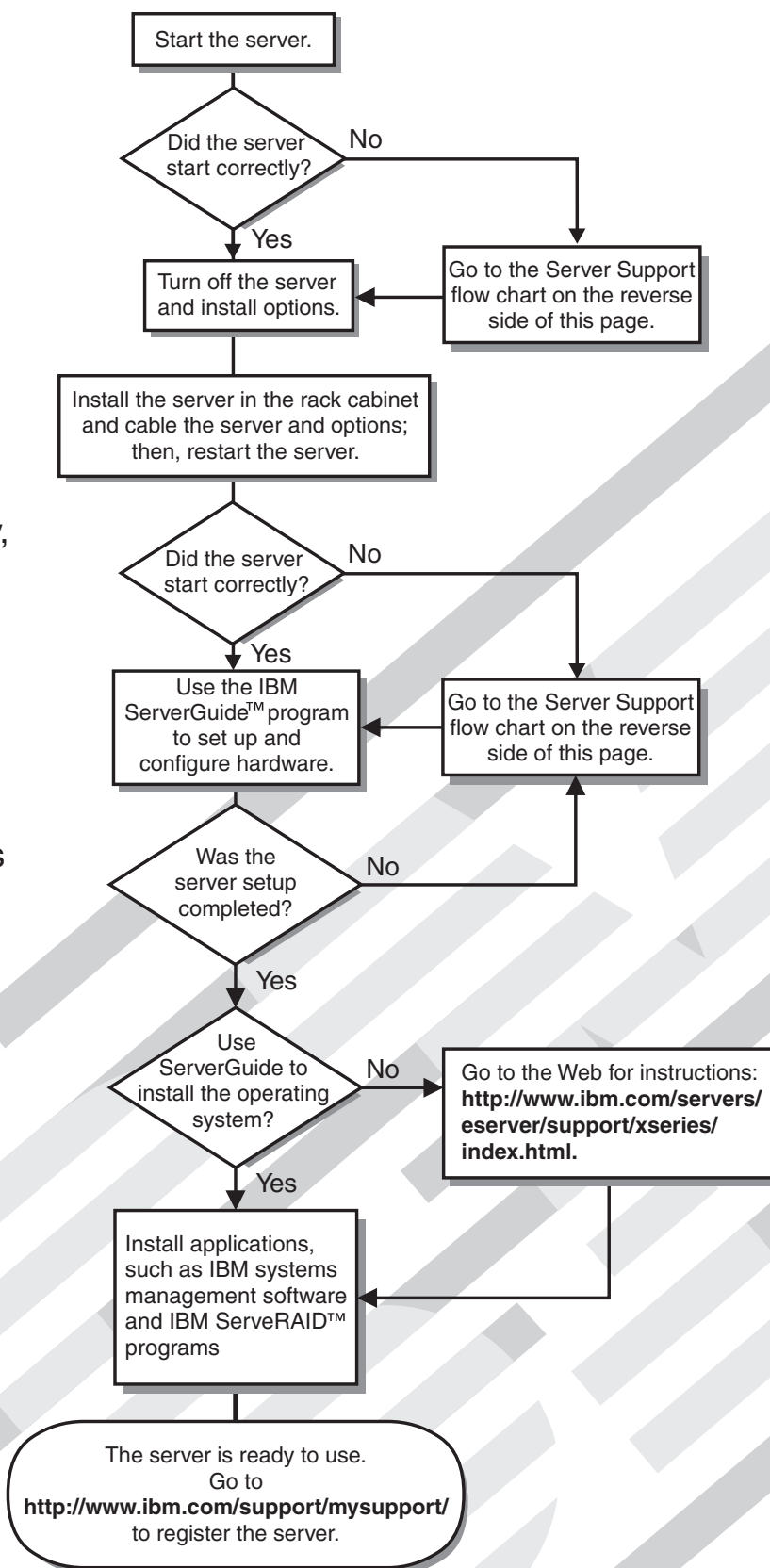# IBM

System x3655
Type 7985

Installation Guide

Welcome.

Thank you for buying an
IBM server. Your server
is based on the X-Architecture
technology, and it features
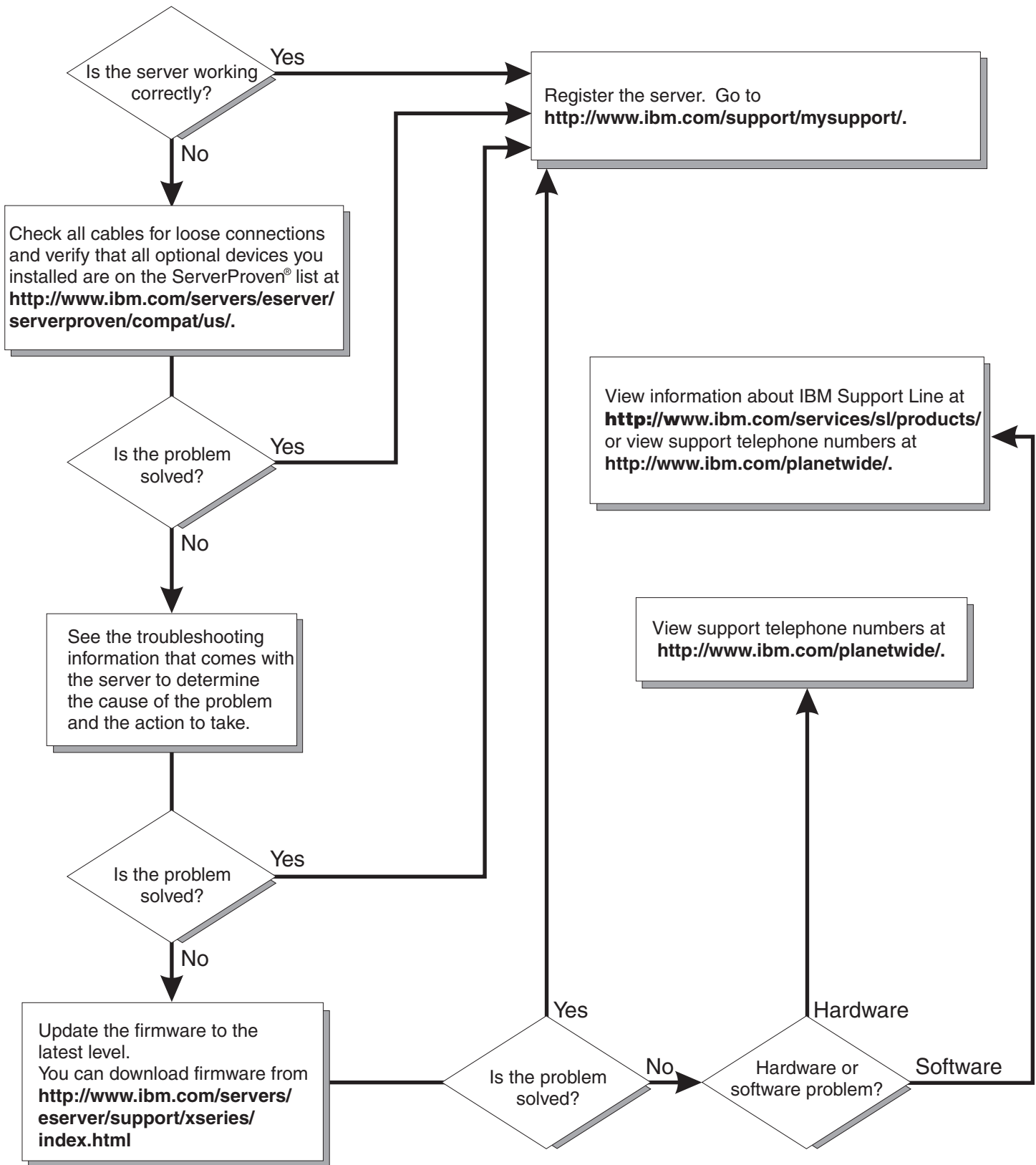superior performance, availability,
and affordability.

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/servers/
eserver/support/xseries/
index.html.

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** →

Yes

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

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/servers/eserver/support/xseries/index.html**

→ **Is the problem solved?**

Yes ↑ → Register the server. Go to **http://www.ibm.com/support/mysupport/.**

No → **Hardware or software problem?**

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

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

IBM System x3655 Type 7985

Installation Guide

Note:

Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 79 and the *Warranty and Support Information* document on the IBM *Documentation* CD.

Third Edition (February 2007)

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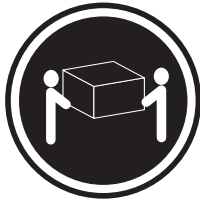
≥ 18 kg (39.7 lb)   ≥ 32 kg (70.5 lb)   ≥ 55 kg (121.2 lb)
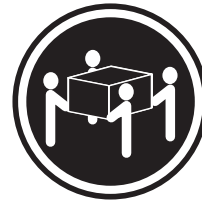
CAUTION:
Use safe practices when lifting.

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 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 26:

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

Attention: This server is suitable for use on an IT power distribution system whose maximum phase-to-phase voltage is 240 V under any distribution fault condition.

Chapter 1. Introduction

This *Installation Guide* contains instructions for setting up your IBM® System x3655 Type 7985 server and basic instructions for installing some optional devices. More detailed instructions for installing optional devices are in the *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
- Starting and configuring the server
- Installing some optional devices
- Solving problems

The server has two model styles, which are based on the size and number of hard disk drive bays:

- The *3.5-inch* models have six 3.5-inch hot-swap hard disk drive bays. Install only 3.5-inch drives in these models. If you install an optional tape drive, the tape drive occupies two of the six 3.5-inch drive bays.
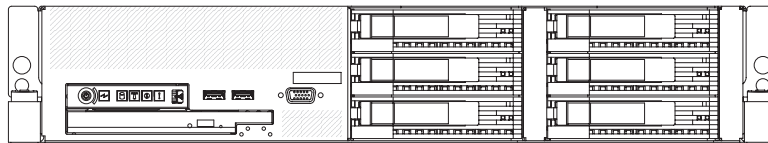
- The *2.5-inch* models have eight 2.5-inch hot-swap hard disk drive bays and one 3.5-inch tape drive bay. Install only 2.5-inch hard disk drives and an optional 3.5-inch tape drive in these models.
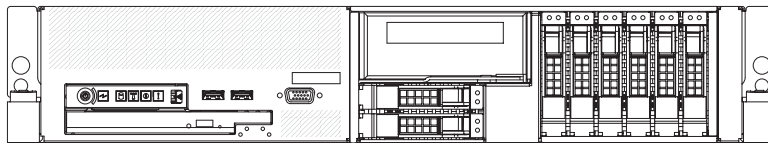
Throughout this documentation, the terms *2.5-inch models* and *3.5-inch models* are used to distinguish between the server styles.

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, go to http://www.ibm.com/servers/eserver/ support/xseries/index.html, select **System x3655** from the **Hardware** list, and click **Go**. For firmware updates, click the **Download** tab. For documentation updates, click the **Install and use tab**, and click **Product documentation.**

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.

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 x3655 server
Machine type	7985
Model number	_____
Serial number	_____

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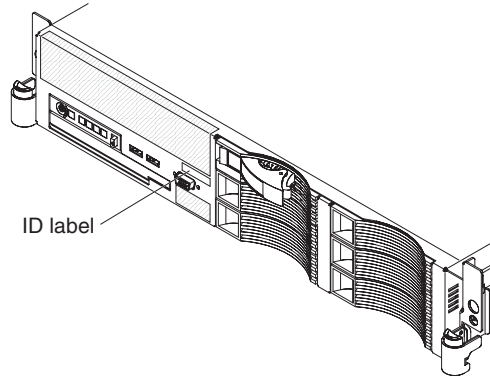
ID label

Note: This illustration shows a model with 3.5-inch hot-swap hard disk drives. Models with 2.5-inch hot-swap hard disk drives are also available. The location of the ID label is the same on both model styles. This illustration might differ slightly from your hardware.

For a list of supported optional devices for the server, see the ServerProven® Web site at 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 your server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *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 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 drive and click **Start --> Run**. In the **Open** field, type

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

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

    ```
    sh runlinux.sh
    ```

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

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

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press 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.

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.

Features and specifications

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

Racks are marked in vertical increments of 4.45 cm (1.75 inches). Each increment is referred to as a unit, or "U."

