

IBM System x3500 M3 Type 7380



Installation and User's Guide

IBM System x3500 M3 Type 7380



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 129, and the *IBM Safety Information, Environmental Notices and User Guide* documents on the *IBM Documentation CD*, and the *Warranty Information* document that comes with the server.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Important:

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

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

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

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

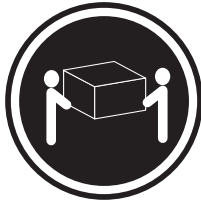
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

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

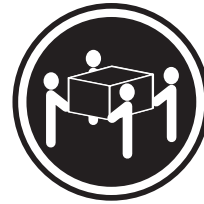
Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

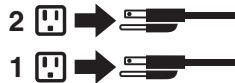
Use safe practices when lifting.

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.



Attention: This product 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 x3500 M3 server

This *Installation and User's Guide* contains instructions for setting up your IBM System x3500 M3 Type 7380 server, instructions for installing optional devices, and instructions for starting and configuring the server. For diagnostic and troubleshooting information, see the *Problem Determination and Service Guide* that is on the IBM *Documentation CD*.

The IBM® System x3500 M3 Type 7380 server is a 5U¹-high high performance server. It can be upgraded to a symmetric multiprocessing (SMP) server through a microprocessor upgrade. It is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and large amounts of reliable data storage.

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 Information* that comes with the server.

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

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

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

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/>.

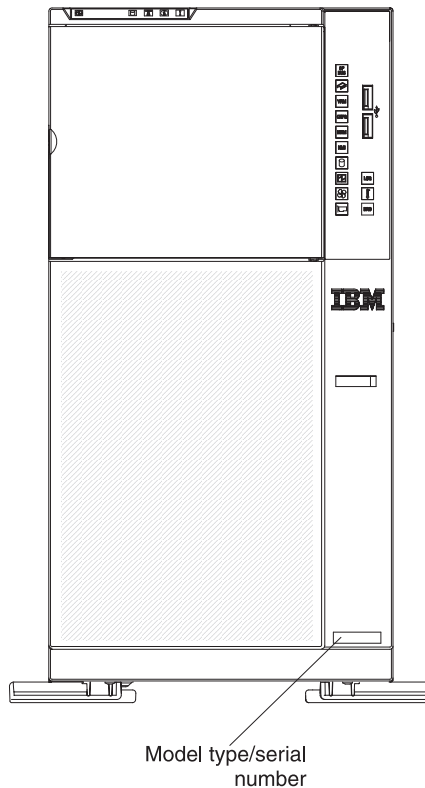
1. Racks are measured in vertical increments of 4.45 cm (1.75 inches) each. Each increment is called a "U." A 1-U-high device is 1.75 inches tall.

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. You will need this information when you register the server with IBM.

Product name	IBM System x3500 M3
Machine type	7380
Model number	_____
Serial number	_____
Key serial number	_____
Key manufacturer	_____
Key phone number	_____

The model number and serial number are on labels on the bottom of the server and on the front, visible through the bezel, as shown in the following illustration.



Important: The server keys cannot be duplicated by a locksmith. If you lose them, order replacement keys from IBM by reporting the key serial number which is on the lock ring.

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

The IBM Documentation CD

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

Hardware and software requirements

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

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

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Ctrl+F to use the Acrobat search function, or 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, 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 *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 *Documentation* CD. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

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

The System x and xSeries 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 comes 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 x3500 M3** and click **Continue**.

Notices and statements in this document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information* document, which is on the IBM *Documentation* CD. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate potential damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage might occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Features and specifications

The following information is a summary of the features and specifications of the server. Depending on the 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"> Intel Xeon up to six-core with integrated memory controller and Quick Path Interconnect (QPI) architecture Designed for LGA 1366 socket Scalable up to twelve cores 32 KB instruction cache, 32 KB data cache, and 4MB, 8 MB and 12MB cache that is shared among the cores Support for up to two microprocessors, second microprocessor with pluggable VRM Support for Intel Extended Memory 64 Technology (EM64T) <p>Note:</p> <ul style="list-style-type: none"> Do not install an Intel Xeon™ 5500 series microprocessor and an Xeon™ 5600 series microprocessor in the same server. 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"> Sixteen DIMM connectors (eight per microprocessor) Minimum: 1 GB Note: If you install a ServeRAID-M1015 SAS/SATA adapter, make sure at least 2 GB of memory is installed in the server before you run DSA from a bootable CD. Maximum: 192 GB <ul style="list-style-type: none"> 48 GB using unbuffered DIMMs (UDIMMs) 192 GB using registered DIMMs (RDIMMs) Type: Registered or unbuffered ECC double-data-rate 3 (DDR3) 800, 1066, and 1333 MHz DIMMs only RDIMMs sizes: 1 GB, 2 GB, 4 GB, 8 GB, and 16 GB single-rank, dual-rank or quad rank UDIMMs sizes: 1 GB, 2 GB and, 4 GB single-rank or dual-rank Chipkill supported 	<p>Drives:</p> <ul style="list-style-type: none"> SATA: <ul style="list-style-type: none"> DVD (standard) DVD/CD-RW (optional) Maximum of two devices can be installed Diskette (optional): External USB 1.44 MB Supported hard disk drives: <ul style="list-style-type: none"> Serial Attached SCSI (SAS) <p>Expansion bays:</p> <ul style="list-style-type: none"> Twenty-four 2.5-inch HDD bays (one optical DVD drive) <p>Note:</p> <ul style="list-style-type: none"> SAS expander card does not support 3 GB RAID adapters. When using ServeRAID adapter M1015 to support more than sixteen 2.5-inch hard disk drives, the maximum number of RAID supported drives is 16. All the other drives will remain JBOD (the drives are presented to the operating system without a RAID configuration). If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter. Eight 3.5-inch HDD bays (only supports UltraSlim DVD drive) Three half-high 5.25-inch bays (one DVD drive installed) Note: Full-high devices such as an optional tape drive will occupy two half-high 5.25-inch bays. <p>PCI and PCI-X expansion slots:</p> <ul style="list-style-type: none"> Six PCI expansion slots on the system board: <ul style="list-style-type: none"> Four PCI Express x8 (2x8 link, 2x4 link) One PCI Express x16 (x8 link) One PCI 32-bit One or two expansion slots on the PCI extender card: <ul style="list-style-type: none"> Standard - One PCI Express x8 (x4 link) on the PCI-Express extender card Optional - Two PCI-X 64/133 slots on the PCI-X extender card 	<p>Power supply:</p> <p>Note: To upgrade to two 920-watt hot-swap power supplies, install the redundant power and cooling option kit. The kit includes one hot-swap 920-watt power-supply and three hot-swap fans.</p> <ul style="list-style-type: none"> Standard: One 920-watt 110 V or 240 V AC input dual-rated power supply Upgradeable to two 920-watt hot-swap power supplies <p>Hot-swap fans:</p> <ul style="list-style-type: none"> Three (standard) Upgradeable to six fans (for redundant cooling) <p>Note: To upgrade to redundant cooling, install the redundant power and cooling option kit. The kit includes one 920-watt hot-swap power-supply and three hot-swap fans.</p> <p>Size:</p> <ul style="list-style-type: none"> Tower <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: approximately 38.9 kg (85.6 lb) when fully configured or 27.4 kg (60.4 lb) minimum Rack <ul style="list-style-type: none"> 5 U Height: 218 mm (8.6 in.) Depth: 702 mm (27.6 in.) Width: 424 mm (16.7 in.) Weight: approximately 37.2 kg (82 lb) when fully configured or 26.2 kg (57.7 lb) minimum <p>Racks are marked in vertical increments of 4.45 cm (1.75 inches). Each increment is referred to as a unit, or "U." A 1-U-high device is 4.45 cm (1.75 inches) tall.</p>
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Table 1. Features and specifications (continued)

<p>Integrated functions:</p> <ul style="list-style-type: none"> • Integrated Management Module (IMM), which provides service processor control and monitoring functions, video controller, remote keyboard, video, mouse, and remote hard disk drive capabilities • Dedicated or shared management network connections • Six-port Serial ATA (SATA) controller embedded • Serial over LAN (SOL) and serial redirection over Telnet or Secure Shell (SSH) • USB flash device with embedded hypervisor software. • Support for remote management presence • One systems-management RJ-45 for connection to a dedicated systems-management network. This system management connector is dedicated to the IMM functions. • Light path diagnostics • Six Universal Serial Bus (USB) ports standard (v2.0 supporting v1.1) <ul style="list-style-type: none"> – Four on rear of server – Two on front of server • One internal USB tape connector • One Broadcom dual-port 10/100/1000 Ethernet controller with Wake on LAN support and TCP/IP Offload Engine (TOE) support • One serial connector, shared with the IMM <p>Note: In messages and documentation, the term <i>service processor</i> refers to the integrated management module (IMM).</p> <p>Video controller:</p> <ul style="list-style-type: none"> • Matrox G200eV video on system board • Compatible with SVGA and VGA 	<p>ServeRAID SAS adapter:</p> <ul style="list-style-type: none"> • ServeRAID-BR10i SAS/SATA adapter that supports RAID levels 0, 1, 1E (standard) • ServeRAID-BR10il SAS/SATA adapter that supports RAID levels 0, 1, 1E (standard) • Optional ServeRAID-MR10i SAS/SATA adapter, which supports RAID levels 0, 1, 5, 6, 10 • Optional ServeRAID-MR10is SAS/SATA adapter, which supports RAID levels 0, 1, 5, 6, 10 • Optional ServeRAID-M1015 SAS/SATA adapter, which supports RAID level 0, 1, 1E • Optional ServeRAID-M5014 SAS/SATA adapter, which supports RAID level 0, 1, 5, 10, 50 • Optional ServeRAID-M5015 SAS/SATA adapter, which supports RAID level 0, 1, 5, 10, 50 <p>Note: If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.</p> <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Sound power, idle: 5.5 bel declared • Sound power, operating: 6.0 bel declared <p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Server on: 10°C to 35°C (50.0°F to 95.0°F); altitude: 0 to 915 m (3000 ft) – Server on: 10°C to 32°C (50.0°F to 90.0°F); altitude: 915 m (3000 ft) to 2134 m (7000 ft) – Server on: 10°C to 28°C (50.0°F to 83.0°F); altitude: 2134 m (7000 ft) to 3050 m (10000 ft) – Server off: 5°C to 45°C (41°F to 113°F) – Shipping: -40°C to 60°C (-40.0°F to 140°F) 	<p>Humidity:</p> <ul style="list-style-type: none"> • Server on: 20% to 80%, maximum dew point 21°C, maximum rate of change 5°C/hour • Server off: 8% to 80%, maximum dew point 27°C <p>Heat output:</p> <p>Approximate heat output:</p> <ul style="list-style-type: none"> • Minimum configuration: 2013 Btu per hour (590 watts) • Maximum configuration: 3610 Btu per hour (1058 watts) <p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50-60 Hz) required • 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 • Approximate input kilovolt-amperes (kVA): <ul style="list-style-type: none"> – Minimum: 0.60 kVA – Maximum: 1.10 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 that are installed and the power-management optional features that are in use. 2. These levels were measured in controlled acoustical environments according to the procedures that are specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average stated values 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:

- **UEFI-compliant server firmware**

IBM System x[®] Server Firmware (server firmware) offers several features, including Unified Extensible Firmware Interface (UEFI) 2.1 compliance, Active Energy Manager technology, enhanced RAS capabilities, and BIOS compatibility support. UEFI replaces the basic input/output system (BIOS) and defines a standard interface between the operating system, platform firmware, and external devices. UEFI-compliant System x servers are 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.

- **Integrated management module**

The Integrated Management module (IMM) combines service processor functions, video controller, and 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. The IMM also provides a virtual presence capability for remote server management capabilities. The IMM provides remote server management through industry-standard interfaces:

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

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

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.

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

The Dynamic System Analysis (DSA) Preboot diagnostics programs are stored on the integrated flash 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 configuration
- Hard disk drive health
- RAID adapter configuration
- Event logs for service processors

The DSA program creates a chronologically ordered merged of the system-event log (as the IPMI event log), the IMM event log (as the ASM event log), and the operating-system event 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 the DSA program, see the *Problem Determination and Service Guide* on the IBM Documentation CD

- **IBM Systems Director**

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.

- **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 116.

- **IBM X-Architecture® technology**

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

- **VMware ESXi embedded hypervisor**

The VMware ESXi embedded hypervisor is available on some server models. Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. The VMware ESXi embedded hypervisor software is provided on USB flash device that is installed in the USB connector on the system board. See “Using the embedded hypervisor” on page 120 for additional information.

- **Active Memory™**

The Active Memory feature improves the reliability of memory through memory mirroring or memory sparing. Memory mirroring stores data in two pairs of DIMMs simultaneously. Memory sparing mode, one channel is a spare of the other two.

- **Large system-memory capacity**

The memory bus supports up to 192 GB of system memory using RDIMMs. The memory controller supports error correcting code (ECC) for up to 16 industry-standard PC3-10600R-999 (single-rank or dual-rank, or 12 quad-rank DIMMs), 800, 1067, and 1333 MHz, DDR3 (third-generation double-data-rate), registered, synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs). The memory bus also supports up to 48 GB UDIMMs of system memory.

- **Integrated network support**

The server comes with one integrated Broadcom 5709C series Gigabit Ethernet controller, which supports connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network. For more information, see “Enabling the Broadcom Gigabit Ethernet Utility program” on page 122.

- **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. See Table 3 on page 24 for more information.

Note: The physical presence requires manual setting on the server to change the TPM configuration. The TPM is enabled and physical presence is not asserted by default. The physical presence needs to be asserted to activate, deactivate, clear or change ownership of the TPM.

- **Intelligent Platform Management Interface (IPMI) 2.0**

IPMI 2.0 support providing secure remote power-on/power-off and several standard alerts for components such as fans, voltage, and temperature.

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

The server supports up to twenty-four (depending on your model) 2.5-inch or eight 3.5-inch hard disk drives in the hot-swap bays. With the hot-swap feature, you can add, remove, or replace hard disk drives without turning off the server.

Note:

- SAS expander card does not support 3 GB RAID adapters.
- When using ServeRAID adapter M1015 to support more than sixteen 2.5-inch hard disk drives, the maximum number of RAID supported drives is 16. All the other drives will remain JBOD (the drives are presented to the operating system without a RAID configuration).

- **Light path diagnostics**

Light path diagnostics provides LEDs to help you diagnose problems. For more information, see the section about light path diagnostics in the *Problem Determination and Service Guide* on the IBM Documentation CD.

- **Memory mirroring**

Memory mirroring improves the availability of memory by writing information to the main memory and redundant locations in a mirrored pair of DIMMs.

- **Memory sparing**

2 channels operating independently, 3rd channel is spare, errors occurring in the normal system memory are tracked, when an error threshold is crossed, the data at the “failing” memory location is copied into the spare memory.

Note: Memory sparing is only available for Intel Xeon 5600 series microprocessor.

- **PCI-32 adapter capabilities**

The server has one slot for a PCI-32 adapter.

- **PCI Express x8 adapter capabilities**

The server has five slots for PCI Express x8 adapters. Three of these slots accept x8 adapters, but the adapters will operate as x4 adapters.

- **PCI Express x16 adapter capabilities**

The server has one slot for PCI Express x16 adapter, which will operate as an x8 adapter.

- **Redundant cooling and power capabilities**

The server supports up to two 920-watt hot-swap power supplies. If the server comes with only one power supply, you can install an additional power supply with three redundant hot-swap cooling fans to add redundant power and cooling capabilities. If the maximum load on the server is less than 920 watts and a problem occurs with one of the power supplies, the other power supply can meet the power requirements. The redundant cooling of the fans enables continued operation if one of the fans fails.

- **ServeRAID support**

The server supports ServeRAID adapters to create redundant array of independent disks (RAID) configurations.

Note: For proper cooling, do not install any card in the slot next in sequence to a ServeRAID adapter with battery backup module (for example, if a ServeRAID adapter with battery backup module is installed in slot 2, do not install any card in slot 3).

- **Symmetric multiprocessing (SMP)**

The server supports up to two Intel Xeon quad-core microprocessors. If the server comes with only one microprocessor, you can install an additional microprocessor to enhance performance and provide SMP capability.

