



System x3650

Type 7979

Installation Guide

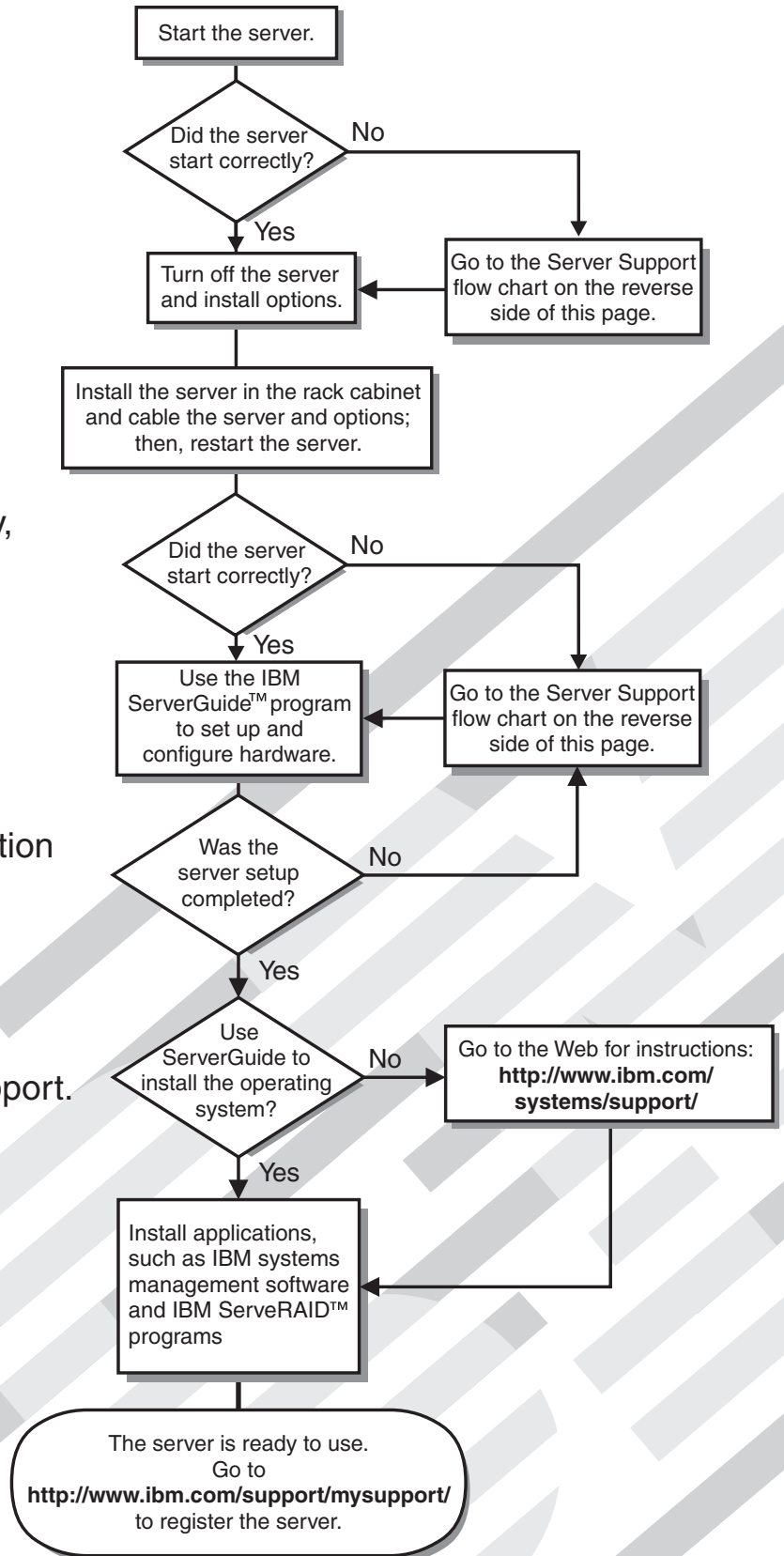
Welcome.

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

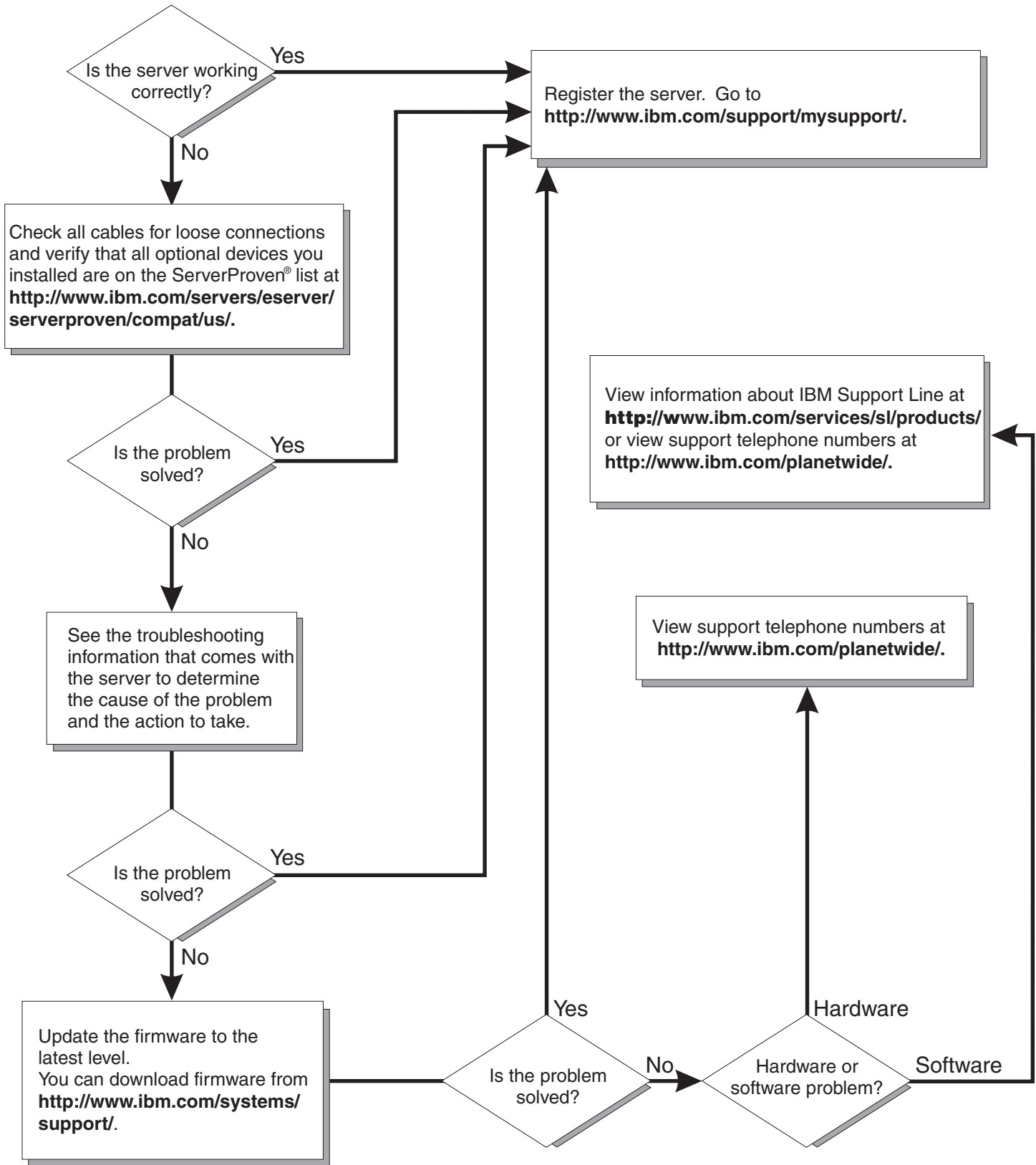
This server *Installation Guide* contains information for setting up and configuring your server.

For detailed information about your server, view the documentation on the IBM *Documentation CD*.

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



Server Support



IBM System x3650 Type 7979



Installation Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 81 and the *Warranty and Support Information* document on the IBM *System x Documentation* CD.

Sixth Edition (December 2007)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

Each caution and danger statement in this document is labeled with a number. This number is used to cross reference an English-language caution or danger statement with translated versions of the caution or danger statement in the *Safety Information* document.

For example, if a caution statement is labeled “Statement 1”, translations for that caution statement are in the *Safety Information* document under “Statement 1.”

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

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

To Disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

Statement 2:



CAUTION:

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

Do not:

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

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

Statement 3:



CAUTION:

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

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



DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.



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

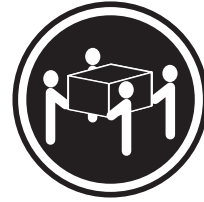
Statement 4:



≥ 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.



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.



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.

Important: This product is not suitable for use with visual display workplace devices according to Clause 2 of the German Ordinance for Work with Visual Display Units.

Chapter 1. Introduction

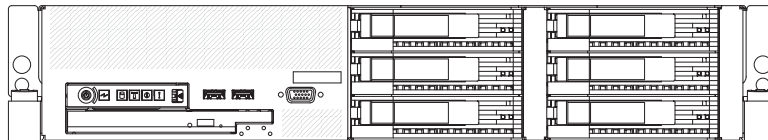
This *Installation Guide* contains instructions for setting up your IBM® System x3650 Type 7979 server and basic instructions for installing some optional devices. More detailed instructions for installing optional devices are in the *User's Guide* on the *IBM System x Documentation CD*, which comes 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

Attention: The information in this document regarding installing and removing power supplies and connecting and disconnecting power refers to ac power supplies only. If the server contains dc power supplies, see the documentation that comes with the dc power supplies. In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply.

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 intend to install a tape drive, the tape drive will occupy 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, complete the following steps:

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

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

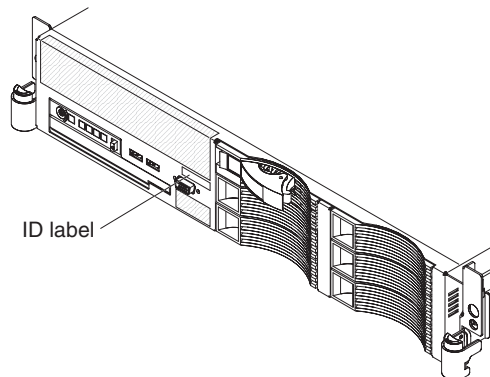
The server comes with an IBM *ServerGuide™ Setup and Installation* CD to help you configure the hardware, install device drivers, and install the operating system.

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

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

Product name	IBM System x3650 server
Machine type	7979
Model number	_____
Serial number	_____

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



Note: This illustration shows a model with 3.5-inch serial-attached SCSI (SAS) hot-swap hard disk drives. Models with 2.5-inch SAS 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 <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 Ctrl+F to use the Acrobat search function or Alt+F to use the xpdf search function within the document.

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

Notices and statements in this document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information* document, which is on the IBM *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 the 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.” A 1-U-high device is 1.75 inches tall.