Table 1. Features and specifications

Microprocessor:
- AMD Opteron dual-core with 2 MB (1 MB per core) Level-2 cache
- 1 GHz Hypertransport interconnect bus
- Support for up to two microprocessors

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

Memory:
- Sixteen DIMM connectors
- Minimum: 1 GB
- Maximum: 64 GB
- Type: Registered, PC2-5300 double data rate (DDR) II, DIMMS
- Sizes: 512 MB, 1 GB, 2 GB, or 4 GB, in pairs

Drives: (depending on your model)
- Hard disk drive: SAS or SATA
- One of the following IDE drives:
  - DVD-ROM
  - CD-RW/DVD-ROM combination

Expansion bays:
- Hot-swap hard disk drive bays: One of the following configurations:
  - Six 3.5-inch drive bays (optional tape drive will require two of these bays)
  - Eight 2.5-inch drive bays and one tape drive bay
- One 5.25-inch Ultrabay Enhanced bay (CD-RW/DVD drive installed)

Expansion slots:
- Three low-profile PCI Express slots (two x8 and one x4 lanes) on system board
- Support for one of the following riser cards:
  - HTX riser card with a full height, full length HTX adapter slot (25 W max.) (standard)
  - PCI Express riser card with a full height, full length adapter slot (x16 lanes) (25 W max.) (optional)
  - PCI-X riser card with one full height, full length, 133 MHz/64-bit adapter slot (optional)

Hot-swap fans:
- Standard: Five
- Maximum: Ten - provide redundant cooling

Hot-swap power supplies:

835 watts (100-240 V ac)
- Minimum: One
- Maximum: Two - provide redundant power

Size (2 U):
- Height: 85.4 mm (3.36 in.)
- Depth: 705 mm (27.8 in.)
- Width: 443.6 mm (17.5 in.)
- Weight: approximately 21.09 kg (46.5 lb) to 29.03 kg (64 lb) depending upon configuration

Integrated functions:
- Baseboard management controller or on-board service control processor
- Two Broadcom 10/100/1000 Ethernet controllers with Wake on LAN® support and TCPIP Offload Engine (TOE) support
- One serial port
- One serial-attached SCSI (SAS) controller
- Six Universal Serial Bus (USB) ports (2.0)
  - two on the front of the server
  - four on the back of the server
- Two video ports
  - one on the front of the server
  - one on the rear of the server
- Support for Remote Supervisor Adapter II SlimLine x

Video controller:
- ATI RN50 video on system board
- Compatible with SVGA and VGA
- 16 MB DDR video memory

RAID controller:
- ServeRAID™-8k-l SAS Controller, 256 MB, that supports RAID levels 0, 1, 10 (standard)
- Upgradable to ServeRAID-8k SAS Controller, 512 MB with battery backup, that supports additional RAID levels

Acoustical noise emissions:
- Declared sound power, idle: 6.8 bel
- Declared sound power, operating: 6.8 bel

Environment:
- Air temperature:
  - Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 914.4 m (3000 ft). Decrease system temperature by 0.75°C for every 1000-foot increase in altitude.
  - Server off: 10° to 43°C (50.0° to 109.4°F); maximum altitude: 2133 m (7000 ft)
  - Shipment: -40° to +60°C (-40° to 140°F); maximum altitude: 2133 m (7000 ft)
- Humidity:
  - Server on/off: 8% to 80%
  - Shipment: 5% to 100%

Heat output:

Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 1230 Btu (360 watts)
- Maximum configuration: 2840 Btu (830 watts)

Electrical input:
- Sine-wave input (50-60 Hz) required
- Input voltage range automatically selected
- 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: 0.36 kVA
  - Maximum 0.93 kVA

Notes:

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

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

Major components of the server

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

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

The following illustrations show the major components in the server.

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

Riser-card
assembly

Remote Supervisor
Adapter II SlimLine

Full-height
adapter

DIMM air baffle

Low-profile
adapter

DIMM

ServeRAID
SAS controller

Heat sink

Microprocessor

Heat-sink retention
module

System board with
shuttle assembly mounted

Shuttle assembly

Chapter 2. Installing optional devices

This chapter provides basic instructions for installing optional hardware devices 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 optional devices, read the following information:

- Read the safety information that begins on page v and the guidelines in "Handling static-sensitive devices" on page 11. This information will help you work safely.
- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, go to http://www.ibm.com/servers/eserver/support/xseries/index.html, select **System x3655** from the **Hardware** list, click **Go**, and click the **Download** tab. For additional information about tools for updating, managing, and deploying firmware, see the System x and xSeries Tool Center at http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp.
- Before you install optional hardware devices, 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 Chapter 5, "Solving problems," on page 57 for diagnostic information.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no 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 screwdriver available.
- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap fans, 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.
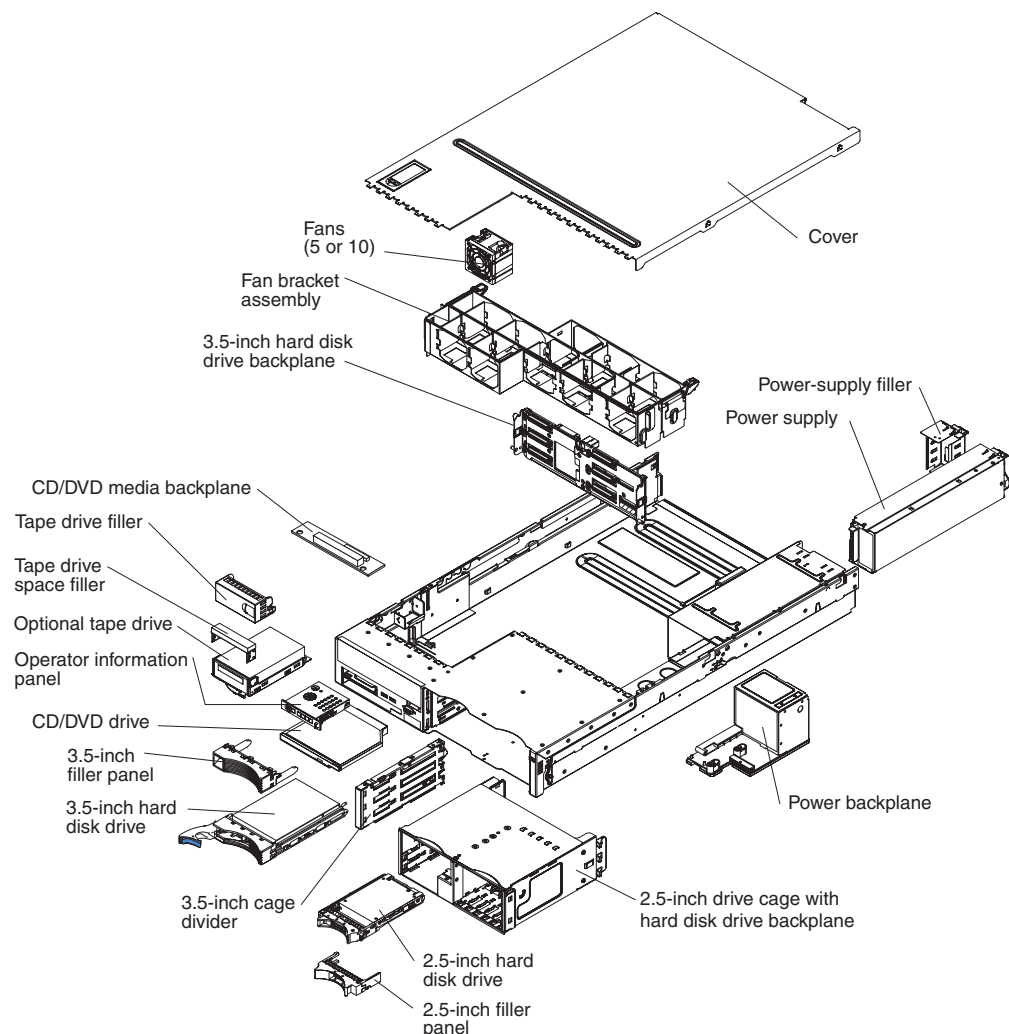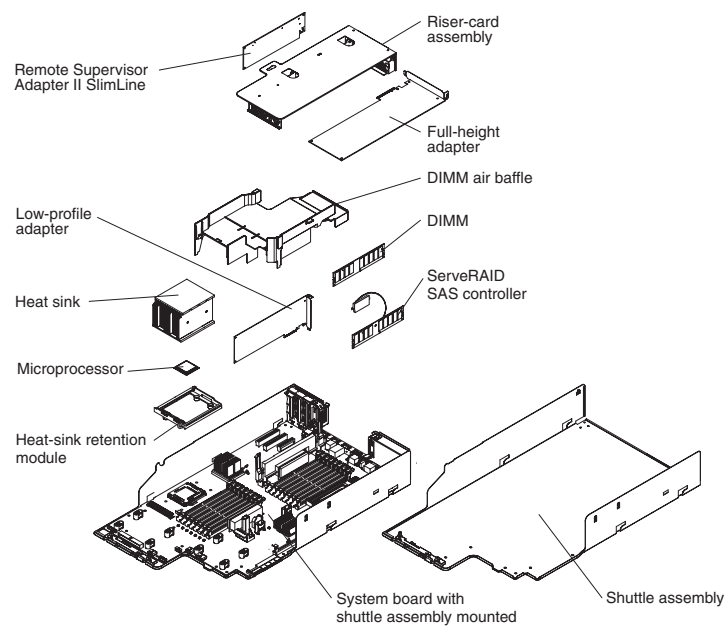- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.

- 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.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

System reliability guidelines

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

- Each of the drive bays has a drive or a filler panel 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. Operating the server for extended periods of time (more than 2 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffle installed. Operating the server without the air baffle might cause the microprocessor 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 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.

- Do not drop 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 cover

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

To remove the 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 to install or remove a microprocessor, memory module, PCI adapter, or tape drive, turn off the server and all attached devices and disconnect all external cables and power cords (see "Turning off the server" on page 37).
3. Press down on the left and right side latches and pull the server out of the rack enclosure until both slide rails lock.

   Note: You can reach the cables on the back of the server when the server is in the locked position.

Cover-release
latch
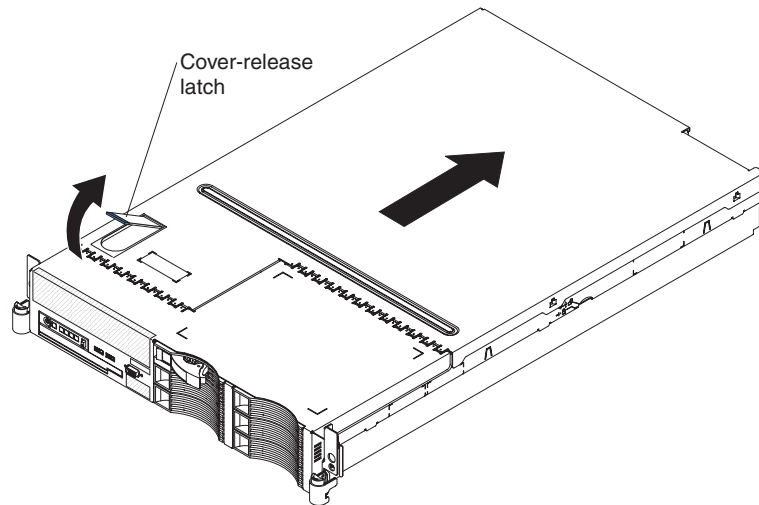
4. Lift the cover-release latch. Lift the cover off the server and set the cover aside.

Removing the air baffle

When you work with some optional devices, you must first remove the air baffle to access certain components or connectors on the system board. The following illustration shows how to remove the air baffle.

Attention: For proper cooling and airflow, replace the air baffle before you turn on the server. Operating the server with an air baffle removed might damage server components.
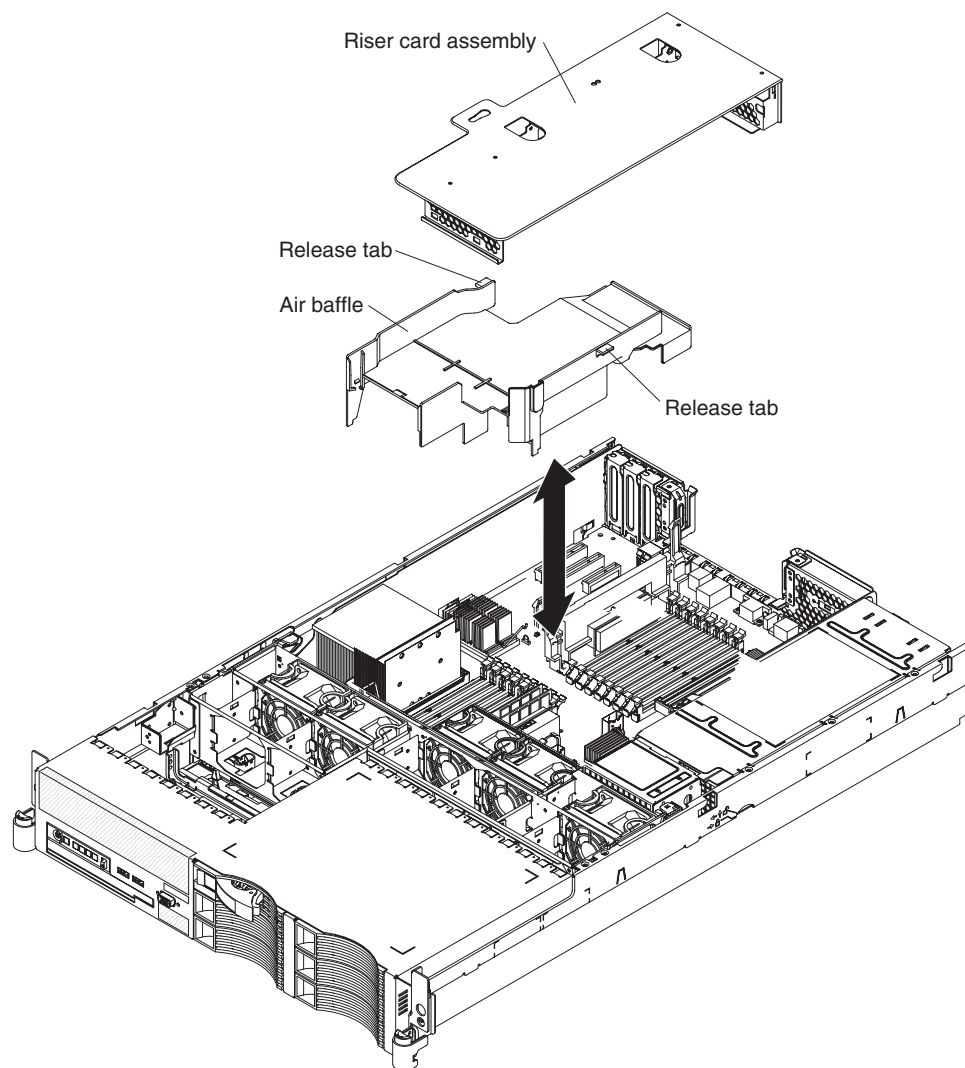
To remove the air baffle, complete the following steps:

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 all power cords and external cables (see "Turning off the server" on page 37); then, remove the cover (see "Removing the cover" on page 11).
3. Remove the riser-card assembly (see "Removing the riser-card assembly" on page 23).
4. Grasp the tabs on each side of the air baffle, and lift the air baffle out of the server.