- **Systems-management capabilities**

The server contains an integrated management module (IMM), which enables you to manage the functions of the server locally and remotely and provides remote presence and blue-screen capture capability. The IMM also provides system monitoring and event recording.

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

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

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

Reliability, availability, and serviceability

Three important 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 correct problems.

The server has the following RAS features:

- 3-year parts, 3-year labor limited warranty (1-year warranty is available in limited geography)
- 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 Setup utility setting
- Availability of microcode level
- ABR (Automatic BIOS 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
- CD-based diagnostic programs
- 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 (DDR) synchronous dynamic random access memory (SDRAM) with serial presence detect (SPD)
- Error logging of POST failures
- Hot-swap SAS hard disk drives
- Integrated Ethernet controllers
- Intelligent Platform Management Interface (IPMI) 2.0
- Key-lock support for physical security
- Memory change messages posted to the system-event log
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts
- Read-only memory (ROM) checksums
- Redundant Ethernet capabilities (requires an optional Ethernet adapter) with failover support
- Standby voltage for system-management features and monitoring
- System auto-configuring from the configuration menu
- System-error LED on the front bezel and diagnostics LEDs on the system board
- Upgradeable microcode for POST, BIOS, 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 in a heterogeneous environment. By using industry standards, IBM Systems Director supports multiple operating systems and virtualization technologies in IBM and non-IBM x86 platforms.

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

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

instant out-of-the-box business value. These common tasks include discovery, inventory, configuration, system health, monitoring, updates, event notification, and 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* DVD 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 UpdateXpress System Pack Installer

The UpdateXpress 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 UpdateXpress System Pack Installer, go to the System x and BladeCenter Tools Center at <http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp> and click **UpdateXpress System Pack Installer**.

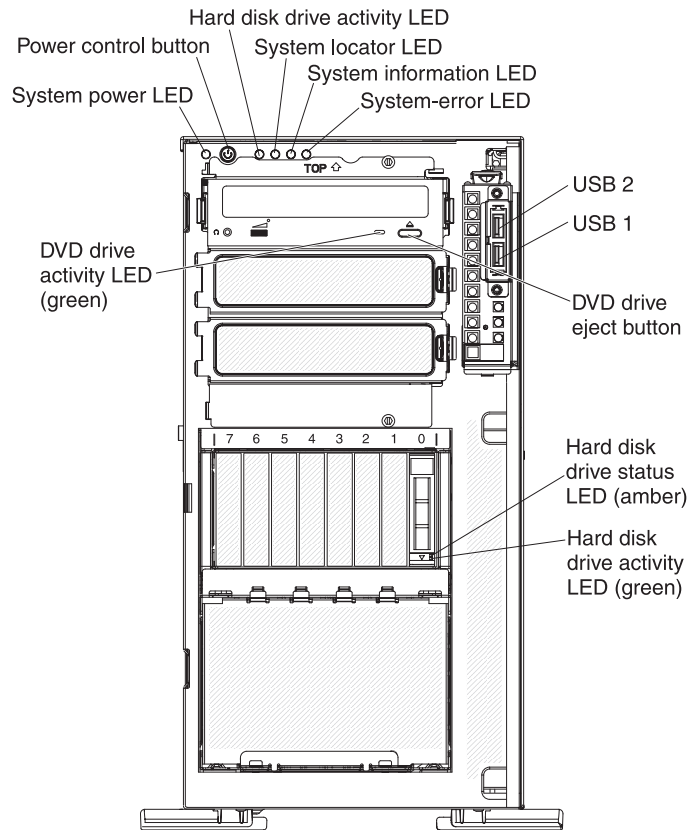
Server controls, LEDs, and power

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

Front view

The following illustration shows the controls and LEDs on the front of the server. (See “Operator information panel” on page 28 for information about the operator information panel.)

Note: The front bezel door is not shown so that the drive bays are visible.



System power LED: The states of the system power LED are as follows:

Lit When this LED is lit and not flashing, it indicates that the server is turned on.

Flashing slowly

When this LED is flashing slowly (once per second), it indicates that the server is turned off and still connected to an AC power source.

Flashing rapidly (4 times per second)

The server is turned off and is not ready to be turned on. The power-control button is disabled. This will last approximately 20 to 40 seconds.

Note: Approximately 20 seconds after the server is connected to ac power, the power-control button becomes active.

Off When this LED is off, it indicates that AC power is not present, or the power supply or the LED itself has failed. A system-power LED is also on the rear of the server.

Power-control button: Press this button to turn the server on and off manually. A power-control-button shield comes with the server. You can install this disk-shaped shield to prevent the server from being turned off accidentally.

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

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

System information LED: When this amber LED is on, the server power supplies are nonredundant, or some other noncritical event has occurred. The event is recorded in the error log. Check the light path diagnostics panel or event log for more information. This LED will remain lit until you resolve the problem or you press the remind button. (See “Remind button” on page 34 for more information.)

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

USB 1 and 2 connectors: Connect USB devices to these connectors.

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

Hard disk drive activity LED: When this LED is flashing, it indicates that the drive is in use.

Hard disk drive status LED: On some server models, each hot-swap hard disk drive has a status LED. When this LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID adapter is installed in the server, when this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the adapter is identifying the drive.

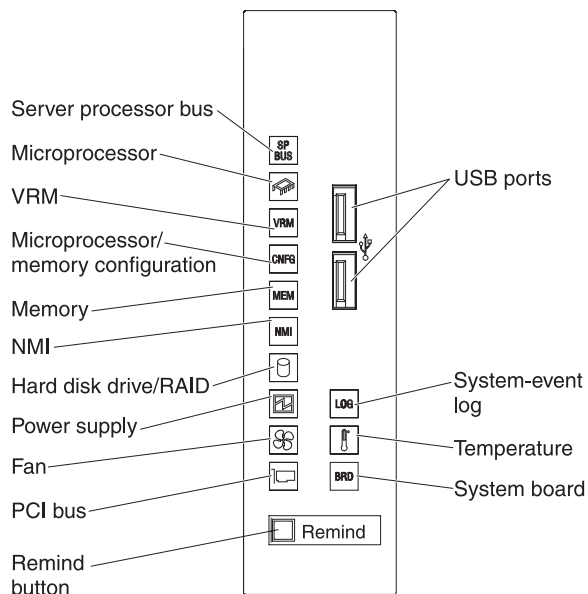
Note: For proper cooling, do not install any card in the slot next in sequence to a ServeRAID adapter with battery backup module (for example, if a ServeRAID adapter with battery backup module is installed in slot 2, do not install any card in slot 3).

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

Light path diagnostics panel

The following illustration shows the front LEDs on the light path diagnostics panel. The light path diagnostics panel is inside the front bezel.

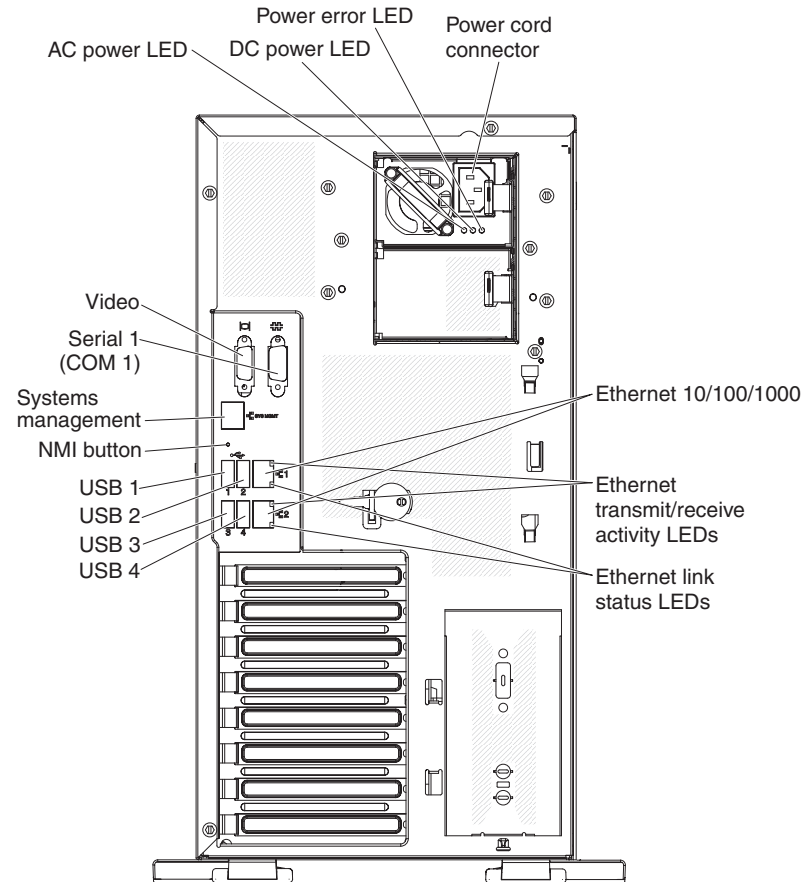
Note: The light path diagnostics LEDs remain lit only while the server is connected to power.



For more information about the light path diagnostics LEDs, see the *Problem Determination and Service Guide* on the IBM Documentation CD.

Rear view

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



AC power LED: Each hot-swap power supply has an AC power LED and a DC power LED. When the AC power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, both the AC and DC power LEDs are lit. For any other combination of LEDs, see “Power-supply LEDs” on page 18.

DC power LED: Each hot-swap power supply has a DC power LED and an AC power LED. When the DC power LED is lit, it indicates that the power supply is supplying adequate DC power to the system. During typical operation, both the AC and DC power LEDs are lit. For any other combination of LEDs, see “Power-supply LEDs” on page 18.

Power error LED: When the power error LED is lit, it indicates that the power supply has failed.

Power-cord connector: Connect the power cord to this connector.

Ethernet connectors: Use either of these connectors to connect the server to a network. When you use the Ethernet 1 connector, the network can be shared with the IMM through a single network cable.

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.

USB 1-4 connectors: Connect a USB device, such as USB mouse or keyboard, to any of these connectors.

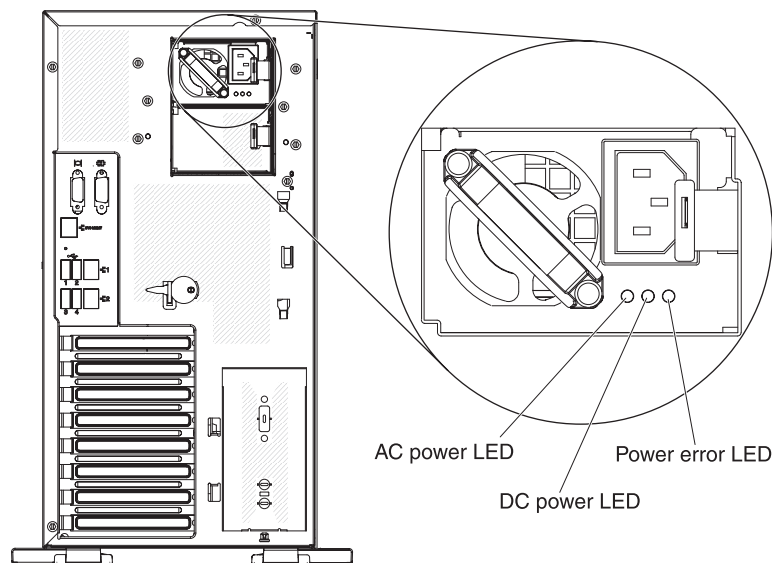
System-management connector: Use this connector to connect the server to a network for systems-management information control. This connector is used only by the IMM.

Serial 1 connector (COM 1): Connect a 9-pin serial device to this connector. The serial port is shared with the integrated management module (IMM). The IMM can take control of the shared serial port to perform text console redirection and to redirect serial traffic, using Serial over LAN (SOL).

Video connector: Connect a monitor to this connector.

Power-supply LEDs

The following illustration shows the power-supply LEDs on the rear of the server. For more information about solving power-supply problems, see the *Problem Determination and Service Guide*.



The following table describes the problems that are indicated by various combinations of the power-supply LEDs and the power-on LED on the operator information panel and suggested actions to correct the detected problems. (See “Operator information panel” on page 28 for information about the operator information panel.)

Table 2. Power-supply LEDs

Power-supply LEDs			Description	Action	Notes
AC	DC	Error			
Off	Off	Off	No AC power to the server or a problem with the AC power source	<ol style="list-style-type: none"> 1. Check the AC power to the server. 2. Make sure that the power cord is connected to a functioning power source. 3. Turn the server off and then turn the server back on. 4. If the problem remains, replace the power supply. 	This is a normal condition when no AC power is present.
Off	Off	On	No AC power to the server or a problem with the AC power source and the power supply had detected an internal problem	<ol style="list-style-type: none"> 1. Replace the power supply. 2. Make sure that the power cord is connected to a functioning power source. 	This happens only when a second power supply is providing power to the server.
Off	On	Off	Faulty power supply	Replace the power supply.	
Off	On	On	Faulty power supply	Replace the power supply.	
On	Off	Off	Power supply not fully seated, faulty system board, or faulty power supply	<ol style="list-style-type: none"> 1. Reseat the power supply. 2. If the system board error LED is off, replace the power supply. 3. (Trained service technician only) If the system board error LED is lit, replace the system board. 	Typically indicates that a power supply is not fully seated.
On	Off or Flashing	On	Faulty power supply	Replace the power supply.	
On	On	Off	Normal operation		
On	On	On	Power supply is faulty but still operational	Replace the power supply.	

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 integrated management module (IMM) is shut down; however, the server can respond to requests from the IMM, 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 not turned on.

Turning on the server

Approximately 20 seconds after the server is connected to AC power, the power-control button becomes active, and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server and start the operating system by pressing the power-control button.

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

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature can turn on the server.

For 32-bit operating systems only: Some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

Turning off the server

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

Important: To view the error LEDs on the system board, leave the server connected to a power source.

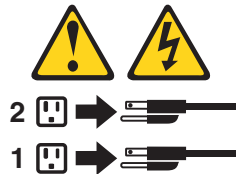
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

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 IMM can turn off the server as an automatic response to a critical system failure.
- You can turn off the server through a request from the IMM.

Chapter 2. Installing optional devices

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

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

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

1. Make sure that the server and the installed firmware levels support the devices that you are installing. If necessary, update the UEFI and IMM2 firmware and any other firmware that is stored on the system boards. For information about where firmware is stored in the server, see Chapter 6, “Configuration information and instructions,” in the *Problem Determination and Service Guide*. For a list of supported optional devices for the server, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/>.
2. Before you install optional hardware devices, make sure that the server is working correctly. Start the server and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Problem Determination and Service Guide* for information about how to run diagnostics.
3. Follow the installation procedures in this chapter and use the correct tools. Incorrectly installed devices can cause system failures because of damaged pins in sockets or connectors, loose cabling, or loose components.
4. Use the best practices to apply current firmware and device-driver updates for the server and optional devices. To download the *IBM System x Firmware Update Best Practices* document, go to <http://www.ibm.com/support/entry/portal/docdisplay?brand=50000020&Indocid=MIGR-5082923>. Additional hints and tips are available from the following sites:
 - IBM support: <http://www.ibm.com/supportportal/>
 - System x configuration tools: <http://www.ibm.com/systems/x/hardware/configtools.html>

Instructions for IBM Business Partners

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

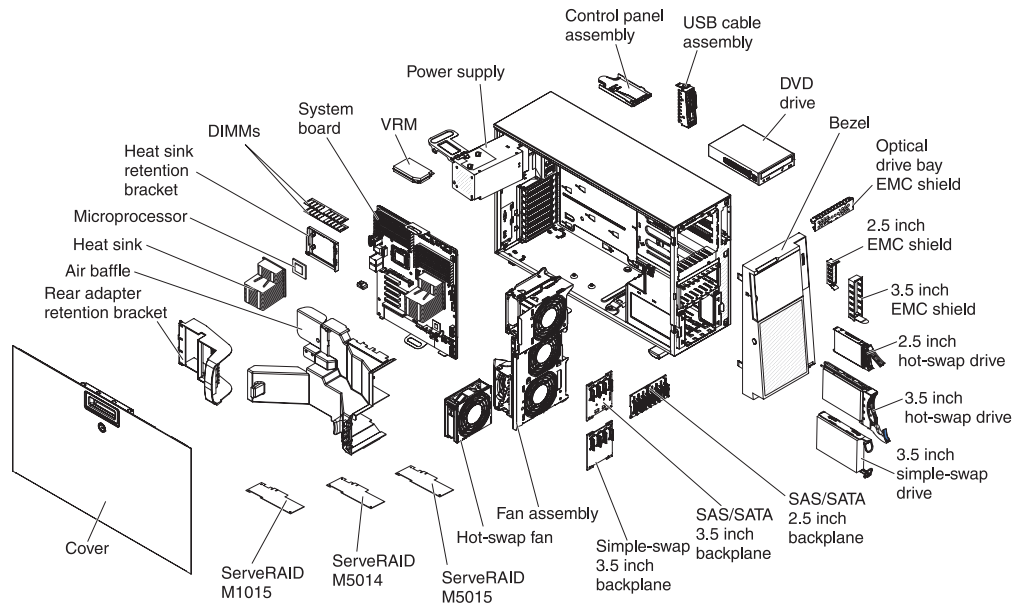
1. Before you configure a server for a customer, complete the Solution Assurance checklist at <http://w3.ibm.com/support/assure/assur30i.nsf/webindex/sa294/>.
2. After you have confirmed that the server starts correctly and recognizes the newly installed devices and that no error LEDs are lit, run the Dynamic System Analysis (DSA) stress tests. For information about using DSA, see the *Problem Determination and Service Guide*.
3. Shut down and restart the server multiple times to ensure that the server is correctly configured and functions correctly with the newly installed devices.
4. Save the DSA log as a file and send it to IBM.