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

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> • Intel® Xeon™ FC-LGA 771 dual-core with 4 MB Level-2 cache or quad-core with 8 MB (2x4 MB) Level-2 cache • Support for up to two microprocessors • Support for Intel Extended Memory 64 Technology (EM64T) <p>Note:</p> <ul style="list-style-type: none"> • Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors. • For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/serverproven/compat/us/ <p>Memory:</p> <ul style="list-style-type: none"> • Twelve DIMM connectors • Minimum: 1 GB • Maximum: 48 GB • Type: Fully buffered DIMM (FBD) PC2-5300 DIMMs only • Sizes: 512 MB, 1 GB, 2 GB, or 4 GB (when available), in pairs • Chipkill™ supported <p>Drives:</p> <p>CD/DVD: IDE 24x CD-RW/ 8x DVD combination</p> <p>Expansion bays:</p> <ul style="list-style-type: none"> • Hot-swap hard disk drive bays: SAS only. Number and size depend on the server model. One of the following configurations: <ul style="list-style-type: none"> – Six 3.5-inch drive bays (optional tape drive [SATA or SCSI] requires two of these bays) – Eight 2.5-inch drive bays and one tape-drive (SATA or SCSI) bay • One 5.25-inch Ultrabay Enhanced bay (CD-RW/DVD drive installed) <p>Expansion slots:</p> <ul style="list-style-type: none"> • Two PCI Express x8 slots (x4 lanes) on system board (low profile) • Support for either of the following optional riser cards: <ul style="list-style-type: none"> – Riser card with two PCI Express x8 slots (x8 lanes) (standard) – Riser card with two 133 MHz/64-bit PCI-X slots 	<p>Hot-swap fans:</p> <ul style="list-style-type: none"> • Standard: Five • Maximum: Ten - provide redundant cooling <p>Hot-swap power supplies:</p> <p>835 watts (100 - 240 V ac)</p> <ul style="list-style-type: none"> • Minimum: One • Maximum: Two - provide redundant power <p>Size (2 U):</p> <ul style="list-style-type: none"> • 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 <p>Integrated functions:</p> <ul style="list-style-type: none"> • Baseboard management controller • Two Broadcom 10/100/1000 Ethernet controllers with Wake on LAN® support and TCP/IP Offload Engine (TOE) support • One RAID controller, active only when a 8k or 8k-l SAS controller is installed • One serial port • One serial-attached SCSI (SAS) controller • Seven Universal Serial Bus (USB) ports (two on front and four on rear of server, plus one internal), v2.0 supporting v1.1 • Two video ports (one on front and one on rear of server) • One internal serial ATA (SATA) connector for tape • Support for Remote Supervisor Adapter II SlimLine <p>Note: In messages and documentation, the term <i>service processor</i> refers to the baseboard management controller or the optional Remote Supervisor Adapter II SlimLine.</p> <p>Video controller:</p> <ul style="list-style-type: none"> • ATI RN50 video on system board • Compatible with SVGA and VGA • 16 MB DDR video memory 	<p>ServeRAID SAS controller:</p> <ul style="list-style-type: none"> • ServeRAID™-8k-l SAS Controller that supports RAID levels 0, 1, 10 (standard) • Upgradeable to ServeRAID-8k SAS Controller, 256 MB with battery backup, that supports RAID levels 0, 1, 1E, 5, 6, and 10 <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 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: <ul style="list-style-type: none"> – Server on/off: 8% to 80% – Shipment: 5% to 100% <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Declared sound power, idle: 6.8 bel • Declared sound power, operating: 6.8 bel <p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> • Minimum configuration: 1230 Btu per hour (360 watts) • Maximum configuration: 3312 Btu per hour (970 watts) <p>Electrical input with hot-swap ac power supplies:</p> <ul style="list-style-type: none"> • Sine-wave input (50-60 Hz) required • Input voltage range automatically selected • Input voltage low range: <ul style="list-style-type: none"> – Minimum: 100 V ac – Maximum: 127 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 200 V ac – Maximum: 240 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> – Minimum: 0.29 kVA – Maximum: 1.00 kVA
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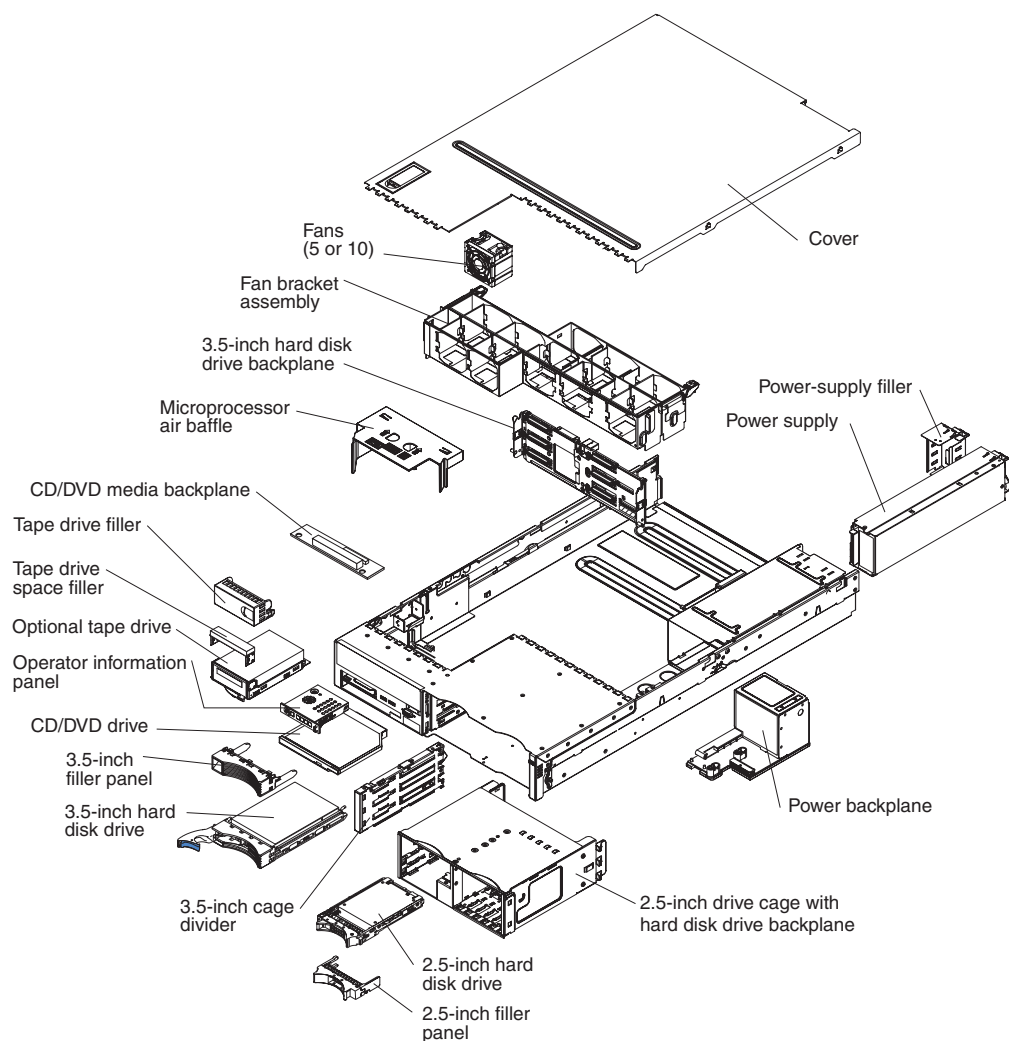
Major components of the server

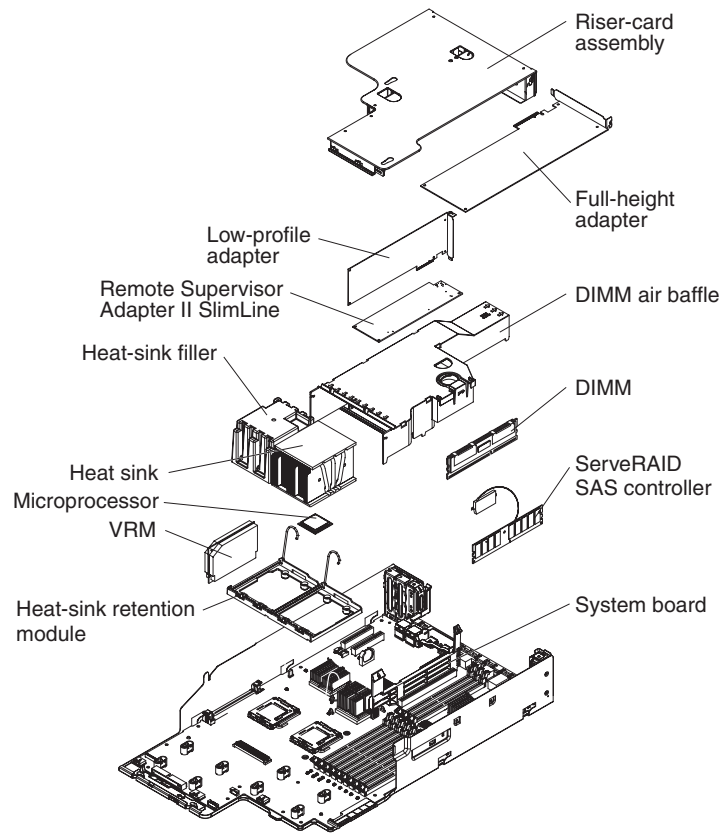
Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.

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

The following illustrations show the major components in the server.

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





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, complete the following steps:

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

1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Software and device drivers**.
4. Click **System x3650** to display the matrix of downloadable files for the server.

For additional information about tools for updating, managing, and deploying firmware, see the System x and xSeries Tools Center at <http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp>.

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see Chapter 5, “Solving problems,” on page 59 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 fans, redundant hot-swap ac power supplies, 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 or non-hot-swap optional devices or components.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply and to install and remove a dc power supply. See the documentation that comes with each dc power supply.

- 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 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffles installed. Operating the server without the air baffles might cause the microprocessors to overheat.
- Microprocessor socket 2 always contains either a heat-sink filler 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.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Removing the cover

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

To remove the cover, complete the following steps:

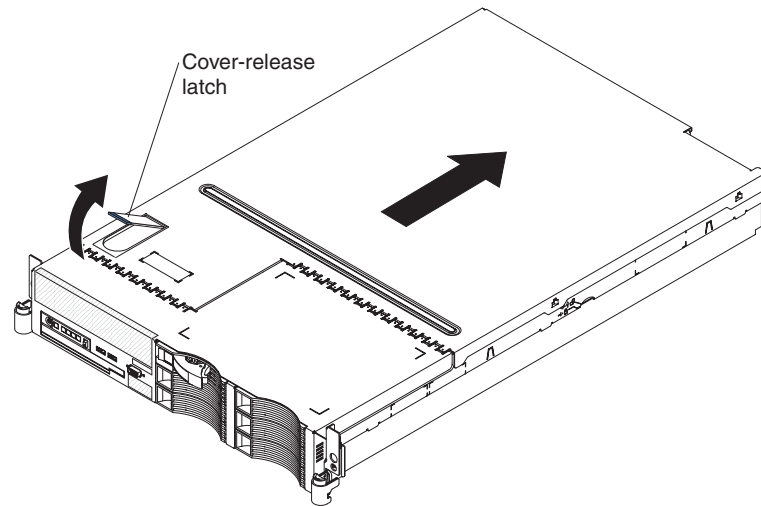
1. Read the safety information that begins on page v and “Installation guidelines” on page 9.

2. If you are planning to install or remove a microprocessor, memory module, PCI adapter, battery, or other non-hot-swap optional device, turn off the server and all attached devices and disconnect all external cables and power cords (see “Turning off the server” on page 39).

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Press down on the left and right side latches and pull the server out of the rack enclosure until both side rails lock.

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



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

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

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 12 Fully Buffered DIMM PC2-5300 512 MB, 1 GB, 2 GB, and 4 GB DIMMs, for a maximum of 48 GB of system memory. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of memory modules that you can use with the server.

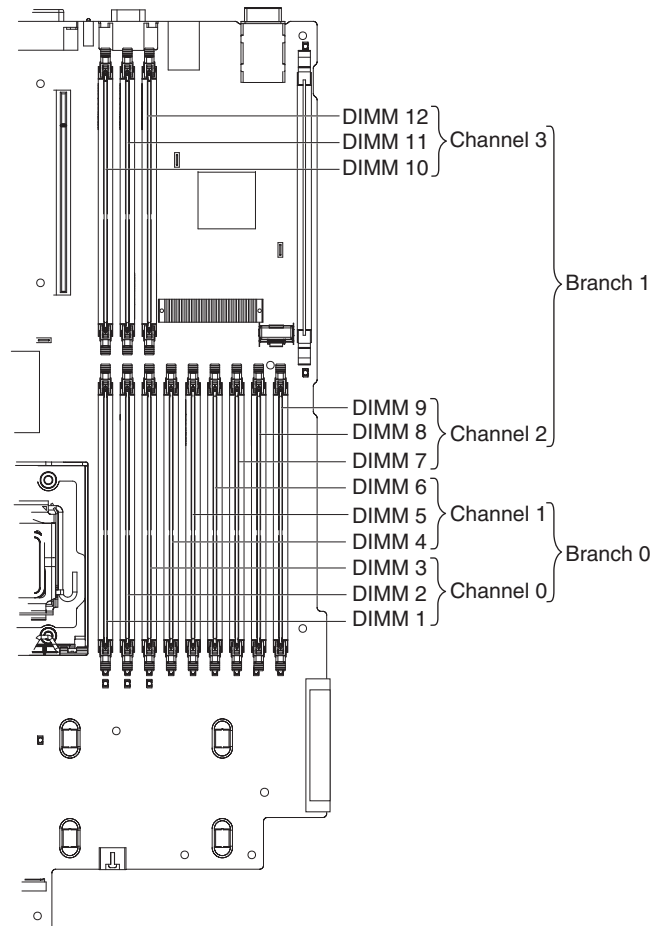
Note: Because some memory is reserved for system operation, the actual usable memory size that is reported by the operating system is less than the total installed size.

- The server comes with a minimum of two 512 MB DIMMs, installed in slots 1 and 4. When you install additional DIMMs, you must install two identical DIMMS at a time, in the order shown in the following table, to maintain performance.

Table 2. DIMM installation sequence

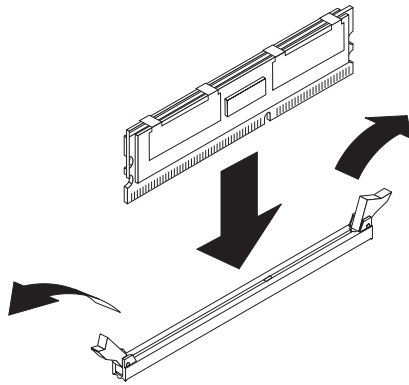
Pair	DIMM connectors
1	1 and 4
2	7 and 10
3	2 and 5
4	8 and 11
5	3 and 6
6	9 and 12

Note: When only one pair of DIMMs is installed in the server and the BIOS code level is version 1.04 (GGE127A) or later, you can improve performance by installing the DIMMs in connectors 1 and 7 instead of 1 and 4. However, because the connectors in the pair are not on the same memory branch (see the following illustration), Chipkill memory protection is disabled.



- Each DIMM in a pair must be the same size, speed, type, and technology to ensure that the server will operate correctly.
- You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller switches from the active pair to the mirroring pair. See “Memory mirroring” on page 15 for more information about memory mirroring and the DIMM installation sequence that is required.

- The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare pair of DIMMs to replace the failed active DIMM pair. See “Online-spare memory” on page 16 for more information about online-spare memory and the DIMM configuration that is required.
- You can enable either online-spare memory or memory mirroring, but not both at the same time. Online-spare memory provides more memory capacity than mirroring; mirroring provides better memory protection but less memory capacity than online-spare memory.
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.



