IBM System x3250 M3 Types 4251, 4252, and 4261

Installation and User's Guide

IBM

IBM System x3250 M3 Types 4251, 4252, and 4261

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Installation and User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, "Notices," on page 77 and the *IBM Safety Information*, *IBM Environmental Notices and User's Guide* on the IBM *System x Documentation* CD, and the *Warranty Information* document that comes with the server.

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

Each caution and danger statement in this documentation 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: Use No. 26 AWG or larger UL-listed or CSA certified telecommunication line cord.

Statement 1:

DANGER

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

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

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

Statement 2:

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

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

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

Statement 3:

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

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

DANGER

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

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

Statement 4:
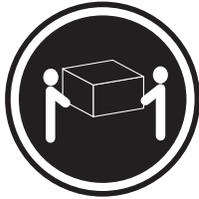
≥ 18 kg (39.7 lb.)　　　　≥ 32 kg (70.5 lb.)　　　　≥ 55 kg (121.2 lb.)
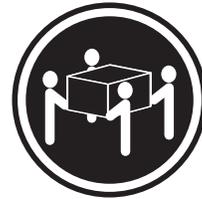
CAUTION:
Use safe practices when lifting.

Statement 5:

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

2

1
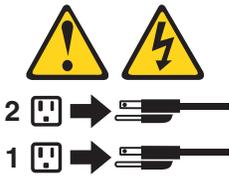
Statement 6:

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

Statement 8:

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

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

Statement 12:

CAUTION:
The following label indicates a hot surface nearby.

Statement 26:

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

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.

Statement 27:

CAUTION:
Hazardous moving parts are nearby.

Chapter 1. The System x3250 M3 server

This *Installation and User's Guide* contains information and instructions for setting up your IBM System x3250 M3 Type 4251, 4252, or 4261 server, instructions for installing some optional devices, and instructions for cabling, and configuring the server. For removing and installing optional devices, diagnostics and troubleshooting information, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD, which comes with the server.

The IBM® System x3250 M3 Type 4251, 4252, or 4261 server is a 1U-high[1] rack model server for high-volume network transaction processing. This high-performance, dual-core or quad-core server is ideally suited for networking environments that require superior microprocessor performance, input/output (I/O) flexibility, and high manageability.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of the server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

The server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the printed *Warranty Information* document that comes with your server.

The server contains IBM X-Architecture® technologies, which help increase performance and reliability. For more information, see "What your server offers" on page 8 and "Reliability, availability, and serviceability" on page 11.

You can obtain up-to-date information about the server and other IBM server products at http://www.ibm.com/systems/x/. At http://www.ibm.com/support/mysupport/, you can create a personalized support page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly e-mail notifications about new technical documents, search for information and downloads, and access various administrative services.

If you participate in the IBM client reference program, you can share information about your use of technology, best practices, and innovative solutions; build a professional network; and gain visibility for your business. For more information about the IBM client reference program, see http://www.ibm.com/ibm/clientreference/.

The server supports two 3.5-inch simple-swap SATA hard disk drives, two 3.5-inch hot-swap SATA or SAS hard disk drives, or four 2.5-inch hot-swap SAS hard disk drives (depending on your model).

Note:

- Simple-swap SATA hard disk drives support AHCI mode.
- Simple-swap models only support ServeRAID-BR10il adapter.

Note: The illustrations in this document might differ slightly from your hardware. The following illustration shows the 2.5-inch hot-swap SAS server model.

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1. Racks are marked in vertical increments of 1.75 inches each. Each increment is referred to as a unit, or a "U". A 1U-high device is approximately 1.75 inches tall.

1

Hard disk drive activity LED
Locator LED
System-error LED
Reset button
Power-control button
Power-on LED
USB 1 connector
USB 2 connector

IBM

Hard disk drive activity
LED (green)
Hard disk drive status
LED (amber)
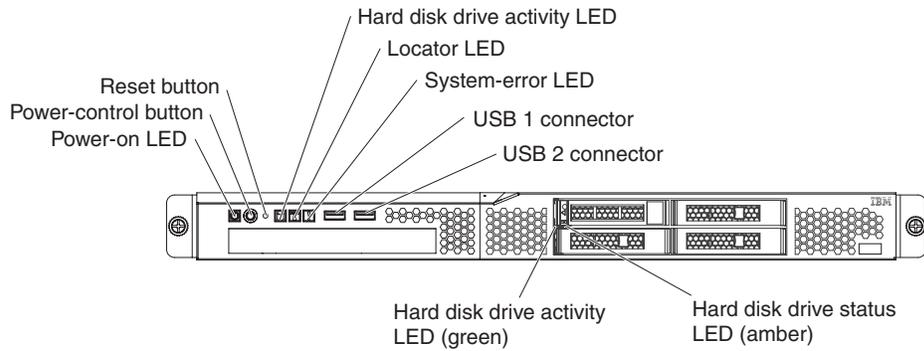
The following illustration shows the 3.5-inch hot-swap SAS/SATA server model.

Hard disk drive activity LED
Locator LED
System-error LED
Reset button
Power-control button
Power-on LED
USB 1 connector
USB 2 connector

Hard disk drive activity
LED (green)
Hard disk drive status
LED (amber)

IBM
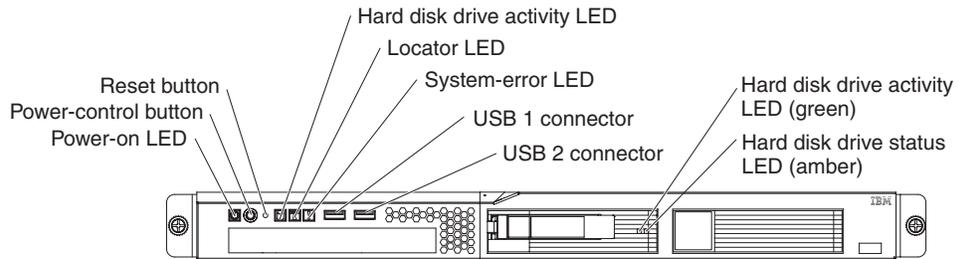
The following illustration shows the 3.5-inch simple-swap SATA server model.

Hard disk drive activity LED
Locator LED
System-error LED
Reset button
Power-control button
Power-on LED
USB 1 connector
USB 2 connector

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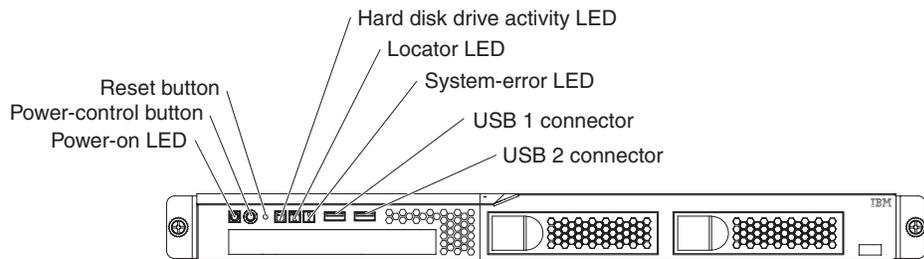
If firmware and documentation updates are available, you can download them from the IBM Web site. The server might have features that are not described in the documentation that comes with the server, and the documentation might be updated occasionally to include information about those features, or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

Record information about the server in the following table.

Product name	IBM System x3250 M3 server
Machine type	4251, 4252, or 4261 (circle the machine type that applies)
Model number	_____
Serial number	_____

The model number and serial number are on the ID label on the front of the server.

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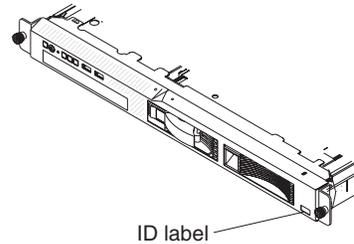
Note: The illustrations in this document might differ slightly from your hardware.

You can download an IBM *ServerGuide Setup and Installation* CD to help you configure the hardware, install device drivers, and install the operating system.

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 on the IBM *System x Documentation* CD for complete rack installation and removal instructions.

The IBM System x Documentation CD

The IBM *System x Documentation* CD contains documentation for the server in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *System x Documentation* CD requires the following minimum hardware and software:
- Microsoft Windows XP, Windows 2000, or Red Hat Linux
- 100 MHz microprocessor
- 32 MB of RAM
- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents, using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your server and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English-language version is displayed.

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

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

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

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

    ```
    sh runlinux.sh
    ```

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

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

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

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

Related documentation

This *Installation and User's Guide* contains general information about the server including how to set up and cabling the server, how to install supported optional devices, and how to configure the server. The following documentation also comes with the server:

- *Problem Determination and Service Guide*

  This document is in PDF on the IBM *System x Documentation* CD. It contains information to help you solve problems yourself, and it contains information for service technicians.

- *Warranty Information*

  This printed document contains information about the terms of the warranty.

- *Rack Installation Instructions*

  This printed document contains instructions for installing the server in a rack and comes with the rack kit.

- *IBM Environmental Notices and User Guide*

  This document is in PDF format on the IBM *System x Documentation* CD. It contains translated environmental notices.

- *Safety Information*

This document is in PDF on the IBM *System x Documentation* CD. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

Depending on the server model, additional documentation might be included on the IBM *System x Documentation* CD.

The System x and BladeCenter Tools Center is an online information center that contains information about tools for updating, managing, and deploying firmware, device drivers, and operating systems. The System x and BladeCenter Tools Center is at http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp.

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

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

1. Go to http://www.ibm.com/systems/support/.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Publications lookup**.
4. From the **Product family** menu, select **System x3250 M3** and click **Go**.

Notices and statements in this document

The caution and danger statements 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 your language 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 might 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 model, some features might not be available, or some specifications might not apply.

Table 1. Features and specifications

Microprocessor:	SATA optical drives:	Integrated functions:

• Supports one Intel quad-core (Xeon 3400 series) or dual-core (Celeron G1101, Pentium G6950, or Core i3 series) processor the IbexPeak 3420 chip set and Multi-chip Package processor architecture
• Designed for LGA 1156 socket
• Scalable up to four cores
• 32 KB instruction cache, 32 KB data cache, and up to 8 MB L3 cache that is shared among the cores
• Support for Intel Extended Memory 64 Technology (EM64T)
Note:
• Use the Setup utility to determine the type and speed of the microprocessor.
• For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.
 	
Memory:
• Minimum: 1 GB
• Maximum: 32 GB
  – 16 GB using unbuffered DIMMs (UDIMMs)
  – 32 GB using registered DIMMs (RDIMMs)
• Types: PC3-8500 or PC3-10600R-999 (single-rank or double-rank), 1066, and 1333 MHz, ECC, DDR3 registered or unbuffered SDRAM DIMMs only
• Connectors: Six dual inline memory module (DIMM) connectors, two-way interleaved
• Supports (depending on the model):
  – 1 GB, 2 GB, and 4 GB unbuffered DIMMS
  – 1 GB, 2 GB, 4 GB, and 8 GB registered DIMMs
	• UltraSlim DVD-ROM combo (optional)
	• Multi-burner (optional)
	
	Hard disk drive expansion bays (depending on the model):
	
	One of the following configurations:
	• Four 2.5-inch hot-swap SAS hard disk drive bays
	• Two 3.5-inch hot-swap SAS or hot-swap SATA hard disk drive bays
	• Two 3.5-inch simple-swap SAS or simple-swap SATA hard disk drive bays
	Note:
	  – Simple-swap SATA hard disk drives support AHCI mode.
	  – Simple-swap models only support ServeRAID-BR10il adapter.
	
	PCI expansion slots:
	
	Supports two PCI riser slots on the riser card that connects to slots 1 and 2 on the system board:
	• Slot 1 supports low-profile cards (PCI Express Gen2 x8
	• Slot 2 supports 3/4-length, full-height cards (PCI Express Gen2 x8 or PCI-X 1.0a 64-bit/133 MHz)
	
	Power supply:
	
	One 351-watt power supply or one 351-watt high efficiency power supply with Active Energy Manager (AEM) depending on your model.
	
	Fans: The server comes standard with five speed-controlled fans.
		• Integrated management module (IMM), which provides service processor control and monitoring functions, video controller, and (when the optional virtual media key is installed) remote keyboard, video, mouse, and remote hard disk drive capabilities
		• Intel 82574L Gb Ethernet controller with TCP/IP Offload Engine (TOE) and Wake on LAN support
		• Seven Universal Serial Bus (USB) 2.0 ports (two front, four rear, and one internal for the optional USB Hypervisor key)
		• Two Ethernet ports
		• Four-port integrated SATA controller
		• Integrated Trusted Platform Module (TPM) support
		• One serial port
		• One VGA port

Table 1. Features and specifications (continued)

RAID controllers:

- A ServeRAID-BR10il v2 SAS/SATA adapter that provides RAID levels 0, 1, and 1E (comes standard on some hot-swap SAS and hot-swap SATA models).
- An optional ServeRAID-MR10i SAS/SATA adapter that provides RAID levels 0, 1, 5, 6, and 10 can be ordered.
- An optional ServeRAID-MR10is VAULT SAS/SATA adapter with an encryption 1078 DE chip set that provides RAID levels 0, 1, 5, 6, and 10 can be ordered.

Acoustical noise emissions:

- Sound power, idling: 6.5 bels maximum
- Sound power, operating: 6.5 bels maximum

Environment:

- Air temperature:
  - Server on: 10°C to 35°C (50.0°F to 95.0°F); altitude: 0 to 914.4 m (3000 ft)
  - Server on: 10°C to 32°C (50.0°F to 89.6°F); altitude: 914.4 m (3000 ft) to 2133.6 m (7000.0 ft)
  - Server off: 10°C to 43°C (50°F to 109.4°F); maximum altitude: 2133.6 m (7000.0 ft)
  - Shipping: -40°C to 60°C (-104°F to 140°F)
- Humidity:
  - Server on: 8% to 80%
  - Server off: 8% to 80%
- Particulate contamination:

  Attention: Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see "Particulate contamination" on page 79.

Video controller (integrated into IMM):

- Matrox G200
- SVGA compatible video controller
- Avocent Digital Video Compression
- Video memory is not expandable

Note: The maximum video resolution is 1280 x 1024

Size:

- Height: 43 mm (1.69 inches, 1 U)
- Depth: 559 mm (22 inches)
- Width: 440 mm (17.32 inches)
- Maximum weight: 12.7 kg (28 lb)

Heat output:

Approximate heat output:
- Minimum configuration: 171 BTU per hour (50 watts)
- Maximum configuration: 1024 BTU per hour (300 watts)

Electrical input:

- Sine-wave input (50 / 60 Hz) required
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Input kilovolt-amperes (kVA), approximately:
  - Minimum: 0.102 kVA
  - Maximum: 0.55 kVA

Notes:

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

2. 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 noise emission level stated in the declared (upper limit) sound-power level, in bels, for a random sample of system.

3. There is no keyboard connector or mouse connector on the server. You can connect a USB keyboard and USB mouse to the server by using the USB connectors.

What your server offers

The server uses the following features and technologies:

- **Integrated management module**

  The Integrated management module (IMM) combines service processor functions, video controller, and (when an optional virtual media key is installed) remote presence function in a single chip. The IMM provides advanced service-processor control, monitoring, and alerting function. If an environmental condition exceeds a threshold or if a system component fails, the IMM lights LEDs to help you diagnose the problem, records the error in the event log, and alerts you to the problem. Optionally, the IMM also provides a virtual presence capability for remote server management capabilities. The IMM provides remote server management through the following industry-standard interfaces:

  - Intelligent Platform Management Interface (IPMI) version 2.0
  - Simple Network Management Protocol (SNMP) version 3
  - Common Information Model (CIM)
  - Web browser

  For additional information, see "Using the integrated management module" on page 66.

- **UEFI-compliant server firmware**

  The IBM System x Server Firmware offers several features, including Unified Extensible Firmware Interface (UEFI) version 2.1 compliance, Active Energy Manager (AEM) technology, enhanced reliability, availability and serviceability (RAS) capabilities, and basic input/output system (BIOS) compatibility support. UEFI replaces the legacy BIOS. UEFI defines a standard interface between the operating system, platform firmware and external devices, and offers capabilities that far exceeds that of the legacy BIOS.

  The server design combines the UEFI capabilities and features with legacy BIOS compatibility. The server is capable of booting UEFI-compliant operating systems, BIOS-based operating systems, and BIOS-based adapters as well as UEFI-compliant adapters.

- **IBM Dynamic System Analysis Preboot diagnostics programs**

  The Dynamic System Analysis (DSA) Preboot diagnostics programs are stored on the integrated USB memory. It collects and analyzes system information to aid in diagnosing server problems. The diagnostic programs collect the following information about the server:

  - System configuration
  - Network interfaces and settings
  - Installed hardware
  - Service processor status and configuration
  - Vital product data, firmware, and UEFI (formerly BIOS) configuration
  - Hard disk drive health
  - RAID controller configuration
  - Event logs for ServeRAID controllers and service processors

  The diagnostic programs create a merged log that includes events from all collected logs. The information is collected into a file that you can send to IBM service and support. Additionally, you can view the information locally through a generated text report file. You can also copy the log to a removable media and view the log from a Web browser.

For additional information about DSA Preboot diagnostics, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD

- **Dual-core or quad-core processing**

  The server supports one Intel Xeon dual-core or quad-core microprocessor.

- **IBM Systems Director CD**

  IBM Systems Director is a workgroup-hardware-management tool that you can use to centrally manage System x and xSeries servers. For more information, see the IBM Systems Director documentation on the *IBM Systems Director* CD and "IBM Systems Director" on page 12.

- **IBM X-Architecture technology**

  IBM X-Architecture technology combines proven, innovative IBM designs to make your Intel-processor-based server powerful, scalable, and reliable. For more information, see http://www.ibm.com/servers/eserver/xseries/xarchitecture/ enterprise/index.html.

  - **VMware ESXi embedded hypervisor**

    The VMware ESXi embedded hypervisor is available on some server models. Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. The VMware ESXi embedded hypervisor software is provided on USB flash device that is installed in the USB connector on the system board. See "Using the embedded hypervisor" on page 67 for additional information.

  - **Remote presence capability and blue-screen capture**

    The remote presence and blue-screen capture features are integrated functions of the integrated management module (IMM) and are available with the purchase of the optional IBM Virtual Media Key. A virtual media key is required to enable the remote presence and blue-screen capture features. The remote presence feature provides the following functions:

    - Remotely viewing video with graphics resolutions up to 1280 x 1024, regardless of the system state
    - Remotely accessing the server, using the keyboard and mouse from a remote client
    - Mapping the DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
    - Uploading a diskette image to the IMM memory and mapping it to the server as a virtual drive

    The blue-screen capture feature captures the video display contents before the IMM restarts the server when the IMM detects an operating-system hang condition. A system administrator can use the blue-screen capture to assist in determining the cause of the hang condition.

    See "Using the remote presence capability and blue-screen capture" on page 68 for additional information.

  - **Large system-memory capacity**

    The memory bus supports up to 32 GB of memory when registered DIMMs are installed. The server supports up to 16 GB if unbuffered DIMMs are installed. The memory controller supports error correcting code (ECC) for up to six industry-standard PC3-8500 or PC3-10600R-999, 1066 and 1333 MHz, DDR3 (third-generation double-data-rate), registered or unbuffered, synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

- **IBM *ServerGuide Setup and Installation* CD**

The *ServerGuide Setup and Installation* CD, which you can download from the Web, provides programs to help you set up the server and install a Windows operating system. The ServerGuide program detects installed optional hardware devices and provides the correct configuration programs and device drivers. For more information about the *ServerGuide Setup and Installation* CD, see "Using the ServerGuide Setup and Installation CD" on page 64.

- **Integrated network support**

  The server comes with an integrated Intel Gigabit Ethernet controller, which supports connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network. For more information, see "Configuring the Gigabit Ethernet controller" on page 70.

- **Integrated Trusted Platform Module (TPM)**

  This integrated security chip performs cryptographic functions and stores private and public secure keys. It provides the hardware support for the Trusted Computing Group (TCG) specification. You can download the software to support the TCG specification, when the software is available. See http://www.ibm.com/servers/eserver/xseries/scalable_family.html for details about the TPM implementation. You can enable TPM support through the Setup utility under the **System Security** menu choice.

- **Active Energy Manager (AEM)**

  The IBM Active Energy Manager solution is an IBM Systems Director plug-in that measures and reports server power consumption as it occurs. This enables you to monitor power consumption in correlation to specific software application programs and hardware configurations. You can obtain the measurement values through the systems-management interface and view them, using IBM Systems Director. For more information, including the required levels of IBM Systems Director and Active Energy Manager, see the IBM Systems Director documentation on the *IBM Systems Director* CD, or see http://www.ibm.com/systems/management/director/resources/.