5. To ship the server, repackage it in the original undamaged packing material and observe IBM procedures for shipping.

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

Server components

The following illustration shows the major components in the server.

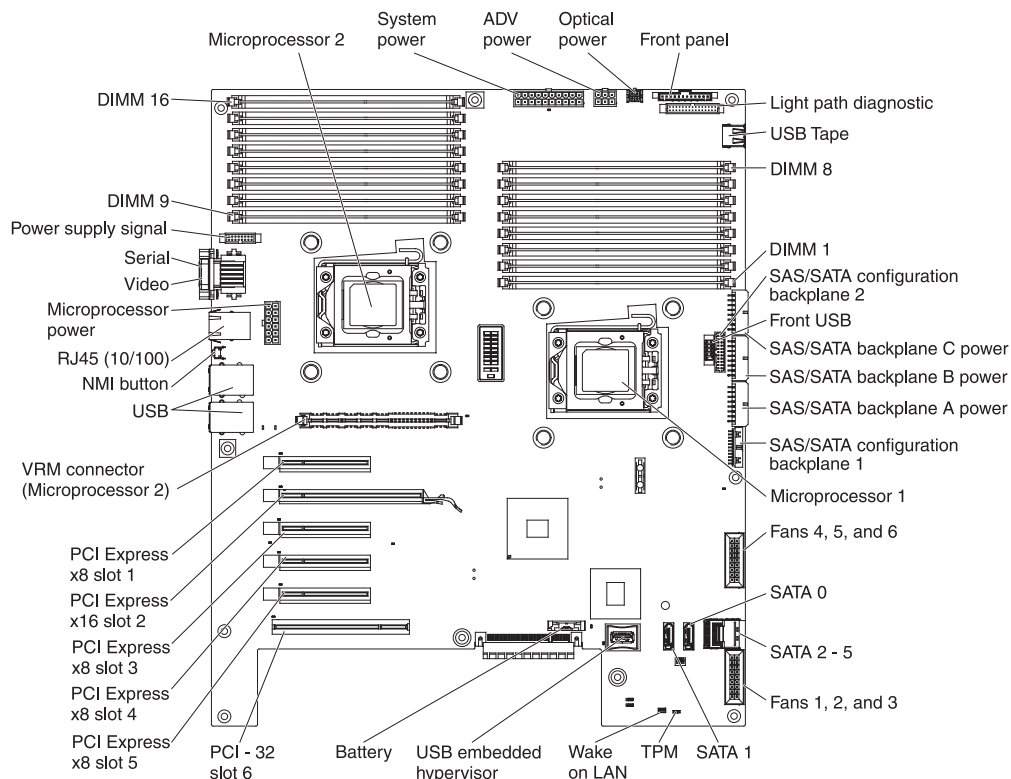


Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.

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

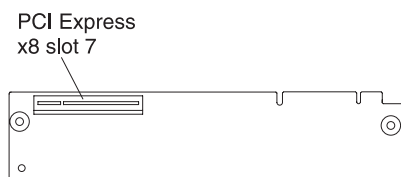
System-board internal connectors

The following illustrations show the internal connectors and switches on the system board.

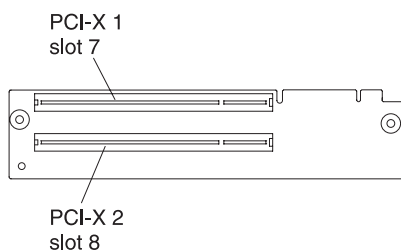


The system board is equipped with a PCI extender card that provides one additional expansion slot. The following illustration shows the additional PCI Express expansion slot that is available on the PCI Express extender card.

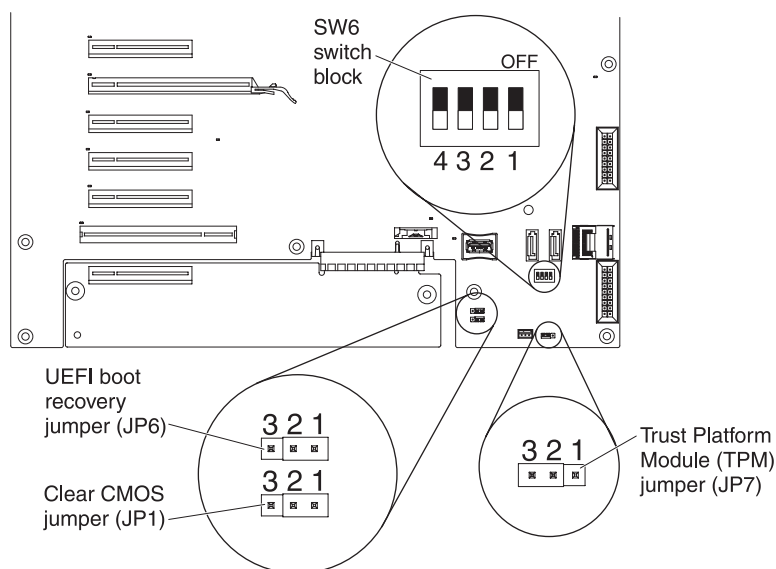
Note: The PCI Express extender card comes standard in the System x3500 M3 server.



The following illustration shows two additional PCI-X expansion slots that are available on the PCI-X extender card.



System-board switches and jumpers



The following tables show the settings of the switches and the jumpers.

Table 3. System-board jumpers

Jumper number	Jumper name	Jumper setting
JP1	CMOS clear	<ul style="list-style-type: none"> Pins 1 and 2: Normal operation (default). Pins 2 and 3: Clears CMOS memory.
JP6	UEFI boot recovery	<ul style="list-style-type: none"> Pins 1 and 2: Normal operation (default). Pins 2 and 3: Enable the UEFI recovery mode.
JP7	Trust Platform Module (TPM)	<ul style="list-style-type: none"> Pins 1 and 2: Physical presence to the TPM. Pins 2 and 3: No physical presence to the TPM (default). <p>Note: The physical presence requires manual setting on the server to change the TPM configuration. The TPM is enabled and physical presence is not asserted by default. The physical presence needs to be asserted to activate, deactivate, clear or change ownership of the TPM.</p>
Note: If no jumper is present, the server responds as on default position.		

Table 4. System-board switch 6

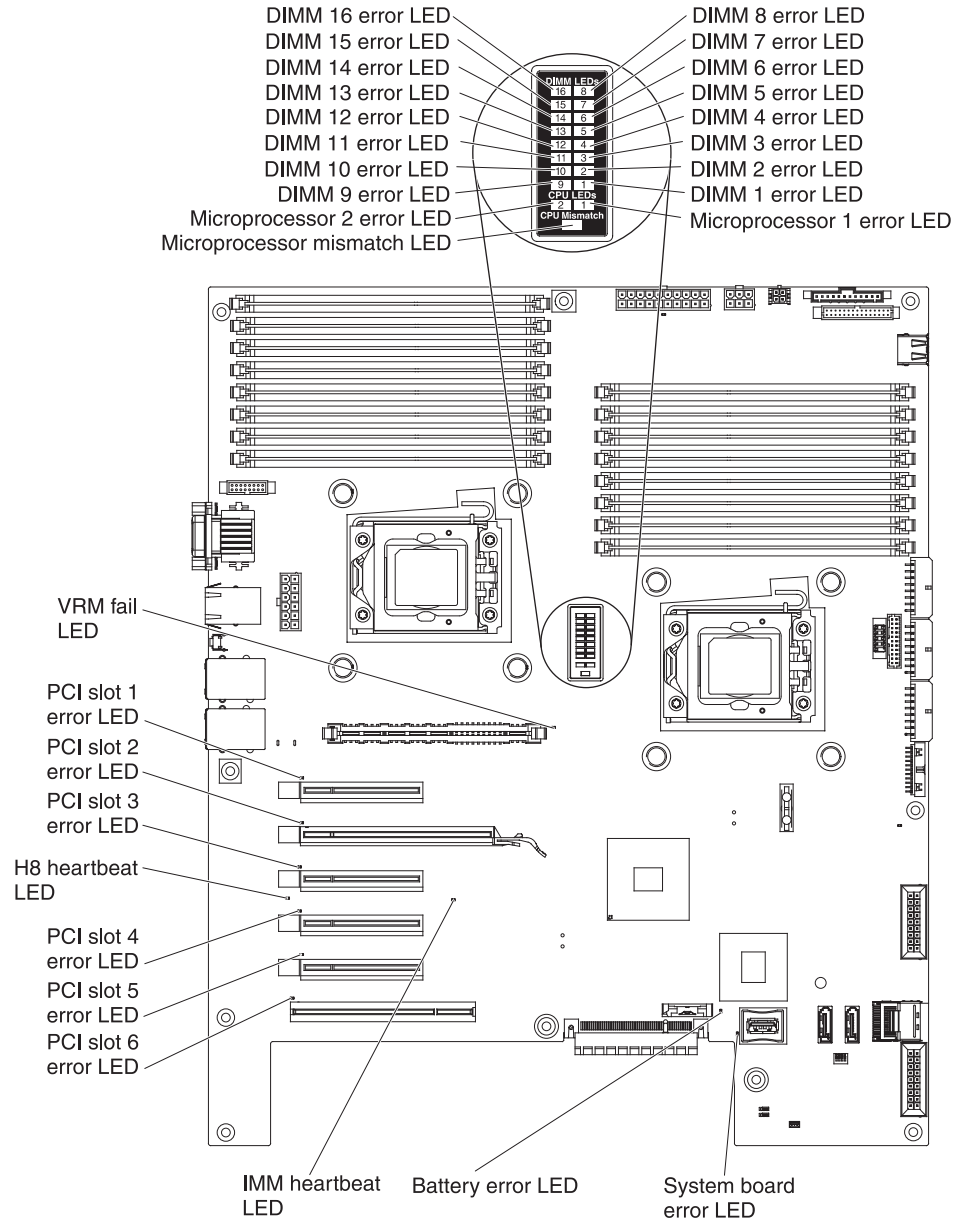
SW 6 Switches	Switch description
1	Reserved (default off)
2	Power-on password override when on (default off)
3	Reserved (default off)
4	When this switch is off, the primary IMM firmware ROM page is loaded. When this switch is on, the secondary (backup) IMM firmware ROM page is loaded (default off).

Notes:

- 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 “Safety” on page vii, “Installation guidelines” on page 35, and “Handling static-sensitive devices” on page 37.)

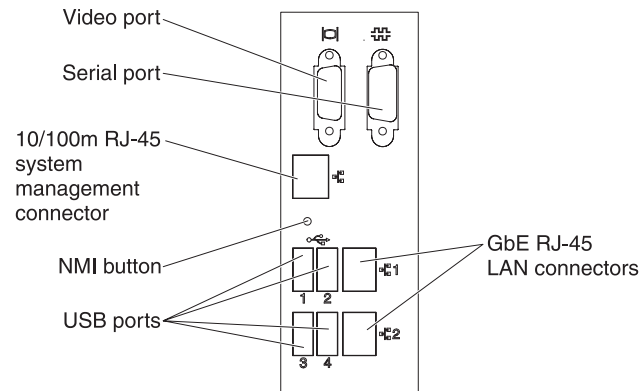
System-board LEDs

The following illustration shows the LEDs on the system board.



System-board external connectors

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



SAS backplane connectors

The following illustrations show the connectors on the SAS backplanes.

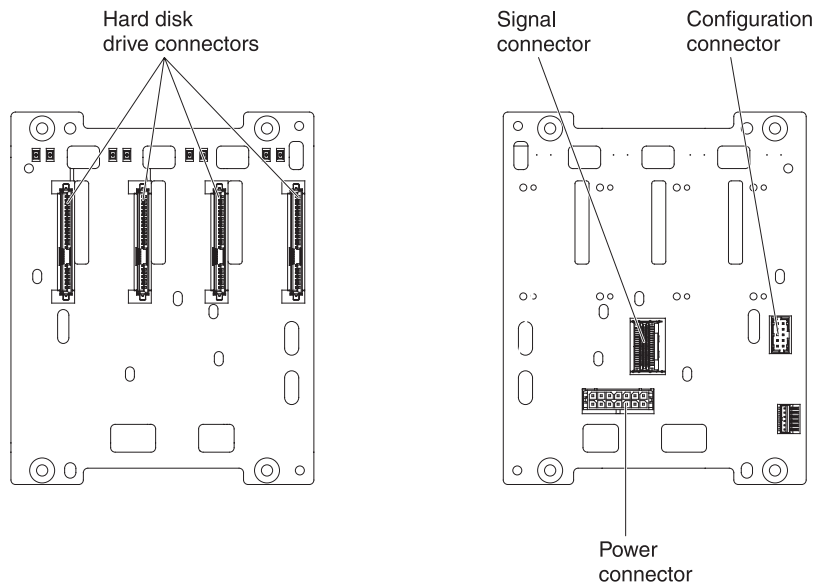


Figure 1. 3.5-inch backplane connectors

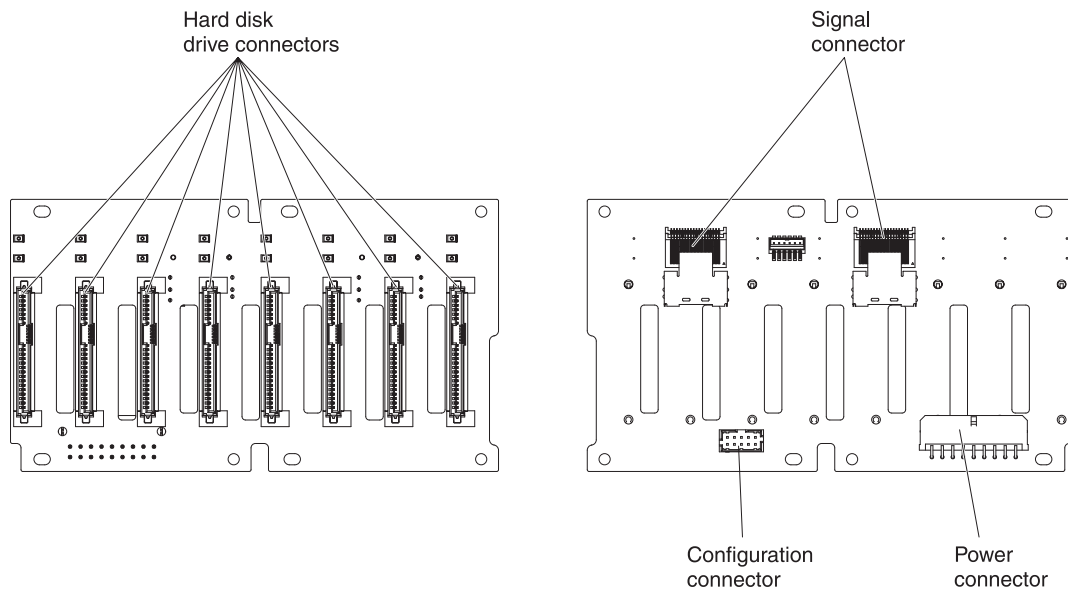
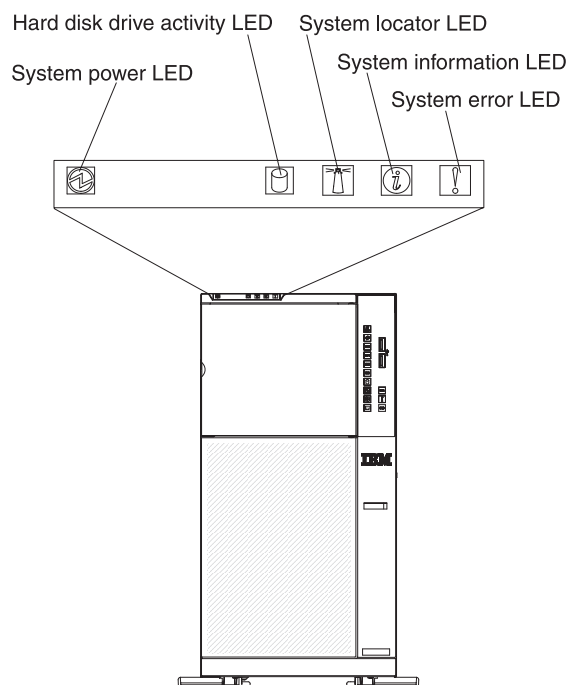


Figure 2. 2.5-inch backplane connectors

Operator information panel

The following illustration shows the LEDs on the operator information panel on the front of the server. (The power-control button is also on the operator information panel. See “Front view” on page 13 for the location of the power-control button.)



