IBM

@server

xSeries 445
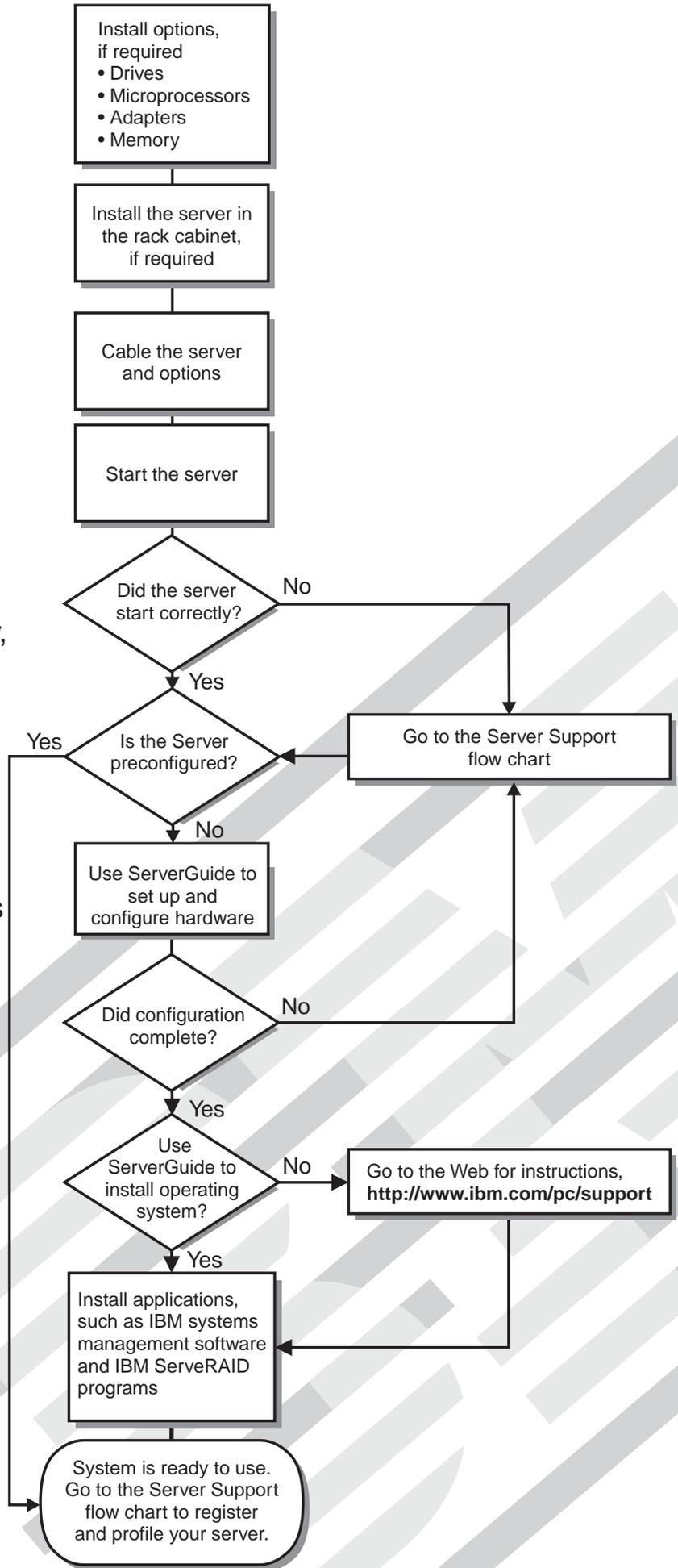### Type 8870

Installation Guide

Welcome. . .

Thank you for buying an IBM xSeries server. Your server is based on the X-Architecture technology, and it features superior performance, availability, and scalability.
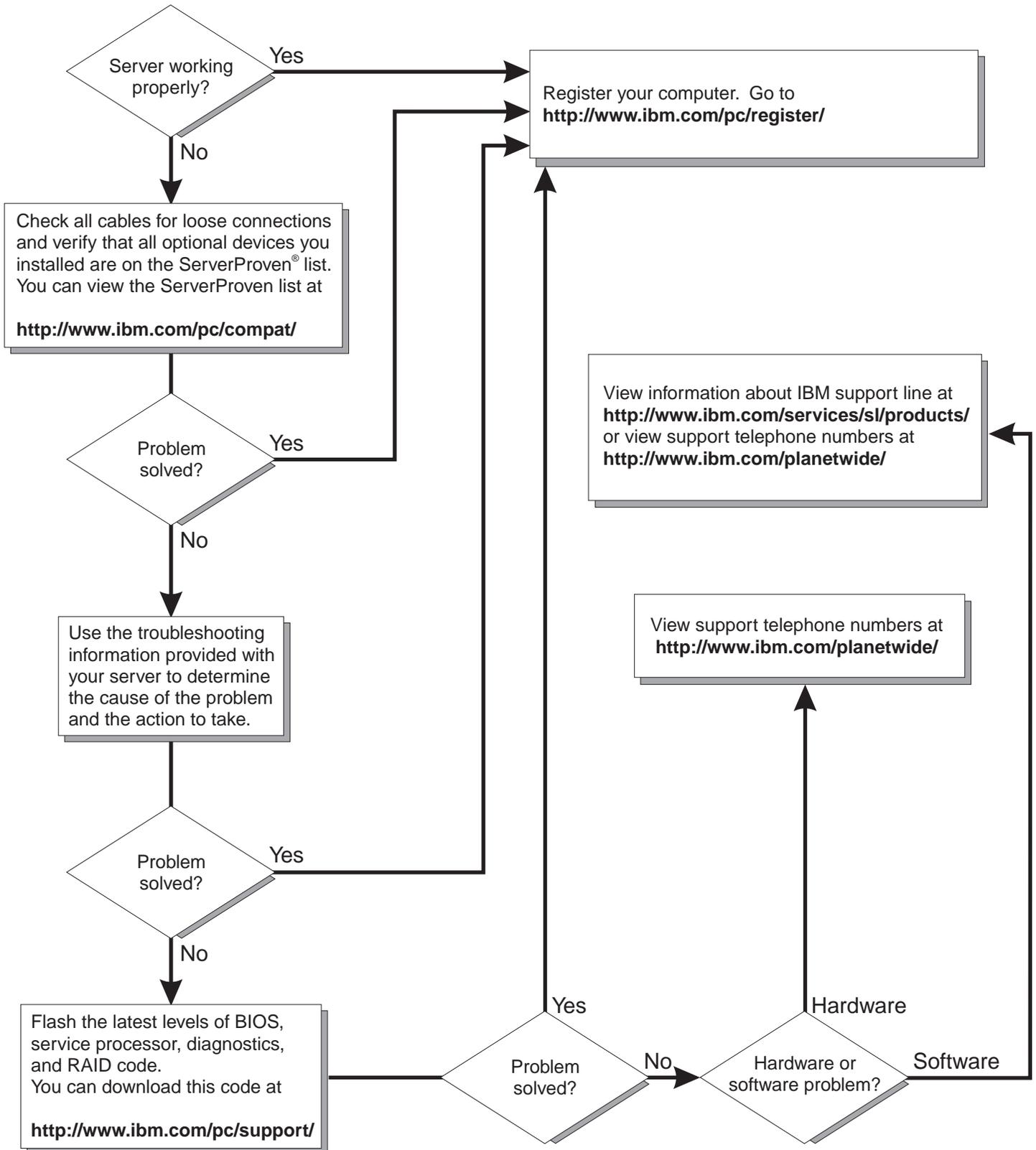
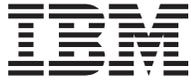This server *Installation Guide* contains information for setting up and configuring your server.

For detailed information about your server, view the publications on the Documentation CD.

You can also find the most current information about your server on the IBM Web site at: http://www.ibm.com/pc/support

Install options, if required
- Drives
- Microprocessors
- Adapters
- Memory

↓

Install the server in the rack cabinet, if required

↓

Cable the server and options

↓

Start the server

↓

Did the server start correctly? — No → Go to the Server Support flow chart

Yes ↓

Is the Server preconfigured? — Yes →

No ↓

Use ServerGuide to set up and configure hardware

↓

Did configuration complete? — No → Go to the Server Support flow chart

Yes ↓

Use ServerGuide to install operating system? — No → Go to the Web for instructions, **http://www.ibm.com/pc/support**

Yes ↓

Install applications, such as IBM systems management software and IBM ServeRAID programs

↓

System is ready to use. Go to the Server Support flow chart to register and profile your server.

Server Support

Server working properly? — **Yes** → Register your computer. Go to **http://www.ibm.com/pc/register/**

No ↓

Check all cables for loose connections and verify that all optional devices you installed are on the ServerProven® list. You can view the ServerProven list at

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

↓

Problem solved? — **Yes** → Register your computer. Go to **http://www.ibm.com/pc/register/**

No ↓

Use the troubleshooting information provided with your server to determine the cause of the problem and the action to take.

↓

Problem solved? — **Yes** → Register your computer. Go to **http://www.ibm.com/pc/register/**

No ↓

Flash the latest levels of BIOS, service processor, diagnostics, and RAID code.
You can download this code at

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

↓

Problem solved? — **Yes** → Register your computer. Go to **http://www.ibm.com/pc/register/**

No →

Hardware or software problem?

Hardware → View support telephone numbers at **http://www.ibm.com/pc/planetwide/**

Software → View information about IBM support line at **http://www.ibm.com/services/sl/products/** or view support telephone numbers at **http://www.ibm.com/planetwide/**

IBM

@server

xSeries 445 Type 8870

Installation Guide

Note: Before using this information and the product it supports, read the general information in Appendix A, "Getting help and technical assistance," on page 81, Appendix B, "IBM Statement of Limited Warranty Z125-4753-07 11/2002," on page 83, and Appendix C, "Notices," on page 99.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

在安装本产品之前，请仔细阅读 Safety Information
(安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

v

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:

DANGER

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

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

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 2:

CAUTION:
When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

> **Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.**
>
> **Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.**

Statement 4:
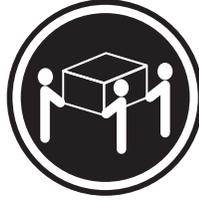
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.
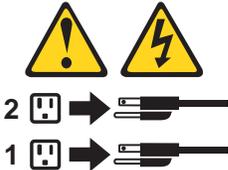
Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Statement 10:

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

>82 kg (180 lb)

Statement 13:

DANGER

> **Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.**

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after handling.*

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. *Lávese las manos después de usar el producto.*

Chapter 1. Introduction

This *Installation Guide* contains instructions for setting up your IBM® @server™ xSeries® 445 Type 8870 server and basic instructions for installing some options. More detailed instructions for installing options are in the *Option Installation Guide* on the IBM *xSeries Documentation* CD, which comes with your server.

This document contains information about:
- Setting up and cabling your server
- Starting and configuring your server
- Installing some options
- Solving problems

Your server might have features that are not described in the documentation that you received with the server. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in your server documentation. These updates are available from the IBM Web site. Complete the following steps to check for updated documentation and technical updates:

1. Go to http://www.ibm.com/pc/support/.
2. In the **Learn** section, click **Online publications**.
3. On the ″Online publications″ page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **xSeries 445**.
5. Click **Continue**.

Your server comes with an IBM *ServerGuide™ Setup and Installation* CD to help you configure the hardware, install device drivers, and install the operating system.

Your server comes with a limited warranty. You can obtain up-to-date information about your server and other IBM server products at http://www.ibm.com/eserver/xseries/.

Record information about your server in the following table. You will need this information when you register your server with IBM.

Product name	IBM @server xSeries 445 server
Machine type	8870
Model number	_____
Serial number	_____

The model and serial numbers are on a label on the lower-left side of the bezel, just above the hard disk drives.

See the *Rack Installation Instructions* for complete rack installation and removal instructions. For a list of supported options for your server, see the ServerProven® list at http://www.ibm.com/pc/compat/.

ID label
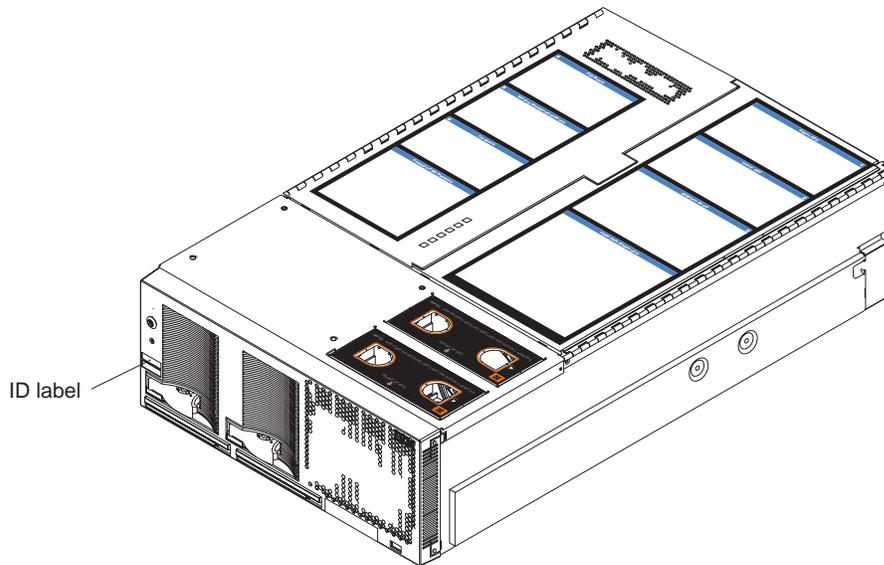
Figure 1. xSeries 445 server

The IBM @server Documentation CD

The IBM @server *Documentation* CD contains documentation for your server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM @server *xSeries 445 Documentation* CD requires the following minimum hardware and software:

- Microsoft® Windows NT® 4.0 (with Service Pack 3 or later), Windows 98, Windows 2000, or Red Hat Linux
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Note: Acrobat Reader software is included on the CD, and you can install it when you run the Documentation Browser.

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the books, and view books using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your system and displays the books in the language for that region (if available). If a book is not available in the language for that region, the English version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into your CD-ROM drive. The Documentation Browser starts automatically.

- If Autostart is disabled or is not enabled for all users:
  - If you are using a Windows operating system, insert the CD into your CD-ROM drive and click **Start --> Run**. In the **Open** field, type

    ```
    e:\win32.bat
    ```

    where *e* is the drive letter of your CD-ROM drive, and click **OK**.
  - If you are using Red Hat Linux, insert the CD into your CD-ROM drive; then, run the following command from the /mnt/cdrom directory:

    ```
    sh runLinux.sh
    ```

Select your server from the **Product** menu. The **Available Topics** list displays all the books for your server. Some books might be in folders. A plus sign (+) indicates each folder or book that has additional books under it. Click the plus sign to display the additional books.

When you select a book, a description of the book appears under **Topic Description**. To select more than one book, press and hold the Ctrl key while you select the books. Click **View Book** to view the selected book or books in Acrobat Reader or xpdf. If you selected more than one book, all the selected books are opened in Acrobat Reader or xpdf.

To search all the books, type a word or word string in the **Search** field and click **Search**. The books in which the word or word string appears are listed in order of the most occurrences. Click a book to view it, and press Crtl+F to use the Acrobat search function or Alt+F to use the xpdf search function within the book.

Click **Help** for detailed information about using the Documentation Browser.

Notices and statements used in this publication

The caution and danger statements that appear in this publication are also in the multilingual *Safety Information* publication, which is on the IBM *xSeries Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* publication.

The following notices and statements are used in the documentation:
- **Notes:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following information is a summary of the features and specifications for your server.

Microprocessor:
• Supports the following microprocessors:
  – Up to 8 Intel® Xeon MP microprocessors (16 in a 16-way configuration)
    OR
  – Up to 4 Intel Xeon DP microprocessors
    Note: Use the Information in BIOS to determine the type and speed of the microprocessors installed in your server.
• IBM XA-32™ chip set with integrated memory, I/O, system cache, and remote I/O controllers
 	
Memory:
• Minimum: 2 GB
• Maximum: 64 GB
• Type: 2-way interleaved PC1600, DDR SDRAM, registered DIMMs only
• Supports 512 MB, 1GB and 2 GB dual inline memory modules (DIMMs)
• XceL4™ Server Accelerator Cache (64 MB per SMP Expansion Module)
 	
Drives:
• Diskette: 1.44 MB
• DVD-ROM
• Supports up to two internal Ultra320 SCSI hard disk drives
 	
Active™ PCI-X expansion slots:
 	
Six 64-bit Active PCI-X expansion slots:
• Two 66 MHz PCI-X slots
• Two 100 MHZ PCI-X slots
• Two 133 MHZ PCI-X slots
• Additional PCI-X slots available in an optional remote I/O expansion enclosure
 	
Cooling:
 	
Four hot-swap fans:
• Two 150 mm x 51 mm redundant fans
• Two 150 mm x 38 mm fans
 	
Acoustical noise emissions:
• Sound power, idling: 6.5 bel maximum
• Sound power, operating: 6.5 bel maximum
	Power supply:
	
	Two hot-swap power supplies (depending on model):
	• 550 watts at 110 V ac or 1050 watts at 220 V ac
	• 600 watts at 110 V ac or 1200 watts at 220 V ac
	
	Video:
	• Models with the Remote Supervisor Adapter II-EXA: ATI Radeon RV-100 video controller on the RSA II-EXA adapter
	• Models with the Remote Supervisor Adapter: ATI Rage XL video controller on the system board
	• PCI bus interface
	• Compatible with SVGA
	
	Size (4 U):
	• Height: 17.8 cm (7 inches, 4 U)
	• Depth: 69.85 cm (27.5 inches)
	• Width: 48.3 cm (19 inches)
	• Maximum weight: 50 kg (110 lb) depending on your configuration
	
	Integrated functions:
	• Broadcom 5704 Dual Gigabit 10/100/1000 Ethernet controller
	• Light path diagnostics feature
	• LSI Logic 1030 Dual Ultra320 SCSI controller
	• Remote Supervisor Adapter II-EXA
	  – ATI Radeon RV-100 video controller
	  – Ethernet port
	  – RSA II-EXA breakout port
	• Remote Supervisor Adapter
	  – ASM interconnect port
	  – Ethernet port
	  – Management port
	• IDE controller
	• RXE Management Port
	• Three USB ports
	• Keyboard port
	• SCSI port
	• Mouse port
	• Symmetrical multiprocessing (SMP) Expansion Ports (three or six ports depending on your configuration)
	• Two remote I/O expansion enclosure (RXE) Expansion Ports
		Environment:
		• Air temperature:
		  – Server on: 10° to 35°C (50.0° to 95.0°F). Altitude: 0 to 914 m (2998.7 ft).
		  – Server on: 10° to 32° C (50.0° to 89.6° F). Altitude: 914 m (2998.7 ft) to 2133 m (6998.0 ft).
		  – Server off: -40° to 60° C (-104° to 140° F). Maximum altitude: 2133 m (6998.0 ft).
		• Humidity:
		  – Server on: 8% to 80%
		  – Server off: 5% to 100%
		
		Heat output:
		
		Approximate heat output in British thermal units (Btu) per hour:
		• Minimum configuration: 855 Btu (250 watts)
		• Maximum configuration: 2726 Btu (800 watts)
		
		Electrical input:
		• Sine-wave input (50 or 60 Hz) required
		• Input voltage low range:
		  – Minimum: 100 V ac
		  – Maximum: 127 V ac
		• Input voltage high range:
		  – Minimum: 200 V ac
		  – Maximum: 240 V ac
		• Input kilovolt-amperes (kVA) approximately:
		  – Minimum: 0.250 kVA
		  – Maximum: 0.800 kVA
		
		Notes:
		1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.
		2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

Major components of the xSeries 445 server

The following illustration shows the locations of major components in your server.

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

Retention bracket

SMP baffle

DIMM access doors

Fan 4

Heat-sink

Cover

SMP Expansion Module

Fan 3

Microprocessor

Fan 2

Microprocessor baffle

DIMM

Fan 1

Center plane

VRM

EMC shield (for single SMP Expansion Module)

Thumbscrews

Shipping thumbscrews

Hot-swap power supply

Hard disk drive

Bezel

DVD-ROM drive

Figure 2. Major components of the xSeries 445 server

Chapter 2. Installing options

This chapter provides basic instructions for installing hardware options in your server. These instructions are intended for users who are experienced with setting up IBM server hardware. If you need more detailed instructions, see the *Option Installation Guide* on the IBM *xSeries Documentation* CD.

Installation guidelines

Before you begin to install options in your server, read the following information:

- Read the safety information beginning on page v and the guidelines in "Handling static-sensitive devices" on page 8. This information will help you work safely with your server and options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and other devices that you will connect to the server.
- Back up all important data before you make changes to disk drives.
- Have a small, flat-blade screwdriver available.
- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap fans, or hot-plug Universal Serial Bus (USB) devices.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- For a list of supported options for your server, go to http://www.ibm.com/pc/compat/.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has only one symmetrical multiprocessing (SMP) Expansion Module installed, ensure that the SMP baffle is installed during normal operation.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place objects in front of the fans.
- Do not leave open spaces above or below an installed server in a rack cabinet. To prevent damage to server components, always install a blank filler panel to cover the open space and to ensure proper air circulation.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- Microprocessor socket 4 always contains either a microprocessor baffle or a microprocessor and heat sink.

Working inside the server with the power on

Your server supports hot-plug, hot-add, and hot-swap devices and is designed to operate safely while it is turned on and the cover is removed. Follow these guidelines when you work inside a server that is turned on:

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices, including your server. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of damage from electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, place it back into its static-protective package. Do not place the device on your server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Opening the cover

Complete the following steps to open the server cover:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
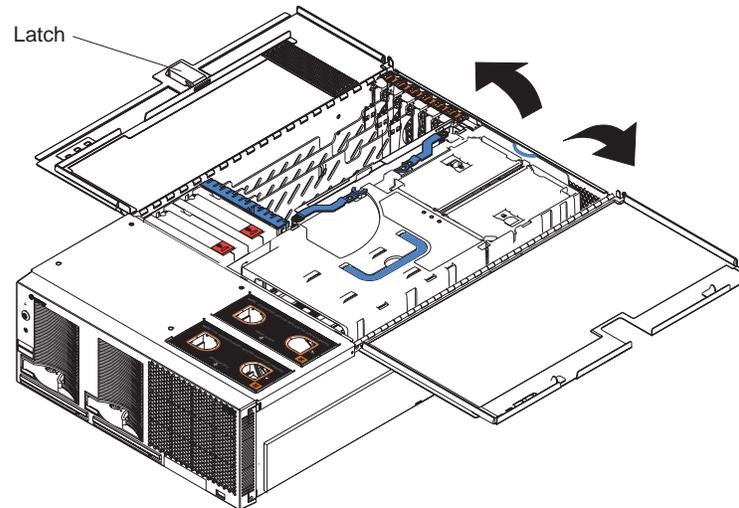

Figure 3. Opening the cover

2. Before opening the top cover, you must remove the rack-support wheels and handles from the server. See the *Rack Installation Instructions* for information.
3. Press the release latch on the left half of the top cover to the right.
4. Using the finger hole in the release latch, open the left half of the cover; then, open the right half of the cover.

