurations (two data paths per drive enclosure). Each pair supports up to 11 drive enclosures, 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.

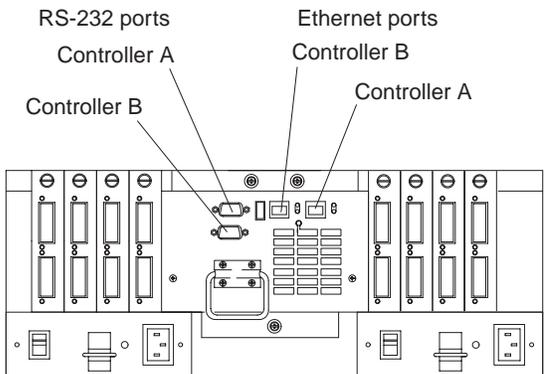
Important

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.



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 illustration shows the location of these 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.

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.

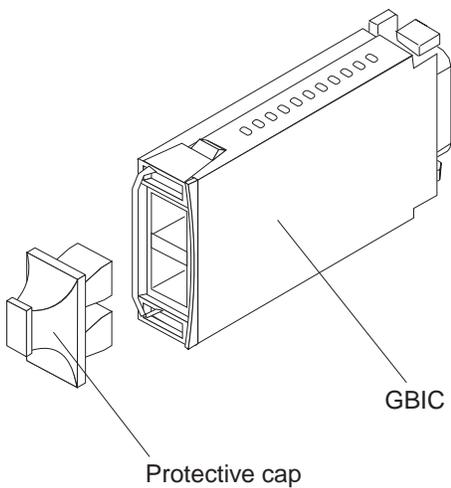
Danger

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).

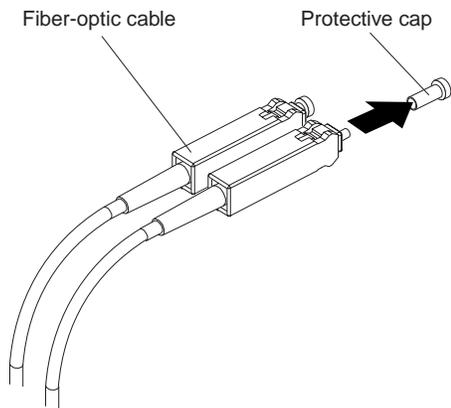
Attention

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

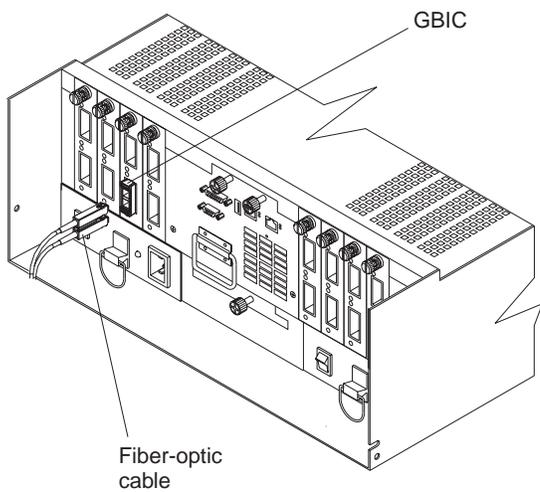
- Do not route the cable along a folding cable-management arm.
- When attaching to a device on slides, leave enough slack in the cable so that it does not bend to a radius smaller than 76 mm (3 inches) when extended or become pinched when retracted.
- Route the cable away from places where it can be 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.

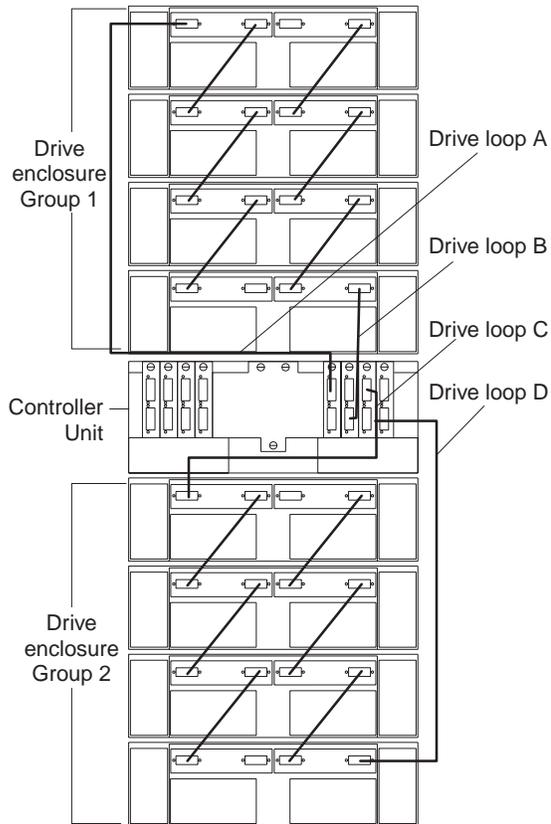
Controller unit and drive enclosure cabling overview

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.

The following illustration 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 illustration.



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 138.

Attention

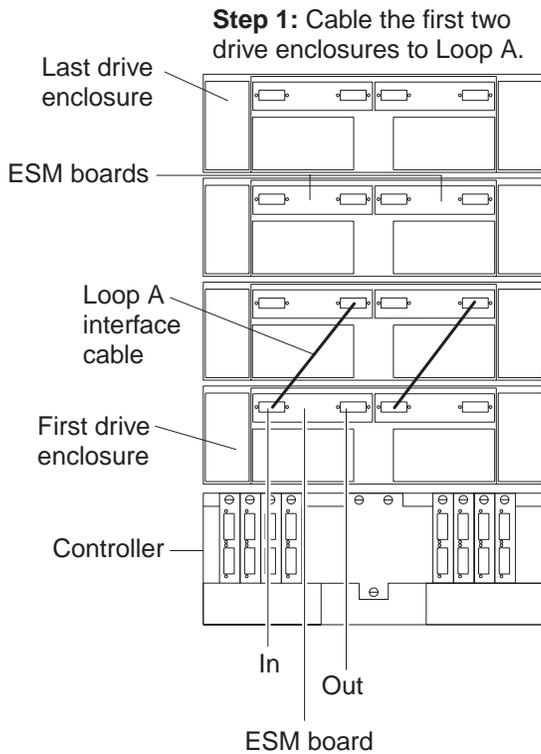
To complete this procedure, you will need two Fibre Channel interface cables. Handle and install fiber-optic cables properly to avoid degraded performance or loss of communications with devices. When working with fiber-optic cables, do not pinch them, step on them, or locate them in aisles or walkways. 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.

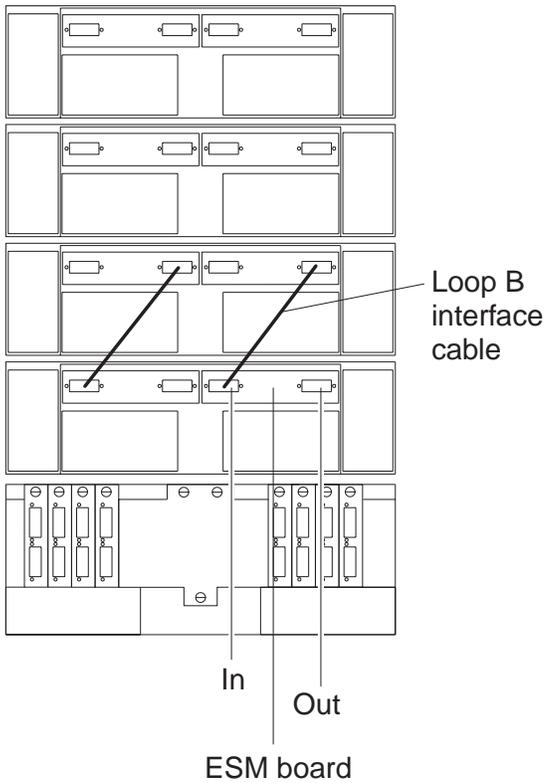
Starting with the first drive enclosure, connect an interface cable from the In port on the left environmental services monitor (ESM) board to the Out port on the left ESM board in the second (next) drive enclosure.

2. Connect the same first two drive enclosures to drive Loop B.

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 the next step; otherwise, go to "Connecting drive cables to the controller unit" on page 138.



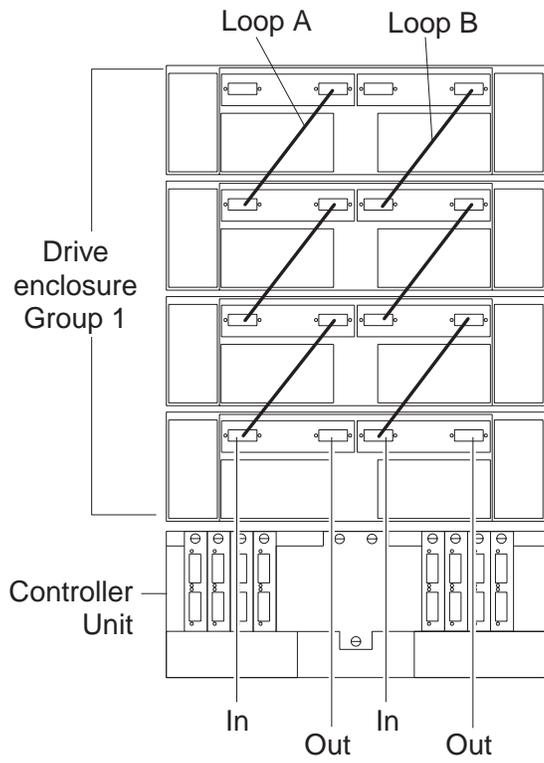
Step 2: Cable the first two drive enclosures to Loop B.

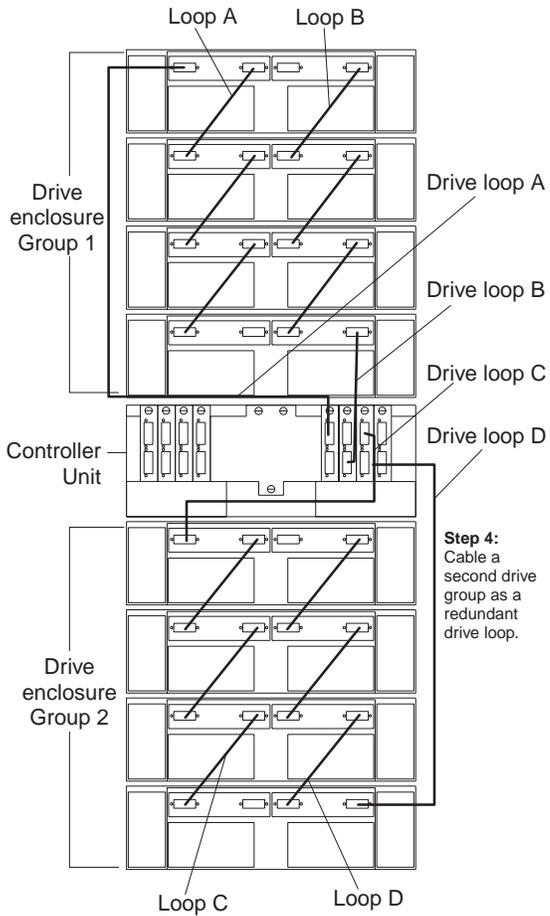


3. Connect additional drive enclosures to drive Loops A and B.

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, repeat this step for the second drive otherwise, go to "Connecting drive cables to the controller unit" on page 138.

4. Repeat Step 1 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 the following illustration. When you finish, go to "Connecting drive cables to the controller unit" on page 138.





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 the following illustration.

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 the following illustration.

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.

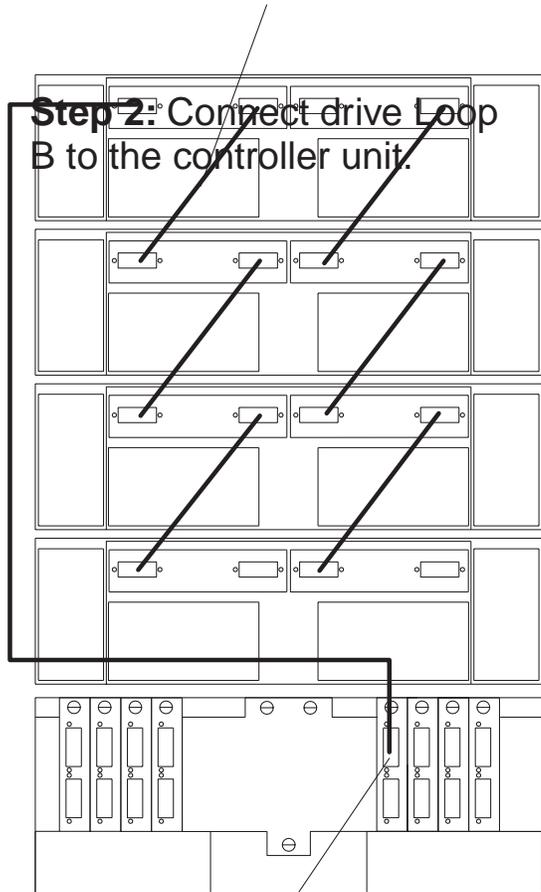
Leave the Out port on the left ESM board and the Out (upper) port on drive mini-hub 3 unoccupied.

To connect a second redundant drive enclosure group to the controller unit, continue with the next step otherwise, go to "Connecting drive cables to the controller unit" on page 138.