- **Large data-storage capacity and hot-swap capability**

  The server supports a maximum of four 2.5-inch hot-swap Serial Attached SCSI (SAS) hard disk drives, two 3.5-inch simple-swap Serial ATA (SATA) hard disk drives, or two 3.5-inch hot-swap SAS or SATA hard disk drives, depending on the server model.

  With the hot-swap feature, you can add, remove, or replace hard disk drives without turning off the server.

- **PCI adapter capabilities**

  The server has two PCI interface slots on the riser card (one supports low-profile cards, and one supports full-height, three-quarter length cards). Both slots can support PCI Express or PCI-X adapters. See "Installing an adapter" on page 42 for detailed information.

- **ServeRAID support**

  The ServeRAID adapter provides hardware redundant array of independent disks (RAID) support to create configurations. The standard RAID adapter provides RAID levels 0, 1, and 1E. An optional RAID adapter is available for purchase that provides RAID levels 0, 1, 5, 6, and 10.

- **Systems-management capabilities**

  The server comes with an integrated management module (IMM). When the IMM is used with the systems-management software that comes with the server, you can manage the functions of the server locally and remotely. The IMM also provides system monitoring, event recording, and network alert capability.

- **TCP/IP offload engine (TOE) support**

The Ethernet controllers in the server support TOE, which is a technology that offloads the TCP/IP flow from the microprocessor and I/O subsystem to increase the speed of the TCP/IP flow. When an operating system that supports TOE is running on the server and TOE is enabled, the server supports TOE operation. See the operating-system documentation for information about enabling TOE.

Note: As of the date of this document, the Linux operating system does not support TOE.

Reliability, availability, and serviceability

Three important computer design features are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored in the server, the availability of the server when you need it, and the ease with which you can diagnose and correct problems.

Your server has the following RAS features:
- 1-year parts and 1-year labor limited warranty for machine type 4251, 3-year parts and 3-year labor limited warranty for machine type 4252, and 4-year parts and 4-year labor limited warranty for machine type 4261.
- Automatic error retry and recovery
- Automatic restart on nonmaskable interrupt (NMI)
- Automatic restart after a power failure
- Advanced Configuration and Power Interface (ACPI)
- Advanced Desktop Management Interface (DMI) features
- Intelligent Platform Management Interface (IPMI) 2.0 support that provides secure remote power on/power off and seven standard alerts for components such as fans, voltage, and thermals
- Auto-restart initial program load (IPL)
- Boot-block recovery
- Built-in, menu-driven configuration and setup programs
- Backup basic input/output system switching under the control of the integrated management module (IMM)
- Built-in monitoring for fan, power, temperature, voltage, and power supply
- Diagnostic support for ServeRAID and Ethernet adapters
- ECC memory
- Error codes and messages
- Hot-swap hard disk drives
- Integrated management module (IMM)
- Menu-driven setup, system configuration, and redundant array of independent disks (RAID) configuration programs
- Parity checking on the small computer system interface (SCSI) bus and PCI buses
- Power management: Compliance with Advanced Configuration and Power Interface (ACPI)
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts on memory, SAS/SATA hard disk drives, fans, and power supplies
- Remote system problem-determination support
- Read-only memory (ROM) checksums
- ROM-based diagnostics
- SDRAM with serial presence detect (SPD)
- Serial Presence Detection (SPD) on memory, VPD, power supply, and hard disk drives backplane
- Single-DIMM isolation of excessive correctable error or multi-bit error by the Unified Extensible Firmware Interface (UEFI)

- Standby voltage for system-management features and monitoring
- Startup (boot) from LAN through remote initial program load (RIPL) or dynamic host configuration protocol/boot protocol (DHCP/BOOTP)
- System auto-configuring from the configuration menu
- System-error logging (POST and IMM)
- Systems-management monitoring through the Inter-Integrated Circuit (IC) protocol bus
- Upgradeable POST, Unified Extensible Firmware Interface (UEFI), diagnostics, IMM firmware, and read-only memory (ROM) resident code, locally or over the LAN
- Vital product data (VPD) on microprocessor, system board, power supply, and SAS/SATA (hot-swap hard disk drive) backplane
- Wake on LAN capability

IBM Systems Director

IBM Systems Director is a platform-management foundation that streamlines the way you manage physical and virtual systems and supports multiple operating systems and virtualization technologies in IBM and non-IBM x86 platforms.

Through a single user interface, IBM Systems Director provides consistent views for viewing managed systems, determining how these systems relate to one another, and identifying their statuses, helping to correlate technical resources with business needs. A set of common tasks that are included with IBM Systems Director provides many of the core capabilities that are required for basic management, which means instant out-of-the-box business value. The following common tasks are included:

- Discovery
- Inventory
- Configuration
- System health
- Monitoring
- Updates
- Event notification
- Automation for managed systems

The IBM Systems Director Web and command-line interfaces provide a consistent interface that is focused on driving these common tasks and capabilities:

- Discovering, navigating, and visualizing systems on the network with the detailed inventory and relationships to the other network resources
- Notifying users of problems that occur on systems and the ability to isolate the sources of the problems
- Notifying users when systems need updates and distributing and installing updates on a schedule
- Analyzing real-time data for systems and setting critical thresholds that notify the administrator of emerging problems
- Configuring settings of a single system and creating a configuration plan that can apply those settings to multiple systems
- Updating installed plug-ins to add new features and functions to the base capabilities
- Managing the life cycles of virtual resources

For more information about IBM Systems Director, see the documentation on the *IBM Systems Director* CD that comes with the server and the IBM xSeries Systems Management Web page at http://www.ibm.com/systems/management/, which presents an overview of IBM Systems Management and IBM Systems Director.

The Update*Xpress* System Packs

The Update*Xpress* System Packs provide an effective and simple way to update device drivers, server firmware, and firmware of supported options contained within the server, for System x and IBM BladeCenter® servers. Each Update*Xpress* System Pack contains all the online driver and firmware updates for a specific machine type and operating system combination. The Update*Xpress* System Packs are released quarterly. Use the Update*Xpress* System Pack Installer to install the current Update*Xpress* System Pack for your server. You can download the installer and the latest Update*Xpress* System Pack for your server from the Web at no additional cost. To download the installer or the latest Update*Xpress* System Pack, go to http://www.ibm.com/systems/support/supportsite.wss/ docdisplay?lndocid=SERV-XPRESS&brandind=5000008 or 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. Under **Related downloads**, click **UpdateXpress**.

Server controls, LEDs, and power

This section describes the controls and light-emitting diodes (LEDs) and how to turn the server on and off. For the locations of other LEDs on the system board, see "System-board LEDs" on page 25.

Front view

The following illustrations show the controls, LEDs, and connectors on the front of the hot-swap 3.5-inch hard disk drive model.
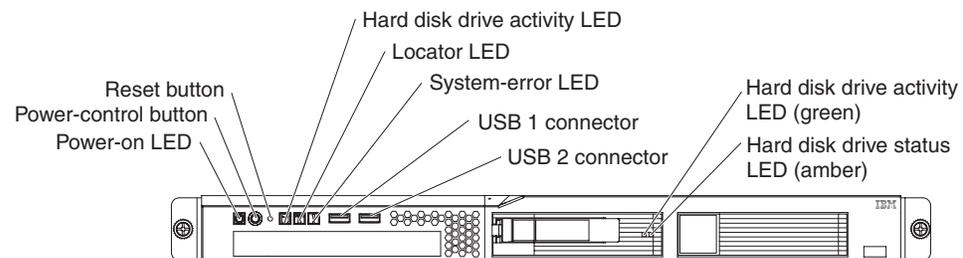
The following illustration shows the controls, LEDs, and connectors on the front of the simple-swap 3.5-inch hard disk drive model.
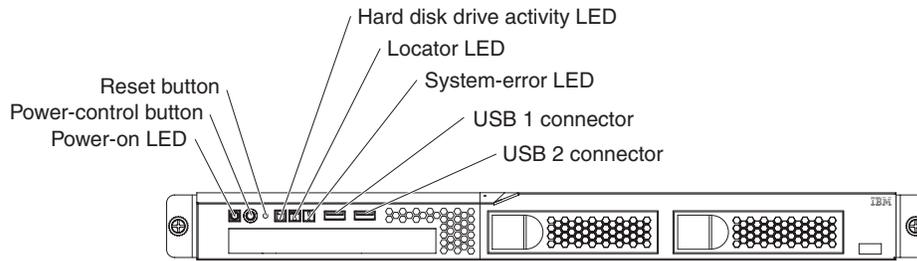
Hard disk drive activity LED
Locator LED
System-error LED
Reset button
Power-control button
Power-on LED
USB 1 connector
USB 2 connector

The following illustration shows the controls, LEDs, and connectors on the front of the hot-swap 2.5-inch hard disk drive model.

Hard disk drive activity LED
Locator LED
System-error LED
Reset button
Power-control button
Power-on LED
USB 1 connector
USB 2 connector

Hard disk drive activity LED (green)

Hard disk drive status LED (amber)

- **Power-on LED:** The states of the power-on LED are as follows:

    Off: AC power is not present, or the power supply or the LED itself has failed.

    Flashing rapidly (4 times per second): The server is turned off and is not ready to be turned on. The power-control button is disabled. This will last approximately 1 to 3 minutes.

    Flashing slowly (once per second): The server is turned off and is ready to be turned on. You can press the power-control button to turn on the server.

    Lit: The server is turned on.

    Fading on and off: The server is in a reduced-power state. To wake the server, press the power-control button or use the IMM Web interface. See "Logging on to the Web interface" on page 69 for information on logging on to the IMM Web interface.
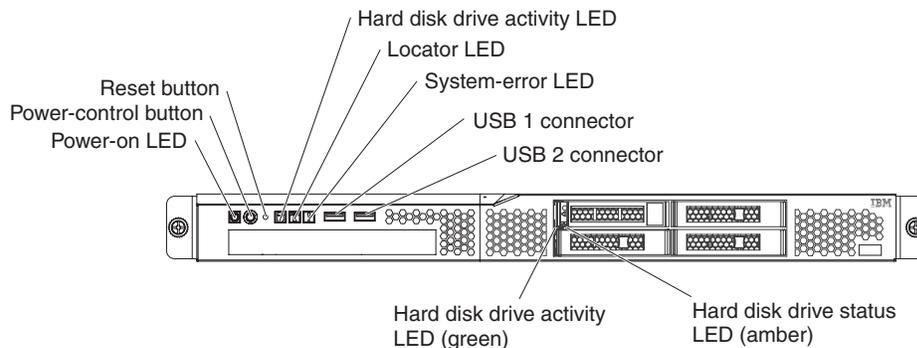
- **Power-control button:** Press this button to turn the server on and off manually or to wake the server from a reduced-power state.

- **Reset button:** Press this 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.

- **Hard disk drive activity LEDs:** When this LED is flashing, it indicates that the associated hard disk drive is in use.

- **Locator LED:** Use this blue LED to visually locate the server among other servers. This LED is also used as a presence detection button. You can use IBM Systems Director to light this LED remotely. This LED is controlled by the IMM.

- **System-error LED:** When this amber LED is lit, it indicates that a system error has occurred.

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

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

- **Optional DVD drive activity LED:** When this LED is lit, it indicates that the optional DVD drive is in use.
- **Hot-swap hard disk drive activity LEDs (some models):** This LED is used on SAS or SATA hard disk drives. Each hot-swap hard disk drive has an activity LED, and when this LED is flashing, it indicates that the drive is in use.
- **Hot-swap hard disk drive status LEDs (some models):** This LED is used on SAS or SATA hard disk drives. When this LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID controller is installed in the server, when this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

Rear view

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

Note: The illustrations in this document might differ slightly from your hardware.
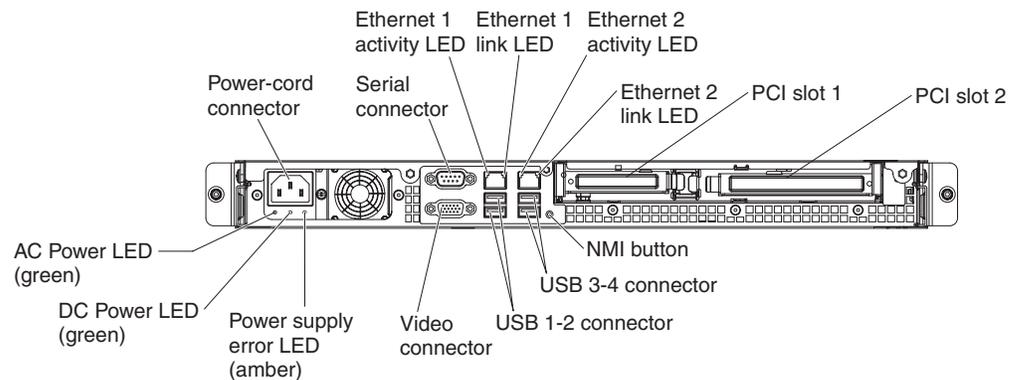
- **Ethernet link LEDs:** When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.
- **Ethernet activity LEDs:** When these LEDs are lit, they indicate that there is activity between the server and the network.
- **AC power LED (some models):** This LED is used on power supply with Active Energy Manager (AEM). This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **DC power LED (some models):** This LED is use on power supply with AEM. This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **Power-error (!) LED (some models):** This LED is use on power supply with AEM. When this amber LED is lit, it indicates that the power supply has failed. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.
- **Power cord connector:** Connect the power cord to this connector.
- **Video connector:** Connect a monitor to this connector.

- **Serial connector:** Connect a 9-pin serial device to this connector. The serial port is shared with the integrated management module (IMM). The IMM can take control of the shared serial port to redirect serial traffic, using Serial over LAN (SOL).
- **USB connectors:** Connect a USB device, such as a USB mouse, keyboard, or other device to any of these connectors.
- **Ethernet connectors:** Use either of these connectors to connect the server to a network. When you use the Ethernet 1 connector, the network can be shared with the IMM through a single network cable.
- **NMI button:** Press this button to force a nonmaskable interrupt to the microprocessor. You might have to use a pen or the end of a straightened paper clip to press the button. It allows you to blue screen the server and take a memory dump (use this button only when directed by the IBM service support).
- **PCI slot 1:** Insert a low-profile PCI Express or PCI-X adapter into this slot. Standard models of the server come with two PCI Express riser assemblies. You can purchase an optional PCI-X riser-card assembly with bracket if you want to install a PCI-X adapter in this slot.
- **PCI slot 2:** Insert a three-quarter length, full-height PCI Express or PCI-X adapter into this slot. Standard models of the server come with two PCI Express riser assemblies. You can purchase an optional PCI-X riser-card assembly with bracket if you want to install a PCI-X adapter in this slot.

Server power features

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

Turning on the server

Approximately 5 seconds after the server is connected to ac power, one or more fans might start running to provide cooling while the server is connected to power and the power-on button LED flashes quickly. Approximately 1 to 3 minutes after the server is connected to ac power, the power-control button becomes active (the power-on LED flashes slowly), and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server 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 devices.

Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to requests to the service processor, such as a remote request to turn on

the server. While the server remains connected to ac power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.
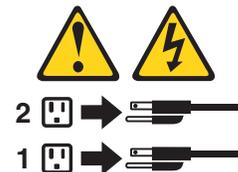
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5:

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

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

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.

- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.

- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.

- The server can be turned off by the Shutdown on LAN feature.

- The integrated management module (IMM) can turn off the server as an automatic response to a critical system failure.

Chapter 2. Installing optional devices

This chapter provides detailed instructions for installing optional hardware devices in the server.

In addition to the instructions in this chapter for installing optional hardware devices, updating firmware and device drivers, and completing the installation, IBM Business Partners must also complete the steps in "Instructions for IBM Business Partners."

Important: To help ensure that the devices that you install work correctly and do not introduce problems, observe the following precautions:

1. Make sure that the server and the installed firmware levels support the devices that you are installing. If necessary, update the UEFI and IMM2 firmware and any other firmware that is stored on the system boards. For information about where firmware is stored in the server, see Chapter 6, "Configuration information and instructions," in the Problem Determination and Service Guide. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.

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

3. Follow the installation procedures in this chapter and use the correct tools. Incorrectly installed devices can cause system failures because of damaged pins in sockets or connectors, loose cabling, or loose components.

4. Use the best practices to apply current firmware and device-driver updates for the server and optional devices. To download the *IBM System x Firmware Update Best Practices* document, go to http://www.ibm.com/support/entry/portal/docdisplay?brand=50000020&lndocid=MIGR-5082923. Additional hints and tips are available from the following sites:
   - IBM support: http://www.ibm.com/supportportal/
   - System x configuration tools: http://www.ibm.com/systems/x/hardware/configtools.html

Instructions for IBM Business Partners

In addition to the instructions in this chapter for installing optional hardware devices, updating firmware and device drivers, and completing the installation, IBM Business Partners must also complete the following steps:

1. Before you configure a server for a customer, complete the Solution Assurance checklist at http://w3.ibm.com/support/assure/assur30i.nsf/webindex/sa294/.

2. After you have confirmed that the server starts correctly and recognizes the newly installed devices and that no error LEDs are lit, run the Dynamic System Analysis (DSA) stress tests. For information about using DSA, see the *Problem Determination and Service Guide*.

3. Shut down and restart the server multiple times to ensure that the server is correctly configured and functions correctly with the newly installed devices.
4. Save the DSA log as a file and send it to IBM.
5. To ship the server, repackage it in the original undamaged packing material and observe IBM procedures for shipping.

Support information for IBM Business Partners is available at http://www.ibm.com/partnerworld/.

Server components

The following illustration shows the major components in the server. The illustrations in this document might differ slightly from your hardware.