   Attention: For proper cooling and airflow, close the cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the cover open might damage server components.

The SMP Expansion Module

The SMP Expansion Module contains the XceL4 system cache, DIMMs, microprocessors, and voltage regulator modules (VRMs). This section provides instructions for removing and installing the SMP Expansion Module, microprocessors, VRMs, and DIMMs.

The following notes describe components in the SMP Expansion Module and other information that you must consider when installing an SMP Expansion Module:

- Use two hands to install or remove an SMP Expansion Module. Do not allow the expansion module to come in contact with the center plane while lifting it out of or setting it into the server.
- For your server to operate properly, there must be a minimum of one SMP Expansion Module installed.
- An SMP Expansion Module must contain at least one microprocessor and two DIMMs.
- If there is only one SMP Expansion Module installed in the server, an SMP baffle must be installed in place of the upper SMP Expansion Module to ensure proper cooling of the server.

- When the minimum number of microprocessors are installed in the SMP Expansion Module, a microprocessor baffle must be installed in microprocessor socket 4 to ensure proper cooling within the server.
- Before removing or installing SMP Expansion Modules, you must remove the retention bracket or brackets and electromagnetic compatibility (EMC) shield from the rear of the server.
- You must run the Configuration/Setup Utility program whenever you remove or replace an SMP Expansion Module or one of its associated options.

Locking levers

CAM opening
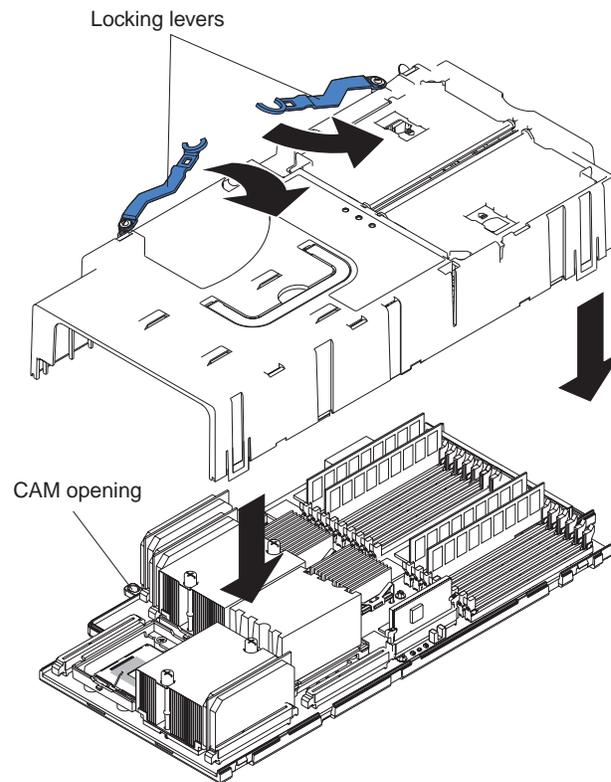
Figure 4. Complete SMP Expansion Module

Removing an SMP Expansion Module and cover

While installing options, you might need to remove one or both of the SMP Expansion Modules. This section describes how to remove an SMP Expansion Module from the server and how to remove the cover from the module.

Complete the following steps to remove an SMP Expansion Module from the server:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and external cables.
3. Open the top cover; then, remove the retention bracket or brackets from the server.
    a. Remove the shipping thumbscrews from the right side of the server.

       Note: There are two shipping thumbscrews per retention bracket.
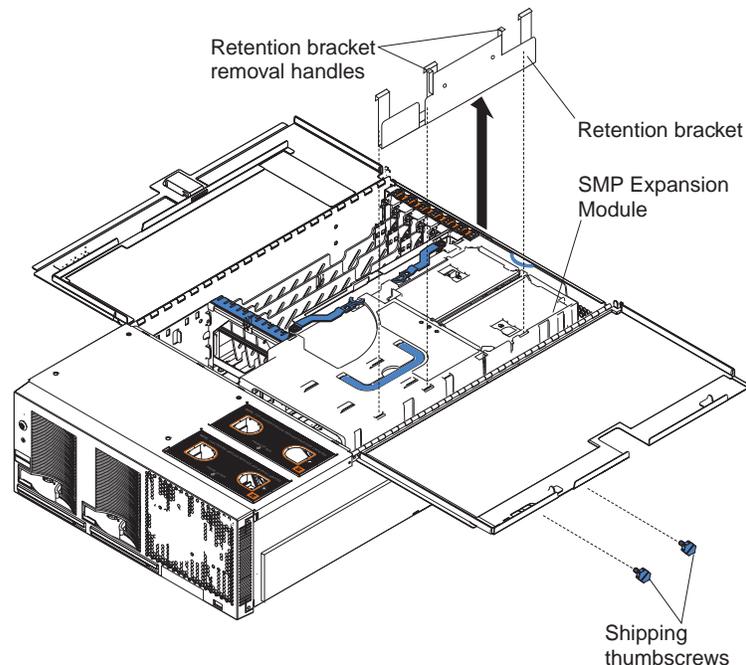
Figure 5. Removing the retention brackets and shipping thumbscrews

    b. Grasp the retention bracket by the removal handles and lift it up and out of the server. Store the retention bracket or brackets in a safe place for later use.

       Note: If there is one SMP Expansion Module installed, you will need to remove the SMP baffle from the server; then, remove the retention bracket from the lower SMP Expansion Module.

4. Remove the EMC shield from the rear of the server:
    a. If necessary, disconnect the SMP Expansion Cables that are connected to the SMP Expansion Modules.
    b. Loosen the blue thumbscrews holding the EMC shield to the server.

EMC shields

For use with one
SMP Module

For use with two
SMP Modules
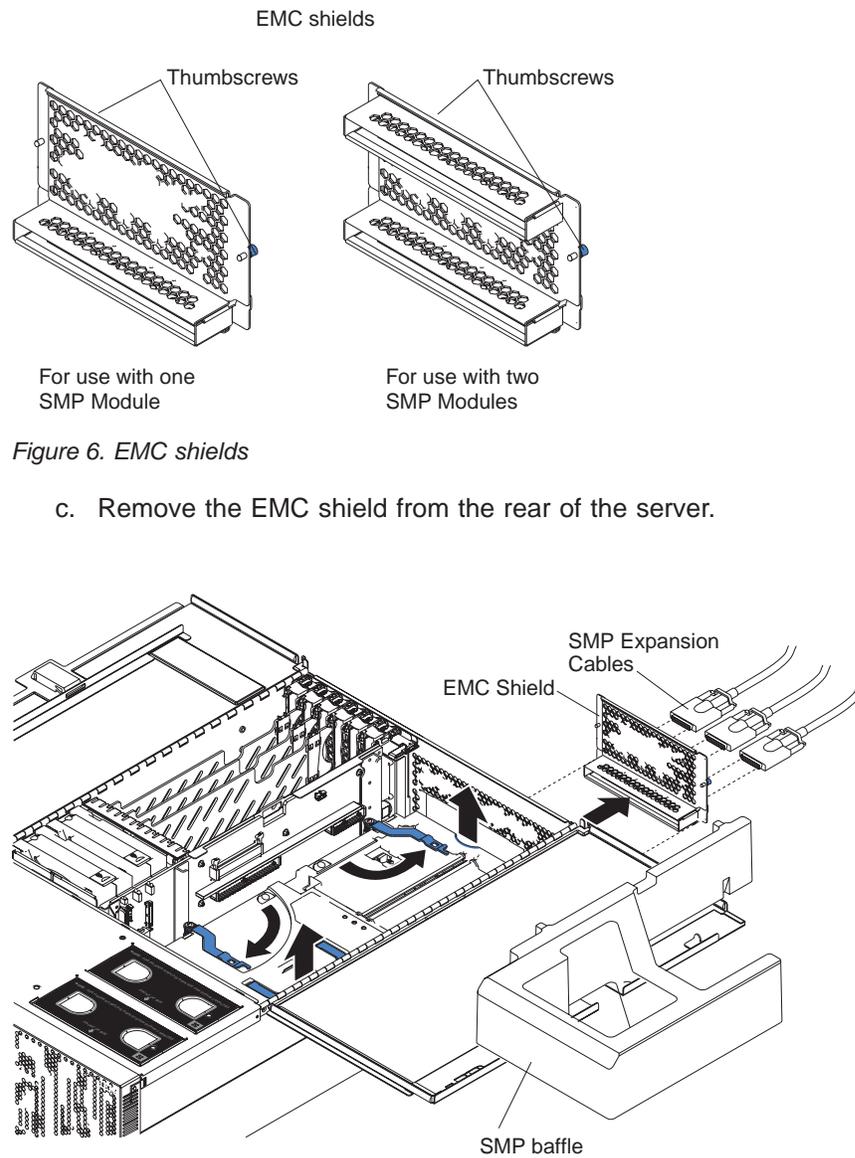
Figure 6. EMC shields

    c. Remove the EMC shield from the rear of the server.
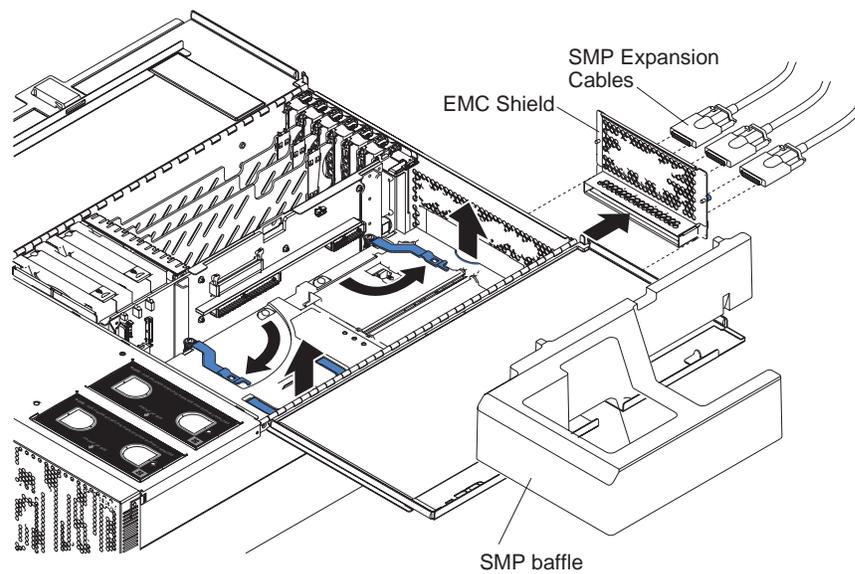
Figure 7. Removing the EMC shield

5. Grasp each of the locking levers on the top of the SMP Expansion Modules, and lift them up slightly.

6. Working from the right side of the server, rotate the two locking levers toward you until they are fully extended, as shown.
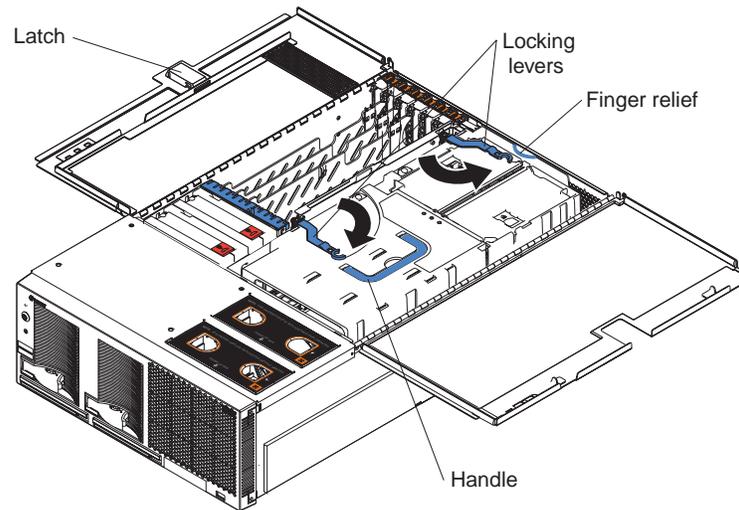
Figure 8. Rotate the locking levers to remove the SMP Expansion Module

7. Being careful not to damage the components on the center plane, use the handle and the finger relief on the SMP Expansion Module cover to carefully lift the SMP Expansion Module out of the server.
8. Remove the SMP Expansion Module cover:
   a. Place the SMP Expansion Module on a flat, level surface.
   b. Rotate the two locking levers until they are fully extended beyond the edge of the SMP Expansion Module cover. Do not force the locking levers past the position shown in the illustration.
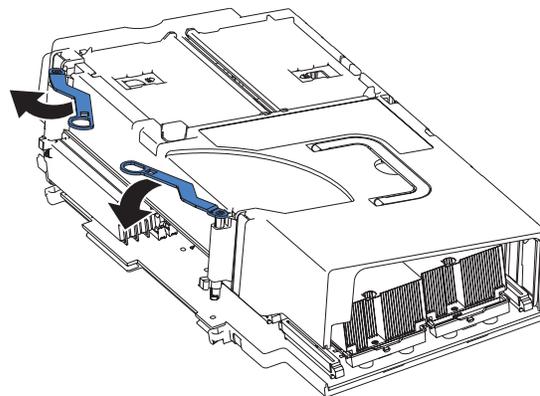
Figure 9. Fully extending the locking levers to remove the SMP Expansion Module cover

c. Using the locking levers, lift the front edge of the cover off the SMP Expansion Module.
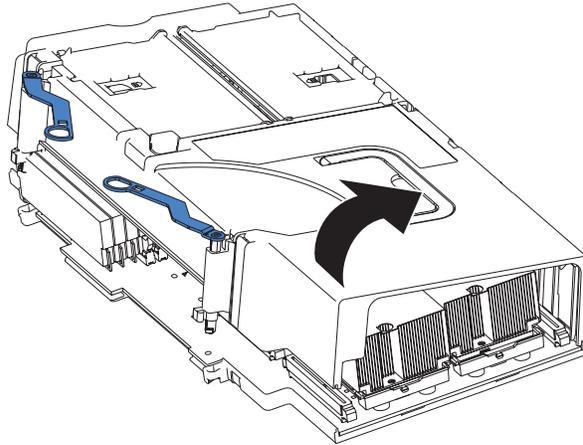
Figure 10. Lifting the front of the cover

d. Lift the cover off the SMP Expansion Module.
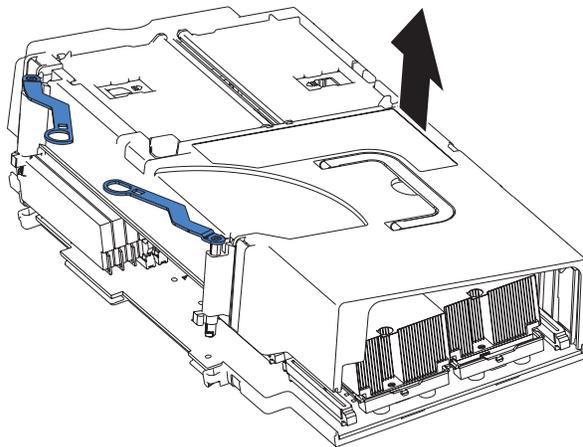
Figure 11. Lifting the cover off the SMP Expansion Module

Installing and replacing a microprocessor

The following notes describe the types of microprocessors that your server supports and other information that you must consider when installing a microprocessor:

- Read the documentation that comes with the microprocessor to determine whether you need to update the basic input/output system (BIOS) code in your server. To download the most current level of BIOS code for the server, go to http://www.ibm.com/pc/support/.

- If your server comes with Intel Xeon MP microprocessors, obtain an SMP-capable operating system. For a list of supported operating systems, go to http://www.ibm.com/pc/compat/.

- To order additional microprocessor or SMP Expansion Module options, contact your IBM marketing representative or authorized reseller.

- To avoid damage and ensure proper server operation after you install a replacement or an additional microprocessor, use a microprocessor that has the same cache size, cache type, clock speed, and internal and external clock frequencies as the microprocessors already installed in the individual SMP Expansion Module. For a list of microprocessors supported by your server, see the ServerProven list at http://www.ibm.com/pc/compat/ on the World Wide Web.

- The microprocessor in socket 1 of the bottom SMP Expansion Module is the startup (boot) microprocessor.

- An air baffle or microprocessor must be installed in microprocessor socket 4, depending on your configuration.

- If you are adding Intel Xeon MP microprocessors, populate the empty microprocessor sockets in numeric order, starting with socket 1. If you install the microprocessors in the wrong order, the server will not start.

  Attention: You must ensure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and SMP expansion board. See Figure 13 on page 17.

- Always install the heat sink that comes with the microprocessor.

- Server models that come with Intel Xeon DP microprocessors support a maximum of two microprocessors per SMP Expansion Module, installed in microprocessor sockets 1 and 4.

- Intel Xeon MP microprocessors are supported in microprocessor sockets 1, 2, 3, and 4. Figure 12 on page 16 shows the location of the startup microprocessor and its VRM on the SMP expansion board. It also shows the microprocessor baffles and the VRM slots for the other microprocessor sockets.

  Note: The illustrations in this document might differ slightly from your hardware.
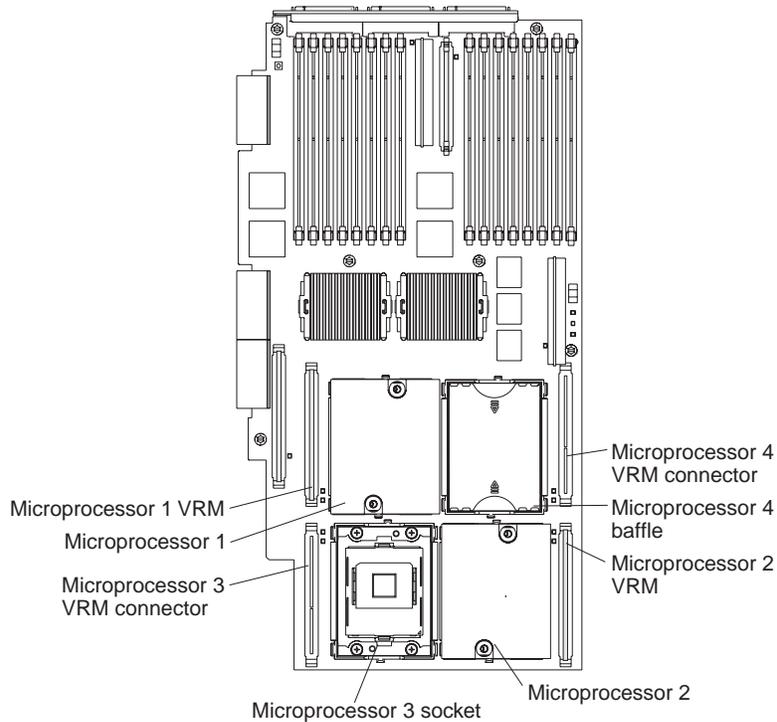
Figure 12. Microprocessor connector and VRM locations

Complete the following steps to install a microprocessor:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices, disconnect the power cords, and disconnect all external cables from the SMP Expansion Module; then, open the cover (see "Opening the cover" on page 9 for details).
3. If necessary, remove the SMP baffle or top SMP Expansion Module.

    Note: If your server contains only one SMP Expansion Module, remove the SMP baffle above it to gain access to the module. If your server contains two SMP Expansion Modules, remove the top module to gain access to the bottom or lower SMP Expansion Module.

4. Remove the SMP Expansion Module in which you plan to install the microprocessor; then, remove the module cover and determine the socket where the microprocessor is to be installed. For details, see "Removing an SMP Expansion Module and cover" on page 11.
5. Determine which type of microprocessors are installed in your server. The easiest way to do this is by the locations of the installed microprocessors in the SMP Expansion Module. If the microprocessors are installed only in sockets 1 and 4, your server came with Intel Xeon DP microprocessors. If the microprocessors are installed in any other sockets, such as 1 and 2 or 1, 2, and 3, your server came with Intel Xeon MP microprocessors.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see "Handling static-sensitive devices" on page 8.

6. If necessary, remove the microprocessor baffle from the microprocessor socket. Keep the microprocessor baffle for possible future use.

7. Touch the static-protective package containing the new microprocessor to any *unpainted* metal surface on the server; then, remove the microprocessor from the package.

8. Install the microprocessor:

   Important: When installing Intel Xeon DP microprocessors, you must install them in the following order: socket 1 then socket 4. When installing Intel Xeon MP microprocessors, you must install them in the following order: sockets 1, 2, 3, and then 4.

   a. Remove the protective label from the microprocessor socket.

   b. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (approximately 135° angle), as shown.

      Attention: You must ensure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and SMP expansion board.
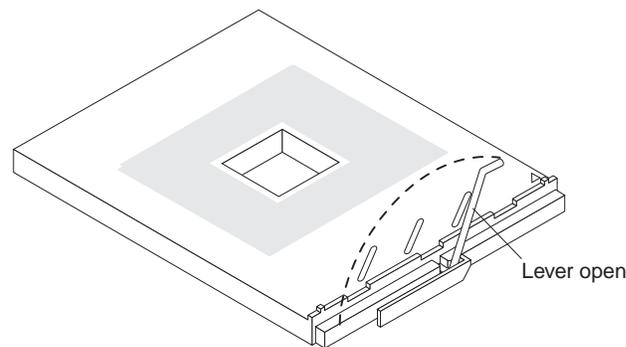
Figure 13. Microprocessor locking lever fully open

   c. Align the triangle icon on the microprocessor with the triangle icon on the socket and press the microprocessor gently into the socket.

      Attention: Make sure that the microprocessor is aligned correctly before you proceed. To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.

   d. Close the locking lever to secure the microprocessor.

9. Install the VRM in the slot adjacent to the microprocessor socket by holding the new VRM by the upper corners, and plug it *firmly* into the slot.