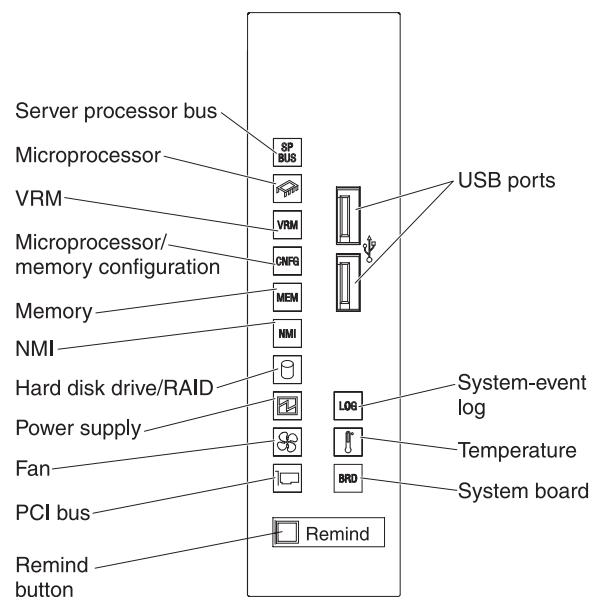
- Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.
- See the *Problem Determination and Service Guide on the IBM Documentation CD* to determine which components are customer replaceable units (CRU) and which components are field replaceable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

Lit light path diagnostics LED with the system-error or information LED also lit	Description
System power (green)	<p>The states of the power-on LED are as follows:</p> <ul style="list-style-type: none"> • Off: AC power is not present, or the power supply or the LED itself has failed. • Flashing rapidly (4 times per second): The server is turned off and is not ready to be turned on. The power-control button is disabled. This will last approximately 20 to 40 seconds. Note: Approximately 20 seconds after the server is connected to ac power, the power-control button 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.
Hard disk drive activity (green)	When this LED is flashing rapidly, it indicates that there is activity on a hard disk drive.

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See the <i>Problem Determination and Service Guide on the IBM Documentation CD</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 	
Lit light path diagnostics LED with the system-error or information LED also lit	Description
System locator (blue)	Use this LED to visually locate the server among other servers. You can use IBM Systems Director to light this LED remotely.
System information (amber)	When this amber LED is lit, it indicates that information about a suboptimal condition in the server is available in the IMM event log or in the system-event log. Check the light path diagnostics panel for more information.
System error (amber)	When this LED is lit, it indicates that a system error has occurred. Use the light path diagnostics panel and the system service label to further isolate the error.

Light path diagnostics panel

The following illustration shows the front USB ports and the LEDs on the light path diagnostics panel. The light path diagnostics panel is inside the front bezel.



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

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

Lit light path diagnostics LED with the system-error or information LED also lit	Description	Action
System-event log (LOG)	A system event log occurred.	View the contents of the system-event log (see the <i>Problem Determination and Service Guide</i> .)
Temperature	The system temperature has exceeded a threshold level.	<ol style="list-style-type: none"> 1. See the system-error log (see the <i>Problem Determination and Service Guide</i> on the IBM Documentation CD) for the source of the fault. 2. Make sure that the airflow in the server is not blocked. 3. Make sure that the room is neither too hot or too cold (room temperature) (see “Environment” in “Features and specifications” on page 6).
System board (BRD)	An error occurred on the system board.	<ol style="list-style-type: none"> 1. Check the LEDs on the system board to identify the component that is causing the error. The BRD LED can be lit for the following conditions: <ul style="list-style-type: none"> • Battery failure • Voltage regulator failure 2. Check the system-event log for information about the error. 3. Replace any failed or missing replaceable components, such as the battery. 4. (Trained service technician only) If the voltage regulator has failed, replace the system board.
PCI bus	A PCI adapter has failed.	<ol style="list-style-type: none"> 1. See the system-error log (see the <i>Problem Determination and Service Guide</i> on the IBM Documentation CD). 2. Check the LEDs on the PCI slots to identify the component that is causing the error and reseat the failing adapter. 3. Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> a. Failing adapter b. (Trained service technician only) System board
Fan	A fan has failed or is operating too slowly.	<ol style="list-style-type: none"> 1. Reinstall the removed fan. 2. If an individual fan LED is lit, replace the fan. 3. (Trained service technician only) Replace the system board.

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See the <i>Problem Determination and Service Guide on the IBM Documentation CD</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Lit light path diagnostics LED with the system-error or information LED also lit	Description	Action
Power supply	A power supply has failed or has been removed.	<ol style="list-style-type: none"> Check the individual power-supply LEDs. Reseat the following components: <ol style="list-style-type: none"> Power supply (Trained service technician only) Power-supply cage cables Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> Power supply (Trained service technician only) Power-supply cage
Hard disk drive /RAID	<p>A hard disk drive, SAS adapter, or RAID adapter error has occurred.</p> <p>Notes:</p> <ol style="list-style-type: none"> This LED is lit also when a hard disk drive is removed from the server. The error LED on the failing hard disk drive is also lit. Check the system-event log for a RAID error. 	<ol style="list-style-type: none"> Reinstall the removed drive. Reseat the following components: <ol style="list-style-type: none"> Failing hard disk drive SAS hard disk drive backplanes SAS signal and power cables System board ServeRAID-BR10i SAS/SATA adapter Replace the components listed in step 2 one at a time, in the order shown, restarting the server each time.
NMI	A hardware error has been reported to the operating system.	<ol style="list-style-type: none"> See the system-error log (see the <i>Problem Determination and Service Guide on the IBM Documentation CD</i>). If the PCI LED is lit, follow the instructions for that LED. If the MEM LED is lit, follow the instructions for that LED. Restart the server.

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

Lit light path diagnostics LED with the system-error or information LED also lit	Description	Action
Memory (MEM)	A memory error has occurred. Note: The error LED on the DIMM is also lit.	<ol style="list-style-type: none"> 1. If the MEM LED and the CNFG LED are lit, complete the following step: <ol style="list-style-type: none"> a. Check the system-event log in the Setup utility or IMM error messages. Follow steps indicated in <i>Problem Determination and Service Guide</i>. 2. If the CNFG LED is not lit, the system might detect a memory error. Complete the following steps to correct the problem: <ol style="list-style-type: none"> a. Update the server firmware to the latest level (see the <i>Problem Determination and Service Guide</i> for more information). b. Reseat or swap the DIMMs. c. Check the system-event log in the Setup utility or IMM error messages. Follow steps indicated in the <i>Problem Determination and Service Guide</i>.
Microprocessor/memory/VRM configuration (CNFG)	A hardware configuration error has occurred. (This LED is used with the MEM, VRM, and CPU LEDs.)	<ol style="list-style-type: none"> 1. (The system error LED, CPU LED, and CNFG LED are lit when POST detects a microprocessor mismatch.) (Trained service technician only) Remove the microprocessors and install two microprocessors of the same cache size, type, and clock speed. 2. (The system error LED, MEM LED, and CNFG LED are lit when POST detects an invalid memory configuration.) Check the system-event log in the Setup utility or IMM error messages. Follow steps indicated in <i>Problem Determination and Service Guide</i>. 3. (The VRM LED and the CNFG LED are lit when POST detects a missing VRM for the second microprocessor.) Install a VRM in the VRM connector on the system board for the second microprocessor. 4. Check the system-event log for information that indicates incompatible components.

<ul style="list-style-type: none"> Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. See the <i>Problem Determination and Service Guide on the IBM Documentation CD</i> to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Lit light path diagnostics LED with the system-error or information LED also lit	Description	Action
VRM	A VRM is missing or failed.	<ol style="list-style-type: none"> Determine whether the CNFG LED is also lit. If the CNFG LED is lit, a VRM is missing. Check the system-event log to determine the reason for the lit LED (for a VRM). Find the failing VRM by checking the LEDs on the system board. Install any missing VRMs. Reseat the following components: <ol style="list-style-type: none"> Failing VRM (Trained service technician only) Microprocessor associated with the VRM Replace the following components one at a time, in the order shown, restarting the server each time: <ol style="list-style-type: none"> Failing VRM (Trained service technician only) Microprocessor associated with the VRM (Trained service technician only) System board
Microprocessor (CPU)	<p>A microprocessor has failed, or an invalid microprocessor configuration has occurred.</p> <p>Note: (Trained service technician only) Make sure that the microprocessors are installed in the correct sequence.</p>	<ol style="list-style-type: none"> Check the system-event log to determine the reason for the lit LED. Determine whether the CNFG LED is also lit. If the CNFG LED is not lit, a microprocessor has failed. <ol style="list-style-type: none"> Make sure that the failing microprocessor, which is indicated by the CPU1 or CPU2 error LED on the system board, is installed correctly. (Trained service technician only) Replace the failing microprocessor. (Trained service technician only) Replace the failing system board. If the CNFG LED is lit and the CPU mismatch LED on the system board is lit, an invalid microprocessor configuration has occurred. <ol style="list-style-type: none"> Make sure that the microprocessors are compatible with each other. They must match in speed and cache size. To compare the microprocessor information, run the Setup utility and select System Information, and then select System Summary. Select Processor Details. (Trained service technician only) Replace an incompatible microprocessor.

<ul style="list-style-type: none"> • Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved. • See the <i>Problem Determination and Service Guide</i> on the IBM Documentation CD to determine which components are customer replaceable units (CRU) and which components are field replaceable units (FRU). • If an action step is preceded by “(Trained service technician only),” that step must be performed only by a trained service technician. 		
Lit light path diagnostics LED with the system-error or information LED also lit	Description	Action
Service processor bus (SP BUS)	The IMM detects an internal error.	<ol style="list-style-type: none"> 1. Remove power from the server; then, reconnect the server to power and restart the server. 2. Updated the firmware on the IMM.

For more information about light path diagnostics, see the *Problem Determination and Service Guide* on the IBM Documentation CD.

Remind button

You can use the remind button on the light path diagnostics panel to put the system-error LED on the operator information panel into Remind mode. When you press the remind button, you acknowledge the error but indicate that you will not take immediate action. The system-error LED flashes while it is in Remind mode and stays in Remind mode until one of the following conditions occurs:

- All known errors are corrected.
- The server is restarted.
- A new error occurs, causing the system-error LED to be lit again.

Installation guidelines

Before you install optional devices, read the following information:

- Read the safety information that begins on page vii, “Working inside the server with the power on” on page 36, and the guidelines in “Handling static-sensitive devices” on page 37. 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 x3500 M3** to display the matrix of downloadable files for the server.

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

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Problem Determination and Service Guide* on the IBM *Documentation* CD for information about how to run diagnostics.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you can stand safely without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- To view the error LEDs on the system board and internal components, leave the server connected to power.
- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap hard disk drives, hot-swap fans, or hot-plug Universal Serial Bus (USB) devices.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.

- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you work inside the server, you might find it easier to lay the server on its side.
- For a list of supported optional devices for the server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.

System reliability guidelines

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

- Each of the drive bays has a drive or an 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 left-side cover before you turn on the server. Operating the server for extended periods of time (more than 30 minutes) with the left-side cover removed might damage server components.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You have replaced a hot-swap fan within 30 seconds of removal.
- You do not remove the air duct or air baffles while the server is running. Operating the server without the air duct or air baffles might cause the microprocessor to overheat.
- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor and heat sink.

Working inside the server with the power on

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

The server supports hot-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 you work 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 might fall into the server as you lean over it.
- Avoid dropping any metallic objects, such as paper clips, hairpins, and screws, into the server.

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Wear an electrostatic-discharge wrist strap, if one is available.
- 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 part 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 you handle devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Internal cable routing and connectors

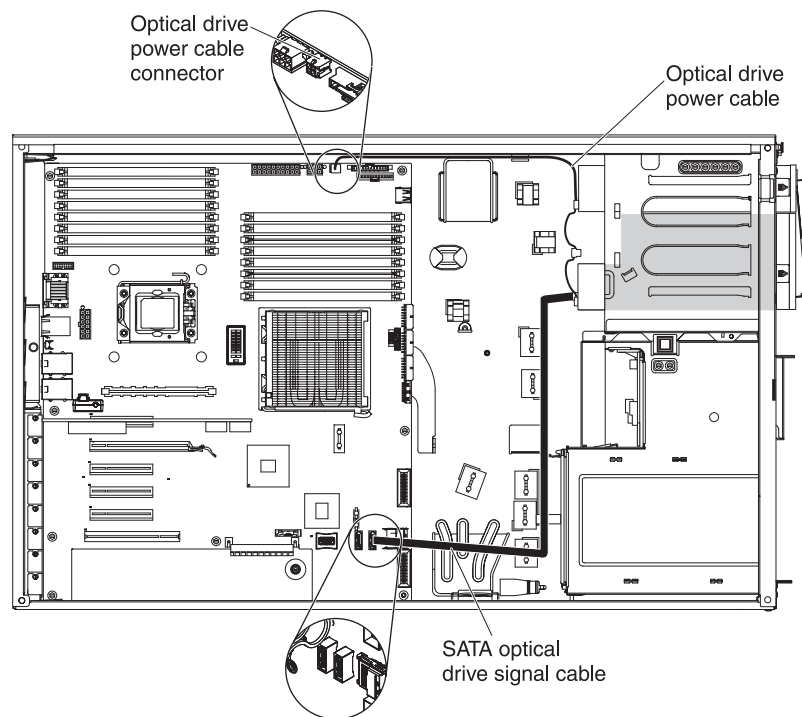
The server uses cables to connect SATA attached, hot-swap SATA, hot-swap SAS and DVD drive devices to the power supply and to the system board.

