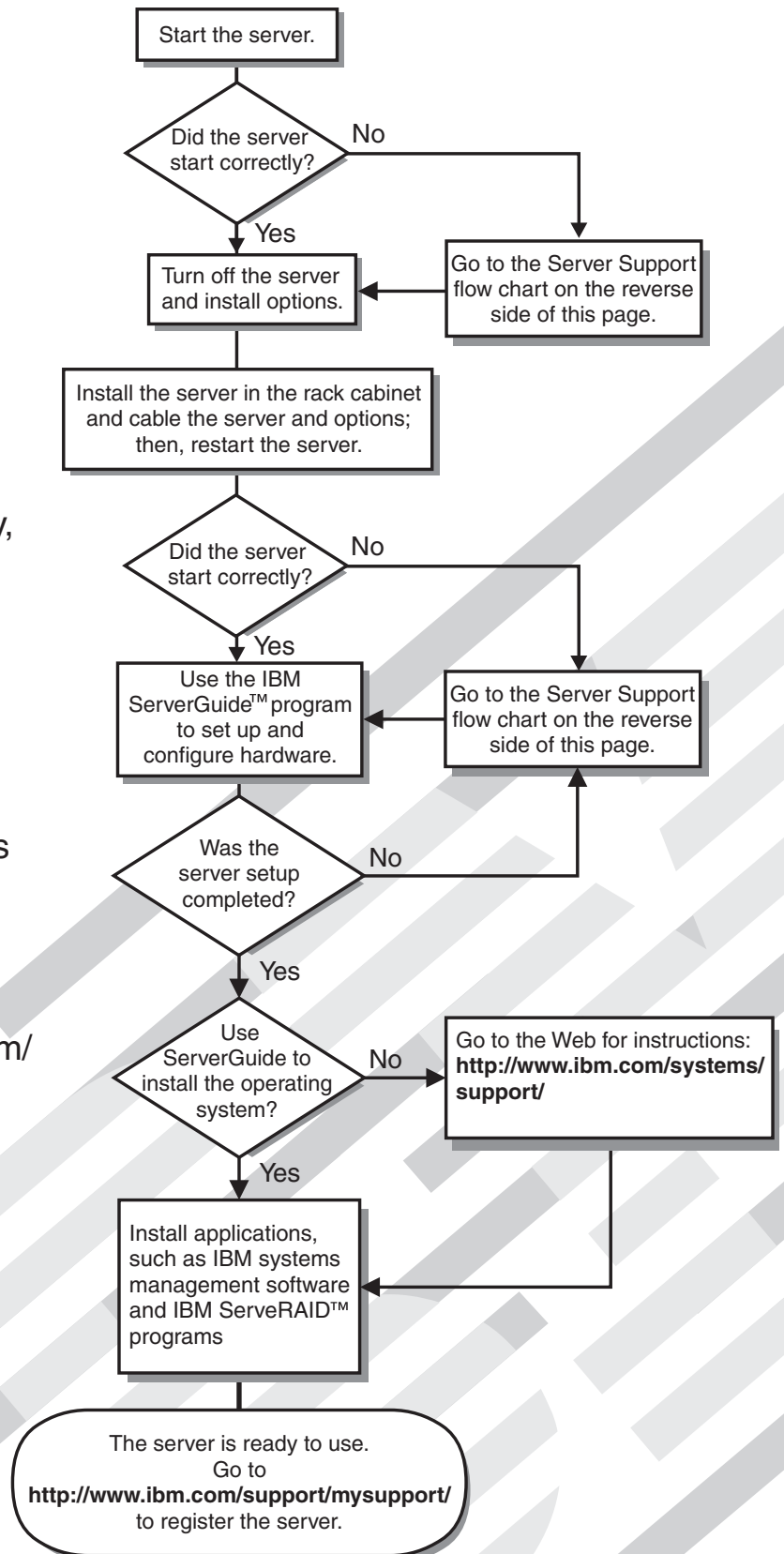# IBM

# System x3550
Type 7978

# Installation Guide

## Welcome.

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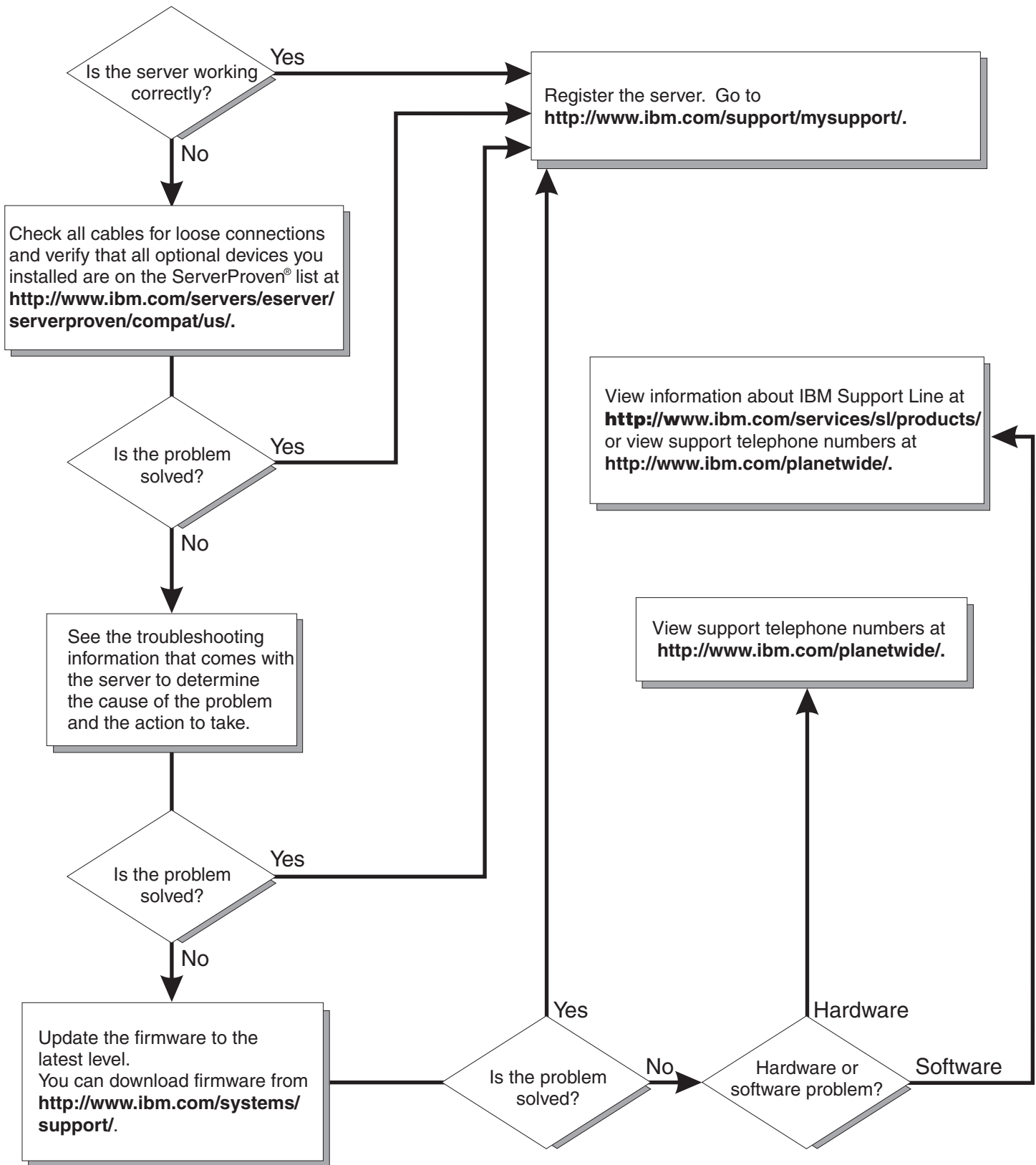
This server *Installation Guide* contains information for setting up and configuring your server.

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

You can also find the most current information about your server at http://www.ibm.com/systems/support/.

---

Start the server.

Did the server start correctly? — No → Go to the Server Support flow chart on the reverse side of this page.

Yes ↓

Turn off the server and install options.

Install the server in the rack cabinet and cable the server and options; then, restart the server.

Did the server start correctly? — No → Go to the Server Support flow chart on the reverse side of this page.

Yes ↓

Use the IBM ServerGuide™ program to set up and configure hardware.

Was the server setup completed? — No → Go to the Server Support flow chart on the reverse side of this page.

Yes ↓

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

Yes ↓

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

The server is ready to use. Go to **http://www.ibm.com/support/mysupport/** to register the server.

# Server Support

**Is the server working correctly?** — Yes → **Register the server. Go to http://www.ibm.com/support/mysupport/.**

No ↓

**Check all cables for loose connections and verify that all optional devices you installed are on the ServerProven® list at http://www.ibm.com/servers/eserver/serverproven/compat/us/.**

↓

**Is the problem solved?** — Yes → **Register the server. Go to http://www.ibm.com/support/mysupport/.**

No ↓

**See the troubleshooting information that comes with the server to determine the cause of the problem and the action to take.**

↓

**Is the problem solved?** — Yes → **Register the server. Go to http://www.ibm.com/support/mysupport/.**

No ↓

**Update the firmware to the latest level. You can download firmware from http://www.ibm.com/systems/support/.**

↓

**Is the problem solved?** — Yes → **Register the server. Go to http://www.ibm.com/support/mysupport/.**

No → **Hardware or software problem?**

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

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

IBM System x3550 Type 7978

# Installation Guide

**Note:** Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 75 and the *Warranty and Support Information* document on the IBM *System x Documentation* CD.

# Contents

# Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

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

**Statement 2:**



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

*Do not:*

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

**Statement 3:**



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

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



**DANGER**

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



Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

**Statement 4:**

≥ 18 kg (39.7 lb.)        ≥ 32 kg (70.5 lb.)        ≥ 55 kg (121.2 lb.)
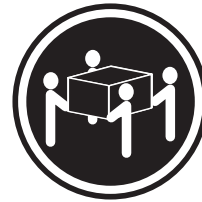
**CAUTION:**
**Use safe practices when lifting.**

**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.**

2

1
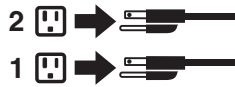
**Statement 6:**

**CAUTION:**
**Do not place any objects on top of a rack-mounted device unless that rack-mounted device is intended for use as a shelf.**

**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 12:**

**CAUTION:**
**The following label indicates a hot surface nearby.**

**Statement 26:**



**CAUTION:**
**Do not place any object on top of rack-mounted devices.**



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

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

# Chapter 1. Introduction

This *Installation Guide* contains instructions for setting up your IBM® System x3550 Type 7978 server and basic instructions for installing some options. More detailed instructions for installing options are in the IBM *User's Guide* on the IBM *System x*™ *Documentation* CD, which comes with the server. This document contains information about:

- Setting up and cabling the server
- Installing some options
- Identifying server controls, LEDs, and power
- Starting and configuring the server
- Solving problems

The System x3550 server supports one of the following hard disk drive configurations:

- Servers with four hot-swap bays support 2.5-inch hot-swap Serial Attached SCSI (SAS) hard disk drives. You can install only 2.5-inch hot-swap SAS drives in these servers.

  The following illustration shows a System x3550 server with a 2.5-inch hard disk drive configuration.
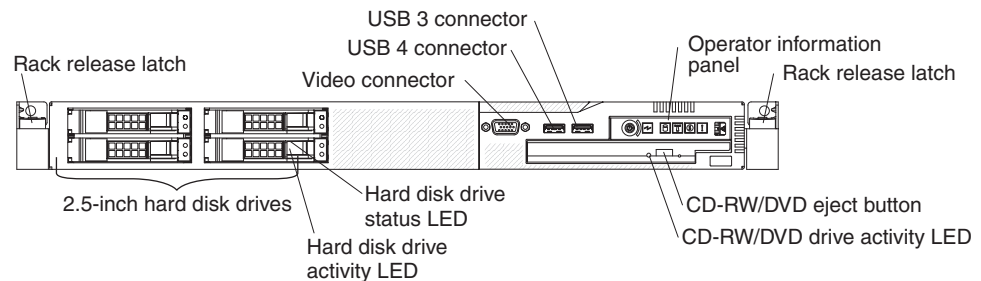


- Servers with two hot-swap bays support 3.5-inch hot-swap SAS or 3.5-inch hot-swap Serial ATA (SATA) hard disk drives. You can install only 3.5-inch hot-swap SAS or hot-swap SATA drives in these servers.
- Servers with two simple-swap bays support 3.5-inch simple swap SATA hard disk drives. You can install only 3.5-inch simple-swap SATA drives in these servers.

  The following illustration shows a System x3550 server with a hot-swap or simple-swap 3.5-inch hard disk drive configuration.
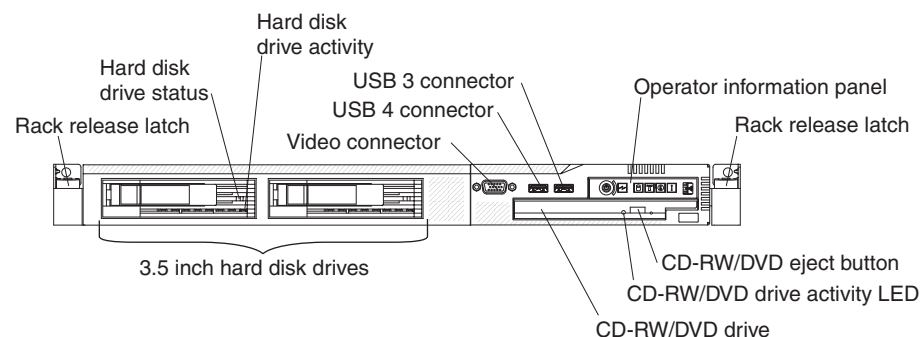


If firmware and documentation updates are available, you can download them from the IBM Web site. The server might have features that are not described in the documentation that comes with the server, and the documentation might be updated

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. To check for updates, complete the following steps.

**Note:** Changes are made periodically to the IBM Web site. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/systems/support/.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Software and device drivers** for firmware updates, or click **Publications lookup** for documentation updates.

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/systems/x/.

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

| | |
|---|---|
| **Product name** | IBM System x3550 server |
| **Machine type** | 7978 |
| **Model number** | _____ |
| **Serial number** | _____ |

The model number and serial number are on the ID label on the front of the server, as shown in the following illustration.

**Note:** This illustration shows a server with a 2.5-inch hard disk drive configuration. The location of the ID label is the same on servers with the 3.5-inch hard disk drive configuration. This illustration might differ slightly from your hardware.



ID label

For a list of supported options for the server, see http://www.ibm.com/servers/ eserver/serverproven/compat/us/.
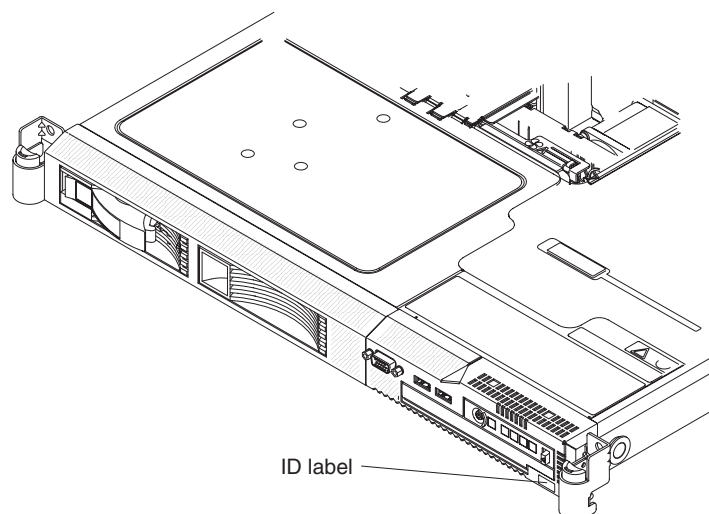
See the *Rack Installation Instructions* document for complete rack installation and removal instructions.

