IBM

Netfinity Fibre Channel RAID Controller Unit

User's Handbook

Before using this information and product it supports, be sure to read the general information under "Appendix C. Product warranties and notices" on page 107.

Contents

Figures

Tables

Safety statement

Before installing this product, read the Safety Information book.

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

安装本产品前请先阅读《安全信息》手册。

Prije instalacije ovog proizvoda pročitajte priručnik sa sigurnosnim uputama.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lue Safety Information -julkaisu, ennen kuin asennat tuotteen.

Avant d'installer ce produit, reportez-vous au livret Safety Information.

Lesen Sie die Broschüre mit den Sicherheitshinweisen, bevor Sie dieses Produkt installieren.

Πριν εγκαταστήσετε αυτό το προϊόν, διαβάστε το εγχειρίδιο Safety Information.

Installálás előtt olvassa el a Biztonsági előírások kézikönyvét !

Prima di installare questo prodotto, leggere il manuale relativo alle informazioni sulla sicurezza

本製品を導入する前に、安全情報資料を御読みください。

이 제품을 설치하기 전에, 안전 정보 책자를 읽어보십시오.

Перед установкой продукта прочтите брошюру по технике безопасности (Safety Information).

Voordat u dit product installeert, dient u eerst de Veiligheidsvoorschriften (zie het boekje "Safety Information) door te lezen.

Les heftet om sikkerhetsinformasjon før du installerer dette produktet. nor

Przed zainstalowaniem tego produktu należy przeczytać broszurę Informacje Dotyczące Bezpieczeństwa.

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

Пред да го инсталирате овој производ прочитајте ја книгата со безбедносни информации.

Pred inštaláciou tohto produktu si prečítajte Informačnú brožúrku o bezpečnosti.

Preden namestite ta izdelek, preberite knjižico Varnostne informacije.

Antes de instalar este producto, lea la publicación Información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

在安裝本產品之前，也請先閱讀「安全性資訊」小冊子。

Electrical safety

1

DANGER

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

To connect	To disconnect
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to receptacles.	3. Remove signal cables from receptacles.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Class 1 laser statement

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

IEC 825-1:1993 CENELEC EN 60 825

About this book

This book provides instructions for setting up, installing, and replacing options for your IBM Netfinity RAID Controller Unit. It also provides information on troubleshooting your controller unit. If you have not yet set up your controller unit, refer to Chapter 1 for detailed information.

How this book is organized

Chapter 1, "Getting started," introduces the controller unit and its primary components and contains setup instructions. This chapter also includes an overview of the controller unit features and components.

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

Chapter 3, "Operating the controller unit," describes the features that aid in operating and servicing the hardware. This chapter explains how to use the controls to turn the controller unit on and off under normal and emergency conditions.

Chapter 4, "Controller unit components," describes the interface boards, cooling system, and power system. It also contains detailed instructions on replacing these components if they fail.

Chapter 5, "Troubleshooting quick reference," contains the problem symptoms and indications that are specific to your controller unit.

Chapter 6, "Getting help, service, and information," describes how to obtain help, service, and information about IBM products.

Appendix A, "Controller specifications," provides controller unit and component specification information.

Appendix B, "Rack cabinet LVD-SCSI cabling examples," provides rack cabinet LVD-SCSI drive cabling examples for specific configurations. Use these examples for connecting a controller unit to one or more LVD-SCSI drive modules.

Appendix C, "Product warranties and notices," provides warranty statements and product notices.

Notices used in this book

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

*   **Note**

    These notices provide important tips, guidance, or advice.

*   **Attention**

    These notices indicate possible damage to programs, devices, or data. An attention notice is placed just *before* the instruction or situation in which damage could occur.

*   **Caution**

    These notices indicate situations that can be potentially hazardous to you. A caution notice is placed just *before* descriptions of potentially hazardous procedure steps or situations.

Related publications

Included with your Netfinity Fibre Channel RAID Controller Unit are the following publications:

*   *Netfinity SYMplicity Storage Manager User's Handbook*.

*   *Netfinity SYMpicity Storage Manager for Windows NT Installation and User's Handbook*.

*   *Netfinity Networked SYMplicity Storage Manager Installation and User's Handbook*.

Additional publications are available for purchase from IBM. For a list of publications available in your country:

*   In the U.S. and Puerto Rico, call 1-800-426-7282.

*   In the United Kingdom, call 01705-565000 or 0161-9056001.

*   In Canada, call 1-800-465-1234.

*   In other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

Chapter 1. Getting started

Thank you for purchasing an IBM Netfinity Fibre Channel RAID Controller Unit. You can use this controller unit to connect two or more host systems to a Fibre Channel.

Fibre Channel is a new technology, similar to a high-speed network, that can be used to connect large amounts of disk storage to a server or cluster of servers. Fibre Channel technology supports increased performance, scalability, availability, and distance for attaching storage subsystems to network servers. IBM Fibre Channel solutions are able to use today's SCSI disks, storage expansion enclosures, and servers.

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

The controller unit comes with a limited three-year on-site warranty. In addition, the Startup Support program provides coverage to customers during the first 90 days after installation at no additional charge.

This comprehensive program enhances IBM support for setup, installation, configuration, and problem determination. It provides assistance for popular network operating systems and network adapters from IBM and non-IBM vendors. In the U.S. and Puerto Rico, call IBM at 1-800-771-2227; in Canada, call 1-800-565-3344; or in other countries call your IBM reseller or IBM Marketing representative.

In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

This section provides brief descriptions of the primary components of the Netfinity Fibre Channel RAID Controller Unit and contains setup instructions. The controller unit can be used with your rack-mounted drive shelves. It supports six, independent, low-voltage differential (LVD) drive-side buses.

The controller unit contains either one or two RAID controllers, two power supplies with fans, and a battery. You can replace the redundant power supply modules, fans, and controllers.

Note: If you choose the controller unit option with only one RAID controller, your controller unit will not operate in redundant mode.

The Netfinity Fibre Channel RAID Controller Unit is available in a standard rack cabinet model.
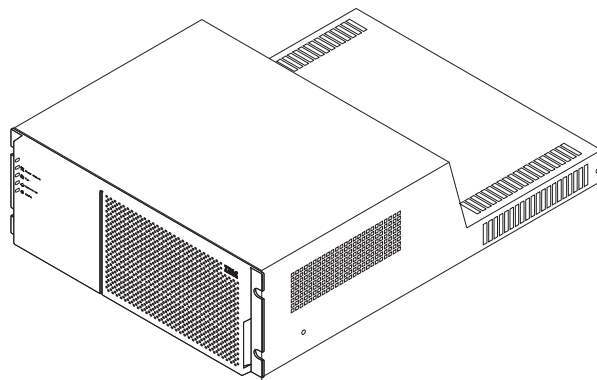
Figure 1. Netfinity Fibre Channel RAID Controller Unit

The controller unit is shipped with the following items:

- *Netfinity Fibre Channel RAID Controller Unit User's Handbook*

- *Netfinity SYMplicity Storage Manager User's Handbook*

- *Netfinity SYMpicity Storage Manager for Windows NT Installation and User's Handbook*

- *Netfinity Networked SYMplicity Storage Manager Installation and User's Handbook*

- Media Interface Adapter (MIA)

- Left and right rail assemblies

- Eight black M6 hex-head screws

- Two power cords

Identifying the removable components

Each model 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, power supplies, and cooling fans. The controller unit also has a removable front cover.

Front view

The front of the controller unit has the following primary components:

- **Front cover (bezel)** – a removable panel with holes for viewing the status lights and for boosting air circulation.

- **RAID Controller CRUs** – two removable units that contain RAID controllers.

- **Battery CRU** – one removable unit that contains a battery and battery charger circuitry.

- **RAID controller fan CRU** – one removable unit that contains two cooling fans and status LEDs.
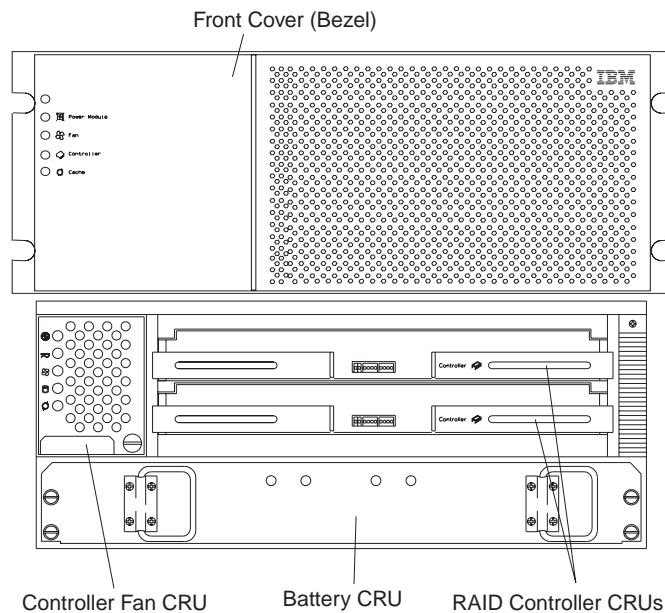
Figure 2. Front view of controller unit

Back view

The back of the controller unit has the following primary components:

- **Connector plate** – a protective panel that contains access holes for interface connectors and jumpers.

- **Power supply CRUs** – two removable units for the power supplies.

- **Power supply fan CRU** – one removable unit for the power supply cooling fans.

Figure 3. Back view of controller unit

Preparing for installation

This section specifies the preparations to take before beginning the installation and explains the installation process. **Read everything in this section before you start** the installation procedure. Perform these tasks in the order given. The instructions in this book assume:

- You have already installed the applicable hosts and host adapters.

- Fibre Channel interface cables are attached to the appropriate hosts and are ready for final connection to the controller unit. (See "Fibre channel host cable requirements" on page 18.)

- The installation site meets all area, environmental, power, and site requirements for the controller unit.

- You have moved the cabinet to its permanent operation location and prepared it for final rack cabinet installation. (See "Preparing the rack" on page 6.)

- The rack cabinet drive enclosures are near their final location and prepared for installation.

To complete the installation procedure, you will need some or all of the following tools and equipment:

- Power cords (shipped with unit)
- Screwdrivers (flat blade and Phillips)
- Antistatic protection (such as a grounding wrist strap)
- Interface cables
- Mounting hardware
- Table or cart (optional)
- Software (to configure one or more disk arrays)

Handling static-sensitive devices

Static electricity, though harmless to you, can seriously damage controller unit 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 controller unit 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 controller-slot screw or other unpainted metal surface on the controller unit 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 controller unit 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 controller unit cover or any metal surface.

Preparing the site

This section lists the space requirements and weight information for the controller unit. For information on interface cables and connections, refer to "Fibre channel host cable requirements" on page 18 and "Appendix B. Rack cabinet LVD-SCSI cabling examples" on page 93.

Floor space

The floor area at the installation site must provide:

- Enough stability to support the weight of the controller unit and associated equipment (See Table 7 on page 85).

- Sufficient space to install the controller unit (see Table 8 on page 86 and Figure 37 on page 86).

Weight

The controller unit total weight depends on the number of components installed in the chassis. Table 7 on page 85 lists the overall weight of the controller unit (unit and shipping), plus the weight for individual components. The maximum weight equals a controller unit containing two RAID controllers, one battery, two power supplies, and two fans. The empty weight of a controller unit with all the CRUs removed equals 14.3 kg (31.6 lbs). Maximum weight of a controller unit equals 34.5 kg (76.0 lbs). For individual component weights see Table 7 on page 85.

4

CAUTION:
Use safe practices when lifting your machine.

Preparing the rack

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

Preparation includes:

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, power cables, or independent power sources, such as an *uninterruptible power supply (UPS)*.

6. Installing support rails for mounting the controller unit and drive enclosures (refer to "Installing the support rails" on page 7).

7. Removing, adding, or reconfiguring drive enclosures or devices in the rack.

8. Reviewing the documentation that comes with your rack enclosure for safety and cabling considerations. Ensure that your planned installation is within the rack guidelines for heat generation, electrical requirements, air flow, and mechanical loading.

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.

10

⚠

CAUTION:

Do not place any object weighing more than 82 kg (180 lbs.) on top of rack mounted devices.

Use this procedure to install mounting hardware in a rack before installing the controller unit.

1. Stop all I/O activity to the devices in the rack in which you are installing the controller unit. Turn off the power switches on both ac distribution boxes in the rack.

2. Install the support rails.

    a. Loosen the large stop screw **1**.

    b. Loosen the screws in the rail **2**.

    c. Remove the 6-32 flat-head screw **3** from the front of the rail and save it for later use.

    d. From the front of the rack, locate the desired position on the rack, based on the even EIA (U level) space and line up the rail with the holes in the rack.
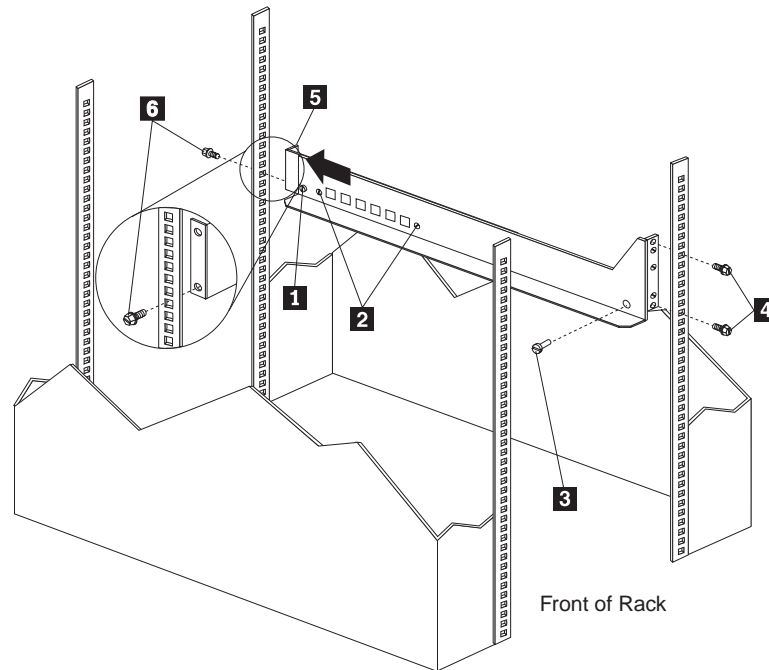
Figure 4. Aligning the front of the rails to the rack

    e. Install two of the eight (black) hex-head screws **4** (provided with your hardware kit) in the top and bottom positions, starting with the top front on each side.

f. Move to the rear of the rack.

g. Slide the rear rail assembly **5** (shown in Figure 4) toward you until it makes contact with the rack.

Note: Make sure the front rail position matches the rear rail position.
          Make sure the alignment spacers are seated well in front of the rack.
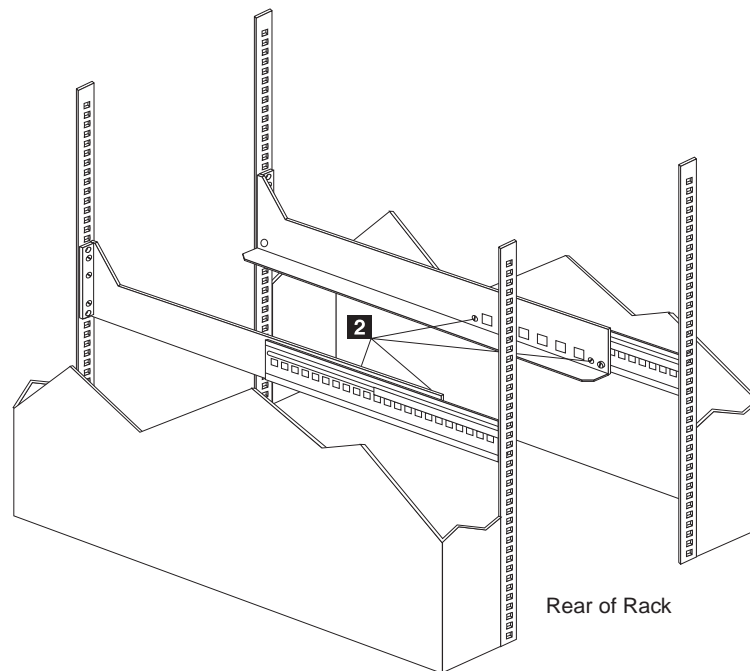
Figure 5. Aligning the rear of the rails to the rack

h. Install two of the hex-head screws **6** (shown in Figure 4) in the top and bottom positions, starting with the top rear on each side.

i. Tighten the two side screws **2** shown in Figure 5.

j. Repeat the rail assembly procedure on the opposite side of the rack.

Preparing the drive enclosures

Prepare the drive enclosures that you are attaching to the controller unit. This may 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

- Installing individual drives in the enclosures

- 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 shipped with each device. When you are finished preparing the drive enclosures, continue with "Preparing the controller unit" on page 10. Refer to "Appendix B. Rack cabinet LVD-SCSI cabling examples" on page 93, for illustrations of connecting the controller unit to one or more LVD-SCSI drive enclosures.

Preparing the controller unit

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

Use this procedure to prepare a controller unit for installation. These instructions assume that you have completed all applicable site, rack cabinet, and drive enclosure preparations discussed on pages 6 through 9.

To gain access to the CRUs, cables, LEDs, and switches inside the controller unit, you must remove the front cover. Figure 6 on page 11 shows how to remove the cover.

Attention: Pulling the cover 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 beyond the edge approximately two inches. Carefully pull the bottom of the cover out **1** to release pins; then slide the cover down **2** as shown in Figure 6.
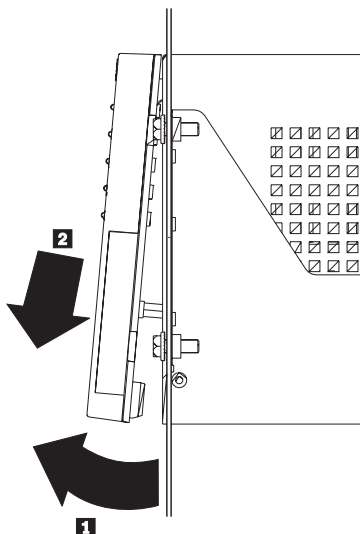
Figure 6. Removing the cover on the controller unit

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

1. Check the contents of the shipping container (See the list of items on page 2).

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

Attention: Electrostatic discharge can damage sensitive components. Use a grounding wrist strap or other antistatic precautions before removing or handling any components in the cabinet.

2. Set the Fibre Host IDs (Figure 7 on page 12) as necessary.

Each RAID controller must have a unique *Fibre Host ID number*.

The host ID numbers assigned to each RAID controller are based on two elements:

• Host ID numbers set through hardware switches on the controller unit. There are five Host ID switches that you can use to set ID numbers 0 through 127 for each RAID controller. The factory default settings are ID 5 for RAID Controller A and ID 4 for RAID Controller B.

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

  The Fibre Host ID switches are located on the upper-right corner of the controller unit. If you need to change the controller host ID setting, move the switches up or down.

Note: This figure illustrates the ID that is 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. Also note that the Host ID has no relationship to the SCSI ID (and will not conflict with the SCSI ID).
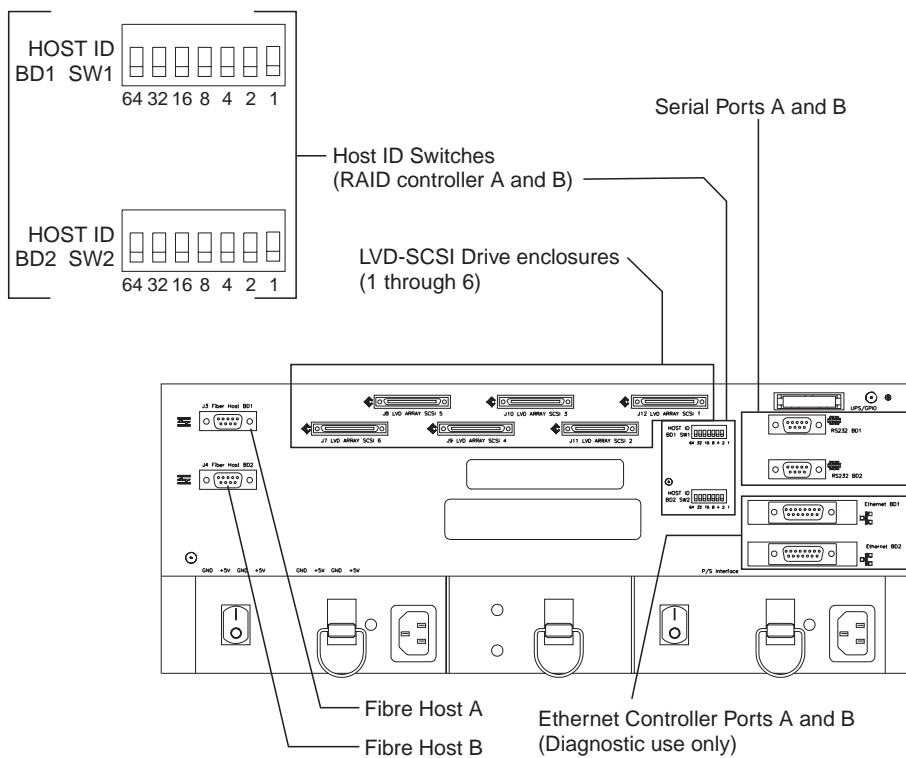
Figure 7. Fibre Host ID settings and interface connections

3. Remove the rest of the CRUs, using Figure 8 on page 13 as a guide.

Remove RAID Controllers
Unlock and open levers; then pull out both RAID controllers.
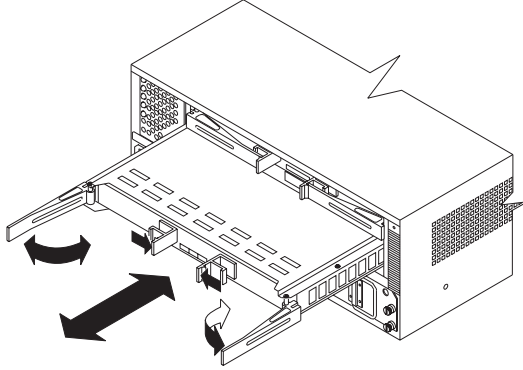
Remove Power Supplies
Pull levers up to unlatch; then remove both power supplies.
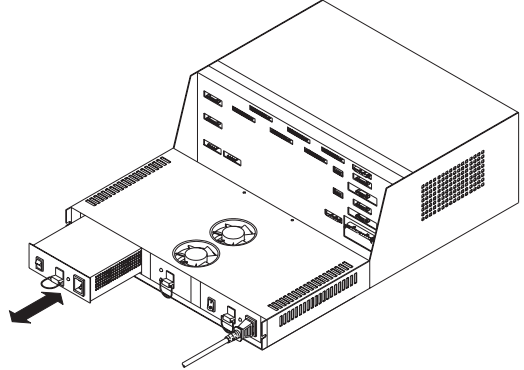
Important

If you are installing the controller for the first time, keep track of which RAID controller (A or B) belongs in each slot. To prevent data loss, you must replace both RAID controllers in their original slots.