Cover

Riser-card Assembly

Heat sink

Microprocessor

Air baffle

DIMM

System board

Power supply

Fans

Operator information panel assembly

DVD drive filler

Bezel

SAS/SATA backplane (some models)

3.5-inch hot-swap hard disk drive (some models)

SATA simple-swap back panel (some models)

Hot-swap hard disk drive filler

3.5-inch drive cage

Simple-swap SATA filler

3.5-inch simple-swap SATA hard disk drive (some models)
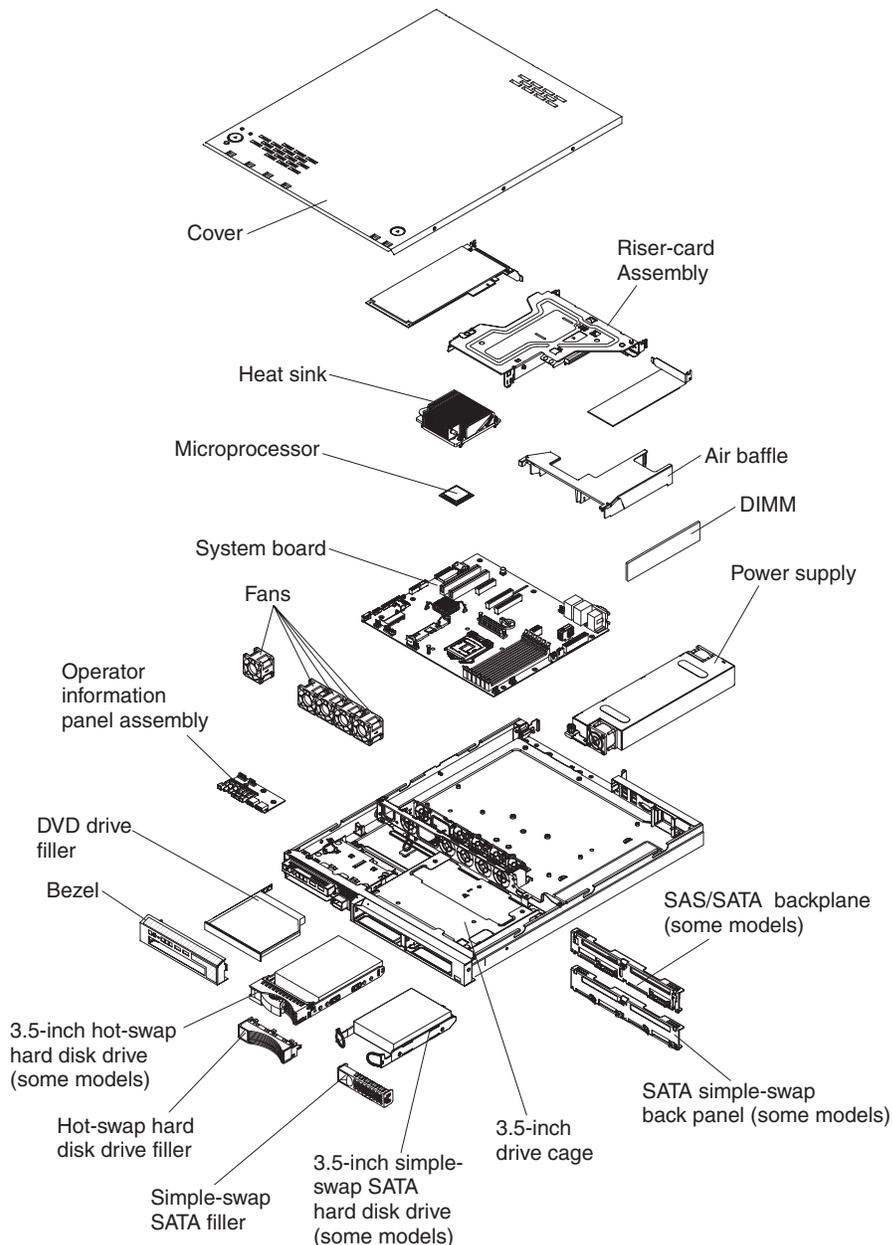
System-board internal connectors

The following illustration shows the internal connectors on the system board.
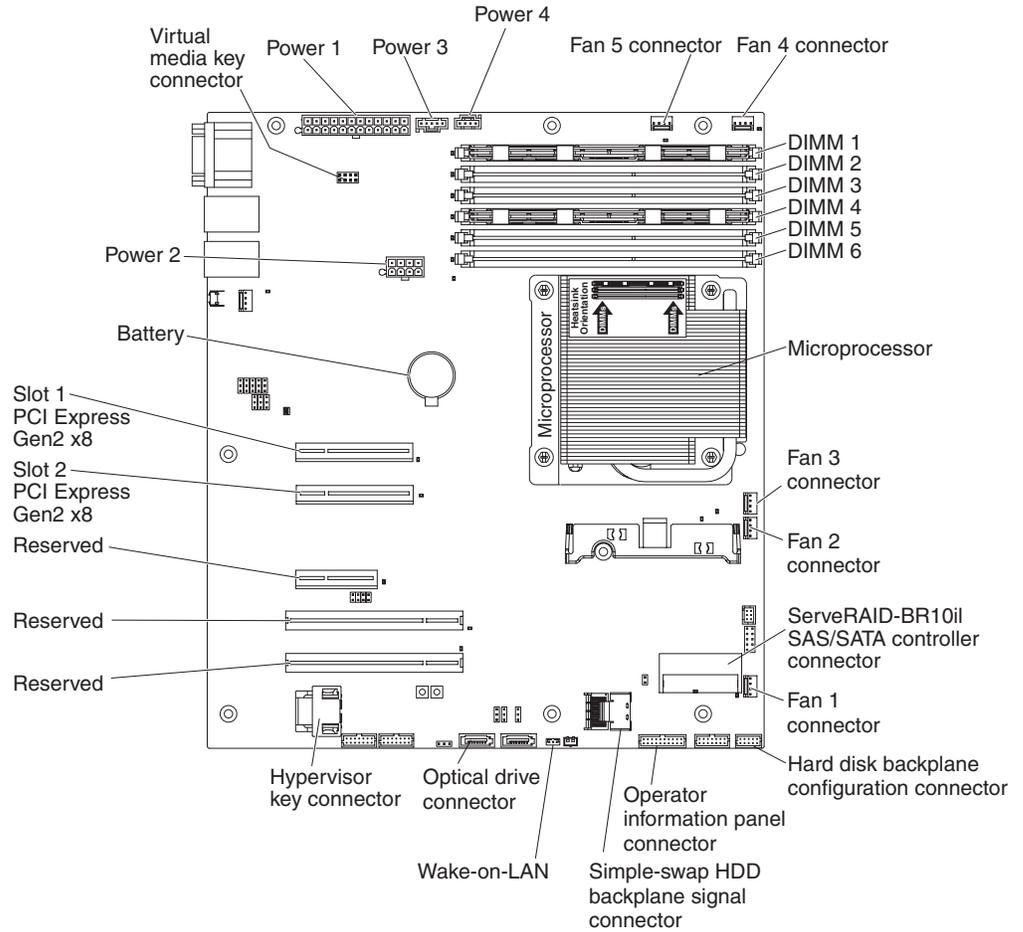
System-board external connectors

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

Serial (com1)
Video
Ethernet connector 1
USB connectors 1 & 2
Ethernet connector 2
USB connectors 3 & 4
SW1 (NMI button)

Microprocessor

Heatsink Orientation

System-board switches and jumpers

The following illustration shows the switches and jumpers on the system board.
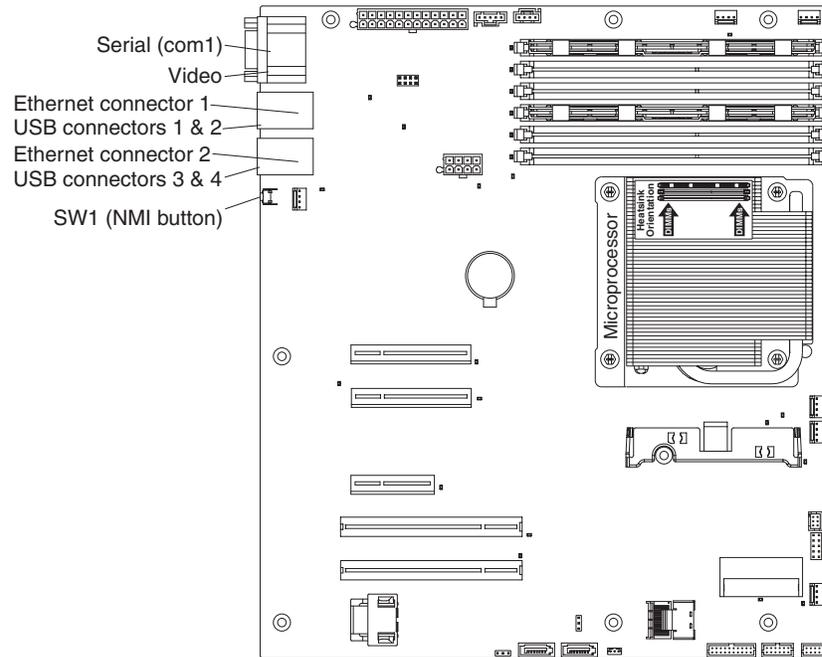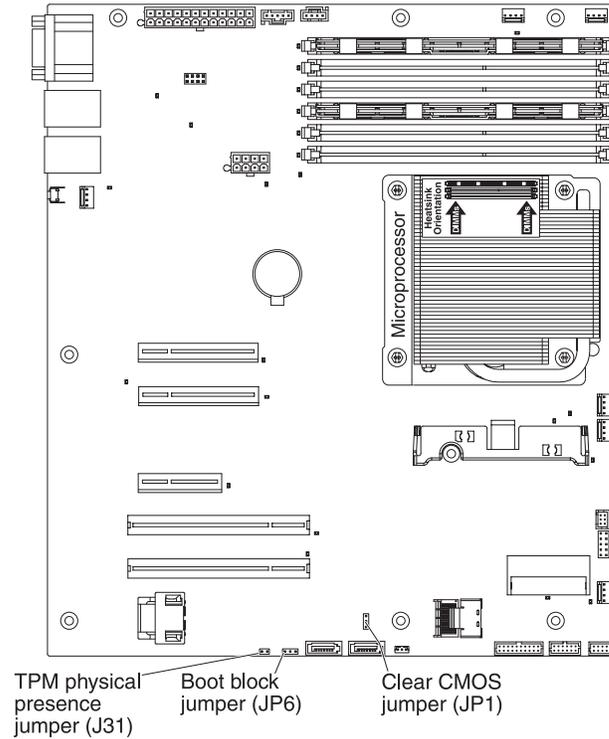

The following table describes the jumpers on the system board.

Table 2. System board jumpers

Jumper number	Jumper name	Jumper setting
JP1	Clear CMOS jumper	• Pins 1 and 2: Keep CMOS data (default). • Pins 2 and 3: Clear CMOS data (including power-on password)
JP6	Boot block jumper	• Pins 1 and 2: Boot from primary BIOS page (default). • Pins 2 and 3: Boot from backup BIOS page.

Table 2. System board jumpers (continued)

| Jumper number	Jumper name	Jumper setting
J31	Trusted Platform Module (TPM) physical presence jumper	Pins 1 and 2: Enable TPM physical presence. To enable TPM physical presence, complete the following steps: 1. Turn off the server and remove all power cords and external cables. 2. Remove the jumper from JP6 and install it on J31 pins 1 and 2. Take note which pins the jumper is originally installed on JP6. 3. Turn on the server and access the Setup utility menu to verify that the TPM function has been activated (see "Setup utility menu choices" on page 58). 4. Turn off the server and replace the jumper on JP6. 5. Turn on the server.

Notes:

1. If no jumper is present in JP1 or JP6, the server responds as if the pins are set to 1 and 2.

2. Changing the position of the boot block jumper from pins 1 and 2 to pins 2 and 3 before the server is turned on alters which flash ROM page is loaded. Do not change the jumper pin position after the server is turned on. This can cause an unpredictable problem.

Important:

1. Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. Review the information in vii, "Installation guidelines" on page 27, "Handling static-sensitive devices" on page 29, and "Turning off the server" on page 16.

2. Any system-board switch or jumper blocks that are not shown in the illustrations in this document are reserved.

System-board LEDs

The following illustration shows the light-emitting diodes (LEDs) on the system board.
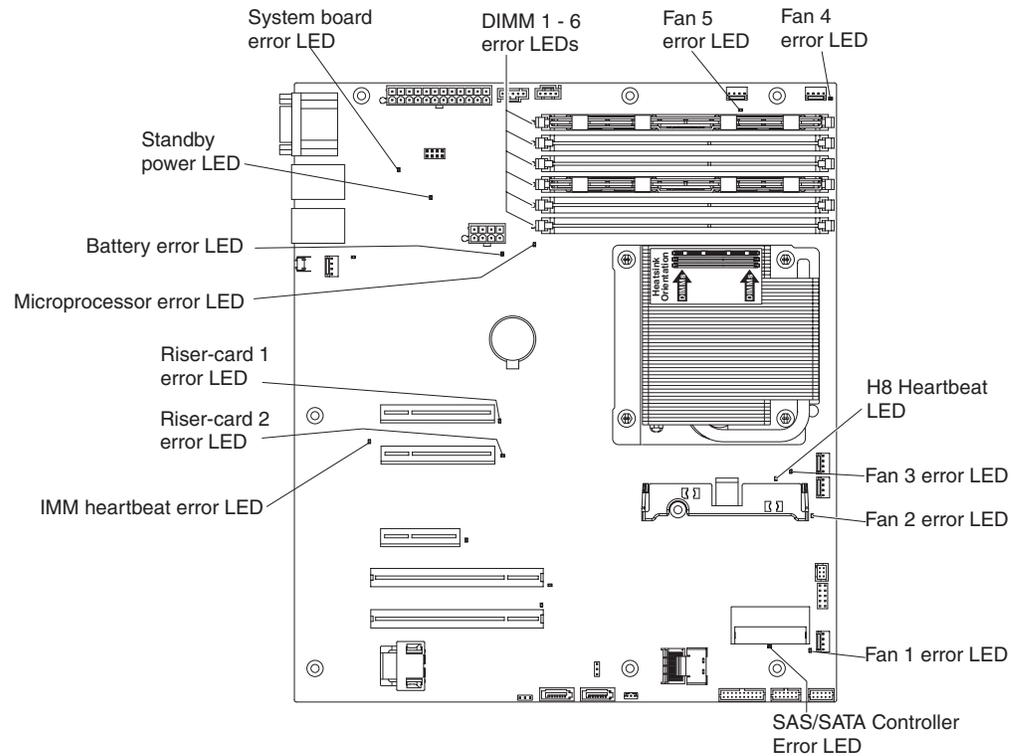
Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit, including the LEDs that are lit on the operation information panel and LEDs inside the server on the system board.

Table 3. System-board LEDs

LED	Description
Error LEDs	When one of these LEDs is lit, it indicates that the associated component has failed.
IMM heartbeat LED	This LED flashes to indicate that the IMM is functioning normally.
Standby power LED	When this LED is lit, it indicates that the server is connected to ac power.

System-board optional-device connectors

The following illustration shows the connectors on the system board for user-installable optional devices.

Virtual media key connector

DIMM 1
DIMM 2
DIMM 3
DIMM 4
DIMM 5
DIMM 6

Microprocessor

Heatsink Orientation

Battery

Riser-card connector 1

Riser-card connector 2

ServeRAID-BR10il SAS/SATA controller connector

Hypervisor key connector

Optical drive connector
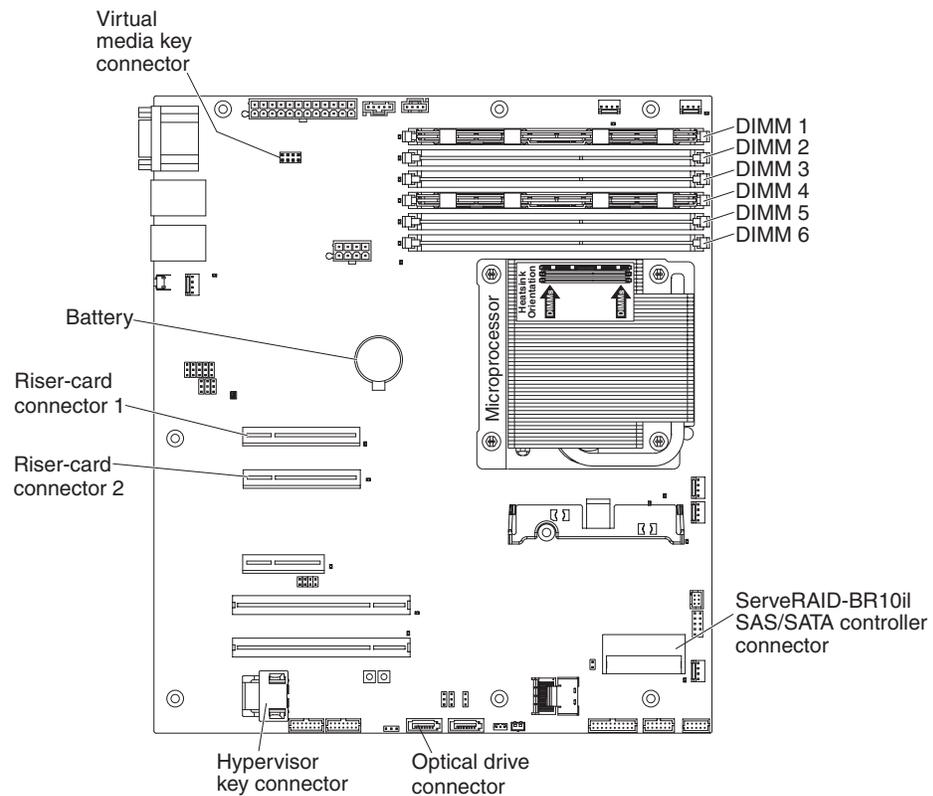
The following illustration shows the locations of the PCI Express slots on the riser-card assembly.

PCI Express x8 slot 2

PCI Express x8 slot 1
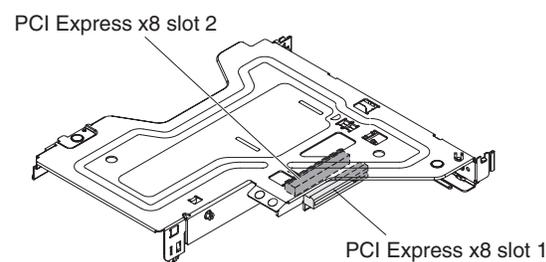
The following illustration shows the location of the PCI-X slot on the optional PCI-X riser-card assembly.

PCI-X slot

Power cable
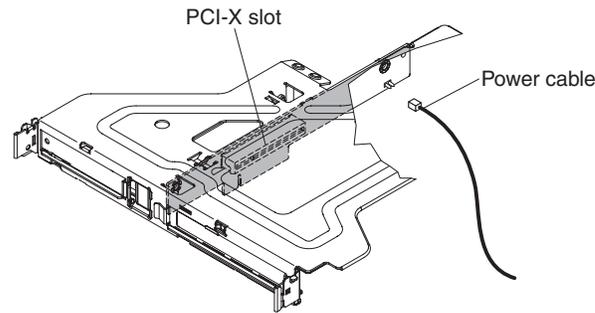
Installation guidelines

Before you install optional devices, read the following information:

- Read the safety information that begins on page vii and the guidelines in "Working inside the server with the power on" on page 28, and "Handling static-sensitive devices" on page 29. 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:

  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 x3250 M3** 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 BladeCenter Tools Center at http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp.

- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.

- If you must start the server while the server cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.

- 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.

- 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, a small Phillips screwdriver, and a T8 torx screwdriver available.
- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap fans, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card.
- 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 system cooling and system reliability, make sure that the following requirements are met:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before you turn on the server.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap fan within 30 seconds of removal.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffle installed. Operating the server without the air baffle might cause the microprocessor to overheat.

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 might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.

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

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.

- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, that could fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

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

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

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

Removing the cover

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

To remove the server cover, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.

   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a

note of which LEDs are lit, including the LEDs that are lit on the front panel, on the rear panel, and LEDs inside the server on the system board; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.

3. If the server has been installed in a rack, slide the server out from the rack enclosure.

4. Press down firmly on the blue tab on the top of the cover (on the right side near the front of the server) and slide the cover toward the rear of the server until the cover has disengaged from the chassis.

Cover-release button
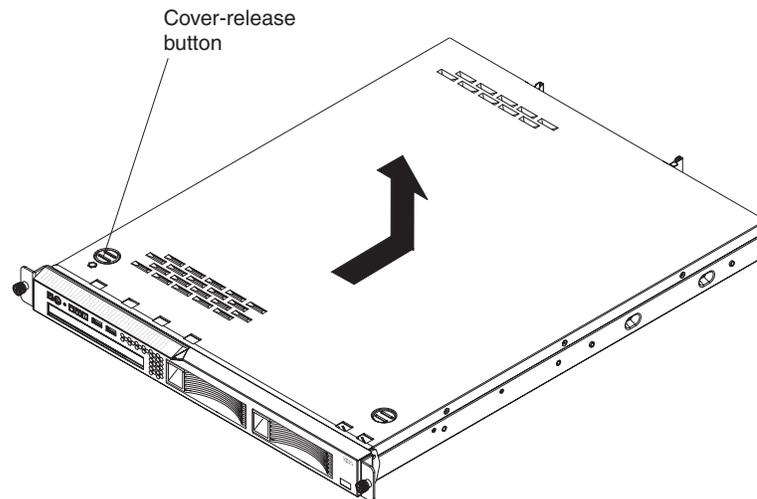
5. Lift the server cover off the server and set it aside.

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

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 you install DIMMs (see "System-board optional-device connectors" on page 26 for the location of the DIMM connectors):

- The server supports only industry-standard double-data-rate 3 (DDR3), 1066 or 1333 MHz, PC3-8500 or PC3-10600 (single-rank, dual-rank, or quad-rank), registered or unbuffered, synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC). See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported memory modules for the server.

- The maximum amount of memory that the server supports is dependent on the type of memory that you install in the server. See "Unbuffered DIMMs (UDIMMs)" on page 31 and "Registered DIMMs (RDIMMs)" on page 33 for more information. The server supports a maximum of six single-rank or dual-rank DIMMs, depending on the type of DIMM you install in the server.

- The maximum operating speed of the server is determined by the slowest DIMM in the server.

- If you install a pair of DIMMs in DIMM connectors 2 and 5, the size and speed of the DIMMs that you install in DIMM connectors 2 and 5 must match each other. However, they do not have to be the same size and speed as the DIMMs that are installed in DIMM connectors 1 and 4.

- You can use compatible DIMMs from various manufacturers in the same pair.
- 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.
- The specifications of a DDR3 DIMM are on a label on the DIMM, in the following format.