   Attention: The new microprocessor comes in a kit with a VRM. Some microprocessor options contain a VRM with a clip to secure the VRM in the slot. This clip is not needed for installations in your server and can be discarded. When installing a new microprocessor, you must install the VRM that comes in the kit.
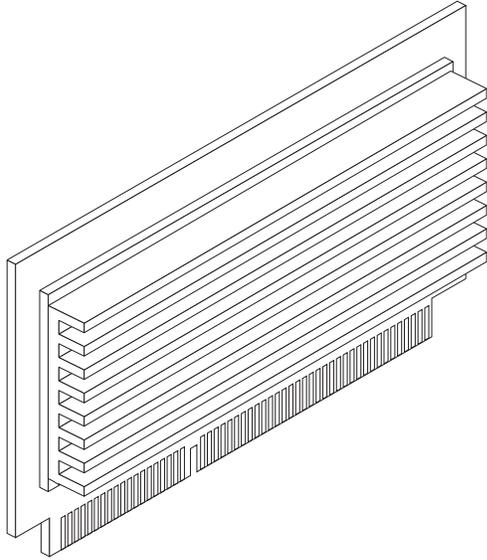
Figure 14. Microprocessor VRM

10. Install the heat sink:

    a. Remove the heat sink from its package and detach the protective cover from the bottom of the heat sink.

       Attention: Do not disturb or contaminate the heat-conducting grease on the bottom of the new heat sink. Doing so damages its heat-conducting capability and exposes the new microprocessor to overheating.
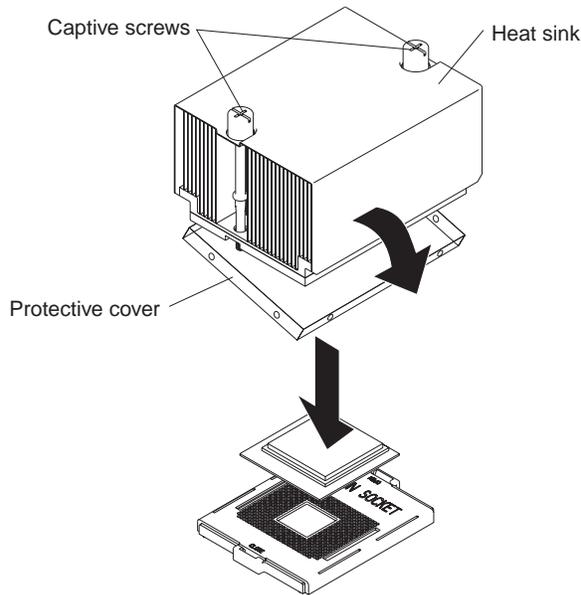
Figure 15. Placing the heat sink on the microprocessor

    b. Align the heat sink over the microprocessor; then, carefully set it down on top of the microprocessor.

c. Using a screwdriver, secure the heat sink to the microprocessor socket on the SMP board using the two captive mounting screws. Press firmly on the screws and tighten them, alternating between them. Do not overtighten the screws.

11. Close the SMP Expansion Module top cover; then, install the module in the server. For details, see "Reinstalling an SMP Expansion Module and cover" on page 23.

12. If you have other options to install or remove, do so now.

13. Close the cover on the server; then, install the server in the rack cabinet and connect all external cables. For details, see "Installing the server in the rack cabinet" on page 33.

14. Turn on the server.

When you install or remove microprocessors, the server configuration information changes. Therefore, you must change and save the new configuration information by using the Configuration/Setup Utility program. See the *User's Guide* on the IBM *xSeries Documentation* CD.

Important: If your server will not start after replacing or installing a microprocessor, you might have installed a microprocessor in the wrong socket or installed a microprocessor of a different type, or the VRM is not seated properly. Ensure that you have installed the microprocessor in the correct location and that it is of the same type. Also ensure that the VRM is properly seated in the slot.

## Installing a memory module

The following notes describe the types of dual inline memory modules (DIMMs) that your server supports and other information that you must consider when installing DIMMs:

- IBM periodically makes updates available to provide enhancements to the standard features of your server. Currently, your server supports the memory mirroring and Memory ProteXion features of the Active Memory technology. Be sure to check the IBM support Web site occasionally to ensure that you have the most current levels of system software installed.

- To use the hot-add and hot-swap memory features, you must reconfigure your server using the Configuration/Setup Utility program. See the *User's Guide* on the IBM *xSeries Documentation* CD for additional information.

    Note: The server must have a minimum of 4 GB of memory installed before you can configure the hot-add memory feature.

- Your server operates with a minimum of two 512 MB DIMMs installed in slots 1 and 3 in the SMP Expansion Module. When installing or removing DIMMs, you must install or remove the DIMMs two at a time and in the order described in this section.

- Use the instructions in "Installing DIMMs" on page 21 to help maintain performance. See the ServerProven list at http://www.ibm.com/pc/compat/ for a list of memory modules for use with your server.

    Note: For optimum performance, balance the amount of memory between the two ports.

Table 1. Memory installation order

Port	Bank	Pair	Slot number
1	1	1	1, 3
2	1	2	9, 11
1	2	3	2, 4
2	2	4	10, 12
1	3	5	5, 7
2	3	6	13, 15
1	4	7	6, 8
2	4	8	14, 16
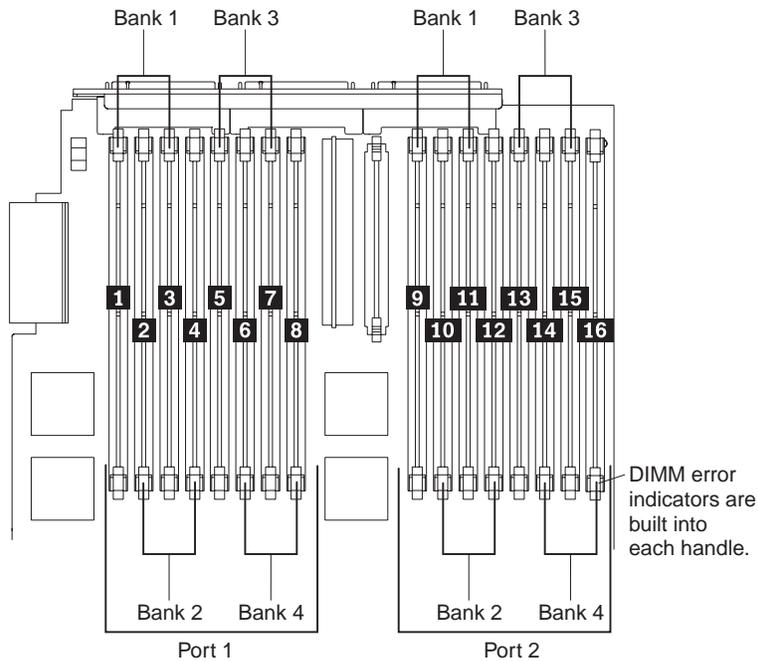
Figure 16. DIMM banks

- Each pair or bank of DIMMs must be of the same size and clock speed to ensure the server will operate properly.
- When you restart the server after you install or remove DIMMs, the server displays a message indicating that the memory configuration has changed. You must use the Configuration/Setup Utility program to save the new configuration information. Start the Configuration/Setup Utility program and select **Save Settings**. See the *User's Guide* on the IBM *xSeries Documentation* CD for additional information.
- You can configure your server to use memory mirroring and memory scrubbing. For detailed information about configuring your server and using these features, see the *User's Guide* on the IBM *xSeries Documentation* CD.

Installing DIMMs

Complete the following steps to install a DIMM in your server:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices, and disconnect all power cords and external cables. Then, open the server cover (see "Opening the cover" on page 9 for details).
3. If necessary, remove the top SMP Expansion Module from the server. See "Removing an SMP Expansion Module and cover" on page 11 for instructions.
4. Open the DIMM access door on the SMP Expansion Module cover that covers the memory port in which you will be installing the new DIMMs.

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

Figure 17. Open the DIMM access door

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see "Handling static-sensitive devices" on page 8.

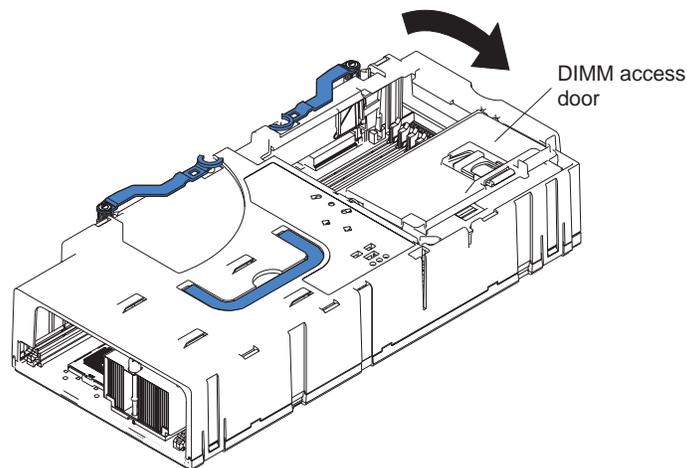5. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.

6. Install the DIMM:

DIMM
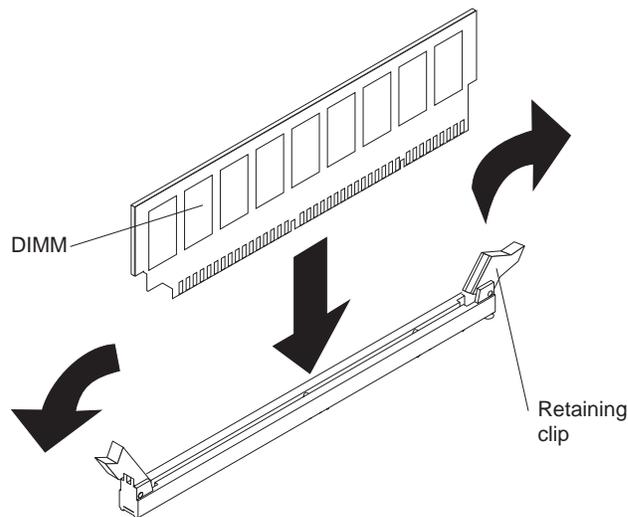
Retaining
clip

Figure 18. Installing a DIMM

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.

a. Open the retaining clip on each end of the DIMM connector. Turn the DIMM so that the pins align correctly with the connector.

b. Insert the DIMM into the connector by aligning the DIMM edges with the slots at each end of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. Be sure that the retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

c. If a gap exists between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.

7. Close the DIMM access door or reinstall the SMP Expansion Module cover (see "Reinstalling an SMP Expansion Module and cover" on page 23).

8. If you have other options to install or remove, do so now.

9. Close the server cover; then, go to "Completing the installation" on page 33.

Note: When you restart the server after you install or remove DIMMs, the server displays a message indicating that the memory configuration has changed. You must use the Configuration/Setup Utility program to save the new configuration information. Start the Configuration/Setup Utility program and select **Save Settings**. See the *User's Guide* on the IBM *xSeries Documentation* CD for additional information.

Reinstalling an SMP Expansion Module and cover

After installing options in the SMP Expansion Module, you will need to reinstall the SMP Expansion Module cover and reinstall the SMP Expansion Module in the server.

Complete the following steps to reinstall the SMP Expansion Module cover:

1. Install the cover on the SMP Expansion Module:

    a. Set the cover on top of the expansion module.

    b. Extend the locking levers as shown in the illustration; then, let the cam on the front of the cover fall into the cam opening on the SMP Expansion Module circuit board.
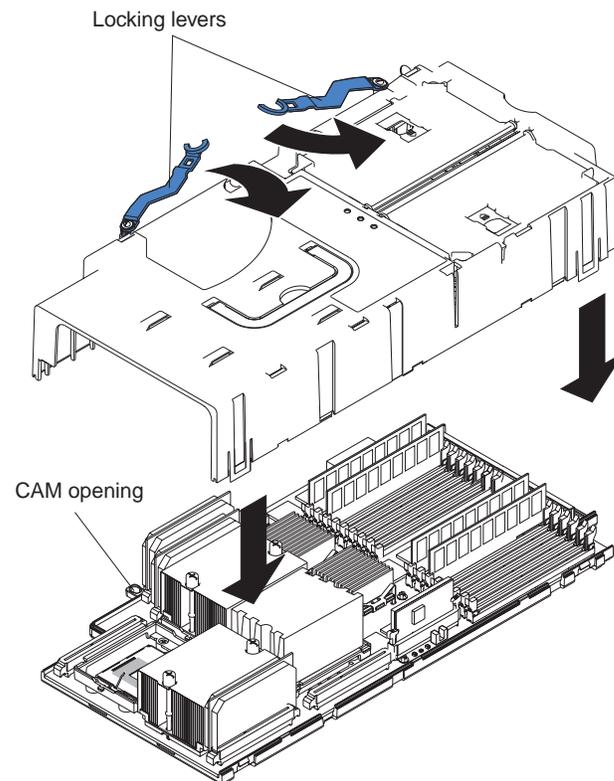
Figure 19. Installing the SMP Expansion Module cover

    c. Release the locking levers and align the rear of the cover with the rear edge of the circuit board.

    d. Press down on the cover until it snaps into place.

e. Lift slightly on the locking levers and rotate them back until they stop.

   Note: The illustrations in this document might differ slightly from your hardware.
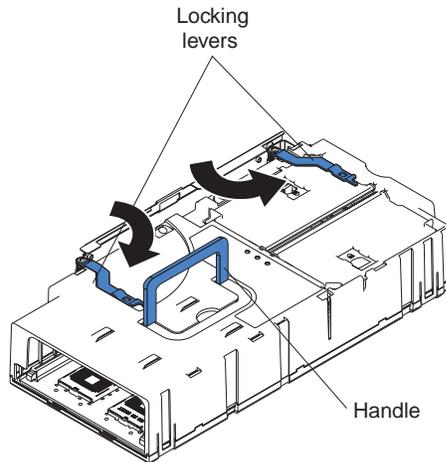
Figure 20. Locking lever position for installing the SMP Expansion Module

2. Install the SMP Expansion Module into the server.
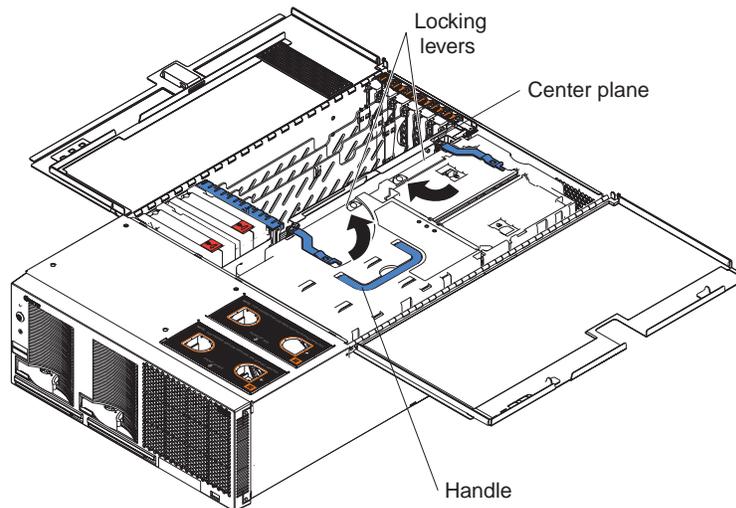
Figure 21. Installing the SMP Expansion Module

   a. Lift the SMP Expansion Module by its handle and use the finger relief to hold the SMP Expansion Module steady.
   b. Being careful not to damage the components on the center plane, lower the SMP Expansion Module into the server.
   c. Release the handle and slide the SMP Expansion Module toward the center plane until it stops.

d. Rotate the SMP Expansion Module locking levers forward until the SMP Expansion Module is securely fastened in place. See the following illustration.
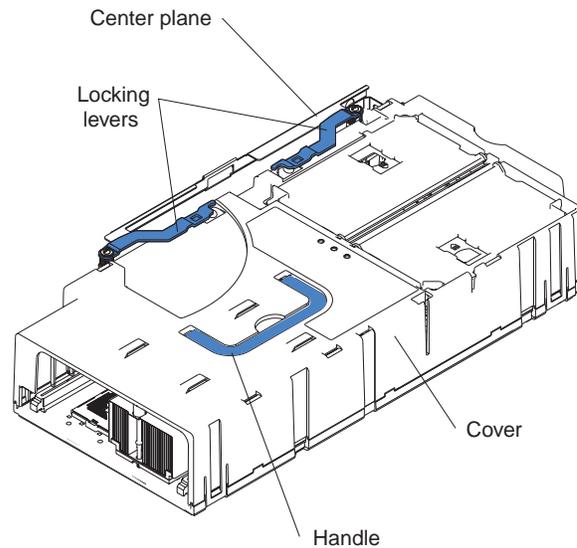
Figure 22. Locking lever position when the SMP Expansion Module is installed

   e. Install the retention bracket.

   Notes:

   1. If there are two SMP Expansion Modules installed in your server, you must install the retention bracket for each of the SMP Expansion Modules. Be sure to install the bottom retention bracket first, then repeat steps 2a through 2e for the top SMP Expansion Module.

   2. If you are going to ship or move the server over a long distance, you must reinstall the shipping thumbscrews.

   f. Install the EMC shield. (See step 4c on page 12 if you need more detailed information.)

Installing an adapter

The following notes describe the types of adapters that your server supports and other information that you must consider when installing an adapter:

- The following illustration shows the location and bus speeds of the PCI-X expansion slots.

    Note: The illustrations in this document might differ slightly from your hardware.
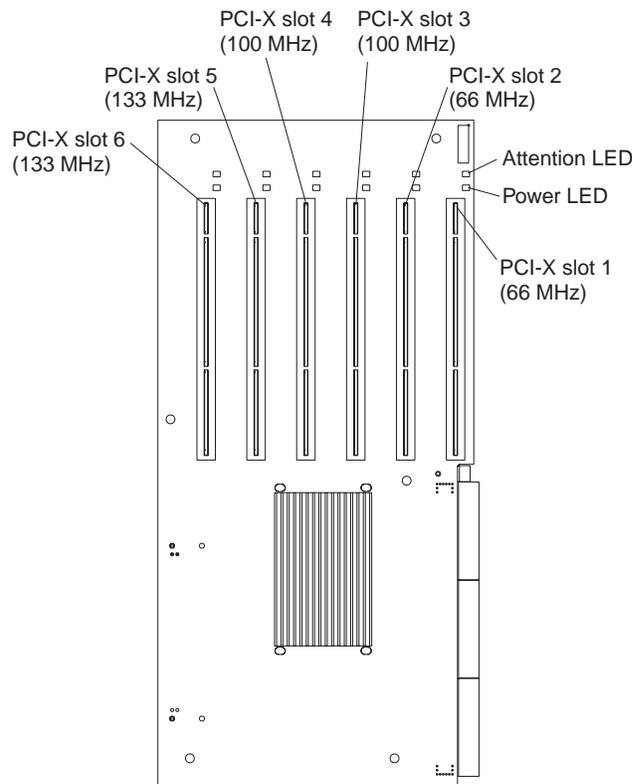
Figure 23. PCI-X slot bus speeds and locations

- Your server supports six hot-plug 64-bit adapters in the expansion slots located on the PCI-X board.

    Note: You can add up to 12 PCI-X slots to your server by connecting your server to an RXE-100 enclosure. For more information about the expansion enclosure, see the documentation that comes with your expansion enclosure.

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter.
- If you need to change the switch settings or jumper settings on your adapter, follow the instructions that come with the adapter.
- Video adapters are not supported.
- Some long adapters have extension handles or brackets installed. Before installing the adapter, you must remove the extension handle or bracket.
- Your server uses a rotational interrupt technique to configure PCI-X adapters. You can use this technique to install PCI-X adapters that currently do not support sharing of PCI-X interrupts.

- Your server scans devices and PCI-X slots to assign system resources in the following order: DVD-ROM drive; disk drives; integrated SCSI devices; PCI-X slots 1, 2, 3, 4, 5, 6; and the integrated Ethernet controller. If an RXE-100 enclosure is attached to the server, the scan continues in sequence with PCI slots 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18.
- You can use the Configuration/Setup Utility program to change the sequence and have the server scan one of the first six PCI slots before it scans the integrated devices. You cannot change the scan sequence of the PCI slots in an RXE-100 enclosure.
- You can install both PCI and PCI-X adapters in the same bus. However, if you install a PCI adapter and a PCI-X adapter in the same bus, the PCI-X features of the PCI-X adapter will be disabled, and the adapter will function as a PCI adapter.
- You can install PCI or PCI-X adapters of speeds faster than what is labeled for a particular PCI-X bus. For example, if you install two 133 MHz adapters into slots that are labeled as 100 MHz slots, the adapters will operate at 100 MHz.
- If you install a 33 MHz and a 66 MHz adapter in the same bus, the bus speed will match that of the slowest adapter.
- If a single 133 MHz adapter is installed in PCI-X bus B (slot 3 or 4) and the other slot in PCI-X bus B is empty, the adapter will operate at 133 MHz.
- Your server supports 3.3 V adapters; it does not support 5.0 V adapters.
- Do not install a PCI-X adapter in PCI-X slot 1 if you are going to install the serial port that comes with your server. See "Installing the serial port" on page 31 for instruction for installing the serial port.

Note: Before hot-swapping any of the PCI-X adapters, read the information in "Working inside the server with the power on" on page 8.

Complete the following steps to install an adapter:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Open the top cover.

   Note: There are six PCI-X slots inside your server: two 66 MHz, two 100 MHz, and two 133 MHz. Before attempting to install a new adapter, be sure that there is an available slot for it. If you need additional PCI-X slots, you can purchase an RXE-100 enclosure through your IBM marketing representative or authorized reseller.
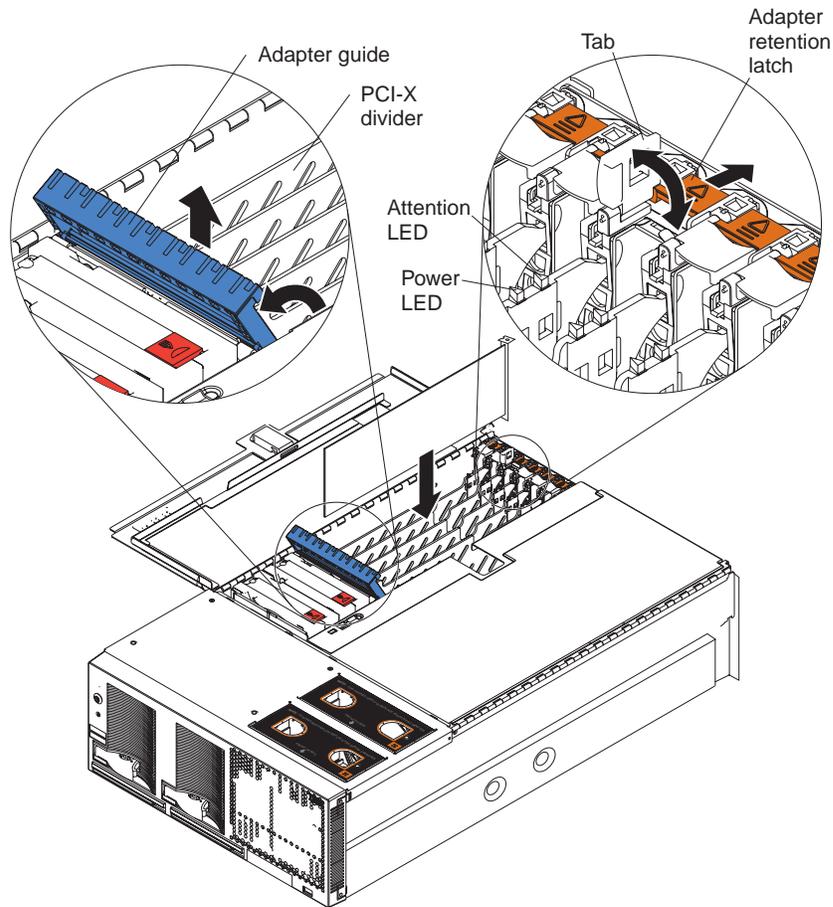
Figure 24. PCI-X slot components

3. See the documentation that comes with your adapter for any cabling instructions.

   Note: Route adapter cables before you install the adapter.