Remove Controller Fan
Loosen screw and pull firmly on handle.
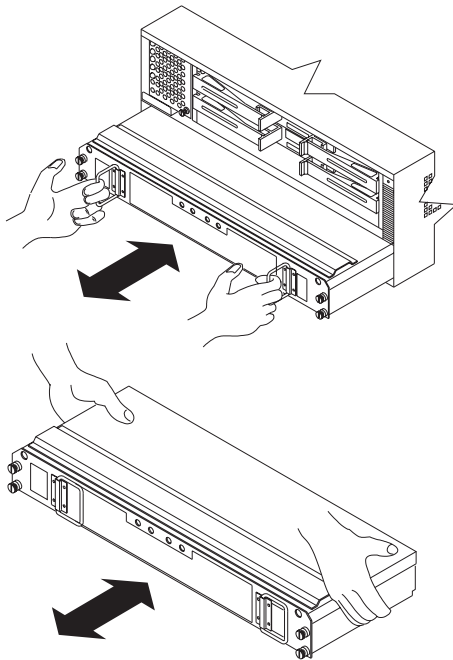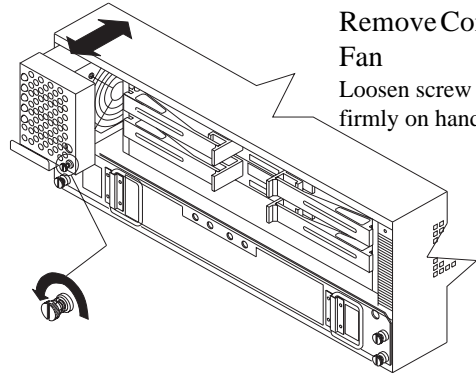
Remove Battery
Loosen screws and pull battery out a few inches. Grasp both sides of CRU and remove it.
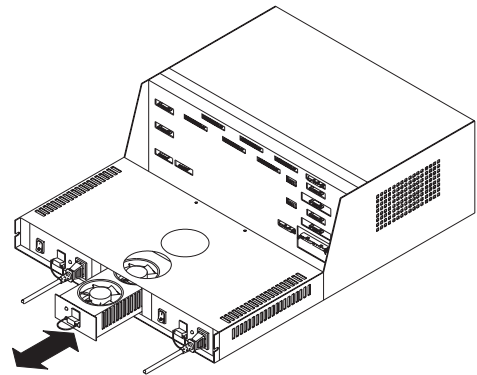
Remove Power Supply Fan
Pull lever up to unlatch; then remove power supply fan.

Figure 8. Removing the CRUs

Installing the controller unit

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

1. Slide the controller unit **1** into the rack until it rests against the stop screw **3**.
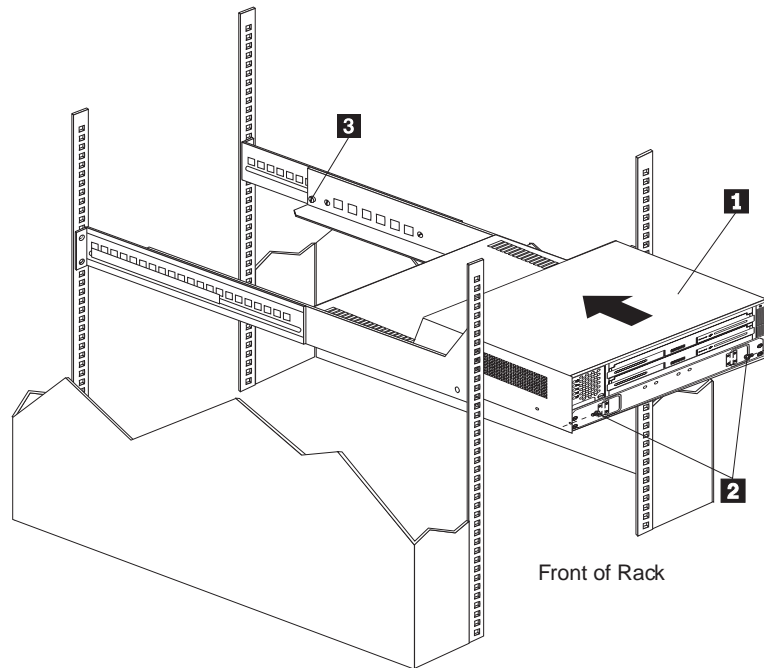
Figure 9. Installing the controller unit

2. Install the two screws **2** (saved from the rail installation step 2c on page 7) on the front inside of the controller unit.

3. Tighten the rear stop screws **3**.

4. Reinstall the battery and controller CRUs.

5. To install additional CRUs, reverse the instructions in Figure 8 "Removing the CRUs" on page 13.

6. Install the front cover.
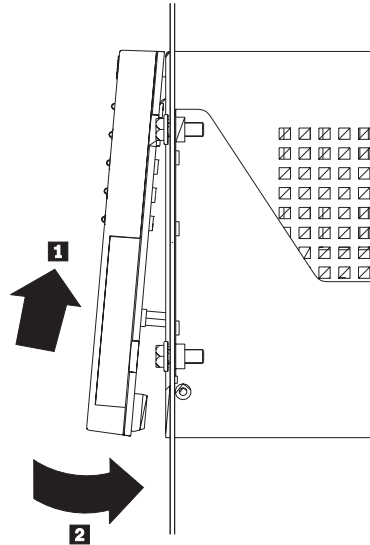
Figure 10. Replacing the cover on the controller unit

7. Continue with Chapter 2 to connect the controller unit to the loop.

IBM Netfinity Fibre Channel RAID Controller User's Handbook

Chapter 2. Connecting the controller unit to the loop

This section provides brief descriptions of the components that connect the controller unit to the loop, instuctions for installing the interface cable, and instructions for completing the installation.

Interface connectors and cables

The controller unit supports the following interface protocols:

* **Drive interface** – LVD Ultra2 SCSI (low-voltage differential, small computer system interface), six drive channels.

* **Host interface** – Fibre Channel (fiber optic through MIA), one per RAID controller.

* **Network interface** – Ethernet, one each per RAID controller through an attachment unit interface (AUI) connection. (This may require an RJ45-AUI converter in your installation. This is not provided.)

LVD-SCSI drive-cable requirements

To connect the controller unit to a drive enclosure, you must use 68-pin, VHDCI (very high density cable interface) LVD, Ultra2 SCSI cables. The controller unit has six channel 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 "Appendix B. Rack cabinet LVD-SCSI cabling examples" on page 93 for examples of connecting the controller unit to one or more LVD-SCSI drive modules.

Fibre channel host cable requirements

Table 17 on page 92 lists the cable requirements for all Fibre Channel connections. For fiber optic connections, you must use multimode, 50-micrometer, fiber-optic cable and a media interface adapter (MIA) (provided with your RAID controller) as shown in Figure 11 on page 18.
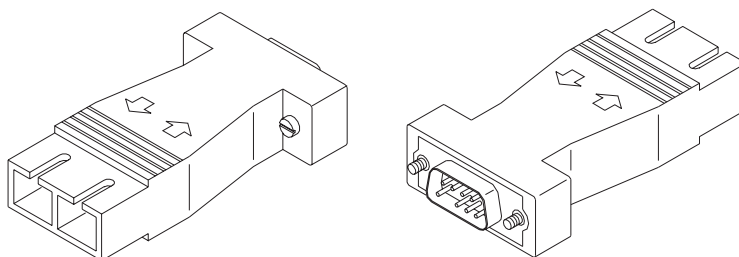
Figure 11. Media interface adapter

Installing the interface cable

When installing the interface cable, refer to the following steps.

1. Install a MIA for each RAID controller installed (see Figure 12 on page 19).

2. Attach one end of the Fibre Channel interface cables to the MIAs.

   Attach the other end of your Fibre Channel interface cables according to your configuration requirements.

3. Connect the LVD-SCSI drive cables (see Figure 12 on page 19).

4. For information about host IDs, go to Step 2 on page 11.

   Attach LVD-SCSI drive cables to the drive LVD connectors on the controller unit and to the drive enclosures. Refer to "Appendix B. Rack cabinet LVD-SCSI cabling examples" on pages 94 through 106, for drive enclosure cabling examples.

   For additional information about cable management, visit the following IBM World Wide Web site:

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

   Refer to the installation instructions shipped with the drive enclosures to see if you need to set the Bridge Enable switch on attached drive enclosures.

Connect MIAs here

Connect LVD-SCSI drive cables here

Connect Ethernet cables here
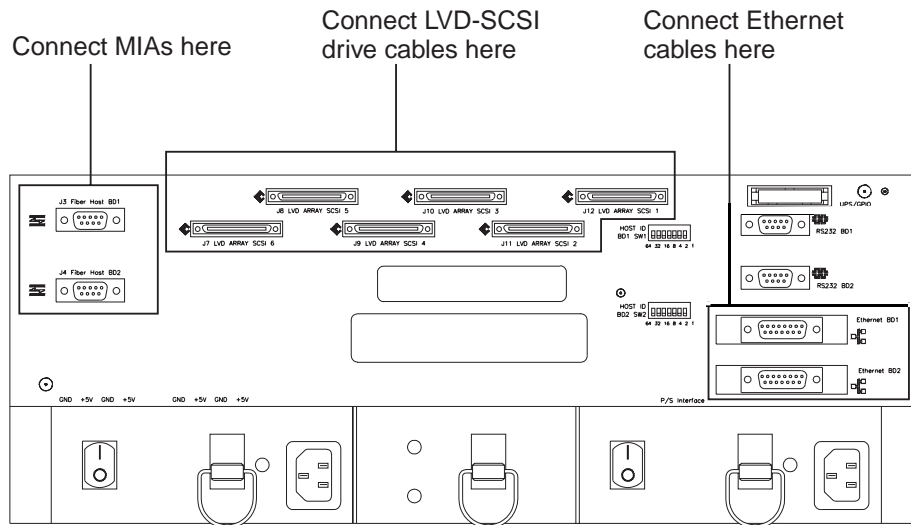
Figure 12. Interface connections on the rear of the controller unit

5. If applicable, attach secondary Ethernet cables.

There is one Ethernet connector for each RAID controller. Attach cables to these connectors if you are using Networked SYMplicity Storage Manager.

6. Route and secure the interface cables.

a. Arrange the interface cables so they clear the vents on the back of the controller unit.

b. Do not overtighten the cable ties or bend the Fibre Channel cables to a radius smaller than 76 mm (3 in.). Also, 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 76 mm (3 in.) when extended or become pinched when retracted.

Completing the controller installation

1. Power up the drive enclosures before powering up the controller unit. If the controller unit is attached to one or more IBM EXP15 drive enclosures, turn on the drive enclosures first, followed by the controller unit.

2. Check the *light emitting diodes* (LEDs) that indicate the status of both the overall controller unit and the individual components within the unit to make sure there are no problems.

Starting the controller unit

You will need the two power cords shipped with the controller unit.

Use these instructions to connect the power cords, turn on the power, and check the controller unit.

1. Make sure that both power switches on the controller unit are turned off (see Figure 13 on page 21).

2. Plug both power cords into the controller unit (see Figure 13 on page 21).

3. Plug both power cords into the ac outlets. To maintain power redundancy, plug each power cord into an independent power source such as external electrical outlets, UPS outlets, or ac distribution boxes inside a rack cabinet.

4. Verify the following:

   a. All cables and CRUs are plugged securely into the controller unit.

   b. The host IDs are set correctly.

   c. The hosts and other devices are ready.

5. Check for other devices attached to the system and determine the proper powerup sequence for all applicable devices.

6. Based on this power-up sequence, turn on the power to each device, including applicable circuit breakers in cabinets. Turn on the power as follows:

   a. Main circuit breakers in the rack cabinet, if applicable

   b. All drive enclosures attached to the controller unit

   c. Both power switches on the back of the controller unit (see Figure 13 on page 21)

   Note: The controller unit might take from 3 to 10 seconds to power up. During this time, you will see the amber and green LEDs on the controller unit turn on and off intermittently.

Power Switch

Power Switch
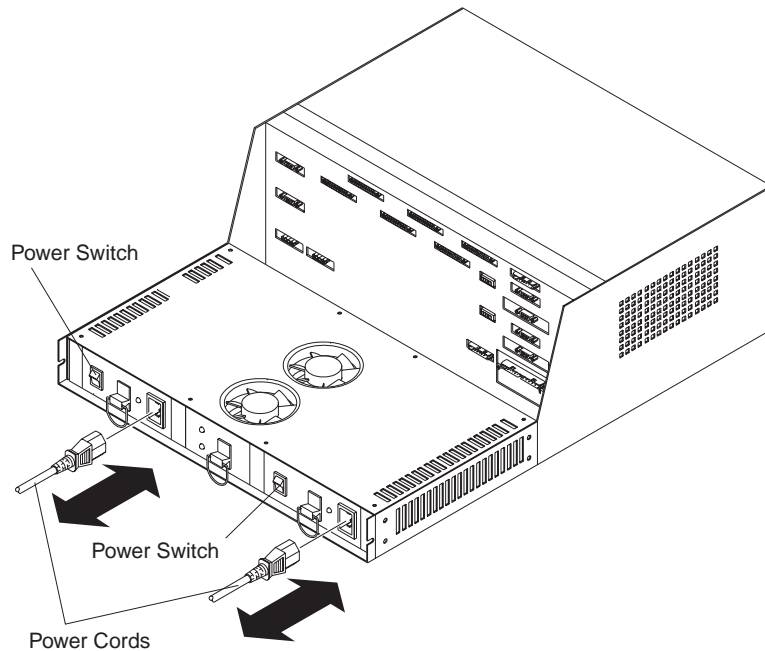
Power Cords

Figure 13. Power cords and power switches

7. Check the controller unit for faults.

Go to "Using the status LEDs" on page 27 and follow the instructions to check the controller unit status. If any Fault LEDs (amber) turn on and remain on, refer to the appropriate page listed in Table 1 on page 30 and Table 2 on page 31.

8. Replace the front cover (see Figure 10 on page 15).

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

9. Go to "Configuring the RAID controllers" on page 22.

Configuring the RAID controllers

Once the controller unit is installed and turned on, you might need to perform certain tasks to complete the installation. These tasks might include:

- Installing RAID management software

- Checking and setting software parameters

- Preparing attached drive enclosures

You will need the following items:

- Software materials shipped with the controller unit

- Configuration worksheet showing how you want to configure the disk arrays (optional)

Use this procedure as a guideline for installing the RAID management software and configuring the RAID controllers and drives.

1. Check the controller unit shipping cartons for software materials, which include software installation media and documentation.

2. Install the software using the appropriate instructions shipped with the software.

3. Configure the system using the appropriate RAID management software.

   Some default software parameters (such as RAID level, drive groups, and caching) are set at the factory before shipment. If SYMplicity Storage Manager or other RAID management software is already installed on the host, use it to check the current software configuration for both the RAID controllers and drives. Change the system configuration, as necessary. Refer to the appropriate software documentation for instructions on using the software.

   Note: Depending on the RAID management software you are using, the controller unit, drive enclosures, or other components in your system might be identified by names that differ from those used in this book. Keep this in mind when using the software.

4. Continue with Chapter 3 on page 23 for information on operating the controller unit.

Chapter 3. Operating the controller unit

The controller unit has several features that aid in operating and servicing the hardware. These include:

- **LEDs** (light emitting diodes) – green or amber lights that are lit or blink to indicate either a normal operating status or hardware error

- **Power switches** – two switches that turn the power on and off on the controller unit

- **Handles and levers** – handholds to help you remove and install individual CRUs more easily

- **Connectors** – sockets for attaching interface and power cables to the controller unit

This section explains how to turn the controller unit on and off under normal and emergency conditions. It also explains how to check the hardware status of the controller unit.

Gaining access to the controls

To gain access to the CRUs, cables, LEDs, and switches inside the controller unit, you must remove the front cover. Figure 14 on page 24 shows how to remove the cover.

Attention: Pulling the cover out too far can damage the hooks at the top. If the controller unit is not installed in a rack, to avoid damaging the plastic hooks, place the controller unit on a flat surface. Be sure the front of the controller unit extends beyond the edge approximately two inches. Carefully pull the bottom of the cover out and then down as shown in the following illustration.

Note: To remove the front cover, pull out on the bottom **1** to release the pins; then slide down **2**.
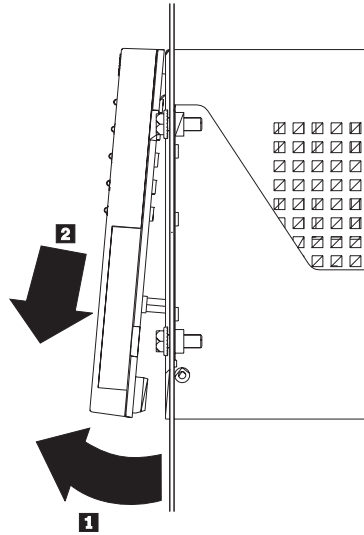
Figure 14. Removing the cover on the controller unit

Turning on the power

> *Note:* If you are turning on the controller unit after an emergency shutdown or power
> outage, use the procedure "Restoring power" on page 26.

You must turn on the drive enclosures first before turning on the controller unit. The
RAID controllers will not acknowledge any attached drives that are powered up after the
controller unit. Use this procedure to turn on the controller unit. For instructions on
turning on the drive enclosures, refer to the drive enclosure documentation.

1. Remove the access panel from the back of the cabinet.

2. If you are turning on the controller unit after a normal shutdown, turn on both power
   switches on the back of the controller unit (see Figure 15 on page 25). You must turn
   on both switches to take advantage of the redundant power supplies. Then, go to
   "Using the status LEDs" on page 27.
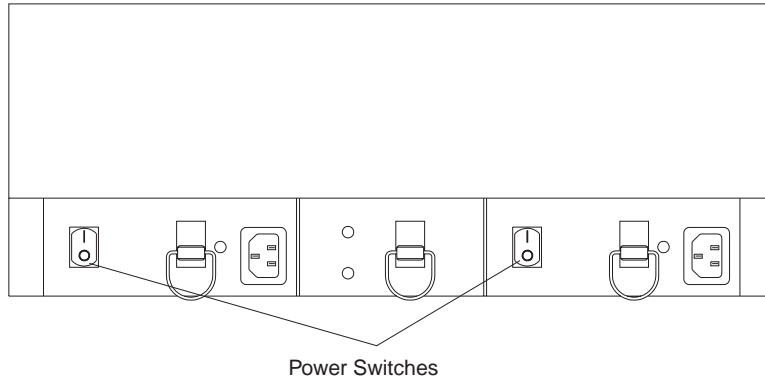
Power Switches

Figure 15. Controller unit power switches (rear view)

Turning off the power

5

CAUTION

The Power Control button on the controler unit 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: Except in an emergency, never turn off the power if any Fault LEDs are lit on the controller unit. Use the proper troubleshooting or servicing procedure to correct the fault before turning off the power. This will ensure that the controller unit will power up correctly later. For guidance, refer to "Using the status LEDs" on page 27.

Use this procedure to turn off the power to the controller unit. The controller unit is designed to run continuously, 24 hours a day. Once you turn on the controller unit, do not turn it off except during certain service procedures.

1. Remove the access panel from the back of the cabinet.

2. Prepare the controller unit for shutdown.

   a. Stop all I/O activity to the RAID controller and attached drive enclosures. If applicable, logically disconnect the RAID controllers and drive enclosures from the hosts. Make sure that the Fast Write Cache LED on the front cover and all applicable drive activity LEDs are off (not blinking).

   b. Make sure that all amber Fault LEDs on the controller unit are off. If any Fault LEDs are lit, correct the problem before you turn off the power (see "Using the status LEDs" on page 27).

3. Turn off the power switches on the controller unit before removing power from drive enclosures (see Figure 15 on page 25).

   Turn off both power switches on the back of the controller unit. If you want to shut down the entire system, turn off the main circuit breakers (or power switches) in the cabinet.

Restoring power

Use this procedure to restart the controller unit 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.

   DO NOT continue with this procedure if you find any evidence of fire, water, or structural damage. If there is no visible damage, go to Step 2.

   If there is evidence of damage, contact IBM for technical support:

   • Within the U.S. call 800-772-2227.

   • Within Canada:

      -   For support, call 800-565-3344.

      -   For more information call 800-465-7999.

   • Outside the U.S. and Canada contact your IBM HelpWare number, your place of purchase, or your local IBM office.

2. Plug in the power cords and turn on the power.

   a. After checking for physical damage, plug in the power cords.

b. Turn on the power switches on all drive enclosures attached to the controller unit. Then, turn on the circuit breakers for the rack.

Note: If the controller unit is attached to drive enclosures, you must turn on these devices before you turn on the controller unit.

c. Turn on both power switches on the back of the controller unit.

3. Check the status of the controller unit and other devices.

Make sure all Fault LEDs are off on the front and back of the controller unit. Once all the devices on the system are powered up, check the overall system status using the SYMplicity Storage Manager software.

4. Close the door on the back of the rack.

Using the status LEDs

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. It is important that you check all LEDs on the front and back of the controller unit when you turn on the power.

