IBM

eserver™

xSeries 455

Type 8855

Installation Guide

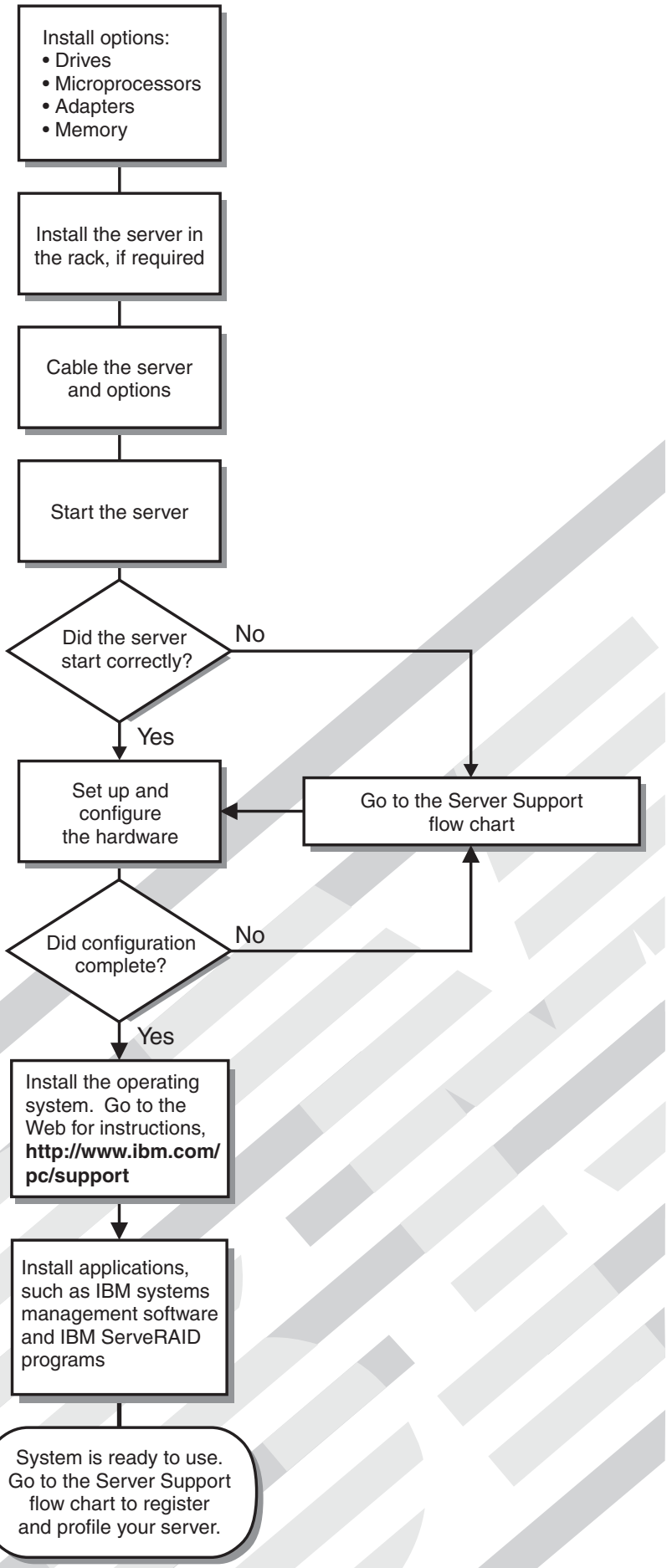
Welcome. . .

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.

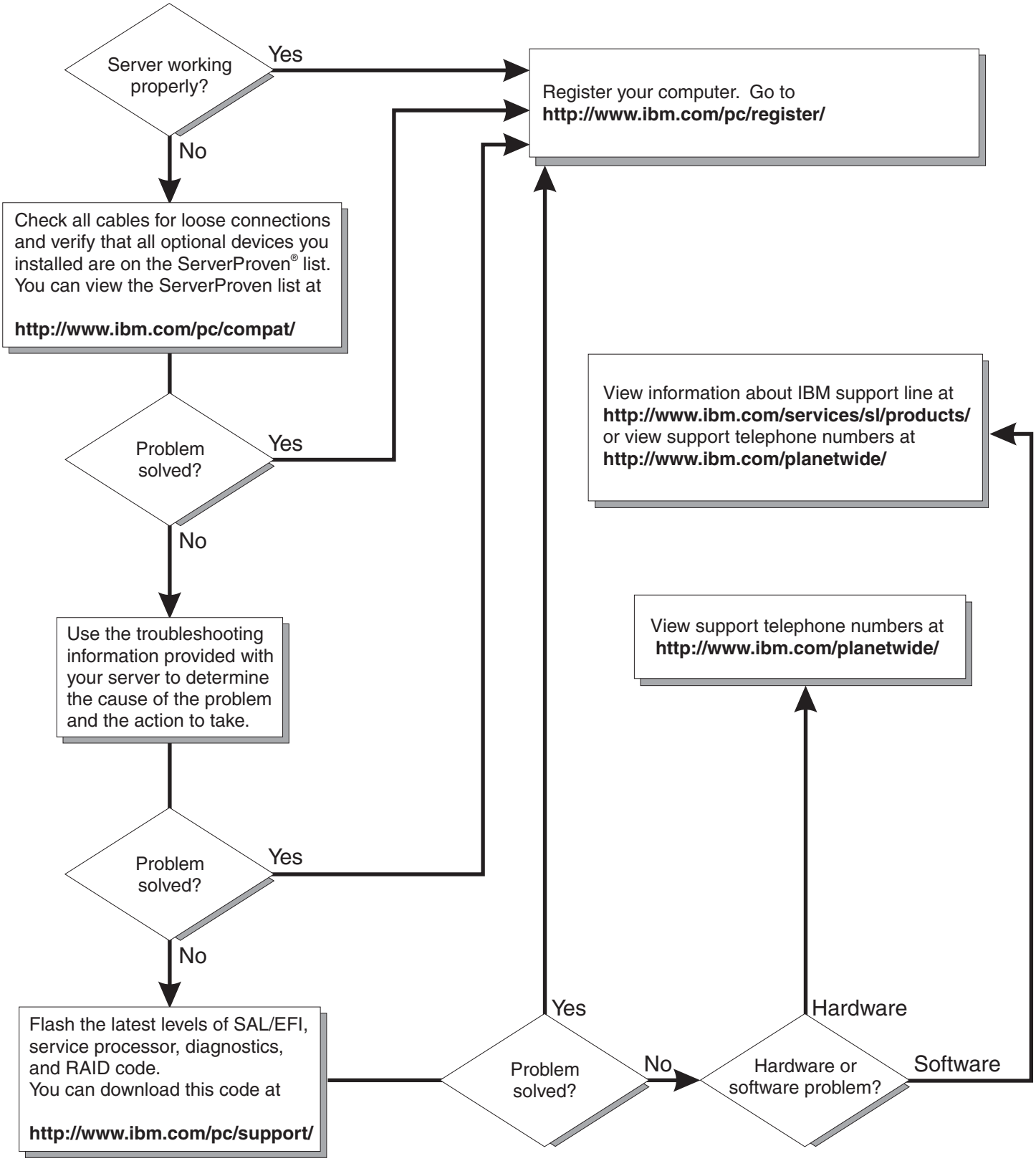
This server *Installation Guide* contains information for setting up and configuring your server.

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/



Server Support



xSeries 455

Installation Guide

Note: Before using this information and the product it supports, read the general information in Appendix A, “IBM Statement of Limited Warranty Z125-4753-07 11/2002”, on page 63 and Appendix B, “Notices”, on page 79.

First Edition (November 2003)

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.

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:

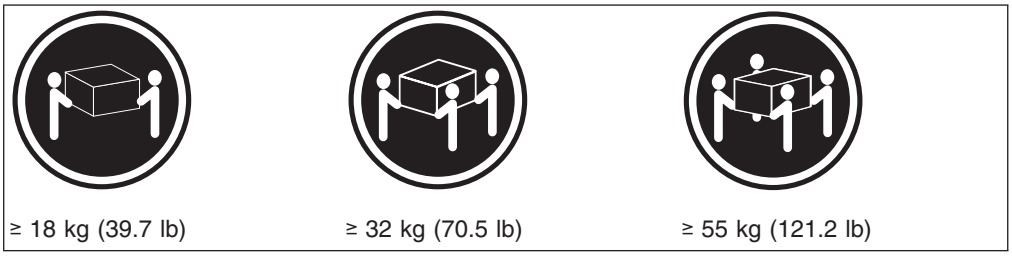
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous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

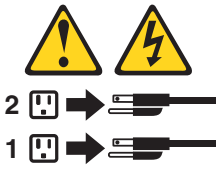
Statement 4:



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)

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™ 455 Type 8855 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 publication 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:

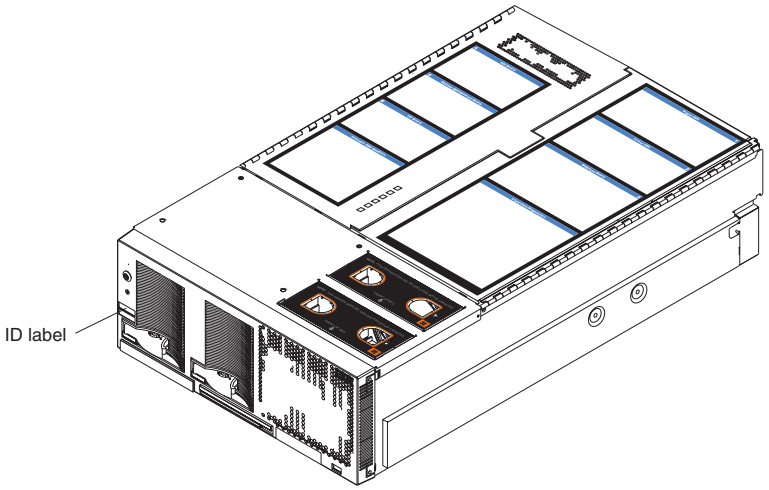
1. Go to http://www.ibm.com/pc/support/.
2. In the **Learn** section, click **Online publications**.
3. On the ″Online publications″ page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **xSeries 455**.
5. Click **Display documents**.

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 455 server
Machine type	8855
Model number	_____
Serial number	_____

The model number and serial number are on the ID label on the left side of the bezel, just above the hard disk drives.



See the *Rack Installation Instructions* publication for complete rack installation and removal instructions.

The IBM xSeries Documentation CD

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

- Microsoft® Windows NT® 4.0 (with Service Pack 3 or later), Windows® 98, or Windows 2000.
- 100 MHz Intel® Pentium® microprocessor.
- 32 MB of RAM.
- Adobe Acrobat Reader 3.0 or later. 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. 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, 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**.

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. If you selected more than one book, all the selected books are opened in Acrobat Reader.

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 within the book.

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

Notices and statements used in this book

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

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 of your server. Depending on your server model, some features might not be available, or some specifications might not apply.

Microprocessor:
- Intel® Itanium 2 1.3 MHz or higher, depending on server model
- 3 MB (minimum) Level-3 cache
- 200 MHz front-side bus (FSB), at two data transfers per cycle, yielding a 400 MHz system bus (minimum)
- Support for up to four microprocessors
- XceL4™ Server Accelerator Cache: 64 MB

Note: Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors in your server.

Active Memory™:
- Minimum: 1 GB
- Maximum: 56 GB
- Type: 2-way interleaved PC2100, ECC DDR SDRAM, registered DIMMs only
- Supports 512 MB, 1 GB, and 2 GB dual inline memory modules (DIMMs)

Drives standard:

DVD/CD-RW: IDE

Expansion bays:
- Two removable media bays (one DVD/CD-RW preinstalled)
- 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

Cooling:

Four hot-swap fans
- Two 150 mm x 51 mm fans
- Two 150 mm x 38 mm fans

Acoustical noise emissions:
- Declared sound power, idle: 6.5 bels
- Declared sound power, operating: 6.5 bels
- Bystander sound pressure, idle: 49 dBa
- Bystander sound pressure, operating: 49 dBa

Power supply:

Two power supplies: 550 watts at 100-127 V ac or 1050 watts at 200-240 V ac (hot-swappable and redundant at 200-240 V ac only)

Video:
- Integrated ATI RageXL video
- PCI bus interface
- Compatible with SVGA
- 8 MB SDRAM video memory

Size (4 U):
- Height: 17.5 cm (6.9 inches, 4 U)
- Depth: 71.3 cm (28.1 inches)
- Width: 44 cm (17.3 inches)
- Maximum weight: 54.3 kg (120 lb), depending on your configuration

Integrated functions:
- Broadcom 5704 10/100/1000 dual port Ethernet controller
- Light path diagnostics
- One external and one internal Ultra320 SCSI port (dual-channel integrated controller with RAID capabilities)
- Remote Supervisor Adapter (service processor)
  - ASM interconnect (peer-to-peer) port
  - Ethernet port
  - Serial port
- IDE controller
- RXE Management Port
- RXE Expansion Ports
- USB ports
- Serial port
- SMP Expansion Ports
- Wake on LAN®

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: 0 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: 854 Btu (250 watts)
- Maximum configuration: 2646 Btu (775 watts)

Electrical input:
- Sine-wave input (50-60 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: 1.3 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.

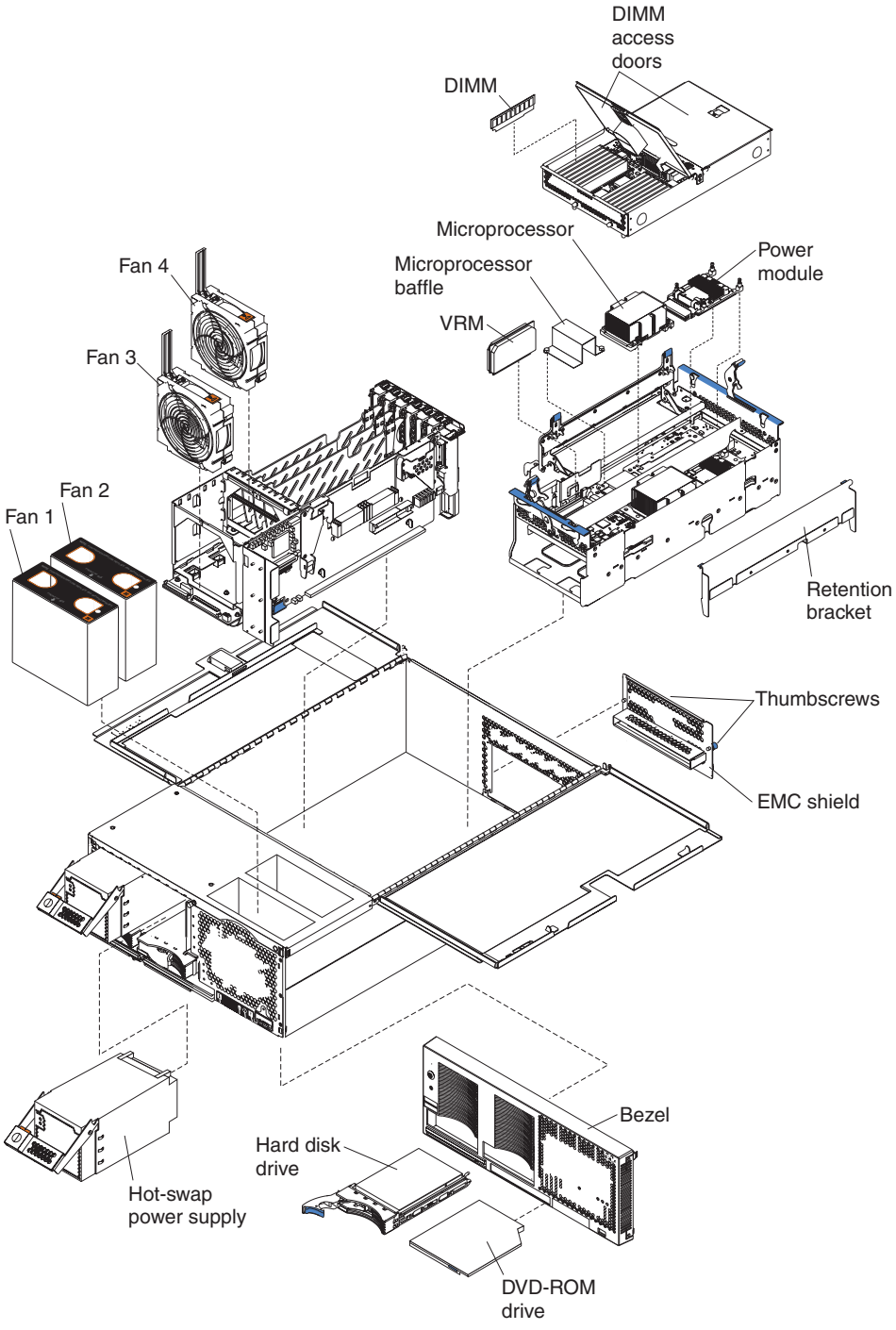
Major components of the xSeries 455 server

The orange color on components and labels in the server indicates hot-swap or hot-plug components. You can install or remove these components while the server is running, provided that the server is configured to support hot-swap and hot-plug components. For information about installing hot-swap and hot-plug components, see Chapter 2, “Installing options”, on page 7.