4. Set any jumpers or switches as described by the adapter manufacturer.

   Note: Do not install an adapter in PCI-X slot 1 if you are going to install the serial port that comes with your server. See "Installing the serial port" on page 31 for instructions for installing the serial port.

5. Install the adapter:

   a. Open the blue adapter guide by lifting the front edge, as shown in the illustration.

   b. Push the orange adapter retention latch toward the rear of the server and open the tab.

   c. Remove the expansion-slot cover and the PCI-X divider.

   d. Carefully grasp the adapter by its top edge or upper corners, and align it with the connector on the PCI-X board.

   e. If necessary, remove the extension handles or bracket before installing a long adapter.

      Attention: When you install an adapter, be sure the adapter is correctly seated in the connector. Improperly seated adapters might cause damage to the PCI-X board or to the adapter.

f. Press the adapter *firmly* into the adapter connector.

g. Reinstall the PCI-X dividers between the Active PCI-X adapter slots.

h. Push down on the blue adapter guide to keep the adapter steady.

i. Close the tab; then, push down on the orange adapter retention latch until it clicks into place, securing the adapter.

6. Connect the internal cables to the adapter.

7. If you have other options to install or remove, do so now.

8. Close the server cover; then, go to "Completing the installation" on page 33.

Cabling a ServeRAID adapter

Some xSeries 445 models come with an optional IBM ServeRAID™ adapter installed to control the internal hot-swap hard disk drives. If you are installing an optional IBM ServeRAID adapter, see the ServeRAID documentation and the cabling information in this section to install the ServeRAID adapter.

Servers that do not come with an IBM ServeRAID adapter installed come with two SCSI cables:

• One end of the first SCSI cable is attached to the connector on the SCSI backplane, and the other end is attached to the connector for the integrated SCSI controller under fans 3 and 4.

• The second SCSI cable is preinstalled along the inside of the server and both ends are loose inside the server. When you install a ServeRAID adapter, you will connect this cable to the adapter and to the SCSI backplane.

The following procedure describes the internal cabling for installing a ServeRAID adapter.

Important: When installing multiple ServeRAID adapters in a server that has the PCI-X slot enabled for high scan (boot) priority, ensure that the ServeRAID adapter controlling the startup (boot) drive is installed in a PCI slot that is scanned before the PCI slots that contain the other ServeRAID adapters. See "Installing an adapter" on page 26.

Complete the following steps to cable the ServeRAID adapter:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.

2. Turn off the server and disconnect all power cords and external cables; then, open the server cover (see "Opening the cover" on page 9).

3. Remove fans 3 and 4, which are located just behind the PCI-X slots (see the illustration on page 5 for the locations of the fans).

4. Disconnect the short SCSI cable from the SCSI backplane and the integrated SCSI controller on the I/O board; then, store this short cable in a safe place for future use.

5. Install the ServeRAID adapter in a PCI-X slot (see "Installing an adapter" on page 26).
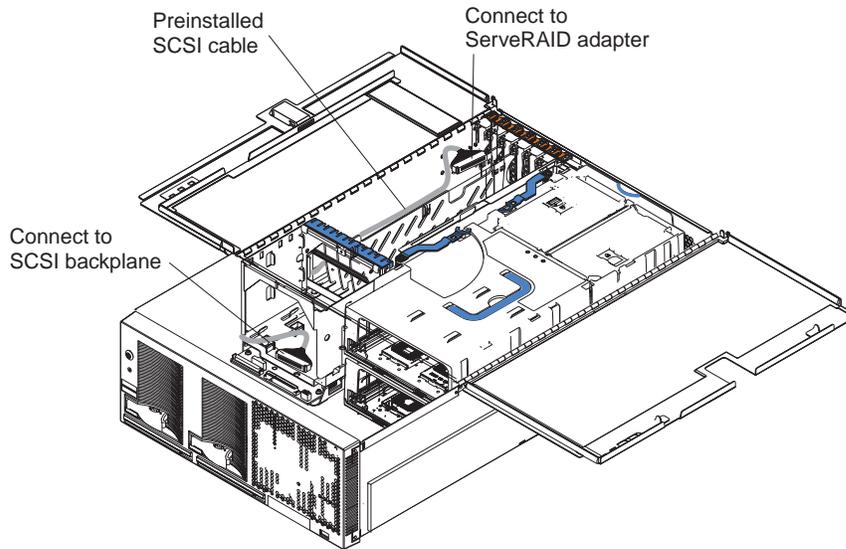
Figure 25. Preinstalled SCSI cable for the ServeRAID adapter

6. Locate the preinstalled SCSI cable; then, attach the connector on the cable to the ServeRAID adapter.

7. Locate the connector on the opposite end of the SCSI cable and connect it to the SCSI backplane connector.
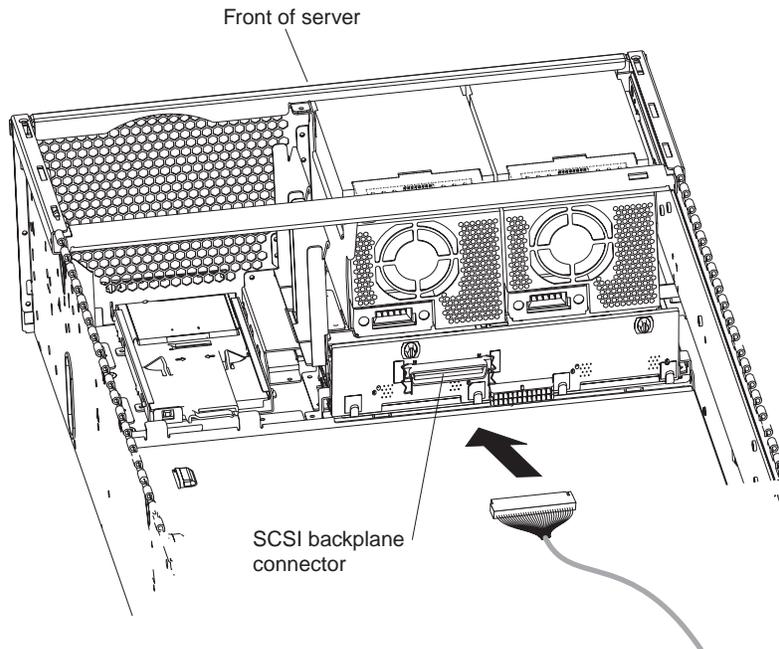
Figure 26. Connecting the preinstalled SCSI cable

8. Reinstall fans 3 and 4.

9. If you have other options to install or remove, do so now.

10. Close the server cover; then, go to "Completing the installation" on page 33.

Installing the serial port

Included with your server is a serial port that you can install at any time. This section provides the instructions for installing the serial port.

Notes:

1. Installation of the serial port is optional. You do not have to install the serial port for your server to operate properly. Also, the cabling information provided in this publication covers some of the possible configurations.

2. The serial port will occupy PCI-X slot one.

Complete the following steps to install the serial port:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.

2. Open the top cover.
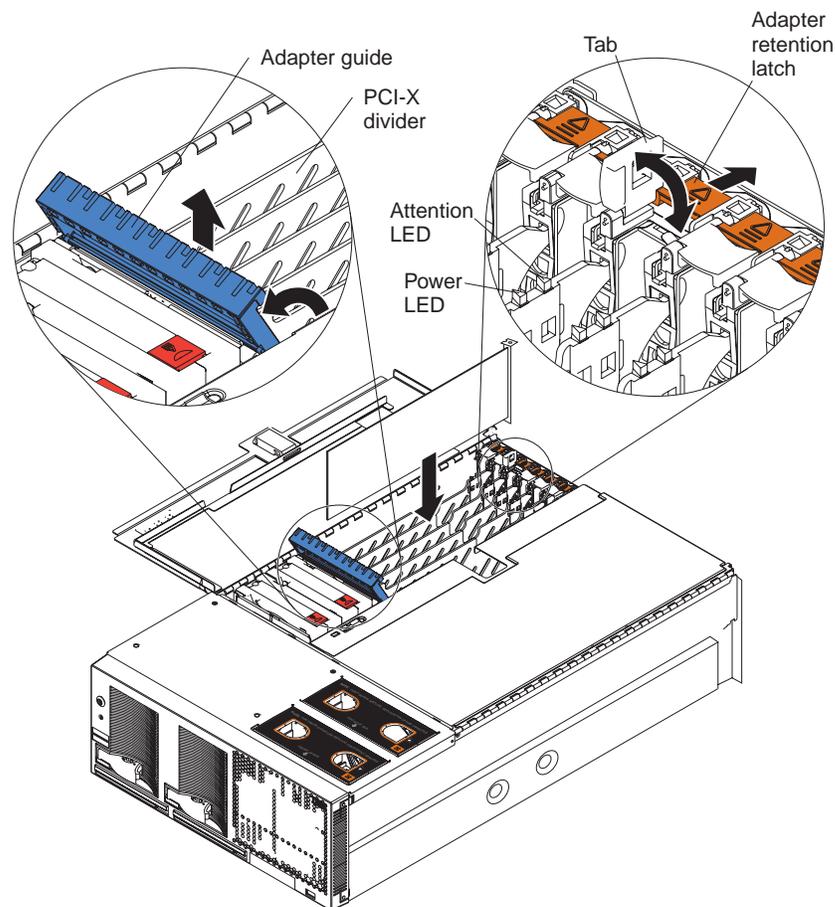
Figure 27. PCI-X slot components

3. Open the blue adapter guide by lifting the front edge, as shown in the illustration.

4. Remove the PCI-X slot cover and the PCI-X divider from slot one.
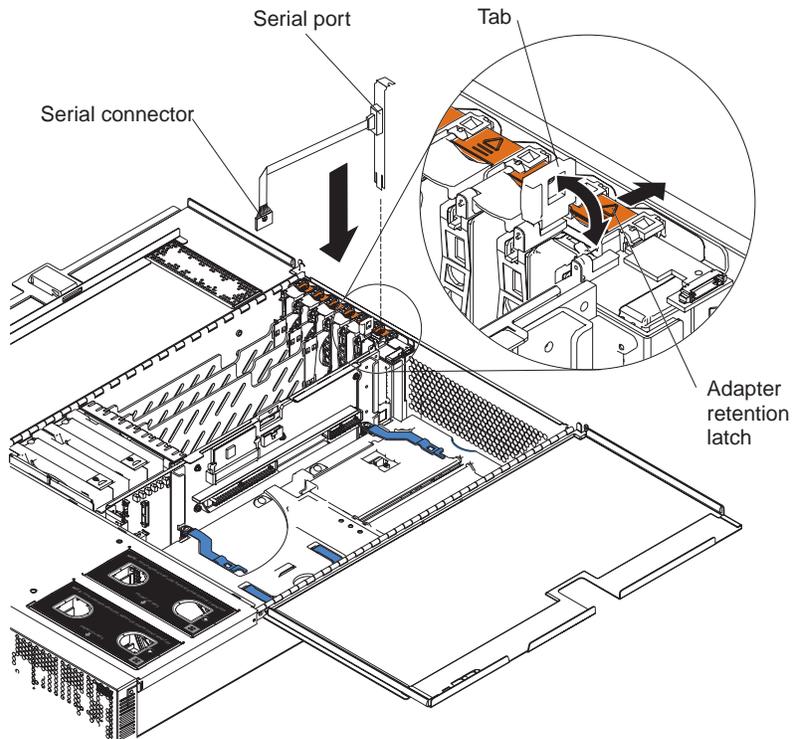
Figure 28. Insert the serial port into PCI-X slot 1

5.   Insert the serial port into the opening.

6.   Close the tab; then, push down on the orange adapter retention latch until it clicks into place.
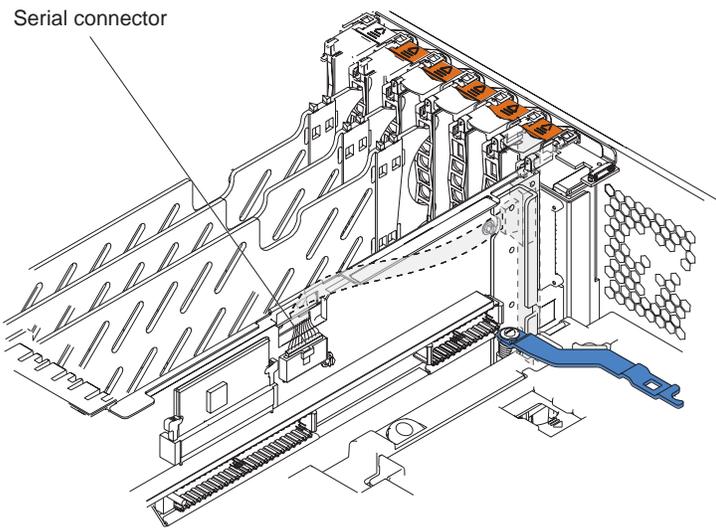
Figure 29. Route the serial port ribbon cable through the slot

7.   Route the ribbon cable through the lower slot in the center of the server.

8.   Connect the serial port ribbon cable to the connector on the center plane.

9.   If you have other options to install or remove, do so now.

10. Go to "Installing the server in the rack cabinet" on page 33.

Note: Use the Configuration/Setup Utility program to configure the serial port.

Completing the installation

This section provides information about installing the server in a rack and cabling the server.

Installing the server in the rack cabinet

Close the cover and install the server into a rack cabinet. See the *Rack Installation Instructions* that came with your server for detailed information on how to install the server in a rack cabinet.

Note: After completing the rack installation, see "Connecting the cables" on page 34 in this publication for instructions and information.
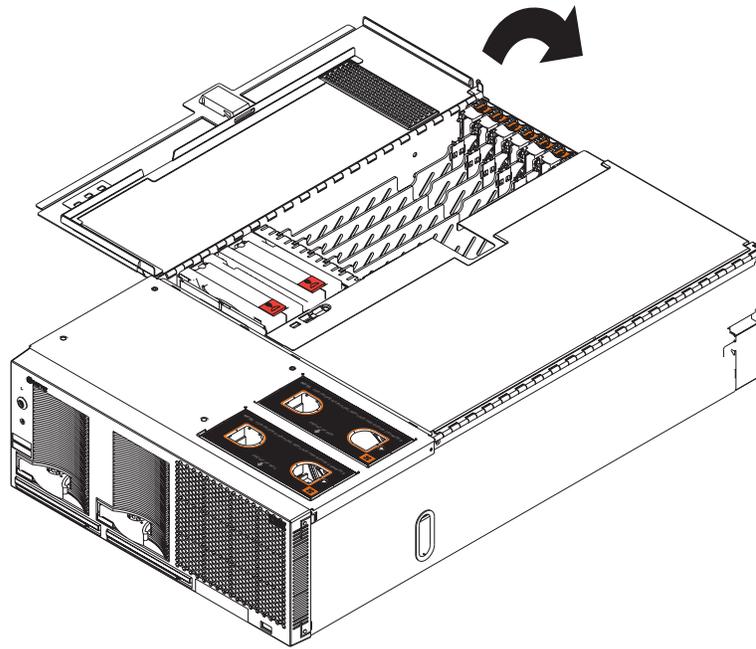
Figure 30. Closing the cover

Connecting the cables

This section describes how to connect cables to the SMP Expansion Port, system power connectors, RXE Expansion Port, SCSI connector, USB connector, video connector, mouse connector, keyboard connector, Ethernet connector, and RXE Management port for up to 16-way operation.

For details about the locations and functions of all of the ports, LEDs, and connectors, see Chapter 3, "Server controls, LEDs, and power," on page 51.

Notes:

1. The information in this publication is for single and dual server configurations using up to 16 microprocessors and four SMP Expansion Modules.
2. There are two different SMP Expansion cables used to connect the SMP Expansion Modules.
   a. 2.5 m (8.2 ft) copper clad (comes in the IBM @server xSeries 445 Two-chassis 16-way Scalability Kit)
   b. 25.4 cm (10 in.) black clad
3. Before connecting RXE or SMP Expansion cables to the server, ensure that the protective cover is removed from the connectors on each end.
4. See the following illustrations to locate the connectors on the back of your server, depending on your model. The illustrations in this document might differ slightly from your hardware.
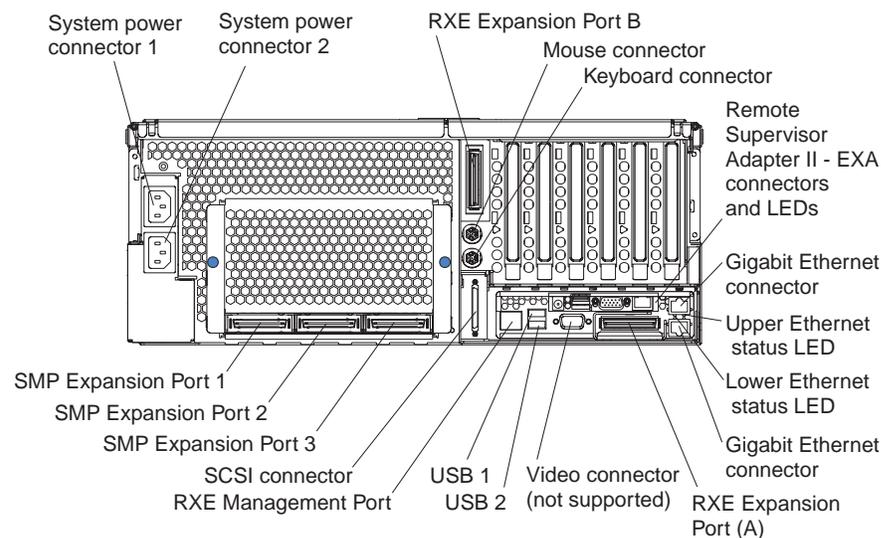
Figure 31. Rear view of Remote Supervisor Adapter II-EXA model

Important: If your server has a Remote Supervisor Adapter II-EXA installed, the integrated video controller on your server is disabled. You must connect a monitor or console switch to the video port on the adapter.

System power connector 1 System power connector 2 RXE Expansion Port B Mouse connector Keyboard connector Remote Supervisor Adapter connectors and LEDs Gigabit Ethernet connector Upper Ethernet status LED Lower Ethernet status LED Gigabit Ethernet connector RXE Expansion Port (A) SMP Expansion Port 1 SMP Expansion Port 2 SMP Expansion Port 3 SCSI connector RXE Management Port USB 1 USB 2 Video connector
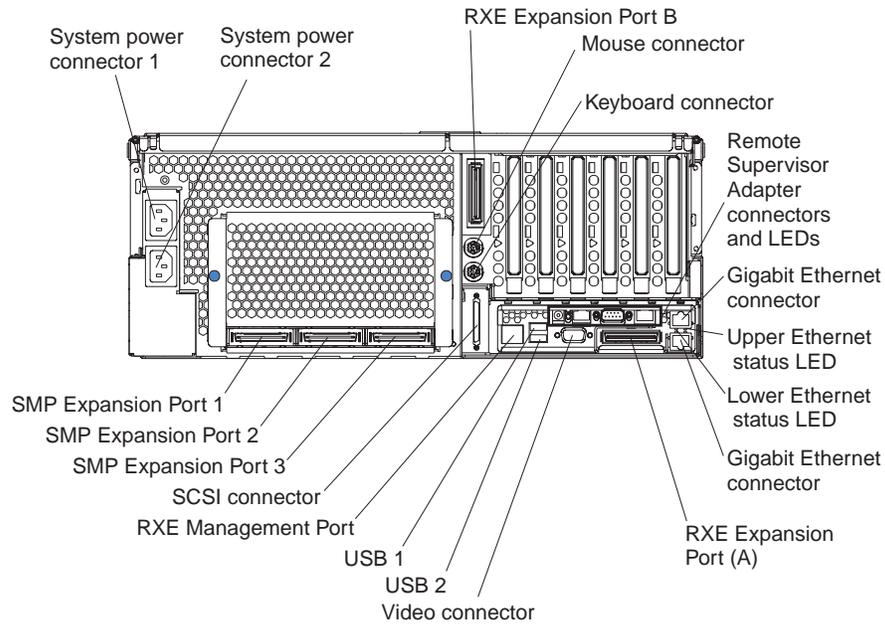
Figure 32. Rear view of Remote Supervisor Adapter model

5. If your server model comes with an operating system, such as Microsoft Windows® 2000 Datacenter Server or VMware ESX server, see the software documentation provided with your software for additional cabling instructions.

To effectively manage the cables on this server, keep groups of cables secured together, and do not run cables across the back of the server. Use cable ties to bundle similar cables together. Use hook-and-loop fasteners to secure the cable bundles to the vertical rails of the rack cabinet.

**Attention:** Do not secure cables too tightly. Overtightening can cause internal damage to the cables.

SMP Expansion Port cabling

Depending upon your configuration, there are either three or six SMP Expansion Ports located on the back of the server. The cabling information in this section is for configurations using up to four SMP Expansion Modules in two servers.

Configurations that use only one SMP Expansion Module have three SMP Expansion Ports and do not require any SMP Expansion Port cabling.