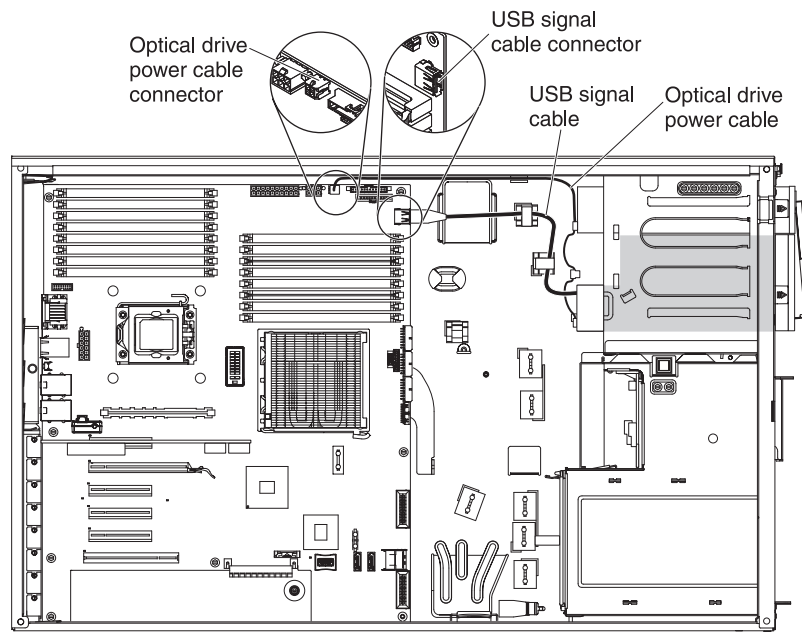
Review the following information before connecting power and signal cables to internal drives:

- 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.

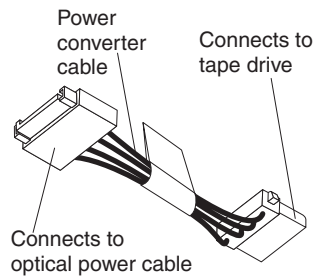
Tape drive cable connection

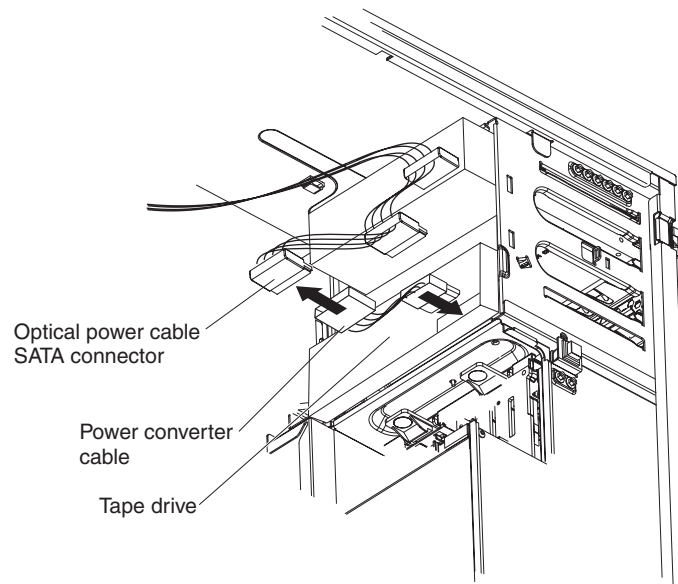
You can install either a USB or SATA tape drive in the server. The following illustration shows the internal cable routing and connectors for both the USB tape drive and the SATA tape drive. It also shows the internal power cable for the optical drives.





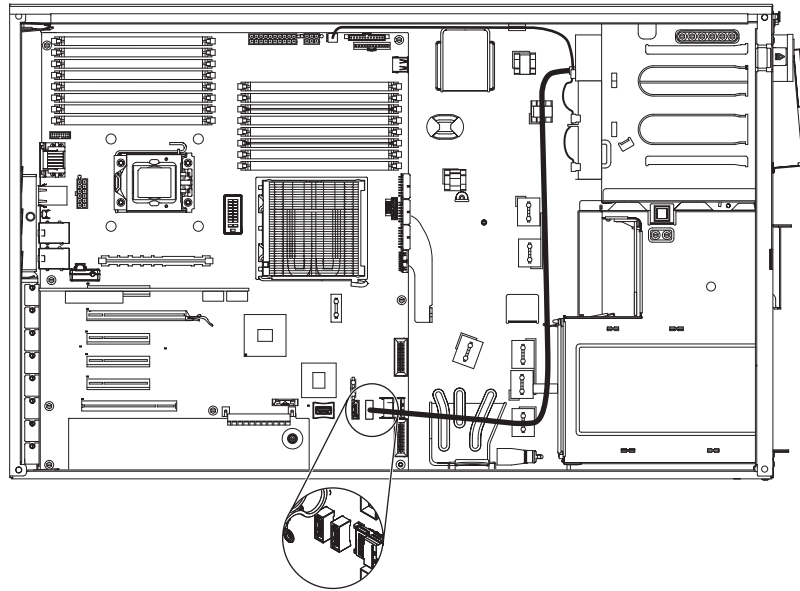
The following illustrations show the cabling information for installing the SATA to traditional power converter cable when you install an RDX internal USB tape drive in the server. This cable comes with the server in the plastic bag with the drive rails.



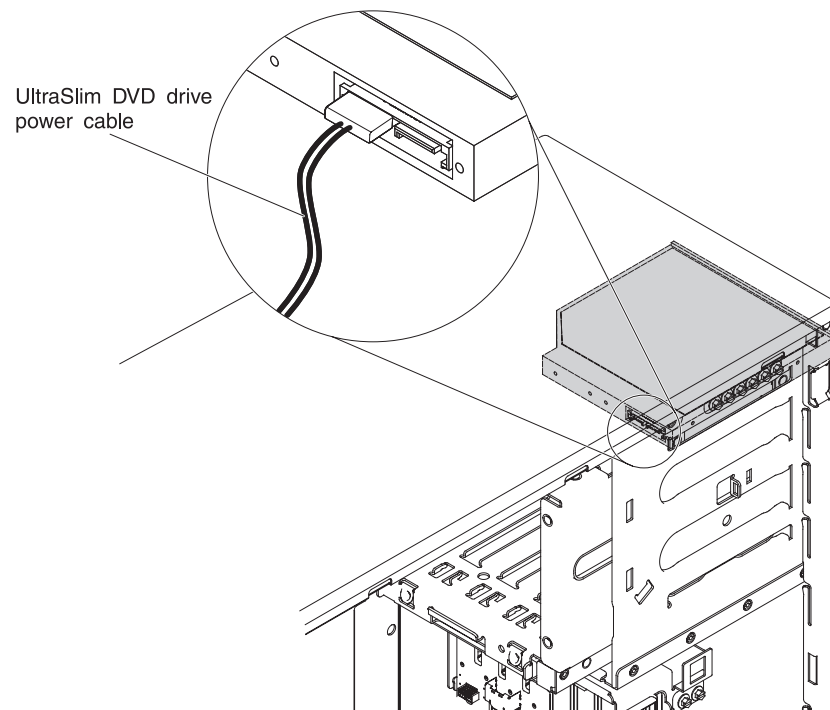


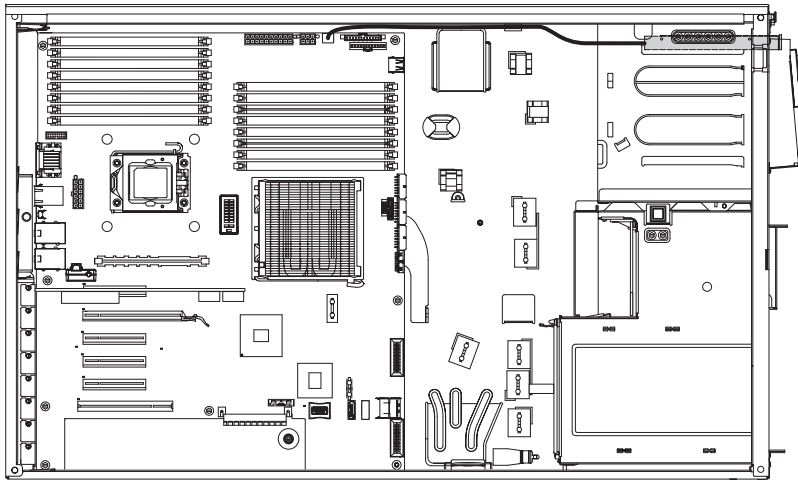
DVD drive cable connection

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

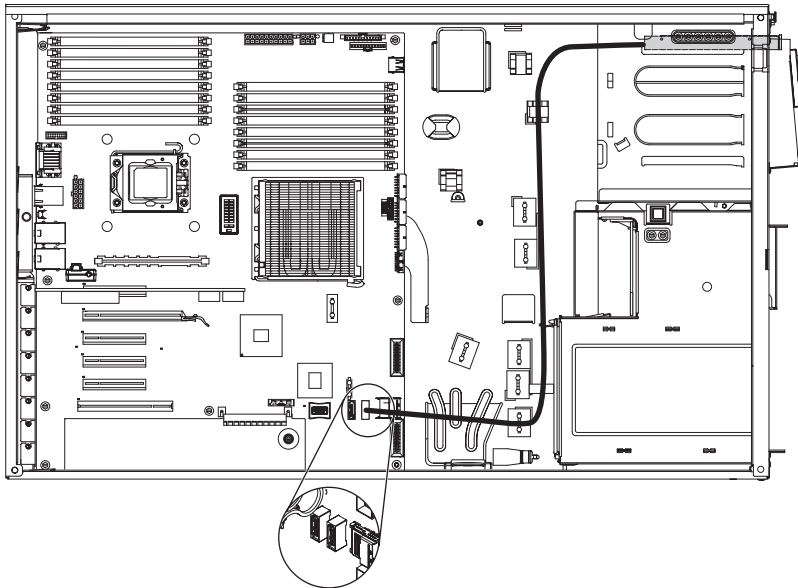


The following illustration shows the internal power cable routing and the connectors from the UltraSlim DVD drive to the system board.



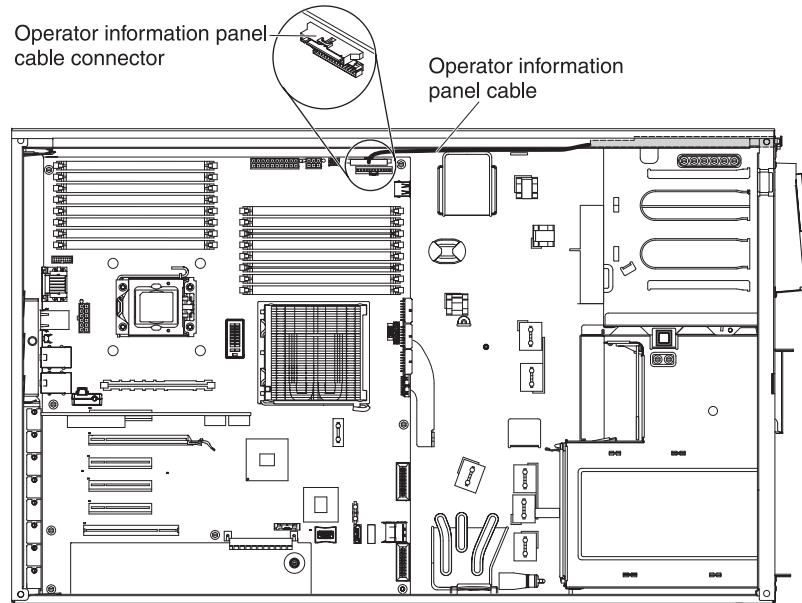


The following illustration shows the internal SATA cable routing and the connectors from the UltraSlim DVD drive to the system board.



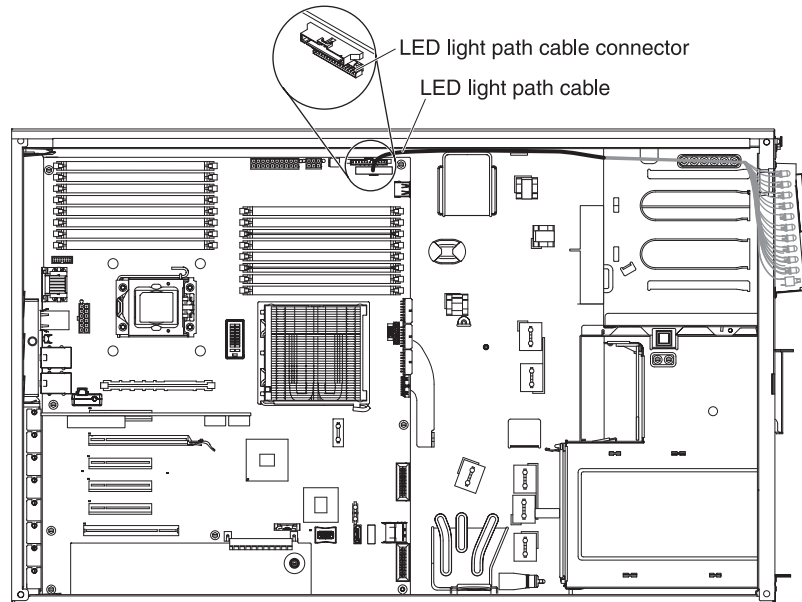
Operator information panel cable connection

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



Light path diagnostics LED panel cable connection

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



Hard disk drive cable connection

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

1. **The following illustrations show the connectors on the 2.5-inch and 3.5-inch hard disk drive backplanes.**