## The IBM System x Documentation CD

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

- Microsoft Windows XP, 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

## 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 or DVD 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 CD or DVD drive and click **Start --> Run**. In the **Open** field, type

      `e:\win32.bat`

      where *e* is the drive letter of the CD or DVD drive, and click **OK**.
    - If you are using Red Hat Linux, insert the CD into the CD or DVD 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 is displayed 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 Crtl+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.

## 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*

**Microprocessor:**

- Intel® Xeon™ FC-LGA 771 dual-core with 4 MB Level-2 cache or quad-core with 8 MB (2x4 MB) Level-2 cache
- Support for up to two microprocessors
- Support for Intel Extended Memory 64 Technology (EM64T)

**Note:**

- Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.
- For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/ serverproven/compat/us/.

**Memory:**

- Minimum: 1 GB
- Maximum: 32 GB
- Type: PC2-5300, 667 MHz, ECC, DDR II fully buffered SDRAM DIMMs only
- Slots: Eight dual inline
- Supports 512 MB, 1 GB, 2 GB, and 4 GB (when available) DIMMs

**Drives:**

CD/DVD: IDE 24x CD-RW/ 8x DVD combination

**Expansion bays (depending on model):**

Either two 3.5-inch or four 2.5-inch hard disk drive bays
- Servers with a 2.5-inch hot-swap drive bay configuration support up to four 2.5-inch hot-swap SAS hard disk drives
- Servers with a 3.5-inch hot-swap drive bay configuration support up to two 3.5-inch SAS or SATA hot-swap hard disk drives
- Servers with a 3.5-inch simple-swap drive bay configuration support up to two 3.5-inch simple-swap SATA hard disk drives

**PCI Expansion slots:**
- One PCI Express x8 (half length)
- One PCI Express x8 (half length) or PCI-X (half length)

**Power supply:**

Maximum of two redundant 670-watt (110 or 220 V ac auto-sensing) hot-swap power supplies.

**Hot-swap fans:**
- Standard: five
- Maximum: six (with two microprocessors installed)

**Size:**
- Height: 43 mm (1.69 inches, 1 U)
- Depth: 711 mm (28 inches)
- Width: 440 mm (17.3 inches)
- Maximum weight: 15.4 kg (34 lb) when fully configured

**Integrated functions:**
- Two Broadcom NetXtreme II Gb Ethernet controllers with TOE and Wake on LAN® support
- Four Universal Serial Bus (USB) 2.0 ports (two front and two rear)
- One Advanced System Management RJ-45 (active only when a Remote Supervisor Adapter II SlimLine is installed)
- One serial port

**Hard disk controllers:**
- Serial ATA (SATA) controller with integrated RAID (simple-swap SATA models)
- Serial-attached SCSI (SAS) controller with integrated RAID (hot-swap SAS models)

**Acoustical noise emissions:**
- Sound power, idling: 6.8 bels maximum
- Sound power, operating: 6.8 bels maximum

**Environment:**
- Air temperature:
  - Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 914 m (2998.7 ft)
  - Server off: -40° to 60°C (-104° to 140°F); maximum altitude: 2133 m (6998.0 ft)
- Humidity:
  - Server on: 8% to 80%
  - Server off: 8% to 80%

**Heat output:**

Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 662 Btu per hour (194 watts)
- Maximum configuration: 2390 Btu per hour (700 watts)

**Electrical input:**
- Sine-wave input (47-63 Hz) required
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Input kilovolt-amperes (kVA), approximately:
  - Minimum: 0.194 kVA
  - Maximum: 0.700 kVA

**Video controller (integrated):**
- ATI Radeon RN50 (dual ports - front and rear)
- Support for SPI Serial flash memory video BIOS
- Flexible memory support
  - 8 MB to 256 MB
  - DDR1 and DDR2 SDRAM and SGRAM

**Notes:**

1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.

2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

# 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 *System x 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.

# Major components of the server

The following illustration shows the major components in the server.
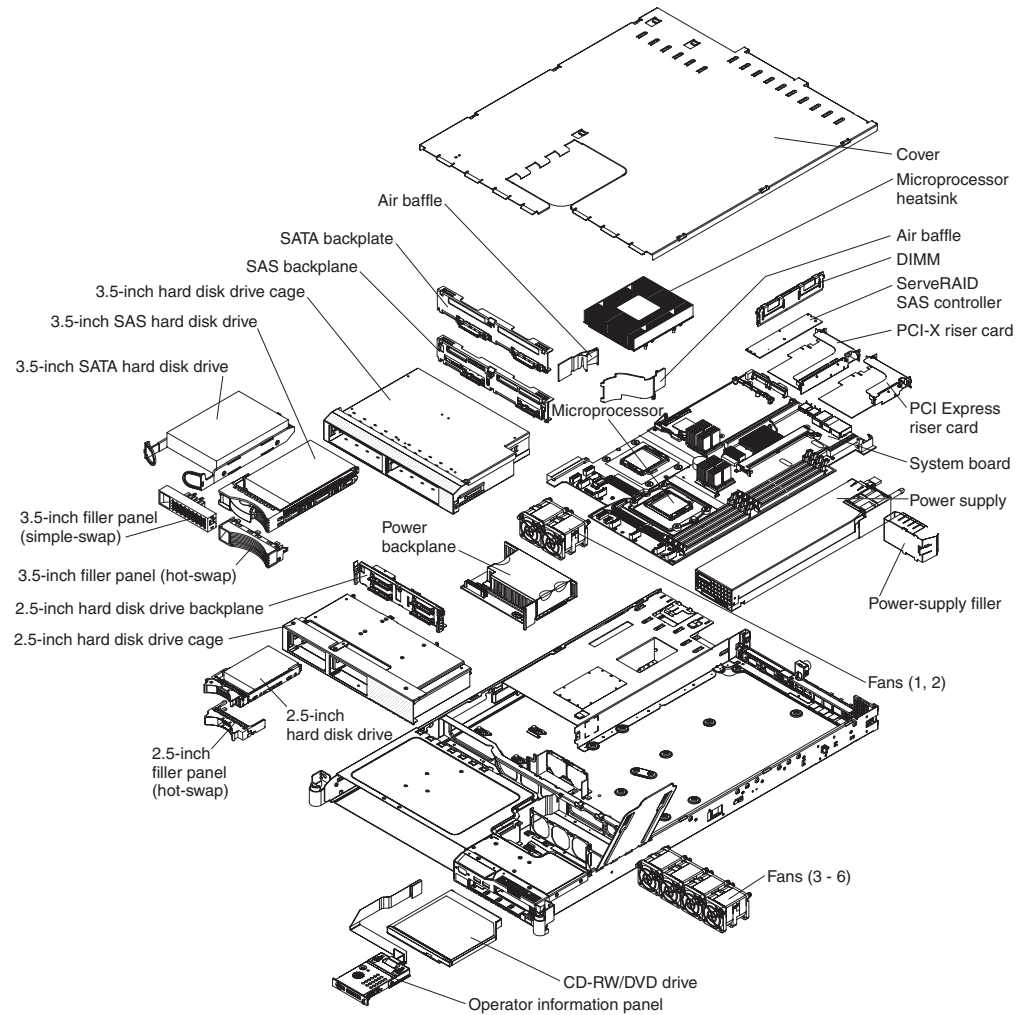


**Note:** The illustrations in this document might differ slightly from your hardware.

# 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 *System x Documentation* CD.

## Installation guidelines

Before you install options, read the following information:

- Read the safety information that begins on page v and the guidelines in "Handling static-sensitive devices" on page 10. 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 server cover is removed, make sure that no one is near the server and that no tools or 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 can 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 and a small Phillips head screwdriver available.
- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap fans, hot-swap drives, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before performing any steps that involve removing or installing 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.
- For a list of supported options for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

## System reliability guidelines

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

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 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.
- 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 to overheat.
- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor and heat sink.

## 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-plug, hot-add, and hot-swap devices and is designed to operate safely while it is turned on and the server 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 surface 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 server cover

**Important:** Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Problem Determination and Service Guide* for diagnostic information.

To remove the server cover, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. If you are planning on removing or installing a microprocessor, memory module, PCI adapter, Remote Supervisor Adapter II SlimLine, RAID controller, simple-swap hard disk drive, or battery, turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.
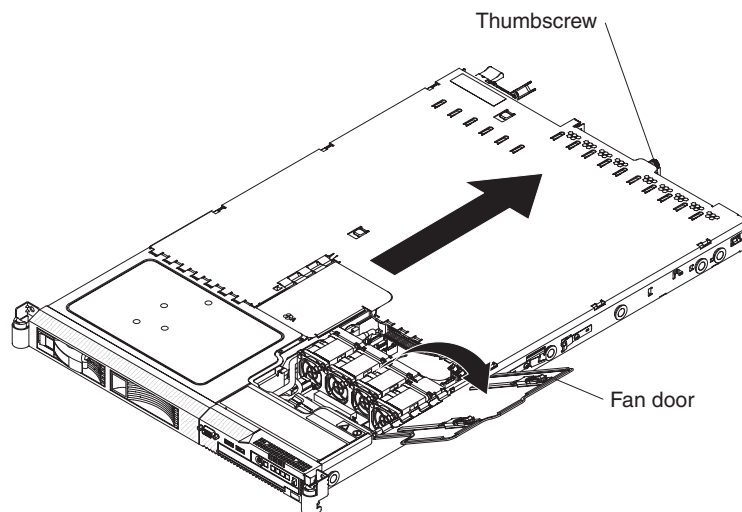


3. If the server has been installed in a rack, slide it out from the rack enclosure. See the *Rack Installation Instructions* that come with the server for information about removing the server from the rack.
4. Slide and lift the two cover-release latches on the fan door on the right side of the top of the server.
5. Lift the fan door cover.
6. Loosen the thumbscrew at the back of the server.
7. Slide the server cover back until the locking tabs release.

8. Lift the server cover off the server and set the server cover aside.

**Attention:** For proper cooling and airflow, replace the server cover before you turn on the server.

# Removing air baffles

There are two air baffles inside the server. These air baffles direct air to cool components inside the server. You might have to remove these baffles to access certain components or connectors on the system board such as DIMMS, IDE cables, or microprocessors.

To remove an air baffle, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary; then, remove the server cover.
3. To remove the air baffle that is closest to the wall of the server, complete the following steps.
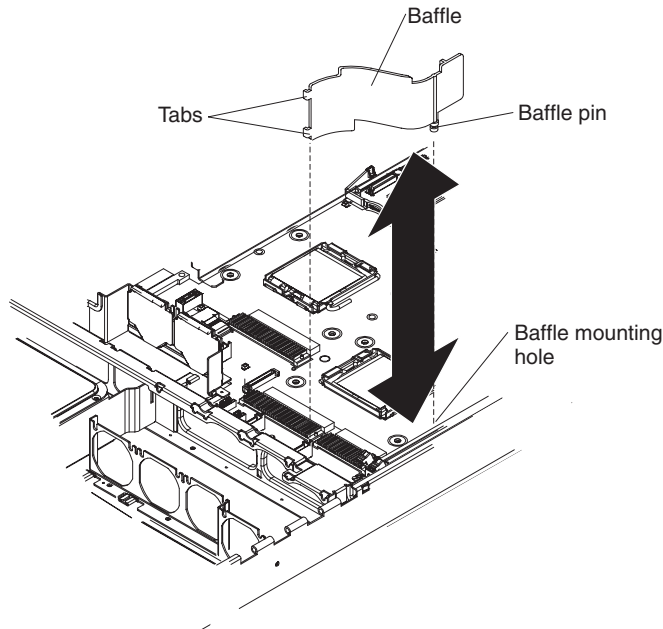


a. Slide the baffle back from the front of the server to disengage the tab at the front of the baffle from the bulkhead that runs the width of the server.
b. Lift the baffle up, making sure that the pins come out of the holes on the system board.

**Attention:** For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with the air baffle removed might damage server components.

4. To remove the air baffle near the center of the server, complete the following steps:
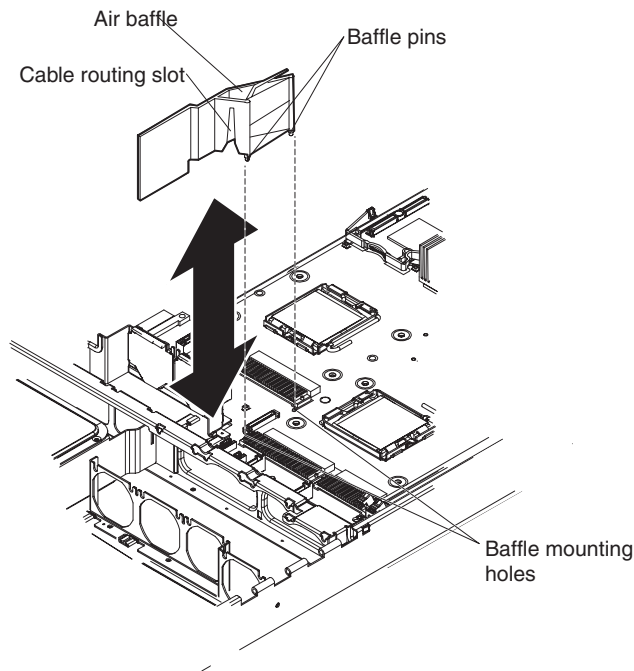
Air baffle

Baffle pins

Cable routing slot

Baffle mounting holes

a. Slide the baffle back from the front of the server to disengage the tab at the front of the baffle from the bulkhead that runs the width of the server.

b. Lift the baffle up slightly, making sure that the pins come out of the holes on the system board.

c. Slide the cables out of the cable routing slot. Make sure that you do not disconnect or loosen the cables.

d. Lift the baffle out completely.

**Attention:** For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with the air baffle removed might damage server components.

## Installing a hard disk drive

Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.

**Note:** Do not mix SAS hard disk drives with SATA hard disk drives.

The following notes describe the type of hard disk drives that the server supports and other information that you must consider when installing a hard disk drive. For a list of supported hard disk drives, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

The server supports one of the following hard disk drive configurations:
• Servers with four hot-swap bays support 2.5-inch hot-swap SAS hard disk drives. You can install only 2.5-inch hot-swap SAS drives in these servers.
• Servers with two hot-swap bays support 3.5-inch hot-swap SAS or 3.5-inch hot-swap SATA hard disk drives. You can install only 3.5-inch hot-swap SAS or hot-swap SATA drives in these servers.

- Servers with two simple-swap bays support 3.5-inch simple-swap SATA hard disk drives. You can install only 3.5-inch simple-swap SATA drives in these servers.
- Do not mix SAS and SATA drives in the same array.

## Installing a hot-swap hard disk drive

To install a 2.5-inch or 3.5-inch SAS hard disk drive, complete the following steps.