You can also use LEDs on the front cover, RAID controller CRUs, and drive enclosures (if applicable) to determine if the RAID controllers and drives are responding to I/O transmissions from the host. Refer to your SYMplicity Storage Manager software documentation for additional information about checking system status.

Note: The following illustration shows two RAID controllers installed in the controller unit.
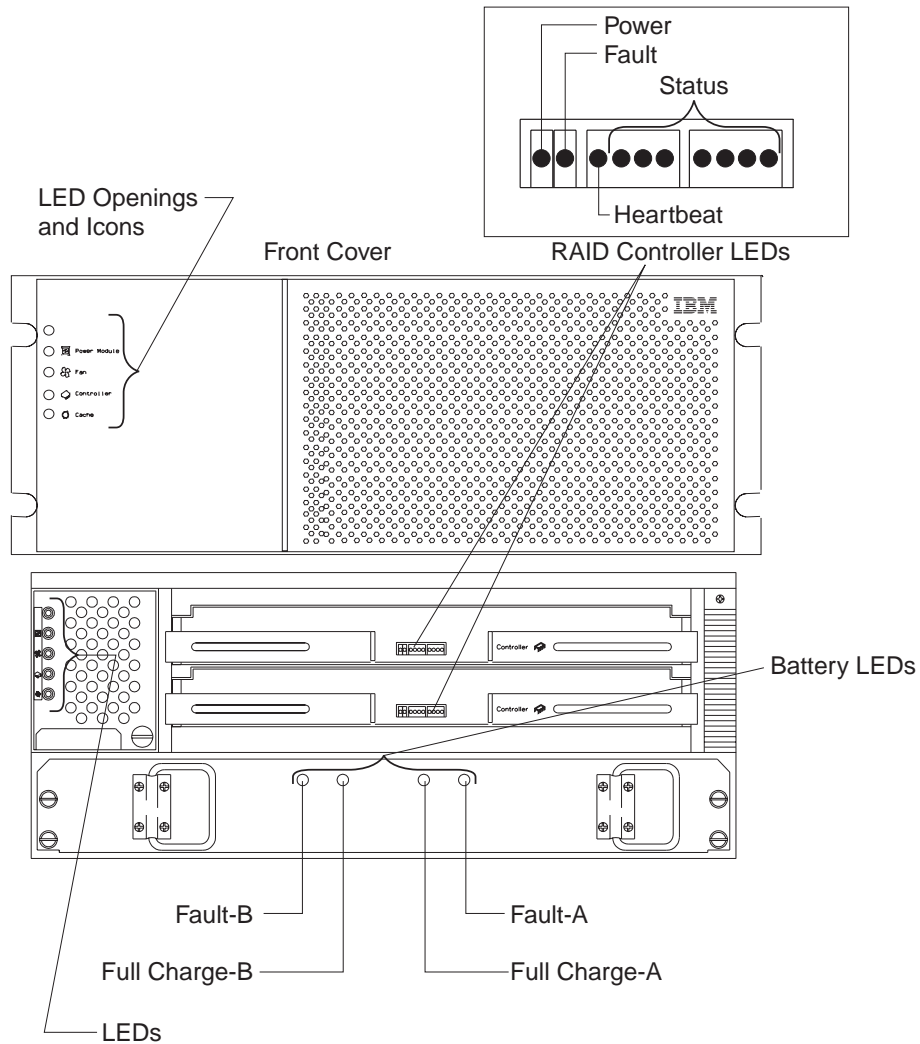
Figure 16. LEDs on the front

Consider the following LED activities when you check LED status:

- If a Fast Write Cache operation or other I/O activity is in progress to the controller unit (or attached drive enclosures), you might see several green LEDs blinking, including the Fast Write Cache LED (on the front cover), RAID controller CRU status LEDs, or applicable drive activity LEDs.

- The green Heartbeat LEDs on the RAID controller CRUs blink continuously. The number and pattern of green status LEDs lit on the RAID controllers depend on how your system is configured. An active RAID controller will not have the same status LEDs lit as a passive RAID controller.

- If you just turned on the power, 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.

Use the following procedure to check the LEDs and operating status of the controller unit and its components. For troubleshooting instructions, go to "Chapter 5. Troubleshooting quick reference" on page 59.

1. Look at the LEDs on the front of the controller unit.

2. Use Figure 16 on page 28 and Table 1 on page 30 to check the status LEDs on the front of the controller unit. Each RAID controller CRU has its own set of status LEDs. Under normal conditions, the green Power LED (left light) is on and the amber LEDs are off.

Table 1: Status LEDs on front of controller unit

Location	LED/switch	LED color	Normal status	Problem status
Front cover (Controller Fan CRU)	Power	Green	On	Off
	Power Supply	Amber	Off	On
	Fan	Amber	Off	On
	Controller	Amber	Off	On
	Fast Write Cache	Green	Blinking[1]	Off[1]
Controller CRU	Fault	Amber	Off	On
	Power	Green	On	Off
	Heartbeat	Green	Blinking[2]	Off
	Status	Green	On[2]	Off[2]
Battery CRU	Fault-B	Amber	Off	On
	Full Charge-B	Green	On	Off
	Fault-A	Amber	Off	On
	Full Charge-A	Green	On	Off

[1] Fast Write Cache LED blinks only during a fast write operation. Refer to Figure 17 "LEDs on the back" on page 31 for details.
[2] Each RAID controller CRU has eight status LEDs, including one Heartbeat LED, that glow in various patterns. See Figure 19 "RAID controller CRU, slots, and LEDs" on page 35 for details.

3. Check the LEDs on the back.

Use Figure 17 and Table 2 to check the status LEDs on the back of the controller unit. All green LEDs should be on and the amber Fault LED should be off.
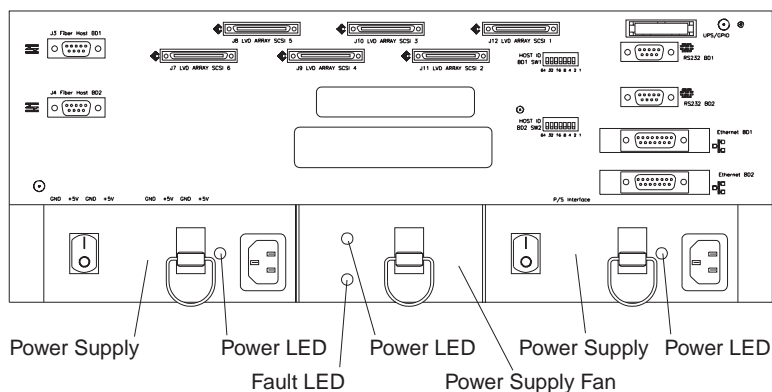
Figure 17. LEDs on the back

Table 2:   Status LEDs on back of controller unit

Location	LED	LED Color	Normal Status	Problem Status
Power Supply CRU	Power	Green	On	Off
Power Supply Fan CRU	Fault	Amber	Off	On
	Power	Green	On	Off

4. When all status LEDs indicate a normal status, replace the front cover on the controller unit and close the rack door.

Chapter 4. Controller unit components

The controller unit consists of one or two RAID controllers, a cooling system, and a power system. This chapter includes a description of each component and detailed instructions on replacing them, if they fail.

You will need antistatic protection and a cart or level surface on which to place the CRUs.

Use this general procedure to remove one or more CRUs from a controller unit.

1. Remove the controller unit front cover and back access panel from the rack. If your unit contains two RAID controllers, go to step 3.

2. If your unit contains only one RAID controller, stop all activity to the controller unit.

   Stop all system processes and I/O activity to the controller unit and clear all data from cache memory (refer to the software documentation for instructions). Make sure that:

   • No activity LEDs on the drives are blinking.

   • All fault LEDs and the Fast Write Cache LED on the controller unit are off.

   Attention: Electrostatic charges can damage sensitive components. Use proper antistatic precautions before removing or handling the CRUs. See "Handling static-sensitive devices" on page 5.

3. Which CRUs are you removing?

   • The battery CRU or a power supply CRU.

   Put on a grounding strap, turn off both power switches, and unplug the power cords from the controller unit. Then, go to Step 4.

   • RAID controller or fan CRUs.

   Put on a grounding strap, then go to Step 4.

4. Using Figure 8 on page 13 as a guide, remove one or more CRUs.

   To reinstall the CRU or CRUs, put on a grounding strap, then reverse steps 1 through 4 in this procedure.

Controllers

The controller unit supports *redundant array of independent disks* (*RAID*) technology. The controller unit contains one or two RAID controllers.
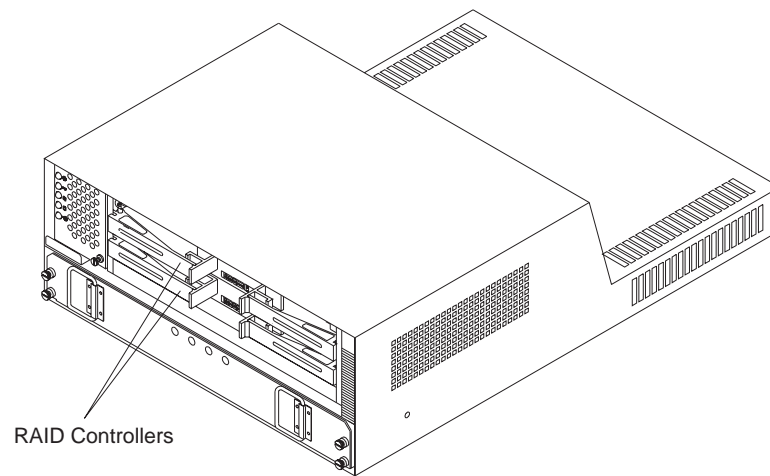
Figure 18. RAID controller CRUs in controller unit

Each RAID controller is removable and is called a *RAID controller CRU* (see Figure 19 on page 35). The RAID controller CRUs slide into one of two *RAID controller slots* on the front of the controller unit and plug directly into the controller backpanel. Two handles lock the RAID controller in place. Each RAID controller slot has a *controller slot letter* that identifies the physical location of the RAID controllers in the chassis: RAID controller slot A or RAID controller slot B. There are ten LEDs (one power, one fault, and eight status) on each RAID controller.

The controller unit supports one or two RAID controllers that attach to hosts through Fibre Channel connections. The RAID controllers also support a SCSI interface for attaching to drive enclosures. Each RAID controller must have a unique Fibre Host ID number assigned through ID switches on the back of the controller unit or host software. For more information on setting Fibre Host IDs, refer to Step 2 on page 11.
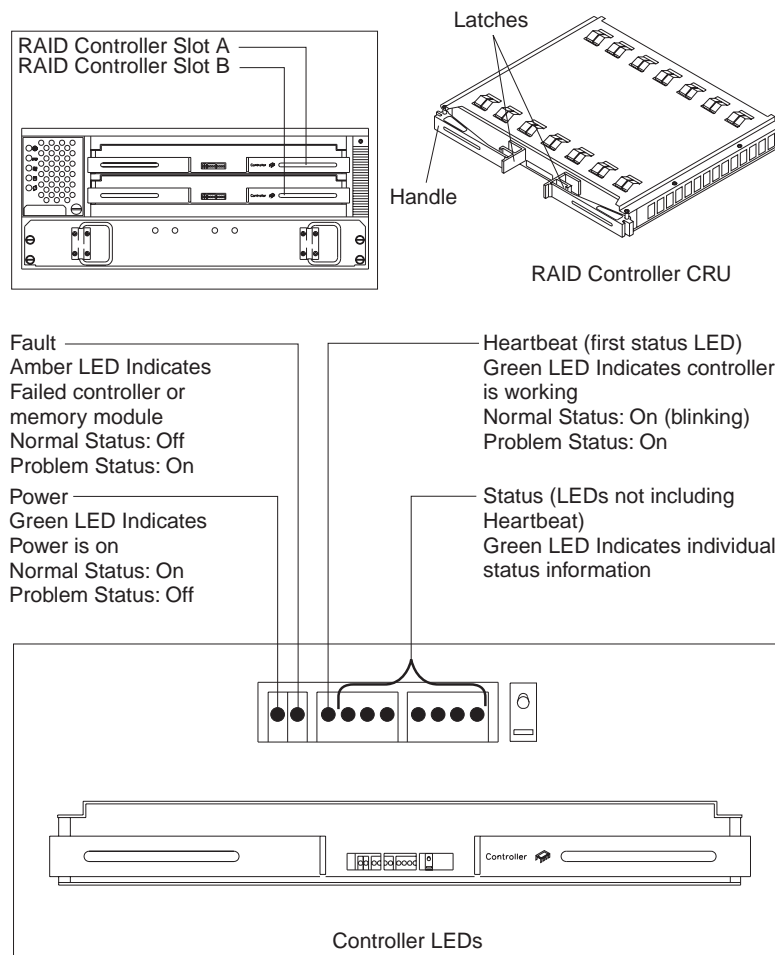
Figure 19. RAID controller CRU, slots, and LEDs

You will need a replacement RAID controller CRU and grounding strap (or other antistatic protection device).

Use this procedure to replace a failed RAID controller CRU.

1. Look at the LEDs on the front cover and answer the following questions.
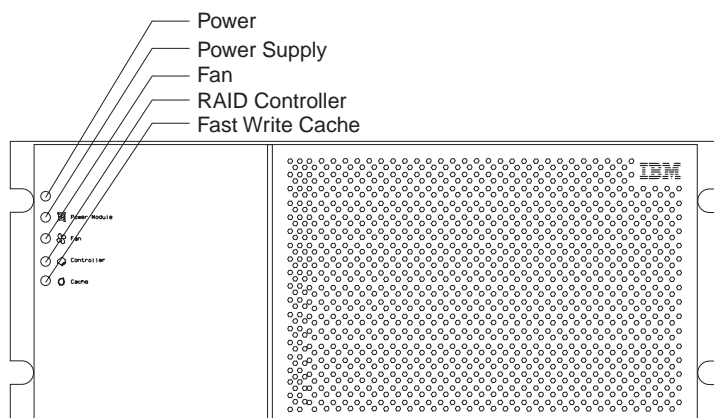
Figure 20. LEDs on front cover

- Is the amber RAID controller LED lit on the front cover?

  Yes: Go to Step 2 on page 36.

  No: If the power supply or fan LED is lit on the front cover, go to "Possible Cause: The power interface board has failed" on page 68 for instructions. Otherwise, go to the next question.

- Has the operating system or SYMplicity Storage Manager software issued an error relating to transmissions between the RAID controller and hosts or drive enclosures?

  Yes: Go to Step 2 on page 36.

  No: Answer the next question.

- Can you perform I/O operations to the drives successfully?

  Yes: Return to normal operation.

  No: To help you determine the source of the problem, read "Identifying interface problems" on page 59. If you still cannot identify the problem, go to Step 2 on page 36 and replace the RAID controller CRU.

2. Read the RAID controller CRU installation instructions.

   a. Open the box containing the replacement RAID controller CRU and remove the instructions.

   b. Read the following:

      - The instructions

- "RAID controller servicing notes" on page 60

- All RAID controller repair and recovery instructions provided with the operating system and SYMplicity Storage Manager software.

c. If necessary, modify the remaining steps to accommodate requirements unique to your system. The instructions shipped with the replacement RAID controller CRU often contain the most current information regarding RAID controllers and servicing procedures. If those conflict with the instructions provided in this procedure, use the instructions shipped with the replacement RAID controller CRU.

3. Remove the front cover (see Figure 14 on page 24), check the RAID controller CRU LEDs (see Figure 16 on page 28), and answer the following questions.

- Is an amber Fault LED lit on one of the RAID controllers?

  Yes: This indicates a failed RAID controller or memory module. Note which RAID controller has a fault (A or B) and go to the next question.

  No: This might indicate an overheating problem or a controller backpanel failure. Go to "Troubleshooting controller unit problems" on page 62 for instructions.

- Do the status lights on the RAID controller indicate a problem with the memory?

  Yes: Call for service.

  No: If no memory failure is indicated, or if you are unable to determine that the fault is caused by a failed memory module, continue with Step 4 to replace the RAID controller CRU.

Attention: Electrostatic charges can damage sensitive components. Use a grounding wrist strap or other antistatic precaution before removing or handling the RAID controllers.

Removing a RAID controller that is operating normally (not failed) could result in data loss. Only remove a RAID controller that has a Fault LED lit or that you marked as "Failed" (offline) through the SYMplicity Storage Manager Software.
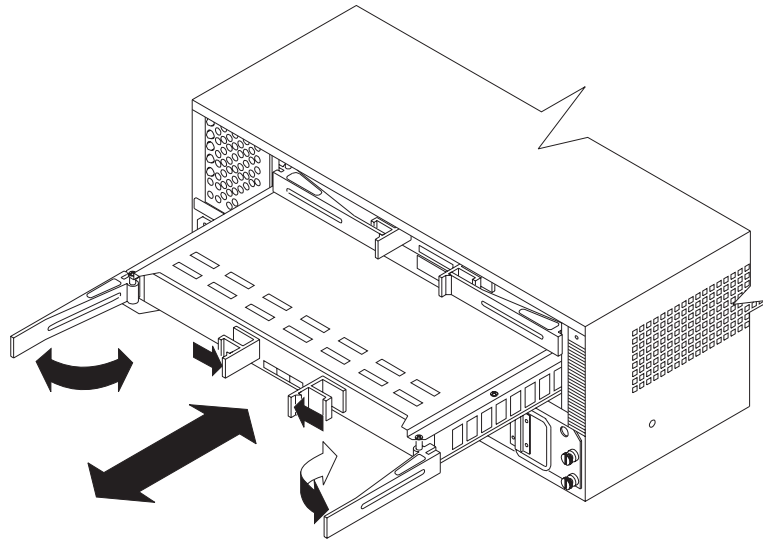
Figure 21. Removing and installing a RAID controller CRU

4. Remove the failed RAID controller.

5. Unpack and check the new RAID controller CRU.

Using the proper handling precautions, remove the RAID controller from the packing material.

6. Install the new RAID controller CRU.

7. Using the SYMplicity Storage Manager software, verify that the firmware version is the same level or newer than what was on the replaced RAID controller.

8. Restore the RAID controller operating status.

Use the SYMplicity Storage Manager software to bring the RAID controller back online and to perform any necessary recovery procedures. Check the LEDs on the RAID controller CRU to make sure the Fault LED remains off. If the Fault LED remains on, it might indicate that the new RAID controller has failed or that there is a controller backpanel problem. Try replacing the RAID controller with another one. If this does not resolve the problem, call for service.

9. Replace the front cover on the controller unit.

Cooling system

The controller unit *cooling system* includes the following components:

- Controller fan CRU
- Power supply fan CRU
- Chassis ventilation holes

These components cool the RAID controller s and power supplies by circulating air through the chassis. This section describes proper ventilation, the RAID controller fan CRU and power supply fan CRUs, and includes instructions for servicing the cooling system.

Controller Fan CRU

Power
ON

Power Supply
Fault

Fan
Fault

Controller
Fault

Fast Write
Cache

RAID
Controller 1

RAID
Controller 2
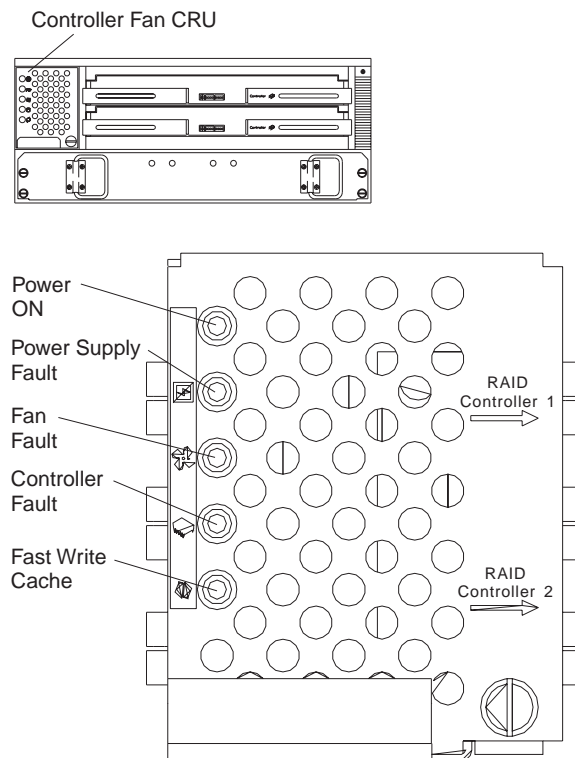
Figure 22. Controller unit cooling system

Cooling problems include any malfunctions or obstructions that impede air flow and cause one or more components in the controller unit to overheat. To avoid cooling problems, always keep the air vents free of obstructions. Also, make sure that the air temperature around the controller unit is within the environmental requirements. (Refer to "RAID controller fan and power supply fan servicing notes" on page 62.)