The blue color on components and labels indicates touch points, where a component can be gripped, a latch moved, and so on.

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

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



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 information, 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. These guidelines will help you work safely with your server or options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options that you intend to install.
- Back up all important data before you make changes to disk drives.
- You do not need to turn off the server to install or replace hot-swap or hot-plug components or hot-plug Universal Serial Bus (USB) devices.
- The orange color on components and labels identifies hot-swap or hot-plug components. You can install or remove hot-swap and hot-plug components while the server is running, provided that the server is configured to support this capability. See the instructions in this chapter for more information about removing and installing hot-swap and hot-plug components.
- The blue color on components and labels indicates touch points, where components can be gripped, a latch moved, and so on.
- For a list of supported options for your server, go to the ServerProven® list at http://www.ibm.com/pc/us/compat/.

Note: Some preconfigured servers have a unique list of supported options. See the software documentation provided with those servers for more information.

System reliability guidelines

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

- The top cover is closed during normal operation.
- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- Each of the power-supply bays has a power supply installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the server. Do not place objects in front of the fans.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan as soon as possible.
- You have replaced a hot-swap drive within 2 minutes of removal.
- If you replace a hot-swap drive, remove the defective drive and wait 15 seconds before you install a new drive.
- All microprocessor sockets always contain either a microprocessor baffle or a microprocessor and heat sink.
- For redundant and hot-swappable operation, the power supplies are connected to 200-240 V ac.

Working inside a server with power on

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

- Avoid 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, rings, necklaces, and loose-fitting wrist watches.
- Remove items from your shirt pocket (such as pens or pencils) that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hair pins, or 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 package until you are ready to install them.

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

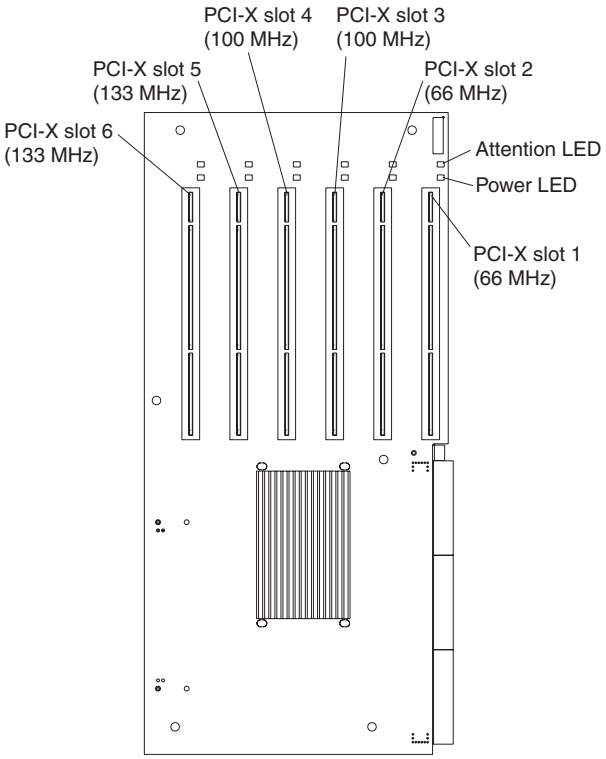
- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the server unit 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 the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Wear a properly grounded wrist strap against your skin to help eliminate static electricity from your body.

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 on the PCI-X board.

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



- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section. 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 full-length adapters have extension handles or brackets installed. Before installing the adapter, you must remove the extension handle or bracket.
- Your server supports six hot-plug 64-bit adapters in the expansion slots on the PCI-X board, as shown in the following table.

Bus	Slot	Supported adapter speed (MHz)
A	1	66
A	2	66
B	3	100 (133 if slot 4 is empty)
B	4	100 (133 if slot 3 is empty)
C	5	133
D	6	133

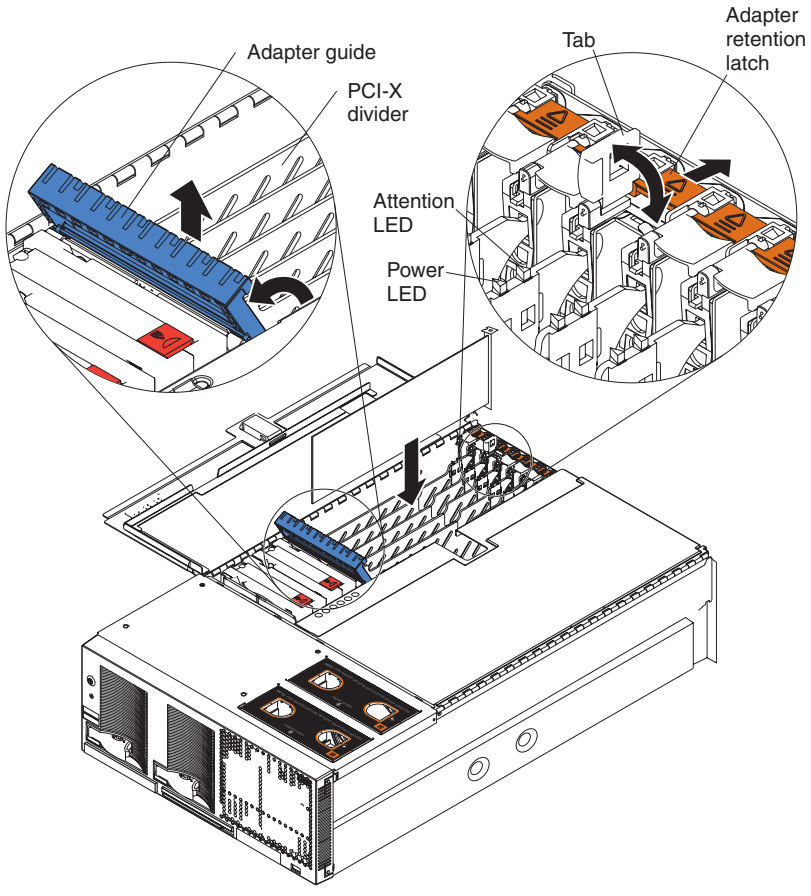
- You can install both PCI and PCI-X adapters on the same bus. However, if you install a PCI adapter and a PCI-X adapter on the same bus, the PCI-X features of the PCI-X adapter will be disabled, and the adapter will function as a PCI adapter.
- You can install PCI or PCI-X adapters of speeds faster 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 on the same bus, the bus speed will match that of the slower adapter.

- If a single 133 MHz adapter is installed on PCI-X bus B (slots 3 and 4) and the other slot on PCI-X bus B is empty, the adapter will operate at 133 MHz.
- Your server supports 3.3 V and universal adapters; it does not support 5.0 V adapters.
- The system scans PCI-X slots to assign system resources. The system attempts to start the first device found. The search order is: PCI-X slots 1, 2, 6, 5, 3, and 4. If an optional remote I/O enclosure is attached, the scan continues with PCI-X slots 11, 12, 9, 10, 7, 8, 17, 18, 15, 16, 13, and 14.

Complete the following steps to install an adapter:

1. Read the safety information beginning on page v and “Installation guidelines” on page 7.
2. Disable the Active PCI-X slots through your operating system before you insert or remove a PCI or PCI-X adapter.

   Note: Some operating systems do not support the enabling and disabling of a PCI-X slot. If your operating system does not support this function, or if you are installing a non-hot-plug adapter, turn off the server and peripheral devices, and disconnect the power cords and all external devices from the back of the server before proceeding, if necessary.
3. Open the top cover.



4. Follow the cabling instructions, if any, that come with the adapter. Route the adapter cables before you install the adapter.
5. Follow the instructions that come with the adapter to set jumpers or switches, if any.

6. Install the adapter:
   a. If you are installing a full-length adapter, open the blue adapter guide by lifting the front edge, as shown in the illustration.
   b. Carefully grasp the adapter by its top edge or upper corners, and align it with the connector on the PCI-X board.
   c. Press the adapter *firmly* into the adapter connector.

      Attention: When you install an adapter, make sure that the adapter is correctly seated in the connector. Improperly seated adapters might cause damage to the PCI-X board or to the adapter.
   d. Push down on the blue adapter guide to keep the adapter steady.
   e. Close the tab; then, push down on the blue adapter-retention latch until it clicks into place, securing the adapter.
7. Connect the internal cables to the adapter.
8. If you have other options to install or remove, do so now.
9. Close the top cover. Go to “Completing the installation” on page 24.

Cabling a ServeRAID adapter

Some xSeries 455 models come with an optional IBM ServeRAID™ adapter installed to control 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:

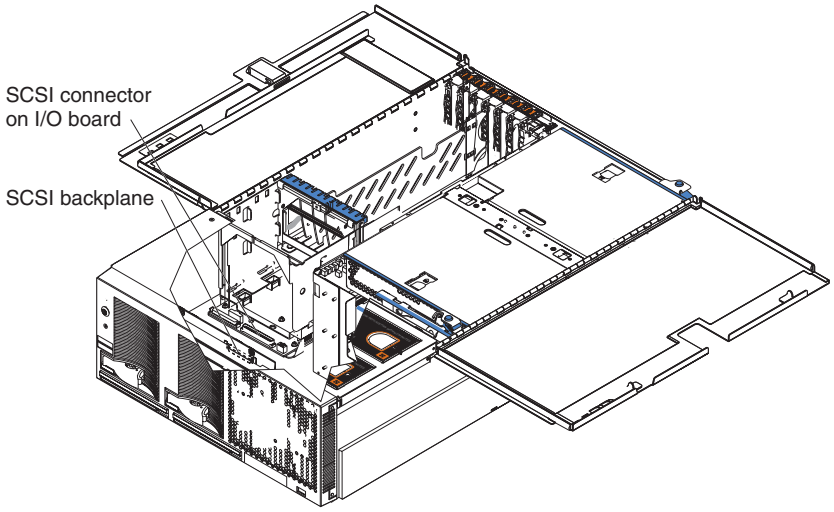
- One end of the first SCSI cable is attached to a SCSI connector on the I/O board, and the other end is attached to the SCSI backplane behind fans 3 and 4.
- The second SCSI cable is preinstalled along the inside of the server and both ends are loose inside the server. When you install a ServeRAID adapter, you can optionally connect this cable to the adapter and to the SCSI backplane to control the internal hard disk drives.

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

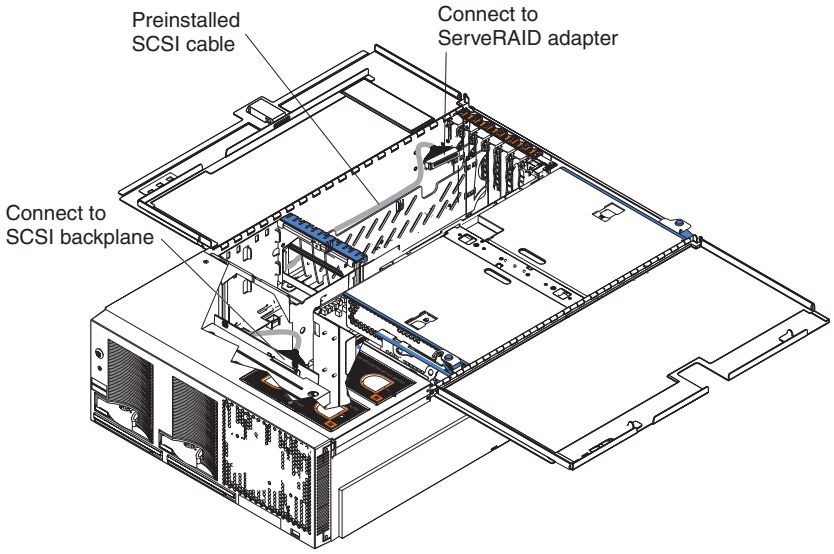
Complete the following steps to cable the ServeRAID adapter:

1. Read the safety information beginning on page v and “Installation guidelines” on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables, if necessary; then, open the cover.
3. Remove fans 3 and 4, which are located just behind the PCI-X slots.
4. Disconnect the short SCSI cable from the SCSI backplane and the SCSI connector 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 8). Install the ServeRAID adapter in PCI-X slot 6, if the adapter will control the internal hard disk drives.



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.
8. Reinstall fans 3 and 4.
9. If you have other options to install or remove, do so now.
10. Close the top cover. Go to “Completing the installation” on page 24.

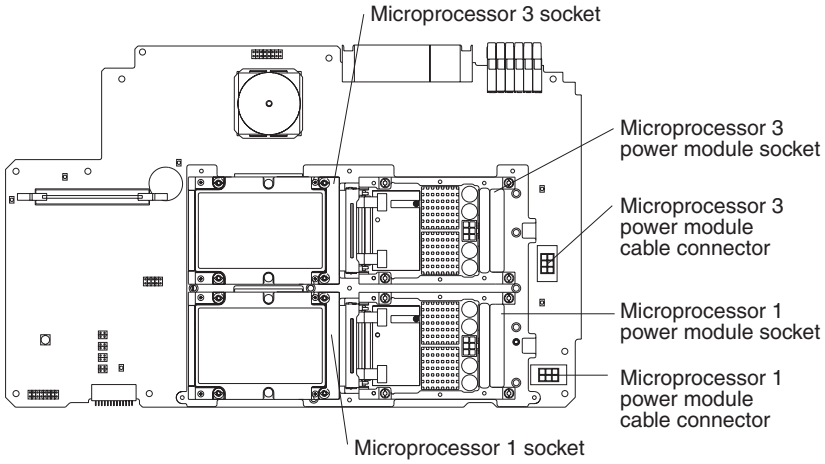
Installing and replacing a microprocessor and power module

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

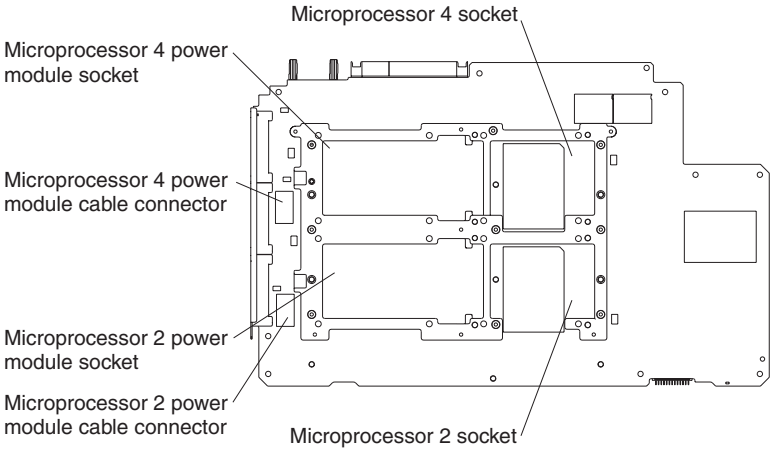
- Your server supports up to four Intel Itanium 2 microprocessors.
- Update the server system abstraction layer/extensible firmware interface (SAL/EFI) code. To download the most current level of SAL/EFI code for the server, go to http://www.ibm.com/pc/support/.
- You will need the following tools:
  - 2.5-mm hex (Allen) wrench (provided with the microprocessor option)
  - T15 Torx wrench (provided with the microprocessor option)
- To order additional microprocessor options, contact your IBM marketing representative or authorized reseller.
- Populate the microprocessor sockets in numeric order. Install the first microprocessor in microprocessor socket 1, the second microprocessor in microprocessor socket 2, and so on.
- The following illustrations show the locations of the microprocessor connectors on the processor board.

