



xSeries 260
Type 8865

Installation Guide

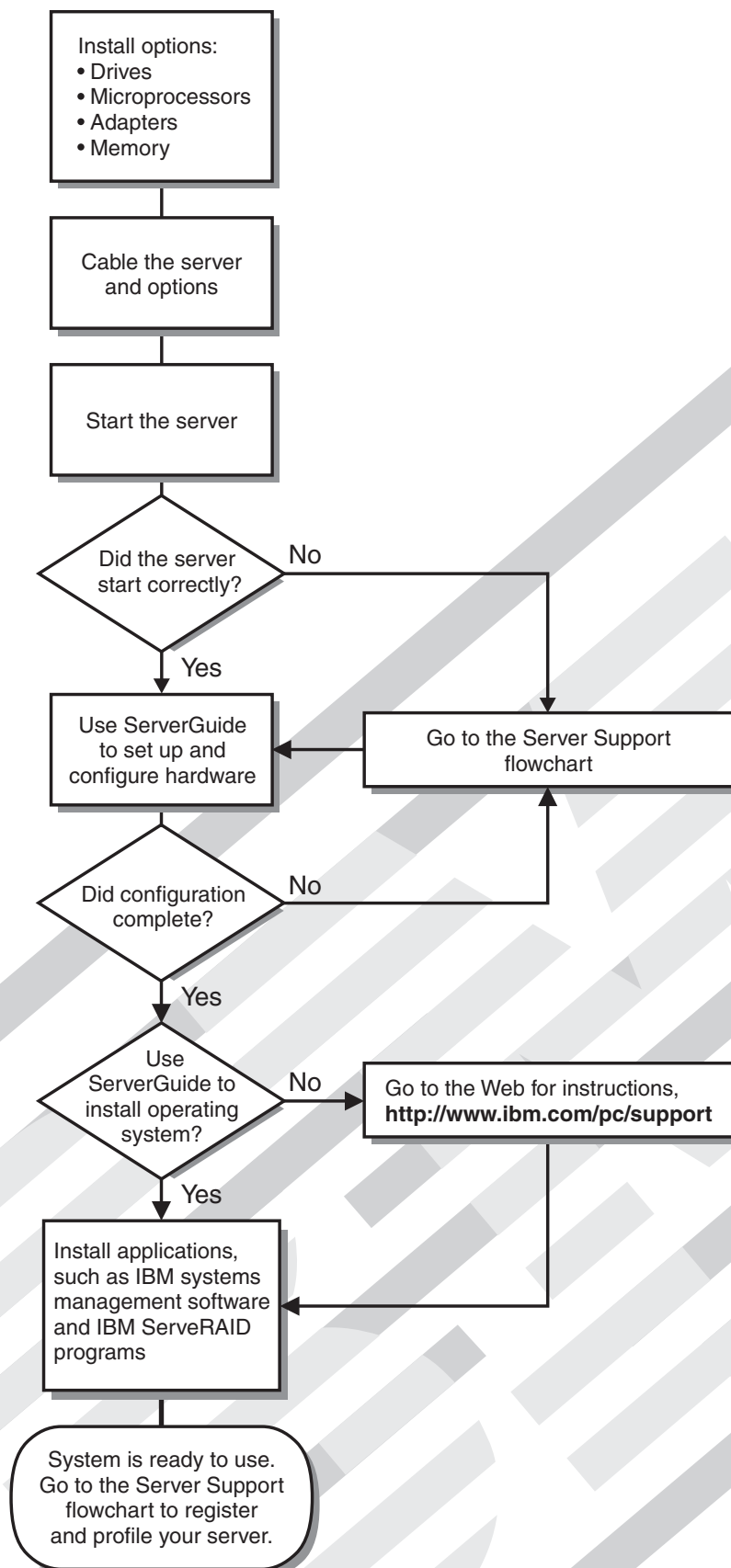
Welcome...

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.

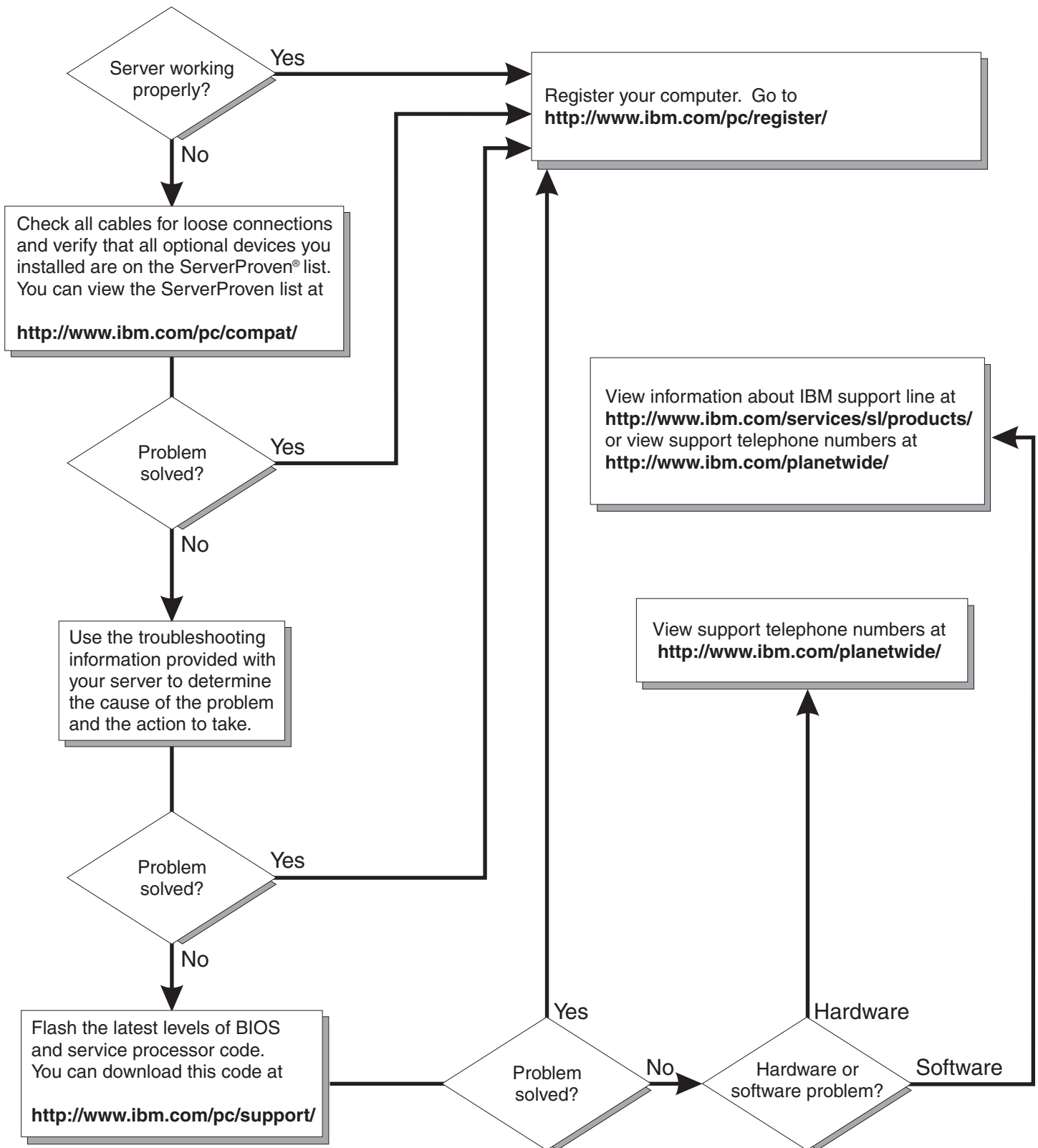
This server *Installation Guide* contains information for setting up and configuring your server.

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 260 Type 8865



Installation Guide

Note: Before using this information and the product it supports, read the general information in “Notices” on page 61, and the *Warranty and Support Information* document on the IBM xSeries *Documentation* CD.

First Edition (July 2005)

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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 ασφαλείας (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.

Important:

All caution and danger statements in this documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* book.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *IBM Safety Information* book under statement 1.

Be sure to read all caution and danger statements in this documentation before performing the instructions. Read any additional safety information that comes with the server or optional device before you install the device.

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

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.

To Disconnect:

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.

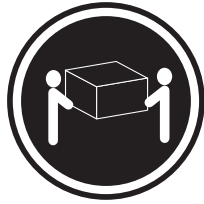


DANGER

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.

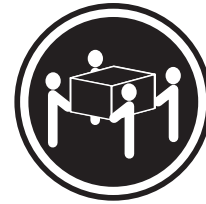
Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



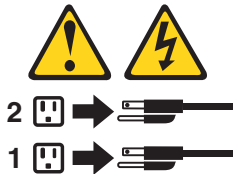
≥ 55 kg (121.2 lb)

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 on top of rack-mounted devices.



Chapter 1. Introduction

This *Installation Guide* contains instructions for setting up your IBM® @server® xSeries® 260 Type 8865 server and basic instructions for installing some options. More detailed instructions for installing options are in the *User's Guide* on the IBM *xSeries Documentation* CD, which comes with the server. This document contains information about:

- Setting up and cabling the server
- Starting and configuring the server
- Installing some options
- Solving problems

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

1. See <http://www.ibm.com/pc/support/>.
2. In the **Browse by topic** section, click **Publications**.
3. On the Publications page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **xSeries 260**.
5. Click **Continue**.

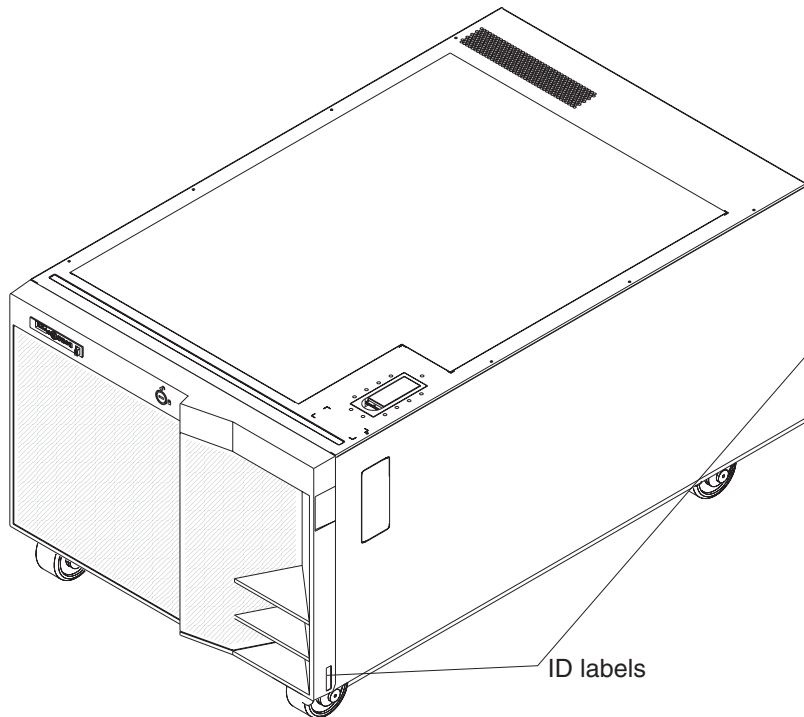
The server comes with an IBM *ServerGuide™ Setup and Installation* CD to help you configure the hardware, install device drivers, and install the operating system.

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

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

Product name	IBM @server xSeries 260
Machine type	8865
Model number	_____
Serial number	_____

The model number and serial number are on the ID labels, one on the lower-right front of the bezel and the other at the rear of the right side, as shown in the following illustration.



For a list of supported options for the server, see the ServerProven[®] Web site at <http://www.ibm.com/pc/compat/>.

The IBM xSeries Documentation CD

The IBM *xSeries Documentation* CD contains documentation for the 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[®] 2000, or Red Hat Linux.
- 100 MHz microprocessor.
- 32 MB of RAM.
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems. 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 documents, and view documents using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your server and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

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

- If Autostart is enabled, insert the CD into the CD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
 - If you are using a Windows operating system, insert the CD into the drive and click **Start --> Run**. In the **Open** field, type
`e:\win32.bat`

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

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

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

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

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

Notices and statements in this document

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

The following notices and statements are used in this document:

- **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 potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following information is a summary of the features and specifications of the server. Depending on the server model, some features might not be available, or some specifications might not apply.