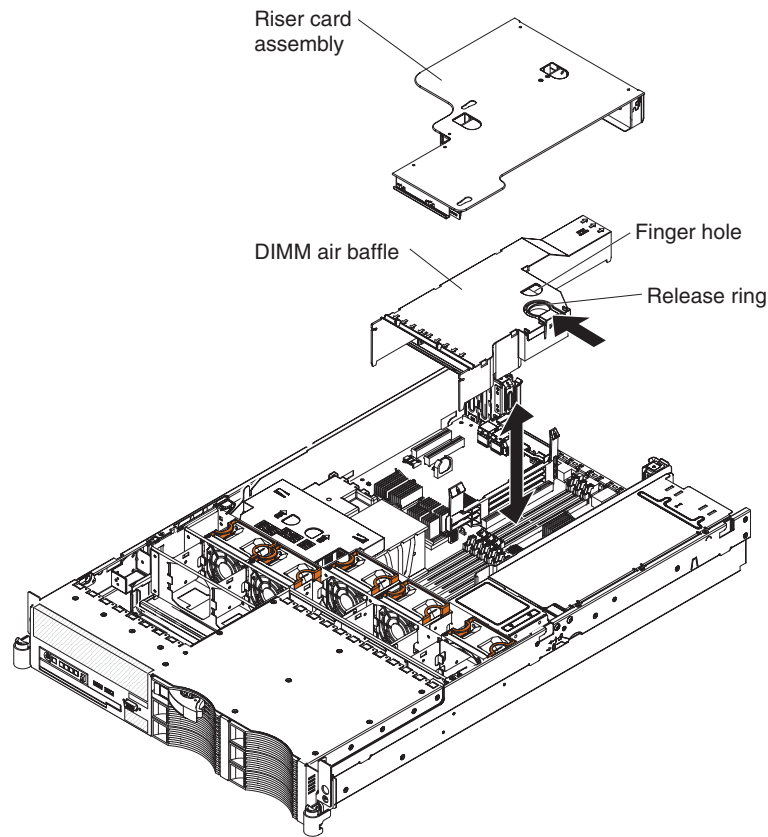
To install a DIMM, complete the following steps:

1. Read the safety information that begins on page v and “Installation guidelines” on page 9.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the server cover.

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



4. Remove the riser-card assembly.
5. Remove the DIMM air baffle.
6. Open the retaining clip on each end of the DIMM connector.
7. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.
8. Turn the DIMM so that the keys align correctly with the connector.
9. Insert the DIMM into the connector. Firmly press the DIMM straight down into the connector. 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.

10. Replace the DIMM air baffle.
11. Replace the riser-card assembly.

If you have other optional devices to install, do so now. Otherwise, go to “Completing the installation” on page 32.

Memory mirroring

You can configure the server to use memory mirroring. Memory mirroring stores data in two pairs of DIMMs simultaneously. If a failure occurs, the memory controller switches from the active pair to the mirroring pair. Memory mirroring reduces the amount of available memory. Enable memory mirroring through the Configuration/Setup Utility program. See the section about using the

Configuration/Setup Utility program in the *User's Guide* on the *IBM System x Documentation* CD for details about enabling memory mirroring.

When you use memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each group must be identical. See Table 3 for the DIMM connectors that are in each group.

Table 3. Memory mirroring DIMM installation sequence

Group	DIMM connectors
1	1, 4, 7, and 10
2	2, 5, 8, and 11
3	3, 6, 9, and 12

Table 4. Memory mirroring DIMM functions

Group	Active DIMMs	Mirroring DIMMs
1	1, 4	7, 10
2	2, 5	8, 11
3	3, 6	9, 12

Online-spare memory

The server supports online-spare memory. This feature disables the failed memory from the system configuration and activates an online-spare pair of DIMMs to replace the failed active DIMM pair.

Online-spare memory reduces the amount of available memory. Before you can enable this feature, you must install up to two additional pairs of DIMMs. The online-spare DIMM pairs must be the same speed, type, and the same size as, or larger than, the largest active DIMM pairs.

Enable online-spare memory through the Configuration/Setup Utility program. The BIOS code assigns the online-spare DIMM pairs according to your DIMM configuration. Online-sparing is enabled on a memory branch basis; the BIOS code does not enable online-sparing on a branch that cannot support online-sparing. See the illustration on page 13 for the memory branch structure. DIMM ranks are online-spared if the DIMMs are installed according to the rules in Table 5 on page 17 or Table 6 on page 17.

Note: POST gives a warning message when online-sparing cannot be enabled on both branches. However, no warning message is given when online-sparing is enabled on one branch and disabled on the other.

Online-spare configurations are supported for each branch. See Table 5 on page 17 and Table 6 on page 17 for the online-spare DIMM connector assignments.

Important: Table 5 on page 17 shows the default DIMM online-spare scheme. If the BIOS code level is version 1.04 or later, you can install the DIMMs according to the scheme shown in Table 6 on page 17 instead.

In the configuration that you use, install the largest DIMMs first.

Table 5. Online-spare DIMM configurations, basic scheme

Number of DIMMs	DIMM connectors	Results
4	1 and 4 (largest DIMMs) 2 and 5	Online-sparing on branch 0
6	1 and 4 (largest DIMMs) 2 and 5 3 and 6	Online-sparing on branch 0
8	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 (dual-rank DIMMs only)	Online-sparing on branch 0 Online-sparing on dual-rank DIMMs on branch 1
10	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11	Online-sparing on branch 0 Online-sparing on branch 1
12	1 and 4 (largest DIMMs) 2 and 5 3 and 6 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1

Table 6. Online-spare DIMM configurations, alternative scheme (requires BIOS code version 1.04 or later)

Number of DIMMs	DIMM connectors	Results
4	7 and 10 (largest DIMMs) 8 and 11	Online-sparing on branch 1
6	7 and 10 (largest DIMMs) 8 and 11 9 and 12	Online-sparing on branch 1
8	7 and 10 (largest DIMMs) 8 and 11 9 and 12 1 and 4 (dual-rank DIMMs only)	Online-sparing on branch 1 Online-sparing on dual-rank DIMMs on branch 0
10	1 and 4 (largest DIMMs) 2 and 5 7 and 10 8 and 11 9 and 12	Online-sparing on branch 0 Online-sparing on branch 1
12	N/A	N/A

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.

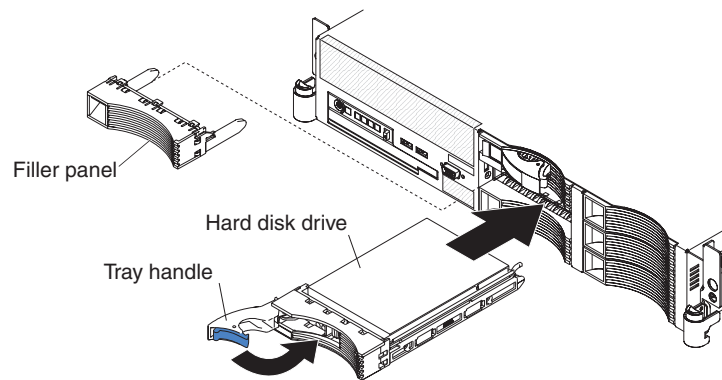
Important: Do not install a SCSI hard disk drive in this server; install only SAS hard disk drives.

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:

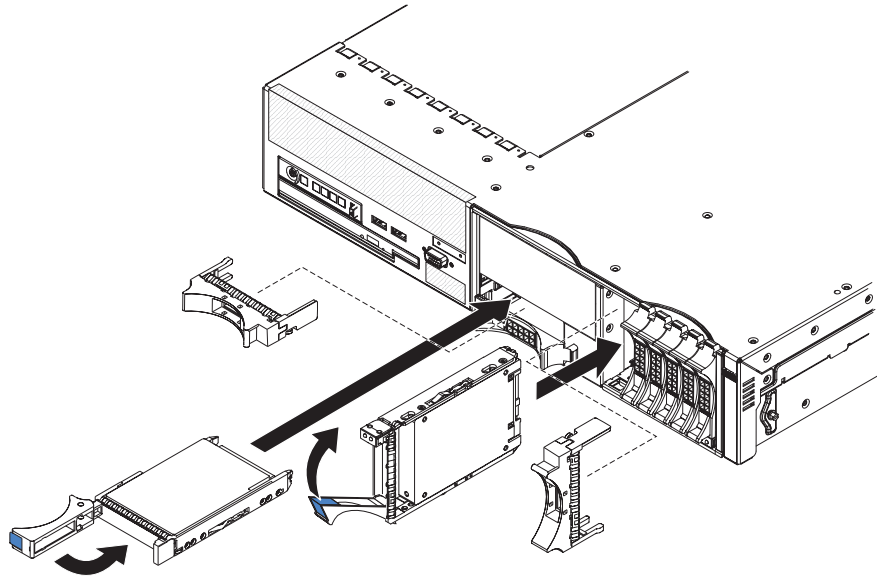
- The server 3.5-inch models support six slim 3.5-inch hard disk drives installed on Ultra-Slim hard disk drive trays for 3.5-inch drives. For a list of supported 3.5-inch hard disk drives, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.
- The server 2.5-inch models support eight 2.5-inch 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, see <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 front of the server.

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

3.5-inch drives



2.5-inch drives



To install a drive in a hot-swap bay, complete the following steps:

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 begins 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 correctly.

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

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

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 32.

Installing a tape drive

For information about installing an optional tape drive, see the *User's Guide* on the IBM *System x Documentation* CD, which comes with the server. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported tape drives.

Installing an additional microprocessor

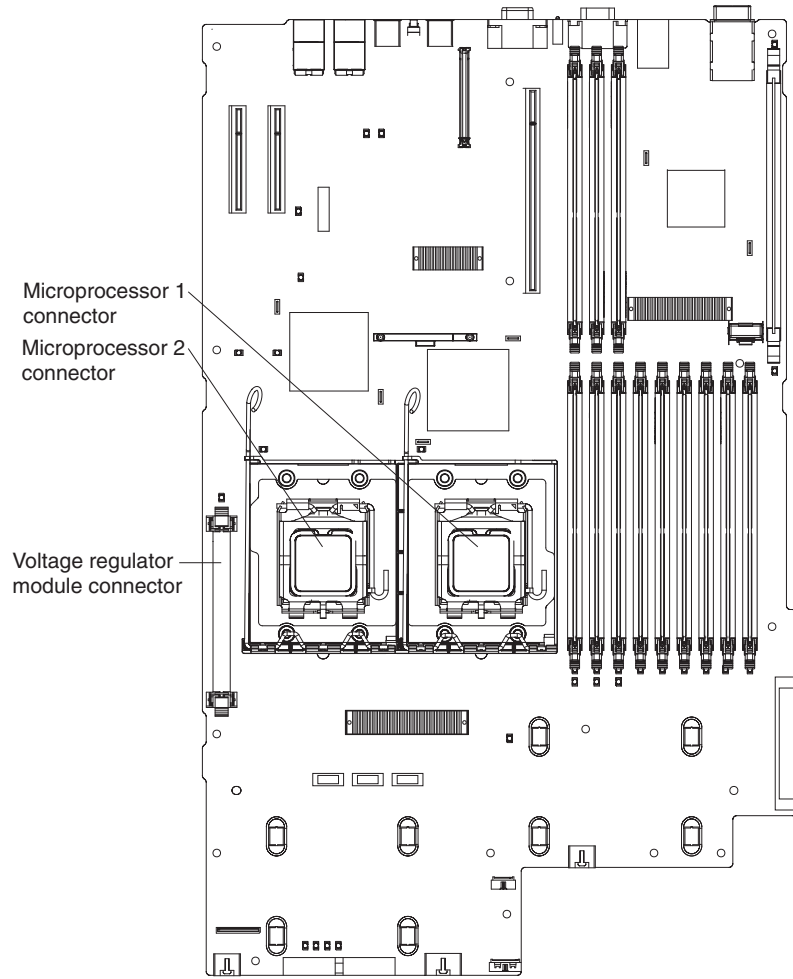
The following notes describe the type of microprocessor that the server supports and other information that you must consider when installing a microprocessor:

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

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

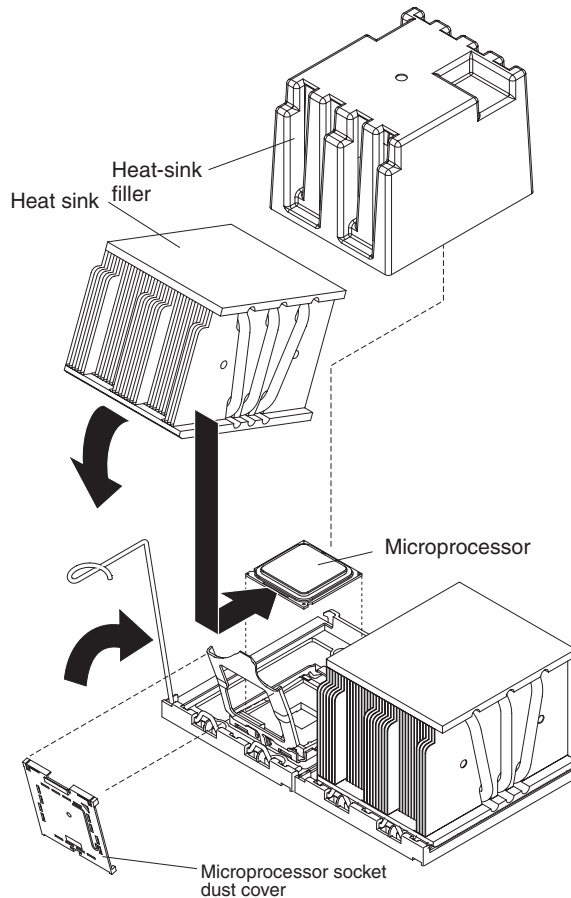
- The server supports up to two microprocessors. If the server comes with one microprocessor, you can install a second microprocessor.
- Both microprocessors must have the same cache size and type, front-side bus frequency, and the same clock speed. Microprocessor internal and external clock frequencies must be identical.
- When you install an additional microprocessor in microprocessor connector 2, you must also install the voltage regulator module (VRM), which comes with the microprocessor, in the VRM connector.
- Read the documentation that comes with the microprocessor to determine whether you must update the basic input/output system (BIOS) code for the server. To download the most current level of BIOS code and many other code updates for your server, go to <http://www.ibm.com/systems/support/>, select **System x3650** from the **Hardware** list, and click the **Download** tab.
- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems and optional devices, go to <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.
- To order additional microprocessors, 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 and other microprocessor-related components on the system board.