**Note:** If you have only one hard disk drive, you must install it in the upper-left bay.
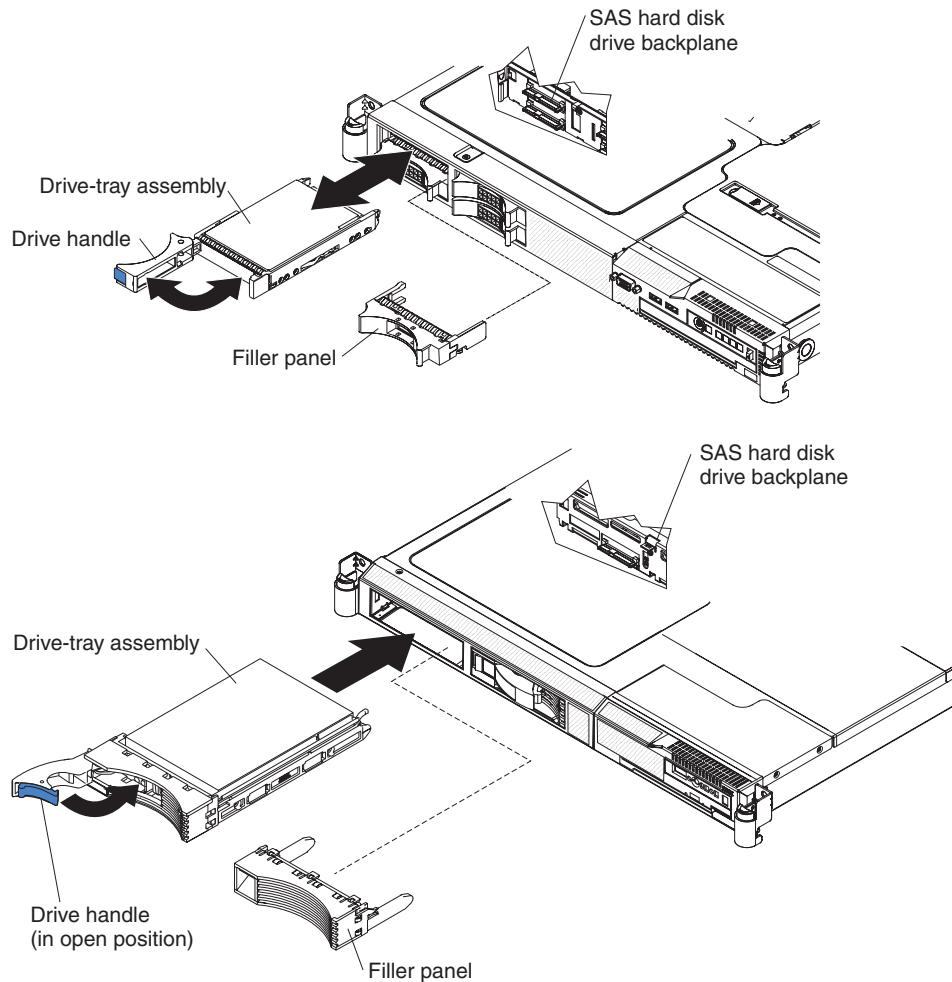


1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Remove the filler panel from the empty drive bay.
3. Install the hard disk drive in the drive bay.
   a. Make sure that the tray handle is open (that is, horizontal to the drive).
   b. Align the drive assembly with the guide rails in the bay.
   c. Gently push the drive assembly into the bay until the drive stops.
   d. Push the tray handle to the closed (locked) position.
   e. Check the hard disk drive status LED to verify 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.

If you have other options to install, do so now. Otherwise, go to "Completing the installation" on page 26.

## Installing a simple-swap hard disk drive

To install a 3.5-inch SATA simple-swap hard disk drive, complete the following steps.

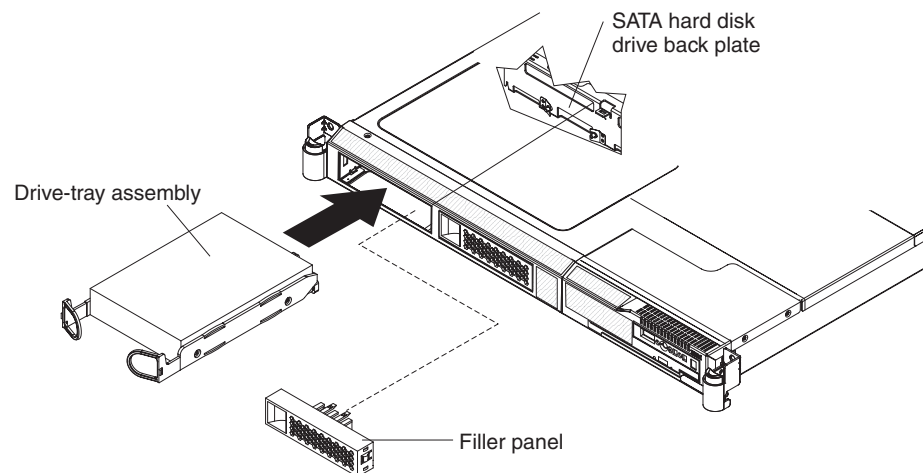**Note:** If you have only one hard disk drive, you must install it in the left bay.



1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Turn off the server and disconnect the power cords and all external cables, if necessary.
3. Remove the filler panel from the empty drive bay.
4. Insert the simple-swap hard disk drive into the drive tray assembly.
   a. Align the drive assembly with the guide rails in the bay.
   b. Gently push the drive assembly into the bay until the rear of the drive snaps into place with the connector on the back plate.
5. Install the filler panel in the drive bay.
6. Reconnect the power cords and turn on the server.
7. Check the hard disk drive status LED to verify 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.

If you have other options to install, do so now. Otherwise, go to "Completing the installation" on page 26.

## Replacing a riser-card assembly

The System x3550 Type 7978 comes with two PCI Express riser-card assemblies. You can replace one of the PCI Express riser-card assemblies with a PCI-X riser-card assembly.

To replace a PCI Express riser-card assembly with a PCI-X riser-card assembly, complete the following steps:

1. Read the safety information that begins on page v and the "Installation guidelines" on page 9.
2. Turn off the server and disconnect the power cords and all external cables, if necessary; then, remove the server cover.
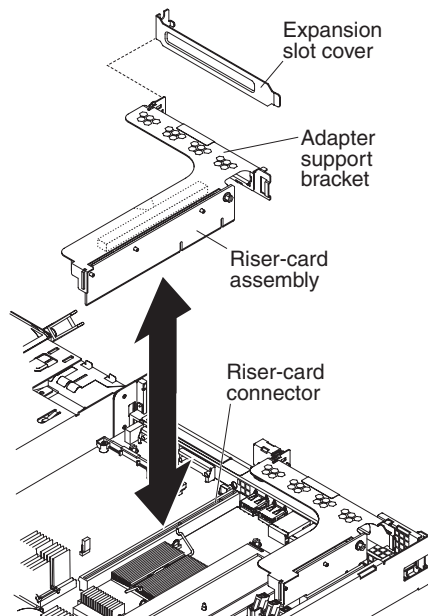


3. Remove the PCI Express riser-card assembly from slot 2 on the system board.
   - If an adapter is installed in the riser-card assembly, disconnect any cables that are connected to the adapter.
   - Grasp the riser-card assembly at the rear edge and lift it from the riser-card connector.
   - Remove the adapter, if one is present, from the riser-card assembly.
4. Install an adapter in the PCI-X riser-card assembly. See "Installing an adapter" for more information. Set any jumpers or switches on the adapter as directed by the adapter manufacturer.
5. Insert the PCI-X riser-card assembly into the riser-card connector on the system board. Make sure that it is fully seated.

If you have other options to install, do so now. Otherwise, go to "Completing the installation" on page 26.

## Installing an adapter

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

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section.
- There are two types of adapters that you can install, depending on which slots are available. You can install the following types of adapters in PCI slots 1 and 2:
  - Only a PCI Express adapter into slot 1
  - Any PCI-X or PCI Express adapter into slot 2

To install an adapter, complete the following steps:

1. Read the safety information that begins on page v and the "Installation guidelines" on page 9.

2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary; then, remove the server cover.
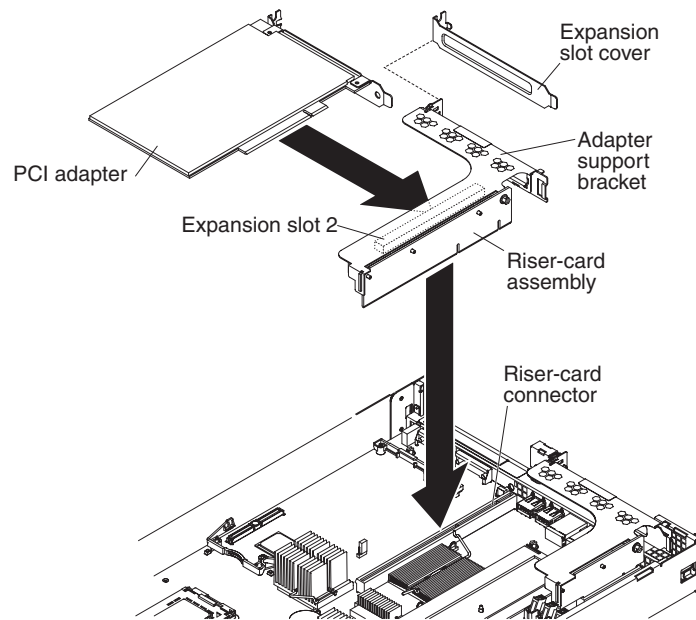


3. Follow the cabling instructions, if any come with the adapter. Route the adapter cables before you install the adapter.
4. Insert the adapter into the riser-card assembly, aligning the edge connector on the adapter with the connector on the riser-card assembly. Press the edge of the connector *firmly* into the riser-card assembly. Make sure that the adapter snaps into the riser-card assembly securely.
5. Install the riser-card assembly in the server. See "Replacing a riser-card assembly" on page 15 for more information.
6. Perform any configuration tasks that are required for the adapter.

If you have other options to install, do so now. Otherwise, go to "Completing the installation" on page 26.

# Replacing the RAID SAS controller

A ServeRAID SAS controller can be installed only in a dedicated slot on the system board. Some models come with a ServeRAID-8k-l SAS controller installed.

The following illustration shows the ServeRAID-8k-l SAS controller.

To replace the ServeRAID-8k-l SAS controller provided in some models with a ServeRAID-8k SAS controller, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary; then, remove the server cover.
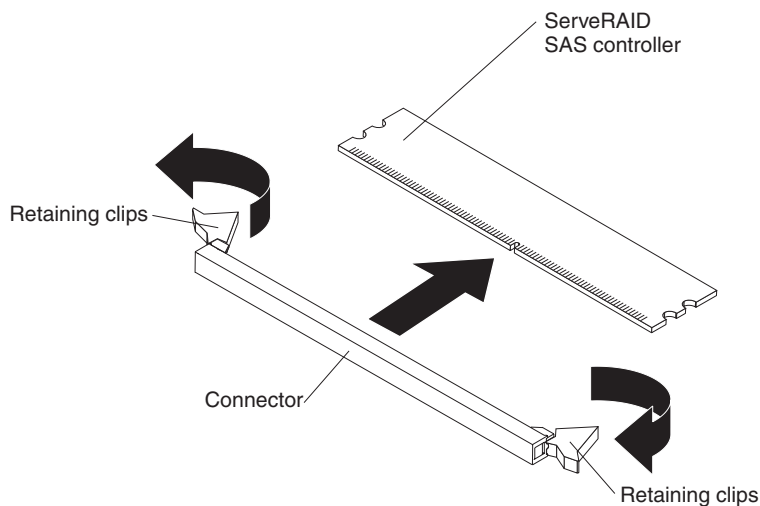3. Remove the ServeRAID-8k-l controller from the connector.
   a. Open the retaining clip on each end of the connector.

      **Attention:** To avoid breaking the retaining clips or damaging the connectors, handle the clips gently.
   b. Carefully grasp the controller by its top edge or upper corners, and pull the controller from the connector.
   c. Place the ServeRAID-8k-l SAS controller into a static-protective package and put it in a safe place.
4. Position the ServeRAID-8k controller by aligning the edge connector with the connector on the system board. Insert the controller *firmly* into the connector. The retaining clips snap into the locked position when the controller is firmly seated in the connector.

Battery mounting tabs

Battery

Battery cable

Battery mounting clips

Battery cable connector
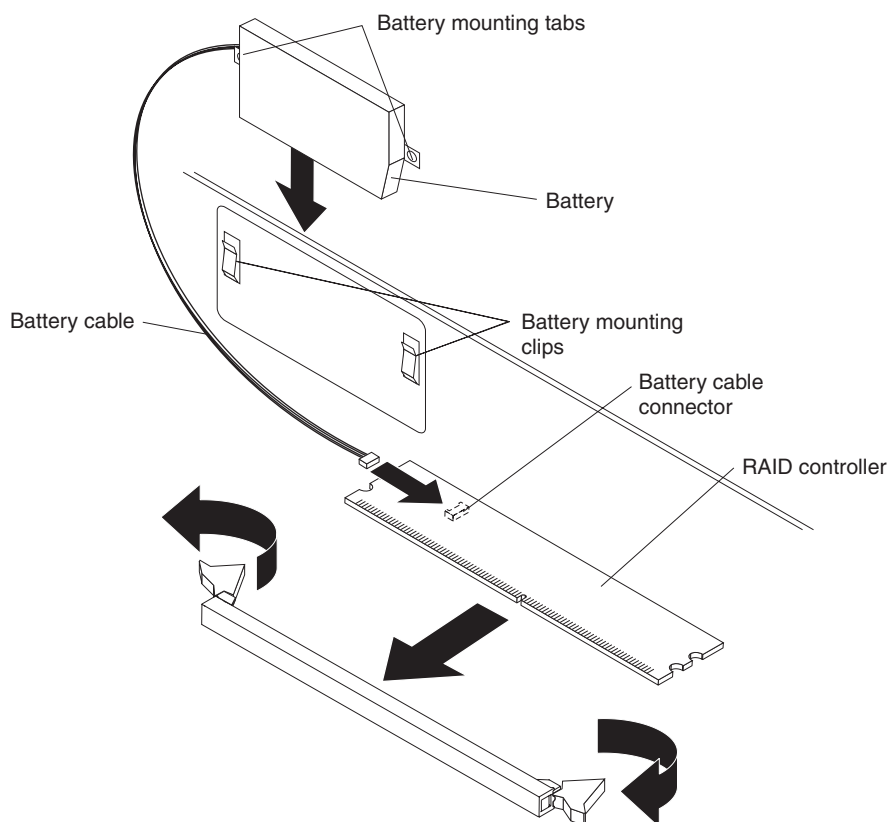
RAID controller

**Attention:** Incomplete insertion might cause damage to the server or the ServeRAID-8k SAS controller.

5. Remove the battery from the RAID controller package.

6. Slide the battery mounting tabs into the battery mounting clips on the server wall next to the connector.

7. Connect the RAID controller battery to the RAID controller.

8. If you have other options to install, do so now. Otherwise, go to "Completing the installation" on page 26.

**Note:** When you restart the server, you will be prompted to import the existing RAID configuration to the new ServeRAID controller.

## Installing a memory module

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

- The server supports up to eight Fully Buffered DIMM PC2-5300 512 MB, 1 GB, 2 GB, and 4 GB DIMMs, for a maximum of 32 GB of system memory. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of memory modules that you can use with the server.

  **Note:** Because some memory is reserved for system operation, the actual usable memory size that is reported by the operating system is less than the total installed size.

- The server comes with a minimum of two 512 MB DIMMs or two 1 GB DIMMs, installed in slots 1 and 3 or slots 5 and 7. When you install additional DIMMs,

you must install two identical DIMMs at a time, in the order shown in the following table, to maintain performance.