- If you are installing a server that has only one SMP Expansion Module and you are connecting an RXE-100 enclosure, go to "RXE Expansion Port cabling for one server with one SMP Expansion Module" on page 41.
- If you are installing a server that has only one SMP Expansion Module and you are not connecting an RXE-100 enclosure, connect all remaining external cables to the server; then, go to "Creating a scalable partition" on page 63 and follow the instructions for creating a scalable partition.
- If you are installing a server that has two SMP Expansion Modules, go to "SMP Expansion Port cabling for one server with two SMP Expansion Modules" on page 36.
- If you are installing two servers that each have two SMP Expansion Modules, go to "SMP Expansion Port cabling for two servers with four SMP Expansion Modules (16-way)" on page 37.

SMP Expansion Port cabling for one server with two SMP Expansion Modules: Complete the following steps to cable two SMP Expansion Modules in a single server together, using the two 25.4 cm (10 in.) SMP Expansion cables, for up to 8-way operation. In the illustration, the SMP Expansion Modules are numbered 0 and 1, from bottom to top. The SMP Expansion Ports are numbered 1 through 3, left to right. If your server comes with two SMP Expansion Modules, the SMP Expansion cables are included with the server. If you purchased a second SMP Expansion Module, the cables are included with the option.
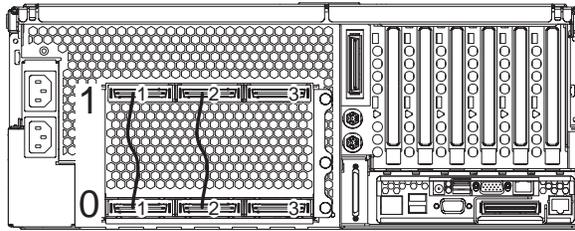
Figure 33. SMP Expansion Module numbering

1. Remove the protective covers from the connectors on the ends of the cables.
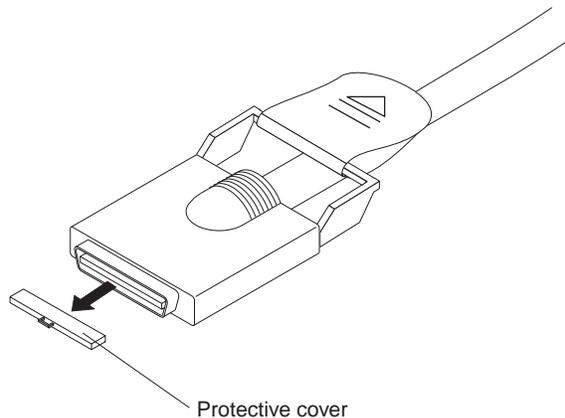
Protective cover

Figure 34. SMP Expansion cable with protective cover

2. Connect one end of a 25.4 cm (10 in.) SMP Expansion cable to port 1 of SMP Expansion Module 0; then, connect the opposite end of the cable to port 1 of SMP Expansion Module 1.
3. Connect one end of the second 25.4 cm (10 in.) SMP Expansion cable to port 2 of SMP Expansion Module 0; then, connect the opposite end of the cable to port 2 of SMP Expansion Module 1.
4. If you are connecting an RXE-100 enclosure, go to "RXE Expansion Port cabling for one server with two SMP Expansion Modules" on page 43. If you are not connecting an RXE-100 enclosure, connect all remaining external cables to the server; then, go to "Creating a scalable partition" on page 63 and follow the instructions for creating a scalable partition.

    Notes:

    1. When multiple cables are connected between the SMP Expansion Module ports, SMP data is interleaved between the cables for better performance.
    2. The server will start and operate with one cable attached between the two SMP Expansion Modules.

***SMP Expansion Port cabling for two servers with four SMP Expansion
Modules (16-way):*** Complete the following steps to cable four SMP Expansion
Modules and two servers together, using the four 2.5 m (8.2 ft) and two 25.4 cm (10
in.) SMP expansion cables that came with your servers, for up to 16-way operation.
In the illustration, the SMP Expansion Modules are numbered 0 through 3, from
primary to secondary server. The SMP Expansion Ports are numbered 1 through 3,
left to right.

1. Remove the protective covers from the connectors on the ends of the cables.
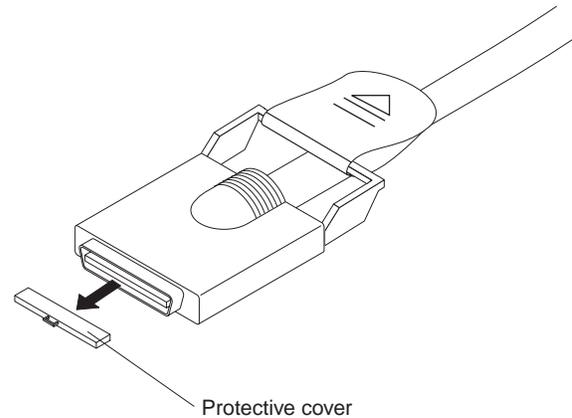
Protective cover

Figure 35. SMP Expansion cable with protective cover

2. Label each end of the 2.5 m (8.2 ft) SMP Expansion cables according to where
    they will connect to each server. See the following illustration. The SMP
    Expansion module numbering shown in the following illustration is for reference
    purposes only. These numbers do not appear on the servers.
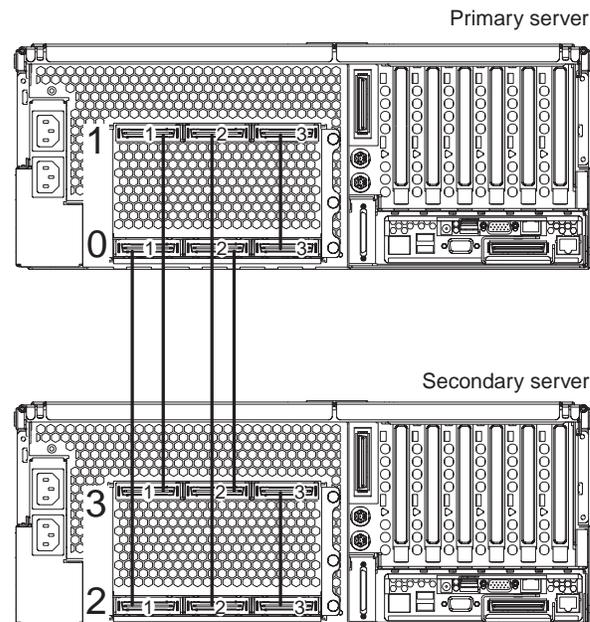
Figure 36. 16-way SMP Expansion port cabling

3. Connect the SMP Expansion cables to the primary server:

a. Connect one end of a 2.5 m (8.2 ft) SMP Expansion cable to port 1 of SMP Expansion Module 0 on the primary server; then, route the cable through the cable-management arm.
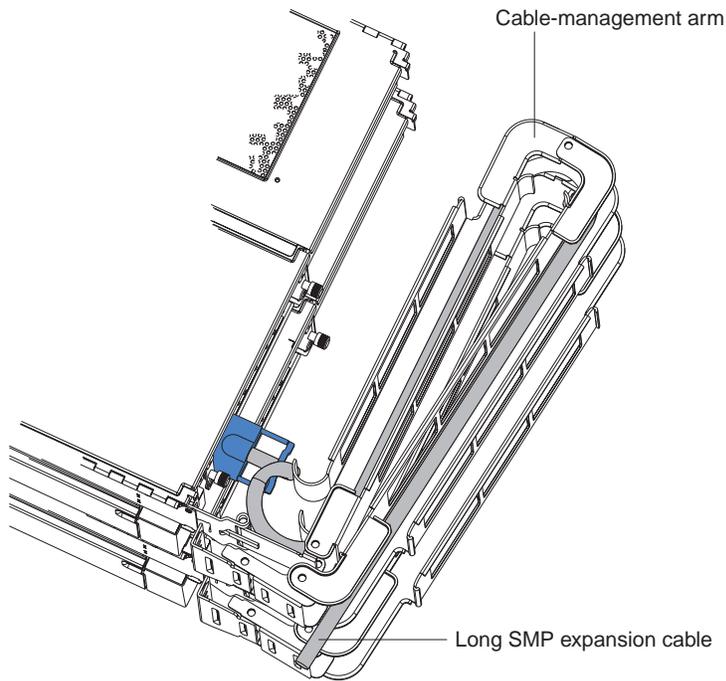
Figure 37. Routing cables through the cable management arm

b. Connect one end of a 2.5 m (8.2 ft) SMP Expansion cable to port 2 of SMP Expansion Module 0 on the primary server; then, route the cable beside the first cable in the cable-management arm.

Cable-management arm

Long SMP expansion cables
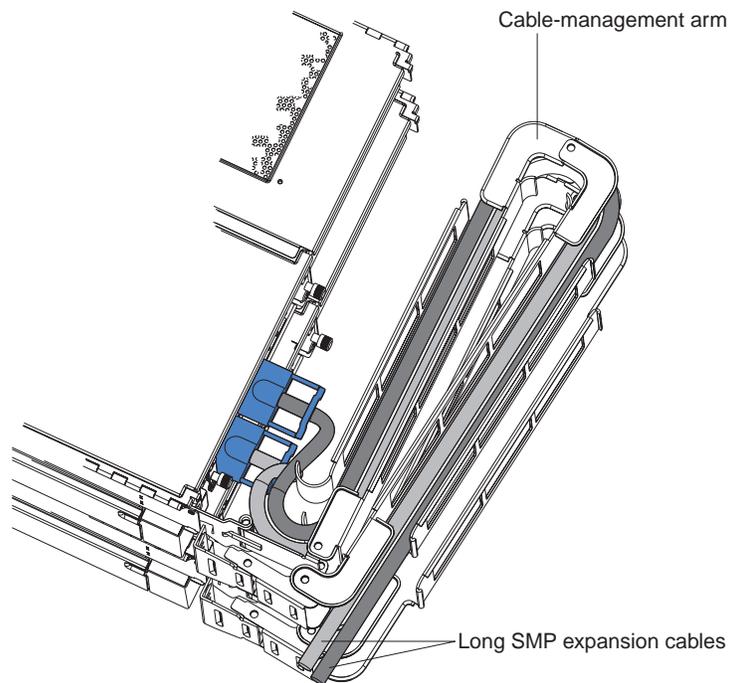
Figure 38. Routing cables through the cable management arm

    c. Connect one end of a 2.5 m (8.2 ft) SMP Expansion cable to port 1 of SMP Expansion Module 1 on the primary server; then, route the cable through the cable-management arm as in step 3a on page 38.

    d. Connect one end of a 2.5 m (8.2 ft) SMP Expansion cable to port 2 of SMP Expansion Module 1 on the primary server; then, route the cable through the cable-management arm as in step 3b on page 38.

    e. Verify that a 25.4 cm (10 in.) SMP Expansion cable is connected between port 3 of SMP Expansion Module 0 and port 3 of SMP Expansion Module 1.

4. Connect the SMP Expansion cables to the secondary server:

    a. Locate the SMP Expansion cable that is connected to port 1 of SMP Expansion Module 0 on the primary server; then, connect the opposite end of the cable to port 1 of SMP Expansion Module 2. Next, route the cable through the secondary cable-management arm.

    b. Locate the SMP Expansion cable that is connected to port 2 of SMP Expansion Module 1 on the primary server; then, connect the opposite end of the cable to port 2 of SMP Expansion Module 2. Next, route the cable through the secondary cable-management arm.

    c. Locate the SMP Expansion cable that is connected to port 1 of SMP Expansion Module 1 on the primary server; then, connect the opposite end of the cable to port 1 of SMP Expansion Module 3. Next, route the cable through the secondary cable-management arm.

    d. Locate the SMP Expansion cable that is connected to port 2 of SMP Expansion Module 0 on the primary server; then, connect the opposite end of the cable to port 2 of SMP Expansion Module 3. Next, route the cable through the secondary cable-management arm.

    e. Verify that a 25.4 cm (10 inches) SMP Expansion cable is connected between port 3 of SMP Expansion Module 2 and port 3 of SMP Expansion Module 3.

5. Connect the Remote Supervisor Adapter or Remote Supervisor Adapter II-EXA Ethernet port on each server to a LAN or to each other with an Ethernet crossover cable. This connection is needed so that the adapters can communicate and perform the necessary functions for the two servers to create or delete scalable partitions.
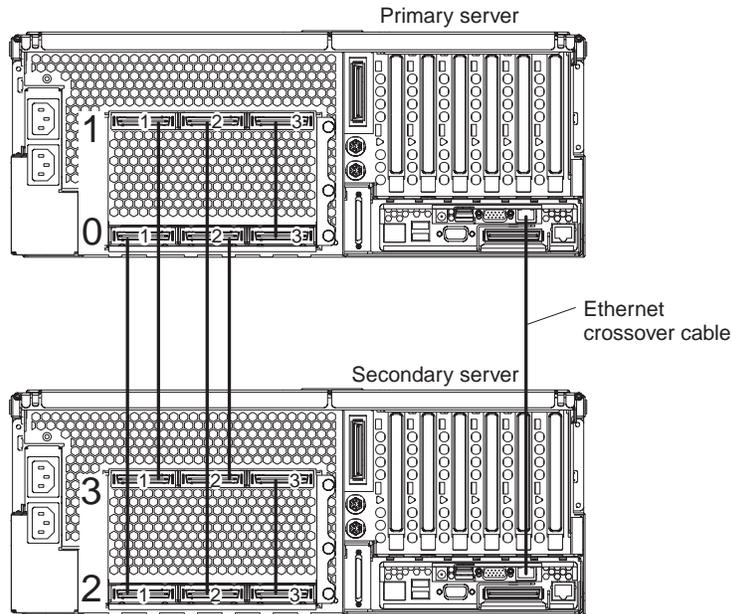
Figure 39. Using an Ethernet crossover cable to connect the Remote Supervisor Adapters.
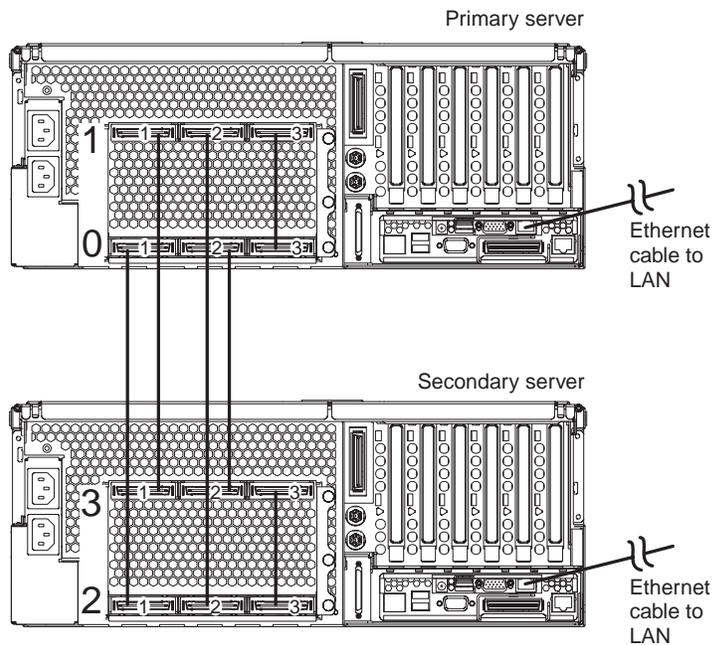
Figure 40. Connecting the Remote Supervisor Adapters to a LAN.

6. Route any remaining cables through the cable-management arms.
7. Secure the cables in the cable-management arms with the hook-and-loop straps that come with your server.

8. If you are connecting an RXE-100 enclosure, go to "RXE Expansion Port cabling for a 16-way configuration" on page 46. If you are not connecting an RXE-100 enclosure, connect all remaining external cables to the server; then, go to "Creating a scalable partition" on page 63 and follow the instructions for creating a scalable partition.

RXE Expansion and Management Port cabling

There are two RXE Expansion Ports on the rear of the server. Use these ports to connect the server to an RXE-100 enclosure and to expand the number of PCI-X slots that are available for use by the server.

There is one RXE Management Port located on the back of the server. You can use this port to connect the server to the management port of an optional RXE-100 enclosure. This port is used to manage the PCI-X slots in an RXE-100 enclosure, including slot assignments and managing access.

For detailed information about how the server and RXE-100 enclosure work together, see the documentation that comes with the RXE-100 enclosure.

RXE Expansion Port cabling for one server with one SMP Expansion Module:
If your server has one SMP Expansion Module installed, complete the following steps to connect an RXE-100 enclosure:

1. Remove the protective covers from the connectors on the ends of the cables.
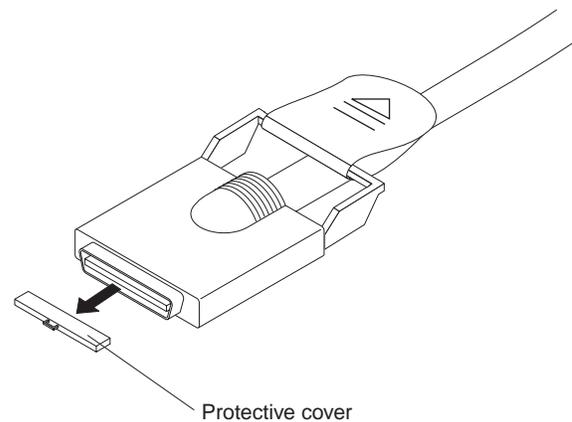
Protective cover

Figure 41. RXE Expansion cable with protective cover

2. Using an RXE Expansion cable, connect one end of the cable to RXE Expansion Port A on the server.

Figure 42. RXE Expansion Port cabling a server with one SMP Expansion Module

3. Connect the opposite end of the cable to an RXE Expansion Port on the RXE-100 enclosure.

4. Using an RXE Management cable, connect one end of the cable to the RXE Management Port on the server.

Figure 43. Cabling RXE Management Port - one server

5. Connect the opposite end of the cable to the RXE Management A (in) Port on the RXE-100 enclosure.

6. Connect all remaining external cables to the server; then, go to "Creating a scalable partition" on page 63 and follow the instructions for creating a scalable partition.

***RXE Expansion Port cabling for one server with two SMP Expansion
Modules:*** If your server has two SMP Expansion Modules installed, complete the
following steps to connect an RXE-100 enclosure:

1. Remove the protective covers from the connectors on the ends of the cables.

Protective cover

Figure 44. RXE Expansion cable with protective cover

2. Using an RXE Expansion cable, connect one end of the cable to RXE
   Expansion Port B on the server.

Figure 45. RXE Expansion port cabling a server with two SMP Expansion Modules

3. Connect the opposite end of the cable to an RXE Expansion Port on the
   RXE-100 enclosure.

   Notes:

   1. When two SMP Expansion Modules are installed, both of the RXE
      Expansion ports are active.
   2. To increase reliability, connect a second cable from RXE Expansion Port A
      on the server to RXE Expansion Port B on the enclosure. This will create a
      redundant data path if either of the two cables fail.

4. Using an RXE Management cable, connect one end of the cable to the RXE Management Port on the server.
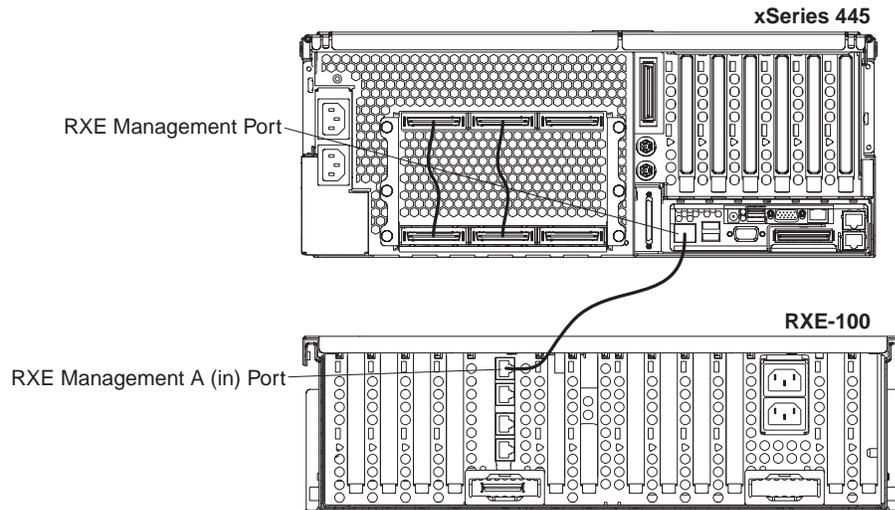
Figure 46. Cabling RXE Management Port - one server

5. Connect the opposite end of the cable to the RXE Management A (in) Port on the RXE-100 enclosure.
6. Connect all remaining external cables to the server; then, go to "Creating a scalable partition" on page 63 and follow the instructions for creating a scalable partition.

RXE Expansion Port cabling for two stand-alone servers: Complete the following steps to cable two stand-alone servers to a single RXE-100 enclosure:

1. Determine which server will be connected to port A of the RXE-100 enclosure and which will be connected to port B.
2. Remove the protective covers from the connectors on the ends of the cables.
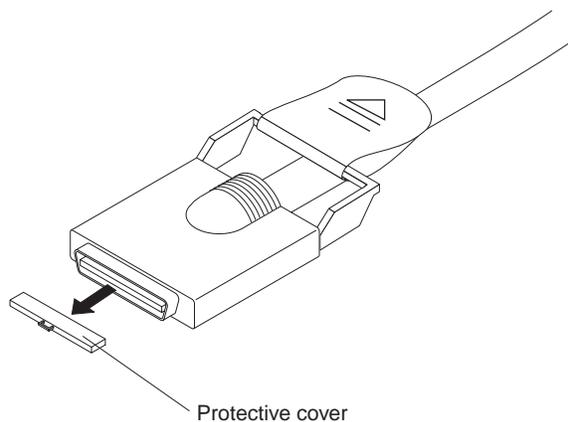
Figure 47. RXE Expansion cable with protective cover

3. Using an RXE Expansion cable, connect one end of the cable to RXE
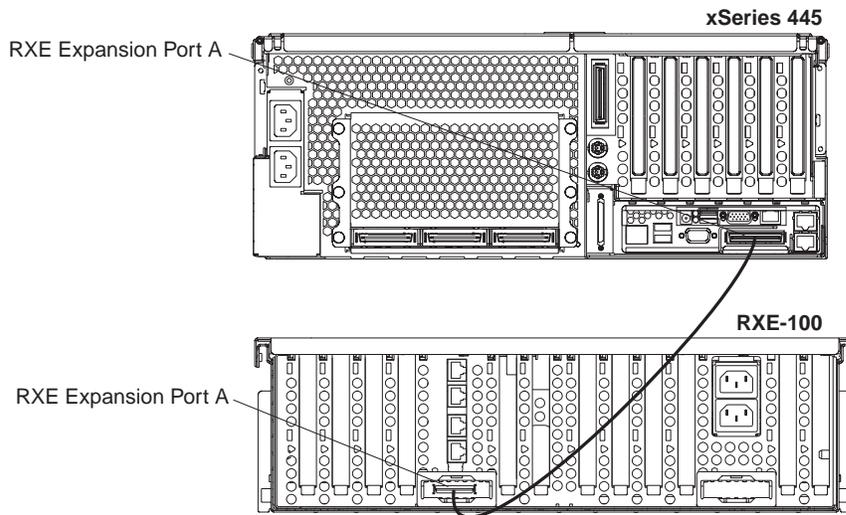   Expansion Port A on the RXE-100 enclosure.

