

System x3400 M2 Types 7836 and 7837



Installation and User's Guide

System x3400 M2 Types 7836 and 7837



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 125 and the *IBM Safety Information*, *IBM Environmental Notices and User's Guide*, and the *Warranty and Support Information* document on the *IBM System x Documentation CD*.

Sixth Edition (February 2012)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες 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 pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

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

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

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

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 2:



CAUTION:

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

Do not:

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

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

Statement 3:



CAUTION:

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

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



DANGER

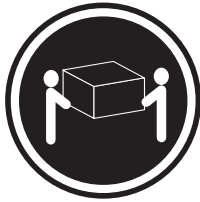
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

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



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

Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

Use safe practices when lifting.

Statement 5:



CAUTION:

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



Statement 8:



CAUTION:

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



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

Statement 11:



CAUTION:

The following label indicates sharp edges, corners, or joints nearby.



Statement 12:



CAUTION:

The following label indicates a hot surface nearby.



Statement 13:



DANGER

Overloading a branch circuit is potentially a fire hazard and a shock hazard under certain conditions. To avoid these hazards, ensure that your system electrical requirements do not exceed branch circuit protection requirements. Refer to the information that is provided with your device for electrical specifications.

Statement 15:



CAUTION:

Make sure that the rack is secured properly to avoid tipping when the server unit is extended.

Statement 17:



CAUTION:

The following label indicates moving parts 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.

Chapter 1. The System x3400 M2 server

This *Installation and User's Guide* contains information and instructions for setting up your IBM System x3400 M2 Types 7836 and 7837 server, instructions for installing 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 x3400 M2 Types 7836 and 7837 is a 5-U-high, high-performance server that is based on IBM X-Architecture® technologies. This high-performance server is ideally suited for networking environments that require superior microprocessor performance, input/output (I/O) flexibility, and 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 *Warranty and Support Information* document on the IBM System x Documentation CD.

The server contains IBM Enterprise X-Architecture technologies, which help increase performance, reliability, and availability. For more information, see “What your server offers” on page 10 and “Reliability, availability, and serviceability” on page 13.

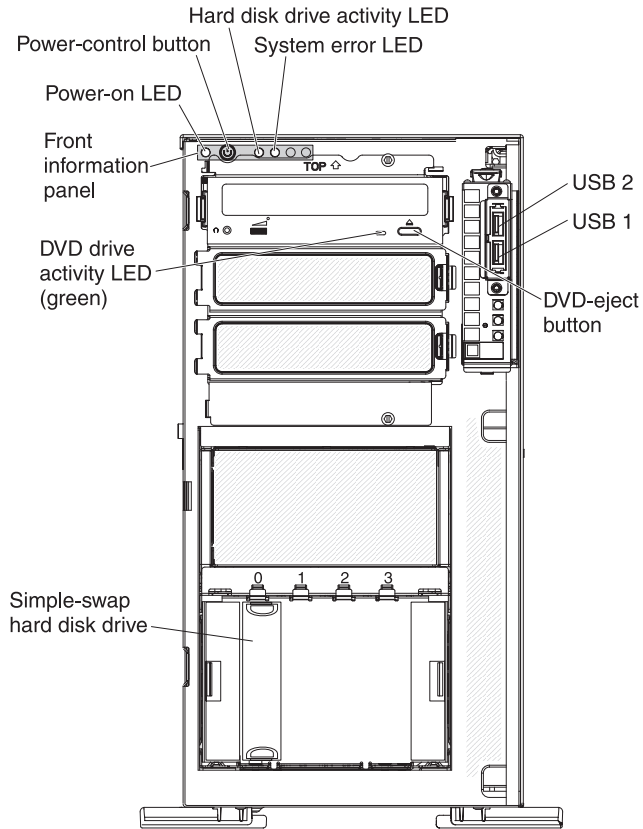
You can obtain up-to-date information about the server and other IBM server products at <http://www.ibm.com/systems/x/>. At <http://www.ibm.com/support/mysupport/>, you can create a personalized support page by identifying IBM products that are of interest to you. From this personalized page, you can 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/>.

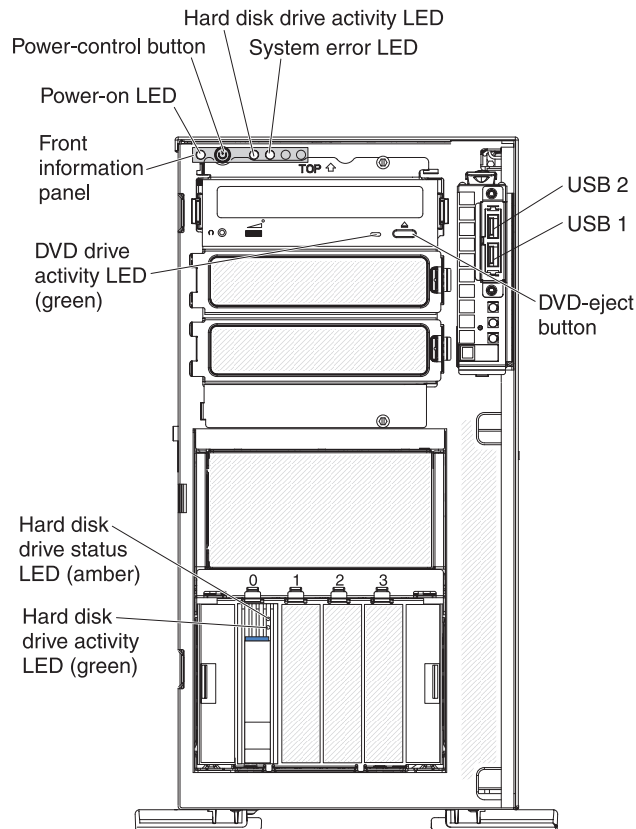
Some server models support four 3.5-inch simple-swap SATA hard disk drives, or four 3.5-inch hot-swap SAS or SATA hard disk drives, sixteen or eight 2.5-inch hot-swap SAS or SATA hard disk drives. The illustrations in this document might differ slightly from your model.

The following is an illustration of the simple-swap server model.

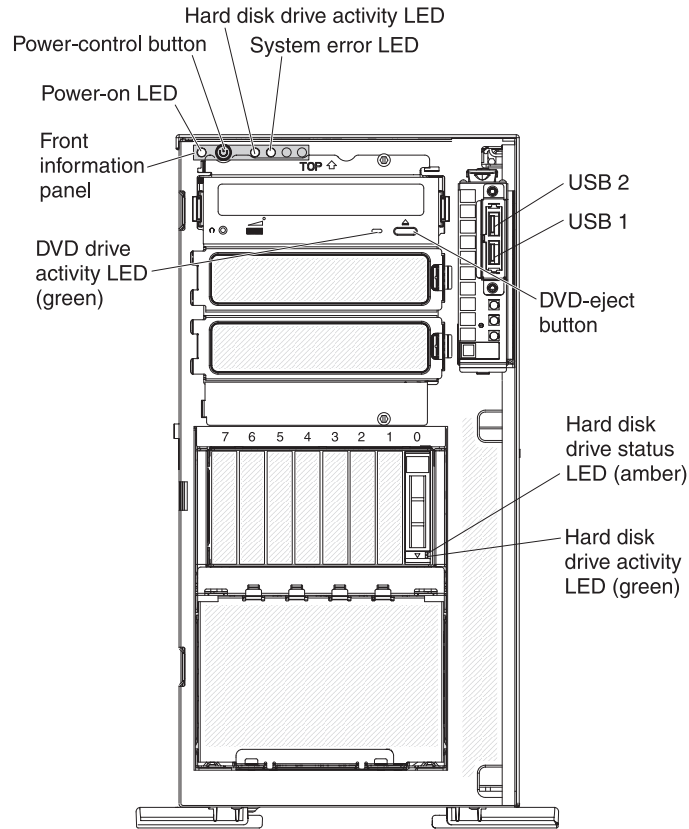
1. Racks are measured in vertical increments of 1.75 inches each. Each increment is called a "U." A 1-U-high device is 1.75 inches tall.



The following is an illustration of the 3.5-inch hot-swap SAS or SATA server model.



The following is an illustration of the 2.5-inch hot-swap SAS or SATA server model.



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.

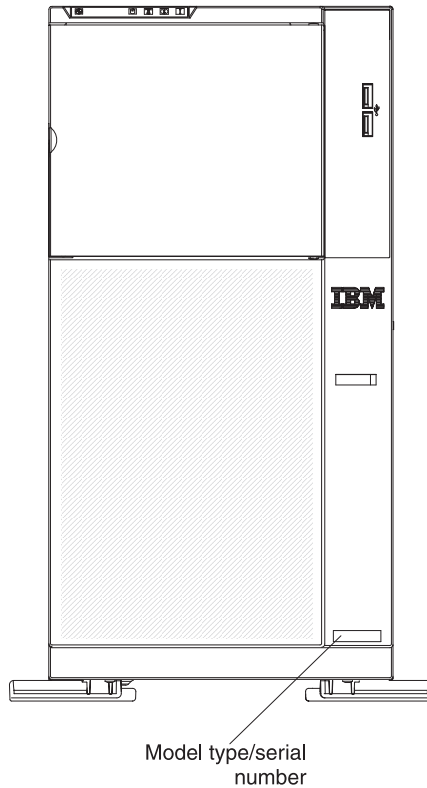
1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Software and device drivers** for firmware updates, or click **Publications lookup** for documentation updates.

Record information about the server in the following table.

Product name	IBM System x3400 M2 server
Machine type	7836 or 7837
Model number	_____
Serial number	_____

The model number and serial number are on the lower right side of the bezel, as shown in the following illustration.

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/>.

Important: The server keys cannot be duplicated by a locksmith. If you lose them, order replacement keys from the key manufacturer. The key serial number and the telephone number of the manufacturer are on a tag that is attached to the keys.

If you plan to install the server in a rack, you must purchase a Tower-to-Rack conversion kit.

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 Ctrl+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:

- *Environmental Notices and User's Guide*
This document is in PDF on the IBM *Documentation* CD. It contains translated environmental notices.
- *IBM License Agreement for Machine Code*
This document is in PDF on the IBM *Documentation* CD. It provides translated versions of the *IBM License Agreement for Machine Code* for your product.

- *Warranty Information*
This is a document that comes with the server. It contains information about the terms of the warranty and getting service and assistance.
- *Licenses and Attributions Documents*
This document is in PDF. It provides the open-source notices.
- *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.
- *Rack Installation Instructions*
This printed document contains instructions for installing the server in a rack and comes with the rack kit.
- *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 xSeries and System x™ 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 xSeries 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 updated documentation and technical 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 x3400 M2** and click **Continue**.

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 for Machine Types 7836 and 7837. Depending on the server model, some features might not be available, or some specifications might not apply.

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> Supports up to two Intel Pentium dual-core or quad-core microprocessors (one installed) with integrated memory controller and QuickPath Interconnect (QPI) architecture. The second microprocessor comes with a pluggable VRM Designed for LGA 1366 socket Scalable up to four cores 32 KB instruction cache, 32 KB data cache, and 8 MB cache that is shared among the cores Support for Intel Extended Memory 64 Technology (EM64T) <p>Note:</p> <ul style="list-style-type: none"> Use the Setup utility to determine the type and speed of the microprocessors. For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/serverproven/compat/us/. <p>Memory:</p> <ul style="list-style-type: none"> Minimum: 1GB Maximum: 96 GB (48 GB in mirrored mode) <ul style="list-style-type: none"> 24 GB using unbuffered DIMMs (UDIMMs) 96 GB using registered DIMMs (RDIMMs) Types: PC3-10600R-900 (single-rank or dual-rank, 800, 1066, and 1333 MHz, ECC, DDR3 registered SDRAM DIMMs only) RDIMMs sizes: 1 GB, 2 GB, 4 GB and 8 GB single-rank, dual-rank or quad rank UDIMMs sizes: 1 GB and 2 GB single-rank or dual-rank 	<p>Fans: Three speed-controlled hot-swap fans</p> <p>Power supply: One 670 watt (100 - 240 V ac)</p> <p>Two 920-watt</p> <p>Size:</p> <ul style="list-style-type: none"> Height: 440 mm (17.3 in.) Depth: 767 mm (30.2 in.) Width: 218 mm (8.6 in.) Weight: 20 kg (42 lb) to 34 kg (75 lb) depending upon configuration <p>RAID controllers:</p> <ul style="list-style-type: none"> A ServeRAID-BR10i 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, 10, 50, and 60 can also be ordered. An optional ServeRAID-MR10is SAS/SATA adapter that provides RAID levels 0, 1, 5, 6, 10, 50, and 60 can also be ordered. <p>Drives (depending on the model):</p> <ul style="list-style-type: none"> Optical drives: SATA Hard disk drives: SAS and SATA 	<p>Drive bays (depending on the model):</p> <ul style="list-style-type: none"> Three 5.25-in. bays (one half-high DVD-ROM drive installed). Optionally you can install one full-high or two half-high internal tape drives in bays 2 and 3. One of the following: <ul style="list-style-type: none"> Four 3.5-inch simple-swap SATA drives Four 3.5-inch hot-swap SAS or SATA drives Sixteen or eight 2.5-inch hot-swap SAS or SATA drives <p>Integrated functions:</p> <ul style="list-style-type: none"> 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 Broadcom BCM5709 Gb Ethernet controller with TCP/IP Offload Engine (TOE) and Wake on LAN support Onboard SATA controller (simple-swap models) Seven Universal Serial Bus (USB) 2.0 ports (two front and four rear of the chassis), and one for the internal USB tape drive. Two Ethernet ports One System Management RJ-45 on the rear to connect to a systems management network. This system management connector is dedicated to the IMM functions. This connector is active with or without the optional IBM Virtual Media Key installed. One serial port Six SATA ports (four through the iPASS connector for simple-swap drives and two for the optical drives)
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Table 1. Features and specifications (continued)

<p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Sound power, idling: 5.5 bel • Sound power, operating: 6.0 bel <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Server on: 10° to 35°C (50° to 95°F) Altitude: 0 to 915 m (3000 ft) – Server on: 10° to 32°C (50° to 90°F) Altitude: 0 to 915 m (3000 ft) to 2134 m (7000 ft) – Server on: 10° to 28°C (50° to 83°F) Altitude: 2134 m (7000 ft) to 3050 m (10000 ft) – Server off: 5° to 45°C (41.0° to 113°F) – Shipping: -40° to 60°C (-40° to 140°F) • Humidity (operating and storage): <ul style="list-style-type: none"> – Server on: 20% to 80%, Maximum dew point 21°C, Maximum rate of change 5°C/hr. – Server off: 8% to 80%, Maximum dew point 27°C <p>Heat output: Approximate heat output in British thermal units (Btu) per hour:</p> <ul style="list-style-type: none"> • Minimum configuration: 693 Btu per hour (203 watts) • Maximum configuration: 2788 Btu per hour (817 watts) 	<p>Up to eight expansion slots (depending on the model):</p> <ul style="list-style-type: none"> • Six expansion slots on the system board <ul style="list-style-type: none"> – Four PCI Express Gen2 x8 slots (two x8 links and two x4 link) – One PCI Express Gen2 x16 slot (x8 link) – One PCI 32-bit/33 MHz slot • One PCI Express Gen1 x8 (x4) slot on the one-slot extender card • Two PCI-X 32-bit/64-bit 133/100/66/MHz slots on the two-slot extender card <p>Video controller:</p> <ul style="list-style-type: none"> • Matrox G200eV video on system board • Compatible with SVGA and VGA <p>Diagnostic LEDs:</p> <ul style="list-style-type: none"> • Fan • Microprocessor • Memory • Power supply • Voltage regulator module (VRM) • PCI • Battery • IMM heartbeat • Enclosure manager heartbeat 	<p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50 or 60 Hz) required • Input voltage and frequency ranges automatically selected • Input voltage low range: <ul style="list-style-type: none"> – Minimum: 100 V ac – Maximum: 127 V ac • Input voltage high range: <ul style="list-style-type: none"> – Minimum: 200 V ac – Maximum: 240 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> – Minimum: 0.21 kVA (all models) – Maximum: 0.82 kVA <p>Notes:</p> <ol style="list-style-type: none"> 1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use. 2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.
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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 115.

- **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 Management (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.

Note: The server does not support DOS (Disk Operating System).

- **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
- Light path diagnostics status
- 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 DSA program creates a chronologically ordered merge of the system-event log (as the IPMI event log), the IMM event log (as the ASM event log), and the operating system 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*

- **High-performance graphics controller**

The server comes with an onboard high-performance graphics controller that supports high resolutions and includes many performance-enhancing features for the operating-system environment.

- **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 14.

- **IBM Enterprise 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>.

- **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 113.

- **Active Energy Manager**

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/servers/systems/management/director/resources/>.

- **Integrated network support**

The server comes with an integrated dual-port Broadcom Gigabit Ethernet controller, which supports connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network. For more information, see “Configuring the Broadcom Gigabit Ethernet controller” on page 119.

- **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 option.

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

Some hot-swap server models support eight or sixteen (depending on your model) slim-high, 2.5-inch hot-swap hard disk drives or four 3.5-inch hot-swap

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

- **Large system-memory capacity**

The server supports up to 96 GB (reduced to 48 GB in mirroring mode) of system memory. The memory controller supports error correcting code (ECC) for up to 12 industry-standard PC3-10600R-999 (single-rank or dual-rank), 800, 1067, and 1333 MHz, DDR3 (third-generation double-data-rate), registered, synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

- **Memory mirroring**

Some models support memory mirroring. Memory mirroring replicates and stores data on two pairs of DIMMs within two channels (channel 0 and 1) simultaneously. If a failure occurs, the memory controller switches from the primary pair of memory DIMMs to the backup pair of DIMMs. To support memory mirroring, you must install a pair of DIMMs at a time. One DIMM must be in channel 0, and the mirroring DIMM must be in the same slot in channel 1. For more information, see memory mirroring on page 49.

- **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. The optional RAID adapters are available for purchase and provide RAID levels 0, 1, 5, 6, 10, 50, and 60. See “Installing an adapter” on page 72 and “Using LSI Configuration Utility program” on page 119 for more information about the adapters that are supported and creating RAID arrays.

- **Symmetric multiprocessing (SMP)**

The server supports up to two Intel Xeon microprocessors. Each microprocessor provides symmetric multiprocessing capability. When you install the second microprocessor, this will enhance the performance of the server.

- **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. The systems-management connector on the rear of the server is dedicated to the IMM. The dedicated systems-management connector provides additional security by physically separating the management network traffic from the production network. You can use the Setup utility to configure the server to use a dedicated systems-management network or a shared network.

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

The Ethernet controller in the server supports 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. The Windows operating system requires that the Windows Scalable Network Pack (SNP) be installed for TOE support.

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

Reliability, availability, and serviceability

Three important server 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 repair problems.

The server might have the following RAS features (the features vary depending on your model):

- 1-year parts and 1-year labor limited warranty for machine type 7836 and 3-year parts and 3-year labor limited warranty for machine type 7837.
- Advanced Configuration and Power Interface (ACPI)
- Advanced Desktop Management Interface (DMI) features
- Automatic error retry or recovery
- Automatic memory downsizing on error detection
- Automatic restart on nonmaskable interrupt (NMI)
- Automatic Server Restart (ASR) logic supporting a system restart when the operating system becomes unresponsive
- Automatic server restart after a power failure, based on the UEFI setting
- Availability of microcode level
- Boot-block recovery
- Built-in, menu-driven setup, system configuration, and redundant array of independent disks (RAID) configuration
- Built-in monitoring for fan, power, temperature, and voltage
- Cooling fans with speed-sensing capability
- Customer support center that is available 24 hours a day, 7 days a week²
- Diagnostic support of ServeRAID adapters
- Error codes and messages
- Error correcting code (ECC) double-data-rate 3 (DDR3) synchronous dynamic random-access memory (SDRAM) with serial presence detect (SPD)
- Error logging of POST failures
- Hot-swap Serial Attached SCSI (SAS) and hot-swap Serial ATA (SATA) hard disk drives
- Integrated Ethernet controller
- Key-lock support for physical security
- Memory change messages posted to the error log
- Integrated management module (IMM)
- Power management
- Power-on self-test (POST)
- Read-only memory (ROM) checksums
- ROM-based diagnostic programs
- Simple-swap Serial Advanced Technology Attachment (SATA) hard disk drives
- Standby voltage for system-management features and monitoring
- System auto-configuring from the configuration menu
- System-error LED on the front bezel and diagnostic LEDs on the system board

2. Service availability will vary by country. Response time varies; may exclude holidays.

- Upgradeable integrated management module (IMM) firmware
- Upgradeable microcode for POST, server firmware, and read-only memory (ROM) resident code, locally or over a LAN
- Vital product data (VPD); includes serial-number information and replacement part numbers, stored in nonvolatile memory, for easier remote maintenance
- 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 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 other, 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 common tasks include the following:

- 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. 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?Indocid=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

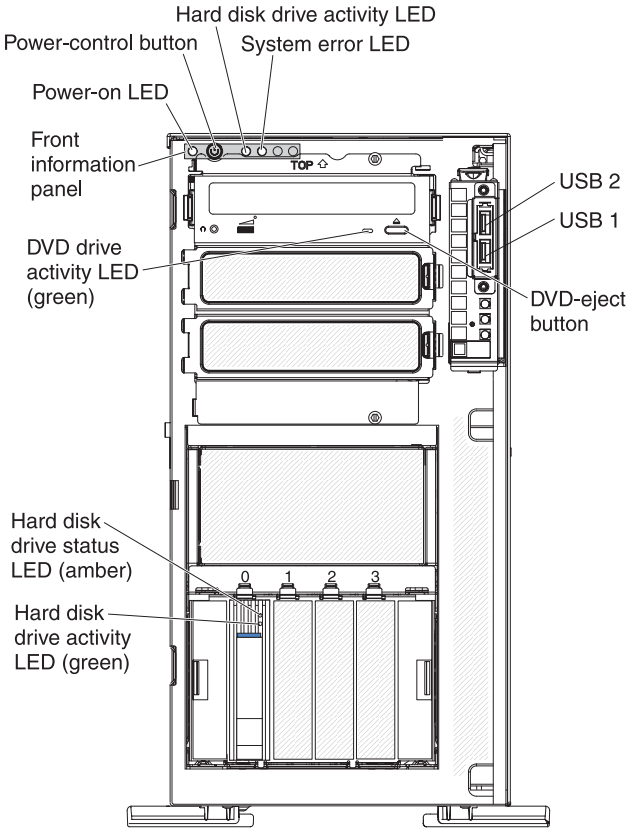
This section describes the controls, light-emitting diodes (LEDs), and connectors on the front and rear of the server, and how to turn the server on and off. For the location of the LEDs on the system board, see “System-board LEDs” on page 33.

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

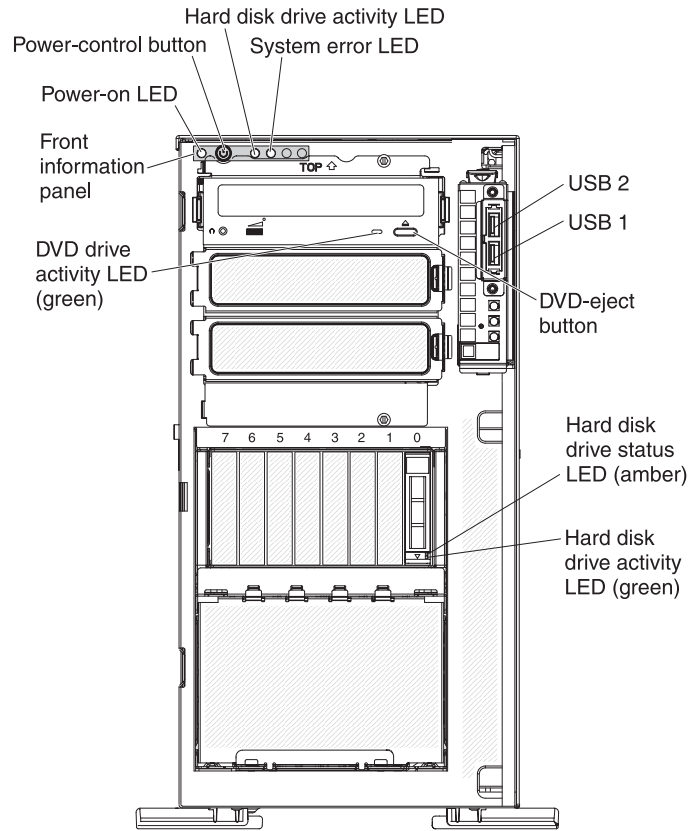
Front view

The following illustrations show the controls, LEDs, and connectors on the front of the server models.

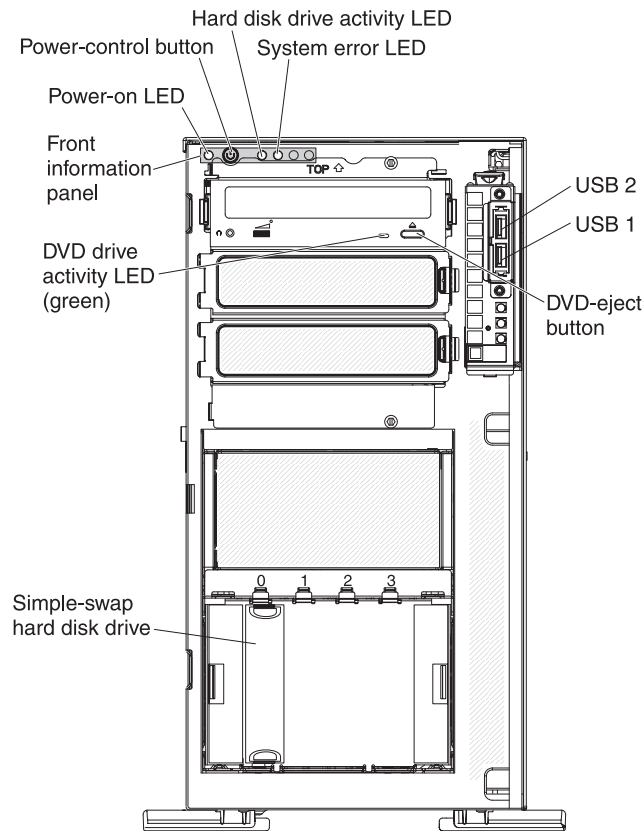
The following illustration shows the 3.5-inch SAS/SATA hot-swap hard disk drive model.



The following illustration shows the 2.5-inch SAS/SATA hot-swap hard disk drive model.



The following illustration shows the 3.5-inch SATA simple-swap hard disk drive model.



Power-control button and power-on LED

Press this button to turn the server on and off manually or to wake the server from a reduced-power state. 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. Approximately 1 to 3 minutes after the server is connected to ac power, the power-control becomes active.

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 118 for information on logging on to the IMM Web interface.

Hard disk drive activity LED

When this LED is flashing rapidly, it indicates that a hard disk drive is in use.

System-error LED

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

An LED on the system board might also be lit to help isolate the error. Detailed troubleshooting information is in the *Problem Determination and Service Guide* on the IBM System x Documentation CD.

USB connectors

Connect USB devices to these connectors.

DVD-eject button

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

DVD drive activity LED

When this LED is lit, it indicates that the DVD drive is in use.