*Table 2. DIMM installation sequence*

| Pair | DIMM connectors |
|------|-----------------|
| 1 | 1 and 3 |
| 2 | 5 and 7 |
| 3 | 2 and 4 |
| 4 | 6 and 8 |

*Figure 1. DIMM connectors, channels, and branches*
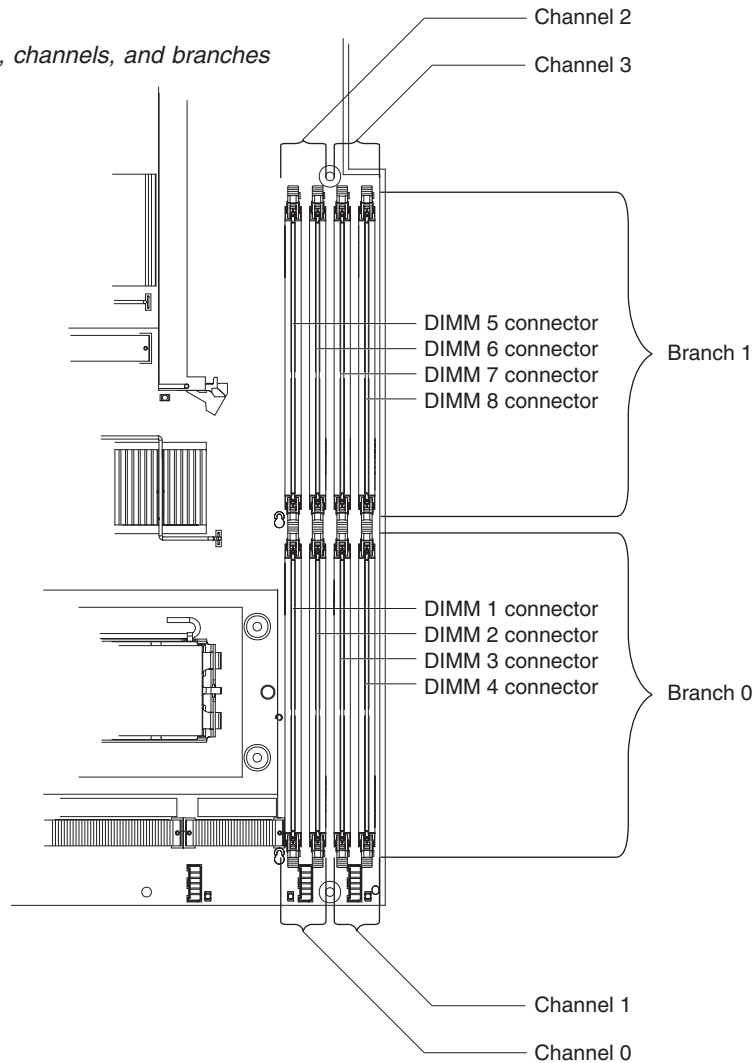


- Each DIMM in a pair must be the same size, speed, type, and technology to ensure that the server will operate correctly.
- You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller switches from the active pair to the mirroring pair. Memory mirroring reduces the amount of available memory. Enable memory mirroring through the Configuration/Setup Utility program.

  When you use memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each group must be identical. See the following table for the installation sequence of DIMM connectors for memory mirroring.

*Table 3. Memory mirroring DIMM installation sequence*

| Group | DIMM connectors |
|-------|-----------------|
| 1 | 1, 3, 5, and 7 |
| 2 | 2, 4, 6, and 8 |

*Table 4. Memory mirroring DIMM functions*

| Group | Active DIMMs | Mirroring DIMMs |
|-------|--------------|-----------------|
| 1 | 1, 3 | 5, 7 |
| 2 | 2, 4 | 6, 8 |

- The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare pair of DIMMs to replace the failed active DIMM pair. Online-spare memory reduces the amount of available memory. Before you can enable this feature, you must install up to two additional pairs of DIMMs. The online-spare DIMM pairs must be the same speed, type, and the same size as, or larger than, the largest active DIMM pairs.

  Enable online-spare memory through the Configuration/Setup Utility program. The BIOS code assigns the online-spare DIMM pairs according to your DIMM configuration. Two online-spare configurations are supported. See Table 5 for the online-spare memory DIMM connector assignments.

*Table 5. Online-spare DIMM connector assignments*

| Group | DIMM connectors |
|-------|-----------------|
| 1 | 1 and 3, 2 and 4 |
| 2 | 5 and 7, 6 and 8 |

- You can enable either online-spare memory or memory mirroring, but not both at the same time. Online-spare memory provides more memory capacity than mirroring; mirroring provides better memory protection but less memory capacity than online-spare memory.
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.

To install a DIMM, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.
3. Remove the server cover.

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

4. Open the retaining clip on each end of the DIMM connector.
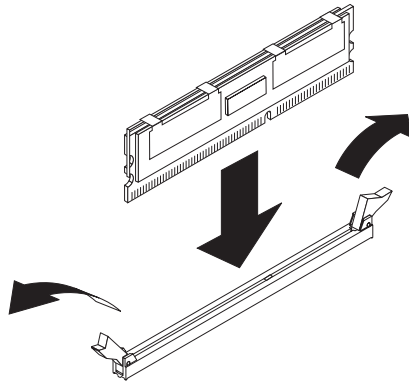
5. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.

6. Turn the DIMM so that the DIMM keys align correctly with the slot.

7. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector.

8. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

   **Note:** 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.

9. If you have other options to install, do so now. Otherwise, go to "Completing the installation" on page 26.

## Installing a microprocessor

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

- The server supports certain Intel Xeon dual-core or quad-core flip-chip land grid array 771 (FC-LGA 771) microprocessors, which are designed for the LGA771 socket. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported microprocessors.

  **Important:** Dual-core and quad-core microprocessors are not interchangeable and cannot be used in the same server. For example, if the server has a dual-core microprocessor, you cannot install a quad-core microprocessor as the second microprocessor. Use the Configuration/Setup Utility program to determine the type and speed of the microprocessor that is currently installed in the server.

- The server supports up to two microprocessors. If the server comes with one microprocessor, you can install a second microprocessor.

- Read the documentation that comes with the microprocessor, so that you can determine whether you have to update the BIOS code. To download the latest level of BIOS code and other code updates for your server, complete the following steps:

  1. Go to http://www.ibm.com/systems/support/.

  2. Under **Product support**, click **System x**.

  3. Under **Popular links**, click **Software and device drivers**.

  4. Click **IBM System x3550** to display the matrix of downloadable files for the server.

- When you install an additional microprocessor, you must also install one additional cooling fan. See the *User's Guide* for more information on installing the additional fan.
- If you have to replace a microprocessor, call for service.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink. For details, see the information about thermal grease in the *Problem and Determination Service Guide*.

  **Note:** Removing the heat sink from the microprocessor destroys the even distribution of the thermal grease and requires replacing the thermal grease.

**Attention:**
- A startup (boot) microprocessor must always be installed in microprocessor socket 1 on the system board.
- To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical.
- Do not remove the first microprocessor from the system board to install the second microprocessor.

The following instructions and illustrations describe how to install the second microprocessor on the system board.

To install an additional microprocessor, complete the following steps:
1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary (see "Turning off the server" on page 32). Remove the server cover.

   **Attention:** When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see "Handling static-sensitive devices" on page 10.
3. Locate microprocessor socket 2 on the system board.
4. Remove the microprocessor dust cover from the surface of the microprocessor socket.

Microprocessor release lever

Microprocessor bracket frame

Microprocessor dust cover
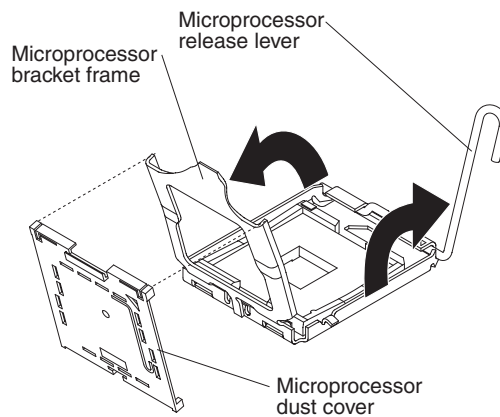
    a. Press down and out on the release lever on the microprocessor socket taking it out of the closed and locked position. Lift up the release lever until it stops in the fully open position (approximately 135° angle) and the top edge of the release lever has moved away from the microprocessor socket.

    b. Lift the hinged microprocessor bracket frame into an open position. Remove the microprocessor dust cover from the bracket frame. Store the dust cover in a safe place.

5. 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:** Dropping the microprocessor during installation or removal can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

6. Position the microprocessor over the microprocessor socket. Use the triangular alignment cutout on the microprocessor socket and the triangular alignment mark on the microprocessor to assist you in aligning the microprocessor to the socket. Then, carefully place the microprocessor into the socket. Do not force the microprocessor, it only fits one way onto the socket.



Microprocessor

Alignment marks

Microprocessor socket dust cover

Microprocessor release lever
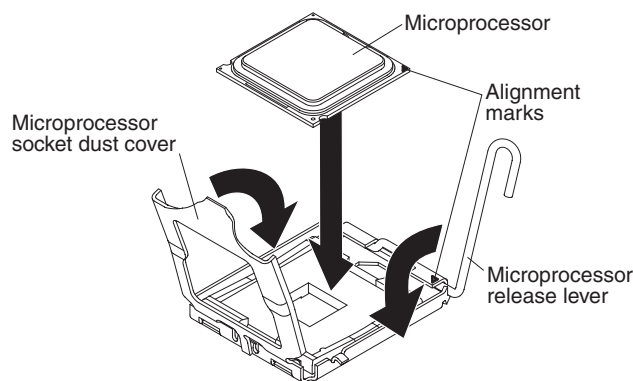
7. Place the microprocessor bracket frame down over the microprocessor and the microprocessor socket to secure the microprocessor position on the socket.

8. Rotate the microprocessor release lever into a closed position.

9. Place the heat sink on top of the microprocessor with the thermal grease side down. Install the screws to secure the heat sink to the system board.

    **Attention:** Do not touch the thermal grease on the bottom of the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it.

Heat sink

Heat-sink
installation
label

Thermal grease

Microprocessor
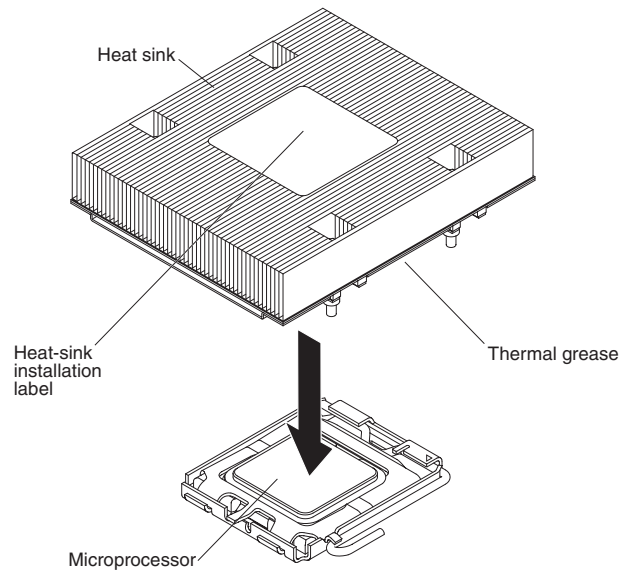
10. If you removed any air baffles, reinstall them now. See page 12 for more information.

**Attention:** If you have to remove the heat sink after installing it, alternately loosen the screws to help break the bond between the components without damaging them.

If you have other options to install, do so now. Otherwise, go to "Completing the installation" on page 26.

## Installing a Remote Supervisor Adapter II SlimLine

An optional Remote Supervisor Adapter II SlimLine can be installed only in a dedicated connector on the system board. After the Remote Supervisor Adapter II SlimLine is installed, the systems-management Ethernet port on the rear of the server is active.

To install a Remote Supervisor Adapter II SlimLine, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary. Remove the server cover.
3. Remove the riser-card assembly in slot 2 and put it in a safe place. See "Replacing a riser-card assembly" on page 15 for more information.
4. Put the protective plastic cover on the Remote Supervisor Adapter II SlimLine.
5. Turn the Remote Supervisor Adapter II SlimLine so that the tabs on the connector align correctly with the connector on the system board.

Remote Supervisor Adapter II  SlimLine

Mounting bracket

Mounting bracket retention latch
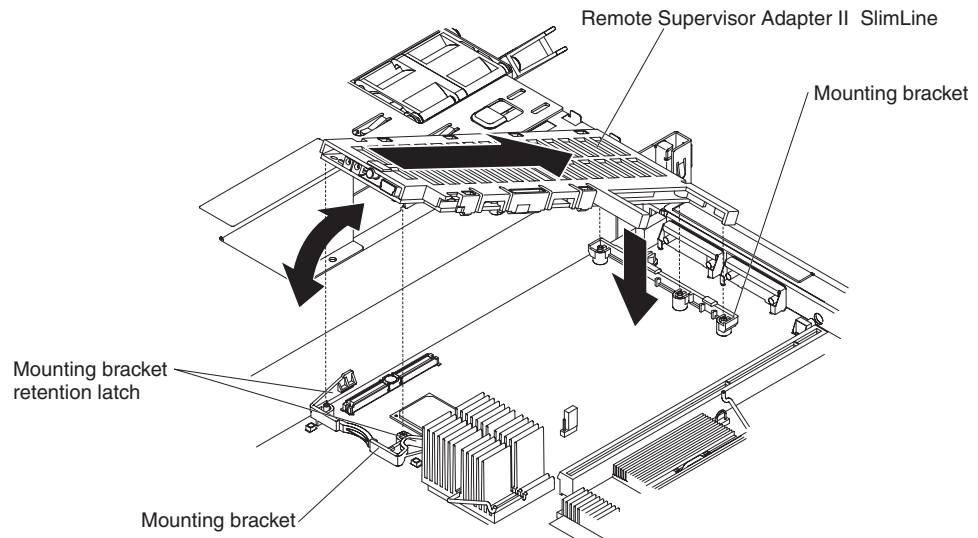
Mounting bracket

6. At a downward angle, slip the free end of the adapter under the tab on the mounting bracket, aligning the holes in the adapter with the posts on the mounting bracket and latch bracket.

7. Rotate the rear of the adapter into the rear mounting bracket, aligning the holes in the adapter with the posts on the mounting bracket.

8. Press the Remote Supervisor Adapter II SlimLine firmly into the connector and secure the mounting bracket retention latches over the adapter.

   **Attention:**   Incomplete insertion might cause damage to the server or the adapter.

9. Replace the riser-card assembly in slot 2 on the system board. See "Replacing a riser-card assembly" on page 15 for more information.

If you have other options to install, do so now. Otherwise, go to "Completing the installation."

## Completing the installation

To complete the installation, complete the following steps:

1. If you removed any air baffles, reinstall them now. See page 12 for the baffle locations or for more information.

2. If you removed the server cover, replace it and close the fan doors. For more information, see "Replacing the server cover."

3. Install the server in the rack cabinet. See the *Rack Installation Instructions* that come with the server for complete rack installation and removal instructions.

4. Connect the cables and power cords. For more information, see "Connecting the cables" on page 27.

5. Update the server configuration. See "Updating the server configuration" on page 28 for more information.

## Replacing the server cover

To replace the server cover, complete the following steps:

• Slide the server cover toward the front of the server, fitting the cover into the tabs for a secure fit.

• Close the covers over the fans and snap down the two fan cover-release latches.

• Tighten the thumbscrew at the back of the server.

Thumbscrew

Fan door
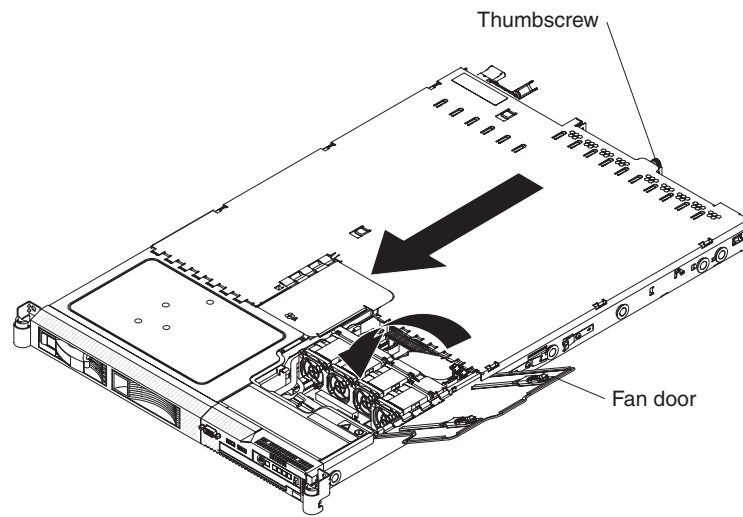
## Connecting the cables

The following illustrations show the locations of the input and output connectors on the front and rear of the server.