   *ggg e*R*xff*-PC3-*wwwwwm-aa-bb-cc*

   where:

   > *ggg* is the total capacity of the DIMM (for example, 1GB, 2GB, or 4GB)
   >
   > *e* is the number of ranks
   >
   > > 1 = single-rank
   > >
   > > 2 = dual-rank
   > >
   > > 4 = quad-rank
   >
   > *ff* is the device organization (bit width)
   >
   > > 4 = x4 organization (4 DQ lines per SDRAM)
   > >
   > > 8 = x8 organization
   > >
   > > 16 = x16 organization
   >
   > *wwwww* is the DIMM bandwidth, in MBps
   >
   > > 8500 = 8.53 GBps (PC3-1066 SDRAMs, 8-byte primary data bus)
   > >
   > > 10600 = 10.66 GBps (PC3-1333 SDRAMs, 8-byte primary data bus)
   >
   > *m* is the DIMM type
   >
   > > E = Unbuffered DIMM (UDIMM) with ECC (x72-bit module data bus)
   > >
   > > R = Registered DIMM (RDIMM)
   > >
   > > U = Unbuffered DIMM with no ECC (x64-bit primary data bus)
   >
   > *aa* is the CAS latency, in clocks at maximum operating frequency
   >
   > *bb* is the JEDEC SPD Revision Encoding and Additions level
   >
   > *cc* is the reference design file for the design of the DIMM

Notes:

1. To determine the type of a DIMM, see the label on the DIMM. The information on the label is in the format xxxxx nRxxx PC3-xxxxx-xx-xx-xxx. The numeral in the sixth numerical position indicates whether the DIMM is single-rank (n=1), dual-rank (n=2), or quad-rank (n=4).
2. The amount of usable memory is reduced, depending on the system configuration. A certain amount of memory must be reserved for system resources. To view the total amount of installed memory and the amount of configured memory, run the Setup utility. For additional information, see Chapter 3, "Configuring the server," on page 57.

The following sections provide additional information specific to unbuffered and registered DIMMs that you must consider.

Unbuffered DIMMs (UDIMMs)

The following notes provide information that you must consider when you install UDIMMs:

- The memory channels run at the fastest common frequency of the DIMMs installed.
- Do not use both UDIMMs and RDIMMs in the same server.

- Using ECC and non-ECC UDIMMs in the server will cause the server to run in non-ECC mode.
- The UDIMM options that are available for the server are 1 GB, 2 GB, and 4 GB DIMMs.
- You can install a maximum of 16 GB of memory in some server models when you use UDIMMs.
- The server supports up to two single-rank or dual-rank UDIMMs per channel.
- DIMM slots 3 and 6 are not supported when you install UDIMMs in the server. Do not install DIMMs in these connectors.
- The following table lists the DIMM support compatibility.

Table 4. Supported DIMM compatibility

DIMM configuration	Intel quad-core (Xeon 3400 series)	Intel dual-core (Core i3)	Intel dual-core (Xeon L3406)
UDIMM non-ECC only	Not supported	Not supported	Not supported
UDIMM ECC only	Supported	Supported	Supported
UDIMM mix ECC with non-ECC	Not supported	Not supported	Not supported
RDIMM ECC only	Supported	Not supported	Not supported

- The following table lists the supported UDIMM population.

Table 5. Supported UDIMM population per channel

DIMM connectors per channel	DIMMs installed in each channel	DIMM type	DIMM speed	Ranks per DIMM (any combination)
2	1	Unbuffered DDR3 ECC	1066, 1333	Single-rank, dual-rank
2	2	Unbuffered DDR3 ECC	1066, 1333	Single-rank, dual-rank

- The following table lists the maximum DIMM population using ranked UDIMMs.

Table 6. Maximum memory population using ranked UDIMMs (depending on your model)

Number of UDIMMs	DIMM type	Size	Total memory
4	Single-rank UDIMMs	1 GB	4 GB
4	Dual-rank UDIMMs	2 GB	8 GB
4	Dual-rank UDIMMs	4 GB	16 GB

- The following table shows the UDIMM memory population rule to optimize the system performance.

Table 7. UDIMM population rule for dual-channel symmetric mode

DIMM connector 1	DIMM connector 2	DIMM connector 3	DIMM connector 4	DIMM connector 5	DIMM connector 6
Populated	Empty	Empty	Empty	Empty	Empty
Populated	Empty	Empty	Populated	Empty	Empty
Populated	Populated	Empty	Populated	Populated	Empty

Registered DIMMs (RDIMMs)

The following notes provide information that you must consider when you install RDIMMs:

- The memory channels run at the fastest common frequency of the installed DIMMs.
- RDIMMs are supported in models with an Intel Xeon 3400 series processor.
- Do not use both RDIMMs and UDIMMs in the same server.
- The server supports up to three single-rank, dual-rank, or quad-rank RDIMMs per channel.
- The RDIMM options that are available for the server are 1 GB, 2 GB, 4 GB, and 8 GB DIMMs.
- You can install a maximum of 32 GB of memory in the server when you use RDIMMs.
- The following table lists the supported RDIMM population.

Table 8. Supported RDIMM population per channel

DIMM connectors per channel	DIMMs installed in each channel	DIMM type	DIMM speed	Ranks per DIMM (any combination)
3	1	Registered DDR3 ECC	1066, 1333	Single-rank, dual-rank
3	2	Registered DDR3 ECC	1066, 1333	Single-rank, dual-rank
3	3	Registered DDR3 ECC	800	Single-rank, dual-rank
3	1	Registered DDR3 ECC	1066	Quad-rank
3	2	Registered DDR3 ECC	800	Quad-rank

- The following table lists the maximum DIMM population using ranked RDIMMs.

Table 9. Maximum memory population using ranked RDIMMs (depending on your model)

Number of RDIMMs	DIMM type	Size	Total memory
6	Single-rank RDIMMs	1 GB	6 GB
6	Dual-rank RDIMMs	2 GB	12 GB
4	Dual-rank RDIMMs	4 GB	16 GB
4	Quad-rank RDIMMs	4 GB	16 GB
6	Dual-rank RDIMMs	4 GB	24 GB
4	Quad-rank RDIMMs	8 GB	32 GB

- The following table shows the RDIMM memory population rule to optimize the system performance.

Table 10. RDIMM population rule for dual-channel symmetric mode

DIMM connector 1	DIMM connector 2	DIMM connector 3	DIMM connector 4	DIMM connector 5	DIMM connector 6
Populated	Empty	Empty	Empty	Empty	Empty
Populated	Empty	Empty	Populated	Empty	Empty

Table 10. RDIMM population rule for dual-channel symmetric mode (continued)

DIMM connector 1	DIMM connector 2	DIMM connector 3	DIMM connector 4	DIMM connector 5	DIMM connector 6
Populated	Populated	Empty	Populated	Populated	Empty
Populated	Populated	Populated	Populated	Populated	Populated

The following illustration shows the location of the DIMM connectors on the system board.
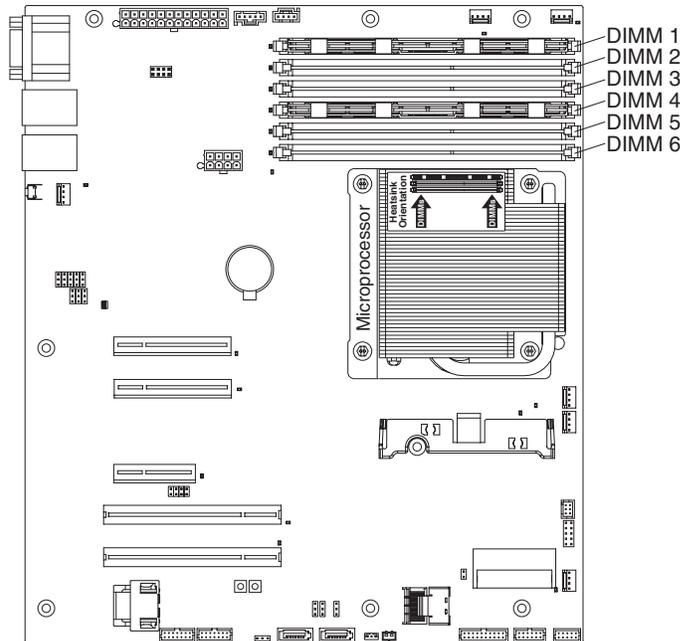
Attention: Static electricity that is released to internal server components when the server is powered on might cause the server to halt, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when you work inside the server with the power on.

To install a DIMM, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables, if necessary.
3. Remove the cover (see "Removing the cover" on page 29).
4. Remove the DIMM air baffle.
5. Locate the DIMM connectors on the system board. Determine the connectors into which you will install the DIMMs. Install the DIMMs in the sequence shown in the following table.

Table 11. DIMM installation sequence

Number of DIMMs	Installation sequence (connectors)
First pair of DIMMs	1, 4
Second pair of DIMMs	2, 5
Third pair of DIMMs	3, 6

6. Open the retaining clip on each end of the DIMM connector.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
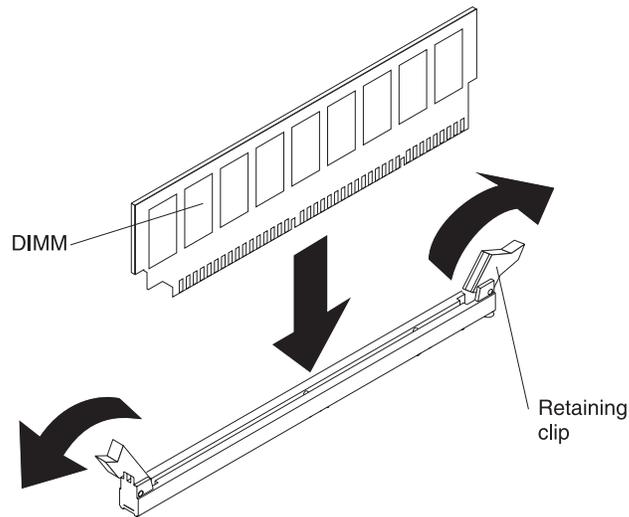
7. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.

8. Turn the DIMM so that the DIMM keys align correctly with the connector.

9. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector (see "System-board optional-device connectors" on page 26 for the locations of the DIMM connectors).

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

    Note: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.

    If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

Installing drives

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

- Locate the documentation that comes with the drive and follow those instructions in addition to the instructions in this chapter.
- Make sure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
- Select the bay in which you want to install the drive.
- The server supports one ultra-slim SATA optical drive.
- Check the instructions that come with the drive to determine whether you have to set any switches or jumpers on the drive. If you are installing a SAS or SATA hard disk drive, be sure to set the SAS or SATA ID for that device.
- The server supports four 2.5-inch or two 3.5-inch hot-swap hard disk drives or two 3.5-inch simple-swap hard drive disk drives.

Note:

- Simple-swap SATA hard disk drives support AHCI mode.
- Simple-swap models only support ServeRAID-BR10il adapter.

- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all bays and PCI and PCI Express slots covered or occupied. When you install a drive, PCI, or PCI Express adapter, save the EMC shield and filler panel from the bay or PCI adapter or PCI Express adapter slot cover in the event that you later remove the device.

- For a complete list of supported optional devices for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Installing a simple-swap Serial ATA hard disk drive

Simple-swap hard disk drives are not hot-swappable. Disconnect all power from the server before you remove or install a simple-swap hard disk drive.To install a simple-swap Serial ATA hard disk drive, complete the following steps.

Note:

- If you have only one hard disk drive, install it in the left drive bay.
- If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.

SATA hard disk drive back plate

Hard disk drive assembly

Filler panel
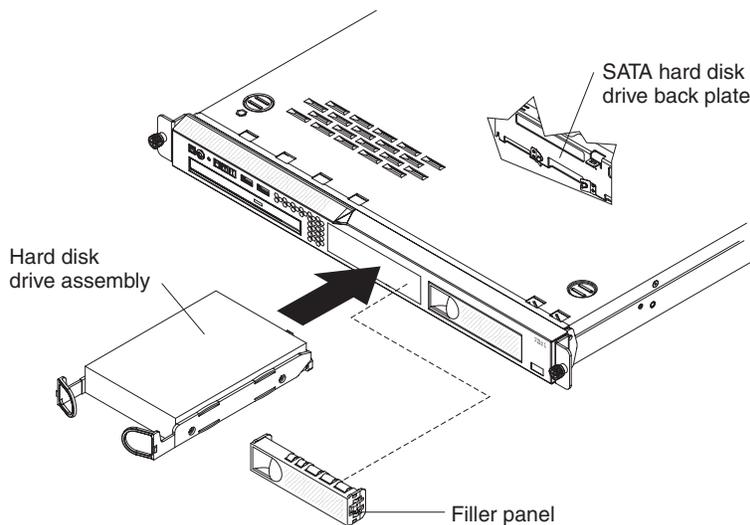
Attention: To avoid damage to the hard disk drive connectors, make sure that the cover is in place and fully closed whenever you install or remove a hard disk drive.

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Make sure that the server cover is in place and fully closed.
3. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.
4. Remove the filler panel from the bay.
5. Pull the loops of the drive tray toward each other, and slide the drive into the server until the drive connects to the back plate.

6. Release the loops of the drive tray.

7. Insert the filler panel into the bay to cover the drive.

If you have other devices to install, do so now. Otherwise, go to "Completing the installation" on page 54.

Note:

- If a RAID controller or adapter is installed, you might have to reconfigure the disk arrays after you install hard disk drives. See your RAID controller or adapter documentation.
- Simple-swap SATA hard disk drives support AHCI mode.
- Simple-swap models only support ServeRAID-BR10il adapter.

To remove a simple-swap SATA drive from the bay, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.

2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.

3. Remove the filler panel from the bay.

4. Pull the loops of the drive tray toward each other and pull the tray out of the bay.

Installing a hot-swap hard disk drive

The 3.5-inch drive hot-swap server models support either two SAS 3.5-inch hard disk drives or two SATA 3.5-inch hard disk drives.
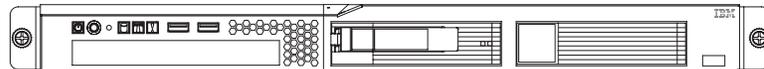

The 2.5-inch drive hot-swap server models support four SAS 2.5-inch hard disk drives.
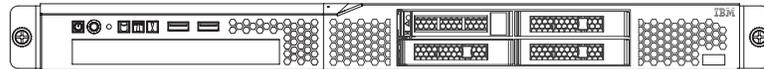
The installation procedure is the same for any of these drives. The illustrations in this procedure show 3.5-inch SAS drives. To install a hot-swap hard disk drive, complete the following steps.

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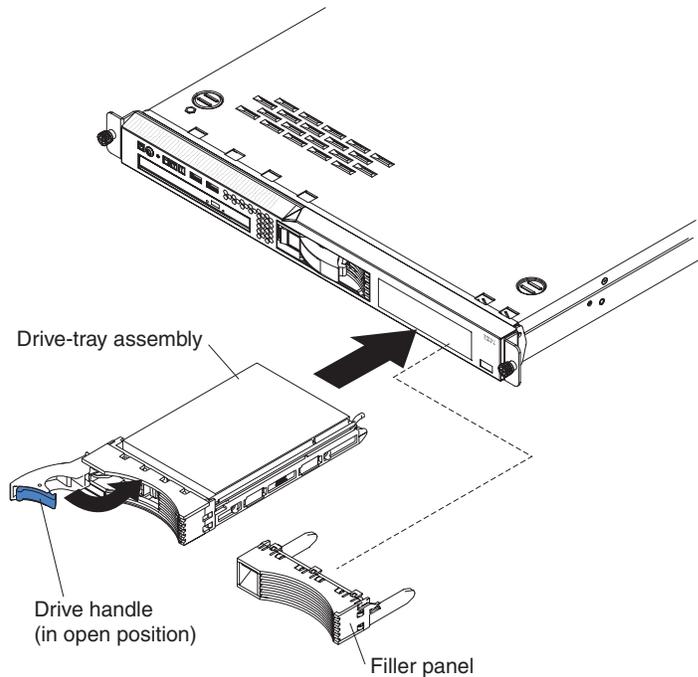
Drive-tray assembly

Drive handle
(in open position)

Filler panel

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Make sure that the server cover is in place and fully closed.
3. Remove the filler panel from the empty drive bay.

   Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or filler panel installed in each bay.
4. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
5. Install the hard disk drive in the drive bay:
   a. Make sure that the tray handle is in the open (unlocked) position.
   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: If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.
6. If you are installing additional hot-swap hard disk drives, do so now.

   Note: If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

IDs for hot-swap hard disk drives

The hot-swap-drive ID that is assigned to each drive is printed on the front of the server. The following illustration shows the location of the IDs of the hard disk drives. The ID numbers and the drive bay numbers are the same.

3.5-inch hard disk drive IDs

2.5-inch hard disk drive IDs
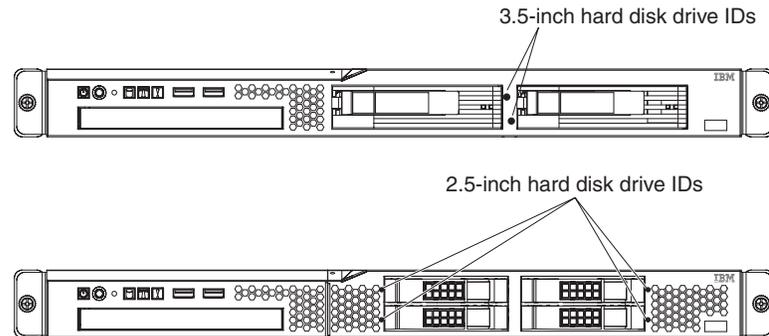
Installing an optional DVD drive

Note: If you are installing a drive that contains a laser, observe the following safety precaution.

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

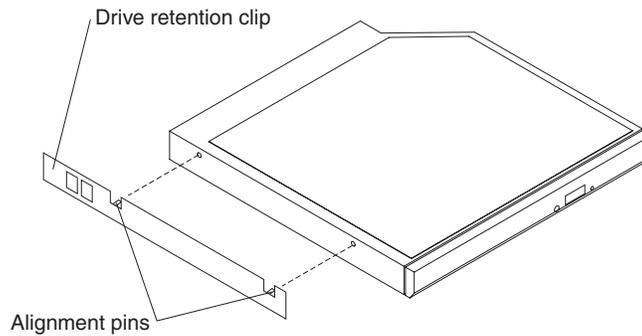To install an optional DVD drive, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.

   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.

3. Remove the cover (see "Removing the cover" on page 29).
4. Remove the DVD drive filler if it is installed. Pull the release tab (the rear of the drive-retention clip) toward the right side of the server to release the clip; then, while you pull the tab, push the DVD drive filler out of the bay. Save the DVD drive filler for future use.

Release tab
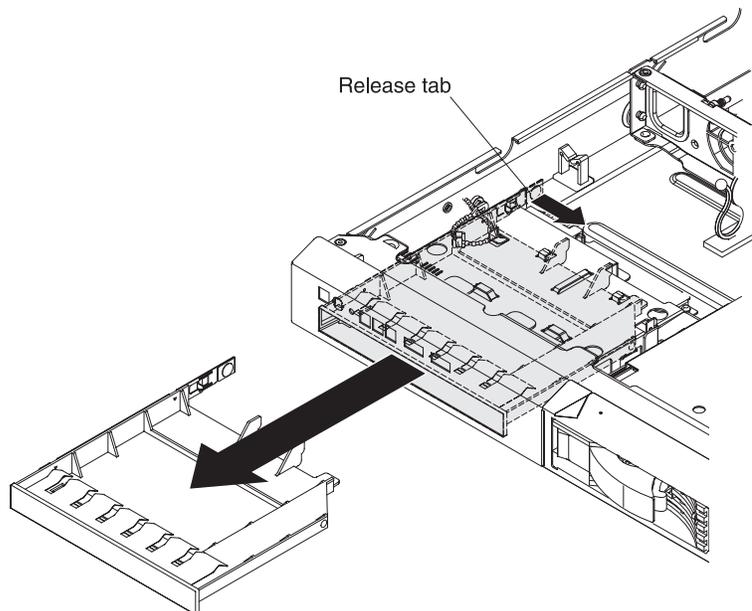
5. Touch the static-protective package that contains the new DVD drive to any unpainted metal surface on the server; then, remove the DVD drive from the package and place it on a static-protective surface.

6. Follow the instructions that come with the DVD drive to set any jumpers or switches.

7. Attach the drive retention clip (that comes with the DVD drive filler) to the side of the new DVD drive.

8. Align the drive in the drive bay and slide the drive into the DVD drive bay until the drive clicks into place.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

Replacing a PCI riser-card assembly

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

1. Read the safety information that begins on page vii and the "Installation guidelines" on page 27.

2. Turn off the server and peripheral devices and disconnect the power cords and all external cables.

   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.