Table 1. Features and specifications

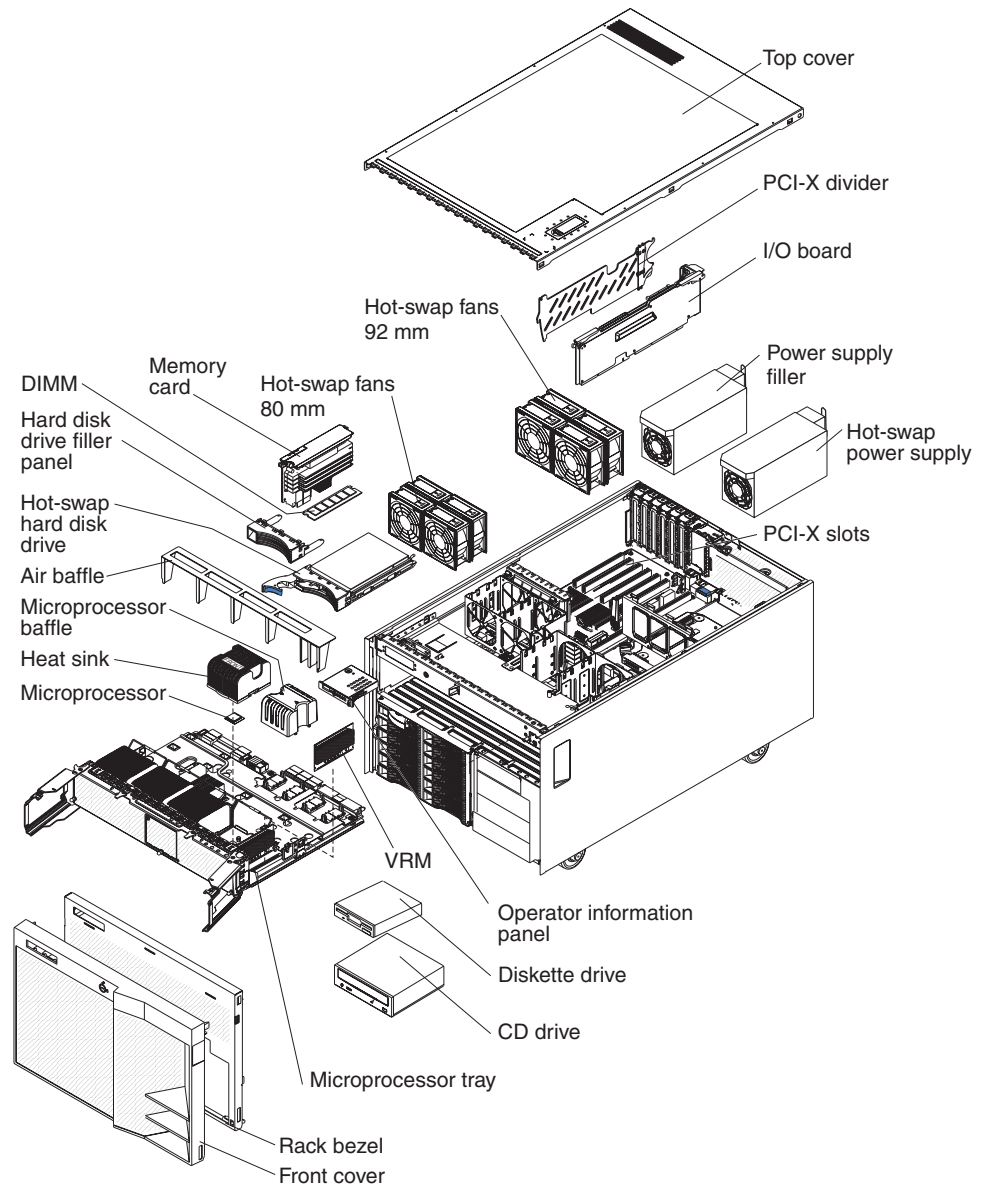
<p>Microprocessor:</p> <ul style="list-style-type: none"> • Intel™ Xeon™ • 1 MB Level-2 cache • 667 MHz front-side bus (FSB) • Support for up to four microprocessors <p>Note: Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.</p> <p>Memory:</p> <ul style="list-style-type: none"> • Minimum: 2 GB depending on server model, expandable to 32 GB • Type: 333 MHz, registered, ECC, PC2-3200 double data rate (DDR) II, SDRAM • Sizes: 1 GB or 2 GB in pairs • Connectors: Two-way interleaved, four dual inline memory module (DIMM) connectors per memory card • Maximum: Four memory cards, each card containing two pairs of PC2-3200 DDRII DIMMs <p>Drives:</p> <ul style="list-style-type: none"> • CD: IDE • Diskette: 1.44 MB • Serial Attached SCSI (SAS) hard disk drive <p>Expansion bays:</p> <ul style="list-style-type: none"> • Twelve SAS, 3.5-inch bays • Three 5.25-inch bays (CD-ROM installed) • One 3.5-inch bay (diskette drive installed) <p>Expansion slots:</p> <p>Six PCI-X 2.0 hot-plug 266 MHz/64-bit slots</p> <p>Upgradeable microcode:</p> <p>System BIOS, diagnostics, service processor, BMC, and SAS microcode</p> <p>Power supply:</p> <ul style="list-style-type: none"> • Standard: Two 775 watt 110 V or 220 V ac input dual-rated power supplies • Upgradeable to four power supplies 	<p>Size:</p> <ul style="list-style-type: none"> • 7 U • Height: 311 mm (12.3 in.) • Depth: 715 mm (28.15 in.) • Width: 440 mm (17.32 in.) • Weight: approximately 55 kg (121.2 lb) when fully configured or 47 kg (104 lb) minimum <p>Racks are marked in vertical increments of 4.45 cm (1.75 inches). Each increment is referred to as a unit, or "U." A 1-U-high device is 4.45 cm (1.75 inches) tall.</p> <p>Integrated functions:</p> <ul style="list-style-type: none"> • Baseboard management controller • IBM EXA-32 Chipset with integrated memory and I/O controller • Service processor support for Remote Supervisor Adapter II SlimLine • Light path diagnostics • Three Universal Serial Bus (USB) ports (2.0) <ul style="list-style-type: none"> – Two on rear of server – One on front of server • Broadcom 5704C dual 10/100/1000 Gigabit Ethernet controllers • ATI 7000-M video <ul style="list-style-type: none"> – 16 MB video memory – SVGA compatible • Mouse connector • Keyboard connector • Serial connector <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Sound power, idle: 6.6 bel declared • Sound power, operating: 6.6 bel declared <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 2133 m (6998.0 ft) – Server off: 10° to 43°C (50.0° to 109.4°F); maximum altitude: 2133 m (6998.0 ft) • Humidity: <ul style="list-style-type: none"> – Server on: 8% to 80% – Server off: 8% to 80% 	<p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> • Minimum configuration: 2006 Btu (588 watts) per hour • Maximum configuration: 6346 Btu (1860 watts) per hour <p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50-60 Hz) required • 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 • Approximate input kilovolt-amperes (kVA): <ul style="list-style-type: none"> – Minimum: 0.60 kVA – Maximum: 1.9 kVA <p>Notes:</p> <ol style="list-style-type: none"> 1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use. 2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.
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Major components of the server

Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.

Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.

The following illustration shows the major components in the server.



Chapter 2. Installing options

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

Installation guidelines

Before you install options, read the following information:

- Read the safety information that begins on page v, “Working inside the server with the power on” on page 8, and the guidelines in “Handling static-sensitive devices” on page 8. This information will help you work safely.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you stand safely without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap fans, hot-plug adapters, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before performing any steps that involve installing or removing adapter cables.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported options for the server, see <http://www.ibm.com/pc/compat/>.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that the following requirements are met:

- Each of the drive bays has a drive or a filler panel installed in it.

- If the server has redundant power, at least three of the power-supply bays have a power supply installed.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffle installed. Operating the server without the air baffle might cause the microprocessor or microprocessors to overheat.
- Microprocessor sockets 2, 3, and 4 each always contain either a microprocessor baffle or a microprocessor and heat sink.
- For redundant and hot-swappable operation, the power supplies are connected to 200-240 V ac.

Working inside the server with the power on

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which could result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.

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

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

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.

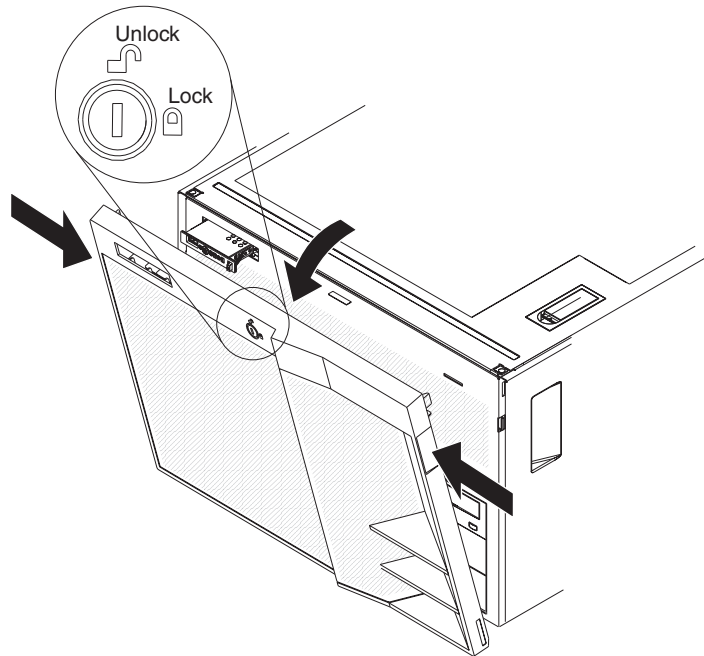
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part on the outside 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 the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Removing the front cover, top cover, and bezel

Remove the top cover and bezel to access the inside of the server. On a tower model, you must also unlock or remove the front cover.

Removing the front cover (tower model only)

To remove the front cover, complete the following steps.



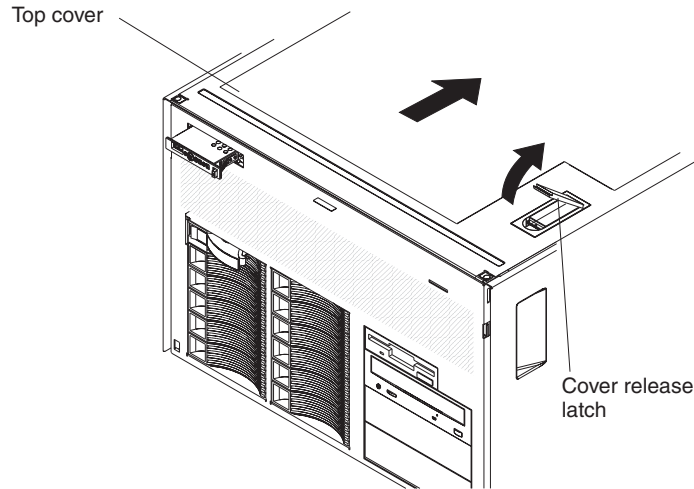
1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. If you are installing or replacing a non-hot-swap component, turn off the server and all peripheral devices. Disconnect all power cords; then, disconnect all external cables from the server.
3. Unlock the front cover; then, grasp the top corners of the front cover and pull it away from the server.

4. Lift the front cover to release the two tabs at the bottom edge of the cover.
5. Store the front cover in a safe place.

Removing the top cover

On a tower model, make sure that you unlock or remove the front cover before you remove the top cover.

To remove the top cover, complete the following steps.



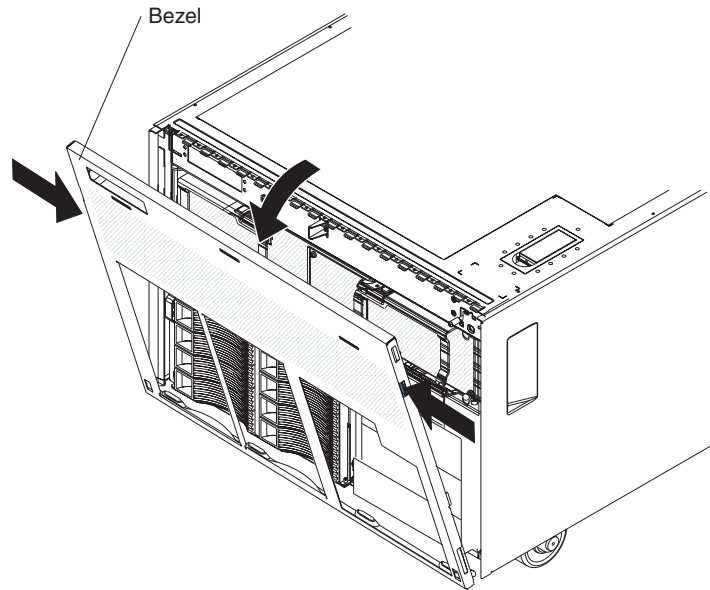
1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. If you are installing or replacing a non-hot-swap component, turn off the server and all peripheral devices. Disconnect all power cords; then, disconnect all external cables from the server.
3. Lift the plastic cover-release latch near the edge of the top cover.
4. Slide the top cover slightly toward the rear of the server; the cover will stop after moving approximately 25 mm (1 inch). Lift the cover off the server, and set the cover aside.

Attention: For proper cooling and airflow, replace the top cover before turning on the server. Operating the server for more than 2 minutes with the top cover removed might damage server components.

Removing the bezel

On a tower model, make sure that you unlock or remove the front cover before you remove the top cover and bezel.

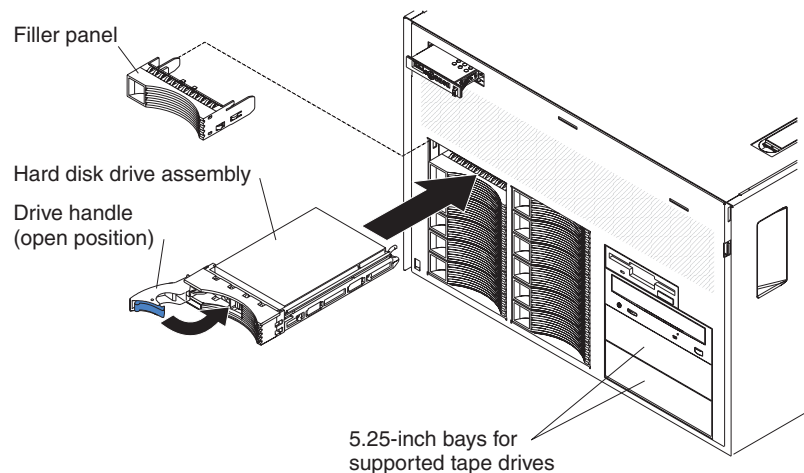
To remove the bezel, complete the following steps:



1. Press on the two release latches at the top edge of the bezel, and pull the top of the bezel slightly away from the server.
2. Lift the bezel to release the two tabs at the bottom edge of the bezel.
3. Store the bezel in a safe place.

Installing a hot-swap hard disk drive

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



The server supports up to two 5.25-inch, half-high, SCSI tape drives in the 5.25-inch bays. A SCSI adapter is required to support the tape drives.

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which could result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.

Complete the following steps to install a hot-swap hard disk drive:

1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. If you are installing drives in a tower model, remove the front cover (see “Removing the front cover (tower model only)” on page 9).
3. Remove the filler panel from one of the empty hot-swap bays.
4. Make sure that the tray handle is open; then, install the hard disk drive into the hot-swap bay.

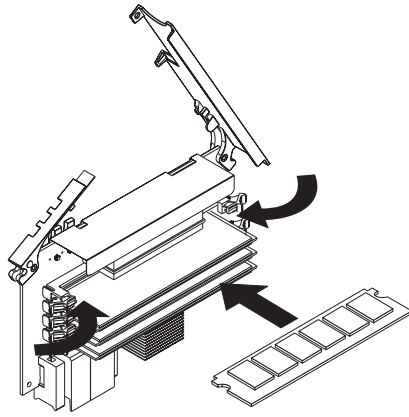
Notes:

1. When you turn on the server, check the hard disk drive status LEDs to make sure that the hard disk drive is operating correctly.
If the amber hard disk drive status LED for a drive is lit continuously, that drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.
2. If the server will be configured for RAID operation using an optional ServeRAID controller, you must configure the disk arrays before installing the 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.

If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 23.

Installing additional DIMMs

The following illustration shows how to install a dual inline memory module (DIMM) on a memory card.



The following notes describe information that you must consider when installing DIMMs:

- You can configure your server to use memory mirroring and memory scrubbing. For detailed information about configuring your server and using these features, see the *User's Guide* on the *IBM xSeries Documentation CD*.
- To use the hot-add and hot-swap memory features, you must reconfigure your server using the Configuration/Setup Utility program. See the *User's Guide* on the *IBM xSeries Documentation CD* for additional information.
- DIMMs can be hot-added to the server once without having to reconfigure the server. If you hot-add additional DIMMs to the server, you must reconfigure your server using the Configuration/Setup Utility program.