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

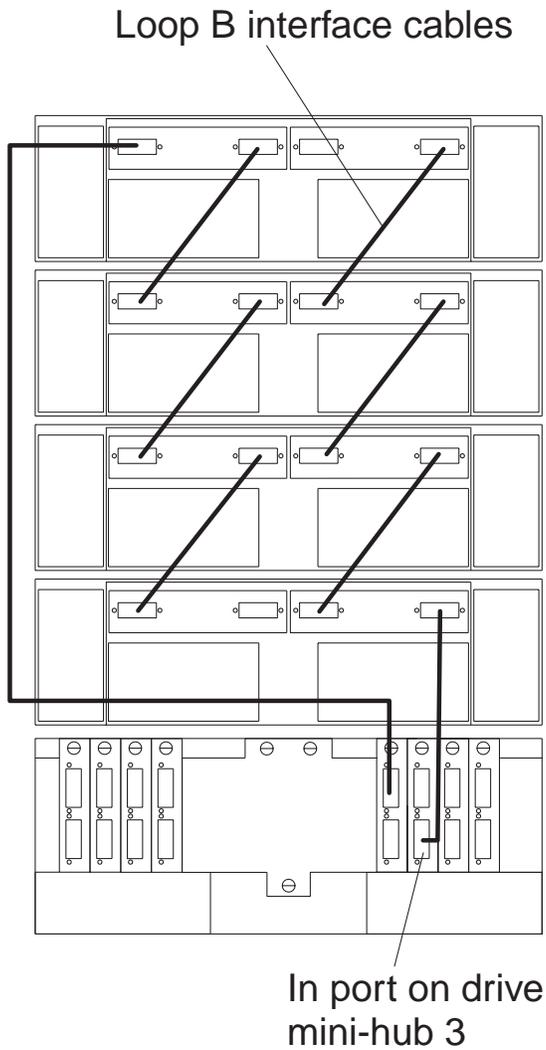
Loop A interface cables

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



Out port on drive mini-hub 4

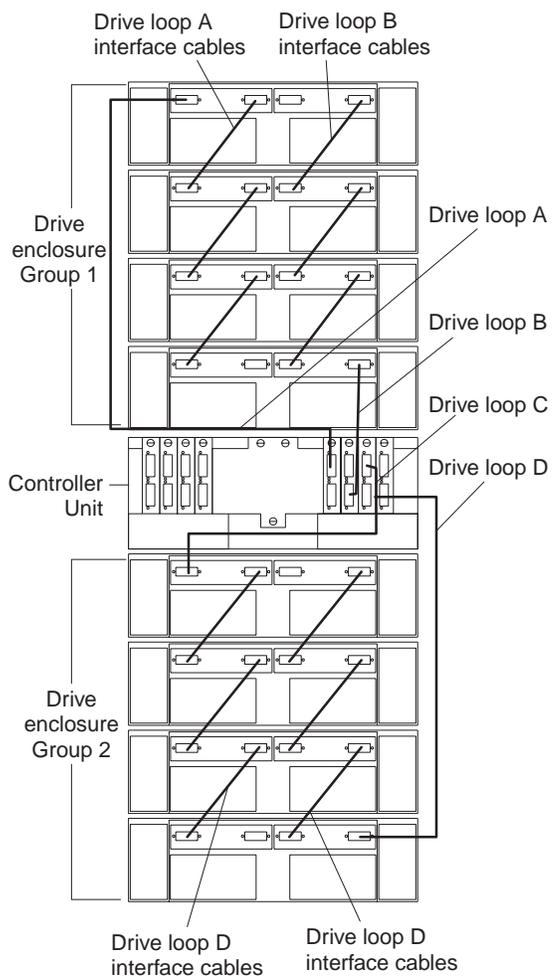
Step 2: Connect drive Loop B to the controller unit.



3. Connect drive Loop C to the controller unit.
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.

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.



5. Go to “Connecting hosts directly to the controller unit.”

Connecting hosts directly to the controller unit

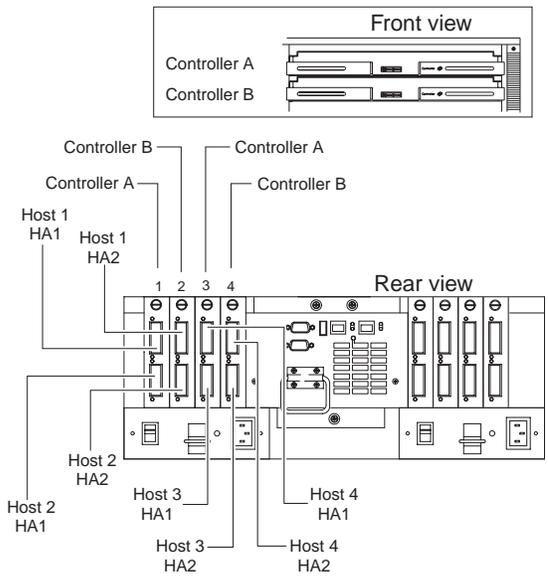
Use this procedure to connect up to four hosts, with two host adapters each, directly to the controller unit. If you are connecting five or more hosts to the controller unit, go to “Connecting hosts using external devices” on page 144.

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 following illustration.
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 145.
2. Connect a second host (Host 2) to the controller unit, as shown in the following illustration.
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 145.
3. Connect a third host (Host 3) to the controller unit.
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 145.
4. Connect a fourth host (Host 4) to the controller unit
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 145.



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.

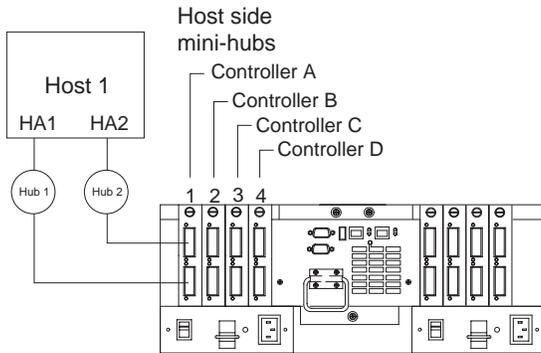
Important

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 the following illustration.
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.



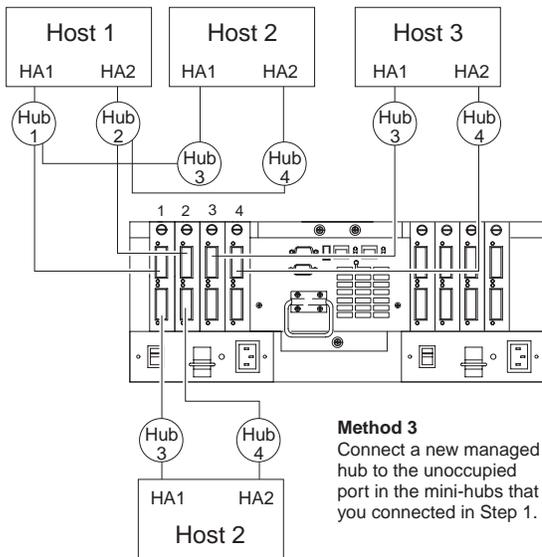
2. Connect additional hosts to the controller unit, using and method shown in the following illustration.
3. Go to "Connecting secondary interface cables."

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.



Method 3

Connect a new managed hub to the unoccupied port in the mini-hubs that you connected in Step 1.

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.

2. To perform diagnostic procedures, connect an RS-232 interface cable to an RS-232 port (see the preceding illustration for the location of these ports).

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.
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.

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.

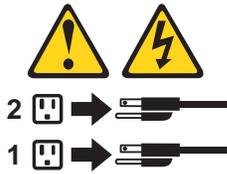
Turn on both power switches on the back of the controller unit. (for the location of the switches). You must turn on both switches to take advantage of the redundant power supplies.

Turning off the power



Caution

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



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.

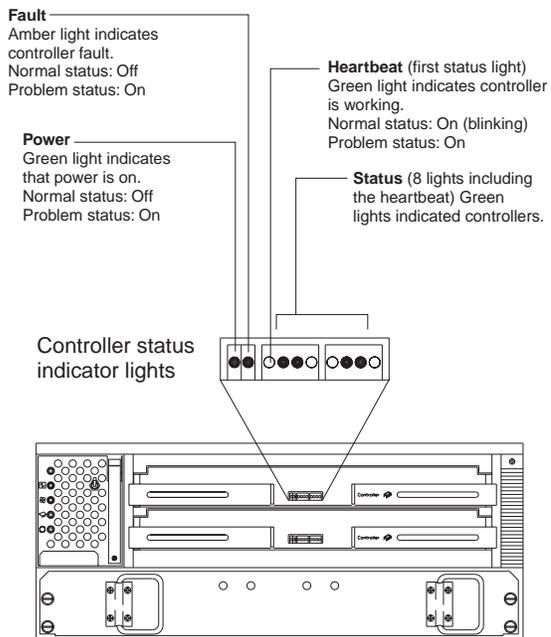
- b. Make sure that all amber fault indicator lights on the controller unit are off. If any fault indicator lights are on, correct the problem before turning off the power.
- 2. Turn off the power switches on the back of the controller unit. 41 for the location of the switches).
- 3. Turn off any drive 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 the following illustration. When the switch is armed, the alarm sounds when a hardware problem occurs.

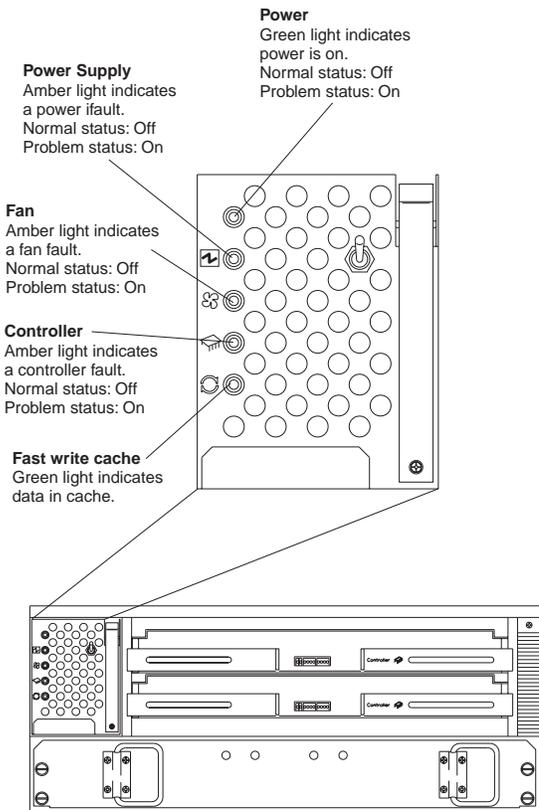
Controller unit indicator lights

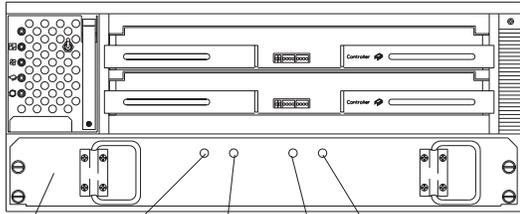
The indicator lights are located on the front the controller unit.



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 Netfinity FAST500 RAID Controller Enclosure Unit UserÆs Reference and IBM Netfinity FAST Storage Manager for Windows NT Installation and Support Guide.





Battery

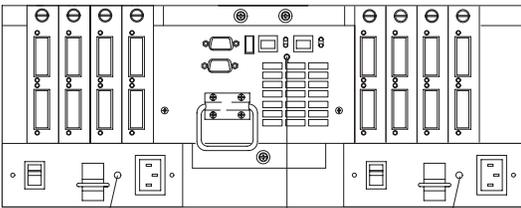
Fault-B
Amber light indicates a fault in the left battery bank.
Normal status: Off
Problem status: On

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

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

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

The indicator lights on the back of the controller unit are shown in the following two illustrations.



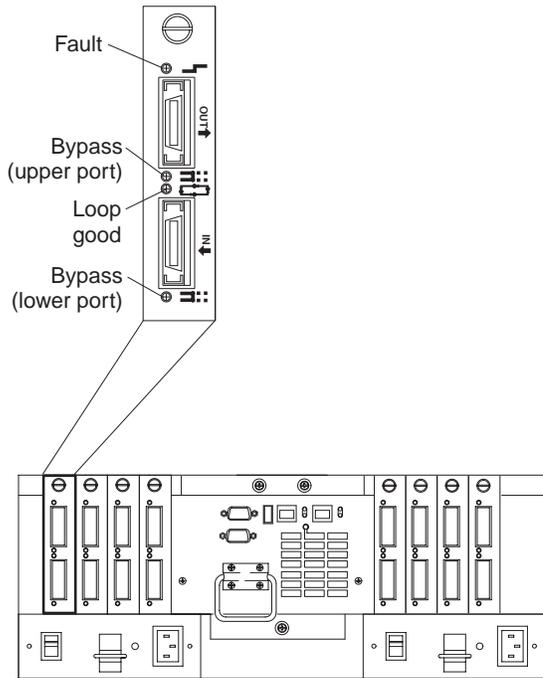
Power
Green light indicates that the power supply is operating properly.
Normal status: On
Problem status: Off

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

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

The mini-hub indicator lights on the back of the controller unit are shown in the following illustration.

Mini-hub indicator lights



The following table describes the 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.

Icon	Indicator light	Color	Normal operation	Problem indicator	Condition indicated
	Bypass (lower port)	Amber	Off	On	<p>The lower mini-hub port is bypassed. Note: If the port is unoccupied, the light is on.</p>

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.
2. When all status indicators show normal status, replace the controller unit front cover.

For operating instructions, refer to the IBM Netfinity FAST500 RAID Controller Enclosure Unit User's Reference.

