



xSeries 235 Type 8671

Installation Guide

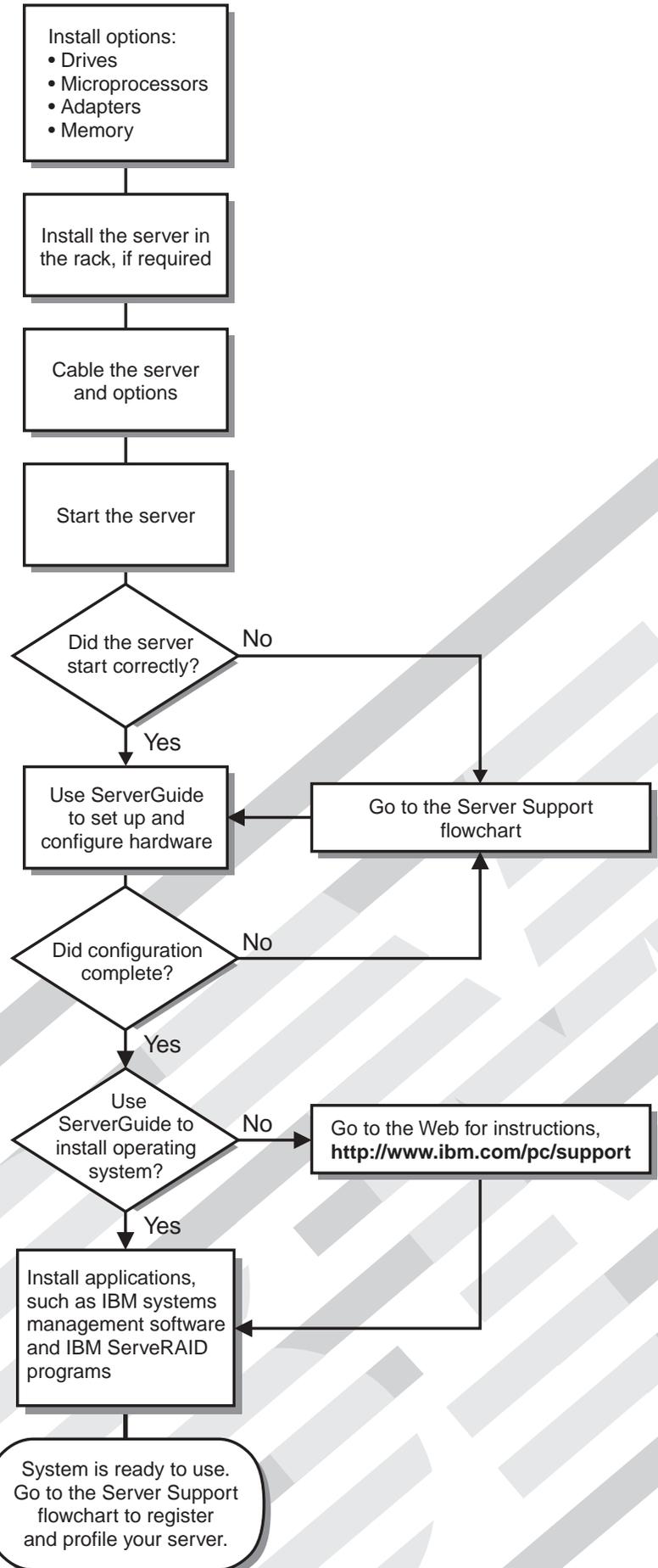
Welcome...

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.

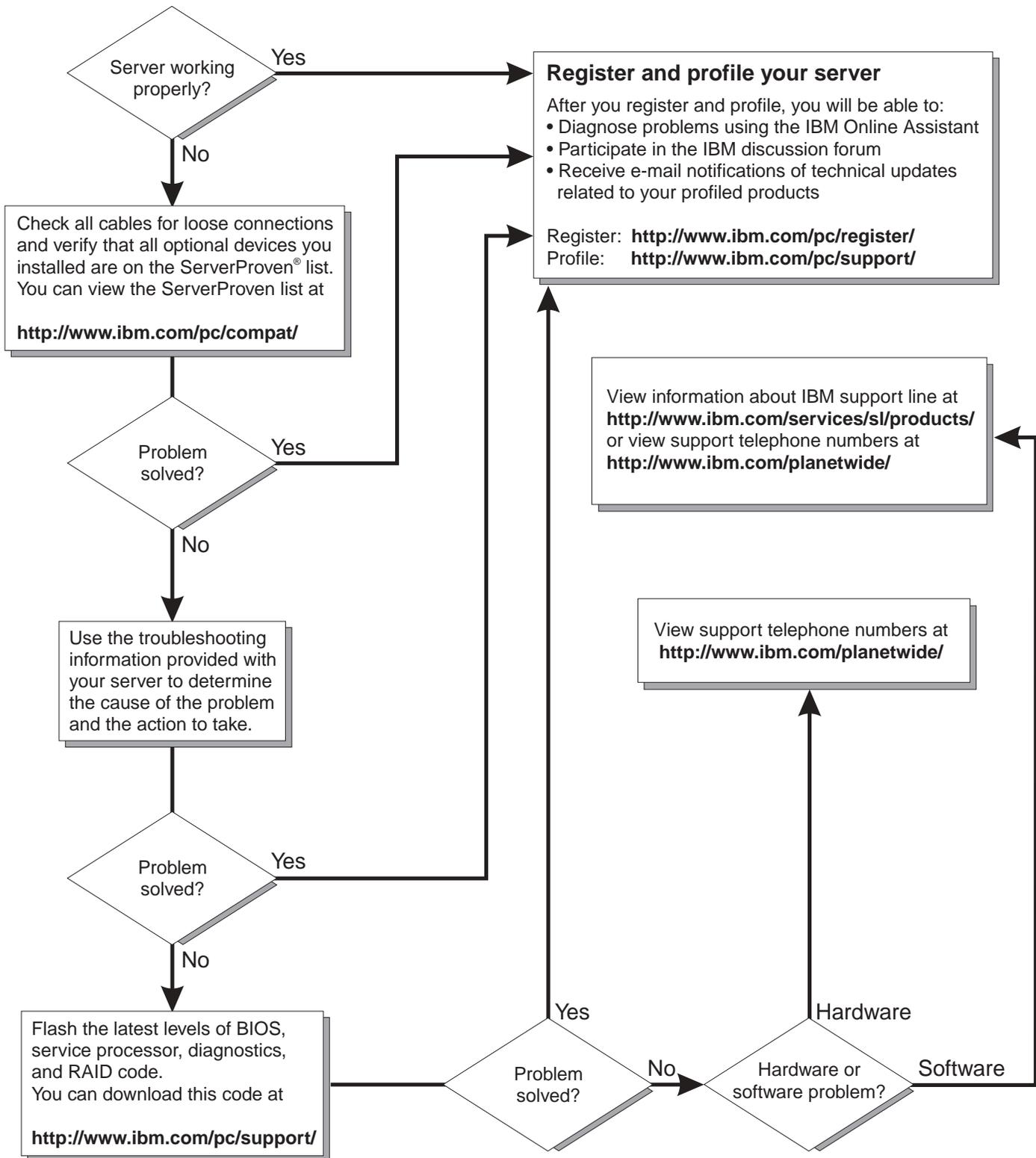
This server *Installation Guide* contains information for setting up and configuring your server.

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



IBM xSeries 235 Type 8671



Installation Guide

Note:

Before using this information and the product it supports, be sure to read the general information in Appendix B, "Warranty information", on page 73 and Appendix C, "Notices", on page 85.

Third Edition (January 2003)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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 pečítajte 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



<p>Danger</p> <p>Electrical current from power, telephone, and communication cables is hazardous.</p> <p>To avoid a shock hazard:</p> <ul style="list-style-type: none">• 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.
--

<p>To connect:</p> <ol style="list-style-type: none">1. Turn everything OFF.2. First, attach all cables to devices.3. Attach signal cables to connectors.4. Attach power cords to outlet.5. Turn device ON.	<p>To disconnect:</p> <ol style="list-style-type: none">1. Turn everything OFF.2. First, remove power cords from outlet.3. Remove signal cables from connectors.4. Remove all cables from devices.
---	---

Statement 2



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

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

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

Statement 3



CAUTION:

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

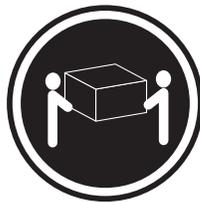
- Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.
- Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation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



Danger

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

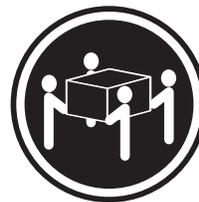
Statement 4



≥18 kg (39.7 lb)



≥32 kg (70.5 lb)



≥55 kg (121.2 lb)

CAUTION:

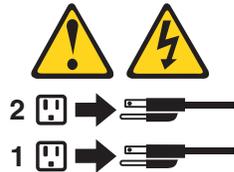
Use safe practices when lifting.

Statement 5



CAUTION:

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



Statement 8



CAUTION:

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



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

Statement 10



CAUTION:

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



>82 kg (180 lb)

Statement 13



DANGER:

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

Statement 14



CAUTION:

Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the following label is attached.



Statement 15



CAUTION:

Make sure that the rack is secured properly to avoid tipping when the server unit is extended.

Statement 16



CAUTION:

Some accessory or option board outputs exceed Class 2 or limited power source limits and must be installed with appropriate interconnecting cabling in accordance with the national electric code.

Statement 17



CAUTION:

The following label indicates moving parts nearby.



Chapter 1. Introduction

Thank you for purchasing an IBM® eServer xSeries™ 235 Type 8671 server. Your server is based on the IBM X-Architecture™ technology; it features superior performance, availability, and scalability.

This *Installation Guide* provides the information that is needed to:

- Set up and cable your server
- Start and configure your server
- Install your network operating system (NOS)

Packaged with this *Installation Guide* are software CDs that help you configure hardware, install device drivers, and install the network operating system (NOS).

Also included is an IBM *xSeries Documentation* CD that provides detailed information about this server.

If you have access to the Internet, you can obtain up-to-date information about your server model and other IBM server products at <http://www.ibm.com/pc/us/eserver/xseries/> on the World Wide Web.

For rack configurations, see the *Rack Installation Instructions* provided on the IBM *xSeries Documentation* CD for complete installation and removal instructions.

Record your product information in this table.	
Product name	_____
Machine type	_____
Model number	_____
Serial number	_____

Your server serial number and model number are on labels on the bottom of the server and on the front, visible through the bezel. You will need these numbers when you register your server with IBM. The information label containing the serial number, machine type, model number, and agency marks for your server is located as follows:

- **Tower model:** On the bottom of the server
- **Rack configuration:** On the side of the server

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

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 Ctrl+F to use the Acrobat search function within the book.

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

Features and specifications

Table 1 provides a summary of the features and specifications for your server.

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> Intel Xeon™, 1.8 GHz or higher depending on server model 512 KB (minimum) Level-2 cache 400 MHz or 533 MHz front-side bus (FSB) depending on server model Support for up to two microprocessors <p>Note: You can use the Configuration/Setup program in your server to determine the specific type of microprocessor on your system board.</p> <p>Memory:</p> <ul style="list-style-type: none"> Standard: 256 MB or 512 MB, depending on server model, expandable to 6 GB Type: 133 MHz/266 MHz, registered, ECC, double data rate, SDRAM Sizes: 128 MB, 256 MB, 512 MB, or 1 GB, in pairs Connectors: two-way interleaved, six dual inline memory module (DIMM) connectors Maximum: Three pairs of DIMMs <p>Drives standard:</p> <ul style="list-style-type: none"> Diskette: 1.44 MB CD-ROM: IDE <p>Expansion bays:</p> <ul style="list-style-type: none"> Six open hot-swap, slim-high, 3.5-inch drive bays Three 5.25-inch bays (CD-ROM drive installed in one bay) One 3.5-inch removable-media drive bay (diskette drive installed) <p>PCI expansion slots:</p> <ul style="list-style-type: none"> Two Active PCI-X™ (hot-plug) 133 MHz/64-bit Three PCI-X non-hot-plug 100 MHz/64-bit One PCI non-hot-plug, 33 MHz/32-bit <p>Upgradeable microcode: BIOS, diagnostics, and IBM integrated system management upgrades (when available) can update EEPROMs on the system board</p>	<p>Predictive Failure Analysis® (PFA) alerts:</p> <ul style="list-style-type: none"> Power supplies Fans Memory Hard disk drives Microprocessors Voltage regulator modules (VRMs) <p>Integrated functions:</p> <ul style="list-style-type: none"> IBM integrated system management processor (ISMP) <ul style="list-style-type: none"> Service processor with Light Path Diagnostics™ RS-485 (ASM interconnect) Support for IBM Remote Supervisor Adapter Broadcom 5703 10/100/1000 Ethernet controller (one port, controller on system board) One serial port One parallel port Two internal Ultra320 SCSI ports (dual-channel integrated SCSI controller with RAID capabilities on the system board) Three Universal Serial Bus (USB) v1.1 ports (one on the front and two on the rear of the enclosure) Keyboard port Mouse port ATI Rage XL video (controller on system board) <ul style="list-style-type: none"> Compatible with SVGA and VGA 8 MB video memory <p>Security features:</p> <ul style="list-style-type: none"> Door and side cover lock Power-on and administrator passwords Remote-control security settings Selectable drive startup Keyboard password System-management security <ul style="list-style-type: none"> User login password Read-only or read/write access Dial-in call-back <p>Power supplies:</p> <ul style="list-style-type: none"> Hot-swap (some models) <ul style="list-style-type: none"> Standard: Two 560 watts (115-230 V ac) for redundancy Redundant/nonredundant indicator on diagnostic LED panel Non-hot-swap (some models) <ul style="list-style-type: none"> Standard: One 560 watts (115-230 V ac) Upgradeable to two hot-swap power supplies 	<p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> Sound power, idle: 6.5 bel Sound power, operating: 6.5 bel Bystander sound pressure, idle: 49 dBA Bystander sound pressure, operating: 49 dBA <p>Redundant cooling: Six hot-swap fans</p> <p>Electrical input:</p> <ul style="list-style-type: none"> Sine-wave input (50-60 Hz) required Input voltage range automatically selected Input voltage low range: <ul style="list-style-type: none"> Minimum: 100 V ac Maximum: 127 V ac Input voltage high range: <ul style="list-style-type: none"> Minimum: 200 V ac Maximum: 240 V ac Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> Minimum: 0.1 kVA Maximum: 0.8 kVA <p>Power available for drives:</p> <ul style="list-style-type: none"> +5 V dc +12 V dc <p>Heat output: Approximate heat output in British thermal units (Btu) per hour</p> <ul style="list-style-type: none"> Minimum configuration: 341 Btu (100 watts/hour) Maximum configuration: 2600 Btu (760 watts/hour) <p>Environment:</p> <ul style="list-style-type: none"> Air temperature: <ul style="list-style-type: none"> Server on: 10° to 35°C (50° to 95°F) Altitude: 0 to 2134 m (7000 ft) Server off: -40° to +60°C (-40° to 140°F) Maximum altitude: 2133 m (7000 ft) Humidity: <ul style="list-style-type: none"> Server on: 8% to 80% Server off: 8% to 80% <p>Size (tower model):</p> <ul style="list-style-type: none"> Height: 440 mm (17.3 in.) Depth: 700 mm (27.5 in.) Width: 221 mm (8.7 in.) Weight: 33.5 kg (74 lb) to 45.8 kg (101 lb) depending upon configuration <p>Size (5 U) (rack configuration):</p> <ul style="list-style-type: none"> Height: 216 mm (8.5 in.) Depth: 674 mm (26.5 in.) Width: 440 mm (17.3 in.) Weight: 33.5 kg (74 lb) to 45.8 kg (101 lb) depending upon configuration
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Notices and statements in this book

The caution and danger statements used in this book also appear in the multilingual *Safety Information* book provided on the IBM *xSeries Documentation* CD. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety book.

The following types of notices and statements are used in this book:

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

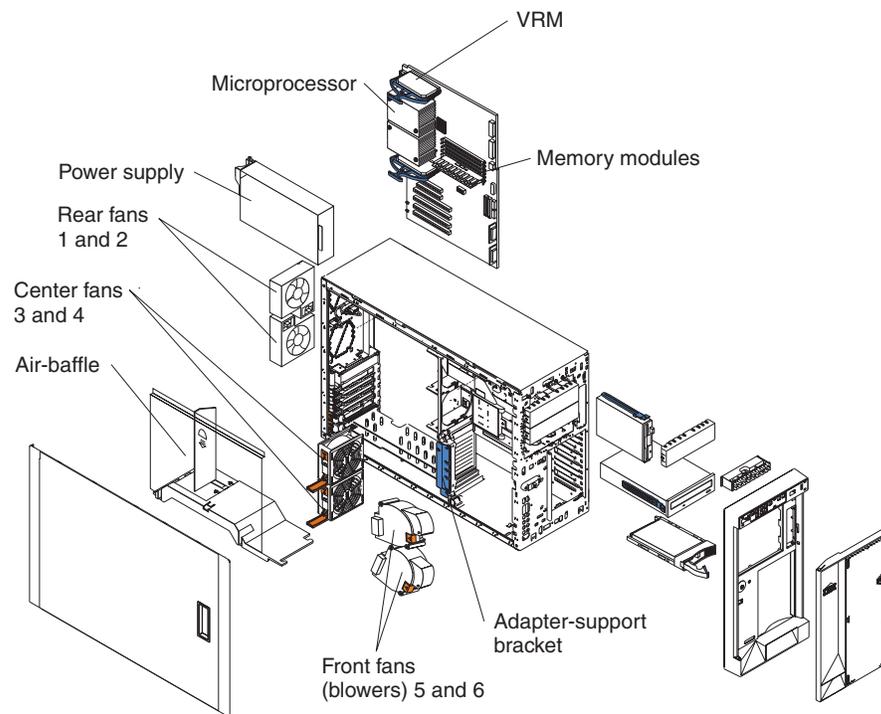
Major components of your server

The orange color on components and labels in your server identifies hot-swap or hot-plug components. You can install or remove hot-swap and hot-plug components while the system is running, provided that your system is configured to support this function. For complete details about installing or removing a hot-swap or hot-plug component, see the detailed information in Chapter 2, “Installing options”, on page 11.

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 major components in the server.

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

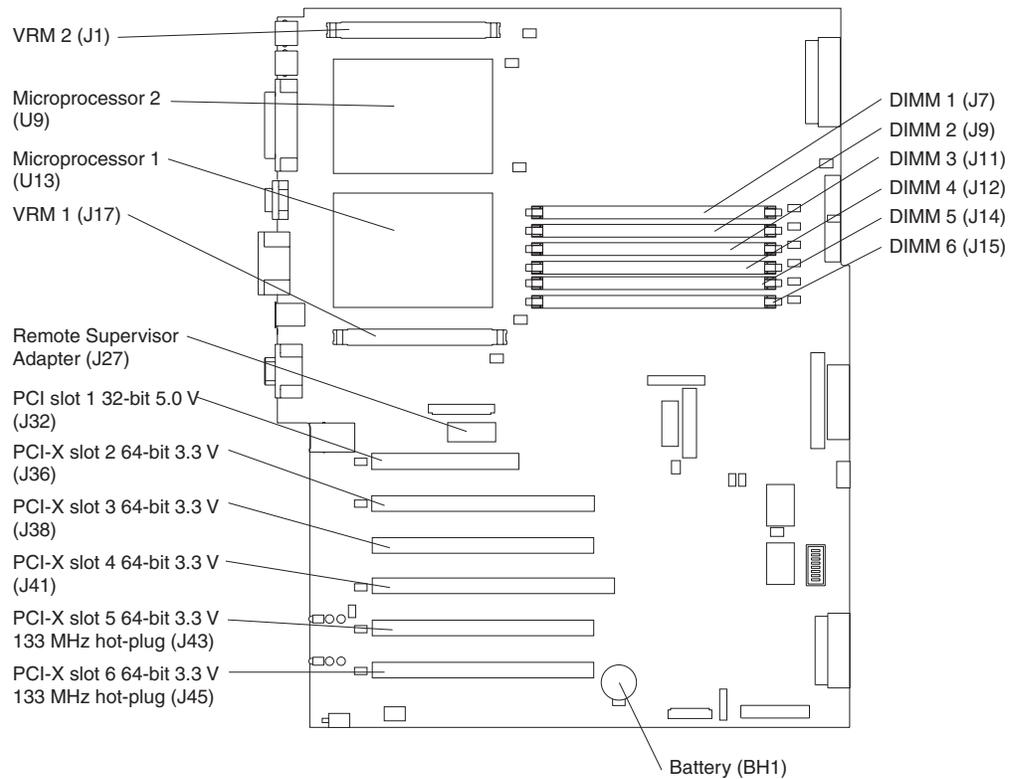


System-board component locations

This section provides illustrations of the system board showing the locations of connectors, switch and jumper blocks, and LEDs.