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

Note: For simplicity, certain components are not shown in 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 internal and external clock frequencies must be identical.

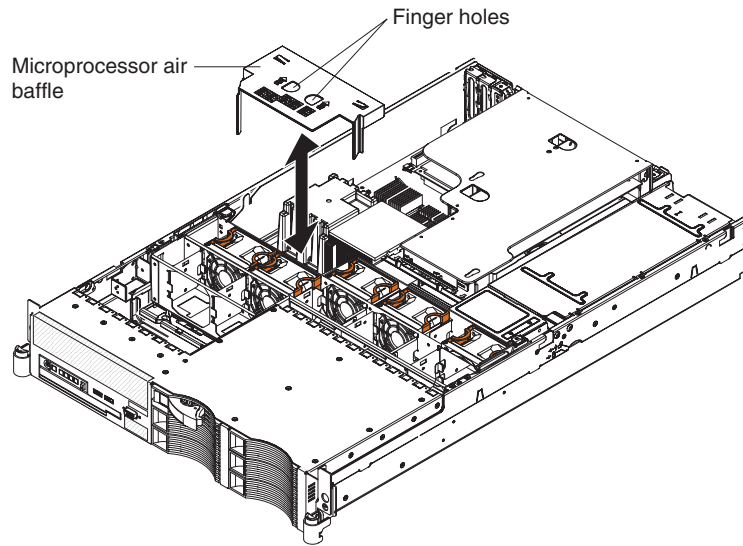
To install an additional microprocessor, complete the following steps:

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.

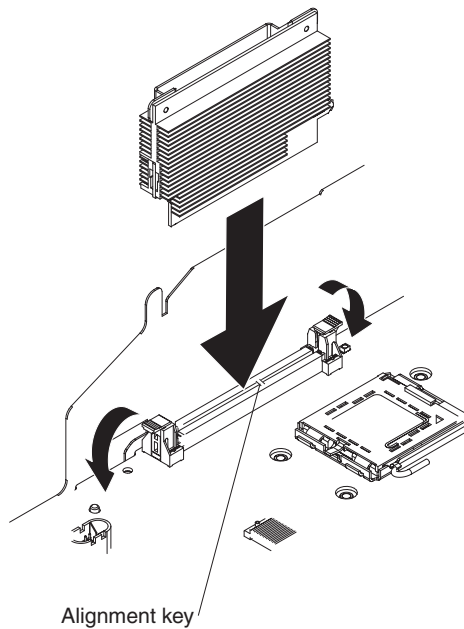
Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the server cover.

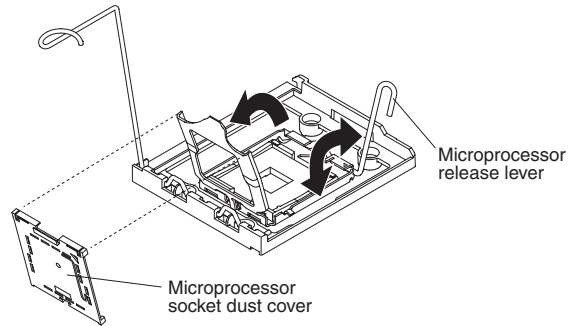
Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 11.



4. Remove the microprocessor air baffle.
5. Touch the static-protective package containing the VRM to any unpainted metal surface on the outside of the server. Then, remove the VRM from the package.



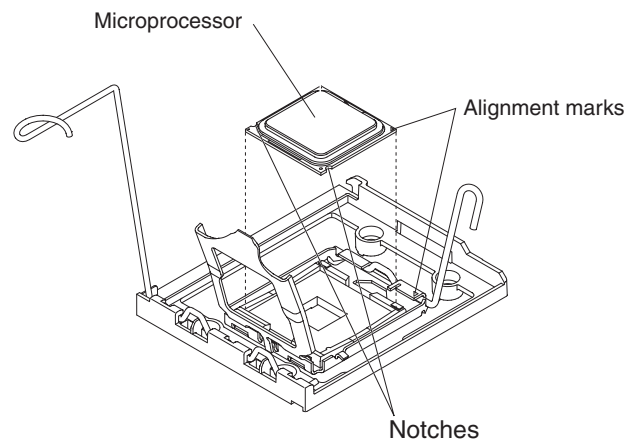
6. Turn the VRM so that the keys align correctly with the VRM connector; then, firmly press the VRM straight down into the connector. Make sure that the connector retaining clips are in the locked position.
7. Install the microprocessor:
 - a. Touch the static-protective package that contains the microprocessor 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 one is present.
- c. Rotate the microprocessor release lever on the socket from its closed and locked position until it stops in the fully open position.

Attention:

- Handle the microprocessor carefully. Dropping the microprocessor during installation or removal can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
- Do not use excessive force when you press the microprocessor into the socket.
- Make sure that the microprocessor is correctly aligned and positioned in the socket before you try to close the lever.



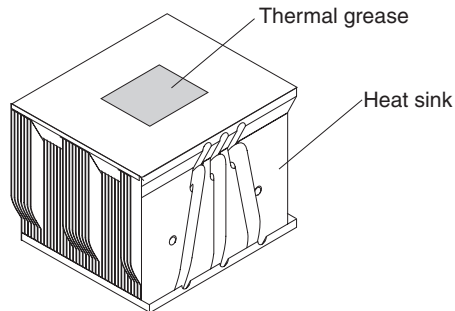
- d. Align the microprocessor with the socket (note the alignment mark and the position of the notches); then, carefully place the microprocessor on the socket. Close the microprocessor bracket frame.

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

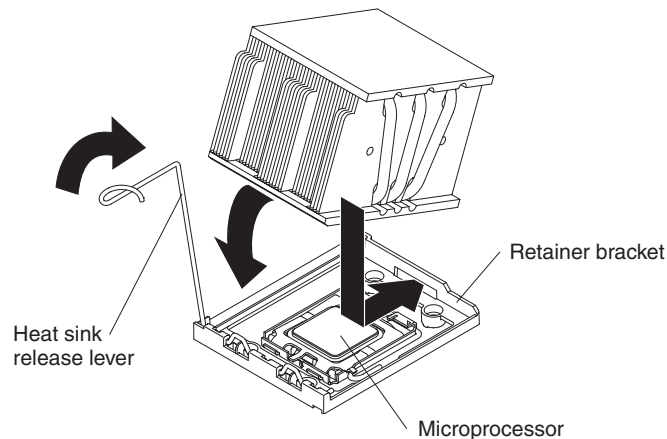
- e. Carefully close the microprocessor release lever to secure the microprocessor in the socket.

8. Install a 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 System x Documentation CD.



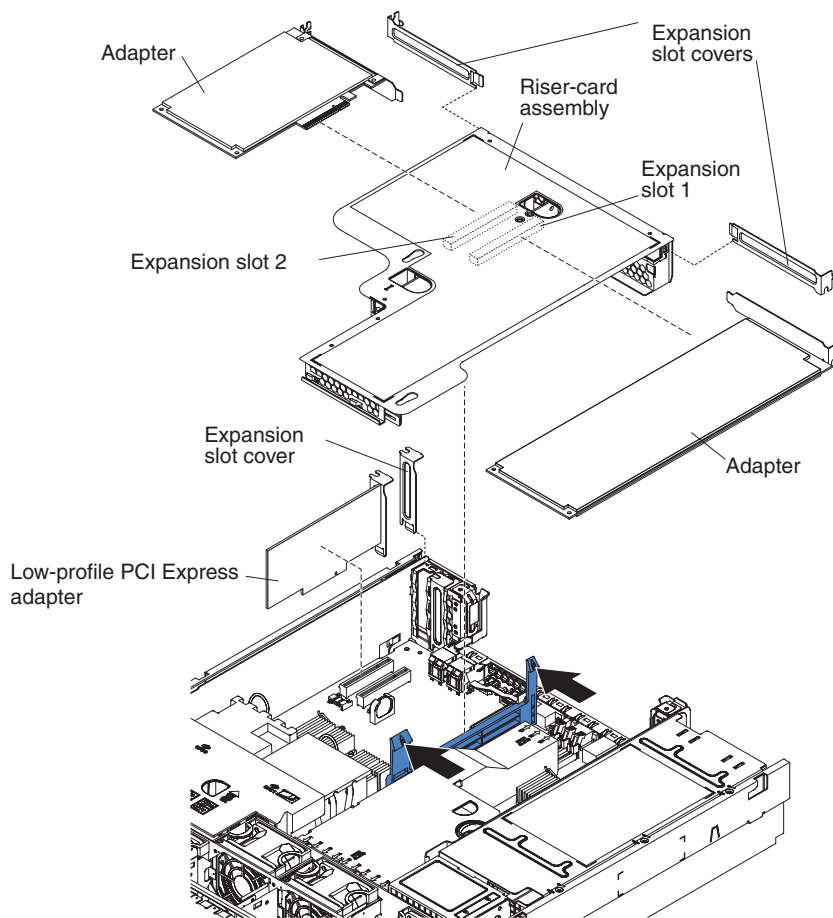
- a. Make sure that the heat-sink release lever is in the open position.
- b. Remove the plastic protective cover from the bottom of the heat sink.
- c. Align the heat sink above the microprocessor with the thermal grease side down.



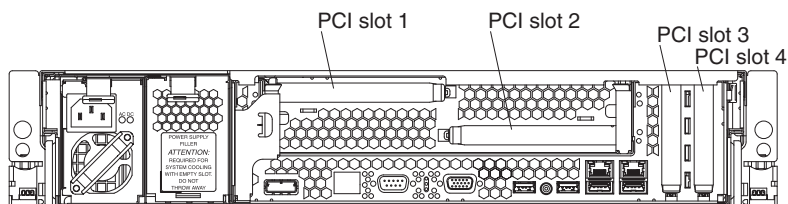
- d. Slide the rear flange of the heat sink into the opening in the retainer bracket.
 - e. Press down firmly on the front of the heat sink until it is seated securely.
 - f. Rotate the heat-sink release lever to the closed position and hook it underneath the lock tab.
9. Install the microprocessor air baffle.

If you have other optional devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 32.

Installing an adapter



The following illustration shows the locations of the adapter 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 PCI Express adapters in PCI slots 3 and 4 on the system board.
- You can install a full-height, half-length adapter in slot 2 on the PCI riser card and a full-height, full-length adapter in slot 1 on the PCI riser card.
- An optional Remote Supervisor Adapter II SlimLine can be installed only in a dedicated slot on the system board. To install a Remote Supervisor Adapter II SlimLine, see “Installing a Remote Supervisor Adapter II SlimLine” on page 29.
- The server supports only 3.3 V and universal PCI adapters.
- The PCI bus configuration is as follows:
 - Non-hot-plug, low-profile PCI Express x8 (x4 lanes), slot 4
 - Non-hot-plug, low-profile PCI Express x8 (x4 lanes), slot 3
 - Non-hot-plug, half-length PCI Express x8 (x8 lanes), slot 2
 - Non-hot-plug, full-length PCI Express x8 (x8 lanes), slot 1

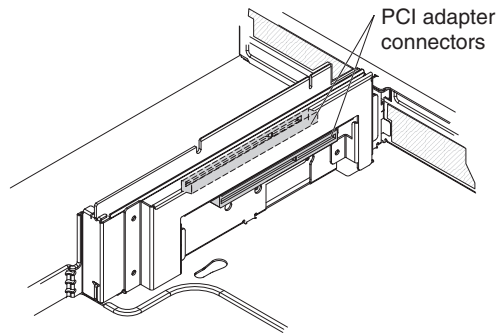
Note: If you have replaced the PCI Express riser-card assembly with the optional PCI-X riser-card assembly, slots 1 and 2 are non-hot-plug, 64-bit, 133-MHz PCI-X slots, which support Integrated xSeries® Adapter (IXA) single-width adapters.

- 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 slots on the PCI riser card.

Note: For clarity, the PCI riser-card assembly is inverted in the illustration.

