IBM Netfinity EXP10

Installation and User's Handbook

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> **Note**
>
> Before using this information and the product it supports, be sure to read the general information under Appendix B, "Product Warranties and Notices" on page 79.

First Edition (November 1997)

Contents

⚠ **DANGER:**

Electrical current from power, telephone, and communication cables is hazardous. To avoid shock hazard, connect and disconnect cables as shown below when installing, moving or opening the covers of this product or attached devices. The power cord must be used with a properly grounded outlet.

To Connect	To Disconnect
Turn everything OFF.	Turn everything OFF.
First, attach all cables to devices.[1]	First, remove power cord from outlet.[2]
Attach signal cables to receptacles.	Remove signal cables from receptacles.
Attach power cord to outlet.	Remove all cables from devices.
Turn device ON.	
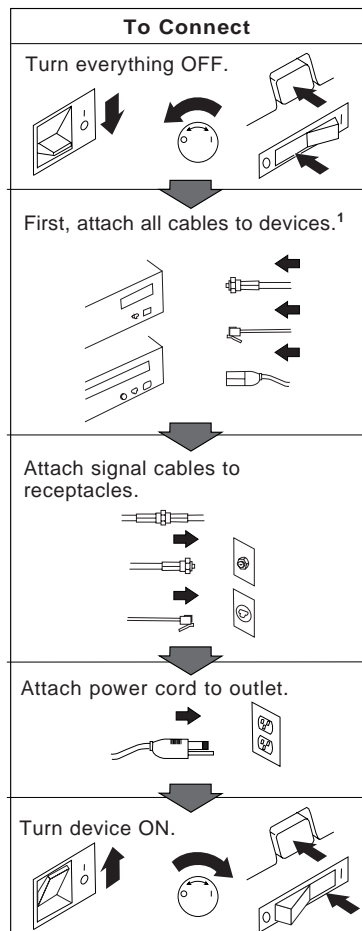
[1] In the U.K., by law, the telephone cable must be connected after the power cord.
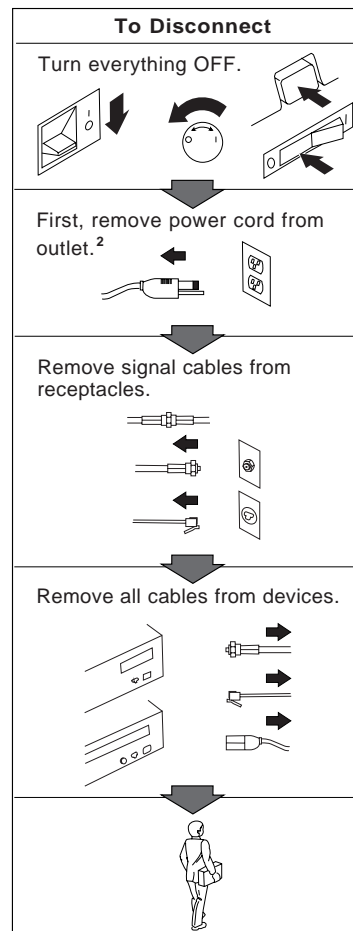
[2] In the U.K., by law, the power cord must be disconnected after the telephone line cable.

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⚠️ DANGER:

Le courant électrique provenant des câbles d'alimentation, télephoniques et de transmission peut présenter un danger. Pour éviter tout risque de choc électrique, connectez et déconnectez ces câbles comme indiqué ci- dessous lorsque vous installez ou déplacez ce matériel ou les unités connectées, ou que vous soulevez un carter.*

Pour connecter	**Pour deconnecter**
Mettez tout hors tension.	Mettez tout hors tension.
Connectez d'abord tous les câbles sur les unités.	Débranchez d'abord le cordon d'alimentation de la prise murale.
Connectez les câbles de signaux sur les prises murales.	Déconnectez les câbles de signaux des prises murales.
Branchez le cordon d'alimentation sur la prise murale.	Déconnectez tous les câbles de unités.
Mettez l'unité sous tension.	

*Le cordon d'alimentation doit être branché sur un socle de prise de courant correctement mis à la terre.

Before installing this product read the Safety Information booklet.

"Antes de instalar seu produto leia o manual de Informações sobre Segurança."

Před instalací tohoto produktu si přečtěte brožuru s bezpečnostními informacemi.

Læs hæftet med sikkerhedsforskrifter, før du installerer dette produkt.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet sisältävä kirjanen.

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

"Vor dem Installieren dieses Produkts die Broschüre mit den Sicherheitsinformationen lesen."

E termék installálása elõtt olvassa el a Bizonsági Tudnivalók kézikönyvét !

Prima di installare questo prodotto, leggere l'opuscolo relativo alla sicurezza.

この製品を設置する際には、まず「安全について」をお読みください。

본 제품을 설치하기 전에 "안전 정보" 자료를 읽으십시오.

Lees voordat u dit produkt gebruikt het boekje met veiligheidsvoorschriften.

"Les sikkerhetsinformasjonen i heftet Safety Information før du installerer dette produktet."

在安装本产品前，请阅读安全信息小册子。

Przed instalowaniem tego produktu należy przeczytać broszurę
dotyczącą wymogów bezpieczeństwa.

"Antes de instalar este produto, leia o folheto de Informações
sobre Segurança."

Перед тем как инсталлировать этот продукт, прочтите
буклет "Инструкция по технике безопасности".

Pred namestitvijo tega izdelka preberite Varnostne informacije.

Antes de instalar este producto consulte el manual de Avisos de
seguridad.

Läs dokumentet med säkerhetsföreskrifter innan du installerar den
här produkten.

在您安裝本產品之前，請先閱讀「安全資訊」手冊•

About This Book

This book provides instructions for installing and replacing options in your IBM Netfinity EXP10 storage expansion unit. It also provides information on troubleshooting your expansion unit. If you have not yet set up your expansion unit, refer to Chapter 2, "Installation Setup" on page 13 for detailed information.

How This Book is Organized

Chapter 1, "Introduction," introduces and describes the expansion unit. This chapter also includes an overview of the expansion unit's features and components.

Chapter 2, "Installation Setup," specifies the preparations you should complete before beginning the installation and explains the overall installation process.

Chapter 3, "Rack Installation," describes how to install the expansion unit in a server rack.

Chapter 4, "Installing and Replacing Devices," contains step-by-step instructions for installing and removing options, such as internal drives and customer replaceable units (CRUs). In addition, this chapter contains instructions for turning the expansion unit on and off.

Chapter 5, "Solving Problems," contains the problem symptoms and error messages that are specific to your expansion unit. This chapter also provides instructions on how to obtain service and technical assistance for your expansion unit and other IBM products that you might plan to use.

Appendix A, "Records," provides a section to record and update important information about your expansion unit, including serial number and device records. Whenever you add options to your expansion unit, be sure to update the information in this appendix.

Appendix B, "Product Warranties and Notices," contains product notices, warranties, and trademarks.

Notices Used in This Book

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

- **Notes**

  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

The *IBM Service and Support* pamphlet comes with your expansion unit. It contains important information and phone numbers to call for different types of support for your expansion unit.

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.

Welcome and Thank You

We appreciate your decision to purchase an IBM Netfinity EXP10 storage expansion unit. This expansion unit allows you to expand the storage capabilities of your system.

The expansion 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's 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 1-800-772-2227; in Canada, call 1-800-565-3344; or in the United Kingdom, call 01705-565000 or 0161-9056001 if you need assistance.

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

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[*] Service availability will vary by country. Response time will vary depending on the number and nature of calls received.

Welcome and Thank You

Chapter 1. Introduction

The IBM® Netfinity® EXP10 storage expansion unit is a compact unit that provides high-capacity small computer system interface (SCSI) disk storage. It delivers fast, high-volume data transfer, retrieval, and storage functions across multiple drives, to multiple hosts. Designed for continuous, reliable service, the expansion unit's modular, redundant disk drives, power supplies, and fans use Hot-Swap logic for easy replacement without shutting down the system.

The expansion unit supports Fast Wide and Ultra SCSI for both the host and drive SCSI interfaces. The drive and host interfaces are single-ended (SE). Designed for easy installation and integration into a wide range of system environments, the expansion unit is available in a variety of configurations.

This chapter contains an overview of the expansion unit's features and components.

39 kg

(86 lbs)

This chapter contains:

Features at a Glance

The following table summarizes the features of the expansion unit.

General	User Interface / Disk Drive Storage	ESM Board

General
 	
• Modularized Components:
  – High-capacity disk drives
  – Environmental Services Monitor (ESM) board
  – Power supplies
  – Cooling fans
• Technology:
  – Supports disk array technology
  – Supports RAID levels 0, 1, and 5
  – SCSI host interface
  – Redundant data storage, cooling system, and power system
  – Hot-Swap logic for drives, power supplies and fans.
  – Automatic recovery after power failure without user intervention
	• User Interface:
	  – Built-in Power, Activity and Fault indicators
	  – Identification labeling on Customer Replaceable Units (CRUs), rear indicator lights, switches and connectors
	  – Easy-to-replace drives, power supplies and fans
	
	Disk Drive Storage
	
	• Current Capabilities:
	  – Max. drives per expansion unit: 10
	  – Drives per drive channel: 5
	  – Drive channels per expansion unit: 2
		ESM Board
		
		• ID Numbers:
		  – Drive channel numbers: 1 and 2
		  – Drive SCSI IDs:
		    - Bus 1 (0-4)
		    - Bus 2 (8-12)
		• Technology and Interfaces:
		  – Model: SCSI, single-ended.
		  – SCSI bus interface: Four, 68-pin, Ultra SCSI connectors for incoming and outgoing SCSI bus cables

Note: For a list of the operating specifications, such as weight, height, and heat output, see Table 1 on page 26.

Front Controls

The primary-user controls on the front of the expansion unit appear in the following illustration:

Active LED — Power/Fault LED — Front Panel

Drive CRU

Drive Levers
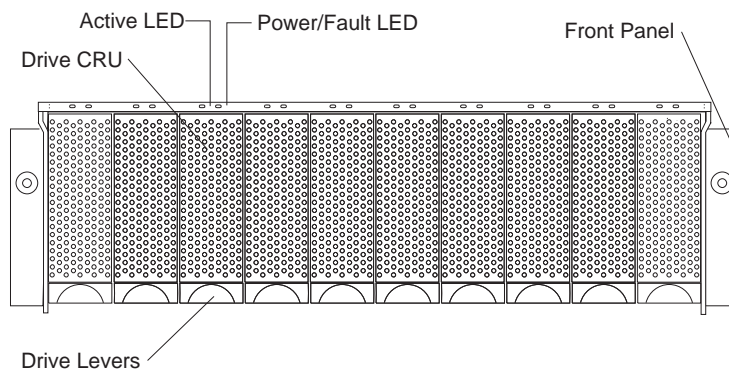
Active LEDs: These green lights indicate drive activity when lit.

Power/Fault LEDs: There are twenty LEDs (two for each drive) located on the front panel above the drive bays.

- Green lights indicate the drive is installed.

- Amber lights indicate a drive failure.

- Amber and green flashing lights indicate a drive rebuild.