Installing the air baffle

To install the air baffle, complete the following steps:

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

Riser card assembly

Release tab

Air baffle

Release tab

1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
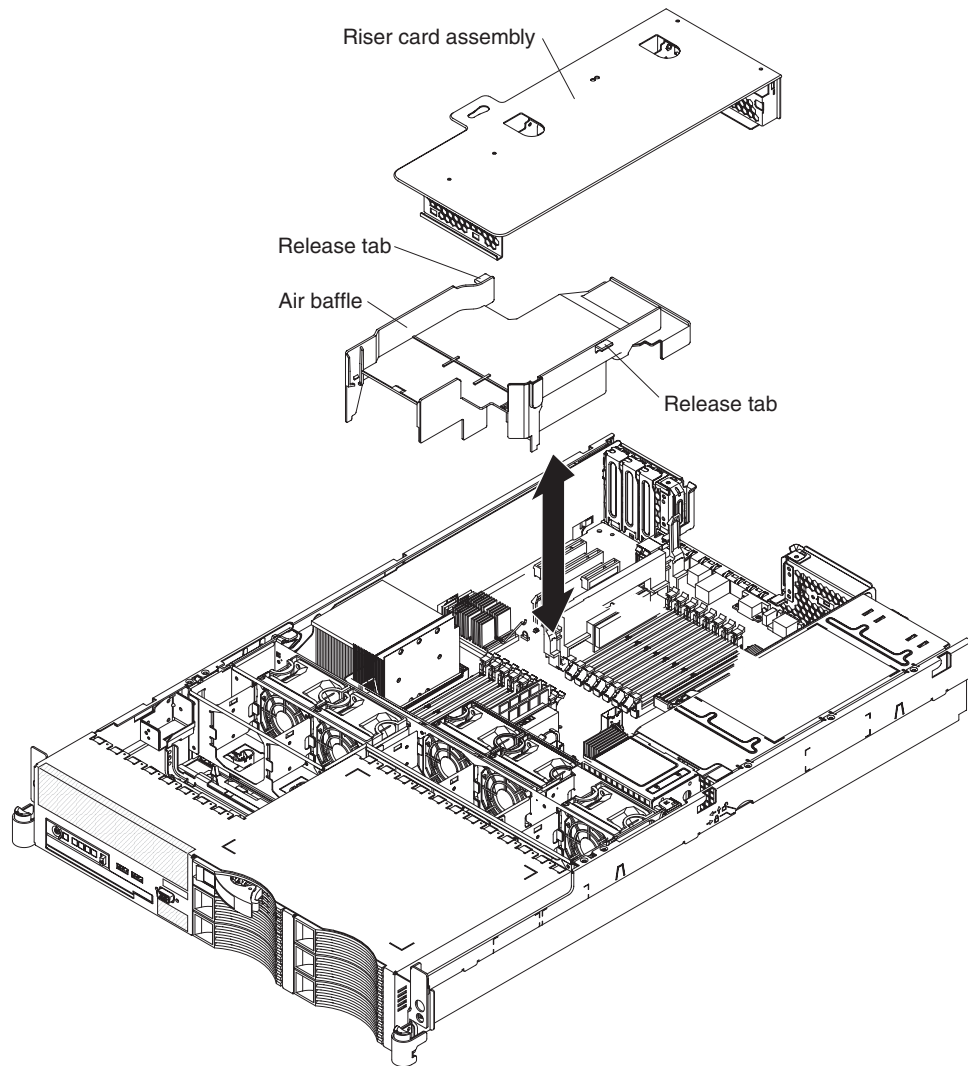2. Hold the air baffle by the tabs on each side. Align the front of the air baffle with the rear of the fan bracket assembly and the side of the heat sink on microprocessor number one.
3. Slide the air baffle down into the server until the bottom edge rests on the system board.

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 sixteen Registered DDR2 PC2-5300, 512 MB, 1 GB, 2 GB, and 4 GB DIMMs, for a maximum of 64 GB of system memory. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of memory modules you can use with the server.

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

- The server comes with a minimum of two 512 MB DIMMs installed in connectors 1 and 2. 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

DIMMs	1 microprocessor installed	2 microprocessors installed
2	DIMM connectors 1 and 2	Not applicable
4	DIMM connectors 1 through 4	DIMM connectors 1 and 2 and 9 and 10
6	DIMM connectors 1 through 6	DIMM connectors 1 through 4 and 9 and 10
8	DIMM connectors 1 through 8	DIMM connectors 1 through 4 and 9 through 12
10	Not applicable	DIMM connectors 1 through 6 and 9 through 12
12	Not applicable	DIMM connectors 1 through 6 and 9 through 14
14	Not applicable	DIMM connectors 1 through 8 and 9 through 14
16	Not applicable	DIMM connectors 1 through 16

- Each DIMM in a pair must be the same size, speed, type, and technology to ensure that the server will operate correctly.
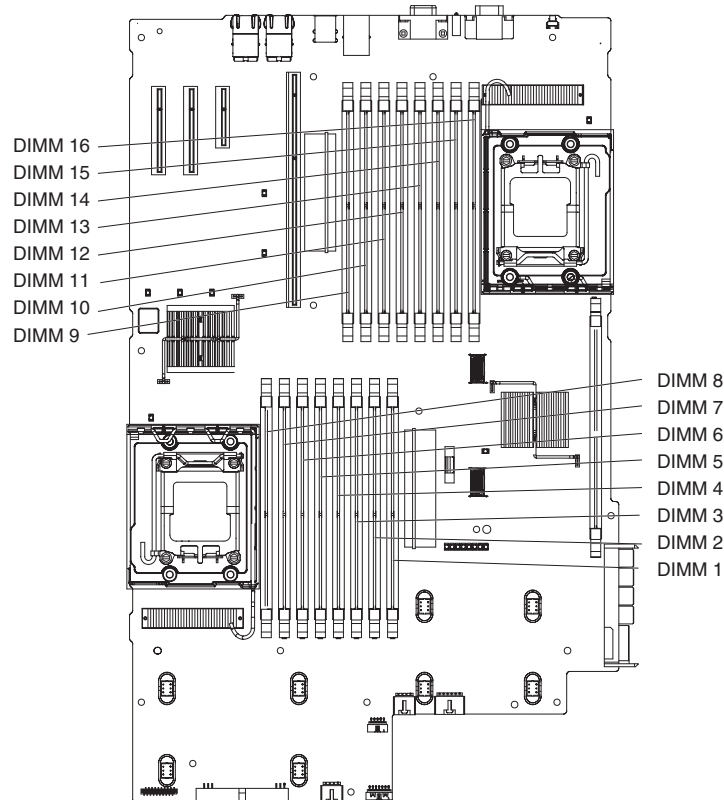
- The server supports online-spare memory. This feature disables a failed pair of DIMMS from the system configuration and activates an online-spare pair of DIMMs to replace the failed pair. Online-sparing is supported on a per processor

basis. Each microprocessor requires that two or more pairs of DIMMs be installed to support online sparing. The DIMMs must be the same speed, type, size (or larger), and technology as the failed pair of DIMMs

Enable online-spare memory through the Configuration/Setup Utility program. The BIOS code assigns the online-spare DIMM pairs according to your DIMM configuration.

- 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.
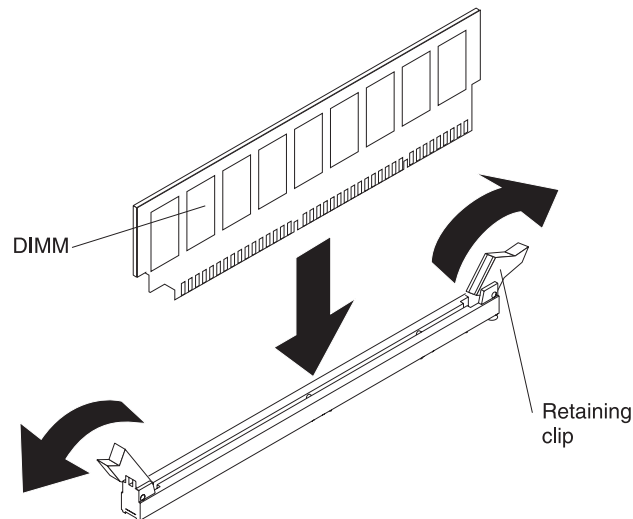
To install a DIMM, complete the following steps:

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 cord and all external cables. Remove the cover.
3. Remove the riser-card assembly (see "Removing the riser-card assembly" on page 23).

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
4. Remove the air baffle (see "Removing the air baffle" on page 12).
5. Open the retaining clip on each end of the DIMM connector.
6. 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.
7. Turn the DIMM so that the key aligns correctly with the connector.
8. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

   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.

If you have other devices to install, do so now. Otherwise, go to "Completing the installation" on page 29.

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.

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

- The 3.5-inch model server supports six, slim, 3.5-inch hot-swap hard disk drives installed on Ultra-Slim hard disk drive trays for 3.5-inch drives. For a list of supported 3.5-inch hard disk drives, go to the ServerProven Web site at http://www.ibm.com/servers/eserver/serverproven/compat/us.
- The 2.5-inch model server supports eight, 2.5-inch, hot-swap hard disk drives installed on Ultra-Slim hard disk drive trays for 2.5-inch drives. For a list of supported 2.5-inch hard disk drives, go to the ServerProven Web site at http://www.ibm.com/servers/eserver/serverproven/compat/us .
- All hot-swap drives in the server should have the same throughput speed rating. Mixing hard disk drives with different speed ratings will cause all drives to operate at the lower throughput speed.
- The ID that is assigned to each bay is printed on the server front.

The following illustrations show how to install a hot-swap hard disk drive.

3.5-inch drives

Important: Install only SAS or SATA 3.5-inch hard disk drives in this server.
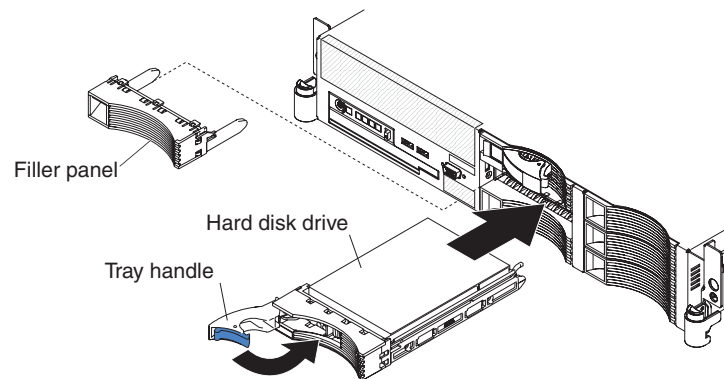
2.5-inch drives

Important: Install only SAS 2.5-inch hard disk drives in this server.
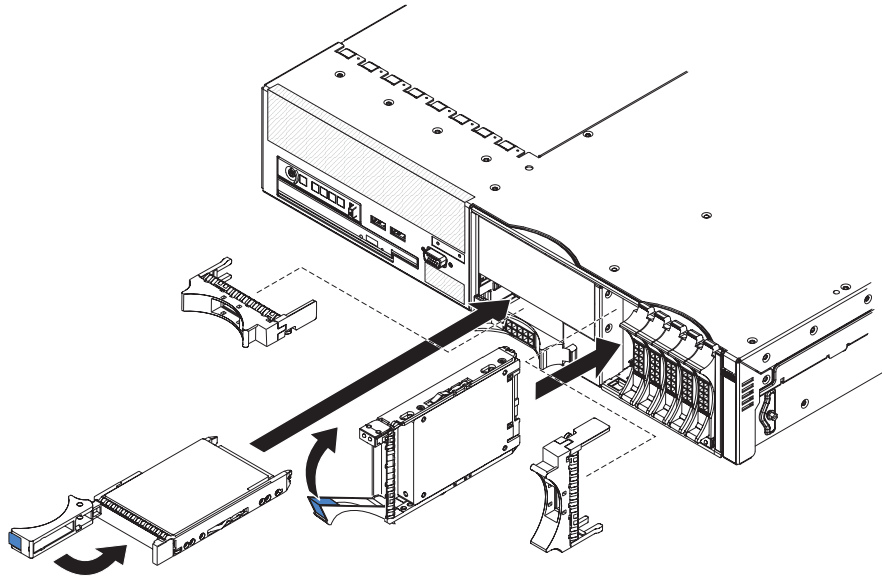
Complete the following steps to install a drive in a hot-swap bay.

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

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

      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.