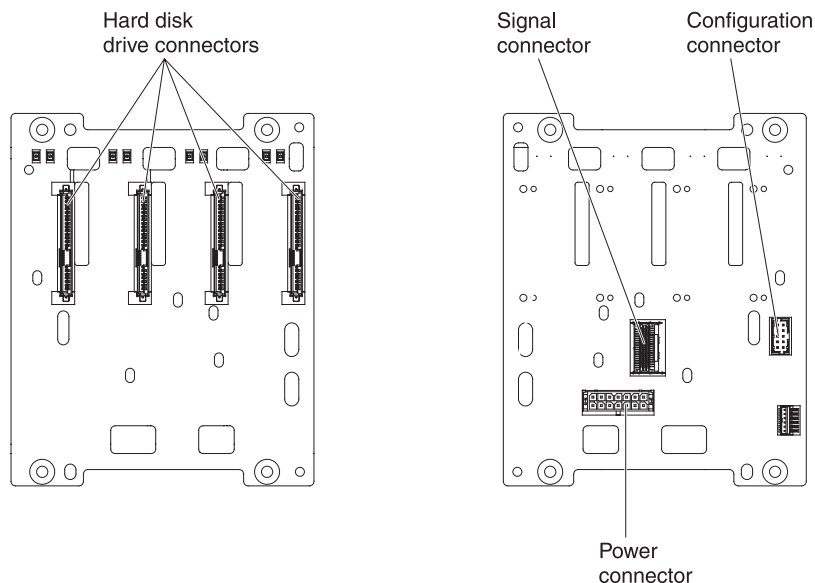


Figure 3. Connectors on the 3.5-inch hard disk drive backplane

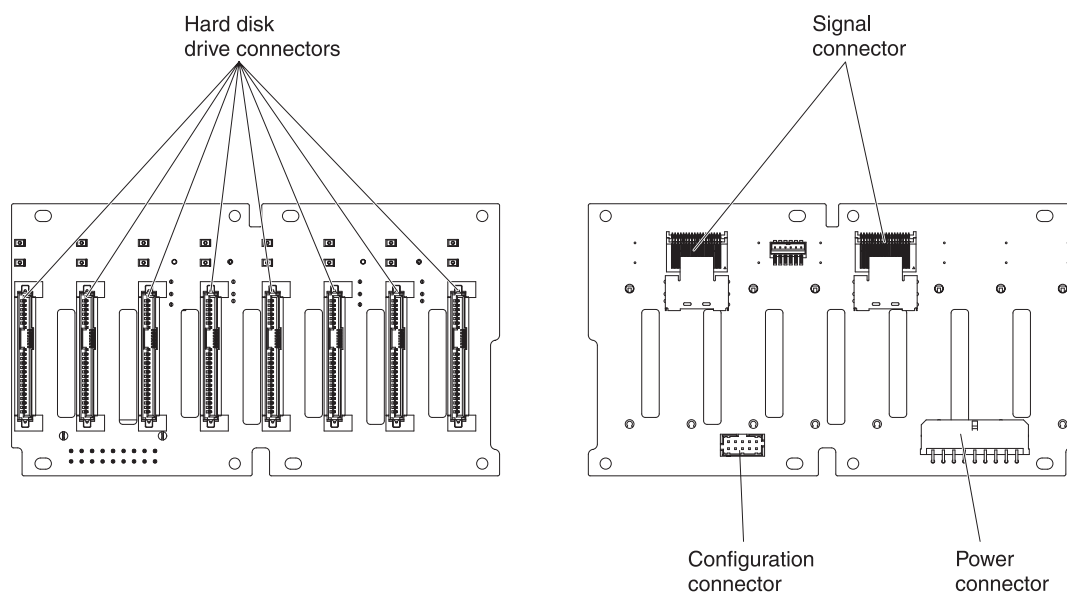


Figure 4. Connectors on the 2.5-inch hard disk drive backplane

2. The following illustrations show the cable connectors on ServeRAID M1015/M5014/M5015 adapters.

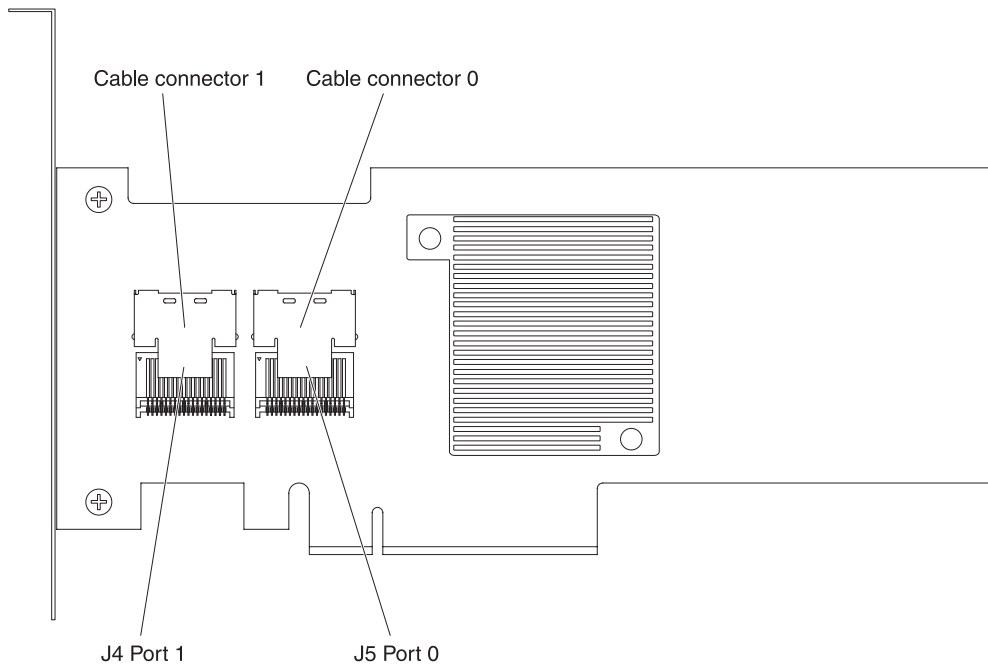


Figure 5. Cable connectors on ServeRAID-M1015 adapter

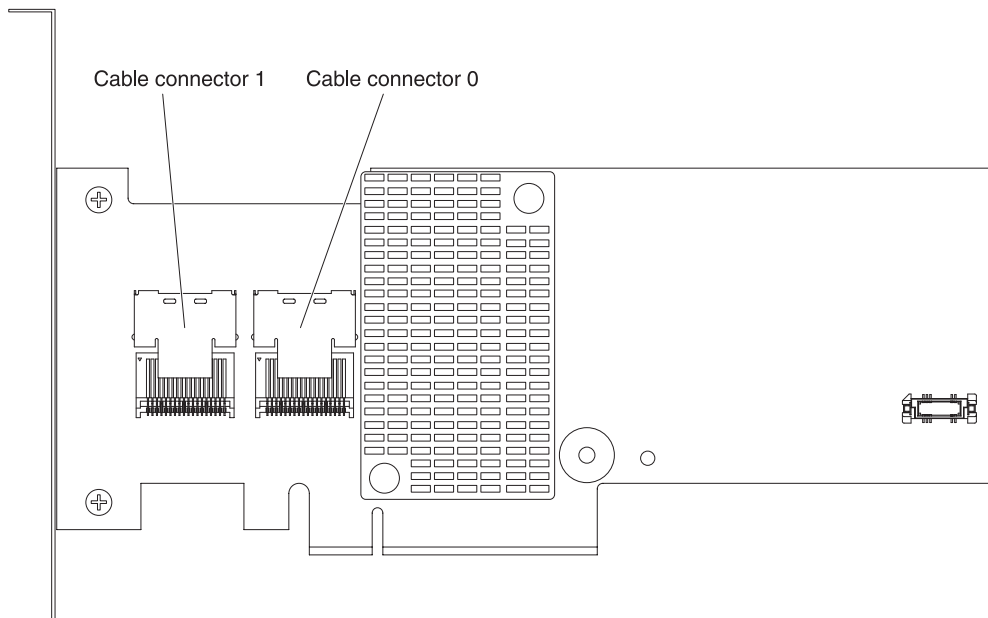


Figure 6. Cable connectors on ServeRAID-M5014 adapter

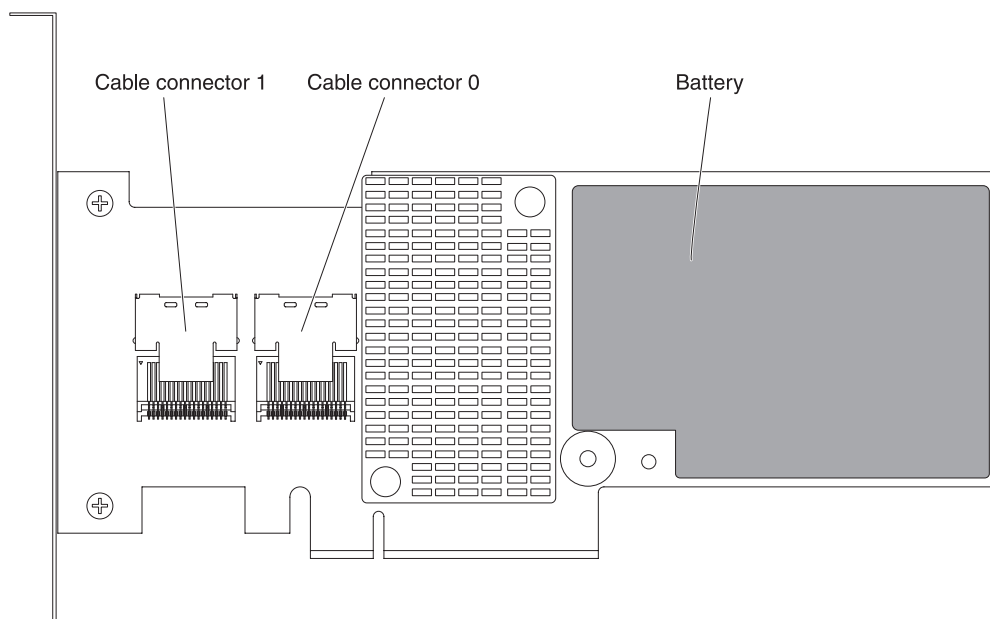


Figure 7. Cable connectors on ServeRAID-M5015 adapter

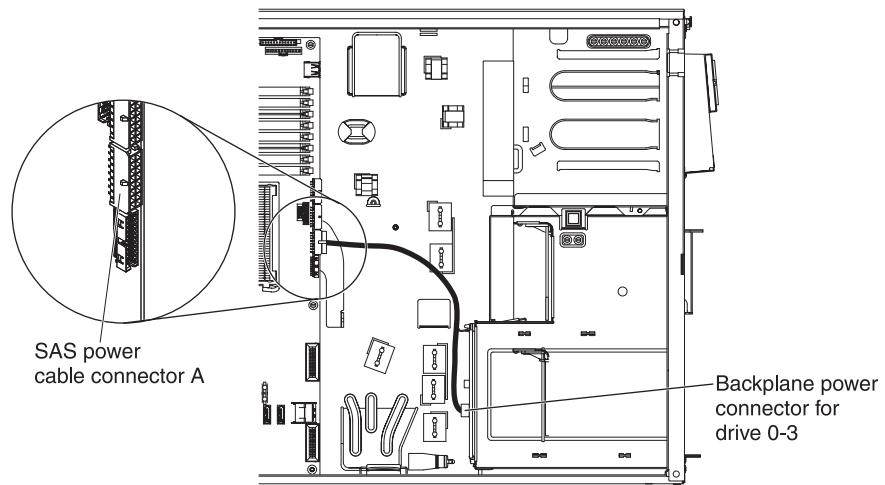
Note:

- For proper cooling, do not install any card in the slot next in sequence to a ServeRAID adapter with battery backup module (for example, if a ServeRAID adapter with battery backup module is installed in slot 2, do not install any card in slot 3).
- If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.

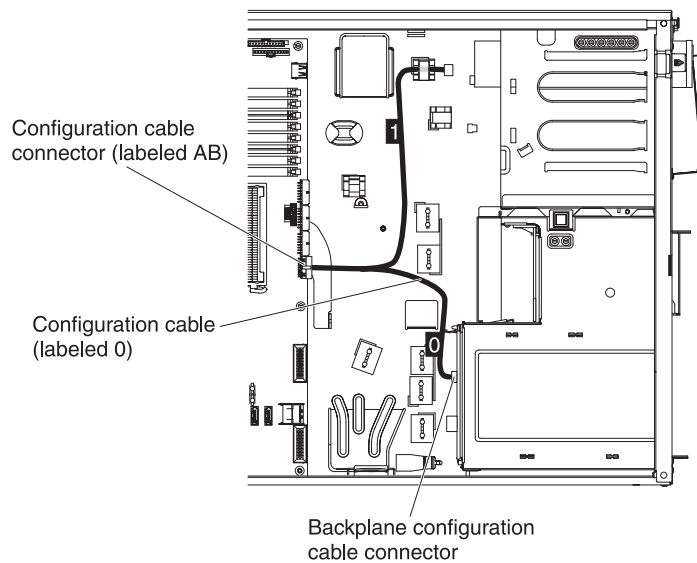
Review the following information before connecting power, configuration, and signal cables for the drives:

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

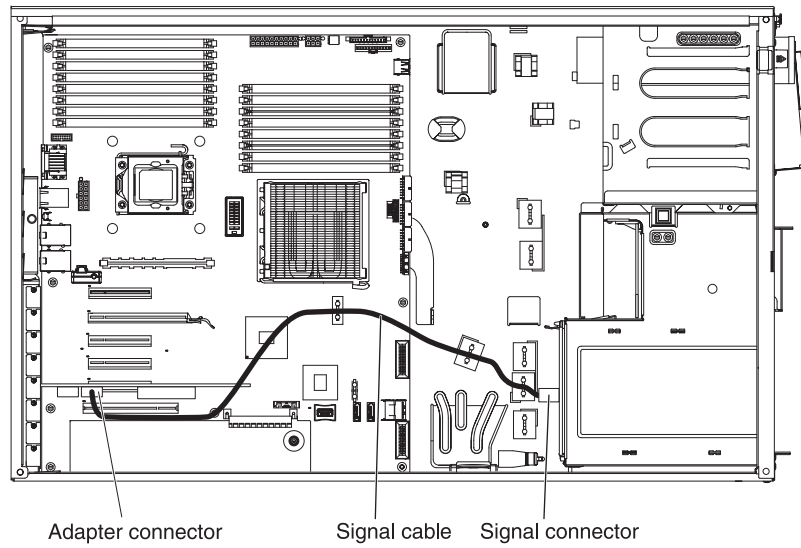
- The following illustration shows the internal power cable routing.



- The following illustration shows the internal configuration cable routing.

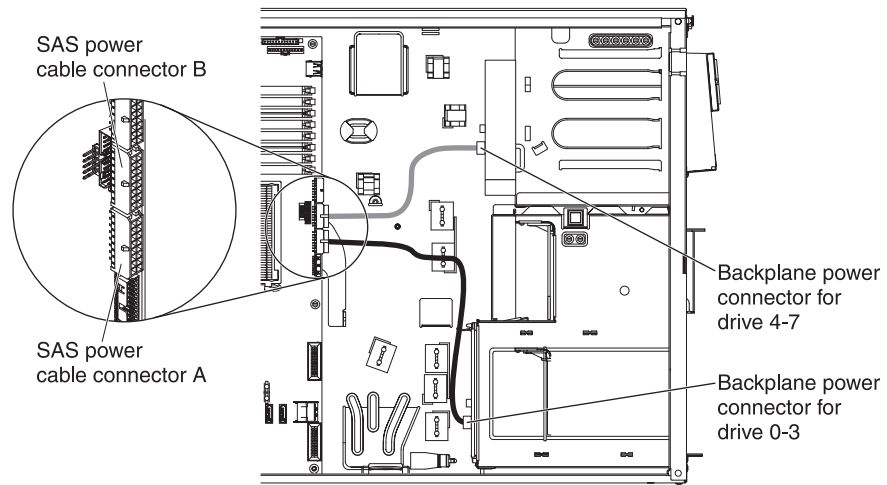


- The following illustration shows the internal signal cable routing for installing a ServeRAID adapter.

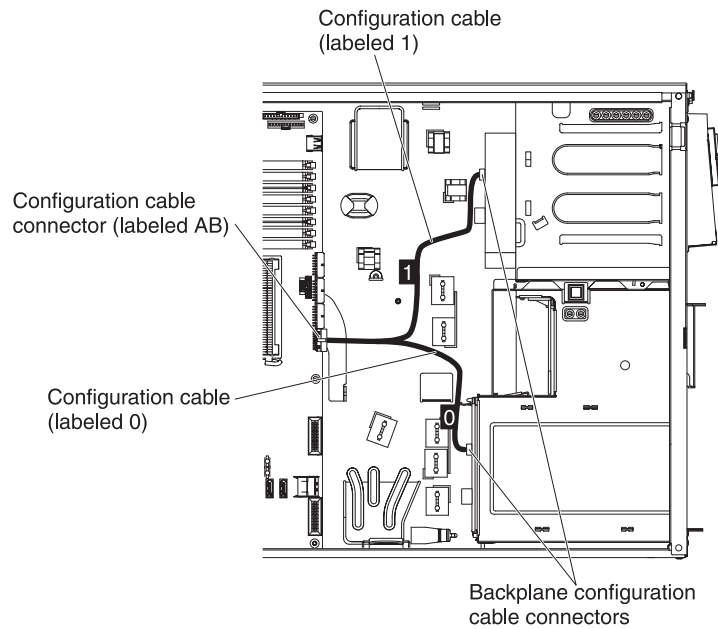


2. **For server models with eight 3.5-inch hot-swap hard disk drives.**

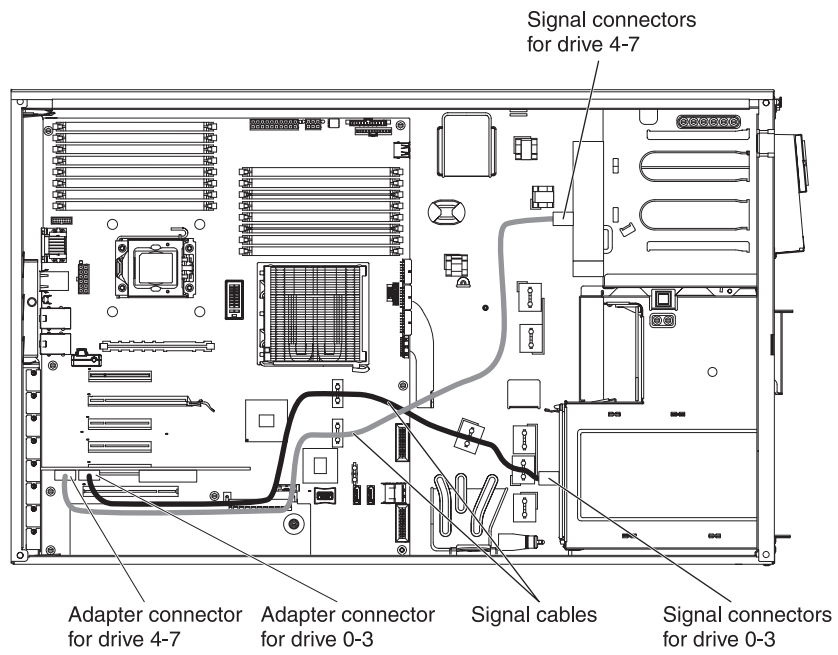
- The following illustration shows the internal power cable routing.