First server RXE Expansion Port B

xSeries 445

RXE Expansion Port A

B

1
0

A

First server RXE Expansion Port A

xSeries 445

B

RXE Expansion Port B

1
0

A

Second server RXE Expansion Port A

Second server RXE Expansion Port B
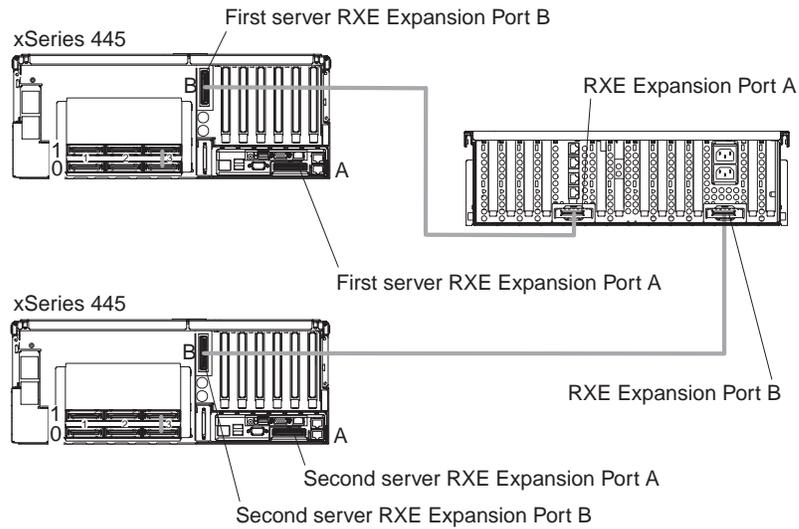
Figure 48. RXE Expansion Port cabling of two stand-alone xSeries 445 servers to a single RXE-100 enclosure

4. Connect the opposite end of the cable to RXE Expansion Port A or B on the
    first server.

    Note: If the server has one SMP Expansion Module installed, you must
    connect the RXE Expansion cable to RXE Expansion Port A on the
    server. If the server has two SMP Expansion Modules installed, connect
    the cable to RXE Expansion Port B.

5. Using an RXE Expansion cable, connect one end of the cable to RXE
    Expansion Port B on the RXE-100 enclosure.

6. Connect the opposite end of the cable to RXE Expansion Port A or B on the
    second server.

    Note: When two SMP Expansion Modules are installed, both of the RXE
    Expansion ports are active.

7. Using an RXE Management cable, connect one end of the cable to the RXE Management Port on one of the servers.
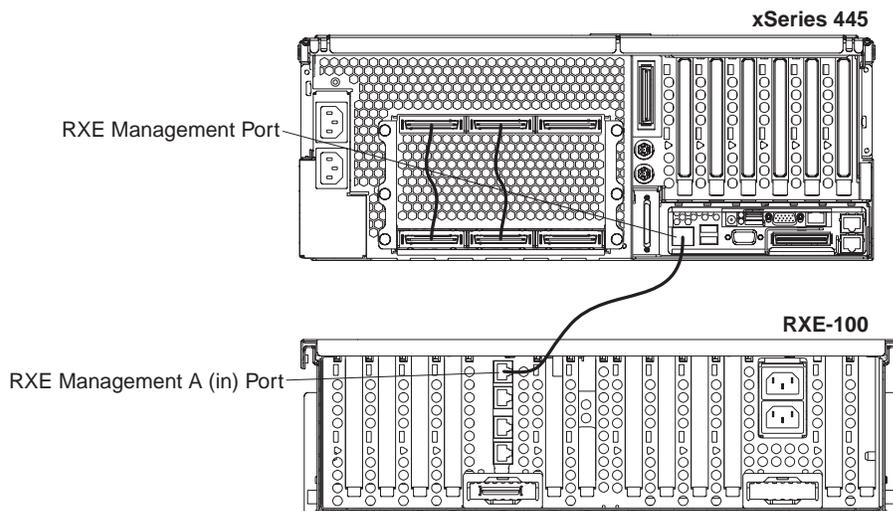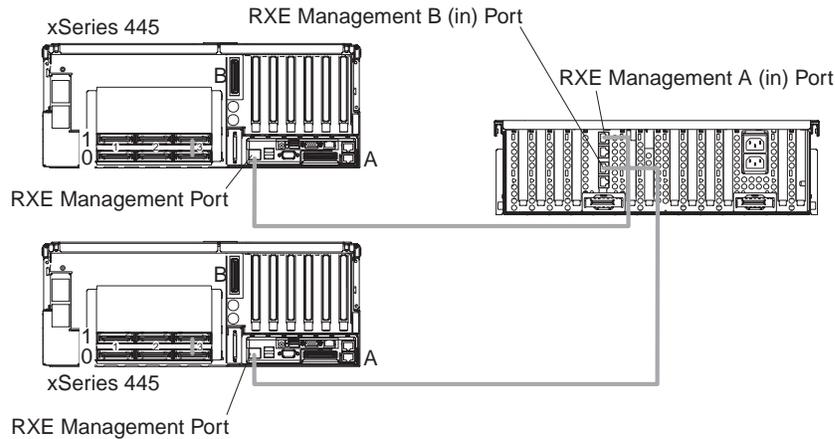

Figure 49. Cabling an RXE Management port - two stand-alone servers

8. Connect the opposite end of the cable to the RXE Management A (in) Port on the RXE-100 enclosure. The RXE Management Port cabling is the same for a server with two SMP Expansion Modules.
9. Repeat steps 7 and 8 for the second server.
10. Connect all remaining external cables to the servers; then, go to "Creating a scalable partition" on page 63 and follow the instructions for creating a scalable partition.

RXE Expansion Port cabling for a 16-way configuration: Complete the following steps to connect an RXE-100 enclosure to a 16-way system:

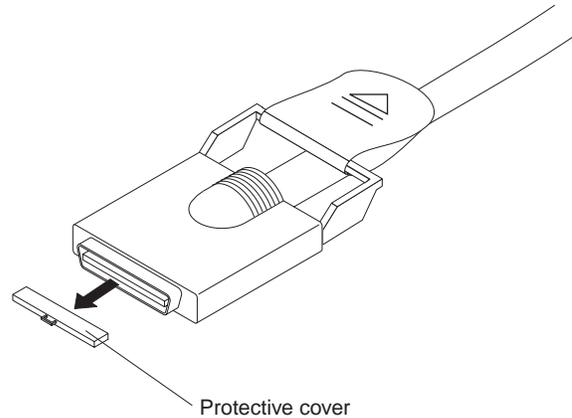1. Remove the protective covers from the connectors on the ends of the cables.
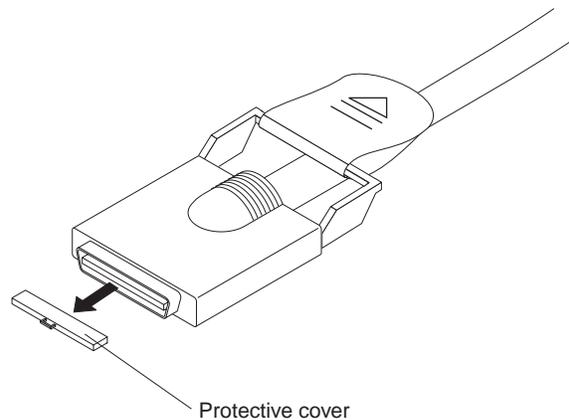
Protective cover

Figure 50. RXE Expansion cable with protective cover

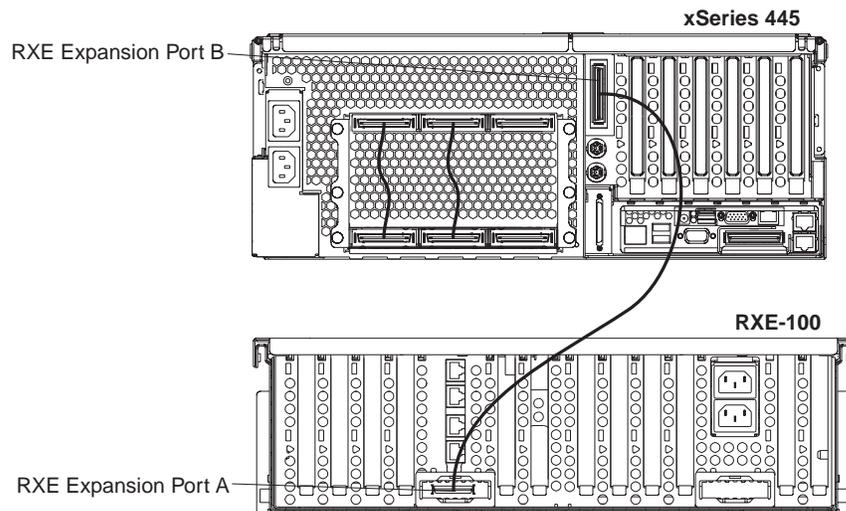2. Using an RXE Expansion cable, connect RXE Expansion Port A on the primary server to RXE Expansion Port A on the secondary server.
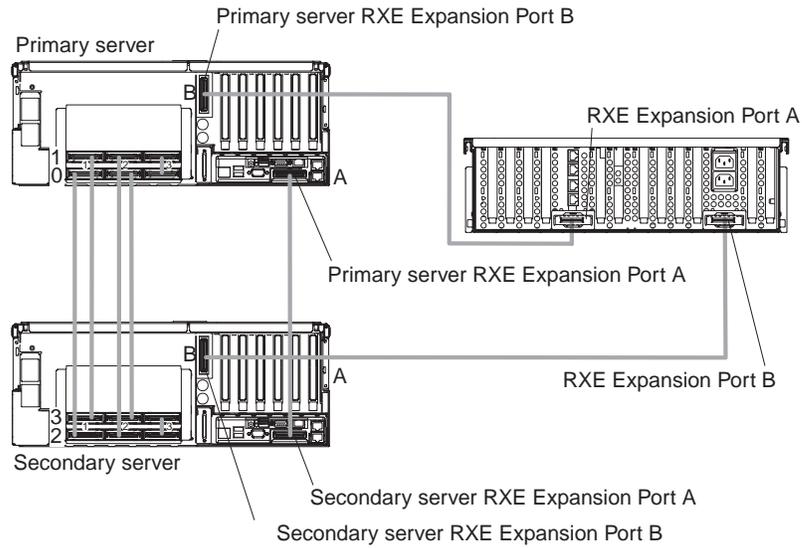
Figure 51. RXE Expansion Port cabling in a 16-way configuration

3. Using an RXE Expansion cable, connect RXE Expansion Port B on the primary server to RXE Expansion Port A on the RXE-100.
4. Using an RXE Expansion cable, connect RXE Expansion Port B on the secondary server to the RXE Expansion Port B on the RXE-100.
5. Using an RXE Management cable, connect the RXE Management Port on the primary server to RXE Management Port A (in) on the RXE-100.
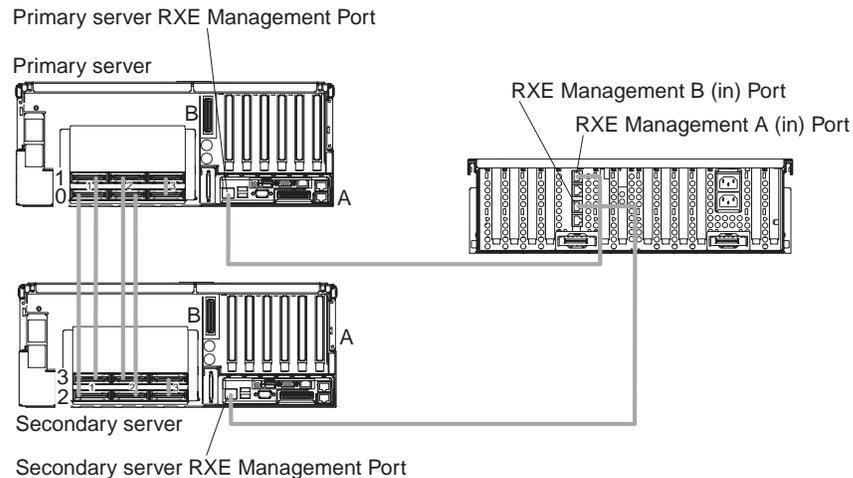
Figure 52. Cabling an RXE Management Port - 16-way configuration

6. Using an RXE Management cable, connect the RXE Management Port on the secondary server to the RXE Management Port B (in) on the RXE-100.
7. Connect all remaining external cables to the servers; then, go to "Creating a scalable partition" on page 63 and follow the instructions for creating a scalable partition.

Power cabling

Your server uses two power cords that can be connected to a primary power unit inside the rack cabinet, such as a properly grounded power distribution unit or uninterruptible power supply, or to an external source, such as a properly grounded electrical outlet.

Complete the following steps to attach the power-supply cords:

1. Connect a power-supply cord to one of the system power connectors on the rear of the server.
2. Connect the other end of the power-supply cord to a properly grounded electrical outlet or to a primary power unit inside the rack cabinet.

   Note: Connecting the power-supply cords to an electrical outlet might cause the server to start automatically. This is an acceptable action. See "Turning on the server" on page 56 for detailed information about turning on the server.

3. Repeat steps 1 and 2 for the second cable.

   Note: The server requires a 220 V ac power connection for full power-supply redundancy. Whenever possible, use a 220 V ac connection for all configurations. However, you can use a 110 V ac connection, but without full power-supply redundancy.

SCSI cabling

You can use the SCSI connector on the back of the server to attach an optional SCSI device, such as one of the IBM external storage enclosures, to the server. For detailed information about how to connect a SCSI device to your server, see the documentation that comes with the SCSI device.

USB cabling

Your server has three USB connectors, one on the front and two on the back of the server. You can use these connectors to attach an optional USB device to the server. For detailed information about how to connect a USB device to your server, see the documentation that comes with the USB device.

Video cabling

You can use the video connector on the back of the server to attach a monitor or optional console switch to the server. For detailed information about how to connect a monitor or optional console switch to your server, see the documentation that comes with the optional device.

Important: If your server has a Remote Supervisor Adapter II-EXA installed, the integrated video controller on your server is disabled. You must connect a monitor or console switch to the video port on the adapter.

Mouse cabling

You can use the mouse connector on the back of the server to attach a mouse to the server. For detailed information about how to connect a mouse to your server, see the documentation that comes with the mouse.

Keyboard cabling

You can use the keyboard connector on the back of the server to connect a keyboard or optional console switch to the server. You can also connect a USB keyboard to the server using one of the USB connectors. After installing a USB keyboard, you might need to use the Configuration/Setup Utility program to enable keyboardless operation and prevent the POST error message 301 from being displayed during startup. For detailed information about how to connect a keyboard or console switch to your server, see the documentation that comes with the keyboard or console switch.

Gigabit Ethernet cabling

Use the two Ethernet connectors on the back of the server to connect the server to a local area network (LAN).

Note: A third Ethernet connector is located on the Remote Supervisor Adapter. This connector is used for specific supervisory functions and should not be confused with the Gigabit Ethernet connector located next to the USB connectors.

Remote Supervisor Adapter cabling

Your server comes with a Remote Supervisor Adapter or a Remote Supervisor Adapter II-EXA. For information about cabling the Remote Supervisor Adapter connectors, see the appropriate *Remote Supervisor Adapter User's Guide* on the IBM *xSeries Documentation* CD.

Chapter 3. Server controls, LEDs, and power

This chapter describes the controls and indicators, and provides the information needed to turn on and turn off the server.

Front view
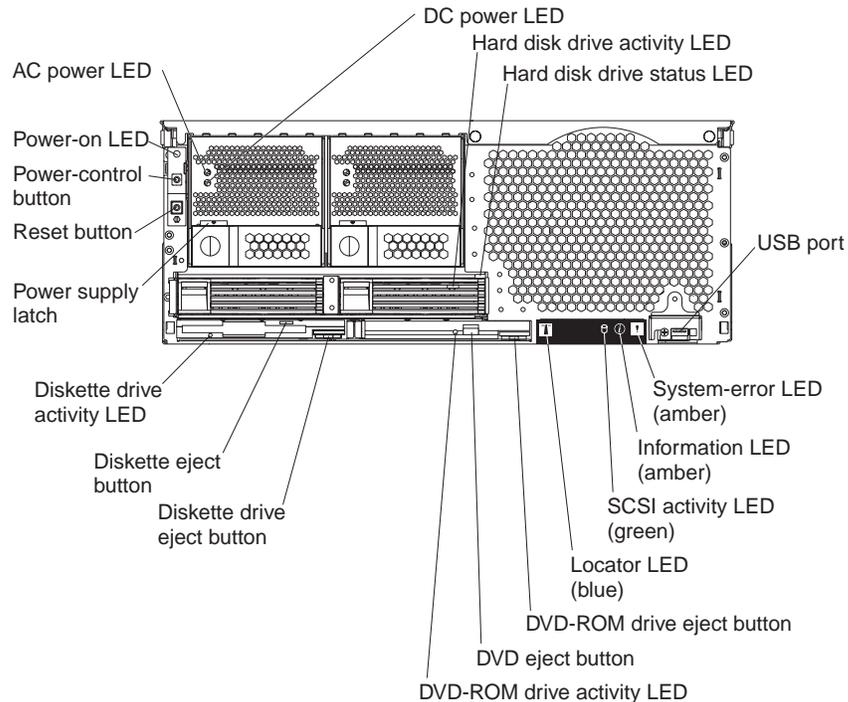
Figure 53. Front view of xSeries 445

AC and DC power LED: Each hot-swap power supply has an ac power LED and a dc power LED. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

Hard disk drive activity LED: This green LED is lit when the hard disk drive is in use.

Hard disk drive status LED: When the drive is connected to the integrated SCSI controller with RAID capabilities, a flashing status LED indicates that the drive is a secondary drive in a mirrored pair and the drive is being synchronized. When the drive is connected to an optional ServeRAID controller, a slowly flashing (one flash per second) status LED indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

USB port: Use this automatically configured port to connect one or more USB devices to the front of the server, using Plug and Play technology.

System-error LED: This amber LED is lit when a system error has occurred.

Information LED: This amber LED is lit when information about a system error has been placed in the System Error log.

SCSI activity LED: This green LED is lit when there is activity on the SCSI bus.

Locator LED: The locator LED is on the left front of the Light Path Diagnostic drawer. This blue LED identifies the primary and secondary servers. This LED blinks on the primary server and remains lit solid on the secondary server.

DVD-ROM drive eject button: Press this button to release a DVD-ROM drive from the server.

DVD eject button: Press this button to release a DVD from the DVD-ROM drive.

DVD-ROM drive activity LED: When this LED is lit, the DVD-ROM drive is in use.

Diskette drive eject button: Press this button to release a diskette drive from the server.

Diskette eject button: Press this button to release a diskette from the diskette drive.

Diskette drive activity LED: When this LED is lit, the diskette drive is in use.

Power-supply latch: This latch is used to secure the power supply in place.

Reset button: Press this button to reset the server and run the power-on self-test (POST). You might have to use a pen or the end of a straightened paper clip to press the button.

Power-control button: Press this button to turn the server on and off manually. A power-control-button shield comes with your server. You can install this disk-shaped shield to prevent the server from being turned off accidentally.

Rear view

System power connector 1 System power connector 2 RXE Expansion Port B Mouse connector Keyboard connector Remote Supervisor Adapter II - EXA connectors and LEDs Gigabit Ethernet connector Upper Ethernet status LED Lower Ethernet status LED Gigabit Ethernet connector RXE Expansion Port (A) SMP Expansion Port 1 SMP Expansion Port 2 SMP Expansion Port 3 SCSI connector RXE Management Port USB 1 USB 2 Video connector (not supported)

Figure 54. Rear view of model with Remote Supervisor Adapter II-EXA

RXE Expansion Port B System power connector 1 System power connector 2 Mouse connector Keyboard connector Remote Supervisor Adapter connectors and LEDs Gigabit Ethernet connector Upper Ethernet status LED Lower Ethernet status LED Gigabit Ethernet connector SMP Expansion Port 1 SMP Expansion Port 2 SMP Expansion Port 3 SCSI connector RXE Management Port USB 1 USB 2 Video connector RXE Expansion Port (A)

Figure 55. Rear view of model with Remote Supervisor Adapter

System power connectors (1 and 2): Connect the system power cords to these two connectors to provide power to the system.

RXE Expansion Port B: Use this port to connect the server to a remote I/O enclosure when two SMP Expansion Modules are installed.

Mouse connector: Connect a mouse to this connector.

Keyboard connector: Connect a keyboard to this connector.

Remote Supervisor Adapter II-EXA connectors and LEDs: The connectors and LEDs on the back of the server are used for system-management information and control.
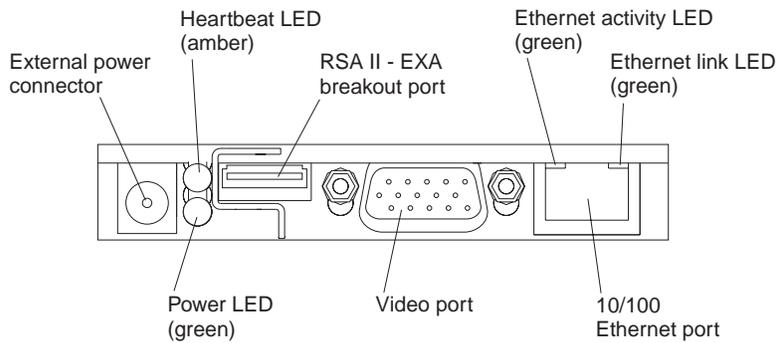
Figure 56. Remote Supervisor Adapter II-EXA connectors

- **External power connector:** You can connect an optional ac power adapter to this connector.
- **Heartbeat LED:** This amber LED flashes continuously to indicate that there is activity on the Remote Supervisor Adapter II-EXA.
- **RSA II-EXA breakout port:** Connect the RSA II-EXA breakout cable to this port to provide two ASM interconnect ports, one USB port, and one Management port.
- **Ethernet activity LED:** This green LED is lit when there is activity on the Ethernet LAN.
- **Ethernet link LED:** This green LED is lit when the Ethernet link is active.
- **10/100 Ethernet port:** Connect Ethernet signal cables to this port.
- **Video port:** Connect a monitor or console switch to this port.