Hot-swap hard disk drive activity LED (some models)

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

When the drive is removed, this LED also is visible on the SAS/SATA backplane, next to the drive connector. The backplane is the printed circuit board behind drive bays 4 through 7 on 3.5-inch hard disk drive models and bays 4 through 19 on 2.5-inch hard disk drive models.

Hot-swap hard disk drive status LED (some models)

On some server models, each hot-swap hard disk drive has an amber status LED. If this amber status LED is lit, it indicates that the associated hard disk drive has failed.

If an optional ServeRAID adapter is installed in the server and the LED flashes slowly (one flash per second), the drive is being rebuilt. If the LED flashes rapidly (three flashes per second), the adapter is identifying the drive.

When the drive is removed, this LED also is visible on the SAS/SATA backplane, below the hot-swap hard disk drive activity LED.

Rear view

The following illustration shows the LEDs and connectors on the rear of the server, depending on your server model.

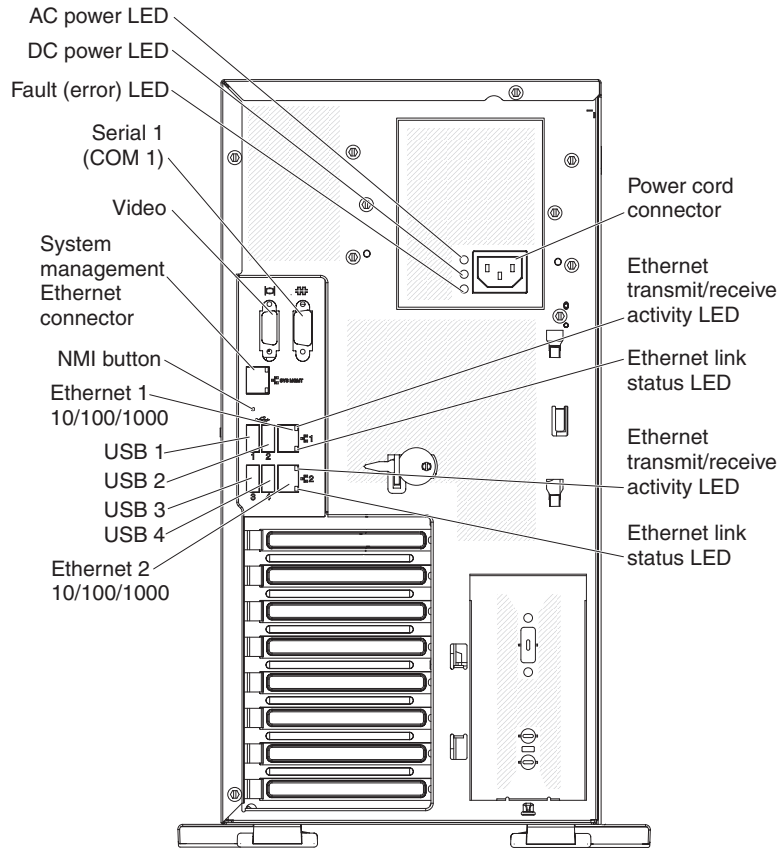


Figure 1. Fixed power supply

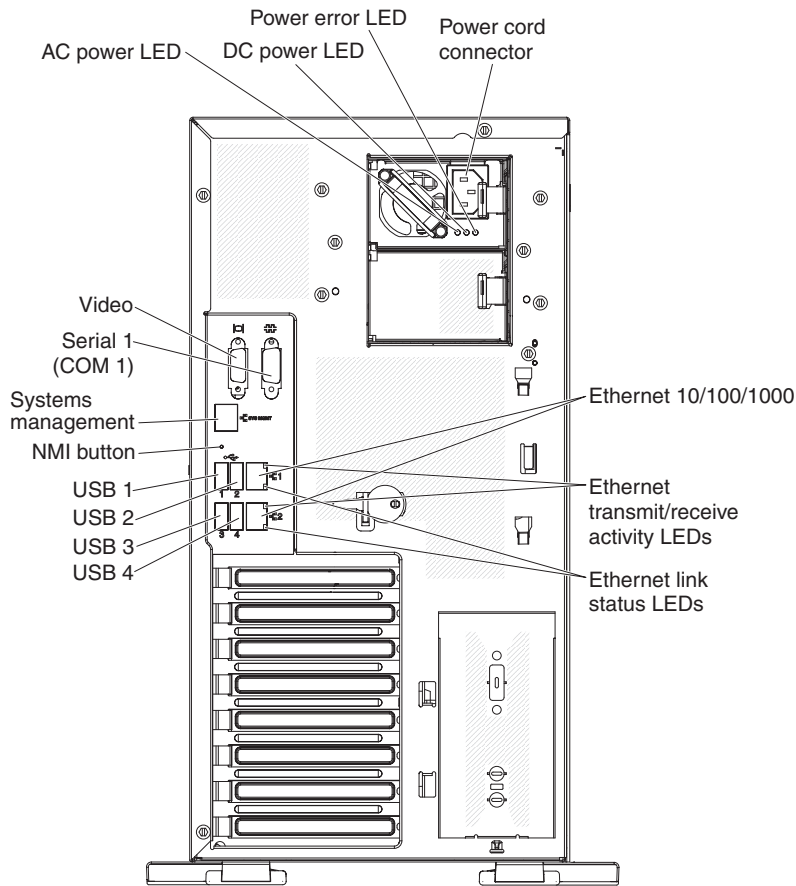


Figure 2. Redundant power supply

Power-cord connector

Connect the power cord to this connector.

AC power LED

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

DC power LED

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

Power-error (Fault) LED

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

Video connector

Connect a monitor to this connector.

Note: The maximum video resolution is 1600 x 1200 at 85 Hz.

Serial connector

Connect a 9-pin serial device to this connector.

Systems-management Ethernet connector

Use this connector to manage the server, using a dedicated management network. If you use this connector, the IMM cannot be accessed directly from a production network. A dedicated management network provides additional security by physically separating the management network traffic from the production network. You can use the Setup utility to configure the server to use a dedicated systems management network or a shared network (see “Using the Setup utility” on page 108).

USB connectors

Connect USB devices to these connectors.

Ethernet connectors

Use these connectors to connect the server to a network.

Ethernet transmit/receive activity LED

This LED is on the Ethernet connector on the rear of the server. When this LED is lit, it indicates that there is activity between the server and the network.

Ethernet link status LED

This LED is on the Ethernet connector on the rear of the server. When this LED is lit, it indicates that there is an active connection on the Ethernet port.

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 rapidly. 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). 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 peripheral component interconnect (PCI) options.

Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to requests 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.

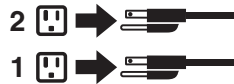
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

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 be turned off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- The server can be turned off by Wake on LAN feature.
- The integrated management module (IMM) can turn off the server as an automatic response to a critical system failure.

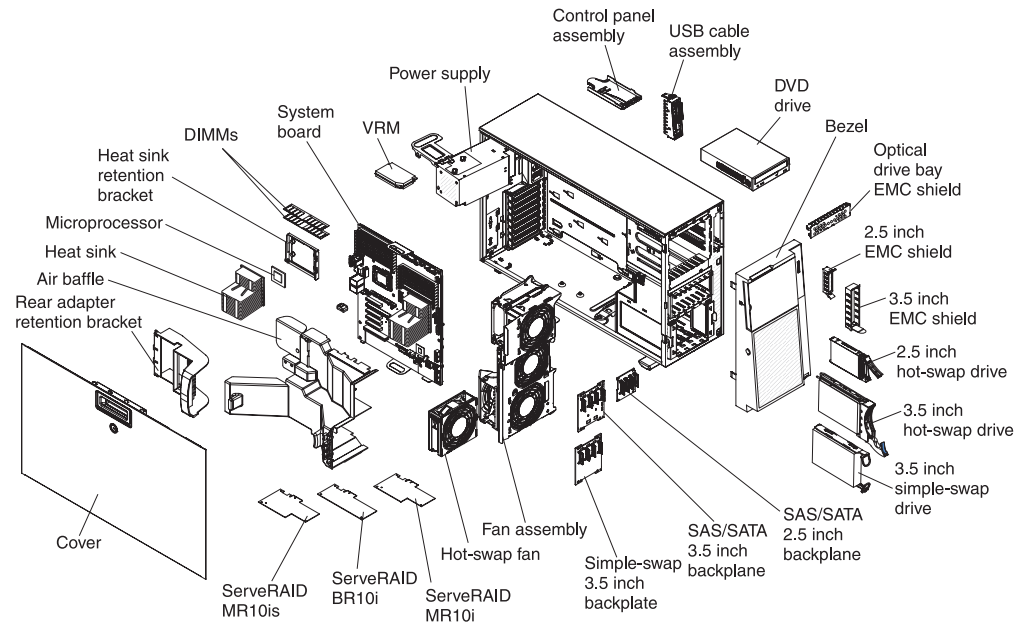
Chapter 2. Installing optional devices

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. If the server is not working correctly, see the *Problem Determination and Service Guide* for diagnostic information.

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

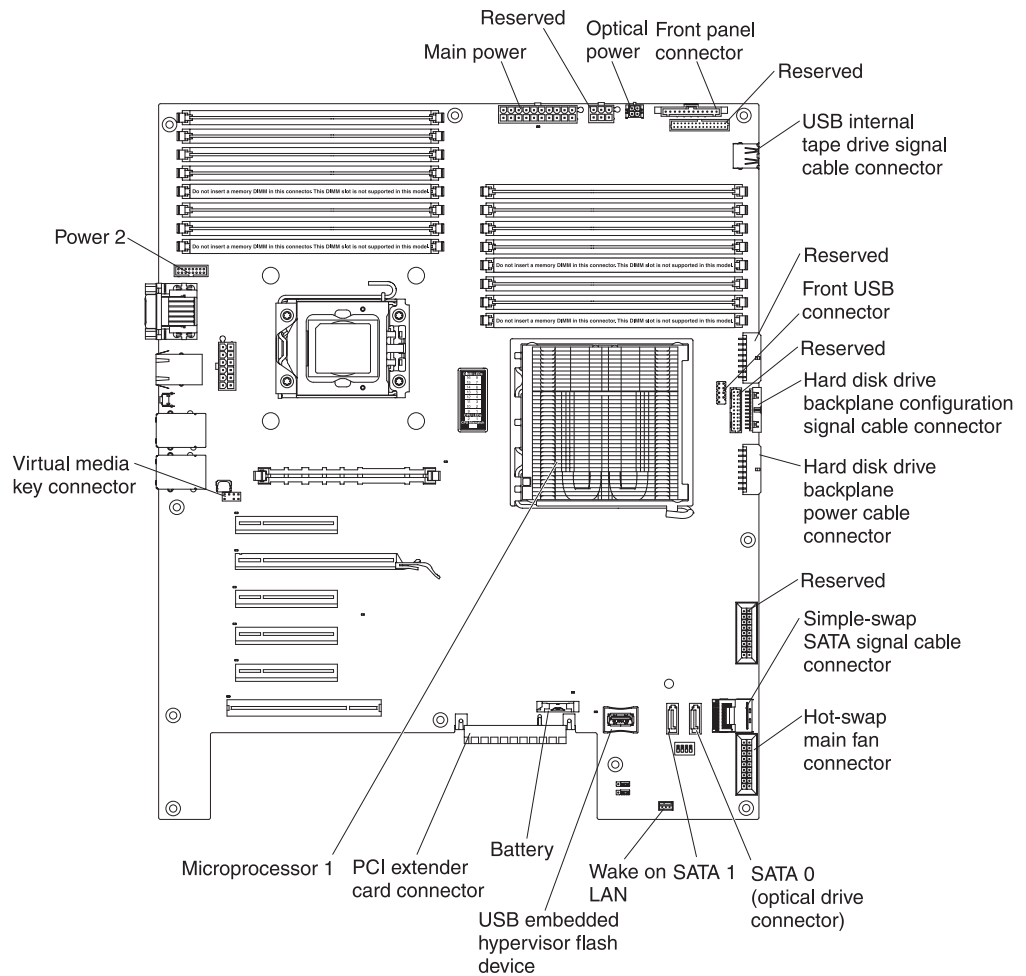
Server components

The following illustration shows the major components in the server (depending on the server model). The illustrations in this document might differ slightly from your hardware.



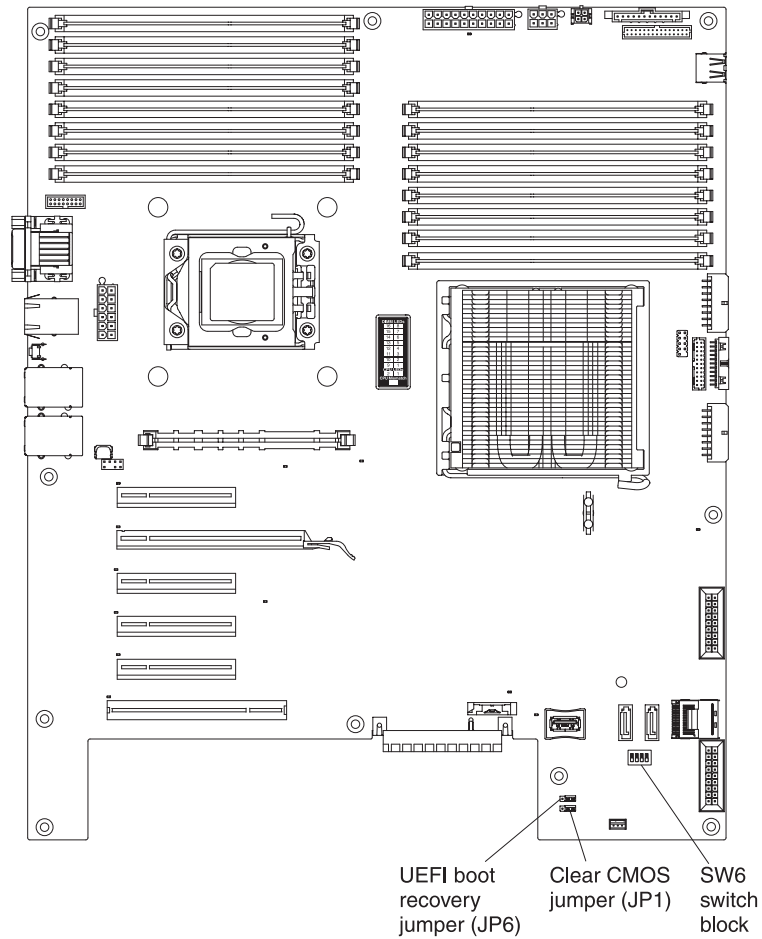
System-board internal connectors

The following illustration shows the internal connectors on the system board.



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	<ul style="list-style-type: none"> • Pins 1 and 2: Normal (default) - This keeps the CMOS data. • Pins 2 and 3: This clears the CMOS data, which clears the power-on password and administrator password. <p>Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.</p>

Table 2. System board jumpers (continued)

Jumper number	Jumper name	Jumper setting
JP6	UEFI boot recovery jumper	<ul style="list-style-type: none"> • Pins 1 and 2: Normal (default) - Loads the primary server firmware ROM. • Pins 2 and 3: This enables the server to recovery if the server firmware becomes damaged.
<p>Notes:</p> <ul style="list-style-type: none"> • If no jumper is present, the server responds as if the pins are set to 1 and 2. • Changing the position of the UEFI boot recovery 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. 		

The following table describes the function of each pin on the SW6 switch block.

Table 3. System board switches

Switch pin number	Default value	Description
1	Off	Reserved.
2	Off	<p>Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Setup utility so that you can change or delete the power-on password. You do not have to move the switch back to the default position after the power-on password is overridden.</p> <p>Changing the position of this switch does not affect the administrator password check if an administrator password is set.</p> <p>Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.</p> <p>See “Passwords” on page 112 for additional information about passwords.</p>
3	Off	Reserved.

Table 3. System board switches (continued)

Switch pin number	Default value	Description
4	Off	<ul style="list-style-type: none"> When this switch is on Off, this is normal mode. This loads the primary IMM firmware ROM page. When this switch is toggled to On, this loads the secondary (backup) IMM firmware ROM page. <p>See the <i>Problem Determination and Service Guide</i> for information about recovering from a firmware update failure.</p>

The following illustration shows the SW5 switch and the jumpers on the system board. See the tables below the illustration for information about the switch settings.

Table 4. System-board switch 5

SW 6 Switches	Switch description
1	Reserved (default off)
2	Reserved (default off)
3	Reserved (default off)
4	When this switch is off, TPM physical present is de-asserted (default off). When this switch is on, TPM physical present is asserted.

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 “Installation guidelines” on page 34, “Handling static-sensitive devices” on page 36, and “Turning off the server” on page 23.
2. Any system-board switch blocks or jumpers that are not shown in the illustrations in this document are reserved.

The following illustration shows the SW 5 switch and the jumpers on the system board. See the tables below the illustration for information about the switch settings.

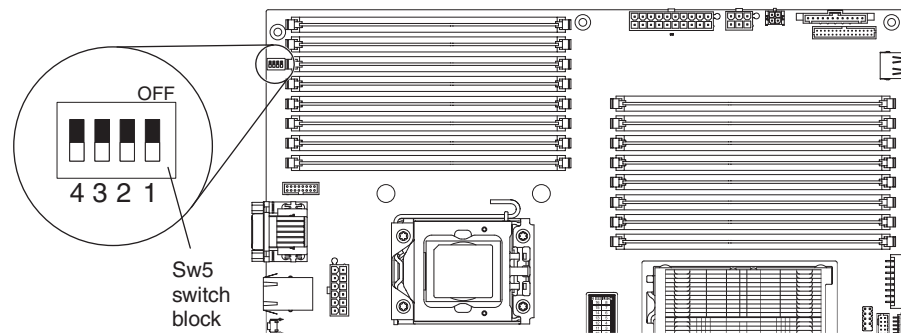


Table 5. System-board switch 5

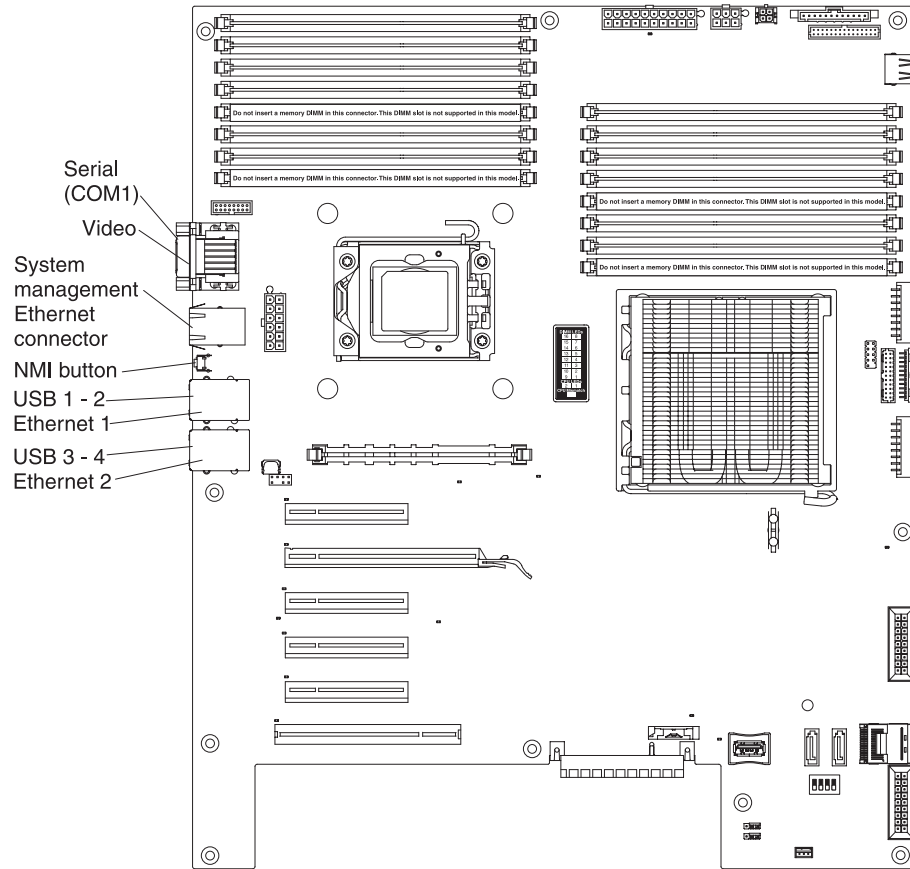
SW 5 Switches	Switch description
1	Reserved (default off)
2	Reserved (default off)
3	Reserved (default off)
4	When this switch is off, TPM physical present is de-asserted (default off). When this switch is on, TPM physical present is asserted.

Notes:

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 and “Installation guidelines” on page 34)
2. Any system-board switch or jumper blocks that are not shown in the illustrations in this document are reserved.

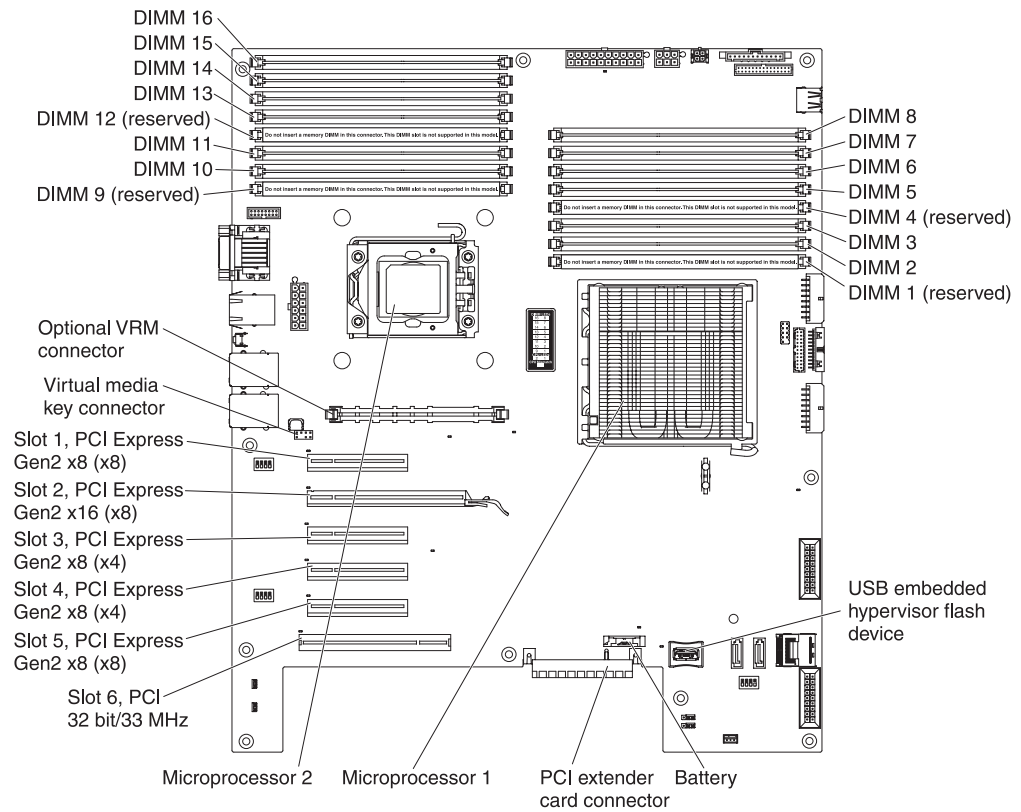
System-board external connectors

The following illustration shows the external input/output (I/O) connectors on the system board.



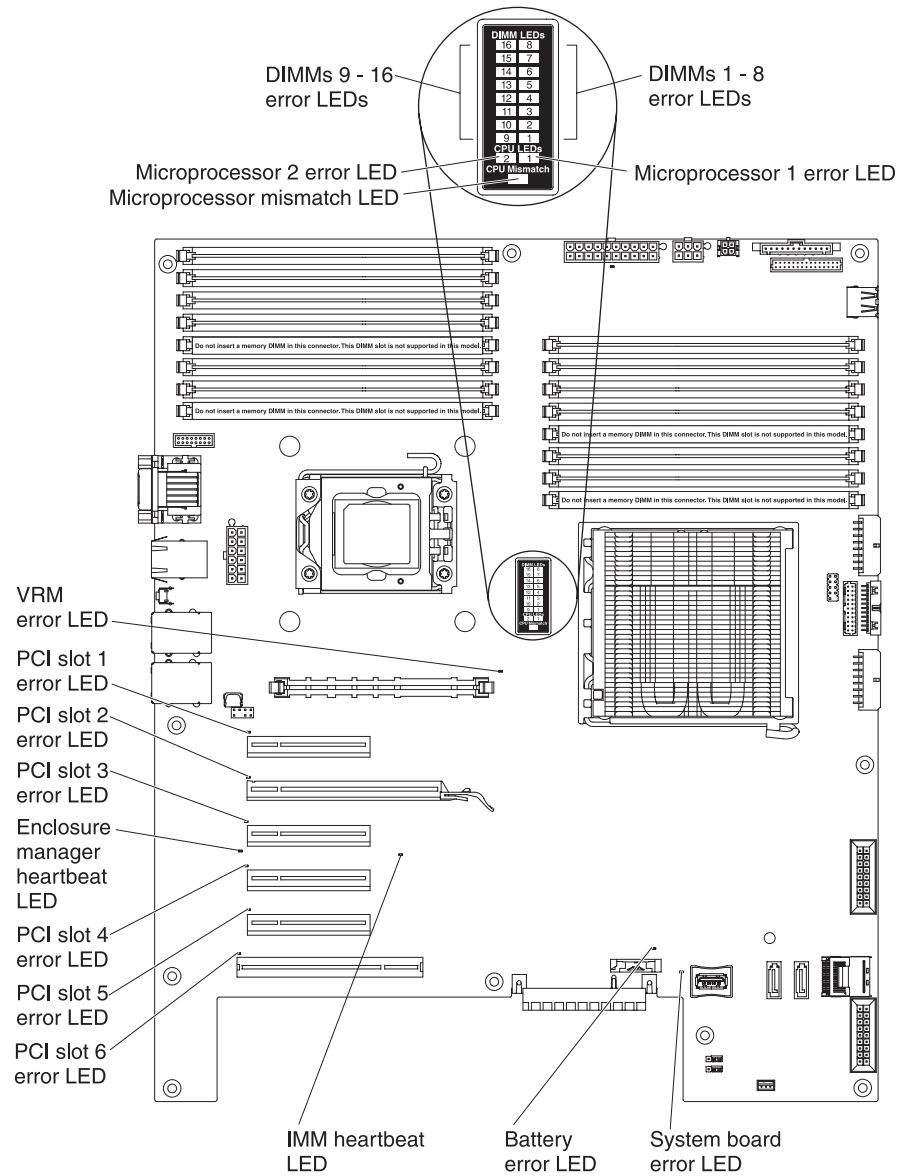
System-board option connectors

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



System-board LEDs

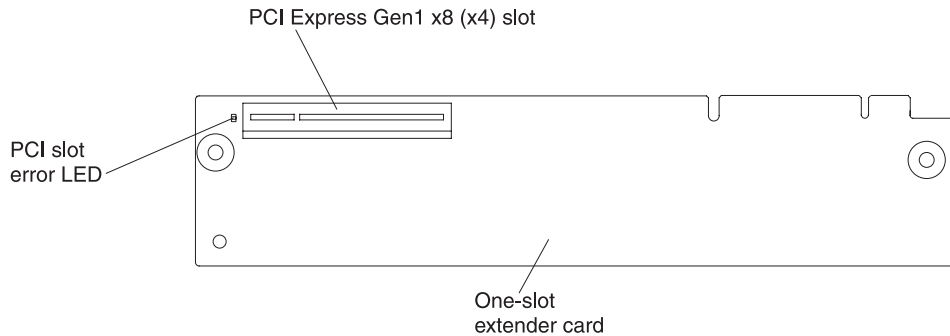
The following illustration shows the light-emitting diodes (LEDs) on the system board.