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

Front



Back



Important: To ensure proper server operation after you install replacement or additional microprocessors, install only microprocessors that have the same cache size and type, and the same clock speed. For a list of microprocessors supported by your server, go to the ServerProven list at http://www.ibm.com/pc/us/compat/.

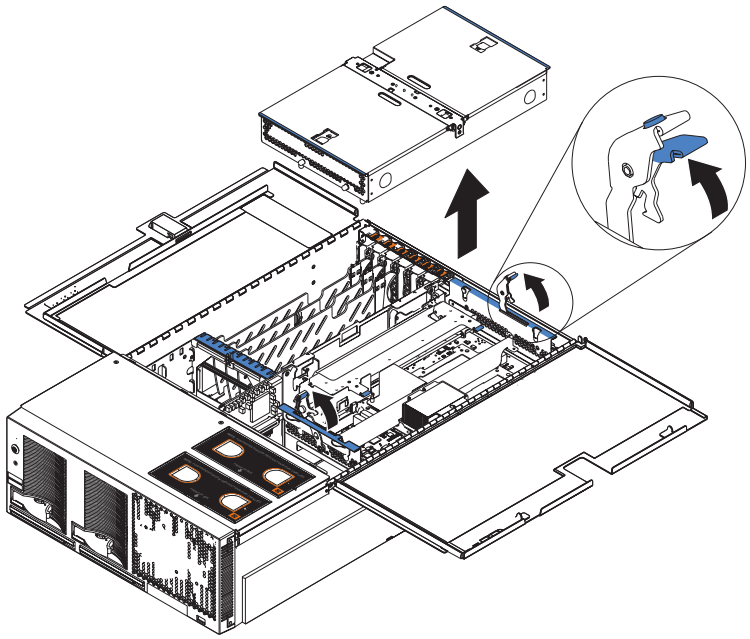
Complete the following steps in the prescribed order to install and replace a microprocessor.

Attention: Failure to complete the following steps in the prescribed order might cause damage to the microprocessor pins and cause the microprocessor to fail.

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 all external cables, if necessary; then, open the cover.
3. Remove the memory-board assembly from the server.

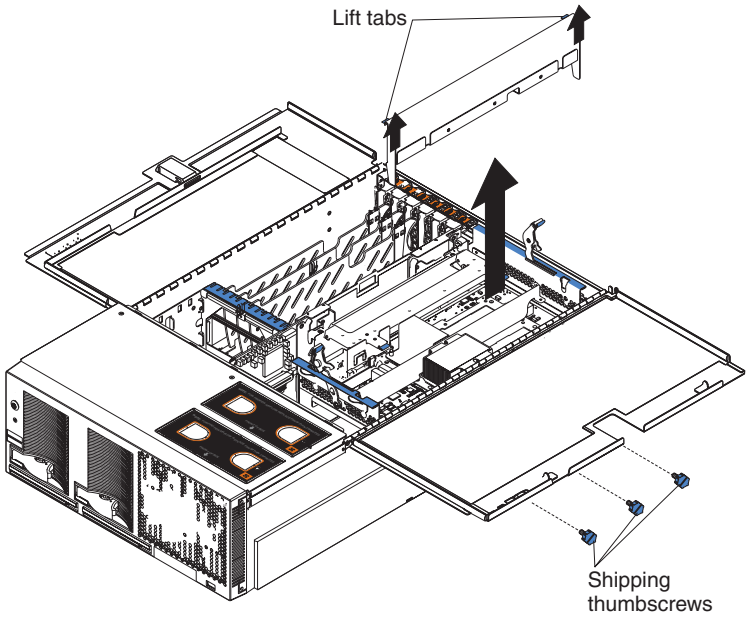
   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 8.

   a. Pull up on the levers to detach the memory-board assembly.
   b. Carefully remove the memory-board assembly from the server and set it aside.

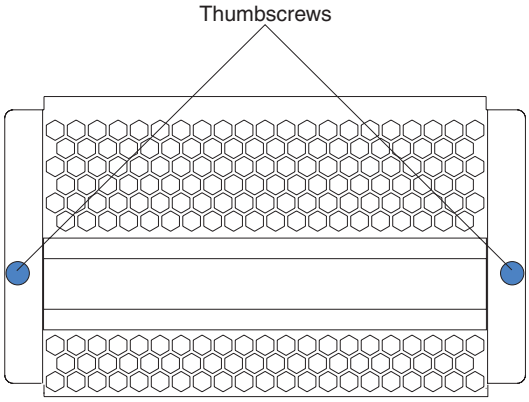


4. Remove the shipping thumbscrews from the right side of the server.

5. Lift the retention bracket from the server.



6. Loosen the blue thumbscrews securing the EMC shield; then, remove the EMC shield from the server.

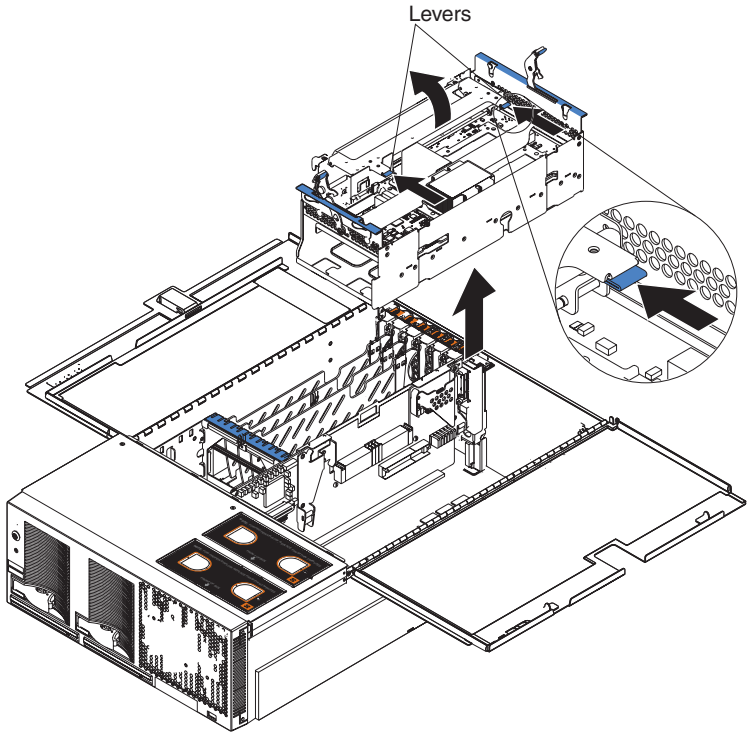


7. Remove the processor-board assembly from the server.

   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.

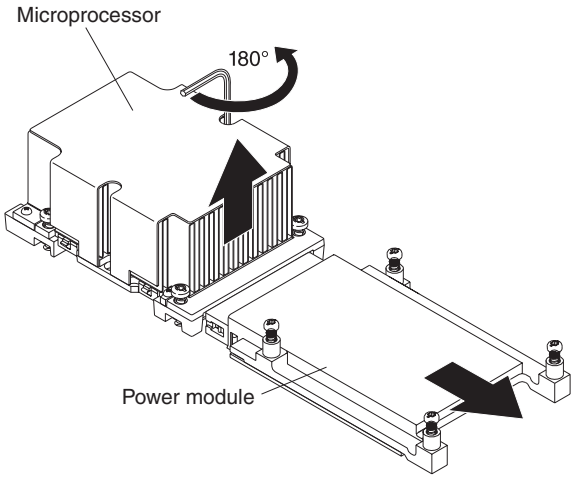
   a. Press to unlock the levers securing the processor-board assembly and pull up on the levers to release the processor-board assembly.

   b. Carefully remove the processor-board assembly from the server and place it on a flat, non-conductive, level surface.



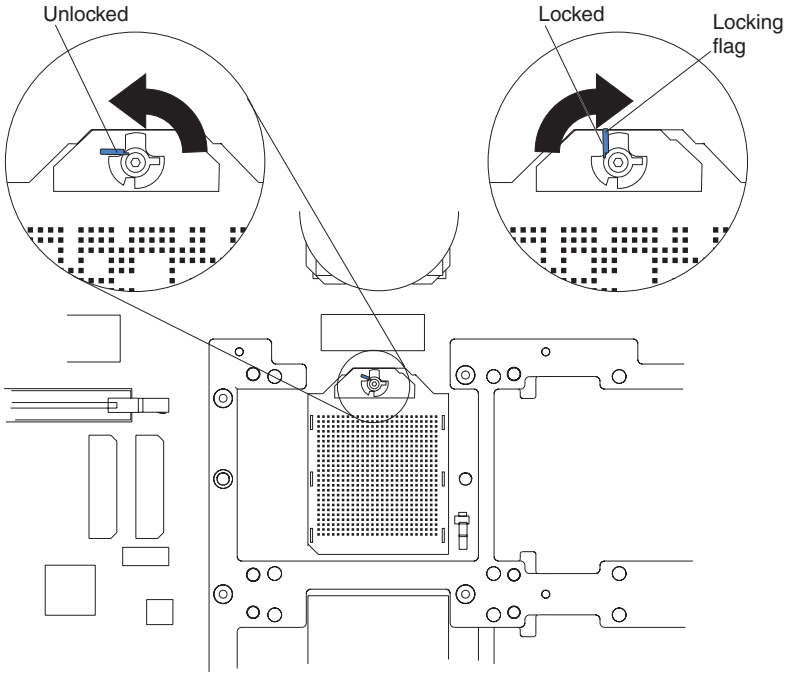
8. If you are installing a new microprocessor, go to step 9 on page 17; otherwise, continue.

   Attention: Failure to complete the instructions in the prescribed order might cause damage to the microprocessor pins and cause the microprocessor to fail.

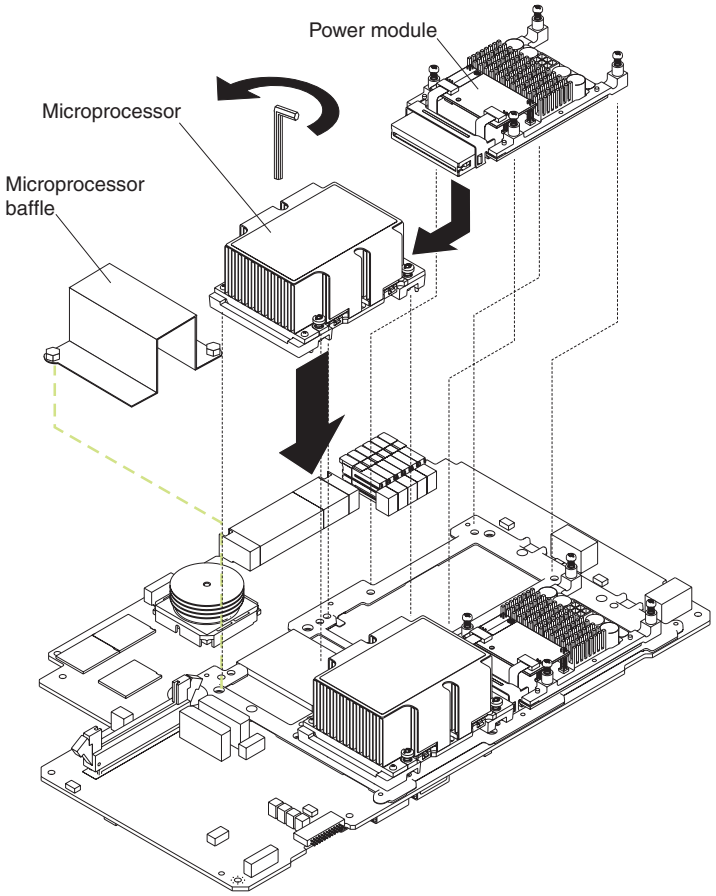


   a. Using the T-handled Torx wrench provided with the microprocessor option, completely loosen the power-module screws.
   b. Slide the power module from the microprocessor and remove the power module.
   c. Completely loosen the heat-sink screws.

d. Use the hex wrench provided with the microprocessor option to open the socket lock and remove the microprocessor.



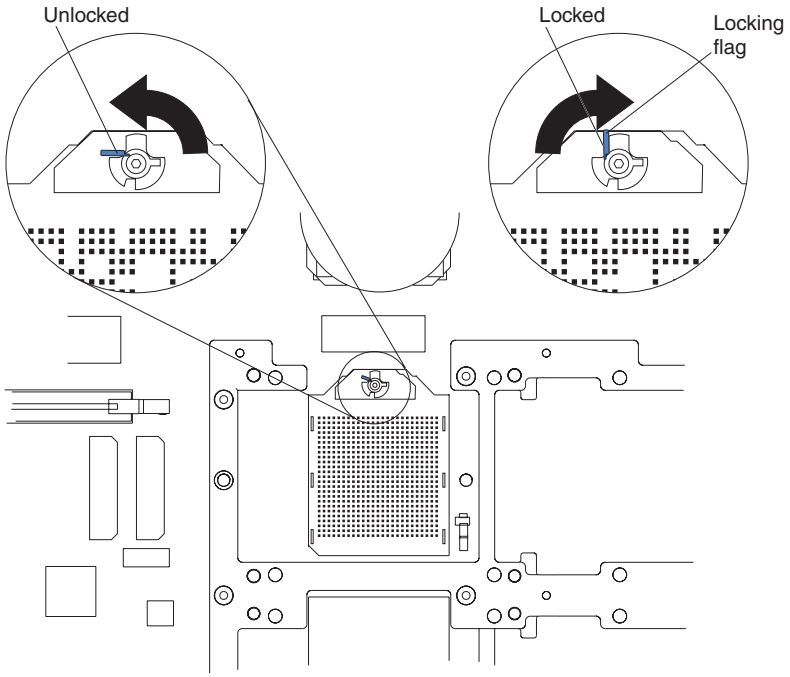
9. Install the microprocessor and power module:



a. Remove the microprocessor baffle from the microprocessor socket. Keep the microprocessor baffle for future use.
b. Remove the protective tape covering the microprocessor socket, if there is any.

   Attention: Inserting the microprocessor in a locked connector might damage the pins and cause the microprocessor to fail.
c. Make sure that the socket lock is in the fully unlocked position to permit inserting the microprocessor. Use the hex wrench that is provided with the microprocessor option to open the lock, if necessary.

   Note: Examine the socket lock of an installed microprocessor to identify the locking flag in the locked position.



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.

d. Touch the static-protective package containing the microprocessor to any unpainted metal surface on the server. Then, remove the microprocessor and power module from the package.