- There must be at least one memory card with one pair of DIMMs installed for the server to operate.
- When you install additional DIMMs on a memory card, be sure to install them in pairs. All the DIMM pairs on each memory card must be of the same size and type.
- Add odd-numbered DIMMs to each available memory card first, and then add the even-numbered pairs.
- Install the DIMMs on each memory card in the order shown in the following table. Each memory card must have at least one pair of DIMMs. See the *User's Guide* on the IBM xSeries Documentation CD for additional memory configuration installation sequences.

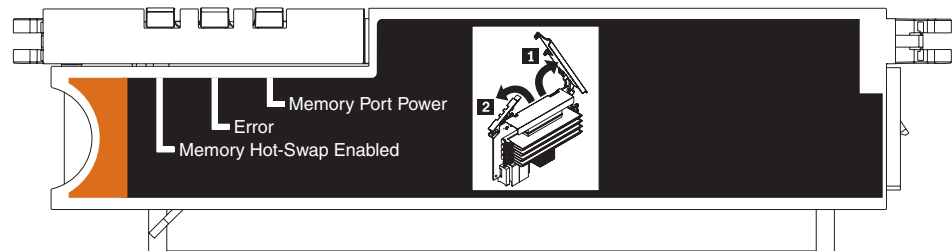
Table 2. Memory card installation sequence

Installation order	Memory card	DIMM pair
First	1	1 and 3
		2 and 4
Second	2	1 and 3
		2 and 4
Third	3	1 and 3
		2 and 4
Fourth	4	1 and 3
		2 and 4

- If memory mirroring is enabled, you can hot-replace one memory card at a time on each memory power bus.

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

The following illustration shows the LEDs on the memory card.



Memory Hot-Swap Enabled LED: When this LED is lit, it indicates that hot-swap memory is enabled.

Error LED: When this LED is lit, it indicates that a DIMM or memory card has failed.

Memory Port Power LED: When this LED is off, it indicates that power is removed from the port and that you can remove the memory card to replace a failed memory card or DIMM.

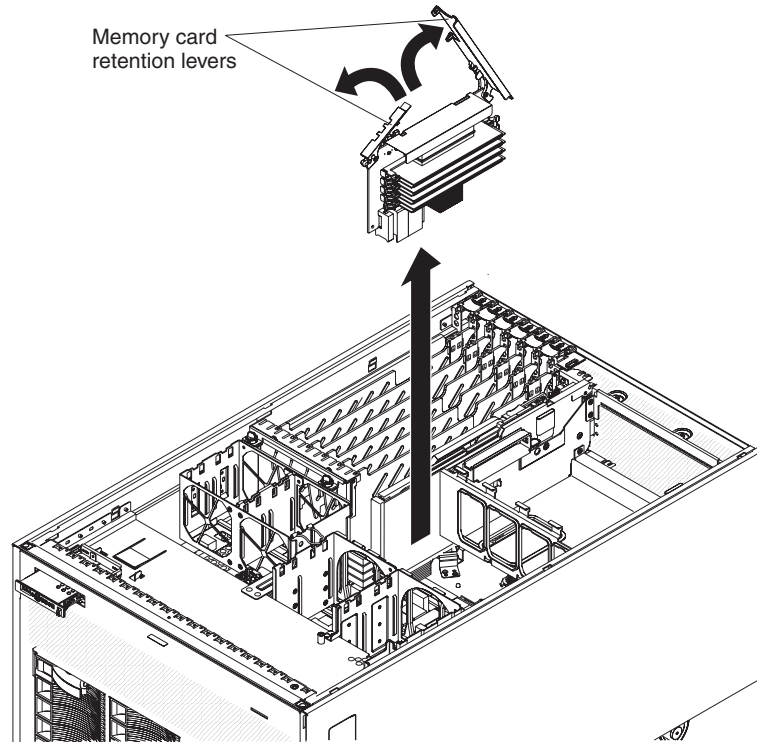
Installing a DIMM

Complete the following steps to install additional DIMMs:

1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. Remove the front cover (tower model only), and the top cover (see “Removing the front cover, top cover, and bezel” on page 9).
3. If you are not hot-swapping a DIMM, turn off the server and peripheral devices, and disconnect the power cords and all external cables necessary to replace the device.

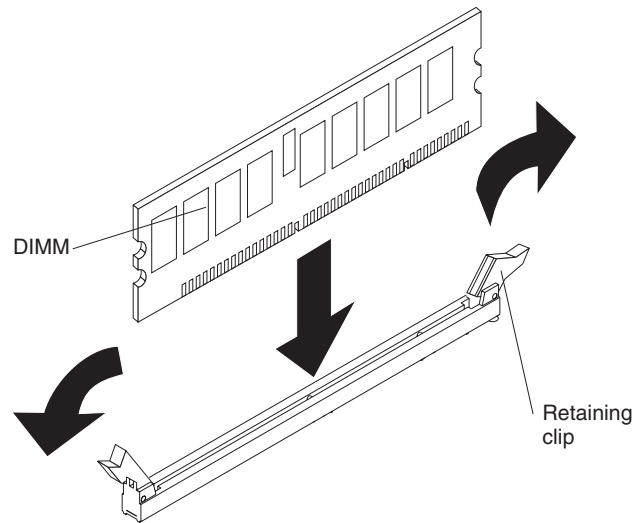
Attention: When moving the memory card, do not allow it to touch any components or structures inside the server.

If you are hot-swapping a DIMM, make sure that the Memory Hot-Swap Enabled LED is lit.



4. Remove the memory card:
 - a. Open the memory card retention levers on the top of the memory card.
 - b. While holding the retention levers open, lift the memory card out of the server.
5. Place the memory card on a flat, static-protective surface with the DIMM connectors facing up.

Attention: To avoid breaking the DIMM retaining clips or damaging the DIMM connectors, open and close the clips gently.
6. Open the retaining clip on each end of the DIMM connector.
7. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.
8. Turn the DIMM so that the DIMM keys align correctly with the slot.



9. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.
10. Repeat steps 6 on page 14 through 9 to install the second DIMM of the pair; then, continue with “Installing a memory card” for instructions on how to install a memory card.

Installing a memory card

The server supports up to four memory cards. Each memory card must have at least one pair of DIMMs. You can hot-add one memory card to each of the memory power buses, provided your operating system supports that function.

At least one memory card with one pair of DIMMs must be installed in the server to operate correctly.

To install a memory card, complete the following steps:

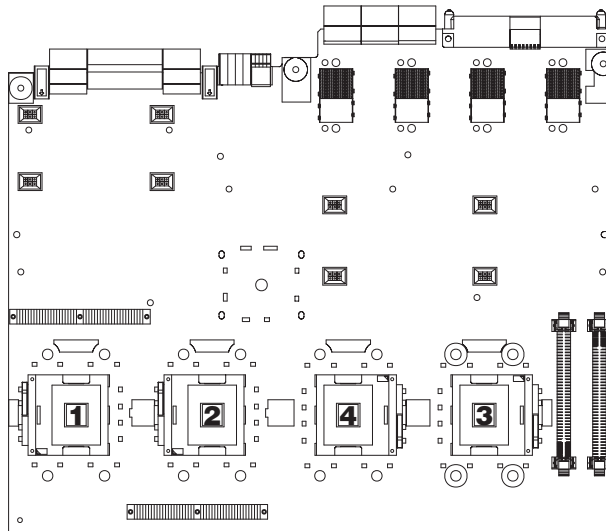
1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. Remove the front cover (tower model only), and the top cover (see “Removing the front cover, top cover, and bezel” on page 9).
3. Make sure that the locking levers on the edge of the memory card are fully open, and insert the memory card into an open memory-card connector on the microprocessor board.
4. Press the memory card into the connector.
5. Close the small locking lever; then, close the large locking lever.

If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 23.

Installing an additional microprocessor

The following notes describe information that you must consider when installing a microprocessor:

- The voltage regulator modules (VRMs) for microprocessors 1 and 2 are integrated on the microprocessor board; the VRMs for microprocessors 3 and 4 come with the microprocessor options and must be installed on the microprocessor board.
- Each microprocessor socket must be populated with either a microprocessor baffle or a heat sink and microprocessor to ensure the server operates properly.
- All microprocessors must be the same cache size and type, and the same clock speed.
- Install the microprocessors in the order shown in the following illustration.

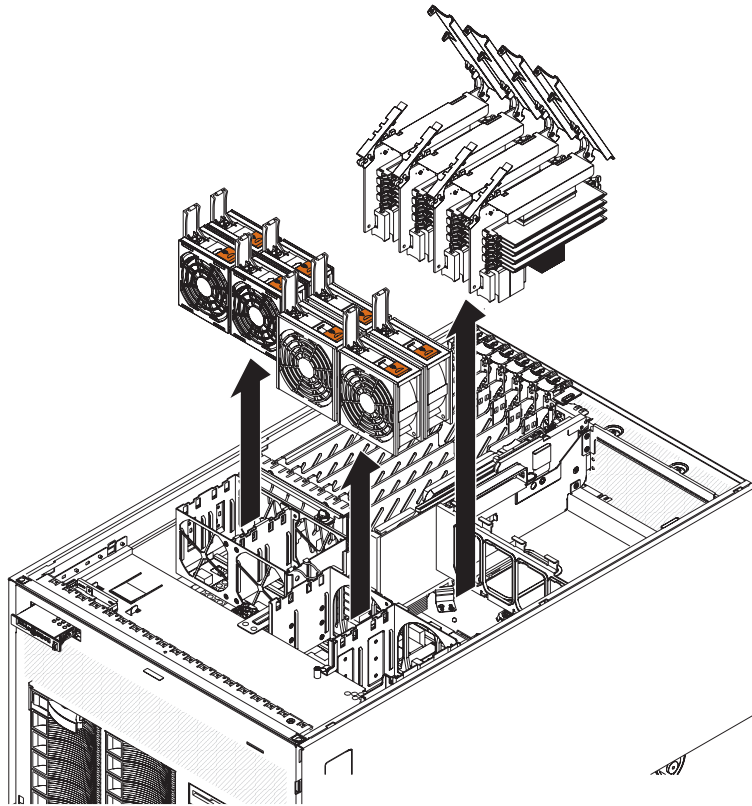


To install an additional microprocessor, complete the following steps:

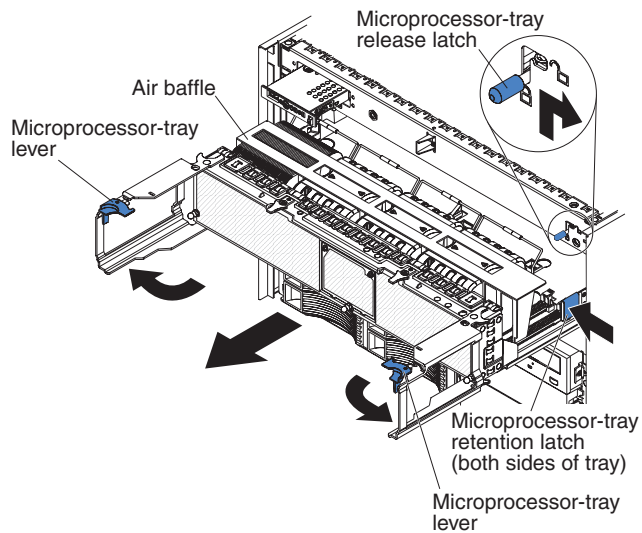
1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and any USB cable that might be connected to the USB port on the front of the server. Remove the server cover and bezel.

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

3. Remove the front cover (tower model only), bezel, and the top cover (see “Removing the front cover, top cover, and bezel” on page 9).

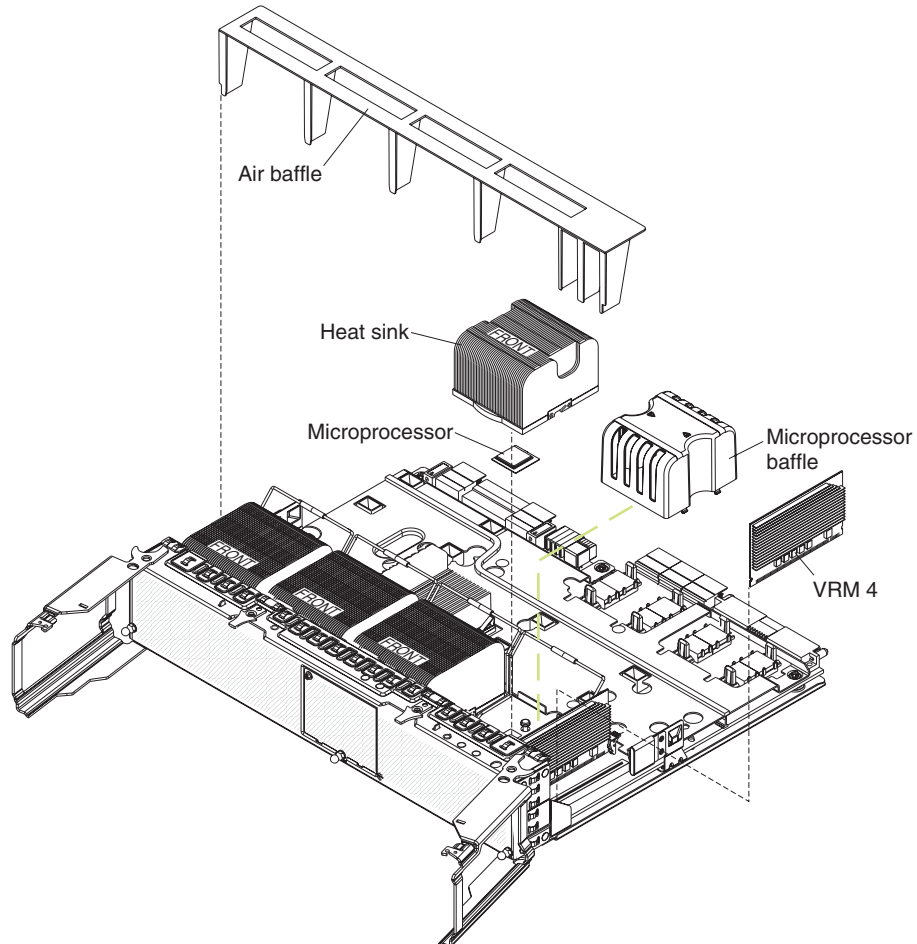


4. Remove all fans from the server.
5. Remove all memory cards from the server.
6. Remove the bezel (see “Removing the bezel” on page 10).
7. Remove the microprocessor tray:
 - a. Open the microprocessor-tray release latch.