*Figure 2. Front of server*

USB 3 connector
USB 4 connector
Video connector

*Figure 3. Rear of server*

Power-supply connector

Ethernet 1
Ethernet 2
USB 2
USB 1
Systems-management Ethernet connector
Serial connector
Video connector
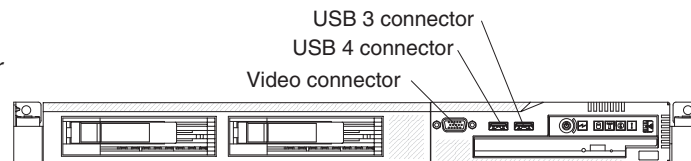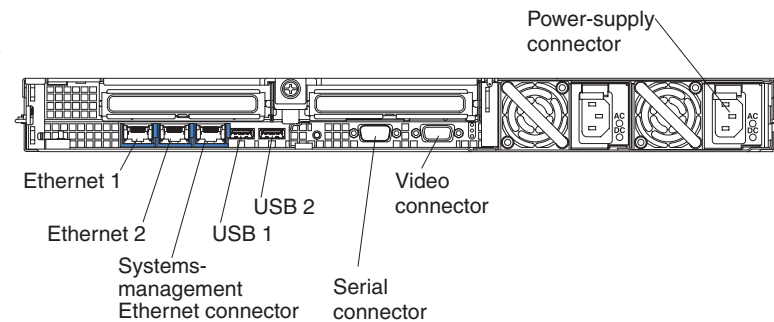
You must turn off the server before you connect or disconnect cables.

See the documentation that comes with any external devices for additional cabling instructions. It might be easier for you to route cables before you connect the devices to the server.

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

USB cable release lever

USB cable
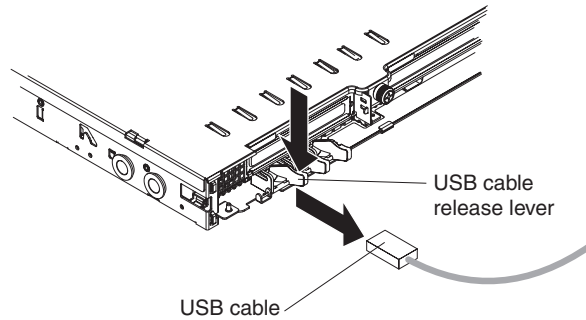
There are release levers on the Ethernet and systems management connectors. To disconnect a cable from one of these connectors, pull up on the lever to release the cable.



Ethernet port

Ethernet activity LED

Ethernet speed LED

Ethernet cable release lever
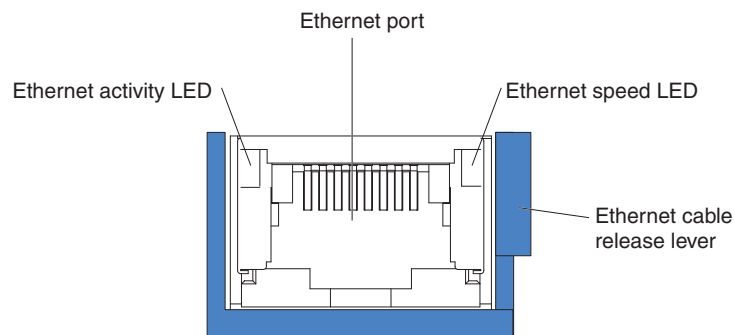
# Updating the server configuration

When you start the server for the first time after you add or remove an internal option or external 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.

Some options have device drivers that you must install. For information about installing device drivers, see the documentation that comes with each option.

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.

If you have installed a Remote Supervisor Adapter II SlimLine to manage the server remotely, see the *Remote Supervisor Adapter II SlimLine User's Guide*, which comes with the adapter, for information about setting up, configuring, and using the adapter.

For information about configuring the integrated Gigabit Ethernet controllers, see the *User's Guide*.

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

This section describes the controls 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. This configuration supports up to four 2.5-inch hot-swappable hard disk drives.
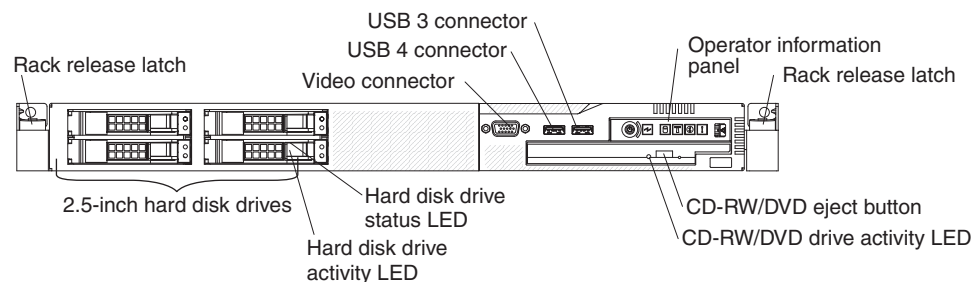
USB 3 connector
USB 4 connector
Video connector
Operator information panel
Rack release latch
Rack release latch

2.5-inch hard disk drives
Hard disk drive status LED
Hard disk drive activity LED
CD-RW/DVD eject button
CD-RW/DVD drive activity LED

The following illustration shows the controls, LEDs, and connectors on the front of the server. This configuration supports up to two 3.5-inch hot-swappable SAS or SATA hard disk drives or two 3.5-inch simple-swap SATA hard disk drives.

USB 3 connector
USB 4 connector
Video connector
Operator information panel
Rack release latch
Rack release latch

3.5-inch hard disk drives
CD-RW/DVD eject button
CD-RW/DVD drive activity LED
Hard disk drive status LED (SAS model)
Hard disk drive activity LED (SAS model)
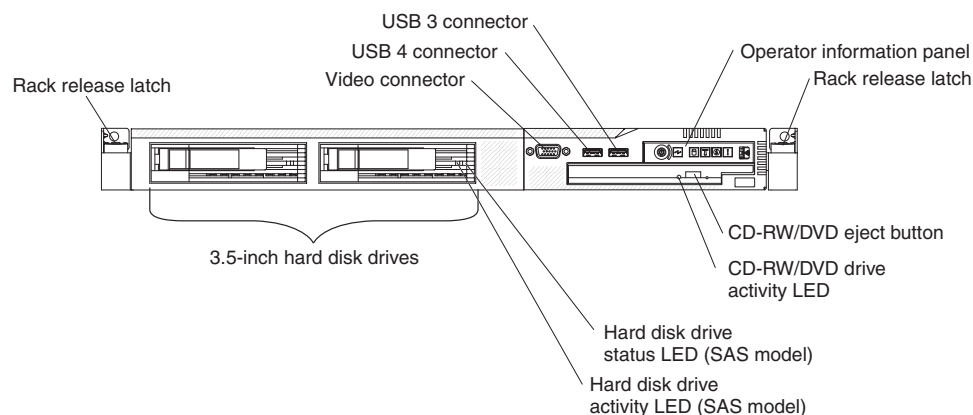
**Note:** The CD-RW/DVD drive is standard in all configurations. The locations of the controls, LEDs, and connectors vary, depending on the hardware configuration that you have.

- **Operator information panel:** This panel contains controls and LEDs about the status of the server.

Power-on LED (green)
System locator LED (blue)
System-error LED (amber)

Power-control button
Hard drive activity LED (green)
System information LED (amber)
Release latch
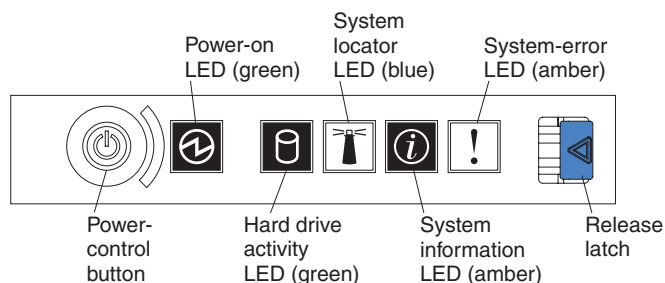
The following controls and LEDs are on the operator information panel:

– **Power-on LED:** When this green 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 is 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. A power LED is also on the rear of the server.

   **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 cord from the electrical outlet.

– **System locator LED:** Use this blue LED to visually locate the server if it is in a location with other servers. You can use IBM Director to light this LED remotely. This LED is controlled by the BMC.

– **System-error LED:** When this amber LED is lit, it indicates that a system error has occurred. A system-error LED is also on the rear of the server. An LED on the light path diagnostics panel on the system board is also lit to help isolate the error. This LED is controlled by the BMC.

– **Release Latch:** Press the release latch to the left to slide out the operator information panel and view the light path diagnostics panel. See the *Problem Determination and Service Guide* for more information about the light path diagnostics panel.

– **System information LED:** When this amber LED is lit, it indicates that a non-critical event has occurred. Check the error log for additional information. See the information about light path diagnostics in the *Problem Determination and Service Guide* for more information about error logs.

– **Hard drive activity LED:** When this green LED is lit, it indicates that one of the hard disk drives is in use.

   **Notes:**
   1. Hard disk drive activity LEDs for the SAS drives are in two places: on the hard disk drive and on the operator information panel.
   2. There is no hard disk drive activity LED on a SATA drive. The only hard disk drive activity LED is on the operator information panel.

– **Power-control button:** Press this button to turn the server on and off manually.

   **Note:** The server can also be turned on or off by a command to the BMC. For more information about using this feature of the BMC, see the *User's Guide* on the IBM *System x Documentation* CD.

• **Rack release latches:** Press the latches on each front side of the server to remove the server from the rack.

• **Video connector:** Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

• **USB connectors:** Connect a USB device, such as a USB mouse, keyboard, or other device to any of these connectors.

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

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

• **Hard disk drive status LED:** This LED is used on SAS hard disk drives. When this LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID™ controller is installed in the server, when this LED is flashing slowly

(one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

- **Hard disk drive activity LED:** This LED is used on SAS hard disk drives. Each hot-swap hard disk drive has an activity LED, and when this LED is flashing, it indicates that the drive is in use.

# Rear view

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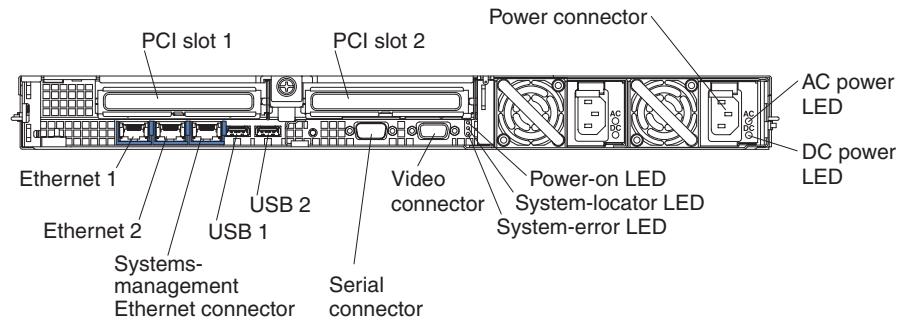


- **PCI slot 1:** Insert a PCI Express type adapter into this slot.
- **PCI slot 2:** Insert a PCI Express type adapter into this slot. You can purchase an optional PCI-X riser card assembly to convert this slot to accept a PCI-X adapter.
- **Power connector:** Connect the power cord to this connector.
- **AC power LED:** Each hot-swap power supply has an ac power LED and a dc power LED. When the ac power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. 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 *System x Documentation* CD.
- **DC power LED:** Each hot-swap power supply has a dc power LED and an ac power LED. When the dc power LED is lit, it indicates that the power supply is supplying adequate dc power to the system. 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 *System x Documentation* CD.
- **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.
- **Power 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.
- **Location LED:** Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.
- **Video connector:** Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.
- **Serial connector:** Connect a 9-pin serial device to this connector. The serial port is shared with the baseboard management controller (BMC). The BMC can take control of the shared serial port to perform text console redirection and to redirect serial traffic, using Serial over LAN (SOL).

- **USB connectors:** Connect a USB device, such as a USB mouse, keyboard, or other device to any of these connectors.
- **Systems-management Ethernet connector:** Use this connector to connect the server to a network for systems-management information control. This connector is active only if you have installed a Remote Supervisor Adapter II SlimLine, and it is used only by the Remote Supervisor Adapter II SlimLine.
- **Ethernet activity LEDs:** When these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.
- **Ethernet link LEDs:** When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.
- **Ethernet connectors:** Use either of these connectors to connect the server to a network.

## 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 (the baseboard management controller or optional Remote Supervisor Adapter II SlimLine) 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 5 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 you installed an optional Remote Supervisor Adapter II SlimLine, the server can be turned on from the Remote Supervisor Adapter II SlimLine user interface.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature can turn on the server.

**Note:** When 4GB or more of memory (physical or logical) is installed, some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

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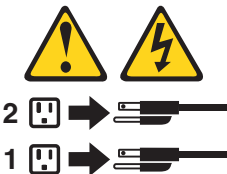
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

**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 turn 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 you installed an optional Remote Supervisor Adapter II SlimLine, the server can be turned off from the Remote Supervisor Adapter II SlimLine user interface.
- The baseboard management controller can turn off the server as an automatic response to a critical system failure.

# 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
- IBM ServerGuide Setup and Installation CD
- Ethernet controller configuration
- Baseboard management controller utility programs
- RAID configuration programs:
  - Use the IBM ServeRAID Configuration Utility program or ServeRAID Manager to configure an array of hot-swap SAS or hot-swap SATA hard disk drives. For information about using these programs, see "Configuring hot-swap SAS or hot-swap SATA RAID" on page 36.
  - Use the Adaptec® HostRAID™ configuration programs to configure an array of simple-swap SATA hard disk drives. For information about using these programs, see "Configuring simple-swap SATA RAID" on page 38.
- Remote Supervisor Adapter II SlimLine configuration
- Boot Menu program

For more information about these programs, see "Configuring the server" in the *User's Guide* on the IBM *System x Documentation* CD.

## Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD contains a setup and installation program that is designed for your server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically.

If a later version of the ServerGuide program is available, you can download a free image of the *ServerGuide Setup and Installation* CD. To download the image, go to the IBM ServerGuide Web page at 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 "ServerGuide problems" on page 55.
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.

## Configuring hot-swap SAS or hot-swap SATA RAID

Use the IBM ServeRAID Configuration Utility program or ServeRAID Manager to configure and manage hot-swap SAS or hot-swap SATA redundant array of independent disks (RAID). Be sure to use these programs as described in this document.

- Use the IBM ServeRAID Configuration Utility program to:
  - Perform a low-level format on a hard disk drive
  - View or change IDs for some attached devices
  - Set protocol parameters on hard disk drives
- Use ServeRAID Manager to:
  - Configure arrays
  - View the RAID configuration and associated devices
  - Monitor operation of the RAID controller

Consider the following information when using the IBM ServeRAID Configuration Utility program or ServeRAID Manager to configure and manage arrays:

- The ServeRAID-8k-l SAS controller that comes with the server supports only RAID level-0 and RAID level-1. Servers that come with four 2.5-inch hot-swap SAS drives also support RAID level-10. You can replace the ServeRAID-8k-l SAS controller with a ServeRAID-8k SAS controller that supports additional RAID levels.
- Hard disk drive capacities affect how you create arrays. The drives in an array can have different capacities, but the ServeRAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- Do not include SAS and SATA drives in the same array.
- To update the firmware and BIOS code for an optional ServeRAID controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID option.

## Using the IBM ServeRAID Configuration Utility program

Use the IBM ServeRAID Configuration Utility program to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- View or change the RAID configuration and associated devices

### Starting the IBM ServeRAID Configuration Utility program

To start the IBM ServeRAID Configuration Utility program, complete the following steps:

1.  Turn on the server.
2.  When the prompt `<<< Press <CTRL><A> for IBM ServeRAID Configuration Utility! >>>` appears, press Ctrl+A.
3.  To select a choice from the menu, use the arrow keys.
4.  Use the arrow keys to select the channel for which you want to change settings.

5. To change the settings of the selected items, follow the instructions on the screen. Be sure to press Enter to save your changes.

### IBM ServeRAID Configuration Utility menu choices

The following choices are on the IBM ServeRAID Configuration Utility menu:

- **Array Configuration Utility**

  Select this choice to create, manage, or delete arrays, or to initialize drives.

- **SerialSelect Utility**

  Select this choice to configure the controller interface definitions or to configure the physical transfer and SAS address of the selected drive.