For more information about the system-board LEDs, see the *Problem Determination and Service Guide* on the IBM System x Documentation CD.

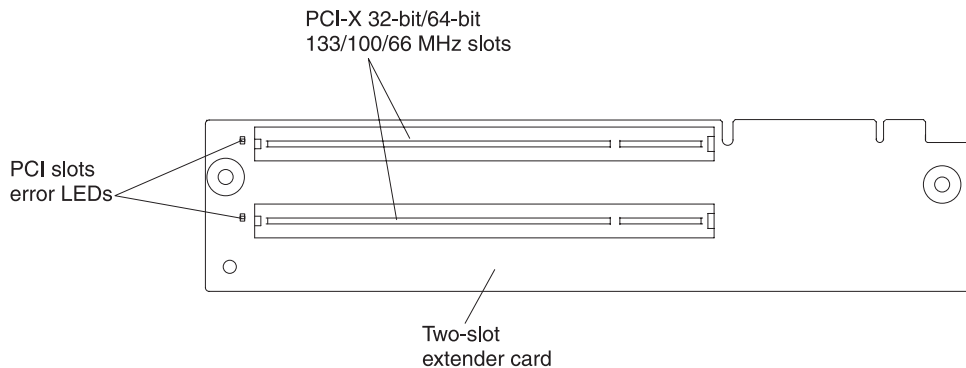
Optional one-slot PCI extender card

The following is an illustration of the one-slot PCI extender card that you can install to add an additional PCI slot to the server.



Optional two-slot PCI extender card

The following is an illustration of the two-slot PCI extender card that you can install to add two additional PCI slots to the server.



Installation guidelines

Before you install options, read the following information:

- Read the safety information that begins on page vii, the guidelines in “Working inside the server with the power on” on page 36, and “Handling static-sensitive devices” on page 36. 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 x3400 M2** to display the matrix of downloadable files for the server.

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

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed. If the server is not working correctly, see the *Problem Determination and Service Guide* for diagnostic information.

- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you can stand safely without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver, 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 fans and hot-swap drives.
- 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 and installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you have to access the inside of the server, you might find it easier to lay the server on its side.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported options for the server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

System reliability guidelines

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

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the server has redundant power, each of the power-supply bays has a power supply installed in it.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place objects in front of the fans. For proper cooling and airflow, replace the server cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the server cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.

- You have replaced a failed fan as soon as possible.
- 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 could result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.

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

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

Handling static-sensitive devices

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

To reduce the possibility of 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.

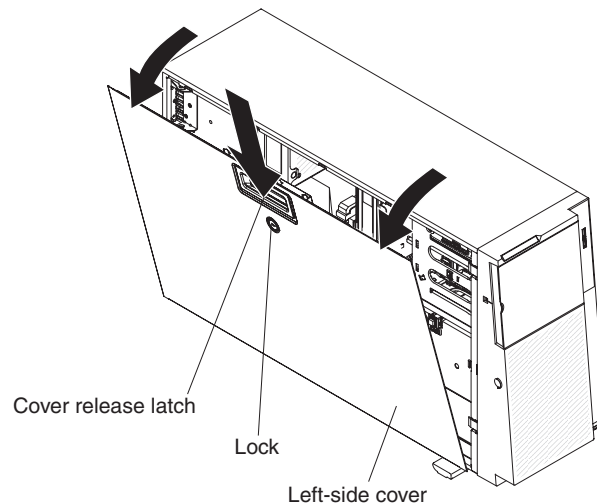
Removing the left-side cover

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. If the server is not working correctly, see the *Problem Determination and Service Guide* for diagnostic information.

To remove the server left-side cover, complete the following steps:

Attention: Operating the server for more than 30 minutes with the left-side cover removed might damage server components. For proper cooling and airflow, replace the left-side cover before turning on the server.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and all attached devices (see “Turning off the server” on page 23); then, disconnect all power cords and external cables.
3. Unlock the left-side cover.
4. Press the cover-release latch down (as shown in the illustration); then, remove the cover and set it aside.



To replace the left-side cover, see “Replacing the left-side cover” on page 104.

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

Removing the bezel

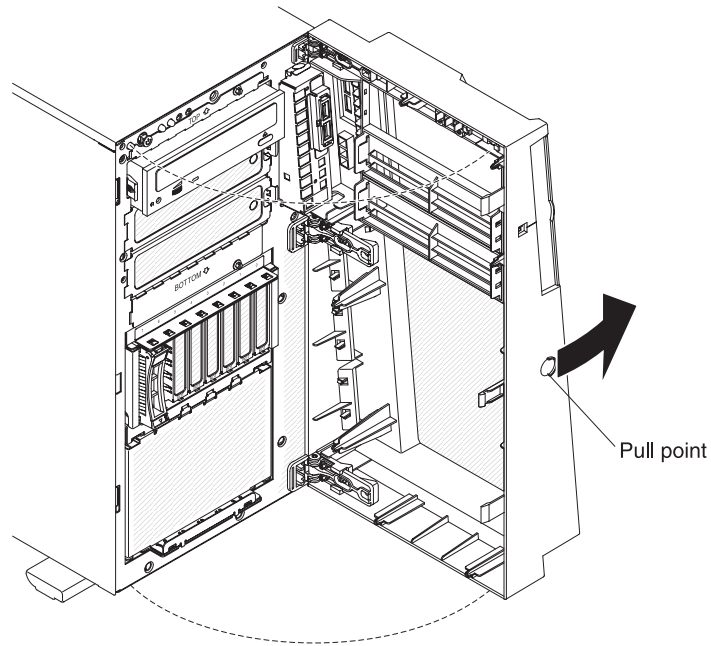
To remove the bezel, complete the following steps:

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Unlock the left-side cover.

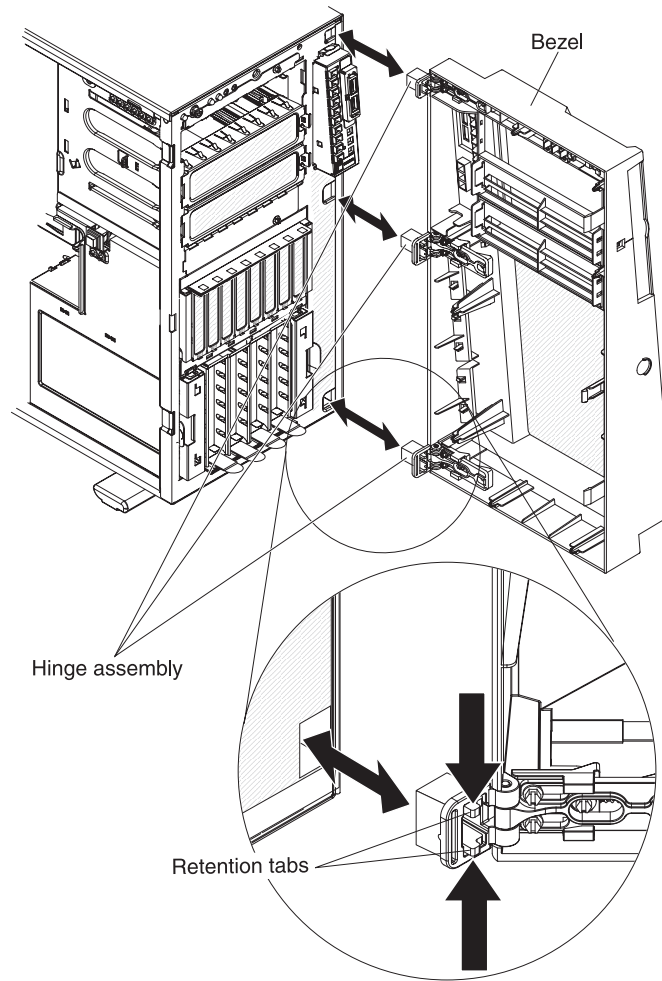
Note: You must unlock the left-side cover to open or remove the bezel. When you lock the server left-side cover, it locks both the cover and the bezel.

3. Remove the bezel. Position your finger on the pull-point area on the left side of the bezel and rotate the bezel away from the server.



4. If you want to remove the bezel completely, press the retention tabs on the hinge assembly toward each other and pull the hinge assembly out of the chassis.

Note: While pressing the retention tabs together, you might need a screwdriver to help pry the hinge out.



Note: The bezel will also disengage from the chassis hinges if you rotate the bezel beyond 180° or if excessive pressure is applied to the bezel. Do not be alarmed because this is how the bezel was designed. The bezel is designed with breakaway hinges so that you can easily reattach it to the chassis.

Opening and closing the bezel media door

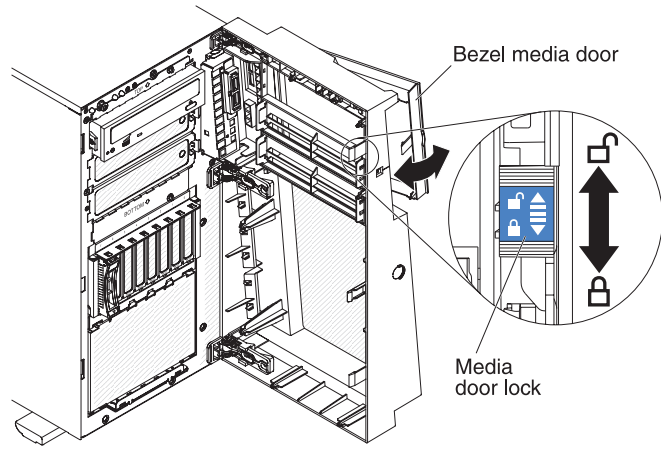
To open the media door, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Unlock the left-side cover.

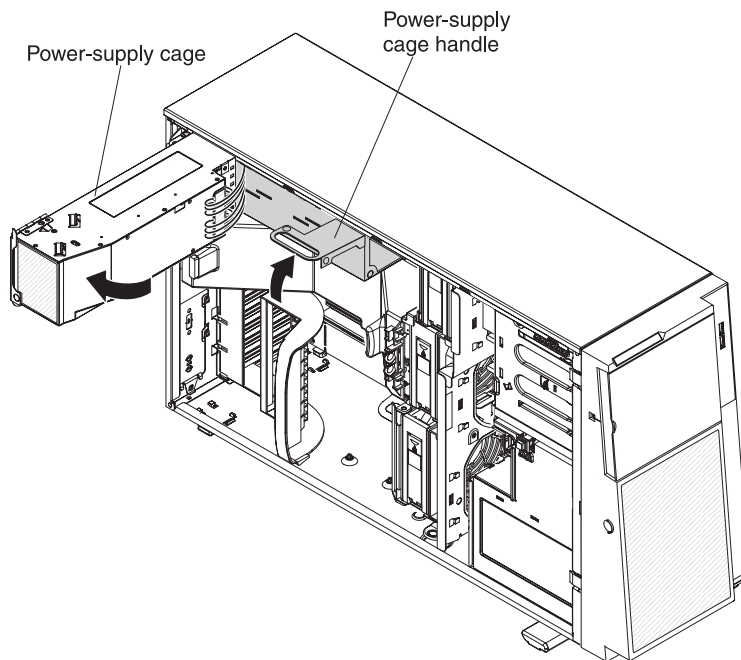
Note: You must unlock the left-side cover to open or remove the bezel. When you lock the server left-side cover, it locks both the cover and the bezel.

3. Grasp the pull-point area on the left side of the bezel door and rotate the bezel to the open position.
4. From inside of the top section of the bezel door, slide the blue tab up to unlock the bezel media door (slide the tab down when you want to lock it); then, grasp the pull-point area on the left side of the media door and pull the door open.

Note: To close and lock the bezel media door, rotate the door to the closed position and slide the blue tab down to lock it.



Opening the power-supply cage



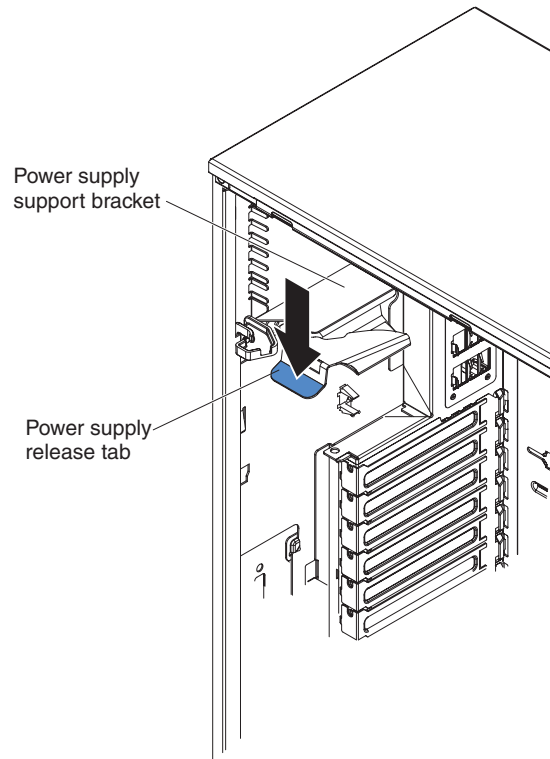
Opening the power-supply cage allows access to the air baffle, microprocessors, and DIMMs. To open the power-supply cage, complete the following steps:

1. Read the safety information that begins on page vii, and “Handling static-sensitive devices” on page 36.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Remove the hot-swap power supply or power supplies, if any are installed (see “Installing a redundant power supply” on page 84).
4. Unlock and remove the left-side cover (see “Removing the left-side cover” on page 38).
5. Pull up on the power-supply cage handle to unlock the cage; then, rotate the cage out until it stops. The tab on the rear power-supply latch bracket clicks into place when the cage is completely out of the way.
6. Let the power-supply cage rest on the rear power-supply latch bracket.

Closing the power-supply cage

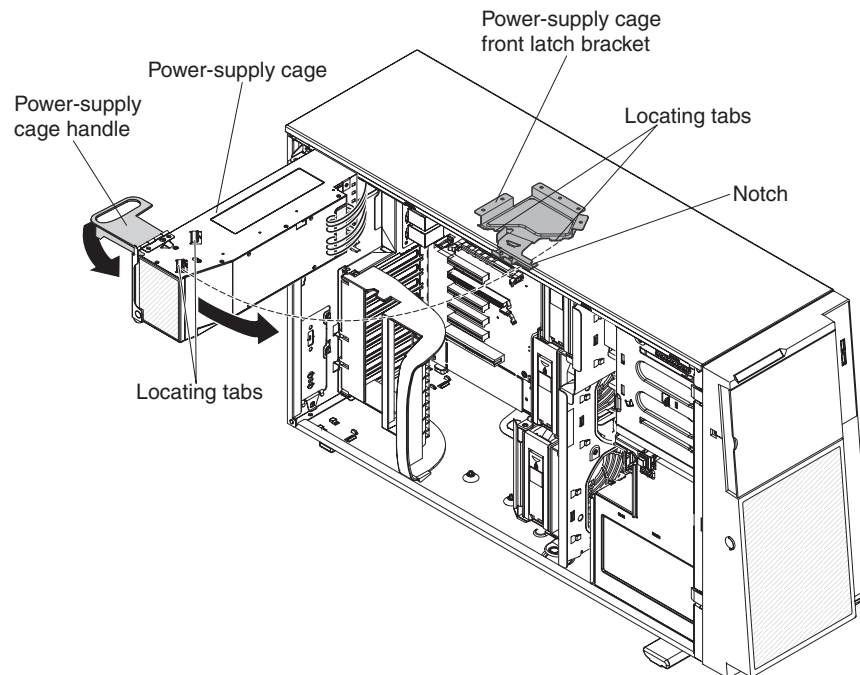
To return the power-supply cage to its closed position, complete the following steps:

1. Rotate the power-supply cage back slightly; then, push down on the release tab on the rear power-supply support bracket.



2. Rotate the power-supply cage into the server chassis. The locating tabs on the power-supply cage must fit over the corresponding tabs on the front latch bracket.

Attention: Do not allow the power-supply cage cables to be caught or pinched while you rotate the power-supply cage into the chassis.

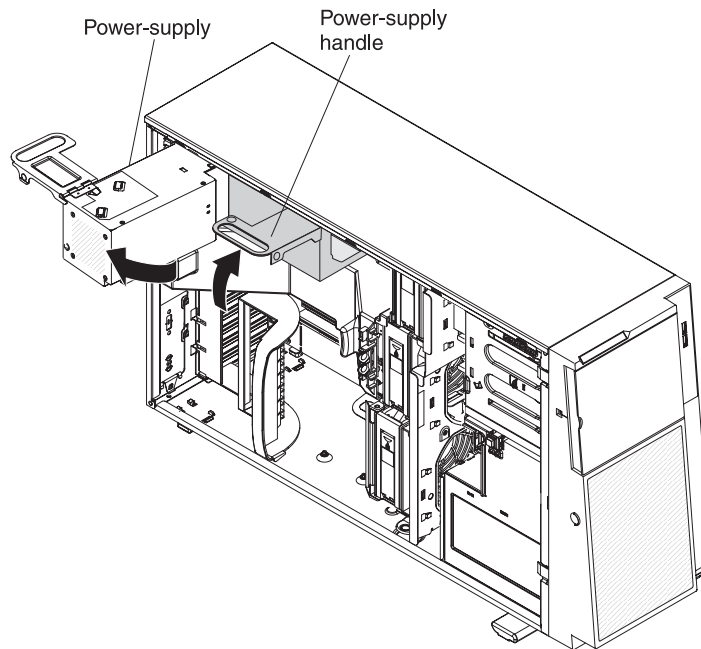


3. Rotate the power-supply cage handle down until the handle tip engages the notch in the front latch bracket; then, lower the handle until it locks in place.
4. Install and lock the left-side cover (see “Replacing the left-side cover” on page 104).
5. Install the hot-swap power supplies “Installing a redundant power supply” on page 84.
6. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the server.

Removing the air baffle

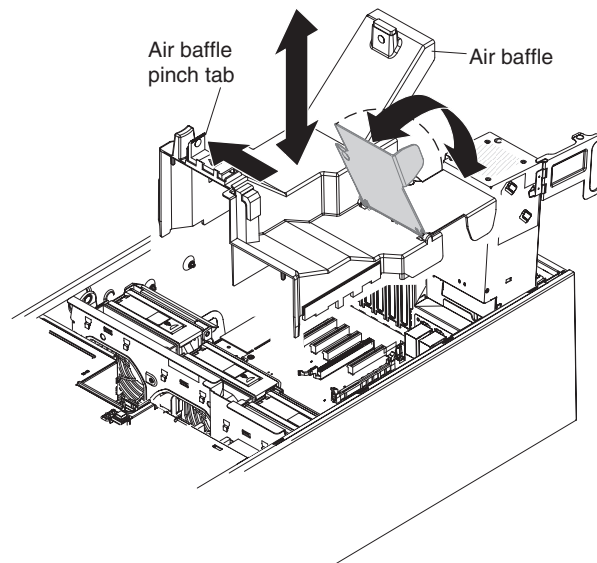
To remove the air baffle, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Carefully lay the server on its side so that it is lying flat and facing up.
Attention: Be careful and do not drop the server.
4. Unlock the left-side cover.
5. Remove the cover (see “Removing the left-side cover” on page 38).
6. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.



7. Remove the air baffle assembly. Lift the rear or the air baffle up; then, press the blue tab (on top of the fan cage) on the air baffle assembly to the left and lift it from the server and set it aside.

Note: It might be easier to remove the air baffle if you lift up the plastic tab that is over the DIMMs in the rear of the server.



Removing the fan cage assembly

To remove the fan cage assembly, complete the following steps:

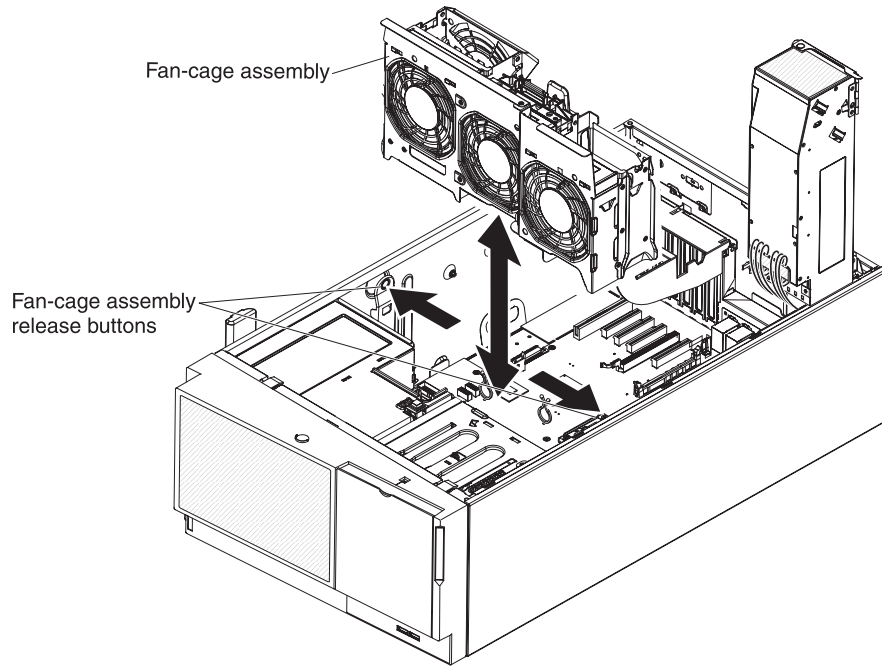
1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Carefully lay the server on its side so that it is lying flat and facing up.

Note: Be careful and do not drop the server.

4. Unlock the left-side cover.
5. Remove the left-side cover (see “Removing the left-side cover” on page 38).
6. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.
7. Remove the air baffle (see “Removing the air baffle” on page 44

Note: It might be easier to remove the air baffle if you lift up the tab that is over the DIMMs in the rear of the server.

8. Press in on the fan cage assembly release buttons on both sides of the chassis to release the fan cage assembly from the connector on the chassis. Lift the fan cage assembly up and out of the chassis and set it aside.



Installing a memory module

The following notes describe the types of dual inline memory modules (DIMMs) that the server supports and other information that you must consider when installing DIMMs (see “System-board option connectors” on page 32 for the location of the DIMM connectors):

Attention: Do not mix UDIMMs and RDIMMs in the same server.

- The server supports industry-standard, 800, 1066, or 1333 MHz, PC3-10600R-999 (single-rank or dual-rank) double-data-rate 3 (DDR3), registered, synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC). For a list of supported options for the server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>; then, select your country and navigate to the list of options for the server.
- The specifications of a DDR3 DIMM are on a label on the DIMM, in the following format.

ggg eRxff-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

6400 = 6.40 GBps (PC3-800 SDRAMs, 8-byte primary data bus)

8500 = 8.53 GBps (PC3-1066 SDRAMs, 8-byte primary data bus)

10600 = 10.66 GBps (PC3-1333 SDRAMs, 8-byte primary data bus)

12800 = 12.80 GBps PC3-1600 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

d is the revision number of the reference design of the DIMM

- The server supports a maximum of 12 single-rank or dual-rank DIMMs.

Note: 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*) or dual-rank (*n=2*).

- The server supports three single-rank or dual-rank DIMMs per channel. The following table shows an example of the maximum amount of memory that you can install, using ranked DIMMs.

Table 6. Maximum memory installation using ranked DIMMs

Number of DIMMs	DIMM type	DIMM size	Total memory
12	Single-rank DIMMs	4 GB	48 GB
12	Dual-rank DIMMs	4 GB	48 GB
12	Dual-rank DIMMs	8 GB	96 GB

- The DIMM options that are available for the server are 1 GB, 2 GB, 4 GB, and 8 GB. The server supports a minimum of 2 GB and a maximum of 96 GB of system memory.

Note: 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 “Using the Setup utility” on page 108.

- A minimum of one DIMM must be installed for each microprocessor. For example, you must install a minimum of two DIMMs if the server has two microprocessors installed. However, to improve system performance, install a minimum of three DIMMs for each microprocessor.
- The maximum operating speed of the server is determined by the slowest DIMM install in the server.
- The server comes with a minimum of two 1 GB DIMMs, installed in slots 3 and 6.
- When you install additional DIMMs in independent mode, install them in the order shown in the following table to optimize system performance. All three channels on the memory interface for each microprocessor can be populated in any order and have no matching requirements.

Table 7. Independent mode DIMM installation sequence

Installed microprocessors	DIMM connector population sequence
Microprocessor socket 1	3, 6, 8, 2, 5, 7
Microprocessor socket 2	11, 14, 16, 10, 13, 15
Note: DIMM connectors 1, 4, 9, and 12 are not functional. Do not install DIMMs in these connectors.	

- The server supports memory mirroring (mirroring mode):
 - Memory-mirroring mode replicates and stores data on two pairs of DIMMs within two channels (channels 0 and 1) simultaneously. If a failure occurs, the memory controller switches from the primary pair of memory DIMMs to the backup pair of DIMMs. To enable memory mirroring through the Setup utility, select **System Settings → Memory**. For more information, see “Using the Setup utility” on page 108. When you use the memory mirroring feature, consider the following information:
 - When you use memory mirroring, you must install a pair of DIMMs at a time. One DIMM must be in channel 0, and the mirroring DIMM must be in the same slot in channel 1. The two DIMMs in each pair must be identical in size, type, and rank (single or dual) , and organization, but not in speed. The channels run at the speed of the slowest DIMM in any of the channels.

- Channel 2, DIMM connectors 7, 8, 15, and 16 are not used in memory-mirroring mode.
- The maximum available memory is reduced to half of the installed memory when memory mirroring is enabled. For example, if you install 48 GB of memory, only 24 GB of addressable memory is available when you use memory mirroring.

The following table lists the usable DIMM connectors on each memory channel.

Table 8. Connectors on each memory channel

Memory channel	DIMM connectors
Channel 0	2, 3, 10, 11
Channel 1	5, 6, 13, 14
Channel 2	7, 8, 15, 16

The following table lists the installation sequence for installing DIMMs in memory-mirroring mode.