3. Remove the cover (see "Removing the cover" on page 29).

4. If an adapter is installed in the riser-card assembly, disconnect any cables that are connected to the adapter.

5. Grasp the front and rear of the riser-card assembly and lift it out of the PCI riser-card slot on the system board.

Riser-card
assembly
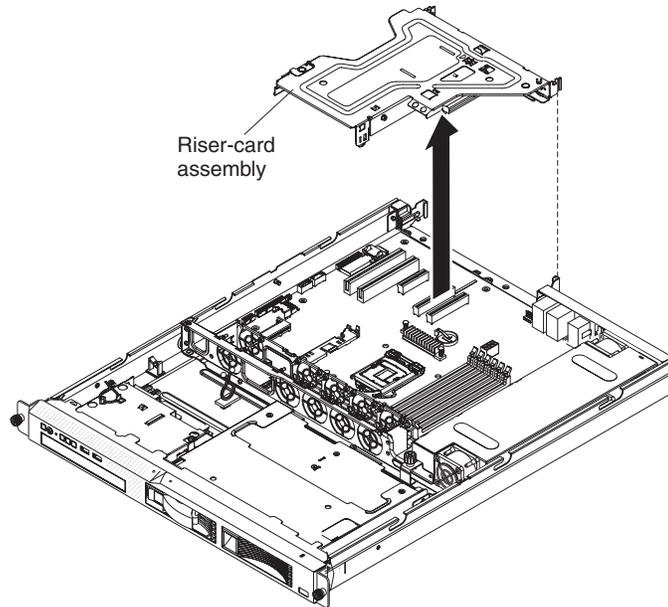
6. Remove the adapter, if one is present, from the riser-card assembly.

7. Set the adapter and riser-card assembly aside.

8. Install the adapter in the new PCI riser-card assembly (see "Installing an adapter").

9. Set any jumpers or switches on the adapter as directed by the adapter manufacturer.

10. Carefully align the riser-card assembly with the guides on the rear of the server and with the riser-card connectors on the system board; then, place your thumbs on locations marked by the blue dots and press down on the riser-card assembly. Make sure that the riser-card assembly is fully seated in the connectors on the system board.
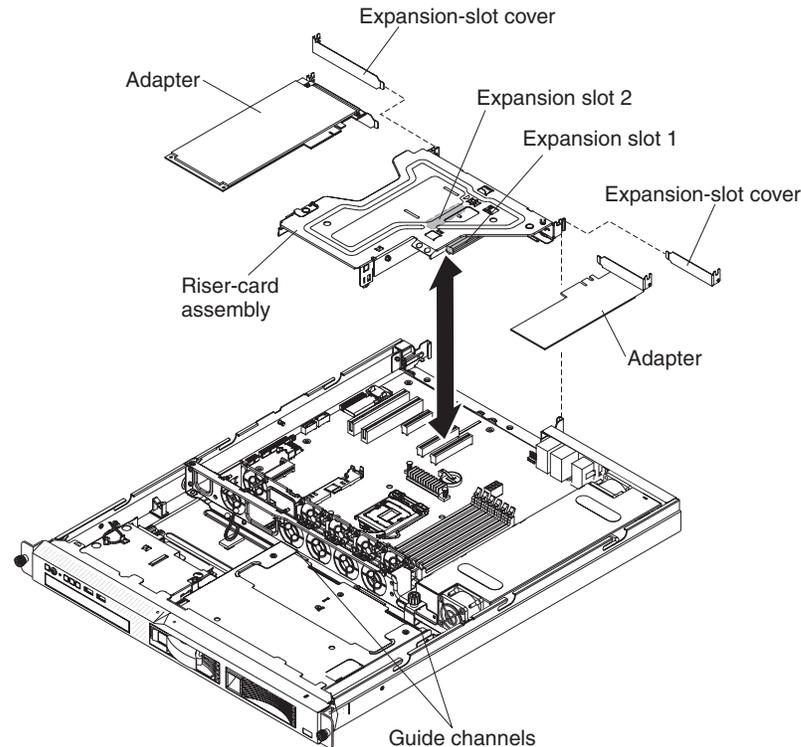
Installing an adapter

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

• Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section. If you have to change switch settings or jumper settings on the adapter, follow the instructions that come with the adapter.

• The adapter slots are on the riser-card assembly. You must first remove the riser-card assembly to access the adapter slots.

• The two PCI Express slots on the riser-card assembly support PCI Express x8 1.0a adapters.

• You can install one low-profile half-length adapter in expansion slot 1 and one full-height, three-quarter length adapter in expansion slot 2.

• If you have installed an optional PCI-X riser-card assembly in the server, you can install a full-height, three-quarter length PCI-X 64/133 MHz adapter in the PCI-X slot on the riser-card assembly. The server does not support full-length adapters.

• The server uses a rotational interrupt technique to configure PCI Express adapters so that you can install PCI Express adapters that do not support sharing of interrupts.

- The optional ServeRAID-MR10i adapter can be purchased and supports RAID levels 0, 1, 5, 6, and 10. The optional ServeRAID-MR10is VAULT adapter with an encryption 1078 DE chip set can be purchased and supports RAID levels 0, 1, 5, 6, and 10. For configuration information, see the ServeRAID documentation at http://www.ibm.com/systems/support/.

  Attention: To ensure proper cooling and airflow, install a ServeRAID adapter that has a battery attached in slot 2 on the riser-card assembly.

- To ensure that any of your ServeRAID adapters function properly on UEFI-based servers, make sure that the adapter firmware level and supporting device drivers are updated to at least 11.x.x-XXX.

- The server scans the PCI slots to assign system resources. The scan sequence is related to the startup sequence. If you have not changed the default startup sequence, the server scans the PCI slots in the following order: the integrated Ethernet controllers 1 and 2; then, the drives that are connected to the SAS/SATA controller; then, PCI Express slots 1 and 2.

- A PCI Express riser-card assembly has a black connector and supports PCI Express adapters, and a PCI-X riser-card assembly has a white (light in color) connector and supports PCI-X adapters.


To install an adapter, complete the following steps:

1. Read the safety information that begins on page vii and the "Installation guidelines" on page 27.

2. Turn off the server and peripheral devices and disconnect the power cords and all external cables; then, remove the server cover (see "Removing the cover" on page 29).

3. Grasp the riser-card assembly at the front grip point and rear edges; then, lift to remove the riser-card assembly. Place the riser-card assembly on a flat, static-protective surface.
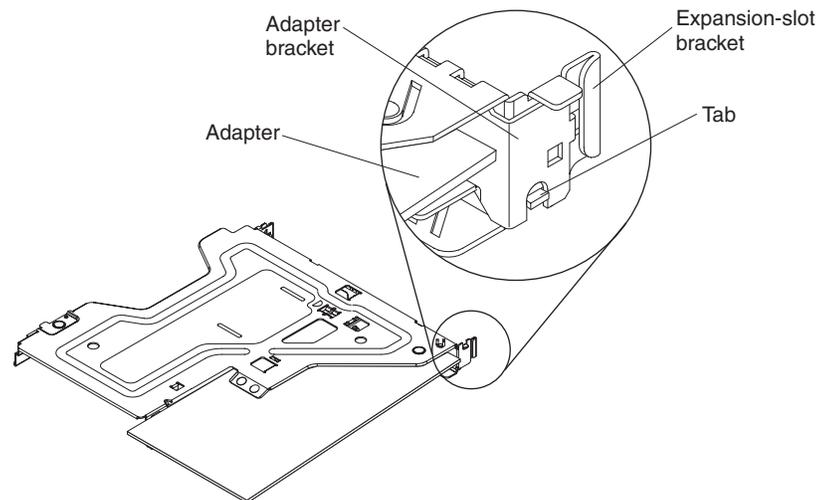
Riser-card
assembly
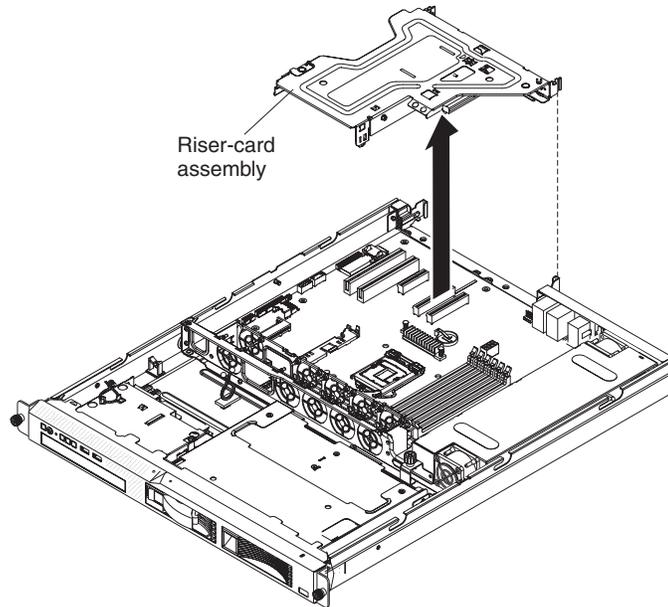
4. If you have installed an optional PCI-X riser-card assembly, disconnect the riser-card power cable from the riser-card assembly.

PCI-X slot

Power cable
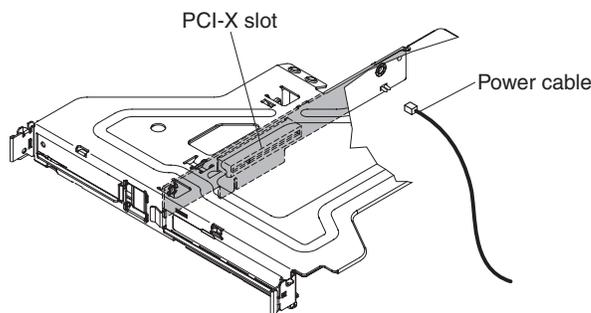
5. Remove the expansion-slot cover on the slot that you intend to use and save for future use.

   Attention: PCI expansion-slot covers must be installed on all vacant slots. This maintains the electronic emissions characteristics of the server and ensures proper cooling of server components.

6. Follow the instructions that come with the adapter to set any jumpers or switches.

7. Follow the cabling instructions, if any come with the adapter. Route the adapter cables before you install the adapter.

8. Insert the adapter into the riser-card assembly, aligning the edge connector on the adapter with the connector on the riser-card assembly. Press the edge of the connector *firmly* into the riser-card assembly. Make sure that the adapter snaps into the riser-card assembly securely.

Attention:

- To ensure proper cooling and airflow, install a ServeRAID adapter that has a battery attached in slot 2 on the riser-card assembly.
- When you install an adapter, make sure that the adapter is correctly seated in the riser-card assembly and that the riser-card assembly is securely seated in the riser-card connector on the system board before you turn on the server. An incorrectly seated adapter might cause damage to the system board, the riser-card assembly, or the adapter.

Important: Make sure that the U-shaped opening in the metal adapter bracket engages the tab on the expansion-slot bracket.

9. Reinstall the riser-card assembly in the server (see "Replacing a PCI riser-card assembly" on page 41).

10. If you have installed an optional PCI-X riser-card assembly in the server, reconnect the riser-card power cable to the riser-card assembly.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

Replacing an IBM ServeRAID-BR10il SAS/SATA Controller v2

Some server models come with an IBM ServeRAID-BR10il SAS/SATA Controller v2 installed. The adapter can be installed only in the dedicated slot on the system board (see "System-board optional-device connectors" on page 26 for the location of the connector). The IBM ServeRAID-BR10il v2 SAS/SATA adapter enables integrated RAID levels 0, 1, and 1E capability on hard disk drives. For configuration information, see the ServeRAID documentation at http://www.ibm.com/systems/support/. To install the adapter if your server model did not come with this adapter, complete the following steps to install an IBM ServeRAID-BR10il v2 SAS/SATA adapter.

Important: To ensure that any of your ServeRAID adapters function properly on UEFI-based servers, make sure that the adapter firmware level and supporting device drivers are updated to at least 11.x.x-XXX.

Attention: Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.

2. Turn off the server and peripheral devices and disconnect the power cords.
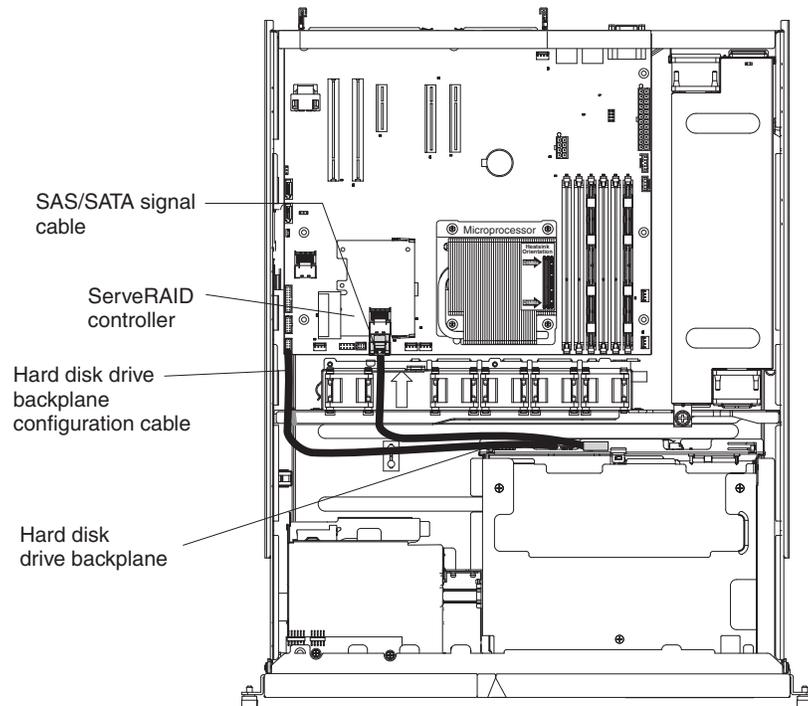
   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.

3. Remove the cover (see "Removing the cover" on page 29).

4. Disconnect the signal cables and power cables from the existing SAS/SATA adapter (if one is installed).

5. Grasp the end of the SAS/SATA adapter next to fan 1 while you press down the white plastic tab (next to the heat sink) toward the heat sink.

6. Pull the SAS/SATA adapter out from the connector on the system board.

7. Place the SAS/SATA adapter into a static-protective package and put it in a safe place.

8. Touch the static-protective package that contains the new ServeRAID-BR10il v2 SAS/SATA adapter to any unpainted surface on the outside of the server; then, grasp the adapter by the top edge or upper corners of the adapter and remove it from the package.

9. Align the ServeRAID-BR10il v2 SAS/SATA adapter so that the keys align correctly with the connector on the system board.

10. Insert the ServeRAID-BR10il v2 SAS/SATA adapter into the connector on the system board until it is firmly seated. The retention bracket secures the ServeRAID-BR10il v2 SAS/SATA adapter in place when the adapter is firmly seated into the connector on the system board.

    Attention: Incomplete insertion might cause damage to the server or the adapter.
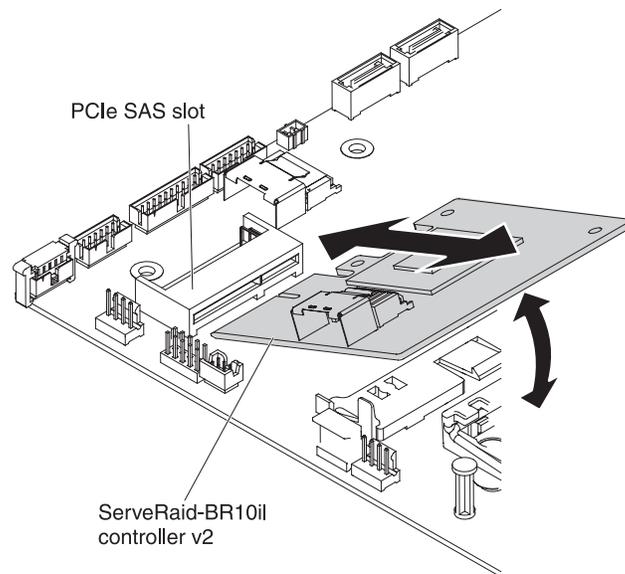
11. Route the signal cable from the drive backplane through the fan cage hole (between fans 1 and 2) as shown in the following illustration.

SAS/SATA signal cable

ServeRAID controller

Hard disk drive backplane configuration cable

Hard disk drive backplane

12. Take the signal cable that is attached to the drive backplane and connect it to the connector on the ServeRAID-BR10il v2 SAS/SATA RAID adapter.

Note: When you restart the server, you are prompted to import the existing RAID configuration to the new ServeRAID adapter.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

Installing an optional IBM ServeRAID-MR10i SAS/SATA Controller

You can purchase an optional IBM ServeRAID-MR10i SAS/SATA controller. It can be installed only in the dedicated slot on the riser-card assembly. For configuration information, see the ServeRAID documentation at http://www.ibm.com/systems/support/.

Important: To ensure that any of your ServeRAID adapters function properly on UEFI-based servers, make sure that the adapter firmware level is updated to at least 11.x.x-XXX, and the supporting drivers.

Attention:
- To ensure proper cooling and airflow, install a ServeRAID adapter that has a battery attached in slot 2 on the riser-card assembly.
- Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

To install the IBM ServeRAID-MR10i SAS/SATA adapter, complete the following steps:

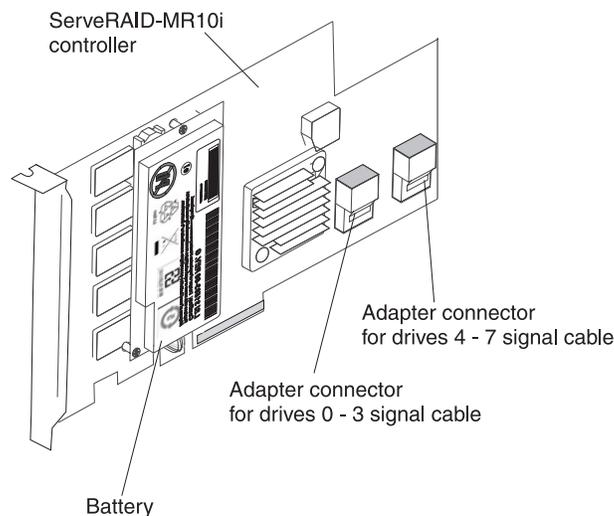1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.

2. Turn off the server and peripheral devices and disconnect the power cords.

   Note: When you disconnect the power source from the server, you lose the ability to view the LEDs because the LEDs are not lit when the power source is removed. Before you disconnect the power source, make a note of which LEDs are lit; then, see the *Problem Determination and Service Guide* for information about how to solve the problem.
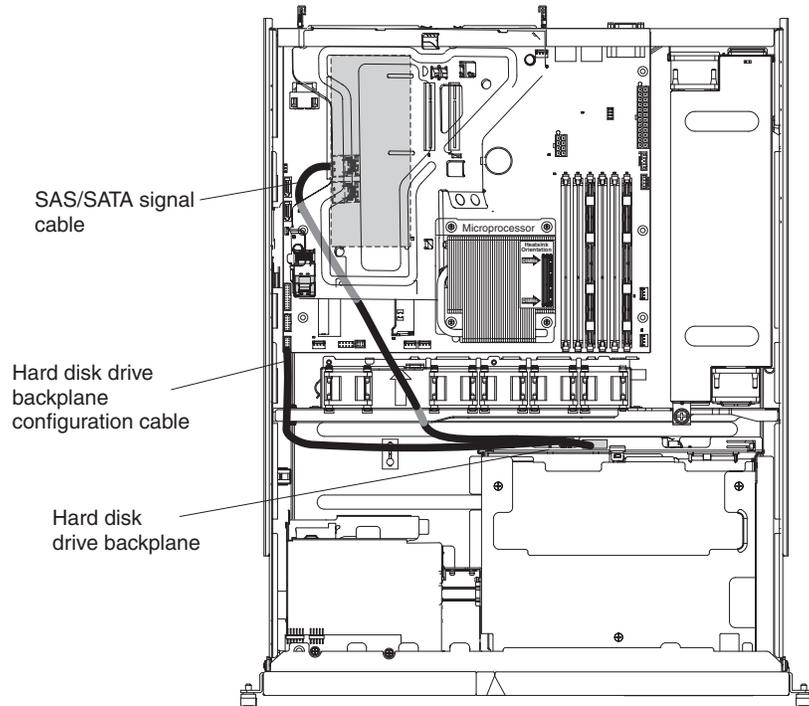
3. Remove the cover (see "Removing the cover" on page 29).
4. Carefully grasp the riser-card assembly at the front and rear edges and lift to remove it from the PCI connectors on the system board.
5. Disconnect the signal cables and power cables from the existing SAS/SATA adapter (if one is installed).
6. Carefully grasp the SAS/SATA adapter and pull it out of the connector on the riser-card assembly.
7. Remove the expansion-slot cover on the slot that you intend to use and save for future use.