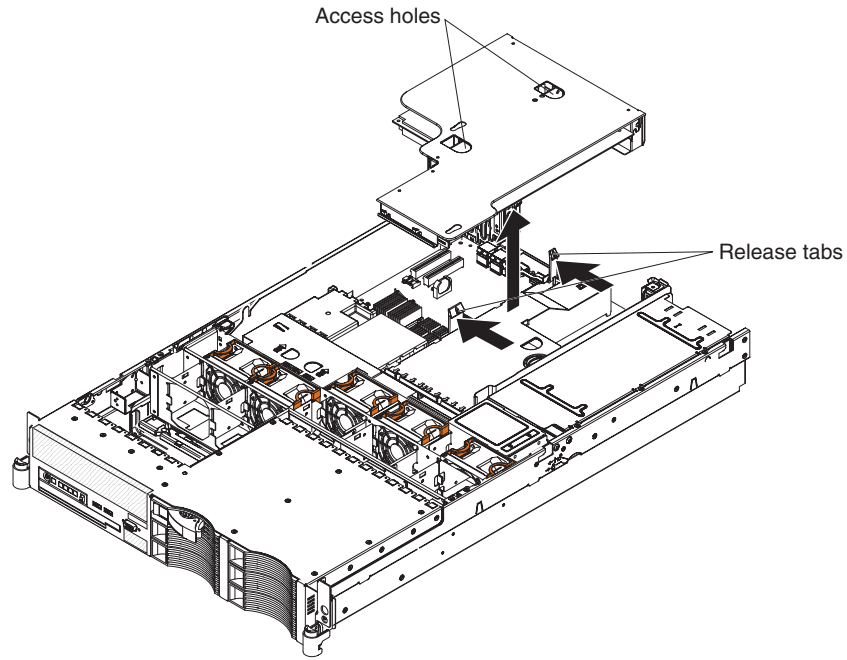


To install an adapter, complete the following steps:

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.

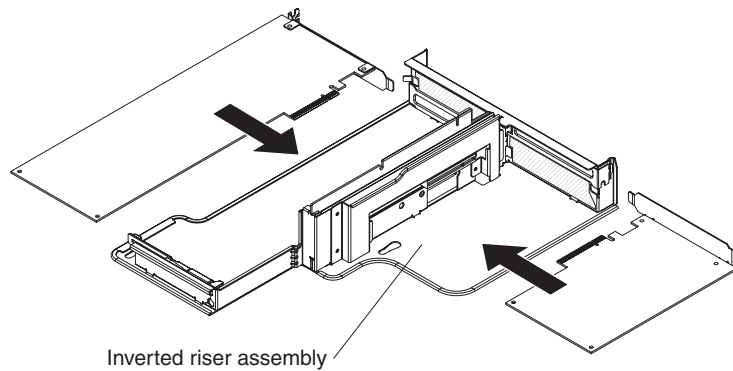
Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the server cover.
4. Determine which expansion slot you will use for the adapter. If you are installing an adapter in PCI slot 1 or 2, remove the PCI riser-card assembly.

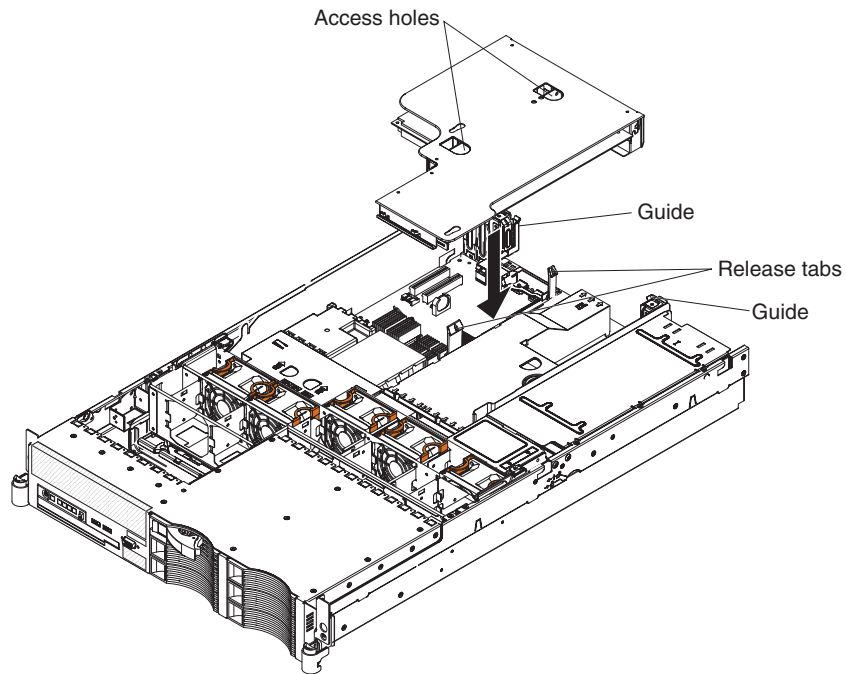


5. Slide the expansion-slot cover out of the PCI low-profile expansion slot or PCI riser-card assembly expansion slot.
6. Install the adapter. The following illustration shows how to install an adapter in a PCI slot on the riser-card assembly.

Note: For clarity, the PCI riser-card assembly is shown inverted in the following illustration.



7. If you removed the PCI riser-card assembly to install the adapter, align the riser-card assembly with the release-tab posts, rear guides, and connector; then, press the PCI riser-card assembly *firmly* into the connector.



8. Connect any required cables to the adapter.

Attention:

- When you route cables, do not block any connectors or the ventilated space around any of the fans.
 - Make sure that cables are not routed on top of components under the PCI riser-card assembly.
 - Make sure that cables are not pinched by the server components.
9. Perform any configuration tasks that are required for the adapter.

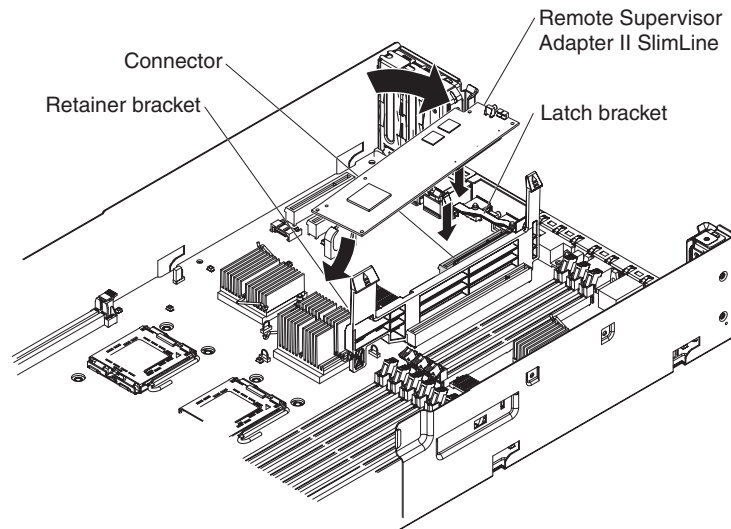
If you have other optional devices to install, do so now. Otherwise, go to “Completing the installation” on page 32.

Installing a Remote Supervisor Adapter II SlimLine

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

Note: Earlier versions of the Remote Supervisor Adapter II SlimLine might not work in this server. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for information about which versions of the Remote Supervisor Adapter II SlimLine are supported.

The following illustration shows how to install a Remote Supervisor Adapter II SlimLine.



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

1. Read the safety information that begins on page v and “Installation guidelines” on page 9.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the server cover.
4. Remove the PCI riser-card assembly.
5. Align the keys on the Remote Supervisor Adapter II SlimLine connector with the connector on the system board.
6. Slip the free end of the Remote Supervisor Adapter II SlimLine under the tab on the retainer bracket, aligning the holes in the adapter with the posts on the retainer bracket and latch bracket; then, press the adapter into the connector on the system board and make sure that all tabs on the latch bracket secure the adapter in place.
7. Replace the PCI riser-card assembly.

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

If you have other optional devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 32.

Replacing the ServeRAID SAS controller

A ServeRAID SAS controller can be installed only in a dedicated slot on the system board. The server comes with a ServeRAID-8k-I SAS Controller installed.

Note: The ServeRAID-8k-I SAS Controller does not have a battery.

To replace the ServeRAID-8k-I SAS Controller with a ServeRAID-8k SAS Controller, complete the following steps:

1. Read the safety information that begins on page v and the “Installation guidelines” on page 9.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 39).

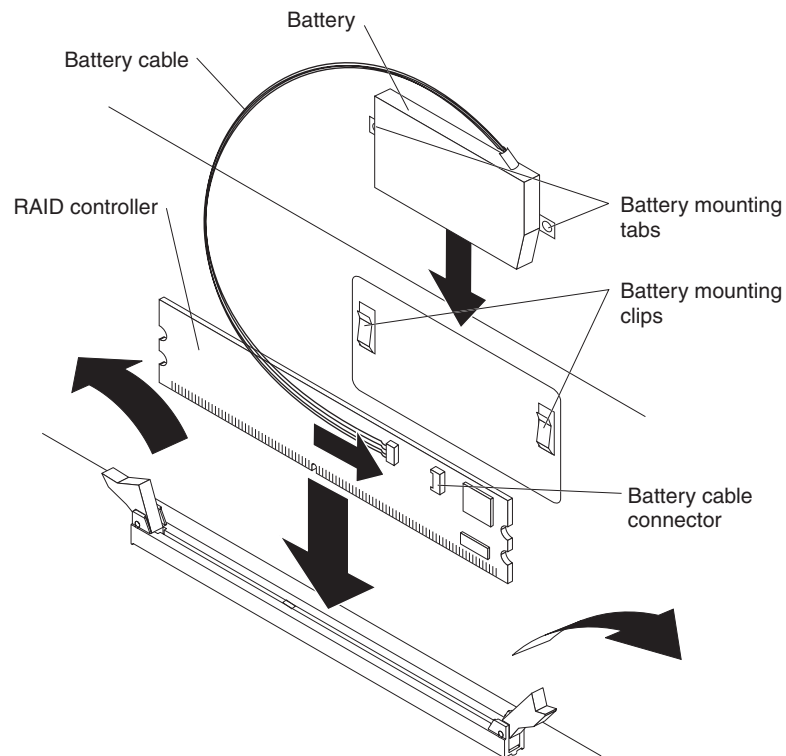
Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

3. Remove the server cover (see “Removing the cover” on page 11).
4. Remove the riser-card assembly and the air baffle over the DIMMs. See the *User’s Guide* for more information.

5. Locate the ServeRAID-8k-I SAS controller on the system board.

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

6. Open the retaining clip on each end of the connector.
7. Lift the ServeRAID-8k-I SAS controller out of the connector.
8. Touch the static-protective package that contains the new ServeRAID-8k SAS controller to any unpainted metal surface on the server. Then, remove the ServeRAID-8k SAS controller from the package.



9. Turn the new ServeRAID-8k SAS controller so that the keys on the bottom edge align correctly with the connector.
10. Firmly press the ServeRAID-8k SAS controller straight down into the connector by applying pressure on both ends of the controller simultaneously. The retaining clips snap into the locked position when the controller is firmly seated in the connector.

Note: If there is a gap between the controller and the retaining clips, the controller has not been correctly installed. In this case, open the retaining clips and remove the controller; then, reinsert the controller.

11. Remove the battery from the ServeRAID-8k SAS Controller package.
12. Slide the battery mounting tabs into the battery mounting clips on the server wall that is next to the ServeRAID SAS controller connector.
13. Connect the battery to the ServeRAID-8k SAS Controller.
14. Replace the air baffle over the DIMMs. See the *User's Guide* for more information.
15. Replace the riser-card assembly.

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

Notes:

1. When you restart the server for the first time after you install a ServeRAID-8k SAS controller, the monitor screen remains blank while the controller initializes the battery. This might take a few minutes, after which the startup process continues. This is a one-time occurrence.

Important: You must allow the initialization process to be completed. If you do not, the battery pack will not work, and the server might not start.

The battery comes partially charged, at 30% or less of capacity. Run the server for 4 to 6 hours to fully charge the controller battery. The LED just above the battery on the controller remains lit until the battery is fully charged.

Until the battery is fully charged, the controller firmware sets the controller cache to write-through mode; after the battery is fully charged, the controller firmware re-enables write-back mode.

2. When you restart the server, you will be given the opportunity to import the existing RAID configuration to the new ServeRAID SAS controller.

Completing the installation

To complete the installation, complete the following steps:

1. Install the cover. See "Installing the cover" on page 33 for more information.
2. 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.

3. Connect the cables and power cords.

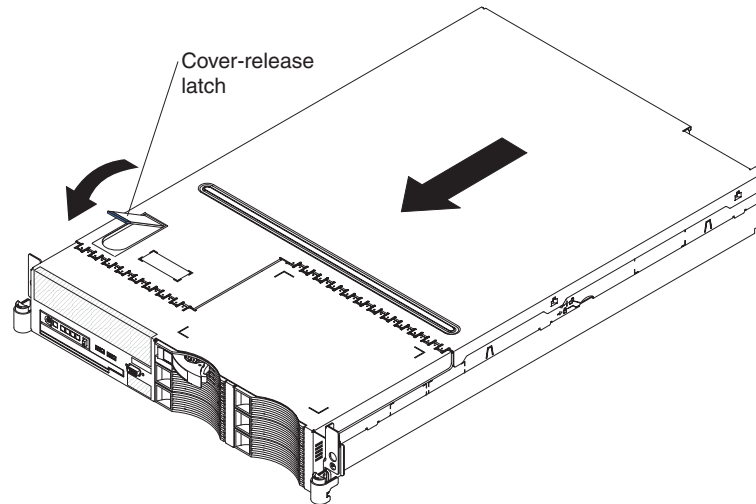
Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

See "Connecting the cables" on page 33 for more information.