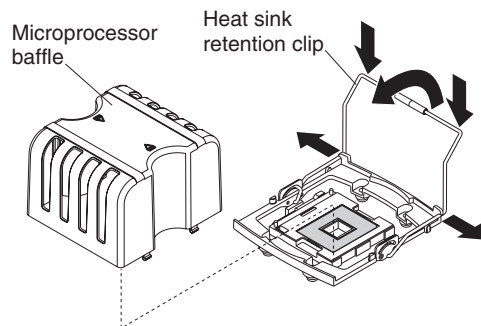


- b. Open the microprocessor-tray levers.

- c. Pull out the microprocessor tray until it stops and then reposition your hands to grasp the body of the tray.
 - d. Press in on the release latches on each side of the tray; then, pull the tray out the rest of the way.
8. Lift the air baffle out of the microprocessor tray.

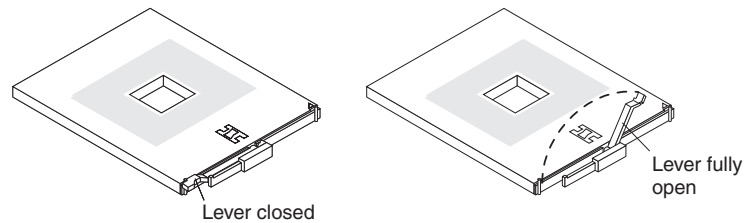


9. Remove the microprocessor baffle from a microprocessor socket and store it for future use. If you remove a microprocessor you must install a microprocessor baffle to prevent the server from overheating.



10. Open the heat-sink retention clip:
- a. Press down on one side of the heat-sink retention clip to release it from the side of the socket; then, repeat the process on the opposite side.
 - b. Rotate the heat-sink retention clip forward to its fully open position.

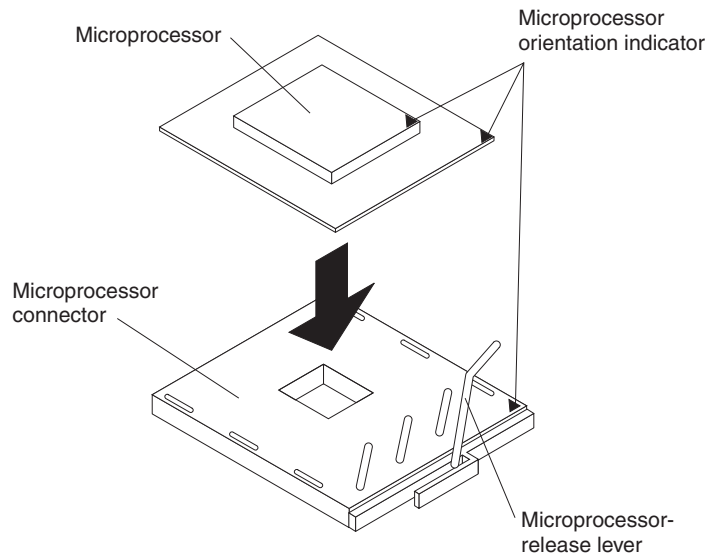
11. Remove the protective cover, tape, or label from the surface of the microprocessor socket, if any is present.
12. Lift the microprocessor-release lever to the fully-open position (approximately 135° angle).



13. Touch the static-protective package that contains the new microprocessor to any unpainted metal surface on the server; then, remove the microprocessor from the package.

Attention: To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.

14. Position the microprocessor over the microprocessor socket as shown in the following illustration. Carefully press the microprocessor into the socket.



15. Close the microprocessor-release lever to secure the microprocessor.
16. Remove the heat sink from its package and remove the cover from the bottom of the heat sink.
17. Position the heat sink above the microprocessor; then, press the heat sink into place and close the heat-sink release lever.

Note: If you are installing an additional microprocessor in microprocessor socket 3 or 4, a VRM must also be installed.

18. If necessary, install a VRM in the correct connector.
19. Reinstall the microprocessor tray in the server:
 - a. Place the air baffle over the heat sinks and microprocessor baffles.

Note: Make sure that the air baffle lies flat and within the grooves on top of the microprocessor heat sinks and microprocessor baffles and that the

air baffle remains in place while you close the microprocessor tray. You might find it helpful to hold the air baffle in place with your thumbs while closing the microprocessor tray.

- b. Make sure that the microprocessor-tray release latch is open; then, push the microprocessor tray into the server.
- c. Close the tray levers and make sure they are securely latched.
- d. Close the microprocessor-tray release latch.
- e. Reinstall the fans and memory cards in the server.

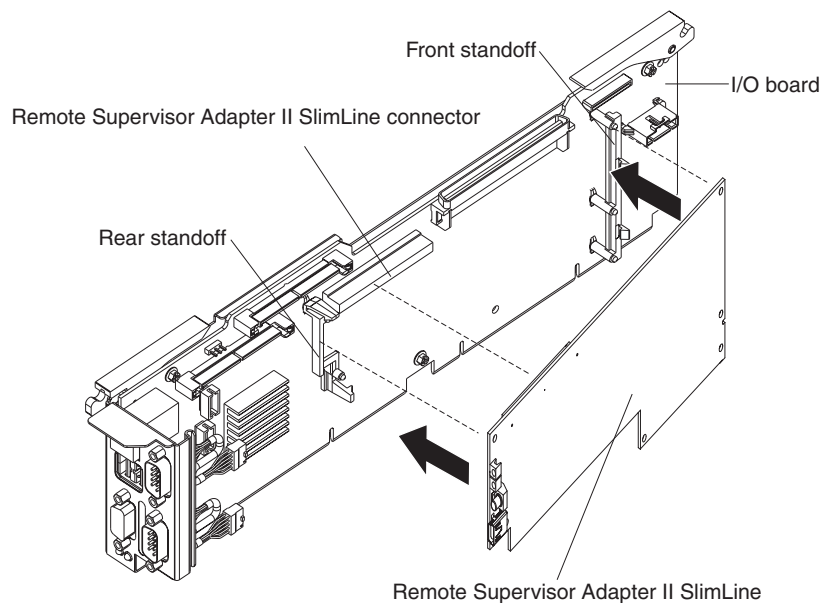
If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 23.

Installing an adapter

The following sections describe how to install adapters in the server.

Installing the Remote Supervisor Adapter II SlimLine

An optional IBM Remote Supervisor Adapter II SlimLine can be installed only in its dedicated connector on the I/O board. The following illustration shows how to install a Remote Supervisor Adapter II SlimLine.



Complete the following steps to install a Remote Supervisor Adapter II SlimLine:

1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables necessary to remove the I/O board.

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

3. Unlock the front cover (tower model only), and remove the top cover (see “Removing the front cover, top cover, and bezel” on page 9).

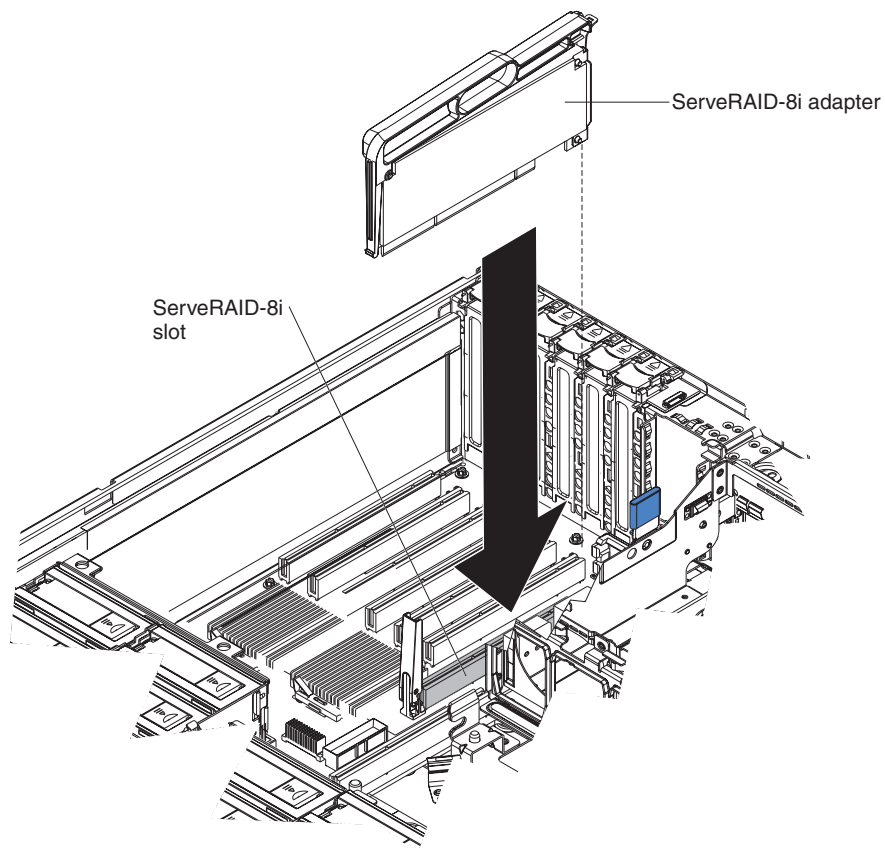
4. Note the location of the internal cables connected to the I/O board; then, remove the cables from the I/O board and move them out of the way.
5. Remove the I/O board from the server and place the I/O board on a flat, static-protective surface with the connectors facing up.
6. Insert the front of the adapter into the front standoff; then, rotate the rear of the adapter into the rear standoff.
7. Press the Remote Supervisor Adapter II SlimLine firmly into the connector.
8. Reinstall the I/O board in the server and reconnect the internal cables to the I/O board.

Installing a ServeRAID-8i adapter

If you are installing an optional ServeRAID-8i adapter, review the following information:

- A ServeRAID-8i adapter can be installed only in the dedicated slot on the PCI-X board.
- The ServeRAID-8i adapter is not cabled to the server, and no rerouting of the SAS cables is required.

The following illustration shows how to install a ServeRAID-8i adapter.



For more detailed instructions or information, see the *User's Guide* on the IBM *xSeries Documentation CD*.

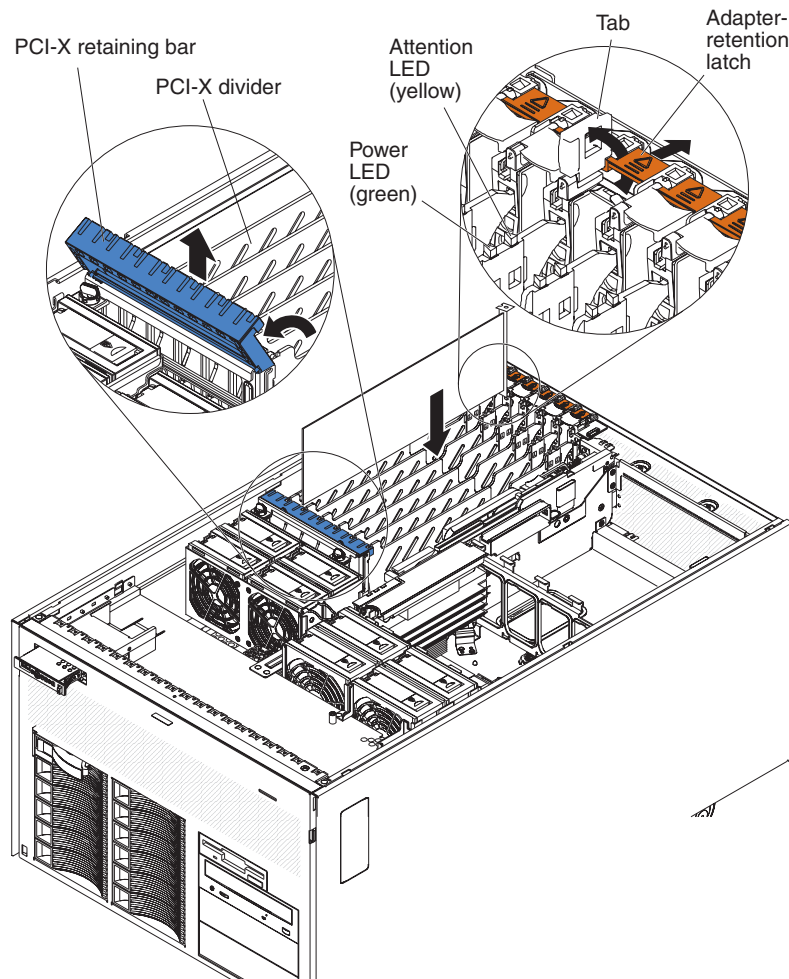
Installing a hot-plug adapter

Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to halt, which could result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.

To install a hot-plug PCI or PCI-X adapter, complete the following steps.

Note: For hot-pluggable adapters, make sure that the PCI hot-plug device driver is installed. For details, see the documentation that comes with the adapter. For more detailed instructions and information about installing PCI/PCI-X adapters, see the section about installing options in the *User's Guide* on the IBM xSeries Documentation CD.

1. Read the safety information that begins on page v and “Installation guidelines” on page 7.
2. Unlock the front cover (tower model only), and remove the top cover (see “Removing the front cover, top cover, and bezel” on page 9).
3. Determine which PCI-X expansion slot you will use for the adapter.



4. See the documentation that comes with the adapter for instructions for setting jumpers or switches and for cabling.

Note: Route adapter cables before you install the adapter.

5. Install the adapter:
 - a. Open the blue adapter guide by lifting the front edge.
 - b. Push the orange adapter retention latch toward the rear of the server and open the tab. The power LED for the slot turns off if an adapter is installed in the slot.
 - c. Remove the expansion-slot cover.
 - d. Carefully grasp the adapter by its top edge or upper corners, and align it with the connector on the PCI-X board.
 - e. If necessary, remove the adapter guide before installing a full-length adapter.
 - f. Press the adapter *firmly* into the adapter connector.
 - g. Push down on the blue PCI-X retaining bar to stabilize the adapter.
 - h. Close the tab; then, push down on the orange adapter retention latch until it clicks into place, securing the adapter.
6. Connect any required cables to the adapter.

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

Completing the installation

To complete the installation, complete the following steps:

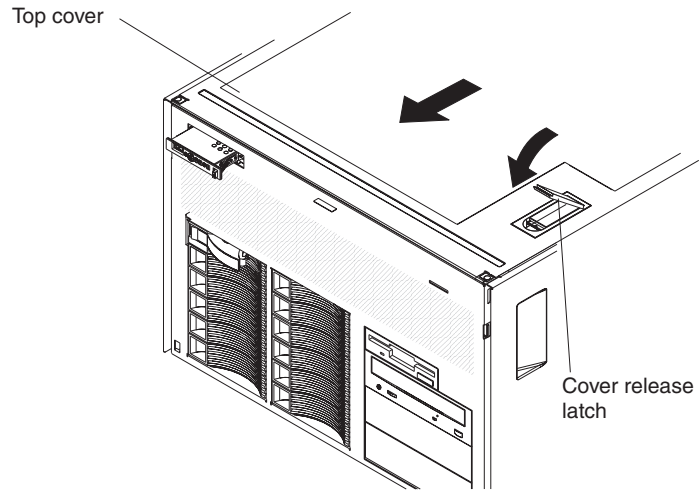
1. Make sure all internal cables are properly routed through the server and that all cable retention devices are in place. If you have installed an optional SAS backplane, be sure that the SAS signal cables have been routed through the internal cable management arm.
2. Install the top cover, bezel, and front cover (tower model only). See “Installing the top cover, bezel and front cover” for more information.
3. Connect the cables and power cords. See “Connecting the cables” on page 25 for more information.
4. Install the server in a rack (rack model only). See the *Rack Installation Instructions* that come with the server for complete rack installation and removal instructions.
5. Put the server in position and lock the casters (tower model only).