   Attention: PCI expansion-slot covers must be installed on all vacant slots.
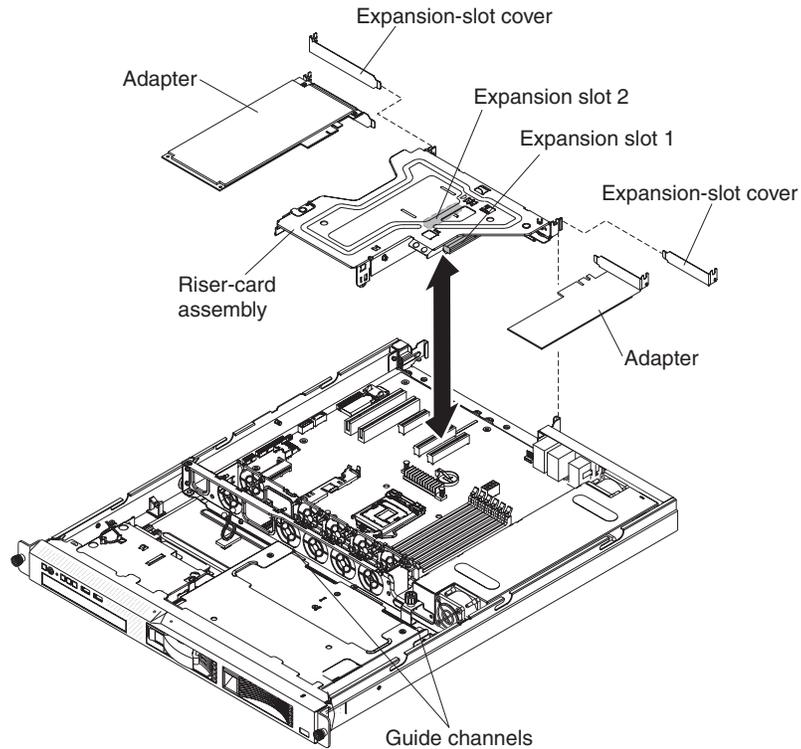
8. Place the SAS/SATA adapter into a static-protective package and put it in a safe place.
9. Touch the static-protective package that contains the new ServeRAID-MR10i SAS/SATA adapter to any unpainted surface on the outside of the server; then, grasp the adapter by the top edge or upper corners of the adapter and remove it from the package.
10. Take the signal cable that is attached to the drive backplane and connect it to the ServeRAID-MR10i SAS/SATA adapter. The following illustration shows the connectors on the controller.

11. Route the signal cables from the drive backplane through the fan cage hole on the left of fan 1 as shown in the following illustration.

SAS/SATA signal cable

Hard disk drive backplane configuration cable

Hard disk drive backplane

12. Align the ServeRAID-MR10i SAS/SATA adapter so that the keys align correctly with the connector on the riser-card assembly.

Expansion-slot cover

Adapter

Expansion slot 2

Expansion slot 1

Expansion-slot cover

Riser-card assembly

Adapter

Guide channels

Attention: PCI expansion-slot covers must be installed on all vacant slots. This maintains the electronic emissions characteristics of the server and ensures proper cooling of server components.

13. Make sure that the riser-card assembly keys align correctly with the connectors on the system board and press down on the riser-card assembly until it is seated firmly into the connectors on the system board.

> **Note:** When you restart the server, you are prompted to import the existing RAID configuration to the new ServeRAID adapter.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

Installing the optional IBM ServeRAID-MR10is VAULT SAS/SATA controller

The optional IBM ServeRAID-MR10is VAULT SAS/SATA controller can be installed only in its dedicated connector on the riser-card assembly. The ServeRAID-MR10is VAULT SAS/SATA adapter is supported on hot-swap server models only. The IBM ServeRAID-MR10is VAULT SAS/SATA adapter with an encryption 1078 DE chip set enables integrated RAID levels 0, 1, 5, 6, and 10 support capability on hot-swap hard disk drives. For configuration information, see the documentation on the ServeRAID CD that comes with the adapter.

Important: To ensure that any of your ServeRAID adapters function properly on UEFI-based servers, make sure that the adapter firmware level and supporting device drivers are updated to at least 11.xx-XXX.

Attention:
* To ensure proper cooling and airflow, install a ServeRAID adapter that has a battery attached in slot 2 on the riser-card assembly.
* Some cluster solutions require specific code levels or coordinated code updates. If the device is part of a cluster solution, verify that the latest level of code is supported for the cluster solution before you update the code.

To install the ServeRAID-MR10is VAULT SAS/SATA controller and route the cables, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.

   Attention: To avoid breaking the retaining clips or damaging the ServeRAID-MR10is VAULT SAS/SATA adapter connector, open and close the clips gently.
3. Remove the cover (see "Removing the cover" on page 29).
4. Disconnect the signal cables and power cables from the existing SAS/SATA adapter (if one is installed).
5. Carefully grasp the riser-card assembly at the front and rear edges and lift to remove it from the PCI connectors on the system board.
6. Carefully grasp the SAS/SATA adapter and pull it out of the connector on the riser-card assembly.
7. Remove the expansion-slot cover on the slot that you intend to use and save for future use.
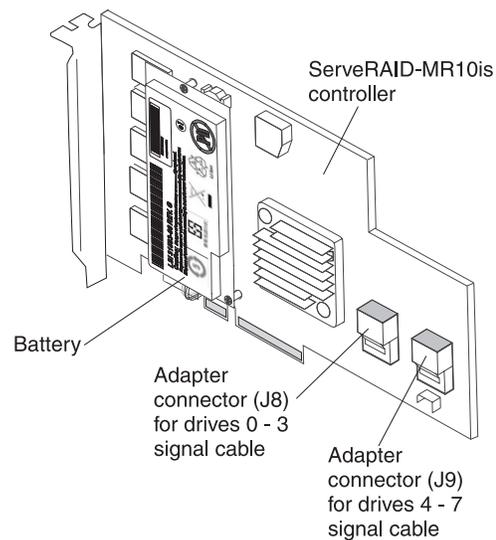
   Attention: PCI expansion-slot covers must be installed on all vacant slots. This maintains the electronic emissions standards of the server and ensures proper ventilation of server components.
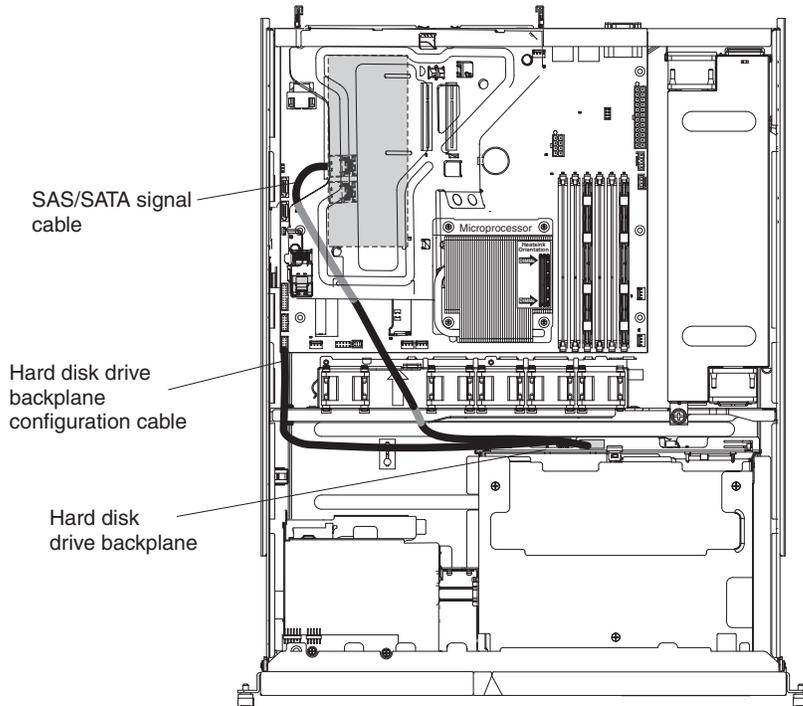8. Place the SAS/SATA adapter into a static-protective package and put it in a safe place.

9. Touch the static-protective package that contains the new ServeRAID-MR10is SAS/SATA adapter to any unpainted surface on the outside of the server; then, grasp the adapter by the top edge or upper corners of the adapter and remove it from the package.

10. If the battery pack (battery carrier and battery) did not come installed on the ServeRAID-MR10is SAS/SATA adapter, install the battery pack.

    a. Align the battery carrier pins and the connector for the battery carrier with the pin holes and connector on the ServeRAID adapter; then, lower the battery carrier onto the ServeRAID adapter.

Battery

Battery carrier

ServeRAID adapter

Connector for battery carrier
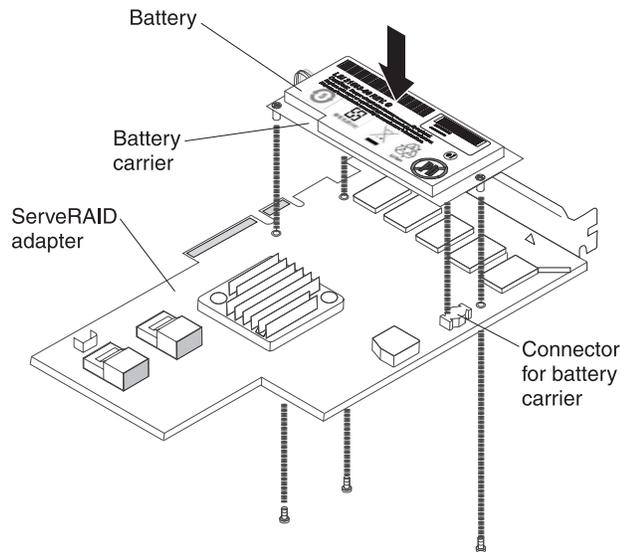
    b. Press the battery carrier into the connector on the ServeRAID adapter until it is firmly connected.

    c. Secure the battery carrier to the ServeRAID adapter with the screws that came with the battery pack.

11. Take the signal cable that is attached to the drive backplane and connect it to the ServeRAID adapter. The following illustration shows the connectors on the controller to which you connect the signal cable from the drive backplane.

ServeRAID-MR10is controller

Battery

Adapter connector (J8) for drives 0 - 3 signal cable

Adapter connector (J9) for drives 4 - 7 signal cable

12. Route the signal cables from the drive backplane through the fan cage hole on the left of fan 1 as shown in the following illustration.

SAS/SATA signal
cable

Microprocessor

Heatsink
Orientation

Hard disk drive
backplane
configuration cable

Hard disk
drive backplane

13. Align the ServeRAID adapter so that the keys align correctly with the
connector on the riser-card assembly.
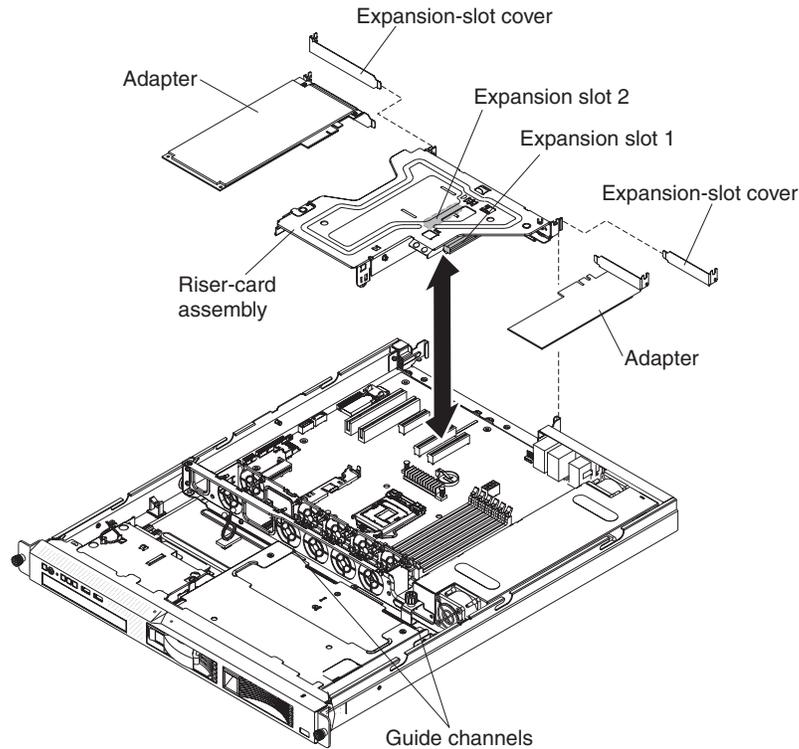
Expansion-slot cover

Adapter

Expansion slot 2

Expansion slot 1

Expansion-slot cover

Riser-card
assembly

Adapter

Guide channels

Attention: PCI expansion-slot covers must be installed on all vacant slots.
This maintains the electronic emissions characteristics of the server and
ensures proper cooling of server components.

14. Make sure that the riser-card assembly keys align correctly with the connectors
on the system board and press down on the riser-card assembly until it is
seated firmly into the connectors on the system board.

Note:

- When you restart the server, you are prompted to import the existing RAID configuration to the new ServeRAID adapter.
- If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

Installing the virtual media key

To install the virtual media key, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Remove the cover (see "Removing the cover" on page 29).
3. Align the virtual media key with the mounting tab and slide it down the tab onto the connector on the system board. Press the virtual media key down into the connector until it is firmly seated on the system board.
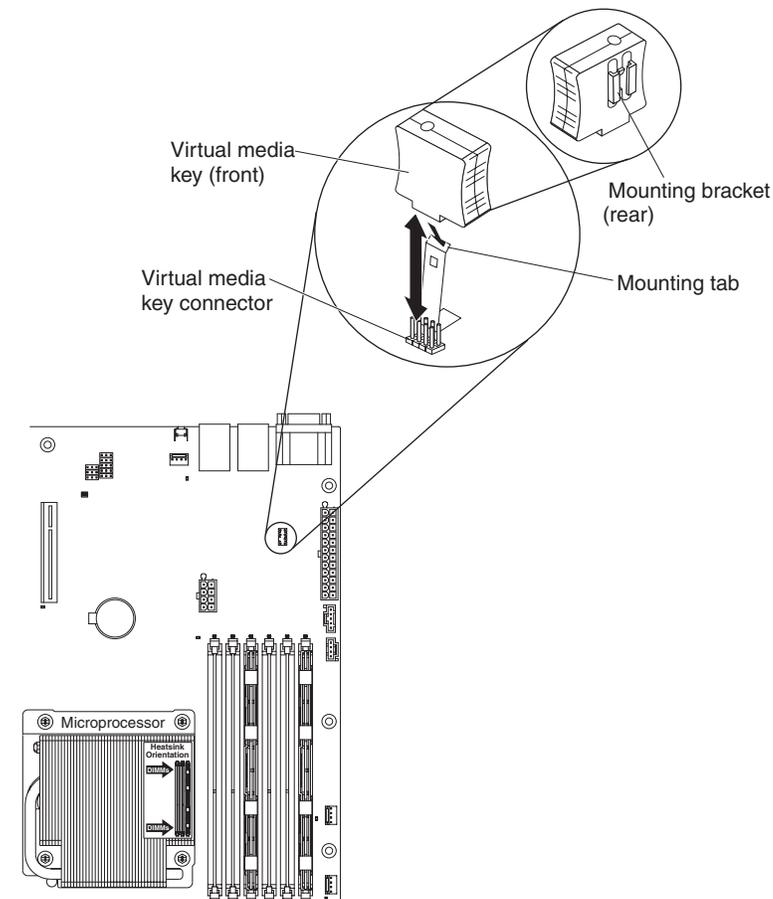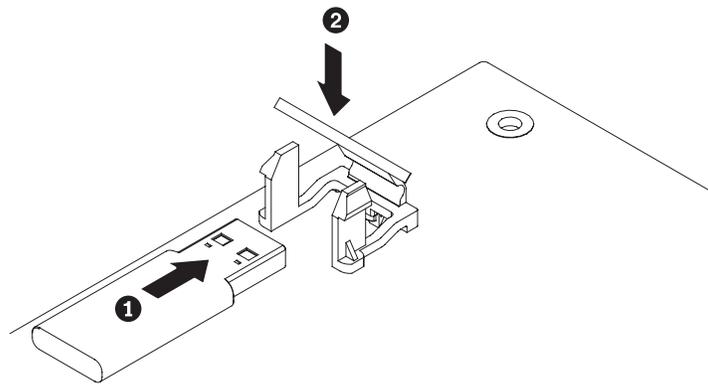

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 54.

Installing a USB embedded hypervisor flash device

To install a hypervisor flash device, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the cover (see "Removing the cover" on page 29).
4. Grasp the front and rear of the riser-card assembly and lift it out of the PCI riser-card slot on the system board.
5. Unlock the retention latch on the USB connector by squeezing the two retention clips toward each other.
6. Lift to open the retention latch.
7. Align the flash device with the USB connector on the system board and push it into the USB connector until it is firmly seated.
8. Press down on the retention latch to lock the flash device into the USB connector.

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

Completing the installation

To complete the installation, complete the following steps:

1. If you removed any air baffles, reinstall them (see "Replacing the DIMM air baffle").
2. If you removed the server cover, replace it (see "Replacing the cover" on page 55).
3. Install the server in the rack cabinet (see the *Rack Installation Instructions* that come with the server for instructions).
4. Reconnect the cables and power cords (see "Connecting the cables" on page 56).
5. Update the server configuration (see "Updating the server configuration" on page 56).
6. Slide the server back into the rack, if necessary.

Replacing the DIMM air baffle

To install the DIMM air baffle, complete the following steps:

1. Read the safety information that begins on page vii and "Installation guidelines" on page 27.

2. Turn off the server and peripheral devices and disconnect the power cords and all external cables (see "Turning off the server" on page 16).

3. Align the DIMM air baffle over the DIMMs so that the baffle pin on the left side of the air baffle aligns with the pin hole next to fan 2 and the baffle pin on the right side of the air baffle aligns with the pin hole next to fan 5 on the system board, and lower it into the server.


Air baffle
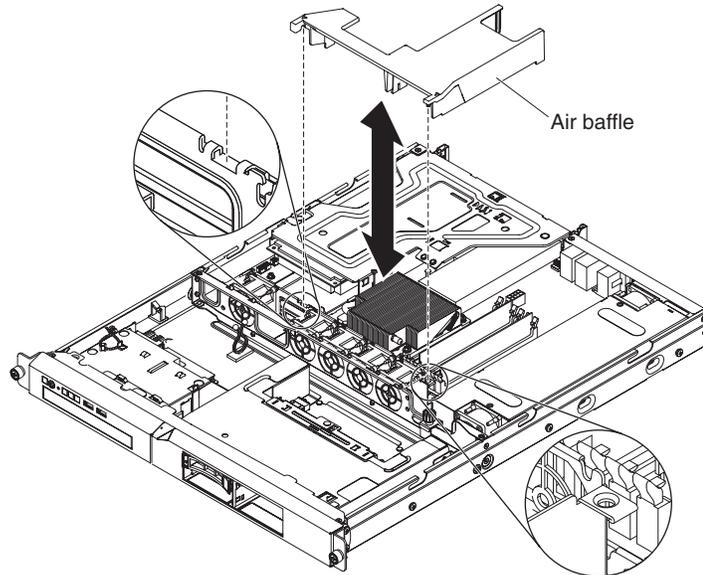
Replacing the cover

To replace the server cover, complete the following steps:

1. Align the cover over the server (toward the rear of the server) until the cover edges slip into position over the chassis.
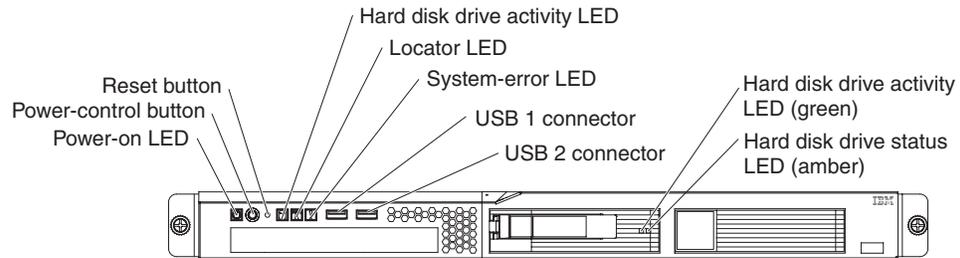
   Important: Before sliding the cover forward, make sure that all the tabs on both the front, rear, and side of the cover engage the chassis correctly. If all the tabs do not engage the chassis correctly, it will be hard to remove the cover later.