Drive Levers: Use the multi-purpose levers to remove, insert, and lock the drives in place.

Note: The IBM ServeRAID and ServeRAID II adapters both provide support for the amber Fault LEDs.

Rear Controls, Indicators, and Connectors

The four CRUs (Customer Replaceable Units) and one Environmental Services Monitor (ESM) board are accessible from the back of the expansion unit. These components contain several user controls, indicators, and connectors.
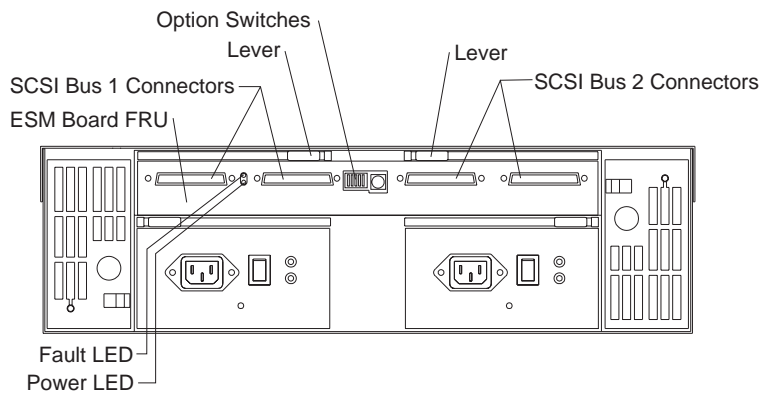
ESM Board User Controls

SCSI Bus Connectors: This 68-pin connector is for attaching your SCSI cables.

Option Switches: Use these switches for selecting drive options.

Power LED: This green light glows when there is power to the ESM board.

Fault LED: This amber light glows if the expansion unit overheats.

Levers: Use the locking handles for removing and inserting the ESM board and the power supplies into the expansion unit.

Note: Only service technicians should remove the ESM board.

Power Supply Controls, Indicators, and Connectors

Lever

Power LED

Fault LED

Power Switch

Power Supply CRU
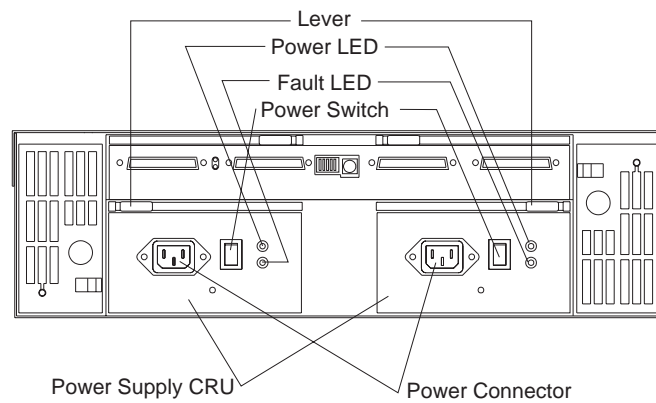
Power Connector

Power connectors: The power cords for the power supplies connect here.

Power Switches: Use these switches to turn the power supplies on and off.

Power LEDs: These green LEDs glow when the power switches are turned on.

Fault LEDs: These amber LEDs glow after a power supply failure.

Levers: Use the locking handles to remove or install power supplies.

Rear Controls, Indicators, and Connectors.

Attention: Always follow these instructions when installing or removing a hot-swap power supply.

To install a hot-swap power supply:

1. Ensure that the AC power switch on the power supply is in the Off position.

2. Install the power supply in the expansion unit.

   a. Slide the power supply into the expansion unit. The LEDs should always be on the right side.

   b. Close the lever until it locks in place.

3. Connect the power cord to the power supply.

4. Wrap the clamp around the power cord about eight inches from the end.

5. Re-attach the nut and tighten securely.

6. Plug the supply power cord into a properly grounded electrical outlet.

7. Turn the switch on the power supply to the On position.

To remove a hot-swap power supply:

1. Turn the switch on the power supply to the Off position.

2. Unplug the supply power cord from the electrical outlet.

3. Disconnect the power cord from the power supply.

4. Remove the nut and clamp from the rear of the power supply.

5. Remove the power supply from the expansion unit.

   a. Grasp the power supply's pull-ring and squeeze the latch to release it.

   b. Pull the lever open and remove the power supply.

Fan User Controls and Indicators

Fault LED ——————————————— Fan CRU

Latch

Handle

> **Fault LEDs:** These amber LEDs glow during fan failures.
>
> **Latches and handles:** Use the latches and handles to remove or install the fans.

Attention: The fans in your expansion unit pull in fresh air and force out hot air. These fans are hot swap redundant, however, when one fan fails, the fan unit needs to be replaced within 48 hours in order to maintain redundancy and optimum cooling. When replacing the failed unit with the new fan unit, insure that this operation is performed in less than 10 minutes to prevent any overheating due to the lack of the additional fans.

Expansion Bays

The following illustrations show the location of the bays in your expansion unit. For information on installing and replacing devices in these bays, refer to Chapter 4, "Installing and Replacing Devices" on page 37.

Hot-Swap Drive Bays: The expansion unit supports up to ten Ultra SCSI hard disk drives.
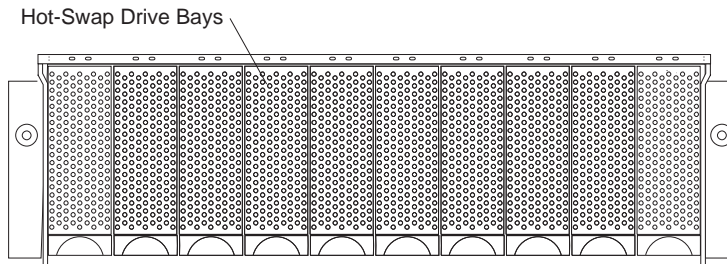
Hot-Swap Drive Bays

Hot-Swap Fan Bays: Your expansion unit has two interchangeable hot-swap fan units. If one fan fails, the second fan continues to operate. Each unit contains two fans.

ESM Board Bay: The Environmental Services Monitor (ESM) board provides a SCSI interface to the drives, and monitors the overall status of the expansion unit. It is mounted in a field replaceable unit (FRU), a component designed for servicing by qualified service technicians only.

Hot-Swap Power Supply Bays: Your expansion unit has two interchangeable hot-swap power supplies.

Hot-Swap Fan Bays

ESM Bay

Hot Swap Power Supply Bays
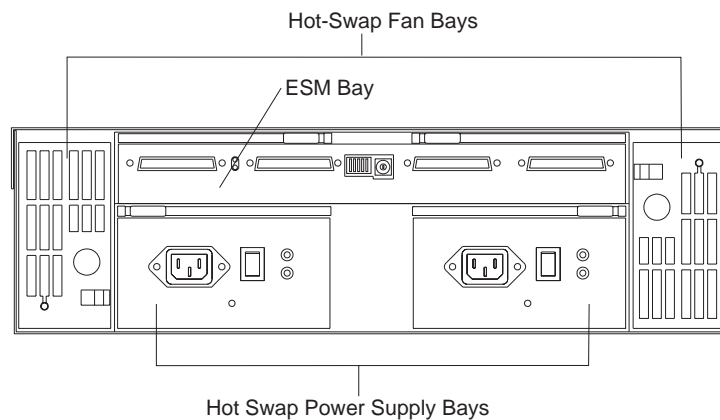
Note: The hot-swap feature enables you to remove and replace hard disk drives, power supplies, and fans without turning off the expansion unit.

System Management Software Support

The IBM Netfinity EXP10 supports software Alert functions via the system monitor of Netfinity Manager Version 5.1 or later. The following Alerts are supported:

- Disk drive disabled
- Power supply bad
- Fan fault
- IBM Netfinity EXP10 over temperature

Refer to the Netfinity Manager User's Guide, Version 5.1 or later for more information on setting up system management software.

This system management software is supported on the IBM ServeRAID Adapter with Service Pack v2.23 or later. System management software is also supported on the IBM ServeRAID II Adapter with v2.30 or later.

Netfinity Manager Service and drive fault LEDs are only supported by IBM ServeRAID and IBM ServeRAID II adapters.

The following adapters are supported:

- IBM PC Server Ultra Wide SCSI PCI
- IBM ServeRAID
- IBM ServeRAID II

Getting Help on the World Wide Web

You can obtain up-to-date information about your IBM Netfinity EXP10, a complete listing of the options that are supported on your model, and information about other IBM server products by accessing the IBM home page at the following address:

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http://www.us.pc.ibm.com/servers/
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IBM Start Up Support

The IBM Start Up Support program provides comprehensive telephone assistance 24 hours a day, seven days a week during your first 90 days after installation.* Assistance is available for IBM and non-IBM network operating systems, network-interface adapters, and other optional peripherals.

For more information about this exceptional program, or for assistance with the installation of your server:

- In the U.S. or Puerto Rico, call 1-800-772-2227.
- In Canada, call 1-800-565-3344.
- In the United Kingdom, call 01705-565000 or 0161-9056001.

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

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* Service availability will vary by country. Response time will vary depending on the number and nature of calls received.

IBM Start Up Support

Chapter 2. Installation Setup

This section specifies the preparations you must complete before beginning the installation, and explains the overall installation process.

This chapter contains:

Preparatory Tasks and Assumptions

The instructions in this book assume:

- You are installing the expansion unit in a 19-inch wide, rack-mount cabinet. The cabinet might also contain:

  - Industry standard EIA railing inside the cabinet for mounting the hardware

  - One or two independent power sources (distribution boxes, uninterruptible power supply, and so on.)

  - A host controller unit

  - Additional expansion units

- You already installed the other components in the cabinet, and moved the cabinet near its permanent operating location.

- You already installed the host controllers and appropriate host adapters.

- Wide SCSI bus cables are attached to the host controllers and are ready for final connection to the expansion unit.

- The cabinet and installation site meet all area, environmental, power, and site requirements for the expansion unit. Refer to the expansion unit's requirements listed in Chapter 3, "Rack Installation" on page 25.

Inventory Checklist

After you fully unpack your expansion unit, verify that you have
the following items:

Hardware:

- □ IBM Netfinity EXP10 storage expansion unit
- □ 0.4 meter SCSI cable (1)
- □ Power cords (2)
- □ Rack mounting hardware kit (1)

Publications:

- □ IBM Netfinity EXP10 Installation and User's Handbook
- □ IBM Service and Support pamphlet
- □ IBM Safety Booklet

If an item is missing or damaged, call 1-800-772-2227 (U.S. and
Puerto Rico); 1-800-565-3344 (Canada); 01705-565000 or 0161-9056001
(U.K.); or contact your IBM reseller or your IBM marketing
representative (all other countries).

Preparing the Cabinet

This section contains information about power cord routing and support rail installation.

Power Cord Routing Information

The expansion unit uses two power cords. You can connect these power cords to the primary power units inside the cabinet (such as an A.C. distribution unit or uninterruptible power supply (UPS)), or to an external source (such as remote power units, a UPS, or wall outlet). Both power cords can use the same power source or independent ones, as long as they meet the power requirements defined in Table 1 on page 26.