4. Update the server configuration. See "Updating the server configuration" on page 34 for more information.

Installing the cover

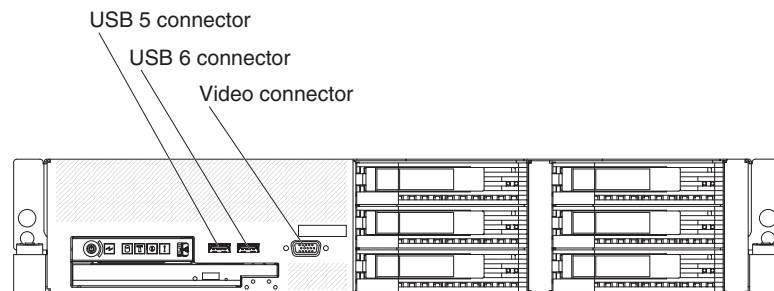
To install the cover, place it into position and slide it forward.



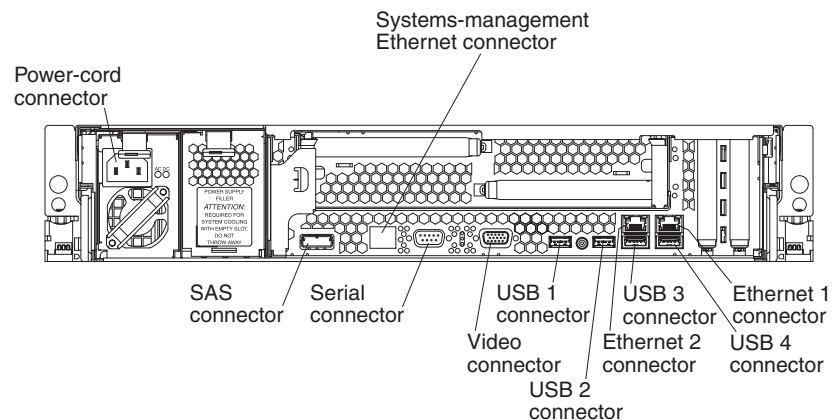
Connecting the cables

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

Front view



Rear view



Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply for instructions and an illustration of the dc power supply.

You must turn off the server before you connect or disconnect 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 internal optional device, external SAS device, or USB keyboard or mouse, 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 41.

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

The server comes with at least one microprocessor. If more than one microprocessor is installed, the server can operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. For more information, see “Using the ServerGuide Setup and Installation CD” on page 41 and the operating-system documentation.

If you have installed or removed a hard disk drive, see “Using the RAID configuration programs” on page 42 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.

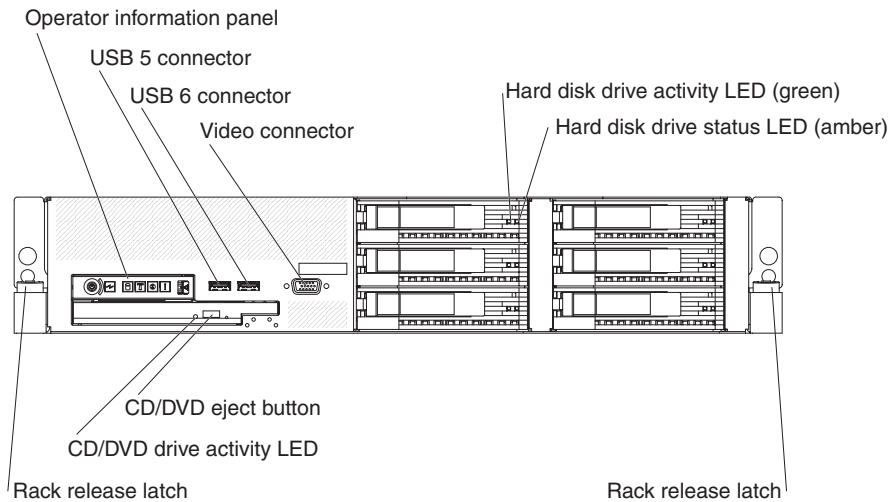
For information about configuring the integrated Gigabit Ethernet controllers, see the *User's Guide*.

Chapter 3. Server controls, LEDs, and power

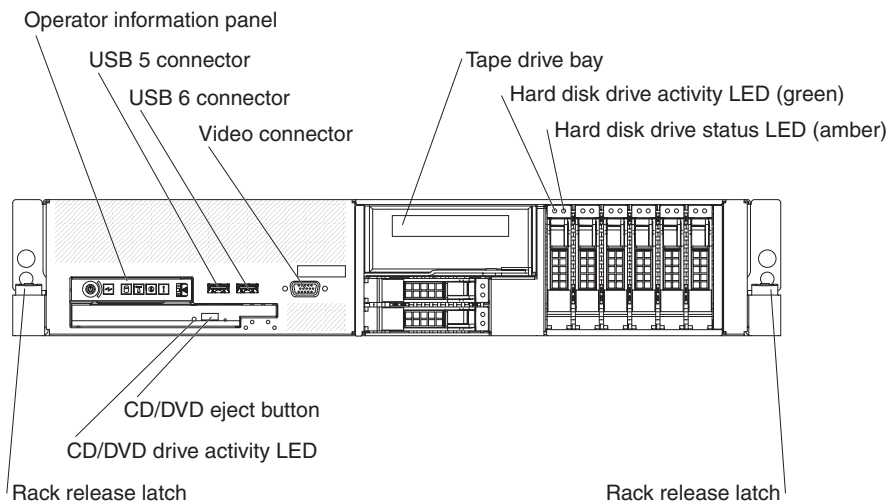
This section describes the controls and light-emitting diodes (LEDs) and how to turn the server on and off.

Front view

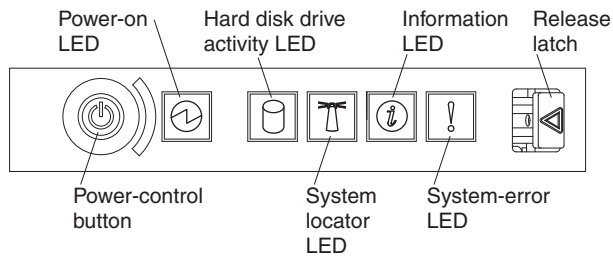
The following illustration shows the controls, light-emitting diodes (LEDs), and connectors on the front of the 3.5-inch model server.



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



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.
- **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 a power source. When this LED is off, it indicates that 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.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- **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, which is behind the operator information 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. The video connectors on the front and rear of the server can be used simultaneously.

Hard disk drive activity LED: 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.

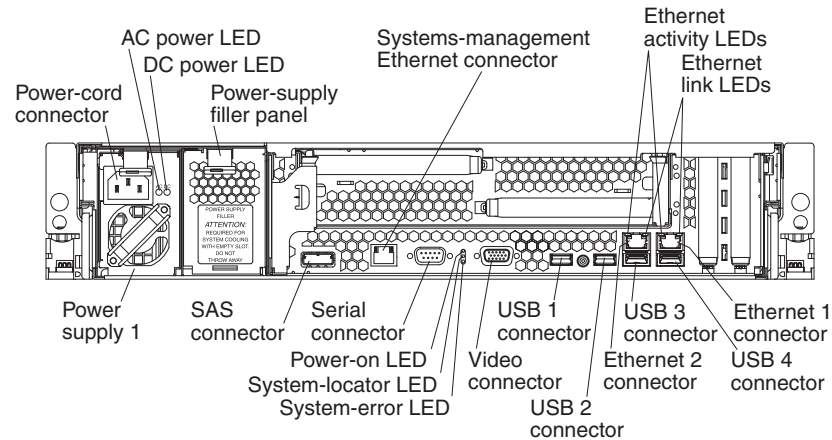
CD/DVD drive activity LED: When this LED is lit, it indicates that the CD-RW/DVD drive is in use.

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.

Attention: In a dc power environment, see the documentation that comes with the dc power supply for information about the power-supply LEDs.



Power-cord connector (ac power supply only): Connect the power cord to this connector.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

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.

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. The video connectors on the front and rear of the server can be used simultaneously.

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 a power source. When this LED is off, it indicates that 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).

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

Server power features

When the server is connected to a 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 power but is not turned on.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

Turning on the server

Approximately 5 seconds after the server is connected to 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 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 power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

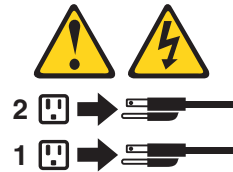
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

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.



Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

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. (See “Using the ServerGuide Setup and Installation CD” for more information.)

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
 - IBM 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 61.
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 passwords

- Set and change 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
- Resolve configuration conflicts

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

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

Using the RAID 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 controller

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

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

Using the IBM ServeRAID Configuration Utility program

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

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

Starting the IBM ServeRAID Configuration Utility program

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

1. Turn on the server.
2. When the prompt <<< Press <CTRL><A> for IBM ServeRAID Configuration Utility! >>> appears, press Ctrl+A. 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 SAS address of the selected drive.
- **Disk Utilities**
Select this choice to format a disk or verify the disk media. Select a device from the list and read the instructions on the screen carefully before making a selection.

Using ServeRAID Manager

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

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

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

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

Configuring the RAID controller

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

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

In the Configuration wizard, you can select express configuration or custom configuration. Express configuration automatically configures the controller by grouping the first two physical drives in the ServeRAID Manager tree into an array and creating a RAID level-1 logical drive. If you select custom configuration, you can select the 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” window, review the information. To change the configuration, click **Modify arrays**.
5. Click **Apply**; when you are asked whether you want to apply the new configuration, click **Yes**. The configuration is saved in the controller and in the physical drives.
6. Exit from ServeRAID Manager and remove the CD from the CD-RW/DVD drive.
7. Restart the server.

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

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

Viewing the configuration

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

drives). When you click an object in the ServeRAID Manager tree, information about that object appears in the right pane. To display a list of available actions for an object, click the object and click **Actions**.

Using the baseboard management controller

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

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

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

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

- **Serial over LAN**

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

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

Enabling and configuring SOL using the OSA SMBridge management utility program

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

BIOS update and configuration

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

1. Update the BIOS code:
 - a. Download the latest version of the BIOS code from <http://www.ibm.com/systems/support/>.
 - b. Update the BIOS code, following the instructions that come with the update file that you downloaded.
2. Update the BMC firmware:

- a. Download the latest version of the BMC firmware from <http://www.ibm.com/systems/support/>.
 - b. Update the BMC firmware, following the instructions that come with the update file that you downloaded.
3. Configure the BIOS settings:
- a. When you are prompted to start the Configuration/Setup Utility program, restart the server and press F1.
 - b. Select **Devices and I/O Ports**; then, make sure that the values are set as follows:
 - **Serial Port A**: Auto-configure
 - **Serial Port B**: Auto-configure
 - c. Select **Remote Console Redirection**; then, make sure that the values are set as follows:
 - **Remote Console Active**: Enabled
 - **Remote Console COM Port**: COM 1
 - **Remote Console Baud Rate**: 19200 or higher
 - **Remote Console Data Bits**: 8
 - **Remote Console Parity**: None
 - **Remote Console Stop Bits**: 1
 - **Remote Console Text Emulation**: ANSI
 - **Remote Console Keyboard Emulation**: ANSI
 - **Remote Console Active After Boot**: Enabled
 - **Remote Console Flow Control**: Hardware
 - d. Press Esc twice to exit the **Remote Console Redirection** and **Devices and I/O Ports** sections of the Configuration/Setup Utility program.
 - e. Select **Advanced Setup**; then, select **Baseboard Management Controller (BMC) Settings**.
 - f. Set **BMC Serial Port Access Mode** to **Dedicated**.
 - g. Press Esc twice to exit the **Baseboard Management Controller (BMC) Settings** and **Advanced Setup** sections of the Configuration/Setup Utility program.
 - h. Select **Save Settings**; then, press Enter.
 - i. Press Enter to confirm.
 - j. Select **Exit Setup**; then, press Enter.
 - k. Make sure that **Yes, exit the Setup Utility** is selected; then, press Enter.