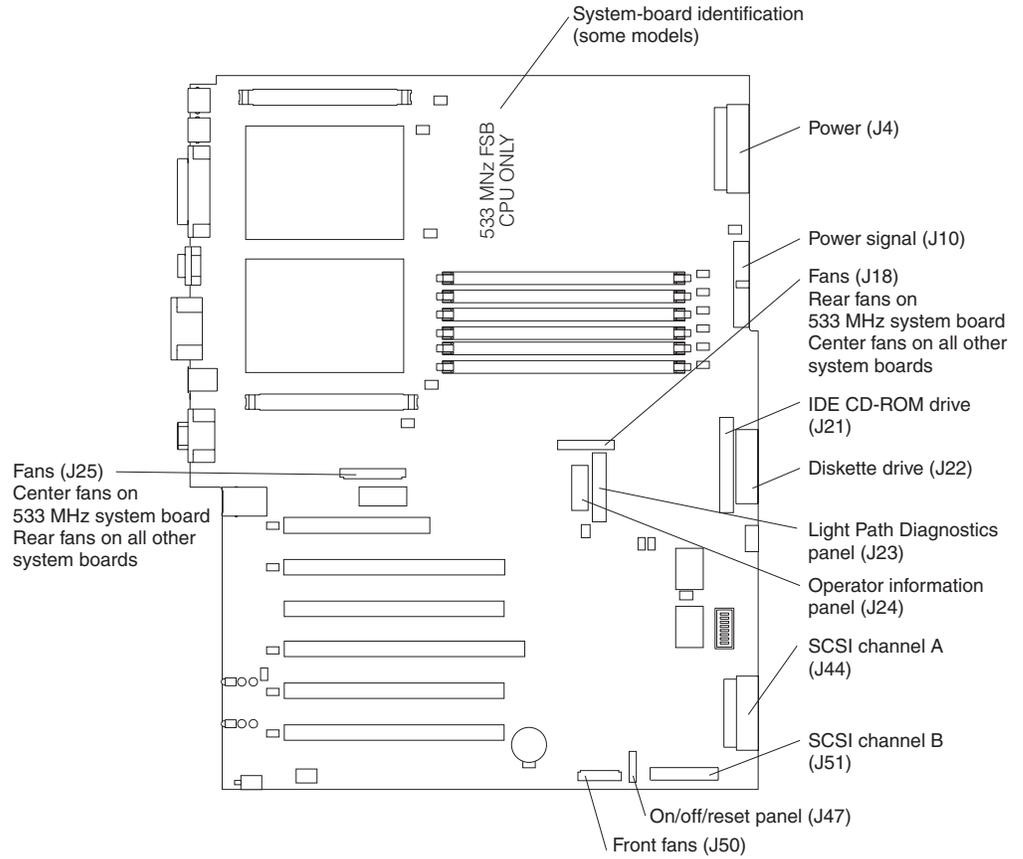
System-board option connectors

The following illustration shows the system-board connectors for user-installable options.



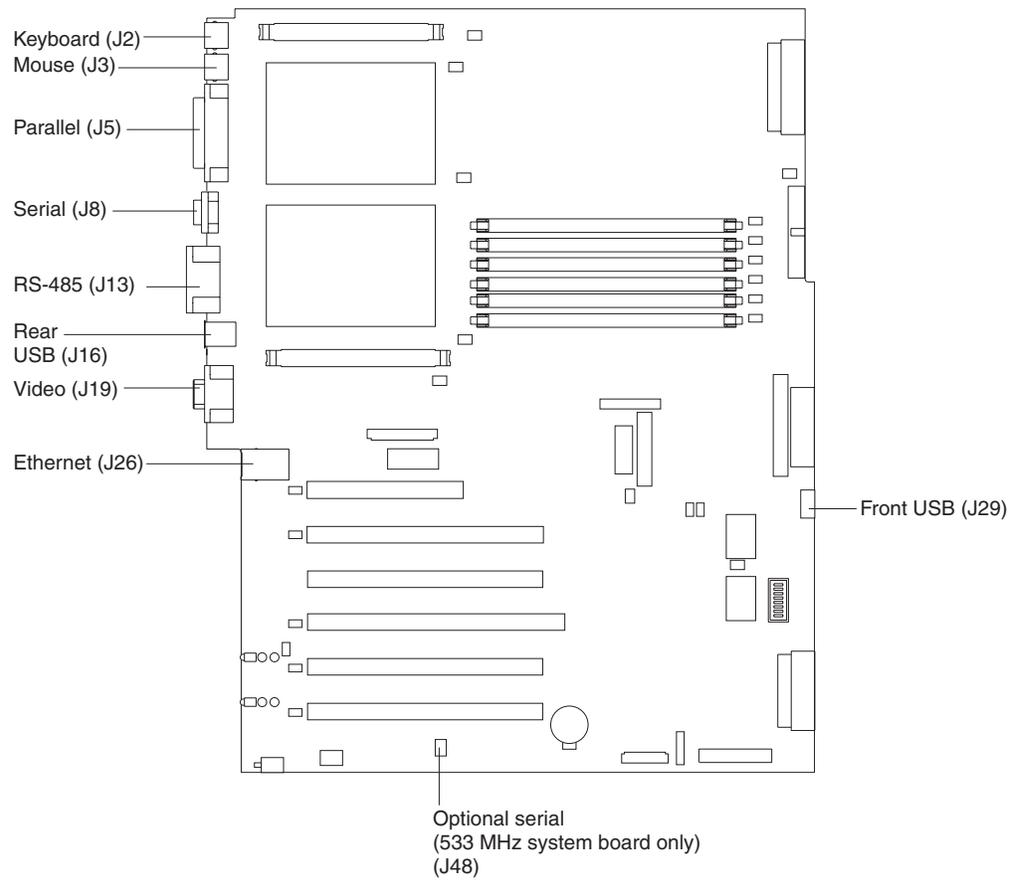
System-board internal cable connectors

The following illustration shows the internal cable connectors on the system board.



System-board external port connectors

The following illustration shows the input/output external port connectors on the system board.



System-board switches and jumpers

The following illustration shows the system-board switch block (SW1) and jumper blocks (J28 and J42) on the system board.

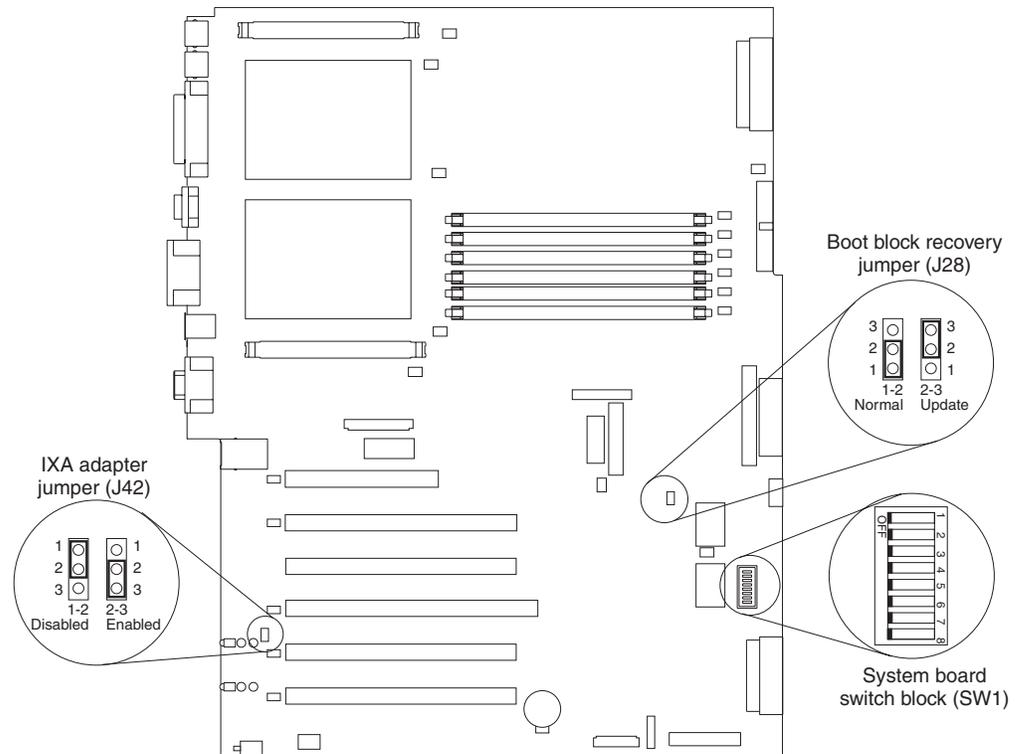


Table 2 describes the function of each switch on the switch block.

Table 2. Switches 1-8

Switch number	Default value	Switch description
8	Off	400 MHz system board - Reserved. 533 MHz system board - Disable Wake on LAN after ac power-on.
7	Off	Power-on override. When toggled to On, this switch forces the server to turn on, overriding the power-on button.
6	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Configuration/Setup Utility program so that you can change or delete the power-on password. You do not need to move the switch back to the default position after the password is overridden. Changing the position of this switch does not affect the administrator password check, if an administrator password is set. See the <i>User's Guide</i> on the IBM xSeries Documentation CD for additional information about the power-on password.
5	Off	Reserved.
4	Off	Reserved.
3	Off	Reserved.
2	Off	Reserved.

Table 2. Switches 1-8 (continued)

Switch number	Default value	Switch description
1	Off	Reserved.

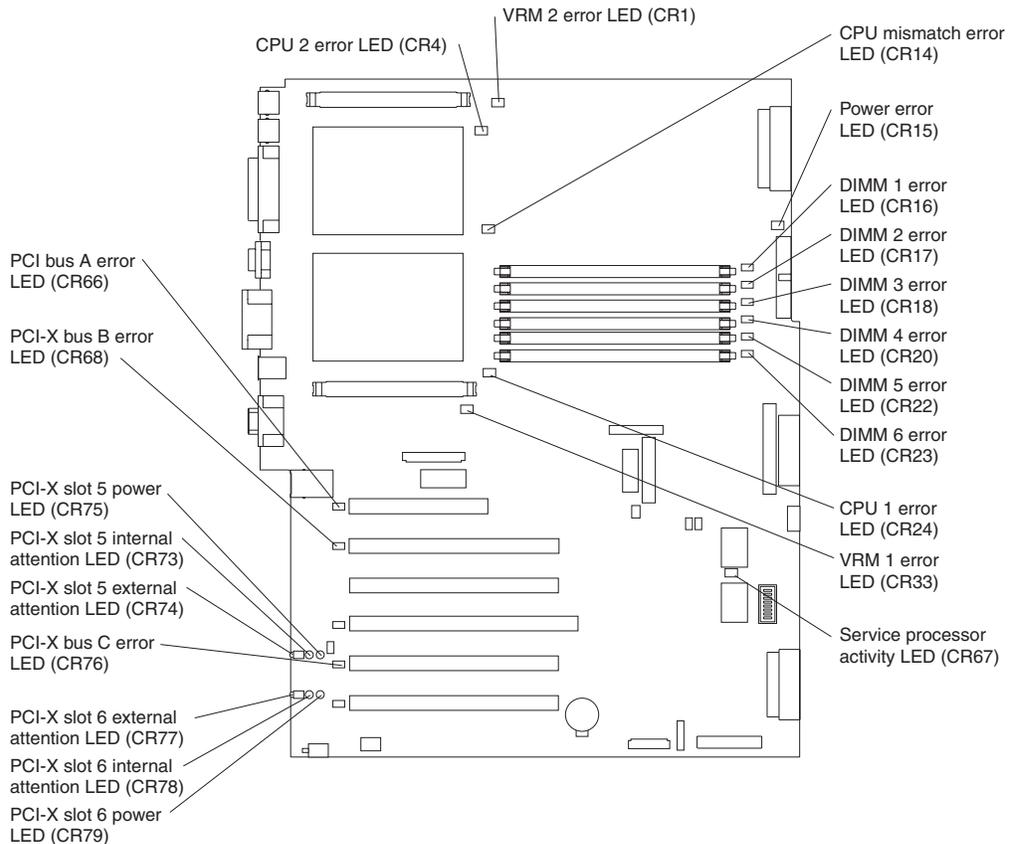
CAUTION:

Before changing any switch settings or moving any jumpers, make sure that the server is turned off and that all power cords and external cables are disconnected.

Note: Any system-board switch or jumper blocks that are not shown in the illustrations in this book are reserved.

System-board LED locations

The following illustration shows the LEDs on the system board. You might need to refer to this illustration when solving problems with the server.



Chapter 2. Installing options

This chapter provides the basic information needed to install options in your server. This section is for all users, but it is written with the experienced user in mind. If you need more detailed installation information, see the *Option Installation Guide* on the IBM *xSeries Documentation CD*.

If you have no options to install, continue with “Cabling the server” on page 40.

Installation guidelines

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

- Become familiar with the information provided in “Safety” on page v and “Handling static-sensitive devices” on page 12. These guidelines will help you work safely while working with your server options.
- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap drives, hot-swap fans, Active PCI™ (hot-plug) adapters, or hot-plug Universal Serial Bus (USB) devices.
- The orange color on components and labels in your server identifies hot-swap or hot-plug component. You can install or remove hot-swap and hot-plug components while the system is running, provided that your system is configured to support this function. For complete details about installing or removing a hot-swap or hot-plug component, see the detailed information in this chapter.
- The blue color on components and labels identifies touch points where you can grip a component, move a latch, and so on.
- 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.
- For a list of supported options for your server, go to <http://www.ibm.com/pc/us/compat/> on the World Wide Web.

System reliability considerations

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

- Each of the drive bays has either a drive or a filler panel installed.
- Each of the power supply-bays has a power supply installed.
- For tower models, make sure that there is at least 50 mm (2 inches) of ventilated space at the sides of the server and 100 mm (4 inches) at the front and rear of the server.

For rack configurations, make sure that space is available around the server to enable the server cooling system to work properly. See the documentation that comes with the rack for additional information.

- The server cover is in place during normal operation.
- The air-baffle cover over the microprocessors remains closed during normal operation.
- A removed hot-swap drive is replaced within 2 minutes of removal.
- Cables for optional adapters are routed according to the instructions provided with the adapters.
- A failed fan is replaced within 48 hours.
- The server is turned off and the power cords are disconnected before you open the air-baffle cover.

- The air-baffle assembly is always installed in the server except when you are installing or removing the components that are under the air-baffle cover.
- When the air-baffle assembly is installed in the server, the air-baffle cover is always closed.
- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor.

Working inside the server with the power on

Your server supports hot-plug, hot-add, and hot-swap devices and is designed to operate safely while 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, necklaces, rings, 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 and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

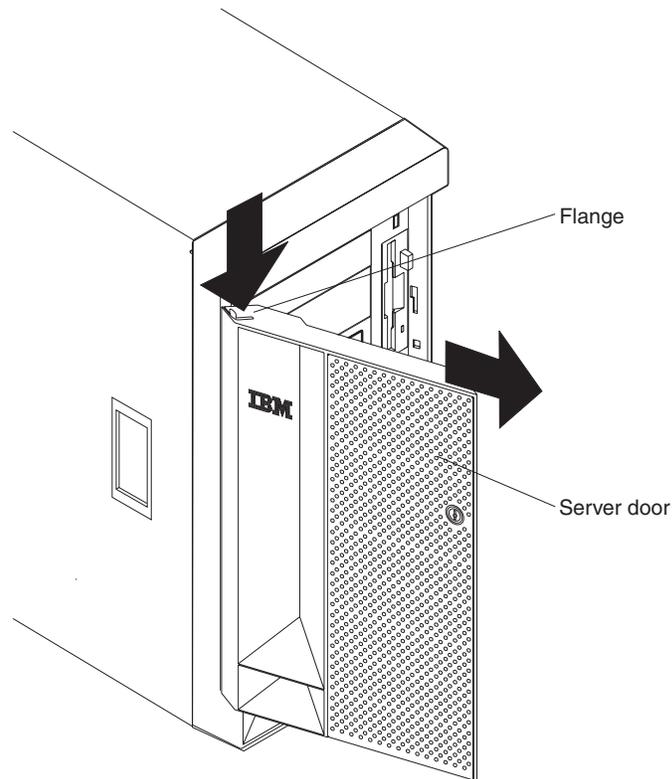
To reduce the possibility of electrostatic discharge, observe the following precautions:

- 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 possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the server for at least 2 seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on your server cover or on a metal surface.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Removing the server door (tower model)

The following illustration shows how to remove the door from the tower model server.

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



Complete the following steps to remove the server door:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Unlock and open the server door.
3. Locate the flange on the top edge of the door.
4. Press the flange downward while pressing outward on the door; then, lift the door up and off the hinge. Set the door aside in a safe place.

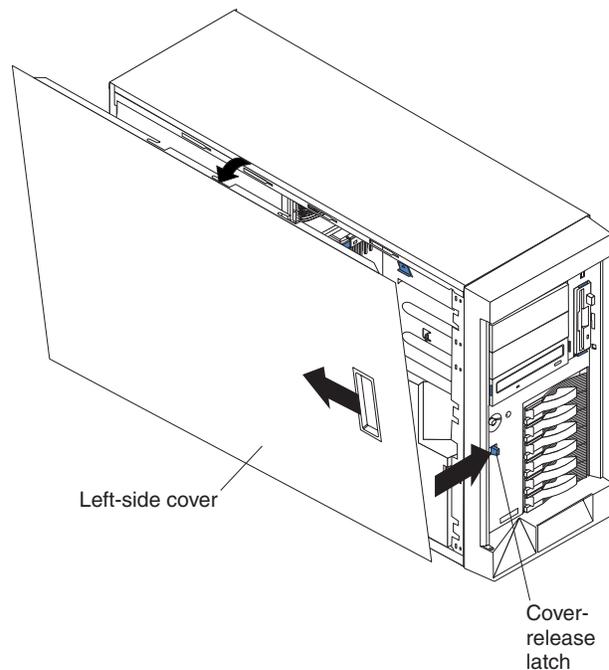
Removing the server left-side cover and bezel (tower model)

This section describes how to remove the left-side cover and bezel from the tower model server.

Removing the left-side cover

The following illustration shows how to remove the left-side cover from the tower model server.

Note: If you have not already removed the door, remove it as described in “Removing the server door (tower model)” on page 13.



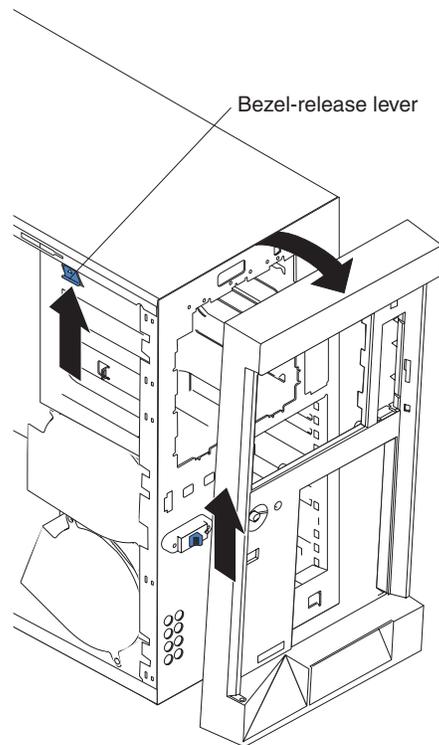
Complete the following steps to remove the server left-side cover:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Push the plastic cover-release latch near the edge of the left-side cover to the right to release the cover.
3. While pushing the plastic cover-release latch, slide the left-side cover slightly toward the rear of the server; the cover will stop after approximately 25 mm (1 inch). Lift the cover off the server and set the cover aside.

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

Removing the bezel

The following illustration shows how to remove the bezel from the tower model server.