Table 9. Memory-mirroring mode DIMM population sequence

DIMMs	Number of installed microprocessors	DIMM connector
First pair of DIMMs	1	3, 6
Second pair of DIMMs	1	2, 5
Third pair of DIMMs	2	11, 14
Fourth pair of DIMMs	2	10, 13

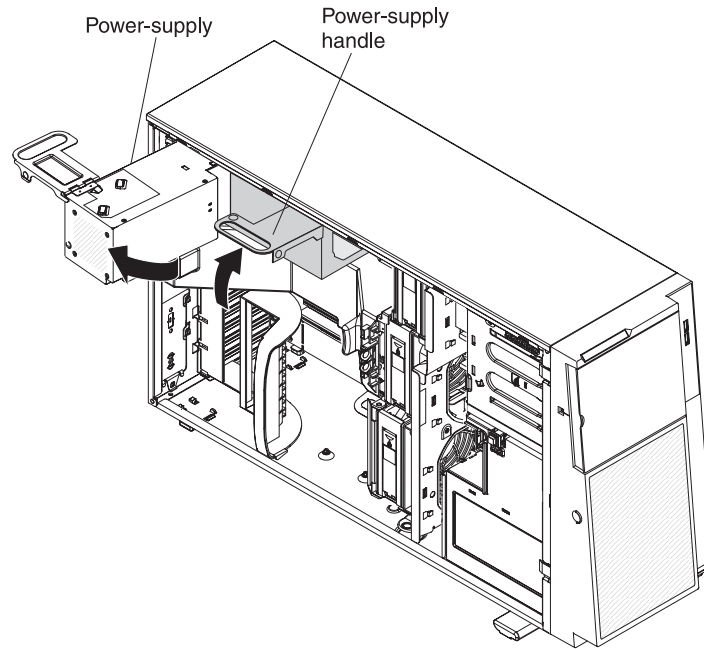
Note: DIMM connectors 7, 8, 15, and 16 are not used in memory-mirroring mode and DIMM connectors 1, 4, 9, and 12 are not functional on this server. Do not install DIMMs in these connectors.

- 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.

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

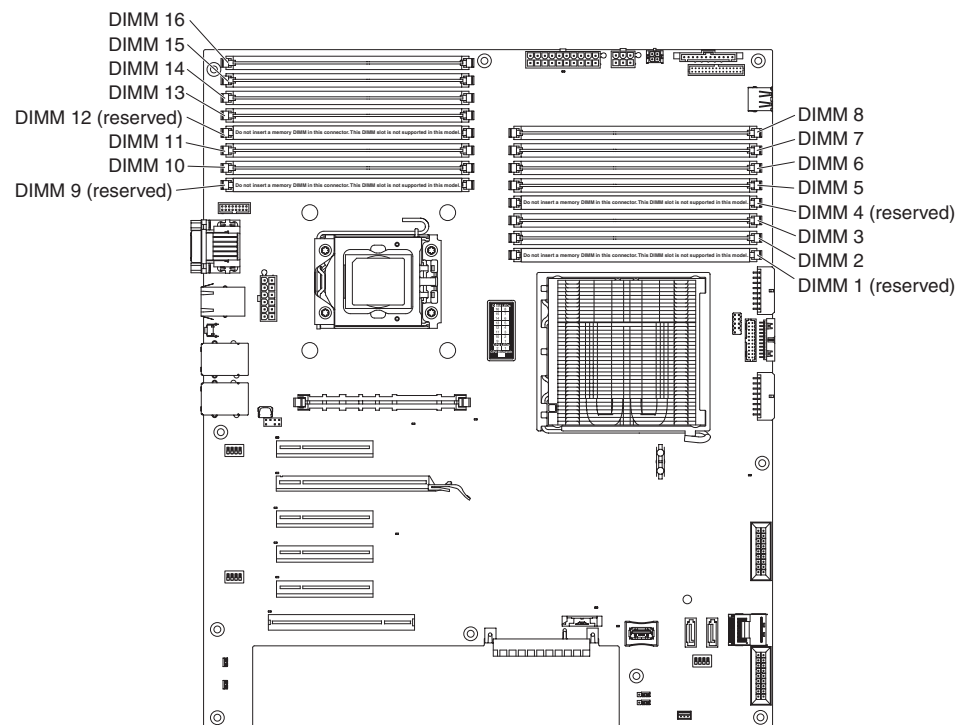
To install a DIMM, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Unlock the left-side cover.
4. Remove the left-side cover (see “Removing the left-side cover” on page 38).
5. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.



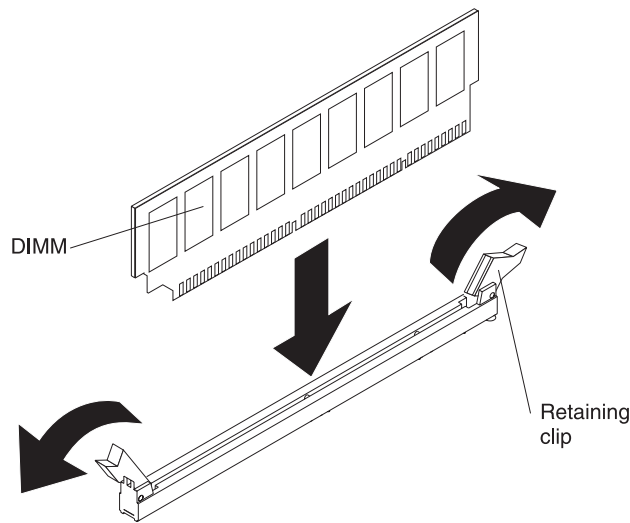
6. Remove the air baffle (see “Removing the air baffle” on page 44).
7. Locate the DIMM connectors on the system board. Determine the connector in which you will install the DIMM. Install the DIMMs in the sequence indicated earlier in this section.

Note: DIMM connectors 1, 4, 9, and 12 are not functional in this server. Do not install DIMMs in these connectors.

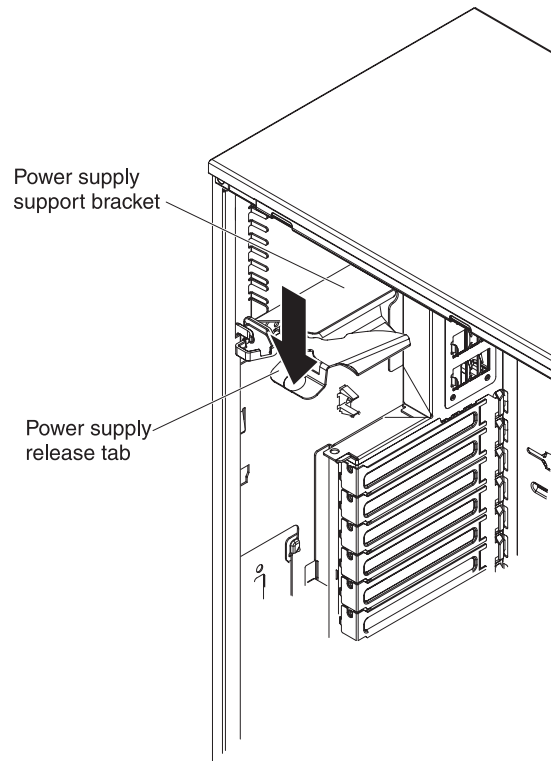


Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.

8. Open the retaining clips and, if necessary, remove any existing DIMM.



9. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the server. Then, remove the new DIMM from the package.
10. Turn the DIMM so that the DIMM keys align correctly with the connector.
11. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips, remove the DIMM, and then reinsert it.
12. Install the air baffle (see “Replace the air baffle” on page 101).
13. Rotate the power-supply cage assembly back into the server. Press the power-supply cage release tab and rotate the power-supply cage assembly into the chassis.



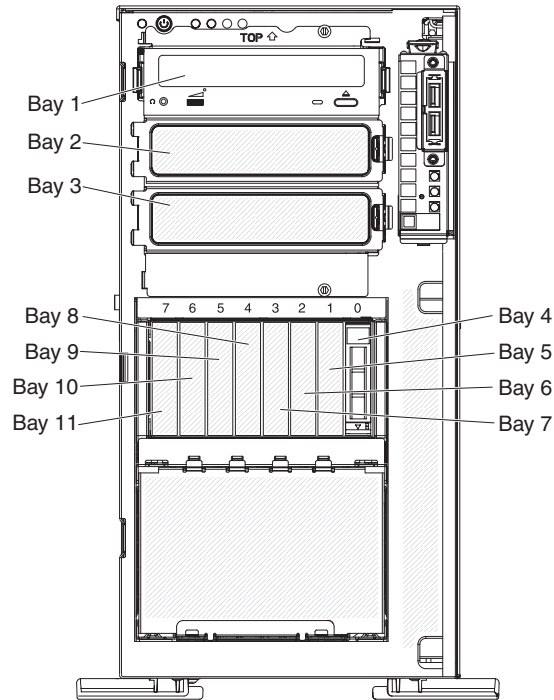
If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 100.

Installing drives

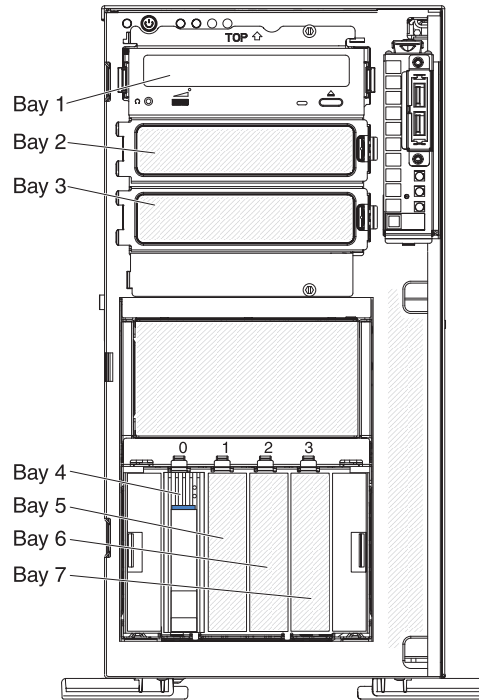
Depending on the server model, the server might come with a SATA attached DVD-ROM drive in bay 1.

The following are illustrations of the server and the locations of the drive bays. Your hardware might differ, depending on the model.

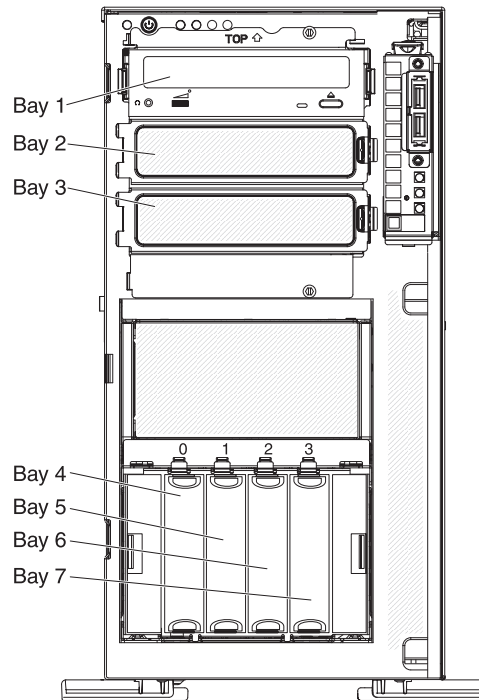
The following illustration shows the locations of the drive bays in the 2.5-inch hot-swap SAS or hot-swap SATA hard disk drive server models.



The following illustration shows the locations of the drive bays in the 3.5-inch hot-swap SAS or hot-swap SATA hard disk drive server models.



The following illustration shows the locations of the drive bays in the 3.5-inch simple-swap SATA hard disk drive server models.



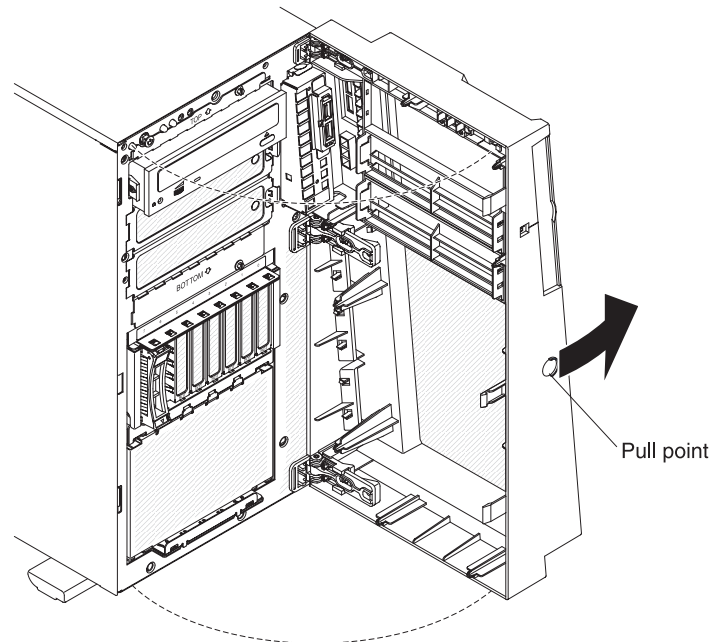
The following notes describe the types of drives that the server supports and other information that you must consider when installing a drive:

- Make sure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
- Check the instructions that come with the drive to see whether you have to set any switches or jumpers on the drive. If you are installing a SAS or SATA device, be sure to set the SAS or SATA ID for that device.
- Optional external tape drives and DVD-ROM drives are examples of removable-media drives. You can install removable-media drives only in bays 1, 2, and 3.
- To install a 3.5-in. drive in a 5.25-in. bay, you must use a 5.25-in. conversion kit.
- The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all bays and PCI slots covered or occupied. When you install a drive or PCI adapter, save the EMC shield and filler panel from the bay or the PCI adapter slot cover in the event that you later remove the drive or adapter.
- For a complete list of supported options for the server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

Installing a DVD drive

To install a DVD drive, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Unlock the left-side cover.
4. Remove the left-side cover (see “Removing the left-side cover” on page 38).
5. Open the bezel. Place your finger on the pull point area on the left side of the bezel door and rotate it away from the server.



6. Remove the EMC shield from the bay in which you want to install the 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

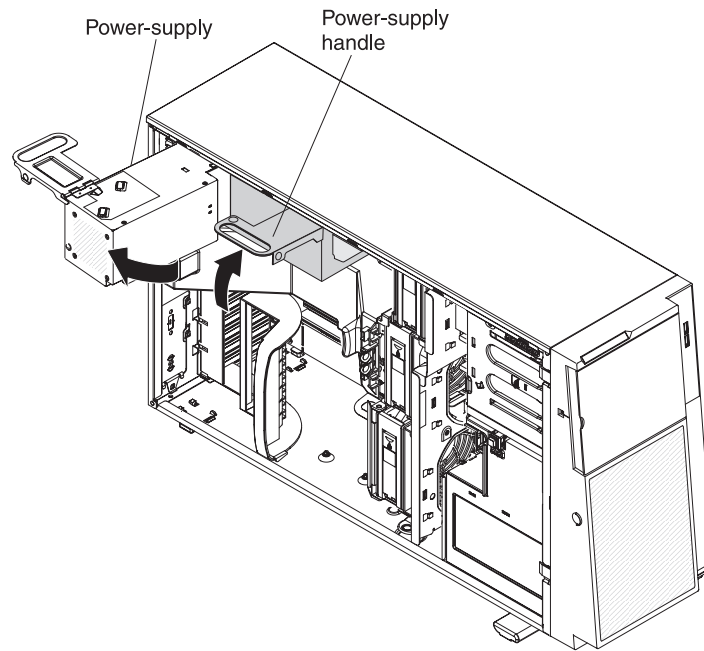
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

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

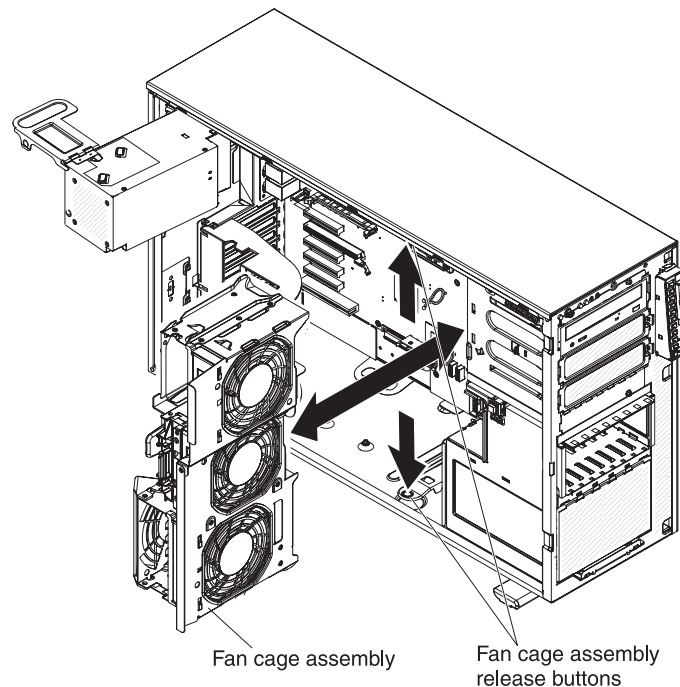


Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

7. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.



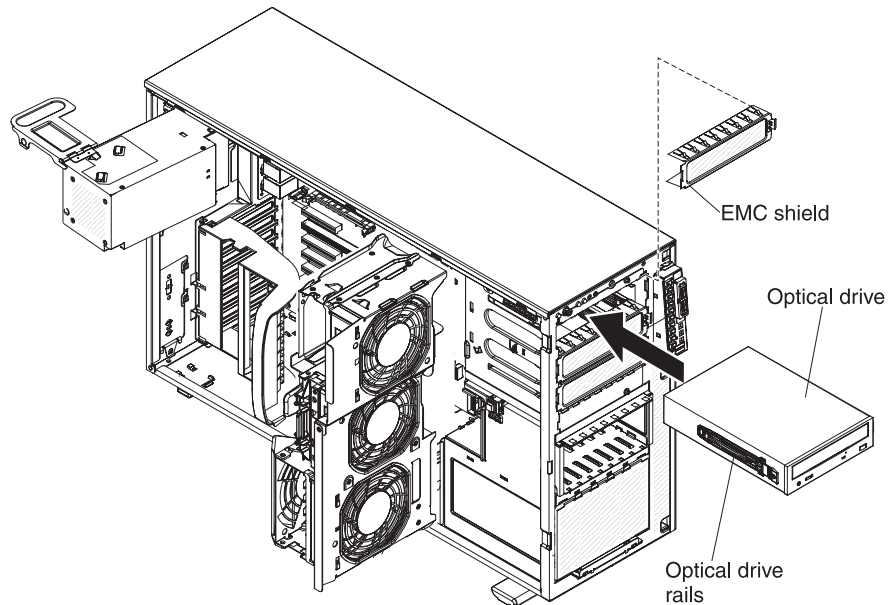
8. Remove the air baffle (see “Removing the air baffle” on page 44).
9. Press in on the fan cage assembly release buttons on the sides of the chassis to release the fan cage assembly from the connector on the chassis. Lift the fan cage assembly up and out of the chassis and set it aside.



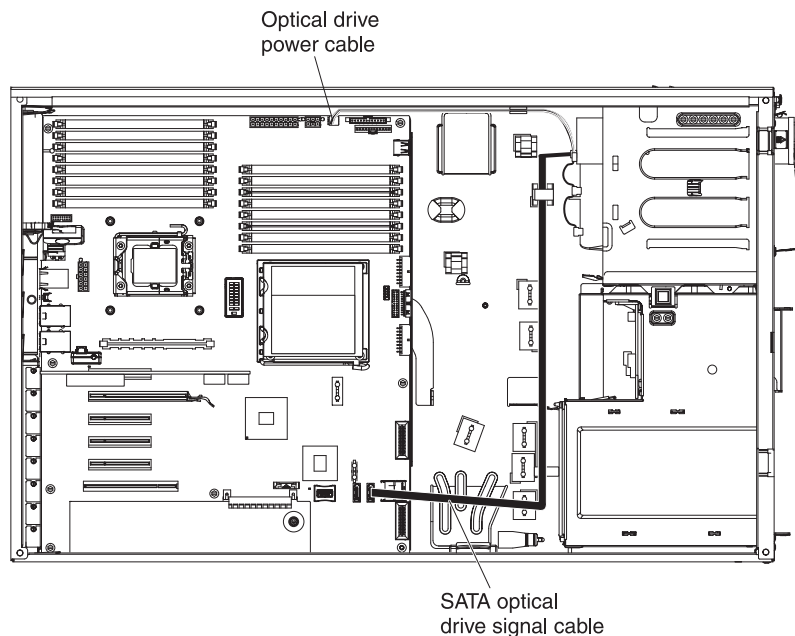
10. Touch the static-protective package that contains the DVD drive to any unpainted metal surface on the server; then, remove the DVD drive from the package and place it on a static-protective surface.
11. Set any jumpers or switches on the drive according to the documentation that comes with the drive.

Note: You might find it easier to install the new drive from the front and then attach the cables.

12. Remove the blue optical drive rails from the inside of the drive bay in which you want to install the drive. Align the holes on the blue optical drive rails with the pins on the side of the drive and snap the optical drive rails onto the drive.

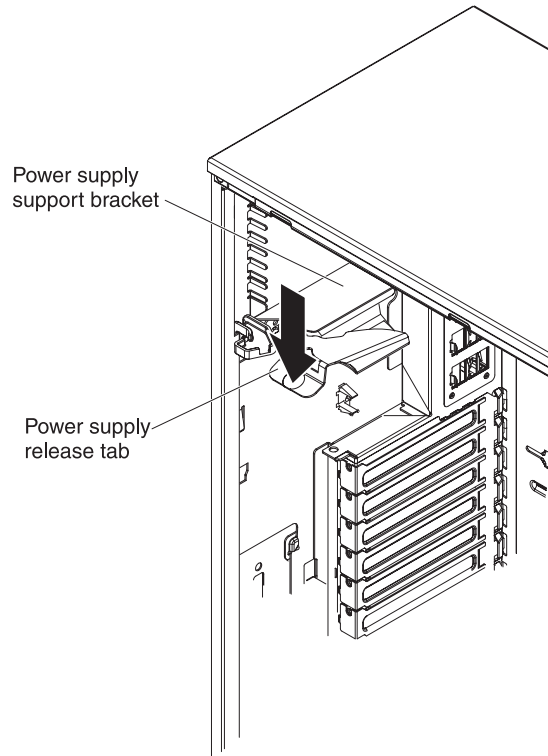


13. If you are installing a 5.25-in. drive in bay 2, push the drive into the bay until it locks into place. If you are installing a 3.5-in. drive in bay 2, attach the 5.25-in. conversion kit and push the drive into the drive bay.
14. Connect power and signal cables to the drive and the connectors on the system board.
15. Route the signal cable through the plastic slot on the bottom of the chassis underneath the fan cage assembly so that it does not block the airflow to the rear of the drives as shown in the following illustration:



See “Power and signal cables for internal drives” on page 71 for more cabling information.

16. If you have another drive to install or remove, do so now.
17. Reinstall the fan cage assembly. Align the fan cage assembly over the fan cage assembly slot and with the connector on the system board. Lower the fan cage assembly into the chassis and press down firmly until the fan cage assembly is seated firmly in place.
18. Rotate the power-supply cage assembly back into the server. Press the power-supply cage release tab and rotate the power-supply cage assembly into the chassis.



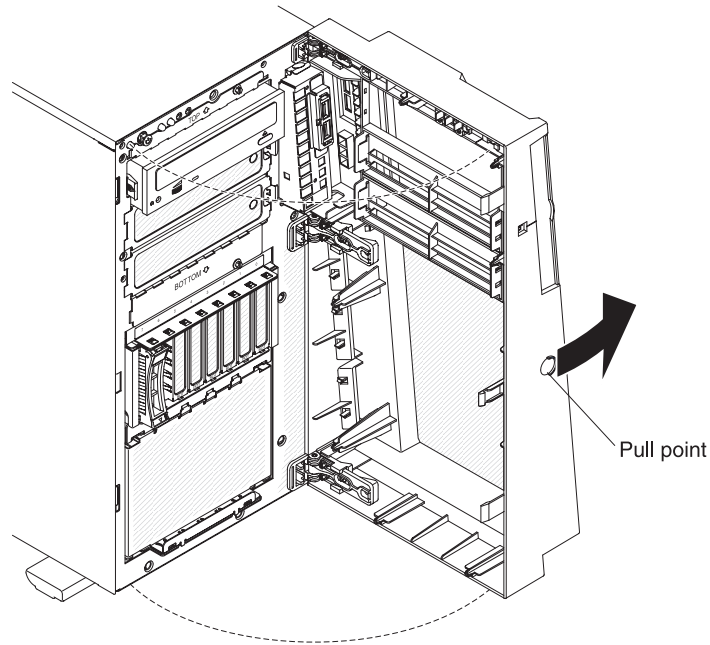
19. Close the bezel.

If you have other options to install or remove, do so now; otherwise go to “Completing the installation” on page 100.

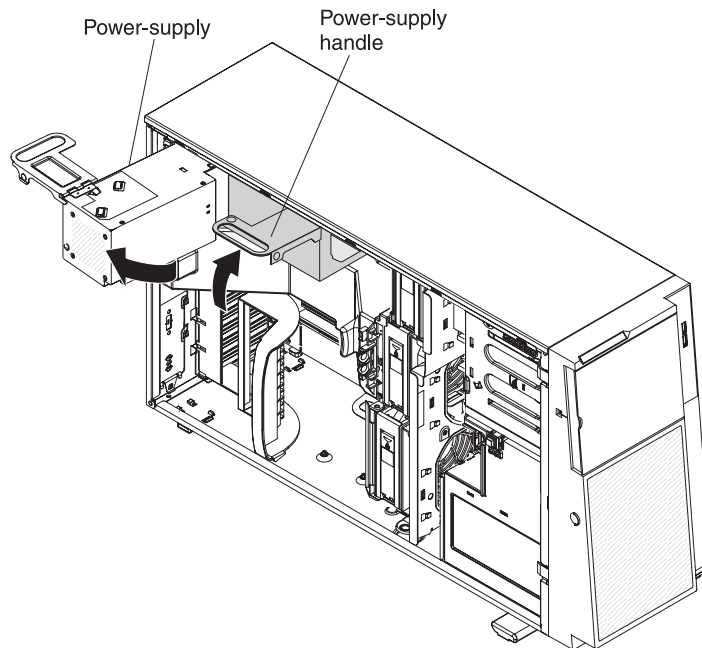
Installing an optional tape drive

To install a optional tape drive, complete the following steps.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Unlock the left-side cover.
4. Remove the left-side cover (see “Removing the left-side cover” on page 38).
5. Open the bezel. Place your finger on the pull point area on the left side of the bezel door and rotate it away from the server.

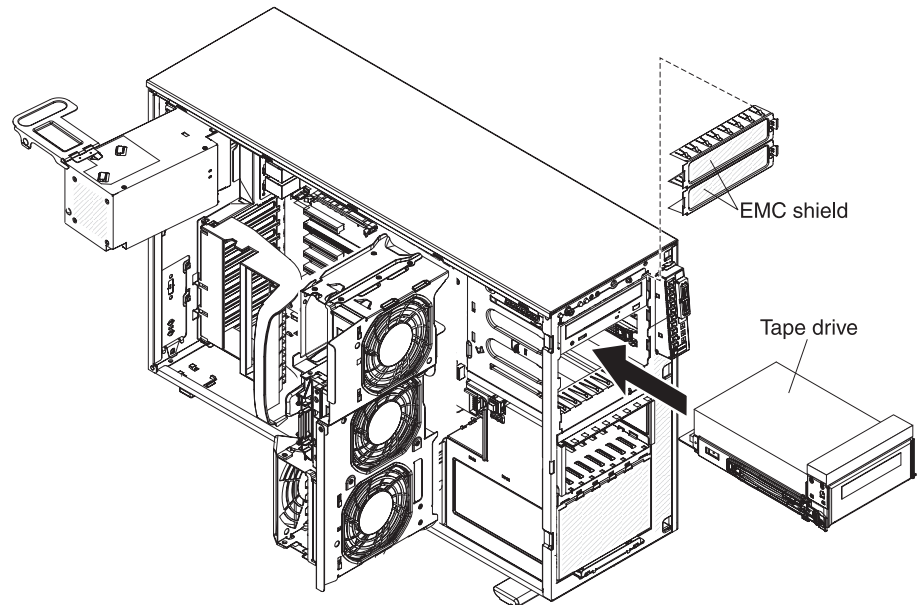


6. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.