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. Always keep vents clean and free of obstruction.
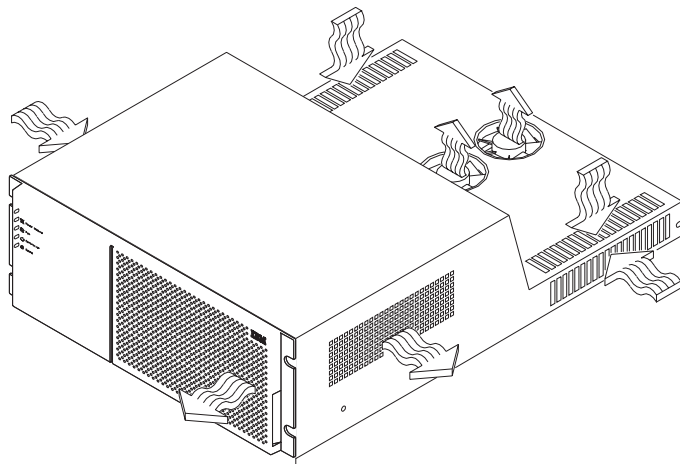
Figure 23. Air flow through chassis

RAID controller fan CRU

The *RAID controller fan CRU* is a single, removable unit containing two cooling fans, temperature monitoring logic, and five LEDs that provide overall system status information. The dual fans provide a redundant cooling system to both RAID controller CRUs. If one fan fails, the other will continue to operate, providing sufficient air circulation to prevent the controllers from overheating until you can replace the entire RAID controller fan CRU. The RAID controller fan CRU plugs directly into a slot on the front of the controller unit, to the left of the RAID controllers. It has a handle and captive screw for easy removal and installation.
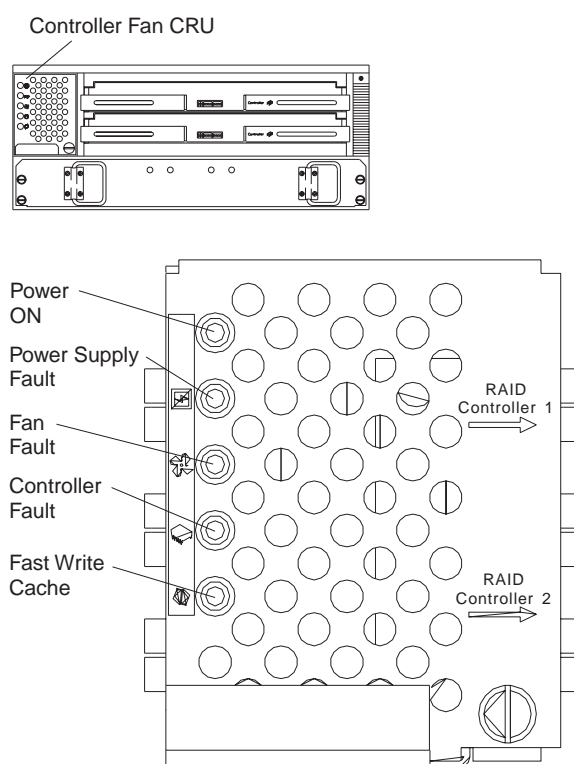
Figure 24. RAID controller fan CRU and status LEDs

Use this procedure to replace a failed RAID controller fan. Before replacing the fan, make sure it is plugged in correctly.

You will need the replacement RAID controller fan CRU and a screwdriver.

1. Read "RAID controller fan and power supply fan servicing notes" on page 62.

2. Unpack the new RAID controller fan.

Attention: Do not operate the controller unit without adequate ventilation and cooling to the RAID controllers. Operating the controller unit without proper cooling to the RAID controllers might damage their circuitry. You *must* shut down the controller unit to prevent overheating if you take more than 15 minutes to remove the RAID controller fan CRU and insert a new one.

3. Remove the failed RAID controller fan CRU.

Remove the front cover from the controller unit. Loosen the captive screw on the RAID controller fan CRU by turning it counterclockwise. If the thumbscrew is too tight, use a flat blade screwdriver to loosen it. Pull firmly on handle and remove CRU.
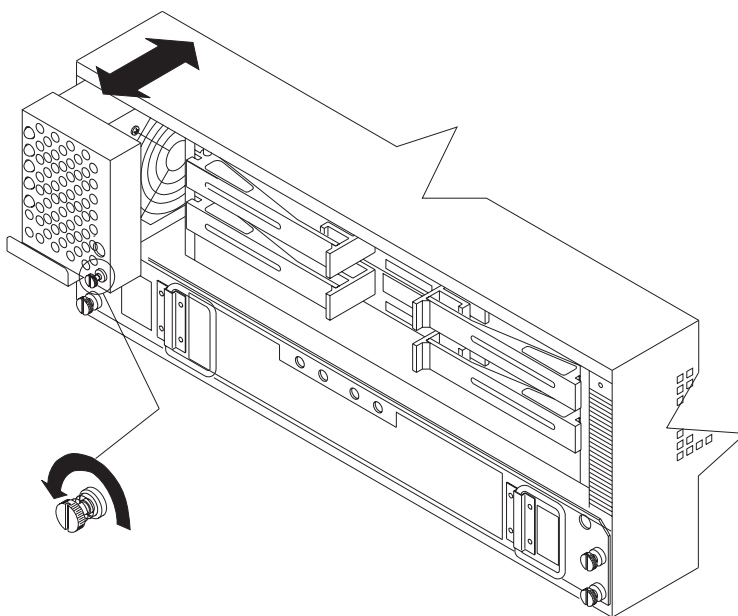
Figure 25. Removing and installing a RAID controller fan

4. Install the new RAID controller fan CRU.

Slide the new CRU into the slot and tighten the screw. The captive screw is spring-loaded and will not tighten unless the fan CRU is inserted all the way into the chassis. If the screw keeps spinning without tightening, push on the front of the fan CRU until it snaps into place – then tighten the captive screw.

5. Check the LEDs on the RAID controller fan CRU (see Figure 24 on page 41).

   The green Power ON LED should be on and the amber fault LEDs should be off.

   - If the amber Fan Fault LED is on, or the green power LED remains off, make sure that the CRU is inserted all the way into the chassis and the thumbscrew is tight.

   - If the Fan Fault LED remains on, it might indicate a problem with the new RAID controller fan CRU. Replace the RAID controller fan CRU with a spare, if available. If a spare is not available, turn off the controller unit to prevent it from overheating while you get a replacement fan.

6. Replace the front cover and close the door on the back of the rack.

Power supply fan CRU

Like the RAID controller fan, the *power supply fan CRU* is a single, removable unit that contains two cooling fans. The dual fans provide a redundant cooling system to both power supply CRUs. If one fan fails, the other will continue to operate. A single fan will provide sufficient air circulation to prevent the power supplies from overheating until you can replace the entire power supply fan CRU. The power supply fan CRU plugs directly into a slot on the back of the controller unit between the power supplies. It has a locking lever, which you unlatch to remove the power supply fan CRU.
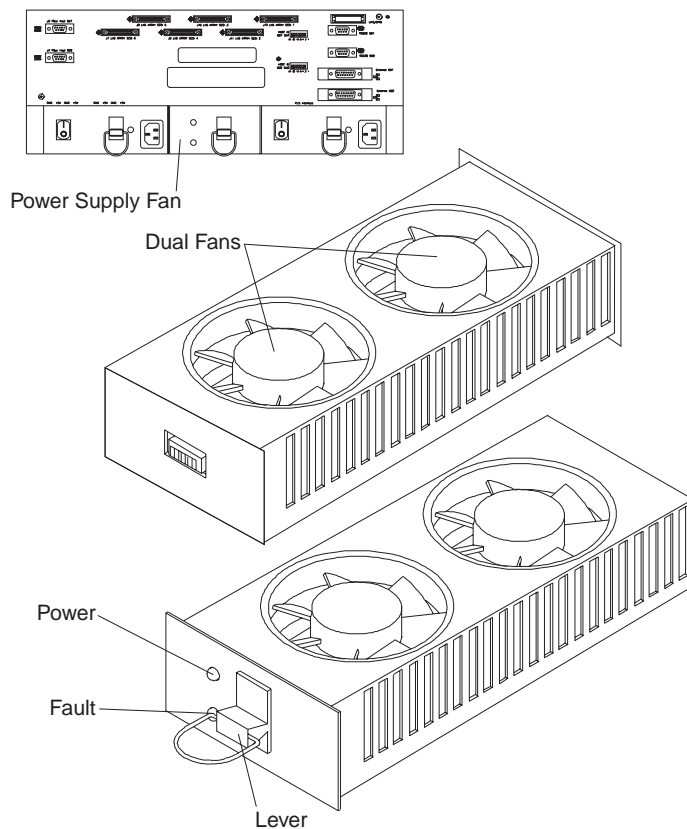
Figure 26. Power supply fan CRU

Power Supply
Fan Fault LED

Fan Fault LED

Power Module

Fan

Controller

Cache

IBM
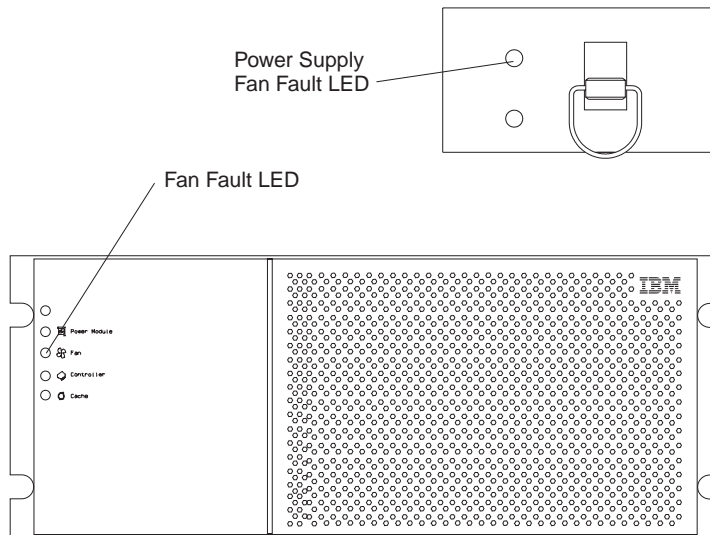
Figure 27. Power supply fan LEDs

Use this procedure to replace a failed power supply fan CRU. (Before replacing a fan, make sure the power supply fan is plugged in correctly.)

1. Read "RAID controller fan and power supply fan servicing notes" on page 62.

2. Unpack the new power supply fan CRU.

3. Remove the failed power supply fan CRU by lifting up on the latching lever and pulling the fan out of the controller unit.
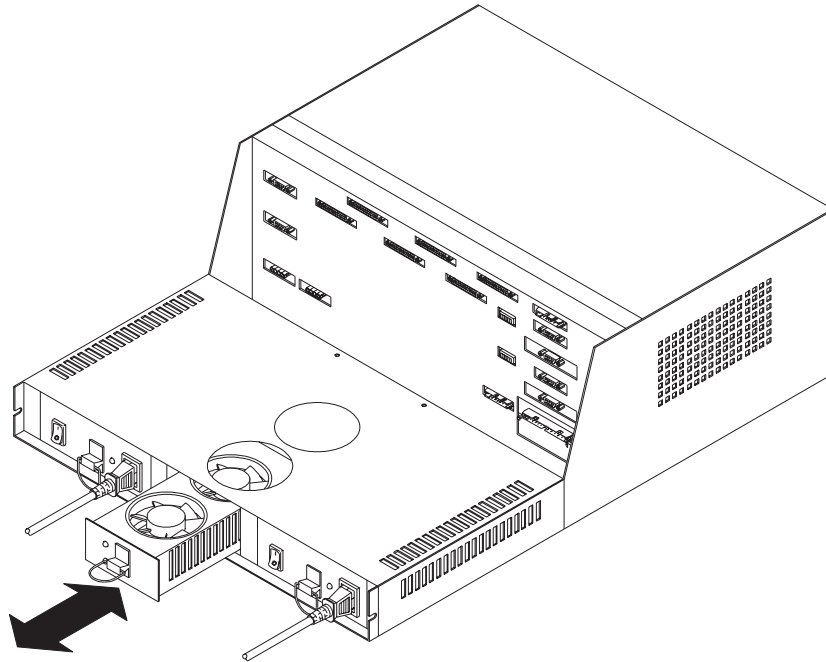
Figure 28. Removing and installing a power supply fan CRU

4. Install the new power supply fan CRU (see Figure 28).

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 it snaps into place.

5. Check the LEDs (see Figure 24 on page 41).

The green power LED should be on and the amber fault LEDs should be off. If the power LED remains off or the fault LED turns on, make sure that the power supply fan CRU is inserted all the way into the chassis and locked in place.

If this does not correct the problem (the fault LED remains on), it might indicate that the new fan CRU is malfunctioning. Replace the power supply fan CRU with another CRU. If a spare power supply fan CRU is not available, turn off the controller unit. This will prevent the power supplies from overheating while you get a replacement fan.

Power system

The controller unit *power system* includes the following hardware components:

- One battery CRU (see Figure 30 on page 48)
- Two power supply CRUs
- Two power cords (one for each power supply)

These components provide power to the RAID controllers and fans inside the chassis. This section describes the basic features of the battery and power supplies, and explains how to replace these components.

Power Supply Connectors   Battery
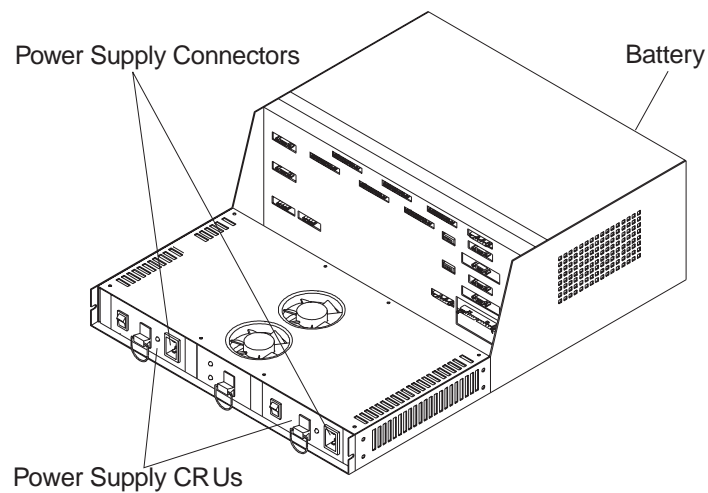
Power Supply CRUs

Figure 29. Controller unit power supply CRUs

Battery CRU

The controller unit contains a removable unit, called a *battery CRU*. This CRU contains rechargeable batteries and a battery-charger board. The battery CRU plugs into the front of the controller unit; it provides backup power to the cache memory for the RAID controllers. During a power outage, a properly charged battery CRU maintains electrical current to the RAID controllers for up to three days. All data stored in memory will be preserved as long as the batteries can sustain power to the cache memory.
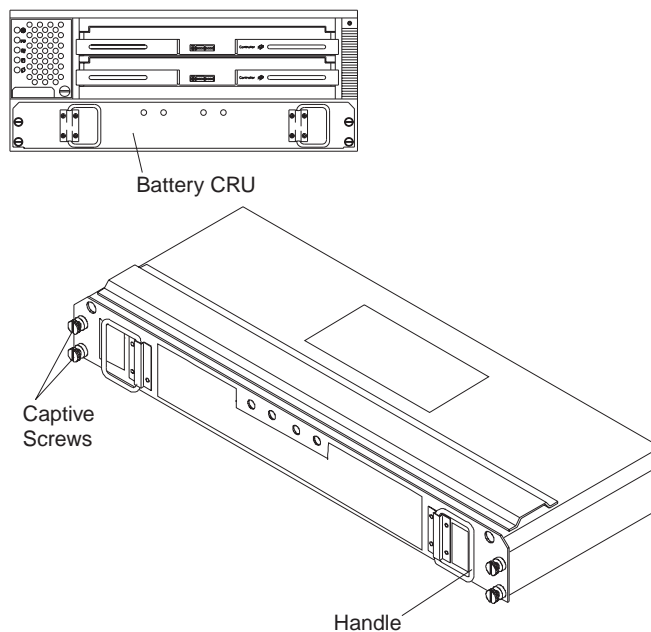
Figure 30. Battery CRU

Checking the battery service date

Note: Under normal circumstances, replace the battery CRU after three years. Using the controller unit in a hot environment that is above 35º C (or 95º F), lowers the battery CRU life expectancy. Under these conditions you might need to replace the battery more often.

Use this procedure to check the service date on the battery CRU.

1. Remove the front cover from the controller unit.

2. Check the "Installation Date" on the Battery Support Information label (see Figure 31 on page 49).

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

- **Date of manufacture** — the date the battery CRU was built at the factory

- **Date of installation** — the date the battery CRU was installed in the controller unit

  Look at the installation date. If it has been more than three years, install a new battery CRU using the instructions in "Replacing the battery CRU" on page 50. Otherwise, go to Step 3.

3. Replace the front cover on the controller unit.
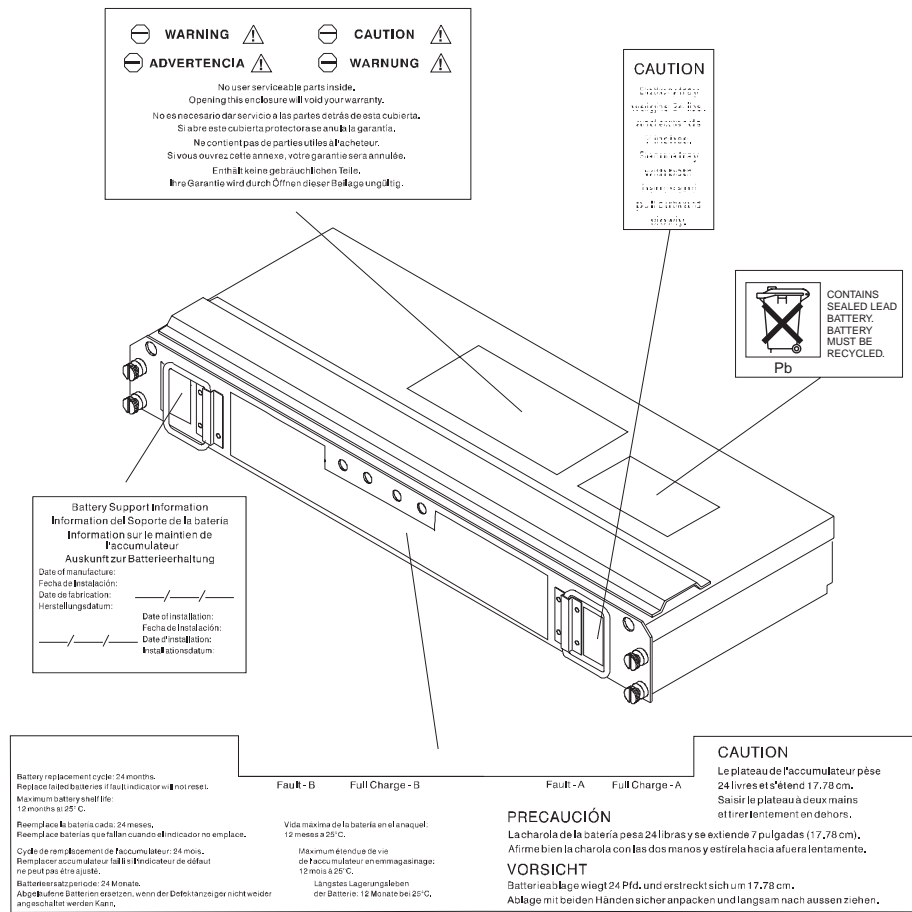
Figure 31. Battery CRU service labels

Replacing the battery CRU

Use this procedure to replace the battery CRU as part of routine maintenance or to replace a failed battery. You will need the replacement battery CRU and a flat blade screwdriver (optional).

1. Prepare the new battery.

Unpack the new battery CRU. Save the shipping material for transporting the used battery CRU to a disposal facility. Find the Battery Support Information label on the front of the new battery CRU. Record today's date on the blank line next to Date of Installation.

2. Remove the controller unit front cover.

Attention: The battery CRU weighs approximately 11 kg (24 lb). Make sure you are prepared to support its weight when you remove it from the chassis.

3. Remove the old battery CRU from the controller unit.

Turn the captive screws on the battery CRU counterclockwise. If they are too tight, use a flat blade screwdriver to loosen the screws. Pull the battery CRU out about 2 inches. Grasp the side with both hands and slide the battery out.
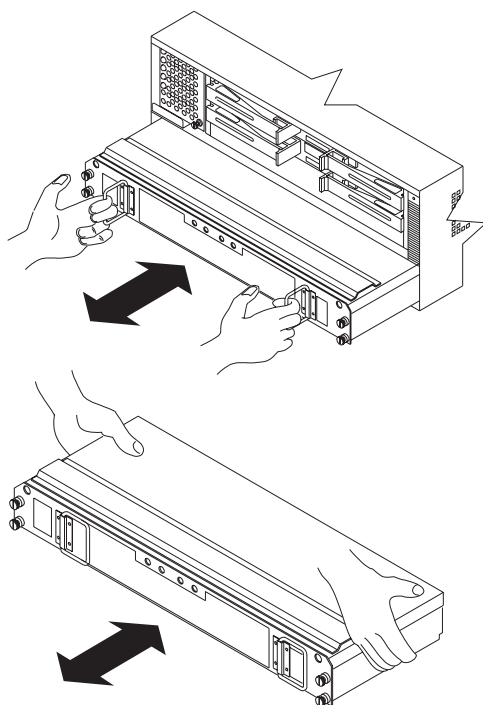
Figure 32. Removing and installing the battery CRU

4. Install the new battery (see Figure 32 on page 50).

Slide the new battery CRU into the slot and tighten all captive screws.

5. Replace the controller unit front cover.

6. Allow the system to run for at least 24 hours in order to properly charge the batteries.

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

7. Dispose of the old battery CRU.
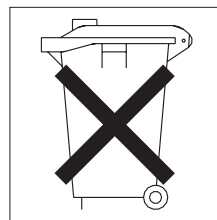
CONTAINS SEALED LEAD BATTERY. BATTERY MUST BE RECYCLED.

Pb

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

Attention: **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 might include procedures for handling batteries as hazardous waste.

Power supply CRU

Two *power supplies* in the controller unit provide electrical power to the internal components by converting incoming ac voltage to dc voltage. Both power supplies are contained in removable *power supply CRUs*. The CRUs slide into the two slots on the back of the controller unit and plug directly into the *power interface board.*

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 source redundancy. The power supplies are interchangeable and redundant. This means that one power supply maintains electrical power to the controller unit if the second power supply shuts down or malfunctions. In addition, you can hot swap the redundant power supplies, which means you can replace a failed power supply while the controller unit is operating.