Complete the following steps to remove the bezel:

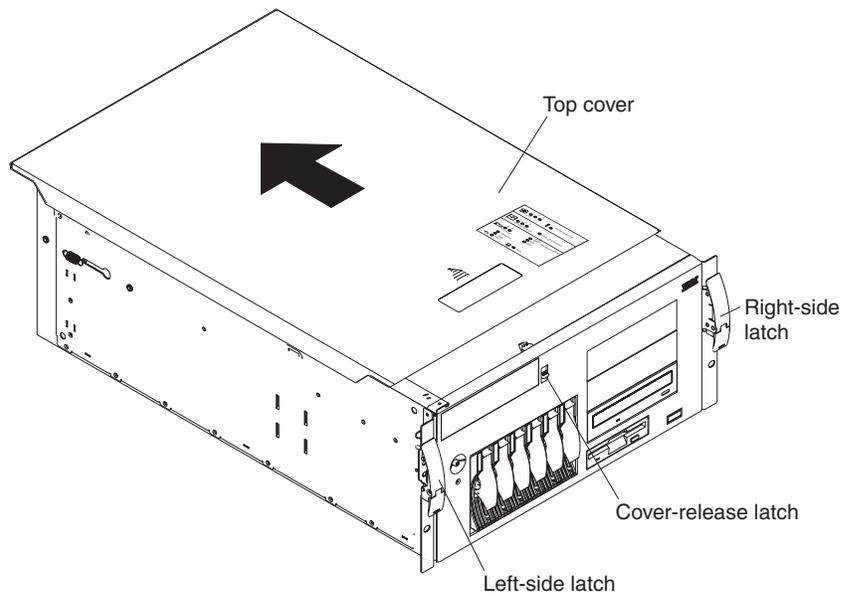
1. Remove the server cover and locate the bezel-release lever.
2. Press up on the bezel-release lever.
3. Pull the top of the bezel away from the chassis; then, lift the bezel to disengage the bottom tabs.
4. Remove the bezel from the server and store the bezel in a safe place.

Removing the server top cover and bezel (rack configuration)

This section describes how to remove the top cover and bezel from the rack configuration server.

Removing the top cover

The following illustration shows how to remove the top cover from a rack configuration server.



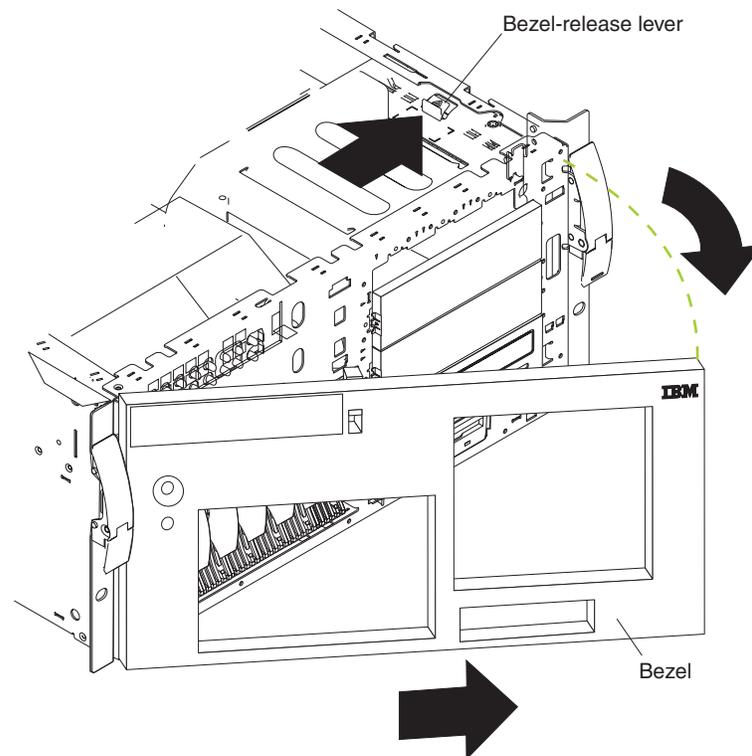
Complete the following steps to remove the server top cover:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Press down on the plastic cover-release latch on the front of the server.
3. While pressing the plastic cover-release latch, slide the top cover slightly toward the rear of the server; the cover will stop after approximately 25 mm (1 inch). Lift the cover off the server and set the cover aside.

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

Removing the bezel

The following illustration shows how to remove the bezel from a rack configuration server.



Complete the following steps to remove the bezel:

1. Remove the server cover and locate the bezel-release lever.
2. Press the bezel-release lever to the unlocked position as indicated on the lever.
3. Pull the right side of the bezel away from the chassis; then, slide the bezel to the right to disengage the tabs.
4. Remove the bezel from the server and store the bezel in a safe place.

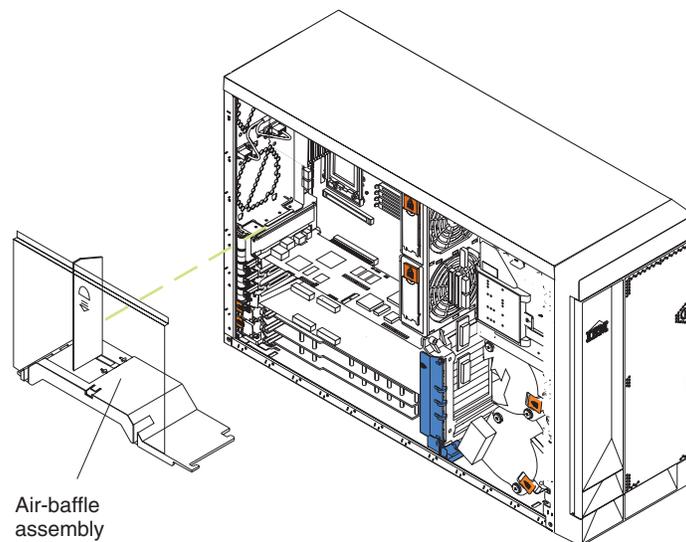
Removing and installing the adapter-support bracket

You might need to remove the adapter-support bracket to access certain components or connectors on the system board.

Note: The adapter-support bracket is attached to the center-fan bracket in the server. Both brackets are removed and installed together as a single unit.

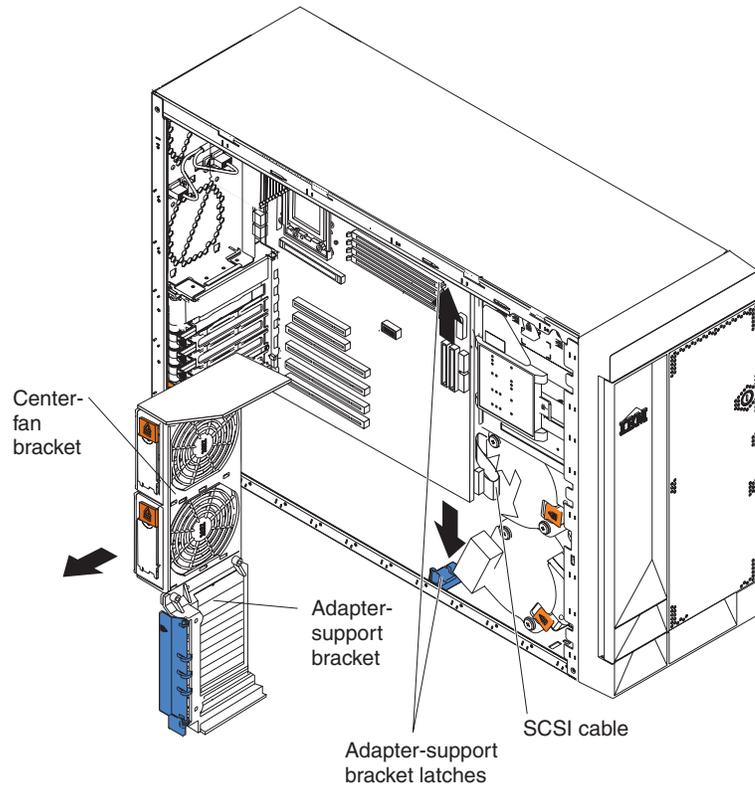
Complete the following steps to remove the adapter-support bracket:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 14 or “Removing the server top cover and bezel (rack configuration)” on page 16).
3. Slide the air-baffle assembly out of the guides; then, remove it from the server.



4. If any cables are connected to the full-length adapters, disconnect those cables.
5. Lift the adapter-retention clip on top of the adapter-support bracket; then, remove the full-length adapters and plastic dividers.
6. Disconnect the end of the cable that is attached to the center-fans connector on the system board. See “System-board internal cable connectors” on page 7 for the location of the center-fans connector.

7. Remove the adapter-support bracket.



- a. Press the release tab on each side of the adapter-support bracket and fan-support bracket unit.
- b. Slide the adapter-support bracket and fan-support bracket unit out of the guides; then, remove it from the server.

Note: To reinstall the adapter-support bracket and other components that you removed or disconnected, reverse the preceding steps. Remember to reroute the cables that you disconnected and to reconnect the center-fans cable to the system board. See “System-board internal cable connectors” on page 7 for the location of the center-fans connector.

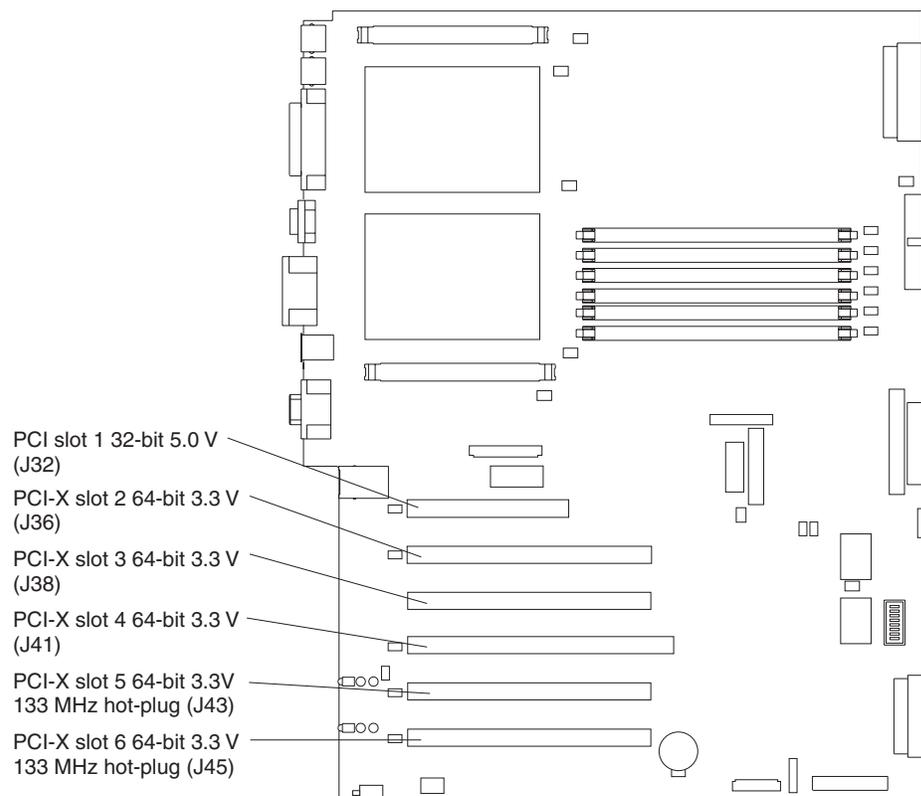
8. Continue with the option installation or removal procedure.

Working with adapters

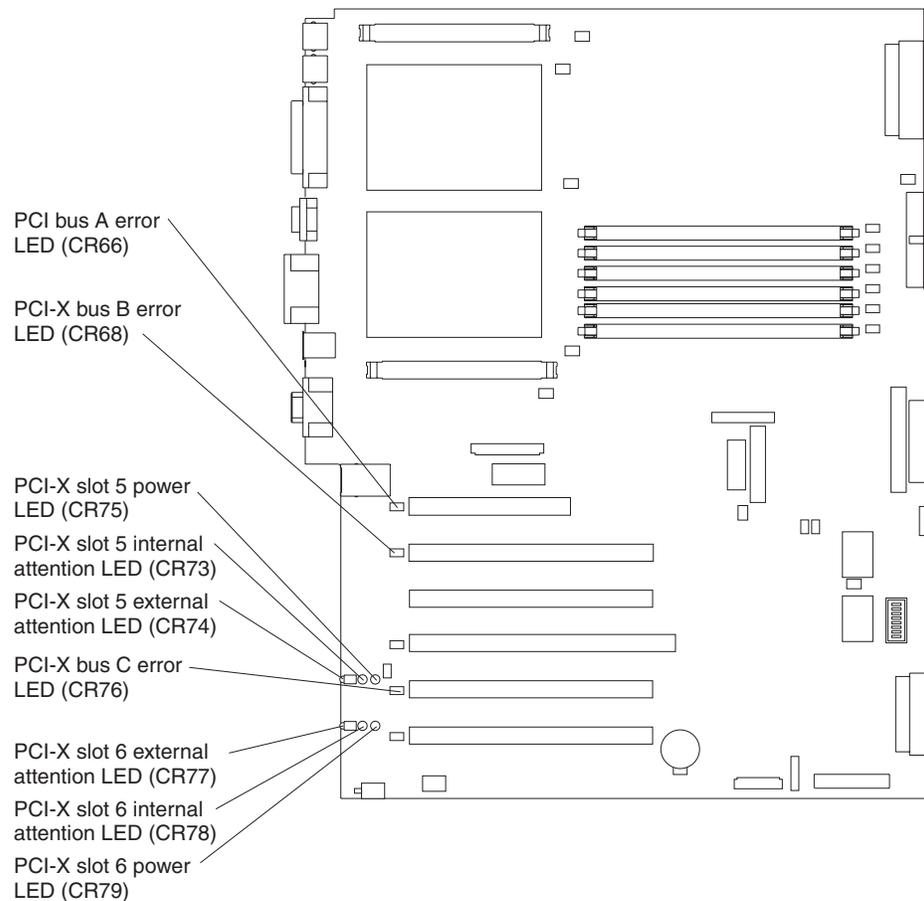
This section describes how to install hot-plug and non-hot-plug PCI and PCI-X adapters. Before you continue with the adapter-installation procedures, review “Adapter considerations” on page 21.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see “Handling static-sensitive devices” on page 12.

The following illustration shows the PCI and PCI-X adapter expansion slots on the system board. Slots 5 and 6 are the Active PCI-X slots. Active PCI-X slots are also called hot-plug PCI-X slots.



Note: See the *Hardware Maintenance Manual and Troubleshooting Guide* on the *IBM xSeries Documentation CD* for additional information about the power-on and attention LEDs.



Adapter considerations

Before you install an adapter, review the following information:

- Read the documentation that comes with your operating system.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter.
- You can install full-length adapters and non-hot-plug adapters in any expansion slot.
- The 32-bit PCI slot supports 5.0 V signaling PCI adapters; it does not support 3.3 V signaling adapters.
- The 64-bit PCI-X slots 2 through 6 support 3.3 V signaling PCI or PCI-X adapters; they do not support 5.0 V signaling adapters.
- The PCI bus configuration is:
 - Non-hot-plug, 32-bit PCI slot 1 is on PCI bus A, 33 MHz
 - Non-hot-plug, 64-bit PCI-X slots 2 and 3, and the integrated Ethernet controller, are on PCI bus B, 100 MHz (independent of slot 4)
 - Non-hot-plug, 64-bit PCI-X slot 4 and the integrated SCSI controller with RAID capabilities are on PCI bus B, 100 MHz (independent of slots 2 and 3)
 - Hot-plug, 64-bit PCI-X slot 5 is on PCI bus C, 133 MHz (independent of slot 6)

- Hot-plug, 64-bit PCI-X slot 6 is on PCI bus C, 133 MHz (independent of slot 5)

Notes:

1. PCI bus A is often referred to as bus 0; PCI bus B is often referred to as bus 1 and bus 2; and PCI bus C is often referred to as bus 3 and bus 5. However, the bus numbers vary according to the adapters that are installed.
 2. If an optional ServeRAID-5i controller is installed, it overrides the standard functionality of the integrated SCSI controller with RAID capabilities and forces PCI-X slot 4 to 66 MHz. The ServeRAID-5i controller must be installed in slot 4 using the 3-U bracket that comes with the controller.
 3. The integrated SCSI controller with RAID capabilities is on PCI bus B.
- The optional IBM Remote Supervisor Adapter must be installed in PCI slot 1 only. Use the ribbon cable that comes with the adapter to connect the adapter to the Remote Supervisor Adapter connector (J27) on the system board.
 - The system scans PCI and PCI-X slots 1 through 6 to assign system resources. The system then starts (boots) the system devices in the following order, if you have not changed the default boot precedence: integrated SCSI controller with RAID capabilities (or optional ServeRAID-5i controller), integrated Ethernet controller, and then PCI and PCI-X slots 1 through 6.

Note: To change the boot precedence for PCI and PCI-X devices, start the Configuration/Setup Utility program and select **Start Options** from the main menu. See the *User's Guide* on the IBM *xSeries Documentation* CD for details about using the Configuration/Setup Utility program.

- The Active PCI-X slots contain:
 - Power-on LEDs
 - Internal attention LEDs
 - External attention LEDs

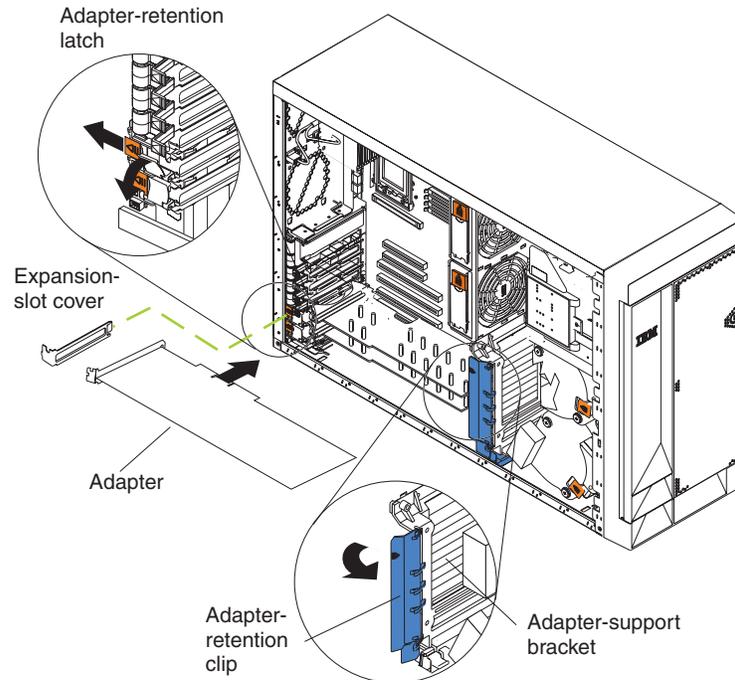
Installing a hot-plug adapter (slots 5 and 6)

This section contains the procedure for installing a hot-plug PCI or PCI-X adapter. If your operating system supports hot-plug PCI or PCI-X adapters, you can replace a failing hot-plug PCI or PCI-X adapter with a new adapter of the same type without turning off power to the server. If your operating system and adapter also support the hot-add feature, you can install a new adapter without turning off the power to the server.

Notes:

1. Although an optional Integrated xSeries Adapter (IXA) can be installed only in slots 5 and 6, it is not a hot-plug adapter. See "Installing a non-hot-plug adapter (any slot)" on page 25 for instructions for installing an IXA adapter.
2. You do not have to turn off the server to install hot-plug adapters in the hot-plug slots. However, you must turn off the server when performing any steps that involve installing or removing cables.

The following illustration shows how to install a PCI or PCI-X hot-plug adapter.



Complete the following steps to install a hot-plug PCI or PCI-X adapter:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 14 or “Removing the server top cover and bezel (rack configuration)” on page 16).
3. Determine which expansion slot you will use for the adapter.

Note: Only PCI-X slots 5 and 6 support hot-plug adapters.

4. Slide the adapter-retention-latch release toward the rear of the server and hold it there while you lift the adapter-retention latch to the unlocked (open) position as indicated by the arrow.

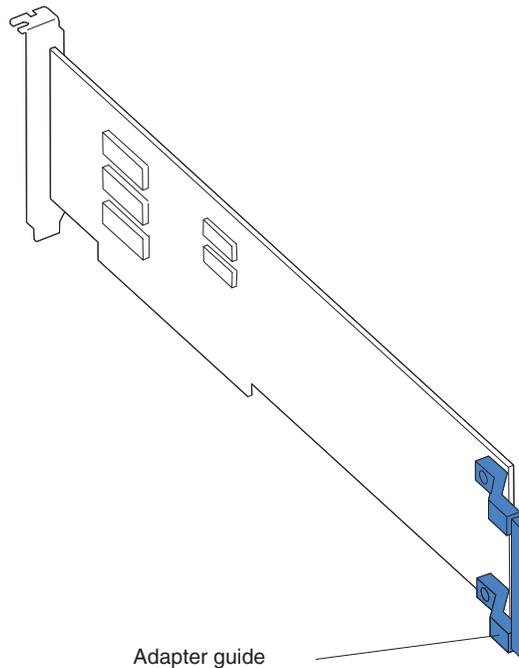
Attention: Expansion slot covers must be installed on all empty slots. This maintains the electronic emissions characteristics of the system and ensures proper cooling of system components.