Because of the limited space in some cabinets, it might be easier to connect and route cables before you install the mounting brackets and hardware devices. If you intend to connect the expansion unit to the cabinet's internal power unit, consider connecting and routing the expansion unit power cords in the cabinet before you install the expansion unit.

Support Rail Installation Information

To install the expansion unit in a rack-mount cabinet, use the mounting hardware (provided with your hardware kit) to:

- Provide a level, stable support for the expansion unit's chassis

- Support the expansion unit's weight

- Properly position the expansion unit in the cabinet to allow proper air circulation around and through the expansion unit

The exact placement of the mounting hardware in the cabinet will depend on how your cabinet is constructed and where (vertically) you intend to install the expansion unit.

Use this procedure to setup the cabinet and prepare to install the expansion unit.

Note: During this installation, you might need to access the interior of the cabinet to attach mounting hardware or to route power and SCSI cables. As well, you must have enough room

around the outside of the cabinet to lift and install the expansion unit into the cabinet. Three U level spacing is required to install the expansion unit in the cabinet.

1. Turn off the power.

   Note: If applicable, make sure that all main power switches in the cabinet are turned off. If the cabinet does not have a master circuit breaker that disables all incoming power, unplug the cabinet's primary power cable from the external A.C. power source.

2. As necessary, remove the front, back, and side panels (or doors) from the cabinet.

   Note: Removing the exterior panels (or doors) from the cabinet might make it easier to install the hardware.

   a. Retrieve the power cords from the expansion unit's shipping container.

      Note: The expansion unit is shipped with two, identical power cords.

   b. Determine the power-up sequence for your system.

      Note: Read your hardware and software documentation provided with the devices (in the cabinet and on the SCSI buses) that you intend to power-up with the expansion unit. Find the information regarding the start-up procedure for each device. Based on this information, determine the sequence in which you must turn on the expansion unit and other devices in the cabinet or attached to the SCSI buses in this system.

3. Plug the power cords into the properly grounded electrical outlets.

   Note: Plug the power cords into the appropriate A.C. electrical outlets inside the cabinet, or into an external UPS or receptacle. If the A.C. power source has several outlets, make sure that you plug the power cords into outlets that power up at the same time.

4. Route the other ends of the power cords so that they are easily accessible to the rear of the expansion unit once it is installed.

5. Install the mounting hardware.

   Note: Make sure that there is enough open space above the mounting hardware to accommodate the expansion unit and to provide sufficient airflow. See Chapter 3, "Rack Installation" on page 25 for instructions on mounting hardware.

6. Complete all other preparations.

   Note: Perform all other preparatory tasks that might be necessary to ensure that the cabinet is ready for this installation (such as installing other hardware devices, cabling, or power units).

Preparing the Expansion Unit

This section explains how to prepare the expansion unit for installation by removing the internal drives and setting the interface options.

Expansion Unit Preparation Information

It is easier to lift the expansion unit and set it onto the support rails in the cabinet if you remove all Customer Replaceable Units (CRUs) first. A fully loaded expansion unit weighs approximately 39 kg (86 lb). If you remove all the CRUs, you can reduce the overall weight.

39 kg
(86 lbs)

Note: The expansion unit is shipped with the decorative bezel attached to the front of the unit with two white screws and nuts in order to protect the light pipes located above the trays.

Before you begin

- Read "Handling Static-Sensitive Devices" on page 39.

- If you have data stored on the drives, label the drives before you remove them. You must replace the drives in the exact slots from which you removed them.

The following are CRUs in your expansion unit.

- Up to ten drives
- Two power supplies
- Two fan units

See the illustration on the next page for instructions on how to remove the CRUs from the expansion unit.
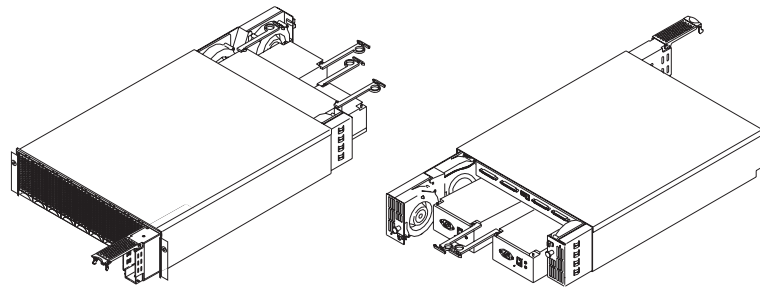
Remove
Drive CRUs
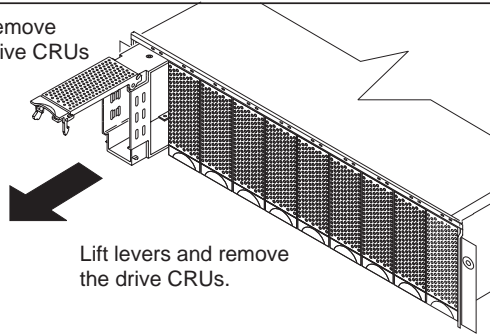
Lift levers and remove
the drive CRUs.

Important: Be sure to keep track of which drive belongs in each slot.
To prevent data loss, you must replace all drives into their original slots.

Remove Fan CRUs

Remove Power
Supply CRUs

Grasp ring and squeeze
to unlatch, pull open
lever, and remove
power supply CRU.

Slide latch left or right, pull
handle, and remove fan CRU.

Set the Expansion Unit Interface Options

There is a set of Option switches located on the back of the expansion unit. You can use these switches to select interface options. Drive SCSI IDs identify each drive in the expansion unit.

The default settings are as follows:

- SCSI IDs = (0-4) for SCSI bus 1 (switch 1 default off)
- SCSI IDs = (8-12) for SCSI bus 2 (switch 2 default on)
- Adapter control to power up disk drives (switch 3 default on)

These default settings support configurations of either a single ten drive SCSI bus or as two independent SCSI buses. All IBM SCSI controllers will selectively power up disk drives under software control. This is the preferred method to power up disk drives.

If configuring the IBM Netfinity EXP10 with two independent SCSI buses the switches (1 and 2) may be set to either position. If configuring the IBM Netfinity EXP10 with a single SCSI bus, the switches (1 and 2) should be set to opposite states. The default is switch 1 off and switch 2 on.

Note: Switches 4 and 5, and the Tray ID switch are not supported.

Tray ID Switch

On

5 4 3 2 1

Off

Option Switches
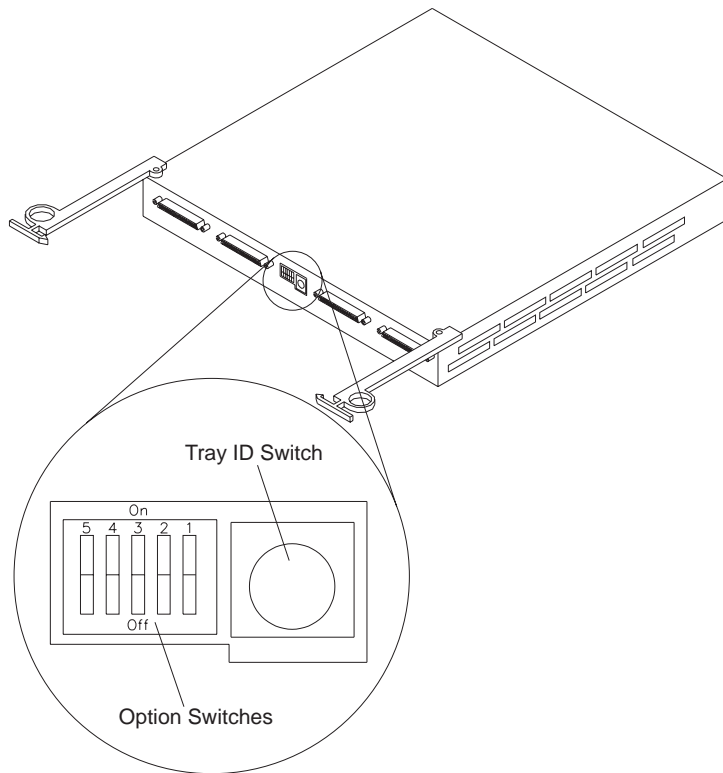
Chapter 3. Rack Installation

This chapter provides instructions for installing an IBM Netfinity EXP10 storage expansion unit in a rack.

Your expansion unit comes with a Rack Mount Kit. Review the preinstallation information in "Before You Begin"; then, continue with "Installing the Expansion Unit in a Rack" on page 27.

Before You Begin

- You will need a flat-blade or a phillips screwdriver.

  Note: Some of the installation procedures require three people.

- Review the safety and handling guidelines specified under "Safety Information" on page v. These guidelines will help you work safely while working with your expansion unit and options.

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

- To ensure cabinet stability, plan the installation of servers and expansion units in the rack starting from the bottom.

- Verify that the rack can meet the operating parameters, as detailed in Table 1 on page 26.

Operating Specifications

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

Size (with front panel and without front rails)	Environment	Acoustical Noise Emissions Values
- Depth: 57.9 cm (22.8 in.) - Height: 13.3 cm (5.19 in.) - Width: 48.2 cm (18.97 in.) **Weight** - Typical expansion unit fully loaded: 39 kg. (86 lbs.) **Electrical Input** - Sine-wave input (50 to 60 Hz) is required - Input Voltage: - Low range: - Minimum: 90 V ac - Maximum: 127 V ac - High range: - Minimum: 198 V ac - Maximum: 257 V ac - Input kilovolt-amperes (kVA) approximately: - Minimum configuration: 0.06 kVA - Maximum configuration: 0.27 kVA	- Air temperature: - expansion unit on: 10° to 35° C (50° to 95° F) Altitude: 0 to 914 m (3000 ft.) - expansion unit on: 10° to 32° C (50° to 90° F) Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.) - Humidity: 10% to 80%	(For typical system configurations: 8 hard drives installed.) - Sound Power (idling): 5.6 bels - Sound Power (operating): 6.0 bels - Sound Pressure (idling): 41 dBA - Sound Pressure (operating): 45 dBA These levels are measured in controlled acoustical environments according 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.

Table 1. Expansion Unit Operating Specifications

Installing the Expansion Unit in a Rack

Before you begin

- Turn off the expansion unit.
- Refer to your rack documentation for additional information on preparing the rack.

In this section, you will use right and left rail assembly brackets and eight (black) hex head screws (provided with your hardware kit).

**39 kg
(86 lbs)**

Note: If your rack has round mounting holes, the upper and lower alignment pins must be removed and can be discarded.