   Note: You might have to reconfigure the disk arrays after installing hard disk drives. See the RAID documentation on the IBM *ServeRAID Support* CD for more information.

   If you have other devices to install, do so now. Otherwise, go to"Completing the installation" on page 29.

Installing an additional 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 up to two AMD Opteron microprocessors. If the server comes with one microprocessor, you can install a second microprocessor but it must be the same type and speed.
- You might have to update the BIOS code. Be sure to read the documentation that comes with the microprocessor so that you can determine whether you have to update the BIOS code. You can download the latest level of BIOS code and many other code updates for your server at http://www.ibm.com/servers/eserver/support/xseries/index.html.
- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems and other optional devices, go to http://www.ibm.com/servers/esever/serverproven/compat/us/.
- To order an additional microprocessor, contact your IBM marketing representative or authorized reseller.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If you have to replace a microprocessor, call for service.
- 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.
- Do not remove the first microprocessor from the system board to install the second microprocessor.

The following illustration shows the microprocessor connector locations on the system board.

Microprocessor 2 connector

Microprocessor 1 connector
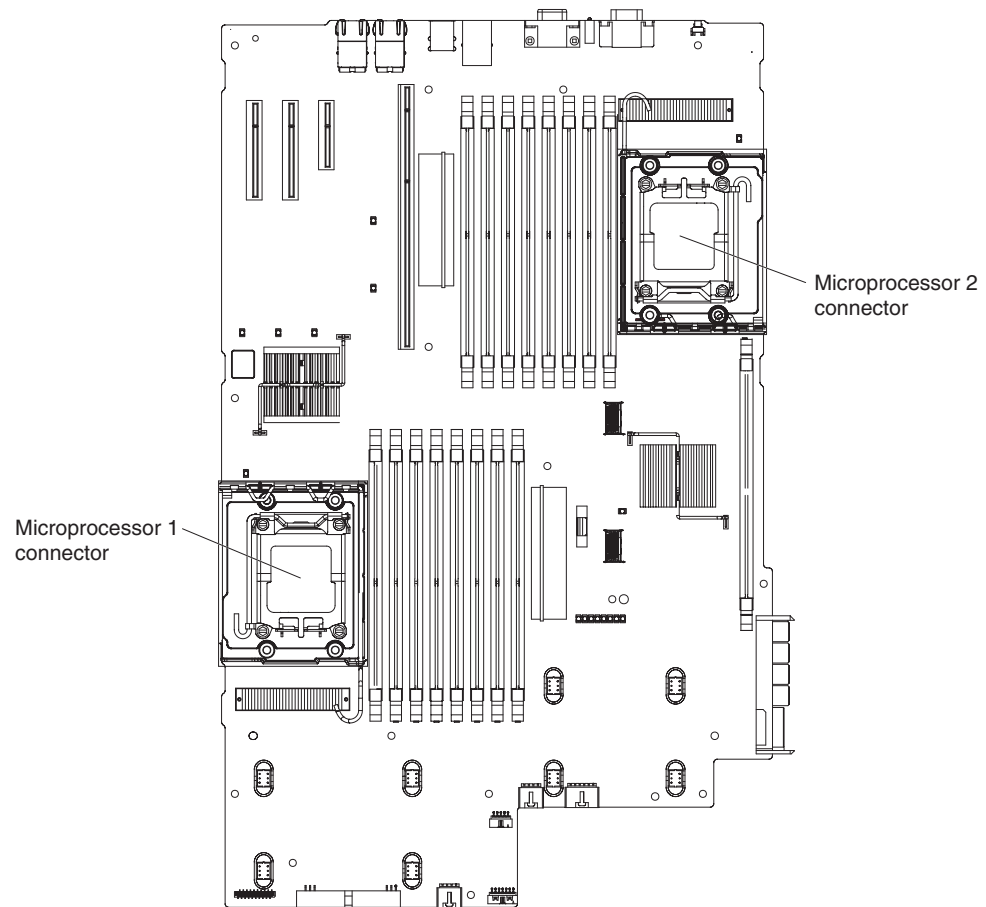
The following illustration shows how to install the second microprocessor on the system board.

Heat sink

Microprocessor

Microprocessor socket
dust cover
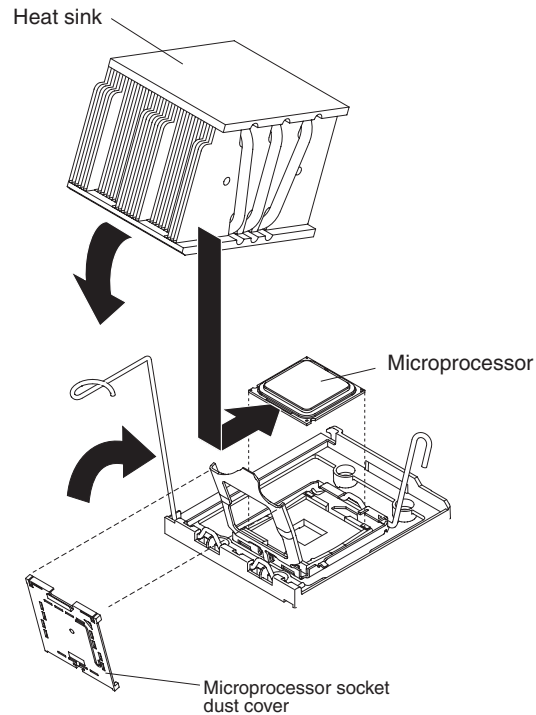
Note: For simplicity, certain components have been removed from this illustration.
Attention:

- A startup (boot) processor must always be installed in microprocessor connector
  1 on the system board.
- To ensure correct server operation when you install an additional microprocessor,
  use microprocessors that have the same cache size and type, and the same
  clock speed. Microprocessor clock frequencies must be identical.

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. 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 11.
3. Remove the riser-card assembly (see "Removing the riser-card assembly" on
   page 23).
4. Remove the air baffle (see "Removing the air baffle" on page 12).
5. Open the heat-sink release latch to the fully open position.
6. Install the microprocessor:
   a. Touch the static-protective package containing the microprocessor to any
      unpainted metal surface on the server. Then, remove the microprocessor
      from the package.
   b. Remove the protective dust cover, tape, or label from the surface of the
      microprocessor socket, if present.
   c. Rotate the microprocessor release lever on the socket from its closed and
      locked position until it stops in the fully open position.

Microprocessor release lever

Microprocessor socket dust cover
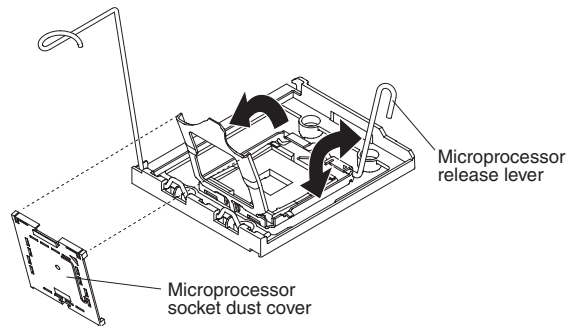
Attention:

- Handle the microprocessor carefully. Dropping the microprocessor during installation or removal can damage the contacts. Also, contaminant on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
- Do not use excessive force when pressing the microprocessor into the socket.

d. Align the microprocessor with the socket (note the alignment mark and the position of the notches); then, carefully place the microprocessor on the socket. Close the microprocessor bracket frame.

Microprocessor

Alignment marks

Notches
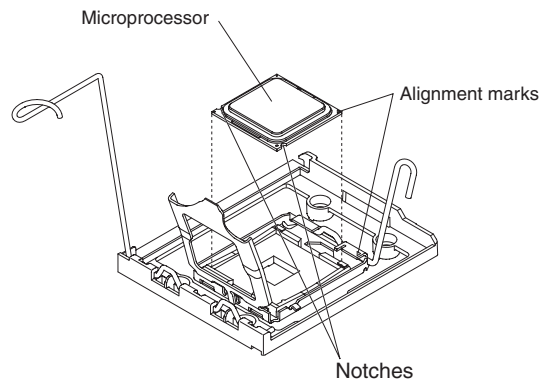
Note: The microprocessor fits only one way on the socket.

e. Carefully close the microprocessor release lever to secure the microprocessor in the socket.

7. Install the heat sink on the microprocessor.

Attention: Do not touch the thermal grease on the bottom of the heat sink or set down the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it. For details, see the information about thermal grease in the *User's Guide* on the IBM *Documentation* CD.

Thermal grease
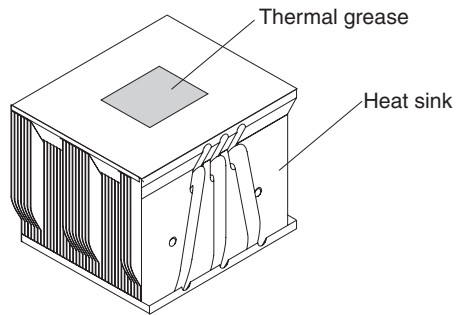
Heat sink

a. Make sure that the heat-sink release lever is in the open position.

b. Remove the plastic protective cover from the bottom of the heat sink.

c. Align the heat sink above the microprocessor with the thermal grease side down.

Retainer bracket

Heat sink release lever

Microprocessor
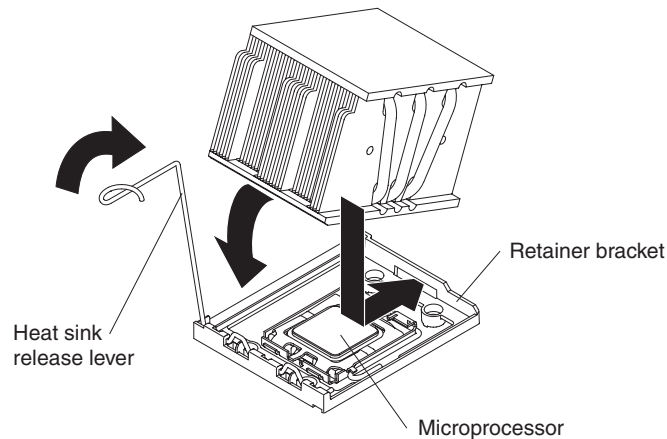
d. Slide the rear flange of the heat sink into the opening in the retainer bracket.

e. Press down firmly on the front of the heat sink until it is seated securely.

f. Rotate the heat-sink release lever to the closed position and hook it underneath the lock tab.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 29.

Removing the riser-card assembly

The server comes with one riser-card assembly that contains an HTX riser card that has an HTX adapter slot. You can replace the HTX riser-card assembly with one that has a PCI-X 64-bit 133 MHz connector, or one that has a PCI-Express x16 connector. See the ServerProven list at http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of riser-card assemblies that you can use with the server.

Complete the following steps to remove the riser-card assembly.
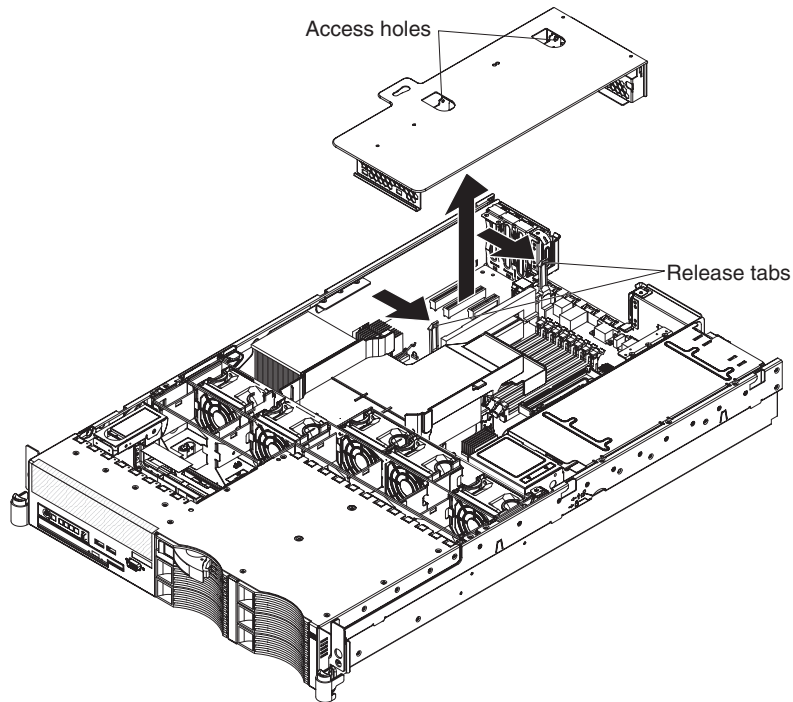
Access holes

Release tabs

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 cord and all external cables.
3. Remove the cover (see "Removing the cover" on page 11).
4. Push the two retention latches on the riser-card assembly toward the second microprocessor slot; then, grasp the assembly at the rear and side edges and lift it to remove it from the server. Place the riser-card assembly on a flat, static-protective surface.