5. Remove the expansion-slot cover from the server. Store it in a safe place for future use.
6. If you are installing a full-length adapter, lift the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.
7. See the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route cables before you install the adapter.

Attention: Avoid touching the components and gold-edge connectors on the adapter.

8. Install the adapter:

- a. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.



- b. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the system board.
Attention: Incomplete insertion might cause damage to the system board or the adapter.
- c. Press the adapter *firmly* into the expansion slot.
- d. Lower the adapter-retention latch over the top corner of the adapter. The adapter-retention latch automatically locks into place.

Important: Power cannot be provided to the adapter slot if the latch is not lowered into place.

9. If you installed a full-length adapter, close the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.

Attention: When you route the cables, do not block the ventilation space around any of the fans.

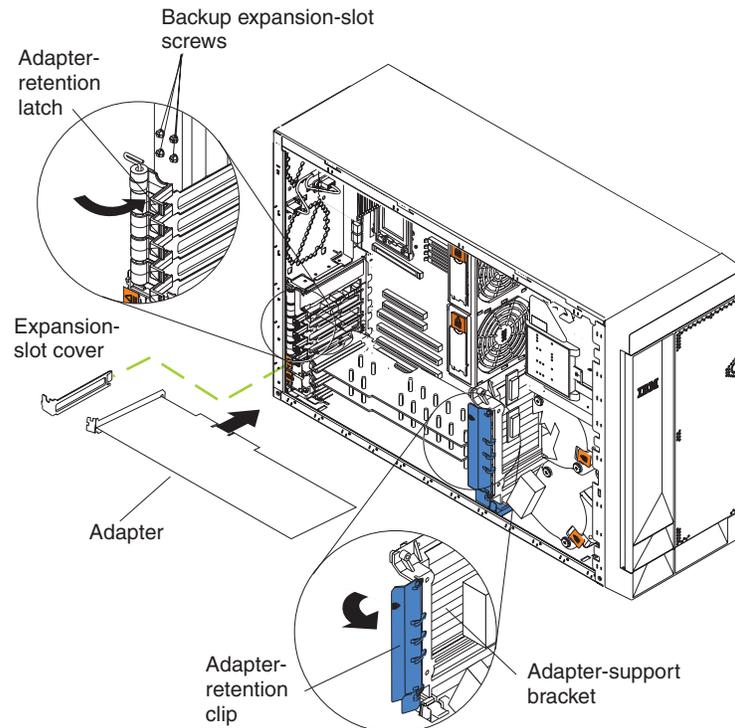
10. Connect any needed cables to the adapter.

Note: You will need to enable the hot-plug PCI-X slot after installing your operating system. See the documentation that comes with your operating system for information about enabling a hot-plug PCI-X slot.

11. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 35.

Installing a non-hot-plug adapter (any slot)

The following illustration shows how to install a non-hot-plug PCI or PCI-X adapter.



Attention: You must install the IXA adapter jumper (J42) between pins 2 and 3 when using an Integrated xSeries Adapter (IXA) in slots 5 and 6.

Notes:

1. Although the optional IXA adapter is not a hot-plug adapter, it must be installed in slots 5 and 6. It is a double width adapter that installs in slot 5 and spans slots 5 and 6.
2. You can install an optional ServeRAID-5i controller only in PCI-X slot 4. Slot 4 is the only PCI-X slot that supports the ServeRAID-5i controller requirements. Install the ServeRAID-5i controller using the 3-U bracket that comes with the controller.

Complete the following steps to install a non-hot-plug PCI or PCI-X adapter:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 14 or “Removing the server top cover and bezel (rack configuration)” on page 16).

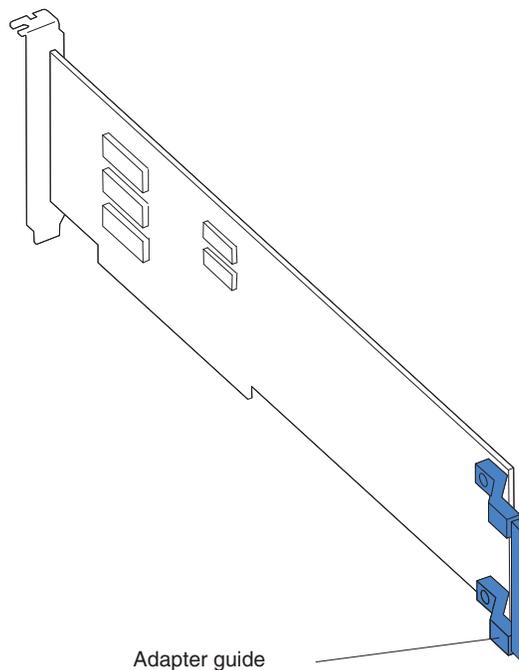
Attention: Expansion slot covers must be installed on all empty slots. This maintains the electronic emissions characteristics of the system and ensures proper cooling of system components.

3. Determine which expansion slot you will use for the adapter, and remove the expansion-slot cover. See the *Option Installation Guide* on the IBM xSeries Documentation CD for details.

4. If you are installing an IXA adapter in slots 5 and 6, make sure that the IXA adapter jumper (J42) is installed between pins 2 and 3; otherwise, make sure it is installed between pins 1 and 2. (See “System-board switches and jumpers” on page 9 for the jumper location.)
5. If you are installing a full-length adapter, lift the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.
6. See the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route any cables before you install the adapter.

Attention: Avoid touching the components and gold-edge connectors on the adapter.

7. Install the adapter:
 - a. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.



- b. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the system board.

Attention: Incomplete insertion might cause damage to the system board or the adapter.

- c. Press the adapter *firmly* into the expansion slot.

Note: If the server is subject to excessive movement or vibration, you can secure the adapter with a screw: insert one of the backup expansion-slot screws (stored next to slot 1) through the top of the adapter bracket into the screw hole to secure the adapter before proceeding to the next step.

- d. Lower the adapter-retention latch over the top corner of the adapter. In slot 5 or 6, make sure the latch is in the locked (closed) position.
8. If you installed a full-length adapter, close the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.

Attention: When you route the cables, do not block the ventilation space around any of the fans.

9. Connect any needed cables to the adapter.
10. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 35.

Installing memory modules

Adding memory to your server is an easy way to make programs run faster. You can increase the amount of memory in your server by installing memory-module options. When you install memory, you must install a pair of matched dual inline memory modules (DIMMs). See the *Option Installation Guide* on the IBM xSeries Documentation CD for more details.

Notes:

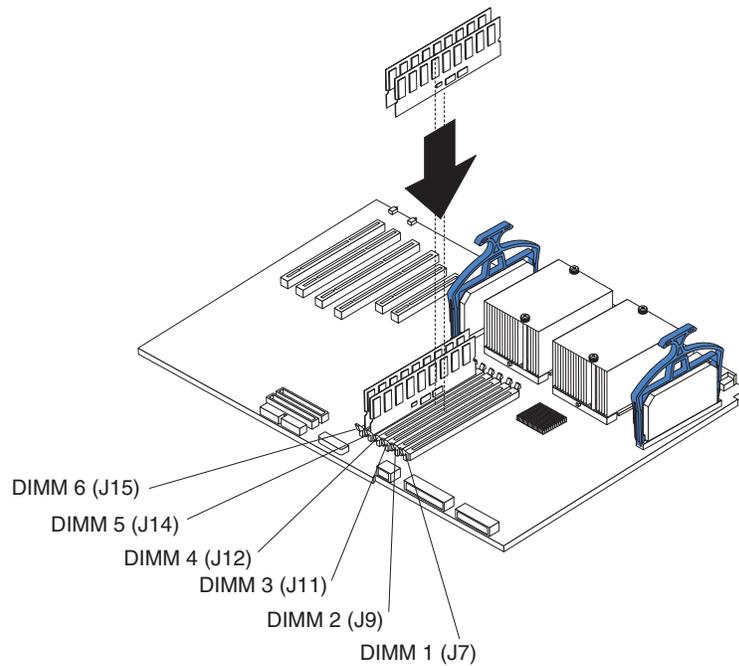
1. When you install additional DIMMs, be sure to install them in pairs. All the DIMMs in a single pair must be the same size, speed, type, and technology. You can mix compatible DIMMs from various manufacturers.
2. The second pair does not have to contain DIMMs of the same size, speed, type, and technology as the first pair.
3. Install only 133 MHz/266 MHz, 2.5 V, 184-pin, double-data-rate (DDR), PC2100, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2100 SDRAM Registered DIMM specification. For a list of supported options for your server, go to <http://www.ibm.com/us/compat/> on the World Wide Web.
4. Your server supports Chipkill™ memory if the DIMMs are all type x4 and larger than 128 MB. Using any 128 MB DIMMs, or DIMMs that are not of type x4, on your server disables Chipkill memory.
5. You do not need to save new configuration information when installing or removing DIMMs. The only exception is if you replace a faulty DIMM that was marked as **Disabled** in the **Memory Settings** menu. In this case, you need to re-enable that memory row in the Configuration/Setup Utility or reload the default memory settings. See the *User's Guide* on the IBM xSeries Documentation CD for more information.

Install the DIMMs in the order shown in the following table.

Table 3. DIMM installation sequence

Pair	DIMM connectors
First	6 and 5 (J15, J14)
Second	4 and 3 (J12, J11)
Third	2 and 1 (J9, J7)

The following illustration shows how to install DIMMs on the system board.



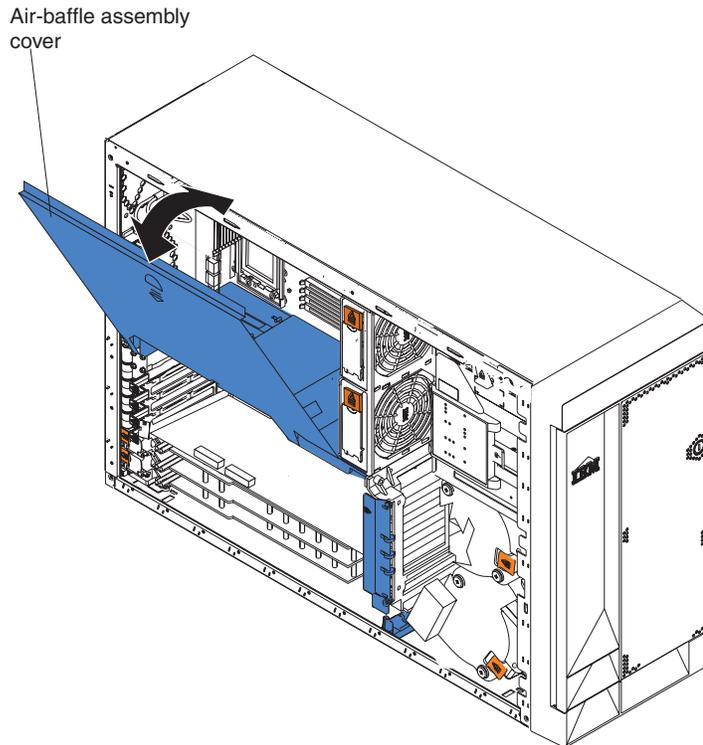
Before you begin, read the documentation that comes with your option.

Complete the following steps to install a DIMM:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 14 or “Removing the server top cover and bezel (rack configuration)” on page 16).

3. Open the cover on the air-baffle assembly.

Note: It is not necessary to remove the air-baffle assembly to perform this step.



4. Determine the connectors into which you will install the DIMMs. (See Table 3 on page 27.)
5. To install the DIMMs, repeat the following steps for each DIMM that you install:
 - a. Turn the DIMM so that the DIMM keys align correctly with the connector on the system board.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

 - b. Insert the DIMM by pressing the DIMM straight into the connector. Be sure that the retaining clips snap into the closed positions.

Note: If a gap exists between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.
6. Close the cover on the air-baffle assembly.
7. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 35.

Installing a hot-swap drive

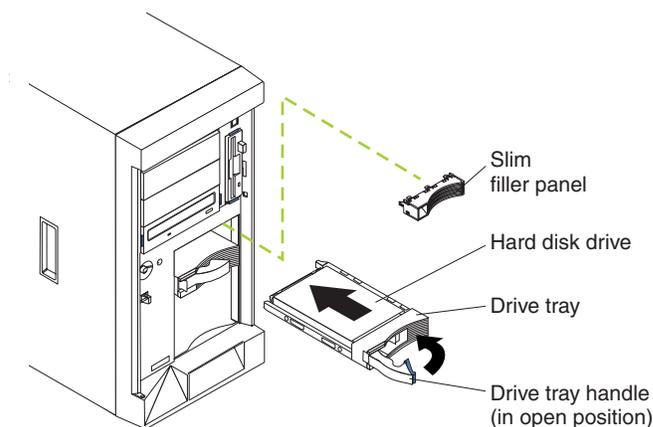
Your server supports a maximum of six 1-inch (26 mm) slim-high, 3.5-inch, hot-swap hard disk drives in the standard hot-swap bays. In the tower model, the hot-swap bays are arranged vertically in the standard hard disk drive cage; the bay numbers are 0 through 5 (from bottom to top). In the rack configuration, the hot-swap bays are arranged horizontally in the standard hard disk drive cage; the bay numbers are 0 through 5 (from left to right). In the tower model, bays 0 through 5 are below the removable-media drive bays. In the rack configuration, bays 0 through 5 are to the left of the removable-media drive bays.

You cannot install hot-swap drives in the removable-media or non-hot-swap drive bays on the front side of the server, unless you install the 3-Pack Ultra320 Hot-Swap Expansion option. See the *Option Installation Guide* on the IBM xSeries Documentation CD for instructions for installing this option.

Notes:

1. All hot-swap drives being used in the server should have the same throughput speed rating; mixing speed ratings might cause all drives to operate at the lower throughput speed.
2. To minimize the possibility of damage to the hard disk drives when you are installing them in a rack configuration, install the server in the rack before installing the hard disk drives.
3. You do not have to turn off the server to install hot-swap drives in the hot-swap drive bays. However, you must turn off the server when performing any steps that involve installing or removing cables.
4. You can install three additional hot-swap hard disk drives in the server after you install the 3-Pack Ultra320 Hot-Swap Expansion option. These drives are in the optional hard disk drive cage.
5. Some filler panels come with a slim filler.
6. The SCSI ID for each hot-swap hard disk drive is printed on the bezel.

The following illustration shows how to install a hot-swap hard disk drive.



Complete the following steps to install a drive in a hot-swap bay:

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed for each bay.

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Remove the filler panel from one of the empty hot-swap bays.
3. Install the hard disk drive in the hot-swap bay:
 - a. Ensure that the tray handle is open (that is, perpendicular to the drive).
 - b. Align the drive assembly with the guide rails in the bay.
 - c. Gently push the drive assembly into the bay until the drive stops.
 - d. Push the tray handle to the closed (locked) position.

Notes:

1. When you turn on the server, you can check the hard disk drive status LEDs to verify that the hard disk drives are operating properly.

If the amber hard disk drive status LED for a drive is lit continuously, that drive is faulty and needs to be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.

2. If your server will be configured for RAID operation using the integrated SCSI controller with RAID capabilities or an optional ServeRAID™ controller, you will need to configure your disk arrays before installing your operating system. See the ServeRAID documentation on the *IBM ServeRAID Support CD* for additional information about RAID operation and complete instructions for using ServeRAID Manager.

Installing an additional microprocessor

Your server comes with one or two microprocessors installed on the system board. Your server supports two microprocessors. With two microprocessors, your server can operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load among the microprocessors. If your server comes with one microprocessor, you can install a second microprocessor.

Attention: To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical. You can use the Configuration/Setup Utility program in your server to determine the specific type of microprocessor on your system board.

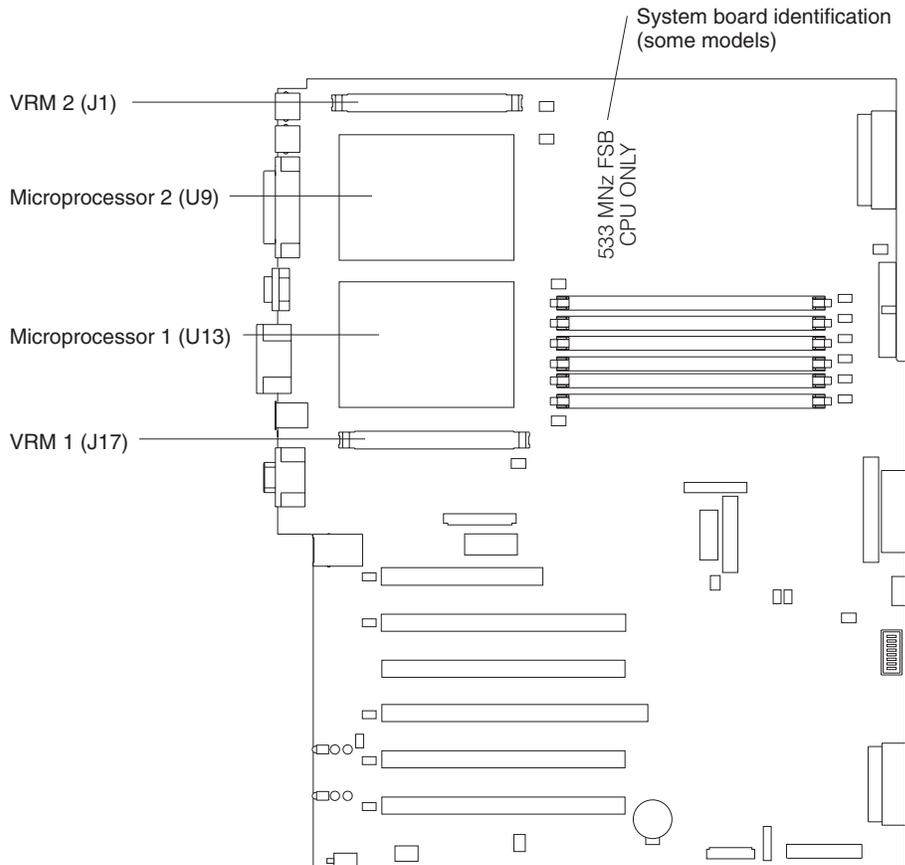
Important: A boot processor must always be installed in socket U13 of the system board.

Notes:

1. To order additional microprocessor options, contact your IBM reseller or IBM marketing representative.
2. When you install a microprocessor in socket U9, you must also install the voltage regulator module (VRM) that comes with the microprocessor, in VRM connector J1.
3. The microprocessor sockets in this server contain built-in termination for the microprocessor bus; therefore, terminator cards are not required for empty microprocessor sockets. However, for airflow, an empty microprocessor socket must contain a microprocessor baffle.
4. The microprocessor speeds are automatically set for this server; therefore, you do not need to set any microprocessor frequency-selection jumpers or switches.
5. If you need to replace a microprocessor, call for service.

The following illustration is a simplified layout of the microprocessor connector locations and other microprocessor-related components on the system board.

Attention: The speed of the microprocessor must match the speed of the system board. The 533 MHz system board is identified as shown in the following illustration; the 400 MHz system board is not marked.

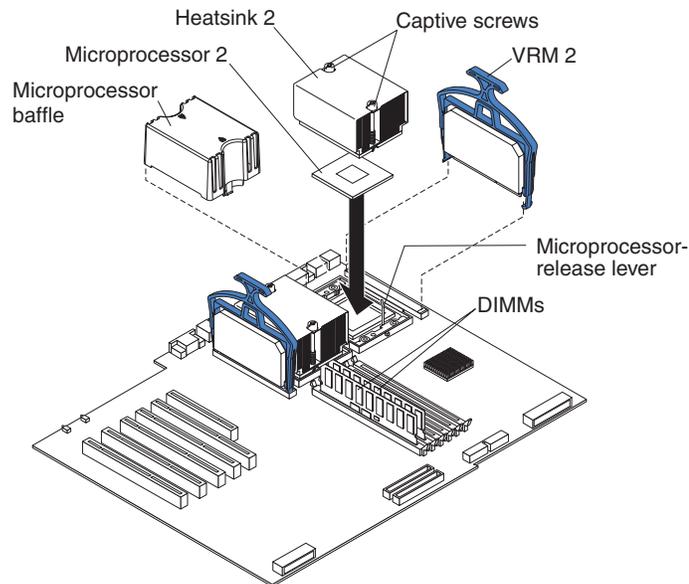


Complete the following steps to install an additional microprocessor kit:

1. Review the information in “Safety” on page v, “Installation guidelines” on page 11, and “Handling static-sensitive devices” on page 12.
2. Remove the server cover (see “Removing the server left-side cover and bezel (tower model)” on page 14 or “Removing the server top cover and bezel (rack configuration)” on page 16).
3. Open the cover on the air-baffle assembly. (See the illustration following step 3 on page 29, if needed.)