Installing the Expansion Unit in a Rack

To install the expansion unit into a rack with square or round mounting holes:

1. Move to the rear of the rack as shown below.

2. Locate the desired position on the rack based on the even EIA (U level) space.
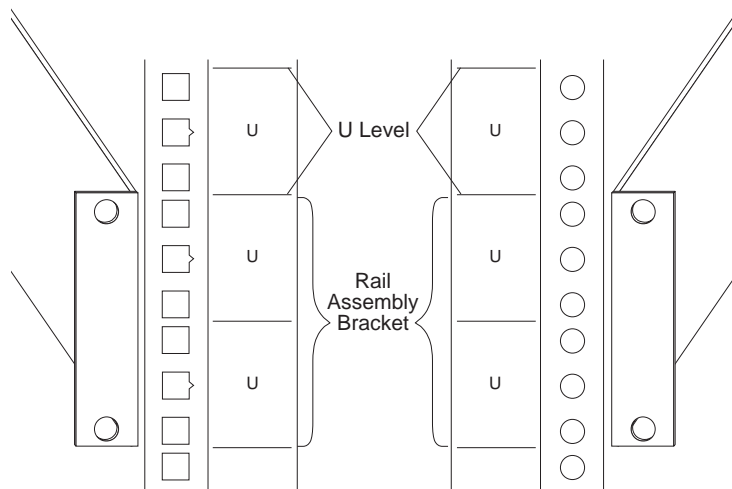
3. Align the rail assembly to the rack.

   a. Install two of the eight (black) hex head screws **1**
   (provided with your hardware kit) in the top and bottom
      positions, starting with the top.

   b. Loosely tighten the screws.

Rear of Rack
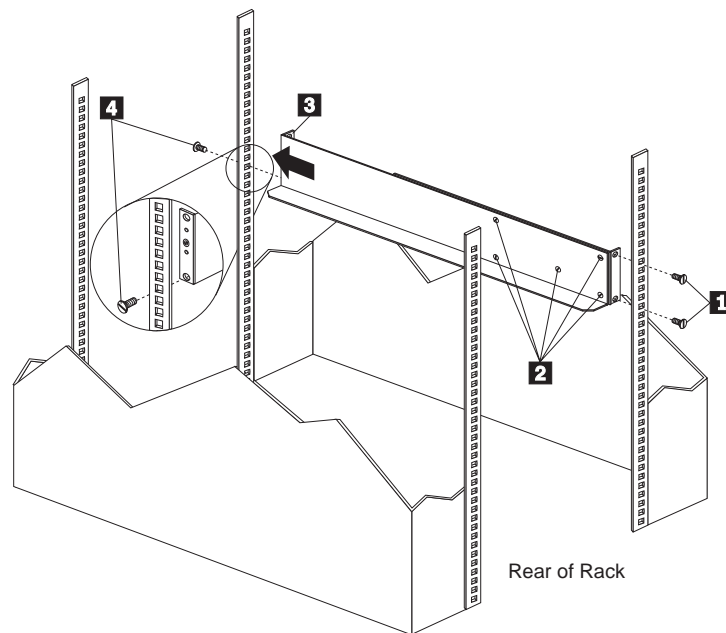
4. Loosen the five screws (four large screws and one small screw)
   2 located on the interior of the rail assembly; then slide the
   front rail assembly forward **3** until it makes contact with the
   front rack rail.

   Note: Make sure the front rail position matches the rear rail
   position.

5. From the front of the rack, mount one (black) hex head screw
   4 into the bottom position of the rail assembly and tighten
   firmly.

   Note: Before tightening, make sure the pins are located
   correctly in the rail holes.

Installing the Expansion Unit in a Rack

6. Tighten the screws firmly on the rear of the rack and the four interior screws on the rail assembly.

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

8. Remove the two small 6-32 screws **1** on the interior side of the rails.
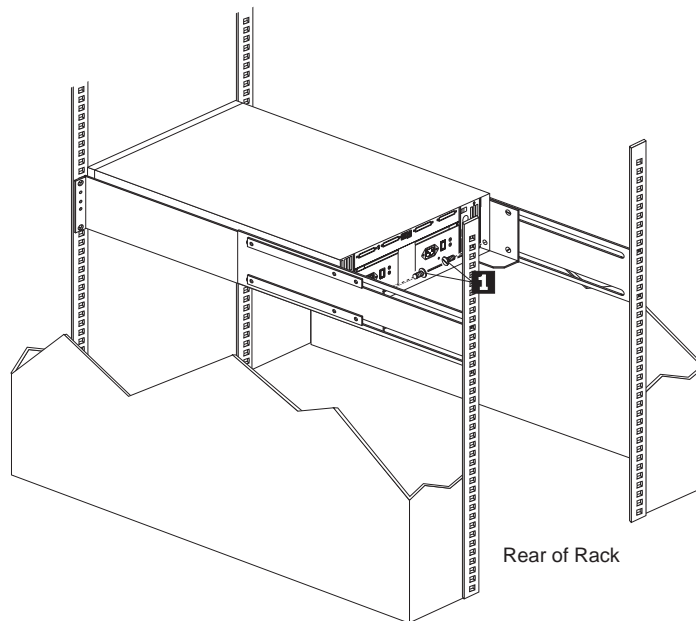
Rear of Rack

9. Slide the expansion unit into the rack.
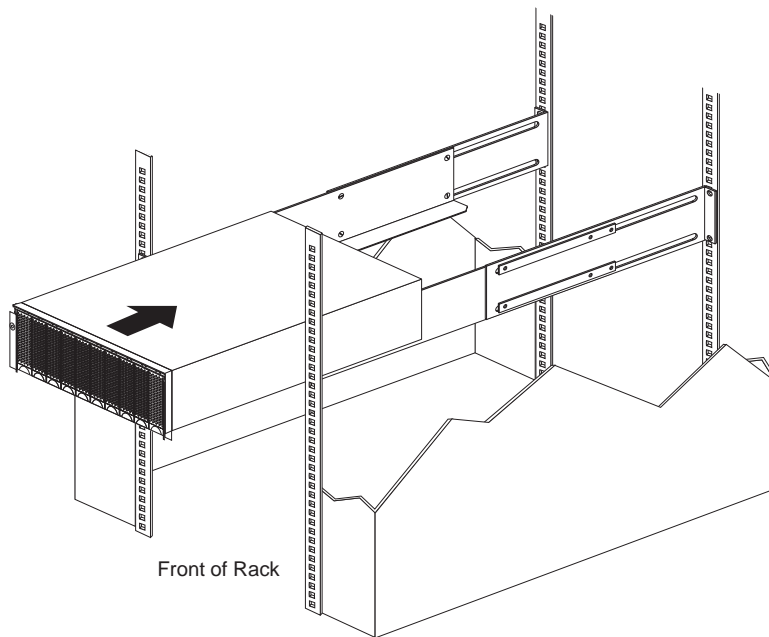
Front of Rack

Installing the Expansion Unit in a Rack

a. Remove and discard the two white screws and nuts **2** from the decorative bezel **1** on the front of the expansion unit.

   Note: Carefully attach the bezel to the front of the expansion unit. The decorative bezel is mounted correctly when the alignment pins match with the holes in the expansion unit.

Front of Rack
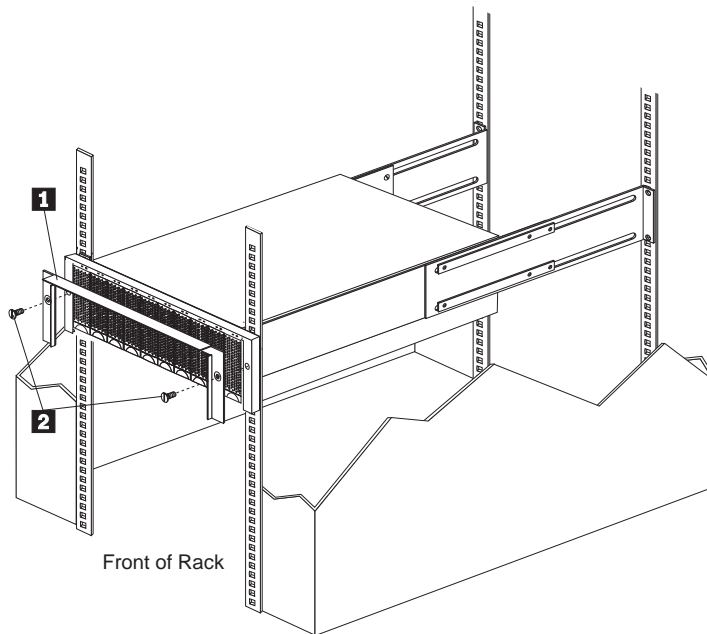
10. Insert the remaining two (black) hex head screws **2** , one on each side, and hand tighten.

   Note: When starting screws, be careful not to cross-threads.

11. Move to the rear of the rack:

    a. From the rear of the rack, re-insert the two 6-32 screws **1** on the rear of the expansion unit.

    b. Tighten the screws firmly.

Rear of Rack
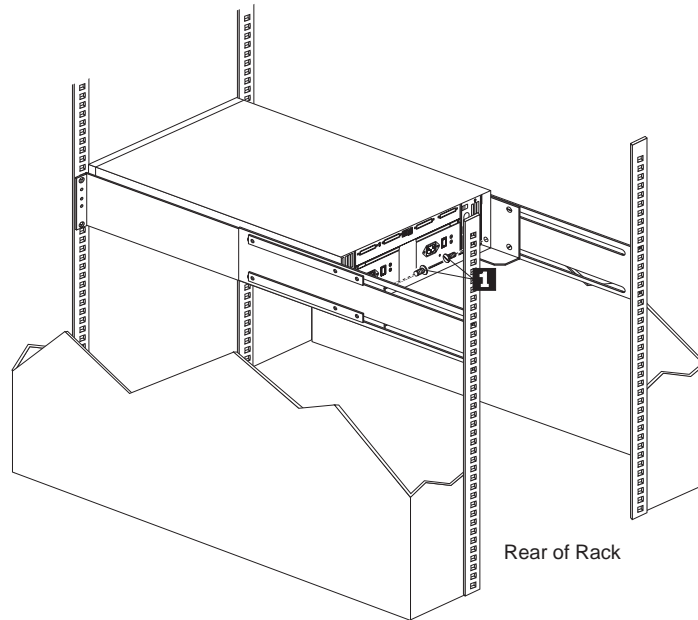
12. Connect the power cord into the rear of each power supply. Remove the nut and wrap the clamp around the line cord approximately eight inches from the end. Re-attach the nut and tighten securely.

    Note: The purpose of this clamp is to prevent the accidental unplugging of the power cord from the power supply.

13. Install the CRUs.

    Note: Refer to Chapter 4, "Installing and Replacing Devices" on page 37 for instructions on installing the CRUs into the expansion unit.

Removing the Expansion Unit from a Rack

There should be few reasons to remove the expansion unit from the rack since most of the CRU's use hot-swap logic. If you do need to remove the expansion unit, please remember to:

Before you begin

- Read "Handling Static-Sensitive Devices" on page 39.
- Turn off both power supply switches on the rear of your expansion unit.
- Follow any additional installation and safety instructions that come with the rack.