Installing the top cover, bezel and front cover

Installing the top cover

To install the server top cover, complete the following steps:

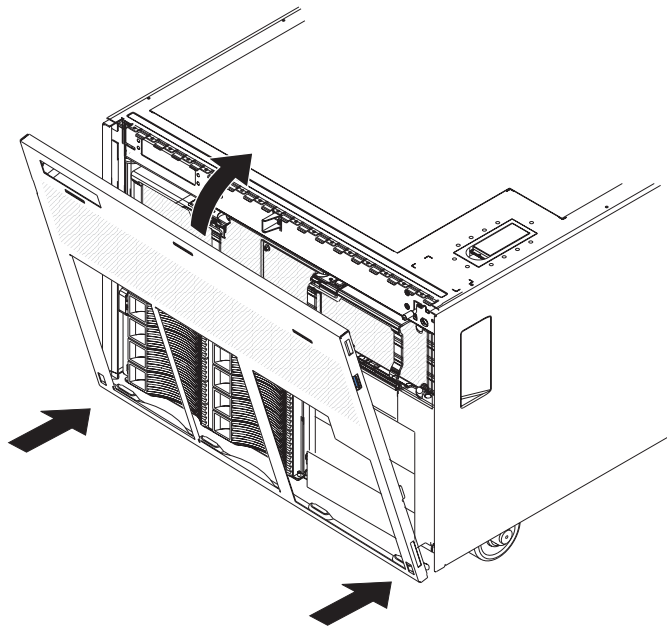
1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.



2. Move the cover-release latch to the open (up) position.
3. Insert the bottom tabs of the cover into the matching slots in the server chassis.
4. Close the cover-release latch to pull the cover forward and lock the cover in place.

Installing the bezel

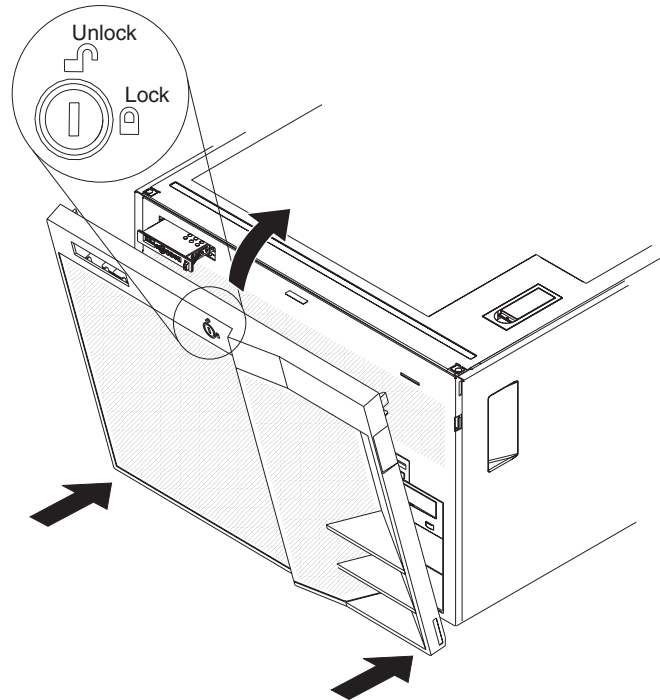
To install the bezel, complete the following steps.



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 locking tabs at the top of the bezel snap into place.

Installing the front cover

To install the front cover (tower model), complete the following steps.



1. Insert the two tabs on the bottom of the front cover into the matching holes on the bezel.
2. Push the top of the front cover toward the server until the two release latches at the top of the bezel snap into place.
3. Lock the tower front cover.

Connecting the cables

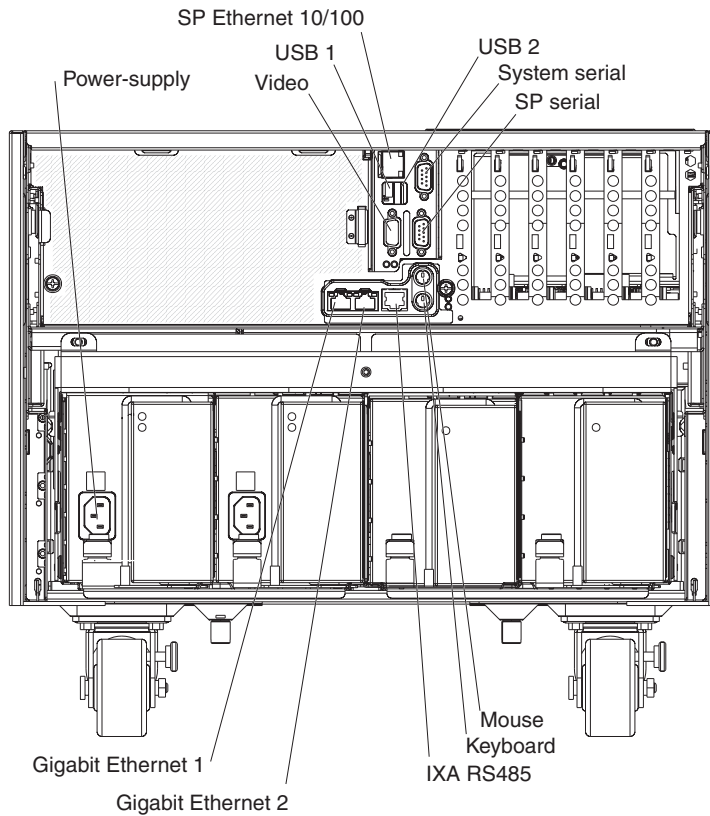
You must turn off the server (see “Turning off the server” on page 31) before connecting any cables to or disconnecting any cables from the server.

See the documentation that comes with optional devices for additional cabling instructions. It might be easier for you to route cables before you install certain options.

Cable identifiers are printed on the cables that come with the server and options. Use these identifiers to connect the cables to the correct connectors.

For details about the location and function of the input and output connectors, see Chapter 3, “Server controls, connectors, LEDs, and power,” on page 27.

The following illustration shows the location of the input and output connectors on the rear of the server.



Updating the server configuration

When you start the server for the first time after you add or remove an internal option or external SAS or SCSI device, you might receive a message that the configuration has changed. The Configuration/Setup Utility program starts automatically so that you can save the new configuration settings. For more information, see the section about configuring the server in the *User's Guide* on the IBM *xSeries Documentation* CD.

Some options have device drivers that you must install. See the documentation that comes with each option for information about installing device drivers.

If more than one microprocessor is installed, the server can operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. For more information, see the section about using the *ServerGuide Setup and Installation* CD in the *User's Guide* on the IBM *xSeries Documentation* CD and the operating-system documentation.

If the server has an optional RAID adapter and you have installed or removed a hard disk drive, see the documentation that comes with the RAID adapter for information about reconfiguring the disk arrays.

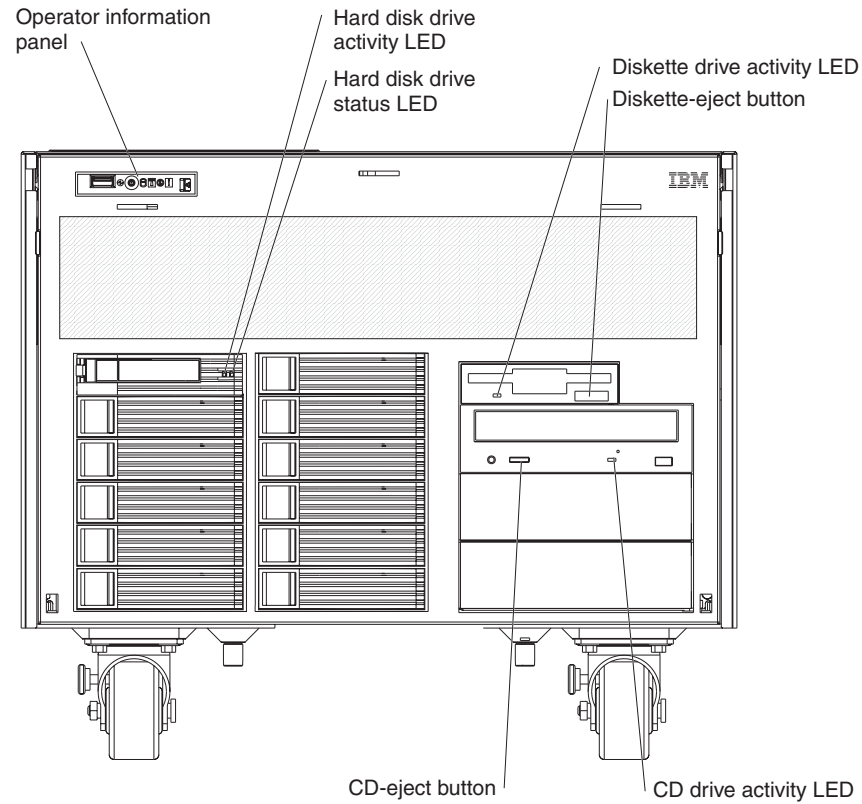
For information about configuring the integrated Gigabit Ethernet controller, see the *User's Guide* on the IBM *xSeries Documentation* CD.

Chapter 3. Server controls, connectors, LEDs, and power

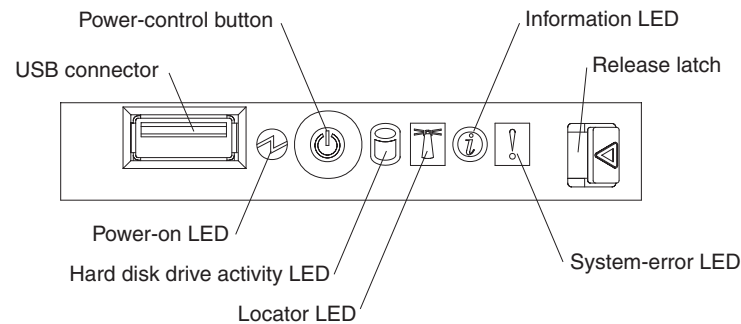
This chapter describes the controls, connectors, and light-emitting diodes (LEDs) and how to turn the server on and off.

Front view

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



Operator information panel: The following illustration shows the controls and LEDs on the operator information panel.



The following controls, connectors, and LEDs are on the operator information panel:

- **USB connector:** Connect a USB device to this connector.
- **Power-control button:** Press this button to turn the server on and off manually. A power-control-button shield comes with the server.

- **Information LED:** When this LED is lit, it indicates that an error or warning message has been written to the system event log.
- **Release latch:** Slide this latch to the left to access the light path diagnostics panel.
- **System-error LED:** When this LED is lit, it indicates that a system error has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.
- **Locator LED:** When this LED is lit, it has been lit remotely by the system administrator to aid in visually locating the server.
- **Hard disk drive activity LED:** When this LED is flashing, it indicates that a SAS hard disk drive is in use.
- **Power-on LED:** When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to an ac power source. When this LED is off, it indicates that ac power is not present, or the power supply or the LED itself has failed.

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

Hard disk drive activity LED: On some server models, each hot-swap hard disk drive has an activity LED. When this LED is flashing, it indicates that the drive is in use.

Hard disk drive status LED: If a ServerRAID-8i adapter is installed, when this LED is lit, it indicates that the associated hard disk drive has failed. If the LED flashes slowly (one flash per second), the drive is being rebuilt. If the LED flashes rapidly (three flashes per second), the controller is identifying the drive.

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

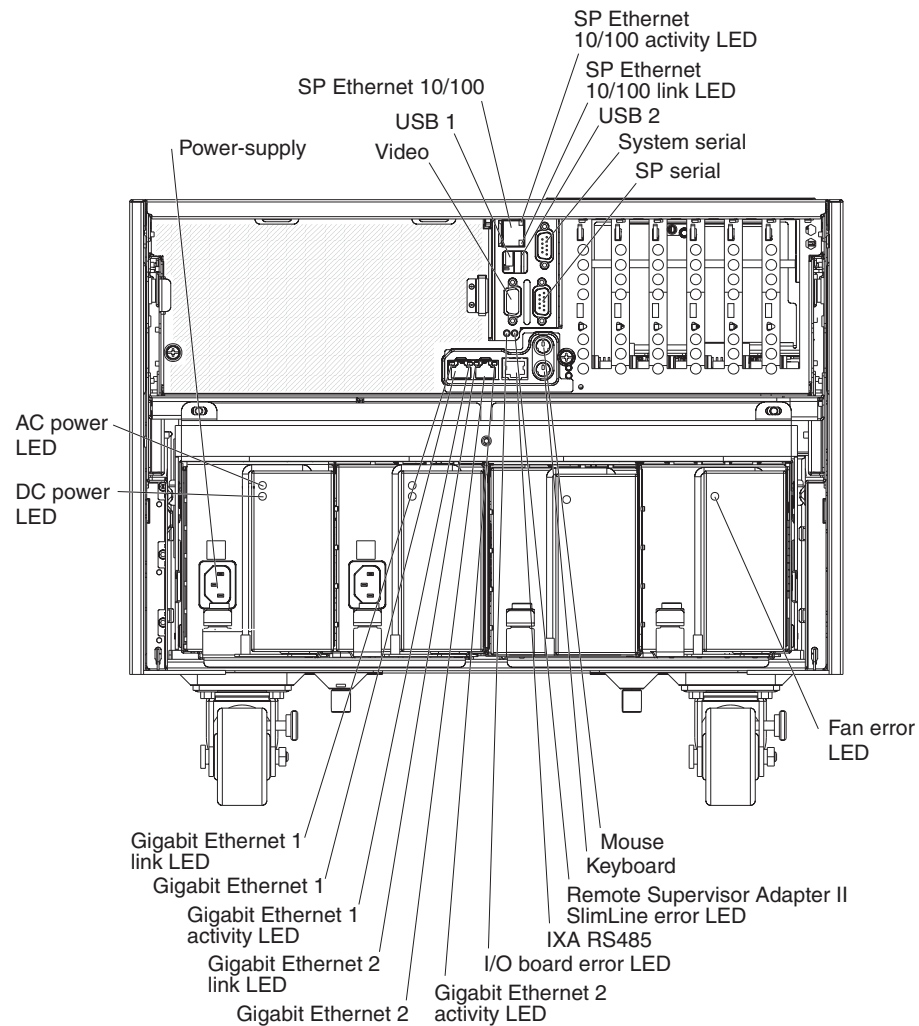
Diskette-eject button: Press this button to release a diskette from the diskette drive.