- The following illustration shows the internal configuration cable routing.

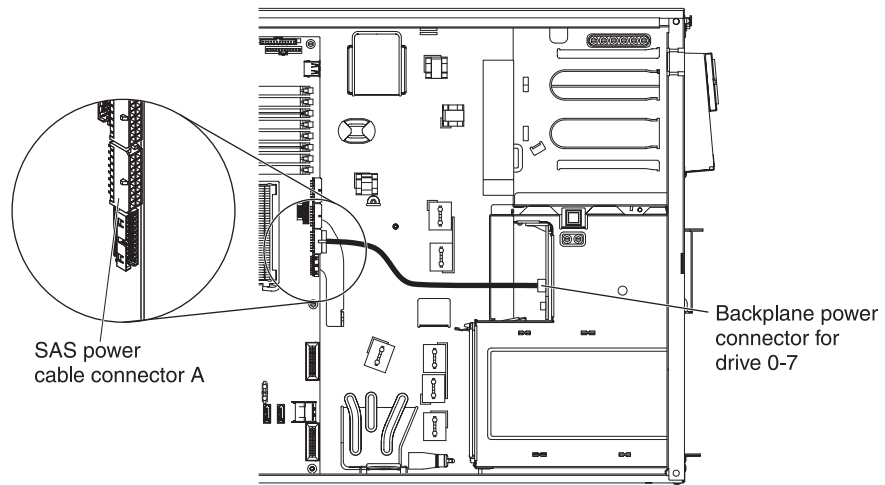


- The following illustration shows the internal signal cable routing for installing a ServeRAID adapter.

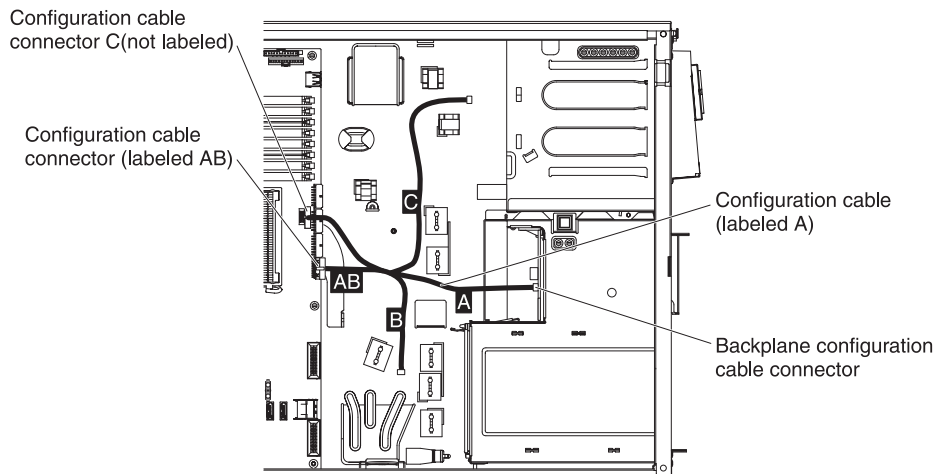


3. **For server models with eight 2.5-inch hot-swap hard disk drives.**

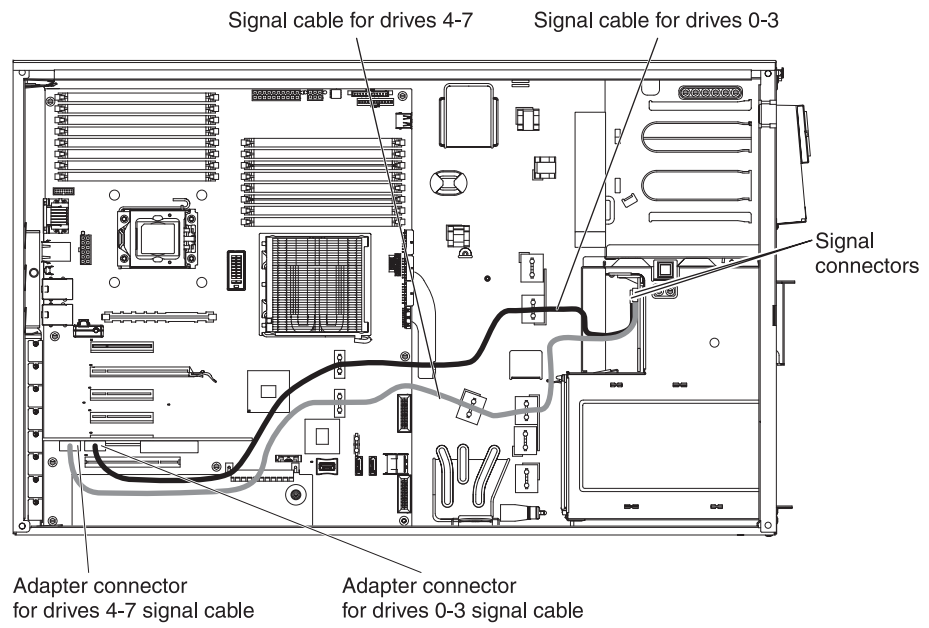
- The following illustration shows the internal power cable routing.



- The following illustration shows the internal configuration cable routing.

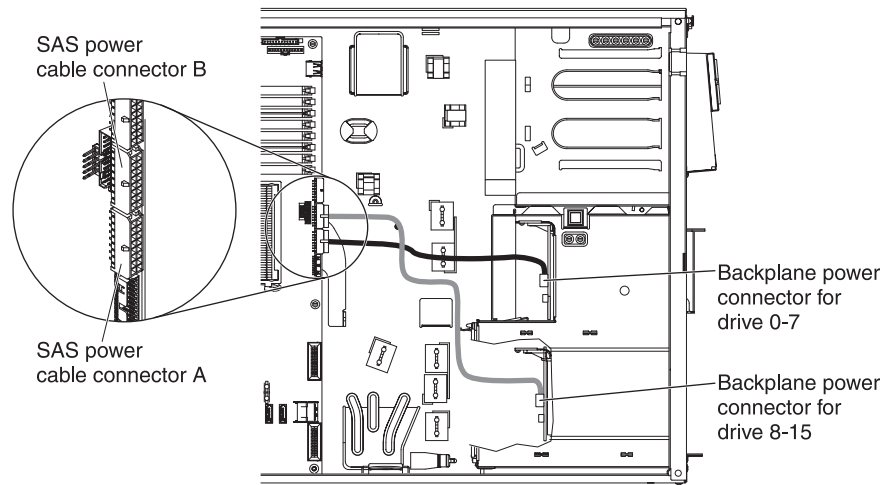


- The following illustration shows the internal signal cable routing for installing a ServerRAID adapter.

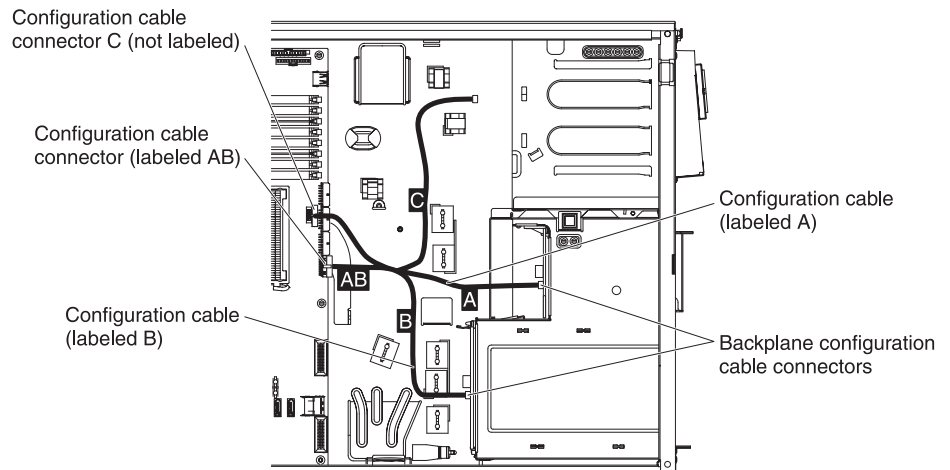


4. **For server models with sixteen 2.5-inch hot-swap hard disk drives.**

- The following illustration shows the internal power cable routing.



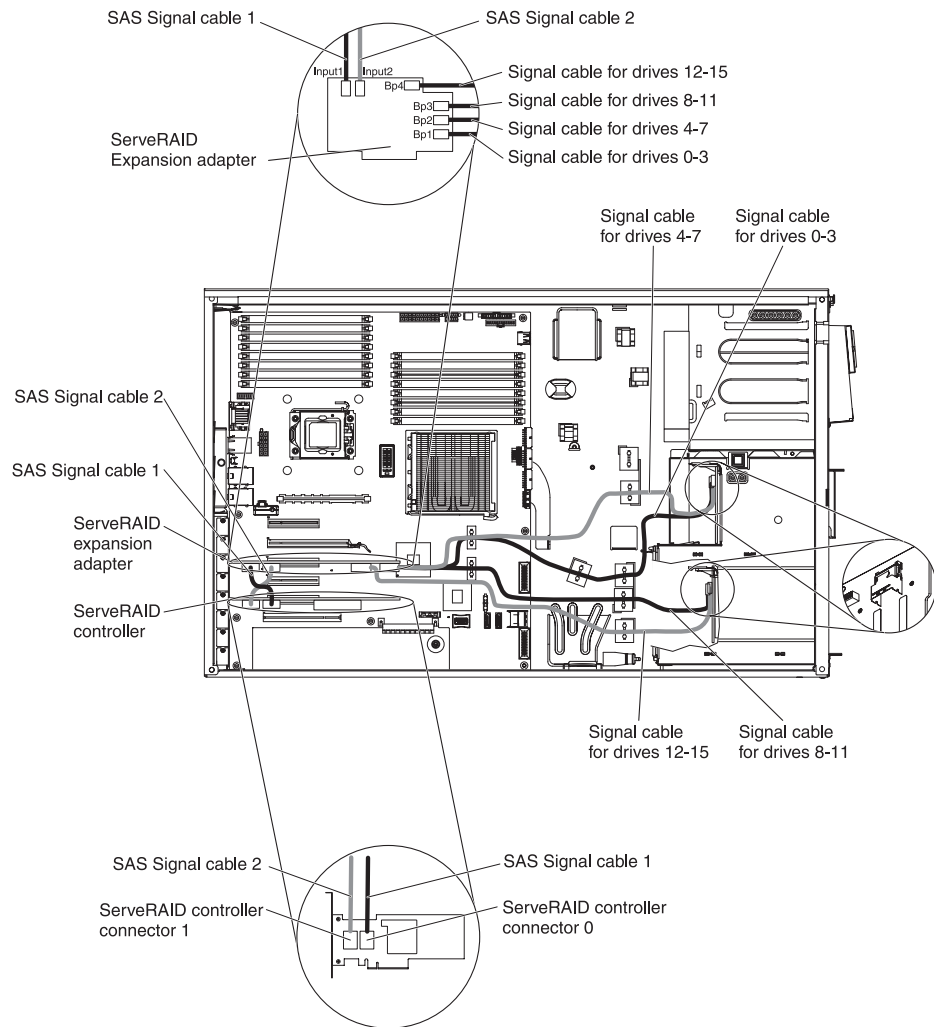
- The following illustration shows the internal configuration cable routing.



- The following illustration shows the internal signal cable routing for installing a ServeRAID adapter and a ServeRAID expansion adapter.

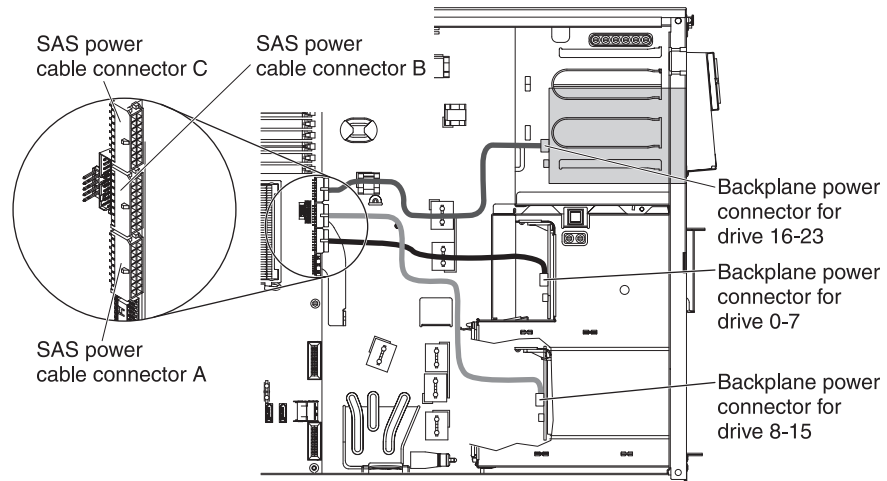
Note:

- SAS expander card does not support 3 GB RAID adapters.
- Install the ServeRAID expansion adapter to the PCI slot 3.

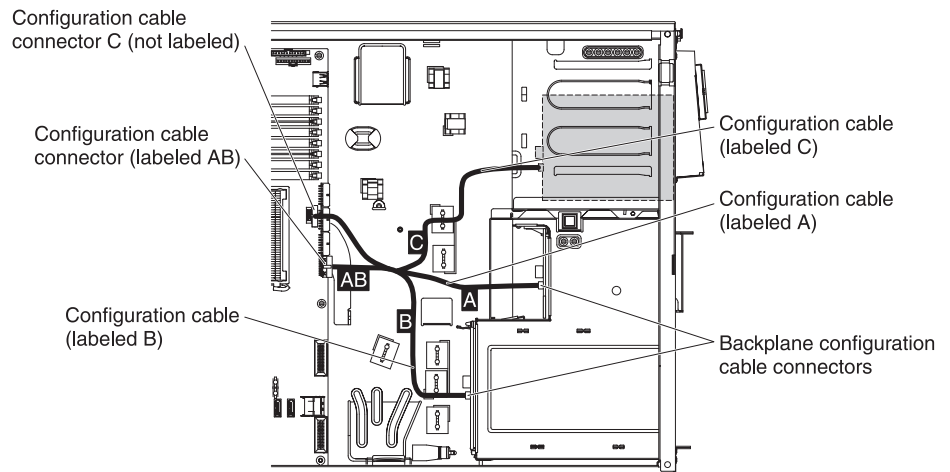


5. **For server models with twenty-four 2.5-inch hot-swap hard disk drives.**

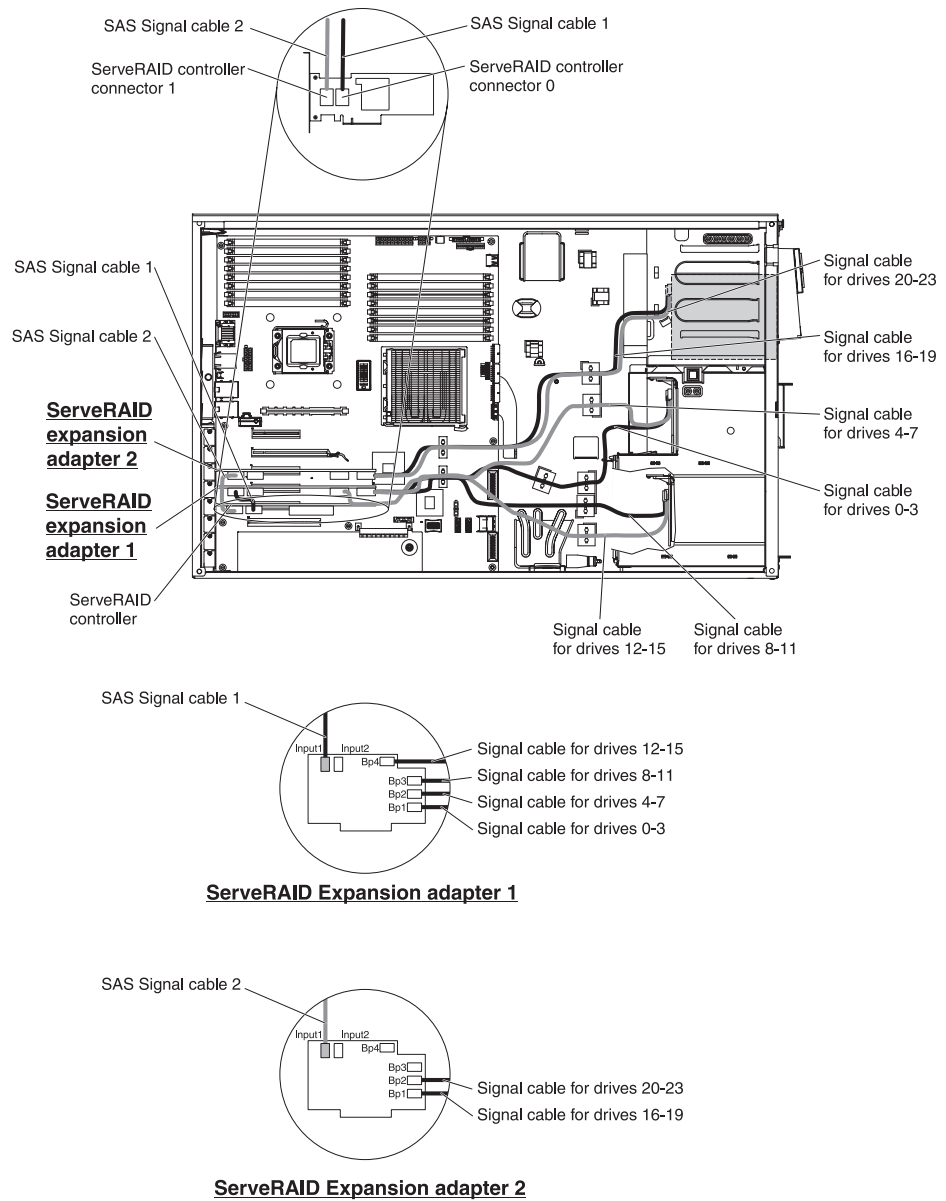
- The following illustration shows the internal power cable routing.