---

39 kg

(86 lbs)

To remove the expansion unit from the rack:

1. Disconnect the two power supply clamps holding the power cords.

2. Remove the two 6-32 screws **1** from the rear of the expansion unit.

Rear of Rack
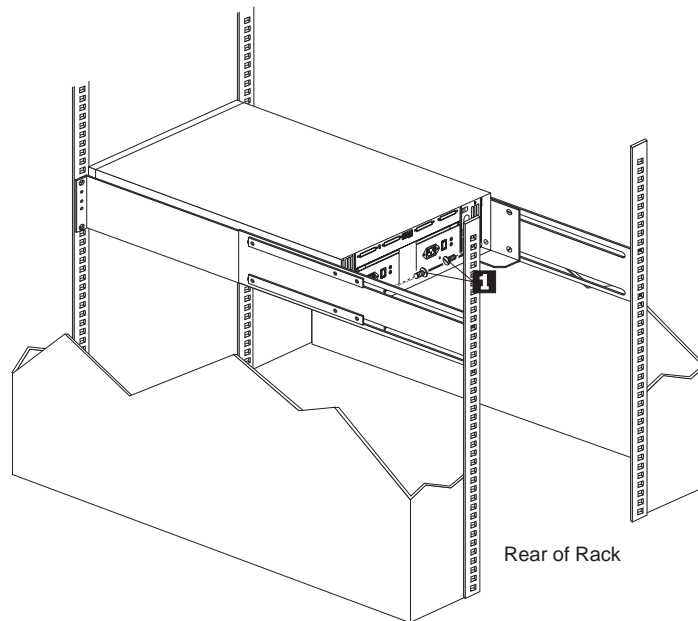
Removing the Expansion Unit from a Rack

3. Remove the top (black) hex head screws **2** from each side of the decorative bezel on the front of the expansion unit.

   Attention: Do not remove the bottom (black) hex head screws. These mount the rails that support your expansion unit.

Front of Rack
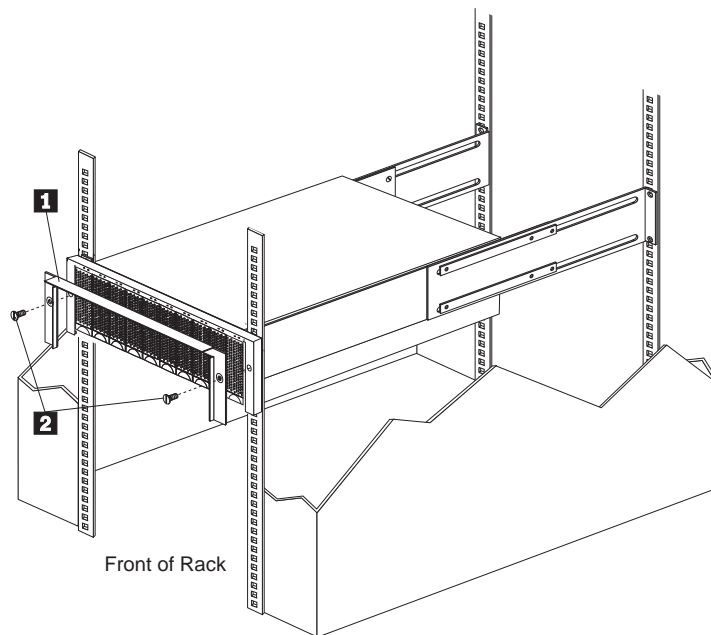
4. Remove the bezel **1** .

   Attention: When handling the expansion unit avoid touching the light pipes to prevent damage to your expansion unit.

5. Remove the expansion unit from the rack.

Chapter 4. Installing and Replacing Devices

This chapter provides instructions to help you add options to your expansion unit. Some option-removal instructions are provided, in case you need to remove hot-swap drives or customer replaceable units (CRUs).

This chapter contains:

Before You Begin

- Become familiar with the safety and handling guidelines specified under "Safety Information" on page v, and "Handling Static-Sensitive Devices" on page 39. These guidelines will help you work safely while working with your expansion unit.

- Make sure you have an adequate number of properly grounded electrical outlets for your expansion unit, server, monitor, and any other options you intend to install.

- Place your system in a location that is dry. Rain or spilled liquids might damage your expansion unit.

- Back up all important data before you make changes to storage devices, such as hard disk drives.

If you are installing the expansion unit in a rack, be sure that the rack provides adequate space around the expansion unit to allow the expansion unit's cooling system to work properly. Refer to the documentation that comes with the rack.

Handling Static-Sensitive Devices

Static electricity, though harmless to you, can seriously damage expansion 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 expansion 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 expansion-slot screw or other unpainted metal surface on the expansion 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 expansion 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 expansion unit's covers or any metal surface.

Preparing to Add Options

Before you begin

- Be sure your current system configuration is working
  properly.
- Read "Handling Static-Sensitive Devices" on page 39.
- You can install the expansion unit in a rack unit. Refer to
  the documentation that comes with the rack for additional
  safety and operating information.

Working with Internal Disk Drives

Drives are devices that your system uses to store and retrieve data. This section explains how you can increase the expansion unit's capacity by adding more drives and replacing existing drives with larger capacity ones.

Your expansion unit contains hardware that lets you replace a failed hard disk drive without turning off the expansion unit. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives.

All hard disk drives are housed in portable drive trays that plug directly into one of ten drive bays on the front of the expansion unit. Above each drive bay on the expansion unit's front panel, there are two LEDs, which indicate the status for that particular drive.
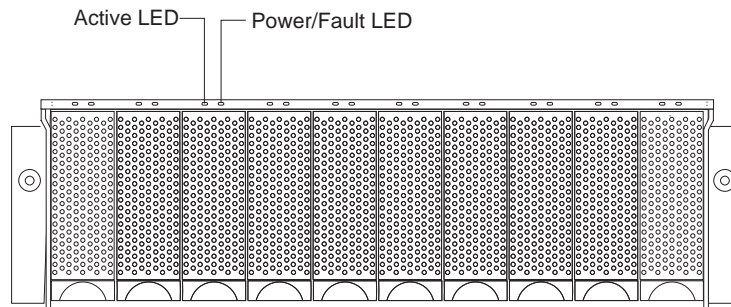
Working with Internal Disk Drives

The following table summarizes the LED states on your hot-swap drives and their definitions.

LED	Drive State	Definitions
Active LED	Green	Glows intermittently during read/write or inquiry operations to the drive.
Power/Fault LED	Green	Glows when there is power to the drive.
Power/Fault LED	Amber/Green	Glows to indicate a drive failure or blinks amber/green to indicate a drive rebuild is under way.

Drive Numbering

There are *two SCSI channels* (1, 2) in the expansion unit. Each
channel uses five SCSI ID numbers. Each disk drive within the
expansion unit has a unique channel number and SCSI ID number,
based on its physical location in the cabinet.

When a drive is plugged into the midplane, its channel number and
SCSI ID are set automatically to the standard ID assignments. (See
the illustration below.) Use the option switch on the ESM board to
change the ID settings.

(1,0) (2,8) (1,1) (2,9) (1,2) (2,10) (1,3) (2,11) (1,4) (2,12)
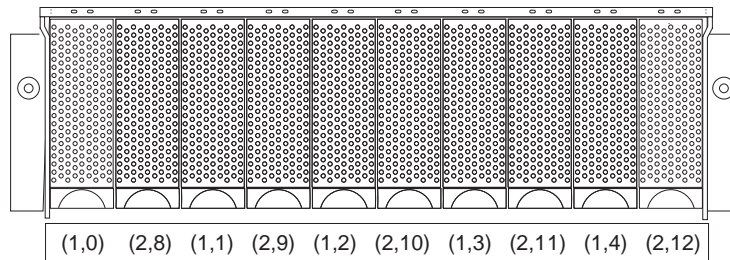
The first number represents the channel number and the second is
the SCSI ID.

┌─── **Important information for IBM ServeRAID users:** ───┐

The view configuration screens show bay numbers, not SCSI IDs.
To calculate the bay number, add 1 to the SCSI ID.

Working with Internal Disk Drives

If the two channels are 'daisy chained' using the 0.4M external SCSI cable that comes with the expansion unit, then the SCSI IDs remain the same, but the drives now are all on the same channel.

(1,0) (1,8) (1,1) (1,9) (1,2) (1,10) (1,3) (1,11) (1,4) (1,12)
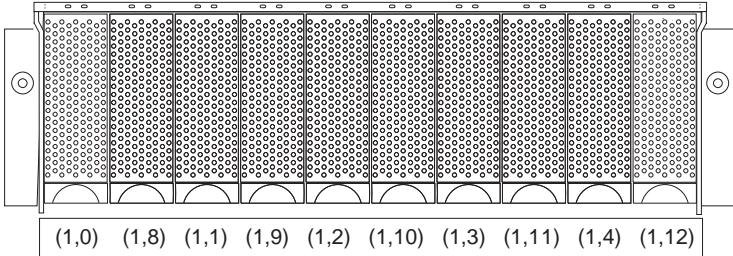
Installing Hot-Swap Drives

Here are a few things to consider when installing drives:

- **Remove empty drive trays.** Expansion unit's shipped without a full set of drives (10) contain blank drive trays in the unused drive bays. Before installing new drives, you must remove the blank trays, which should be saved for future use. Each of the ten bays must always contain either a blank tray or a tray with a disk drive.

- Install 16-bit SCSI drives.

Attention: If you are replacing a drive that is part of a RAID level 1 or RAID level 5 logical drive, ensure that you install the replacement drive in the correct bay. Failure to replace the drives in their correct bays can result in loss of data.

Installing Additional Hot-Swap Drives

Use this procedure to install additional drives in the expansion unit. You can install additional drives while the expansion unit is powered-up and running. However, you must have empty drive bays to accommodate the new drives.

Before you begin

- Read "Handling Static-Sensitive Devices" on page 39.
- Read the instructions that come with the internal drive.

---

1. Check for Fault LEDs. If any amber LEDs are lit, refer to Table 3 on page 66.

Active LED — Power/Fault LED — Front Panel
Drive CRU
Drive Levers
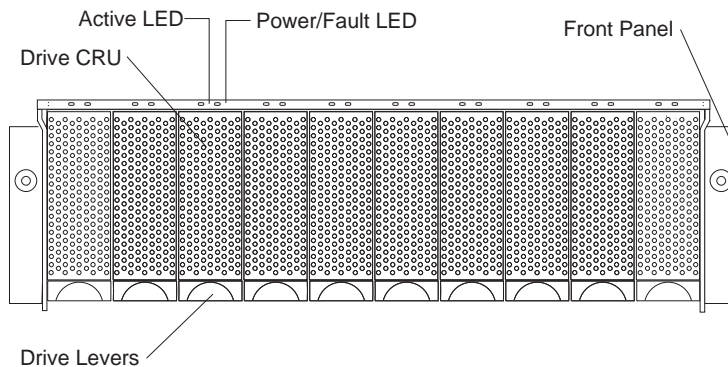
2. Remove the blank drive trays:

   a. Pull on the bottom of the tray lever to release the lever.

   b. Lift the lever and slide the blank tray out of the bay.