Attention:

1) Forcing the microprocessor socket lock clockwise beyond the closed position might damage the socket locking mechanism. Before you install a microprocessor in the socket, use the hex wrench that is provided with the microprocessor option to close and open the socket lock to observe the locking flag in the closed position. Also, note the resistance of the locking mechanism in the closed position. When installing the microprocessor, do not force the socket lock clockwise beyond the closed position. If you need to see the microprocessor socket lock clearly, shine a flashlight over the microprocessor connector.
2) Make sure that the microprocessor is aligned and seated correctly before you proceed. To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.

e. Insert the microprocessor gently into the connector. The microprocessor rests flat on the retention mechanism when properly seated.
f. Lock the socket lock, using the hex wrench that is provided with the microprocessor option.
g. Tighten the heat-sink screws to secure the microprocessor, using the T-handled Torx wrench that is provided with the microprocessor option.
h. Carefully slide the power module into the microprocessor.
i. Tighten the power-module screws to secure the power module.
j. Connect the power-module cable to the power module and to the adjacent power-module cable connector.

10. Carefully install the processor-board assembly and retention bracket.
11. Install the EMC shield on the rear of the server; then, hand tighten the blue thumbscrews to secure the EMC shield.
12. Carefully install the memory-board assembly.
13. If you have other options to install or remove, do so now.
14. Close the top cover. Go to “Completing the installation” on page 24.

Installing memory

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:

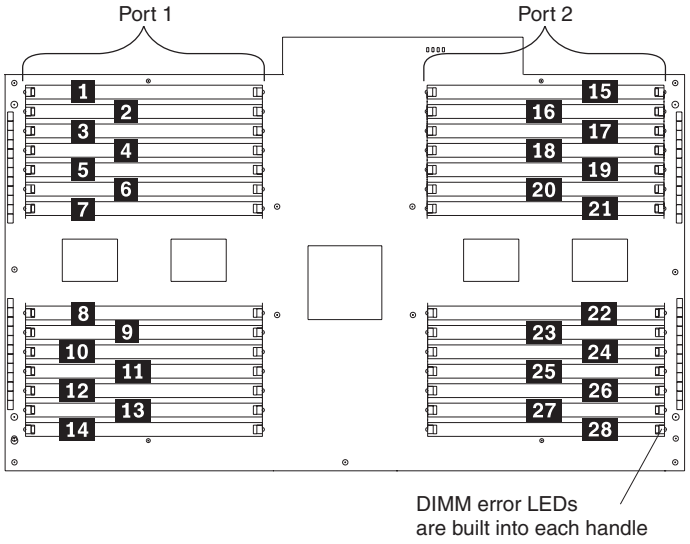
- Your server supports 512 MB, 1 GB, and 2 GB DIMMs, for a maximum of 56 GB of system memory. Go to the ServerProven list at http://www.ibm.com/pc/compat/ for a list of memory modules you can use with your server.
- Your server comes with a minimum of two 512 MB DIMMs, installed in slots 1 and 14. When installing additional DIMMs, you must install two DIMMS at a time, in the order shown in the following table to maintain performance.

Table 1. DIMM installation sequence

Pair	DIMM connectors (port 1)	Pair	DIMM connectors (port 2)
1	1 and 14	2	15 and 28
3	2 and 13	4	16 and 27
5	3 and 12	6	17 and 26
7	4 and 11	8	18 and 25
9	5 and 10	10	19 and 24

Table 1. DIMM installation sequence (continued)

Pair	DIMM connectors (port 1)	Pair	DIMM connectors (port 2)
11	6 and 9	12	20 and 23
13	7 and 8	14	21 and 22



- Each DIMM in a pair must be of the same size and technology to ensure that the server will operate properly.
- 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.
- When using memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each bank must be identical. The following table shows the pairs that are in each bank. See Table 1 on page 19 for the DIMM connector pair assignments.

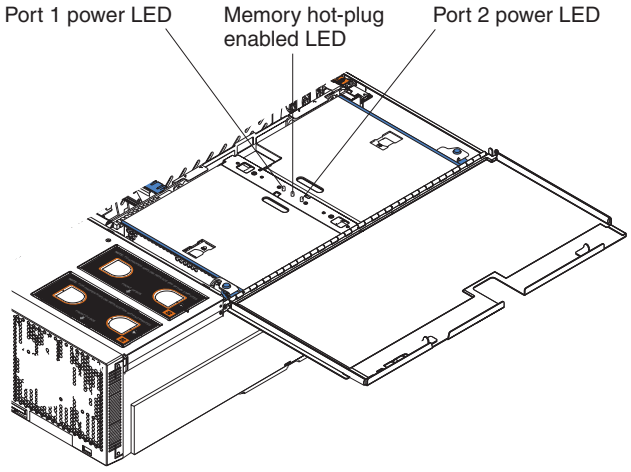
Table 2. Memory mirroring DIMM installation sequence

Bank	DIMM pairs	Bank	DIMM pairs
1	1 and 2	5	9 and 10
2	3 and 4	6	11 and 12
3	5 and 6	7	13 and 14
4	7 and 8		

- You can replace a failed DIMM while the server is on, provided that you have enabled memory mirroring and that you have installed all DIMMs in the sequence to support memory mirroring.

  If a problem with a DIMM is detected, light path diagnostics will light the system-error LED on the front of the server, indicating that there is a problem and guide you to the defective DIMM. When this occurs, first identify the defective DIMM; then, remove and replace the DIMM.

The following illustration shows the LEDs on the DIMM access door:



Port 1 power LED: When this LED is off, it indicates that power is removed from the port and that you can replace a failed DIMM.

Memory hot-plug enabled LED: When this LED is lit, it indicates that hot-swap memory is enabled. When this LED is flashing, it indicates that data is being mirrored on the replacement DIMMs.

Port 2 power LED: When this LED is off, it indicates that power is removed from the port and that you can replace a failed DIMM.

- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message indicating that the memory configuration has changed.

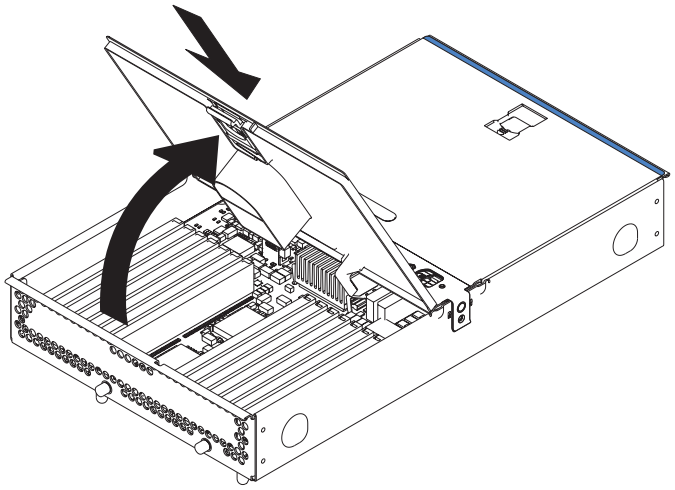
Removing and replacing DIMMs

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

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 all external cables, if necessary; then, open the cover.

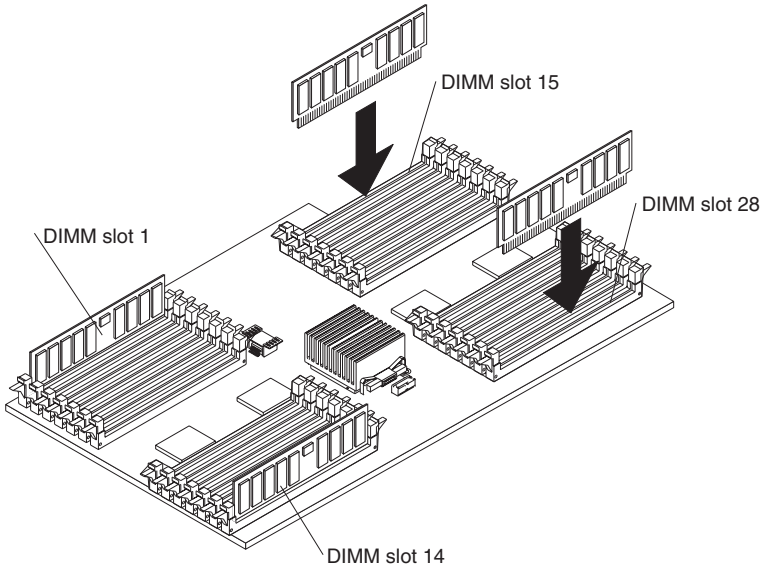
   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 8.

3. Open the DIMM access door that covers the DIMM connector into which you will be installing the DIMM.



4. Install the new DIMM:
   a. Open the retaining clip on each end of the DIMM connector.
   b. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.

      Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
   c. Turn the DIMM so that the DIMM keys align correctly with the slot.
   d. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.



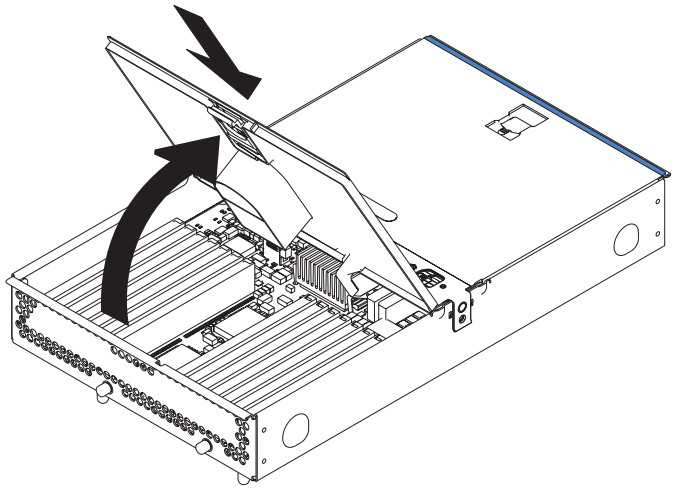
5. Close the DIMM access door.
6. If you have other options to install or remove, do so now.
7. Close the top cover. Go to “Completing the installation” on page 24.

Hot-replacing DIMMs

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

1. Read the safety information beginning on page v and “Installation guidelines” on page 7.
2. Open the top cover and verify that the memory hot-plug enabled LED on the DIMM access door is lit before removing and replacing the DIMM.

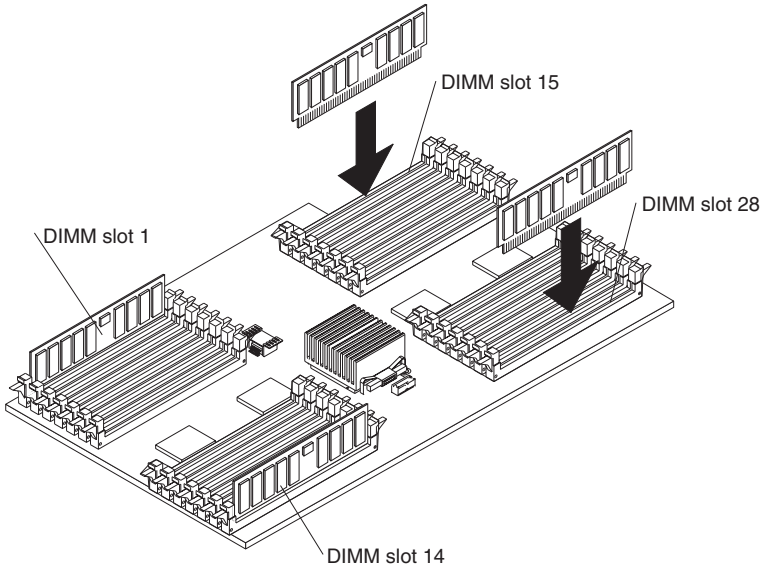
   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 8.
3. Open the DIMM access door and verify that the memory port power LED is off before replacing a DIMM. Then, open the retaining clip on each end of the DIMM connector and remove the DIMM from the server.



4. Install the new DIMM:
   a. Open the retaining clip on each end of the DIMM connector.
   b. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.

      Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
   c. Turn the DIMM so that the DIMM keys align correctly with the slot.
   d. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the

retaining clips, remove the DIMM, and then reinsert it.



5. Close the DIMM access door and verify that the memory port power LED is lit.

   Note: The memory hot-plug enabled LED flashes to indicate that data is being mirrored on the replacement DIMMs. Wait until the LED stops flashing before you hot-replace DIMMs again.
6. If you have other options to install or remove, do so now.
7. Close the top cover. Go to “Completing the installation”.

Completing the installation

Complete the following steps to complete the installation:

1. Close the top cover.
2. Install the server in the rack cabinet. See the *Rack Installation Instructions* that come with your server for detailed information about how to install the server in a rack cabinet.

   Attention:

   - Install your server only in a rack cabinet with perforated doors.
   - Do not leave open space above or below an installed server in your rack cabinet. To help prevent damage to server components, always install a filler panel to cover the open space and to help ensure proper air circulation. See the documentation that comes with your rack cabinet for more information.
3. Connect the cables and power cords. See “Connecting the cables” for more information.

Connecting the cables

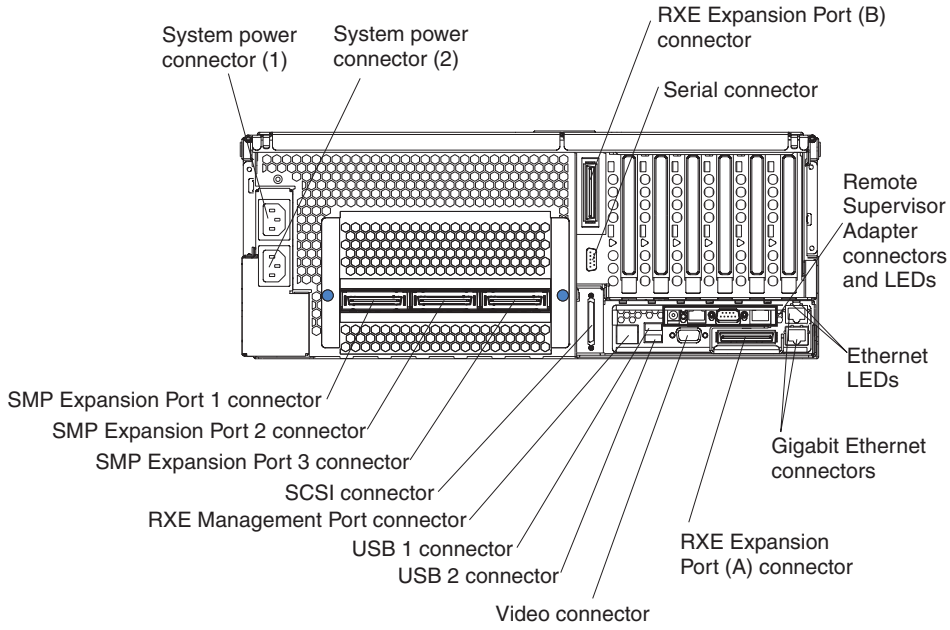
The following illustration shows the locations of the input and output connectors on your server.

Notes:

1. You must turn off the server before connecting or disconnecting cables from your server.

2. See the documentation that comes with your external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.
3. Cable identifiers are printed on the cables that come with your server and options. Use these identifiers to connect the cables to the correct connectors.
4. There are two optional IBM @server xSeries 455 SMP Expansion cable kits available to connect the SMP Expansion Port connectors.
   - 4-way to 8-way Scalability Kit (comes with two 2.5 m (8.2 feet) SMP Expansion cables).
   - 8-way to 16-way Supplemental Kit (comes with three 2.5 m (8.2 feet) SMP Expansion cables and one 3.5 m (11.6 feet) SMP Expansion cable).
5. If your server comes with an operating system installed, see the documentation that comes with your software for additional cabling instructions.
6. To effectively manage the cables on your 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 cabling

The cabling information in this section is for multi-node configurations using two or four servers. A node is one of multiple servers in a configuration interconnected through the SMP Expansion Ports to share system resources.