Power Supply CRUs

Power Switch

Lever

Power LED

Power Connector
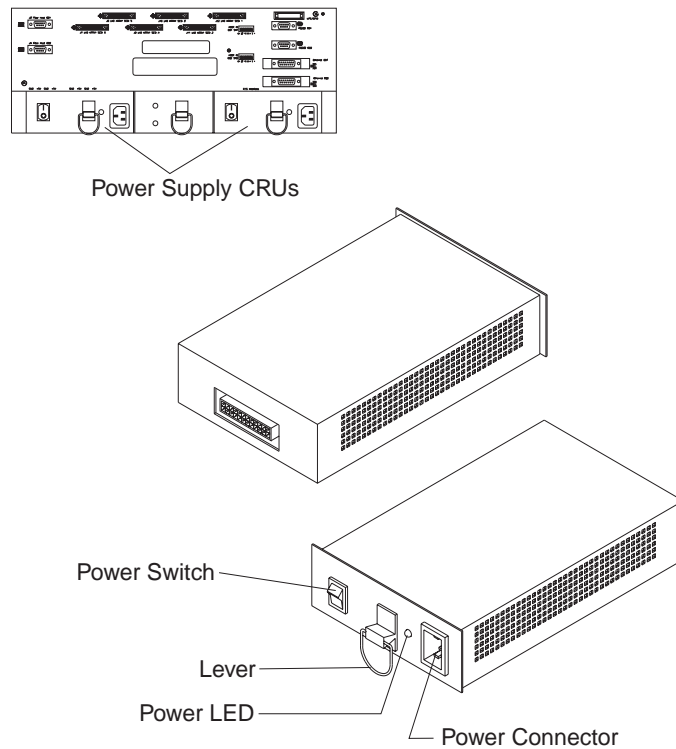
Figure 33. Power supply CRUs

Power supply recovery notes

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 the temperature exceeds 70° C (158° F), the second power supply shuts down, which turns off all power to the controller unit.

Attention: There is a serious problem in the rack enclosure if the air temperature inside the rack is hot enough to cause the power supplies to shut down.

Once the air temperature cools to below 70° C (158° F), the power supplies automatically restart. An automatic restart resets the RAID 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.

Replacing a failed power supply

Use this procedure to replace a failed power supply.

1. Remove the access panel from the back of the rack enclosure.

2. Check the LEDs on the front and back of the controller unit.

   If a power supply has failed, the amber power supply LED on the front cover is turned on and the green power LED on the failed power supply is turned off.
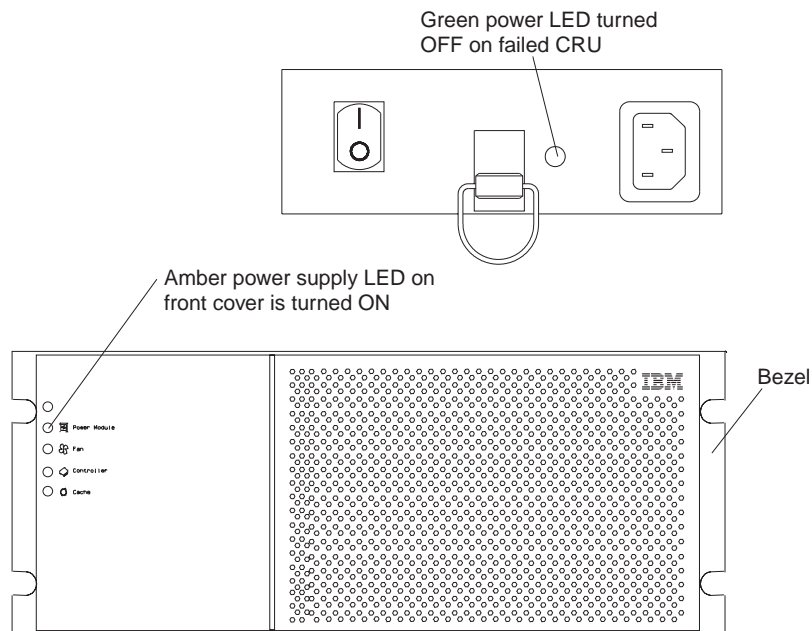
Figure 34. Fault indicators for a failed power supply

3. Turn off the power switch and unplug the power cord from the failed power supply (see Figure 35 on page 55).
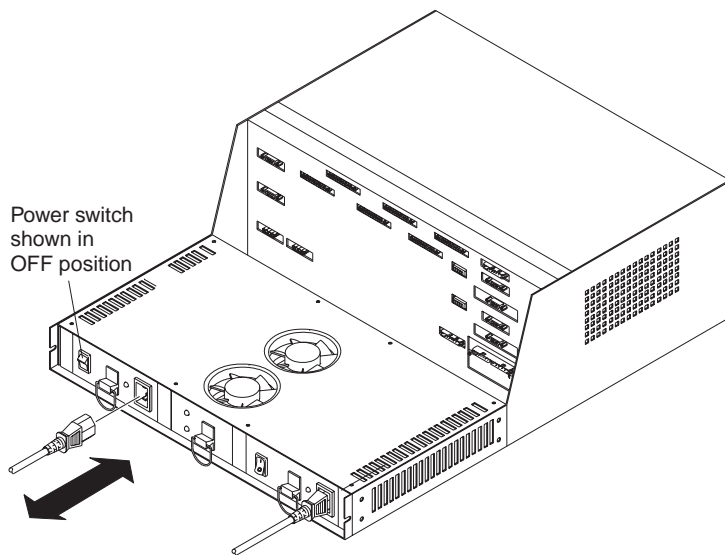
Figure 35. Power supply switches and power cords

1

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

To avoid a shock hazard:

**Disconnect the attached power cords, telecommunications
systems, networks, and modems before you open the device
covers, unless instructed otherwise in the installation and
configuration procedures**

4. To remove the failed power supply, pull up the ring to release the CRU and slide the
CRU out.
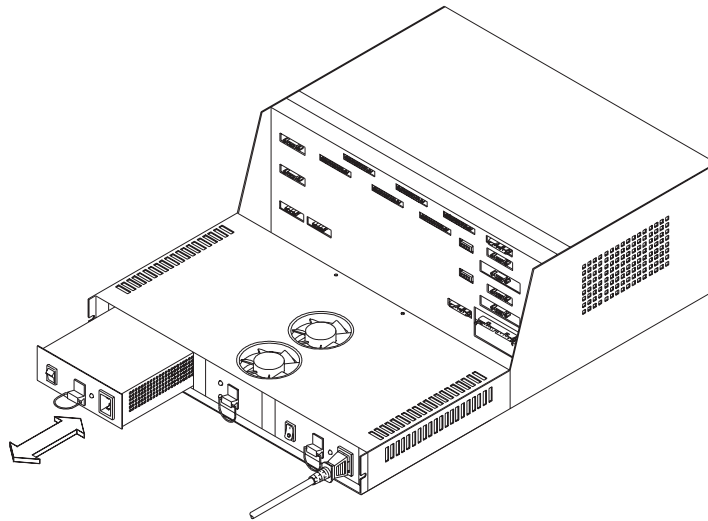
Figure 36. Removing and installing a power supply CRU

5. Unpack the new power supply, then push the CRU into the slot until the lever locks in place (see Figure 36).

6. Plug in the power cord and turn on the power (see Figure 35 on page 55).

7. Check the new power supply and other controller unit LEDs for faults.

8. Replace the back door on the rack, as necessary.

Moving the controller unit

You might need to move the controller unit under the following circumstances:

• Moving the controller unit to a new location

• Removing one or more CRUs during a service procedure or to make the controller unit easier to lift.

Perform the following preparatory tasks before moving the controller unit to a new location. These will help safeguard the equipment and ensure a smoother transition to the new environment. These tasks include:

• Always make sure that all I/O activity to and from the controller unit has stopped.

• Shut down all devices in the rack.

- Turn off both power supply switches on the rear of your controller unit.

- Unplug the controller unit before moving it to the new location.

- Follow any additional installation and safety instructions that come with the rack.

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

4

⚠

CAUTION:
Use safe practices when lifting.

To remove the controller unit from the rack, see "Installing the controller unit" on page 14 and reverse the directions:

1. Remove the front bezel.

2. Remove the CRUs from the controller unit.

3. Loosen the two screws from the rear of the controller unit.

4. Remove the two 6-32 flat-head screws from the inside of the front sides.

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

5. Slide the controller unit out of the rack.

Chapter 5. Troubleshooting quick reference

This chapter provides problem symptoms, possible causes, and troubleshooting procedures. It also contains additional servicing information.

Identifying interface problems

Interface problems include any malfunctions that delay, interrupt, or prevent successful input/output (I/O) activity between the hosts and other devices on the Fibre Channel loop. This includes transmissions between the controller unit and drive enclosures attached to it. For the purpose of this discussion, the controller unit *interface components* include:

- Internal components:

    - One or two RAID controllers

    - RAID controller board cage (includes controller backpanel)

- External connections:

    - Fibre Channel host adapters, cables, terminators, and hub or switching devices

    - SCSI drive cables

Interface problems on any computer system can be divided into two main categories:

- *Software problems* that hamper communications typically involve one or more of the following elements:

    - Host operating system software error

    - Disk array or other application error

    - Incorrect configuration settings

- *Hardware problems* that might disrupt communications include the following elements:

    - Loose, disconnected, or damaged interface cables or connectors

    - Improper interface ID settings (hardware switches)

    - Failed RAID controllers, memory modules, or controller unit backpanel

    - Failed drive enclosures, host-adapter boards, or other devices on the Fibre Channel loops

Troubleshooting interface problems

The first step is to determine whether the interface problem is caused by hardware or software. Hardware problems indicate defective equipment. Software problems indicate operating system or disk-array application errors. To isolate the problem, do the following:

1. If the interface problem occurred during or immediately following a software activity, try to undo whatever the software did; then step through each software function (in small increments) until the problem occurs again. This will help identify the function that is working incorrectly.

2. If the interface problem occurred without an apparent software-related activity, check the operating system and SYMplicity Storage Manager software for error messages and associated procedures.

3. Check the controller unit for faults (see "Using the status LEDs" on page 27). If any amber LEDs are on, go to Table 3 "RAID controller troubleshooting chart" on page 63 for instructions.

4. Check all interface cables, especially the host Fibre Channel cables, to make sure they are securely connected and undamaged.

5. If you have moved the controller unit to another location or attached new devices to it, check the following:

   a. Host ID settings for both RAID controllers. Although Fibre Channel will move conflicting addresses, make sure these settings are unique.

   b. Interface cable connections. Make sure all cables are routed correctly. Change the cable connections as necessary. See Appendix B on page 93 for information on interface cable routing and connections to the controller unit.

Problems resulting from a defective host adapter board, RAID controller, memory module, or controller backpanel might be difficult to detect. If checking all the items listed above does not identify the problem, go to the Troubleshooting tables starting on page 63.

RAID controller servicing notes

Consider the following when servicing the RAID controllers in the controller unit:

- Always use proper precautions against electrostatic discharge before removing and handling the RAID controller CRUs or other components inside the controller unit.

- Always read pertinent documentation. This includes online instructions on replacing failed RAID controllers and documentation shipped with the replacement controller RAID CRU, particularly the kit instructions. Kit instructions often contain the most current service information.

- Interface cables and RAID controllers are user replaceable. However, the memory modules and controller board cage assembly, which includes the controller unit backpanel, must be serviced ONLY by a qualified, trained service technician.

- You can *hot swap* a failed RAID controller (replace it while the controller unit is turned on and operating) as long as the failed RAID controller meets both of the following conditions:

  a. Is one of a *redundant pair* (two RAID controllers attached to the same host).

  b. Has a passive or active/failed status in the SYMplicity Storage Manager software.

- If cache mirroring is enabled in a redundant pair of RAID controllers and one RAID controller fails, the second RAID controller will assume processing functions without data loss. However, some or all data might be lost if either of the following conditions occurs:

  a. A catastrophic controller failure occurs in a controller unit that has only one RAID controller.

  b. Cache mirroring is disabled and a failure occurs before data can be written from cache memory to disk.

- Remove the front cover (see Figure 6 on page 11) to service the RAID controllers or view the LEDs on each CRU.

- Make sure that the new RAID controller is the same type (memory size, firmware version, and so on) as the one you are replacing. If you have two RAID controllers, make sure they are both the same firmware version and memory size.

- A RAID controller fault might be due to a failed memory module. If this occurs, call for service.

Battery servicing notes

Replace the battery whenever it fails to hold a charge. The service label on the battery CRU provides a blank line for recording the last date on which the battery was replaced. If you replace the battery CRU and still experience battery-related problems, such as loss of battery power to the RAID controllers or batteries not charging properly, the controller unit might have defective battery components, such as the battery harness or the battery connection to the controller backpanel, power harnesses, or power interface board.

Attention: The battery CRU is a sealed canister with no user-serviceable parts inside. When servicing the battery CRU, replace the entire CRU, not individual batteries or parts. Opening the battery CRU will void your warranty.

RAID controller fan and power supply fan servicing notes

You can *hot swap* the RAID controller fan and power supply CRUs (replace them while the controller unit is turned on and running), as long as you complete the exchange within 15 minutes. The time limit only applies to the total time that the fan CRU is out of the chassis. The time begins when you remove the failed CRU and ends when you reseat the new one. This does not include the time it takes you to perform this entire procedure (for example, checking the LEDs).

Both fans failing simultaneously in the RAID controller fan CRU is unlikely. Such a failure would cause either one or both RAID controllers to overheat. Under these circumstances, the amber RAID controller LED on the front cover might turn on. Shut down the controller unit immediately and let the unit cool to room temperature. Replace the RAID controller fan (see page 45) and turn on the power. Check the controller Fault LED. It should remain off. If the Fault LED stays on, replace the RAID controller (see the procedure on page 35.)

Both fans in the power supply fan CRU failing simultaneously is unlikely. Such a failure would cause one or both power supplies to overheat. Under these circumstances, the amber power supply LED on the front cover turns on and the overheated power supply automatically shuts down (its green power LED turns off). Once the ambient air temperature cools to below 70° C (158° F), the power supply automatically turns on. Replace the failed power supply fan using the procedure on page 45, then check the power supply LEDs (fault LED on the front and power LED on the back). If the power supply fault LED remains on, replace the power supply using the instructions on page 54.

Troubleshooting controller unit problems

You can use the following troubleshooting tables, along with Figure 24 on page 41 and Figure 27 on page 45 to identify possible causes for controller unit problems.

Table 3: RAID controller troubleshooting chart

Symptom	Possible cause	Possible solution
The controller LED on the front cover is on.	A. A RAID controller CRU is missing or unplugged.	1. Check the Power LEDs on both RAID controller CRUs. If both Power LEDs are on, go to cause B. If one Power LED is off, make sure that the CRU is plugged in correctly and its handles are locked in place. 2. If the Power LED remains off or the Fault LED turns on, go to cause B.
	B. A RAID controller CRU failed.	1. Check the Fan LED on the front cover. If it is on, go to "Cooling troubleshooting chart" on page 65. If not, go to the next step. 2. Replace the failed RAID controller CRU using the instructions on page 35. 3. If the Fault LED remains on after replacing the RAID controller, go to cause C or D.
	C. One or more memory modules failed.	Call for service.
	D. The controller backpanel failed.	Call for service.
Software issued a RAID controller error message.	A RAID controller CRU failed.	1. Check the Fan LED on the front cover. If it is on, go to "Cooling troubleshooting chart" on page 65. If not, go to the next step. 2. Replace the failed RAID controller CRU using the instructions on page 35.

Table 3: RAID controller troubleshooting chart (continued)

Symptom	Possible cause	Possible solution
The controller Fault LEDs on the front cover and on the RAID controller CRU are on.	A. A RAID controller CRU is missing or not installed correctly.	1. Check the Power LEDs on both RAID controller CRUs. If one Power LED is off, make sure that the CRU is plugged in correctly and its handles are locked in place. 2. If the RAID controller CRUs Power LED remains off, a CRU Fault LED turns on, or both RAID controllers look normal, yet the RAID controller LED on the front cover remains on, go to cause B.
	B. A RAID controller failed.	Replace the failed RAID controller CRU using the instructions on page 35. If this does not fix the problem, go to cause C or D.
	C. One or more memory modules failed.	Call for service.
	D. The controller backpanel failed.	Call for service.
The fan LED on the front cover is lit.	One of the fan CRUs has failed.	1. Check the LEDs on the front cover (Figure 34 on page 54) to determine whether the RAID controller fan or power supply fan has failed. 2. If the fan LED is on, look at the LEDs on the power supply fan CRU, go to step a or b. If a different LED is lit on the front cover, go to "RAID controller CRU, slots, and LEDs" on page 35. a. If the RAID controller fan CRU Fault LED is on, go to the replacement procedure on page 41. b. If the power supply fan CRU Fault LED is on, go to page 45.

Table 4:   Cooling troubleshooting chart

Symptom	Possible cause	Possible solution
The RAID controller Fault and Fan LEDs on the front cover are on.	A. Both a RAID controller and the RAID controller fan failed.	1. Check both RAID controller CRUs for Fault LEDs, then replace the failed RAID controller CRU using the instructions on page 35. 2. After replacing the failed RAID controller, check the LEDs on the front cover. If the Fan LED is still on, replace the RAID controller fan CRU using the instructions on page 41.
	B. A RAID controller fan failed causing one or both RAID controllers to overheat.	1. Stop all activity to the RAID controller unit and turn off the power. 2. Replace the failed RAID controller fan CRU using the instruction on page 41. 3. Allow the controller unit to cool, then turn on the power. 4. Check both RAID controller CRUs for Fault LEDs. If a RAID controller Fault LED turns on, replace the failed RAID controller CRU using the instructions on page 35.

Table 4: Cooling troubleshooting chart (continued)

Symptom	Possible cause	Possible solution
The Fan LED on the front cover is on.	A. A power supply fan CRU is missing or unplugged.	1. Make sure the power supply fan CRU is plugged in correctly. 2. Check the LEDs on the power supply fan CRU. The Power LED should be on and the Fault LED should be off. If so, go to cause C. If the Power LED is off or the Fault LED is on, go to cause B.
	B. A power supply fan CRU has failed.	Replace the power supply fan CRU using the instructions on page 45.
	C. A RAID controller fan CRU is missing or unplugged.	1. Make sure the RAID controller fan CRU is plugged in correctly. 2. If the Power LED remains off, it indicates a failed RAID controller fan CRU. Go to cause D.
	D. A RAID controller fan CRU has failed.	Check the Fault LED on the RAID controller fan CRU. If the Fault LED is on, replace the RAID controller fan CRU using the instructions on page 41.
	E. Circuitry failed or the Power LED is burned out on the RAID controller fan CRU.	Replace the RAID controller fan CRU using the instructions on page 41.

Table 4: Cooling troubleshooting chart (continued)

Symptom	Possible cause	Possible solution
The RAID controller and Fan LEDs on the front cover are on.	A. Both a RAID controller and the RAID controller fan failed.	1. Check both RAID controller CRUs for Fault LEDs; then replace the failed RAID controller CRU using the instructions on page 35. 2. After replacing the failed RAID controller, check the LEDs on the front cover. If the Fan LED is still on, replace the RAID controller fan CRU using the instructions on page 41.
	B. A RAID controller fan failed causing one or both RAID controllers to overheat.	1. Stop all activity to the controller unit and turn off the power. 2. Replace the RAID controller fan CRU using the instructions on page 41. 3. Allow the controller unit to cool; then turn on the power. 4. Check both RAID controller CRUs for Fault LEDs. If either Fault LED is on, replace the failed RAID controller CRU using the instructions on page 35.

Table 5: Power troubleshooting chart

Symptom	Possible cause	Possible solution
The Power LEDs on the front cover and power supply CRUs are on, but all other Power LEDs are off.	A. Other CRUs are missing or not installed correctly.	Check all CRUs in the controller unit and make sure they are installed securely. If this does not fix the problem, call for service.
	B. The dc power harness or power interface board failed.	Call for service.
	C. The controller backpanel failed.	Call for service.
Loss of battery backup during a power outage.	The battery failed or the battery CRU is missing.	Replace the battery CRU using the instructions on page 50.
No power to the controller unit (all Power LEDs are off).	A. The power switches are turned off.	1. Turn on both power switches on the controller unit. 2. Turn on the main circuit breakers in the rack, if applicable.
	B. The power cords are unplugged.	Check to make sure all power cords are plugged in securely.
	C. The power supplies overheated or failed.	1. Wait 10 minutes. If the power supplies turn on automatically, use the recovery procedure on page 73. If not, go to step 2. 2. Go to page 54 and replace the power supplies.
One power supply LED (CRU) is on and the other is off.	A. A power supply is turned off or unplugged.	Plug in the power cord and turn on the power switch. If the LED remains off, go to cause B.
	B. A power supply is overheated or failed.	1. Wait 10 minutes. If the power supply turns on automatically, use the recovery procedure on page 73. If not, go to step 2. 2. Replace the power supply CRU using the instructions on page 54.

Table 5: Power troubleshooting chart (continued)

Symptom	Possible cause	Possible solution
The amber power supply LED on the front of the controller unit is on.	A. A power supply is missing or not plugged in properly.	Insert and lock the power supply into place. If the fault LED is still on, go to cause B.
	B. A power supply is overheated or failed.	1. Wait 10 minutes. If the power supply turns on automatically, use the recovery procedure on page 73. If not, go to step 2. 2. Replace the power supply CRU using the instructions on page 54.
Power is on and working in the rack cabinet, but the controller unit has no power.	A. The controller unit is unplugged or turned off.	Plug in both power cords and turn on both power switches (see Figure 13 on page 21). If this does not resolve the problem, go to cause B.
	B. A power supply failed.	1. Check the power supply LED on the front cover. If it is on, go to the next step. 2. Look at the LEDs on both power supply CRUs. If a Fault LED is on, replace the failed power supply using the instructions on page 54. If both are off, go to the next symptom.
The power supply CRU LEDs are on, but all the other CRU LEDs are off.	A. The dc power harness has failed.	Call for service.
	B. The power interface board has failed.	Call for service.
The Fault-A or Full Charge-B LED on the battery CRU is on.	The left or right battery bank has failed.	Replace the battery CRU using the instructions on page 50.