Linux configuration

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

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

Red Hat Enterprise Linux ES 4 configuration:

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

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

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

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

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

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

```
ttyS0
```

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

1. Modify the /etc/lilo.conf file:

- a. Add the following text to the end of the first default=linux line
-Monitor
- b. Comment out the map=/boot/map line by adding a # at the beginning of this line.
- c. Comment out the message=/boot/message line by adding a # at the beginning of this line.
- d. Add the following line before the first image= line:
This will allow you to only Monitor the OS boot via SOL
- e. Add the following text to the end of the first label=linux line:
-Monitor
- f. Add the following line to the first image= section. This enables SOL.
append="console=ttyS0,19200n8 console=tty1"
- g. Add the following lines between the two image= sections:
This will allow you to Interact with the OS boot via SOL
image=/boot/vmlinuz-2.4.9-e.12smp
label=linux-Interact
initrd=/boot/initrd-2.4.9-e.12smp.img
read-only
root=/dev/hda6
append="console=tty1 console=ttyS0,19200n8 "

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

Original /etc/lilo.conf contents

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

Modified /etc/lilo.conf contents

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

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

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

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

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

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

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

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

Original `/boot/grub/grub.conf` contents

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


Modified /boot/grub/grub.conf contents

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

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

SUSE SLES 9.0 configuration:

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

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

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

1. Add the following line to the end of the # getty-programs for the normal runlevels section of the /etc/inittab file. This enables hardware flow control and enables users to log in through the SOL console.
7:2345:respawn:/sbin/agetty -h ttyS0 19200 vt102
2. Add the following line after the tty6 line at the bottom of the /etc/securetty file to enable a user to log in as the root user through the SOL console:
ttyS0
3. Complete the following steps to modify the /boot/grub/menu.lst file:

- a. Comment out the gfxmenu line by adding a # in front of the word gfxmenu.
- b. Add the following line before the first title line:
This will allow you to only Monitor the OS boot via SOL
- c. Append the following text to the first title line:
SOL Monitor
- d. Append the following text to the kernel line of the first title section:
console=ttyS1,19200 console=tty0
- e. Add the following four lines between the first two title sections:
This will allow you to Interact with the OS boot via SOL
title linux SOL Interactive
kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791
console=tty1 console=ttyS0,19200
initrd (hd0,1)/boot/initrd

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

Original /boot/grub/menu.lst contents	Notes
<pre>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 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</pre>	<p>1</p> <p>1</p>
<p>Note 1: The kernel line is shown with a line break. In your file, the entire entry must all be on one line.</p>	

Modified /boot/grub/menu.lst contents	Notes
<pre>#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 title floppy</pre>	<p>1</p>

Modified /boot/grub/menu.lst contents	Notes
<pre> 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 </pre>	1
<p>Note 1: The kernel line is shown with a line break. In your file, the entire entry must all be on one line.</p>	

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

Microsoft Windows 2003 Standard Edition configuration

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

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

1. Complete the following steps to determine which boot entry ID to modify:
 - a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.
 - b. In the Boot Entries section, locate the boot entry ID for the section with an OS friendly name of Windows Server 2003, Standard. Write down the boot entry ID for use in the next step.
2. To enable the Microsoft Windows Emergency Management System (EMS), at a Windows command prompt, type

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

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

3. Complete the following steps to verify that the EMS console is redirected to the COM1 serial port:
 - a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.
 - b. Verify the following changes to the bootcfg settings:
 - In the Boot Loader Settings section, make sure that `redirect` is set to COM1 and that `redirectbaudrate` is set to 19200.
 - In the Boot Entries section, make sure that the OS Load Options: line has `/redirect` appended to the end of it.

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

Original bootcfg program output

```
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
```

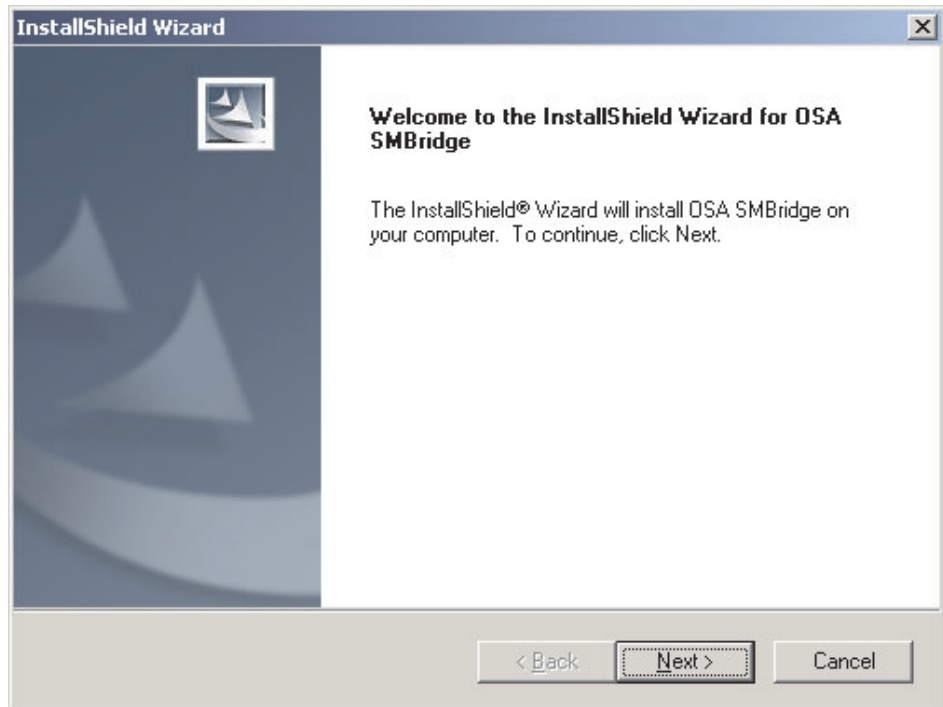
You must restart the Windows 2003 operating system after you complete this procedure for the changes to take effect and to enable SOL.

Installing the OSA SMBridge management utility program

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

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

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



3. Follow the prompts to complete the installation.

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

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

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

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

where `xx` is the release level being installed.

6. Follow the prompts to complete the installation. When the installation is complete, the utility copies files to the following directories:

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

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

```
smbridge status
smbridge start
smbridge stop
smbridge restart
```

Using the baseboard management controller utility programs

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

Using the baseboard management controller configuration utility program

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

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

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

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

Using the baseboard management controller firmware update utility program

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

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

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

Using the OSA SMBridge management utility program

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

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

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

Use the following commands in CLI mode:

- **identify**

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

- **power**

Turn the server on and off remotely.

- **sel**

Perform operations with the BMC system event log.

- **sysinfo**

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

- **Serial over LAN**

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

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

Use the following commands in an SOL session:

- **connect**

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

- **identify**

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

- **power**

Turn the server on and off remotely.

- **reboot**

Force the server to restart.

- **sel get**

Display the BMC system event log.

- **sol**

Configure the SOL function.

- **sysinfo**

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

Chapter 5. Solving problems

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

If you cannot locate and correct the problem using the information in this chapter, see Appendix A, “Getting help and technical assistance,” on page 79, 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 also appear during startup if POST detects a hardware-configuration problem.

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

- **Troubleshooting tables**

These tables list problem symptoms and steps to correct the problems. See “Troubleshooting tables” on page 62 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 74 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.

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/systems/support/>, select **System x3650**, click the **Install and use** tab, and click **Product documentation**.

Table 7. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
161	The real-time clock battery has failed.	<ol style="list-style-type: none"> 1. Reseat the battery. 2. Replace the battery or call for service.
162	A device configuration has changed.	<ul style="list-style-type: none"> • Run the Configuration/Setup Utility program, select Load Default Settings, and save the settings. • Make sure that optional devices are turned on and installed correctly.
163	The time of day has not been set.	Run the Configuration/Setup Utility program and set the date and time.
289	A failing DIMM was disabled.	Make sure that the DIMMs are supported by the server and that they are installed correctly.
301, 303	Keyboard and keyboard controller	Make sure that the keyboard cable is connected and that nothing is resting on the keyboard keys.
1810	PCI device error	Make sure that all PCI adapters are installed correctly. In the Configuration/Setup Utility program, make sure that all PCI devices are enabled. Disable option ROMs and integrated devices that are not needed and set the PCI device boot priority to ensure that the boot device option ROM is able to load.
1962	POST could not find an operating system.	Install an operating system.
00019xxx	Microprocessor x is not functioning or failed the built-in self-test.	Make sure that microprocessor x is installed correctly. (Trained service technician only) If the problem remains, replace microprocessor x.
012980xx 012981xx	Data for microprocessor x	Download and install the latest level of BIOS code.

ServerGuide problems

The following table lists problem symptoms and suggested solutions.

Table 8. *ServerGuide Setup and Installation CD*

Symptom	Suggested action
The <i>ServerGuide Setup and Installation CD</i> will not start.	<ol style="list-style-type: none">1. Make sure that the server supports the ServerGuide program and has a startable (bootable) CD-RW/DVD drive.2. If the startup (boot) sequence settings have been changed, make sure that the CD-RW/DVD drive is first in the startup sequence.3. If more than one CD or DVD drive is installed, make sure that only one drive is set as the primary drive. Start the CD from the primary drive.
The ServeRAID program cannot view all installed drives, or the operating system cannot be installed.	<ol style="list-style-type: none">1. Make sure that there are no duplicate IRQ assignments.2. Make sure that the hard disk drive is connected correctly.3. Make sure that the hard disk drive cables are securely connected.
The operating-system installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start the operating-system CD.	Make sure that the operating-system CD is supported by the ServerGuide program. See the <i>ServerGuide Setup and Installation CD</i> 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, there is no logical drive defined (SAS RAID systems. Run the ServerGuide program and make sure that setup is complete.

Troubleshooting tables

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

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

1. Check the light path diagnostics LEDs on the operator information panel (see “Light path diagnostics” on page 74).
2. Remove the software or device that you just added.
3. Run the diagnostic tests to determine whether the server is running correctly.
4. Reinstall the new software or new device.

CD-RW/DVD drive problems

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

Symptom	Action
The CD-RW/DVD drive is not recognized.	<ol style="list-style-type: none">1. Make sure that:<ul style="list-style-type: none">• 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 signal cable and connector are not damaged and the connector pins are not bent.• All damaged parts are repaired or replaced.• 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:<ol style="list-style-type: none">a. CD-RW/DVD driveb. IDE/Ultrabay Enhanced (UBE) interposer card cable4. Replace the components listed in step 3 one at a time, in the order shown, restarting the server each time.
The CD-RW/DVD drive is not working correctly.	<ol style="list-style-type: none">1. Clean the CD or DVD.2. Run the CD-RW/DVD drive diagnostic programs.3. Check the connector and signal cable for bent pins or damage.4. Replace any damaged parts.5. Reseat the CD-RW/DVD drive.6. Replace the CD-RW/DVD drive.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The CD-RW/DVD drive tray is not working.	<ol style="list-style-type: none"> 1. Make sure that the server is turned on. 2. Insert the end of a straightened paper clip into the manual tray-release opening. 3. Reseat the CD-RW/DVD drive. 4. Replace the CD-RW/DVD drive.

General problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
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

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
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 Attached Disk Test.

Intermittent problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
A problem occurs only occasionally and is difficult to diagnose.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • All cables and cords are connected securely to the rear of the server and attached devices. <p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.</p> <ul style="list-style-type: none"> • When the server is turned on, air is flowing from the fan grille. If there is no airflow, the fans are not working. This can cause the server to overheat and shut down. 2. Check the system event/error log or BMC system event log (see “Error Logs” in the <i>Problem Determination and Service Guide</i>).
The server resets (restarts) occasionally	<ol style="list-style-type: none"> 1. If the reset occurs during POST and the POST watchdog timer is enabled (click Advanced Setup --> Baseboard Management Controller (BMC) Setting --> BMC Post Watchdog in the Configuration/Setup Utility program to see the POST watchdog setting), make sure that sufficient time is allowed in the watchdog timeout value (BMC POST Watchdog Timeout). See the <i>User’s Guide</i> for information about the settings in the Configuration/Setup Utility program. <p>If the server continues to reset during POST, see the “POST” and “Diagnostic programs” sections in the <i>Problem Determination and Service Guide</i>.</p> 2. If the reset occurs after the operating system starts, disable any automatic server restart (ASR) utilities, such as the IBM Automatic Server Restart IPMI Application for Windows, or ASR devices that may be installed. <p>Note: ASR utilities operate as operating-system utilities and are related to the IPMI device driver.</p> <p>If the reset continues to occur after the operating system starts, the operating system might have a problem; see “Software problems” on page 73.</p> 3. If neither condition applies, check the system event/error log or BMC system event log (see “Error Logs” in the <i>Problem Determination and Service Guide</i>).

USB keyboard, mouse, or pointing-device problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
All or some keys on the keyboard do not work.	<ol style="list-style-type: none"> 1. If you have installed a USB keyboard, run the Configuration/Setup Utility program and enable keyboardless operation to prevent the POST error message 301 from being displayed during startup. 2. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for keyboard compatibility. 3. Make sure that: <ul style="list-style-type: none"> • The keyboard cable is securely connected. • The server and the monitor are turned on. 4. Move the keyboard cable to a different USB connector. 5. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Keyboard b. (Only if the problem occurred with a front USB connector) Internal USB cable c. (Trained service technician only) System board
The USB mouse or USB pointing device does not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The mouse is compatible with the server. See http://www.ibm.com/servers/eserver/serverproven/compat/us/. • The mouse or pointing-device USB cable is securely connected to the server, and the device drivers are installed correctly. • The server and the monitor are turned on. 2. If a USB hub is in use, disconnect the USB device from the hub and connect it directly to the server. 3. Move the mouse or pointing device cable to another USB connector. 4. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Mouse or pointing device b. (Only if the problem occurred with a front USB connector) Internal USB cable c. (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.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • No error LEDs are lit on the operator information panel. • Memory mirroring or memory sparing does not account for the discrepancy. • The memory modules are seated correctly. • You have installed the correct type of memory (see “Installing a memory module” on page 12). • If you changed the memory, you updated the memory configuration in the Configuration/Setup Utility program. • All banks of memory are enabled. The server might have automatically disabled a memory bank when it detected a problem, or a memory bank might have been manually disabled. 2. Check the POST error log for error message 289: <ul style="list-style-type: none"> • If a DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If a DIMM was disabled by the user or by POST, run the Configuration/Setup Utility program and enable the DIMM. 3. Run memory diagnostics (see “Running the diagnostic programs” in the <i>Problem Determination and Service Guide</i>). 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. Install the DIMMs in the sequence that is described in “Installing a memory module” on page 12. 6. Reseat the DIMMs. 7. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. DIMMs b. (Trained service technician only) System board
Multiple rows of DIMMs in a branch are identified as failing.	<ol style="list-style-type: none"> 1. Reseat the DIMMs; then, restart the server. 2. Replace the lowest-numbered DIMM pair of those that are identified; then, restart the server. Repeat as necessary. 3. (Trained service technician only) Replace the system board.