Complete the following steps to configure and cable a multi-node configuration:

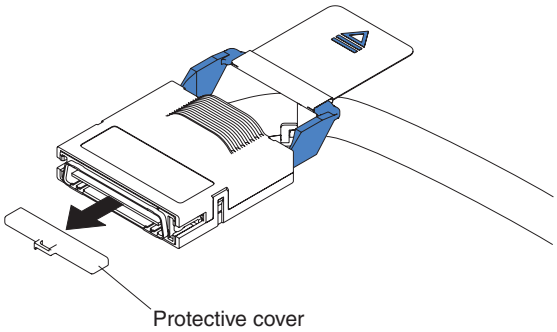
1. Update the SAL/EFI code and the service processor firmware. To download the most current level of SAL/EFI code and service processor firmware, go to http://www.ibm.com/pc/support/. For more information:
   - Read the release notes included with the SAL/EFI code.
   - See the *Remote Supervisor Adapter User's Guide* on the IBM *xSeries Documentation* CD.

2. Configure the nodes using the Configuration/Setup Utility program. See the *User's Guide* on the IBM *xSeries Documentation* CD.
3. Cable the configuration using the instructions in this section.
4. Configure the scalable partition. See "Configuring scalable partitions" on page 47.
5. Make sure the service processor on each node is configured and connected to the network. See the *Remote Supervisor Adapter User's Guide* on the IBM *xSeries Documentation* CD.

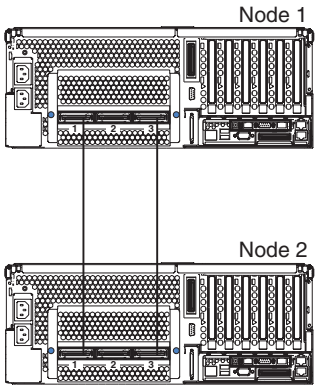
Two-node configuration

A two-node configuration requires the 4-way to 8-way Scalability Kit option. Complete the following steps to cable a two-node configuration for up to 8-way operation:

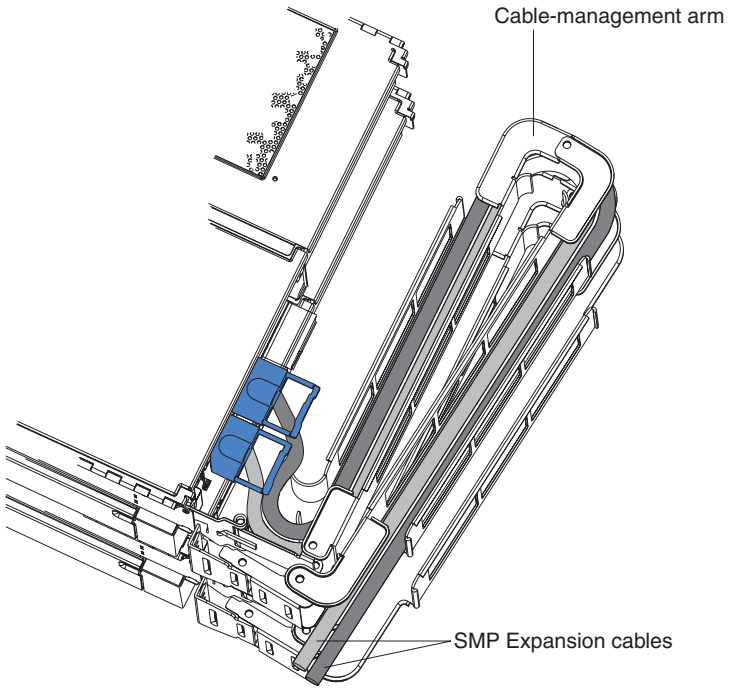
1. Remove the protective covers from the connectors on the ends of the cables.



2. Label each end of the SMP Expansion cables according to where they will be connected to each server. See the following illustration.



3. Connect the SMP Expansion cables to node 1:
   a. Connect one end of an SMP Expansion cable to port 1 on node 1; then, route the cable through the node 1 cable-management arm.
   b. Connect one end of an SMP Expansion cable to port 3 on node 1; then, route the cable through the node 1 cable-management arm.

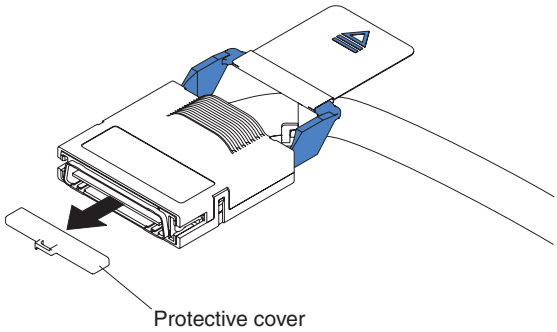


4. Connect the SMP Expansion cables to node 2:
   a. Locate the SMP Expansion cable that is connected to port 1 on node 1; then, connect the opposite end of the cable to port 1 of node 2. Next, route the cable through the node 2 cable-management arm.
   b. Locate the SMP Expansion cable that is connected to port 3 on node 1; then, connect the opposite end of the cable to port 3 of node 2. Next, route the cable through the node 2 cable-management arm.
5. Connect the Remote Supervisor Adapter Ethernet connector on each server 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 manage scalable partitions.
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. Go to “RXE Expansion cabling” on page 30 and complete that procedure, if you are connecting the configuration to a remote I/O enclosure.

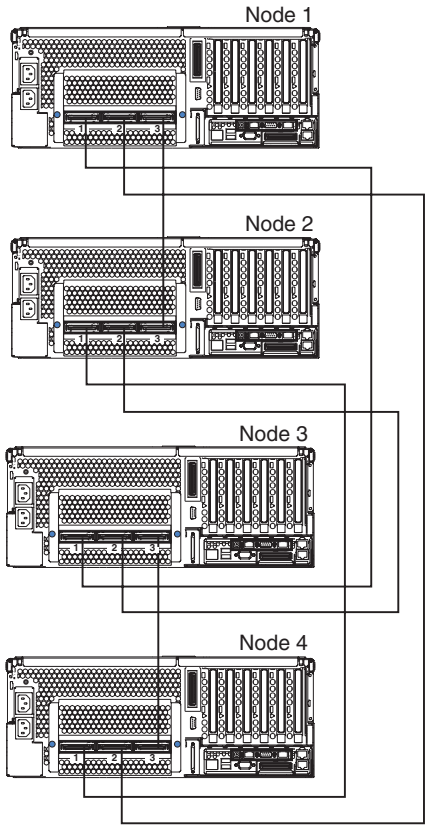
Four-node configuration

A four-node configuration requires one 4-way to 8-way Scalability Kit option and one 8-way to 16-way Supplemental Kit option. Complete the following steps to cable a four-node configuration for up to 16-way operation:

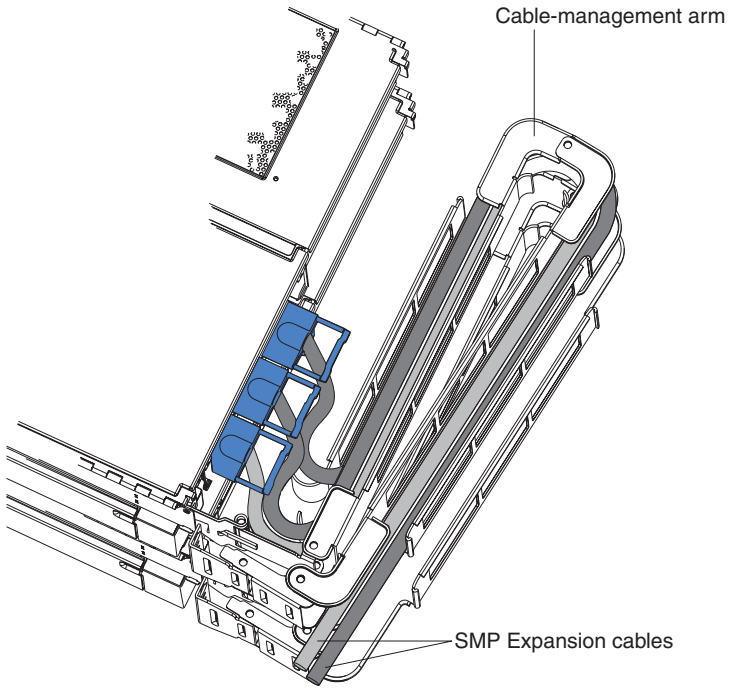
1. Remove the protective covers from the connectors on the ends of the cables.



2. Label each end of the SMP Expansion cables according to where they will be connected to each server. See the following illustration.



3. Connect the SMP Expansion cables to node 1:
   a. Connect one end of an SMP Expansion cable to port 1 on node 1; then, route the cable through the node 1 cable-management arm. Use a 2.5 m (8.2 feet) SMP Expansion cable for this connection.
   b. Connect one end of an SMP Expansion cable to port 2 on node 1; then, route the cable through the node 1 cable-management arm. Use a 3.5 m (11.6 feet) SMP Expansion cable for this connection.
   c. Connect one end of an SMP Expansion cable to port 3 on node 1; then, route the cable through the node 1 cable-management arm. Use a 2.5 m (8.2 feet) SMP Expansion cable for this connection.



4. Connect the SMP Expansion cables to node 2:
   a. Connect one end of an SMP Expansion cable to port 1 on node 2; then, route the cable through the node 2 cable-management arm. Use a 2.5 m (8.2 feet) SMP Expansion cable for this connection.
   b. Connect one end of an SMP Expansion cable to port 2 on node 2; then, route the cable through the node 2 cable-management arm. Use a 2.5 m (8.2 feet) SMP Expansion cable for this connection.
   c. Locate the SMP Expansion cable that is connected to port 3 on node 1; then, connect the opposite end of the cable to port 3 of node 2. Next, route the cable through the node 2 cable-management arm.
5. Connect the SMP Expansion cables to node 3:
   a. Locate the SMP Expansion cable that is connected to port 1 on node 1; then, connect the opposite end of the cable to port 1 of node 3. Next, route the cable through the node 3 cable-management arm.
   b. Locate the SMP Expansion cable that is connected to port 2 on node 2; then, connect the opposite end of the cable to port 2 of node 3. Next, route the cable through the node 3 cable-management arm.
   c. Connect one end of an SMP Expansion cable to port 3 on node 3; then, route the cable through the node 3 cable-management arm. Use a 2.5 m (8.2 feet) SMP Expansion cable for this connection.
6. Connect the SMP Expansion cables to node 4:
   a. Locate the SMP Expansion cable that is connected to port 1 on node 2; then, connect the opposite end of the cable to port 1 of node 4. Next, route the cable through the node 4 cable-management arm.
   b. Locate the SMP Expansion cable that is connected to port 2 on node 1; then, connect the opposite end of the cable to port 2 of node 4. Next, route the cable through the node 4 cable-management arm.
   c. Locate the SMP Expansion cable that is connected to port 3 on node 3; then, connect the opposite end of the cable to port 3 of node 4. Next, route the cable through the node 4 cable-management arm.

7. Connect the Remote Supervisor Adapter Ethernet connector on each server to the network. This connection is needed so that the Remote Supervisor Adapters can communicate and manage scalable partitions.
8. Route any remaining cables through the cable-management arms.
9. Secure the cables in the cable-management arms with the hook-and-loop straps that come with your server.
10. Go to “RXE Expansion cabling” and complete that procedure, if you are connecting the configuration to one or more remote I/O enclosures.

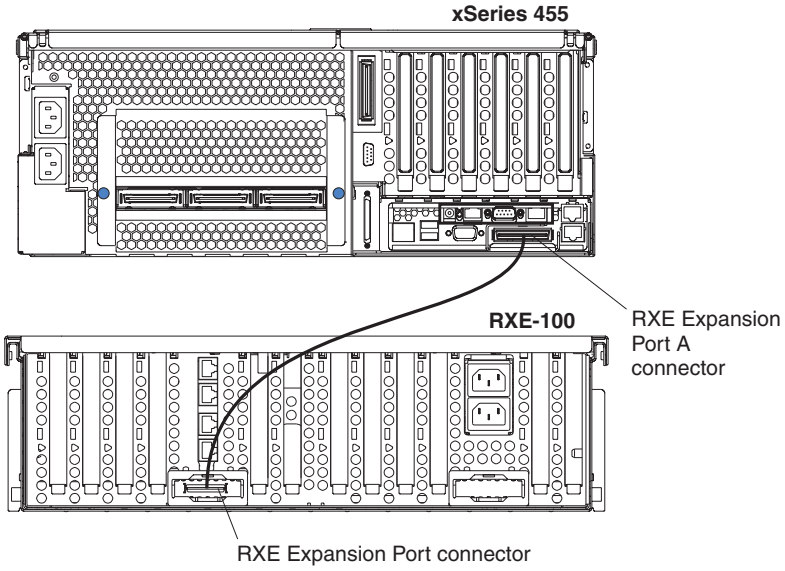
RXE Expansion cabling

There are two RXE Expansion Port connectors on the rear of the server. Use these ports to connect the server to a remote I/O enclosure and to expand the number of PCI-X slots that are available for use by the server. For detailed information about cabling the RXE Expansion Port connectors, see the documentation that comes with the remote I/O enclosure.

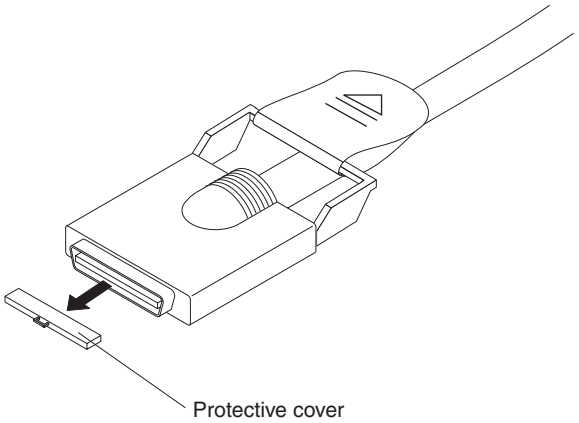
Use either the 3.5 m Remote I/O Cable Kit option or the 8 m Remote I/O Cable Kit option to connect the server and remote I/O enclosure.

One server

Complete the following steps to connect the server to a remote I/O enclosure with one expansion kit installed.



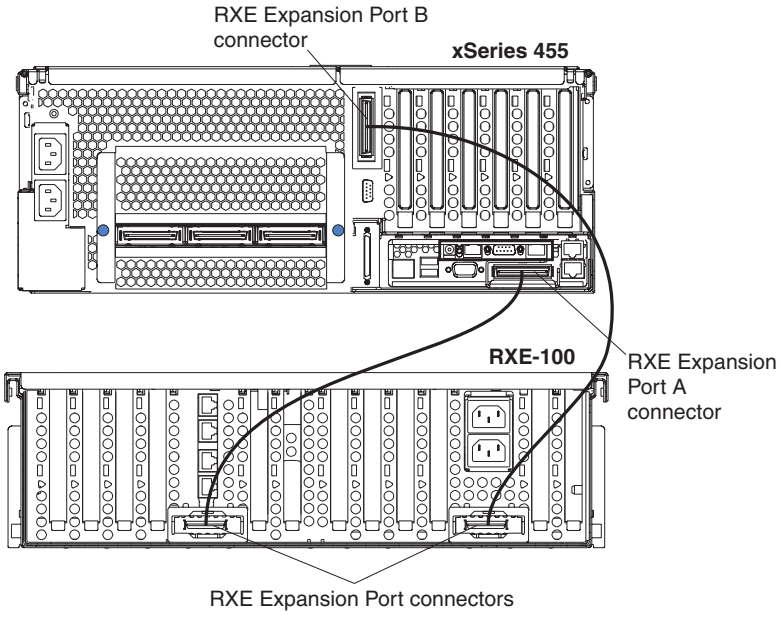
1. Remove the protective covers from the connectors on the ends of the cables.