Table 5:   Power troubleshooting chart (continued)

Symptom	Possible cause	Possible solution
The Full Charge-A or Full Charge-B LED on the battery CRU is off.	The left or right battery bank is not yet fully charged.	1. Turn on the power and allow the controller unit to run 24 hours in order to recharge the battery. 2. If after 24 hours, the Full Charge LED remains off or one of the Fault LEDs turns on, replace the battery CRU using the instructions on page 50.
A Battery Low error message was issued by the software.	A. Power has been turned off for an extended period and drained the battery power.	1. Turn on the power and allow the controller unit to run 24 hours to recharge the batteries. 2. If after 24 hours, the battery low error persists, replace the battery CRU using the instructions on page 50.
	B. The batteries are weak and the CRU is due for replacement.	Check the last service date for the battery CRU. If it has been three years since the battery was replaced, replace the battery CRU using the instructions on page 50**.**
The battery CRU is new, but will not hold a charge.	A. The battery charger board has failed.	1. Replace the battery CRU using the instructions on page 50. 2. Allow the system to run for at least 24 hours in order to properly charge the batteries. If this does not solve the problem, go to cause B.
	B. The battery harness has failed.	Replace the battery harness. This procedure must be performed by a qualified service technician only. Call for service.
Loss of battery backup during a power outage.	The battery has failed or the battery CRU is missing.	Replace the battery CRU using the instructions on page 50.

Table 5:   Power troubleshooting chart (continued)

Symptom	Possible cause	Possible solution
No power to the controller unit (all Power LEDs are off).	A. The power switches are turned off.	1. Turn on both power switches on the controller unit. 2. Turn on the main circuit breakers in the rack cabinet, if applicable.
	B. The power cords are unplugged.	Make sure all power cords are plugged in securely.
	C. The power supplies overheated or failed.	1. Wait 10 minutes. If the power supplies turn on automatically, use the recovery procedure on page 73. If not, go to step 2. 2. Go to page 54 and replace the power supplies.
One power supply LED is on and the other is off.	A. A power supply is turned off or unplugged.	Plug in the power cord and turn on the power switch. If the LED remains off, go to cause B.
	B. A power supply is overheated or failed.	1. Wait 10 minutes. If the power supplies turn on automatically, use the recovery procedure on page 73. If not, go to step 2. 2. Replace the power supply CRU using the instructions on page 54.
The power supply LED on the front cover is on.	A. A power supply is missing or not plugged in properly.	Insert and lock the power supply into place. If the fault LED is still on, go to cause B.
	B. A power supply is overheated or failed.	1. Wait 10 minutes. If the power supplies turn on automatically, use the recovery procedure on page 73. If not, go to step 2. 2. Replace the power supply CRU using the instructions on page 54.
The Fault-A or Fault-B LED on the battery CRU is on.	The left or right battery bank has failed.	Replace the battery CRU using the instructions on page 50.

Table 6: Software troubleshooting chart

Symptom	Possible cause	Possible solution
Software errors occur when attempting to access RAID controllers or drives.	A. Software function or configuration problems.	Check the appropriate software and documentation to make sure the system is set up correctly or that the proper command was executed.
	B. The controller unit power switches or main circuit breakers in the rack cabinet are turned off.	Make sure that all power switches are turned on.
	C. The interface cables are loose, disconnected, or defective.	Check all the cables between the host, controller unit, drive enclosures, and other devices on the network. Make sure they are undamaged (particularly fiber optic cables) and securely attached.
	D. The ID settings are incorrect.	Make sure that the Fibre Host IDs and SCSI Drive IDs are set properly for all devices, particularly if you just removed or added a new device to the loop.
	E. A RAID controller or drive failed.	1. Check the controller unit for a RAID controller fault. If the RAID controller LED on the front cover is turned on, replace the RAID controller CRU using the instructions on page 35. 2. Check the drive eclosure for a drive fault. If a failed drive is indicated, replace the drive using the instructions in the drive enclosure documentation.
	F. The controller backpanel has failed.	Call for service.

Table 6: Software troubleshooting chart (continued)

Symptom	Possible cause	Possible solution
The controller Fault LEDs on the front cover and on the RAID controller CRU are on.	A. A RAID controller CRU is missing or not installed correctly.	1. Check the Power LEDs on both RAID controller CRUs. If one Power LED is off, make sure that the CRU is plugged in correctly and its handles are locked in place. 2. If the RAID controller CRUs Power LED remains off, a CRU Fault LED turns on, or both RAID controllers look normal, yet the controller LED on the front cover remains on, go to cause B.
	B. A RAID controller failed.	Replace the failed RAID controller CRU using the instructions on page 35. If this does not fix the problem, call for service.
	C. One or more memory modules failed.	Call for service.
	D. The controller backpanel failed.	Call for service.

Recovering from a power supply shutdown

Use this procedure to regain normal system operation after a power supply shutdown other than an automatic power supply shutdown.

1. Remove the access panel from the back of the rack.

2. Answer the following questions:

    a. Does the current problem match one of the conditions listed below?

- One power supply has shut down.

  The Power LED on the CRU and the Power Supply LED on the front cover are off.

- Both power supplies have shut down.

  All power to the controller unit is off, but the drives are operating without fault.

- Power supplies are shutting down and restarting.

  One or both power supplies shut down, then turn on again automatically.

- The air temperature at the back of the controller unit is 70º C (158º F) or higher.

  Yes: Go to Step 3.

  No: Go to question b.

b. Are both power cords plugged in securely to the controller unit and to ac units in the rack or to external ac outlet?

- **Yes**: Go to question c.

- **No**: Correct the problem and continue normal operation.

c. Is the Power Supply LED located on the front cover lit?

- **Yes:** This indicates a failed power supply. Go to "Replacing a failed power supply" on page 54.

- **No:** Go to Table 5 "Power troubleshooting chart" on page 68.

Attention: **If the air temperature inside the rack is hot enough to cause the power supplies to shutdown, 70º C (158º F) or above, there is a serious problem in the rack.** Remove all panels from the rack immediately to help cool the controller unit and drives. Do whatever is necessary to alleviate the over-temperature problem (such as shutting down the power or using external fans to cool the area).

3. Cool the area to a normal operating temperature; then check the power supplies.

If the Power LED on one or both power supplies turns on again, go to Step 4. If the power supply (or both power supplies) remain off, it might indicate a faulty power cord, a failed power supply (see page 54), or a failed power interface board. Call for service.

4. Check the system for faults or damage.

When the power supplies restart, check all the LEDs on the controller unit and the attached drive enclosures.

Chapter 6. Getting help, service, and information

If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

For example, IBM maintains pages on the World Wide Web where you can get information about IBM products and services, find the latest technical information, and download device drivers and updates. Some of these pages are:

http://www.ibm.com	Main IBM home page
http://www.pc.ibm.com	IBM Personal Computing
http://www.pc.ibm.com/support	IBM Personal Computing Support
http://www.pc.ibm.com/us/desktop/	IBM Commercial Desktop (U.S.)
http://www.pc.ibm.com/us/intellistation/	IBM IntelliStation (U.S.)
http://www.pc.ibm.com/us/netfinity/	IBM Netfinity and PC Servers (U.S.)
http://www.pc.ibm.com/us/options/	IBM Options (U.S.)

You can select a country-specific Web site from these pages.

Help is also available from bulletin boards and online services, as well as by fax and telephone. This section provides information about these sources.

Services available and telephone numbers listed are subject to change without notice.

Service support

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Personal Computer HelpCenter (1-800-772-2227 in the U.S.) for hardware product assistance covered under the terms of the IBM Statement of Limited Warranty. See "Getting help by telephone" on page 79 for HelpCenter telephone numbers in other countries.

The following services are available during the warranty period:

- Problem Determination - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.

- IBM Hardware Repair - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.

- Engineering Change Management - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make Engineering Changes (ECs) available that apply to your hardware.

Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- Machine Type and Model

- Serial numbers of your IBM hardware products

- Description of the problem

- Exact wording of any error messages

- Hardware and software configuration information

If possible, be at your computer when you call.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts

- All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.

- Identification of software problem sources

- Configuration of BIOS as part of an installation or upgrade

- Changes, modifications, or upgrades to device drivers

- Installation and maintenance of network operating systems (NOS)

- Installation and maintenance of application programs

Refer to the IBM Statement of Limited Warranty for a full explanation of IBM's warranty terms.

Before you call for service

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your computer or software. Also, be sure to read the information in any README files that come with your software.

Most computers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your computer also contains information about the diagnostic tests you can perform.

If you receive a POST error code when you turn on your computer, refer to the POST error-message charts in your hardware documentation. If you do not receive a POST error code, but suspect a hardware problem, refer to the troubleshooting information in your hardware documentation or run the diagnostic tests.

If you suspect a software problem, consult the documentation (including README files) for the operating system or application program.

Getting customer support and service

Purchasing an IBM PC hardware product entitles you to standard help and support during the warranty period. If you need additional support and services, a wide variety of extended services are available for purchase that address almost any need.

Using the World Wide Web

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

   http://www.pc.ibm.com

You can find support information for your IBM products, including supported options, on the IBM Personal Computing Support page at:

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

If you select Profile from the support page, you can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable Files. You will have the information you need, all in one place. In addition, you can choose to receive e-mail notifications whenever new information becomes available about your registered products. You also can access online support forums, which are community sites monitored by IBM support staff.

For information about specific Personal Computer products, visit the following pages:

   http://www.pc.ibm.com/us/intellistation/

   http://www.pc.ibm.com/us/desktop/

   http://www.pc.ibm.com/us/netfinity/

http://www.pc.ibm.com/us/thinkpad/

http://www.pc.ibm.com/us/options/

http://www.pc.ibm.com/us/aptiva/

You can select a country-specific Web site from these pages.

Using electronic support services

If you have a modem, you can get help from several popular services. Bulletin boards and online information services provide assistance through question-and-answer message areas, live chat rooms, searchable databases, and more.

Technical information is available on a wide range of topics, such as:

- Hardware setup and configuration

- Preinstalled software

- OS/2, DOS, and Windows

- Networking

- Communications

- Multimedia

In addition, the latest device driver updates are available.

The IBM Bulletin Board System (BBS) can be reached 24 hours a day, 7 days a week. Modem speeds of up to 14,400 baud are supported. Long distance telephone charges might apply. To access the IBM BBS:

- In the U.S., call 1-919-517-0001.

- In Canada:
    –In Montreal, call 514-938-3022.
    –In Toronto, call 905-316-4255 or 416-956-7877.
    –In Vancouver, call 604-664-6464.

- In the U.K., call 01256 336655.

Commercial online services, such as America Online (AOL), containing information about IBM products. (For AOL, use the "Go to" keyword **IBM Connect**.)

Getting information by fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada you can receive by fax marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs). You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine.

To access the IBM Automated Fax System, do the following:

- In the U.S., call 1-800-426-3395.

- In Canada, call 1-800-465-3299.

Getting help online

Online Housecall is a remote communication tool that allows an IBM technical-support representative to access your PC by modem. Many problems can be remotely diagnosed and corrected quickly and easily. In addition to a modem, a remote-access application program is required. This service is not available for servers. There might be a charge for this service, depending on the request.

For more information about configuring your PC for Online Housecall:

- In the U.S., call 1-800-772-2227.

- In Canada, call 1-800-565-3344.

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

Getting help by telephone

During the warranty period, you can get help and information by telephone through the IBM PC HelpCenter. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your computer and IBM monitor

- Installing and setting up IBM options purchased from IBM or an IBM reseller

- 30-day, preinstalled-operating-system support

- Arranging for service (on-site or carry-in)

- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased an IBM PC Server or IBM Netfinity Server, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system

- Installing and configuring interface cards

- Installing and configuring network adapters

Please have the following information ready when you call:

- Machine Type and Model

- Serial numbers of your computer, monitor, and other components, or your proof of purchase

- Description of the problem

- Exact wording of any error messages

- Hardware and software configuration information for your system

If possible, be at your computer when you call.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.[1]

Country	Telephone number
Austria	1-546 585 075
Belgium - Dutch	02-717-2504
Belgium - French	02-717-2503
Canada	1-800-565-3344
Denmark	3-525-6905
Finland	9-22-931805
France	01-69-32-40-03
Germany	069-6654-9003
Ireland	01-815-9207

---

1. Response time will vary depending on the number and complexity of incoming calls

Italy	02-4827-5003
Luxembourg	298-977-5060
Netherlands	020-504-0531
Norway	2-305-3203
Portugal	01-791-5147
Spain	091-662-4270
Sweden	08-632-0063
Switzerland - German	01-212-1810
Switzerland - French	022-310-0418
Switzerland - Italian	091-971-0523
United Kingdom	01475-555555
U.S.A. and Puerto Rico	1-800-772-2227

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

Getting help around the world

If you travel with your computer or need to move it to another country, you can register for International Warranty Service. When you register with the International Warranty Service Office, you will receive an International Warranty Service Certificate that is honored virtually worldwide, wherever IBM or IBM resellers sell and service IBM PC products.

For more information or to register for International Warranty Service:

- In the U.S. or Canada, call 1-800-497-7426.

- In Europe, call 44-1475-893638 (Greenock, U.K.).

- In Australia and New Zealand, call 61-2-9354-4171.

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

Purchasing additional services

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

Enhanced PC Support line

Enhanced PC Support is available for desktop and mobile IBM computers that are not connected to a network. Technical support is provided for IBM computers and IBM or non-IBM options, operating systems, and application programs on the Supported Products list.

This service includes technical support for:

- Installing and configuring your out-of-warranty IBM computer

- Installing and configuring non-IBM options in IBM computers

- Using IBM operating systems in IBM and non-IBM computers

- Using application programs and games

- Tuning performance

- Installing device drivers remotely

- Setting up and using multimedia devices

- Identifying system problems

- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more information about purchasing Enhanced PC Support, see "Ordering support line services" on page 83.

900-number operating system and hardware support

In the U.S., if you prefer to obtain technical support on a pay-as-you go basis, you can use the 900-number support line. The 900-number support line provides support for IBM PC products that are out of the warranty period.

To access this support, call 1-900-555-CLUB (2582). You will be notified of the charge per minute.

Network and Server Support line

Network and Server Support is available for simple or complex networks made up of IBM servers and workstations using major network operating systems. In addition, many popular non-IBM adapters and network interface cards are supported.

This service includes all of the features of the Enhanced PC Support Line, plus:

- Installing and configuring client workstations and servers

- Identifying system problems and correcting problems on the client or the server

- Using IBM and non-IBM network operating systems

- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more information about purchasing Network and Server support, see "Ordering support line services."

Ordering support line services

Enhanced PC Support Line and Network and Server Support Line services are available for products on the Supported Products list. To receive a Supported Products list:

- In the U.S.:

  1 Call 1-800-426-3395.

  2 Select document number 11683 for Network and Server support.

  3 Select document number 11682 for Enhanced PC support.

- In Canada, contact IBM Direct at 1-800-465-7999, or:

  1 Call 1-800-465-3299.

  2 Select the HelpWare catalog.

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

For more information or to purchase these services:

- In the U.S., call 1-800-772-2227.

- In Canada, call 1-800-465-7999.

- In all other countries, contact your HelpCenter.

Warranty and repair services

You can upgrade your standard hardware warranty service or extend the service beyond the warranty period.

Warranty upgrades in the U.S. include:

- Carry-in service to on-site service

  If your warranty provides carry-in repair service, you can upgrade to on-site repair service, either standard or premium. The standard upgrade provides a trained servicer within the next business day (9 a.m. to 5 p.m., local time, Monday though Friday). The premium upgrade provides 4-hour average response, 24 hours a day, 7 days a week.

- On-site service to premium on-site service

  If your warranty provides for on-site service, you can upgrade to premium on-site service (4-hour average on-site response, 24 hours a day, 7 days a week).

You also can extend your warranty. Warranty and Repair Services offers a variety of post-warranty maintenance options, including ThinkPad EasyServ Maintenance Agreements. Availability of the services varies by product.

For more information about warranty upgrades and extensions:

- In the U.S., call 1-800-426-4968.

- In Canada, call 1-800-465-7999.

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

Ordering publications

Additional publications are available for purchase from IBM. For a list of publications available in your country:

- In the U.S., Canada, and Puerto Rico, call 1-800-879-2755.

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

Appendix A. Controller specifications and requirements

This appendix describes the controller unit and the component specifications and requirements.

The following tables list the weight and dimension specifications of the controller unit. Figure 37 on page 86 shows the dimensions.

Table 7: Controller unit weight

Weight criteria	Controller unit weight		Individual component weight				
	Maximum	Empty	RAID controller	Battery	RAID controller fan	Power supply fan	Power supply
Unit	34.5 kg (76.0 lb)	14.3 kg (31.6 lb)	3.0 kg (6.6 lb)	9.7 kg (21.4 lb)	0.9 kg (1.9 lb)	0.7 kg (1.5 lb)	1.5 kg (3.3 lb)
Shipping	48.5 kg (107.0 lb)	28.4 kg (62.6 lb)	5.0 kg (11.0 lb)	11.8 kg (26.0 lb)	2.3 kg (5.0 lb)	2.1 kg (4.5 lb)	2.9 kg (6.5 lb)

Table 8: Controller unit dimensions

With front cover			Without front cover		
Height	**Width**	**Depth**	**Height**	**Width**	**Depth**
174 mm (6.8 in.)	483 mm (19.0 in.)	610 mm (24.0 in.)	174 mm (6.8 in.)	440 mm (17.3 in.)	610 mm (24.0 in.)
Shipping carton					
Height		**Width**		**Depth**	
480 mm (18.9 in.)		610 mm (24.0 in.)		845 mm (33.3 in.)	
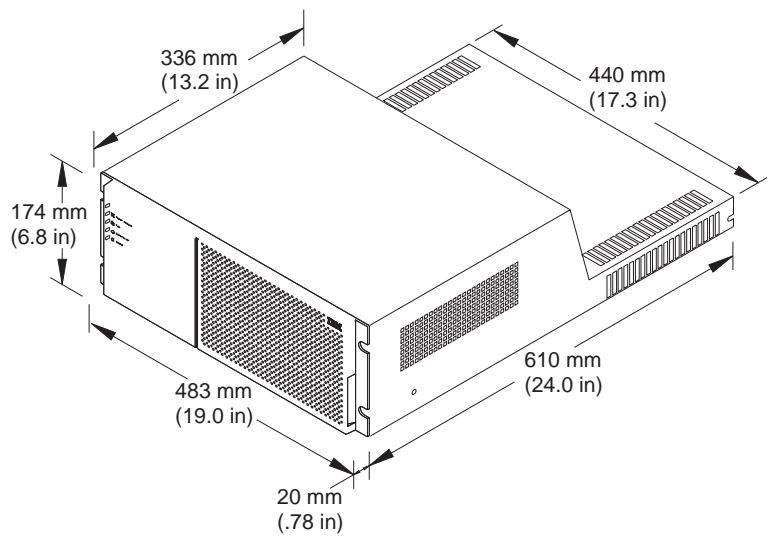
Figure 37. Controller unit dimensions

Controller unit CRU specifications

The following tables list the controller unit CRU specifications.

Table 9: RAID controller CRU specifications

Weight	Interface	Array support
Component weight: 3.0 kg (6.6 lb)	Host using MIA	Drive channels - 6
Shipping weight - 5.0 kg (11.0 lb)	• Fibre Channel	Drives per channel - 10
	• Fiber optic	Maximum no. of drives - 60
	• 1 host connection per RAID controller	RAID levels - 0, 1, 3, and 5
Power Requirement	Host using Ethernet	**Factory Settings**
+5 V dc; 7.0 A	• 1 Ethernet connection per RAID controller	• RAID controller A: Host ID 5
+12 V dc; 0.1 A		• RAID controller B: Host ID 4
	Drive	
Memory	• LVD SCSI 16-bit, Ultra2 synchronous	**Data Transfer Rates**
Processor/Cache Size - 32/ 128 MB	• 6 drive channels total	Fibre Channel host - 100 MB/sec maximum
	Service	LVD SCSI drive - 80 MB/sec (16-bit synchronous)
	• 1 RS-232 connection per RAID controller	

Table 10: RAID controller fan CRU specifications

Category	Criteria	Specification
Weight	Component weight	0.9 kg (1.9 lb)
	Shipping weight	2.3 kg (5.0 lb)
Power requirement	+5 V dc	0.07 A
	+12 V dc	0.7 A

Table 11: Power supply fan CRU specifications

Category	Criteria	Specification
Weight	Component weight	0.7 kg (1.5 lb)
	Shipping weight	2.1 kg (4.5 lb)
Power requirement	+5 V dc	0.02 A
	+12 V dc	0.65 A

Table 12: Battery CRU specifications

Category	Criteria	Specification
Weight	Component weight	9.7 kg (21.4 lb)
	Shipping weight	11.8 kg (26.0 lb)
Power requirement (input)	+5 V dc	0.07 A
	+12 V dc	2.5 A

Table 13: Power supply CRU specifications

Category	Criteria	Specification
Weight	Component weight	1.5 kg (3.3 lb)
	Shipping weight	2.9 kg (6.5 lb)
Power requirement	+12 Vdc	1.0 A (max. per CRU at 220 Vac)
		2.0 A (max. per CRU at 110 Vac)

Controller unit environmental requirements

Table 14 lists the temperature, humidity, heat output, and sound requirements for the controller unit.

Table 14: Environmental requirements

Element	Parameter	Requirement
Air temperature	System on	$0^{°}$ C to 35° C (0° F to $95^{°}$ F) Altitude: 0 to 914 m (3000 ft.)
	System on	$0^{°}$ C to $32^{°}$ C ($0^{°}$ F to $90^{°}$ F) Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)
	System off	$10^{°}$ C to $43^{°}$ C ($50^{°}$ F to $110^{°}$ F) Maximum altitude: 2133 m (7000 ft.)
Humidity	System on	8% to 80%; maximum wetbulb 23° C (73.4° F)
	System off	8% to 80%; maximum wetbulb 27° C (80° F) Altitude: 0 to 2133 m (0 to 7000 ft.)
Heat Output	Approximate heat output in British thermal units (Btu) per hour: 731.0 (0.329 kVA or 214.0 W)	
Sound	Sound power, idling and operating[1]	6.4 bel
	Sound pressure, idling and operating[1]	50 dBa

[1] 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.

Controller unit power requirements

Table 15 lists the electrical power requirements for the controller unit.