   Important: The integrated video controller is disabled for models with a Remote Supervisor Adapter II-EXA installed.
- **Power LED:** This green LED comes on and stays lit when you plug in your server.

Remote Supervisor Adapter connectors and LEDs: The connectors and LEDs on the back of the server are used for system-management information and control.
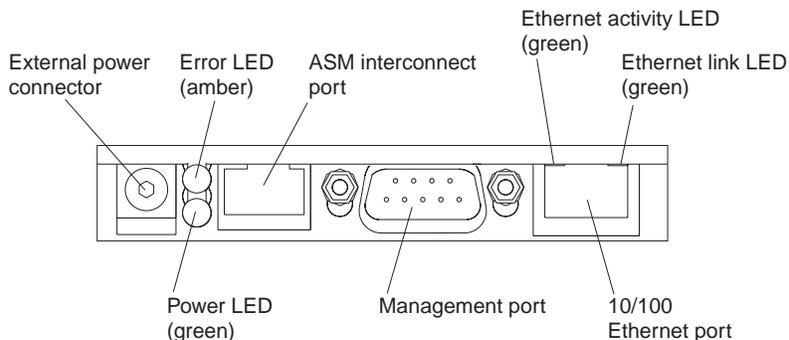
Figure 57. Remote Supervisor Adapter connectors

- **External power connector:** You can connect an optional ac power adapter to this connector.

- **Error LED:** This amber LED is lit when a system-management error has occurred.
- **ASM interconnect port:** Connect signal cables for managing expansion-module resources to this port.
- **Ethernet activity LED:** This green LED is lit when there is activity on the Ethernet LAN.
- **Ethernet link LED:** This green LED is lit when the Ethernet link is active.
- **10/100 Ethernet port:** Connect Ethernet signal cables to this port.
- **Management port:** Connect a serial cable to this port to enable system management through a modem, or connect a null modem cable to this port to enable system management through a workstation or laptop computer.
- **Power LED:** This green LED comes on and stays lit when you plug in your server.

**Gigabit Ethernet ports:** Connect Gigabit Ethernet signal cables to these ports. These ports support 10/100/1000 speed connections.

Upper Ethernet status LED: This LED displays the link and activity status for the upper Gigabit Ethernet port. When the LED is lit green, the link is active. When the LED blinks green and amber, there is activity on the Ethernet LAN.

Lower Ethernet status LED: This LED displays the link and activity status for the lower Gigabit Ethernet port. When the LED is lit green, the link is active. When the LED blinks green and amber, there is activity on the Ethernet LAN.

RXE Expansion Port A: Use this port to connect the server to a remote I/O enclosure, when only one SMP Expansion Module is installed.

Video connector: Connect the signal cable for a monitor to this connector.

Important: If your server has a Remote Supervisor Adapter II-EXA installed, you must connect a monitor or console switch to the video port on the adapter. The integrated video controller on the server is disabled.

USB 2: Use this automatically configured port to connect one or more USB devices to the server, using Plug and Play technology.

USB 1: Use this automatically configured port to connect one or more USB devices to the server, using Plug and Play technology.

RXE Management Port: Use this port to connect a management cable from the server to a remote I/O enclosure.

SCSI connector: Connect external SCSI devices to this connector.

SMP Expansion Port 3: Use this port to interconnect two SMP Expansion Modules together in 16-way configurations.

SMP Expansion Port 2: Use this port to interconnect two SMP Expansion Modules together.

SMP Expansion Port 1: Use this port to interconnect two SMP Expansion Modules together.

Server power features

When the server is connected to an ac power source but is not turned on, the operating system does not run, and all core logic except for the service processor is shut down; however, the server can respond to requests from the service processor, such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to ac power but it is not turned on.

Turning on the server

Approximately 20 seconds after the server is connected to ac power, the power-control button becomes active, and you can turn on the server and start the operating system by pressing the power-control button.

You can also turn on the server in any of the following ways:

- If the server is connected to an Advanced System Management interconnect network that contains at least one server with an optional Remote Supervisor Adapter installed, the server can be turned on from the Remote Supervisor Adapter user interface.
- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If your operating system supports the system-management software for an optional Remote Supervisor Adapter, the system-management software can turn on the server.
- If your operating system supports the Wake on LAN® feature, the Wake on LAN feature can turn on the server.

Note: When you press the power-control button on either the primary or secondary server in a 16-way configuration, both servers will be turned on. If both servers do not turn on when either power-control button is pressed, see the *Hardware Maintenance Manual* and *Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to requests from the service processor, such as a remote request to turn on the server. To remove all power from the server, you must disconnect it from the power source.

Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.
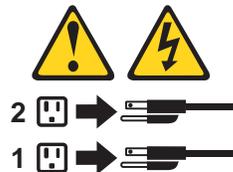
You can turn off the server in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will be turned off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button until the server turns off.
- If the server is connected to an Advanced System Management interconnect network that contains at least one server with an optional Remote Supervisor Adapter installed, the server can be turned off from the Remote Supervisor Adapter user interface.
- The server can be turned off from the Remote Supervisor Adapter user interface.
- If the Wake on LAN feature turned on the server, the Wake on LAN feature can turn off the server.
- The Remote Supervisor Adapter can turn off the server as an automatic response to a critical system failure.

Note: When you press the power-control button on either the primary or secondary server in a 16-way configuration, both servers will be turned off. If both servers do not turn off when either power-control button is pressed, see the *Hardware Maintenance Manual* and *Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

Chapter 4. Configuring your server

The following configuration programs are provided with your server:

- **IBM *ServerGuide Setup and Installation* CD**

  The *ServerGuide Setup and Installation* CD includes software setup and installation tools that are specifically designed for IBM xSeries 445 servers. If you did not purchase a preconfigured server, you can use this CD during the initial installation of your server to configure the server hardware and to simplify your operating system installation. See the *User's Guide* on the IBM *xSeries Documentation* CD for more detailed information.

  Notes:

  1. If you are installing a Linux-based operating system, do not install the default ATI video driver. Instead, install the Video Electronics Standards Association (VESA) video driver and set the resolution to 1024 x 768.

  2. If your server model comes with an operating system, such as Microsoft Windows 2000 Datacenter Server or VMware ESX server, see the software documentation provided with your software for configuration information.

- **Configuration/Setup Utility**

  This program is part of the basic input/output system (BIOS) code that comes with your server. You can use this program to configure the serial connector assignment, change the drive startup sequence, set the date and time, and set passwords. See "Using the Configuration/Setup Utility program" on page 60 for more information.

  Note: In a 16-way configuration, some options or settings are defined through the primary server, while others must be defined on the individual server. Ensure that options or settings on the secondary server are correct before creating a scalable partition.

- **LSI Logic Configuration Utility**

  With the built-in LSI Logic Configuration Utility program, you can configure the integrated SCSI controller and the devices that are attached to it. See "Using the LSI Logic Configuration Utility program" on page 61.

- **ServeRAID configuration program**

  This program comes with the optional ServeRAID adapters and with server models that have a ServeRAID adapter preinstalled. If the server has a ServeRAID adapter installed, you must use the ServeRAID configuration program to define and configure the disk-array subsystem *before* you install the operating system. If your server model came with an operating system installed, your disk-array subsystem is already configured. For more information about using the ServeRAID configuration program, see the ServeRAID information on the IBM *xSeries Documentation* CD.

  Note: If your server model comes with an operating system, such as Microsoft Windows 2000 Datacenter Server or VMware ESX server, see the software documentation provided with your software for configuration information.

- **Remote Supervisor Adapter configuration process**

  Configuration activities are also required for the Remote Supervisor Adapter or Remote Supervisor Adapter II-EXA. See "Using the Remote Supervisor Adapter" on page 62 for a description of features. For information about cabling, configuring, and using the Remote Supervisor Adapter to manage the server

remotely, see "Using the Remote Supervisor Adapter" on page 62 and the appropriate *Remote Supervisor Adapter User's Guide* on the IBM *xSeries Documentation* CD.

- **Integrated System Management update and configuration**

  To update the integrated system management processor (ISMP) firmware, see "Using the Integrated System Management Firmware Update Utility program" on page 62.

- **Configuring Scalable Partitions**

  For the information and instructions needed to create or remove a scalable partition, see "Configuring scalable partitions" on page 63.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides state-of-the-art programs to detect the server model and hardware options that are installed, configure the server hardware, provide device drivers, and help you install your operating system. For information about the supported operating-system versions, see the label on the CD.

Complete the following steps to start the *ServerGuide Setup and Installation* CD:

1. Insert the CD, and then restart the server. If the ServerGuide CD does not start, see "ServerGuide startup problems" on page 70.
2. Follow the instructions on the screen to:
   a. Select your language.
   b. Select your keyboard layout and country.
   c. View the overview to learn about the ServerGuide features.
   d. Review the readme file for installation tips about your operating system and adapters.
   e. Start the setup and hardware configuration programs.
   f. Start the operating-system installation. You will need your operating-system CD.

Using the Configuration/Setup Utility program

The Configuration/Setup Utility program is part of the BIOS code. You can use it to:
- Configure system devices and ports
- Configure scalable partitions
- Configure memory settings
- Change the drive startup sequence
- Enable USB keyboard and mouse support
- Resolve configuration conflicts
- Set the date and time
- Set passwords and security settings

Complete the following steps to start the Configuration/Setup Utility program:

1. Turn on the server and watch the monitor screen.

   Note: In a 16-way configuration, some options or settings are defined through the primary server, while others must be defined on the individual server. Ensure that options or settings on the secondary server are correct before creating a scalable partition.

2. When the message `Press F1 for Configuration/Setup` appears, press F1.

   Note: Depending on your configuration, you might experience a delay before the Configuration/Setup menu appears.

3. Follow the instructions on the screen.

Using the LSI Logic Configuration Utility program

LSI Logic Configuration is a built-in, menu-driven configuration utility program that you can use to:

- Set a SCSI device scan order
- View or change SCSI IDs for attached devices
- Set SCSI protocol parameters on SCSI hard disk drives

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level-1 and RAID level-1 Enhanced (RAID level-1E). Installing an optional ServeRAID controller provides additional RAID levels. See "Using the ServeRAID configuration programs" on page 62 for information about configuring your server for RAID operation.

2. If you install a different type of RAID adapter in your server, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

Complete the following steps to start the LSI Logic Configuration Utility program:

1. Turn on the server.

2. When the

   `<<<Press <CTRL><C> to start LSI Logic Configuration Utility>>>`

   prompt appears, press Ctrl+C.

   Note: If an administrator password has been set, you are prompted to type the password to start the LSI Logic Configuration Utility program.

3. Use the arrow keys to select a controller (channel) from the list of adapters; then, press Enter.

4. Follow the instructions on the resulting screen to change the settings of the selected items; then, press Enter. The **Device Properties** and **Mirroring Properties** choices produce additional screens of parameters to review or change.

Using the ServeRAID configuration programs

A ServeRAID adapter enables you to use multiple physical SCSI hard-disk drives as logical drives, operating as a disk array. To enable you to configure the ServeRAID controller, the adapter comes with a CD containing the ServeRAID Manager program and the ServeRAID Mini-Configuration program.

Note: If your server model came with an operating system, such as Microsoft Windows 2000 Datacenter Server or VMware ESX server, see the software documentation provided with your software for configuration information.

Use the IBM *ServeRAID Support* CD that comes with your server to configure your integrated SCSI controller with RAID capabilities and to perform an initial RAID configuration on your server. For details about using these programs, see the documentation that comes with the ServeRAID adapter and the *User's Guide* on the IBM *ServeRAID Support* CD.

Using the Remote Supervisor Adapter

For information about cabling, configuring, and using the Remote Supervisor Adapter or Remote Supervisor Adapter II-EXA to manage the server remotely, see the *User's Guide* and the appropriate *Remote Supervisor Adapter User's Guide* on the *IBM Documentation* CD.

Using the Integrated System Management Firmware Update Utility program

To update the firmware for the integrated system management processor (ISMP), download the Integrated System Management Processor Update utility program for your server from the IBM Support Web site at http://www.ibm.com/pc/support/. Run the utility program to create a diskette that you can use to update the firmware. The utility program updates the integrated system management processor firmware only and does not affect any device drivers.

Complete the following steps to update the firmware:
1. Turn off the server.
2. Insert the diskette into the diskette drive.
3. Turn on the server. If the server does not start from the diskette, use the Configuration/Setup Utility program to configure the diskette drive as a startup device. (For more information, see the information about Configuration/Setup Utility start options in the *User's Guide*). Then, start again at step 1 of this procedure.
4. From the main menu, select **Update System Management Firmware** and press Enter.
5. Follow the instructions on the screen to complete the update.

If there is an error in updating the firmware, try updating the firmware again.

Configuring scalable partitions

The Scalable Systems Manager program is an extension to IBM Director that provides a graphical user interface for creating and managing scalable partitions. See the *Scalable Systems Manager Installation and Users Guide* for information on how to use that program to configure scalable partitions on xSeries 445 servers. You can also use the Configuration/Setup Utility program to configure scalable partitions. This section provides information and instructions for creating and deleting scalable partitions through the Configuration/Setup Utility program.

Before you create scalable partitions, read the following information:

- Before you can create or delete a scalable partition, the Remote Supervisor Adapters must have an IP address and must be connected to a network or to each other with an Ethernet crossover cable. This connection is needed so that the Remote Supervisor Adapters can communicate and perform the necessary functions for the two servers to create or delete scalable partitions.
- When creating a scalable partition consisting of an RXE-100, you must create the scalable partition initially through the Configuration/Setup Utility program before you can use Scalable Systems Manager.
- When a scalable partition consisting of two servers in a 16-way configuration is created, the DVD-ROM drive, diskette drive, keyboard, USB connectors, mouse, and video are disabled on the secondary server.
- In the Configuration/Setup Utility program, Expansion Port A Destination and Expansion Port B Destination refer to the RXE Expansion Port connection from the expansion enclosure to the server.
- In a 16-way configuration, the SMP IDs of the Primary and Secondary Scalable Nodes must be different.

Creating a scalable partition

Complete the following steps to create a scalable partition:

1. If you have not already done so, connect the RXE expansion and RXE management cables between the server and the remote expansion enclosure. See "RXE Expansion and Management Port cabling" on page 41 for information about RXE cabling.
2. Start the Configuration/Setup Utility program.
3. From the main menu, select **Advanced Setup**.
4. Select **Scalable Partition Settings**.
5. Select **Create Scalable Partition Settings**.
6. For 4-way and 8-way single chassis configurations, complete the following steps:
   a. Select **1 x445 chassis** as the Scalable System Configuration.
   b. Select the number of PCI-X slots available to the RXE Expansion Port in the remote expansion enclosure. The following choices are available:
      0 - No PCI-X slots are assigned to the RXE Expansion Port.
      6 - Only six of the 12 slots are assigned to the RXE Expansion Port.
      12 - All 12 PCI-X slots are assigned to the RXE Expansion Port.

c. Complete one of the following procedures, depending on the number of SMP Expansion Modules that are installed:
- One SMP Expansion Module - If six or 12 PCI-X slots are available, select Primary Scalable Node, Port A for the RXE Port destination.
- Two SMP Expansion Modules - If six or 12 PCI-X slots are available to port A or port B, select Primary Scalable Node, Port B for the RXE Port destination. If six PCI-X slots are available to port A and six PCI-X slots are available to port B, select Primary Scalable Node, Port A for the RXE Port A destination and Primary Scalable Node, Port B for the RXE Port B destination.

d. Go to step 8..

7. For a 16-way, two-chassis configuration, complete the following steps:

a. Select **2 x445 chassis** as the Scalable System Configuration.

b. Enter a Scalable Partition ID **0000 through 9999**.

c. For the primary boot node, select **SMP ID 0**.

   Note: The SMP ID can be 0 or 2, but it must be different from the SMP ID of the secondary x445 scalable node.

d. Enter the Secondary ASM host name or IP address.

e. From the **Secondary Scalable Node SMP ID** menu, select **Yes, SMP ID 2**.

   Note: This SMP ID must be different from the SMP ID for the primary boot node.

f. Select the number of PCI-X slots available to the RXE Expansion Port in the remote expansion enclosure. The following choices are available:
   0 - No PCI-X slots are assigned to the RXE Expansion Port.
   6 - Only six of the 12 slots are assigned to the RXE Expansion Port.
   12 - All 12 PCI-X slots are assigned to the RXE Expansion Port.

g. If 12 PCI-X slots are available to port A, select Primary Scalable Node, Port B for the RXE Port A destination. If six PCI-X slots are available to port A and six PCI-X slots are available to port B, select Primary Scalable Node, Port A for the RXE Port A destination and Primary Scalable Node, Port B for the RXE Port B destination.

8. Select **Write Scalable Partition Settings** and follow the prompts to exit the menu item.

9. Save and Exit the Configuration/Setup Utility Program.

   Note: See the software documentation that comes with your operating system to install your operating system.

Deleting a scalable partition

Complete the following steps to delete the scalable partition:

1. Start the Configuration/Setup Utility on the primary server.
2. From the main menu, select **Advanced Setup**.
3. Select **Scalable Partition Settings**.
4. Select either **Delete ALL Scalable Partition** or **Delete ONLY Local Scalable Partition**.

   Note: Do not select **Write Scalable Partition Settings** when you delete the scalable partition.
5. Exit the Configuration/Setup Utility program.
6. Turn off the servers.
7. If necessary, remove the SMP Expansion cables and reconnect them according to your new configuration. See "Connecting the cables" on page 34 for instructions.
8. Restart the servers.

Chapter 5. Updating IBM Director

If you plan to use IBM Director to manage your server, you must install the applicable IBM Director updates for the xSeries 445 server.

Note: For Automatic Server Restart (ASR) support and environmental-sensor support, you must install version 4.1 of IBM Director.

To install the IBM Director updates, complete the following steps, in order:

1. If you plan to enable the Automatic Server Restart (ASR) feature, install the ASR device driver, which is available from the IBM Web site:
   a. Go to http://www.ibm.com.
   b. Click **Support & downloads**.
   c. Click **Downloads & drivers**.
   d. In the **Enter search terms** field, type `advanced system management 8870` and click **Submit**.
   e. Select the applicable IBM Advanced System Management device driver for your server and operating system.
   f. Click the file link for the executable file to download the file, and follow the instructions in the readme file to install the device driver.
2. Install the IBM Director application.
3. Check the IBM Web site to see if any updates are available for your server. If updates are available, download them from the IBM web site; then, install them according to the instructions in the readme files.
   a. Go to http://www.ibm.com.
   b. Click **Support & downloads**.
   c. Click **Downloads & drivers**.
   d. In the **Enter search terms** field, type `director 8870` and click **Submit**.
   e. Select the update that you want to download.
   f. Click the file link for the executable file to download the file, and follow the instructions in the readme file to install the update.

Chapter 6. Solving problems

This section provides basic troubleshooting information to help you solve some common problems that might occur while you are setting up your server.

If you cannot locate and correct the problem using the information in this section, see Appendix A, "Getting help and technical assistance," on page 81, the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD, and the "Server Support" flowchart in the front of this book.

Diagnostic tools overview

The following tools are available to help you identify and solve hardware-related problems:

- **POST beep codes**

  The power-on self-test beep codes indicate the detection of a problem.

  – On beep indicates successful completion of POST, with no errors.

  – More than one beep indicates that POST detected a problem. Error messages also appear during startup if POST detects a hardware-configuration problem.

    See "POST beep code descriptions" on page 70 and the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information.

- **Troubleshooting charts**

  These charts list problem symptoms and steps to correct the problems. See "Troubleshooting charts" on page 71 for more information.

- **Diagnostic programs and error messages**

  The system diagnostic programs are provided in ROM. These programs test the major components of your server. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information.

- **Light path diagnostics**

  Use the light path diagnostics feature to identify system errors quickly. See "Light path diagnostics feature overview" on page 76 for more information.

POST beep code descriptions

POST emits one beep to signal successful completion. If POST detects a problem during startup, other beep codes might occur. Use the following beep code descriptions to help identify and solve problems that are detected during startup.

Note: See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information about the POST beep codes.

One beep
POST was completed successfully.

Repeating long beeps
A memory error has occurred. Make sure that all DIMMs are correctly installed.

One long beep and two short beeps
A video error has occurred, and the BIOS cannot initialize the monitor screen to display additional information.

ServerGuide startup problems

Look for the symptom in the left column of the chart. Probable solutions to the problem are in the right column.

Note: If your server model came with an operating system, such as Microsoft Windows 2000 Datacenter Server or VMware ESX server, see the software documentation provided with your software for configuration information.

Symptom	Suggested action
Setup and Installation CD will not start.	• Ensure that the system is a supported server with a startable (bootable) DVD-ROM drive. • If the startup (boot) sequence settings have been altered, be sure the DVD-ROM is first in the boot sequence.
ServeRAID program cannot view all installed drives - or - cannot install NOS.	If you installed an optional ServeRAID adapter: • Ensure that there are no duplicate SCSI IDs or IRQ assignments. • Ensure that the hard disk drive is connected properly.
The *Operating System Installation* program continuously loops.	Free up more space on the hard disk drive.
ServerGuide will not start *your* NOS CD.	Ensure that the NOS CD you have is supported by ServerGuide. See the *Setup and Installation* CD label for a list of NOS versions supported.
Cannot install NOS - option is grayed out.	Either there is no logical drive defined (ServeRAID systems) or the ServerGuide system partition is not present. Run the ServerGuide setup and configuration program and ensure that setup is complete

Troubleshooting charts

The following table lists problem symptoms and suggested solutions.

Device	Suggested action
DVD-ROM drive The DVD-ROM drive is not recognized.	Verify that: • The primary IDE channel is enabled in the Configuration/Setup Utility program. • All cables and jumpers are installed correctly. • The correct device driver is installed for the DVD-ROM drive. **Note:** When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server.
Diskette drive Diskette drive in-use light stays on, or the server bypasses the diskette drive.	If there is a diskette in the drive, verify that: • The diskette drive is enabled in the Configuration/Setup Utility program. • The diskette is good and not damaged. (Try another diskette if you have one.) • The diskette contains the necessary files to start the server. • Your software program is working properly. **Note:** When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server. If the diskette drive in-use light stays on or the server continues to bypass the diskette drive, call for service.
Other devices Problems such as broken cover locks or indicator lights not working.	Call for service.
Intermittent problems A problem occurs only occasionally and is difficult to detect.	Verify that: • All cables and cords are connected securely to the rear of the server and attached options. • When the server is turned on, air is flowing from the rear of the server at the fan grille. If there is no air flow, the fan is not working. This causes the server to overheat and shut down. • Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. If the problem remains, call for service.
Keyboard, mouse, or pointing-device All or some keys on the keyboard do not work.	• Make sure that the keyboard cable is properly connected to the server. • Make sure that the server and the monitor are turned on. • Try using another keyboard. **Note:** When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server. If the problem remains, call for service.