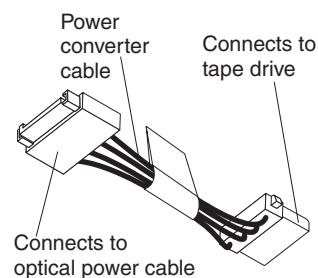


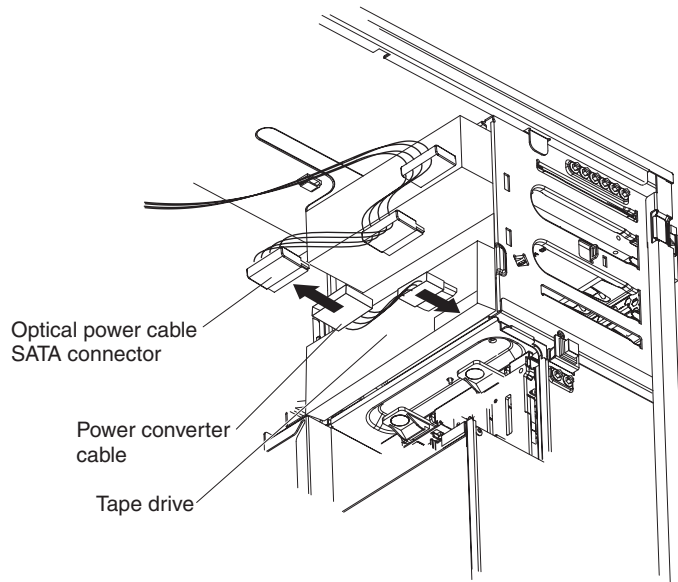
7. Remove the air baffle (see "Removing the air baffle" on page 44).
8. Remove the fan cage assembly. Press in on the fan cage assembly release buttons on the sides of the chassis to release the fan cage assembly from the connector on the chassis. Lift the fan cage assembly up and out of the chassis and set it aside.
9. Remove the EMC shields from the bays in which you want to install the tape drive.

10. Touch the static-protective package that contains the tape drive to any unpainted metal surface on the server; then, remove the tape drive from the package and place it on a static-protective surface.
11. Install the blue rails on the sides of the tape drive.
12. Align the rails on tape drive with the guides in the drive bay; then, slide the tape drive into the server from the front of the server until it click into place.

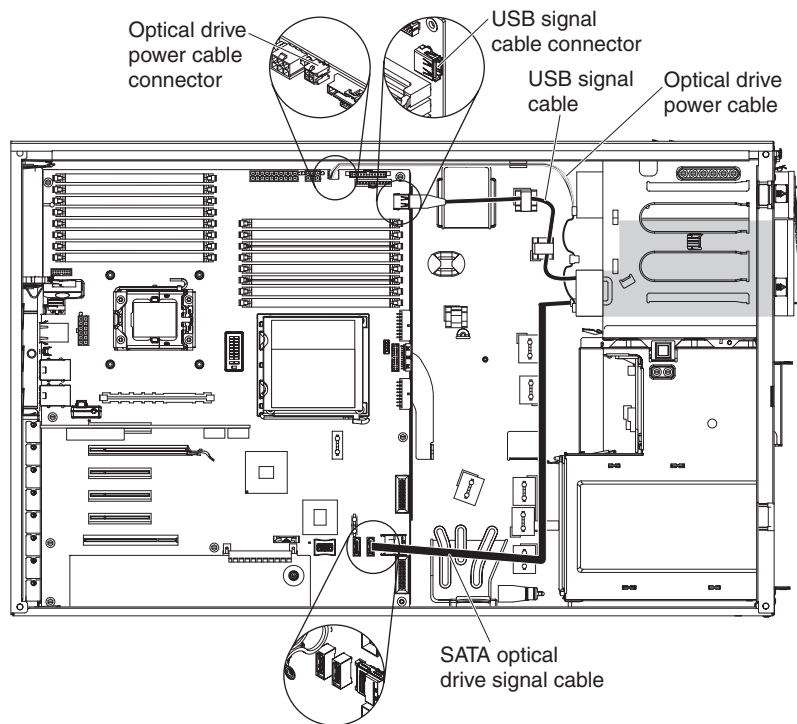


13. If the tape drive comes with screws, secure the tape drive to the chassis with the supplied screws.
14. Connect one of the connectors on the optical drive power cable to the tape drive. If however, you are installing an RDX internal USB tape drive, you will need to install the SATA to traditional power converter cable. Locate the SATA to traditional power converter cable that came with the server in the plastic bag with the drive rails; then connect one end of the converter cable to the third connector (the default connector) on the optical drive power cable and connect the other end of the cable to the tape drive as shown in the following illustrations.





15. Connect one end of the tape drive signal cable to the tape drive and the other end to the connector on the system board. Route the cable through the plastic slots on the bottom of the chassis underneath the fan cage assembly as shown in the following illustration:



See “Power and signal cables for internal drives” on page 71 for more cabling information.

16. Reinstall the fan cage assembly. Align the fan cage assembly over the fan cage assembly slot and with the connector on the system board. Lower the fan cage assembly into the chassis and press down firmly until the fan cage assembly is seated firmly in place.

Note: Make sure that all wires and cables inside the server are routed correctly before installing the fan cage assembly. Wiring that is not properly routed could be damaged or might prevent the fan cage assembly from seating properly in the server.

17. Rotate the power-supply cage assembly back into the server. Press the power-supply cage release tab and rotate the power-supply cage assembly into the chassis.
18. Close the bezel.

If you have other options to install or remove, do so now; otherwise go to “Completing the installation” on page 100.

Installing a hot-swap hard disk drive

Some server models come with hot-swap SAS or SATA hot-swap hard disk drives. Before you install a hot-swap hard disk drive, read the following information:

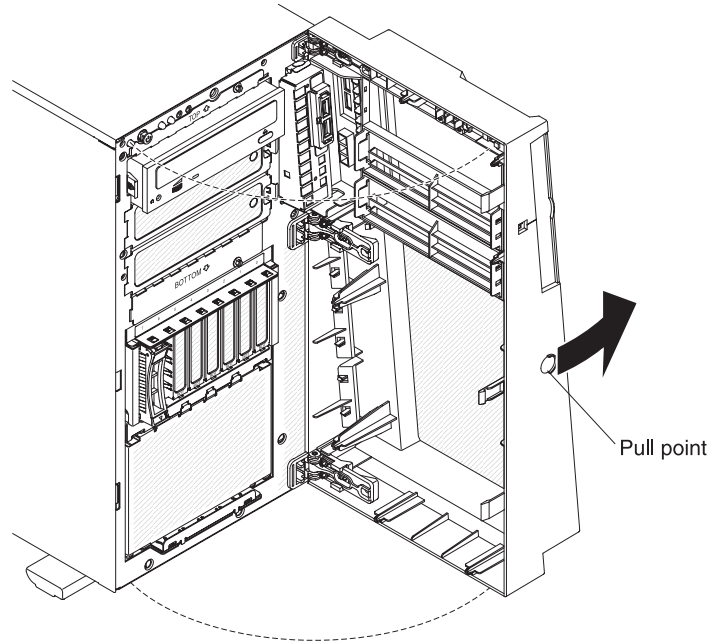
- The hot-swap drives must be either all SAS hard disk drives or all SATA hard disk drives; do not mix SAS and SATA drives in the server.
- The hot-swap hard disk drive models come with the following drives (depending on your model):
 - Four 3.5-inch hot-swap SAS or SATA hard disk drives
 - Eight or sixteen 2.5-inch hot-swap SAS or SATA hard disk drives
- The sequence for installing the 3.5-inch hard disk drives in the four-bay models is to install the drives starting from the left bay (bay 4) and go to the right bay (bay 7) in that order.
- The sequence for installing the 2.5-inch hard disk drives in the eight-bay models is to install the drives starting from the right bay (bay 4) and go to the left bay (bay 11) in that order.
- The hot-swap drives are arranged horizontally in the standard hard disk drive cage; the drive numbers are 0 through 7 (right to left) on models with eight hard disk drives and 8 through 15 (right to left) on servers with 16 hard disk drives. When you install hard disk drives, start with drive 0.
- Inspect the drive tray for signs of damage.
- Make sure that the drive is correctly installed in the tray.
- You do not have to turn off the server to install hot-swap drives in the hot-swap drive bays.
- All hot-swap drives must have the same throughput speed rating; mixing speed ratings might cause all drives to operate at the lower throughput speed.
- The drive ID for each hot-swap hard disk drive is printed on the bezel.
- To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each drive bay.

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

To install a hot-swap hard disk drive, complete the following steps:

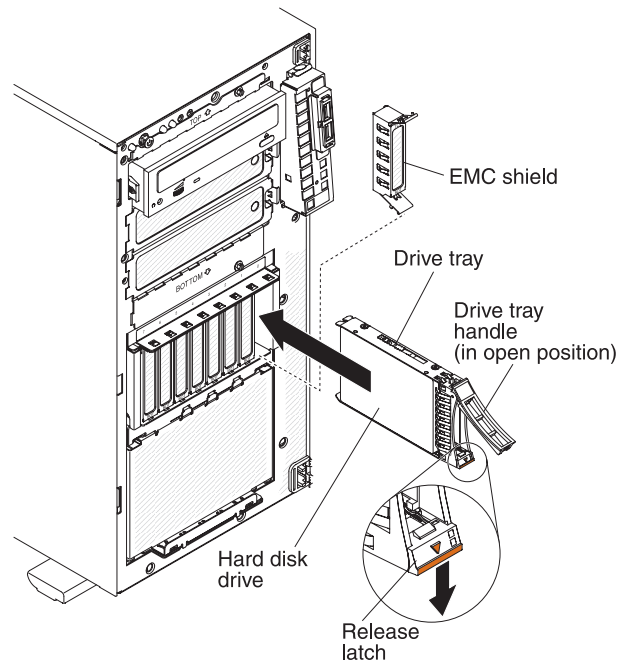
1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Unlock the left-side cover.
3. Open the bezel. (see “Removing the bezel” on page 38).
4. Place your finger on the pull point area on the left side of the bezel door and rotate it away from the server.

Note: After you rotate the bezel beyond 90°, you can pull the bezel off the server and set it aside, if you want to remove it completely.

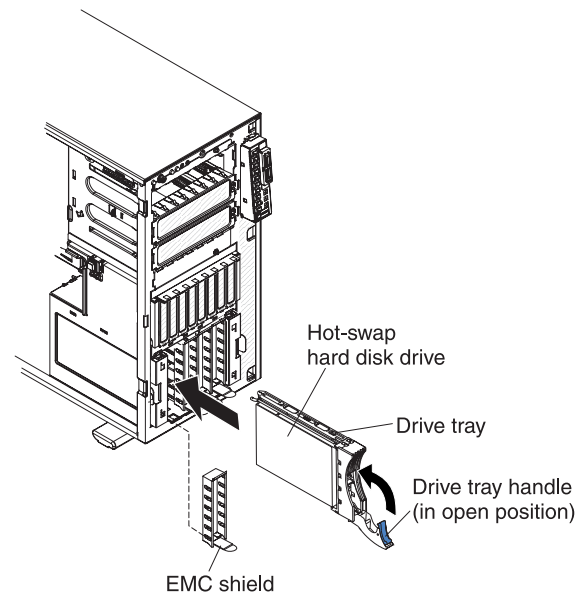


5. Remove the EMC shield from the bay in which you want to install the drive.
6. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
7. Install the hard disk drive in the hot-swap bay:
 - a. Make sure that the drive tray handle is open.
 - b. Align the drive assembly with the guide rails in the bay.

The following is the 2.5-inch hot-swap model:



The following is the 3.5-inch hot-swap model:



- c. Gently slide the drive assembly into the drive bay until the drive stops.
- d. Push the drive tray handle to the closed (locked) position.
- e. See “Power and signal cables for internal drives” on page 71 and the *Problem Determination and Service Guide* for cabling information, if needed.
- f. Check the hard disk drive status indicator to make sure that the hard disk drive is operating correctly. (You might have to restart the server before the drive is recognized.) If the amber hard disk drive status LED for a drive is lit continuously, it indicates that the drive is faulty and must be replaced. If the amber hard disk drive status LED for a drive is flashing slowly, this indicates that the drive is being rebuilt. If the amber hard disk drive status LED for a drive is flashing rapidly, this indicates that the controller is identifying the drive. If the green hard disk drive activity LED is flashing, it indicates that the drive is in use.

Note: If the server is configured for RAID operation using an optional ServeRAID adapter, you might have to reconfigure your disk arrays after installing hard disk drives. See the ServeRAID documentation on the IBM Web site at <http://www.ibm.com/systems/support/> for information about configuring and managing RAID arrays.

- g. Close the bezel.
- 8. If you are installing additional hot-swap hard disk drives, do so now.

If you have other options to install or remove, do so now; otherwise go to “Completing the installation” on page 100.

IDs for hot-swap hard disk drives

Hot-swap server models have drive bays that are connected to a SAS/SATA backplane. This backplane, also known as the hot-swap-drive backplane, is the printed circuit board behind these bays.

The hot-swap-drive backplane controls the IDs for the internal hot-swap drive bays. The following tables list the IDs for the hard disk drives and backplane that are connected to hot-swap models.

Table 10. IDs for the four-bay 3.5-inch hot-swap drive models

Drive bay number	ID
Drive bay 4	0
Drive bay 5	1
Drive bay 6	2
Drive bay 7	3

Table 11. IDs for the eight-bay 2.5-inch hot-swap models

Drive bay number	ID
Drive bay 4	0
Drive bay 5	1
Drive bay 6	2
Drive bay 7	3
Drive bay 8	4
Drive bay 9	5
Drive bay 10	6
Drive bay 11	7

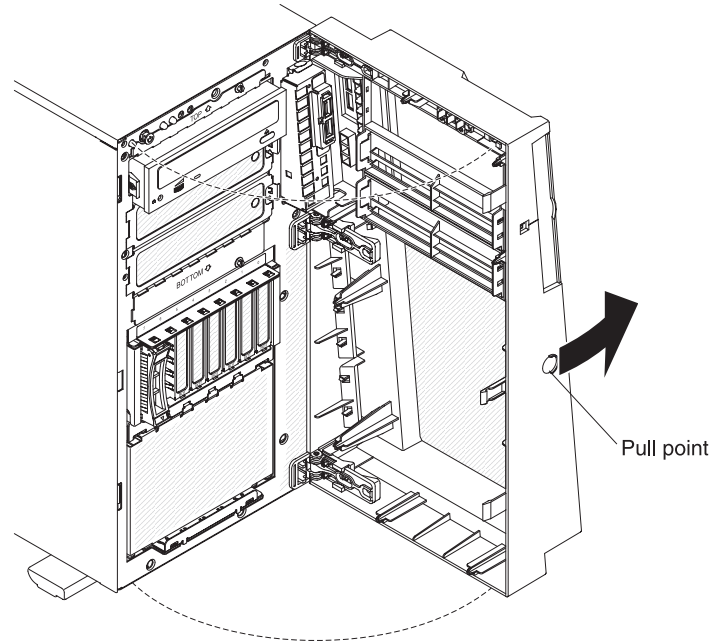
Installing a simple-swap SATA hard disk drive

Some server models come with four 3.5-inch simple-swap SATA hard disk drives that are accessible from the front of the server. You must turn off the server before installing simple-swap drives in the server. Before you install a simple-swap SATA hard disk drive, read the following information:

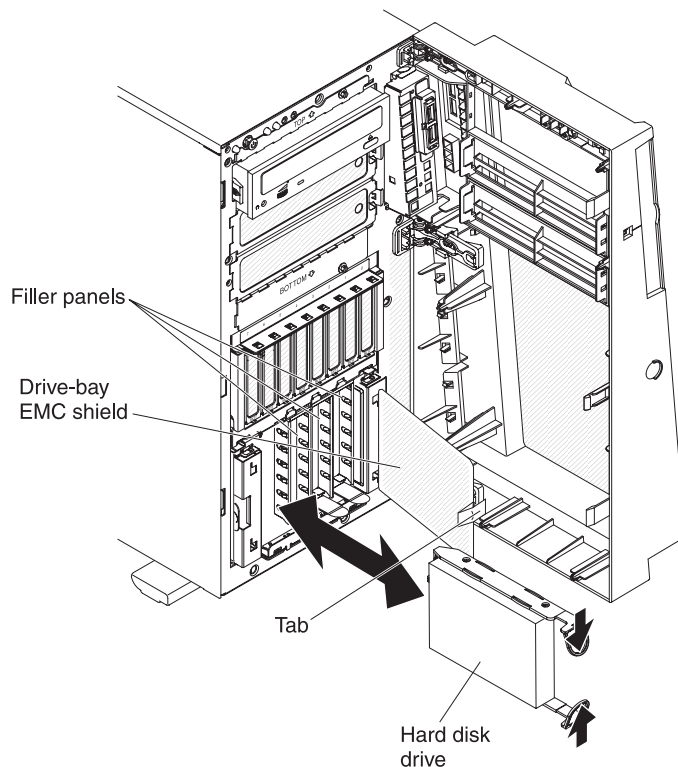
- You can only install four simple-swap SATA hard disk drives in the server.
- The sequence for installing the hard disk drives is to install the drives starting from the left bay (bay 4) and go the right bay (bay 7) in that order.

To install a simple-swap hard disk drive, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords.
3. Unlock the left-side cover.
4. Remove the left-side cover (see “Removing the left-side cover” on page 38).
5. Open the bezel. Place your finger on the pull point area on the left side of the bezel door and rotate it away from the server.



6. Remove the filler panel from the drive bay in which you want to install the drive.
7. Grasp the tab on the drive bay EMC shield and rotate it to the open position.



8. 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.
9. Align the drive assembly with the guide rails in the bay (the connector end of the drive goes in first).
10. Press the drive assembly loops toward each other; then, carefully slide the drive assembly into the drive bay until it stops and release the loops.

Note: Do not release the loops on the drive assembly until it is completely seated.

11. See “Power and signal cables for internal drives” on page 71 and the *Problem Determination and Service Guide* for cabling information, if needed.
12. Close the drive bay EMC shield.
13. Close the bezel.

If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 100.

The simple-swap-drive backplate controls the IDs for the internal simple-swap drive bays. The following table lists the IDs for the hard disk drives and backplate that are connected to simple-swap models.

Table 12. IDs for the 3.5-inch simple-swap drive models

Drive bay number	ID
Drive bay 4	0
Drive bay 5	1
Drive bay 6	2
Drive bay 7	3

Power and signal cables for internal drives

The server uses cables to connect SATA attached, simple-swap SATA, hot-swap SATA and hot-swap SAS devices to the power supply and to the system board. (See “System-board internal connectors” on page 26 for the location of system-board connectors.) Review the following information before connecting power and signal cables to internal drives:

- The drives that are preinstalled in the server come with power and signal cables attached. If you replace any drives, remember which cable is attached to which drive.
- When you route a cable, make sure that it does not block the airflow to the rear of the drives or over the microprocessor or DIMMs.

The following cables are provided:

- The DVD drive is attached to an ATA signal cable. The blue connector is attached to the SATA 0 (optical drive connector) on the system board. The connector on the other end is attached to the SATA device. The middle connector attaches to an optional optical device or tape drive. A separate power cable provides power to the device from the system board.
- **Simple-swap SATA models:** The simple-swap SATA models come with a combination signal/power cable that connects to the connector on the system board and the simple-swap SATA backplate to provide signal and power to the simple-swap SATA drives. Connect the power connector on the split end of the cable to the **Hard disk drive backplane power connector** (labeled A) on the system board and connect the signal connector on the split end of the cable to the **Simple-swap SATA signal cable connector** on the system board. The other end of the combination signal/power cable has a signal cable connected to each drive bay signal connector on the simple-swap SATA backplate and a power cable connected to each drive bay power connector on the simple-swap SATA backplate.
- **Hot-swap SAS or hot-swap SATA models:**
 - The 2.5-inch hot-swap SAS and hot-swap SATA models come with the following cables to provide signal and power to the hot-swap SAS/SATA drives:
 - Four single signal cables (thick red and black) that connects to the signal cable connectors on the hard disk drive backplanes (the backplanes are labeled A0 and A1) and the connectors on the SAS/SATA RAID adapter (see the ServeRAID adapters installation instructions in this document for more cabling information).
 - Two split power cables (red/yellow/black). The end of the power cable with the single connector connects to the **Hard disk drive backplane power connector** (the power connector labeled A) on the system board and the end of the power cable with the two connectors, connects to the power connectors on the hard disk drive backplanes (the backplanes are labeled A0 and A1).
 - Two split configuration signal cables (black). The end of the configuration signal cable with the single connector connects to the **Hard disk drive backplane configuration signal connector** (the configuration connector labeled A) on the system board and the end of the configuration signal cable with the two connectors, connects to the configuration signal connectors on the hard disk drive backplanes (the backplanes are labeled A0 and A1).

- The 3.5-inch hot-swap SAS and hot-swap SATA models come with the following to provide signal and power to the 3.5-inch hot-swap SAS/SATA drives.:
 - A single signal cable (thick red and black) that connects to the hard disk drive backplane and one of the connectors on the SAS/SATA RAID adapter (see the ServeRAID adapters installation instructions in this document for more cabling information).
 - A single power cable (red/yellow/black) that connects to the **Hard disk drive backplane power connector** (the power connector labeled A) on the system board and to the power connector on the hard disk drive backplane.
 - A single configuration signal cable (black) that connects to the **Hard disk drive backplane configuration signal connector** (the configuration connector labeled A) on the system board and the configuration signal connector on the hard disk drive backplane.

For more information about the requirements for SAS/SATA cables and connecting SAS/SATA devices, see the documentation that comes with these devices.

For a list of supported options for the server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

Installing an adapter

The following notes describe the types of adapters that the server supports and other information that you must consider when installing an adapter. Adapter that the server supports might vary, depending on your server model.

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section. If you must change the switch setting or jumper settings on the adapter, follow the instructions that come with the adapter.
- Read the documentation that comes with your operating system.
- Use PCI slot 2 for video adapters.
- Do not set the maximum digital video adapter resolution above 1600 x 1200 at 85 Hz for an LCD monitor. This is the highest resolution that is supported for any add-on video adapter that you install in the server.
- Any high-definition video-out connector or stereo connector on any add-on video adapter is not supported
- The server provides up to eight adapter connectors, or slots as follows (depending on your server model):

Note: The *x8 (x4)* designation for slot 3 (for example) identifies an x8 slot that is designed to support x8 adapters and x4 adapters that can downshift to operate at the x4 bandwidth. If you install an x8 adapter in slot 3 that can downshift to the x4 bandwidth, it will run at the x4 bandwidth. The x8 connector can be used for x4 and x8 adapters. These same rules apply to the other PCI slots also. Check the information that comes with your adapter for compatibility information.

- Slots on the system board:
 - Slot 1, PCI Express Gen 2 x8 (x8)
 - Slot 2, PCI Express Gen 2 x16 (x8)
 - Slot 3, PCI Express Gen 2 x8 (x4)
 - Slot 4, PCI Express Gen 2 x8 (x4)
 - Slot 5, PCI Express Gen 2 x8 (x8)

- Slot 6, PCI 32-bit/33 MHz
- If you install the optional one-slot PCI extender card in the server:
 - One additional PCI Express Gen 1 x8 (x4) slot is available
- If you install the optional two-slot PCI extender card in the server:
 - Two additional PCI-X 32-bit/64-bit 133/100/66 MHz slots are available
- You can install full-length adapters that are included in the ServerProven® list in slots 2, 3, 4, and 5 on the system board, and the slots on the one-slot or two-slot extender cards. You can only install half-length adapters in slots 1 and 6.
- The 32-bit slot 6 supports 5.0 V keyed PCI adapters; they do not support 3.3 V keyed adapters. Universal adapters are supported in slots 4 and 5 if they are universally keyed.
- You can install the IBM ServeRAID-BR10i SAS/SATA controller, the optional IBM ServeRAID-MR10i SAS/SATA controller, or the optional IBM ServeRAID-MR10is VAULT SAS/SATA controller in slots 1 of hot-swap SAS or hot-swap SATA models. These ServeRAID adapters are not supported on the simple-swap models.
- The ServeRAID-BR10i adapter comes standard on hot-swap SAS and hot-swap SATA models and provides RAID levels 0, 1, and 1E support. You can order the ServeRAID-MR10i adapter which provides RAID levels 0, 1, 5, 6, 10, 50, and 60 support, and the optional ServeRAID-MR10is adapter with an encryption 1078 DE chip provides RAID levels 0, 1, 5, 6, 10, 50, and 60 support.
To ensure that any of your ServeRAID 10i, 10is, or 10M 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:** 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.
- The server scans PCI Express slot 1, PCI-X slots 4 and 5, and PCI-Express slots 2 and 3 to assign system resources. Then, the server starts the devices in the following order, if you have not changed the default startup sequence: PCI Express slot 1, PCI-X slots 4 and 5, PCI Express slot 2, PCI slot 6, and PCI Express slot 3.
- For a list of supported options for the server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

To install an adapter, complete the following steps:

Note: The instructions in this section apply to any PCI adapter (for example, video graphics adapters or network adapters).

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the left-side cover (see “Removing the left-side cover” on page 38).
3. Carefully lay the server on its side so that it is lying flat and facing up.

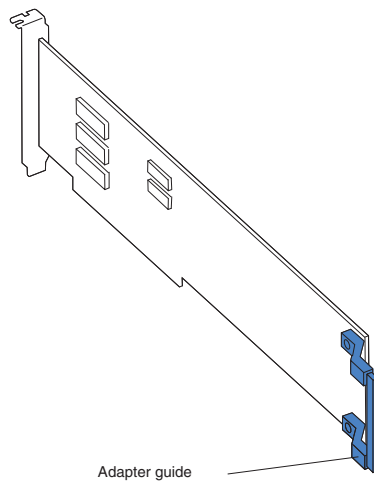
Note: Be careful and do not drop the server.

4. Follow the cabling instructions that come with the adapter to set jumpers or switches, if there are any. Route the adapter cables before you install the adapter.
5. Rotate the rear adapter-retention bracket to the open (unlocked) position.

6. If you are installing a full-length adapter, press on the release lever on the right side of the front adapter-retention bracket to release the retaining tab on the left side of the bracket.
7. Remove the screw that secures the expansion-slot cover to the chassis. Store the expansion-slot cover and screw in a safe place for future use.