Note: It is not necessary to remove the air-baffle assembly to perform this step.

4. Locate the second microprocessor socket (connector U9) on the system board.
5. Remove the microprocessor baffle from the second microprocessor socket.
6. If the second microprocessor socket is covered with protective film, peel and remove the film.



7. Install a VRM in the corresponding VRM connector (J1):
 - a. Center the VRM over the connector. Make sure that the VRM is oriented and aligned correctly.
 - b. Carefully but firmly push down the VRM clip handle to seat the VRM in the connector.
 - c. Make sure that the VRM clip locks on the VRM connector at both sides.

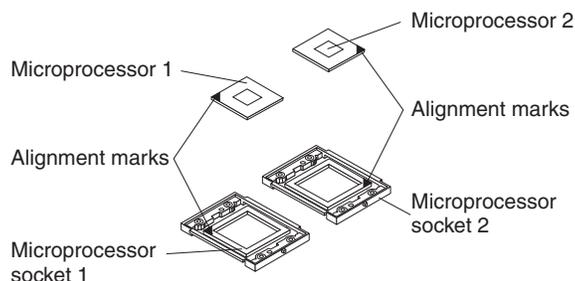
CAUTION:

You must lift up the microprocessor-release lever before inserting the microprocessor into the socket. Inserting the microprocessor into the socket without lifting up the microprocessor-release lever can damage the microprocessor and system board.

8. Install the microprocessor:
 - a. Touch the static-protective package containing the new microprocessor to any *unpainted* metal surface on the server; then, remove the microprocessor from the package.
 - b. Pull out and lift up on the microprocessor-release lever to unlock the microprocessor socket.
 - c. Center the microprocessor over the microprocessor socket. Align the triangle on the corner on the microprocessor with the triangle on the corner on the socket and carefully press the microprocessor into the socket.

Attention:

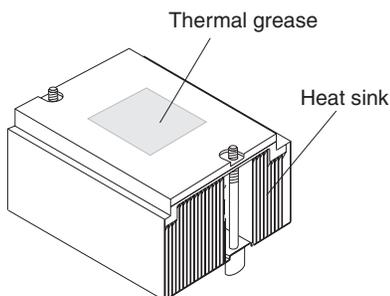
- Do not use excessive force when pressing the microprocessor into the socket.
- Make sure that the microprocessor is oriented and aligned correctly with pin number 1 in the socket before you try to close the microprocessor-release lever.



- d. Carefully close the microprocessor-release lever to secure the microprocessor in the socket.
9. Install a heat sink on the microprocessor:
- a. Remove the protective film from the bottom of the heat sink.

Notes:

- 1) Do not set the heat sink down after you remove the protective film.



- 2) Do not touch the thermal grease on the bottom of the heat sink. Touching the thermal grease will contaminate it. If the thermal grease on the microprocessor or heat sink becomes contaminated, contact your service technician.
- b. Align and place the heat sink on top of the microprocessor in the retention bracket. Press firmly on the heat sink.
- Attention:** Alternate the tightening of the two captive screws to prevent damage to the microprocessor. Ensure that the screws are completely tightened until they stop; otherwise, damage to the microprocessor will occur.
- c. Secure the heat sink to the microprocessor. Alternate between the two captive screws in the heat sink while tightening them.
10. If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 35.

Completing the installation

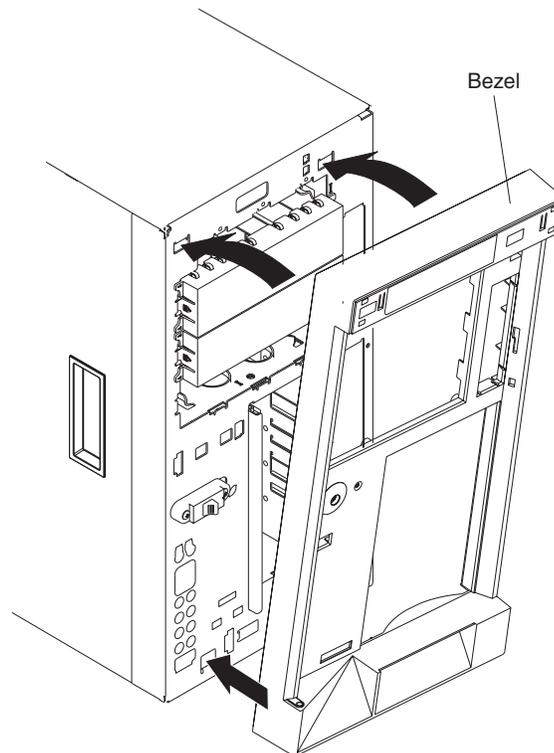
To complete your installation, you must reinstall the bezel, reinstall the server cover, connect all the cables and, for certain options, run the Configuration/Setup Utility program. Follow the instructions in this section.

Attention:

- For proper cooling and airflow, replace the server cover before turning on the server. Operating the server for extended periods of time (over 30 minutes) with the server cover removed might damage server components.
- To ensure proper server operation, do not remove the air-baffle assembly from the server except when installing or removing the components that are under the air-baffle cover.

Installing the server bezel and left-side cover (tower model)

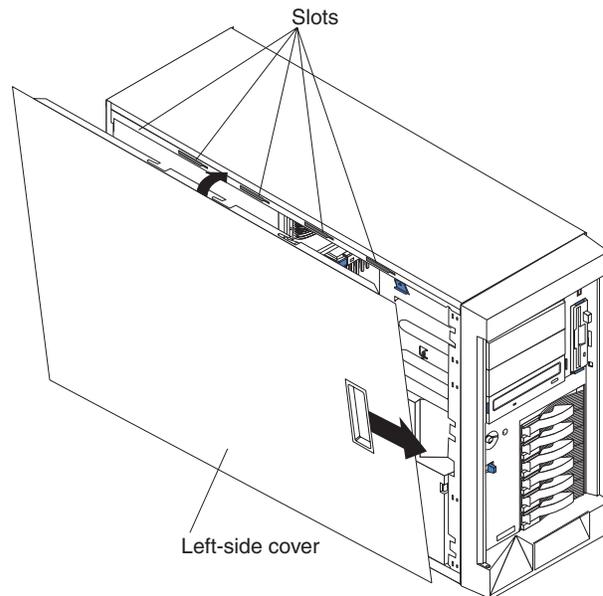
The following illustration shows how to install the bezel on the tower model server.



Complete the following steps to install the bezel:

1. Insert the two tabs on the bottom of the bezel into the matching holes on the server chassis.
2. Push the top of the bezel toward the server until the two tabs at the top of the bezel snap into place.

The following illustration shows how to install the left-side cover on the tower model server.

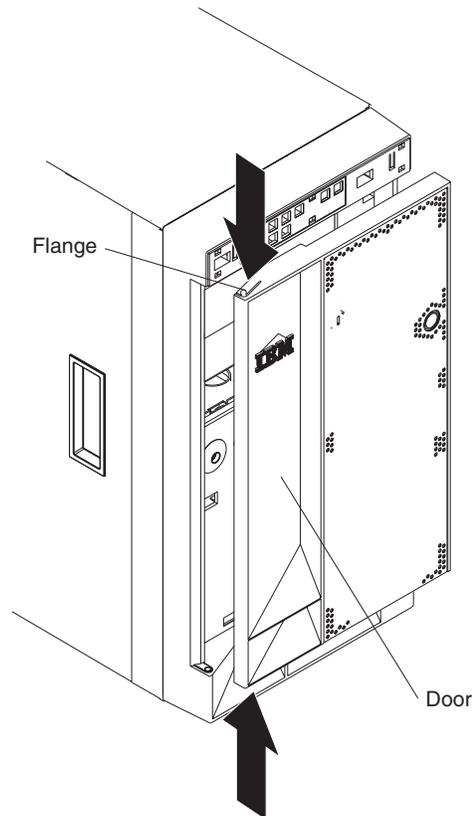


Complete the following steps to install the server left-side cover:

1. Before installing the cover, check that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
2. Place the bottom lip of the left-side cover over the bottom edge of the server chassis.
3. Rotate the left-side cover to a vertical position, inserting the tabs at the top of the left-side cover into the matching slots in the server chassis.
4. Slide the left-side cover forward until it locks in place.
5. Continue with “Installing the server door (tower model)” on page 37.

Installing the server door (tower model)

The following illustration shows how to install the door on the tower model server.



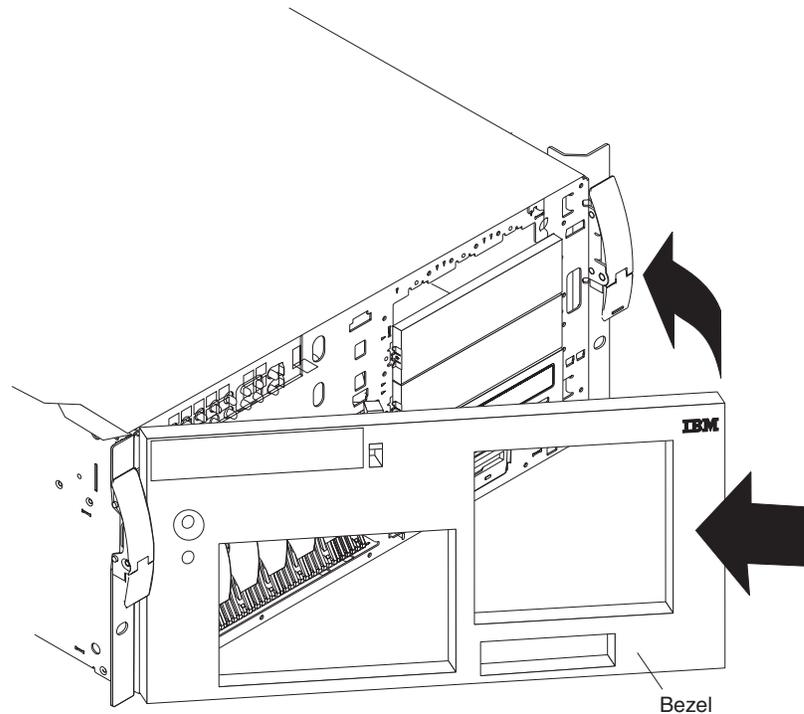
Complete the following steps to install the server door:

1. Set the door on the bottom hinge.
2. Locate the flange on the top edge of the door.
3. Press the flange downward while pressing the top of the door toward the server, until the flange connects with the top hinge. Release the flange.
4. Continue with “Cabling the server” on page 40.

Attention: Be sure to maintain a clearance of at least 100 mm (4 inches) on the front and rear of the server to allow for air circulation.

Installing the server bezel and top cover (rack configuration)

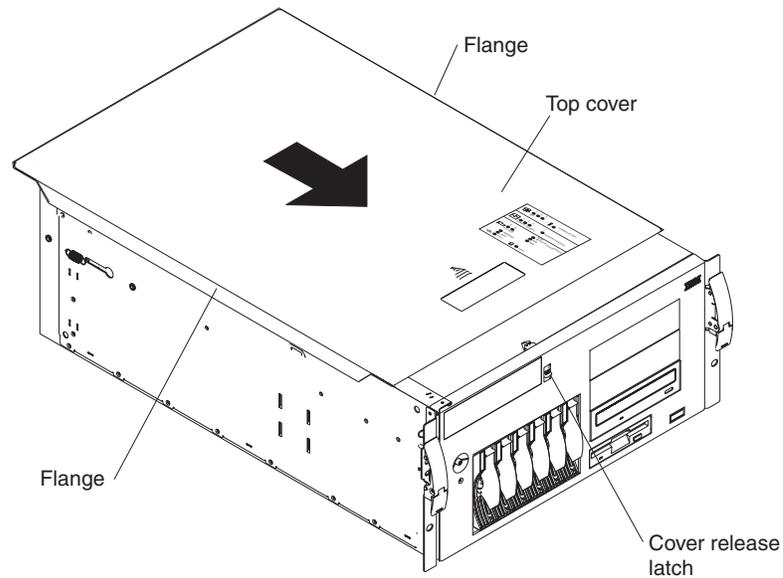
The following illustration shows how to install the bezel on a rack configuration server.



Complete the following steps to install the bezel:

1. Insert the two tabs on the left-side of the bezel into the matching holes on the server chassis.
2. Push the right-side of the bezel toward the server until the two tabs at the right-side of the bezel snap into place.

The following illustration shows how to install the server top cover on a rack configuration server.



Complete the following steps to install the server top cover:

1. Before installing the cover, check that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
2. Place the cover-release latch in the open (up) position.
3. Place the lip of the left side of the top cover over the top-left edge of the server chassis.
4. Rotate the top cover to a horizontal position, inserting the tabs at the right side of the top cover into the matching slots in the server chassis.
5. Slide the top cover forward until it locks in place.
6. Continue with “Cabling the server” on page 40.

Note: See the *Rack Installation Instructions* provided on the IBM xSeries Documentation CD for additional rack installation and cabling information.

Cabling the server

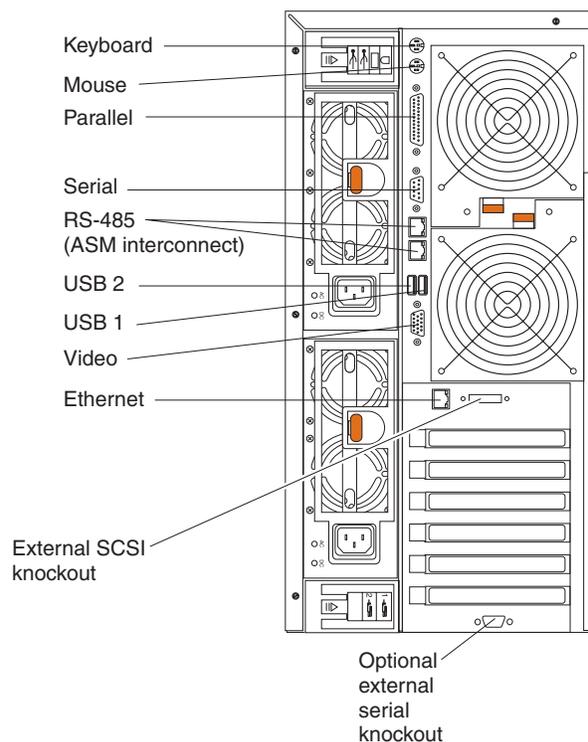
Notes:

1. Make sure you turn off the server before connecting any cables to or disconnecting any cables from the server.
2. For additional cabling instructions, see the *User's Guide* on the IBM xSeries Documentation CD and the documentation that comes with your options. It might be easier for you to route any cables before you install certain options.
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. For example, the hard disk drive cables are labeled "HDD option."

Two cable-restraint brackets are on the rear of the tower model servers. Route the power cords through the power-cord restraint bracket on the bottom. After you connect the cables to the selected devices, route the cables (for example, the cables that are connected to the I/O ports) through the I/O cable-restraint bracket on the top.

See the following illustrations for the locations of the input and output connectors on your server.

Note: The USB 3 connector is on the front of the server. (See "Front view" on page 43 for the USB 3 connector location.)



Detailed cabling instructions for a typical rack server configuration are given in the *Rack Installation Instructions* provided on the IBM xSeries Documentation CD.

Keyboard cabling

Your server has one keyboard port on the back of the server. Connect a keyboard to this port.

Pointing device cabling

Your server has one pointing device port on the back of the server. Connect a pointing device to this port.

Parallel port cabling

Your server has one parallel port on the back of the server. You can connect a parallel device to this port.

Serial cabling

Your server has one standard serial port on the back of the server and one optional serial port. You can connect a serial device to each of these ports.

Advanced System Management Interconnect cabling

Your server has two Advanced System Management (ASM) Interconnect ports on the back of the server. Use these ports to connect the server to a Remote Supervisor Adapter in a remote server. The ports support full asynchronous RS-485 communication through a daisy-chain cable in half-duplex mode. Both ports have automatic termination, and either port can be used if your server is at the beginning or end of an RS-485 network.

Notes:

1. Do not confuse the two ASM Interconnect ports that are next to the video port with the Gigabit Ethernet port.
2. If you install an optional Remote Supervisor Adapter in your server, use the RS-485 ports on the Remote Supervisor Adapter and not the integrated RS-485 ports on the back of your server.

USB cabling

Your server has three USB ports, one on the front and two on the back of the server. You can connect USB devices to these ports.

Video cabling

Your server has one video port on the back of the server. Connect a monitor to this port.

Gigabit Ethernet cabling

Your server has one Ethernet port on the back of the server. Use this port to connect the server to a LAN.

Note: Do not confuse the Gigabit Ethernet port with the two ASM Interconnect ports that are next to the video port.

Power cabling

Your server comes with one or two power cords that you can connect to an uninterruptible power supply or to an external source, such as a properly grounded electrical outlet.

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

1. Connect each power-supply cord to one of the system power connectors on the rear of the server.
2. Plug the other end of each power-supply cord into a properly grounded electrical outlet or uninterruptible power supply.

Note: Plugging the power-supply cords into electrical outlets might cause the server to start automatically. This is an acceptable action.

3. See “Turning on the server” on page 47 for detailed information about turning on the server.

Updating your server configuration

When you start your server for the first time after you add or remove an internal option or an external SCSI device, you might see a message telling you that the configuration has changed. The Configuration/Setup Utility program automatically starts so that you can save the new configuration information. See Chapter 4, “Configuring your server”, on page 51 for additional information.

Some options have device drivers that you need to install. See the documentation that comes with your option for information about installing any required device drivers.

Your server comes with one or two microprocessors installed on the system board. If you have installed an additional microprocessor, your server can now operate as an SMP server. Therefore, you might need to upgrade your operating system to support SMP. See the *User's Guide* on the IBM *xSeries Documentation* CD and your operating-system documentation for additional information.

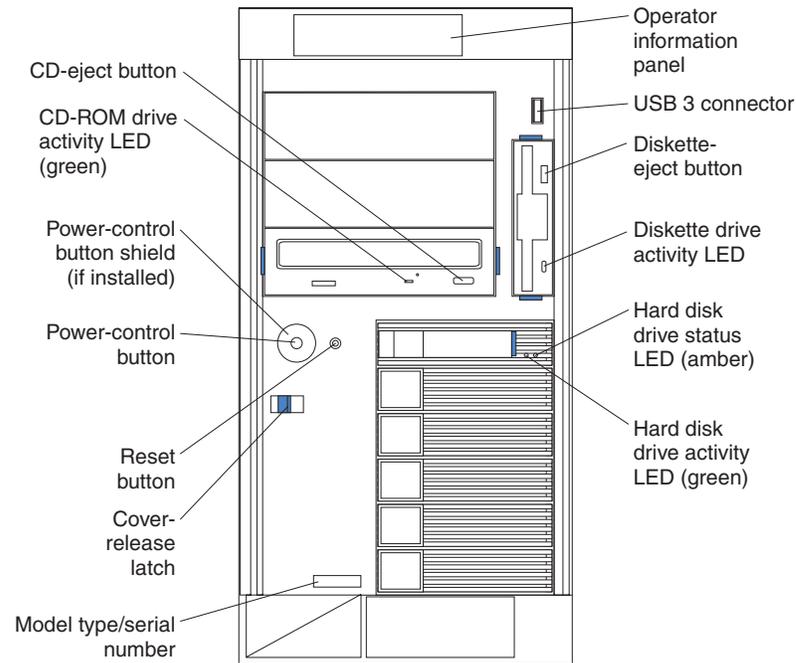
If your server has a RAID configuration using the integrated SCSI controller with RAID capabilities or has a ServeRAID controller installed and you have installed or removed a hard disk drive, see the ServeRAID documentation that comes with your server for information about reconfiguring your disk arrays.