Locations

Controller unit

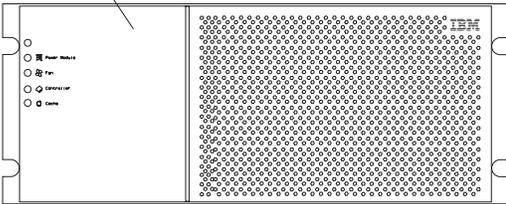
The controller unit supports direct attachment of up to four hosts containing two host adapters each, and is designed to provide maximum host- and drive-side redundancy. Using an external hub, the controller unit can support up to 64 host adapters per controller (up to 128 host adapters per controller unit).

Each controller unit contains several removable components, called customer replaceable units (CRUs), that you can access from either the front or back of the unit. These CRUs include the battery, RAID controllers, controller fan, power supplies, fan and communications module, mini-hubs, and Gigabit Interface Converters (GBICs). The controller unit also has a removable front bezel.

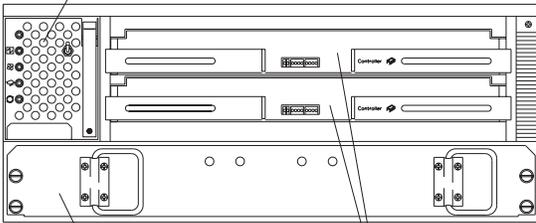
Front view: The following illustration shows the controller unit front view and the following components:

- Bezel - Removable front cover with holes for viewing the status lights and for boosting air circulation.
- Controller fan - One removable unit that contains two cooling fans and status indicator lights.
- Battery - One removable unit that contains a battery and battery charger circuitry.
- Controllers - Two removable units, each contains one RAID controller.

Removable
bezel



Controller fan

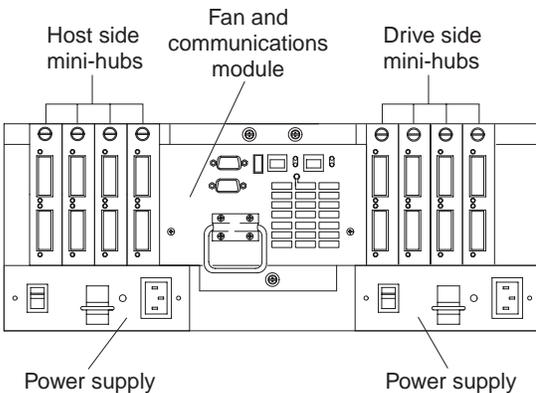


Battery

Controllers

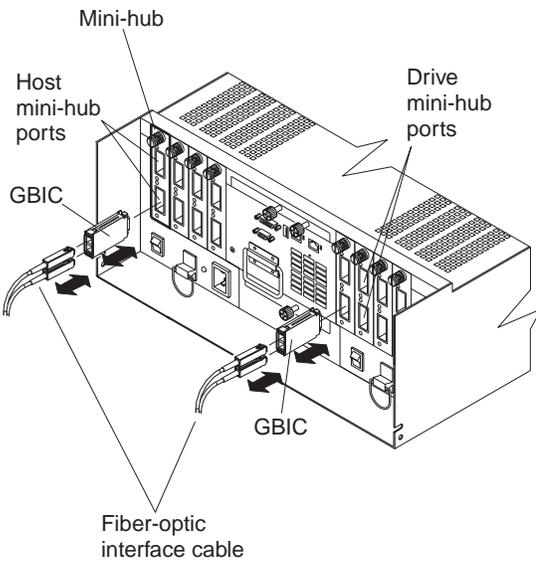
Back view: The following two illustrations show the controller unit back view and the following components:

- Host side and drive side mini-hubs û Up to eight removable mini-hubs to which you can connect GBICs and fiber-optic host and drive interface cables for the controller unit.
- Power supplies - Two removable units that contain the power supplies.
- Fan and communications module û One removable unit that contains the power supply cooling fans, Ethernet ports, and RS-232 (serial) ports.



Fibre Channel connections

When fully configured, the back of the controller unit can accommodate up to four host side and four drive side mini-hubs. Each mini-hub is a single, removable unit that provides the Fibre Channel interface between a controller unit and hosts and drives. Each mini-hub has two GBIC ports. One Gigabit Interface Converter (GBIC) connects into each mini-hub port. The following illustration shows the Fibre Channel components.



Caution

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

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

Danger

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

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

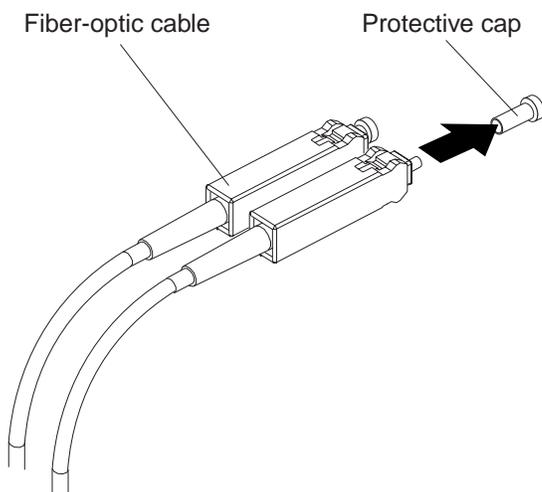
Attention

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

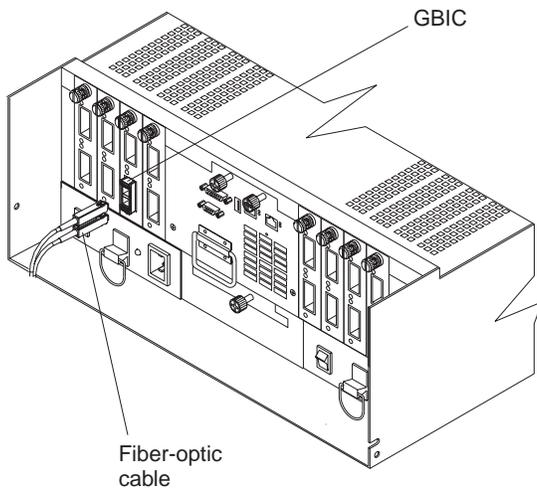
- Do not route the cable along a folding cable management arm.
- When attaching to a device on slides, leave enough slack in the cable so that it does not bend to a radius smaller than 76 mm (3 inches) when extended or become pinched when retracted.
- Route the cable away from places where it can be 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.



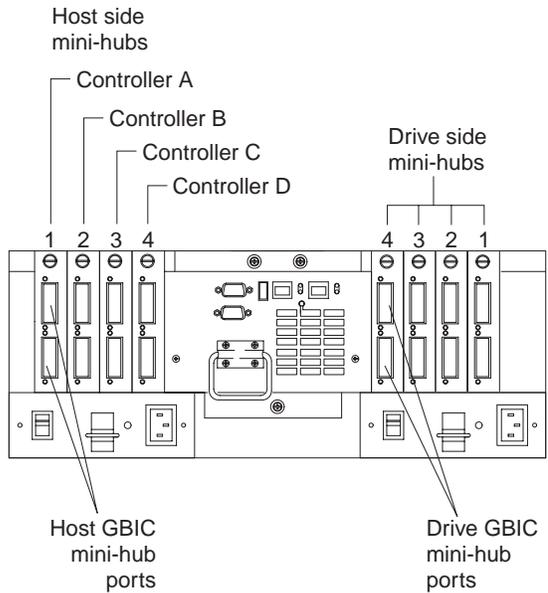
After installing the cables, the Fibre Channel Arbitrated Loop is operational.

Interface ports

The controller unit has the following types of interface ports:

- Host
- Drive
- Ethernet
- RS-232 (serial)

The following illustration shows the host and drive mini-hub ports.

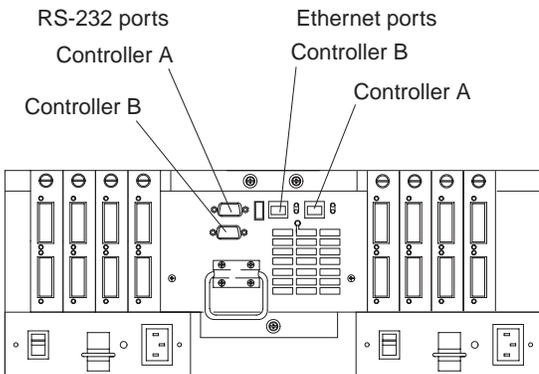


For more information about connecting the controller unit and drive enclosures (also referred to as expansion units) using the host and drive interface ports, refer to the IBM Netfinity FAST500 RAID Controller Enclosure Unit Installation Guide.

Host mini-hubs: There are up to four host side mini-hubs, two per controller. Mini-hubs 1 and 3 correspond to the top controller (Controller A) and mini-hubs 2 and 4 correspond to the bottom controller (Controller B). Each pair of mini-hubs accommodates one host channel. Each mini-hub provides host loop connectivity and self-diagnostic features. To ensure redundancy, you must connect each host to a Controller A and Controller B mini-hub.

Drive mini-hubs: The controller unit has four drive channels. Each channel accommodates one drive side mini-hub. All mini-hubs on the drive side attach to both Controller A and Controller B.

Ethernet and RS-232 interface ports: Each controller has an Ethernet interface port and an RS-232 (serial) interface port. Use the Ethernet ports if you want to directly manage the controllers. Use the RS-232 ports for diagnostic service. The following illustration shows the location of these interface ports.



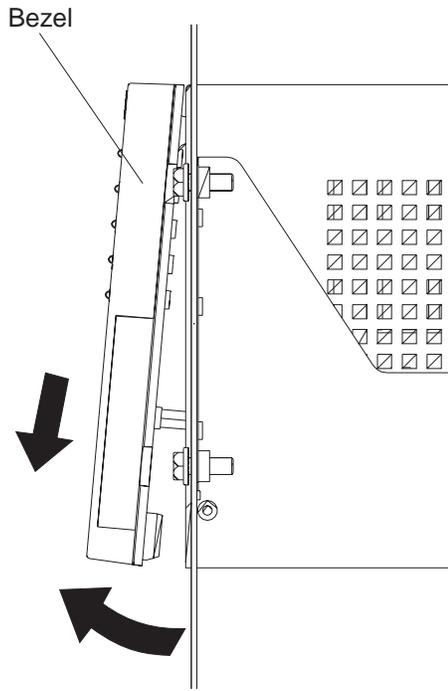
Accessing the controls

To access the controllers, battery, controller fan, and indicator lights, you must remove the controller unit bezel, as shown in the following illustration.

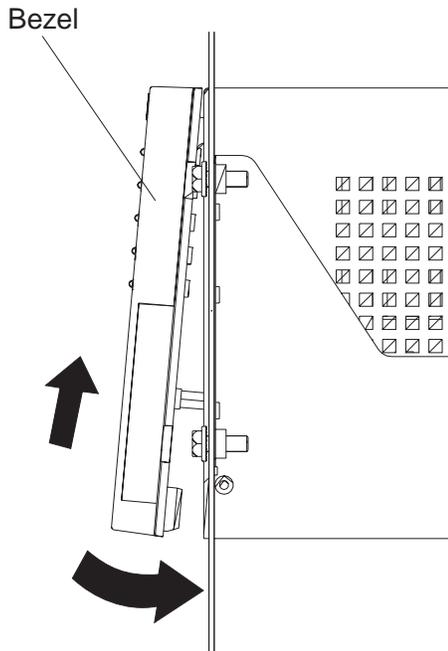
Attention

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

1. Carefully pull the bottom of the bezel out to release the pins; then slide the bezel down, as shown in the following illustration.



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



Turning on the power

Use the following procedure to turn on power to the controller unit. If you are restoring power to the controller unit after an emergency shutdown or power outage, go to “Overtemperature condition and power supply shutdown” on page 166.

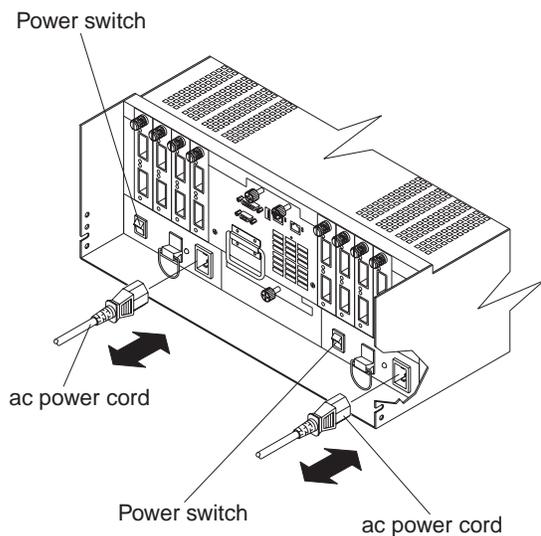
Important

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 attached 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. You must turn on both switches to take advantage of the redundant power supplies.



Turning off the power

Caution

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

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. For more information, see "Checking the indicator lights" on page 85.

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 can take a long time for the drive indicator lights to stop blinking.

1. 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. For more information, see "Checking the indicator lights" on page 85.
2. Turn off the power switches on the back of the controller unit.(see
3. Turn off any drive enclosures attached to the controller unit.

Monitoring status through software

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

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

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

Recovering from a controller unit failure might require you to perform procedures other than replacing the component. The storage-management software gives these procedures.

Note

Always follow the software recovery procedures to prevent data loss.