Installing the riser-card assembly

To install the riser-card assembly, complete the following steps:
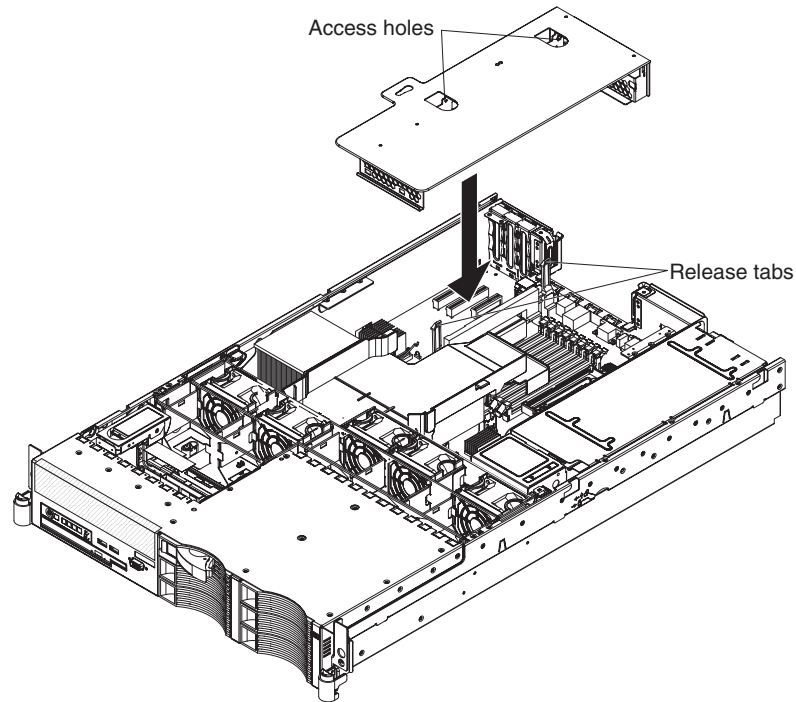
1. Read the safety information that begins on page v and "Installation guidelines" on page 9.
2. Make sure that the server and all peripheral devices are turned off, and that the power cords and all external cables are disconnected.
3. Reinstall the Remote Supervisor Adapter II SlimLine if you removed it.
4. Reinstall any adapters and reconnect any cables you might have removed in other procedures.
5. Carefully align the riser-card assembly with the retention latches, the guides on the rear of the server, and the riser-card connector on the system board; then, press down on the assembly. Make sure that the riser-card assembly is fully seated in the riser-card connector on the system board.

If you have other devices to install, do so now. Otherwise, go to "Completing the installation" on page 29.

Installing an adapter
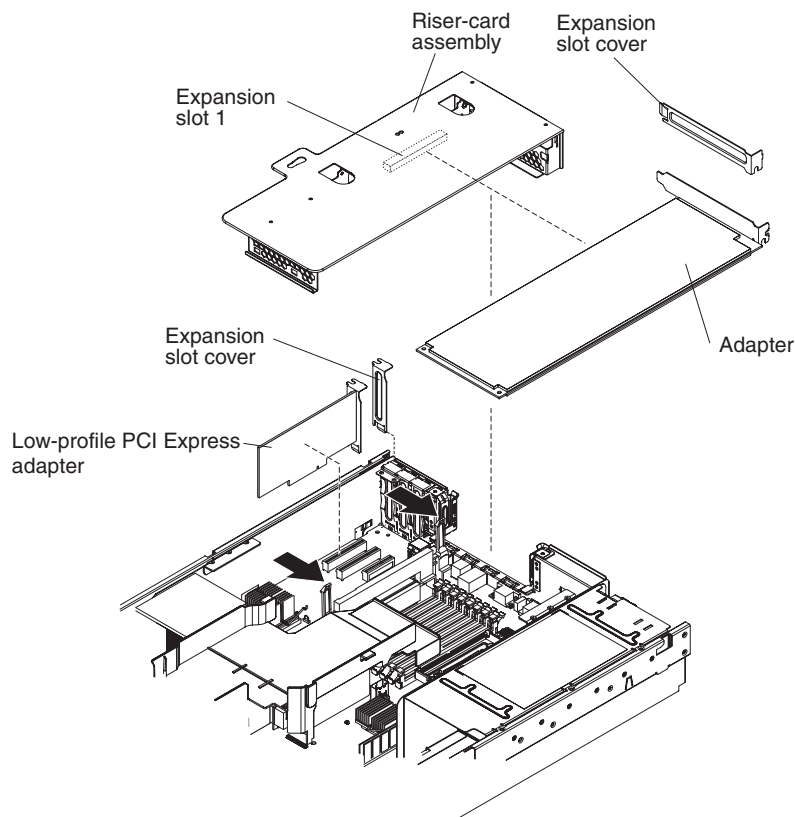
The following illustration shows the location of the PCI expansion slots.
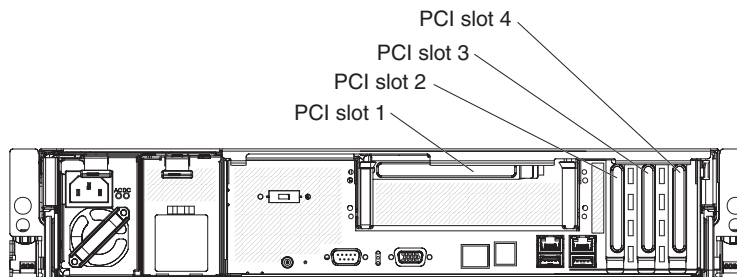
The following notes describe the types of adapters that the server supports and other information that you must consider when installing an adapter:

- You can install only low-profile adapters in PCI slots 2 and 3 on the system board.
- The server comes with one riser-card assembly that contains an HTX riser card that has an HTX connector. You can replace the HTX riser card assembly with one that has a PCI-Express x16 connector or one that has a PCI-X 64-bit, 133 MHz connector.
- You can install a standard full-length HTX, PCI Express, or PCI-X adapter in slot 1 on the riser-card assembly.
- The optional Remote Supervisor Adapter II SlimLine is installed on the riser card. To install a Remote Supervisor Adapter II SlimLine, see "Installing the Remote Supervisor Adapter II SlimLine" on page 28.
- Your server supports only 3.3 V and universal PCI adapters.

- The PCI bus configuration is as follows:
  - Non-hot-plug, full-length PCI Express x16 (x16 lanes) or PCI-X 64 bit, 133 MHz, slot 1
  - Non-hot-plug, low profile PCI Express x4 (x4 lanes), slot 2
  - Non-hot-plug, low profile PCI Express x8 (x8 lanes), slots 3 and 4
- The system scans devices in the following order, if you have not changed the default boot precedence: integrated Ethernet controllers, integrated SAS controller, and then PCI slots 1, 2, 3, and 4.

PCI riser card

The following illustration shows the location of the adapter expansion slot on the PCI riser card.

Note: For clarity, the riser-card assembly is shown inverted.
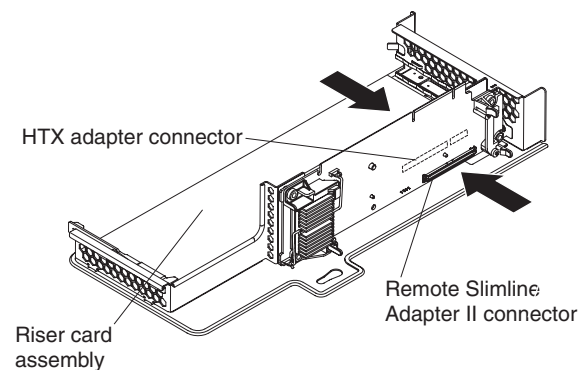
To install an adapter, complete the following steps:

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 all power cords and external cables; then, remove the cover.
3. Determine which expansion slot you will use for the adapter. If you are installing an adapter in PCI slot 1, remove the riser-card assembly (see "Removing the riser-card assembly" on page 23).
4. Slide the expansion-slot cover out of the PCI low-profile expansion slot or riser-card assembly expansion slot.
5. Install the adapter. The following illustration shows how to install an adapter on the riser-card assembly.

Note: For clarity, the riser-card assembly is shown inverted.
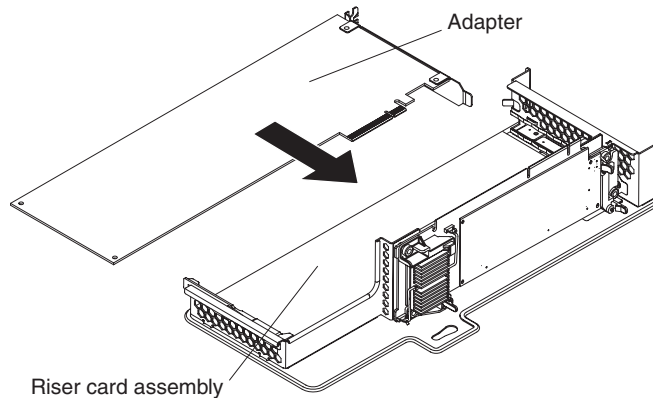
6. Replace the riser card assembly if you removed it to install the adapter (see "Installing the riser-card assembly" on page 25).

7. Perform any configuration tasks that are required for the adapter.

If you have other devices to install, do so now. Otherwise, go to "Completing the installation" on page 29.

Installing the Remote Supervisor Adapter II SlimLine

The optional Remote Supervisor Adapter II SlimLine is installed on the riser card. After the Remote Supervisor Adapter II SlimLine is installed, the systems-management Ethernet port on the rear of the server is active.

Note: Earlier versions of the Remote Supervisor Adapter II SlimLine might not work in this server. See the ServerProven list at http://www.ibm.com/servers/eserver/ serverproven/compat/us/ for the supported Remote Supervisor Adapter II SlimLine.

For details about installing a Remote Supervisor Adapter II SlimLine, see the documentation that comes with the adapter. The following illustration shows how to install the Remote Supervisor Adapter II SlimLine on the riser-card.
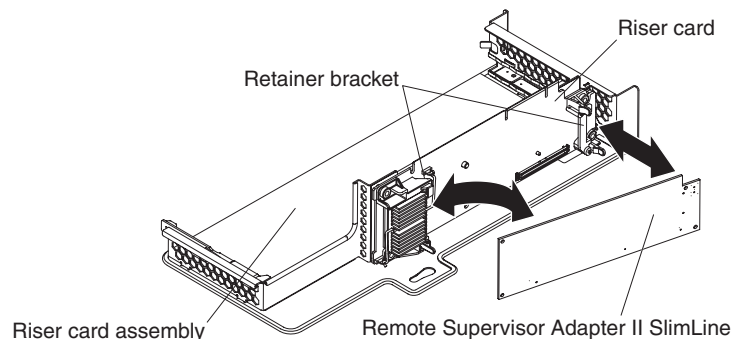
To install the Remote Supervisor Adapter II SlimLine, complete the following steps:

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 all power cords and external cables.

3. Remove the riser-card assembly (see "Removing the riser-card assembly" on page 23).

4. Turn the Remote Supervisor Adapter II SlimLine so that the connector aligns correctly with the connector on the riser card.

5. Install the end of the adapter without the connector first. Slide the adapter under the tabs; then, slide the holes in the adapter onto the pins on the retainer bracket.

6. Rotate the free end of the adapter down under the tabs and onto the pins on the retainer brackets; then, press the adapter into the connector on the riser card and make sure that all the tabs on the latch brackets secure the adapter in place.

See the documentation that comes with the Remote Supervisor Adapter II SlimLine for information about installing the firmware and configuring the option. Create a backup copy of the configuration so that if you need to replace the adapter in the future, you can restore the configuration.

Note: When you start the server for the first time after you install the Remote Supervisor Adapter II SlimLine, the start up process will take several minutes longer than a typical startup.

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

Replacing the ServeRAID SAS Controller

The server comes with a ServeRAID-8k-I SAS Controller installed. To replace the ServeRAID-8k-I SAS Controller or install a ServeRAID-8k SAS Controller, see the instructions in the *User's Guide* on the IBM *System x Documentation* CD.

Installing an optional tape drive

To install an optional tape drive in the server, see the instuctions in the *User's Guide* on the IBM *System x Documentation* CD.

Completing the installation

To complete the installation, complete the following steps:

1. If you removed the air baffle, install the air baffle (see "Installing the air baffle" on page 13).

2. If you removed the riser-card assembly, install the riser-card assembly (see "Installing the riser-card assembly" on page 25).

3. Install the cover. See "Installing the cover" on page 30 for more information.

4. Install the server in the rack cabinet. See the *Rack Installation Instructions* that come with the server for detailed information about how to install the server in a rack cabinet.

   Attention:

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

5. Connect the cables and power cords. See "Connecting the cables" on page 30 for more information.

6. Update the server configuration. See "Updating the server configuration" on page 31 for more information.

Installing the cover

To install the cover, complete the following steps.

Cover-release latch
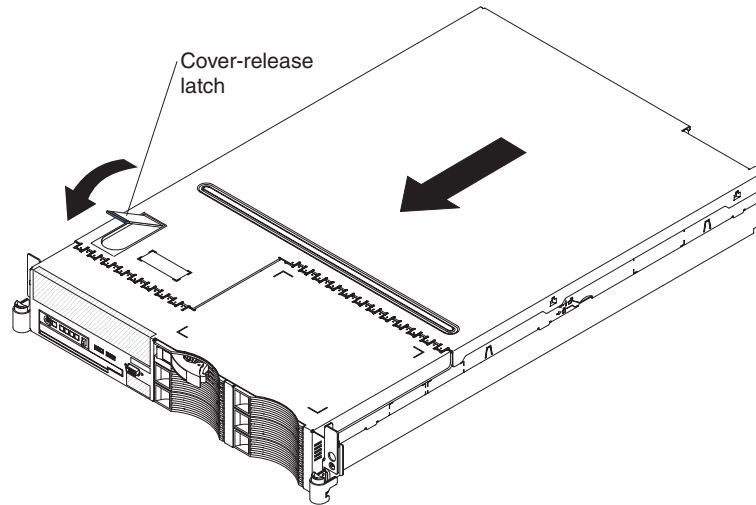
1. Place the cover-release latch in the open (up) position.
2. Insert the bottom tabs of the top cover into the matching slots in the server chassis.
3. Press down on the cover-release latch to lock the cover in place.
4. Slide the server into the rack.