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

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

Rear view

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



Power-supply connector: Connect the power cord to this connector.

Video connector: Connect a monitor to this connector.

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

SP Ethernet 10/100 connector: Use this connector to connect the service processor to a network.

SP Ethernet 10/100 activity LED: This LED is on the SP Ethernet 10/100 connector. When this LED is lit, it indicates that there is activity between the server and the network.

SP Ethernet 10/100 link LED: This LED is on the SP Ethernet 10/100 connector. When this LED is lit, it indicates that there is an active connection on the Ethernet port.

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

System serial connector: Connect a 9-pin serial device to this connector.

SP Serial connector: Connect a 9-pin serial device to this connector.

Fan error LED: This LED is on the power supply filler. When this LED is lit, it indicates that the fan has failed.

Mouse connector: Connect a mouse or other device to this connector.

Keyboard connector: Connect a keyboard to this connector.

Remote Supervisor Adapter II SlimLine error LED: This LED is on the I/O board and is visible on the rear of the server. When this LED is lit, it indicates that there is a problem with the IBM Remote Supervisor Adapter II SlimLine.

IXA RS485 connector: Use this connector to connect to an iSeries server when an Integrated xSeries Adapter (IXA) is installed.

I/O board error LED: This LED is on the I/O board and is visible on the rear of the server. When this LED is lit, it indicates that there is a problem with the I/O board.

Gigabit Ethernet 2 activity LED: This LED is on the Gigabit Ethernet 2 connector. When this LED flashes, it indicates that there is activity between the server and the network.

Gigabit Ethernet 2 connector: Use this connector to connect the server to a network.

Gigabit Ethernet 2 link LED: This LED is on the Gigabit Ethernet 2 connector. When this LED is lit, it indicates that there is an active connection on the Ethernet port.

Gigabit Ethernet 1 activity LED: This LED is on the Gigabit Ethernet 1 connector. When this LED flashes, it indicates that there is activity between the server and the network.

Gigabit Ethernet 1 connector: Use this connector to connect the server to a network.

Gigabit Ethernet 1 link LED: This LED is on the Gigabit Ethernet 1 connector. When this LED is lit, it indicates that there is an active connection on the Ethernet port.

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

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

Server power features

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

Turning on the server

Approximately 20 seconds after the server is connected to ac power, the power-control button becomes active, and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server and start the operating system by pressing the power-control button.

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

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If your operating system supports the systems-management software for an optional Remote Supervisor Adapter II SlimLine, the systems-management software can turn on the server.
- If your operating system supports the Wake on LAN[®] feature, the Wake on LAN feature can turn on the server.

Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to requests from the service processor, such as a remote request to turn on the server. While the server remains connected to ac power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

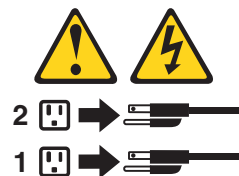
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5:



CAUTION:

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



The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will be turned off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- If an optional Remote Supervisor Adapter II SlimLine is installed in the server, the server can be turned off from the Remote Supervisor Adapter II SlimLine user interface.
- If the Wake on LAN feature turned on the server, the Wake on LAN feature can turn off the server.
- You can turn off the server through a request from the service processor.

Chapter 4. Configuring the 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 the server to configure basic hardware features and to simplify the operating-system installation.

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

- Configuration/Setup Utility program
- Baseboard management controller utility programs
- SAS/SATA Configuration Utility program
- ServeRAID Manager
- PXE boot utility program
- Remote Supervisor II Web interface

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

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides programs to detect the server model and installed hardware options, configure the server hardware, provide device drivers, and help you install the operating system. For information about the supported operating-system versions, see the label on the CD. If the *ServerGuide Setup and Installation* CD did not come with the server, you can download the latest version from <http://www.ibm.com/pc/qtechinfo/MIGR-4ZKPPT.html>.

To start the *ServerGuide Setup and Installation* CD, complete the following steps:

1. Insert the CD, and restart the server. If the CD does not start, see “Troubleshooting tables” on page 40.
2. Follow the instructions on the screen to:
 - a. Select your language.
 - b. Select your keyboard layout and country.
 - c. View the overview to learn about 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 operating-system CD.

Using the Configuration/Setup Utility program

The Configuration/Setup Utility program is part of the BIOS code. You can use it to:

- Change interrupt request (IRQ) settings
- Change the startup drive sequence
- Configure serial-connector assignments
- Enable USB keyboard and mouse support
- Resolve configuration conflicts

- Set the date and time
- Set passwords and security settings

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

1. Turn on the server.
2. When the message Press F1 for Configuration/Setup appears, press F1. If an administrator password has been set, you must type the administrator password to access the full Configuration/Setup Utility menu.
3. Follow the instructions on the screen.

Installing and using the baseboard management controller utility programs

The baseboard management controller provides environmental monitoring for the server. If environmental conditions exceed thresholds or if system components fail, the baseboard management controller lights LEDs to help you diagnose the problem and also records the error in the BMC system event log.

The baseboard management controller also provides the following remote server management capabilities through the OSA SMBridge management utility program:

- **Command-line interface (IPMI Shell)**

The command-line interface provides direct access to server management functions through the IPMI 1.5 protocol. Use the command-line interface to issue commands to control the server power, view system information, and identify the server. You can also save one or more commands as a text file and run the file as a script.

- **Serial over LAN**

Establish a Serial over LAN (SOL) connection to manage servers from a remote location. You can remotely view and change the BIOS settings, restart the server, identify the server, and perform other management functions. Any standard Telnet client application can access the SOL connection.

See the *User's Guide* on the IBM xSeries Documentation CD for details.

Using the baseboard management controller utility programs

Use the baseboard management controller utility programs to configure the baseboard management controller, download firmware updates and SDR/FRU updates, and remotely manage a network.

Using the baseboard management controller configuration utility program

Use the baseboard management controller configuration utility program to view or change the baseboard management controller configuration settings. You can also use the utility program to save the configuration to a file for use on multiple servers.

Go to <http://www.ibm.com/pc/support/> to download the utility program; then, copy the `bmc_cfg.exe` file to a configuration utility diskette on a USB diskette drive.

To start the baseboard management controller configuration utility program, complete the following steps:

1. Insert the configuration utility diskette into the diskette drive and restart the server.
2. From a command-line prompt, type `bmc_cfg` and press Enter.

3. Follow the instructions on the screen.

See the *User's Guide* on the IBM *xSeries Documentation* CD for details.

Using the SAS/SATA Configuration Utility program

To start the SAS/SATA Configuration Utility program, complete the following steps:

1. Turn on the server.
2. When the prompt <<< Press <CTRL><A> for Adaptec SAS/SATA Configuration Utility! >>> appears, press Ctrl+A.
3. To select a choice from the menu, use the arrow keys.
4. Follow the instructions on the screen to change the settings of the selected items, and press Enter.

Using the ServeRAID configuration programs

A ServeRAID controller enables you to configure multiple physical hard disk drives to operate as logical drives in a disk array. The controller comes with a CD containing the ServeRAID Manager program and the ServeRAID Mini-Configuration program, which you can use to configure the ServeRAID controller. For information about these programs, see the documentation that comes with the ServeRAID controller and the *User's Guide* on the IBM *xSeries Documentation* CD. If your server comes with an operating system installed, such as Microsoft Windows 2000 Datacenter Server, see the software documentation that comes with the server for configuration information.

Using the PXE boot agent utility program

The Preboot Execution Environment (PXE) boot agent utility program is part of the BIOS code. You can use it to specify the startup order of devices and enable or disable operating-system wake-up support.

Note: The server does not support changing the network boot protocol or specifying the startup order of devices through the PXE boot agent utility program.

Complete the following steps to start the PXE boot agent utility program:

1. Turn on the server.
2. When the Initializing Intel (R) Boot Agent Version X.X.XX PXE 2.0 Build XXX (WfM 2.0) prompt appears, press Ctrl+S. You have 2 seconds (by default) to press Ctrl+S after the prompt appears. If the prompt does not appear, use the Configuration/Setup Utility program to enable the Ethernet PXE/DHCP option.
3. Use the arrow keys and press Enter to select a choice from the menu.
4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Using the Remote Supervisor II Web Interface

The Remote Supervisor II Web Interface is a graphical user interface that you can use to perform many of the tasks that were previously only available through the Configuration/Setup Utility program. The Remote Supervisor II Web Interface is in the Remote Supervisor Adapter II integrated service processor and is accessed using a Web browser on the administrator console or another computer that is connected to the server through the SP serial connector on the rear of the server.

Before using the Remote Supervisor II Web interface, read the following information:

- A Remote Supervisor Adapter II SlimLine must be installed in the server.
- You must have a Web browser to access the Web interface.
- You must know the IP address or the host name of the Remote Supervisor Adapter II SlimLine that you are connecting to.
- The IP address and the host name can be found in the Configuration/Setup Utility program or from your network administrator.
- You can connect directly to the server or use an Ethernet network to access the service processor and the Remote Supervisor Adapter II Web Interface.
- The following cable connections are required:
 - Crossover cable from the SP connector to a computer.
 - An Ethernet cable that is connected to an Ethernet network.

See the *User's Guide* on the *IBM xSeries Documentation* CD for instructions.

Chapter 5. Solving problems

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

If you cannot locate and correct the problem using the information in this chapter, see “Getting help and technical assistance,” on page 59, the *Problem Determination and Service Guide* on the IBM xSeries Documentation CD, and the “Server Support” flowchart in the front of this document.

Diagnostic tools overview

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

- **POST beep codes**

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

- One beep indicates successful completion of POST, with no errors.
- More than one beep indicates that POST detected a problem. Error messages also appear during startup if POST detects a hardware-configuration problem.

See “POST beep codes,” and the *Problem Determination and Service Guide* on the IBM xSeries Documentation CD for more information.

- **Troubleshooting tables**

These tables list problem symptoms and steps to correct the problems. See “Troubleshooting tables” on page 40 for more information.

- **Diagnostic programs and error messages**

The system diagnostic programs are provided in ROM. These programs test the major components of the server. See the *Problem Determination and Service Guide* on the IBM xSeries Documentation CD for more information.

- **Light path diagnostics**

Use light path diagnostics to diagnose system errors quickly. See “Light path diagnostics” on page 50 for more information.

POST beep codes

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

Note: See the *Problem Determination and Service Guide* on the IBM xSeries Documentation CD for more information about the POST beep codes.

One beep

POST was completed successfully without finding any errors.

Two short beeps

The server configuration has changed.

Other beep codes

See the *Problem Determination and Service Guide* on the IBM xSeries Documentation CD for more information about the POST beep codes.

POST error codes

The following table provides an abbreviated list of the error codes and messages that might appear during POST. See the *Problem Determination and Service Guide* on the IBM xSeries Documentation CD for more information about the POST error codes and messages. See <http://www.ibm.com/pc/support/> to check for updated technical information.

Error code	Description	Action
		<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.
162	Device configuration error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, select Load Default Settings, and save the settings. 2. Reseat the following components: <ol style="list-style-type: none"> a. Battery b. Failing device c. I/O board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
163	Real-time clock error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, select Load Default Settings, make sure the date and time are correct, and save the settings. 2. Reseat the following components: <ol style="list-style-type: none"> a. Battery b. I/O board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
289	A DIMM has been disabled by the user or by the system.	<ol style="list-style-type: none"> 1. If the DIMM was disabled by the user, run the Configuration/Setup Utility program and enable the DIMM. 2. Make sure that the DIMM is installed correctly. 3. Reseat the DIMM. 4. Replace the DIMM.
301	Keyboard or keyboard controller error.	<ol style="list-style-type: none"> 1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. Reseat the following components: <ol style="list-style-type: none"> a. Keyboard connection b. I/O board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
303	Keyboard controller error.	<ol style="list-style-type: none"> 1. Reseat the following components: <ol style="list-style-type: none"> a. I/O board b. Keyboard connection 2. Replace the components listed in step 1 one at a time, in the order shown, restarting the server each time.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Error code	Description	Action
00019xxx	Microprocessor <i>x</i> is not functioning or failed the built-in self-test; check VRM and processor LEDs.	<p>Make sure that microprocessor <i>x</i> is installed correctly. If the problem remains, replace microprocessor <i>x</i>.</p> <ol style="list-style-type: none"> 1. Reseat the following components: <ol style="list-style-type: none"> a. Microprocessor tray b. (Trained service technician only) Microprocessor <i>x</i> 2. Replace the following components one at a time, in the order shown, restarting the server each time. <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessor <i>x</i> b. (Trained service technician only) Microprocessor tray
00180xxx	A PCI adapter has requested memory resources that are not available.	<ol style="list-style-type: none"> 1. Change the order of the adapters in the PCI-X slots. Make sure that the boot device is positioned early in the scan order. 2. Make sure that the settings for the PCI adapter and all other adapters in the Configuration/Setup Utility program are correct. If the memory resource settings are not correct, change them. 3. If all memory resources are being used, remove an adapter to make memory available to the PCI adapter. Disabling the BIOS on the adapter should correct the error. See the documentation that comes with the adapter.
012980xx 012981xx	No update data for microprocessor <i>x</i>	<ol style="list-style-type: none"> 1. Make sure that all microprocessors have the same cache size. 2. Update the BIOS code again. 3. (Trained service technician only) Reseat microprocessor <i>x</i>. 4. (Trained service technician only) Replace microprocessor <i>x</i>.
I9990305	An operating system was not found.	<ol style="list-style-type: none"> 1. Make sure that a bootable operating system is installed. 2. Run the hard disk drive diagnostic tests. 3. Reseat the following components: <ol style="list-style-type: none"> a. Hard disk drive b. SAS hard disk drive backplane and cables c. CD drive and cables d. I/O board 4. Replace the components listed in step 3 one at a time, in the order shown, restarting the server each time.