Device	Suggested action
The mouse or pointing device does not work.	• Verify that the mouse or pointing-device cable is securely connected and the device drivers are installed correctly. • Try using another mouse or pointing device. **Note:** When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server. If the problem remains, call for service.
USB Keyboard, mouse, or pointing-device All or some keys on the keyboard do not work.	• Make sure that the keyboard USB cable is properly connected to the server. • Make sure that the server and the monitor are turned on. • Ensure that the USB mouse and keyboard support are enabled in BIOS. • Try using another keyboard. **Note:** When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server. If the problem remains, call for service.
The USB mouse or USB pointing device does not work.	• Make sure that the mouse or pointing-device USB cable is properly connected to the server. • Make sure that the server and the monitor are turned on. • Ensure that the USB mouse and keyboard support are enabled in BIOS. • Try using another mouse or pointing device. **Note:** When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server. If the problem remains, call for service.
Memory The amount of memory displayed is less than the amount of memory installed.	Verify that: • The memory modules are seated properly. • You have installed the correct type of memory. • If you changed the memory, the memory configuration has been updated in the Configuration/Setup Utility program. • All DIMM slots are enabled. The server might have automatically disabled a DIMM slot if it detected a problem, or a DIMM slot might have been manually disabled. • Memory mirroring is disabled. If memory mirroring is enabled, only half of the installed memory will be displayed. If the problem remains, call for service.
Monitor The monitor works when you turn on the server, but goes blank when you start some application programs.	Verify that: • The primary monitor cable is connected to the video port. • You installed the necessary device drivers for the applications. **Note:** When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server. Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information that comes with the monitor for adjusting and testing instructions. If the problem remains, call for service.

Device	Suggested action

The screen is blank.	Verify that:
	• The server power cord is plugged into the server and a working electrical outlet.
	• The monitor cables are connected properly.
	   Note: For server models that come with a Remote Supervisor Adapter II-EXA installed, the integrated video controller on the server is disabled. You must connect the monitor to the video port on the Remote Supervisor Adapter II-EXA.
	• The monitor is turned on and the brightness and contrast controls are adjusted correctly.
	   Note: When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server.
	
	If the problem remains, call for service.

Only the cursor appears.	Call for service.
Wavy, unreadable, rolling, distorted screen, or screen jitter.	If the monitor self-tests show the monitor is working properly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor. **Notes:** 1. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). 2. Non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, see your IBM reseller or IBM marketing representative. If the problem remains, call for service.
Wrong characters appear on the screen.	If the wrong language is displayed, update the BIOS code with the correct language. If the problem remains, call for service.
Option	Verify that: • The option is designed for the server. See the "Server Support" flowchart on the inside of the front cover for information about obtaining ServerProven compatibility information from the World Wide Web. • You followed the installation instructions that came with the option. • The option is installed correctly.
An IBM option that was just installed does not work.	• You have not loosened any other installed options or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. If the problem remains, call for service.

Device	Suggested action
An IBM option that used to work does not work now.	Verify that all of the option hardware and cable connections are secure. If the option comes with its own test instructions, use those instructions to test the option. If the failing option is a SCSI option, verify that: • The cables for all external SCSI options are connected correctly. • The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • All external SCSI options are turned on. You must turn on external SCSI options before turning on the server. If the problem remains, call for service.
Power The server does not power on.	Verify that: • The power cables are properly connected to the server. • The electrical outlet functions properly. • The type of memory installed is correct. • If you just installed an option, remove it, and restart the server. If the server now turns on, you might have installed more options than the power supply supports. • The LEDs on the power supply are on. If the problem remains, call for service.
Serial port The number of serial ports identified by the operating system is less than the number of serial ports installed.	Verify that: • Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports are disabled. • The ribbon cable is properly connected to the center plane. • The serial-port adapter, if you installed one, is seated properly. If the problem remains, call for service.
A serial device does not work.	Verify that: • The ribbon cable is properly connected to the center plane. • The serial port is enabled and is assigned a unique address. If the problem remains, call for service.
Software Suspected software problem.	To determine if problems are caused by the software, verify that: • Your server has the minimum memory requirements needed to use the software. For memory requirements, see the information that comes with the software. **Note:** If you have just installed an adapter or memory, you might have a memory-address conflict. • The software is designed to operate on your server. • Other software works on your server. • The software that you are trying to use works on another server. If you received any error messages when using the software program, see the information that comes with the software for a description of the messages and solutions to the problem. If the problem remains, contact your place of purchase.

Device	Suggested action

Universal Serial Bus (USB) ports
 	
A USB device does not work.
	Verify that:
	1. You are not trying to use a USB device during POST, if you have a standard (non-USB) keyboard attached to the keyboard port.
	    Note: If a standard (non-USB) keyboard is attached to the keyboard port, then the USB is disabled and the USB device might not work during POST.
	2. The correct USB device driver is installed.
	3. Your operating system supports USB devices.
	    Note: When two servers are connected in a 16-way configuration, the DVD-ROM, diskette drive, keyboard port, USB ports (except for Remote Supervisor Adapter II-EXA functionality), mouse, and video are disabled on the secondary server.
	
	If the problem remains, call for service.

Light path diagnostics feature overview

Use the light path diagnostics to quickly identify the system errors that occurred in that server. The light path diagnostics panel is located inside the light path diagnostics drawer, on the front right of the server. To access the light path diagnostics panel, press on the front of the light path diagnostics drawer. The light path diagnostics panel will be exposed.
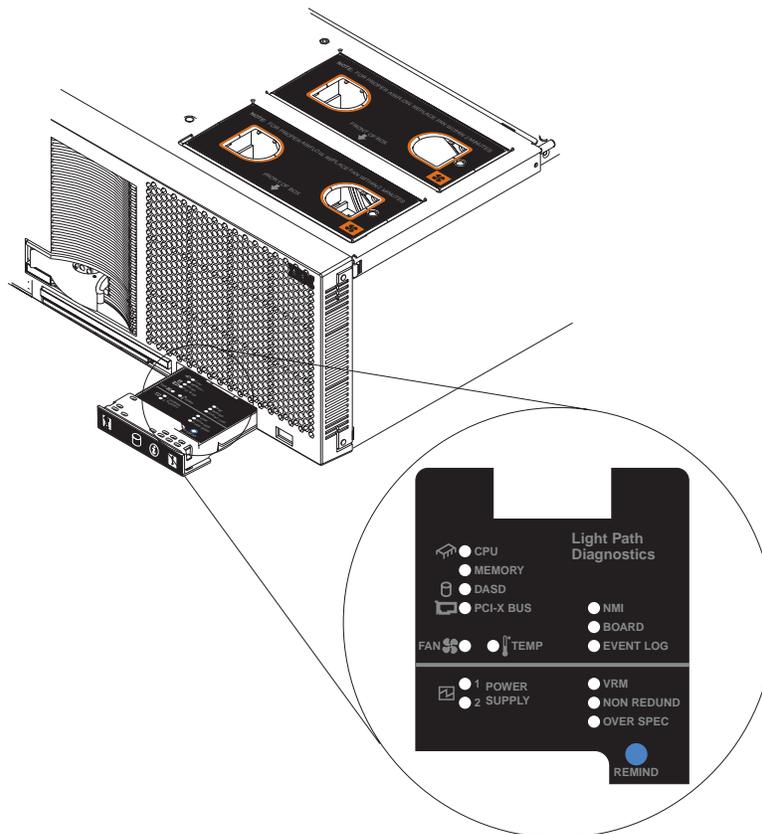
Figure 58. Light path diagnostics

Your server is designed so that any light path diagnostics LEDs that are lit can be lit again without ac power after you open the cover. This feature helps you isolate a problem if an error causes the server to shut down. See "Light path diagnostics table" on page 78 for information about identifying problems using these LEDs.

Important: You have up to 12 hours to use the light path diagnostics LEDs after ac power has been removed from the server. After 12 hours, you must turn on the server again to be able to use the light path diagnostics LEDs to identify system errors.

Complete the following steps to view the LEDs when the server cover has been opened:

1. Turn off the server and all peripheral devices; then, disconnect all external cables from the server.
2. Slide the server out of the rack cabinet.
3. Open the top cover.

4. Press and hold the light path diagnostics (blue) button on the diagnostics panel. The LEDs will be lit while the button is pressed.

   Note: You can illuminate the LEDs for a maximum of two minutes. After that time, the circuit that powers the LEDs is exhausted.

5. Close the cover on the server; then, slide the server into the rack cabinet and connect all external cables. For more information, see "Installing the server in the rack cabinet" on page 33 for instructions.

See "Light path diagnostics table" on page 78 for information about identifying problems using these LEDs.

Identifying problems using the light path diagnostics feature

This section provides information about using the light path diagnostics feature to help you identify problems that might occur during installation.

The diagnostic panel

First look at the diagnostic panel for help in identifying problems. If a system error occurs, the system-error LED on the front of this panel is lit. Press the front of the panel to open it and look for any lit LEDs. Make a note of any LEDs that are lit, then close the panel.

LEDs on the top of the server

After viewing the diagnostic panel, pull out the server from the rack and view the top cover. In the center of the top cover is a set of six LEDs and the system service labels. The numbers beside the LEDs correspond to the numbers located on the system service label. Note the lit LED, and see the numbered block on the system service label that corresponds to the lit LED. Then, follow the instructions, if any, in the numbered block.

LEDs on the SMP Expansion Modules and system boards

To locate the actual component that caused the error, locate the lit LED next to that component.

For example:

A system error has occurred and you note that the CPU LED on the diagnostic panel is lit. Referring to the LEDs on the top cover, you see that LED 2 is lit. You then locate the panel on the system service label with the number 2 on it. In this case, the instructions in the panel tell you to remove the lower SMP Expansion Module. This tells you that the problem occurred with one of the microprocessors in the lower SMP Expansion Module. Follow the procedure in "Removing an SMP Expansion Module and cover" on page 11 to remove the lower SMP Expansion Module; then, remove the cover from the SMP Expansion Module. Located near the edge connectors on the circuit board is the light-path capacitor switch. Press and hold the switch until you locate the lit LED beside the defective microprocessor. Follow the instructions in the *Option Installation Guide* on the IBM *xSeries Documentation* CD to remove and replace the microprocessor.

Light path diagnostics table

Use the following table to help determine the cause of the error and the action you should take.

Lit LED on diagnostics panel	Cause	Action
None	An error has occurred and cannot be isolated, or the error log is full.	An error has occurred that is not represented by a light path diagnostics LED. Check the system error log for more information about the error.
CPU	One of the microprocessors has failed.	• Check the microprocessor failure LEDs on the system board. • If a microprocessor failure LED is on, make sure the microprocessor is installed correctly. (See the *Option Installation Guide* on the *IBM xSeries Documentation CD* for installation instructions.) If the problem remains, call for service.
MEMORY	A memory error occurred.	• Check the DIMM failure LEDs on the system board. • Replace the DIMM indicated by the lit DIMM failure LED. If the problem remains, call for service.
DASD	One of the hot-swap hard drives has failed	• Make sure the hard drive is installed correctly. Remove and re-install, if necessary. • Check to see that the server fans are operating correctly. If the problem remains, call for service.
PCI-X BUS	An error occurred on a PCI bus.	• Check the system error log. • If you cannot isolate the failing adapter from the information in the system error log, try to determine the failing adapter by removing one adapter at a time from the failing PCI-X bus and restarting the server after each adapter is removed. If the problem remains, call for service.
FAN	A fan has failed or is operating too slowly. **Note:** A failing fan can also cause the TEMP LED to be lit.	Check the LEDs on the fans and replace the indicated fan. If the problem remains, call for service.
TEMP	The system temperature has exceeded a threshold level.	• Check to see if a fan has failed. If it has, replace the fan. • Make sure the room temperature is not too hot. (See "Features and specifications" on page 4 for temperature information.) If the problem remains, call for service.

Lit LED on diagnostics panel	Cause	Action
NMI	A non-maskable interrupt occurred **Note:** The PCI-X BUS or MEMORY LED might also be lit.	• Check the system error log. • If the PCI-X BUS LED is lit, follow the instructions for that LED. • If the MEMORY LED is lit, follow the instructions for that LED. • Restart the server. If the problem remains, call for service.
BOARD	A system board has failed	Call for service.
EVENT LOG	Non-optimal condition exists	• Check the system error log. • Check the service processor log.
POWER SUPPLY 1	Power supply 1 has failed	• Make sure the power supply is installed correctly. • Verify that the ac power cords are properly connected to functional power sources. If the problem remains, call for service.
POWER SUPPLY 2	Power supply 2 has failed	• Make sure the power supply is installed correctly. • Verify that the ac power cords are properly connected to functional power sources. If the problem remains, call for service.
VRM	One of the VRMs on one of the SMP Expansion Module boards has failed	Remove ac power from the server and then restart the server. If the problem remains, call for service.
NON REDUND	Power redundancy has been lost **Note:** A POWER SUPPLY LED might also be lit.	• The server requires a 220 V ac power connection for full power-supply redundancy. Whenever possible, use a 220 V ac connection for all configurations. • If a POWER SUPPLY LED is lit, follow the instructions for that LED. • Verify that the ac power cords are properly connected to functional power sources. If the problem remains, call for service.
OVER SPEC	Power supply rating exceeded	• The server requires a 220 V ac power connection for full power-supply redundancy. Whenever possible, use a 220 V ac connection for all configurations. • Verify that the ac power cords are properly connected to functional power sources. If the problem remains, call for service.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries or IntelliStation® system, and whom to call for service, if it is necessary.

Before you call

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

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

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/pc/support/ and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at
http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

Getting help and information from the World Wide Web

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

You can find service information for your IBM products, including supported options, at http://www.ibm.com/pc/support/.

Software service and support

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

For more information about Support Line and other IBM services, go to http://www.ibm.com/services/, or go to http://www.ibm.com/planetwide/ for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to http://www.ibm.com/planetwide/ for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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

Appendix B. IBM Statement of Limited Warranty Z125-4753-07 11/2002

Part 1 - General Terms

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. **Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.**

What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

What this Warranty Does not Cover

This warranty does not cover the following:
- any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
- failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
- failure caused by a product for which IBM is not responsible; and
- any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

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

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

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

When you call for service, you must follow the problem determination and resolution procedures that IBM specifies. A technician will attempt to make an initial diagnosis of your problem and help you resolve it over the telephone.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called "BIOS"), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit ("CRU") (e.g., keyboard, mouse, speaker, memory, hard disk drive and other easily replaceable parts), IBM will ship these parts to you for replacement by you.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Exchange of a Machine or Part

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

Your Additional Responsibilities

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

You also agree to:
1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
    a. follow the service request procedures that IBM or your reseller provides;
    b. backup or secure all programs, data, and funds contained in the Machine;
    c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
    d. inform IBM or your reseller of changes in the Machine's location.
4. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

Limitation of Liability

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

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

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than
1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

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

UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF,

OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

Governing Law

Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Statement of Limited Warranty, without regard to conflict of law principles.

THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

Jurisdiction

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

Part 2 - Country-unique Terms

AMERICAS

ARGENTINA

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

BRAZIL

Governing Law: *The following is added after the first sentence:*
Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

PERU

Limitation of Liability: *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

NORTH AMERICA

How to Obtain Warranty Service: *The following is added to this Section:*
To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Limitation of Liability: *The following replaces item 1 of this section:*

1.   damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

What this Warranty Covers: *The following paragraph is added to this section:*
The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

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

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State or Territory.

CAMBODIA, LAOS, AND VIETNAM

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State of New York, United States of America.

CAMBODIA, INDONESIA, LAOS, AND VIETNAM

Arbitration: *The following is added under this heading:*
Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the

post of chairman shall be filled by the president of the SIAC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

HONG KONG S.A.R. OF CHINA AND MACAU S.A.R. OF CHINA

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of Hong Kong Special Administrative Region of China.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this section:*
1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence; and
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

JAPAN

Governing Law: *The following sentence is added to this section:*
Any doubts concerning this Statement of Limited Warranty will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

MALAYSIA

Limitation of Liability: *The word "**SPECIAL**" in item 3 of the fifth paragraph is deleted.*

NEW ZEALAND

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

Limitation of Liability: *The following is added to this section:*
Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

PHILIPPINES

Limitation of Liability: *Item 3 in the fifth paragraph is replaced by the following:*

SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator. The two arbitrators appointed by the parties shall appoint a third arbitrator who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

SINGAPORE

Limitation of Liability: *The words* "**SPECIAL**" *and* "**ECONOMIC**" *in item 3 in the fifth paragraph are deleted.*

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:
The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

How to Obtain Warranty Service: If you purchase a Machine in Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom or Vatican State, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service. If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase a Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

*Add the following paragraph in **Western Europe** (Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, Spain, San Marino, Sweden, Switzerland, United Kingdom, Vatican State):*

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

Governing Law:

The phrase "the laws of the country in which you acquired the Machine" is replaced by:

1) "the laws of Austria" **in Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia;** 2) "the laws of France" **in Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna;** 3) "the laws of Finland" **in Estonia, Latvia, and Lithuania;** 4) "the laws of England" **in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe;** and 5) "the laws of South Africa" **in South Africa, Namibia, Lesotho and Swaziland.**

Jurisdiction: *The following exceptions are added to this section:*

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) in **Belgium** and **Luxembourg**, all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in Russia**, all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) **in South Africa, Namibia, Lesotho and Swaziland**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) **in Turkey** all disputes arising out of or in connection with this Statement of Limited Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 9) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

Arbitration: *The following is added under this heading:*

In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

In Estonia, Latvia and Lithuania all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

How to Obtain Warranty Service: *The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information.

You may contact IBM at the following address:
    IBM Warranty & Service Quality Dept.
    PO Box 30
    Spango Valley
    Greenock
    Scotland PA16 0AH

AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:
1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a

maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

FRANCE AND BELGIUM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:
1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*
The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this section:

The warranty period for Machines is 12 months from the date of delivery. The limitation period for consumers in action for breach of warranty is the statutory period as a minimum. In case IBM or your reseller is unable to repair an IBM

Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

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

Limitation of Liability: *The following paragraph is added to this section:*

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

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

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

EGYPT

Limitation of Liability: *The following replaces item 2 in this section:*
as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this section:*
In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: (items 1 and 2 unchanged).

GERMANY

What this Warranty Covers: *The following replaces the first sentence of the first paragraph of this section:*

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

The following paragraphs are added to this section:

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

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

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

Limitation of Liability: *The following paragraph is added to this section:*

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

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

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

HUNGARY

Limitation of Liability: *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

IRELAND

What this Warranty Covers: *The following is added to this section:*
Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.
1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.

3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM, its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:
1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

SLOVAKIA

Limitation of Liability: *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this section:*

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

UNITED KINGDOM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.
1. IBM will accept unlimited liability for:
    a. death or personal injury caused by the negligence of IBM; and
    b. any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.
2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds

Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

These limits also apply to IBM's suppliers and resellers. They state the maximum for which IBM and such suppliers and resellers are collectively responsible.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM or any of its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:
1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

Warranty Period

The warranty period may vary by country or region and is specified in the table below.

Note: "Region" means either Hong Kong or Macau Special Administrative Region of China.

Machine - IBM @server xSeries 445 Type 8870

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide	3 years	• For models announced before 1 August 2003: 2 • For models announced after 1 December 2003: 1 and 2
* See "Types of Warranty Service" for the legend and explanations of warranty-service types.		

A warranty period of 3 years on parts and 1 year on labor means that IBM provides warranty service without charge for:
1. parts and labor during the first year of the warranty period; and
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor provided in performance of the repair or replacement(s) in the second and third year of the warranty period.

Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above table and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM's normal service area, contact your local IBM representative or your reseller for country and location specific information.

1. **Customer Replaceable Unit ("CRU") Service**

   IBM will ship CRU parts to you for your replacement. If IBM instructs you to return the replaced CRU, you are responsible for returning it to IBM in accordance with IBM's instructions. If you do not return the defective CRU, if IBM so instructs, within 30 days of your receipt of the replacement CRU, IBM may charge you for the replacement.

2. **On-site Service**

   IBM or your reseller will either repair or exchange the failing Machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. **For some Machines, certain repairs may require sending the Machine to an IBM service center.**

3. **Courier or Depot Service***

   You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

4. **Customer Carry-In or Mail-In Service**

   You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM's expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

* This type of service is called ThinkPad® EasyServ or EasyServ in some countries.

The IBM Machine Warranty World Wide Web site at http://www.ibm.com/servers/support/machine_warranties/ provides a worldwide overview of IBM Limited Warranty for Machines, a Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.**

To obtain warranty service contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

EU Country Telephone List

Phone numbers are subject to change without notice.

Austria -- 43-1-24592-5901	Italy -- 39-02-482-9202
Belgium -- 02-718-4339	Luxembourg -- 352-360385-1
Denmark -- 4520-8200	Netherlands -- 020-514-5770
Finland -- 358-9-4591	Portugal -- 351-21-7915-147
France -- 0238-557-450	Spain -- 34-91-662-4916
Germany -- 07032-15-4920	Sweden -- 46-8-477-4420
Greece -- 30-210-688-1220	United Kingdom -- 01475-555-055
Ireland -- 353-1-815-4000	

Appendix C. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. 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. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

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Chipkill	ThinkPad
EtherJet	Tivoli
e-business logo	Tivoli Enterprise
@server	Update Connector
FlashCopy	Wake on LAN
IBM	XA-32
IBM (logo)	XA-64
IntelliStation	X-Architecture
NetBAY	XceL4
Netfinity	XpandOnDemand
NetView	xSeries
OS/2 WARP	

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

Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

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

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

Maximum memory may require replacement of the standard memory with an optional memory module.

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

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

Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. Information on product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.

Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml or contact your local waste disposal facility.

In the United States, IBM has established a collection process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

In the Netherlands, the following applies.

Electronic emission notices

Federal Communications Commission (FCC) statement

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

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. 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 using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

声　　明
此为 A 级产品。在生活环境中，
该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Power cords

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

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

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

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

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

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

IBM power cord part number	Used in these countries and regions
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Maceo, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil

IBM power cord part number	Used in these countries and regions
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

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