Microprocessor problems

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* 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.	<ol style="list-style-type: none"> 1. Correct any errors that are indicated by the LEDs (see “Light path diagnostics LEDs” in the <i>Problem Determination and Service Guide</i>). 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. Reseat the following components: <ol style="list-style-type: none"> a. (Trained service technician only) Microprocessors b. VRM, if microprocessor 2 is installed 5. (Trained service technician only) Replace the microprocessors.

Monitor problems

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

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
Testing the monitor	<ol style="list-style-type: none"> 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 <i>Problem Determination and Service Guide</i>). 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: <ol style="list-style-type: none"> a. Remote Supervisor Adapter II SlimLine (if one is present) b. (Trained service technician only) System board
The screen is blank.	<ol style="list-style-type: none"> 1. If the server is attached to a KVM switch, bypass the KVM switch to eliminate it as a possible cause of the problem: connect the monitor cable directly to the correct connector on the rear of the server. 2. Make sure that: <ul style="list-style-type: none"> • The server is turned on. 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. <p>Important: In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank monitor screen. If this occurs and the Boot Fail Count option in the Start Options of the Configuration/Setup Utility program is enabled, you must restart the server three times to reset the configuration settings to the default configuration (the memory connector or bank of connectors enabled).</p> 3. Make sure that the correct server is controlling the monitor, if applicable. 4. Make sure that damaged BIOS code is not affecting the video; see the <i>Problem Determination and Service Guide</i> for information about recovering from a BIOS failure. 5. See the <i>Problem Determination and Service Guide</i> 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.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The application program is not setting a display mode that is higher than the capability of the monitor. • You installed the necessary device drivers for the application. 2. Run video diagnostics (see the <i>Problem Determination and Service Guide</i> for information about running the diagnostic programs). <ul style="list-style-type: none"> • If the server passes the video diagnostics, the video is good; see the <i>Problem Determination and Service Guide</i> for information about solving undetermined problems.
The monitor has screen jitter, or the screen image is wavy, unreadable, rolling, or distorted.	<ol style="list-style-type: none"> 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. <p>Attention: Moving a color monitor while it is turned on might cause screen discoloration.</p> <p>Move the device and the monitor at least 305 mm (12 in.) apart, and turn on the monitor.</p> <p>Notes:</p> <ol style="list-style-type: none"> a. To prevent diskette drive read/write errors, make sure that the distance between the monitor and any external diskette drive is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. 2. Reseat the following components: <ol style="list-style-type: none"> a. Monitor cable b. Remote Supervisor Adapter II SlimLine (if one is present) 3. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. 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.	<ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> a. Monitor b. (Trained service technician only) System board

Optional-device problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
An IBM optional device that was just installed does not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • 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. <p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.</p> <ul style="list-style-type: none"> • 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.	<ol style="list-style-type: none"> 1. Make sure that all of the hardware and cable connections for the device are secure. <p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.</p> 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

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- 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
<p>The power-control button does not work, and the reset button does work (the server does not start).</p> <p>Note: The power-control button will not function until 20 seconds after the server has been connected to power.</p>	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The power cords are correctly connected to the server and to a working power source. <p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.</p> <ul style="list-style-type: none"> • 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. 2. Make sure that the power-control button and the reset button are working correctly: <p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.</p> <ol style="list-style-type: none"> a. Disconnect the server power cords. b. Reseat the operator information panel assembly cable. c. Reconnect the power cords. d. Press the power-control button to restart the server. If the button does not work, replace the operator information panel assembly. e. Press the reset button (on the light path diagnostics panel) to restart the server. If the button does not work, replace the operator information panel assembly. 3. If you just installed an optional device, remove it, and restart the server. If the server now starts, you might have installed more devices than the power supply supports. 4. Reseat the power backplane and restart the server. 5. Replace the power backplane and restart the server. 6. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Power supplies <p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install the dc power supply. See the documentation that comes with each dc power supply.</p> b. (Trained service technician only) System board 7. See “Solving power problems” and “Solving undetermined problems” in the <i>Problem Determination and Service Guide</i>.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The server does not turn off.	<ol style="list-style-type: none"> 1. Turn off the server by pressing the power-control button for 5 seconds. 2. Restart the server. 3. If the server fails POST and the power-control button does not work, disconnect the power cord for 20 seconds; then, reconnect the power cord and restart the server. Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply. 4. If the problem remains, suspect the system board.
The OVER SPEC LED on the light path diagnostics panel is lit, and the one of the power channel LEDs on the system board is lit.	See the power troubleshooting table in the <i>Problem Determination and Service Guide</i> or call for service.
The server unexpectedly shuts down, and the LEDs on the operator information panel are not lit.	See “Solving undetermined problems” in the <i>Problem Determination and Service Guide</i> .

Serial port problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
The number of serial ports that are identified by the operating system is less than the number of installed serial ports.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • Each port is assigned a unique address in the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial-port adapter (if one is present) is seated correctly. 2. Reseat the serial port adapter, if one is present. 3. Replace the serial port adapter, if one is present.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
A serial device does not work.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. • The device is connected to the correct connector (see “Rear view” on page 37). 2. Reseat the following components: <ol style="list-style-type: none"> a. Failing serial device b. Serial cable c. Remote Supervisor Adapter II SlimLine (if one is present) 3. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Failing serial device b. Serial cable c. Remote Supervisor Adapter II SlimLine (if one is present) d. (Trained service technician only) System board

Software problems

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Symptom	Action
You suspect a software problem.	<ol style="list-style-type: none"> 1. To determine whether the problem is caused by the software, make sure that: <ul style="list-style-type: none"> • The server has the minimum memory that is needed to use the software. For memory requirements, see the information that comes with the software. If you have just installed an adapter or memory, the server might have a memory-address conflict. • The software is designed to operate on the server. • Other software works on the server. • The software works on another server. 2. If you received any error messages when using the software, see the information that comes with the software for a description of the messages and suggested solutions to the problem. 3. Contact your place of purchase of the software.

Universal Serial Bus (USB) port 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.	<ol style="list-style-type: none"> 1. Make sure that: <ul style="list-style-type: none"> • The correct USB device driver is installed. • The operating system supports USB devices. 2. Make sure that the USB configuration options are set correctly in the Configuration/Setup Utility program menu (see the <i>User's Guide</i> for more information). 3. If you are using a USB hub, disconnect the USB device from the hub and connect it directly to the server. 4. Move the device cable to a different USB connector.

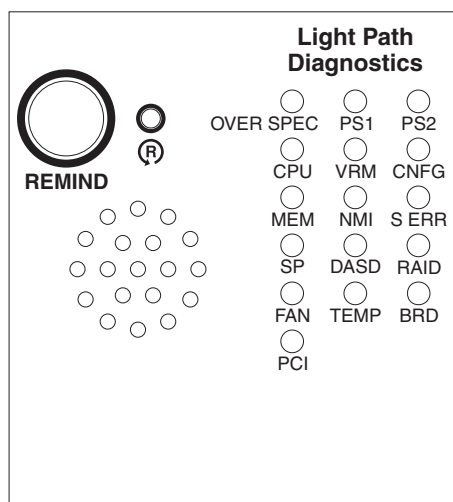
Video problems

See “Monitor problems” on page 68.

Light path diagnostics

Use light path diagnostics to diagnose system errors. The light path diagnostics panel is behind the operator information panel, on the left front of the server. To access the light path diagnostics panel, slide the release latch on the front of the operator information panel to the left.

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 to place the server 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 a power source but is not turned on, provided that the power supply is operating correctly. This feature helps you to isolate the problem when the operating system is shut down.

Diagnosing problems using light path diagnostics

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

1. **Light path diagnostics panel** - Look at this panel first. If a system error has occurred, the system-error LED on the front of the light path diagnostics drawer is lit. Slide the latch to the left on the front of the operator information panel to access the light path diagnostics panel. Note any LEDs that are lit, and then close the drawer.
2. **LEDs on the system board** - To identify the component that is causing the error, note the lit LED on or beside the component.

Light path diagnostics LEDs

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

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the parts listing in the <i>Problem Determination and Service Guide</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
LED	Description	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.	Use the Configuration/Setup Utility program to check the system-error log for information about the error.
OVER SPEC	The power supplies are using more power than their maximum rating.	<ol style="list-style-type: none"> 1. Remove optional devices from the server. 2. Replace the failing power supply. <p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply.</p>
PS 1	The power supply in bay 1 has failed.	<p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply.</p> <ol style="list-style-type: none"> 1. Make sure that the power supply is correctly seated. 2. Replace the failed power supply.

- 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.

LED	Description	Action
PS 2	The power supply in bay 2 has failed.	<p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply and to remove and install a dc power supply. See the documentation that comes with each dc power supply.</p> <ol style="list-style-type: none"> 1. Make sure that the power supply is correctly seated. 2. Replace the failed power supply.
CPU	A microprocessor has failed.	<ol style="list-style-type: none"> 1. Make sure that the failing microprocessor, which is indicated by a lit LED on the system board, is installed correctly. See the <i>User's Guide</i> on the IBM <i>System x Documentation</i> CD for information about installing a microprocessor. 2. Call for service.
VRM	An error occurred on the microprocessor voltage regulator module (VRM).	<ol style="list-style-type: none"> 1. Replace the VRM. 2. Call for service.
CNFG	A hardware configuration error has occurred.	<ol style="list-style-type: none"> 1. Check the microprocessors that were just installed to make sure that they are compatible with each other and with the VRM (see “Installing an additional microprocessor” on page 20 for compatibility requirements). 2. (Trained service technician only) Replace an incompatible microprocessor. 3. Check the system error logs for information about the error. Replace any components that are indicated. (Use the Configuration/Setup Utility program to view the error logs.)
MEM	A memory error has occurred.	Replace the failing DIMM, which is indicated by the lit LED on the system board.
NMI	A machine check error has occurred.	Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
S ERR	Reserved.	
SP	The service processor has failed.	<p>Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.</p> <ol style="list-style-type: none"> 1. Remove power from the server; then, reconnect the server to power and restart the server. 2. Update the firmware on the BMC. 3. If a Remote Supervisor Adapter II SlimLine is installed, update the firmware; if the problem remains, replace the adapter. 4. Call for service
DASD	A hard disk drive error has occurred.	<ol style="list-style-type: none"> 1. Check the LEDs on the hard disk drives and replace the indicated drive. 2. Call for service.

- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the parts listing in the *Problem Determination and Service Guide* 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.

LED	Description	Action
RAID	A RAID controller error has occurred.	<ol style="list-style-type: none"> 1. Make sure that a RAID controller is installed. Note: The server will not start without a RAID controller installed. 2. Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.)
FAN	A fan has failed, is operating too slowly, or has been removed. The TEMP LED might also be lit.	Replace the failing fan, which is indicated by a lit LED on the fan itself.
TEMP	The system temperature has exceeded a threshold level. A failing fan can cause the TEMP LED to be lit.	<ol style="list-style-type: none"> 1. Determine whether a fan has failed. If it has, replace it. 2. Make sure that the room temperature is not too high. See “Features and specifications” on page 4 for temperature information. 3. Make sure that the air vents are not blocked. 4. Call for service.
BRD	An error has occurred on the system board.	<ol style="list-style-type: none"> 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. (Use the Configuration/Setup Utility program to view the error logs.)
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.	<ol style="list-style-type: none"> 1. Check the LEDs on the PCI slots to identify the component that is causing the error. 2. Check the system-error log for information about the error. (Use the Configuration/Setup Utility program to view the error logs.) 3. 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. 4. 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 section contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your system, and whom to call for service, if it is necessary.

Before you call

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

- Check all cables to make sure that they are connected.

Attention: In a dc power environment, only trained service personnel other than IBM service technicians are authorized to connect or disconnect power to the dc power supply. See the documentation that comes with each dc power supply.

- 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 System x 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/systems/support/> to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/systems/support/> and follow the instructions. Also, some documents are available through the IBM Publications Center at <http://www.ibm.com/shop/publications/order/>.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM systems, optional devices, services, and support. The address for IBM System x and xSeries information is <http://www.ibm.com/systems/x/>. The address for IBM BladeCenter information is <http://www.ibm.com/systems/bladecenter/>. The address for IBM IntelliStation® information is <http://www.ibm.com/intellistation/>.

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

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, 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/services/>, 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

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:
IBM Taiwan Corporation
3F, No 7, Song Ren Rd.
Taipei, Taiwan
Telephone: 0800-016-888

Appendix B. Notices

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Alert on LAN	Netfinity	Wake on LAN

BladeCenter	Predictive Failure Analysis	XA-32
Chipkill	ServeRAID	XA-64
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Important notes

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

CD or DVD drive speed is the variable read rate. Actual speeds vary and are often less than the possible maximum.

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

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 can 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 that are available from IBM.

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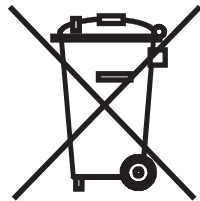
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Battery return program

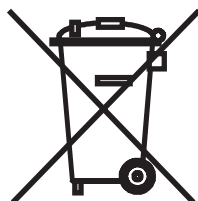
This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. 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:



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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

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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

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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

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Avis de conformité à la réglementation d'Industrie Canada

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United Kingdom telecommunications safety requirement

Notice to Customers

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

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European Community contact:
IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569

Telephone: 0049 (0)711 785 1176
Fax: 0049 (0)711 785 1283
E-mail: tjahn@de.ibm.com

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Part Number: 44R5190

Printed in USA

(1P) P/N: 44R5190