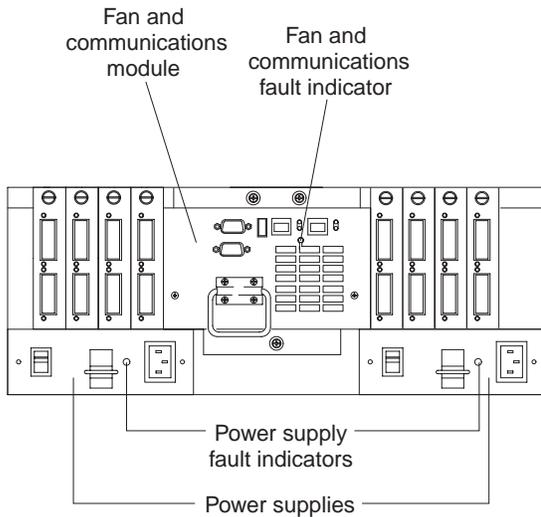
For more information about the storage-management software, refer to the following:

- IBM Netfinity FASiT Storage Manager for Windows NT Installation and Support Guide

- IBM Netfinity Fibre Channel Storage Manager Concepts Guide
- The following IBM Netfinity FAS/T Storage Manager online help is available:
 - Enterprise Management Online Help
 - Subsystem Management Online Help

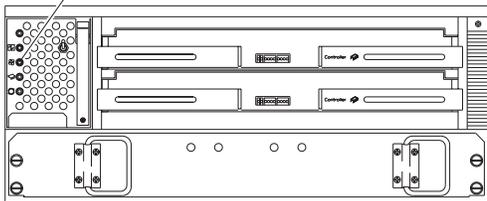
Overtemperature condition and power supply shutdown

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



The storage-management software causes the fault indicator to light before the temperature has risen sufficiently to shut down the power supplies. The light comes on when the controller unit temperature exceeds 45°C (113°F). The controller unit shuts down if the temperature rises to 70°C (158°F). If both power supplies shut down, the fault indicator cannot come on.

Controller fan fault indicator



Turning on the power after an

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

1. Turn off the power switches and cool the controller unit (for example, replace the fans, use external fans to cool the room, and so on).
2. Once the air temperature is below the upper operating temperature of 45° C (113° F), turn on the power switches.
3. Check the controller unit for faults or damage. Use the storage-management software to check the overall status of the controller unit and its components. Repair any faults found.

Turning on the power after an emergency

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

1. After the emergency situation is over or power is restored to the building, check all components and cables for damage. If there is no visible damage, continue with Step 2; otherwise, have your system serviced.
2. Make sure the power cords are plugged in.
3. Turn on the circuit breakers in the cabinet and turn on the power switches on all drive enclosures attached to the controller unit. If the system is off because of a power outage, the power switches are already on.

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 attached 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.

4. Turn on both power switches on the back of the controller unit.
5. Check the status of the controller unit and other devices. Make sure all fault indicator lights are off on the front and back of the controller unit.

For more information, see “Checking the indicator lights” on page 85.

6. When all the devices on the system are powered up, check the overall system status using the storage-management software.

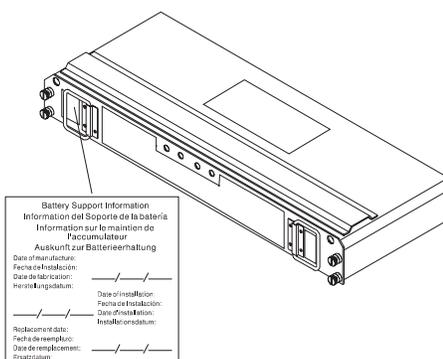
Checking the battery service date

Note

Replace the battery whenever it fails to hold a charge or every three years. Using the controller unit in a hot environment (above 35°C or 95°F) lowers the battery life expectancy. Under these conditions, you might need to replace the battery more often.

To check the battery service date, do the following:

1. Remove the controller unit bezel.
2. Check the Battery Support Information label, as shown in the following illustration.



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

- Date of Manufacture - Date the battery was built at the factory
 - Date of Installation - Date the battery was installed in the controller unit
 - Replacement Date - Date to replace the battery (see the note at the beginning of this section)
3. Look at the replacement date and do the following:
 - If it is time to replace the battery, install a new battery.
 - If it is not time to replace the battery, replace the controller unit bezel.

Preparing to move the controller unit

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

If you are moving the controller unit a short distance (within the same building), and you have sufficient assistance (one or more additional helpers) or equipment (such as a fork lift), you might be able to move the controller unit without removing each component CRU. If you do not have sufficient assistance or equipment, use the procedure in "Removing and installing the components" to safely move the equipment to its new location.

If you are moving the controller unit a significant distance (for example, to another building or city), be sure to pack it in its original shipping container.

For more information about assembling or disassembling the controller unit, refer to the IBM Netfinity FASt500 RAID Controller Enclosure Unit Installation Guide.

Removing and installing the components

Use the following procedure to remove all component CRUs before moving or relocating the controller unit. Replace the CRUs after you complete the procedure.

1. Prepare the controller unit for shutdown, as follows:
 - a. Stop all I/O activity to the controller unit and attached drive enclosures.
 - b. Logically disconnect the controller and drive enclosures from the hosts.
 - c. Make sure that the fast write cache indicator light on the front bezel is off (not blinking).
 - d. Make sure that 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 can take a long time for the drive indicator lights to stop blinking.

2. Remove the controller unit bezel.
3. 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. For more information, see “Checking the indicator lights” on page 85.

Caution:

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

4. Turn off both power switches and unplug the power cords from the controller unit.
5. If you are shutting down the system, turn off the main circuit breakers or power switches.
6. Disconnect the interface cables and label the host Fibre Channel cables.

Attention

Handle and install fiber-optic cables properly to avoid degraded performance or loss of communications with devices. When working with fiber-optic cables, do not pinch them, step on them, or locate them in aisles or walkways. Do not overtighten the cable straps or bend the cables to a radius smaller than 76 mm (3 in.).

7. Disconnect and label all remaining cables from the controller unit, so that you can correctly reconnect them later.

Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

8. Remove all CRUs from the controller unit.
9. Remove the two screws from the inside rear of the controller unit; then, remove the two screws from the inside front of the controller unit. Save the four screws for later.

Attention

Do not remove the black hex head screws. These secure the rails that support your controller unit.

Caution

Use safe practices when lifting.

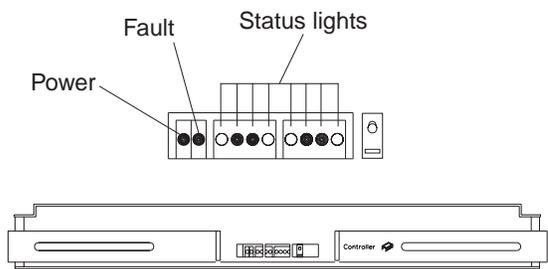
10. Slide the controller unit out of the rack and set it on a level, dry surface.
11. If you are shipping the controller unit to another location, replace all CRUs in the controller unit. Carefully pack the unit in its original shipping container. You are finished with this procedure.
12. If you are moving the controller unit to another cabinet, remove the support rails and power cords from the old cabinet and install them in the new one.
13. To replace the controller unit and components, using the proper cautions, reverse Step 1 through Step 10, of the controller removal procedure with the following steps.
 - a. Slide the controller unit into the rack.
 - b. Insert and tighten two of the screws that you previously removed on the inside front of the controller unit.
 - c. Insert and tighten the remaining two screws on the inside rear of the controller unit.
 - d. Replace all CRUs in the controller unit.
 - e. Connect the interface cables and host Fibre Channel cables
 - f. Connect the remaining cables to the controller unit.
 - g. Turn on the main circuit breakers or power switches.
 - h. Plug in the power cords to the controller unit; then, turn on both power switches.
 - i. Make sure that all amber fault indicator lights on the controller unit are off. If any fault indicator lights are on, correct the problem.
 - j. Replace the controller unit bezel.
 - k. Check the indicator lights.

RAID Controller

The controller unit supports redundant array of independent disks (RAID) technology. The controller unit contains two RAID controllers.

Each controller comes in a removable, portable unit, called a controller CRU. The controller CRUs slide into one of two controller slots on the front of the controller unit and attach to hosts through Fibre Channel connections. Two handles lock the controller in place. Each controller slot has a controller slot designation that identifies the physical

location of the controller in the chassis: controller slot A (top) or controller slot B (bottom). Each controller CRU has ten indicator lights: one power, one fault, and eight status indicator lights, as shown in the following illustration.



Servicing notes: Consider the following when servicing the controllers in the controller unit:

- The controller unit supports two controller CRUs, which attach to hosts through Fibre Channel connections.
- You can hot swap or replace a failed controller while the controller unit is in operation as long as the failed controller is one of a redundant pair (two controllers attached to the same host) and has a *passive* or *offline* status in the storage-management software.
- If cache mirroring is enabled in redundant controllers and one controller fails, the second controller assumes processing functions without data loss. However, some or all data might be lost if cache mirroring is disabled and a failure occurs before data is written from cache memory to disk.
- If you replace the controller CRU and still experience problems, the controller unit might have defective components or connections. Check the storage-management software for indications of other component failures.
- If a controller CRU fails, the fault light on the affected controller glows. For more information about indicator lights, see "Checking the indicator lights" on page 85.
- Firmware between the two controllers is automatically synchronized when you replace a controller.

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

Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

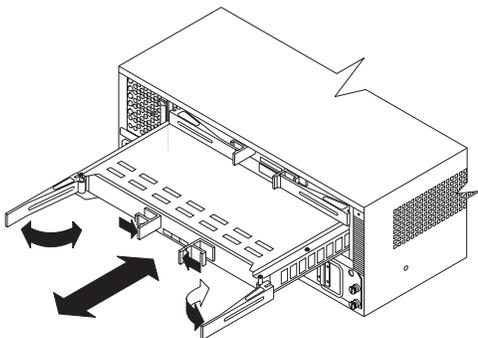
1. Remove the controller unit bezel, as shown in the following illustration.

Attention

Removing a controller that is operating normally (not failed) can result in data loss. Only remove a controller that:

- Has a fault indicator light that is glowing
- Is marked as "Failed" (offline) through the storage-management software.

2. Using the following illustration as a guide, remove the controller that has failed.
 - a. Squeeze the two center tabs and open the handles.
 - b. Remove the controller.
 - c. Close the handles and snap into place.



Attention

To avoid potential data loss, make sure that the new controller has the same memory size as the one you are replacing. If you install a controller with a different memory size, the storage-management software suspends cache mirroring and issues an error message. If the memory size is not the same, you need to upgrade the cache memory. For more information, see "Installing additional cache memory in a controller" on page 174.

3. Unpack and check the new controller.

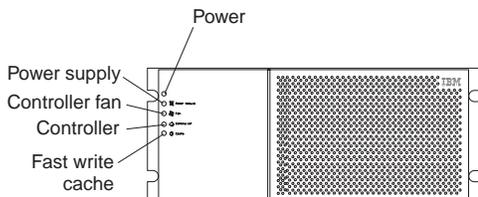
Using the proper handling precautions, remove the new controller from the packing material. Check the shipping invoice and the controller to make sure that it has the same memory size as the controller that you just removed.

4. Install the new controller as follows:
 - a. Squeeze the two center tabs and open the handles.
 - b. Using the handles, slide the controller into the slot until the back edge hooks onto the frame.
 - c. Close the handles and snap into place.

Attention

When you replace a failed controller, the storage-management software automatically synchronizes the firmware between the existing controller and the new controller. After replacing a controller, always use the storage-management software to verify the firmware levels.

5. Check the controller indicator lights.



- a. If the green power indicator is on and the amber fault indicator is off, go to Step 6.
- b. If the green power indicator remains off or the fault indicator is on after a few seconds, make sure that the controller CRU is locked into place. If the fault indicator remains on, go to Step c.
- c. Use the storage-management software to check the status of both controllers. If applicable, perform the recovery procedures required by the software. If this corrects the fault and the controller unit is operating without error, go to Step 6. If not, go to Step d.
- d. Replace the controller CRU. If the problem is not corrected, replace the controller unit bezel faults, go to Step 6.

Installing additional cache memory in a controller:

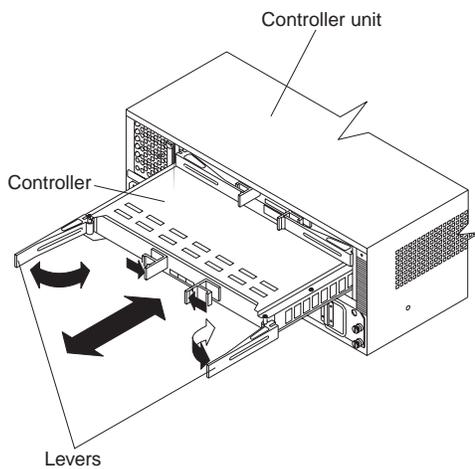
The controller comes with 256 MB of cache memory installed. You can add an additional 256 MB dual inline memory module (DIMM) for a total of 512 MB cache, with the IBM Netfinity FASiT500 256 MB Cache option.

Use the following procedure to upgrade your controller cache memory.