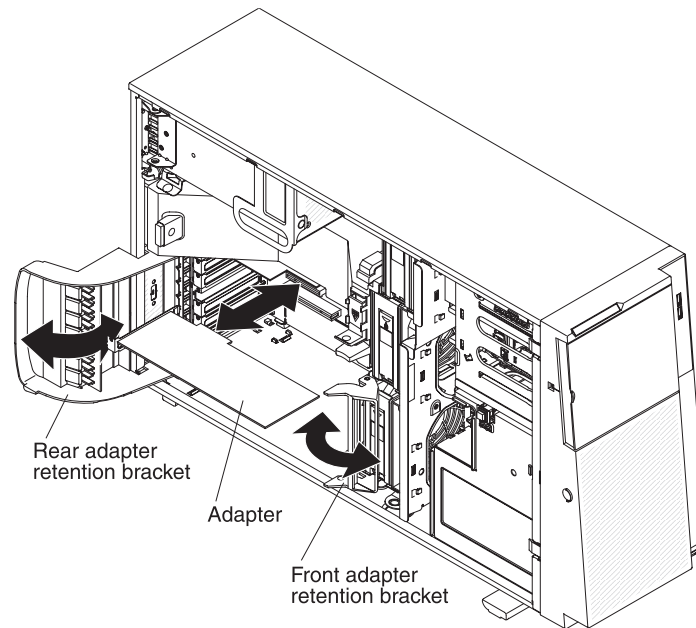
Note: Expansion-slot covers must be installed on all vacant slots. This maintains the electronic emissions standards of the server and ensures proper ventilation of server components.

8. Touch the static-protective package that contains the adapter to any unpainted metal surface on the server. Then, remove the adapter from the static-protective package. Avoid touching the components and gold-edge connectors on the adapter.
9. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.



10. Carefully grasp the adapter by the top edge or upper corners, and move the adapter directly from the static-protective package to the expansion slot. Align the adapter with the expansion slot guides; then, press the adapter *firmly* into the expansion slot. For a full-length adapter, make sure that the front edge of the adapter is properly seated in the correct slot in the front adapter-retention bracket.

Note: Make sure that the adapter is seated correctly in the expansion slot before you turn on the server. Incomplete installation of an adapter might damage the system board or the adapter.



11. Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans.
12. Rotate the rear adapter-retention bracket to the closed (locked) position.
13. Rotate the front adapter-retention bracket to the closed (locked) position.

If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 100.

Installing a second microprocessor

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

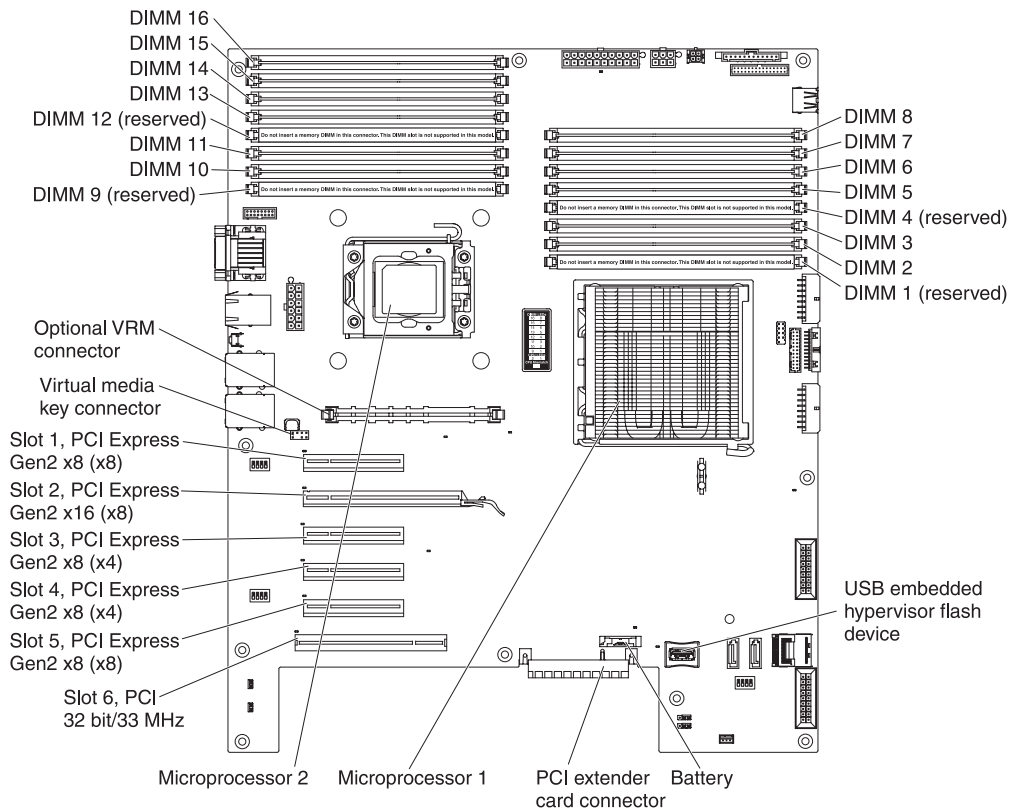
- The server comes with one microprocessor installed, but supports up to two microprocessors.
- A microprocessor must be installed and removed only by a trained service technician.

Attention: Always use the microprocessor installation tool to install a microprocessor. Failing to use the microprocessor installation tool may damage the microprocessor sockets on the system board. Any damage to the microprocessor sockets may require replacing the system board.

- Read the documentation that comes with the microprocessor to determine whether you have to update the server firmware. To download the most current level of the firmware for your server, go to <http://www.ibm.com/systems/support/>, and click **Downloads and drivers**.
- The first microprocessor must always be installed in microprocessor socket 1.
- When one microprocessor is installed, a heat sink filler is not required for microprocessor socket 2; however, the air baffle must be installed to provide proper system cooling.
- Do not remove the first microprocessor from the system board when you install the second microprocessor.
- When you install the second microprocessor, you must also install additional memory. See “Installing a memory module” on page 48.

- The first microprocessor voltage regulator module (VRM) is integrated on the system board.
- When you install a second microprocessor, you must also install the voltage regulator module (VRM), which comes with the microprocessor option kit, in the VRM connector on the system board.
- Some models support dual-core microprocessors or quad-core microprocessors. Do not mix dual-core microprocessors and quad-core microprocessors in the same system. Install all dual-core or all quad-core microprocessors in the server.
- To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same QuickPath Interconnect (QPI) link speed, integrated memory controller frequency, core frequency, power segment, internal cache size, and type. You can use the Setup utility to determine the specific type of microprocessor that is installed on the system board.
- Mixing microprocessors of different stepping levels within the same server model is supported. You do not have to install the microprocessor with the lowest stepping level and features in microprocessor socket 1.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink.
- If you have to replace a microprocessor, call for service.
- To order additional microprocessor options, contact your IBM marketing representative or authorized reseller. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported microprocessors.

The following illustration shows the locations of the microprocessor connectors and the VRM connector.

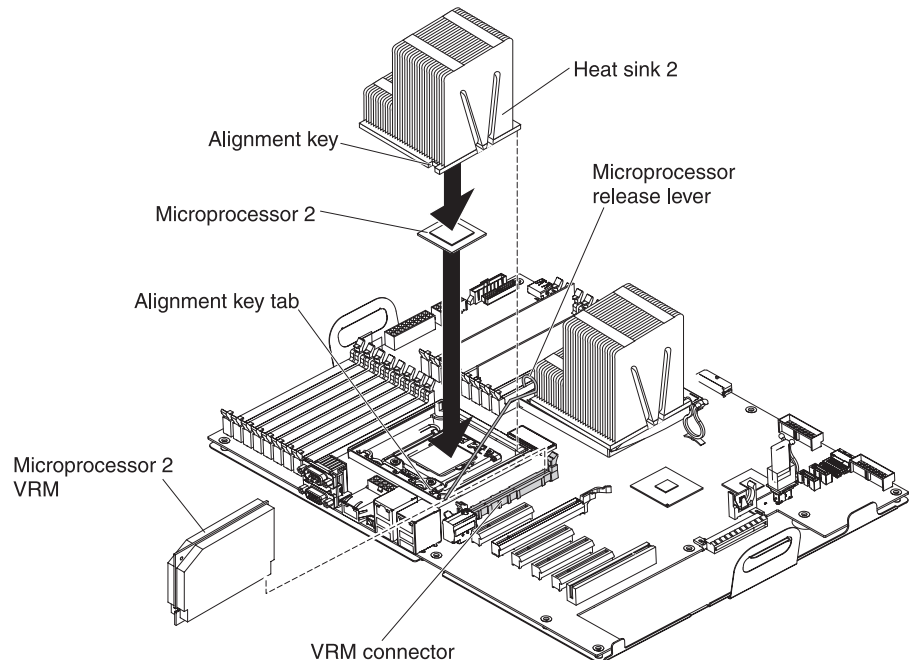


To install an additional microprocessor, complete the following steps:

1. Read the safety information beginning on page vii, and “Installation guidelines” on page 34.
2. Turn off the server and disconnect all power cords and external cables (see “Turning off the server” on page 23); then, unlock and remove the server cover (see “Removing the left-side cover” on page 38).
3. Carefully lay the server on its side so that it is lying flat and facing up.

Note: Be careful and do not drop the server.

4. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.
5. Remove the air baffle (see “Removing the air baffle” on page 44).
6. Install the VRM in the VRM connector:
 - a. Open the retaining clip on each end of the VRM connector on the system board.
 - b. Turn the VRM so that the VRM keys align correctly with the slot connector.



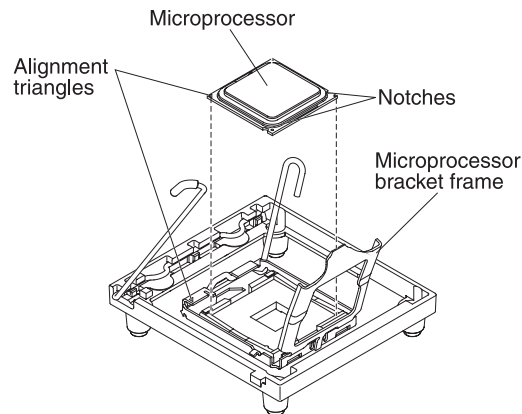
- c. Firmly press the VRM straight down into the connector by applying pressure on both ends of the VRM simultaneously.
 - d. Make sure that the retaining clips are in the locked position when the VRM is firmly seated in the connector.
7. Locate the second microprocessor connector on the system board.
 8. Install the microprocessor:
 - a. Touch the static-protective package that contains the microprocessor to any unpainted metal surface on the server. Then, remove the microprocessor from the package.
 - b. Remove the protective cover, tape, or label from the surface of the microprocessor socket, if any is present.

Attention: Make sure that the release latch on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board.

- c. Rotate the microprocessor release latch on the microprocessor socket from its closed and locked position to its fully open position.

Attention:

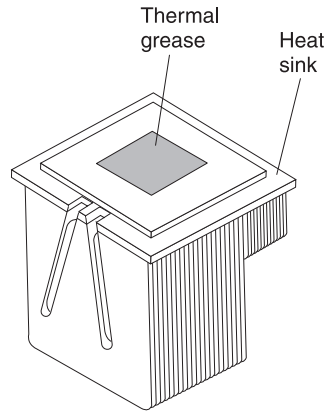
- Do not touch the microprocessor contact; handle the microprocessor by the edges only. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
 - Handle the microprocessor carefully. Dropping the microprocessor during installation or removal can damage the contacts.
 - Do not use excessive force when pressing the microprocessor into the socket.
 - Make sure that the microprocessor is oriented and aligned with land number 1 in the socket before you try to close the latch.
- d. Align the microprocessor with the socket (note the alignment mark and the position of the notches); then, carefully place the microprocessor on the socket and close the microprocessor bracket frame.



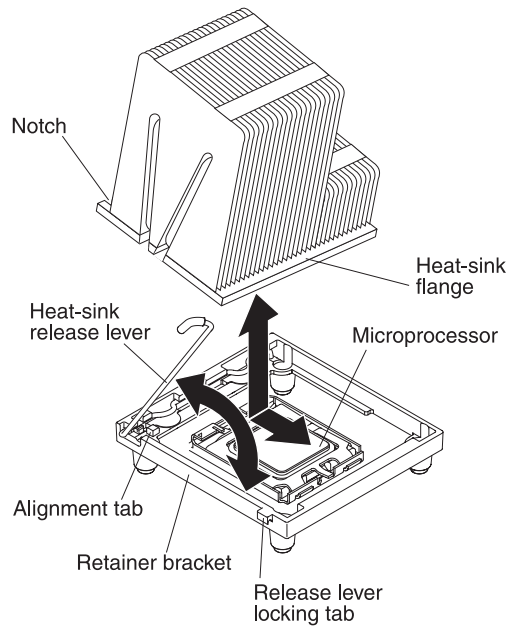
- e. Carefully close the microprocessor release latch to secure the microprocessor in the socket.
9. Install the heat sink.

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

The following illustration shows the bottom surface of the heat sink.

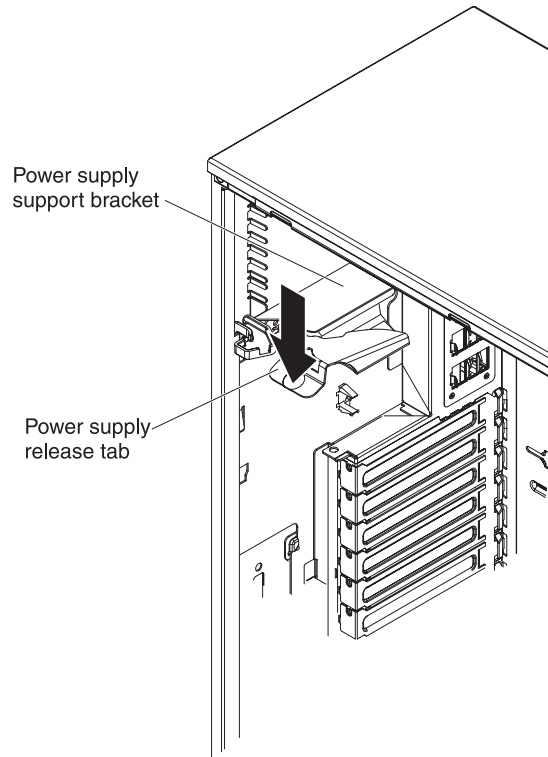


- a. Make sure that the heat-sink release lever is in the open position.
- b. Remove the plastic protective cover from the bottom of the heat sink.
- c. If the new heat sink did not come with thermal grease, (Trained service technician only) apply thermal grease on the microprocessor before you install the heat sink (see the *Problem Determination and Service Guide* for information on applying thermal grease).
- d. Align the heat sink above the microprocessor with the thermal-grease side down.



- e. Tilt the heat sink slightly to the side and slide the heat sink flange underneath the flange of the heat sink retainer bracket.

- f. Press down firmly on the heat sink until it is seated securely.
 - g. Rotate the heat-sink lever to the closed position and hook it underneath the lock tab.
10. Reinstall the air baffle (see “Replace the air baffle” on page 101).
 11. Rotate the power-supply cage assembly back into the server. Press the power-supply cage release tab and rotate the power-supply cage assembly into the chassis.



If you have other options to install or remove, do so now. Otherwise, go to “Completing the installation” on page 100.

Removing a power supply

When you remove or install a power supply, observe the following precautions.

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 11:



CAUTION:

The following label indicates sharp edges, corners, or joints nearby.



Statement 17:



CAUTION:

The following label indicates moving parts nearby.

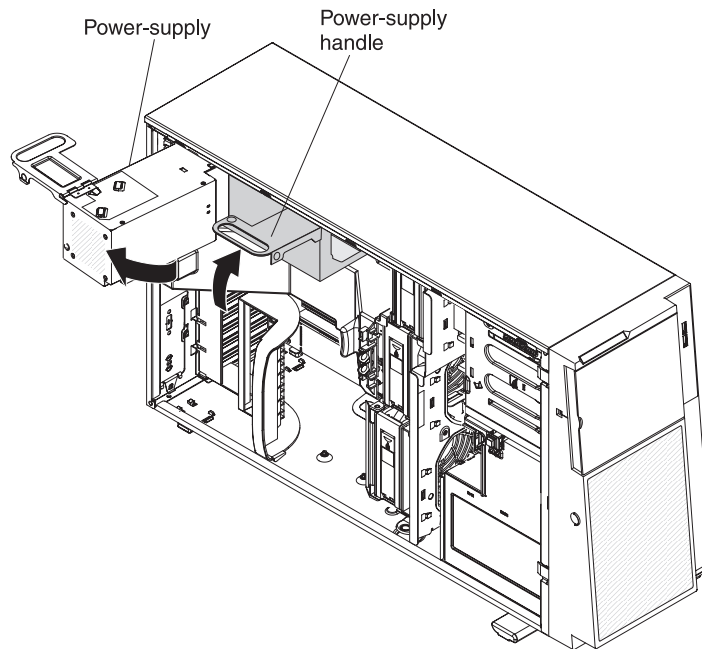


To remove a power supply, complete the following steps.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and all attached devices; then, disconnect all power cords and external cables.
3. Unlock and remove the left-side cover (see “Removing the left-side cover” on page 38).

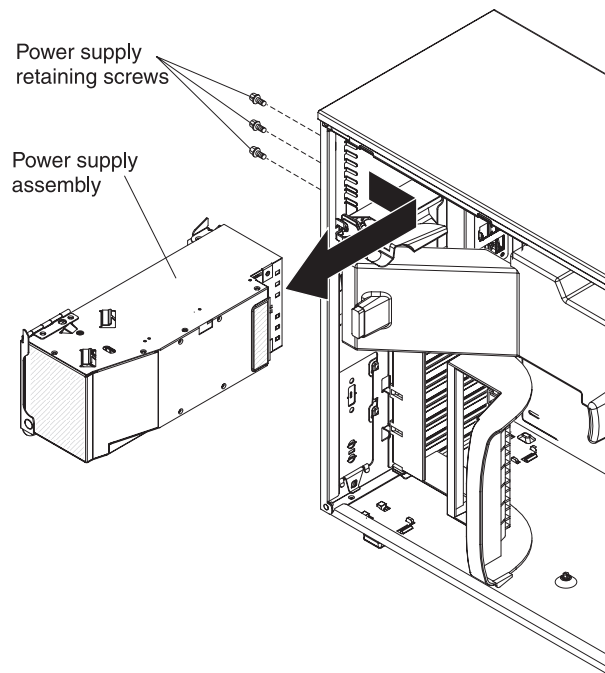
Note: It might be helpful to lay the server on its side for the remainder of this procedure.

4. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.



5. Disconnect the cables from the power supply to the system board and all internal components. Be sure to make a note of the cable routing.

Attention: Support the power supply while you remove the mounting screws. After the screws are removed, the power supply is loose and can damage other components in the server.
6. While you support the power-supply, remove the three screws from the pivot bracket that secure the power supply to the chassis; then, lift the power supply off the chassis. Save the screws to use when you install the replacement power supply.



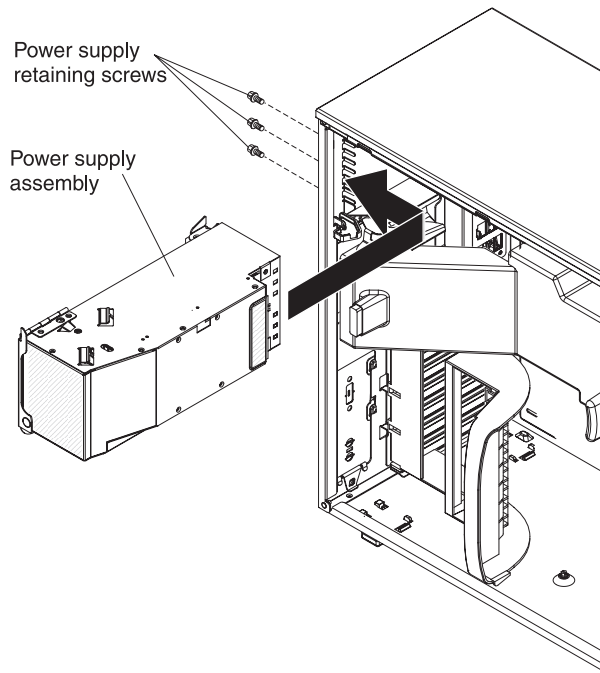
7. If you are instructed to return the power supply, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Installing a power supply

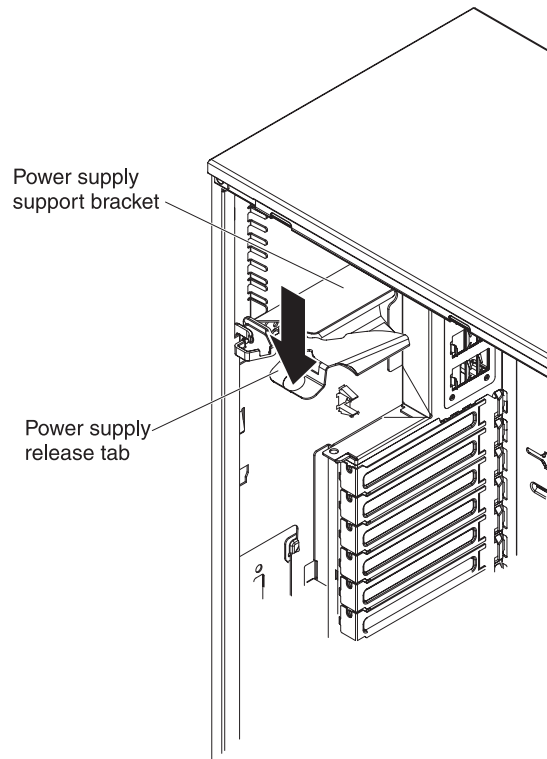
To install a power supply, complete the following steps.

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

1. Align the screw holes in the power supply cage pivot bracket with the corresponding screw holes on the rear of the chassis.



2. While you support the power supply cage, install the three screws that secure the power supply to the chassis.
3. Connect the cables from the power supply to the system board and all internal components.
4. Rotate the power-supply cage assembly back into the server. Press the power-supply cage release tab and rotate the power-supply cage assembly into the chassis.



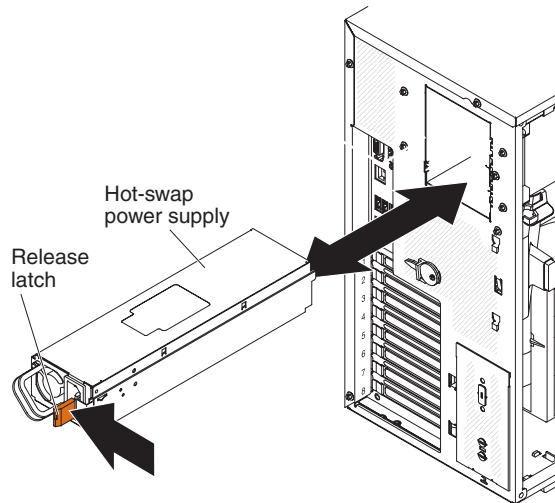
5. Install the left-side cover (see “Replacing the left-side cover” on page 104).
6. Lock the left-side cover.
7. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the server.

Installing a redundant power supply

To install the redundant power, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Remove the left-side cover (see “Removing the left-side cover” on page 38 for more information).

Attention: To ensure proper system cooling, do not leave the cover off the server for more than 2 minutes.
3. Slide the new power supply partially into the empty power-supply bay. Pinch the orange release latch and push the power supply the rest of the way into the bay until it is seated.



4. Install the left-side cover (see “Replacing the left-side cover” on page 104).
5. Connect one end of the new power cord into the connector on the back of power supply, and connect the other end of the power cord to a properly grounded electrical outlet.
6. Make sure that the ac power LED on the top of each power supply is lit, indicating that the power supply is operating correctly. If the server is turned on, make sure that the dc power LED on the top of the power supply is lit also.

Removing a hot-swap fan

Attention:

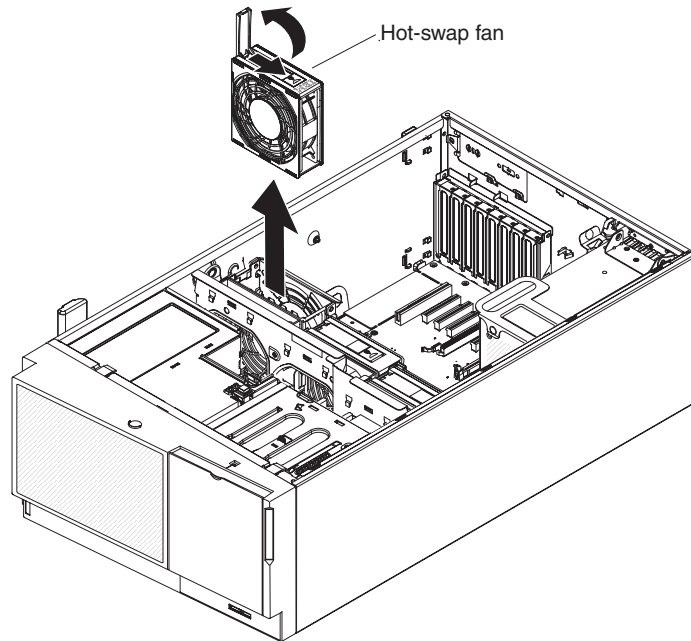
- Replace a hot-swap fan within 30 seconds of removal.
- To ensure proper cooling and airflow, do not operate the server for more than 2 minutes with the left-side cover removed.

To remove a hot-swap fan, complete the following steps.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.

Attention: Static electricity that is released to internal server components when 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.

2. Unlock and remove the left-side cover (see “Removing the left-side cover” on page 38).
3. With your finger, slide the orange release tab on the fan in the direction indicated by the arrow on the top of the fan to unlock the fan handle. Grasp the fan handle and pull the fan out of the fan cage.



4. If you are instructed to return the hot-swap fan, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

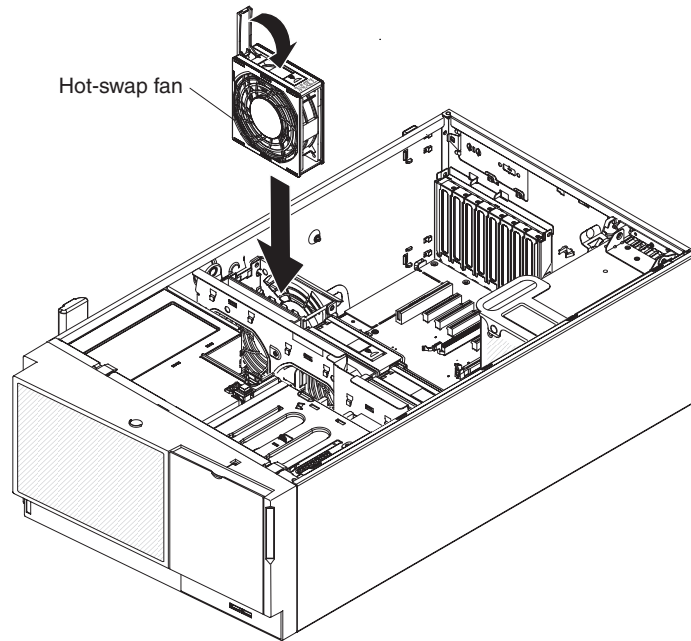
Installing a hot-swap fan

Attention:

- Replace a hot-swap fan within 30 seconds of removal.
- To ensure proper cooling and airflow, do not operate the server for more than 2 minutes with the left-side cover removed.