- **Disk Utilities**

  Select this choice to format a disk or verify the disk media. Select a device from the list and read the instructions on the screen carefully before making a selection.

## Using ServeRAID Manager

Use ServeRAID Manager, which is on the *IBM ServeRAID Manager Application* CD, to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- Erase all data from a hard disk drive and return the disk to the factory-default settings
- View the RAID configuration and associated devices
- Monitor the operation of the RAID controller

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the RAID controller and perform an initial RAID configuration on the server, you must run ServeRAID Manager in Startable CD mode, as described in the instructions in this section.

See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information about RAID technology and instructions for using ServeRAID Manager to configure the RAID controller. Additional information about ServeRAID Manager is also available from the **Help** menu. For information about a specific object in the ServeRAID Manager tree, select the object and click **Actions --> Hints and tips**.

### Configuring the RAID controller

By running ServeRAID Manager in Startable CD mode, you can configure the RAID controller before you install the operating system. The information in this section assumes that you are running ServeRAID Manager in Startable CD mode.

To run ServeRAID Manager in Startable CD mode, turn on the server; then, insert the CD into the CD-RW/DVD drive. If ServeRAID Manager detects an unconfigured controller and ready drives, the Configuration wizard starts.

In the Configuration wizard, you can select express configuration or custom configuration. Express configuration automatically configures the controller by grouping the first two physical drives in the ServeRAID Manager tree into an array and creating a RAID level-1 logical drive. If you select custom configuration, you can select the physical drives that you want to group into an array and create a hot-spare drive.

*Using express configuration:*   To use express configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click Next.
4. In the "Configuration summary" window, review the information. To change the configuration, click **Modify arrays**.
5. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
6. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
7. Restart the server.

*Using custom configuration:*   To use custom configuration, complete the following steps:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**.
4. In the "Create arrays" window, from the list of ready drives, select the drives that you want to group into the array.
5. Click the (Add selected drives) icon to add the drives to the array.
6. If you want to configure a hot-spare drive, complete the following steps:
   a. Click the **Spares** tab.
   b. Select the physical drive that you want to designate as the hot-spare drive, and click the (Add selected drives) icon.
7. Click **Next**.
8. Review the information in the "Configuration summary" window. To change the configuration, click **Back**.
9. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
10. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
11. Restart the server.

### Viewing the configuration

You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem (such as arrays, logical drives, hot-spare drives, and physical drives). When you click an object in the ServeRAID Manager tree, information about that object appears in the right pane. To display a list of available actions for an object, click the object and click **Actions**.

## Configuring simple-swap SATA RAID

**Important:**  HostRAID is not supported on the SCO 6.0 and UnixWare 7.14 operating systems.

Use the Adaptec HostRAID Configuration Utility program to add RAID level-0 and level-1 functionality to the integrated Serial ATA controller (simple-swap SATA models). Be sure to use this program as described in this document. Use this program to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- View or change the RAID configuration and associated devices

When you are using the Adaptec RAID Configuration Utility program to configure and manage simple-swap SATA arrays, consider the following information:

- The integrated Serial ATA controller with integrated SATA RAID (simple-swap SATA models) supports RAID level-0 and level-1 with the option of having a hot-spare drive.
- You cannot use the *ServerGuide Setup and Installation* CD to configure the integrated Serial ATA controller with integrated RAID.
- Hard disk drive capacities affect how you create arrays. Drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.

# Using the Adaptec RAID Configuration Utility program

Use the Array Configuration Utility to add RAID level-0 and level-1 functionality to the integrated Serial ATA (SATA) controller. This utility is a part of the BIOS code. For additional information about using the Adaptec RAID Configuration Utility program, see the documentation on the *Adaptec HostRAID Support* CD. If this CD did not come with the server, you can download it from http://www.ibm.com/support/.

## Using the SATA HostRAID feature

The instructions in this section are for using the Array Configuration Utility program to access and perform an initial RAID level-1 configuration.

For additional information about using the Array Configuration Utility program to create, configure, and manage arrays, see the documentation on the *Adaptec HostRAID Support* CD.

***Configuring the controller:*** To use the Array Configuration Utility program to configure a RAID level-1 array, complete the following steps:

1. Turn on the server.
2. When the prompt `Press <CTRL><<A> for Adaptec RAID Configuration Utility` appears, press Ctrl+A.
3. Select **Array Configuration Utility**.
4. Select **Create Array**.
5. From the list of ready drives, select the two drives that you want to group into the array.
6. When you are prompted to select the RAID level, select **RAID-1**.
7. (Optional) Type an identifier for the array.
8. When you are prompted for the array build method, select **Quick Int**.
9. Follow the instructions on the screen to complete the configuration, and select **Done** to exit.
10. Restart the server.

*Viewing the configuration:* To view information about the SATA controller, complete the following steps:

1. Start the Array Configuration Utility.

2. From the Array Configuration Utility window, select **Manage Arrays**.

3. Select an array and press Enter.

4. Press Esc to exit from the program.

# Using the baseboard management controller utility program

The baseboard management controller (BMC) utility program provides basic service-processor environmental monitoring functions for the server. If an environmental condition exceeds a threshold or if a system component fails, 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 (CLI) provides direct access to server management functions through the IPMI 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.

**Important:** The server Ethernet ports are set to DHCP by default. In order to find your BMC on an existing network, you will need to identify the server by the default hostname. The default hostname for each server is the last 8 characters of the BMC MAC address. The BMC MAC address can be found in the setup utility, on a label on the system board, and on a tag hanging from the front of the server. Once you have deployed your server, make sure that you remove the BMC MAC address tag from the front of the server so that it does not impede airflow through the front of the server.

# Enabling and configuring SOL using the OSA SMBridge management utility program

To enable and configure the server for SOL by using the OSA SMBridge management utility program, you must update and configure the BIOS code; update and configure the baseboard management controller (BMC) firmware; update and configure the Ethernet controller firmware; and enable the operating system for an SOL connection.

## BIOS update and configuration

To update and configure the BIOS code to enable SOL, complete the following steps:

1. Update the BIOS code:

   a. Download the latest version of the BIOS code from http://www.ibm.com/ systems/support/.

b. Update the BIOS code, following the instructions that come with the update file that you downloaded.

2. Update the BMC firmware:

   a. Download the latest version of the BMC firmware from http://www.ibm.com/systems/support/.

   b. Update the BMC firmware, following the instructions that come with the update file that you downloaded.

3. Configure the BIOS settings:

   a. When you are prompted to start the Configuration/Setup Utility program, restart the server and press F1.

   b. Select **Devices and I/O Ports**; then, make sure that the values are set as follows:

      - **Serial Port A**: Auto-configure
      - **Serial Port B**: Auto-configure

   c. Select **Remote Console Redirection**; then, make sure that the values are set as follows:

      - **Remote Console Active**: Enabled
      - **Remote Console COM Port**: COM 1
      - **Remote Console Baud Rate**: 19200 or higher
      - **Remote Console Data Bits**: 8
      - **Remote Console Parity**: None
      - **Remote Console Stop Bits**: 1
      - **Remote Console Text Emulation**: ANSI
      - **Remote Console Keyboard Emulation**: ANSI
      - **Remote Console Active After Boot**: Enabled
      - **Remote Console Flow Control**: Hardware

   d. Press Esc twice to exit the **Remote Console Redirection** and **Devices and I/O Ports** sections of the Configuration/Setup Utility program.

   e. Select **Advanced Setup**; then, select **Baseboard Management Controller (BMC) Settings**.

   f. Set **BMC Serial Port Access Mode** to **Dedicated**.

   g. Press Esc twice to exit the **Baseboard Management Controller (BMC) Settings** and **Advanced Setup** sections of the Configuration/Setup Utility program.

   h. Select **Save Settings**; then, press Enter.

   i. Press Enter to confirm.

   j. Select **Exit Setup**; then, press Enter.

   k. Make sure that **Yes, exit the Setup Utility** is selected; then, press Enter.

## Linux configuration

For SOL operation on the server, you must configure the Linux operating system to expose the Linux initialization (booting) process. This enables users to log in to the Linux console through an SOL session and directs Linux output to the serial console. See the documentation for your specific Linux operating-system type for information and instructions.

Use one of the following procedures to enable SOL sessions for your Linux operating system. You must be logged in as a root user to perform these procedures.

### Red Hat Enterprise Linux ES 4 configuration:

**Note:** This procedure is based on a default installation of Red Hat Enterprise Linux ES 4. The file names, structures, and commands might be different for other versions of Red Hat Linux.

To configure the general Linux parameters for SOL operation when you are using the Red Hat Enterprise Linux ES 4 operating system, complete the following steps.

**Note:** Hardware flow control prevents character loss during communication over a serial connection. You must enable it when you are using a Linux operating system.

1. Add the following line to the end of the `# Run gettys in standard runlevels` section of the /etc/inittab file. This enables hardware flow control and enables users to log in through the SOL console.

   `7:2345:respawn:/sbin/agetty -h ttyS0 19200 vt102`

2. Add the following line at the bottom of the /etc/securetty file to enable a user to log in as the root user through the SOL console:

   `ttyS0`

*LILO configuration:*   If you are using LILO, complete the following steps:

1. Modify the /etc/lilo.conf file:
   a. Add the following text to the end of the first `default=linux` line

      `-Monitor`

   b. Comment out the `map=/boot/map` line by adding a `#` at the beginning of this line.

   c. Comment out the `message=/boot/message` line by adding a `#` at the beginning of this line.

   d. Add the following line before the first `image=` line:

      `# This will allow you to only Monitor the OS boot via SOL`

   e. Add the following text to the end of the first `label=linux` line:

      `-Monitor`

   f. Add the following line to the first `image=` section. This enables SOL.

      `append="console=ttyS0,19200n8 console=tty1"`

   g. Add the following lines between the two `image=` sections:

      ```
      # This will allow you to Interact with the OS boot via SOL
      image=/boot/vmlinuz-2.4.9-e.12smp
          label=linux-Interact
          initrd=/boot/initrd-2.4.9-e.12smp.img
          read-only
          root=/dev/hda6
          append="console=tty1 console=ttyS0,19200n8 "
      ```

   The following examples show the original content of the /etc/lilo.conf file and the content of this file after modification.

| Original /etc/lilo.conf contents |
|---|
| ```
prompt
timeout=50
default=linux
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
message=/boot/message
linear
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
image=/boot/vmlinuz-2.4.9-e.12
    label=linux-up
    initrd=/boot/initrd-2.4.9-e.12.img
    read-only
    root=/dev/hda6
``` |

| Modified /etc/lilo.conf contents |
|---|

```
prompt
timeout=50
default=linux-Monitor
boot=/dev/hda
#map=/boot/map
install=/boot/boot.b
#message=/boot/message
linear
# This will allow you to only Monitor the OS boot via SOL
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux-Monitor
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
    append="console=ttyS0,19200n8 console=tty1"
# This will allow you to Interact with the OS boot via SOL
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux-Interact
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
    append="console=tty1 console=ttyS0,19200n8 "
image=/boot/vmlinuz-2.4.9-e.12
    label=linux-up
    initrd=/boot/initrd-2.4.9-e.12.img
    read-only
    root=/dev/hda6
```

2. Run the **lilo** command to store and activate the LILO configuration.

When the Linux operating system starts, a `LILO boot:` prompt is displayed instead of the graphical user interface. Press Tab at this prompt to install all of the boot options that are listed. To load the operating system in interactive mode, type `linux-Interact` and then press Enter.

*GRUB configuration:* If you are using GRUB, complete the following steps to modify the /boot/grub/grub.conf file:

1. Comment out the `splashimage=` line by adding a # at the beginning of this line.
2. Add the following line before the first `title=` line:
   ```
   # This will allow you to only Monitor the OS boot via SOL
   ```
3. Append the following text to the first `title=` line:
   ```
   SOL Monitor
   ```
4. Append the following text to the `kernel/` line of the first `title=` section:
   ```
   console=ttyS0,19200 console=tty1
   ```
5. Add the following five lines between the two `title=` sections:
   ```
   # This will allow you to Interact with the OS boot via SOL
   title Red Hat Linux (2.4.9-e.12smp) SOL Interactive
       root (hd0,0)
   ```

```
        kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=tty1
            console=ttyS0,19200
            initrd /initrd-2.4.9-e.12smp.img
```

**Note:** The entry that begins with `kernel /vmlinuz` is shown with a line break after `console=tty1`. In your file, the entire entry must all be on one line.

The following examples show the original content of the /boot/grub/grub.conf file and the content of this file after modification.

| **Original /boot/grub/grub.conf contents** |
|---|

```
#grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE:  You have a /boot partition. This means that
#          all kernel and initrd paths are relative to /boot/, eg.
#          root (hd0,0)
#           kernel /vmlinuz-version ro root=/dev/hda6
#           initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=10
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Enterprise Linux ES (2.4.9-e.12smp)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12smp.img
title Red Hat Enterprise Linux ES-up (2.4.9-e.12)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12 ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12.img
```

**Modified /boot/grub/grub.conf contents**