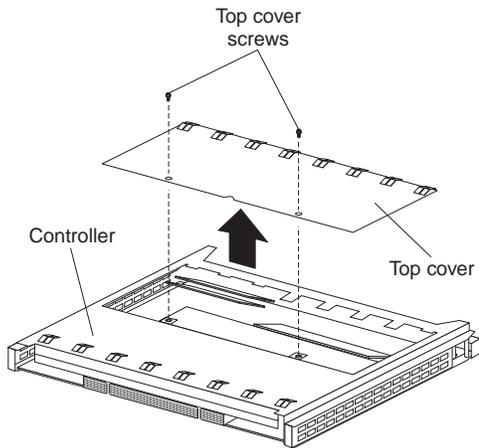
Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

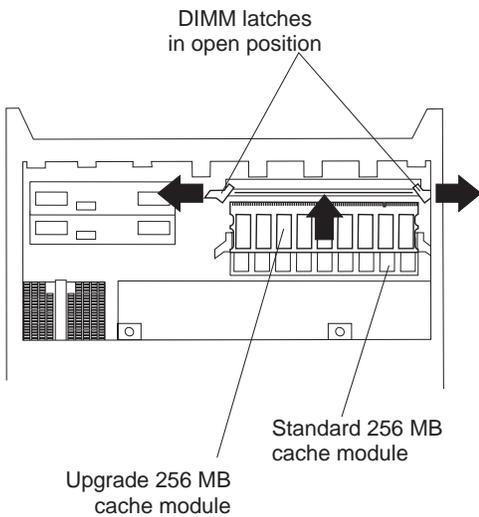
1. Unlock and open the levers on the controller; then, use the levers to pull the controller out of the controller unit a few inches. Grasp both sides of the controller to completely remove it from the controller unit.



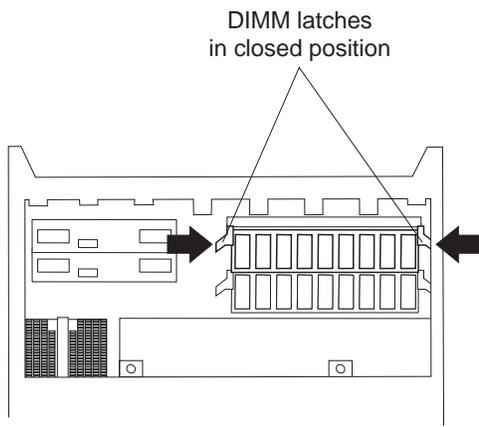
2. Remove both screws from the top cover of the controller; then, lift the cover and set it aside to install after you upgrade your cache.



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.
7. Install the controller back in the controller unit.

Battery

The battery CRU contains rechargeable batteries and a battery-charger board. The battery CRU plugs into the front of the controller unit where it provides backup power to the controller's cache memory. During a power outage, a properly charged battery CRU maintains electrical current to the controller's cache memory for up to five days with 256 MB cache memory installed and up to 3 days with 512 MB cache memory installed. Therefore, all data stored in memory is preserved as long as the batteries can sustain power to the cache memory. However, the battery does not provide power to the rest of the system during a power outage. Therefore, the system is not able to write data to drives without a backup power source.

Servicing notes: Consider the following when servicing the battery in the controller unit:

- The battery has a three-year life expectancy. Replace the battery every three years or whenever it fails to hold a charge. Using the controller unit in a hot environment (above 35° C or 95° F) lowers the life expectancy of the battery. Under these conditions, you might need to replace the battery more often.
- The service label on the battery provides a blank line for recording the last date on which the battery was serviced. Check this label to determine when to replace the battery. For information about using the software to track battery age, refer to the Netfinity FASiT Storage Manager documentation and online help.

- If a battery fails, the fault light on the battery glows. For more information about indicator lights, see "Checking the indicator lights" on page 85.
- If you replace the battery and still experience battery problems (for example, loss of battery power to the controllers or batteries not charging properly), the controller unit might have defective components or connections. Check the storage-management software for indications of other component failures.

Replacing a failed battery: When instructed by the storage-management software, replace the battery.

Attention

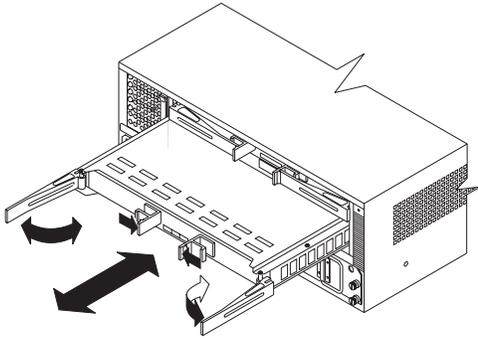
Because the battery CRU is a sealed unit, you must replace the entire CRU (not just the batteries) in order to keep the battery backup system in working order. Opening the battery CRU voids your warranty.

1. Use the storage-management software to check that there is no data in cache and that all caching has stopped. Data in cache is unprotected if a power outage occurs while the battery CRU is out of operation.

Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

2. Prepare the new battery.
Unpack the battery CRU. Save the packing material for shipping the used battery CRU to a disposal facility. Find the "Battery Support Information" label on the front of the new battery CRU, as shown in the following illustration.



3. Fill in the following information:
 - Date of Installation - Record today's date on the blank line
 - Replacement Date - Record the expiration date (three years from today's date) on the blank line
4. Remove the controller unit bezel.

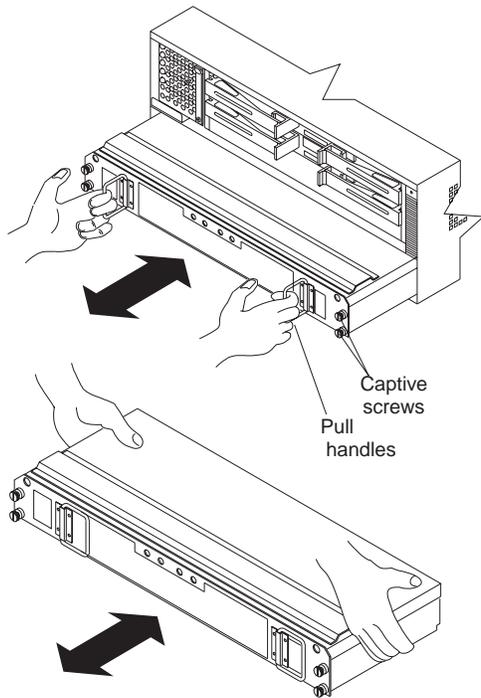
Attention

Be careful when removing the battery. The battery weighs approximately 6.4 kg (14 lbs).

Caution

Never remove the cover on a power supply or any part that has the following label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

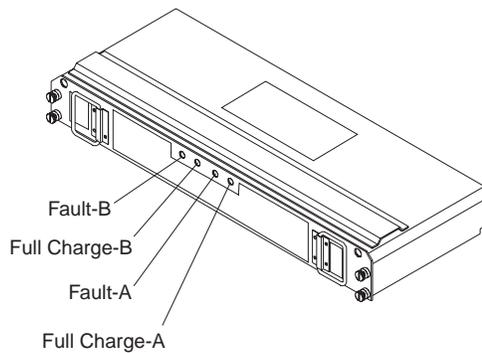
- Loosen the four captive screws on the battery. If they are too tight, use a flat blade screwdriver to loosen the screws.
- Using the pull handles, slide out the battery about 5 cm (2 in.).
- Using both hands, grasp the sides of the battery and pull out.



5. Install the new battery.
 - Using both hands, slide the battery about 5 cm (2 in.) into the slot.
 - Using the pull handles, push the battery into the slot completely.
 - Tighten the four captive screws.
6. Replace the controller unit bezel.
7. Run the system for at least 24 hours to properly charge the batteries.

The battery can take up to 15 minutes to complete its self-test and up to 24 hours to fully charge, especially after a power loss of more than a few minutes. When properly charged, both full-charge indicator lights on the front of the battery are on.

8. Check the battery indicator lights.



Note

If either the Full Charge-A or the Full Charge-B indicator light is blinking, the battery is in the process of charging.

9. Reset the battery installation date using the storage-management software. The software continues to issue battery-related errors if the installation date is not reset.

Attention

Use proper facilities to recycle the used battery CRU. If the battery CRU is physically damaged or leaking electrolyte gel, DO NOT ship it to a recycling center. The battery contains sealed lead acid batteries that might be considered hazardous material. You must handle this unit in accordance with all applicable local and federal regulations.

10. Dispose of the used battery CRU according to local and federal regulations, which might include hazardous material handling procedures.

Controller fan

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

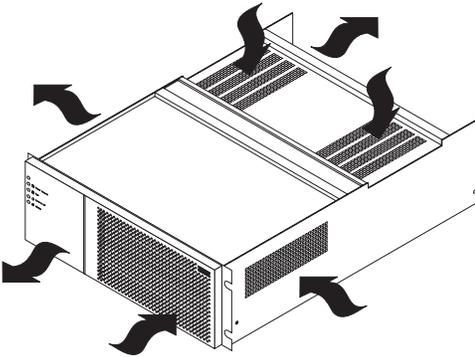
To prevent cooling problems, the controller unit must have proper air circulation throughout the chassis. Cooling problems include any malfunctions or obstructions that impede air flow and cause one or more components in the

controller unit to overheat. Make sure that the ambient air temperature around the controller unit is within the environmental requirements. To boost air circulation, the controller unit chassis has air vents along its top and sides. These vents serve as air intake and exhaust passages. Always keep vents clean and free of obstructions.

The following illustration shows the controller unit air flow. Make sure your installation site allows adequate ventilation to the controller unit during operation.

Note

Allow at least 60 cm (2 ft) of clearance in front of and behind the controller unit for proper ventilation.



Servicing notes: Consider the following when servicing the controller fan:

- Both fans failing simultaneously in the controller fan is unlikely. Such a failure will cause either one or both controllers to overheat. Under these circumstances, the amber controller light on the front panel might turn on. Shut down the controller unit immediately and let the unit cool to room temperature and then replace the controller fan.
- You can hot swap, or replace, the controller fan, as long as you complete the exchange within 15 minutes. The time limit applies to the total time that the fan is out of the chassis. The time begins when you remove the failed controller fan and ends when you install the new one. This does not include the time it takes to perform the entire procedure (for example, checking the indicator lights).
- If a controller fan fails, the fault light on the controller fan glows. For more information about indicator lights, see "Checking the indicator lights" on page 85.
- If you replace the controller fan and still experience problems, the controller unit might have defective

components or connections. Check the storage-management software for indications of other component failures.

Replacing a failed controller fan: When instructed by the storage-management software, replace a controller fan.

Attention

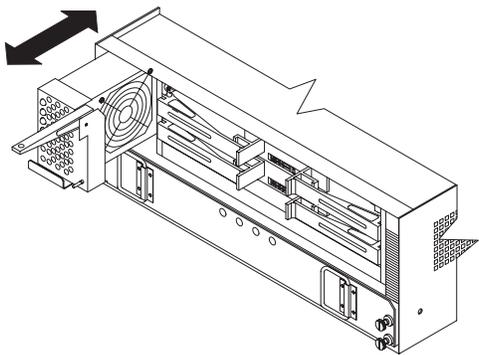
When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

1. Unpack the new controller fan.
2. Remove the controller unit bezel. eol.

Attention

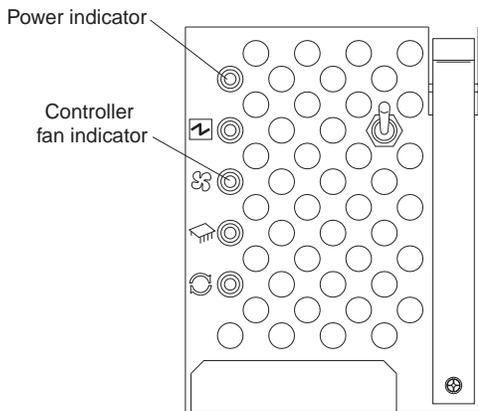
To prevent damage to the controller unit components, do not operate the controller unit without adequate ventilation to the controllers. If it will take longer than 15 minutes to replace the controller fan, you must shut down the controller unit to prevent it from overheating. The time limit applies to the total time that the fan is out of the chassis.

3. Remove the failed controller fan, as shown in illustration.
 - a. Lift up the lever on the controller fan.
 - b. Pull firmly on the bottom lip to remove the fan.



4. Install the new controller fan.
 - a. Slide the new controller fan all the way into the slot.
 - b. Press down on the lever and snap the lever into place.

5. The following illustration shows the indicator lights on the controller fan.



When the controller fan is operating properly, the green power indicator is on and the amber indicator is off.

- If the amber fan light is on or the green power indicator remains off, make sure that the controller fan is seated securely in the slot and that the lever is snapped into place.
 - If the controller fan indicator remains on, it might indicate a problem with the new controller fan. Replace the controller fan with a spare, if available. If not, turn off the controller unit to prevent it from overheating until you can replace the fan.
6. Replace the controller unit bezel.

Fan and communications module

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

Servicing notes: Consider the following when servicing the fan and communications module:

- The fan and communications module contains two serial RS-232 connections used for diagnostic purposes and two Ethernet RJ-45 connections used for direct network- management.
- You can hot swap the fan and communications module as long as you complete the exchange within 15 minutes from when you remove the failed unit until you install the new one.
- It is unlikely that both fans in the fan and communications module will fail simultaneously. Such a failure will cause one or both power supplies to overheat. In these circumstances, the amber power supply indicator light on the bezel turns on and the overheated power supply automatically shuts down (the green power indicator light turns off). Once the ambient air temperature cools below 70° C (158° F), the power supply automatically turns on. Replace the failed fan and communications module then check the power supply indicator lights (fault indicator light on the front and power indicator light on the back). If the power supply fault indicator light remains on, replace the power supply. For more information about indicator lights, see “Checking the indicator lights” on page 85.
- If you replace the fan and communications module and still experience problems, the controller unit might have defective components or connections. Check the storage- management software for indications of other component failures.