Troubleshooting tables

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

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
CD or DVD drive problems	Action
The CD or DVD drive is not recognized.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The IDE channel to which the CD or DVD drive is attached (primary or secondary) is enabled in the Configuration/Setup Utility program. • All cables and jumpers are installed correctly. • The correct device driver is installed for the CD or DVD drive. 2. Run the CD or DVD drive diagnostic programs. 3. Reseat the following components: <ol style="list-style-type: none"> a. CD or DVD drive b. CD or DVD drive cable c. I/O board 4. Replace the components listed in step 3 one at a time, in the order shown, restarting the server each time.
A CD or DVD is not working correctly.	<ol style="list-style-type: none"> 1. Clean the CD or DVD. 2. Run the CD or DVD drive diagnostic programs. 3. Reseat the CD or DVD drive. 4. Replace the CD or DVD drive.
The CD or DVD drive tray is not working.	<ol style="list-style-type: none"> 1. Make sure that the server is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the CD or DVD drive. 4. Replace the CD or DVD drive.
General problems	Action
A cover lock is broken, an LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.
Hard disk drive problems	Action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk test).	Remove the drive indicated on the diagnostic tests; then, run the hard disk drive diagnostic test again. If the remaining drives are recognized, replace the drive that you removed with a new one.
The server stops responding during the hard disk drive diagnostic test.	Remove the hard disk drive that was being tested when the server stopped responding, and run the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive that you removed with a new one.
A hard disk drive was not detected while the operating system was being started.	Reseat all hard disk drives and cables; then, run the hard disk drive diagnostic tests again.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
A hard disk drive passes the diagnostic Fixed Disk Test but the problem remains.	Run the diagnostic SCSI Fixed Disk Test. Note: This test is not available to servers using RAID or servers with IDE or SATA hard disk drives.
Intermittent problems	Action
A problem occurs only occasionally and is difficult to diagnose.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • All cables and cords are connected securely to the rear of the server and attached devices. • When the server is turned on, air is flowing from the fan grille. If there is no airflow, the fan is not working. This can cause the server to overheat and shut down. 2. Check the system-error log or BMC log.
Standard or USB keyboard, mouse, or pointing-device problems	Action
All or some keys on the keyboard do not work.	<ol style="list-style-type: none"> 1. (USB keyboard) If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. (Standard keyboard) If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the keyboard cable directly to the correct connector on the rear of the server. 3. Make sure that: <ul style="list-style-type: none"> • The keyboard cable or USB cable is securely connected to the server and the keyboard and mouse cables are not reversed. • The server and the monitor are turned on. 4. Reseat the following components: <ol style="list-style-type: none"> a. Keyboard b. I/O board 5. Replace the components listed in step 4 one at a time, in the order shown, restarting the server each time.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

The mouse or pointing device does not work.

1. (Standard mouse) If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the mouse or pointing device cable directly to the correct connector on the rear of the server.
2. Make sure that:
 - The mouse or pointing-device cable or USB cable is securely connected and the keyboard and mouse cables are not reversed.
 - (Standard mouse) The mouse device drivers are installed correctly.
 - (Standard mouse) The mouse is enabled in the Configuration/Setup Utility program.
 - (USB mouse) Keyboardless operation has been enabled in the Configuration/Setup Utility program.
3. (USB mouse) If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the server.
4. Reseat the following components:
 - a. Mouse or pointing device
 - b. I/O board
5. Replace the components listed in step 4 one at a time, in the order shown, restarting the server each time.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Memory problems	Action
<p>The amount of system memory that is displayed is less than the amount of installed physical memory.</p>	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • No error LEDs are lit on the operator information panel or on the memory card. • Memory mirroring does not account for the discrepancy. • The memory modules are seated correctly. • You have installed the correct type of memory. • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program. • All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled. 2. Check the POST error log for error message 289: <ul style="list-style-type: none"> • If a DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If a DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM. 3. Run memory diagnostics. 4. Make sure there is no memory mismatch when the server is at the minimum memory configuration. 5. Add one pair of DIMMs at a time, making sure the DIMMs match for each pair added. 6. Add one memory card at a time, making sure the memory matches for each card added. 7. Reseat the following components: <ol style="list-style-type: none"> a. DIMM b. Memory card 8. Replace the components listed in step 7 one at a time, in the order shown, restarting the server each time.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Microprocessor problems	Action
<p>The server emits a continuous beep during POST, indicating that the startup (boot) microprocessor is not working correctly.</p>	<ol style="list-style-type: none"> 1. Correct any errors indicated by the light path diagnostics LEDs (see “Light path diagnostics” on page 50). 2. Make sure that all microprocessors are supported on this server, and that they all match in speed and cache size. 3. (Trained service technician only) Make sure that the microprocessor 1 is seated correctly. 4. Reseat the following components: <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessor 1 b. Microprocessor VRM 3 or 4 c. Microprocessor tray 5. (Trained service technicians only) If there is no indication of which microprocessor has failed, isolate the error by testing with one microprocessor at a time. 6. Replace the following components one at a time, in the order shown, restarting the server each time. <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessor 1 b. Microprocessor VRM 3 or 4 c. (Trained service technician only) Microprocessor tray 7. (Trained service technician only) If there are multiple error codes or light path diagnostics LEDs that indicate a microprocessor error, reverse the locations of two microprocessors to determine whether the error is associated with a microprocessor or with a microprocessor socket. If the error codes or LEDs indicate an error that is associated with microprocessor socket 3 or 4, reverse the locations of VRM 3 and VRM 4. <ul style="list-style-type: none"> • If the error is associated with a microprocessor, replace the microprocessor. • If the error is associated with a VRM, replace the VRM. • If the error is associated with a microprocessor socket, replace the microprocessor tray.
Monitor problems	Action
<p>Testing the monitor</p>	<ol style="list-style-type: none"> 1. Make sure the monitor cables are firmly connected. 2. Try using a different monitor on the server, or try using the monitor that is being tested on a different server. 3. Run the diagnostic programs. If the monitor passes the diagnostic programs, the problem might be a video device driver. 4. Reseat the following components: <ol style="list-style-type: none"> a. Remote Supervisor Adapter II SlimLine (if one is present) b. I/O board 5. Replace the components listed in step 4 one at a time, in the order shown, restarting the server each time.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
The screen is blank.	<ol style="list-style-type: none"> 1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server. 2. Make sure that: <ul style="list-style-type: none"> • The server is turned on. • The monitor cables are connected correctly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. • Make sure that no beep codes sounded when the server is turned on. <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 option in the Start Options of the Configuration/Setup Utility program is enabled, you must restart the server three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled).</p> 3. Make sure that the correct server is controlling the monitor, if applicable. 4. Make sure that damaged BIOS code is not affecting the video. 5. Observe the checkpoint LEDs on the I/O board; if the codes are changing, go to the next step.
The monitor works when you turn on the server, but the screen goes blank when you start some application programs.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The application program is not setting a display mode that is higher than the capability of the monitor. • You installed the necessary device drivers for the application. 2. Run video diagnostics. <ul style="list-style-type: none"> • If the server passes the video diagnostics, the video is good. • (Trained service technician only) If the server fails the video diagnostics, reseal the I/O board. • Replace the I/O board.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
<p>The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.</p>	<ol style="list-style-type: none"> 1. If the monitor self-tests show the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. Attention: Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor. Notes: <ol style="list-style-type: none"> a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. 2. Reseat the following components: <ol style="list-style-type: none"> a. Monitor b. Remote Supervisor Adapter II SlimLine (if one is present) c. I/O board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
<p>Wrong characters appear on the screen.</p>	<ol style="list-style-type: none"> 1. If the wrong language is displayed, update the BIOS code with the correct language. 2. Reseat the following components: <ol style="list-style-type: none"> a. Monitor b. I/O board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
<p>Optional-device problems</p>	<p>Action</p>
<p>An IBM optional device that was just installed does not work.</p>	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The device is designed for the server (see the ServerProven list at http://www.ibm.com/pc/compat/). • You followed the installation instructions that came with the device and the device is installed correctly. • You have not loosened any other installed devices or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration. 2. Reseat the device that you just installed. 3. Replace the device that you just installed.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

An IBM optional device that used to work does not work now.

1. Make sure that all of the hardware and cable connections for the device are secure.
2. If the device comes with test instructions, use those instructions to test the device.
3. If the failing device is a SCSI device, make sure that:
 - The cables for all external SCSI devices are connected correctly.
 - The last device in each SCSI chain, or the end of the SCSI cable, is terminated correctly.
 - Any external SCSI device is turned on. You must turn on an external SCSI device before turning on the server.
4. Reseat the failing device.
5. Replace the failing device.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Power problems	Action
<p>The power-control button does not work, and the reset button does work (the server does not start).</p> <p>Note: The power-control button will not function until 20 seconds after the server has been connected to ac power.</p>	<ol style="list-style-type: none"> 1. Make sure that the operator information panel power-control button is working correctly: <ol style="list-style-type: none"> a. Disconnect the server power cords. b. Reconnect the power cords. c. (Trained service technician only) Reseat the operator information panel cables, and then repeat steps 1a and 1b. <ul style="list-style-type: none"> • (Trained service technician only) If the server starts, reseal the operator information panel. If the problem remains, replace the operator information panel. • (Trained service technician only) If the server does not start, bypass the operator information panel power-control button by using the force power-on jumper; if the server starts, reseal the operator information panel. If the problem remains, replace the operator information panel. 2. Make sure that the reset button is working correctly: <ol style="list-style-type: none"> a. Disconnect the server power cords. b. Reconnect the power cords. c. (Trained service technician only) Reseat the light path diagnostics panel cable, and then repeat steps 2a and 2b. <ul style="list-style-type: none"> • (Trained service technician only) If the server starts, replace the light path diagnostics panel. • If the server does not start, go to step 3. 3. Make sure that: <ul style="list-style-type: none"> • The power cords are correctly connected to the server and to a working electrical outlet. • The type of memory that is installed is correct. • The memory card is fully seated. • The LEDs on the power supply do not indicate a problem. • The microprocessors are installed in the correct sequence. 4. Reseat the following components: <ol style="list-style-type: none"> a. Memory card b. (Trained service technician only) Power switch connector c. (Trained service technician only) Power backplane d. I/O board 5. Replace the components listed in step 4 one at a time, in the order shown, restarting the server each time. 6. If you just installed an optional device, remove it, and restart the server. If the server now turns on, you might have installed more devices than the power supply supports.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
The server does not turn off.	<ol style="list-style-type: none"> 1. Determine whether you are using an Advanced Configuration and Power Management (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps: <ol style="list-style-type: none"> a. Press Ctrl+Alt+Delete. b. Turn off the server by holding the power-control button for 5 seconds. c. Restart the server. d. If the server fails POST and the power-control button does not work, disconnect the ac power cord for 20 seconds; then, reconnect the ac power cord and restart the server. 2. If the problem remains or if you are using an ACPI-aware operating system, suspect the I/O board.
The server unexpectedly shuts down, and the LEDs on the operator information panel are not lit.	See the <i>Problem Determination and Service Guide</i> on the IBM xSeries Documentation CD for more information.
Serial port problems	Action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial-port adapter (if one is present) is seated correctly. 2. Reseat the serial port adapter. 3. Replace the serial port adapter. <p>For more information about the serial port, see the <i>User's Guide</i> on the IBM xSeries Documentation CD.</p>
A serial device does not work.	<ol style="list-style-type: none"> 1. Make sure that: <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 correct port. 2. Reseat the following components: <ol style="list-style-type: none"> a. Failing serial device b. Serial cable c. Remote Supervisor Adapter II SlimLine (if one is present) d. I/O board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time. <p>For more information about the serial port, see the <i>User's Guide</i> on the IBM xSeries Documentation CD.</p>
ServerGuide problems	Action
The <i>ServerGuide Setup and Installation</i> CD will not start.	<ul style="list-style-type: none"> • Make sure that the server supports the ServerGuide program and has a startable (bootable) CD (or DVD) drive. • If the startup (boot) sequence settings have been altered, make sure that the CD drive is first in the startup sequence. • If more than one CD drive is installed, make sure that only one drive is set as the primary drive. Start the CD from the primary drive.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
The SCSI RAID program cannot view all installed drives, or the operating system cannot be installed.	<ul style="list-style-type: none"> • Make sure that there are no duplicate SCSI IDs or IRQ assignments. • Make sure that the hard disk drive is connected correctly.
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start the operating-system CD.	Make sure that the operating-system CD is supported by the ServerGuide program. See the <i>ServerGuide Setup and Installation</i> CD label for a list of operating-system versions that support the ServerGuide program.
The operating system cannot be installed; the option is not available.	Make sure that the operating system is supported on the server. If the operating system 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 make sure that setup is complete.
Software problems	Action
You suspect a software problem.	<ol style="list-style-type: none"> 1. To determine whether the problem is caused by the software, make sure that: <ul style="list-style-type: none"> • The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, the server might have a memory-address conflict. • The software is designed to operate on the server. • Other software works on the server. • The software works on another server. 2. If you received any error messages when using the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem. 3. Contact your place of purchase of the software.
Universal Serial Bus (USB) port device problems	Action
A USB device does not work.	<ol style="list-style-type: none"> 1. Run USB diagnostics. 2. Make sure that: <ul style="list-style-type: none"> • The correct USB device driver is installed. • The operating system supports USB devices. • A standard PS/2[®] keyboard or mouse is not connected to the server. If it is, a USB keyboard or mouse will not work during POST. 3. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program menu (see the <i>User's Guide</i> for more information). 4. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.

Light path diagnostics

Light path diagnostics is a system of LEDs on various external and internal components of the server. When an error occurs, LEDs are lit throughout the server. By viewing the LEDs in a particular order, you can often identify the source of the error.

The server is designed so that LEDs remain lit when the server is connected to an ac power source but is not turned on, provided that the power supply is operating correctly. This feature helps you to isolate the problem when the operating system is shut down.

Any memory, microprocessor, or VRM LED can be lit again without ac power after you remove the microprocessor tray so that you can isolate a problem. After ac power has been removed from the server, power remains available to these LEDs for up to 24 hours.

To view the memory, microprocessor, or VRM LEDs, press and hold the light path diagnostics button on the memory card or on the microprocessor board briefly to light the error LEDs.

The LEDs that were lit while the server was running will be lit again while the button is pressed.

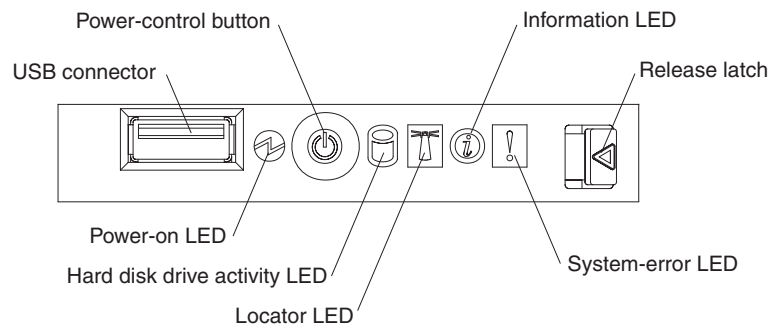
Many errors are first indicated by a lit information LED or system-error LED on the operator information panel on the front of the server. If one or both of these LEDs are lit, one or more LEDs elsewhere in the server might also be lit and can direct you to the source of the error.