To install a hot-swap fan, complete the following steps.

1. Touch the static-protective package that contains the hot-swap fan to any unpainted metal surface on the server; then, remove the fan from the package and place it on a static-protective surface.
2. Align the fan over the fan slot and lower fan into the slot in the fan cage assembly.



3. Press down on the fan until it locks into place; then, close the fan handle to the locking position.
4. Install the left-side cover (see “Replacing the left-side cover” on page 104).
5. Lock the left-side cover.

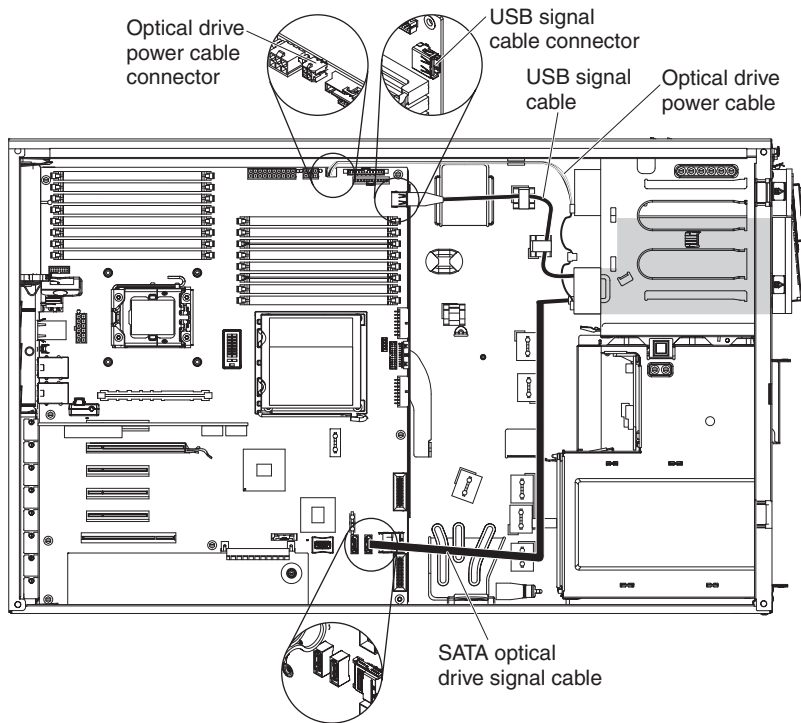
Internal cable routing and connectors

The server uses cables to connect SATA attached, simple-swap SATA, hot-swap SATA and hot-swap SAS devices to the power supply and to the system board.

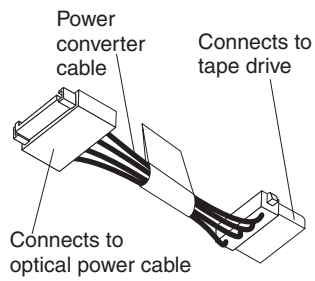
Review the following information before connecting power and signal cables to internal drives:

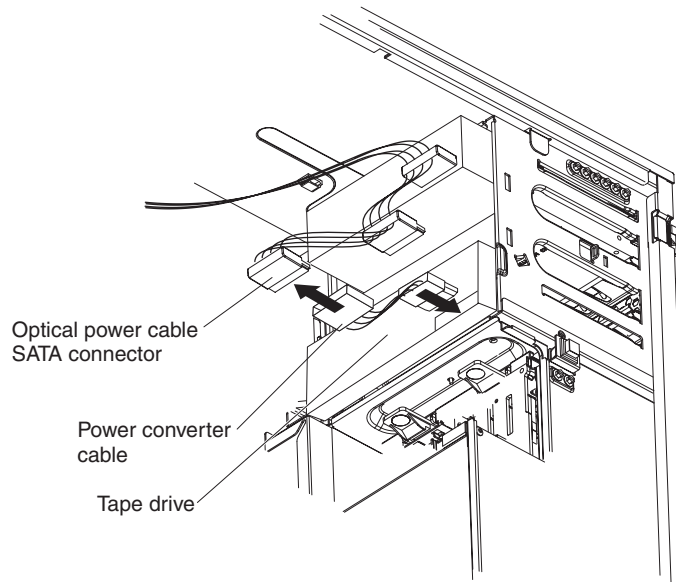
- The drives that are preinstalled in the server come with power and signal cables attached. If you replace any drives, remember which cable is attached to which drive.
- When you route a cable, make sure that it does not block the airflow to the rear of the drives or over the microprocessor or DIMMs.

You can install either a USB or SATA tape drive in the server. The following illustration shows the internal cable routing and connectors for both the USB tape drive and the SATA tape drive. It also shows the internal power cable for the optical drives.

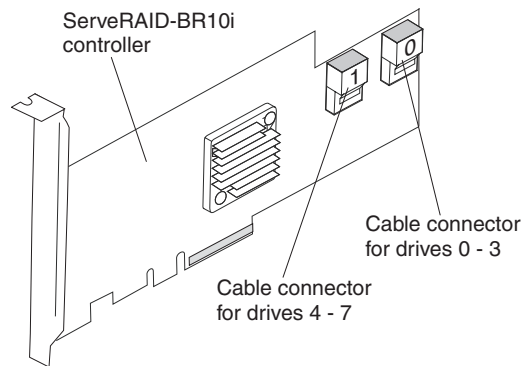


The following illustrations show the cabling information for installing the SATA to traditional power converter cable when you install an RDX internal USB tape drive in the server. This cable comes with the server in the plastic bag with the drive rails.

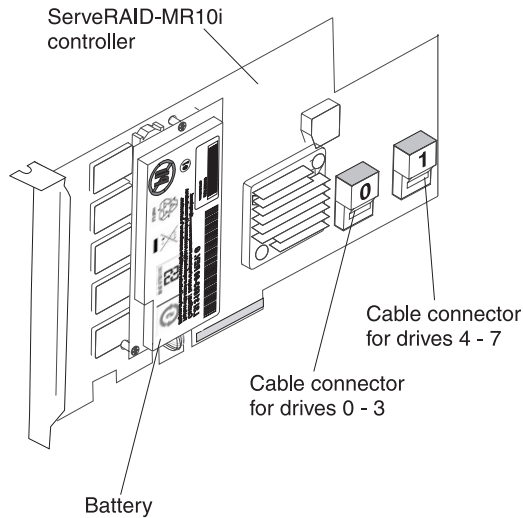




The following illustration shows the cable connectors on the ServeRAID-BR10i controller.



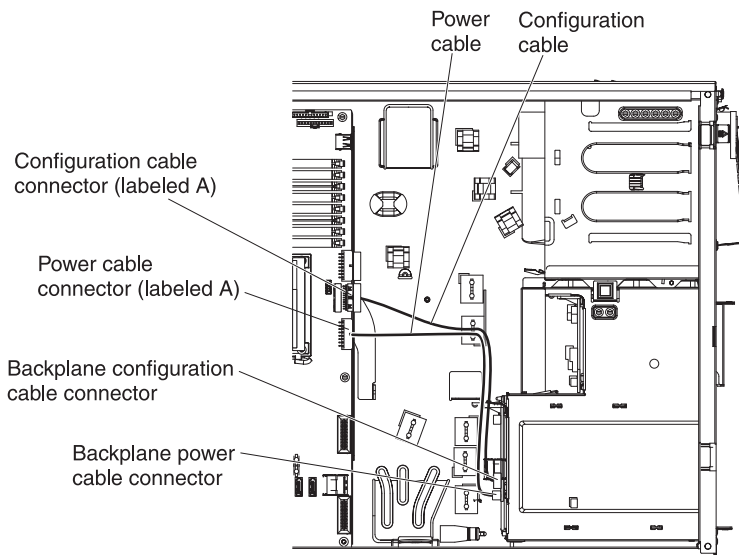
The following illustration shows the cable connectors on the ServeRAID-MR10i controller.



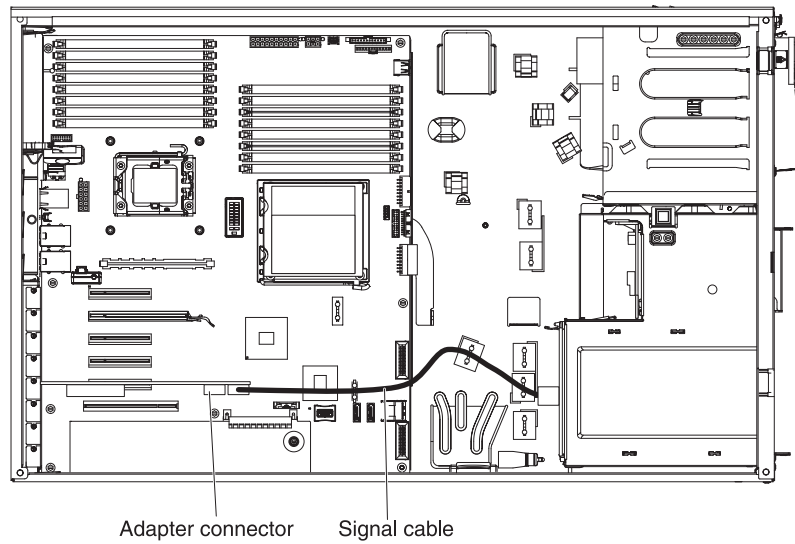
Review the following information before connecting power, configuration, and signal cables:

1. For server models with four 3.5-inch hot-swap hard disk drives.

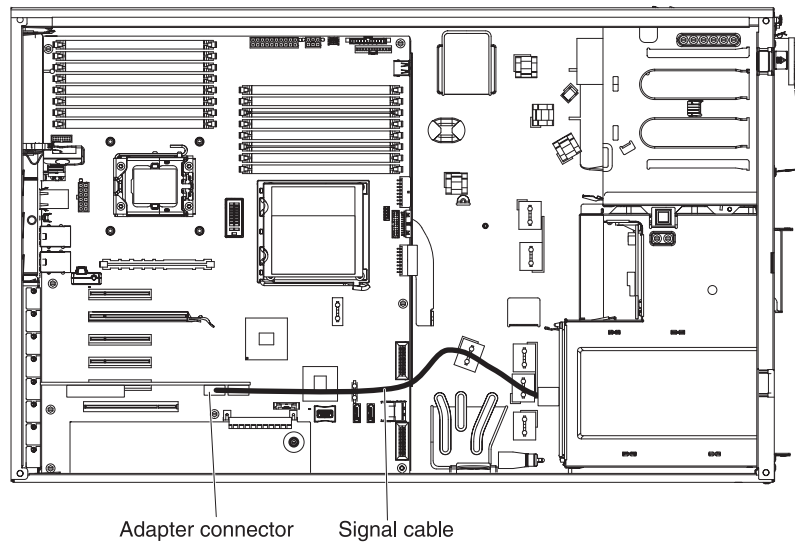
- The following illustration shows the internal power and configuration cable routing.



- The following illustration shows the internal signal cable routing for installing a ServeRAID-BR10i SAS/SATA adapter.

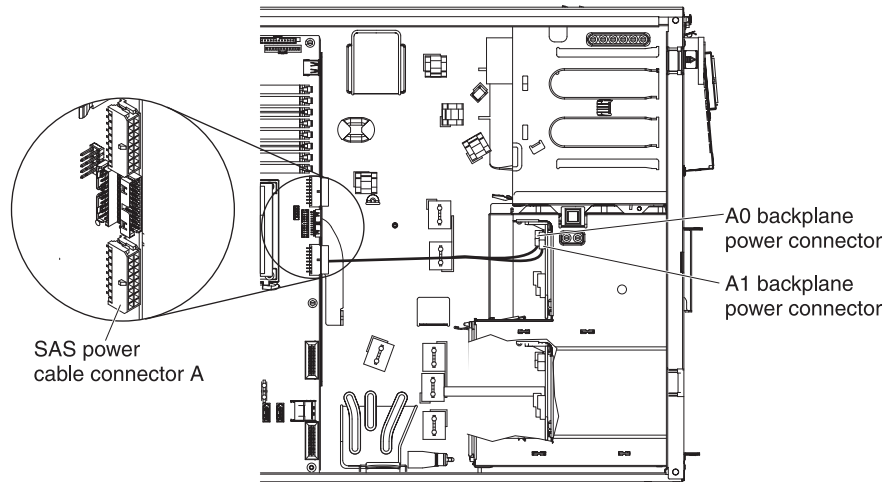


- The following illustration shows the internal signal cable routing for installing a ServerRAID-MR10i SAS/SATA adapter.

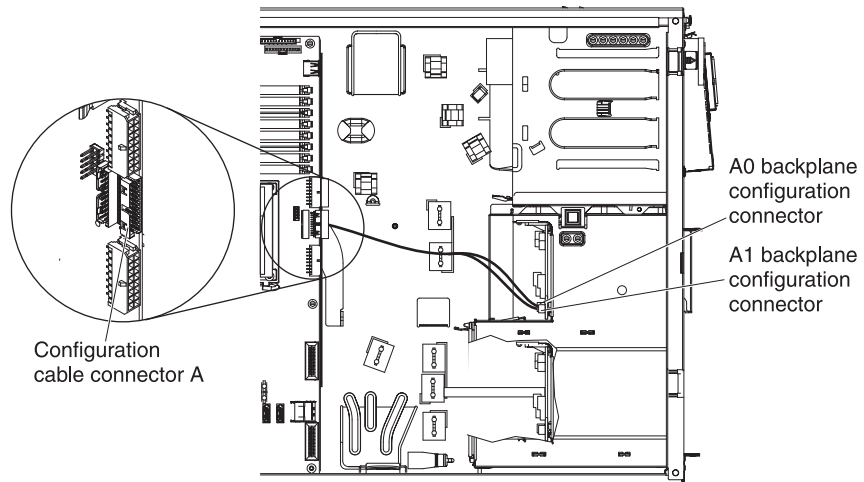


2. For server models with eight 2.5-inch hot-swap hard disk drives.

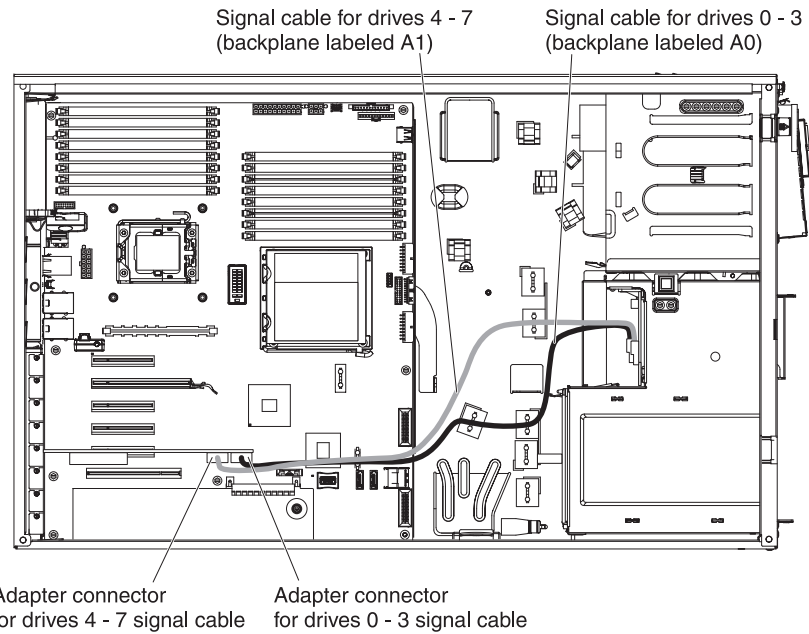
- The following illustration shows the internal power cable routing.



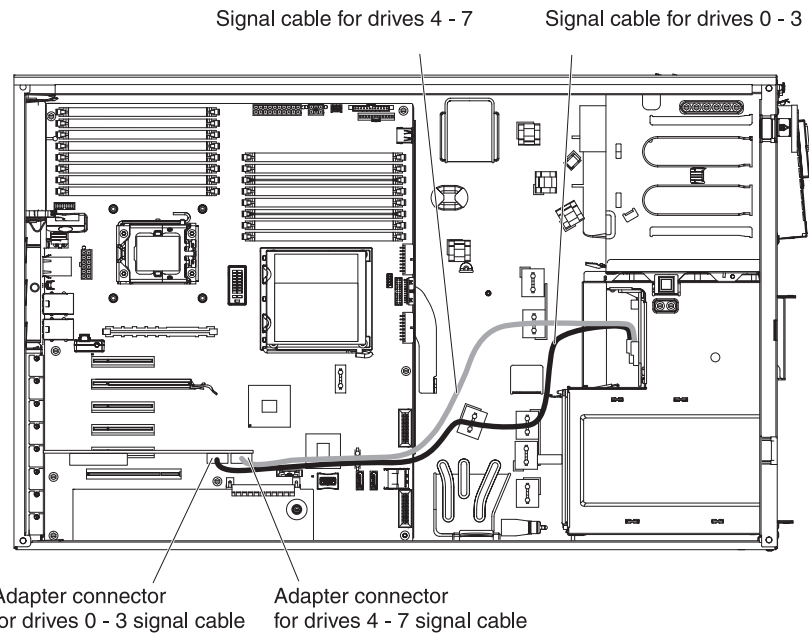
- The following illustration shows the internal configuration cable routing.



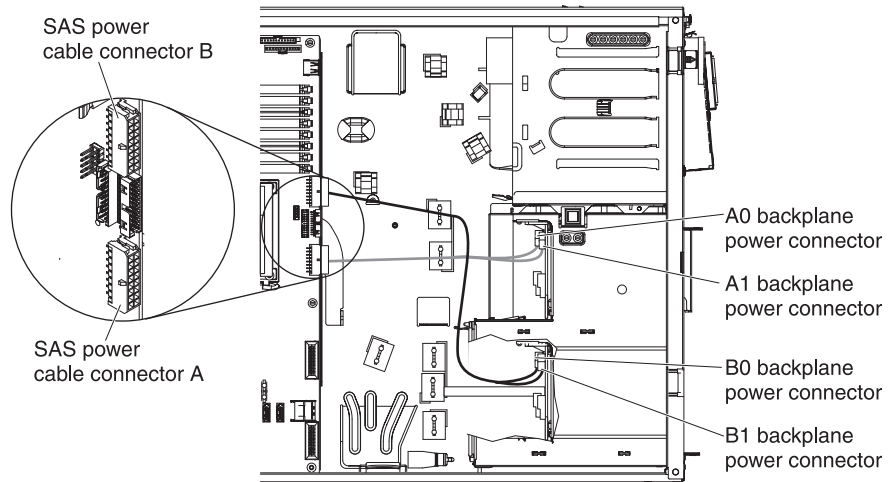
- The following illustration shows the internal signal cable routing for installing a ServeRAID-BR10i SAS/SATA adapter.



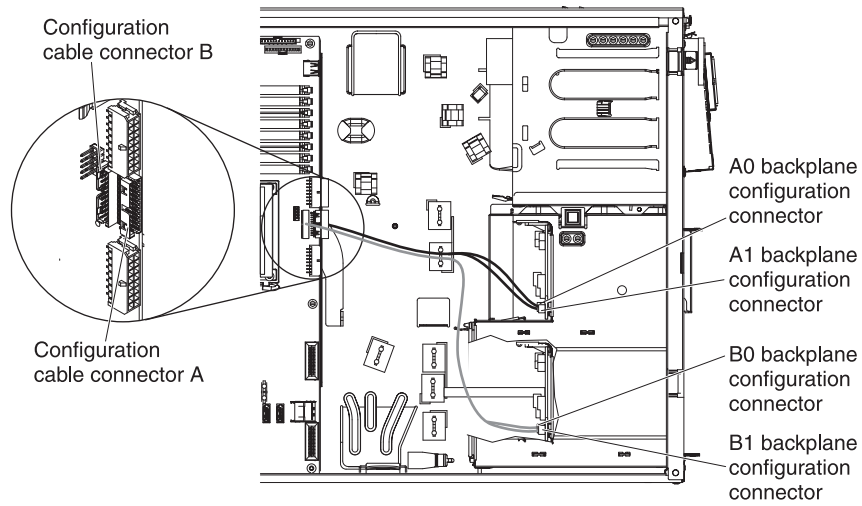
- The following illustration shows the internal signal cable routing for installing a ServerRAID-MR10i SAS/SATA adapter.



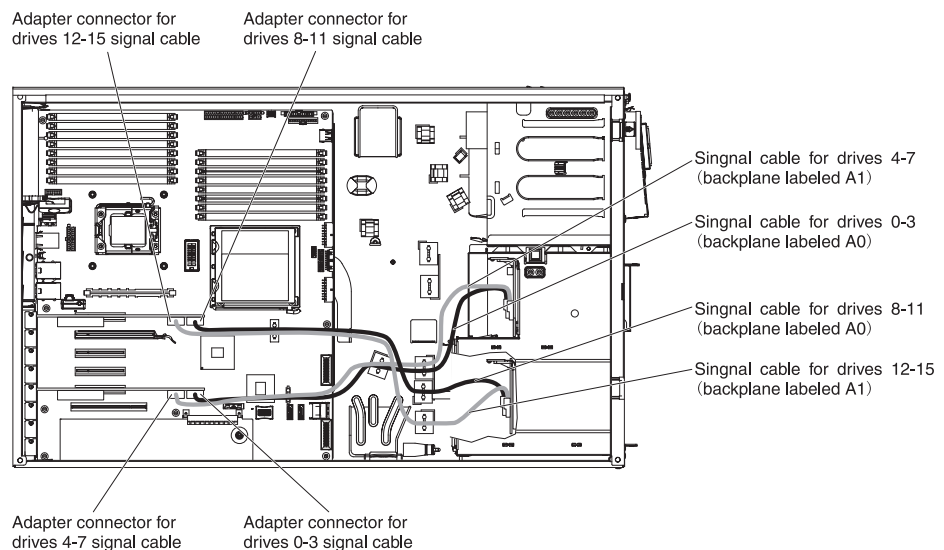
3. **For server models with sixteen 2.5-inch hot-swap hard disk drives.**
 - The following illustration shows the internal power cable routing.



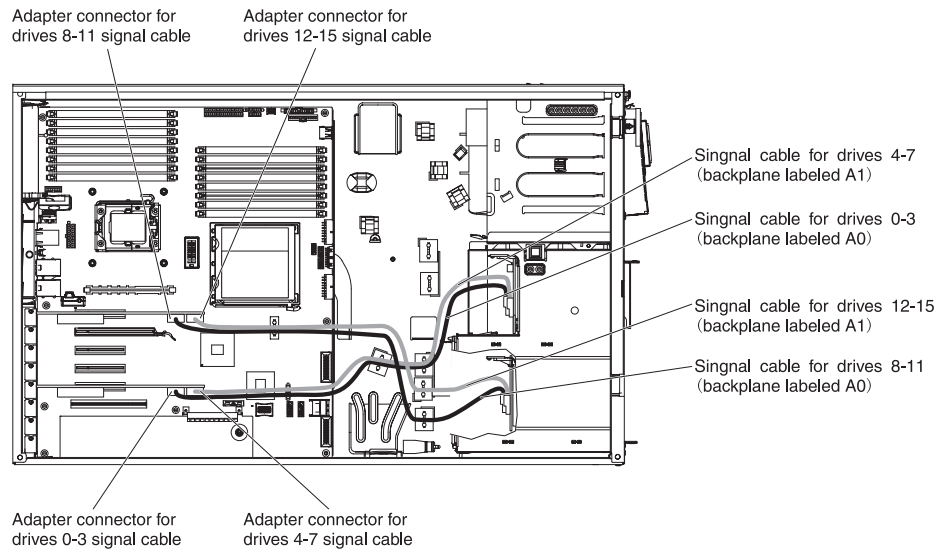
- The following illustration shows the internal configuration cable routing.



- The following illustration shows the internal signal cable routing for installing a ServerRAID-BR10i SAS/SATA adapter.

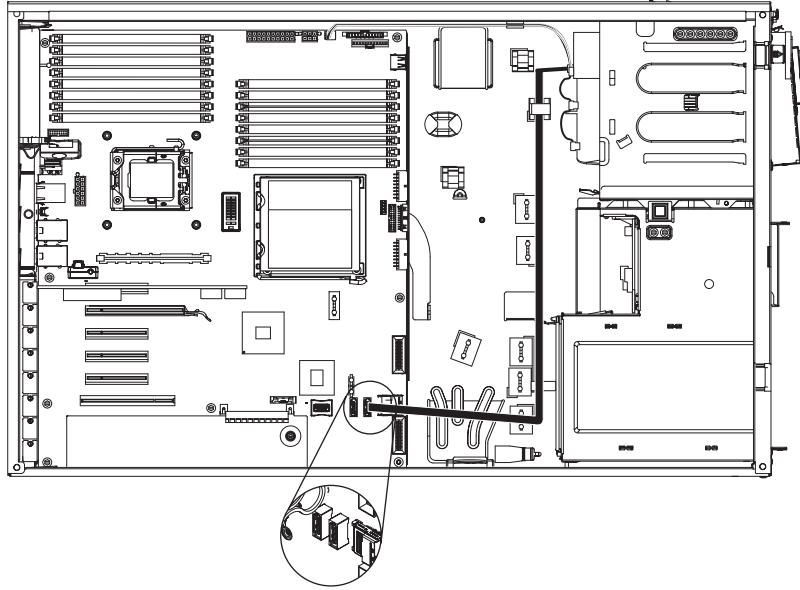


- The following illustration shows the internal signal cable routing for installing a ServeRAID-MR10i SAS/SATA adapter.



The following illustration shows the internal SATA and power cable routing and the connectors from the DVD drive to the system board.

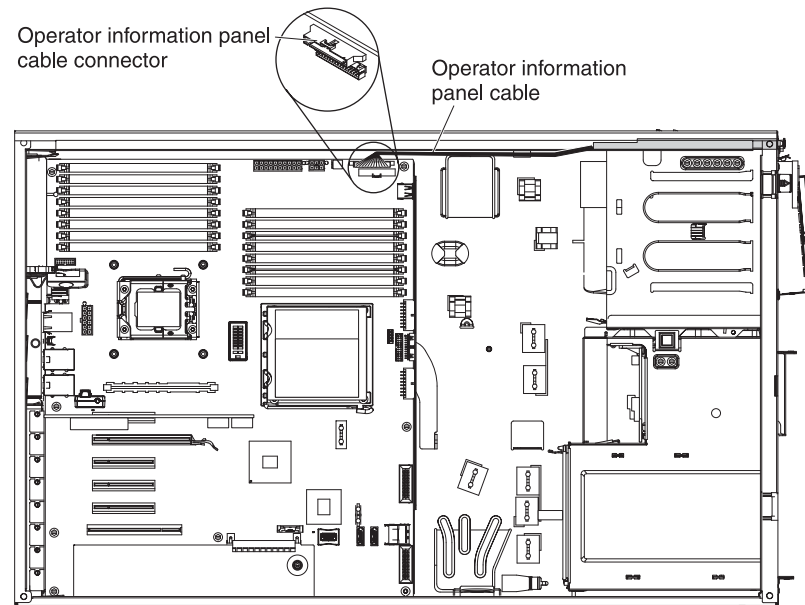
Note: Do not disconnect the cable by using excessive force. Failing to remove the cable properly may damage the connectors on the system board. Any damage to the connectors may require replacing the system board.