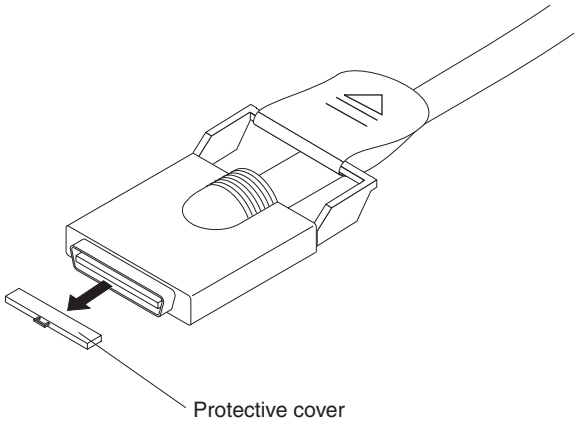
2. Using an RXE Expansion cable, connect one end of the cable to the RXE Expansion Port A connector on the server.
3. Connect the opposite end of the cable to an RXE Expansion Port connector on the remote I/O enclosure.

Go to “RXE Management cabling” on page 35.

Complete the following steps to connect the server to a remote I/O enclosure with two expansion kits installed.



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

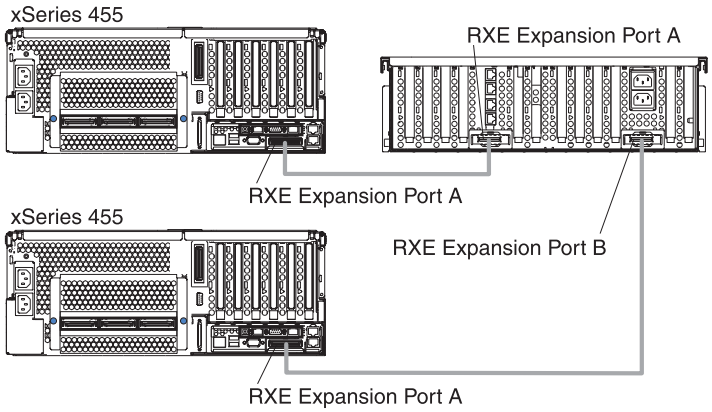


2. Using an RXE Expansion cable, connect one end of the cable to the RXE Expansion Port A connector on the server.
3. Connect the opposite end of the cable to an RXE Expansion Port connector on the remote I/O enclosure.
4. (Optional) Using an RXE Expansion cable, connect one end of the cable to the RXE Expansion Port B connector on the server. Connect the opposite end to an RXE Expansion Port connector on the remote I/O enclosure.This cable connection provides fail-over support.

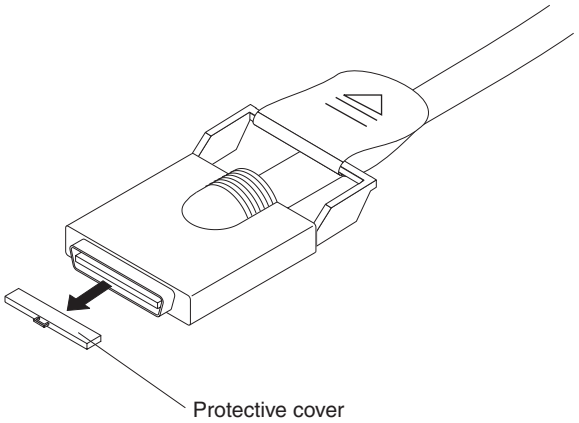
Go to “RXE Management cabling” on page 35.

Two stand-alone servers

Complete the following steps to connect two stand-alone servers sharing one remote I/O enclosure.



1. Determine which server will be connected to port A of the remote I/O enclosure and which will be connected to port B.
2. Remove the protective covers from the connectors on the ends of the cables.



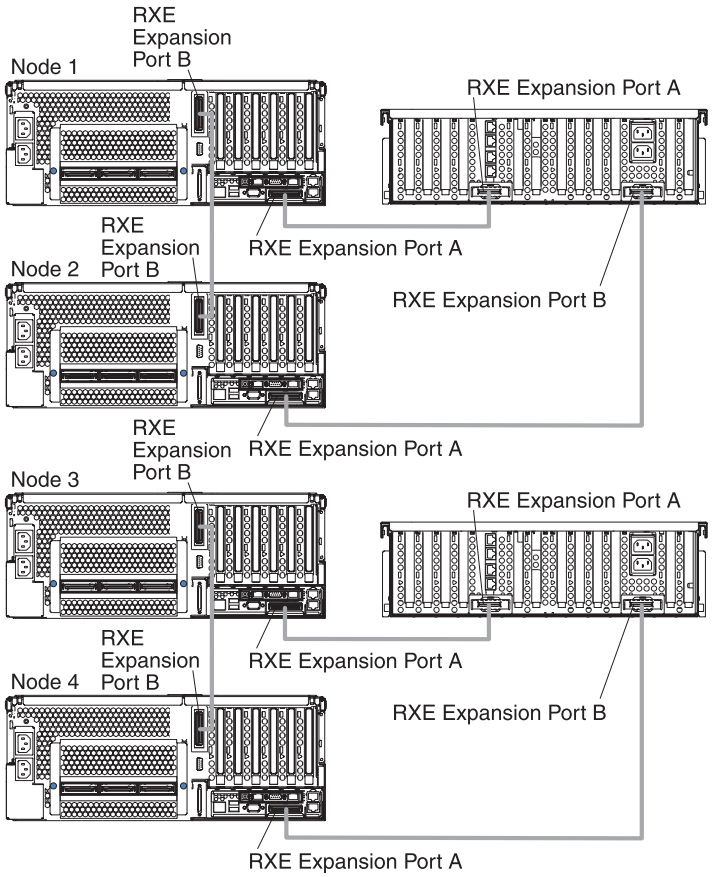
3. Using an RXE Expansion cable, connect one end of the cable to the RXE Expansion Port A connector on the remote I/O enclosure.
4. Connect the opposite end of the cable to the RXE Expansion Port A connector on the applicable server.
5. Using an RXE Expansion cable, connect one end of the cable to the RXE Expansion Port B connector on the remote I/O enclosure.
6. Connect the opposite end of the cable to the RXE Expansion Port A connector on the applicable server.

Go to “RXE Management cabling” on page 35.

Multi-node configurations

Complete the following steps to connect a remote I/O enclosure to a two-node or four-node configuration. For information about cabling the RXE Management Port

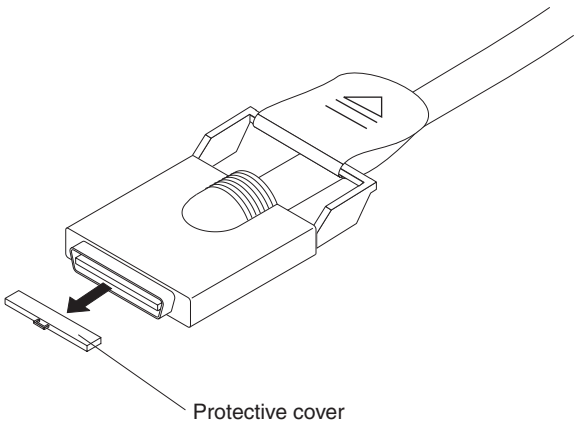
connectors, see “RXE Management cabling” on page 35.



Notes:

1. You can connect a remote I/O enclosure to both nodes of a two-node configuration. If the remote I/O enclosure has only one expansion kit installed, you can connect the RXE Expansion Port A connector on the primary server to the remote I/O enclosure.
2. You can connect a remote I/O enclosure to nodes 1 and 2 *or* nodes 3 and 4 of a four-node configuration. You can also connect remote I/O enclosures to both nodes 1 and 2 *and* nodes 3 and 4 of a four-node configuration.

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



2. Using an RXE Expansion cable, connect the RXE Expansion Port A connector on one server to the remote I/O enclosure.
3. Using an RXE Expansion cable, connect the RXE Expansion Port A connector on the other server to the remote I/O enclosure.
4. (Optional) Using an RXE Expansion cable, connect the RXE Expansion Port B connector on one server to the RXE Expansion Port B connector on the other server. This cable connection provides fail-over support.

Go to “RXE Management cabling”.

RXE Management cabling

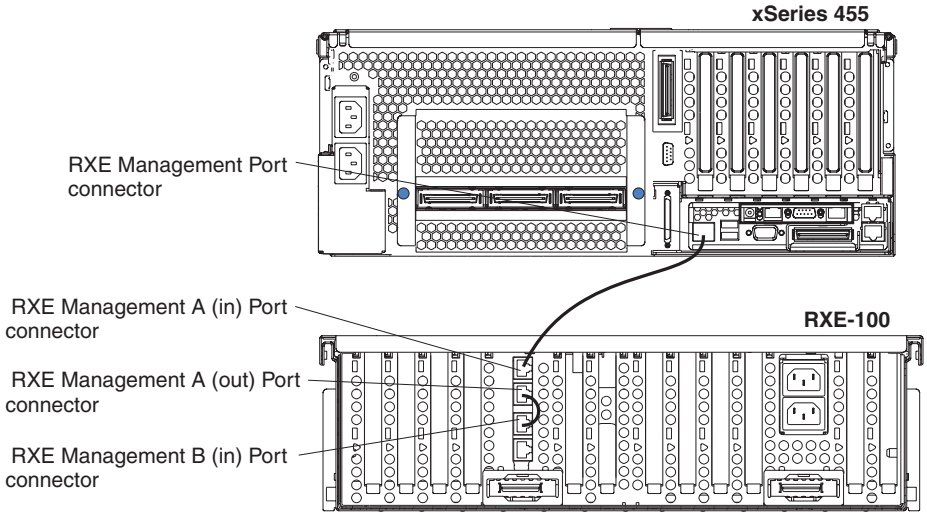
There is one RXE Management Port connector on the back of the server. Use this port to connect the server to the management port of an optional remote I/O enclosure. This port is used to manage the PCI-X slots in a remote I/O enclosure, including slot assignments and managing access. For details about how the server and remote I/O enclosure work together, see the documentation that comes with the enclosure.

Use either the 3.5 m Interconnect Management Cable Kit option or the 8 m Interconnect Management Cable Kit option to connect the server and the remote I/O enclosure.

One server

Complete the following steps to connect the server RXE Management Port connector to a remote I/O enclosure.

Note: Use the following instructions regardless of whether your remote I/O enclosure has one or two expansion kits installed.

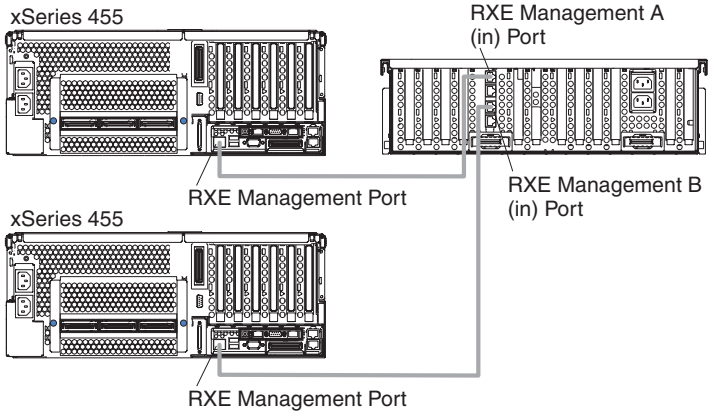


1. Using an RXE Management cable, connect one end of the cable to the RXE Management Port connector on the server.
2. Connect the opposite end of the cable to the RXE Management A (in) Port connector on the remote I/O enclosure.
3. Using a jumper cable, connect the RXE Management A (out) Port on the remote I/O enclosure to the RXE Management B (in) Port on the remote I/O enclosure.

Two stand-alone servers

Complete the following steps to connect the RXE Management Port connectors of two stand-alone servers to a remote I/O enclosure.

Note: The configuration shown in the following illustration is two servers that are independent of each other. Notice that there are no interconnecting cables between the two servers.



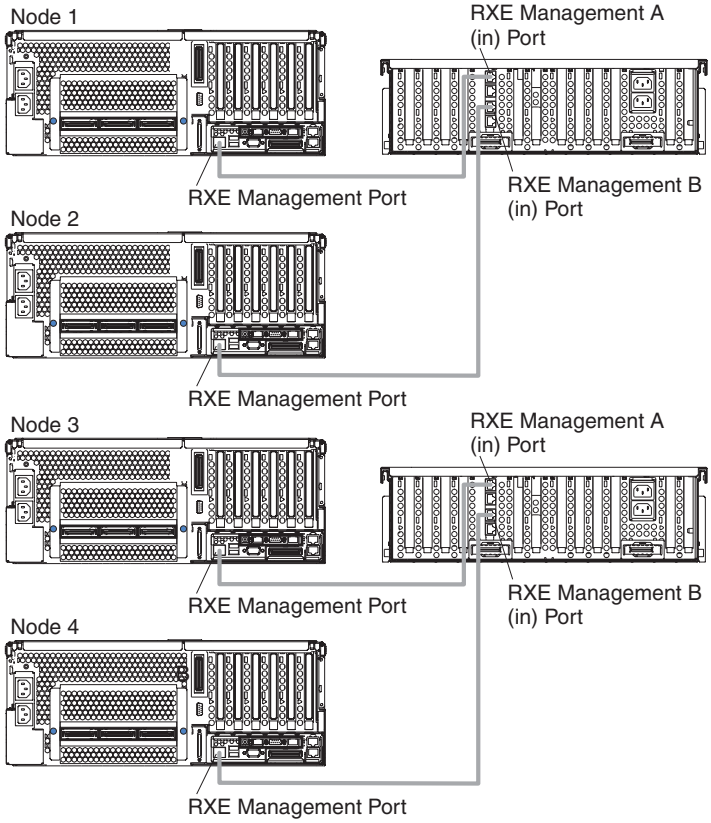
1. Using an RXE Management cable, connect one end of the cable to the RXE Management Port connector on one of the servers.
2. Connect the opposite end of the cable to the RXE Management A (in) Port connector on the remote I/O enclosure.
3. Using an RXE Management cable, connect one end of the cable to the RXE Management Port connector on the other server.
4. Connect the opposite end of the cable to the RXE Management A (in) Port connector on the remote I/O enclosure.

Multi-node configurations

Complete the following steps to connect a remote I/O enclosure to a two-node or four-node configuration.

Note: You can connect a remote I/O enclosure to both nodes of a two-node configuration. If the remote I/O enclosure has only one expansion kit installed, you can connect the RXE Management Port connector on the primary server to the RXE Management A (in) Port on the remote I/O

enclosure.



1. Using an RXE Management cable, connect the RXE Management Port connector on one server to the remote I/O enclosure.
2. Using an RXE Management cable, connect the RXE Management Port connector on the other server to the remote I/O enclosure.

Power cabling

Your server comes with two power cords that can be connected to an external source, such as a properly grounded electrical outlet. Your server can also use 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.

Complete the following steps to connect the power cords:

1. Connect the power cords to the system power connectors on the rear of the server.

   Notes:

   a. The power supplies are hot-swappable and redundant only at 200-240 V ac.

   b. Both power supplies must be connected to the power source for operation at 100-127 V ac.

   c. During normal operation, both power supplies must be installed for proper operation.

2. Connect the other end of the power cord to a properly grounded electrical outlet or a power distribution unit inside the rack cabinet.

   Note: Connecting the power cords into an electrical outlet might cause the server to start automatically. This is an acceptable action.

3. See “Turning on the server” on page 42 for detailed information about turning on the server.

SCSI cabling

There is one SCSI connector on the back of the server. Use this connector to connect the server to an optional SCSI device such as a storage enclosure. For information about how to connect the option to your server, see the documentation that comes with the option.