```
#grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE: You have a /boot partition. This means that
#         all kernel and initrd paths are relative to /boot/, eg.
#         root (hd0,0)
#         kernel /vmlinuz-version ro root=/dev/hda6
#         initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=10
# splashimage=(hd0,0)/grub/splash.xpm.gz
# This will allow you to only Monitor the OS boot via SOL
title Red Hat Enterprise Linux ES (2.4.9-e.12smp) SOL Monitor
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=ttyS0,19200 console=tty1
    initrd /initrd-2.4.9-e.12smp.img
# This will allow you to Interact with the OS boot via SOL
title Red Hat Linux (2.4.9-e.12smp) SOL Interactive
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=tty1 console=ttyS0,19200
    initrd /initrd-2.4.9-e.12smp.img
title Red Hat Enterprise Linux ES-up (2.4.9-e.12)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12 ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12.img
```

You must restart the Linux operating system after you complete these procedures for the changes to take effect and to enable SOL.

***SUSE SLES 9.0 configuration:***

**Note:** This procedure is based on a default installation of SUSE Linux Enterprise Server (SLES) 9.0. The file names, structures, and commands might be different for other versions of SUSE Linux.

To configure the general Linux parameters for SOL operation when using the SLES 9.0 operating system, complete the following steps.

**Note:** Hardware flow control prevents character loss during communication over a serial connection. You must enable it when using a Linux operating system.

1. Add the following line to the end of the `# getty-programs for the normal runlevels` section of the /etc/inittab file. This enables hardware flow control and enables users to log in through the SOL console.

   `7:2345:respawn:/sbin/agetty -h ttyS0 19200 vt102`

2. Add the following line after the `tty6` line at the bottom of the /etc/securetty file to enable a user to log in as the root user through the SOL console:

   `ttyS0`

3. Complete the following steps to modify the /boot/grub/menu.lst file:

a. Comment out the `gfxmenu` line by adding a `#` in front of the word `gfxmenu`.

b. Add the following line before the first `title` line:

   ```
   # This will allow you to only Monitor the OS boot via SOL
   ```

c. Append the following text to the first `title` line:

   ```
   SOL Monitor
   ```

d. Append the following text to the `kernel` line of the first `title` section:

   ```
   console=ttyS1,19200 console=tty0
   ```

e. Add the following four lines between the first two `title` sections:

   ```
   # This will allow you to Interact with the OS boot via SOL
   title linux SOL Interactive
      kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791
      console=tty1 console=ttyS0,19200
      initrd (hd0,1)/boot/initrd
   ```

The following examples show the original content of the /boot/grub/menu.lst file and the content of this file after modification.

| Original /boot/grub/menu.lst contents | Notes |
|---|---|
| ```<br>gfxmanu (hd0,1)/boot/message<br>color white/blue black/light-gray<br>default 0<br>timeout 8<br><br>title linux<br>  kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791<br>  initrd (hd0,1)/boot/initrd<br>title floppy<br>  root<br>  chainloader +1<br>title failsafe<br>  kernal (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp<br>disableapic maxcpus=0 3<br><br>  initrd (hd0,1)/boot/initrd.shipped<br>``` | <br><br><br><br><br>1<br><br><br><br><br><br>1 |
| **Note 1:** The kernel line is shown with a line break. In your file, the entire entry must all be on one line. | |

| Modified /boot/grub/menu.lst contents | Notes |
|---|---|
| ```<br>#gfxmanu (hd0,1)/boot/message<br>color white/blue black/light-gray<br>default 0<br>timeout 8<br><br># This will allow you to only Monitor the OS boot via SOL<br>title linux SOL Monitor<br>  kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 console=ttyS1,19200<br>console=tty1<br>  initrd (hd0,1)/boot/initrd<br># This will allow you to Interact with the OS boot via SOL<br>title linux SOL Interactive<br> kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 console=tty1 console=ttyS0,19200<br> initrd (hd0,1)/boot/initrd<br>title floppy<br>``` | <br><br><br><br><br><br><br>1 |

| Modified /boot/grub/menu.lst contents | Notes |
|---|---|
| ```<br>  root<br>  chainloader +1<br>title failsafe<br>  kernel (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp<br>disableapic maxcpus=0 3<br>  initrd (hd0,1)/boot/initrd.shipped<br>``` | 1 |
| **Note 1:** The kernel line is shown with a line break. In your file, the entire entry must all be on one line. | |

You must restart the Linux operating system after you complete these procedures for the changes to take effect and to enable SOL.

## Microsoft Windows 2003 Standard Edition configuration

**Note:** This procedure is based on a default installation of the Microsoft® Windows® 2003 operating system.

To configure the Windows 2003 operating system for SOL operation, complete the following steps. You must be logged in as a user with administrator access to perform this procedure.

1. Complete the following steps to determine which boot entry ID to modify:

   a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.

   b. In the `Boot Entries` section, locate the boot entry ID for the section with an OS friendly name of Windows Server 2003, Standard. Write down the boot entry ID for use in the next step.

2. To enable the Microsoft Windows Emergency Management System (EMS), at a Windows command prompt, type

   `bootcfg /EMS ON /PORT COM1 /BAUD 19200 /ID boot_id`

   where *boot_id* is the boot entry ID from step 1b; then, press Enter.

3. Complete the following steps to verify that the EMS console is redirected to the COM1 serial port:

   a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.

   b. Verify the following changes to the bootcfg settings:

      - In the `Boot Loader Settings` section, make sure that `redirect` is set to `COM1` and that `redirectbaudrate` is set to `19200`.

      - In the `Boot Entries` section, make sure that the `OS Load Options:` line has `/redirect` appended to the end of it.

   The following examples show the original bootcfg program output and the output after modification.

| Original bootcfg program output |
|---|
| ```<br>Boot Loader Settings<br>---------------------------<br>timeout: 30<br>default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>Boot Entries<br>----------------<br>Boot entry ID: 1<br>OS Friendly Name: Windows Server 2003, Standard<br>Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>OS Load Options: /fastdetect<br>``` |

| Modified bootcfg program output |
|---|
| ```<br>Boot Loader Settings<br>---------------------------<br>timeout: 30<br>default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>redirect: COM1<br>redirectbaudrate: 19200<br>Boot Entries<br>----------------<br>Boot entry ID: 1<br>OS Friendly Name: Windows Server 2003, Standard<br>Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>OS Load Options: /fastdetect /redirect<br>``` |

You must restart the Windows 2003 operating system after you complete this procedure for the changes to take effect and to enable SOL.

## Installing the OSA SMBridge management utility program

**Important:** To obtain maximum benefit from the OSA SMBridge management utility program, install and load the program *before* problems occur.

To install the OSA SMBridge management utility program on a server running a Windows operating system, complete the following steps:

1. Go to http://www.ibm.com/systems/support/ and download the utility program and create the OSA BMC Management Utility CD.
2. Insert the OSA BMC Management Utility CD into the drive. The InstallShield wizard starts, and a window similar to that shown in the following illustration opens.

3. Follow the prompts to complete the installation.

   The installation program prompts you for a TCP/IP port number and an IP address. Specify an IP address, if you want to limit the connection requests that will be accepted by the utility program. To accept connections from any server, type `INADDR_ANY` as the IP address. Also specify the port number that the utility program will use. These values will be recorded in the smbridge.cfg file for the automatic startup of the utility program.

To install the OSA SMBridge management utility program on a server running a Linux operating system, complete the following steps. You must be logged in as a root user to perform these procedures.

1. Go to http://www.ibm.com/systems/support/. Download the utility program and create the OSA BMC Management Utility CD.
2. Insert the OSA BMC Management Utility CD into the drive.
3. Type `mount/mnt/cdrom`.
4. Locate the directory where the installation RPM package is located and type `cd/mnt/cdrom`.
5. Type the following command to run the RPM package and start the installation:

   `rpm -ivh smbridge-2.0-xx.rpm`

   where *xx* is the release level being installed.
6. Follow the prompts to complete the installation. When the installation is complete, the utility copies files to the following directories:

   /etc/init.d/SMBridge
   /etc/smbridge.cfg
   /usr/sbin/smbridged
   /var/log/smbridge/Liscense.txt
   /var/log/smbridge/Readme.txt

The utility starts automatically when the server is started. You can also locate the /ect/init.d directory to start the utility and use the following commands to manage the utility:
  smbridge status
  smbridge start
  smbridge stop
  smbridge restart

# 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.

**Note:** You must attach an optional USB diskette drive to the server to run this program.

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.

### Using the baseboard management controller firmware update utility program

Use the baseboard management controller firmware update utility program to download and apply a baseboard management controller firmware update and SDR/FRU data update. The firmware update utility program updates the baseboard management controller firmware and updates SDR/FRU data only and does not affect any device drivers.

**Note:** To ensure proper server operation, be sure to update the server baseboard management controller firmware before you update the BIOS code.

To update the firmware, if the Linux or Windows operating-system update package is available from the World Wide Web and you have obtained the applicable update package, follow the instructions that come with the update package.

### Using the OSA SMBridge management utility program

Use the OSA SMBridge management utility program to remotely manage and configure a network. The utility program provides the following remote management capabilities:

- **CLI (command-line interface) mode**

  Use CLI mode to remotely perform power-management and system identification control functions over a LAN or serial port interface from a command-line interface. Use CLI mode also to remotely view the BMC system event log.

  Use the following commands in CLI mode:

  – **identify**

Control the system-locator LED on the front of the server.

– **power**

Turn the server on and off remotely.

– **sel**

Perform operations with the BMC system event log.

– **sysinfo**

Display general system information that is related to the server and the baseboard management controller.

- **Serial over LAN**

Use the Serial over LAN capability to remotely perform control and management functions over a Serial over LAN (SOL) network. You can also use SOL to remotely view and change the server BIOS settings.

At a command prompt, type `telnet localhost 623` to access the SOL network. Type `help` at the `smbridge>` prompt for more information.

Use the following commands in an SOL session:

– **connect**

Connect to the LAN. Type `connect -ip` *ip_address* `-u` *username* `-p` *password*.

– **identify**

Control the system-locator LED on the front of the server.

– **power**

Turn the server on and off remotely.

– **reboot**

Force the server to restart.

– **sel get**

Display the BMC system event log.

– **sol**

Configure the SOL function.

– **sysinfo**

Display system information that is related to the server and the globally unique identifier (GUID).

# 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 Appendix A, "Getting help and technical assistance," on page 73, the IBM *Problem Determination and Service Guide* on the IBM *System x 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 (POST) beep codes indicate the detection of a problem. See "POST beep codes" and the IBM *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for more information.

- **Troubleshooting tables**

  These tables list problem symptoms and steps to correct the problems. See "Troubleshooting tables" on page 56 for more information.

- **Light path diagnostics**

  Use light path diagnostics to diagnose system errors quickly. See "Light path diagnostics" on page 68 for more information.

- **Diagnostic programs and error messages**

  The diagnostic programs, which are stored in upgradable read-only memory (ROM) on the system board, are the primary method of testing the major components of the server. See the IBM *Problem Determination and Service Guide* on the IBM *System x Documentation* CD 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 *System x Documentation* CD for more information about the POST beep codes.

A single problem might cause more than one error message. When this occurs, correct the cause of the first error message. The other error messages usually will not occur the next time POST runs.

**One beep**
> POST was completed successfully without finding any errors.

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

**Other beep codes**
> See the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for information about other beep codes.

# POST error codes

The following table provides an abbreviated list of the error codes that might appear during POST. See the IBM *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for more information about the POST error codes. To check for updated technical information, complete the following steps.

**Note:** Changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/systems/support/.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Publications lookup**.
4. From the **Product family** menu, select **System x3550** and click **Continue**.

*Table 6. Abbreviated list of error codes*

| Error code | Description | Action |
|---|---|---|
| 161 | The real-time clock battery has failed. | 1. Reseat the battery.<br>2. Replace the battery or call for service. |
| 162 | A device configuration has changed. | 1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings.<br>2. Make sure that optional devices are turned on and installed correctly. |
| 163 | The time of day has not been set. | Run the Configuration/Setup Utility program and set the date and time. |
| 201 | Memory test error. | Make sure that the DIMMs are installed correctly. |
| 289 | A failing DIMM was disabled. | Make sure that the DIMMs are supported by the server and that they are installed correctly. |
| 301, 303 | Keyboard and keyboard controller | Make sure that the keyboard cable is connected and that nothing is resting on the keyboard keys. |
| 11xx | Serial port configuration error. | Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings. |
| 0018*xxx* | PCI device error | 1. Make sure the PCI adapters and riser cards are installed correctly.<br>2. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings.<br>3. Remove the PCI adapters and riser cards, one at a time, until the problem is isolated. |
| 00019*xxx* | Microprocessor *x* is not functioning or failed the built-in self-test. | Make sure that microprocessor *x* is installed correctly. (Trained service technician only) If the problem remains, replace microprocessor *x*. |
| 01298*xxx* | Data for microprocessor *x* | Download and install the latest level of BIOS code. |
| I9990305 | Operating system not found | Run the Configuration/Setup Utility program to make sure that a bootable operating system is installed on one or more devices that are listed in the boot order. |

# ServerGuide problems

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| The *ServerGuide Setup and Installation* CD will not start. | 1. Make sure that the server supports the ServerGuide program and has a startable (bootable) CD-RW/DVD drive.<br>2. If the startup (boot) sequence settings have been changed, make sure that the CD-RW/DVD drive is first in the startup sequence.<br>3. If more than one CD-RW/DVD drive is installed, make sure that only one drive is set as the primary drive. Start the CD from the primary drive. |
| The ServeRAID program cannot view all installed drives, or the operating system cannot be installed. | 1. Make sure that there are no duplicate IRQ assignments.<br>2. Make sure that the hard disk drive is connected correctly.<br>3. Make sure that the hard disk drive cables are securely connected. |
| 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 *ServerGuide Setup and Installation* CD label for a list of supported operating-system versions. |
| The operating system cannot be installed; the option is not available. | Make sure that the server supports the operating system. If it does, no logical drive is defined (RAID servers). Run the ServerGuide program and make sure that setup is complete. |

# Troubleshooting tables

Use the troubleshooting tables to find solutions to problems that have identifiable symptoms. See the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for more detailed troubleshooting information. If you cannot find the problem in these tables, run the diagnostic programs (see "Running the diagnostic programs" in the *Problem Determination and Service Guide*).

If you have just added new software or a new optional device and the server is not working, complete the following steps before using the troubleshooting tables:

1. Check the light path diagnostics LEDs (see "Light path diagnostics" on page 68).
2. Remove the software or device that you just added.
3. Run the diagnostic tests to determine whether the server is running correctly.
4. Reinstall the new software or new device.

# CD-RW/DVD drive problems

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---------|--------|
| The CD-RW/DVD drive is not recognized. | 1. Make sure that:<br>   • The IDE channel to which the CD-RW/DVD drive is attached (primary) is enabled in the Configuration/Setup Utility program.<br>   • All cables and jumpers are installed correctly.<br>   • The correct device driver is installed for the CD-RW/DVD drive.<br>2. Run the CD-RW/DVD drive diagnostic programs.<br>3. Reseat the following components:<br>   a. CD-RW/DVD drive<br>   b. CD-RW/DVD drive cable<br>4. Replace the following components one at a time, in the order shown, restarting the server each time:<br>   a. CD-RW/DVD drive<br>   b. CD-RW/DVD drive cable<br>   c. (Trained service technician only) System board |
| The CD-RW/DVD is not working correctly. | 1. Clean the CD-RW/DVD drive.<br>2. Run the CD-RW/DVD drive diagnostic programs.<br>3. Reseat the following components:<br>   a. CD-RW/DVD drive<br>   b. CD-RW/DVD drive cable<br>4. Replace the CD-RW/DVD drive. |

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| The CD-RW/DVD drive tray is not working. | 1. Make sure that the server is turned on.<br>2. Insert the end of a straightened paper clip into the manual tray-release opening.<br>3. Reseat the CD-RW/DVD drive cable.<br>4. Replace the CD-RW/DVD drive. |

## General problems

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| 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

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| Not all drives are recognized by the hard disk drive diagnostic test. | Remove the drive that is indicated by 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. |
| A hard disk drive passes the diagnostic Fixed Disk Test, but the problem remains. | Run the diagnostic for SCSI Attached Disks. |

| | |
|---|---|
| • **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* on the IBM *System x Documentation* CD 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.** | |
| **Symptom** | **Action** |
| A hard disk drive that you are installing does not fit correctly in the cage. | Make sure that the type of drive is correct for this server. |

## Intermittent problems

| | |
|---|---|
| • **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* on the IBM *System x Documentation* CD 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.** | |
| **Symptom** | **Action** |
| A problem occurs only occasionally and is difficult to diagnose. | 1. Make sure that:<br>  • All cables and cords are connected securely to the rear of the server and attached devices.<br>  • There is adequate cooling airflow. Reduced airflow due to a failed fan or an internal or external obstruction can cause the server to overheat and shut down.<br>2. Check the system-error log or the BMC log (see "Error Logs" in the *Problem Determination and Service Guide*).<br><br>If the problem remains, call for service. |
| The server resets (restarts) occasionally | 1. If the reset occurs during POST and the POST watchdog timer is enabled (click **Advanced Setup --> Baseboard Management Controller (BMC) Setting --> BMC Post Watchdog** in the Configuration/Setup Utility program to see the POST watchdog setting), make sure that sufficient time is allowed in the watchdog timeout value (**BMC POST Watchdog Timeout**). See the *User's Guide* for information about the settings in the Configuration/Setup Utility program. If the server continues to reset during POST, see the "POST" and "Diagnostic programs" sections in the *Problem Determination and Service Guide*.<br>2. If the reset occurs after the operating system starts, disable any automatic server restart (ASR) utilities, such as the IBM Automatic Server Restart IPMI Application for Windows, or ASR devices that may be installed.<br>**Note:** ASR utilities operate as operating-system utilities and are related to the IPMI device driver. If the reset continues to occur after the operating system starts, the operating system might have a problem; see "Software problems" on page 68.<br>3. If neither condition applies, check the system-error log or BMC log (see "Error Logs" in the *Problem Determination and Service Guide*).<br><br>If the problem remains, call for service. |