3. Install the drive:

   a. Unlatch and open the lever and insert the drive into the empty bay.

   b. Lock the lever in place.
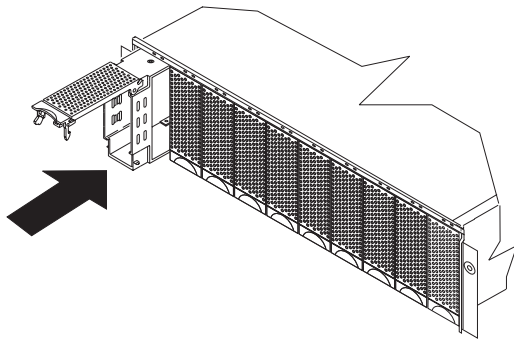
4. Check for LED Faults.

    a. When drives are ready for use, the green Active LED should be off and the Power/Fault LEDs should be glowing green.

    b. If the Power/Fault light is amber, remove the drive from the unit and wait 10 seconds; then, re-install the drive. If your SCSI adapter is the IBM ServeRAID; go to the ServeRAID User's Guide for additional information and procedures on changing the state of the drive from the current Default state to any other state (for example, HSP, RDY, rebuild drive to ONL, and so on). The amber LED should go off within 10 seconds of the drive state change (to something other than DDD).

    If your SCSI adapter is the IBM ServeRAID II, in some cases, the drive will automatically reset to either a hotspare (HSP) or be rebuilt (ONL). See the ServeRAID II User's Guide for additional information. If the state change in the ServeRAID II configuration does not change automatically (amber LED does not go off), then refer to the ServeRAID II User's Guide for directions on how to perform a manual drive state change. The amber LED should go off within 10 seconds of a drive state change (to something other than DDD).

    c. Configure the drives using the appropriate disk array software.

Replacing Internal Hot-Swap Drives

Drive problems include any malfunctions that delay, interrupt, or prevent successful I/O activity between the hosts and the hard disk drives in the expansion unit. This includes transmission problems between the host controllers, the ESM board, and the drives. This section explains how to replace a failed drive.

Note: Failure to replace drives in their correct bay might result in loss of data.

Check the applicable hardware and software documentation provided with your system to see if there are restrictions regarding hard disk drive configurations. Some systems might not allow mixing different drive capacities or types within an array.

Before you begin

- Read "Handling Static-Sensitive Devices" on page 39.
- Turn off the expansion unit. However, if removing hot-swap drives, you can leave the expansion unit turned on.
- Determine the location of the drive that you want to remove.
---

1. Remove the drive.

   a. Pull on the bottom of the drive lever to release the lever.

   b. Lift the lever and pull the drive partially out of the bay.

   c. Wait at least ten seconds before fully removing the drive from the expansion unit to allow for spin down.

2. Install the new drive.

   a. Unlatch and open the drive lever and insert the drive.

   b. Lock the lever in place.

3. Check the LEDs.

   a. When drives are ready for use, the green Active LEDs should be off and the Power/Fault LEDS should be glowing green.

b. If the Power/Fault light is amber, lift the lever and pull the drive partially out of the bay. Wait at least ten seconds before fully removing the drive from the expansion unit to allow for spin down. If your SCSI adapter is the IBM ServeRAID; go to the ServeRAID User's Guide for additional information and procedures on changing the state of the drive from the current Default state to any other state (for example, HSP, RDY, rebuild drive to ONL, and so on). The amber LED should go off within 10 seconds of the drive state change (to something other than DDD).

If your SCSI adapter is the IBM ServeRAID II, in some cases, the drive will automatically reset to either a hotspare (HSP) or be rebuilt (ONL). See the ServeRAID II User's Guide for additional information. If the state change in the ServeRAID II configuration does not change automatically (amber LED does not go off), then refer to the ServeRAID II User's Guide for directions on how to perform a manual drive state change. The amber LED should go off within 10 seconds of a drive state change (to something other than DDD).

4. Return to normal operation.

Working with SCSI Components

This section contains information about SCSI configurations and cable restrictions.

SCSI Configurations

The IBM Netfinity EXP10 comes with an electronics board that interfaces between the external SCSI cables and the hot-swap backplane. There are a total of four 68-pin standard SCSI connectors. From left to right as seen from the back, these connectors are: SCSI bus 1 IN, SCSI bus 1 OUT, SCSI bus 2 IN, SCSI bus 2 OUT. There are several ways to use these buses:

SCSI Connectors

1 In   1 Out   2 In   2 Out
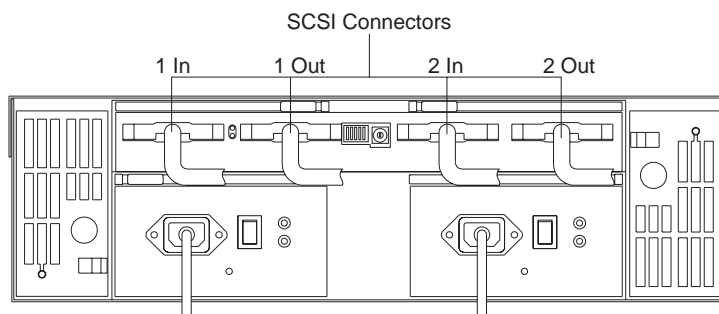
- **To configure both buses independently:**

    1. Attach one external SCSI cable from the controller in the server to the SCSI bus 1 IN connector.

    2. Attach a second external SCSI cable from the controller in the server to the SCSI bus 2 IN connector.

    3. Attach an external SCSI terminator to the SCSI bus 1 OUT connector.

        Note: SCSI bus 2 OUT will come with a SCSI terminator already in place. In addition, an optional terminator is available.

        Switches 1 and 2 (of 5) in the back middle of the expansion unit are used to set the SCSI IDs of the disk drives for SCSI bus 1 and 2 respectively.

4. Block switch positions:

   – Switch 1 off (down position): address preset for low
     address (0-4).
   – Switch 2 on (up position): address preset for (8-12).

   Note: Switches may be left alone or for the user naming
          convention convenience, switch 2 may be moved
          down to set the addresses of bus 2 to low addressing
          (0-4).

- **To configure the box as a single 10 drive SCSI channel:**

  1. Attach one external SCSI cable from the controller in the
     server to the SCSI bus 1 IN connector.

  2. Connect a 0.4 meter 'daisy chain' cable that comes with the
     expansion unit into the SCSI bus 1 OUT and to the SCSI bus
     2 IN connectors.

  3. Leave the external terminator on the SCSI bus 2 OUT
     connector.

     Note: The IBM Netfinity EXP10 comes standard with this
            terminator already in this position.

  4. Keep block switches (1 and 2) in their default positions:

     – Switch 1 off (down position): address preset for low
       address (0-4).
     – Switch 2 on (up position): address preset for (8-12).

- **To configure both buses independently for clustering:**

  1. Attach one external SCSI cable from the controller in the
     server to the SCSI bus 1 IN connector.

  2. Attach a second external SCSI cable from the controller in
     the server to the SCSI bus 1 OUT connector.

     Note: This completes the setup for SCSI channel 1.

  3. Attach one external SCSI cable from the controller in the
     server to the SCSI bus 2 IN connector.

  4. Attach a second external SCSI cable from the controller in
     the server to the SCSI bus 2 OUT connector.

> *Note:* This completes the setup for SCSI channel 2.

> 5. The block switches should either be left in their preset state, or switch 2 can be set off (down position).

- **To configure the box as a cluster of ten drives on a single channel:**

  1. Attach one external SCSI cable from the controller in the server to the SCSI bus 1 IN connector.

  2. Attach a second external SCSI cable from the controller in the server to the SCSI bus 2 OUT connector.

  3. Connect a 0.4 meter cable to the SCSI bus 1 OUT and SCSI bus 2 IN connectors.

  4. Keep the switch block switches (1 and 2) in their original state:

     - Switch 1 off (down position): address preset for low address (0-4).
     - Switch 2 on (up position): address preset for (8-12).

Attention: On the switch block, switch position 3 should be on or in the up-right position. This will allow the controller to spin up the drives. Otherwise, the simultaneous load of all drives powering on could cause the power supplies to shut themselves down due to an overload condition.

Cable Restrictions

There are restrictions on the speed that a controller can communicate with the Ultra SCSI drives. Ensure that the SCSI adapter is set to the appropriate speed setting. Some adapters will default to the Ultra speed. The following table presents the cabling/speed requirements.

Note: Refer to your SCSI Adapter documentation to alter SCSI bus speeds.

Table 2. Drive Speed vs Cable Length

Cable Length	Single Controller	Cluster Controller
2m cable	Ultra[1]	F/W
3m cable	F/W[2]	F/W
4.xm cable	F/W	–

Note: A SCSI channel from a SCSI adapter must be dedicated to the IBM Netfinity EXP10. This means that the corresponding internal SCSI connector must be left unused.

---

[1] Ultra speed is often set up in the SCSI controller by setting the transfer rate. Check your SCSI controller documentation to see how to set this parameter.

[2] F/W stands for 'Fast' SCSI speed and 'Wide' SCSI bus. Check with your SCSI controller documentation to see how to set this parameter.

Working with Hot-Swap Power Supplies

The power supplies are customer replaceable units (CRUs) and do not require preventive maintenance.

- Both power supplies must always be in place, even if one is not functioning properly, to maintain proper cooling.

- Replace power supplies if amber LEDs remains on.

- Refer to Table 3 on page 66 for information on LEDs.

Attention: Always follow these instructions when installing or removing a hot-swap power supply.

To install a hot-swap power supply:

1. Ensure that the AC power switch on the power supply is in the Off position.

AC Power Connectors

AC Power Switches

2. Install the power supply in the expansion unit.

   a. Slide the power supply into the expansion unit. The LEDs
      should always be on the right side.

   b. Close the lever until it locks in place.

3. Connect the power cord to the power supply.

4. Wrap the clamp around the power cord about eight inches from
   the end.

5. Re-attach the nut and tighten securely.

6. Plug the supply power cord into a properly grounded electrical
   outlet.

7. Turn the switch on the power supply to the On position.

To remove a hot-swap power supply:

1. Turn the switch on the power supply to the Off position.

2. Unplug the supply power cord from the electrical outlet.

3. Disconnect the power cord from the power supply.

4. Remove the nut and clamp from the rear of the power supply.

5. Remove the power supply from the expansion unit.

   a. Grasp the power supply's pull-ring and squeeze the latch to
      release it.

   b. Pull the lever open and remove the power supply.

Note: When replacing a power supply due to a failure, insure that the power supply latch is mounted to the side of the supply that would be toward the middle of the machine. If not, remove the lever screw, flip the lever over and re-tighten the screw on the opposite side. (See the illustration below.)
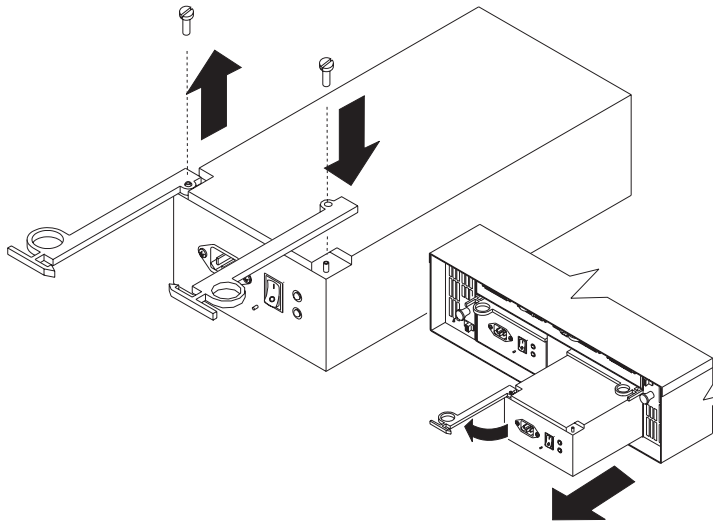
Working with the Hot-Swap Cooling Fans

Attention: Do not run the expansion unit without adequate ventilation and cooling, because it might cause damage to the internal components and circuitry.