USB cabling

There are three USB connectors, one on the front and two on the back of the server. Use these connectors to connect the server to an optional USB device. For information about how to connect the option to your server, see the documentation that comes with the device.

Serial cabling

There is one serial connector on the back of the server. Use this connector to connect the server to a modem or other optional serial device. For information about how to connect this device to your server, see the documentation that comes with the device.

Video cabling

There is one video connector on the back of the server. Use this connector to connect the server to a monitor or optional console switch. For information about how to connect this device to your server, see the documentation that comes with the device.

Gigabit Ethernet cabling

There are two Ethernet connectors on the back of the server. Use these connectors to connect the server to a LAN.

Note: A third Ethernet connector is on the Remote Supervisor Adapter. This connector is used for specific supervisory functions; do not confuse it with the Gigabit Ethernet connectors.

Remote Supervisor Adapter cabling

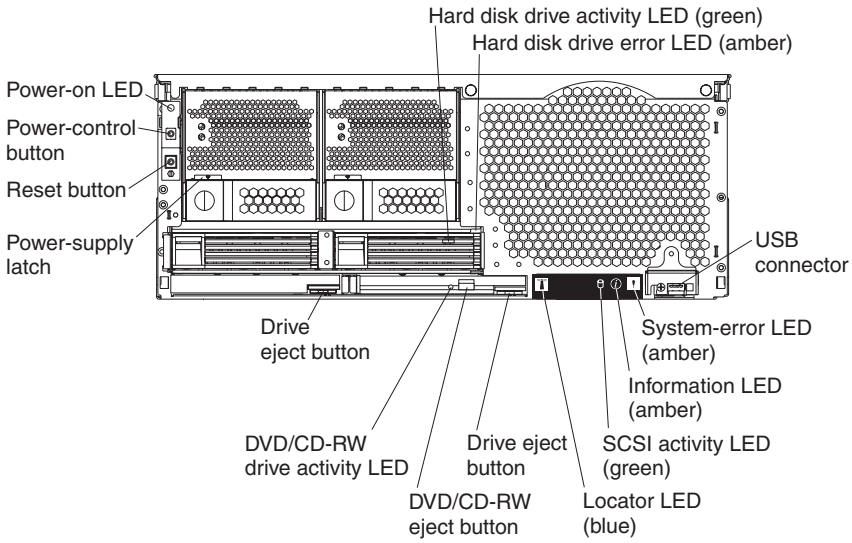
Your server comes with a Remote Supervisor Adapter. For information about cabling the Remote Supervisor Adapter connectors, see the *User's Guide* on the IBM *xSeries Documentation* CD.

Chapter 3. Server controls, LEDs, and power

This section describes the controls and light-emitting diodes (LEDs) on the front and rear of your server. It also describes how to turn the server on and off.

Front view

The following illustration shows the controls, LEDs, and connectors on the front of the server.



Power-on LED: When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to an ac power source. When this LED is off, it indicates that ac power is not present.

Note: If this LED is off, it does not mean that there is no electrical power in the server. The LED might be burned out or the server might have malfunctioned. To remove all electrical power from the server, you must disconnect the power cords from the electrical outlets.

Hard disk drive activity LED: When this LED is lit, it indicates that the hard disk drive is in use.

Hard disk drive error LED: On some server models, each hot-swap hard disk drive has an error LED. The interpretation of a flashing error LED depends on the SCSI controller connected to the hot-swap drive. When the drive is connected to the integrated SCSI controller with RAID capabilities, a flashing error LED indicates that the drive is a secondary drive in a mirrored pair and the drive is being synchronized.

USB connector: Connect a USB device to this connector.

System-error LED: When this LED is lit, it indicates a system error has occurred.

Information LED: When this LED is lit, it indicates that information about a system error has been entered in the System Error log.

SCSI activity LED: When this LED is lit, it indicates that there is activity on the SCSI bus.

Locator LED: Use this LED to visually locate the server if it is in a location with numerous other servers.

In multi-node configurations, when this LED flashes during startup, it indicates that the server is the primary node. When this LED is lit during startup, it indicates that the server is a secondary node.

Drive eject button: Press this button to release the drive from the server.

DVD/CD-RW eject button: Press this button to release a DVD or CD from the drive.

DVD/CD-RW drive activity LED: When this LED is lit, it indicates that the DVD/CD-RW drive is in use.

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

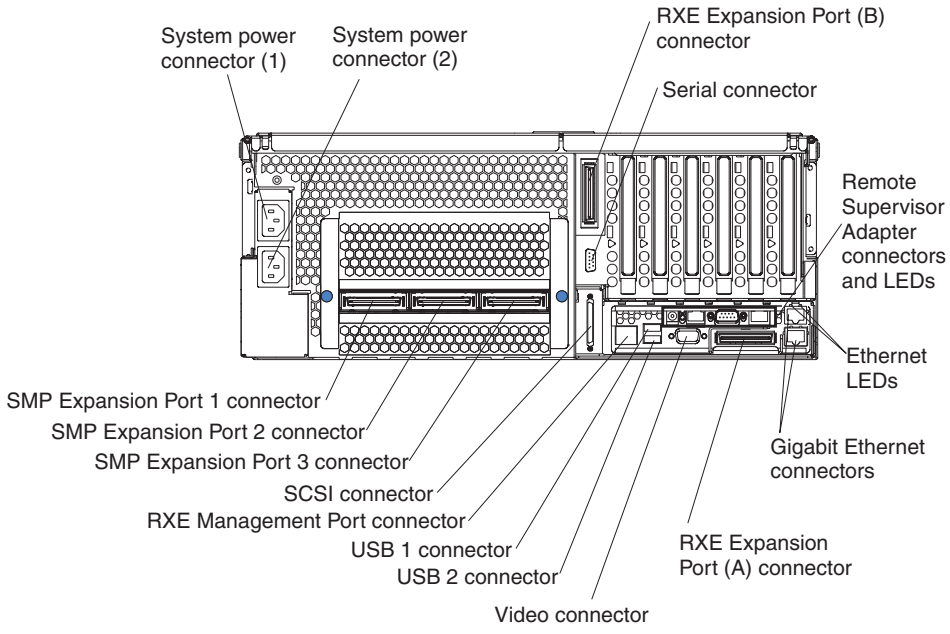
Power-supply latch: This latch secures the power supply in place.

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

The following illustration shows the connectors and LEDs on the rear of the server.

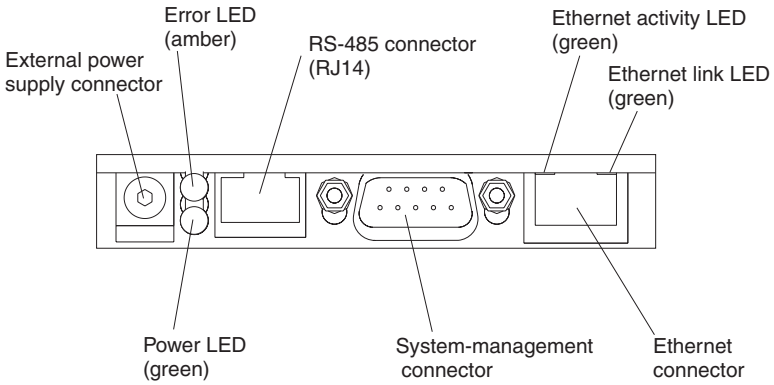


System power connectors (1 and 2): Connect the power cords to these two connectors to provide power to the server.

RXE Expansion Port (B) connector: Connect a remote I/O enclosure to this connector.

Serial connector: Connect the signal cable for a modem or other serial device to this connector.

Remote Supervisor Adapter connectors and LEDs: This group of connectors and LEDs on the back of the server are used for system management information and control.



- **External power supply connector:** This connector is not supported on this server.
- **Error LED:** When this amber LED is lit, it indicates an error on the Remote Supervisor Adapter.
- **ASM RS-485 connector (RJ-14):** Connect signal cables for managing expansion module resources to this connector.
- **Ethernet activity LED:** When this green LED flashes, it indicates that there is activity on the Ethernet LAN.
- **Ethernet link LED:** When this green LED is lit, it indicates that there is an active link connection.
- **Ethernet connection:** Connect Ethernet signal cables to this connector.
- **System-management connector:** Connect signal cables for modems or other serial devices to this connector.
- **Power LED:** This LED indicates the status of the power connection.

Ethernet LEDs: When these LEDs are amber, they indicate that there is activity on the Ethernet LAN. When these LEDs are green, they indicate that there is an active link connection on the Gigabit Ethernet controller.

Gigabit Ethernet connectors: Use these connectors to connect the server to a network.

RXE Expansion Port (A) connector: Connect a remote I/O enclosure to this connector.

Video connector: Connect a monitor to this connector.

USB 2 connector: Connect a USB device to this connector.

USB 1 connector: Connect a USB device to this connector.

RXE Management Port connector: Connect a remote I/O enclosure to this connector.

SCSI connector: Connect a SCSI device to this connector.

SMP Expansion Port 3 connector: Use this connector to connect the server to other servers and form multi-node configurations.

SMP Expansion Port 2 connector: Use this connector to connect the server to other servers and form multi-node configurations.

SMP Expansion Port 1 connector: Use this connector to connect the server to other servers and form multi-node configurations.

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 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. The server can also be turned on in any of the following ways:

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If ac power is present, the server can be turned on from the Remote Supervisor Adapter user interface.
- The Wake on LAN feature can turn on the server.

Notes:

1. The power supplies are hot-swappable and redundant only at 200-240 V ac.
2. Both power supplies must be connected to the power source for operation at 100-127 V ac.
3. During normal operation, both power supplies must be installed for proper operation.
4. While the server is powering up, the power-on LED on the front of the server is lit. When the server is connected to ac power but is not turned on, the power-on LED on the front of the server flashes.
5. When you press the power-control button on any server in a scalable partition, all servers in the scalable partition will be turned on. If the servers do not turn on when the power-control button is pressed, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

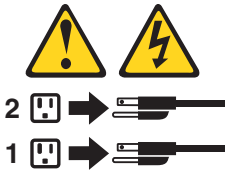
Turning off the server

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.



The server can be turned off 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 for more than 4 seconds to turn off the server.
- If the server is connected to an Advanced System Management interconnect network, the server can be turned off using the Remote Supervisor Adapter user interface.

Notes:

1. You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the server. You can use this feature if the operating system stops functioning.
2. If you disconnect the server from the power source, wait approximately 15 seconds for the server to stop running before you open the cover. Watch for the power-on LED on the front of the server to stop flashing.
3. When you press the power-control button on any server in a scalable partition, all servers in the scalable partition will be turned off. If the servers do not turn off when the power-control button is pressed, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

Chapter 4. Configuring the server

The Extensible Firmware Interface (EFI) Firmware Boot Manager provides access to utility programs and controls the startup environment. After you turn on the server, this program offers you a choice of startup options. For example, you can start to an operating system located on the network or media, or access the Configuration/Setup Utility program.

In addition to the EFI Firmware Boot Manager, you can use the following configuration programs to customize the server hardware:

- Configuration/Setup Utility
- ServeRAID Manager
- LSI Logic Configuration Utility
- Remote Supervisor Adapter configuration process
- Scalable partition configuration process

For more information about these programs, see “Configuring your server” in the *User’s Guide* on the IBM *xSeries Documentation* CD.

Using the EFI Firmware Boot Manager

Use the EFI Firmware Boot Manager to configure a variety of startup options and to access utility programs. You can use it to:

- Start the Configuration/Setup Utility program
- Set the startup options
- Configure device drivers
- Select a startup operating system

Complete the following steps to start the EFI Firmware Boot Manager:

1. Turn on the server.
2. Follow the instructions on the screen.

Using the Configuration/Setup Utility program

Configuration/Setup is a menu-driven utility that is part of the SAL/EFI code that comes with your server. You can use it to:

- Enable memory mirroring
- Set the date and time
- Configure scalable partitions
- View configuration information
- Set and change passwords and Remote Control Security settings
- Set and change settings for advanced hardware features
- View and clear error logs

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

1. Turn on the server.

   Note: In a multi-node configuration, some options or settings are defined through the primary server, and others must be defined on the individual

(secondary) servers. Make sure that options and settings on the secondary servers are correct before creating a scalable partition.

2. From the EFI Firmware Boot Manager, select the Configuration/Setup Utility program.
3. Follow the instructions on the screen.

Using ServeRAID Manager

Note: If your server comes with an operating system installed, see the software documentation that comes with your server for configuration information.

You can use the ServeRAID Manager program, on the IBM *ServeRAID Support* CD, to:

- Configure a redundant array of independent disks (RAID)
- View your RAID configuration and associated devices
- Monitor operation of your RAID controllers

The ServeRAID Manager program operates in two ways:

- Startable CD mode
- As an installed software program

See the ServeRAID documentation on the IBM *ServeRAID Support* CD for additional information about RAID technology and instructions for using ServeRAID Manager.

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level 1 operation.
2. You must configure your SCSI controller with RAID capabilities *before* you install your operating system to use RAID level 1 operation.
3. If you install another 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.
4. The *IBM ServeRAID-6M Controller RAMDrive Support* CD includes code you must install if you have installed a ServeRAID-6M controller and you plan to install Microsoft Windows Server 2003, Enterprise Edition (64-bit) on hard disk drives controlled by the ServeRAID-6M controller. Install the code *after* you have configured your RAID arrays. See the README file on the *IBM ServeRAID-6M Controller RAMDrive Support* CD for instructions.

Using the LSI Logic Configuration Utility

The LSI Logic Configuration Utility program is a built-in, menu-driven configuration utility program. You can use it to:

- Perform a low-level format on a hard disk
- Set the SCSI device scan order
- Set the SCSI ID for a controller

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports RAID level 1.

2. You must configure your SCSI controller with RAID capabilities *before* you install your operating system to use RAID level 1.
3. If you install a different type of RAID controller in your server, follow the configuration instructions in the documentation that comes with the controller 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. From the EFI Firmware Boot Manager, select **Driver setup**.
3. From the device driver menu, select the LSI Logic Ultra320 SCSI device driver.

Using the Remote Supervisor Adapter

The Remote Supervisor Adapter is one of the products in the Advanced System Management (ASM) family. It provides around-the-clock remote access and system management of your server and has the following features:

- Remote management regardless of the status of the server
- Remote control of hardware and operating systems
- Web-based management with standard Web browsers (no other software is required)
- Text-based user interface terminal access

The Remote Supervisor Adapter provides the following specific features:

- Continuous health monitoring and control
- Advanced Predictive Failure Analysis® (PFA)
- Configurable notification and alerts
- Event logs that are time stamped, saved in nonvolatile memory, and can be attached to e-mail alerts
- Remote graphics console redirection
- LAN, serial, and Advanced System Management (ASM) interconnect remote access
- Point-to-point protocol (PPP) support
- Simple Network Management Protocol (SNMP)
- Domain Name System (DNS) and Dynamic Host Configuration Protocol (DHCP) support
- Remote power control
- Microsoft Windows Server 2003, Enterprise Edition (64-bit) blue-screen capture
- Remote firmware update and access to critical server settings
- Optional, independent power, which enables around-the-clock access to the server, even if the server is powered off

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

Configuring scalable partitions

This section provides information and instructions for creating and deleting scalable partitions through the Configuration/Setup Utility program.

Note: The Scalable Systems Manager program, when available, 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 about how to use that program to configure scalable partitions.

Before you create or delete scalable partitions, read the following information:

- The Remote Supervisor Adapters must be connected to a network through a management console device. This connection is needed so that the Remote Supervisor Adapters can communicate and manage scalable partitions.
- PCI slot numbering starts with the primary node, including attached remote I/O enclosures, and continues with the secondary nodes, in numeric order of the logical node IDs.
- To change the primary node, delete the scalable partition from the current primary node; then, create a new scalable partition from the new primary node.