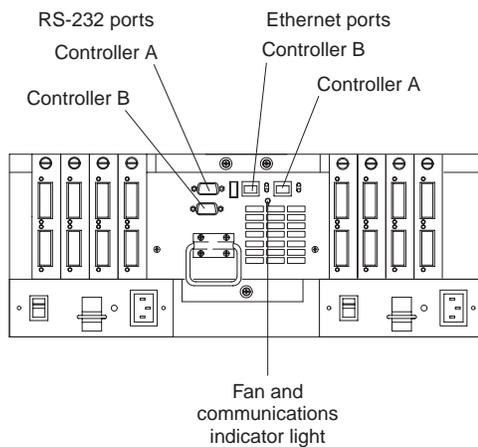
Replacing a failed fan and communications module: When instructed by the storage-management or diagnostic software, replace a fan and communications unit.

Attention

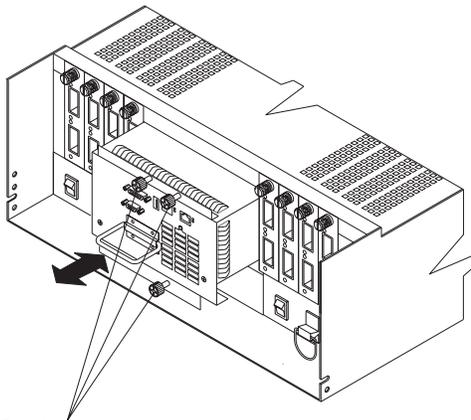
To prevent damage to the controller unit circuitry, do not operate the controller unit without adequate ventilation to the controllers. If it will take longer than 15 minutes to replace the controller fan, you must shut down the controller unit to prevent it from overheating. The time limit applies only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

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

1. Unpack the new fan and communications module.
2. If you are using a diagnostic program, stop the program before disconnecting the cables.
3. Disconnect all RS-232 and Ethernet interface cables from the failed fan and communications module. The locations of the ports are shown in the following illustration.



4. Remove the failed fan and communications CRU from the controller unit.



Captive screws

- a. Using a flat-blade screwdriver, loosen the three captive screws on the fan and communications module.
 - b. Use the pull handle to slide the module out of the slot a few inches.
 - c. Grasp the sides of the module with both hands and remove it from the controller unit.
5. Install the new fan and communications module.

Push the new fan and communications module all the way into its chassis slot. Use a flat-blade screwdriver to tighten the three captive screws on the new module, securing it into place.

6. Check the fan and communications indicator light.
- If the amber fault indicator light is on, make sure that the fan and communications module is inserted all the way into the chassis and secured in place.
 - If the fault indicator light remains on, one or both fans inside the fan and communications module might be malfunctioning. Replace the failed fan and communications module with a spare, if available. If not, shut down the controller unit until you can replace the failed fan and communications module with a new one.
7. Reconnect the interface cables to the new fan and communications module.

Power supply

The controller unit power system consists of two power supplies. The power supplies slide into either of the two slots on the back of the controller unit. The power supplies provide power to the internal components by converting incoming ac voltage to dc voltage. The power supplies are interchangeable and redundant. Each power supply uses one power cord. You can plug both power cords into a common power source or plug each cord into a separate

circuit for power redundancy. One power supply can maintain electrical power to the controller unit if the other power supply is turned off or malfunctions.

Servicing notes: Consider the following when servicing the power supplies:

- Each power supply has a built-in sensor that detects the following conditions:
 - Overvoltage
 - Overcurrent
 - OvertemperatureIf any of these conditions occur, one or both power supplies enter shutdown mode. All power remains off until one of the following occurs:
 - You cycle the power switches (turn off the power switches, wait at least 30 seconds, then turn on the power switches).
 - The power supplies automatically resume operation when the ambient air temperature cools to below 70° C (158° F). When the power supplies automatically resume operation, the controller also resumes operation.After you manually cycle the power off then on, or when the power supplies automatically resume operation, an automatic restart resets the controllers, attempts to spin up the drives (which has no effect on the drives if they are already running), and returns the controller unit to normal operation without operator intervention.
- You can hot swap (replace) a power supply because the two power supplies provide redundancy.
- Both power supplies have built-in temperature sensors designed to prevent the power supplies from overheating. If a temperature sensor detects an ambient air temperature greater than 70° C (158° F), the overheated power supply automatically shuts down. The second power supply remains on as long as its temperature remains below 70° C (158° F). If the second power supply overheats, it turns off all power to the controller unit.

Note

There is a serious problem if the air temperature inside the cabinet is hot enough to cause the power supplies to shut down.

- The controller unit is capable of power-up recovery without operator intervention. Once the air temperature cools to below 70° C (158° F), the power supplies automatically restart. An automatic restart resets the controllers, attempts to spin up the drives, which has no effect on the drives if they are

already running, and returns the controller unit to normal operation.

- If a power supply fails, the green power indicator light on the power supply is off and the amber power supply fault light on the controller fan on the front of the controller unit glows. For more information, see “Checking the indicator lights” on page 85.
- If you replace the power supply CRU and still experience problems, the controller unit might have defective components or connections. Check the storage-management software for indications of other component failures.

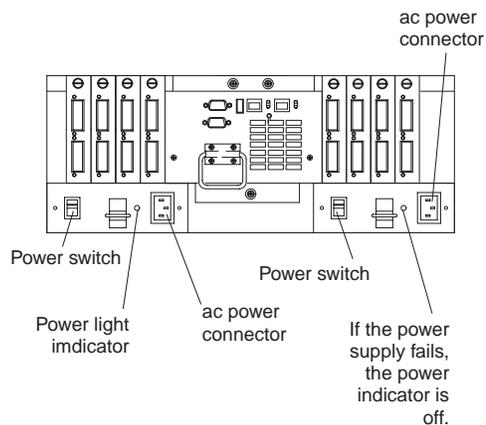
Replacing a failed power supply: When instructed by the storage-management software, replace a power supply.

1. Check the power supply indicator light on the back of the controller unit, as shown in the following illustration. Be sure that the green power light on the failed power supply is off.

Caution

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

2. Turn off the power switch and unplug the power cord from the failed power supply.

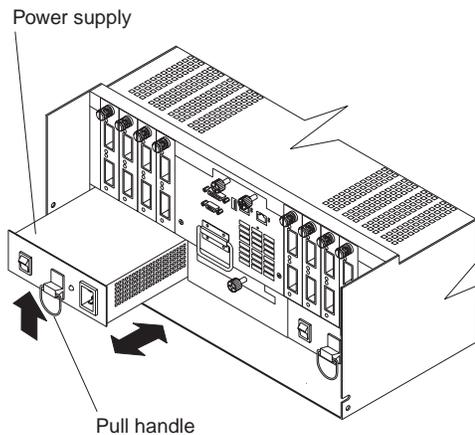


Caution

Never remove the cover on a power supply or any part that has the following label attached. Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

- Using the following illustration as a guide, remove the failed power supply.

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



Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

- Unpack and install the new power supply. Using the pull handle, push the power supply into the slot until it locks into place.
- Plug in the power cord and turn on the power.
- Check the new power supply and other controller unit indicator lights for faults. For more information, "Checking the indicator lights" on page 85.

Mini-hubs

The mini-hubs are located on the back of the controller unit. A mini-hub is a single, removable unit that provides the Fibre Channel interface between a controller unit and hosts or drives. The back of the controller unit can accommodate eight mini-hubs: up to four host side and up to four drive side mini-hubs. Each mini-hub has two ports. A Gigabit Interface Converter (GBIC) is installed in a mini-hub port. Then a fiber-optic interface cable is connected into the GBIC. For more information, see "Fibre Channel connections" on page 3 and "GBICs" on page 51.

Servicing notes: Consider the following when servicing mini-hubs:

- You can hot swap (replace) a failed mini-hub while the controller unit is in operation.
- Four indicator lights provide status information. If a mini-hub fails, the interface fault and the bypass indicator lights on the mini-hub glow and the loop good indicator light is off. For more information about indicator lights, see "Checking the indicator lights" on page 85.
- If you replace the mini-hub and the GBICs in them and still experience problems, the controller unit might have defective components or connections. Check the storage-management software for indications of other component failures.

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

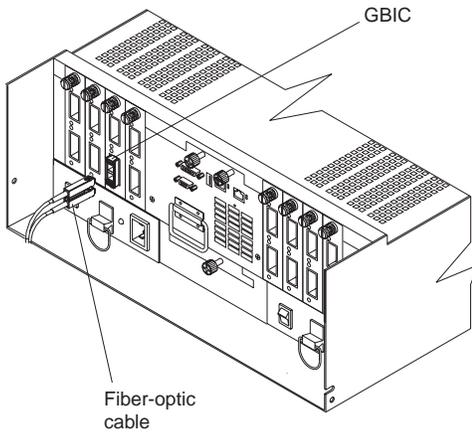
Attention

To prevent possible data loss, do not pull cables from a mini-hub that has not failed.

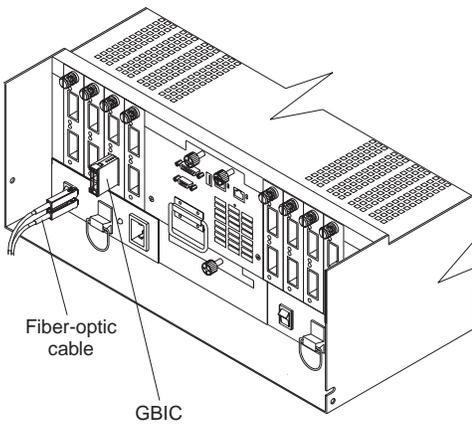
1. On the mini-hub that has failed, remove the fiber-optic cables from the GBICs; then, replace the protective caps on the cables.

Note

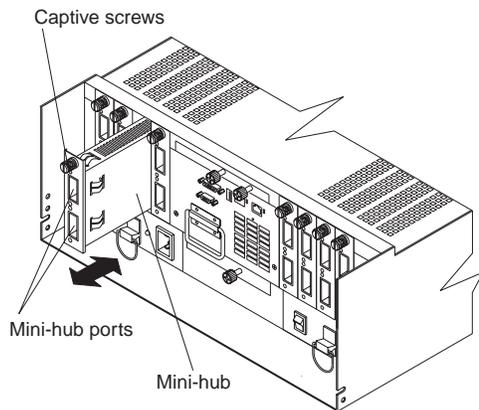
If you are using IBM GBICs, you must remove the fiber-optic cable from the GBIC before you can remove the GBIC from the mini-hub port.



2. Remove any GBICs in the mini-hub. If a GBIC you are removing has a metal latch, move the latch to the unlocked (center) position. Pull the GBIC from its mini-hub port; then, replace the protective caps on the mini-hub port; then, replace the protective caps on the GBIC.



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



Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

4. Unpack the new mini-hub and slide it into the appropriate slot; then, tighten the captivescrew.
5. Replace the GBICs.
 - a. Remove the protective cap from the GBIC.
 - b. If the GBIC you are installing has a metal latch, move the metal latch to the unlocked (center) position.
 - c. Slide the GBIC into the mini-hub port.
 - d. Rotate the metal latch outward to the locked position (flush with the rear of the GBIC).
6. Replace the fiber-optic cables.
7. Check the indicator lights on the mini-hub.

When the mini-hub is operating properly, the green loop good light is on and the fault light is off. If the mini-hub is connected to a Fibre Channel loop, the amber port bypass light is off. If a problem is indicated, use the storage-management software to check the controller unit status.

GBICs

GBICs (Gigabit Interface Converters) are used to connect mini-hub ports to attached nodes. A GBIC slides into a mini-hub port on the back of the controller unit and then a host- or drive-interface cable connects into the GBIC.

Servicing notes: Consider the following when servicing GBICs:

- You can hot swap (replace) a failed GBIC while the controller unit is in operation.
- The operational loop performance is not affected when you install or remove a GBIC.
- Four indicator lights on a mini-hub provide status information. If a GBIC fails, the interface fault and the bypass indicator lights on the mini-hub glow and the loop good indicator light is off. For more information about indicator lights, see “Checking the indicator lights” on page 85.
- If you replace the GBIC and still experience problems, the controller unit might have defective components or connections. Check the storage-management software for indications of other component failures.

Replacing a failed GBIC

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.

When instructed by the storage-management software, replace a GBIC in the mini-hub.

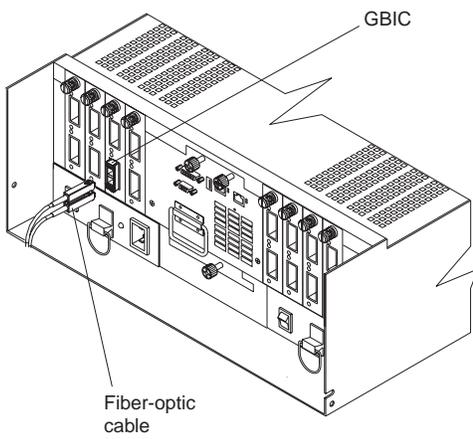
Attention

To prevent possible data loss, do not pull cables from a GBIC that has not failed.

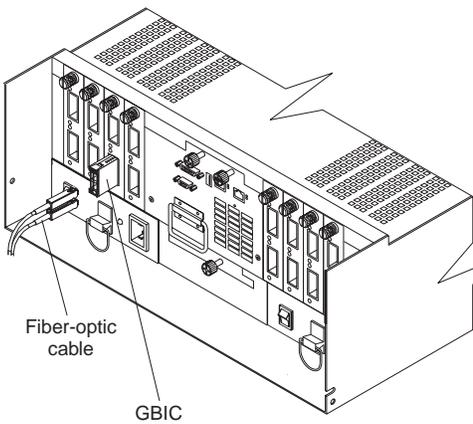
1. Remove the fiber-optic cable from the GBIC that has failed; then, replace the protective caps on the cables.