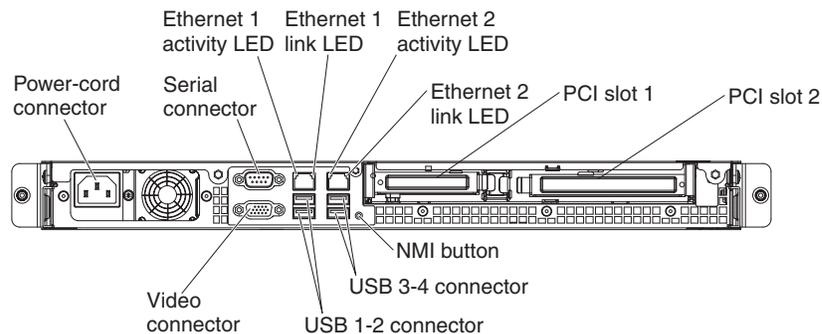2. Slide the cover forward toward the front of the server until the cover is completely closed.
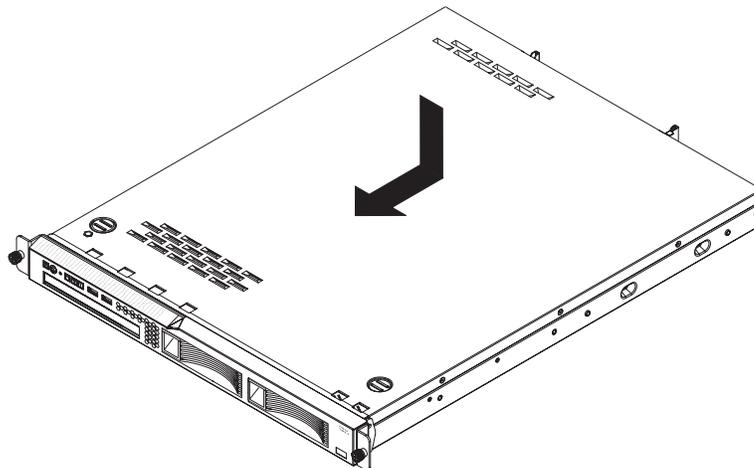
Connecting the cables

The following illustration shows the locations of the input and output connectors on the front of the server.

Hard disk drive activity LED
Locator LED
Reset button
System-error LED
Power-control button
USB 1 connector
Power-on LED
USB 2 connector
Hard disk drive activity LED (green)
Hard disk drive status LED (amber)

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

Ethernet 1 activity LED   Ethernet 1 link LED   Ethernet 2 activity LED
Power-cord connector   Serial connector
Ethernet 2 link LED   PCI slot 1   PCI slot 2
NMI button
Video connector   USB 3-4 connector
USB 1-2 connector

You must turn off the server before you connect or disconnect cables.

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

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

Updating the server configuration

When you start the server for the first time after you add or remove a device, you might receive a message that the configuration has changed. The Setup utility starts automatically so that you can save the new configuration settings.

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

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

Note: If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.

For information about configuring the integrated Gigabit Ethernet controller, see "Configuring the Gigabit Ethernet controller" on page 70.

Chapter 3. Configuring the server

The following configuration programs come with the server:

- **Setup utility**

  The UEFI (formerly BIOS) Setup Utility program is part of the basic input/output system firmware. Use it to change interrupt request (IRQ) settings, change the startup-device sequence, set the date and time, and set passwords. For information about using this program, see "Using the Setup utility" on page 58.

- **Boot Manager program**

  The Boot Manager program is part of the server firmware. Use it to override the startup sequence that is set in the Setup utility and temporarily assign a device to be first in the startup sequence. For more information about using this program, see "Using the Boot Manager program" on page 63.

- **IBM** *ServerGuide Setup and Installation* **CD**

  The ServerGuide program provides software-setup tools and installation tools that are designed for the server. Use this CD during the installation of the server to configure basic hardware features, such as an integrated SAS/SATA controller with RAID capabilities, and to simplify the installation of your operating system. For information about using this CD, see "Using the ServerGuide Setup and Installation CD" on page 64.

- **Integrated management module**

  Use the integrated management module (IMM) for configuration, to update the firmware and sensor data record/field replaceable unit (SDR/FRU) data, and to remotely manage a network. For information about using the IMM, see "Using the integrated management module" on page 66.

- **VMware ESXi embedded hypervisor**

  The VMware ESXi embedded hypervisor is available on the server models that come with an installed the USB embedded hypervisor flash device. The USB flash device is installed in the USB connector on the system board. Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. For more information about using the embedded hypervisor, see "Using the embedded hypervisor" on page 67.

- **Remote presence capability and blue-screen capture**

  The remote presence and blue-screen capture feature are integrated into the Integrated Management Module (IMM). The virtual media key is required to enable the remote presence functions. When the optional virtual media key is installed in the server, it activates the remote presence functions. Without the virtual media key, you will not be able to access the network remotely to mount or unmount drives or images on the client system. However, you will still be able to access the Web interface without the virtual media key. You can order the optional IBM Virtual Media Key, if one did not come with your server. For more information about how to enable the remote presence function, see "Using the remote presence capability and blue-screen capture" on page 68.

- **Ethernet controller configuration**

  For information about configuring the Ethernet controller, see "Configuring the Gigabit Ethernet controller" on page 70.

- **LSI Configuration Utility program**

  Use the LSI Configuration Utility program to configure the integrated SAS/SATA controller with RAID capabilities and the devices that are attached to it. For information about using this program, see "Using the LSI Configuration Utility program" on page 71.

The following table lists the different server configurations and the applications that are available for configuring and managing RAID arrays.

Table 12. Server configuration and applications for configuring and managing RAID arrays

Server configuration	RAID array configuration (before operating system is installed)	RAID array management (after operating system is installed)
ServeRAID-BR10il v2 adapter installed	LSI Utility (Setup utility, press Ctrl+C), ServerGuide	MegaRAID Storage Manager (for monitoring storage only)
ServeRAID-MR10i adapter installed	MegaRAID Storage Manager (MSM), MegaRAID BIOS Configuration Utility (press C to start), ServerGuide	MegaRAID Storage Manager (MSM)
ServeRAID-MR10is VAULT adapter installed	MegaRAID Storage Manager (MSM), MegaRAID BIOS Configuration Utility (press C to start), ServerGuide	MegaRAID Storage Manager (MSM)

- **IBM Advanced Settings Utility (ASU) program**

  Use this program as an alternative to the Setup utility for modifying UEFI settings and IMM settings. Use the ASU program online or out of band to modify UEFI settings from the command line without the need to restart the server to access the Setup utility. For more information about using this program, see "IBM Advanced Settings Utility program" on page 73.

Using the Setup utility

Use the Setup utility to perform the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set the startup characteristics of the server and the order of startup devices
- Set and change settings for advanced hardware features
- View, set, and change settings for power-management features
- View and clear error logs
- Resolve configuration conflicts

Starting the Setup utility

To start the Setup utility, complete the following steps:

1. Turn on the server.

   Note: Approximately 1 to 3 minutes after the server is connected to ac power, the power-control button becomes active.

2. When the prompt `<F1> Setup` is displayed, press F1. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.

3. Select settings to view or change.

Setup utility menu choices

The following choices are on the Setup utility main menu. Depending on the version of the firmware, some menu choices might differ slightly from these descriptions.

- **System Information**

  Select this choice to view information about the server. When you make changes through other choices in the Setup utility, some of those changes are reflected in the system information; you cannot change settings directly in the system information. This choice is on the full Setup utility menu only.

  – **System Summary**

    Select this choice to view configuration information, including the ID, speed, and cache size of the microprocessor, machine type and model of the server, the serial number, the system UUID, and the amount of installed memory. When you make configuration changes through other options in the Setup utility, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

  – **Product Data**

    Select this choice to view the system-board identifier, the revision level or issue date of the firmware, the integrated management module and diagnostics code, and the version and date.

  This choice is on the full Setup utility menu only.

- **System Settings**

  Select this choice to view or change the server component settings.

  – **Processors**

    Select this choice to view or change the processor settings.

  – **Memory**

    Select this choice to view or change the memory settings.

  – **Devices and I/O Ports**

    Select this choice to view or change assignments for devices and input/output (I/O) ports. You can configure the serial ports; configure remote console redirection; enable or disable integrated Ethernet controllers. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device).

  – **Power**

    Select this choice to set the operating mode if a power loss occurs.

  – **Operating Modes**

    Select this choice to view or change the operating profile (performance and power utilization).

  – **Legacy Support**

    Select this choice to view or set legacy support.

    - **Force Legacy Video on Boot**

      Select this choice to force INT video support, if the operating system does not support UEFI video output standards.

    - **Rehook INT 19h**

      Select this choice to enable or disable devices from taking control of the boot process. The default is **Disable**.

    - **Legacy Thunk Support**

      Select this choice to enable or disable UEFI to interact with PCI mass storage devices that are non-UEFI compliant.

  – **Integrated Management Module**

    Select this choice to view or change the settings for the integrated management module.

    - **POST Watchdog Timer**

Select this choice to view or enable the POST watchdog timer.

- **POST Watchdog Timer Value**

  Select this choice to view or set the POST loader watchdog timer value.

- **Reboot System on NMI**

  Enable or disable restarting the system whenever a nonmaskable interrupt (NMI) occurs. **Enable** is the default.

- **Commands on USB Interface Preference**

  Select this choice to enable or disable the Ethernet over USB interface on IMM.

- **Network Configuration**

  Select this choice to view the system management network interface port, the IMM MAC address, the current IMM IP address, and the host name; define the static IMM IP address, subnet mask, and gateway address; specify whether to use the static IP address or have DHCP assign the IMM IP address; save the network changes; and reset the IMM.

- **Reset IMM to Defaults**

  Select this choice to view or reset IMM to the default settings.

- **Reset IMM**

  Select this choice to reset IMM.

– **System Security**

  Select this choice to view or configure Trusted Platform Module (TPM) support.

– **Adapters and UEFI Drivers**

  Select this choice to view information about the UEFI 1.10 and UEFI 2.0 compliant adapters and drivers installed in the server.

– **Network**

  Select this choice to view or configure the network device options, such as PXE and network devices.

- **Date and Time**

  Select this choice to set the date and time in the server, in 24-hour format (*hour*:*minute*:*second*).

  This choice is on the full Setup utility menu only.

- **Start Options**

  Select this choice to view or boot to devices, including the startup sequence. The server starts from the first boot record that it finds.

  The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds.

  This choice is on the full Setup utility menu only.

- **Boot Manager**

  Select this choice to view, add, delete, or change the device boot priority, boot from a file, select a one-time boot, or reset the boot order to the default setting.

  If the server has Wake on LAN hardware and software and the operating system supports Wake on LAN functions, you can specify a startup sequence for the Wake on LAN functions. For example, you can define a startup sequence that checks for a disc in the CD-RW/DVD drive, then checks the hard disk drive, and then checks a network adapter.

- **System Event Logs**

Select this choice to enter the System Event Manager, where you can view the POST event log and system-event log.

The POST event log contains the three most recent error codes and messages that were generated during POST.

The system-event log contains POST and system management interrupt (SMI) events and all events that are generated by the baseboard management controller that is embedded in the integrated management module.

Important: If the system-error LED on the front of the server is lit but there are no other error indications, clear the system-event log. Also, after you complete a repair or correct an error, clear the system-event log to turn off the system-error LED on the front of the server.

– **POST Event Viewer**

Select this choice to enter the POST event viewer to view the POST event log.

– **System Event Log**

Select this choice to view the system-event log.

– **Clear System Event Log**

Select this choice to clear the system-event log.

• **User Security**

Select this choice to set or clear passwords. See "Passwords" on page 62 for more information.

This choice is on the full and limited Setup utility menu.

– **Power-on Password**

Select this choice to set a power-on password. See "Power-on password" on page 62 for more information.

– **Administrator Password**

Select this choice to set an administrator password. An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu. If an administrator password is set, the full Setup utility menu is available only if you type the administrator password at the password prompt. For more information, see "Administrator password" on page 63.

Attention: If you forget the administrator password, you cannot reset the password. You must replace the system board.

• **Save Settings**

Select this choice to save the changes that you have made in the settings.

• **Restore Settings**

Select this choice to cancel the changes that you have made in the settings and restore the previous settings.

• **Load Default Settings**

Select this choice to cancel the changes that you have made in the settings and restore the factory settings.

• **Exit Setup**

Select this choice to exit from the Setup utility. If you have not saved the changes that you have made in the settings, you are asked whether you want to save the changes or exit without saving them.

Passwords

From the **User Security** menu choice, you can set, change, and delete a power-on password and an administrator password. The **User Security** choice is on the full Setup utility menu only.

If you set only a power-on password, you must type the power-on password to complete the system startup and to have access to the full Setup utility menu.

An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu. If you set only an administrator password, you do not have to type a password to complete the system startup, but you must type the administrator password to access the Setup utility menu.

If you set a power-on password for a user and an administrator password for a system administrator, you must type the power-on password to complete the system startup. A system administrator who types the administrator password has access to the full Setup utility menu; the system administrator can give the user authority to set, change, and delete the power-on password. A user who types the power-on password has access to only the limited Setup utility menu; the user can set, change, and delete the power-on password, if the system administrator has given the user that authority.

Power-on password

If a power-on password is set, when you turn on the server, the system startup will not be completed until you type the power-on password. You can use any combination of 6-20 printable ASCII characters for the password.

When a power-on password is set, you can enable the Unattended Start mode, in which the keyboard and mouse remain locked but the operating system can start. You can unlock the keyboard and mouse by typing the power-on password.

If you forget the power-on password, you can regain access to the server in any of the following ways:
- If an administrator password is set, type the administrator password at the password prompt. Start the Setup utility and reset the power-on password.
- Remove the battery from the server and then reinstall it. See the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for instructions for removing the battery.
- Change the position of the clear CMOS jumper on the system board to pins 2 and 3 to bypass the power-on password check. The jumper location is shown in the following illustration.

TPM physical presence jumper (J31) | Boot block jumper (JP6) | Clear CMOS jumper (JP1)
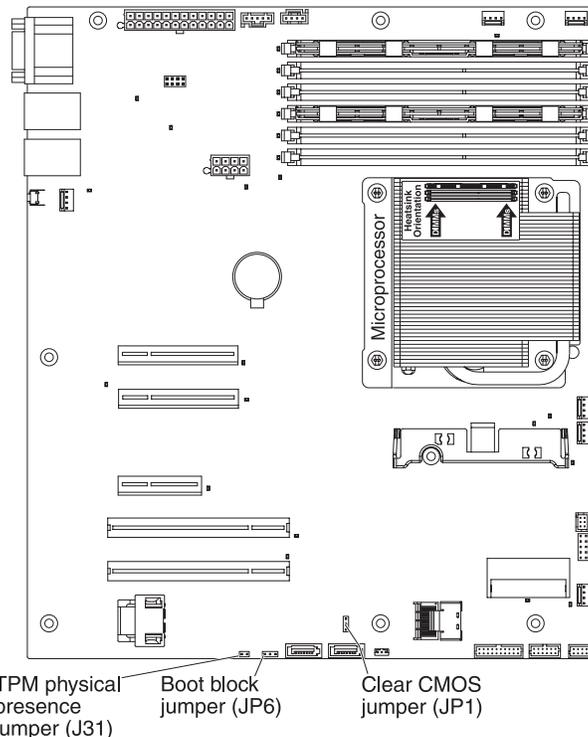
Attention: Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. See the safety information that begins on page vii. Do not change settings or move jumpers on any system-board switch or jumper blocks that are not shown in this document.

The power-on password override jumper does not affect the administrator password.

Administrator password

If an administrator password is set, you must type the administrator password for access to the full Setup utility menu. You can use any combination of 6-20 printable ASCII characters for the password.

Attention: If you forget the administrator password, you cannot reset the password. You must replace the system board.

Using the Boot Manager program

The Boot Manager program is a built-in, menu-driven configuration utility program that you can use to temporarily redefine the first startup device without changing settings in the Setup utility.

To use the Boot Manager program, complete the following steps:

1. Turn off the server.
2. Restart the server.
3. When the prompt `<F12> Select Boot Device` is displayed, press F12. If a bootable USB mass storage device is installed, a submenu item (**USB Key/Disk**) is displayed.
4. Use the Up Arrow and Down Arrow keys to select an item from the **Boot Selection Menu** and press **Enter**.

The next time the server starts, it returns to the startup sequence that is set in the Setup utility.

Starting the backup server firmware

The system board contains a backup copy area for the server firmware. This is a secondary copy of the server firmware that you update only during the process of updating the server firmware. If the primary copy of the server firmware becomes damaged, use this backup copy.

To force the server to start from the backup copy, turn off the server; then, place the JP6 jumper in the backup position (pins 2 and 3).

Use the backup copy of the server firmware until the primary copy is restored. After the primary copy is restored, turn off the server; then, move the JP6 jumper back to the primary position (pins 1 and 2).

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides software setup tools and installation tools that are designed for your server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. Use this CD during the initial installation of the server to simplify the operating-system installations by providing updated device drivers and, in some cases, installing them automatically. To download the CD, go to http://www.ibm.com/systems/management/serverguide/ sub.html and click **IBM Service and Support Site**.

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

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" in the *Problem Determination and Service Guide* on the *System x Documentation* CD.
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 for your operating system and adapter.
   e. Start the operating-system installation. You will need your operating-system CD.

The ServerGuide program has the following features:

- An easy-to-use interface
- Diskette-free setup, and configuration programs that are based on detected hardware
- ServeRAID Manager program, which configures your ServeRAID adapter
- Device drivers that are provided for your server model and detected hardware
- Operating-system partition size and file-system type that are selectable during setup

ServerGuide features

Features and functions can vary slightly with different versions of the ServerGuide program. To learn more about the version that you have, start the *ServerGuide Setup and Installation* CD and view the online overview. Not all features are supported on all server models.

The ServerGuide program requires a supported IBM server with an enabled startable (bootable) CD drive. In addition to the *ServerGuide Setup and Installation* CD, you must have your operating-system CD to install the operating system.

The ServerGuide program performs the following tasks:
- Sets system date and time
- Detects the RAID adapter or controller and runs the SAS/SATA RAID configuration program
- Checks the microcode (firmware) levels of a ServeRAID adapter and determines whether a later level is available from the CD
- Detects installed hardware options and provides updated device drivers for most adapters and devices
- Provides diskette-free installation for supported Windows operating systems
- Includes an online readme file with links to tips for your hardware and operating-system installation

Setup and configuration overview

When you use the *ServerGuide Setup and Installation* CD, you do not need setup diskettes. You can use the CD to configure any supported IBM server model. The setup program provides a list of tasks that are required to set up your server model. On a server with a ServeRAID adapter or SAS/SATA controller with RAID capabilities, you can run the SAS/SATA RAID configuration program to create logical drives.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

Important: Before you install a legacy operating system (such as VMware) on a server with an LSI SAS controller, you must first complete the following steps:

1. Update the device driver for the LSI SAS controller to the latest level.
2. In the Setup utility, set **Legacy Only** as the first option in the boot sequence in the **Boot Manager** menu.
3. Using the LSI Configuration Utility program, select a boot drive.

For detailed information and instructions, go to https://www-947.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=MIGR-5083225.

Typical operating-system installation

The ServerGuide program can reduce the time it takes to install an operating system. It provides the device drivers that are required for your hardware and for the operating system that you are installing. This section describes a typical ServerGuide operating-system installation.

Note: Features and functions can vary slightly with different versions of the ServerGuide program.

1. After you have completed the setup process, the operating-system installation program starts. (You will need your operating-system CD to complete the installation.)

2. The ServerGuide program stores information about the server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.

3. The ServerGuide program presents operating-system partition options that are based on your operating-system selection and the installed hard disk drives.

4. The ServerGuide program prompts you to insert your operating-system CD and restart the server. At this point, the installation program for the operating system takes control to complete the installation.