Chapter 3. Server controls, indicators, and power

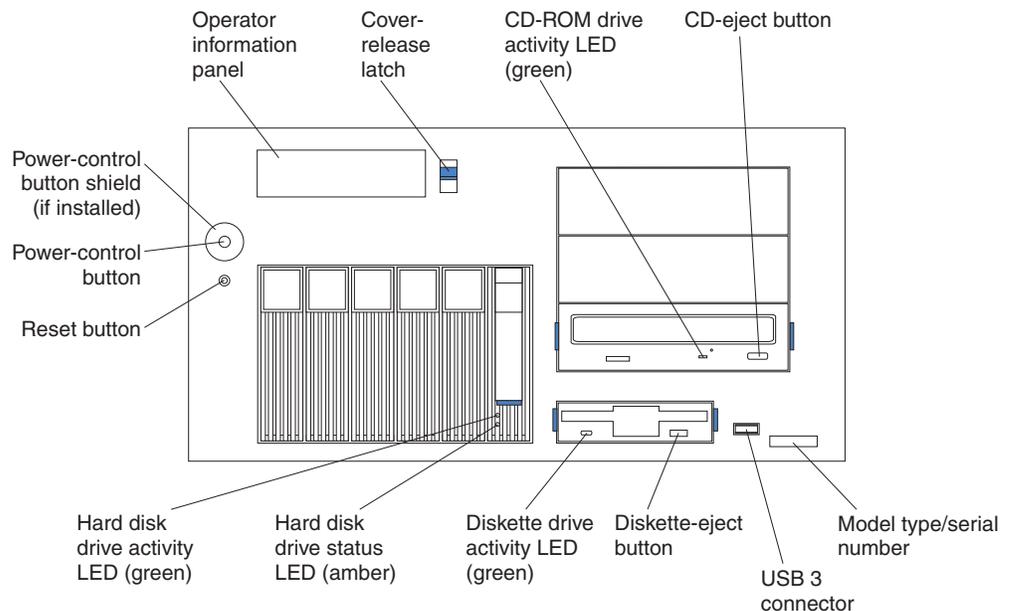
This section identifies the controls and indicators on the front and rear of your server. It also describes the power features of your server.

Front view

Tower model



Rack configuration



Operator information panel: The LEDs on this panel give status information for your server. See “Operator information panel” on page 46 for more information.

USB 3 connector: This is the front USB connector. Two additional USB connectors are on the rear of the server.

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

Diskette-drive activity LED: When this LED is on, it indicates that the diskette drive is in use.

Hard disk drive activity LED: Each hot-swap drive has a hard disk drive activity LED. When this green LED is flashing, the drive is being accessed.

Hard disk drive status LED: Each hot-swap drive has a hard disk drive status LED. When this amber LED is on continuously, the drive has failed. If an optional IBM ServeRAID controller is installed in the server, when the LED flashes slowly (one flash per second), the drive is being rebuilt. When the LED flashes rapidly (three flashes per second), the controller is identifying the drive.

Model type/serial number: The model type identifies your server model. The serial number uniquely identifies your server.

Cover-release latch: Slide this latch to release the cover.

Reset button: Press this button to reset the server and run POST.

Power-control button: Press this button to manually turn on the server or put the server in Standby mode (see “Server power features” on page 47).

Power-control button shield: You can install this circular disk over the power-control button to prevent accidental manual power-off. This disk is provided with your server.

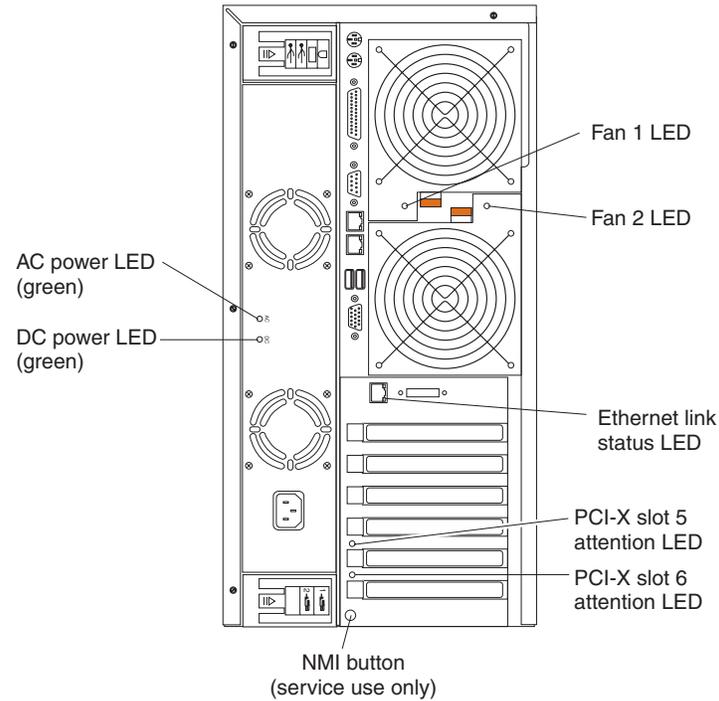
CD-ROM drive activity LED: When this LED is on, it indicates that the CD-ROM drive is in use.

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

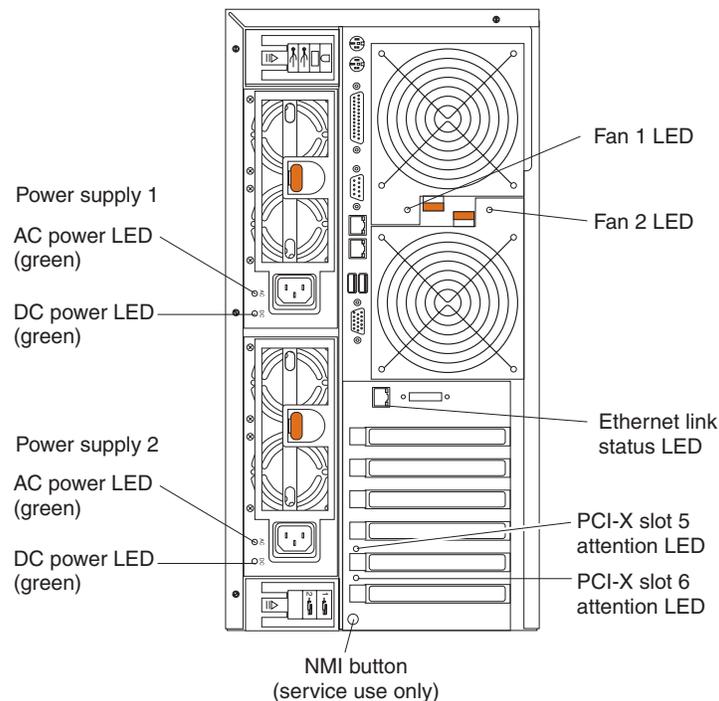
Rear view

This section identifies the indicators on the rear of your server. The following illustrations contain most of these indicators. The remaining indicators are illustrated in “Working with adapters” and “Advanced System Management ports” in the *Option Installation Guide* on the IBM xSeries Documentation CD.

Server with fixed power supply



Server with hot-swap power supplies



Fans 1 and 2 LEDs: These LEDs provide status information about rear fans 1 and 2. For additional information, see the section about the Light Path Diagnostics feature in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

Ethernet link status LED: This LED is on the Ethernet connector. When this LED is on, there is an active connection on the Ethernet port.

PCI-X slot attention LED: This green LED flashes approximately once per second when it is on. This LED is visible from the rear of the server and from inside the server. The meaning of the attention LED is defined by your operating system. For an illustration showing this LED on the system board, see the *Option Installation Guide* on the IBM xSeries Documentation CD. For additional information, see “LEDs for Active PCI slots” in the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

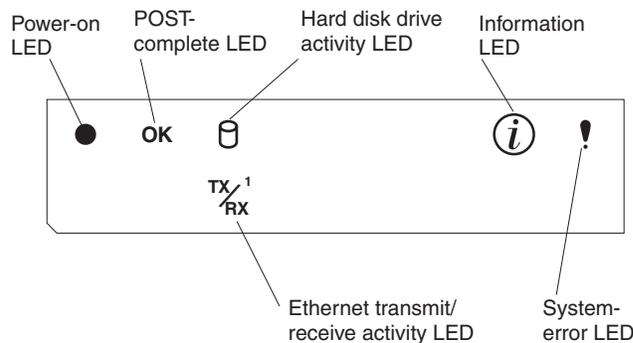
NMI button: The Non-Maskable Interrupt (NMI) button is for service use only.

DC power LED: This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are on. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

AC power LED: This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are on. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD.

Operator information panel

The following illustration shows the status LEDs on the operator information panel on the front of the server.



Important: If the power-on LED is off, it does not mean there is no electrical current present in the server. The LED might be burned out. To remove all electrical current from the server, you must unplug the server power cords from the electrical outlets or from the uninterruptible power device.

Power-on LED: When this green LED is on, power is present in the server. When this LED flashes, the server is in Standby mode (the system operating system is turned off and ac current is present). When this LED is off, the power subsystem, the ac power, or an LED has failed.

POST-complete LED: This green LED is on when POST is completed without any errors.

Hard disk drive activity LED: This green LED flickers when there is activity on a hard disk drive.

Information LED: When this amber LED is on, the server power supplies are nonredundant, or some other noncritical event has occurred. The event is recorded in the Error log. See the *User's Guide* on the IBM xSeries Documentation CD for instructions for viewing the Error log. Check the diagnostic LED panel for more detailed information (see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD).

System-error LED: This amber LED is on when a system error occurs. An LED on the diagnostic LED panel will also be on to further isolate the error. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD for additional information.

Ethernet transmit/receive activity LED: When this green LED is on, there is activity between the server and the network.

Server power features

This section contains information about how to properly turn your server on and off.

Turning on the server

Turning on the server refers to the act of plugging the power cords of your server into the power source and starting the operating system.

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

- If the power cords are connected to a power source, you can press the power-control button on the front of the server.

Notes:

1. You can install a circular disk over the power-control button to prevent accidental manual power-off. This disk, known as the power-control button shield, comes with your server.
 2. After you plug the power cords of your server into the electrical outlets, wait approximately 20 seconds before pressing the power-control button. During this time, the system-management adapter is initializing; therefore, the power-control button does not respond.
- If the server is turned on and a power failure occurs, the server will restart automatically when power is restored.
 - If ac power is present, the server is in Standby mode, and the server is connected to an ASM interconnect network that contains at least one system with an optional Remote Supervisor Adapter installed, the server can be turned on from the Remote Supervisor Adapter user interface.
 - If ac power is present, the server is in Standby mode, and an optional Remote Supervisor Adapter is installed in the server, the server can be turned on from the Remote Supervisor Adapter user interface.
 - When you plug in your server for the first time, Wake on LAN[®] can turn on the server.
 - If your server was previously turned on, it must be properly placed in Standby mode for the Wake on LAN feature to turn on the server.

Complete the following steps to manually turn on the server:

1. Review the information in “Safety” on page v.
2. Turn on all external devices, such as the monitor.
3. Plug the server power cords into the power source.
4. Press the power-control button on the front of the server.

Note: While the server is powering up, the power-on LED on the front of the server is lit.

Turning off the server

Turning off the server refers to the act of disconnecting the server from the power source.

Complete the following steps to manually turn off the server:

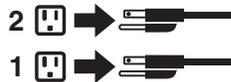
1. Review the information in “Safety” on page v.
2. See your operating system documentation for the proper procedure to shut down the operating system.

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.



3. Press the power-control button on the front of the server. This will put the server in Standby mode.

Note: You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the server and to force it into Standby mode. You can use this feature if the operating system stops functioning.

4. Disconnect the server from the power source.

Note: After disconnecting all the power cords, wait approximately 15 seconds for your system to stop running. Watch for the power-on LED on the front of the server to stop flashing.

Standby mode

Standby mode refers to the condition in which the server is connected to an ac power source but the server operating system is not running and all core logic is shut down except for the service processor. In Standby mode, the server can respond to service processor requests, such as a remote request to turn on the server. When the server is in Standby mode, the power-on LED on the front of the server flashes (when the server is running, the power-on LED stays on and does not flash).

You can put the server in Standby mode in any of the following ways:

- You can press the power-control button on the server. This starts an orderly shutdown of the operating system, if this feature is supported by your operating system.
- If the server is connected to an ASM interconnect network which contains at least one system with an optional Remote Supervisor Adapter installed, the server can be placed in Standby mode from the Remote Supervisor Adapter user interface.
- If an optional Remote Supervisor Adapter is installed in the server, the server can be placed in Standby mode from the Remote Supervisor Adapter user interface.

Attention: You must disconnect all the server power cords from the electrical outlets to remove all power from the server.

Complete the following steps to put the server into Standby mode:

1. See the operating system documentation for the proper procedure to shut down the operating system.

Note: Each operating system is different. Read all the documentation about shutting down the operating system before continuing.

2. Press the power-control button on the front of the server.

Notes:

- a. After you place the server in Standby mode, wait at least 5 seconds before you turn on the server again.
- b. You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the operating system and to force it into Standby mode. You can use this feature if the operating system stops functioning.

The ISMP can put the server in Standby mode as an automatic response to a critical system failure. You can also put the server into Standby mode remotely by means of an optional Remote Supervisor Adapter or through connection to an ASM interconnect network.

Chapter 4. Configuring your server

The *ServerGuide™ Setup and Installation* CD provides software setup tools and installation tools that are specifically designed for your IBM server. Use this CD during the initial installation of your server to configure basic hardware features and to simplify your network operating system (NOS) installation. (See “Using the ServerGuide Setup and Installation CD” on page 52 for more information.)

In addition to the *ServerGuide Setup and Installation* CD, you can use the following configuration programs to customize your server hardware:

- **Configuration/Setup Utility**

This program is part of the basic input/output system (BIOS) code that comes with your server. You can use this program to configure serial and parallel port assignments, change interrupt request (IRQ) settings, change the drive startup sequence, set the date and time, and set passwords. You also can use this program to view the system configuration settings, for example, the number and type of installed microprocessors, the amount of installed memory, or the BIOS diagnostics version level. See “Using the Configuration/Setup Utility program” on page 52 for more information.

- **LSI Logic Configuration Utility**

With the built-in LSI Logic Configuration Utility program, you can configure the integrated SCSI controller and the devices that are attached to it. See “Using the LSI Logic Configuration Utility program” on page 52.

- **ServeRAID Manager**

The ServeRAID programs come with your server. If your server has a ServeRAID controller installed, you must use the ServeRAID Configuration program to define and configure your disk-array subsystem *before* you install your operating system. See “Using ServeRAID Manager” on page 53 for more information.

This section provides the instructions for starting the utility programs. See the *User's Guide* on the *IBM xSeries Documentation* CD for detailed instructions for using the configuration programs and *ServerGuide Setup and Installation* CD.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides state-of-the-art programs to detect the server model and hardware options that are installed, configures the server hardware, provides device drivers, and helps you install your operating system.

Note: If the *ServerGuide Setup and Installation* CD does not start, see “ServerGuide program problems” on page 65.

1. Insert the *ServerGuide Setup and Installation* CD, and restart the server.
2. Follow the instructions that appear on the screen to:
 - a. Select your language.
 - b. Select your keyboard layout and country.
 - c. View the overview to learn about ServerGuide features.
 - d. View the README file to review installation tips about your operating system and adapter.
 - e. Start the setup and hardware configuration programs.
 - f. Start the operating system installation. You will need your copy of the operating system CD.

Note: For information about the supported operating system versions, see the *ServerGuide Setup and Installation* CD label.

Using the Configuration/Setup Utility program

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

- Configure serial port assignments
- Change the drive startup sequence
- Enable USB keyboard and mouse support
- Resolve configuration conflicts
- Set the date and time
- Set passwords

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

1. Turn on the server and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1.

Note: If you have previously set both levels of passwords (power-on and administrator), you must type the administrator password to access the full Configuration/Setup Utility menu. Without the administrator password, limited Configuration/Setup Utility program functions are available.

3. Follow the instructions that appear on the screen.

Using the LSI Logic Configuration Utility program

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

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

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level-1 and RAID level-1 Enhanced (RAID level-1E). Installing an optional ServeRAID-5i controller provides additional RAID levels. See “Using ServeRAID Manager” for information about configuring your server for RAID operation.
2. If you install a different type of RAID adapter in your server, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

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

1. Turn on the server.
2. When the <<< Press <CTRL><C> to start LSI Logic Configuration Utility >>> prompt appears, press Ctrl+C.

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

3. Use the arrow keys to select a controller (channel) from the list of adapters; then, press Enter.
4. Follow the instructions on the resulting screen to change the settings of the selected items; then, press Enter. The **Device Properties** and **Mirroring Properties** choices produce additional screens of parameters to review or change.

Using ServeRAID Manager

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

- Configure a redundant array of independent disks (RAID)
- Restore a SCSI hard disk to factory-default settings, erasing all data
- 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

The following sections provide instructions for running ServeRAID Manager in startable-CD mode to configure your integrated SCSI controller with RAID capabilities and perform an initial RAID configuration on your server. See the ServeRAID documentation on the *IBM ServeRAID Support CD* for additional information about RAID technology and instructions for using ServeRAID Manager to configure your integrated SCSI controller with RAID capabilities.

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level-1 and RAID level-1E. Installing an optional ServeRAID-5i controller provides additional RAID levels.
2. If you install a different type of RAID adapter in your server, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

Before you install your operating system, you must configure the controller that is attached to the hard disk drives. You must use the configuration program on the *IBM ServeRAID Support CD* to configure the integrated SCSI controller with RAID capabilities or to configure an optional IBM ServeRAID controller.

Notes:

1. You cannot use the *ServerGuide Setup and Installation CD* to configure the optional controllers.
2. To update the firmware and BIOS for an optional ServeRAID controller, you must use the *IBM ServeRAID Support CD* that comes with the ServeRAID option.

Using ServeRAID Manager in startable-CD mode

The information in this section focuses on using the ServeRAID Manager program in Startable CD mode to configure your controller. For information about installing ServeRAID Manager, see the documentation on the *IBM ServeRAID Support CD*.

When you run the ServeRAID Manager program from the startable *IBM ServeRAID Support CD*, you are using startable-CD mode, in which you can configure your controller *before* you install your operating system.

To run the ServeRAID Manager program in startable-CD mode, turn on the server; then, insert the *IBM ServeRAID Support CD* into the CD-ROM drive. If the ServeRAID Manager program detects an unconfigured controller and ready drives, the program automatically starts the Configuration wizard, and a window similar to that shown in Figure 1 opens.

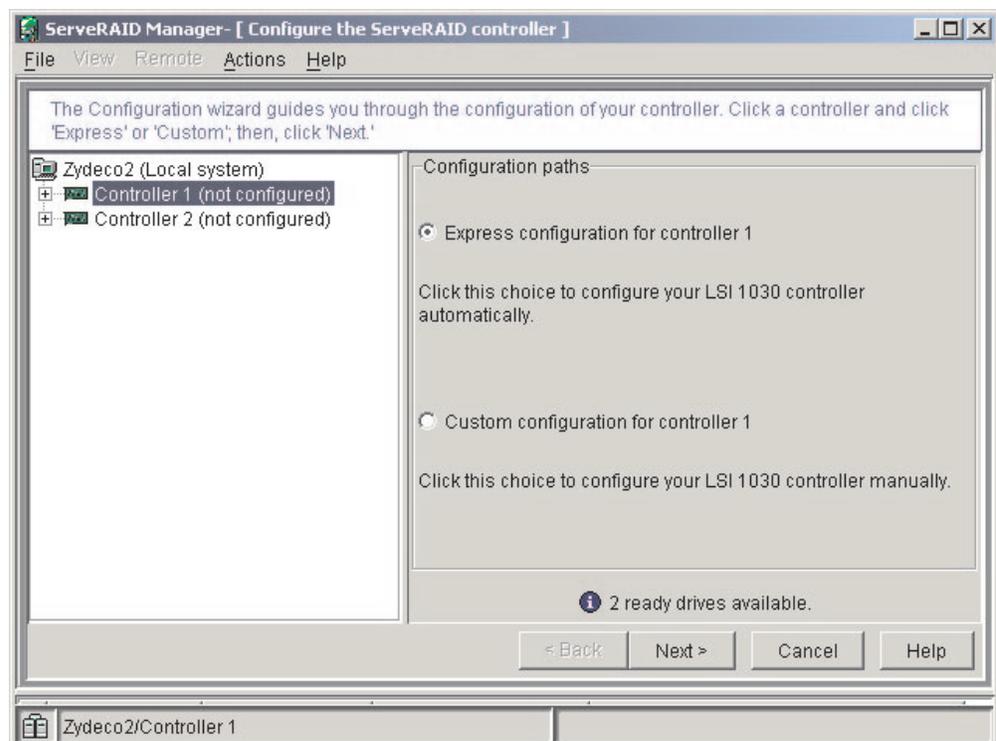


Figure 1. "Configuration wizard" window

Configuring the controller

You can use the Configuration wizard to configure your controller. The Configuration wizard provides two configuration options: Express and Custom. Express configuration automatically configures your controller, and you can use Custom configuration to configure your controller manually.