Note

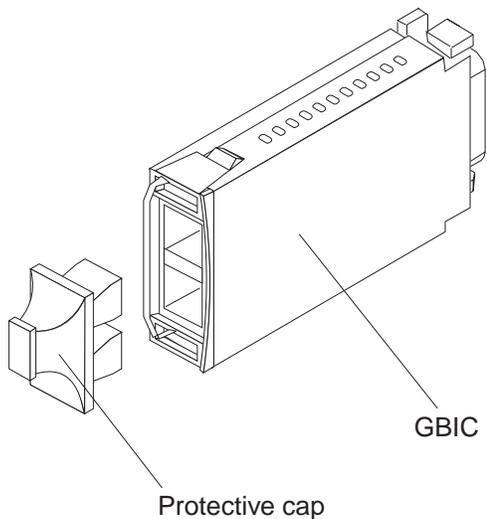
If you are using IBM GBICs, you must remove the fiber-optic cable from the GBIC before you can remove the GBIC from the mini-hub port.



2. Remove the GBICs from the mini-hub ports. If the GBIC you are removing has a metal latch, move the latch to the unlocked (center) position. Pull the failed GBIC from its mini-hub port.



3. Insert the protective cap on the GBIC.



Attention

When you handle electrostatic discharge (ESD) sensitive devices, take precautions to avoid damage from static electricity. For details about handling ESD-sensitive devices, refer to the following Web site and use a search term of ESD: <http://www.ibm.com/>

4. Unpack the new GBIC; then, do the following:
 - a. Remove the protective cap from the GBIC.
 - b. If the GBIC you are installing has a metal latch, move the metal latch to the unlocked (center) position.
 - c. Slide the GBIC into the mini-hub port.
 - d. Rotate the metal latch outward to the locked position (flush with the rear of the GBIC).
5. Reconnect the interface cables.
6. Check the indicator lights on the mini-hub.

When the mini-hub is operating properly, the green loop good light is on and the fault light is off. If the mini-hub is connected to a Fibre Channel loop, the amber port bypass light is off. If a problem is indicated, use the storage-management software to check the controller unit status.

Operating specifications

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

- Size (with front panel and without mounting rails)
 - Depth: 63.5 cm (25 in.)
 - Height: 17.45 cm (6.87 in.)
 - Width: 44.45 cm (17.5 in.)
- Weight

- Typical controller unit fully configured: 38.6 kg (85 lbs)
- Electrical input
 - Sine-wave input (50 to 60 Hz) is required
 - Input voltage:
 - Low range:
 - Minimum: 90 V ac
 - Maximum: 132 V ac
 - High range:
 - Minimum: 198 V ac
 - Maximum: 262 V ac
 - Input kilovolt-amperes (kVA) approximately: 0.214 kVA
- Environment
 - Air temperature:
 - Controller unit on: 10% to 35% C (50% to 95% F)
 - Altitude: 0 to 914 m (3000 ft)
 - Controller unit on: 10% to 32% C (50% to 90% F)
 - Altitude: 914 m (3000 ft) to 2133 m (7000 ft)
- Humidity 10% to 80%
- Acoustical noise emissions values for typical system configurations:
 - Sound power (idling): 6.5 bels
 - Sound power (operating): 6.5 bels
 - Sound pressure (idling): 49 dBA
 - Sound pressure (operating): 49 dBA

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.

Symptom-to-FRU Index

This index supports Type 3552 Fibre Channel RAID Controller.

The Symptom-to-FRU lists symptoms and the possible causes. The most likely cause is listed first.

Note

Always start with the "General Checkout" on page 85. For IBM devices not supported by this index, refer to the manual for that device.

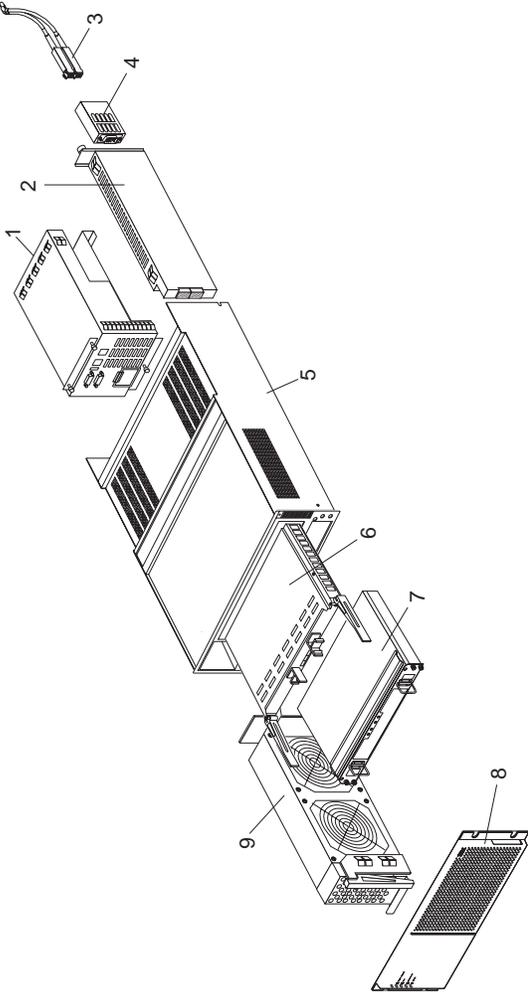
Note

Do **Not** look directly into any fiber cable or GBIC optical output. Read "Safety Information" on page 203. To view an optical signal, use a mirror to view the reflected light.

Problem	FRU/Action
Controller LED (front cover) is on.	<ol style="list-style-type: none">1. Reseat Controller CRU2. Controller CRU
Software issued a controller error message.	<ol style="list-style-type: none">1. Check Controller Fan2. Controller CRU
Software errors occur when attempting to access controllers or drives.	<ol style="list-style-type: none">1. Check appropriate software and documentation to make sure the system is set up correctly and the proper command was executed2. Power to the Controller3. Interface cables4. ID settings5. Controller6. Drive7. Controller backpanel
Fan LED (front cover) is on.	<ol style="list-style-type: none">1. Power supply fan CRU2. Controller fan CRU
Controller and Fan fault LEDs (front cover) are on.	<ol style="list-style-type: none">1. Check both Fan and Controller CRUs for fault LED and replace faulty CRU
Fault-A or Fault-B LED (battery CRU) is on.	<ol style="list-style-type: none">1. Battery CRU

Problem	FRU/Action
Full Charge-A or Full Charge-B LED (battery CRU) is off.	<ol style="list-style-type: none"> 1. Power-on Controller and allow batteries to charge for 24 hours until the Full Charge LEDs are on. 2. Battery CRU 3. Both power supplies
No power to controller (all power LEDs off)	<ol style="list-style-type: none"> 1. Check power switches and power cords 2. Power supplies
Power Supply LED is off.	<ol style="list-style-type: none"> 1. Check and reseal power supply 2. Check for overheating. Wait ten minutes for the power supply CRU to cool down. 3. Power supply CRU
Power Supply CRUs LED are on, but all other CRU LEDs are off.	<ol style="list-style-type: none"> 1. DC power harness

Parts Listing (Type 3552 Fiber Channel RAID Controller)



Index	Fibre Channel RAID Controller (Type 3526)	FRU
1	175W-Watt Power Supply	01K6743
2	GBIC Card Assembly	37L0096
	Rear Fan Assembly	37L0102
3	Optical Cable - 1 Meter	37L0083
3	Optical Cable - 5 Meters	03K9202
3	Optical Cable - 25 Meters	03K9204
4	Short Wave GBIC	03K9206
4	Long Wave GBIC	03K9208
5	Frame Assembly with Midplane	37L0093
6	Fibre Channel Host Adapter (optional)	09N7292
7	Battery Backup Assembly	37L0099
8	Bezel Assembly	10L7043
9	Front Fan Assembly (Controller CRU Fan)	37L0094
	256 MB DIMM	37L0095
	Battery Cable	03K9285
	Blank Cannister	37L0100
	Line Cord Jumper, High Voltage	36L8886
	Power Cable	37L0101
	Miscellaneous Hardware Kit	37L0092
	RAID Card	37L0098
	Rail Kit	37L0085

Related Service Information

Safety Information

The following section contains the safety information that you need to know before servicing the IBM Netfinity Fibre Channel Hub, Fibre Channel Adapter, Fibre Channel RAID Controller, or Fibre Channel GBICs.

Laser Compliance Statement

Some IBM Server products are equipped from the factory with a Gigabit Interface Converter (GBIC). GBICs are also sold separately as options. The GBIC is a laser product. The GBIC is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, the GBIC is certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

When a GBIC is installed, note the following.



percaución:

Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

Removing the covers of the GBIC could result in exposure to hazardous laser radiation. There are no serviceable parts inside the GBIC. **Do not remove the GBIC covers.**

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



PELIGRO

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

激光适应性声明

一些 IBM 服务器产品出厂时装配了 Gigabit Interface Converter (千兆比特接口转换器, GBIC)。GBIC 也可作为选配件单独销售。GBIC 是一种激光产品。GBIC 被证明符合 Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J 对 1 类激光产品的要求。并且, GBIC 被证明符合 International Electrotechnical Commission (IEC) 825 以及 CENELEC EN 60 825 对 1 类激光产品的要求。

如果安装了 GBIC 设备, 请注意下列内容:



注意: 不遵循此处指定的控制、调整、或操作过程的操作将可能导致危险的辐射泄漏。

取下 GBIC 的外盖会导致危险的激光辐射泄漏。GBIC 内没有可使用的部件。请不要取下 GBIC 的外盖。

一些 GBIC 包含 3A 类或 3B 类激光二极管, 请注意下列内容:



危险: 打开时有激光辐射。不要直视或使用光学仪器观察激光束, 并避免激光束直接照射。

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危险: 打开时有激光辐射。不要直视或使用光学仪器观察激光束, 并避免激光束直接照射。

- Statement 1



DANGER

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.

To avoid shock hazard:

- **The power cord must be connected to a properly wired and earthed receptacle.**
- **Any equipment to which this product will be attached must also be connected to properly wired receptacles.**

When possible, use one hand to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.

Electrical current from power, telephone, and communications cables is hazardous. To avoid shock hazard, connect and disconnect cables as described following when installing, moving, or opening covers of this product or attached devices.

To Connect

1. Turn Everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to receptacles.
4. Attach power cord(s) to outlet.
5. Turn device ON.

To Disconnect

1. Turn Everything OFF.
2. First, remove power cord(s) from outlet.
3. Remove signal cables from receptacles.
4. Remove all cables from devices.

NOTE: In the UK, by law, the telephone cable must be connected after the power cord.

NOTE: In the UK, the power cord must be disconnected after the telephone cable.

- Instrução 1



PERIGO

Para evitar choques elétricos, não conecte ou desconecte nenhum cabo, nem efetue instalação, manutenção ou reconfiguração deste produto durante uma tempestade com raios.

Para evitar choques elétricos:

- **O cabo de alimentação deve ser conectado a um receptáculo corretamente instalado e aterrado.**
- **Todos os equipamentos aos quais este produto será conectado devem também ser conectados a receptáculos corretamente instalados.**

Quando possível, utilize uma das mãos para conectar ou desconectar cabos de sinal, para evitar um possível choque ao tocar duas superfícies com potenciais elétricos diferentes.

A corrente elétrica proveniente de cabos de alimentação, de telefone e de comunicação é perigosa. Para evitar choques elétricos, conecte e desconecte os cabos conforme descrito a seguir, ao instalar, movimentar ou abrir tampas deste produto ou de dispositivos conectados.

Para Conectar

1. DESLIGUE tudo.
2. Conecte primeiro todos os cabos nos dispositivos.
3. Conecte os cabos de sinal nos receptáculos.
4. Conecte o(s) cabo(s) de alimentação nas tomadas.
5. LIGUE o dispositivo.

Para Desconectar

1. DESLIGUE tudo.
2. Remova primeiro o(s) cabo(s) de alimentação das tomadas.
3. Remova os cabos de sinal dos receptáculos.
4. Remova todos os cabos dos dispositivos.

声明 1



危险!

为避免电击危险，请不要在暴风雨期间连接或断开任何电缆，或是进行此产品的安装、维护或重新配置操作。

为避免电击危险：

- 电源线必须连接到适当的电线及接地插座。
- 此产品将要连接的所有设备也必须连接到正确接线的插座上。

如果可能，请使用一只手连接或断开连接信号电缆，以避免在接触两个具有不同电势的表面时遭到电击。

电源线、电话线以及通信电缆中的电流非常危险。为避免电击，请在安装、移动或打开本产品或连接设备的外盖时，按照下述步骤连接或断开电缆。

要连接电缆

1. 关闭所有设备。
2. 首先将所有电缆与设备连接。
3. 将信号线连接到插座。
4. 将电源线连接到电源插座。
5. 打开设备。

要断开电缆

1. 关闭所有设备。
2. 首先从电源插座拔下电源线。
3. 从插座拔下信号电缆。
4. 从设备上拔下所有电缆。

• 声明 1



危险

為了避免雷擊，在閃電期間，請勿連接或拔掉本裝置上的任何電纜線，或請勿安裝、維修或重新架構本產品。

為了避免雷擊：

- 電源線必須連接到接線及接地正確的插座。
- 本產品所連接的設備也必須連接到接線正確的插座。

儘可能使用單手來連接或拔掉信號電纜，以避免因接觸兩不同電位的平面，而受到電擊。

電源、電話及通信電纜上均有電流通過。為了避免電擊，在安裝、移動本產品，或開啓本產品的蓋子或與本產品連接之裝置的蓋子時，請依照下列「連接」及「拔掉」電纜線的步驟操作。

連接

1. 關掉所有開關。
2. 首先，將所有電纜線連接到裝置。
3. 將信號電纜連接到信號插座。
4. 將電源線連接到電源插座。
5. 開啓裝置電源。

拔掉

1. 關掉所有開關。
2. 首先，自電源插座拔掉電源線。
3. 拔掉信號插座上的所有信號電纜。
4. 拔掉裝置上的所有電纜線。

• Notice nç 1



PERIGO

Pour éviter tout risque de choc électrique, ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.