Connecting the cables

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

Front view

USB 5 connector

USB 6 connector

Video connector

Rear view

Power cord connector — Systems-management Ethernet connector — Ethernet 2 connector / Ethernet 1 connector

Optional external SAS connector — Serial connector — Video connector — USB 1/USB 2 connectors — USB 4 connector / USB 3 connector
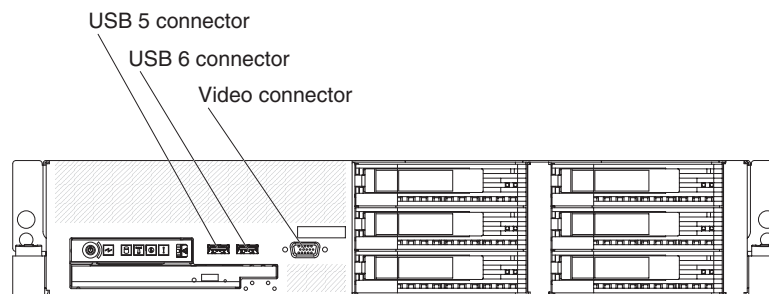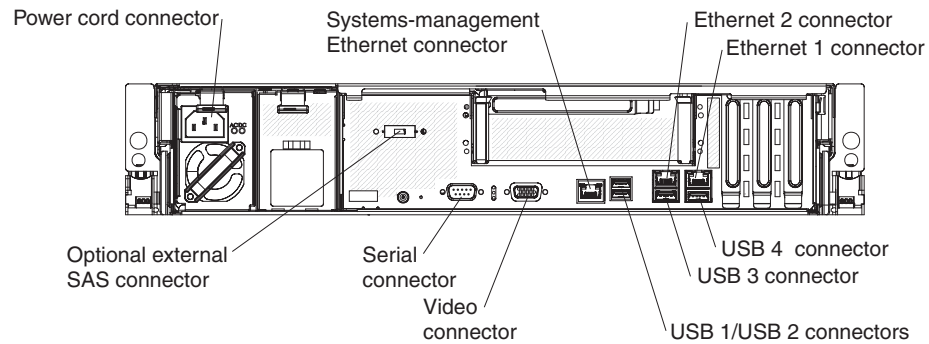
You must turn off the server before connecting or disconnecting cables from the server.

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.

Updating the server configuration

When you start the server for the first time after you add or remove an optional devices, you might receive a message that the configuration has changed. The Configuration/Setup Utility program starts automatically so that you can save the new configuration settings. For more information, see Chapter 4, "Configuring the server," on page 39.

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

If you have installed or removed a hard disk drive, see "Using the ServeRAID configuration programs" on page 40 for information about reconfiguring the disk arrays.

If you have installed a Remote Supervisor Adapter SlimLine to manage the server remotely, see the *Remote Supervisor Adapter 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, 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, light-emitting diodes (LEDs), and connectors on the front of the 3.5-inch model server.
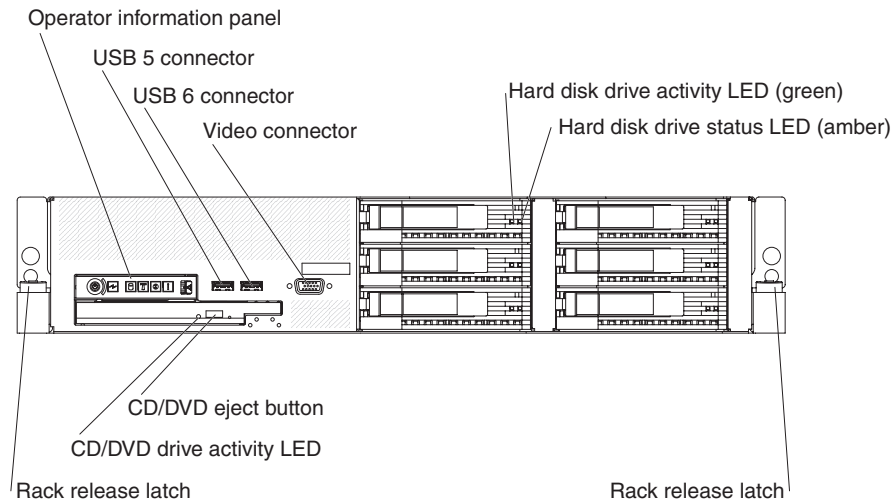
Operator information panel

USB 5 connector

USB 6 connector

Video connector

Hard disk drive activity LED (green)

Hard disk drive status LED (amber)

CD/DVD eject button

CD/DVD drive activity LED

Rack release latch

Rack release latch

The following illustration shows the controls, light-emitting diodes (LEDs), and connectors on the front of the 2.5-inch model server.

Operator information panel

USB 5 connector

USB 6 connector

Video connector

Tape drive bay

Hard disk drive activity LED (green)

Hard disk drive status LED (amber)

CD/DVD eject button

CD/DVD drive activity LED

Rack release latch

Rack release latch
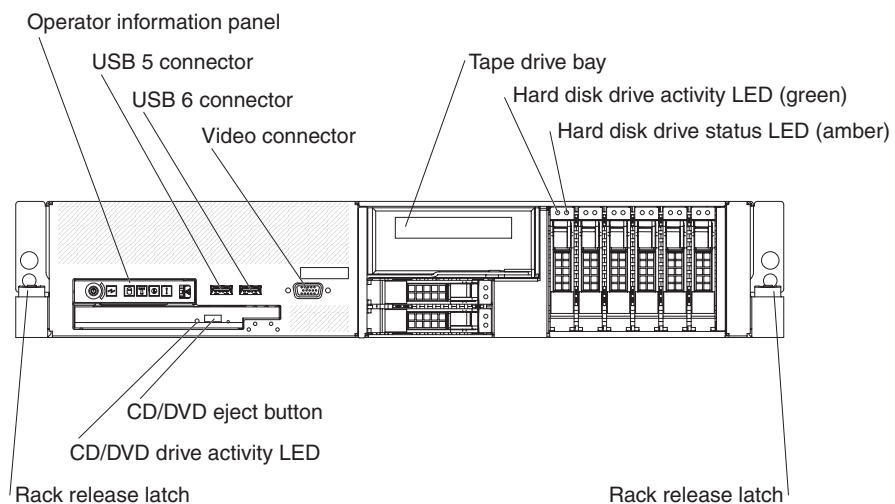
Operator information panel: This panel contains controls, LEDs, and connectors. The following illustration shows the controls, LEDs, and connectors on the operator information panel.

Power-on LED   Hard disk drive activity LED   Information LED   Release latch

Power-control button   System locator LED   System-error LED
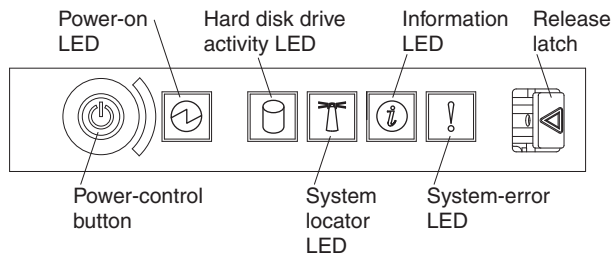
The following controls, LEDs, and connectors are on the operator information panel:

- **Power-control button:** Press this button to turn the server on and off manually. A power-control-button shield comes installed on the server to prevent the server from being turned off accidentally.
- **Power-on LED:** When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to an ac power source. When this LED is off, it indicates that ac power is not present, or the power supply or the LED itself has failed.

  Note: If this LED is off, it does not mean that there is no electrical power in the server. The LED might be burned out. To remove all electrical power from the server, you must disconnect the power cord from the electrical outlet.
- **Hard disk drive activity LED:** when this LED is flashing, it indicates that a hard disk drive is in use.
- **System-locator LED:** Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.
- **Information LED:** When this LED is lit, it indicates that a noncritical event has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.
- **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.
- **Release latch:** Slide this latch to the left to access the light path diagnostics panel.

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

Video connector: Connect a monitor to this connector.

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

Hard disk drive status LED: On some server models, each hot-swap hard disk drive has a status LED. When this LED is lit, it indicates that the drive has failed. When this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt as part of a RAID configuration. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

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

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

Rack release latches: Press these latches to release the server from the rack.

Rear view

The following illustration shows the connectors and LEDs on the rear of the server.
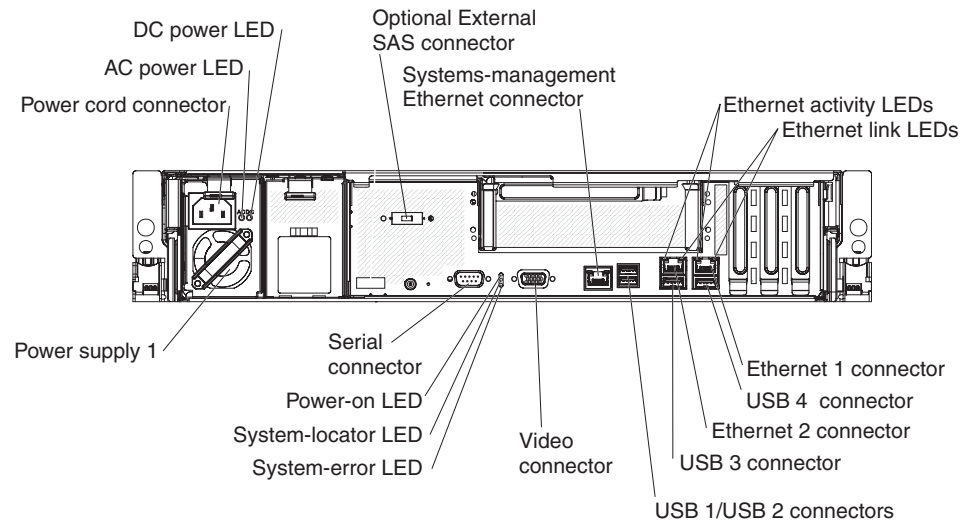
Power-cord connector: Connect the power cord to this connector.

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.

Optional external SAS connector: Connect a serial-attached SCSI (SAS) device to this connector.

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.

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

Video connector: Connect a monitor to this connector.

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.

System-locator LED: Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.

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

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).

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 your operating system supports the Wake on LAN feature, the Wake on LAN feature can turn on the server.

Note: When 4 GB 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.
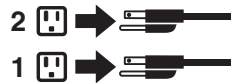
The server can be turned off in any of the following ways:

- 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 be turned off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- The service processor can turn off the server as an automatic response to a critical system failure.
- You can turn off the server through a request from the service processor.

Chapter 4. Configuring the server

The *ServerGuide Setup and Installation* CD provides software setup tools and installation tools that are specifically designed for your IBM server. Use this CD during the initial installation of the server to configure basic hardware features and to simplify the operating-system installation.

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

- Configuration/Setup Utility program
- Baseboard management controller utility programs
- RAID configuration programs
    - ServeRAID Configuration Utility program
    - ServeRAID Manager

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

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

1. Insert the CD, and restart the server. If the CD does not start, see "ServerGuide problems" on page 72.
2. Follow the instructions on the screen to:
    a. Select your language.
    b. Select your keyboard layout and country.
    c. View the overview to learn about ServerGuide features.
    d. View the readme file to review installation tips about your operating system and adapter.
    e. Start the setup and hardware configuration programs.
    f. Start the operating-system installation. You will need your operating-system CD.

Using the Configuration/Setup Utility program

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

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change the power-on passwords

- Set the startup characteristics of the server and the order of startup devices (startup-drive sequence)
- Set and change settings for advanced hardware features
- View and clear the error log
- Change interrupt request (IRQ) settings
- Enable USB legacy keyboard and mouse support
- Resolve configuration conflicts

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

1. Turn on the server.
2. When the prompt `Press F1 for Configuration/Setup` appears, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to access the full Configuration/Setup Utility menu. If you do not type the administrator password, a limited Configuration/Setup Utility menu will appear.
3. Select settings to view or change.

Using the ServeRAID configuration programs

Use the IBM ServeRAID Configuration Utility program and ServeRAID Manager to configure and manage redundant array of independent disks (RAID) arrays. 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 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 controllers

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

- The ServeRAID-8k-l SAS controller that comes with the server supports only RAID level-0, level-1, and level-10. You can replace the 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 use drives with different speeds and data rates in the array.
- To update the firmware and BIOS code for an optional ServeRAID SAS controller, you must use the IBM ServeRAID CD that comes with the ServeRAID option.

Using the IBM ServeRAID Configuration Utility program

Use the IBM ServeRAID Configuration Utility Manager 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 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. If you have set an administrator password, you are prompted to type the password.
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 the 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 Support* CD, to:

- 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. If you install a different type of RAID adapter in the server, follow the instructions in the documentation that comes with the adapter to view or change SCSI settings for attached devices.

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 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 two 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" review the information. To change the configuration, click **Modify arrays**.
5. Click **Apply**; when asked if you want to apply the new configuration, click **Yes**. The configuration information 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 information is saved in the controller and in the physical drives.
10. Exit from ServeRAID Manager and remove the CD from the CD 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**.