The fans are interchangeable and customer replaceable and do not require preventive maintenance. The fans help maintain proper air circulation across the components inside the expansion unit. Air flows through the expansion unit from the front to the back.

You can Hot-Swap the fans (replace them while the expansion unit is turned on and running), as long as you complete the exchange within 10 minutes. This time limit applies only to the total time that a fan is out of the expansion unit, beginning when you remove the failed unit and ending when you re-seat the new one. This does not include the time it takes you to perform this entire procedure (checking LEDs, unpacking the new fan, and so on).

Both fan units must always be in place, even if one is not functioning properly, to maintain proper cooling.

Note: Refer to Table 3 on page 66 for more information on LEDs.
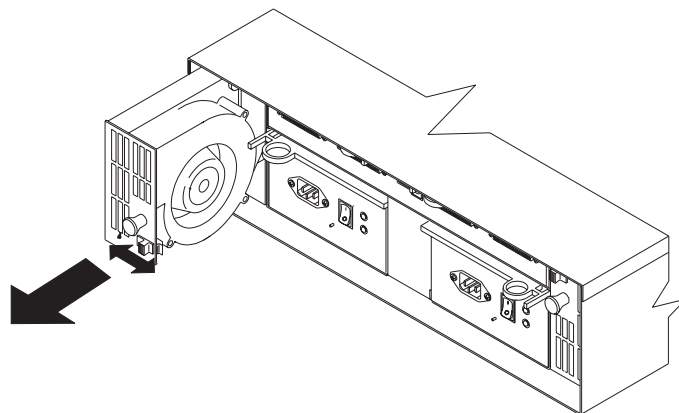
Use the following procedures to replace a hot-swap fan:

1. Check the LEDs on the back of the expansion unit.

2. Remove the failed fan.

    a. Slide the latch left or right to unlock the fan.

    b. Use the handle (black knob) to pull the fan from the expansion unit.

3. Install the new fan.

4. Check the LEDs.

   The Fault LEDs should turn off after a few seconds, if they remain on, refer to Table 3 on page 66.

Turning the Expansion Unit On and Off

This section contains instructions for turning the expansion unit on and off under normal and emergency circumstances.

Note: If you are turning on the expansion unit after an emergency shutdown or power outage, refer to "Restore Power After an Emergency" on page 63.

AC Power Connectors

AC Power Switches
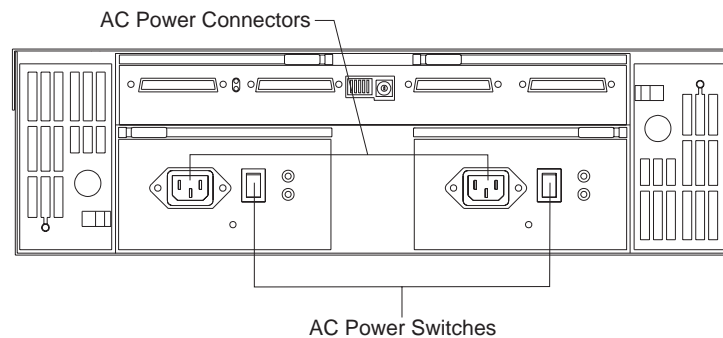
Turning the Power On

Use this procedure to turn on the power.

- **Initial start-up:**
  1. Verify that:

     a. All communication and power cables are plugged into the back of the expansion unit.

     b. All hard disk drives are locked securely in place.

     c. The Option switch on the expansion unit is set correctly.

     d. The host controller and other SCSI bus devices are ready for the initial power-up.

     e. Check the system documentation for all the hardware devices you intend to power-up and determine the proper start up sequence.

Turning the Expansion Unit On and Off

> *Note:* In general, the IBM Netfinity EXP10 should be powered on prior to or at the same time as the system unit.

2. Turn on the power to each device, based on this power-up sequence.
3. Turn on *both* power supply switches on the back of the expansion unit.

> *Note:* The expansion unit may take a few seconds to power-up. During this time, you may see the amber and green LEDs on the expansion unit turn on and off intermittently. When the power-up sequence is complete, only the green LEDs should remain glowing. If you still have one or more amber LEDs glowing, refer to Table 3 on page 66.

- **Re-starting:**

  If you are re-starting after a normal shutdown, wait at least ten seconds before you attempt to turn on *both* power supply switches.

Turning the Power Off

Attention: Except in an emergency, never turn off the power if any
Fault LEDs are lit on the expansion unit, especially on the drives.
You should correct the fault before you attempt to turn off the
power, using the proper troubleshooting or servicing procedure.
This will ensure that the expansion unit will power up correctly
later. For guidance, refer to Table 3 on page 66.

The expansion unit is designed to run continuously, 24 hours a day.
Once you turn on the expansion unit, it should remain on. The only
time you should turn off the power is when:

- Instructions in a hardware or software procedure require you to
  turn off the power.

- A factory representative or service technician tells you to turn
  off the power.

- A power outage or emergency situation occurs (see "Performing
  an Emergency Shutdown" on page 62).

Use this procedure to turn off the power.

1. Make sure that all I/O activity has stopped. If applicable,
   logically disconnect from the host controller.

2. Make sure that all amber Fault LEDs are off. If any Fault LEDs
   are lit (drives, power supplies, or fans), correct the problem
   before you turn off the power. For guidance, refer to Table 3
   on page 66.

3. Turn off *both* power supply switches on the back of the
   expansion unit.

Performing an Emergency Shutdown

Attention: Emergency situations might include: fire, flood, extreme weather conditions, or other hazardous circumstances. If a power outage or emergency situation occurs, you should always turn off all the power switches on all computing equipment. This will help safeguard your equipment from potential damage due to electrical surges when power is restored. If the expansion unit loses power unexpectedly, it may be due to a hardware failure in the power system or mid-plane (see Table 3 on page 66).

Use this procedure to shutdown during an emergency.

1. If you have time, stop all activity and check the LEDs (front and back). Make note of any fault LEDs that may be lit so you can correct the problem when you turn on the power again.

2. Turn off *both* power supply switches; then, unplug both power cords from the expansion unit.

Restore Power After an Emergency

Note: The following instructions assume that you turned off the power supply switches during an emergency situation or after a power outage occurred.

Use this procedure to restart the expansion unit after a power failure or emergency shut down.

1. After the emergency situation is over or power is restored to the building, check the expansion unit for damage.

   Note: If there is no visible damage, continue with Step 2, otherwise, have your system serviced. See "Getting Help, Service, and Information" on page 69.

2. After you have checked for damage, plug in the expansion unit's power cords and turn on *both* power switches.

3. Only the green LEDs on the front and back should be glowing. If one or more of the amber Fault LEDs are lit, refer to Table 3 on page 66 for instructions.

4. Refer to your software application to check the software status of the expansion unit.

Restore Power After an Emergency

Chapter 5. Solving Problems

This chapter contains information to help you solve some of the simpler problems you might have with your expansion unit.

This chapter contains:

Overview of the Diagnostic Tools

System problems can be caused by hardware, software, or user error. (An example of a user error is pressing the wrong key.) You might be able to solve the problem yourself or provide helpful information to a service technician.

Troubleshooting Charts

You can use the troubleshooting charts in this section to find solutions to problems that have definite symptoms.

Problem Indicator	Component	Possible Cause	Possible Solutions
Amber LED on	Front Panel	(Flashing) host issued drive rebuild command	No action necessary.
		Drive failure	Replace failed drive.
	Fan CRU	Fan failure	Replace failed fan.
	ESM board	Subsystem is overheated	Check fans for faults. Replace failed fan if necessary.
		Environment too hot	Check the ambient temperature around the expansion unit. Cool as necessary.
		Defective LED or hardware failure	If you cannot detect a fan failure or overheating problem, have the expansion unit serviced.
Amber LED on, green LED off	Power supply CRU	Power switch turned off	Turn on power switch.
Amber and green LEDs on	Power supply CRU	Power supply failure	Replace failed power supply CRU.
Amber/green LEDs off	Drive CRU	CRU not plugged in	Make sure that the drive is inserted and locked in place correctly. If you remove a drive from its bay, always wait at least 10 seconds before you plug it back into the expansion unit.
		Drive failure	If the drive is locked in place and its Power/Fault LED remains off, replace the drive.
All green LEDs off	All CRUs	Subsystem power off	Check that both expansion unit power cords are plugged in and both power switches are on. If applicable, check that the cabinet's main circuit breakers are turned on.
		A.C. power failure	Check building's circuit breaker and A.C. outlet.
		Power supplies failed	Replace both power supplies.
		Mid-plane failure	Have the expansion unit serviced.

Table 3. Expansion Unit Troubleshooting Chart

Problem Indicator	Component	Possible Cause	Possible Solutions
Intermittent or sporadic power loss to the expansion unit	Some or all CRUs	Defective AC power source	Check the AC power source to the cabinet. If applicable, check the cabinet's power components (power units, UPS, and so on). Replace defective power cords.
		Power supply failure	Check for a fault LED on the power supplies and replace the failed CRU.
		Mid-plane failure	Replace mid-plane (service technician only).
One or more green LEDs off	Power supply CRUs	Power cord unplugged or switch turned off	Make sure cord is plugged in and switch is turned on.
		Power supply CRU unplugged	Turn off the power switch. Make sure the power supply is plugged in properly and locked in place. Turn the power on again.
	One or two drive CRUs	No activity to the drives	No action required.
		Drive CRU not plugged in	If you remove a drive from its bay, always wait at least 10 seconds before you plug it back into the expansion unit.
		Drive failure	Check the drive for Fault LEDs. Replace as necessary.
	All drive CRUs or those on one bus	No activity to the drives	No action required.
		Damaged or loose SCSI cables	Check SCSI bus cables and connections.
		ESM board failure	Use RAID management software to check the SCSI bus status. Have the expansion unit serviced to replace the ESM board.
		Mid-plane failure	Have the expansion unit serviced to replace the mid-plane.
	Several CRUs	Hardware failure	Replace the affected CRUs. If this doesn't correct the problem, replace the ESM board, followed by the mid-plane.

Troubleshooting Charts

Unable to access drives on one or both SCSI buses	Drives and SCSI bus	Incorrect SCSI ID settings	Make sure SCSI cables are undamaged and properly connected. Check the drive SCSI ID settings. If drives are daisy-chained to same SCSI bus, Option switches 1 and 2 must be set to different SCSI ID settings.
		ESM board failure	Replace failed ESM board (service technician only).
Random errors	Subsystem	Mid-plane failure	Replace mid-plane (service technician only).