Pour éviter tout risque de choc électrique :

- **Les cordons d'alimentation du présent produit et de tous les appareils qui lui sont connectés doivent être branchés sur des socles de prise de courant correctement câblés et mis à la terre.**

Afin d'éviter tout risque de choc électrique provenant d'une différence de potentiel de terre, n'utilisez qu'une main, lorsque cela est possible, pour connecter ou déconnecter les cordons d'interface.

Le courant électrique passant dans les câbles de communication, ou les cordons téléphoniques et d'alimentation peut être dangereux. Pour éviter tout risque de choc électrique, lorsque vous installez ou que vous déplacez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion

1. Mettez les unités hors tension.
2. Commencez par brancher tous les cordons sur les unités.
3. Branchez les câbles d'interface sur les prises.
4. Branchez les cordons d'alimentation sur un socle de prise de courant.
5. Mettez les unités sous tension.

Déconnexion

1. Mettez les unités hors tension.
2. Commencez pas débrancher les cordons alimentation des socles de prise de courant.
3. Débranchez les câbles d'interface des prises.
4. Débranchez tous les câbles des unités.

- Hinweis 1



VORSICHT

Aus Sicherheitsgründen bei Gewitter an diesem Gerät keine Kabel anschließen oder lösen. Ferner keine Installations-, Wartungs- oder Rekonfigurationsarbeiten durchführen.

Aus Sicherheitsgründen:

- **Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.**
- **Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.**

Signalkabel möglichst einhändig anschließen oder lösen, um einen Stromschlag durch Berühren von Oberflächen mit unterschiedlichem elektrischem Potential zu vermeiden.

Elektrische Spannungen von Netz-, Telefon- und Datenübertragungsleitungen sind gefährlich. Um einen Stromschlag zu vermeiden, nur nach den Anweisungen arbeiten, die für Installation, Transport oder Öffnen von Gehäusen dieses Produkts oder angeschlossenen Einheiten gelten.

Kabel anschließen

1. Alle Geräte ausschalten und Netzstecker ziehen.
2. Zuerst alle Kabel an Einheiten anschließen.
3. Signalkabel an Anschlußbuchsen anschließen.
4. Netzstecker an Steckdose anschließen.
5. Gerät einschalten.

Kabel lösen

1. Alle Geräte ausschalten.
2. Zuerst Netzstecker von Steckdose lösen.
3. Signalkabel von Anschlußbuchsen lösen.
4. Alle Kabel von Einheiten lösen.

- Avviso 1



PERICOLO

Per evitare il pericolo di scosse elettriche durante i temporali, non collegare o scollegare cavi, non effettuare l'installazione, la manutenzione o la riconfigurazione di questo prodotto.

Per evitare il pericolo di scosse elettriche:

- **collegare il cavo di alimentazione ad una presa elettrica correttamente cablata e munita di terra di sicurezza;**
- **collegare qualsiasi apparecchiatura collegata a questo prodotto ad una presa elettrica correttamente cablata e munita di terra di sicurezza.**

Quando possibile, collegare o scollegare i cavi di segnale con una sola mano per evitare il rischio di scosse derivanti dal contatto con due superfici a diverso potenziale elettrico.

La corrente elettrica circolante nei cavi di alimentazione, del telefono e di segnale è pericolosa. Per evitare scosse elettriche, collegare e scollegare i cavi come descritto quando si effettuano l'installazione, la rimozione o l'apertura dei coperchi di questo prodotto o durante il collegamento delle unità.

Per collegare

1. **SPEGNERE** tutti i dispositivi.
2. Collegare prima tutti i cavi alle unità.
3. Collegare i cavi di segnale alle prese.
4. Collegare il(i) cavo(i) di alimentazione alla presa elettrica.
5. **ACCENDERE** le unità.

Per scollegare

1. **SPEGNERE** tutti i dispositivi.
2. Rimuovere prima il(i) cavo(i) di alimentazione dalla presa elettrica.
3. Rimuovere i cavi di segnale dalle prese.
4. Rimuovere tutti i cavi dalle unità.



위험

전기 충격을 피하려면 날씨가 나쁠 때(예: 눈 또는 비가 오거나 천둥 번개가 칠 때)는 케이블을 연결하거나 끊지 않도록 하고 이 제품의 설치, 유지보수 또는 재구성 등의 작업을 수행하지 않도록 하십시오.

전기 충격을 피하려면 다음과 같아야 합니다.

- 고압선은 적절한 배선 및 접지 상태의 콘센트로 연결되어야 합니다.
- 이 제품이 접속될 모든 장비도 적절한 배서 상태의 콘센트로 연결되어야 합니다.

다른 전위를 가진 두 표면을 만졌을 때 발생할 수 있는 전기 충격을 피하려면 한 손으로 신호선을 연결하거나 끊으십시오.

전원, 전화 및 통신 케이블로부터 흘러 나오는 전류는 위험합니다. 전기 충격을 피하려면 이 제품이나 접속 장치를 설치, 이동 및 덮개를 열 때 다음 설명에 따라 케이블을 연결하고 끊도록 하십시오.

연결하려면	연결해제하려면
1. 모든 스위치를 켜다.	1. 모든 스위치를 끄다.
2. 먼저 모든 케이블을 장치에 연결한다.	2. 먼저 모든 케이블을 장치에 제거한다.
3. 신호선을 콘센트에 연결한다.	3. 신호선을 콘센트에서 제거한다.
4. 전원을 콘센트에 연결한다.	4. 장치에서 모든 케이블을 제거한다.
5. 장치 스위치를 켜다.	

• Declaración 1



PELIGRO

Para evitar una posible descarga eléctrica, no conecte ni desconecte los cables ni lleve a cabo ninguna operación de instalación, de mantenimiento o de reconfiguración de este producto durante una tormenta eléctrica.

Para evitar una posible descarga:

- **El cable de alimentación debe conectarse a un receptáculo con una instalación eléctrica correcta y con toma de tierra.**
- **Los aparatos a los que se conecte este producto también deben estar conectados a receptáculos con la debida instalación eléctrica.**

Cuando sea posible, utilice una sola mano para conectar o desconectar los cables de señal a fin de evitar una posible descarga al tocar dos superficies con distinto potencial eléctrico.

La corriente eléctrica de los cables de comunicaciones, teléfono y alimentación puede resultar peligrosa. Para evitar una posible descarga, siga las indicaciones de conexión y desconexión de los cables siempre que tenga que instalar, mover o abrir las cubiertas de este producto o de los dispositivos acoplados.

Instrucciones de conexión

1. Apague todos los componentes (OFF).
2. En primer lugar, conecte todos los cables a los dispositivos.
3. Conecte los cables de señal a los receptáculos.
4. Conecte los cables de alimentación a las tomas.
5. Encienda el dispositivo (ON).

Instrucciones de desconexión

1. Encienda todos los componentes (ON).
2. En primer lugar, retire los cables de alimentación de las tomas.
3. Retire los cables de señal de los receptáculos.
4. Retire todos los cables de los dispositivos.

Safety Inspection Guide:

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of non-IBM features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock).
- Explosive hazards, such as a damaged CRT face or bulging capacitor
- Mechanical hazards, such as loose or missing hardware

The guide consists of a series of steps presented in a checklist. Begin the checks with the power-off, and the power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power-off the computer. Disconnect the power cord.
3. Check the power cord for:
 - a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
 - b. The power cord should be the appropriate type as specified in the parts listings.
 - c. Insulation must not be frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling Electrostatic Discharge-Sensitive Devices:

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

1. Use product-specific ESD procedures when they exceed the requirements noted here.
2. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people.
- Wear a grounded wrist strap against your skin to eliminate static on your body.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

Note

The use of a grounding system is desirable but not required to protect against ESD damage.

- Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
- Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
- Use the round ground-prong of the AC plug on AC-operated computers.

Grounding Requirements:

Electrical grounding of the PC Server Rack and computers is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Problem Determination Tips

Due to the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

- Machine type and model
- Processor or hard disk upgrades
- Failure symptom
 - Do diagnostics fail?
 - What, when, where, single, or multiple systems?
 - Is the failure repeatable?
 - Has this configuration ever worked?
 - If it has been working, what changes were made prior to it failing?
 - Is this the original reported failure?
- Reference/Diagnostics Diskette Version
 - Type and version level
- Hardware configuration
 - Print (print screen) configuration currently in use
 - BIOS level
- Operating system software
 - Type and version level

Important

To eliminate confusion, identical systems are considered *identical* only if they:

1. Are the exact machine type and models
2. Have the same BIOS level
3. Have the same adapters/attachments in the same locations
4. Have the same address jumpers/terminators/cabling
5. Have the same software versions and levels
6. Have the same Reference/Diagnostics Diskette (version)
7. Have the same configuration options set in the system
8. Have the same setup for the operation system control files

Comparing the configuration and software set-up between “working and non-working” systems will often lead to problem resolution.

Phone Numbers, U.S. and Canada

Note

EMEA customers should contact their Dealer or IBM Service organization.

Before you place a call to the Support Center, refer to "Problem Determination Tips" on page 216.

Authorized Dealers or Servicers

Number	Information
919-517-0001	Bulletin Board Service - PC Company
800-528-7705	Bulletin Board Service - TSS Only
800-937-3737	IBM Business Partner Education
800-426-2472	IBM Customer Engineer Technical Support
800-IBM-DEAL	IBM Dealer Support Center
800-342-6672	IBM Direct Desktop Software Sales
303-924-4015	IBM Part Number ID and Look Up
800-426-7763	IBM PC HelpCenter
800-237-5511	IBM Software Defect Support (CSDs)
800-327-5711	IBM Software Ordering (Publications)
800-426-1484	IBM Supplies Technical Hotline
800-388-7080	IBM Warranty Parts Claims Center

U.S. Customers and Helpware Subscribers

Number	Information
919-517-0001	Bulletin Board Service - PC Company
800-426-8322	Customer Education Business Unit
800-999-0052	Customized Operational Services
800-237-4824	EduQuest (Educational Computers)
800-964-8523	End User HelpDesk Support
800-742-2493	IBM Anti-Virus Services
800-447-4700	IBM Authorized Dealer Referrals
800-426-2468	IBM Dealer Referral
800-426-3333	IBM Information Referral Service
800-IBM-SERV	IBM Service
800-772-2227	IBM PC HelpCenter and HelpDesk
800-426-7282	IBM Technical Manuals
800-426-9402 (Ext. 150)	Multimedia Information Center
800-241-1620	Multimedia HelpCenter
800-342-6672	OS/2 Information Line
800-237-5511	OS/2 Support Services
800-284-5933	Prodigy
914-962-0310	Prodigy User Questions
800-547-1283	Technical Coordinator Program
	SystemXtra for Personal Systems
	LAN Automated Distribution/2
	OS/2 Bulletin Board
	OS/2 Application Assistance Center
800-551-2832	Technical Solutions Magazine

IBM Canada Customer and Servicer Support

Number	Information
800-661-PSMT	Business Partner Marketing Support
905-316-5556	Business Partner Marketing Support - Toronto
514-938-6048	Business Partner Marketing Support - French
800-465-6600	Customer Relations
905-316-6666	Customer Relations - Toronto
800-465-6666	Customer Service Dispatch
800-263-2769	Customer Service Parts
800-465-2222	Customer Support Center (ISC)
416-443-5701	Customer Service Repair Centre
800-465-7999	HelpClub Registration
800-465-7999	IBM Direct
905-513-3367	IBM Certification Administrator
905-316-2683	IBM Certification Coordinator Mail to: 50 Acadia Drive Markham, Ontario L3R 0B3
800-465-3299	IBM HelpFax
905-316-3299	IBM HelpFax - Toronto
800-565-3344	IBM HelpPC
800-268-3100	IBM Information Network Support
800-268-3100	IBM Information Network Support - Toronto
800-387-8343	IBM PC Service Partners
800-663-7662	Lexmark Product Information
800-263-2769	Parts Orders, Exchange or Emergency
416-443-5808 (Fax)	Parts Regular Orders, Exchange
416-443-5755	Parts Orders, Inquiries
514-938-3022	PC Co Bulletin Board - Montreal
905-316-4255	PC Co Bulletin Board - Toronto
604-664-6464	PC Co Bulletin Board - Vancouver
204-934-2735	PC Co Bulletin Board - Winnipeg
800-661-7768	PS Marketing Support (PSMT)
800-465-1234	Publications Ordering
905-316-4148	Service Management Support
905-316-4100 (Fax)	Service Management Support
905-316-4150	Service Manager
905-316-4100 (Fax)	Service Manager
905-316-4872	Service Quality Programs
905-316-4100 (Fax)	Service Quality Programs
800-661-2131	Skill Dynamics (Education)
800-565-3344	PS/1 Warranty Customer Helpline
800-387-8483	PS/1 Warranty Service (DOAs)
416-443-5835 (Fax)	Warranty Claim Fulfillment
905-316-2445	Warranty Claim Reimbursement
905-316-3515 (Fax)	Warranty Claim Reimbursement
416-443-5778	Warranty Claim Parts Inquiry
800-505-1855	Warranty Provider Support Hotline
800-267-7472	Warranty Service, ThinkPad

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_____ Yes _____ No

2. What would you like to see added, changed, or deleted in this manual?

3. What is your service experience level?

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4. Which computers do you service most?

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