Note: If the integrated RAID controller has two channels, it will appear in the ServeRAID Manager tree as two controller objects. However, you can configure only one array and one RAID level-1 or level-1E logical drive.

Using Express configuration: Express configuration automatically configures your controller. It creates an array by grouping together the first two physical drives that appear in the ServeRAID Manager tree, and it creates a RAID level-1 logical drive.

Complete the following steps to use Express configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click **Next**. The “Configuration summary” window opens.
4. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Modify arrays**.

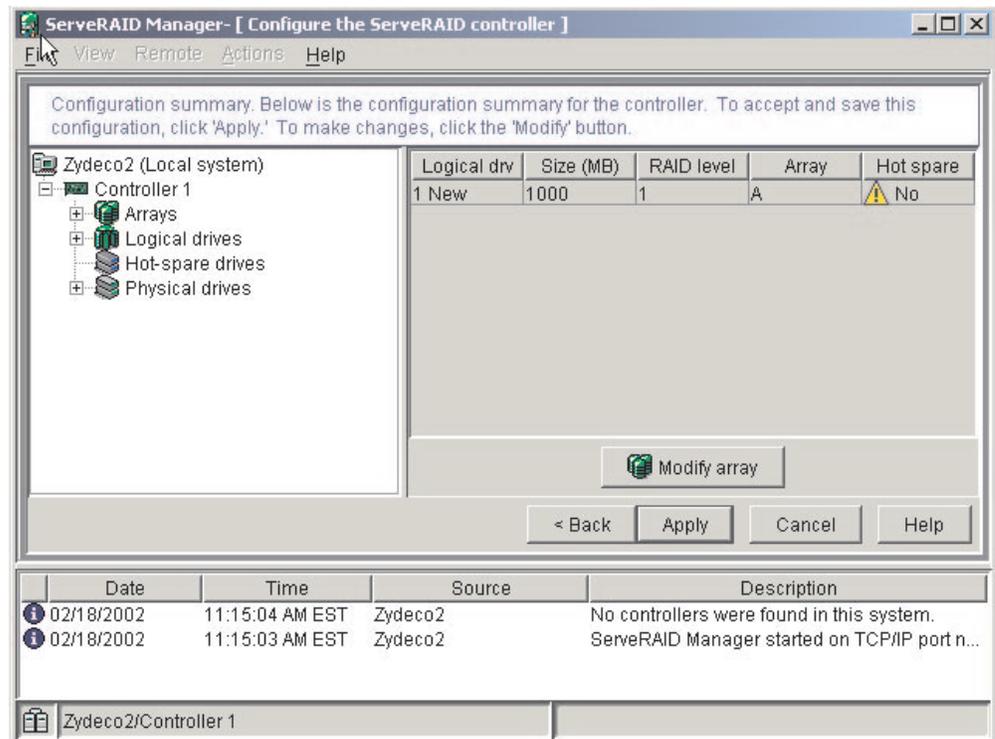


Figure 2. “Configuration summary” window

5. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
6. Exit from the ServeRAID Manager program and remove the CD from the CD-ROM drive.
7. Restart the server.

Using Custom configuration: To configure your controller manually, select Custom configuration. Using Custom configuration, you can select which two physical drives you want to configure and create a hot-spare drive.

Complete the following steps to use Custom configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**. The “Create arrays” window opens.

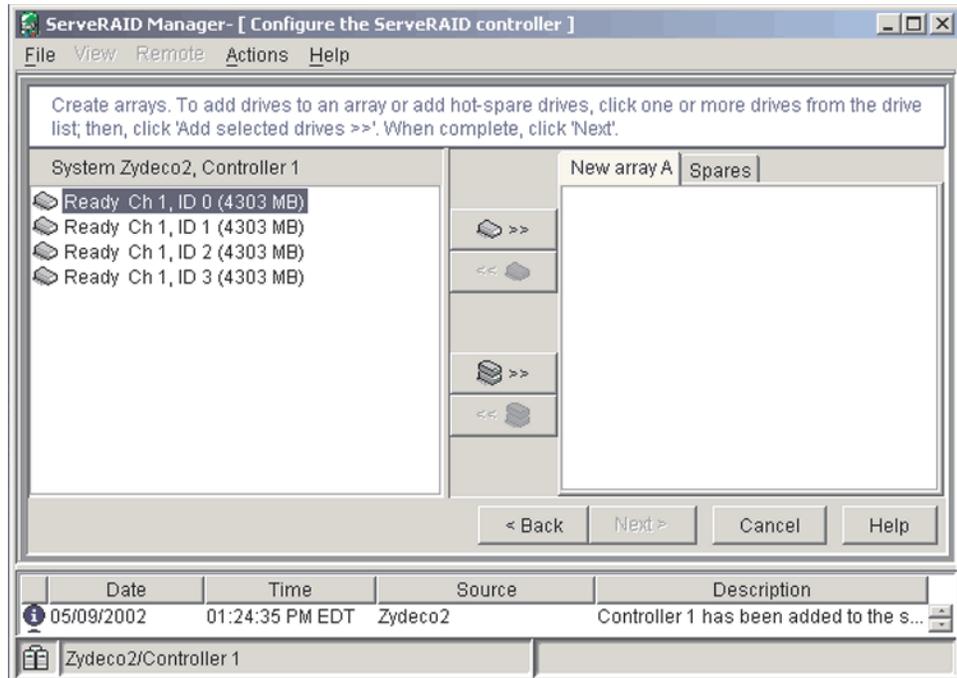


Figure 3. “Create arrays” window

4. From the list of ready drives, select the two drives you want to move to the array.
5. Click  (Add selected drives) to add the drives to the array.
6. Complete the following steps if you want to configure a hot-spare drive:
 - a. Click the **Spares** tab.
 - b. Select the physical drive you want to designate as the hot-spare drive; then, click  (Add selected drives).

7. Click **Next**. The “Configuration summary” window opens.

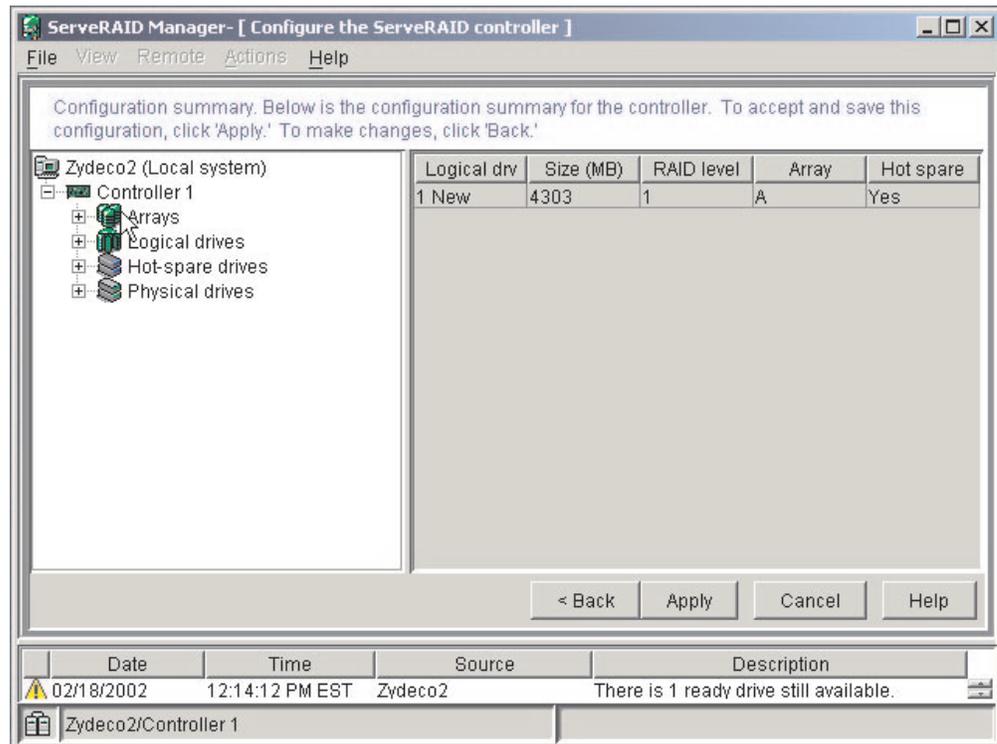


Figure 4. “Configuration summary” window

8. Review the information that is displayed in the “Configuration summary” window. To change the configuration, click **Back**.
9. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
10. Exit from the ServeRAID Manager program, and remove the CD from the CD-ROM drive.
11. Restart the server.

Viewing your configuration

You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem (such as arrays, logical drives, hot-spare drives, and physical drives).

To view information, expand the ServeRAID Manager tree; then, click the relevant tree object. Detailed information about the selected device appears in the right pane.

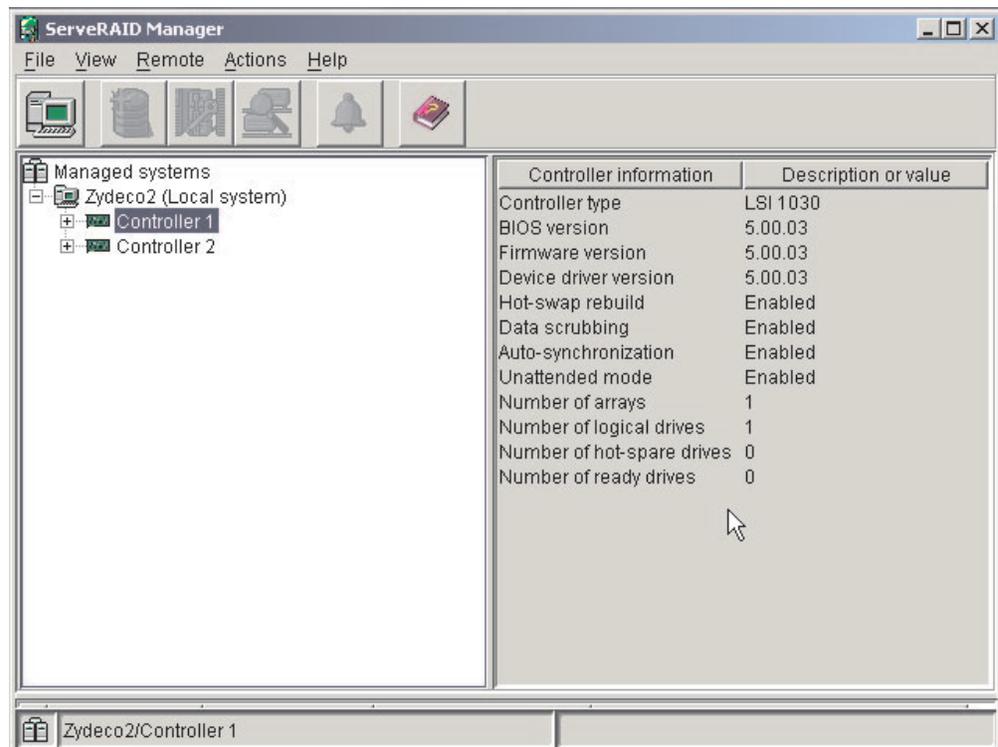


Figure 5. ServeRAID Manager window

To display available actions for an item, click the item in the ServeRAID Manager tree and click **Actions**.

Getting assistance

For more information about ServeRAID Manager, see the online help system. To start the help system, either click  (Information about this window) on the toolbar or select an item from the **Help** menu.

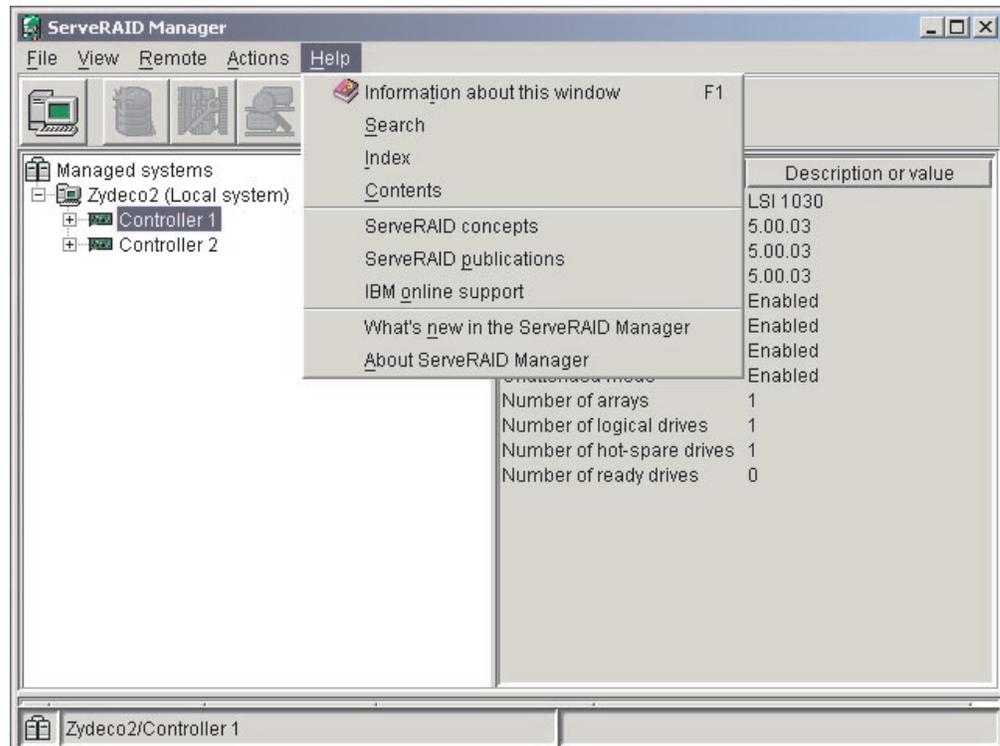


Figure 6. ServeRAID Manager help menu

The help system (ServeRAID Assist) will open within the ServeRAID Manager interface.

To learn more about the ServeRAID Manager tree objects and the actions that apply to them, select a tree object and click **Actions** → **Hints and tips**. ServeRAID Assist will start, and information about the tree object will appear in the right pane of ServeRAID Manager.

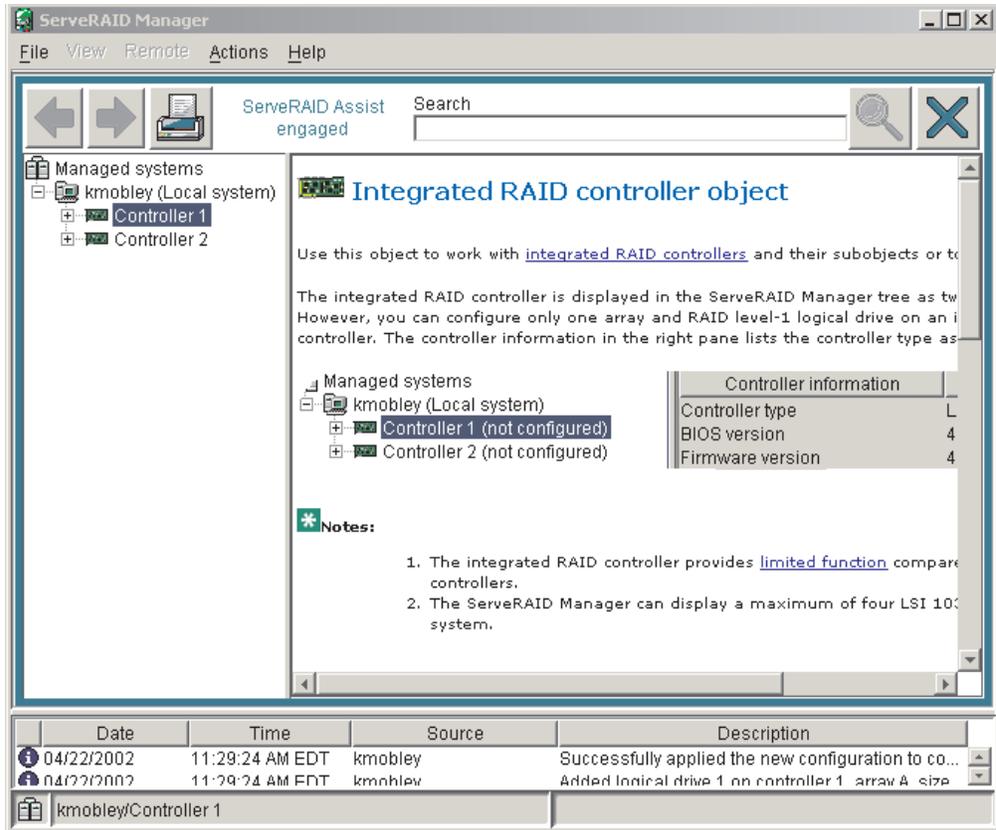


Figure 7. Hints and tips feature

Chapter 5. Installing IBM Director updates

If you plan to use IBM Director to manage your server, you must install the applicable IBM Director updates, which could include a Service Pack for your release of IBM Director, individual emergency fixes (eFixes), and a Director System Support Package (DSSP) for this server.

Note: For Automatic Server Restart (ASR) support and environmental-sensor support, you must install version 3.1.1 of IBM Director.

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

1. If you plan to enable the Automatic Server Restart (ASR) feature, install the ASR device driver, which is available from the IBM Web site:
 - a. Go to the IBM Web site at <http://www.ibm.com>.
 - b. Click **Support & downloads**.
 - c. In the **Technical support** keyword search field, type Advanced System Management 8647 and click **Go**.
 - d. From the next page, click **IBM Advanced System Management Device Driver Diskette for Microsoft Windows 2000 and Windows NT 4.0 Version 2.07** (or a later version, if it is available).
 - e. From the next page, download the executable file and follow the instructions in the readme file to install the device driver.
2. Install the IBM Director application.
3. If the IBM Director CD that comes with your server includes the IBM Director Service Pack, install the Service Pack. If the CD does not contain the Service Pack, check the IBM Web site to see if a Service Pack is available. If it is, download and install the Service Pack according to the instructions in its readme file.
4. Install any applicable eFixes, DSSPs, and additional updates for your server from the IBM Web site.

Complete the following steps to obtain and install eFixes, DSSPs, or other updates:

1. Go to the IBM Web site at <http://www.ibm.com>.
2. Click **Support & downloads**.
3. In the **Technical support** keyword search field, type Director 8647 and click **Go**.
4. From the next page, click the eFix, DSSP, or update that you want to download.
5. From the next page, download the executable file and follow the instructions in the readme file to install the update.

Chapter 6. Solving problems

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

If you cannot locate and correct the problem using the information in this section, see Appendix A, “Getting help and technical assistance”, on page 71, the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD, and the “Server Support” flowchart in the front of this book.

POST beep code descriptions

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

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

Table 4. POST beep code descriptions

Beep code	Descriptions of the POST beep codes
No beep	Call for service.
Continuous	If no video appears, the startup (boot) microprocessor failed. Verify that the startup microprocessor is installed correctly. If it is, replace the startup microprocessor. If the problem persists, call for service.
One short	POST was completed successfully. One beep also occurs after POST if you enter an incorrect password.
Two short	Follow the instructions that appear on the screen.
Three short	POST detected a system memory error. Verify that the memory is installed correctly. If it is, replace the failing memory module.
Repeating short	The system board might contain a failing component. <ol style="list-style-type: none">1. Verify that the keyboard and pointing devices are connected properly.2. Ensure that nothing is resting on the keyboard.3. Disconnect the pointing device; then, restart the server. If the problem goes away, replace the pointing device. If the problem remains, call for service.
One long and one short	If the video controller on the system board is being used, call for service. If you installed an optional video adapter, replace the failing adapter.
One long and two short	A video I/O adapter ROM is not readable, or the video subsystem is defective. If you installed an optional video adapter, replace the failing adapter. If the problem remains, call for service.
One long and three short	The system-board video subsystem has not detected a monitor connection to the server. Ensure that the monitor is connected to the server. If the problem remains, replace the monitor.
Two long and two short	POST does not support the optional video adapter. Replace the optional video adapter with one that is supported by the server or use the integrated video controller.
All other beep codes	<ol style="list-style-type: none">1. Verify that the system memory modules are installed correctly.2. Turn off the server; then, restart the server. If the problem remains, call for service.

POST error messages

The following table provides an abbreviated list of the error messages that might appear during POST.