Before working inside the server to view light path diagnostics LEDs, read the safety information that begins on page v and “Handling static-sensitive devices” on page 8.

If an error occurs, view the light path diagnostics LEDs in the following order:

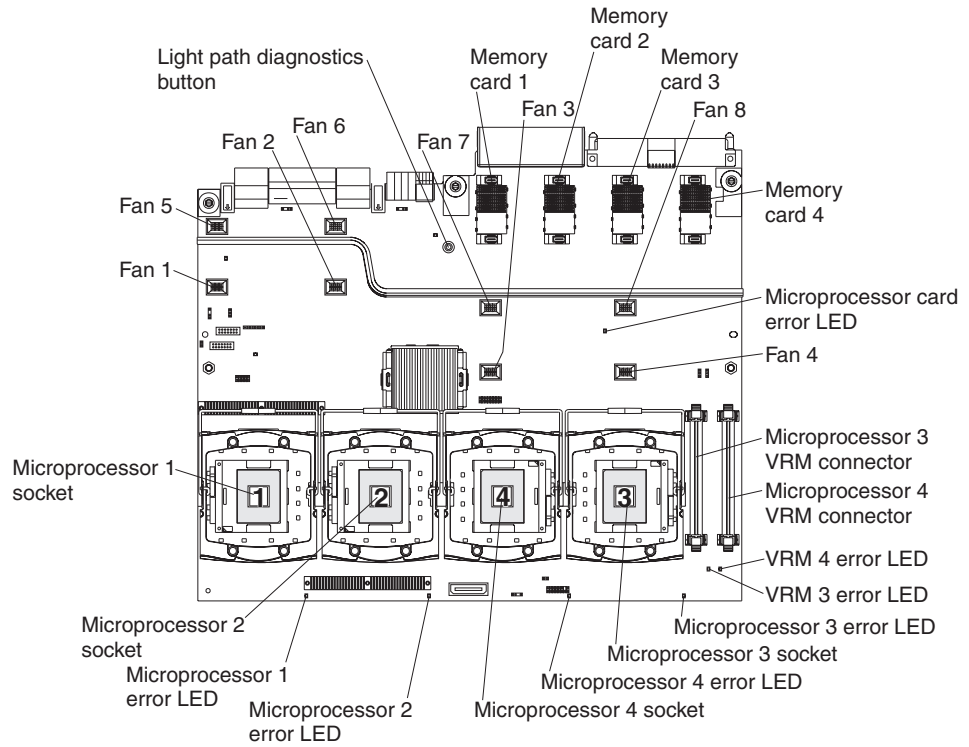
1. Check the operator information panel on the front of the server.
 - If the information LED is lit, it indicates that information about a suboptimal condition in the server is available in the BMC log or in the system-error log.
 - If the system-error LED is lit, it indicates that an error has occurred; go to step 3 on page 52.

The following illustration shows the operator information panel.

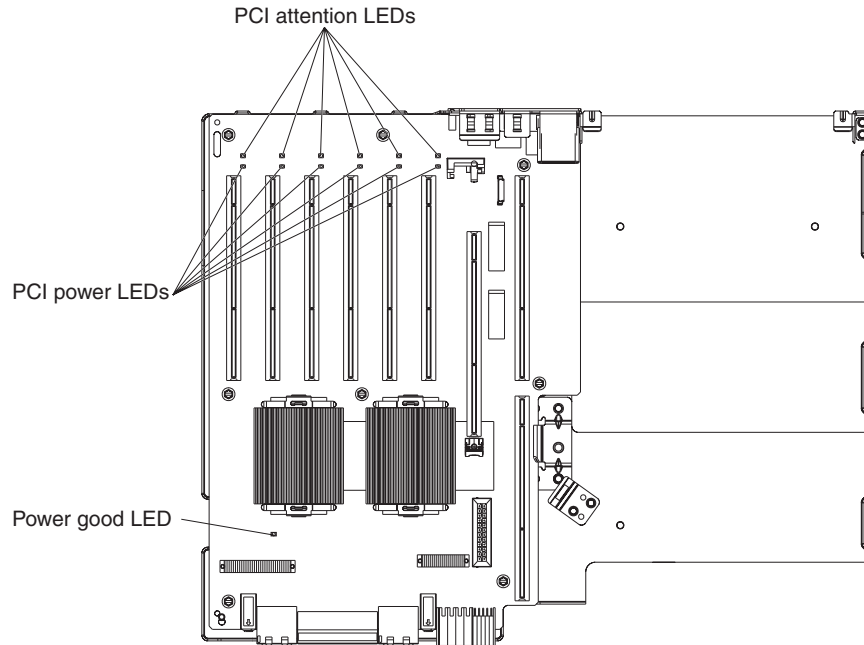


2. Unlock the front cover (tower model only) and remove the server cover to look inside the server for lit LEDs. Certain components inside the server have LEDs that will be lit to indicate the location of a problem. For example, a VRM error will light the LED next to the failing VRM on the microprocessor tray.

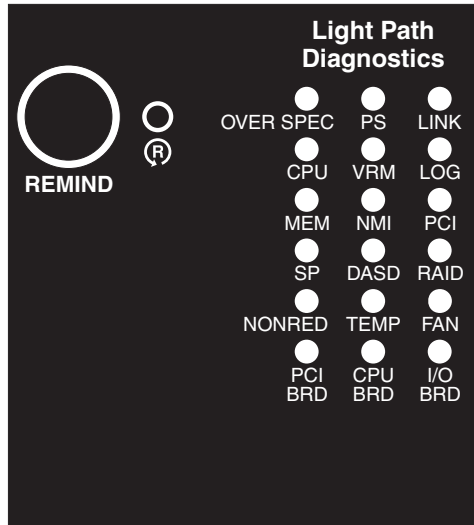
The following illustration shows the LEDs and connectors on the microprocessor tray.



The following illustration shows the LEDs on the PCI-X board.



3. To view the light path diagnostics panel, press the release latch on the front of the operator information panel to the left; then, slide it forward. This reveals the light path diagnostics panel. Lit LEDs on this panel indicate the type of error that has occurred.



Look at the system service label on the top of the server, which gives an overview of internal components that correspond to the LEDs on the light path diagnostics panel. This information and the information in “Light path diagnostics panel” can often provide enough information to correct the error.

Remind button

You can use the remind button on the light path diagnostics panel to put the system-error LED on the operator information panel into Remind mode. When you press the remind button, you acknowledge the error but indicate that you will not take immediate action. The system-error LED flashes while it is in Remind mode and stays in Remind mode until one of the following conditions occurs:

- All known errors are corrected.
- The server is restarted.
- A new error occurs, causing the system-error LED to be lit again.

Light path diagnostics panel

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

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Lit light path diagnostics LED with the system-error LED also lit	Description	Action
All LEDs off (the power LED is lit).		No action necessary.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Lit light path diagnostics LED with the system-error LED also lit	Description	Action
OVERSPEC	There is insufficient power to power the system. The NON RED and LOG LEDs might also be lit.	<ol style="list-style-type: none"> 1. Check that ac power is available to all power supplies. 2. Replace any failed power supply. 3. Reseat the following components: <ol style="list-style-type: none"> a. Power supply b. Microprocessor tray 4. Remove optional devices. 5. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Power supply b. (Trained service technician only) Microprocessor tray
PS	<p>A power supply or power supply filler has failed or has been removed.</p> <p>Note: In a redundant power configuration, the dc power LED on one power supply might be off.</p>	<ol style="list-style-type: none"> 1. Reinstall the removed power supply or power supply filler. 2. Check the individual power-supply LEDs to find the failing power supply or power supply filler. 3. Reseat the following components: <ol style="list-style-type: none"> a. Failing power supply or power supply filler b. Microprocessor tray 4. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Failing power supply or power supply filler b. (Trained service technician only) Microprocessor tray 5. If a 12 V fault has occurred, remove ac power before restoring dc power.
LINK	Reserved for future use	

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Lit light path diagnostics LED with the system-error LED also lit	Description	Action
CPU	<p>A microprocessor has failed, is missing, or has been improperly installed.</p> <p>Note: Make sure that the microprocessors are installed in the correct sequence; see “Installing an additional microprocessor” on page 16.</p>	<ol style="list-style-type: none"> 1. Check the BMC log or the system-error log to determine the reason for the lit LED. 2. Find the failing, missing, or mismatched microprocessor by checking the LEDs on the microprocessor tray. 3. Reseat the following components: <ol style="list-style-type: none"> a. Microprocessor tray b. (Trained service technician only) Failing microprocessor 4. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. (Trained service technician only) Failing microprocessor b. (Trained service technician only) Microprocessor tray
VRM	<p>A dc-dc regulator has failed or is missing.</p>	<ol style="list-style-type: none"> 1. Check the BMC log or the system-error log to determine the reason for the lit LED (for a VRM). 2. Find the failing or missing VRM by checking the LEDs on the microprocessor tray. 3. Install any missing VRMs. 4. Reseat the following components: <ol style="list-style-type: none"> a. Failing VRM b. (Trained service technician only) Microprocessor associated with the VRM c. Microprocessor tray 5. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Failing VRM b. (Trained service technician only) Microprocessor associated with the VRM c. (Trained service technician only) Microprocessor tray
LOG	<p>Information is present in the BMC log and system-error log. One or both logs might be full or almost full.</p>	<ol style="list-style-type: none"> 1. Save the log if necessary. Then, clear the log. 2. Check the log for possible errors.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Lit light path diagnostics LED with the system-error LED also lit	Description	Action
MEM	Memory failure. Note: The error LED on the memory card might also be lit.	<ol style="list-style-type: none"> 1. Remove the memory card with the lit error LED on the top of the card; then, press the light path diagnostics button on the memory card to identify the failed DIMM. 2. Reseat the DIMM. 3. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. DIMM b. Memory card c. (Trained service technician only) Microprocessor tray
NMI	A hardware error has been reported to the operating system. Note: The PCI or MEM LED might also be lit.	<ol style="list-style-type: none"> 1. See the BMC log and the system-error log. 2. If the PCI LED is lit, follow the instructions for that LED. 3. If the MEM LED is lit, follow the instructions for that LED. 4. Restart the server.
PCI	A PCI adapter has failed. Note: The error LED next to the failing adapter on the PCI-X board is also lit.	<ol style="list-style-type: none"> 1. See the BMC log or the system-error log. 2. Reseat the following components: <ol style="list-style-type: none"> a. Failing adapter b. I/O board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
SP	There is a fault in the Remote Supervisor Adapter II SlimLine.	<ol style="list-style-type: none"> 1. Reseat the Remote Supervisor Adapter II SlimLine. 2. Update the firmware for the Remote Supervisor Adapter II SlimLine. 3. Replace the Remote Supervisor Adapter II SlimLine.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Lit light path diagnostics LED with the system-error LED also lit	Description	Action
DASD	<p>A hard disk drive has failed or has been removed.</p> <p>Note: The error LED on the failing hard disk drive might also be lit.</p>	<ol style="list-style-type: none"> 1. Reinstall the removed drive. 2. Reseat the following components: <ol style="list-style-type: none"> a. Failing hard disk drive b. SAS hard disk drive backplane cables c. I/O board 3. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Failing hard disk drive b. SAS hard disk drive backplane cables c. SAS backplane d. I/O board
RAID	<p>The RAID adapter (ServeRAID-8i) has indicated a fault.</p>	<ol style="list-style-type: none"> 1. Check the BMC log or the system-error log for information. 2. Reseat the following components: <ol style="list-style-type: none"> a. RAID adapter b. Hard disk drives c. I/O board 3. Replace the components in step 2 one at a time, in the order shown, restarting the server each time.
NONRED	<p>The server is operating with nonredundant power. If a power supply or ac power source fails, the system will be over spec.</p> <p>Note: The LOG LED might also be lit.</p>	<ol style="list-style-type: none"> 1. If the PS LED on the light path diagnostics panel is lit, follow the instructions for that LED. 2. Replace the failing power supply. 3. Remove optional devices.
TEMP	<p>A system temperature or component has exceeded specifications.</p> <p>Note: A fan LED might also be lit.</p>	<ol style="list-style-type: none"> 1. See the BMC log or the system-error log for the source of the fault. 2. Make sure that the airflow in the server is not blocked. 3. If a fan LED is lit, reseat the fan. 4. Replace the fan for which the LED is lit. 5. Make sure that the room is neither too hot nor too cold (see “Environment” in “Features and specifications” on page 4). 6. If one of the integrated VRMs indicates “hot,” remove ac power before restoring dc power.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU).
- If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician.

Lit light path diagnostics LED with the system-error LED also lit	Description	Action
FAN	A fan has failed or has been removed. Note: A failing fan can also cause the TEMP LED to be lit.	<ol style="list-style-type: none"> 1. Reinstall the removed fan. 2. If an individual fan LED is lit, replace the fan. 3. Reseat the microprocessor tray. 4. (Trained service technician only) Replace the microprocessor tray.
PCI BRD	The PCI-X board has failed.	<ol style="list-style-type: none"> 1. (Trained service technician only) Reseat the PCI-X board assembly. 2. Run diagnostic program 3. (Trained service technician only) Replace the PCI-X board assembly.
CPU BRD	The microprocessor tray has failed.	<ol style="list-style-type: none"> 1. (Trained service technician only) Reseat the microprocessor tray. 2. Run diagnostic program 3. (Trained service technician only) Replace the microprocessor tray.
I/O BRD	The I/O board has failed.	<ol style="list-style-type: none"> 1. Reseat the I/O board. 2. Replace the I/O board.

Appendix. 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 @server 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. Information about diagnostic tools is in the *Hardware Maintenance Manual and Troubleshooting Guide* or *Problem Determination and Service Guide* on the IBM xSeries Documentation CD or IBM BladeCenter Documentation CD or in the *IntelliStation Hardware Maintenance Manual* at the IBM support Web site.
- 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 or to submit a request for information.

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 @server 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 @server 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, some publications are available 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 @server and IntelliStation products, services, and support. The address for IBM xSeries and BladeCenter information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/us/intellistation/>.

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

Software service and support

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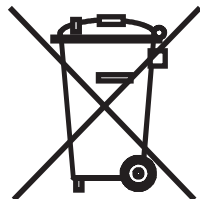
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Industry Canada Class A emission compliance statement

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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

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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

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

Chinese Class A warning statement

聲 明
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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.

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

IBM power cord part number	Used in these countries and regions
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda

IBM power cord part number	Used in these countries and regions
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14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

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