Table 15: Power requirements

Item	Parameter	Requirement	
Circuit breaker	3.0 A (slow-blow fuse per power supply)		
Controller unit ac power	Nominal voltage	100 to 240 V ac	
	Frequency	50/60 Hz	
	Idle current	1.0 A[1]	
	Maximum operating current	1.0 A[1]	
	Maximum surge current	2.0 A[1]	
Component dc power		**+5 V dc**	**+12 V dc**
	RAID controller	7.0 A	0.1 A (per RAID controller)
	Battery	0.07 A	2.5 A
	Controller fan	0.07 A	0.7 A
	Power supply fan	0.02 A	0.65 A (per fan CRU)
	Power supply	Low voltage: 2.0 A (max. per power supply at 220 V ac)	
		High voltage: 1.0 A (max. per power supply at 120 V ac)	

[1] Typical current at 240 V ac, 60 Hz (assumes 0.70 power efficiency, 0.99 power factor).

Site wiring and power considerations

The controller unit is a nominal 100 V ac to 240 V ac, 50/60 Hz unit that meets standard voltage requirements for operation both in and outside the U.S.A. It uses standard industrial wiring with a line-to-neutral or line-to-line power connection (see Table 16 on page 91).

Consider the following when preparing the site and rack for installation:

- **AC power source.** The ac power source must provide the correct voltage, current, and frequency specified on the manufacturer's nameplate. Internal ac distribution boxes (such as the rack power units) must be able to handle the power requirements for this unit (see Table 16 on page 91). You must have an independent ac power source for each power supply in the controller unit in order to maintain full redundancy.

- **Earth ground.** There must be an earth ground conductor on the ac power source.

- **Circuit overloading**. Make sure the power circuits and associated circuit breakers in both the rack and building provide sufficient power and overload protection. To prevent possible damage to the unit, isolate its power source from large switching loads (such as air conditioning motors).

- **Power interruptions**. The controller unit will withstand the following applied voltage interruptions:

  - Input transient: 50% of nominal voltage

  - Duration: one half cycle

  - Minimum frequency: once every 10 seconds

- **Power failures** — Once power is restored after a complete power failure, the unit will automatically perform a power-up recovery sequence without operator intervention.

Table 16: Site wiring voltages

Input Power	50 Hz			60 Hz		
	Nominal	Minimum	Maximum	Nominal	Minimum	Maximum
Single phase line-to-neutral	100	90	107	100	90	107
	127	114	136	120	104	127
	220	198	235			
	230	207	246			
	240	216	257			
Single phase line-to-line	200	180	214	200	180	214
				208	180	220
				240	208	254

Interface cable requirements

Table 17 lists the fibre channel interface cable requirements.

Table 17: Fibre channel interface cable requirements

Cable Descriptions				
Item	**Media type**	**Data size**	**Transfer speed**	**Range**
Fiber optic (multimode, 50 micrometer)	Shortwave laser	100 MB/sec	1062.5 Mbaud	up to 500 m

Appendix B. Rack cabinet LVD-SCSI cabling examples

This appendix provides cabinet LVD-SCSI drive cabling examples for specific configurations. Use the following examples for connecting a controller unit to one or more LVD-SCSI drive enclosures.

Configuration:
1 controller unit
1 drive enclosure
2 drive channels
5 drives per channel
Bridge disable = ON
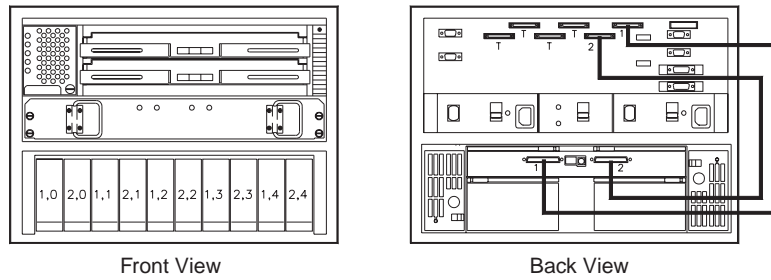
Figure 38. Rack cabinet cabling to one drive enclosure

Configuration:
1 controller unit
2 drive enclosures
4 drive channels
5 drives per channel
Bridge disable = ON
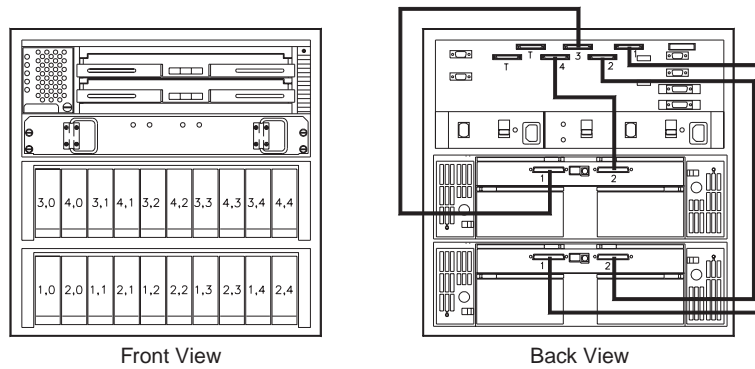
Figure 39. Rack cabinet cabling to two drive enclosures

Configuration:

1 controller unit

3 drive enclosures

6 drive channels

5 drives per channel (channels 1 through 6)

All bridge disable = ON

Front View   Back View
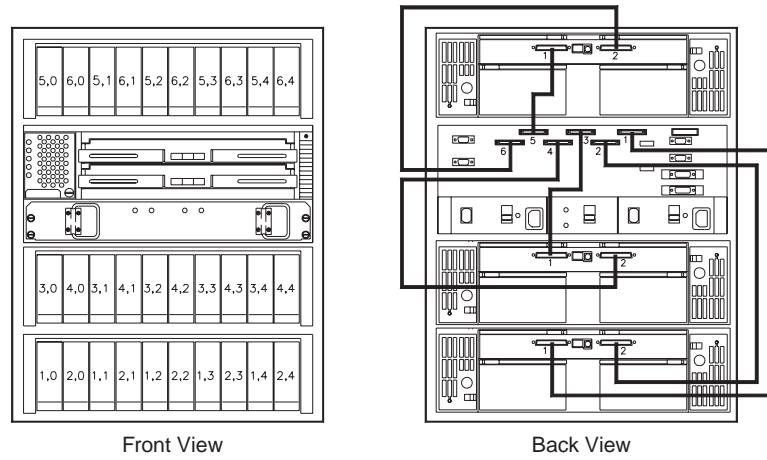
Figure 40. Rack cabinet cabling to three drive enclosures

Configuration:

1 controller unit

4 drive enclosures

4 drive channels

10 drives per channel (10 drives for each drive enclosure)

All 4 bridge disables = OFF

Front View   Back View
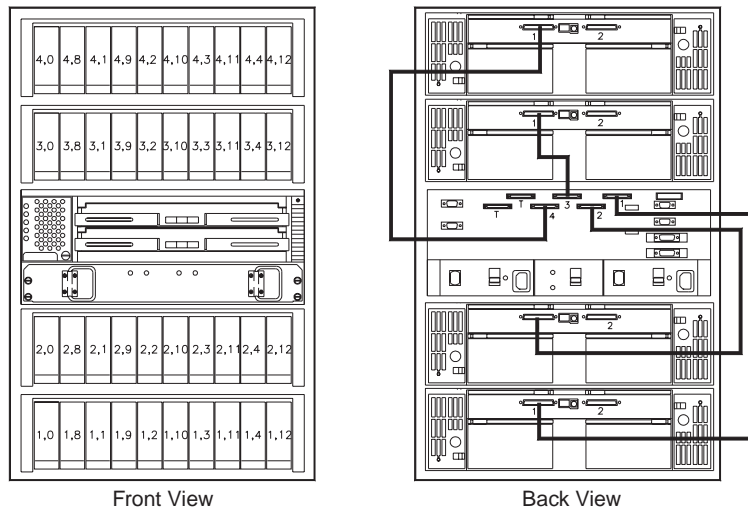
Figure 41. Rack cabinet cabling to four drive enclosures

Configuration:

1 controller unit

5 drive enclosures

5 drive channels

10 drives per channel

All 5 bridge disables = OFF
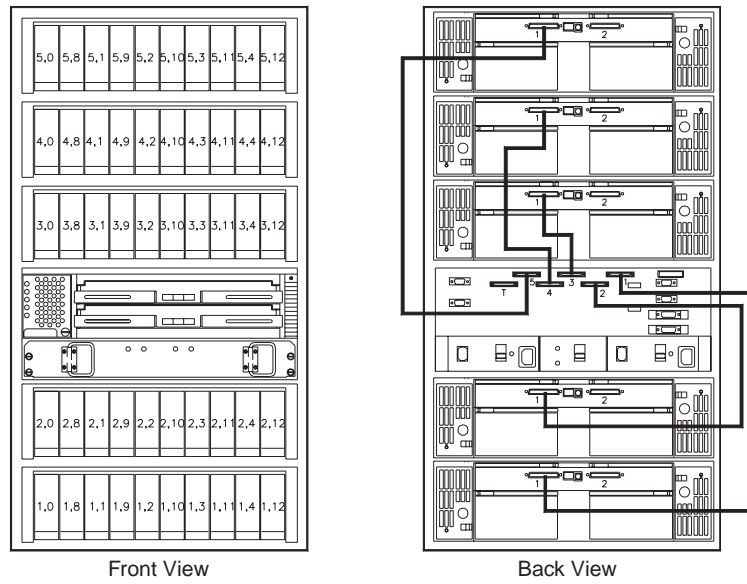
Figure 42. Rack cabinet cabling to five drive enclosures

Configuration:
1 controller unit
6 drive enclosures
6 drive channels
10 drives per channel
All 6 bridge disables = OFF

6,0	6,8	6,1	6,9	6,2	6,10	6,3	6,11	6,4	6,12		

| 5,0 | 5,8 | 5,1 | 5,9 | 5,2 | 5,10 | 5,3 | 5,11 | 5,4 | 5,12 |

| 4,0 | 4,8 | 4,1 | 4,9 | 4,2 | 4,10 | 4,3 | 4,11 | 4,4 | 4,12 |

| 3,0 | 3,8 | 3,1 | 3,9 | 3,2 | 3,10 | 3,3 | 3,11 | 3,4 | 3,12 |

| 2,0 | 2,8 | 2,1 | 2,9 | 2,2 | 2,10 | 2,3 | 2,11 | 2,4 | 2,12 |

| 1,0 | 1,8 | 1,1 | 1,9 | 1,2 | 1,10 | 1,3 | 1,11 | 1,4 | 1,12 |

Front View   Back View
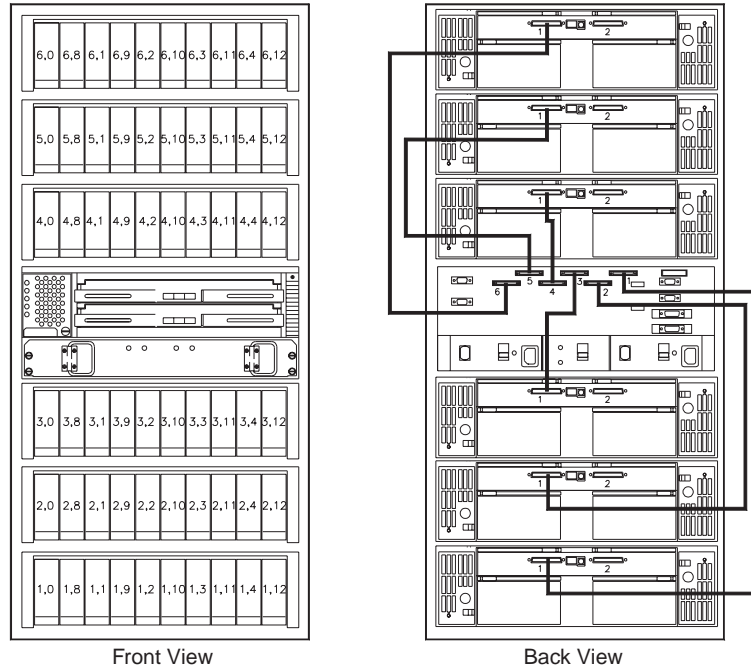
Figure 43. Rack cabinet cabling to six drive enclosures

Configuration:
2 controller units (A and E)

5 drive enclosures (B, C, D, F, and G)

5 drives per channel on channels 1 through 5 (controller unit A; drive enclosures B, C, and D)

5 drives per channel on channels 1 through 5 (controller unit E; drive enclosures D, F, and G)

All 5 bridge disables = ON
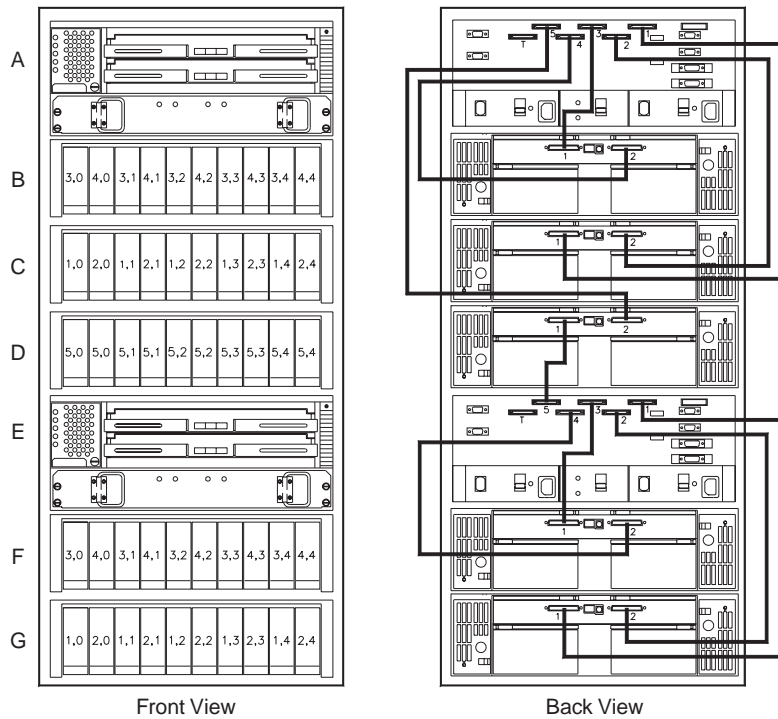
Figure 44. Dual controller unit rack cabinet cabling to five drive enclosures

Configuration:
2 controller units (A and F)
6 drive enclosures (B, C, D, E, G, and H)
5 drives on channel 1 (controller units A and F; drive enclosures D and H)
5 drives on channel 2 (controller units A and F; drive enclosures D and H)
5 drives on channel 3 (controller units A and F; drive enclosures C and G)
5 drives on channel 4 (controller units A and F; drive enclosures C and G)
5 drives on channel 5 (controller units A and F; drive enclosures B and E)
5 drives on channel 6 (controller units A and F; drive enclosures B and E)
All 6 bridge disables = ON
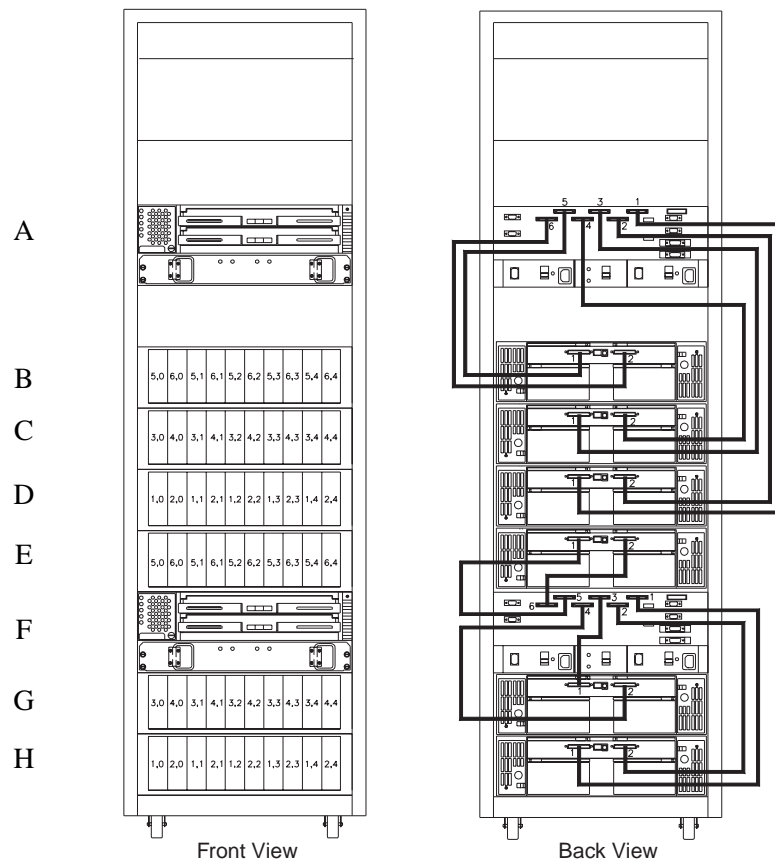
Figure 45. Dual controller unit rack cabinet cabling to six drive enclosures

Configuration:

2 controller units (A and G)

7 drive enclosures (B, C, D, E, F, H, and I)

5 drives on channels 1 and 2 (controller unit A and drive enclosure D)

5 drives on channels 3 and 4 (controller unit A and drive enclosure C)

5 drives on channels 5 and 6 (controller unit A and drive enclosure B)

10 drives each on channels 1 and 2 (controller unit G; drive enclosures H and I)

10 drives each on channels 1, 2, 3, and 4 (controller unit G; drive enclosures H, I, F, and E)

Enclosures B, C, and D, bridge disables = ON

Enclosures E, F, H, and I, bridge disables = OFF
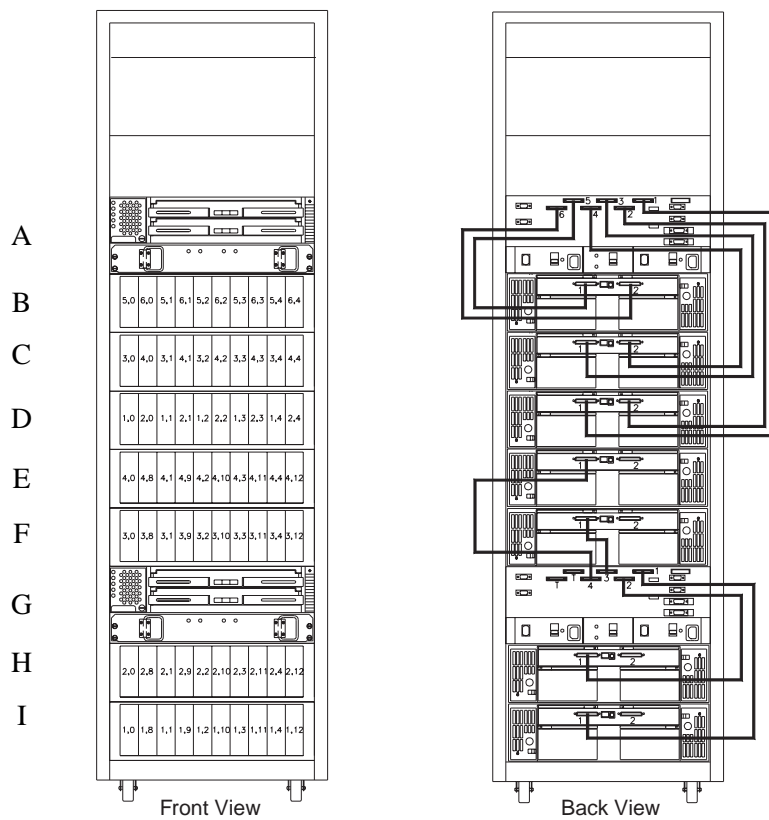
Figure 46. Dual controller unit rack cabinet cabling to seven drive enclosures

Configuration:

2 controller units (B and H)

8 drive enclosures (A, C, D, E, F, G, I, and J)

5 drives on channels 1 and 2 (controller unit B and drive enclosure D)

5 drives on channels 3 and 4 (controller unit B and drive enclosure C)

5 drives on channels 5 and 6 (controller unit B and drive enclosure A)

10 drives each on channels 1 through 5 (controller unit H; drive enclosures E, F, G, I, and J)

Enclosures A, C, and D, bridge disables = ON

Enclosures E, F, G, I, and J, bridge disables = OFF
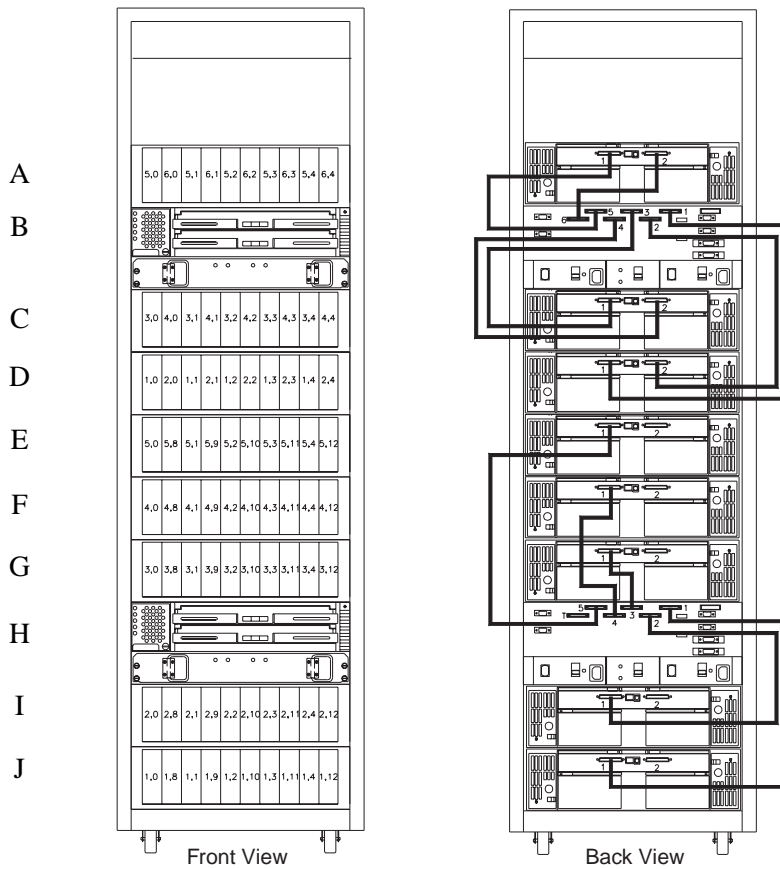
Figure 47. Dual controller unit rack cabinet cabling to eight drive enclosures