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

Table 5. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
162	Change in device configuration	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program; then, exit, saving the configuration settings. 2. Verify that your optional devices are turned on and installed correctly.
163	Time of day has not been set	Set the correct date and time.
196 198 199	Processor mismatch	Verify that CPU 2 is the same type and speed as CPU 1.
201	Change in memory configuration	Verify that your memory is fully seated and installed properly.
289	Failing DIMM was disabled	Verify that your memory is correct for your server and that it is installed properly.
301 303	Keyboard and keyboard controller	Ensure that the keyboard cable is connected and nothing is resting on the keyboard keys.
962	Parallel port configuration error	Start the Configuration/Setup program and verify that the parallel-port setting is correct.
1162	Serial port configuration conflict	Start the Configuration/Setup program and ensure that the IRQ and I/O port assignments needed by the serial port are available.
1301	Operator information panel cable not detected	Verify that the operator information panel cable is connected to J24 on the system board.
1302	On/off/reset panel cable not detected	Verify that the on/off/reset panel cable is connected to J47 on the system board.
1304	Light Path Diagnostics panel cable not detected	Verify that the Light Path Diagnostics panel cable is connected to J23 on the system board.
1602	Remote Supervisor Adapter (RSA) cable not detected	Verify that the RSA cable is connected to J27 on the system board.
00019xxx	Processor x is not functioning or failed the built-in test	Verify that processor x is installed correctly. If the problem remains, replace processor x.
00180xxx	A PCI adapter requested a resource that is not available	Start the Configuration/Setup program and ensure that the resources needed by the PCI adapter are available.
012980xx 012981xx	Data for processor x	Download and install the latest system BIOS level.
I9990305	POST could not find an operating system.	Install your operating system.

ServerGuide program problems

The following table lists problem symptoms and suggested solutions.

Table 6. ServerGuide Setup and Installation CD

Symptom	Suggested action
The <i>ServerGuide Setup and Installation</i> CD will not start.	<ul style="list-style-type: none">• Ensure that the server is supported and has a startable (bootable) CD-ROM drive.• If the startup (boot) sequence settings have been altered, ensure that the CD-ROM drive is first in the startup sequence.• If more than one CD-ROM drive is installed, ensure that only one drive is set as the primary drive. Start the CD from the primary drive.
The SCSI RAID program cannot view all installed drives, or the NOS cannot be installed.	<ul style="list-style-type: none">• Ensure that there are no duplicate SCSI IDs or IRQ assignments.• Ensure that the hard disk drive is connected properly.
The Operating System Installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start your NOS CD.	Ensure that the NOS CD you have is supported by the ServerGuide program. See the <i>ServerGuide Setup and Installation</i> CD label for a list of supported NOS versions.
The NOS cannot be installed; the option is not available.	Ensure that the NOS is supported on your server. If the NOS is supported, either there is no logical drive defined (SCSI RAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide program, and ensure that setup is complete.

Troubleshooting chart

Notes:

1. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM xSeries Documentation CD for more detailed troubleshooting charts.
2. If you cannot find the problem in the troubleshooting charts, run the diagnostic programs. If you have run the diagnostic test programs, or if running the tests does not reveal the problem, call for service.

Table 7. Troubleshooting charts

Symptom	Suggested action
CD-ROM drive problems	
CD-ROM drive is not recognized.	Verify that: <ul style="list-style-type: none"> • The IDE channel to which the CD-ROM drive is attached (primary or secondary) is enabled in the Configuration/Setup Utility program. Note: On systems with a single IDE channel, only the primary channel can be used. • All cables and jumpers are installed correctly. • The correct device driver is installed for the CD-ROM drive.
Diskette drive problems	
Diskette drive activity LED stays on, or the system bypasses the diskette drive.	If there is a diskette in the drive, verify that: <ul style="list-style-type: none"> • The diskette drive cables are correctly and securely connected. • The diskette drive is enabled in the Configuration/Setup Utility program. • The diskette is good and not damaged. (Try another diskette if you have one.) • The diskette contains the necessary files to start the server. • Your software program is working properly. If the diskette drive activity LED stays on, or the system continues to bypass the diskette drive, call for service.
Expansion enclosure problems	
The SCSI expansion enclosure used to work but does not work now.	Verify that: <ul style="list-style-type: none"> • 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. • Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. For more information, see your SCSI expansion enclosure documentation.
General problems	
Problems such as broken cover locks or indicator LEDs not working.	Call for service.
Hard disk drive problems	
Not all drives are recognized by the hard disk drive diagnostic test ("Fixed Disk" test).	<ol style="list-style-type: none"> 1. Remove the first drive not recognized and try the hard disk drive diagnostic test again. 2. If the remaining drives are recognized, replace the drive you removed with a new one.

Table 7. Troubleshooting charts (continued)

Symptom	Suggested action
System stops responding during hard disk drive diagnostic test.	<ol style="list-style-type: none"> 1. Remove the hard disk drive 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 you removed with a new one.
Intermittent problems	
A problem occurs only occasionally and is difficult to detect.	<p>Verify that:</p> <ul style="list-style-type: none"> • 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 grill. If there is no airflow, the fan is not working. This can cause the server to overheat and shut down. • Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. <p>If you have verified these items and the problem remains, call for service.</p>
Keyboard, mouse, or pointing-device problems.	
All or some keys on the keyboard do not work.	<ul style="list-style-type: none"> • Make sure that the keyboard cable is securely connected to the system, and that the keyboard and mouse cables are not reversed. • Make sure that the server and the monitor are turned on. • Try using another keyboard. <p>If the problem remains, call for service.</p>
The mouse or pointing device does not work.	<ul style="list-style-type: none"> • Make sure that the mouse or pointing-device cable is securely connected, and that the keyboard and mouse cables are not reversed. • Verify that the mouse device drivers are installed correctly. • Try using another mouse or pointing device. <p>If the problem remains, call for service.</p>
Memory problems	
The amount of system memory displayed is less than the amount of physical memory installed.	<p>Verify that:</p> <ul style="list-style-type: none"> • The memory modules are seated properly. • You have installed the correct type of memory. • If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program. • All banks of memory on the DIMMs are enabled. The server might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. <p>Look in the POST error log for error message 289:</p> <ul style="list-style-type: none"> • If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If the DIMM was disabled by the user or by POST: <ol style="list-style-type: none"> 1. Start the Configuration/Setup Utility program. 2. Enable the DIMM. 3. Save the configuration and restart the server. • If you continue to get this error, replace the DIMM. <p>If the problem remains, call for service.</p>

Table 7. Troubleshooting charts (continued)

Symptom	Suggested action
Microprocessor problems	
The server emits a continuous tone during POST.	<p>The startup (boot) microprocessor is not working properly.</p> <p>Verify that the startup microprocessor is seated properly. If it is, replace the startup microprocessor.</p> <p>If the problem remains, call for service.</p>
Monitor problems	
Testing the monitor.	<p>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.</p> <p>If you still cannot find the problem, call for service.</p>
The screen is blank.	<p>Verify that:</p> <ul style="list-style-type: none"> • The server power cord is plugged into the server and a working electrical outlet. • The monitor cables are connected properly. • The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. <p>If the servers are C2T chained together, verify that:</p> <ul style="list-style-type: none"> • The C2T chain cables are securely connected to the servers. • The C2T breakout cable is connected properly. • A server that is turned on is selected. <p>Important: In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank monitor screen. If this occurs and the Boot Fail Count feature in the Start Options of the Configuration/Setup Utility program is set to Enabled (its default setting), you must restart the server three times to force the system BIOS to reset the CMOS values to the default configuration (memory connector or bank of connectors enabled).</p> <p>If you have verified these items and the screen remains blank, call for service.</p>
Only the cursor appears.	Call for service.
The monitor works when you turn on the server but goes blank when you start some application programs.	<p>Verify that:</p> <ul style="list-style-type: none"> • The primary monitor cable is connected to the C2T device breakout cable. • You installed the necessary device drivers for the applications. <p>If you have verified these items and the screen remains blank, call for service.</p>

Table 7. Troubleshooting charts (continued)

Symptom	Suggested action
The screen is wavy, unreadable, rolling, distorted, or has screen jitter.	<p>If the monitor self-tests show the monitor is working properly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor.</p> <p>Notes:</p> <ol style="list-style-type: none"> To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). Non-IBM monitor cables might cause unpredictable problems. 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 reseller or IBM marketing representative. <p>If the problem remains, call for service.</p>
Wrong characters appear on the screen.	<p>If the wrong language is displayed, update the BIOS code with the correct language.</p> <p>If the problem remains, call for service.</p>
Option problems	
An IBM option that was just installed does not work.	<p>Verify that:</p> <ul style="list-style-type: none"> The option is designed for the server. See the "Server Support" flowchart for information about obtaining ServerProven[®] compatibility information from the World Wide Web. You followed the installation instructions that came with the option. The option is installed correctly. You have not loosened any other installed options or cables. You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. <p>If the problem remains, call for service.</p>
An IBM option that used to work does not work now.	<p>Verify that all of the option hardware and cable connections are secure.</p> <p>If the option comes with its own test instructions, use those instructions to test the option.</p> <p>If the failing option is a SCSI option, verify that:</p> <ul style="list-style-type: none"> 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. Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. <p>If the problem remains, call for service.</p>
Power problems	
The server does not turn on.	<p>Verify that:</p> <ul style="list-style-type: none"> The power cords are properly connected to the server. The electrical outlet functions properly. The type of memory installed is correct. If you just installed an option, remove it, and restart the server. If the server now turns on, you might have installed more options than the power supply supports. <p>If the problem remains, call for service.</p>

Table 7. Troubleshooting charts (continued)

Symptom	Suggested action
The server does not turn off.	<p>Verify whether you are using an ACPI or non-ACPI operating system.</p> <p>If you are using a non-ACPI operating system:</p> <ol style="list-style-type: none"> 1. Press Ctrl+Alt+Delete. 2. Turn off the system by using the power-control button. You might need to press and hold the power-control button for five seconds to force the server to turn off. <p>If the problem remains or if you are using an ACPI-aware operating system, call for service.</p>
Serial port problems	
The number of serial ports identified by the operating system is less than the number of serial ports installed.	<p>Verify that:</p> <ul style="list-style-type: none"> • Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial-port adapter, if you installed one, is seated properly. <p>If the problem remains, call for service.</p>
A serial device does not work. For more information about the serial port, see the <i>Option Installation Guide</i> on the IBM xSeries Documentation CD.	<p>Verify that:</p> <ul style="list-style-type: none"> • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. • The device is connected to the serial port and that the serial port is connected to serial connector (J8) on the system board. <p>If the problem remains, call for service.</p>
Software problem	
Suspected software problem.	<p>To determine if problems are caused by the software, verify that:</p> <ul style="list-style-type: none"> • Your server has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. Note: If you have just installed an adapter or memory, you might have a memory address conflict. • The software is designed to operate on your server. • Other software works on your server. • The software that you are using works on another system. <p>If you received any error messages when using the software program, see the information that comes with the software for a description of the messages and suggested solutions to the problem.</p> <p>If you have verified these items and the problem remains, contact your place of purchase.</p>
Universal Serial Bus (USB) port problems	
A USB device does not work.	<p>Verify that:</p> <ul style="list-style-type: none"> • You are not trying to use a USB device during POST if you have a standard (non-USB) keyboard attached to the keyboard port. Note: If a standard (non-USB) keyboard is attached to the keyboard port, the USB is disabled and no USB device will work during POST. • The correct USB device driver is installed. • Your operating system supports USB devices. <p>If the problem remains, call for service.</p>

Appendix A. Getting help and technical assistance

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

Before you call

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

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

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

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, README files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/pc/support/> and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at <http://www.elink.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/>. If you click **Profile** from the support page, you can create a customized support page. The support page has many sources of information and ways for you to solve problems, including:

- Diagnosing problems, using the IBM Online Assistant
- Downloading the latest device drivers and updates for your products
- Viewing Frequently Asked Questions (FAQ)
- Viewing hints and tips to help you solve problems
- Participating in IBM discussion forums
- Setting up e-mail notification of technical updates about your products

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.

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.

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

Appendix B. Warranty information

This section contains information about your warranty period and the service and support that are provided by your warranty.

Warranty period

The warranty period varies by machine type and country or region.

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

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician.

A warranty period of 3 years on parts and 1 year on labor means that IBM will provide warranty service without charge for:

1. parts and labor during the first year of the warranty period
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor it provides in performance of the repair or replacement.

The IBM Machine Warranties Web site at http://www.ibm.com/servers/support/machine_warranties/ contains a worldwide overview of the IBM Statement of Limited Warranty for IBM Machines, a glossary of terms used in the Statement of Limited Warranty, Frequently Asked Questions (FAQ), and links to Product Support Web pages. The IBM Statement of Limited Warranty is available from this Web site in 29 languages in Portable Document Format (PDF).

Machine - IBM @server xSeries 235 Type 8671

Country or region	Warranty period	Service delivery method
Japan	Parts - 3 years, labor - 1 year	On-site
Worldwide	3 years	On-site

Problem determination

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician. The service specialist will run diagnostic tests on the hardware and check the software.

Running diagnostics

The IBM service specialist will help you determine whether your equipment is functioning as specified. It might be necessary to isolate the failing xSeries, Netfinity®, or IntelliStation system; IBM component; or both from any active production environment to run diagnostics and perform defect-isolation programs. You are responsible for making the system, IBM component, or both available for running diagnostics and defect-isolation programs.

Checking software

The IBM service specialist will help you ensure that the correct BIOS code, firmware, device drivers, and other supporting IBM software are installed and correctly configured. It might be necessary to manually gather information about the relevant software levels or run IBM-approved utility programs to gather this information. It might be necessary to isolate the failing system from any active production environment to gather this information. You are responsible, with assistance from the service specialist, for gathering this information. The IBM Statement of Limited Warranty does not include on-site assistance with this activity.

Warranty service and support

With the original purchase of an IBM xSeries or IntelliStation system, you have access to extensive service and support. During the IBM Machine warranty period, you may call IBM or your reseller for problem-determination assistance under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.
- **Customer replaceable units (CRUs)** - Some parts of IBM servers are designated as customer replaceable units. IBM ships CRUs to you for replacement by you. CRUs include keyboards, monitors, memory, diskette drives, hard disk drives, and mice (this list is not inclusive of all CRUs).

The following items are not covered under warranty service:

- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXXX.
- Identification of software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of BIOS code, firmware, or device drivers that are designated as customer installable.

See the IBM Statement of Limited Warranty for a full explanation of IBM warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- The machine type and model of your IBM hardware product (if available)
- Serial numbers of your IBM hardware products
- A description of the problem
- The exact wording of any error messages
- Hardware and software configuration information

International Warranty Service

If you travel with your xSeries or IntelliStation system or relocate it to a country where your system is sold and serviced by IBM or IBM resellers authorized to perform warranty service, International Warranty Service (IWS) is available during the warranty period. Eligible IBM systems are identified by their four-digit machine types.

You can obtain IWS through the service delivery method (such as depot, carry-in, or on-site) provided in the servicing country. Service methods and procedures vary by country, and some service or parts might not be available in all countries. Service centers in certain countries might not be able to service all models of a particular machine type. In addition, some countries might have fees and restrictions that apply at the time of service.

To determine whether your system is eligible for IWS, go to <http://www.ibm.com/pc/support/> and click **Warranty lookup**.

Purchasing additional services

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

For more information about these services, contact your IBM marketing representative.

IBM Statement of Limited Warranty Z125-4753-06 8/2000

Part 1 - General Terms

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

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

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

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

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Items Not Covered by Warranty: 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, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

Warranty Service: To obtain warranty service for a Machine, contact IBM or your reseller. If you do not register your Machine with IBM, you may be required to present proof of purchase.

During the warranty period, IBM or your reseller, if approved by IBM to provide warranty service, provides without charge certain types of repair and exchange service to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. At its discretion, IBM or your reseller will 1) either repair or exchange the failing Machine and 2) provide the service either at your location or a service center. IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Some parts of IBM Machines are designated as Customer Replaceable Units (called "CRUs"), e.g., keyboards, memory, or hard disk drives. IBM ships CRUs to you for replacement by you. You must return all defective CRUs to IBM within 30 days of your receipt of the replacement CRU. You are responsible for downloading designated Machine Code and Licensed Internal Code updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

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

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

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
 - a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides;
 - b. secure all programs, data, and funds contained in a Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations; and
 - d. inform IBM or your reseller of changes in a Machine's location.

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

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

Limitation of Liability: Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other

contract or tort claim), 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.

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

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

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 Agreement, without regard to conflict of law principles.

Part 2 - Country-unique Terms

AMERICAS

BRAZIL

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

NORTH AMERICA

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

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

The IBM Warranty for Machines: *The following paragraph is added to this Section:* The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other 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.

The following is added to this Section: Disputes and differences arising out of or in connection with this Agreement shall be finally settled by arbitration which shall be held in Singapore in accordance with the rules of the International Chamber of Commerce (ICC). The arbitrator or arbitrators designated in conformity with those rules shall have the power to rule on their own competence and on the validity of the Agreement to submit to arbitration. The arbitration award shall be final and binding for the parties without appeal and the arbitral award shall be in writing and set forth the findings of fact and the conclusions of law.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. 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 before proceeding upon the reference. The third arbitrator shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the ICC. 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.

The English language version of this Agreement prevails over any other language version.

HONG KONG AND MACAU

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.

INDIA

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

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence;
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

JAPAN

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

NEW ZEALAND

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

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

PEOPLE'S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces this Section:* Both you and IBM consent to the application of the laws of the State of New York (except when local law requires otherwise) to govern, interpret, and enforce all your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Any disputes arising from or in connection with this Agreement will first be resolved by friendly negotiations, failing which either of us has the right to submit the dispute to the China International Economic and Trade Arbitration Commission in Beijing, the PRC, for arbitration in accordance with its arbitration rules in force at the time. The arbitration tribunal will consist of three arbitrators. The language to be used therein will be English and Chinese. An arbitral award will be final and binding on all the parties, and will be enforceable under the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958).

The arbitration fee will be borne by the losing party unless otherwise determined by the arbitral award.

During the course of arbitration, this Agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

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.

Warranty Service: If you purchase an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM. If you purchase an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, 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 an IBM 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 authorized service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM authorized service provider.

Governing Law: The applicable laws that govern, interpret and enforce rights, duties, and obligations of each of us arising from, or relating in any manner to, the subject matter of this Statement, without regard to conflict of laws principles, as well as Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided, except that in 1) Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Former Yugoslav Republic of Macedonia, Romania, Slovakia, Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, the laws of Austria apply; 2) Estonia, Latvia, and Lithuania, the laws of Finland apply; 3) Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Mali, Mauritania, Morocco, Niger, Senegal, Togo, and Tunisia, this Agreement will be construed and the legal relations between the parties will be determined in accordance with the French laws and all disputes arising out of this Agreement or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 4) 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, United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe, this Agreement will be governed by English Law and disputes relating to it will be submitted to the exclusive jurisdiction of the English courts; and 5) in Greece, Israel, Italy, Portugal, and Spain any legal claim arising out of this Statement will be brought before, and finally settled by, the competent court of Athens, Tel Aviv, Milan, Lisbon, and Madrid, respectively.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

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

The following paragraphs are added to this Section:

The minimum warranty period for Machines is six months. In case IBM or your reseller 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.

Extent of Warranty: *The second paragraph does not apply.*

Warranty Service: *The following is added to this Section:* During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

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.

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).*

IRELAND

Extent of Warranty: *The following is added to this Section:* Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties 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 items one and two of the first paragraph of this Section:*1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and 2. the amount of any other actual direct damages, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY

Limitation of Liability: *The following replaces the second sentence in the first paragraph: In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than: 1. (unchanged) 2. as to any other actual damage arising in all situations involving nonperformance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim. Applicability of suppliers and resellers (unchanged).*

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

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

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

UNITED KINGDOM

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

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

The following item is added to this paragraph: 3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

Appendix C. Notices

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Active PCI	PS/2
Active PCI-X	ServeRAID
Alert on LAN	ServerGuide
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Chipkill	TechConnect
EtherJet	Tivoli
e-business logo	Tivoli Enterprise
FlashCopy	Update Connector
HelpWare	Wake on LAN
IBM	XA-32
Light Path Diagnostics	XA-64
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Netfinity	XceL4
NetView	XpandOnDemand
OS/2 WARP	xSeries

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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.

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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.

Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

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

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

Taiwan electrical emission 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。

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
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa
13F9979	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka

IBM power cord part number	Used in these countries and regions
14F0033	Antigua, Bahrain, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Ethiopia, Italy, Libya, Somalia
14F0087	Israel
1838574	Thailand
6952301	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

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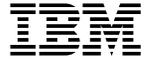
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