# USB keyboard, mouse, or pointing-device problems

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| All or some keys on the keyboard do not work. | 1. Run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup.<br><br>2. Make sure that:<br>  • The keyboard cable is securely connected.<br>  • The server and the monitor are turned on.<br><br>3. Reseat the keyboard cable.<br><br>4. If you are using an external USB hub, disconnect the keyboard from the hub and connect it directly to the server.<br><br>5. Replace the following components one at a time, in the order shown, restarting the server each time:<br>  a. Keyboard<br>  b. (Trained service technician only) System board |
| The USB mouse or USB pointing device does not work. | 1. Make sure that:<br>  • The mouse or pointing-device USB cable is securely connected to the server, and the keyboard and the device drivers are installed correctly.<br>  • The server and the monitor are turned on.<br>  • Keyboardless operation has been enabled in the Configuration/Setup Utility program.<br><br>2. Reseat the mouse or pointing-device cable.<br><br>3. If you are using an external USB hub, disconnect the mouse or pointing device from the hub and connect it directly to the server.<br><br>4. Replace the following components one at a time, in the order shown, restarting the server each time:<br>  a. Mouse or pointing device<br>  b. (Trained service technician only) System board |

# Memory problems

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| The amount of system memory that is displayed is less than the amount of installed physical memory. | 1. Make sure that: <br> • No light path diagnostics LEDs are lit on the operator information panel. <br> • Memory mirroring or sparing does not account for the discrepancy. <br> • The DIMMs are seated correctly. <br> • You have installed the correct type of memory. See "Installing a memory module" on page 19. <br> • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program. <br> • 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. <br> 2. Check the POST error log for error message 289: <br> • If a DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. <br> • If a DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM. <br> 3. Run memory diagnostics (see "Running the diagnostic programs" in the *Problem Determination and Service Guide*). <br> 4. Add one pair of DIMMs at a time, making sure that the DIMMs in each pair are matching. Install the DIMMs in the sequence described in "Installing a memory module" on page 19. <br> 5. Reseat the DIMMs. See "Installing a memory module" on page 19. <br> 6. Replace the following components one at a time, in the order shown, restarting the server each time: <br>   a. DIMMs <br>   b. (Trained service technician only) System board |
| Multiple rows of DIMMs in a branch are identified as failing. | 1. Reseat the DIMMs; then, restart the server. <br> 2. Replace the lowest-numbered DIMM pair of those identified; then, restart the server. Repeat as necessary. <br> 3. (Trained service technician only) Replace the system board. |

# Microprocessor problems

| | |
|---|---|
| • | **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* on the IBM *System x Documentation* CD 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.** |

| Symptom | Action |
|---|---|
| The server emits a continuous beep during POST, indicating that the startup (boot) microprocessor is not working correctly. | 1. Correct any errors that are indicated by the light path diagnostics LEDs (see "Light path diagnostics" on page 68). <br> 2. Make sure that the server supports the microprocessor. <br> 3. (Trained service technician only) Make sure that the microprocessor is seated correctly. <br> 4. (Trained service technician only) Replace the microprocessor. |

# Monitor problems

Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the documentation that comes with the monitor for instructions for testing and adjusting the monitor. If you cannot diagnose the problem, call for service.

| | |
|---|---|
| • | **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* on the IBM *System x Documentation* CD 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.** |

| Symptom | Action |
|---|---|
| Testing the monitor | 1. Make sure that the monitor cables are firmly connected. <br> 2. Try using a different monitor on the server, or try testing the monitor on a different server. <br> 3. Run the diagnostic programs. If the monitor passes the diagnostic programs, the problem might be a video device driver. <br> 4. Reseat the Remote Supervisor Adapter II SlimLine (if one is present). <br> 5. Replace the following components one at a time, in the order shown, restarting the server each time: <br>    a. Remote Supervisor Adapter II SlimLine (if one is present). <br>    b. (Trained service technician only) System board. |

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| The screen is blank. | 1. If an external USB hub is in use, disconnect the monitor from the hub and connect it directly to the server.<br><br>2. Make sure that:<br> • The server is turned on. If there is no power to the server, see "Power problems" on page 65.<br> • The monitor cables are connected correctly.<br> • The monitor is turned on and the brightness and contrast controls are adjusted correctly.<br> • No beep codes sound when the server is turned on.<br><br>**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).<br><br>3. Make sure that the correct server is controlling the monitor, if applicable.<br><br>4. Make sure that damaged BIOS code is not affecting the video; see the *Problem Determination and Service Guide* for information about recovering from a BIOS failure.<br><br>5. See the *Problem Determination and Service Guide* for information about solving undetermined problems. |
| The monitor works when you turn on the server, but the screen goes blank when you start some application programs. | 1. Make sure that:<br><br> • The application program is not setting a display mode that is higher than the capability of the monitor.<br><br> • You installed the necessary device drivers for the application.<br><br>2. Run video diagnostics (see the *Problem Determination and Service Guide* for information about running the diagnostic programs). If the server passes the video diagnostics, the video is good; see the *Problem Determination and Service Guide* for information about solving undetermined problems. |

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted. | 1. If the monitor self-tests show the that 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.<br><br>**Attention:** Moving a color monitor while it is turned on might cause screen discoloration.<br><br>Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.<br><br>**Notes:**<br><br>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.).<br><br>b. Non-IBM monitor cables might cause unpredictable problems.<br><br>2. Reseat the following components:<br>• Monitor cable<br>• Remote Supervisor Adapter II SlimLine (if one is present)<br><br>3. Replace the following components one at a time, in the order shown, restarting the server each time:<br>a. Monitor cable<br>b. Monitor<br>c. Remote Supervisor Adapter II SlimLine (if one is present)<br>d. (Trained service technician only) System board |
| Wrong characters appear on the screen. | 1. If the wrong language is displayed, update the BIOS code with the correct language.<br><br>2. Reseat the monitor cable.<br><br>3. Replace the following components one at a time, in the order shown, restarting the server each time:<br>a. Monitor<br>b. (Trained service technician only) System board |

# Optional-device problems

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| An IBM optional device that was just installed does not work. | 1. Make sure that:<br>   • The device is designed for the server (see http://www.ibm.com/servers/eserver/serverproven/compat/us/).<br>   • You followed the installation instructions that came with the device and the device is installed correctly.<br>   • You have not loosened any other installed devices or cables.<br>   • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration.<br>2. Reseat the device that you just installed.<br>3. Replace the device that you just installed. |
| An IBM optional device that worked previously does not work now. | 1. Make sure that all of the hardware and cable connections for the device are secure.<br>2. If the device comes with test instructions, use those instructions to test the device.<br>3. Reseat the failing device.<br>4. Replace the failing device. |

# Power problems

| | |
|---|---|
| • | **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* on the IBM *System x Documentation* CD 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.** |

| Symptom | Action |
|---|---|
| The power-control button does not work, and the reset button does work (the server does not start).<br>**Note:** The power-control button will not function until 20 seconds after the server has been connected to ac power. | 1. Make sure that the power-control button is working correctly:<br>  a. Disconnect the server power cords.<br>  b. Reconnect the power cords.<br>  c. Press the power-control button.<br>  d. If the server does not start, disconnect the server power cords and reseat the operator information panel cables; then, repeat steps 1a through 1c. If the problem remains, replace the operator information panel.<br>2. Make sure that:<br>  • The power cords are correctly connected to the server and to a working electrical outlet.<br>  • The server contains the correct type of DIMMs.<br>  • The DIMMs are correctly seated.<br>  • (Trained service technician only) The microprocessor is correctly installed.<br>3. 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.<br>4. Reseat the following components:<br>  a. DIMMs<br>  b. (Trained service technician only) Power backplane<br>5. Replace the following components one at a time, in the order shown, restarting the server each time:<br>  a. DIMMs<br>  b. Power supply<br>  c. (Trained service technician only) Power backplane<br>  d. (Trained service technician only) System board<br>6. See "Solving undetermined problems" in the *Problem Determination and Service Guide*. |

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| The server does not start. | Check the four 12-volt power LEDs (A, B, C, and D) on the system board. See the *Problem Determination and Service Guide* for the LED locations.<br><br>1. If the Channel A power LED is lit, check components in the following order.<br>  a. Remove all PCI adapters and riser cards. Try restarting the server. If the server starts, reinstall the PCI adapters and riser cards, one at a time, to isolate the defective adapter.<br>  b. (Trained service technician only) System board<br>  c. (Trained service technician only) Power backplane<br>2. If the Channel B power LED is lit, check components in the following order:<br>  a. Fans 1 and 2<br>  b. (Trained service technician only) Remove microprocessor 2 (if present). Try restarting the server.<br>  c. (Trained service technician only) System board<br>  d. (Trained service technician only) Power backplane<br>3. If the Channel C power LED is lit, check components in the following order:<br>  a. Fans 3 and 4<br>  b. (Trained service technician only) System board<br>  c. (Trained service technician only) Power backplane<br>  d. (Trained service technician only) Microprocessor 1<br>4. If the Channel D power LED is lit, check components in the following order:<br>  a. Remove all DIMMs. Try restarting the server, listening for any memory error beep codes. If the server restarts, reinstall the DIMMs, one pair at a time, to isolate the defective DIMM.<br>  b. Fans 5 and 6<br>  c. (Trained service technician only) System board<br>  d. (Trained service technician only) Power backplane |
| The server does not turn off. | 1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or a non-ACPI operating system. If you are using a non-ACPI operating system, complete the following steps:<br>  a. Press Ctrl+Alt+Delete.<br>  b. Turn off the server by pressing the power-control button for 5 seconds.<br>  c. Restart the server.<br>  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. |
| The server unexpectedly shuts down, and the LEDs on the operator information panel are not lit. | See "Solving undetermined problems" in the *Problem Determination and Service Guide*. |

# Serial port problems

- **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* on the IBM *System x Documentation* CD 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.**

| Symptom | Action |
|---|---|
| The number of serial ports that are identified by the operating system is less than the number of installed serial ports. | 1. Make sure that:<br>  • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports is disabled.<br>  • The serial-port adapter (if one is present) is seated correctly.<br>2. Reseat the serial port adapter.<br>3. Replace the serial port adapter. |
| A serial device does not work. | 1. Make sure that:<br>  • The device is compatible with the server.<br>  • The serial port is enabled and is assigned a unique address.<br>  • The device is connected to the correct connector.<br>2. Reseat the following components:<br>  a. Failing serial device<br>  b. Serial cable<br>  c. Remote Supervisor Adapter II SlimLine (if one is present)<br>3. Replace the following components one at a time, in the order shown, restarting the server each time:<br>  a. Failing serial device<br>  b. Serial cable<br>  c. Remote Supervisor Adapter II SlimLine (if one is present)<br>  d. (Trained service technician only) System board |

# Software problems

| | |
|---|---|
| • **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* on the IBM *System x Documentation* CD 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.** | |

| Symptom | Action |
|---|---|
| You suspect a software problem. | 1. To determine whether the problem is caused by the software, make sure that:<br> • 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.<br> • The software is designed to operate on the server.<br> • Other software works on the server.<br> • The software works on another server.<br><br>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.<br><br>3. Contact your place of purchase of the software. |

# Universal Serial Bus (USB) port problems

| | |
|---|---|
| • **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* on the IBM *System x Documentation* CD 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.** | |

| Symptom | Action |
|---|---|
| A USB device does not work. | 1. Make sure that:<br> • The correct USB device driver is installed.<br> • The operating system supports USB devices.<br><br>2. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program (see the *User's Guide* on the IBM *Documentation* CD for more information).<br><br>3. If you are using an external USB hub, disconnect the USB device from the hub and connect it directly to the server. |

# Video problems

See "Monitor problems" on page 61.

# 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.

When LEDs are lit to indicate an error, they remain lit when the server is turned off, provided that the server is still connected to power and the power supply is operating correctly.

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

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

**Light Path Diagnostics**

| | | |
|---|---|---|
| OVER SPEC | PS1 | PS2 |
| CPU | VRM | CNFG |
| MEM | NMI | S ERR |
| SP | DASD | RAID |
| FAN | TEMP | BRD |
| PCI | | |

**REMIND**

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.

## Diagnosing problems using light path diagnostics

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

1. **Light path diagnostics panel** - Look at this panel first. If a system error has occurred, the system-error LED on the front of the light path diagnostics drawer is lit. Slide the latch to the left on the front of the light path diagnostics drawer to access the light path diagnostics panel. Note any LEDs that are lit, and then close the drawer.

2. **LEDs on the system board** - To identify the component that is causing the error, note the lit LED on or beside the component.

## Light path diagnostics LEDs

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

| Lit light path diagnostics LED with the system-error or information LED also lit | Description | Action |
|---|---|---|
| None | An error has occurred and cannot be diagnosed, or the Advanced System Management (ASM) processor on the Remote Supervisor Adapter II SlimLine has failed. The error is not represented by a light path diagnostics LED. | Check the system error log for information about the error. |
| OVER SPEC | The power supplies are using more power than their maximum rating. | Replace the failing power supply, or remove optional devices from the server. |
| PS1 | The power supply in bay 1 has failed. | Replace the failed power supply. |
| PS2 | The power supply in bay 2 has failed. | Replace the failed power supply. |
| CPU | A microprocessor has failed. | Make sure that the failing microprocessor, which is indicated by a lit LED on the system board, is installed correctly. See "Installing a microprocessor" on page 22 for information about installing a microprocessor. |
| VRM | Reserved. | Reserved. |
| CNFG | Microprocessor configuration error. | • Check the microprocessor options for compatibility.<br>• Check the system error log for information indicating incompatible components. |
| MEM | A memory error has occurred. | Replace the failing DIMM, which is indicated by the lit LED on the system board. |
| NMI | A machine check error has occurred. | Check the system error log for information about the error. |
| S ERR | Reserved | |
| SP | The service processor has failed. | Remove ac power from the server; then, reconnect the server to ac power and restart the server.<br><br>If a Remote Supervisor Adapter II SlimLine is installed, replace it. |
| DASD | A hard disk drive error has occurred. | Check the LEDs on the hard disk drives and replace the indicated drive. |
| BRD | An error has occurred on the system board. | • Check the LEDs on the system board to identify the component that is causing the error.<br>• Check the system error log for information about the error. |
| FAN | A fan has failed, is operating too slowly, or has been removed. A failing fan can also cause the TEMP LED to be lit. | Replace the failing fan, which is indicated by a lit LED near the fan connector on the system board. |
| TEMP | The system temperature has exceeded a threshold level. | • Determine whether a fan has failed. If it has, replace it.<br>• Make sure that the room temperature is not too high. See "Features and specifications" on page 4 for temperature information.<br>• Make sure that the air vents are not blocked. |
| RAID | A RAID controller error has occurred. | Check the system error log for information about the error. If an optional RAID controller adapter is installed, see the documentation that comes with the RAID controller. |

| Lit light path diagnostics LED with the system-error or information LED also lit | Description | Action |
|---|---|---|
| PCI | An error has occurred on a PCI bus or on the system board. An additional LED will be lit next to a failing PCI slot. | • Check the LEDs at the PCI slots to identify the component that is causing the error.<br>• Check that the PCI riser assemblies are seated correctly.<br>• Check the system error log for information about the error.<br>• If you cannot isolate the failing adapter through the LEDs and the information in the system error log, remove one adapter at a time from the failing PCI bus, and restart the server after each adapter is removed. |

# Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your 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 and any optional devices are 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 *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to the IBM support Web site at http://www.ibm.com/systems/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 documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

## Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, 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/systems/support/ and follow the instructions. Also, some documents are available through the IBM Publications Center at http://www.ibm.com/shop/publications/order/.

## 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 systems, optional devices, services, and support. The address for IBM System x and xSeries® information is http://www.ibm.com/systems/x/. The address for IBM BladeCenter® information is http://www.ibm.com/systems/bladecenter/. The address for IBM IntelliStation® information is http://www.ibm.com/intellistation/.

You can find service information for IBM systems and optional devices at
http://www.ibm.com/systems/support/.

## Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage,
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## IBM Taiwan product service

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台灣國際商業機器股份有限公司
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IBM Taiwan product service contact information:
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Processor speed indicates the internal clock speed of the microprocessor; other factors also affect application performance.

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When referring to processor storage, real and virtual storage, or channel volume, KB stands for 1024 bytes, MB stands for 1 048 576 bytes, and GB stands for 1 073 741 824 bytes.

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**For Taiwan:** Please recycle batteries.



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## Industry Canada Class A emission compliance statement

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

## Avis de conformité à la réglementation d'Industrie Canada

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## 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.

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European Community contact:
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   Fax: 0049 (0)711 785 1283
   E-mail: tjahn@de.ibm.com

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求採取某些適當的對策。

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在这种情况下，可能需要用户对其
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