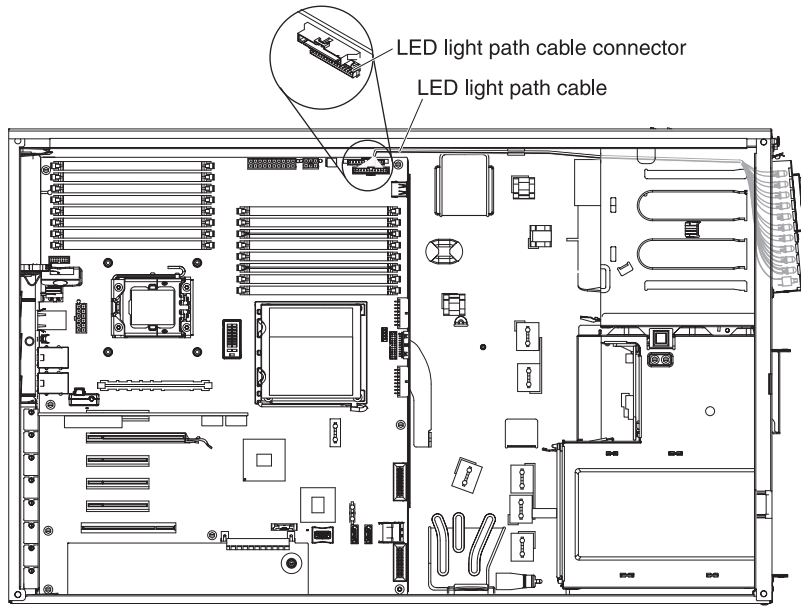
The following illustration shows the internal cable routing and connectors from the operator information panel to the system board.

Notes:

1. To remove the operator information panel cable, slightly press the cable toward the chassis; then, pull to remove the cable from the connector on the system board. Pulling the cable out of the connector by excessive force might cause damage to the cable or connector.
2. To connect the operator information panel cable on the system board, press evenly on the cable. Pressing on one side of the cable might cause damage to the cable or connector.
3. Failing to install or remove the cable with care may damage the connectors on the system board. Any damage to the connectors may require replacing the system board.



The following illustration shows the internal cable routing and connectors from the light path diagnostics LED panel to the system board.



Installing the virtual media key

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

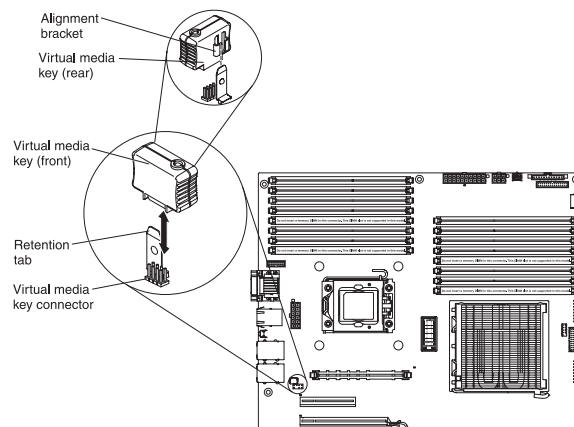
1. Read the safety information that begins on page vii and “Installation guidelines” on page 34.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Unlock the left-side cover.
4. Remove the left-side cover (see “Removing the left-side cover” on page 38).
5. Carefully lay the server on its side so that it is lying flat and facing up.

Note: Be careful and do not drop the server.

6. Rotate the rear adapter-retention bracket to the open (unlocked) position.
7. Remove any adapters that prevent you from accessing the virtual media key connector on the system board

Note: Make a note of the cabling for later when you reinstall the adapters.

8. Align the alignment bracket on the rear of the key with the retention tab on the system board; then, slide the key down into the virtual media key connector on the system board until it is firmly seated in place.



9. Reinstall any adapters that you removed earlier.
10. Rotate the rear adapter retention bracket to the closed (locked) position.
11. Reinstall the left-side cover (see “Replacing the left-side cover” on page 104).
12. Lock the left-side cover.
13. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the server.

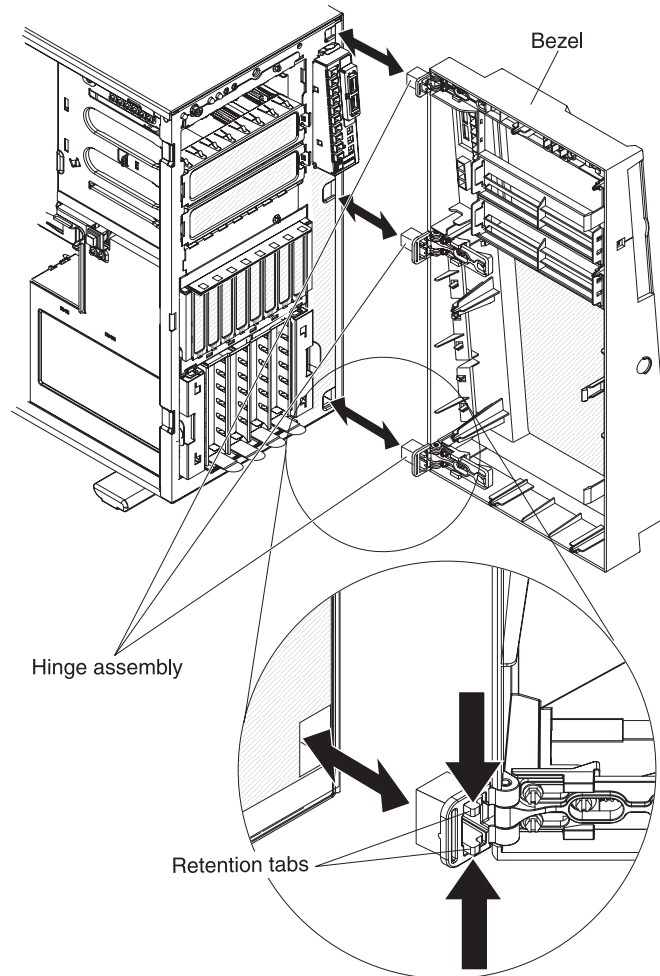
Completing the installation

To complete the installation, you must replace the bezel, reinstall the left-side cover, and connect all the cables and, for certain options, run the Setup utility. Follow the instructions in this section.

Replacing the bezel

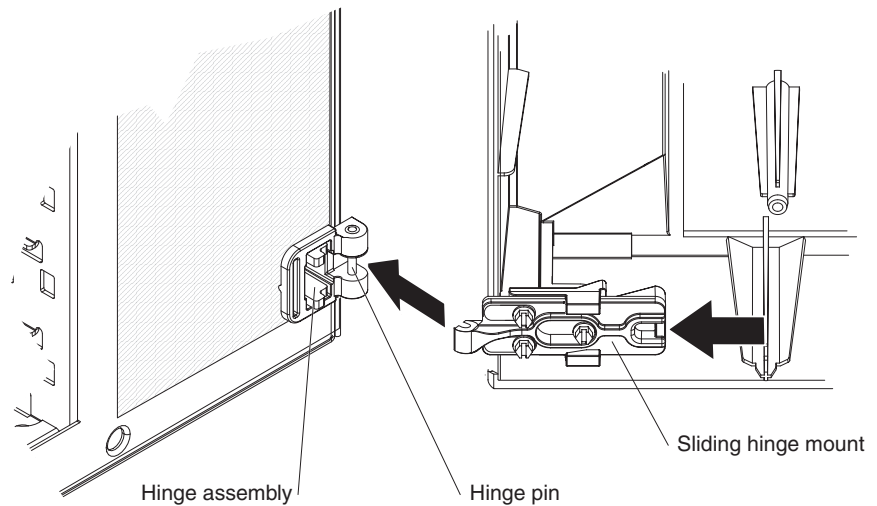
To replace the bezel, complete the following steps:

1. If you removed the bezel from the chassis, align the hinge assembly with the hinge holes on the chassis.



2. Push the hinges into the holes on the chassis until they snap into place.
3. If however, the bezel was removed by detaching the sliding hinge mount from the hinge assembly (using the breakaway method as the bezel was designed to do), complete the following steps to reattach the bezel:

- a. Press in on the rear of the sliding hinge mount until it extends beyond the edge of the bezel, and hold it in place.



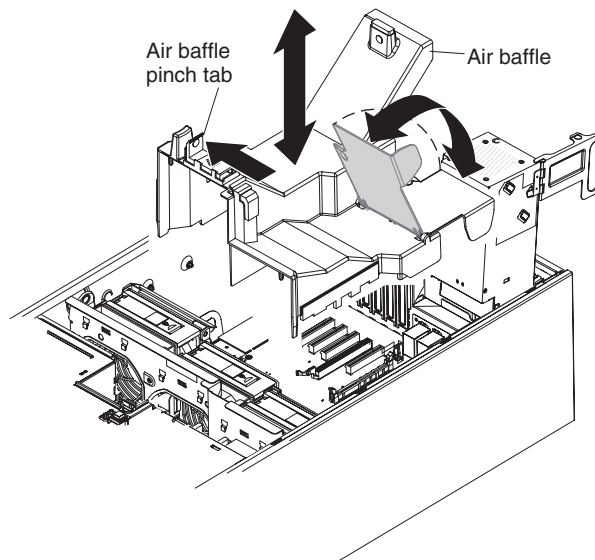
- b. Align the sliding hinge mount with the hinge pin on the hinge assembly on the chassis.
 - c. Press the sliding hinge mount against the hinge pin until the sliding hinge mount snaps onto the hinge pin.
4. Close the bezel.

Note: When you lock the server left-side cover, it locks both the cover and the bezel.

Replace the air baffle

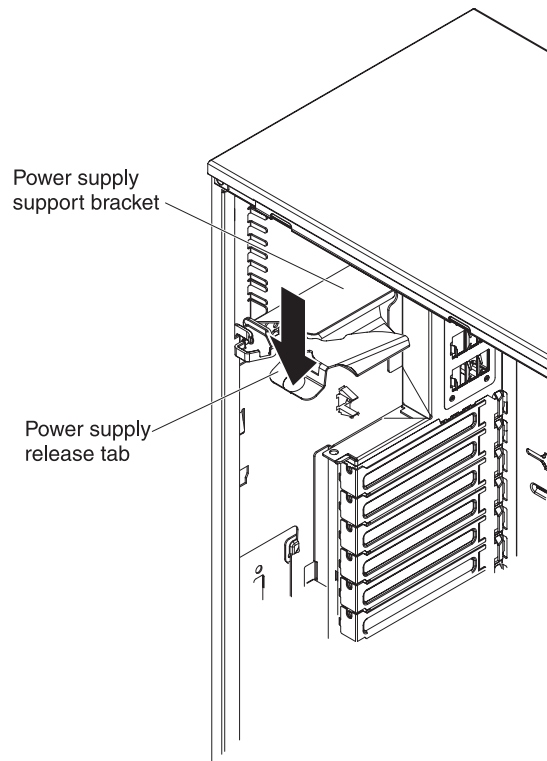
To replace the air baffle, complete the following steps:

1. Align the air baffle pins with the holes on the fan cage and the pin hole on the rear of the chassis.



2. Lower the air baffle into the server until the air baffle is seated firmly.

3. Press the power supply release tab and rotate the power supply back into the server.



Installing the fan cage assembly

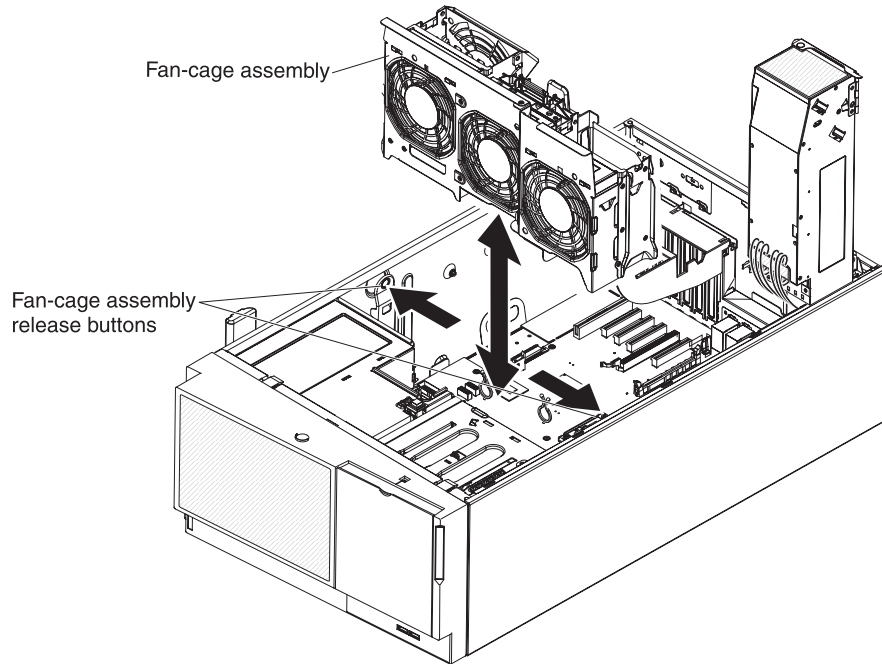
Attention:

- Replace a hot-swap fan within 30 seconds of removal.
- To ensure proper cooling and airflow, do not operate the server for more than 30 minutes with the left-side cover removed.

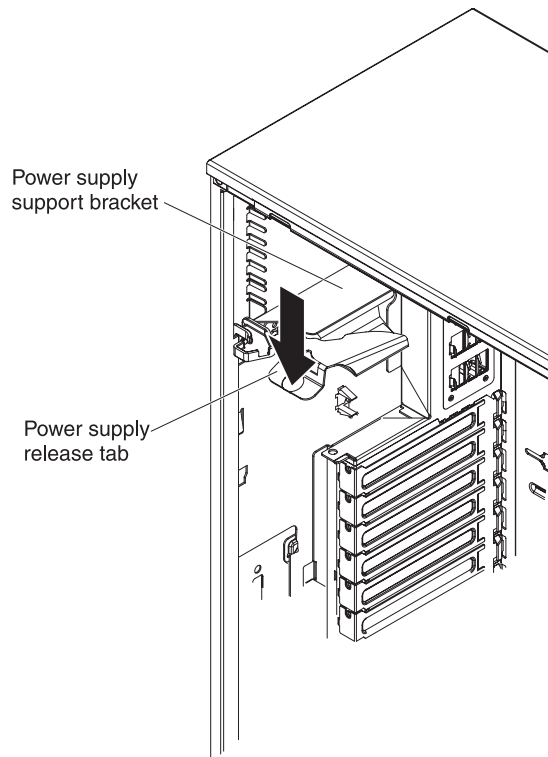
To install the fan cage assembly, complete the following steps.

1. Align the fan cage assembly with the guide rails on the sides of the chassis.

Note: Make sure that both release buttons click into place.

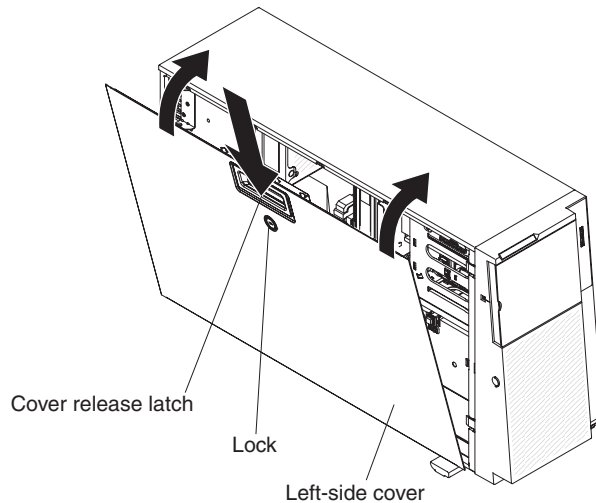


2. Slide the fan cage assembly into the chassis and press firmly until the fan cage is seated firmly in place.
3. Install the air baffle (see “Replace the air baffle” on page 101).
4. Rotate the power-supply cage assembly back into the server. Press the power-supply release tab and rotate the power-supply cage assembly into the chassis.



Replacing the left-side cover

If you removed the left-side cover, reinstall it.



To reinstall the left-side cover, complete the following steps:

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server. Also, make sure that all internal cables are correctly routed.
2. Insert the bottom edges of the cover onto the inside lip of the chassis and rotate the cover toward the server and push it closed to lock it into place.
3. Lock the left-side cover.

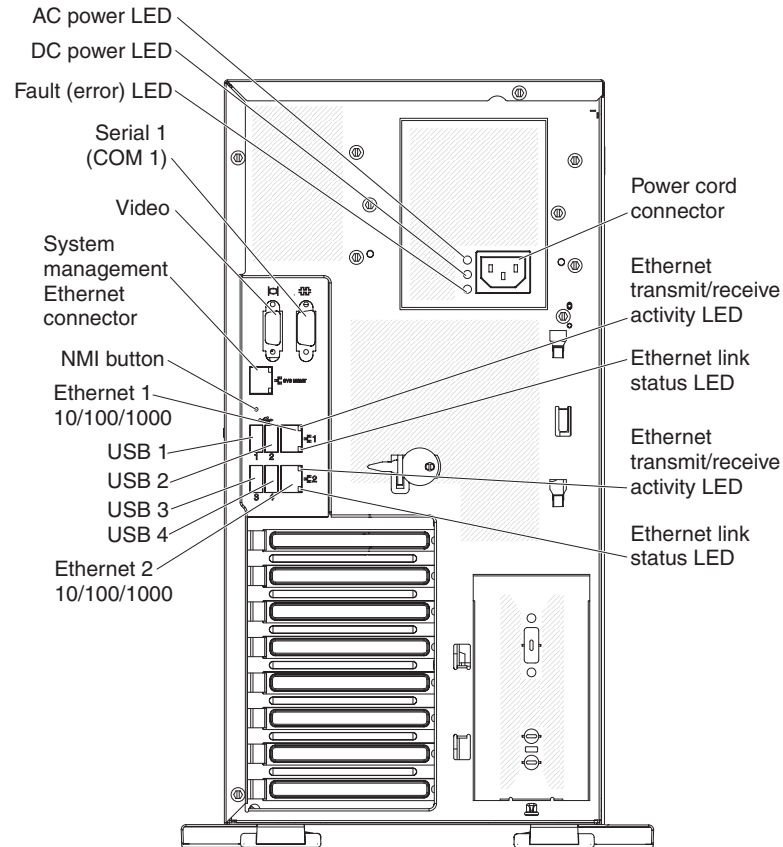
Note: When you lock the server left-side cover, it locks both the cover and the bezel.

Connecting the cables

Attention: To prevent damage to equipment, connect the power cords last.

If the server cables and connector panel have color-coded connections, match the color of the cable end with the color of the connector. For example, match a blue cable end with a blue panel connector, a red cable end with a red connector, and so on.

The following illustration shows the input/output (I/O) connectors on the rear of the server.



For additional cabling information, see “Power and signal cables for internal drives” on page 71 and the ServeRAID adapters installation instructions in this document.

Updating the server configuration

When you start the server for the first time after you add or remove an internal option or an external 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. For additional information, see “Using the Setup utility” on page 108.

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

If the server has a ServeRAID adapter and you have installed or removed a hard disk drive, see the ServeRAID documentation for information about reconfiguring the disk arrays.

Connecting external devices

If you install a supported optional adapter, you can attach external devices to the server.

To attach an external device, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 34, and the documentation that comes with the device.
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the device to prepare it for installation and to connect it to the server.

Chapter 3. Configuring the server

The following configuration programs and utilities 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 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 108.

- **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 113.

- **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 113.

- **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 115.

- **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 “Enabling the remote presence feature” on page 117.

- **Ethernet controller configuration**

For information about configuring the Ethernet controller, see “Configuring the Broadcom Gigabit Ethernet controller” on page 119.

- **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 LSI Configuration Utility program” on page 119

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

Table 13. 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-BR10i adapter (LSI 1068) installed	LSI Utility (Setup utility, press Ctrl+C), ServerGuide	MegaRAID Storage Manager (for monitoring storage only)
ServeRAID-MR10i adapter (LSI 1078) 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 121.

Using the Setup utility

Use the Unified Extensible Firmware Interface (UEFI), formerly BIOS, Setup Utility program 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.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

3. Select settings to view or change.

Setup utility menu choices

The following choices are on the Setup utility main menu for the UEFI. 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 microprocessors, 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, the SAS/SATA controller, SATA optical drive channels, and PCI slots. 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 view or change power capping to control consumption, processors, and performance states.

- **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.
 - **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 iSCSI, PXE, and network devices.
- Note:** The configuration forms for UEFI 2.1 and greater compliant add-on network devices might be located here.
- **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.
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 error messages in the system event logs. You can use the arrow keys to move between pages in the error log.

The system event logs contain all event and error messages that have been generated during POST, by the systems-management interface handler, and by the system service processor (IMM). Run the diagnostic programs to get more information about error codes that occur. For additional information about running the diagnostic programs and viewing the logs, see the *Problem Determination and Service Guide* on the IBM System x Documentation CD.

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

- **System Event Log**

Select this choice to view the IMM system event log.

- **Clear System Event Log**

Select this choice to clear the IMM system event log.

- **User Security**

Select this choice to set, change, or clear passwords. See “Passwords” on page 112 for more information.

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

- **Set Power-on Password**

Select this choice to set or change a power-on password. See “Power-on password” on page 112 for more information.

- **Clear Power-on Password**

Select this choice to clear a power-on password. See “Power-on password” on page 112 for more information.

- **Set Administrator Password**

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

Select this choice to set or change 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 112.

- **Clear Administrator Password**

Select this choice to clear an administrator password. For more information, see “Administrator password” on page 112.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. 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.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

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 can type either 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 up to seven characters (A - Z, a - z, and 0 - 9) for the password.

If you forget the power-on password, you can regain access to the server in the following way:

- If an administrator password is set, type the administrator password at the password prompt. Start the Setup utility and reset the power-on password.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

Administrator password

An administrator password is intended to be used by a system administrator; it limits access to the full Setup utility menu. You can use any combination of up to seven characters (A - Z, a - z, and 0 - 9) for the password.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. 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 IBM System x Server Firmware (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* contains a setup and installation program that is designed for your server. The ServerGuide program detects the server model and optional hardware devices that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically. You can download a free image of the *ServerGuide Setup and Installation CD* or purchase the CD from the ServerGuide fulfillment Web site at <http://www.ibm.com/systems/management/serverguide/sub.html>. To download the free image, 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.

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 x3400 M2**.
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.

The IMM supports the following basic systems-management features:

- Environmental monitor with fan speed control for temperature, voltages, fan failure, and power supply failure.
- Light path diagnostics LEDs indicators to report errors that occur with fans, power supplies, microprocessor, hard disk drives, and system errors.
- 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).

- Automatic microprocessor disable on failure and restart in a two-microprocessor configuration when one microprocessor signals an internal error. When one of the microprocessors fail, the server will disable the failing microprocessor and restart with the other microprocessor.
- 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 server 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.
- Serial port redirection over Telnet or SSH.
- Serial over LAN (SOL).
- Active Energy Manager.
- 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.

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

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 1600 x 1200 at 85 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 option connectors” on page 32).
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.
Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.
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 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 PASSWORD (passw0rd with a zero, not a 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 Broadcom Gigabit Ethernet Utility program

The Broadcom 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.

To enable the Broadcom Gigabit Ethernet Utility program, complete the following steps:

1. From the Setup utility main menu, select **Devices and I/O Ports** and press Enter.
2. Select **Enable/Disable onboard device(s)** and press Enter.
3. Select **Ethernet** and press Enter.
4. Select **Enable** and press Enter.
5. Exit to the main menu and select **Save Settings** and press Enter.

Configuring the Broadcom Gigabit Ethernet controller

The Ethernet controllers are integrated on the system board. They provides an interface for connecting to a 10-Mbps, 100-Mbps, or 1-Gbps network and provides full duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet ports in the server supports 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 operates at that rate and mode.

You do not have to set any jumpers or configure the controller. However, you must install a device driver to enable the operating system to address the controller. 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 x3400 M2** and click **Go**.

Using LSI Configuration Utility program

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 or optional ServeRAID-MR10is VAULT SAS/SATA controller with an encryption 1078 DE chip, they provide RAID levels 0, 1, 5, 6, 10, 50, and 60 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.

Attention: If you set an administrator password and then forget it, there is no way to change, override, or remove it. You must replace the system board.

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.

The Update*Xpress* System Pack Installer

The Update*Xpress* System Pack Installer detects supported and installed device drivers and firmware in the server and installs available updates. For additional information and to download the Update*Xpress* System Pack Installer, go to the System x and BladeCenter Tools Center at <http://publib.boulder.ibm.com/infocenter/toolctr/v1r0/index.jsp> and click **Update*Xpress* System Pack Installer**.

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 website at <http://www.ibm.com/supportportal/> 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/supportportal/> 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 website 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/supportportal/>.

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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Microsoft, Windows, and Windows NT are trademarks of Microsoft Corporation in the United States, other countries, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries.

Important notes

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

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

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

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

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

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 14. Limits for particulates and gases

Contaminant	Limits
Particulate	<ul style="list-style-type: none">The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2¹.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	<ul style="list-style-type: none">Copper: Class G1 as per ANSI/ISA 71.04-1985³Silver: 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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Telecommunication regulatory statement

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.

Electronic emission notices

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

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

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This product is in conformity with the protection requirements of EU Council Directive 2004/108/EC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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

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

European Community contact:
IBM Technical Regulations
Pascalstr. 100, Stuttgart, Germany 70569
Telephone: 0049 (0)711 785 1176
Fax: 0049 (0)711 785 1283
E-mail: tjahn@de.ibm.com

Germany Electromagnetic Compatibility Directive

Deutschsprachiger EU Hinweis:

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

Dieses Produkt entspricht den Schutzanforderungen der EU-Richtlinie 2004/108/EG zur Angleichung der Rechtsvorschriften über die elektromagnetische Verträglichkeit in den EU-Mitgliedsstaaten und hält die Grenzwerte der EN 55022 Klasse A ein.

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Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

Dieses Produkt entspricht dem "Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG)". Dies ist die Umsetzung der EU-Richtlinie 2004/108/EG in der Bundesrepublik Deutschland.

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) (bzw. der EMC EG Richtlinie 2004/108/EG) für Geräte der Klasse A

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen. Verantwortlich für die Konformitätserklärung des EMVG ist die IBM Deutschland GmbH, 70548 Stuttgart.

Generelle Informationen:

Das Gerät erfüllt die Schutzanforderungen nach EN 55024 und EN 55022 Klasse A.

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Japan Electronics and Information Technology Industries Association (JEITA) statement

高調波ガイドライン適合品

Japanese Electronics and Information Technology Industries Association (JEITA)
Confirmed Harmonics Guideline (products less than or equal to 20 A per phase)

Korea Communications Commission (KCC) statement

이 기기는 업무용(A급)으로 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

This is electromagnetic wave compatibility equipment for business (Type A). Sellers and users need to pay attention to it. This is for any areas other than home.

Russia Electromagnetic Interference (EMI) Class A statement

ВНИМАНИЕ! Настоящее изделие относится к классу А. В жилых помещениях оно может создавать радиопомехи, для снижения которых необходимы дополнительные меры

People's Republic of China Class A electronic emission statement

声 明

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Part Number: 00D3187

Printed in USA

(1P) P/N: 00D3187