Using the baseboard management controller

The baseboard management controller provides basic environmental monitoring for the server. If an environmental condition exceeds a threshold or if system components fail, the baseboard management controller lights LEDs to help you diagnose the problem and also records the error in the BMC system event log.

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

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

  The command-line interface provides direct access to server management functions through the IPMI 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 Telenet 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 and 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/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/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 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

`gfxmanu (hd0,1)/boot/message`
`color white/blue black/light-gray`
`default 0`
`timeout 8`
 	
`title linux`
`  kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791`
`  initrd (hd0,1)/boot/initrd`
`title floppy`
`  root`
`  chainloader +1`
`title failsafe`
`  kernal (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp`
`disableapic maxcpus=0 3`
 	
`  initrd (hd0,1)/boot/initrd.shipped`
	
	1
	
	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

`#gfxmanu (hd0,1)/boot/message`
`color white/blue black/light-gray`
`default 0`
`timeout 8`
 	
`# This will allow you to only Monitor the OS boot via SOL`
`title linux SOL Monitor`
`  kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 console=ttyS1,19200`
`console=tty1`
`  initrd (hd0,1)/boot/initrd`
`# 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`
	
	1

Modified /boot/grub/menu.lst contents	Notes

``
title floppy
  root
  chainloader +1
title failsafe
  kernel (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp
disableapic maxcpus=0 3
 	
  initrd (hd0,1)/boot/initrd.shipped
``
	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 completing 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
Boot Loader Settings --------------------------- timeout: 30 default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS Boot Entries ---------------- Boot entry ID: 1 OS Friendly Name: Windows Server 2003, Standard Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS OS Load Options: /fastdetect

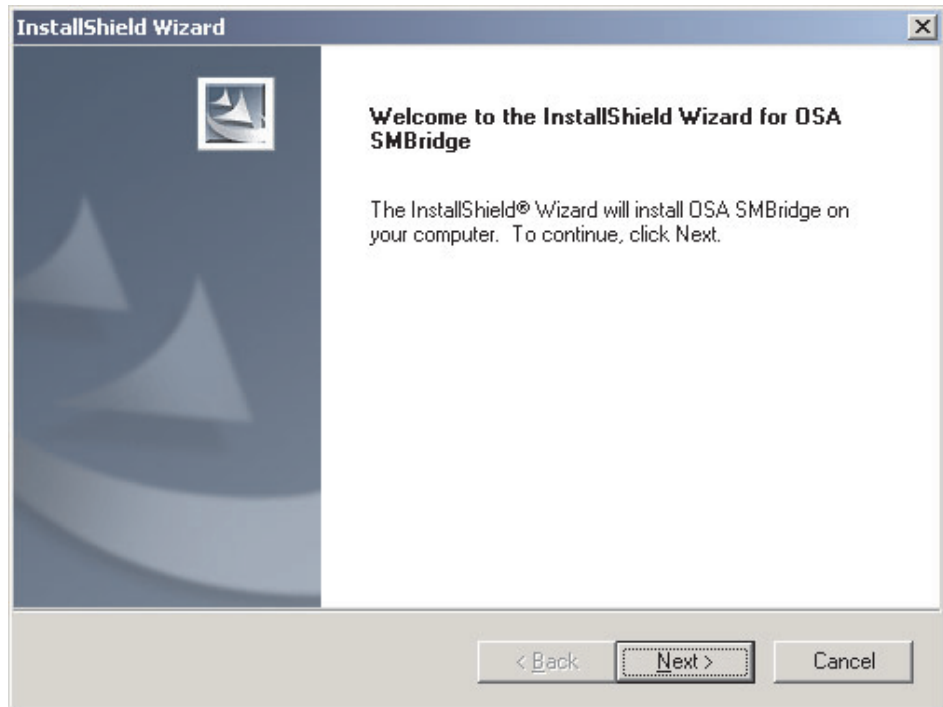| **Modified bootcfg program output** |
| :--- |
| Boot Loader Settings
----
timeout: 30
default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
redirect: COM1
redirectbaudrate: 19200
Boot Entries

Boot entry ID: 1
OS Friendly Name: Windows Server 2003, Standard
Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS
OS Load Options: /fastdetect /redirect |

You must restart the Windows 2003 operating system after completing 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/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/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.
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 smbrodge-2.0-xx6.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 a SDR/FRU update. The firmware update utility program updates the baseboard management controller firmware and 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 System Event/Error 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 diagnose and correct problems using the information in this chapter, see Appendix A, "Getting help and technical assistance," on page 77, the *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 beep codes indicate the detection of a problem.
  - One beep indicates successful completion of POST, with no errors.
  - More than one beep indicates that POST detected a problem. Error messages are displayed also if POST detects a hardware-configuration problem.

    See "POST beep codes" and the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for more information.

- **Troubleshooting tables**

  These tables list problem symptoms and actions to correct the problems. See "Troubleshooting tables" on page 61 for more information.

- **Diagnostic programs and error messages**

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

- **Light path diagnostics**

  Use light path diagnostics to diagnose system errors quickly. See "Light path diagnostics" on page 73 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.

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

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

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

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 *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, go to http://www.ibm.com/servers/eserver/support/xseries/index.html, select **System x3655** and click **Go**; then, click the **Install and use** tab, and click **Product documentation**.

Table 3. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
101, 102	Tick timer internal interrupt, internal timer channel 2	1. Reseat the system board. 2. (Trained service technician only) Replace the system board.

151	Real-time clock error.	1. Reseat the battery.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. System-board battery
		  b. (Trained service technician only) System board

162	Device configuration error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, and save the settings.
		2. Reseat the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. Failing device
		  c. (Trained service technician only) System board

163	Real-time clock error.	1. Run the Configuration/Setup Utility program, select **Load Default Settings**, make sure the date and time are correct, and save the settings.
		2. Reseat the battery.
		3. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Battery
		  b. (Trained service technician only) System board

Table 3. Abbreviated list of POST error messages (continued)

POST message	Failing device or problem found	Suggested action

289	A DIMM has been disabled by the user or by the system.	1. If the DIMM was disabled by the user, run the Configuration/Setup Utility program and enable the DIMM.
		2. Reseat the disabled DIMM.
		3. (Trained service technician) Reseat the microprocessor.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. Disabled DIMM
		  b. Microprocessor
		  c. (Trained service technician only) System board

301	Keyboard or keyboard controller error.	1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup.
		2. Reseat the keyboard.
		3. Replace the following components one at at time, in the order shown, restarting the server each time:
		  a. Keyboard
		  b. (Trained service technician only) System board

303	Keyboard controller error.	(Trained service technician only) Replace the system board.

00019xxx	Microprocessor x is not functioning or failed the built-in self-test.	1. (Trained service technician only) Reseat microprocessor x.
		2. Replace the following components one at a time, in the order shown, restarting the server each time:
		  a. (Trained service technician) Microprocessor x
		  b. (Trained service technician only) System board

Table 3. Abbreviated list of POST error messages (continued)

POST message	Failing device or problem found	Suggested action

00180xxx	A PCI adapter has requested memory resources that are not available.	1. See http:\\www.ibm.com/servers/eserver/ support/xseries/index.html and search for MIGR-61663 for additional information on the error code.
		2. Verify that the BIOS code is at the latest level.
		3. Run the Configuration/Setup Utility program to verify that the interrupt resource settings are correct.
		4. Reseat the failing adapter (if installed).
		5. Replace the following components one at a time, in the order shown, restarting the server each time:
		   a. Failing adapter
		   b. (Trained service technician only) System board

012980*xx* 012981*xx*	No update data for microprocessor *xx*.	1. Update the BIOS code. 2. Reseat microprocessor xx. 3. Replace microprocessor xx.

19990305	An operating system was not found.	1. Make sure that a bootable operating system is installed.
		2. Run the hard disk drive diagnostic test.
		3. Reseat the had disk drive.
		4. Replace the following components one at a time, in the order shown, restarting the server each time:
		   a. Hard disk drive
		   b. (Trained service technician only) System board

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 on the operator information panel (see "Light path diagnostics" on page 73).
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 or 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* 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 or DVD drive is not recognized.	1. Make sure that:
	   • The IDE channel to which the CD-RW/DVD drive is attached (primary) is enabled in the Configuration/Setup Utility program.
	   • All cables and jumpers are installed correctly.
	   • The correct device driver is installed for the CD-RW/DVD drive.
	2. Run the CD-RW/DVD drive diagnostic programs.
	3. Reseat the following components:
	   a. CD-RW/DVD drive
	   b. IDE/Ultrabay Enhanced (UBE) interposer card cable
	4. Replace the components listed in step 3 one at a time, in the order shown, restarting the server each time.

A CD-RW/DVD is not working correctly.	1. Clean the CD or DVD. 2. Run the CD-RW/DVD drive diagnostic programs. 3. Reseat the CD-RW/DVD drive. 4. Replace the CD-RW/DVD drive.
The CD-RW/DVD drive tray is not working.	1. Make sure that the server is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the CD-RW/DVD drive. 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* 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 cover lock is broken, an LED is not working, or a similar problem has occurred.	If the part is a CRU, replace it. If the part is a FRU, the part must be replaced by a trained service technician.

Hard disk drive problems

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

Symptom	Action
Not all drives are recognized by the hard disk drive diagnostic test (the Fixed Disk 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 SCSI Fixed Disk Test (see"Running the diagnostic programs" in the *Problem Determination and Service Guide*).

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_ 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: • All cables and cords are connected securely to the rear of the server and attached devices. • When the server is turned on, air is flowing from the fan grille. If there is no airflow, the fan is not working. This can cause the server to overheat and shut down. 2. Check the system-error log or BMC log (see "Error Logs" in the _Problem Determination and Service Guide_).

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_ 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. If you are using a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. Make sure that: • The keyboard cable is securely connected. • The server and the monitor are turned on. 3. If you are using a USB keyboard and it is connected to a USB hub, disconnect the keyboard from the hub and connect it directly to the server. 4. Replace the following components one at a time, in the order shown, restarting the server each time: a. Keyboard 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* 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 mouse or pointing device does not work.	1. Make sure that:
	  • The mouse or pointing-device cable is securely connected to the server.
	  • The mouse or pointing-device device drivers are installed correctly.
	  • The server and the monitor are turned on.
	  • The mouse option is enabled in the Configuration/Setup Utility program.
	2. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the server.
	3. Reseat the mouse or pointing device cable.
	4. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Mouse or pointing device
	  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* 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:
	  • No error LEDs are lit on the operator information panel.
	  • The memory modules are seated correctly.
	  • You have installed the correct type of memory (see "Installing a memory module" on page 14).
	  • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program.
	  • All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled.
	2. Check the POST error log for error message 289:
	  • If a DIMM was disabled by a system-management interrupt (SMI), replace the DIMM.
	  • If a DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM.
	3. Run memory diagnostics (see "Running the diagnostic programs" in the *Problem Determination and Service Guide*).
	4. Make sure that there is no memory mismatch when the server is at the minimum memory configuration (two 512 MB DIMMs).
	5. Add one pair of DIMMs at a time, making sure that the DIMMs in each pair are matching.
	6. Reseat the following components one at a time, in the order shown, restarting the server each time:
	  a. DIMMs
	  b. (Trained service technician only) System board
	7. Replace the components listed in step 7 one at a time, in the order shown, restarting the server each time.

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_ 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 microprocessor is not working correctly.	1. Correct any errors that are indicated by the light path diagnostics LEDs (see "Light path diagnostics" on page 73).
	 2. Make sure that the server supports all the microprocessors and that the microprocessors match in speed and cache size.
	 3. (Trained service technician only) Make sure that microprocessor 1 is seated correctly.
	 4. If there is no indication of which microprocessor has failed, isolate the error by testing with one microprocessor at a time.
	 5. (Trained service technician only) If there are multiple error codes or light path diagnostics LEDs that indicate a microprocessor error, reverse the locations of two microprocessors to determine whether the error is associated with a microprocessor or with a microprocessor socket.
	   • If the error is associated with a microprocessor, replace the microprocessor.
	   • If the error is associated with a microprocessor socket, replace the system board.

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.

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

Symptom	Action

Testing the monitor.	1. Make sure that the monitor cables are firmly connected.
	2. Try using the other video port.
	3. Try using a different monitor on the server, or try testing the monitor on a different server.
	4. Run the diagnostic programs (see the *Problem Determination and Service Guide*). If the monitor passes the diagnostic programs, the problem might be a video device driver.
	5. Reseat the Remote Supervisor Adapter II SlimLine (if one is present).
	6. Replace the following components one at a time, in the order shown, restarting the server each time:
	  a. Remote Supervisor Adapter II Slimline (if one is present)
	  b. (Trained service technician only) System board

The screen is blank.	1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server.
	2. Make sure that:
	  • The server is turned on. If there is no power to the server, see "Power problems" on page 70.
	  • The monitor cables are connected correctly.
	  • The monitor is turned on and the brightness and contrast controls are adjusted correctly.
	  • No beep codes sound when the server is turned on.
	