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. See the *Option Installation Guide* on the IBM *xSeries Documentation* CD 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. Use one of the following procedures, depending on the configuration.
   - Single-chassis configuration:
     a. Select **1 x455 chassis** as the scalable partition configuration.
     b. Type a scalable partition ID.
     c. If a remote I/O enclosure is attached, complete the following steps:
        1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
        2) Select the destination of Expansion Port A on the remote I/O enclosure.
        3) Select the destination of Expansion Port B on the remote I/O enclosure.
   - Two-chassis configuration:
     a. Select **2 x455 chassis** as the scalable partition configuration.
     b. Type a scalable partition ID.
     c. Type the ASM host name or IP address for the secondary node.
     d. If a remote I/O enclosure is attached, complete the following steps:
        1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
        2) Select the destination of Expansion Port A on the remote I/O enclosure.
        3) Select the destination of Expansion Port B on the remote I/O enclosure.
   - Four-chassis configuration:
     a. Select **4 x455 chassis** as the scalable partition configuration.

b. Type a scalable partition ID.
c. Type the ASM host names or IP addresses for the secondary nodes.
d. If a remote I/O enclosure is attached in the first RXE configuration, complete the following steps:
   1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
   2) Select the destination of Expansion Port A on the remote I/O enclosure.
   3) Select the destination of Expansion Port B on the remote I/O enclosure.
e. If a remote I/O enclosure is attached in the second RXE configuration, complete the following steps:
   1) Select the number of PCI-X slots available to each RXE Expansion Port on the remote I/O enclosure.
   2) Select the destination of Expansion Port A on the remote I/O enclosure.
   3) Select the destination of Expansion Port B on the remote I/O enclosure.

7. Select **Write Scalable Partition Settings** and follow the prompts to exit the menu item.
8. Save the changes 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 Settings** or **Delete Local Scalable Partition Settings**.

   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 the *Option Installation Guide* on the IBM *xSeries Documentation* CD for information.
8. Restart the servers.

Chapter 5. Solving problems

This chapter 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 chapter, see Chapter 6, “Getting help and technical assistance”, on page 61, 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 diagnose and solve hardware-related problems:

- **POST error codes**

  The power-on self-test error codes indicate the status of POST. See “POST error codes” and the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information.
- **Light path diagnostics**

  Use light path diagnostics to diagnose system errors quickly. See “Light path diagnostics” on page 56 for more information.
- **Troubleshooting charts**

  These charts list problem symptoms and steps to correct the problems. See the “Troubleshooting charts” on page 52 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.

POST error codes

The following table provides an abbreviated list of the error codes that might appear in the System Error Log during POST. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information about the POST error codes.

Table 3. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
229	External cache on the processor board	Have the system serviced.
1200	Processor board	Check that the processor board is properly seated. If it is, call for service.
201	Memory board	Check that the memory board is properly seated. If it is, call for service.
16*xx*	I/O board	Check that the I/O board is properly seated. If it is, call for service.
175 or 188	Electrically erasable programmable ROM (EEPROM) on I/O board	Update the system SAL/EFI code.
1813	SCSI controller	Call for service.

Troubleshooting charts

The following tables list problem symptoms and suggested solutions. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more detailed troubleshooting charts. If you cannot find the problem in these charts, run the diagnostic programs. If you have run the diagnostic programs, or if running the tests does not reveal the problem, call for service.

DVD/CD-RW drive problems

Symptom	Suggested action
The DVD/CD-RW drive is not recognized.	Make sure that the device is inserted in the right-side bay and is seated correctly in the bay. If the problem remains, call for service.

Expansion enclosure problems

Symptom	Suggested action
The SCSI expansion enclosure used to work but does not work now.	Make sure that: • The cables for all external SCSI options are connected correctly. • The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • Any external SCSI devices are turned on. You must turn on external SCSI devices before turning on the server. For more information, see your SCSI expansion enclosure documentation.

General problems

Symptom	Suggested action
A cover lock is broken, an LED is not working, or a similar problem has occurred.	Call for service.

Hard disk drive problems

Symptom	Suggested action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk test).	1. Remove the first drive that is not recognized and try the hard disk drive diagnostic test again. 2. If the remaining drives are recognized, replace the drive that you removed with a new one.
The server stops responding during the hard disk drive diagnostic test.	1. Remove the hard disk drive that was being tested when the server stopped responding and try the diagnostic test again. 2. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.

Intermittent problems

Symptom	Suggested action
A problem occurs only occasionally and is difficult to diagnose.	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 airflow, the fan is not working. This causes the server to overheat and shut down. • The SCSI bus and devices are configured correctly and the last external device in each SCSI chain is terminated correctly. Check the system-error LED on the front of the server. See “Light path diagnostics” on page 56 for more information. If the problem remains, call for service.

Memory problems

Symptom	Suggested action
The amount of system memory displayed is less than the amount of physical memory installed.	Verify that: • The memory modules are seated properly. • You have installed the correct type of memory. • All banks of memory are enabled. The server might have automatically disabled a DIMM bank when it detected a problem. • Memory mirroring is disabled. If the problem remains, call for service.

Monitor problems

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 instructions for testing and adjusting the monitor. If you cannot diagnose the problem, call for service.

Symptom	Suggested action
The screen is blank.	Make sure that: • The server power cord is connected to the server and a working electrical outlet. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. **Note:** During startup, the server might appear to be unresponsive for an unusual length of time (30 seconds to several minutes). In a single-node configuration, the locator LED on the front of the server flashes during startup and indicates that POST is in progress. In a multi-node configuration during startup, the locator LED flashes on the primary node and is lit on the secondary nodes. If the problem remains, call for service.
Only the cursor appears.	Call for service.

Symptom	Suggested action
The monitor works when you turn on the server, but the screen goes blank when you start some application programs.	Make sure that you have installed the necessary device drivers for the application programs. 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.
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	If the monitor self-tests show that the monitor is working correctly, 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. **Attention:** Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 300 mm (12 in.) apart, and turn on the monitor. **Notes:** 1. To prevent diskette drive read/write errors, make sure that the distance between the monitor and diskette drives is at least 75 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, contact your IBM marketing representative or authorized reseller. If the problem remains, call for service.
Wrong characters appear on the screen.	If the wrong language is displayed, update the SAL/EFI code with the correct language. If the problem remains, call for service.

Option problems

Symptom	Suggested action
An IBM option that was just installed does not work.	Make sure 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 come with the option. • You have not loosened any other installed options or cables. • You have 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.

Symptom	Suggested action
An IBM option that used to work does not work now.	• Make sure 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, make sure 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 problems

Symptom	Suggested action
The server does not turn on.	Make sure that: • The LEDs on the power supply are lit. • The power cables are correctly connected to the server. • The ac power source functions correctly. • 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 supplies support. If the problem remains, call for service.

Serial port problems

For more information about the serial port, see the *Option Installation Guide* on the IBM *xSeries Documentation* CD.

Symptom	Suggested action
The number of serial ports identified by the operating system is less than the number of serial ports that are installed.	Verify that the serial-port adapter, if you installed one, is seated properly. If the problem remains, call for service.
A serial device does not work.	Make sure that: • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. **Note:** Serial devices are configured by default as system console devices. If the problem remains, call for service.

Software problems

Symptom	Suggested action
You suspect a software problem.	To determine whether the problem is caused by the software, make sure that: • Your server has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. 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 (startable DOS media will not work on your server). • Other software works on your server. If you received any error messages when using the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem. If the problem remains, contact your place of purchase of the software.

Universal Serial Bus device problems

Symptom	Suggested action
A USB device does not work.	Verify that the correct USB device driver is installed. If the problem remains, call for service.

USB keyboard, mouse, or pointing-device problems

Symptom	Suggested action
All or some keys on the keyboard do not work.	• Make sure that the keyboard USB cable is correctly connected to the server. • Try using another keyboard. 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 correctly connected to the server. • Try using another mouse or pointing device. If the problem remains, call for service.

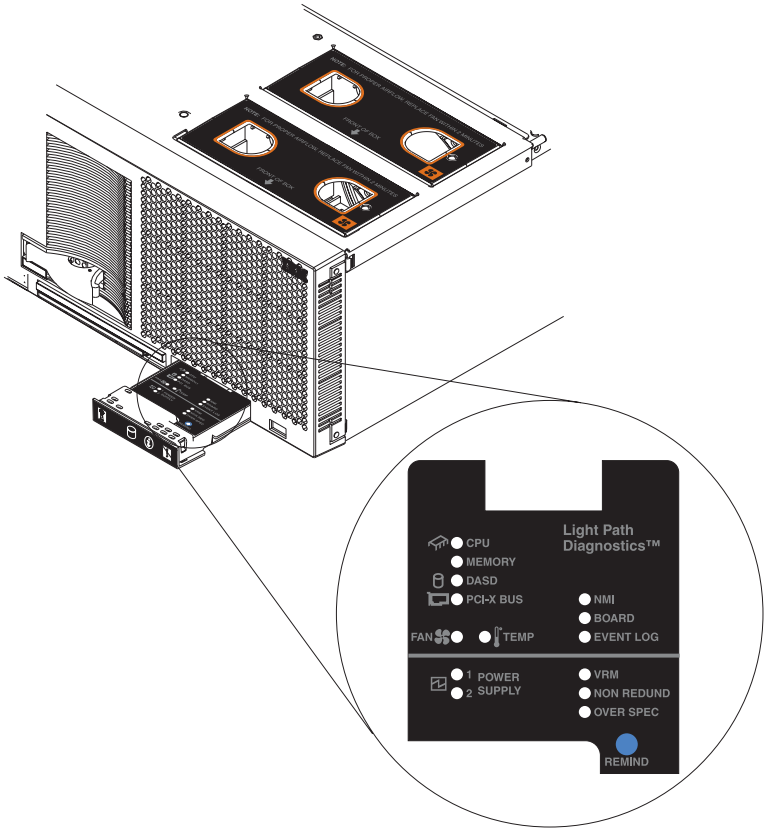
Light path diagnostics

Use light path diagnostics to diagnose system errors. The light path diagnostics panel is inside the light path diagnostics drawer, on the right front of the server. To access the light path diagnostics panel, press on the front of the light path diagnostics drawer.

To acknowledge a system error but not take immediate action, press the REMIND button and place light path diagnostics in Remind mode. The system-error LED flashes in Remind mode. If a new failure occurs, the system-error LED is lit again.

The following illustration shows the LEDs on the light path diagnostics panel. See “Diagnosing problems using light path diagnostics” on page 57 for information about

diagnosing problems using these LEDs.



Diagnosing problems using light path diagnostics

LEDs in three locations on the server are available to help you diagnose problems that might occur during installation. Use them in the following order:

1. **Light path diagnostics panel** - Look at this panel first. If a system error has occurred, the system-error LED on the front of the light path diagnostics drawer is lit. Press on the front of the light path diagnostics drawer to access the light path diagnostics panel. Note any LEDs that are lit, and then close the drawer.
2. **LEDs on the top of the server** - Slide the server out of the rack cabinet. There are six LEDs and a system service label in the center of the top cover. The numbers beside the LEDs correspond to numbers on the system service label. Note the lit LEDs and follow the instructions in the corresponding numbered blocks on the label.
3. **LEDs on the system boards** - To identify the component that is causing the error, note the lit LED beside the component.

The following example illustrates how to use light path diagnostics to diagnose a system error:

1. Note that the CPU LED on the light path diagnostics panel is lit.
2. Note that LED 2 on the top of the server is lit. The instructions on the system service label corresponding to LED 2 indicate that one of the microprocessors is defective. Follow the instructions on the label to remove the processor board.
3. Press and hold the switch on the circuit board until you locate the lit LED beside the defective microprocessor.
4. Follow the instructions in the *Option Installation Guide* on the IBM *xSeries Documentation* CD to remove and replace the microprocessor.

Light path diagnostics LEDs

The following table lists the LEDs on the light path diagnostics panel, the problems that they indicate, and actions to solve the problems.

Table 4. Light path diagnostics

LED	Problem	Action
None	An error has occurred and cannot be diagnosed, or the ASM processor has failed. The error is not represented by a Light Path Diagnostic LED.	Check the system error log for more information about the error.
CPU	A microprocessor has failed.	• Check the microprocessor failure LEDs on the system board. **Note:** If you have installed more than one microprocessor, check the reverse side of the processor board for lit microprocessor failure LEDs. • If a microprocessor error LED is lit, make sure that the microprocessor is installed correctly. See “Installing and replacing a microprocessor and power module” on page 13 for installation instructions. If the problem remains, call for service.
MEMORY	A memory error occurred.	• Check the DIMM failure LEDs on the memory board. • Replace the DIMM indicated by the lit DIMM failure LED.
DASD	A hard disk drive error occurred.	Check the LEDs on the hard disk drives and replace the indicated drive.
PCI-X BUS	An error occurred on a PCI bus.	• Check the error log for additional information. • If you cannot isolate the failing adapter from the information in the 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. A failing fan can also cause the TEMP LED to be lit.	Check the LEDs on the fans and replace the indicated fan.
TEMP	The system temperature has exceeded a threshold level.	• Determine whether a fan has failed. If it has, replace it. • Make sure that air vents are not blocked. • Make sure that the room temperature is not too high. (See “Features and specifications” on page 4 for temperature information.) If the problem remains, call for service.
NMI	A machine check abort error has occurred.	Check the error log to identify the condition.

Table 4. Light path diagnostics (continued)

LED	Problem	Action
BOARD	A system board has failed.	• Check the LEDs on the top of the server to determine which of the boards failed. • Remove ac power from the server; then, reconnect the server to ac power and restart the server. If the problem remains, call for service.
EVENT LOG	A system warning has occurred.	Check the error log to diagnose the condition.
PS1 and PS2	The indicated power supply has failed.	Replace the power supply. If the problem remains, call for service.
VRM	One of the VRMs has failed.	• Remove ac power from the server; then, reconnect the server to ac power and restart the server. • Check the error log for additional information. If the problem remains, call for service.
NON REDUND	The power supplies are no longer redundant, or a power supply has failed.	• Determine whether a power supply has failed. If it has, replace it. • Use a higher voltage ac power source, or remove optional devices from the server until redundancy is restored, if redundancy is required.
OVER SPEC	The power supplies are using more power than the maximum rating.	Replace the failed power supply, or remove optional devices from the server.

Chapter 6. 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 A. 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 455

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
All	Parts - 3 years, labor - 3 years	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 B. 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.

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

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

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product, and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Edition notice

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries, or both:

Active Memory
Active PCI
Active PCI-X
Alert on LAN
C2T Interconnect
Chipkill
EtherJet
e-business logo
@server
FlashCopy
IBM
IntelliStation
NetBAY
Netfinity
NetView
OS/2 WARP
Predictive Failure Analysis
PS/2
ServeRAID
ServerGuide
ServerProven
TechConnect
ThinkPad
Tivoli
Tivoli Enterprise
Update Connector
Wake on LAN
XA-32
XA-64
X-Architecture
XceL4
XpandOnDemand
xSeries

Lotus, Lotus Notes, SmartSuite, and Domino are trademarks of Lotus Development Corporation and/or IBM Corporation in the United States, other countries, or both.

Intel, MMX, and Pentium are trademarks of Intel Corporation in the United States, other countries, or both.

Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Java and all Java-based trademarks and logos are trademarks or registered trademarks of Sun Microsystems, Inc. in the United States, other countries, or both.

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 causedby 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

IBM power cord part number	Used in these countries and regions
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
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

Index

R

S

T

U

V

W

Part Number: 88P9197

Printed in U.S.A.

(1P) P/N: 88P9197