Table 4. Expansion Unit Troubleshooting Chart

Note: If you cannot find the problem in the troubleshooting charts, test the entire system. See your server documentation for more detailed information on testing and diagnostic tools.

If you already have run the server's test program, or if running the test does not reveal the problem, have the system serviced. (See "Getting Help, Service, and Information" on page 69.)

Getting Help, Service, and Information

This section contains information to help you solve more complex problems that you might encounter with your expansion unit. It provides instructions on how to obtain service and technical assistance, and information about other publications, products, warranties, and services that IBM offers.

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 Computer home page
`http://www.us.pc.ibm.com/desktop/`	IBM Commercial Desktop home page (U.S.)
`http://www.us.pc.ibm.com/servers/`	IBM Server home page (U.S.)
`http://www.us.pc.ibm.com/options/`	IBM Options home page (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.

Before You Call for Service

Many expansion unit 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 expansion unit.

Most servers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. For troubleshooting and error information about your expansion unit, see Table 3 on page 66.

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 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 NT
- Networking
- Communications
- Multimedia

In addition, the latest device driver updates are available.

The IBM PC Company 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 PC Company BBS:

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

- – In Halifax, call 902-420-0300.
- – In Montreal, call 514-938-3022.
- – In Toronto, call 905-316-4255 or 416-956-7877.
- – In Vancouver, call 604-664-6461 or 604-664-6464.
- – In Winnipeg, call 204-934-2735.

Commercial online services that contain information about IBM products include:

- CompuServe

  Use the following GO words: APTIVA, IBMPS2, ThinkPad, PowerPC, ValuePoint, IBMSVR, or IBMOBI.

- PRODIGY

  Use the Jump command; type **IBM** and select **PC Product Support.**

- America Online

  Use the "Go to" keyword **IBM Connect**.

Using the World Wide Web
On the World Wide Web, the Personal Computers home page has information about IBM Personal Computer products and support. The address for the IBM Personal Computers home page is:

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

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

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

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

```
http://www.us.pc.ibm.com/servers/
```

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

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

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

Getting Customer Support and Service

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 free marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs). You can call the IBM PC Company 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 PC Company Automated Fax System, do the following:

- In the U.S., call 1-800-426-3395.
- In Canada, call 1-800-465-3299.

Getting Help by Telephone

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

- Setting up your expansion unit 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 Netfinity EXP10, you are eligible for Netfinity 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:

- Serial numbers of your expansion unit, 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 expansion unit when you call.

These services are available 24 hours a day, 7 days a week.*

- In the U.S. and Puerto Rico, call 1-800-772-2227.
- In Canada, call 1-800-565-3344. :
- In the United Kingdom, call 01705-565000 or 0161-9056001.

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

Getting Help Around the World

If you need to move your expansion unit 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.

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,

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* Service availability will vary by country. Response time will vary depending on the number and nature of incoming calls.

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 75.

900-Number Operating System and Hardware Support Line
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 expansion unit

- 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 IBM reseller or IBM marketing representative.

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. Records

Whenever you add options to your expansion unit, be sure to update the information in this appendix. Accurate, up-to-date records make it easier to add other options and, if the need should arise, to report a hardware problem.

Record the Identification Numbers

Record and retain the following information.

Product Name	IBM Netfinity EXP10
Serial Number	_____

The serial number is located on bottom surface on the rear of the machines.

Installed Device Records

Use the following tables to keep a record of the options installed in or attached to your expansion unit. This information can be helpful when you install additional options or if you ever need to report a hardware problem. Copy these tables before recording information in them, in case you need extra space to write new values later, when you update your system's configuration.

Installed Device Records

Expansion Unit Disk Drive Location	Disk Drive Serial Number	Expansion Unit SCSI Channel (1,2)	SCSI Address (0-4) or (8-12)	Adapter Number	Adapter Channel Number (1:3)
Bay 1	_____	_____	_____	_____	_____
Bay 2	_____	_____	_____	_____	_____
Bay 3	_____	_____	_____	_____	_____
Bay 4	_____	_____	_____	_____	_____
Bay 5	_____	_____	_____	_____	_____
Bay 6	_____	_____	_____	_____	_____
Bay 7	_____	_____	_____	_____	_____
Bay 8	_____	_____	_____	_____	_____
Bay 9	_____	_____	_____	_____	_____
Bay 10	_____	_____	_____	_____	_____

Table 5. Internal Drives and Devices

Appendix B. Product Warranties and Notices

This appendix contains warranty and emission notices for the
United States, Puerto Rico, Canada, and the United Kingdom. In
addition, this appendix contains trademarks and general-information
notices.

This appendix contains:

Warranty Statements

The following warranty statements are for the United States, Canada, Puerto Rico, and the United Kingdom.

United States, Canada and Puerto Rico

The following is the statement of limited warranty for the United States, Canada, and Puerto Rico.

International Business Machines Corporation   Armonk, New York, 10504

Statement of Limited Warranty

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally 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. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. If you have any questions, contact IBM or your reseller.

Machine: IBM Netfinity EXP10

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

*Contact your place of purchase for warranty service information.

Production Status

Each 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 warranty terms apply.

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 receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if authorized by IBM, will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

For IBM or your reseller to provide warranty service for a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many of these transactions involve the removal of parts and their return to IBM. You

represent that all removed parts are genuine and unaltered. A part that replaces a removed part will assume the warranty service status of the replaced part.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair it or replace it with one that is at least functionally equivalent, without charge. The replacement may not be new, but will be in good working order. If IBM or your reseller is unable to repair or replace the Machine, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user. However, for Machines which have a life-time warranty, this warranty is not transferable.

Warranty Service
To obtain warranty service for the Machine, you should contact your reseller or call 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 will provide certain types of repair and exchange service, either at your location or at IBM's or your reseller's service center, to restore a Machine to good working order.

When a type of 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. 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 ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange.

You agree to:
 1. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
 2. where applicable, before service is provided —
     a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
     b. secure all programs, data, and funds contained in a Machine, and
     c. 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.

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

Product Warranties and Notices

The warranties may be voided by misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, removal or alteration of Machine or parts identification labels, or failure caused by a product for which IBM is not responsible.

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

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 only for:

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 or loss, up to the greater of U.S. $100,000 or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR LOSSES OR 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 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 EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

United Kingdom

IBM warrants this IBM product to be in good working order and conforms to its officially published IBM specifications for a period of three years from the date of first purchase by an end-user customer.

Note: Batteries for Mobile products are limited to 1 year warranty.

Your sales receipt or authorised dated and stamped warranty service certificate is proof of your entitlement to warranty service.

If this product is not in good working order, IBM will, at its option, repair or replace this product at no additional charge except as set forth below. Repair parts and replacement products will be provided on an exchange basis and will be either new, equivalent to new or reconditioned. All replaced parts and products become the property of IBM. This warranty does not cover the repair of damage to the product resulting from:

* Accident, disaster, misuse and abuse

* Use of parts not manufactured or sold by IBM

* Modification of the product

* Service provided by anyone other than IBM or an authorised IBM service provider.

IBM does not warrant that the functions in any preloaded program will meet your requirements or that the operations of the preloaded program will be uninterrupted or error free.

There is no other warranty whether express or implied. In case the exclusion of certain warranties would be precluded by applicable law, such warranties would be limited in duration to the warranty period stated above.

Warranty Performance

Warranty service may be obtained by returning the product during warranty period to an authorised IBM service provider and by providing proof of your warranty service entitlement. You are responsible for any associated transportation charges and insurance during shipment and return.

Product Warranties and Notices

For a product purchased in a group A country (as defined), warranty service may be obtained from any authorised IBM service provider in any group A country; similarly for a product purchased in a group B country, warranty service may be obtained from any authorised IBM service provider in any group B country.

Group A Countries
Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland Italy, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Group B Countries
Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Czechia, Russia, Armenia, Bellarus, Georgia, Kirghizia, Hungary, Kazakhstan, Macedonia, Moldova, Poland, Romania, Slovakia, Serbia-Montenegro, Slovenia, Ukraine.

On-Site Service
Some IBM products are sold with a service entitlement which is delivered on the customers premises (on-site). If the product you have purchased carries with it an entitlement to IBM on-site service, this service is provided during the warranty period subject to the following terms and conditions:

- The product must have been announced as qualifying for On-Site Service in the country in which Warranty Service is being claimed.

- You must contact a local authorised IBM service provider and be prepared to supply proof of warranty entitlement. The authorised IBM service provider will attempt to resolve your problem over the telephone. If this is not possible, a trained service engineer will be dispatched to your location to repair the IBM product.

- The service representative must be provided with full access to the equipment reported as faulty.

- The equipment must be located within 50 kilometers (or more depending on country) of the authorised IBM service provider.

Liability

IBM shall have no liability for lost profits or other consequential damages, even if advised of the possibility of such damages, or for any claim by any third party. IBM's total liability for a breach or breaches of this warranty by IBM is limited to 100,000 US Dollars of direct damages. This financial limitation of liability will not apply to claims for death or personal injury or damage to real or personal property caused by IBM negligence.

General

No statements contained herein shall affect the statutory rights of consumers.

International Warranty Service

IBM International hardware warranty service is available for those customers, travelling to countries in which their PC products are announced and sold by IBM or IBM resellers, upon registering with IBM International Warranty Service Office. IBM International Warranty Service is provided subject to the terms and conditions of the IBM Warranty Statement provided with the product in the country of purchase. Service outside the country of purchase will be provided under local service procedures. Customers who wish to relocate their machine to another country and wish to obtain warranty service must first register with the International Warranty Service Office based in Greenock. The I.W.S.O. will offer advice on the warranty service available in the country or countries where the customer wishes to relocate and will issue an International Warranty Service Certificate upon proof of warranty status of the customers machine. Contact the I.W.S.O. on

Tel + 44 1475 893638

Fax + 44 1475 893732

Alternatively customers may register for International Warranty Service via their local IBM Office.

Product Warranties and Notices

Notes:

1. International Warranty Service is not available on IBM Options unless they are installed in or connected to an IBM System Unit which is registered for International Warranty Service.

2. Customers are not required to register their machine for International Warranty Service if relocation is within the countries of Group A or Group B.

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
> 500 Columbus Avenue
> Thornwood, NY 10594
> U.S.A.

Trademarks

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

HelpWare
IBM
Netfinity
OS/2
PowerPC
ThinkPad
ValuePoint

The following terms are trademarks of other companies:

America Online is a trademark or registered trademark of America Online, Incorporated.

CompuServe is a trademark or registered trademark of CompuServe, Incorporated.

PRODIGY is a trademark or registered trademark of Prodigy Services Company.

Windows NT is a trademark or registered trademark of Microsoft Corporation.

Other company, product, and service names , which may be denoted by a double asterisk may be trademarks or service marks of others.

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 meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur 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 United Kingdom Limited, PO BOX 30 Spango Valley Greenock Scotland PA160AH.

CAUTION:
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

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

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:

IBM Power Cord Part Number	Used in These Countries
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa
13F9979	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, 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, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

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Part Number: 05L1430

Printed in U.S.A.

November 1997