	  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).
	3. Make sure that the correct server is controlling the monitor, if applicable.
	4. Make sure that damaged BIOS code is not affecting the video; see the *Problem Determination and Service Guide* for information about recovering from a BIOS failure.
	5. 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* 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 works when you turn on the server, but the screen goes blank when you start some application programs.	1. Make sure that: • The application program is not setting a display mode that is higher than the capability of the monitor. • You installed the necessary device drivers for the application. 2. Run video diagnostics (see the *Problem Determination and Service Guide* for information about running the diagnostic programs). If the video passes the video diagnostics, the video is good; see the *Problem Determination and Server Guide* for information about solving undetermined problems.
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	1. If the monitor self-tests show that the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. **Attention:** Moving a color monitor while it is turned on might cause screen discoloration. Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor. **Notes:** a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. 2. Reseat the following components: a. Monitor cable b. Remote Supervisor Adapter II SlimLine (if one is installed) 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor cable b. Monitor c. Remote Supervisor Adapter II SlimLine (if one is present) 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. 2. Reseat the monitor cable. 3. Replace the following components one at a time, in the order shown, restarting the server each time: a. Monitor 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_ 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: • The device is designed for the server (see http://www.ibm.com/servers/eserver/serverproven/compat/us/). • You followed the installation instructions that came with the device and the device is installed correctly. • You have not loosened any other installed devices or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or any other device is changed, you must update the configuration. 2. Reseat the device that you just installed. 3. Replace the device that you just installed.
An IBM optional device that used to work does not work now.	1. Make sure that all of the hardware and cable connections for the device are secure. 2. If the device comes with test instructions, use those instructions to test the device. 3. Reseat the failing device. 4. Follow the instructions for device maintenance, such as keeping the heads clean, and troubleshooting in the documentation that comes with the device. 5. 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* 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 not work (the server does not start).
 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:
	    a. Disconnect the server power cords.
	    b. Reconnect the power cords.
	    c. (Trained service technician only) Reseat the operator information panel cables, and then repeat steps 1a and 1b. If the server starts, reseat the operator information panel. If the problem remains, replace the operator information panel.
	 2. Make sure that the reset button is working correctly:
	    a. Disconnect the server power cords.
	    b. Reconnect the power cords.
	    c. Reseat the light path diagnostics panel cable, and then repeat steps 1a and 1b.
	        • If the server starts, replace the light path diagnostics panel.
	        • If the server does not start, go to step 3.
	 3. Make sure that:
	    • The power cords are correctly connected to the server and to a working electrical outlet.
	    • The type of memory that is installed is correct.
	    • The LEDs on the power supply do not indicate a problem.
	    • The microprocessors are installed in the correct sequence.
	 4. Reseat the following components:
	    a. Power switch connector
	    b. Power backplane
	 5. Replace the components listed in step 4 one at a time, in the order shown, restarting the server each time.
	 6. If you just installed an optional device, remove it, and restart the server. If the server now turns on, you might have installed more devices than the power supply supports.
	 7. See "Power supply LEDs" in the *Problem Determination and Service Guide*.
	 8. See "Solving undetermined problems" in the *Problem Determination and Service Guide*.

The server does not turn off.	1. Determine whether you are using an Advanced Configuration and Power Interface (ACPI) or non-ACPI operating system. If you are using a non-AC PI operating system complete the following steps:
	    a. Press Ctrl+Alt+Delete.
	    b. Turn off the server by pressing the power-control button for 5 seconds.
	    c. Restart the server.
	    d. If the server fails POST and the power-control button does not work, disconnect the ac power cord for 20 seconds; then, reconnect the ac power cord and restart the server.
	 2. If the problem remains, or if you are using an ACPI-aware operating system, suspect the 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* 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 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* 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:
	  • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports is disabled.
	  • The serial-port adapter (if one is installed) is seated correctly.
	2. Reseat the serial port adapter.
	3. Replace the serial port adapter.

A serial device does not work.	1. Make sure that:
	  • The device is compatible with the server.
	  • The serial port is enabled and is assigned a unique address.
	  • The device is connected to the correct connector (see "Rear view" on page 35).
	2. Reseat the following components:
	  a. Failing serial device
	  b. Serial cable
	  c. Remote Supervisor Adapter II SlimLine (if one is installed)
	3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.

ServerGuide problems

The following table lists problem symptoms and suggested solutions.

Table 4. ServerGuide Setup and Installation CD

Symptom	Suggested 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 (or DVD) drive. 2. If the startup (boot) sequence settings have been altered, make sure that the CD drive is first in the startup sequence. 3. If more than one CD drive is installed, make sure that only one drive is set as the primary drive. Start the CD from the primary drive.
The ServeRAID program cannot view all installed drives, or the operating system cannot be installed.	1. Make sure that there are no duplicate IDs or IRQ assignments. 2. Make sure that the hard disk drive is connected correctly.
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start the operating-system CD.	Make sure that the operating-system CD is supported by the ServerGuide program. See the *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 operating system is supported on the server. If the operating system is supported, either there is no logical drive defined (SAS RAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide program and make sure that setup is complete.

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* 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:
	  • The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, the server might have a memory-address conflict.
	  • The software is designed to operate on the server.
	  • Other software works on the server.
	  • The software works on another server.
	2. If you receive any error messages while you use the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem.
	3. Contact your place of purchase of the software.

Universal Serial Bus (USB) port 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* 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.**

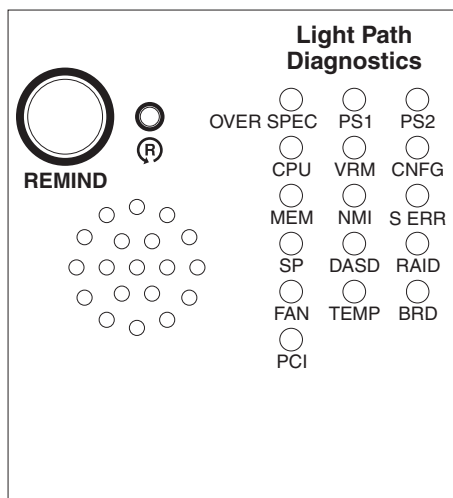| Symptom	Action
A USB device does not work.	1. Run USB diagnostics (see "Running the diagnostic programs" in the *Problem Determination and Server Guide*. 2. Make sure that: • The correct USB device driver is installed. • The operating system supports USB devices. • A standard PS/2 keyboard or mouse is not connected to the server. If it is, a USB keyboard or mouse will not work during POST. 3. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program (see the *User's Guide* for more information). 4. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server.

Video problems

See "Monitor problems" on page 67.

Light path diagnostics

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

The following illustration shows the controls and LEDs on the light path diagnostics panel.

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.

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 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.

   Important: If the server has a baseboard management controller, clear the BMC log and system-event log after you resolve the condition. This will turn off the information LED.

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.

LED	Problem	Action
None, but the system-error LED is lit.	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	There is insufficient power to power the server.	1. Add an optional power supply if only one power supply is installed. 2. Use 220 V ac input power. 3. Reseat the following components: a. Power supply b. Power backplane 4. Replace the components listed in step 3 one at a time, in the order shown, restarting the server each time.
PS 1	The power supply in bay 1 has failed.	1. If all 10 fans are installed, make sure power supply 1 and power supply 2 are installed. 2. Make sure the power supply is correctly seated and the AC power cord is plugged in. 3. If the problem remains, replace the power supply.

LED	Problem	Action
PS 2	The power supply in bay 2 has failed.	1. If all 10 fans are installed, make sure power supply 1 and power supply 2 are installed. 2. Make sure the power supply is correctly seated and the AC power cord is plugged in. 3. If the problem remains, replace the power supply.
CPU	A microprocessor has failed, is missing, or has been incorrectly installed. **Note:** (Trained service technician only) Make sure that the microprocessors are installed in the correct sequence; see "Installing an additional microprocessor" on page 19).	1. Check the BMC log or the system-error log to determine the reason for the lit LED. 2. Find the failing, missing, or mismatched microprocessor by checking the LEDs. 3. (Trained service technician) Reseat the failing microprocessor. 4. (Trained service technician) Replace the failing microprocessor.
VRM		Not Used
CNFG	A hardware configuration error has occurred.	1. When lit in conjunction with the FAN LED, check the fan configuration. 2. When lit in conjunction with the PS1 or PS2 LEDs, check the power supply configuration. 3. When lit in conjunction with the CPU LED, check the microprocessors that were just installed to make sure that they are compatible with each other (see "Installing an additional microprocessor" on page 19 for compatibility requirements). 4. (Trained service technician only) Replace an incompatible microprocessor. 5. Check the system error log for information about the error. Replace any components that are indicated.
MEM	A memory error has occurred.	1. Replace the failing DIMM, which is indicated by the lit LED on the system board. 2. If no LEDs on the board are lit, check the memory population sequence (DIMMs not installed in pairs).
NMI	A hardware error has been reported to the operating system. **Note:** The PCI or MEM LED might also be lit.	1. See the BM log and the system-error log (see "Error logs" in the *Problem Determination and Service Guide*). 2. If the PCI LED is lit, follow the instructions for that LED. 3. If the MEM LED is lit, follow the instructions for that LED. 4. Restart the server.
S ERR	A PCI slot error has occurred.	1. See the BMC log or the system-error log. 2. Replace the failing adapter. 3. (Trained service technician only) Replace the system board.
SP	There is a fault in the Remote Supervisor Adapter II SlimLine.	1. Reseat the Remote Supervisor Adapter II SlimLine. 2. Update the firmware for the Remote Supervisor Adapter II SlimLine (see "Updating the firmware" in the *Problem Determination and Service Guide*). 3. Replace the Remote Supervisor Adapter II SlimLine.

LED	Problem	Action
DASD	A hard disk drive has failed or has been removed. **Note:** The error LED on the failing hard disk drive is also lit.	1. Reinstall the removed drive. 2. Reseat the following components: a. Failing hard disk drive b. Hard disk drive backplane c. Disk drive cable d. (Trained service technician only) System board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
RAID	A RAID adapter has indicated fault.	1. See the BMC log or the system-error log (see "Error logs" in the *Problem Diagnostic and Service Guide*). 2. Reseat the following components: a. RAID adapter b. Hard disk drives c. (Trained service technician only) System board 3. Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
FAN	A fan has failed, is operating too slowly, or has been removed. The TEMP LED might also be lit.	1. Reinstall the removed fan. 2. If an individual fan LED is lit, replace the fan.
TEMP	A system temperature or component has exceeded specifications. **Note:** A fan LED might also be lit.	1. See the BMC log or the system-error log (see "Error logs" in the *Problem Determination and Service Guide* for the source of the fault). 2. Make sure that the airflow in the server is not blocked. 3. If a fan LED is lit, reseat the fan. 4. Replace the fan for which the LED is lit. 5. Make sure that the room temperature is not too high. See "Features and specifications" on page 4. 6. Call for service.
BRD	An error has occurred on the system board.	1. Check the LEDs on the system board to identify the component that is causing the error. 2. Check the system error log for information about the error.
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 on the PCI slots to identify the component that is causing the error. • Check the system error log for information about the error. • 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. • Call for service.

Appendix A. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system or optional device, 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 *Hardware Maintenance Manual and Troubleshooting Guide* or *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.

  Note: For some IntelliStation models, the *Hardware Maintenance Manual and Troubleshooting Guide* is available only from the IBM support Web site.

- Go to the IBM support Web site at http://www.ibm.com/servers/eservers/support /xseries/index.html 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/servers/eservers/support/xseries/ index.html 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 IntelliStation information is http://www.ibm.com/intellistation/.

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

Software service and support

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

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

Hardware service and support

Important: When you call for service, you will be asked to provide the four-digit machine type of your system, which is 7985.

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

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

IBM Taiwan product service

台灣 IBM 產品服務聯絡方式：
台灣國際商業機器股份有限公司
台北市松仁路 7 號 3 樓
電話：0800-016-888

IBM Taiwan product service contact information:
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    3F, No 7, Song Ren Rd.
    Taipei, Taiwan
    Telephone: 0800-016-888

Appendix B. Notices

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Active PCI-X	IntelliStation	Tivoli Enterprise
AIX	NetBAY	Update Connector
Alert on LAN	Netfinity	Wake on LAN

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BladeCenter	Predictive Failure Analysis	XA-32
Chipkill	ServeRAID	XA-64
e-business logo	ServerGuide	X-Architecture
@server	ServerProven	XpandOnDemand
FlashCopy	System x	xSeries
i5/OS		

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Important notes

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

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

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

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

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

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

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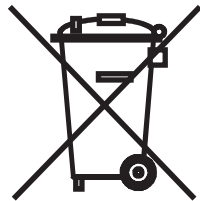
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This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.

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This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

Remarque: Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

In accordance with the European WEEE Directive, electrical and electronic equipment (EEE) is to be collected separately and to be reused, recycled, or recovered at end of life. Users of EEE with the WEEE marking per Annex IV of the WEEE Directive, as shown above, must not dispose of end of life EEE as unsorted municipal waste, but use the collection framework available to customers for the return, recycling, and recovery of WEEE. Customer participation is important to minimize any potential effects of EEE on the environment and human health due to the potential presence of hazardous substances in EEE. For proper collection and treatment, contact your local IBM representative.

Battery return program

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

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

For Taiwan: Please recycle batteries.

For the European Union:

For California: Perchlorate material – special handling may apply. See http://www.dtsc.ca.gov/hazardouswaste/perchlorate/.

The foregoing notice is provided in accordance with California Code of Regulations Title 22, Division 4.5 Chapter 33. Best Management Practices for Perchlorate Materials. This product/part may include a lithium manganese dioxide battery which contains a perchlorate substance.

Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

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

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

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