Installing your operating system without using ServerGuide

If you have already configured the server hardware and you are not using the ServerGuide program to install your operating system, complete the following steps to download the latest operating-system installation instructions from the IBM Web site.

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. From the menu on the left side of the page, click **System x support search**.

4. From the **Task** menu, select **Install**.

5. From the **Product family** menu, select **System x3250 M3**.

6. From the **Operating system** menu, select your operating system, and then click **Search** to display the available installation documents.

Using the integrated management module

The integrated management module (IMM) is a second generation of the functions that were formerly provided by the baseboard management controller hardware. It combines service processor functions, video controller, and (when an optional virtual media key is installed) remote presence function in a single chip.

For more information about IMM, see the *Integrated Management Module User's Guide* at http://www.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=MIGR-5079770&brandind=5000008

The IMM supports the following basic systems-management features:

- Environmental monitor with fan speed control for temperature, voltages, fan failure, and power supply failure.
- DIMM error assistance. The Unified Extensible Firmware Interface (UEFI) disables a failing DIMM that is detected during POST, and the IMM lights the associated system error LED and the failing DIMM error LED.
- System-event log (SEL).
- ROM-based IMM firmware flash updates.
- Auto Boot Failure Recovery (ABR).
- A virtual media key, which enables remote presence support (remote video, remote keyboard/mouse, and remote storage).
- Nonmaskable interrupt (NMI) detection and reporting.
- Automatic Server Restart (ASR) when POST is not complete or the operating system hangs and the operating system watchdog timer times-out. The IMM

might be configured to watch for the operating system watchdog timer and reboot the system after a timeout, if the ASR feature is enabled. Otherwise, the IMM allows the administrator to generate a nonmaskable interrupt (NMI) by pressing an NMI button on the system board for an operating-system memory dump. ASR is supported by IPMI.

- Intelligent Platform Management Interface (IPMI) Specification V2.0 and Intelligent Platform Management Bus (IPMB) support.
- Invalid system configuration (CNFG) LED support.
- Serial port redirection over Telnet or SSH.
- Serial over LAN (SOL).
- Active Energy Manager (AEM).
- Query power-supply input power.
- PECI 2 support.
- Power/reset control (power-on, hard and soft shutdown, hard and soft reset, schedule power control).
- Alerts (in-band and out-of-band alerting, PET traps - IPMI style, SNMP, e-mail).
- Operating-system failure blue screen capture.
- Command-line interface.
- Configuration save and restore.
- PCI configuration data.
- Boot sequence manipulation.

The IMM 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 2.0 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 UEFI settings, restart the server, identify the server, and perform other management functions. Any standard Telnet client application can access the SOL connection.

Using the embedded hypervisor

The VMware ESXi embedded hypervisor is available on server models that come with an installed USB embedded hypervisor flash device. The USB flash device installs in the USB connector on the system board (see "Installing a USB embedded hypervisor flash device" on page 54). Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. The USB flash device is required to activate the hypervisor functions.

To start using the embedded hypervisor functions, you must add the USB flash device to the boot order in the Setup utility.

To add the USB flash device to the boot order, complete the following steps:

1. Turn on the server.

> **Note:** Approximately 1 to 3 minutes after the server is connected to ac power, the power-control button becomes active.

2. When the prompt `<F1> Setup` is displayed, press F1.

3. From the Setup utility main menu, select **Boot Manager**.

4. Select **Add Boot Option**; then, select **Embedded Hypervisor**. Press Enter, and then select Esc.

5. Select **Change Boot Order** and then select **Commit Changes**; then, press Enter.

6. Select **Save Settings** and then select **Exit Setup**.

If the embedded hypervisor flash device image becomes corrupt, you can use the *VMware Recovery* CD that comes with the system to recover the flash device image. To recover the flash device image, complete the following steps:

1. Turn on the server.

> **Note:** Approximately 1 to 3 minutes after the server is connected to ac power, the power-control button becomes active.

2. Insert the VMware Recovery CD into the CD or DVD drive.

3. Follow the instructions on the screen.

For additional information and instructions, see the *VMware ESXi Server 3i Embedded Setup Guide* at http://www.vmware.com/pdf/vi3_35/esx_3i_e/r35/vi3_35_25_3i_setup.pdf

Using the remote presence capability and blue-screen capture

The remote presence and blue-screen capture features are integrated functions of the integrated management module (IMM). When the optional IBM Virtual Media Key is installed in the server, it activates the remote presence functions. The virtual media key is required to enable the integrated remote presence and blue-screen capture features. Without the virtual media key, you will not be able to access the network remotely to mount or unmount drives or images on the client system. However, you can still access the Web interface without the key.

After the virtual media key is installed in the server, it is authenticated to determine whether it is valid. If the key is not valid, you receive a message from the Web interface (when you attempt to start the remote presence feature) indicating that the hardware key is required to use the remote presence feature.

The virtual media key has an LED. When this LED is lit and green, it indicates that the key is installed and functioning correctly. When the LED is not lit, it indicates that the key might not be installed correctly.

The remote presence feature provides the following functions:

- Remotely viewing video with graphics resolutions up to 1280 x 1024 at 75 Hz, regardless of the system state
- Remotely accessing the server, using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the IMM memory and mapping it to the server as a virtual drive

The blue-screen capture feature captures the video display contents before the IMM restarts the server when the IMM detects an operating-system hang condition. A system administrator can use the blue-screen capture to assist in determining the cause of the hang condition.

Enabling the remote presence feature

To enable the remote presence feature, complete the following steps:

1. Install the virtual media key into the dedicated slot on the system board (see "System-board optional-device connectors" on page 26).

2. Turn on the server.

   Note: Approximately 1 to 3 minutes after the server is connected to ac power, the power-control button becomes active.

Obtaining the IP address for the IMM

To access the Web interface, you need the IP address for the IMM. You can obtain the IMM IP address through the Setup utility. The server comes with a default IP address for the IMM of 192.168.70.125. To locate the IP address, complete the following steps:

1. Turn on the server.

   Note: Approximately 1 to 3 minutes after the server is connected to ac power, the power-control button becomes active.

2. When the prompt `<F1> Setup` is displayed, press F1. (This prompt is displayed on the screen for only a few seconds. You must press F1 quickly.) If you have set both a power-on password and an administrator password, you must type the administrator password to access the full Setup utility menu.

3. From the Setup utility main menu, select **System Settings**.

4. On the next screen, select **Integrated Management Module**.

5. On the next screen, select **Network Configuration**.

6. Find the IP address and write it down.

7. Exit from the Setup utility.

Logging on to the Web interface

To log on to the Web interface to use the remote presence functions, complete the following steps:

1. Open a Web browser on a computer that connects to the server and in the **address** or **URL** field, type the IP address or host name of the IMM to which you want to connect.

   Note: The IMM defaults to DHCP. If a DHCP host is not available, the IMM assigns a static IP address of 192.168.70.125.

2. On the Login page, type the user name and password. If you are using the IMM for the first time, you can obtain the user name and password from your system administrator. All login attempts are documented in the event log.

   Note: The IMM is set initially with a user name of USERID and password of PASSW0RD (passw0rd with a zero, not the letter O). You have read/write access. You must change the default password the first time you log on.

3. On the Welcome page, type a timeout value (in minutes) in the field that is provided. The IMM will log you off of the Web interface if your browser is inactive for the number of minutes that you entered for the timeout value.

4. Click **Continue** to start the session. The System Health page provides a quick view of the system status.

Enabling the Intel Gigabit Ethernet Utility program

The Intel Gigabit Ethernet Utility program is part of the server firmware. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in the startup sequence. Enable and disable the Intel Gigabit Ethernet Utility program from the Setup utility.

Configuring the Gigabit Ethernet controller

The Ethernet controllers are integrated on the system board. They provide an interface for connecting to a 10 Mbps, 100 Mbps, or 1 Gbps network and provide full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in the server support auto-negotiation, the controllers detect the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operate at that rate and mode.

You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers. To find updated information about configuring the controllers, 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. From the **Product family** menu, select **System x3250 M3** and click **Go**.

Enabling and configuring Serial over LAN (SOL)

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.

To enable and configure the server for SOL, you must update and configure the UEFI code; update and configure the integrated management module (IMM) firmware; update and configure the Ethernet controller firmware; and enable the operating system for an SOL connection.

UEFI update and configuration

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

1. Update the UEFI code:

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

b. Update the UEFI code, following the instructions that come with the update file that you downloaded.
2. Update the IMM firmware:
   a. Download the latest version of the IMM firmware from http://www.ibm.com/systems/support/.
   b. Update the IMM firmware, following the instructions that come with the update file that you downloaded.
3. Configure the UEFI settings:
   a. When you are prompted to start the Configuration/Setup Utility program, restart the server and press F1.
   b. Select **System Settings** → **Devices and I/O Ports**.
   c. Select **Console Redirection Settings**; then, make sure that the values are set as follows:
      • **COM Port 1**: Enable
      • **Remote Console**: Enable
      • **Serial Port Sharing**: Enable
      • **Serial Port Access Mode**: Dedicated COM1 Settings
      • **Baud Rate**: 115200
      • **Data Bits**: 8
      • **Parity**: None Stop
      • **Bits**: 1
      • **Thermal Emulation**: ANSI
      • **Active After Boot**: Enable
      • **Flow Control**: Hardware
   d. Press Esc twice to exit the **Devices and I/O Ports** section of the Configuration/Setup Utility program.
   e. Select **Save Settings**; then, press Enter.
   f. Press Enter to confirm.
   g. Select **Exit Setup**; then, press Enter.
   h. Make sure that Yes, exit the Setup Utility is selected; then, press Enter.

Using the LSI Configuration Utility program

Note:
      • Simple-swap SATA hard disk drives support AHCI mode.
      • Simple-swap models only support ServeRAID-BR10il adapter.

Use the LSI Configuration Utility program to configure and manage redundant array of independent disks (RAID) arrays. Be sure to use this program as described in this document.

• Use the LSI Configuration Utility program to perform the following tasks:
   – Perform a low-level format on a hard disk drive
   – Create an array of hard disk drives with or without a hot-spare drive
   – Set protocol parameters on hard disk drives

The integrated SAS/SATA controller with RAID capabilities supports RAID arrays. You can use the LSI Configuration Utility program to configure RAID 1 (IM), RAID 1E (IME), and RAID 0 (IS) for a single pair of attached devices. If you install the optional ServeRAID-MR10i SAS/SATA controller, it provides RAID levels 0, 1, 5, 6,

and 10 support. If you install a different type of RAID adapter, follow the instructions in the documentation that comes with the adapter to view or change settings for attached devices.

In addition, you can download an LSI command-line configuration program from http://www.ibm.com/systems/support/.

When you are using the LSI Configuration Utility program to configure and manage arrays, consider the following information:

- The integrated SAS/SATA controller with RAID capabilities supports the following features:
  - Integrated Mirroring (IM) with hot-spare support (also known as RAID 1)

    Use this option to create an integrated array of two disks plus up to two optional hot spares. All data on the primary disk can be migrated.
  - Integrated Mirroring Enhanced (IME) with hot-spare support (also known as RAID 1E)

    Use this option to create an integrated mirror enhanced array of three to eight disks, including up to two optional hot spares. All data on the array disks will be deleted.
  - Integrated Striping (IS) (also known as RAID 0)

    Use this option to create an integrated striping array of two to eight disks. All data on the array disks will be deleted.
- Hard disk drive capacities affect how you create arrays. The drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- If you use an integrated SAS/SATA controller with RAID capabilities to configure a RAID 1 (mirrored) array after you have installed the operating system, you will lose access to any data or applications that were previously stored on the secondary drive of the mirrored pair.
- If you install a different type of RAID controller, see the documentation that comes with the controller for information about viewing and changing settings for attached devices.

Starting the LSI Configuration Utility program

To start the LSI Configuration Utility program, complete the following steps:

1. Turn on the server.

   Note: Approximately 1 to 3 minutes after the server is connected to ac power, the power-control button becomes active.

2. When the prompt `<F1 Setup>` is displayed, press F1. If you have set an administrator password, you are prompted to type the password.
3. Select **System Settings ➔ Adapters and UEFI drivers**.
4. Select **Please refresh this page on the first visit** and press Enter.
5. Select **LSI** *controller_driver_name Driver* and press Enter, where *controller_driver_name* is the name of the SAS/SATA controller driver. For the SAS/SATA controller driver name, see the documentation that comes with your controller.
6. To perform storage-management tasks, follow the procedures in the documentation that comes with the SAS/SATA controller.

When you have finished changing settings, press Esc to exit from the program; select **Save** to save the settings that you have changed.

Formatting a hard disk drive

Low-level formatting removes all data from the hard disk. If there is data on the disk that you want to save, back up the hard disk before you perform this procedure.

Note: Before you format a hard disk, make sure that the disk is not part of a mirrored pair.

To format a drive, complete the following steps:

1. From the list of adapters, select the controller (channel) for the drive that you want to format and press Enter.
2. Select **SAS Topology** and press Enter.
3. Select **Direct Attach Devices** and press Enter.
4. To highlight the drive that you want to format, use the Up Arrow and Down Arrow keys. To scroll left and right, use the Left Arrow and Right Arrow keys or the End key. Press Alt+D.
5. To start the low-level formatting operation, select **Format** and press Enter.

Creating a RAID array of hard disk drives

To create a RAID array of hard disk drives, complete the following steps:

1. From the list of adapters, select the controller (channel) for the drives that you want to mirror.
2. Select **RAID Properties**.
3. Select the type of array that you want to create.
4. Use the arrow keys to highlight the first drive in the pair; then, press the Minus (-) or Plus (+) key to change the mirror value to **Primary**.
5. Continue to select the next drive using the Minus (-) or Plus (+) key until you have selected all the drives for your array.
6. Press C to create the disk array.
7. Select **Apply changes and exit menu** to create the array.

IBM Advanced Settings Utility program

The IBM Advanced Settings Utility (ASU) program is an alternative to the Setup utility for modifying UEFI settings. Use the ASU program online or out of band to modify UEFI settings from the command line without the need to restart the system to access the Setup utility.

You can also use the ASU program to configure the optional remote presence features or other IMM settings. The remote presence features provide enhanced systems-management capabilities.

In addition, the ASU program provides limited settings for configuring the IPMI function in the IMM through the command-line interface.

Use the command-line interface to issue setup commands. You can save any of the settings as a file and run the file as a script. The ASU program supports scripting environments through a batch-processing mode.

For more information and to download the ASU program, go to
http://www.ibm.com/systems/support/.

Updating IBM Systems Director

If you plan to use IBM Systems Director to manage the server, you must check for
the latest applicable IBM Systems Director updates and interim fixes.

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

To locate and install a newer version of IBM Systems Director, complete the
following steps:

1. Check for the latest version of IBM Systems Director:

   a. Go to http://www.ibm.com/systems/management/director/downloads.html.

   b. If a newer version of IBM Systems Director than what comes with the server
      is shown in the drop-down list, follow the instructions on the Web page to
      download the latest version.

2. Install the IBM Systems Director program.

If your management server is connected to the Internet, to locate and install
updates and interim fixes, complete the following steps:

1. Make sure that you have run the Discovery and Inventory collection tasks.

2. On the Welcome page of the IBM Systems Director Web interface, click **View
   updates**.

3. Click **Check for updates**. The available updates are displayed in a table.

4. Select the updates that you want to install, and click **Install** to start the
   installation wizard.

If your management server is not connected to the Internet, to locate and install
updates and interim fixes, complete the following steps:

1. Make sure that you have run the Discovery and Inventory collection tasks.

2. On a system that is connected to the Internet, go to http://www.ibm.com/
   eserver/support/fixes/fixcentral/.

3. From the **Product family** list, select **IBM Systems Director**.

4. From the **Product** list, select **IBM Systems Director**.

5. From the **Installed version** list, select the latest version, and click **Continue**.

6. Download the available updates.

7. Copy the downloaded files to the management server.

8. On the management server, on the Welcome page of the IBM Systems
   Director Web interface, click the **Manage** tab, and click **Update Manager**.

9. Click **Import updates** and specify the location of the downloaded files that you
   copied to the management server.

10. Return to the Welcome page of the Web interface, and click **View updates**.

11. Select the updates that you want to install, and click **Install** to start the
    installation wizard.

Appendix A. Getting help and technical assistance

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

Before you call

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

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system and any optional devices are turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system. Information about diagnostic tools is in the *Problem Determination and Service Guide* on the IBM *Documentation* CD that comes with your system.
- Go to the IBM support Web site at http://www.ibm.com/systems/support/ to check for technical information, hints, tips, and new device drivers or to submit a request for information.

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, 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 your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to http://www.ibm.com/partnerworld/ and click **Find a Business Partner** on the right side of the page. For IBM support telephone numbers, see http://www.ibm.com/planetwide/. 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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Important notes

This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks nor is it intended to be used in a public services network.

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.

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

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Some software might differ from its retail version (if available) and might not include user manuals or all program functionality.

Particulate contamination

Attention: Airborne particulates (including metal flakes or particles) and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server that is described in this document. Risks that are posed by the presence of excessive particulate levels or concentrations of harmful gases include damage that might cause the server to malfunction or cease functioning altogether. This specification sets forth limits for particulates and gases that are intended to avoid such damage. The limits must not be viewed or used as definitive limits, because numerous other factors, such as temperature or moisture content of the air, can influence the impact of particulates or environmental corrosives and gaseous contaminant transfer. In the absence of specific limits that are set forth in this document, you must implement practices that maintain particulate and gas levels that are consistent with the protection of human health and safety. If IBM determines that the levels of particulates or gases in your environment have caused damage to the server, IBM may condition provision of repair or replacement of servers or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 13. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days
[1] ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. [2] The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction. [3] ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.	

Documentation format

The publications for this product are in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when you use the PDF files and want to request a Web-based format or accessible PDF document for a publication, direct your mail to the following address:

Information Development
IBM Corporation
205/A015
3039 E. Cornwallis Road
P.O. Box 12195
Research Triangle Park, North Carolina 27709-2195
U.S.A.

In the request, be sure to include the publication part number and title.

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Note: When attaching a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices supplied with the monitor.

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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 communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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European Community contact:
IBM Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
Email: tjahn@de.ibm.com

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Deutschsprachiger EU Hinweis:

Hinweis für Geräte der Klasse A EU-Richtlinie zur Elektromagnetischen Verträglichkeit

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Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:
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Armonk, New York 10504
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Der verantwortliche Ansprechpartner des Herstellers in der EU ist:
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IBM-Allee 1, 71137 Ehningen, Germany
Telephone: +49 7032 15-2937
Email: tjahn@de.ibm.com

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高調波ガイドライン適合品

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Index

A

accessible documentation   79
acoustical noise emissions   7
adapter
   ServeRAID-MR10is VAULT
      installing   50
adapter, installation   42
adapters supported   42
administrator password   61
assistance, getting   75
attention notices   5
availability   11

B

backup firmware
   starting   64
bays   6
before you install a legacy operating system   65
blue screen capture features   9
blue-screen capture feature
   overview   9, 69
boot manager program
   using   63

C

cables
   connecting   56
cabling
   the ServeRAID-MR10is VAULT adapter   50
caution statements   5
CD-RW/DVD
   drive activity LED   15
   eject button   14
Class A electronic emission notice   80
completing
   the options installation   54
components
   on the server   20
configuration programs
   LSI Configuration Utility   57
configuration, server
   updating   56
configuring
   with ServerGuide   65
configuring the server   57
connecting
   the cables   56
connector
   Ethernet   16
   power supply   15
   serial   16
   USB   14, 16
   video
      rear   15

connectors
   for options on the system board   26
   on the rear of the server   15
connectors, external system board   22
connectors, internal system board   21
contamination, particulate and gaseous   7, 79
controllers
   Ethernet   70
controls, LEDs, and power   13
cover
   replacing   55
cover, removing   29
creating
   RAID array   73

D

danger statements   5
device drivers, updates   13
devices, static-sensitive
   handling   29
diagnostics program
   DSA Preboot   8
DIMMs
   installing   30
documentation
   Documentation Browser   3
   Documentation CD   3
documentation format   79
documentation, updated
   finding   5
drives   10
   installing   35
DVD drive
   installing   40
Dynamic System Analysis (DSA) Preboot diagnostics
  program   8

E

electrical input   7
electronic emission Class A notice   80
embedded hypervisor
   using   67
Enterprise X-Architecture technology   9
environment   7
Ethernet
   activity status LED   15
   link status LED   15
Ethernet connector   16
Ethernet support   10
expansion bays   6
external, system board connectors   22

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