Configuration:
2 controller units (C and I)
9 drive enclosures (A, B, D, E, F, G, H, J, and K)
5 drives each on channels 1 through 6 (controller unit C)
10 drives each (drive enclosures E, F, G, H, J, and K)
10 drives each on channels 1 through 6 (controller unit I)
Enclosures A, B, and D, bridge disables = ON
Enclosures E, F, G, H, J, and K, bridge disables = OFF
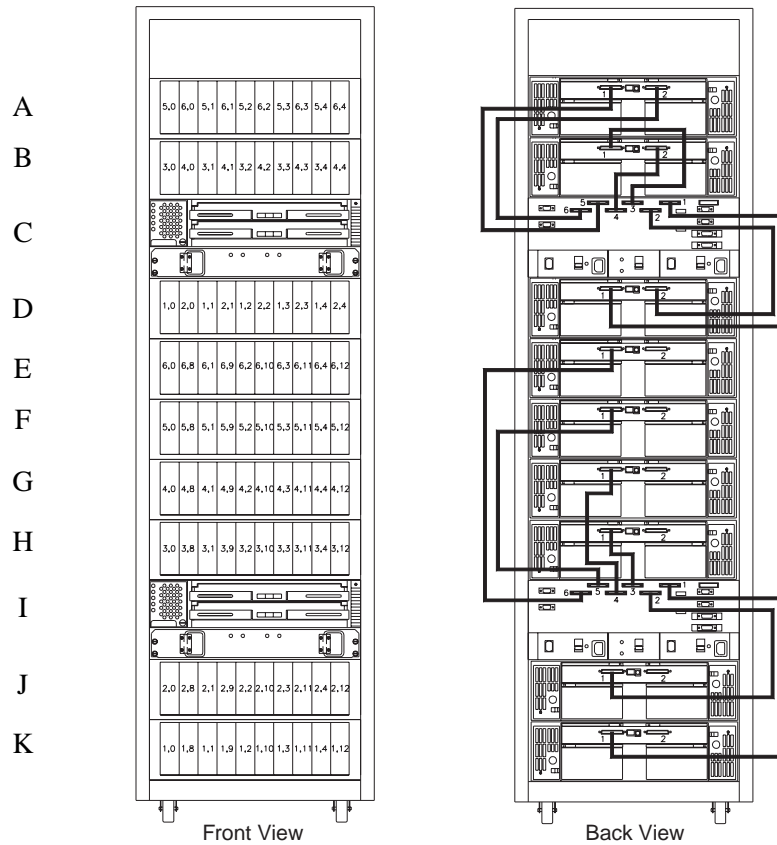
Figure 48. Dual controller unit rack cabinet cabling to nine drive enclosures

Configuration:
2 controller units (D and J)
10 drive enclosures (A, B, C, E, F, G, H, I, K, and L)
10 drives in each enclosure
10 drives each on channels 1 through 5 (on both controller units)
All bridge disables = OFF
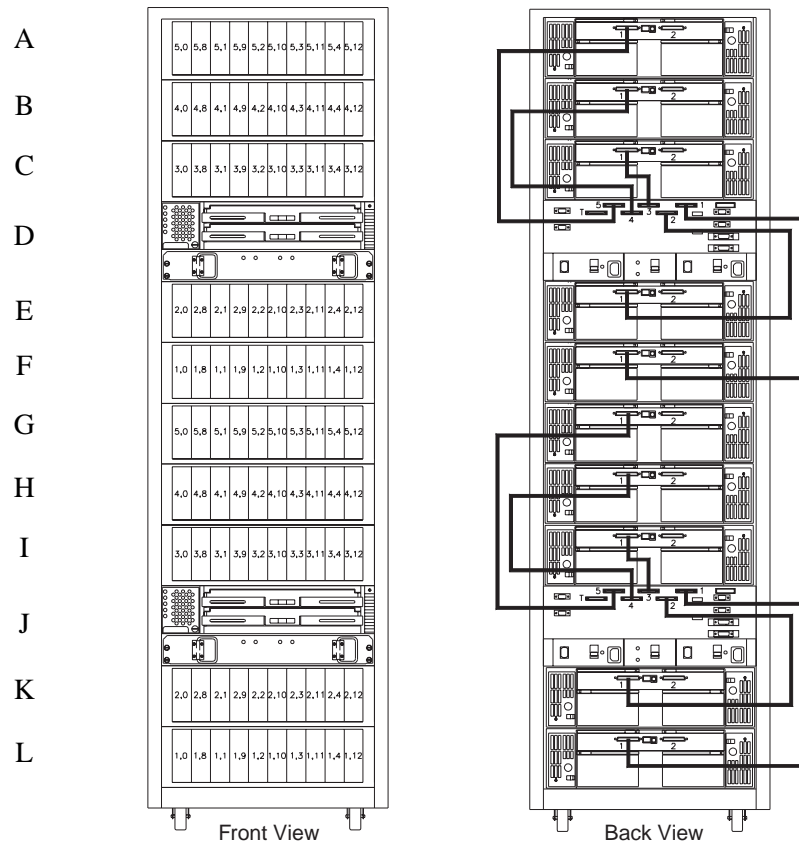
Figure 49. Dual controller unit rack cabinet cabling to ten drive enclosures

Configuration:

3 controller units (C, D, and G)

6 drive enclosures (A, B, E, F, H, and I)

10 drives in each enclosure

5 drives each on channels 1 through 4 (controller units C, D, and G)

All bridge disables = ON
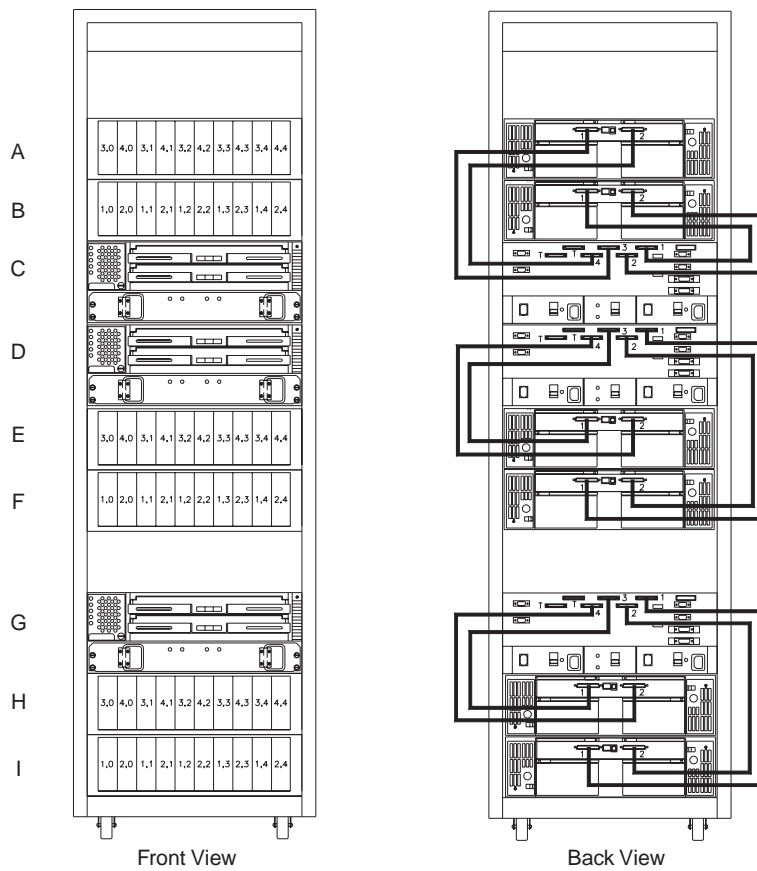
Figure 50. Triple controller unit rack cabinet cabling to six drive enclosures

Configuration:

3 controller units (C, D, and H)

7 drive enclosures (A, B, E, F, G, I, and J)

10 drives in each enclosure

5 drives each on channels 1 through 5 (controller units D and H)

All bridge disables = ON
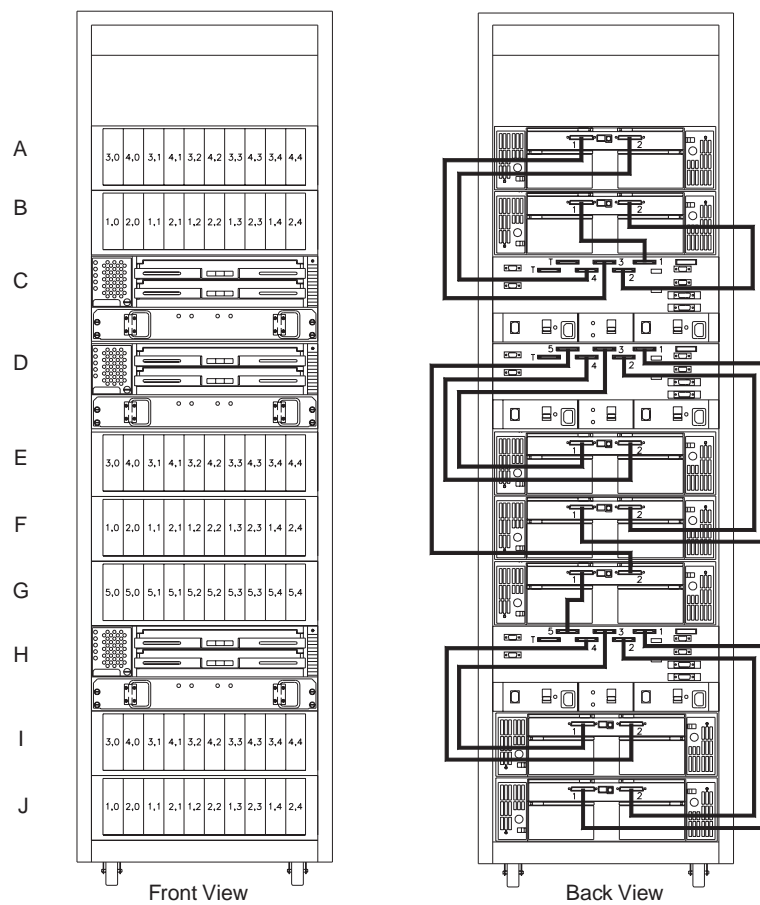
Figure 51. Triple controller unit rack cabinet cabling to seven drive enclosures

Configuration:

3 controller units (D, E, and I)

8 drive enclosures (A, B, C, F, G, H, J, and K)

5 drives each on channels 1 through 5 (controller units D and E)

5 drives each on channels 1 through 6 (controller unit I)

All bridge disables = ON
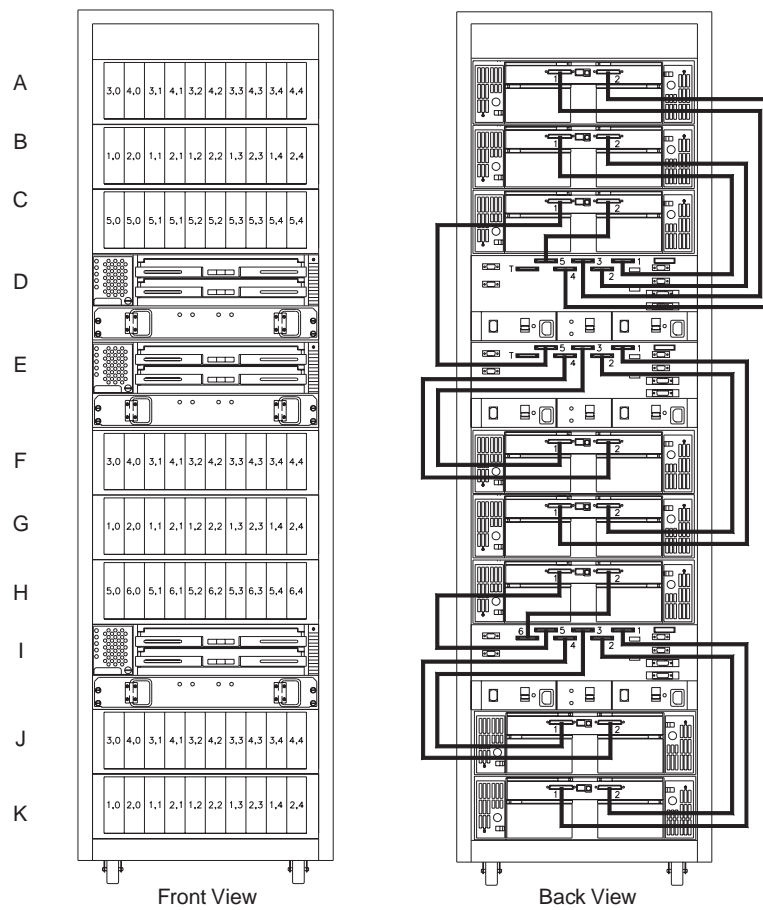
Figure 52. Triple controller unit rack cabinet cabling to eight drive enclosures

Appendix C. Product warranties and notices

This appendix contains the product warranties, product notices, trademark acknowledgments, electronic emissions statements, and other notices.

Warranty statements

The warranty statements consist of two parts: Part 1 and Part 2. Part 1 varies by country. Part 2 is the same for both statements. Be sure to read both the Part 1 that applies to your country and Part 2.

- **United States, Puerto Rico, and Canada (Z125-4753-05 11/97)**
  (Part 1 - General Terms on page 107)

- **Worldwide except Canada, Puerto Rico, Turkey, and United States (Z125-5697-01 11/97)**
  (Part 1 - General Terms on page 110)

- **Worldwide Country-Unique Terms**
  (Part 2 - Country-Unique Terms on page 112)

IBM Statement of Limited Warranty for United States, Puerto Rico, and Canada (Part 1 - General Terms)

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

.

> **Machine**: Netfinity Fibre Channel RAID Controller Unit
>
> **Warranty Period***: Limited Three-Year On-Site Service
>
> *Contact your place of purchase for warranty service information. Some IBM Machines are eligible for On-site warranty service depending on the country where service is performed.*

The IBM Warranty for Machines

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

During the warranty period IBM or your reseller, if approved by IBM to provide warranty service, will provide repair and exchange service for the Machine, without charge, under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

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

Extent of Warranty

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

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

Items Not Covered by Warranty

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

Unless specified otherwise, IBM provides non-IBM machines **WITHOUT WARRANTIES OF ANY KIND.**

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

Warranty Service

To obtain warranty service for the Machine, contact your reseller or IBM. In the United States, call IBM at 1-800-772-2227. In Canada, call IBM at 1-800-565-3344. You may be required to present proof of purchase.

IBM or your reseller provides certain types of repair and exchange service, either at your location or at a service center, to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. IBM may repair the failing Machine or exchange it at its discretion.

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

Any feature, conversion, or upgrade IBM or your reseller services must be installed on a Machine which is 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

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

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;

2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and

3. where applicable, before service is provided

    a follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides,

    b secure all programs, data, and funds contained in a Machine,

    c provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations, and

    d inform IBM or your reseller of changes in a Machine's location.

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

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

Production Status

Each IBM Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's appropriate warranty terms apply.

Limitation of Liability

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and

2. the amount of any other actual direct damages, up to the greater of U.S. $100,000 (or equivalent in local currency) or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

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

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

IBM Statement of Warranty Worldwide except Canada, Puerto Rico, Turkey, United States (Part 1 - General Terms)

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

Machine: Netfinity Fibre Channel RAID Controller Unit

Warranty Period*: Limited Three-Year On-Site Service

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

The IBM Warranty for Machines

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

During the warranty period IBM or your reseller, if approved by IBM to provide warranty service, will provide repair and exchange service for the Machine, without charge, under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

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

Extent of Warranty

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

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

Items Not Covered by Warranty

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

Unless specified otherwise, IBM provides non-IBM machines **WITHOUT WARRANTIES OF ANY KIND.**

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

Warranty Service

To obtain warranty service for the Machine, contact your reseller or IBM. You may be required to present proof of purchase.

IBM or your reseller provides certain types of repair and exchange service, either at your location or at a service centre, to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. IBM may repair the failing Machine or exchange it at its discretion.

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

Any feature, conversion, or upgrade IBM or your reseller services must be installed on a Machine which is 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

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

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;

2. obtain authorisation from the owner to have IBM or your reseller service a Machine that you do not own; and

3. where applicable, before service is provided

    a follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides,

    b secure all programs, data, and funds contained in a Machine,

    c provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfil their obligations, and

    d inform IBM or your reseller of changes in a Machine's location.

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

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

Production Status

Each IBM Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's appropriate warranty terms apply.

Limitation of Liability

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and

2. the amount of any other actual direct damages, up to the greater of U.S. $100,000 (or equivalent in local currency) or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

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

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

Part 2 - Worldwide Country-Unique Terms

ASIA PACIFIC

AUSTRALIA: The IBM Warranty for Machines: The following paragraph is added to this Section:

The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other legislation and are only limited to the extent permitted by the applicable legislation.

Extent of Warranty: The following replaces the first and second sentences of this Section:

The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, operation in other than the Specified Operating Environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible.

Limitation of Liability: The following is added to this Section:

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

PEOPLE'S REPUBLIC OF CHINA: Governing Law: The following is added to this Statement:

The laws of the State of New York govern this Statement.

INDIA: Limitation of Liability: The following replaces items 1 and 2 of this Section:

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence;

2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Warranty, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

NEW ZEALAND: The IBM Warranty for Machines: The following paragraph is added to this Section:

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

Limitation of Liability: The following is added to this Section:

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

EUROPE, MIDDLE EAST, AFRICA (EMEA)

The following terms apply to all EMEA countries.

The terms of this Statement of Warranty apply to Machines purchased from an IBM reseller. If you purchased this Machine from IBM, the terms and conditions of the applicable IBM agreement prevail over this warranty statement.

Warranty Service

If you purchased an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchased an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirgihzia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

The applicable laws, Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided. However, the laws of Austria govern this Statement if the warranty service is provided in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria Croatia, Czech Republic, Federal Republic of Yugoslavia, Georgia, Hungary, Kazakhstan, Kirghizia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, and Ukraine.

The following terms apply to the country specified.

EGYPT: Limitation of Liability: The following replaces item 2 in this Section:

2. as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim.

Applicability of suppliers and resellers (unchanged).

FRANCE: Limitation of Liability: The following replaces the second sentence of the first paragraph of this Section:

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: (items 1 and 2 unchanged).

GERMANY: The IBM Warranty for Machines: The following replaces the first sentence of the first paragraph of this Section:

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this Section:

The minimum warranty period for Machines is six months.

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

Extent of Warranty: The second paragraph does not apply.

Warranty Service: The following is added to this Section:

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Production Status: The following paragraph replaces this Section:

Each Machine is newly manufactured. It may incorporate in addition to new parts, re-used parts as well.

Limitation of Liability: The following is added to this Section:

The limitations and exclusions specified in the Statement of Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

In item 2, replace "U.S. $100,000" with "1.000.000 DEM."

The following sentence is added to the end of the first paragraph of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

IRELAND: Extent of Warranty: The following is added to this Section:

Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: The following replaces items one and two of the first paragraph of this Section:

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and 2. the amount of any other actual direct damages, up to the greater of Irish Pounds 75,000 or 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY: Limitation of Liability: The following replaces the second sentence in the first paragraph:

In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than: (item 1 unchanged) 2) as to any other actual damage arising in all situations involving non-performance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim.

Applicability of suppliers and resellers (unchanged).

The following replaces the second paragraph of this Section:

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

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND: Limitation of Liability: The following is added to this Section:

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

TURKIYE: Production Status: The following replaces this Section:

IBM fulfils customer orders for IBM Machines as newly manufactured in accordance with IBM's production standards.

UNITED KINGDOM: Limitation of Liability: The following replaces items 1 and 2 of the first paragraph of this Section:

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;

2. the amount of any other actual direct damages or loss, up to the greater of Pounds Sterling 150,000 or 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

The following item is added to this paragraph:

3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default will be limited to damages.

NORTH AMERICA

CANADA: Warranty Service: The following is added to this Section:

To obtain warranty service from IBM, call 1-800-465-6666.

UNITED STATES OF AMERICA: Warranty Service: The following is added to this Section:

To obtain warranty service from IBM, call 1-800-IBM-SERV.

Notices

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
N. Castle Drive
Armonk, NY 10504-1785
U.S.A.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

IBM
Netfinity
IntelliStation
HelpCenter
OS/2
ThinkPad
HelpWare

Other company, product, and service names may be trademarks or service marks of others.

Electronic emissions notices

The IBM Netfinity Fibre Channel RAID Controller Unit has been tested and found to comply with the Industry Canada and FCC *Class B* requirements. The IBM Netfinity servers in which you can install the Fibre Channel RAID Controller Unit comply with Industry Canada and FCC *Class A* requirements. When you install the Fibre Channel RAID Controller Unit in an IBM Netfinity server, the adapter complies with the Industry Canada and FCC *Class A* requirements.

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A Emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

United Kingdom telecommunications safety requirements

Notice to customers

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

European Community directive conformance statement

This product is in conformity with the protection requirements of EC Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electro-magnetic compatibility.

A declaration of Conformity with the requirements of the Directive has been signed by IBM Corporation, 3039 Cornwallis Road, Research Triangle Park, North Carolina, 27709.

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

Australia and New Zealand Class A statement

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

Taiwanese electromagnetic interference (EMI) statement

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

Power cords

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

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

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

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

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

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

IBM power cord part number	Used in these countries and regions
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paragray, Uruguay, Western Samoa
13F9979	Afganistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0033	Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Dubai, Fiji, Ghana, Hong Kong, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Ethiopia, Italy, Libya, Somalia
14F0087	Israel
1838574	Thailand
62X1045	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Hondoras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

Index