- The following illustration shows the internal configuration cable routing.



- The following illustration shows the internal signal cable routing for installing a ServeRAID adapter and two ServeRAID expansion adapters.

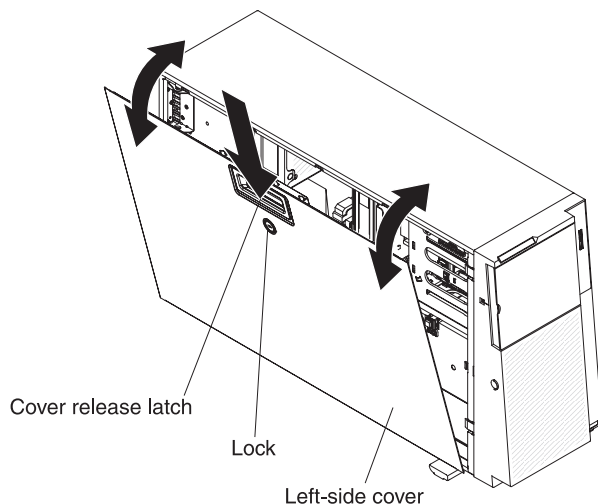


Note:

- SAS expander card does not support 3 GB RAID adapters.
- Install the ServeRAID expansion adapter 2 and 1 to the PCI slot 3 and 4.
- When using ServeRAID adapter M1015 to support more than sixteen 2.5-inch hard disk drives, the maximum number of RAID supported drives is 16. All the other drives will remain JBOD (the drives are presented to the operating system without a RAID configuration).

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, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Problem Determination and Service Guide* for diagnostic information.



To remove the cover, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. If you are planning to view the error LEDs that are on the system board and components, leave the server connected to power and go directly to step 5.
3. Turn off the server and all attached devices.
4. Disconnect all external cables and power cords.
5. Using the supplied key, unlock the left-side cover.
6. Pull the cover-release latch down and rotate the top edge of the cover away from the server.

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

7. Remove the left-side cover from the server.

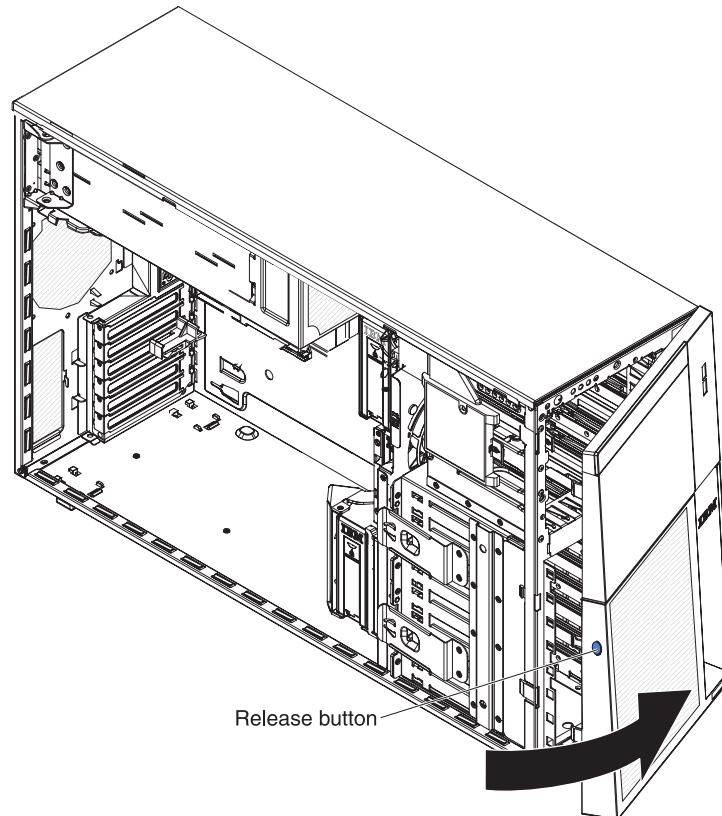
Opening the bezel media door

To open or remove the media door, complete the following steps:

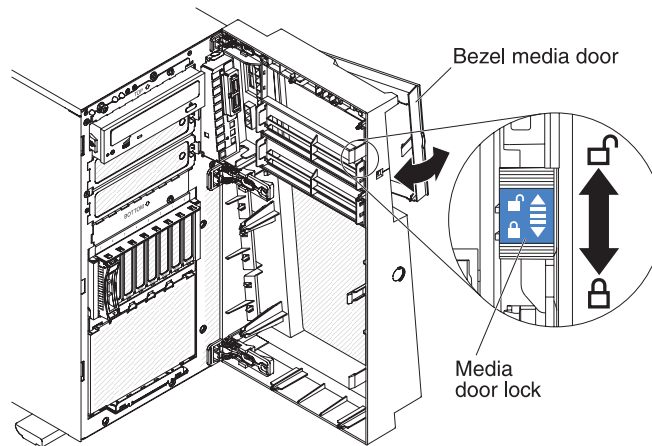
1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Unlock the left-side cover.

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

3. Press the button on the left edge of the bezel, and rotate the left side of the bezel away from the server.

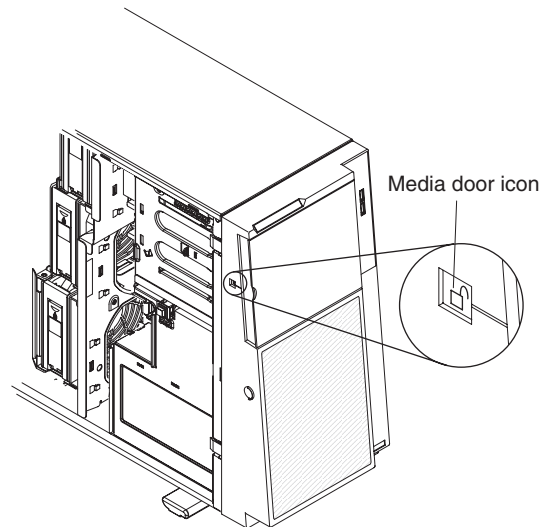


4. From inside of the top section of the bezel door, slide the blue tab up to unlock the bezel media door; then, grasp the depressed area on the left side of the media door and pull the door open.

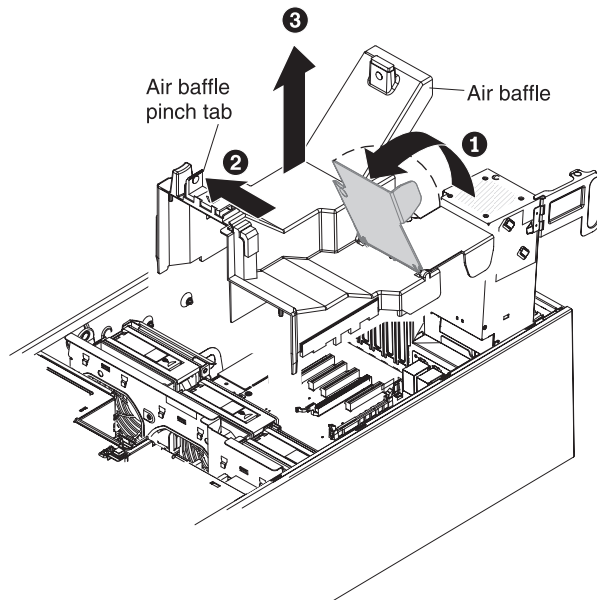


Note: To remove the media door from the bezel, push upward on the media door hinge to remove it from the bezel.

5. When the media door is unlocked, the icon on the side of the bezel will be in the unlocked position.



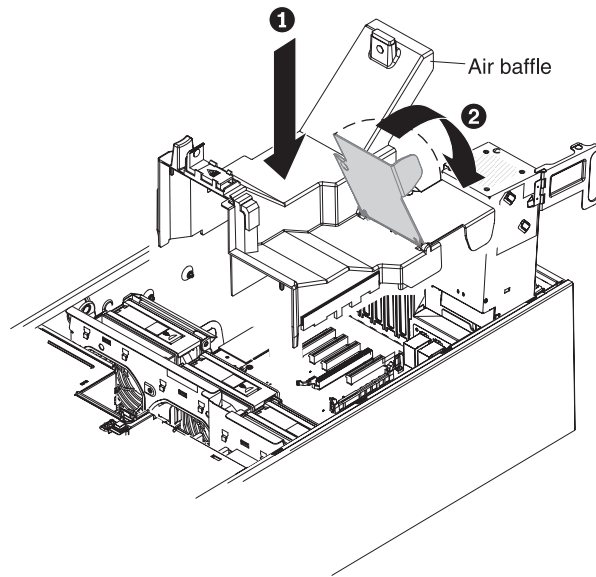
Removing the air baffle



To remove the air baffle, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and all attached devices.
3. Disconnect all external cables and power cords.
4. Remove the left-side cover (see “Removing the left-side cover” on page 57 for more information).
5. Remove the power supplies from the power-supply cage.
6. Unlatch the power-supply cage and rotate it out of the server until it locks.
7. Rotate the rear of the air baffle up **1**. Find the pinch tab on the air baffle, pinch it together with your fingers **2**, and lift the air baffle out of the server **3**.

Installing the air baffle



To install the air baffle, complete the following steps:

1. With the rear (hinged) part of the air baffle lifted up, align the positioning pins on the ends of the air baffle with the locating holes in the server chassis and fan cage assembly.
2. Slide the air baffle down into the server **1** until the positioning pins fit into the locating holes; then, press down on the air baffle until the pinch tab clicks into place.
3. Rotate the rear (hinged) part of the air baffle **2** down to the system board.

Note: Make sure that the power-supply cage cables are not caught under the air baffle.

4. Return the power-supply cage to its closed position (see “Closing the power-supply cage” on page 65).
5. Install the hot-swap power supply or power supplies (see “Installing a redundant power supply and fans” on page 102).
6. Install and lock the left-side cover (see “Completing the installation” on page 105).
7. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the server.

Installing the fan cage assembly

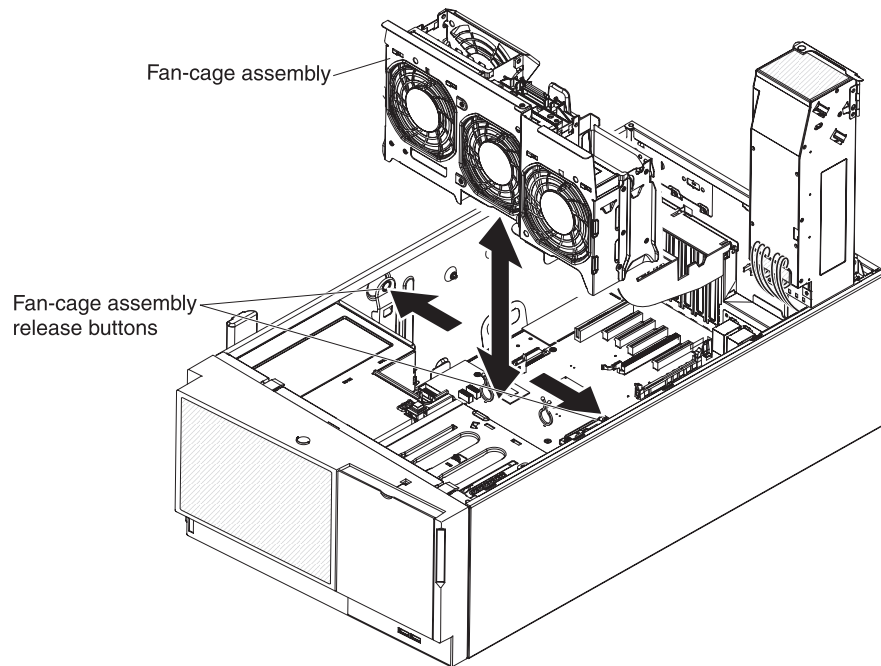
Attention:

- 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 side cover removed.

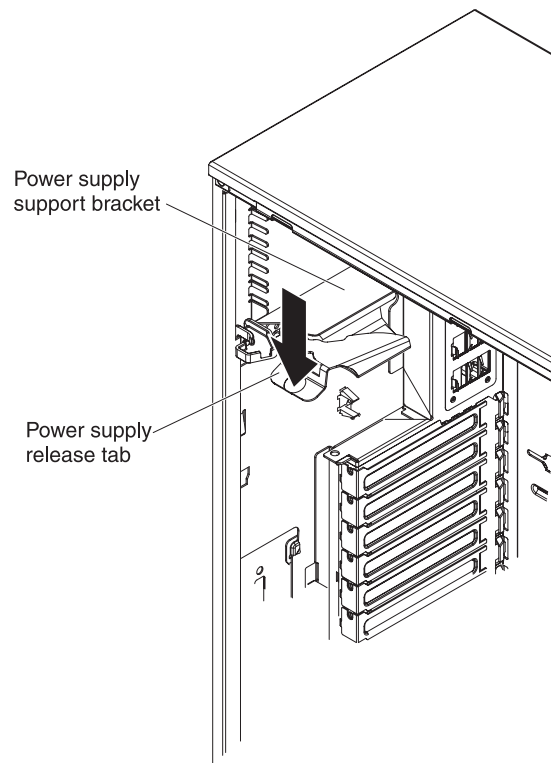
To install the fan cage assembly, complete the following steps.

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.



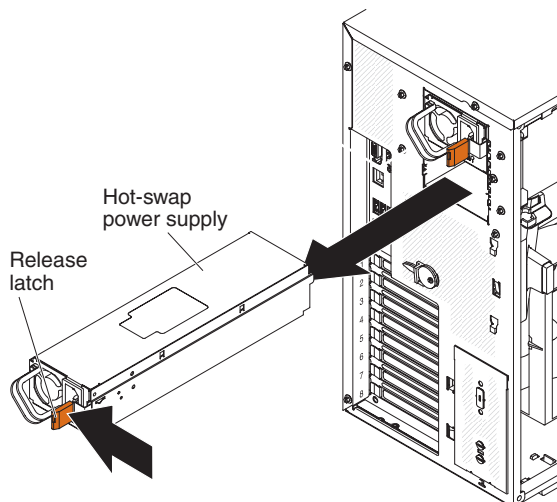
2. Slide the fan cage assembly into the chassis and press firmly until the fan cage is seated firmly in place.
3. Install the air baffle (see "Installing the air baffle" on page 61).
4. Rotate the power-supply cage assembly back into the server. Press the power-supply release tab and rotate the power-supply cage assembly into the chassis.



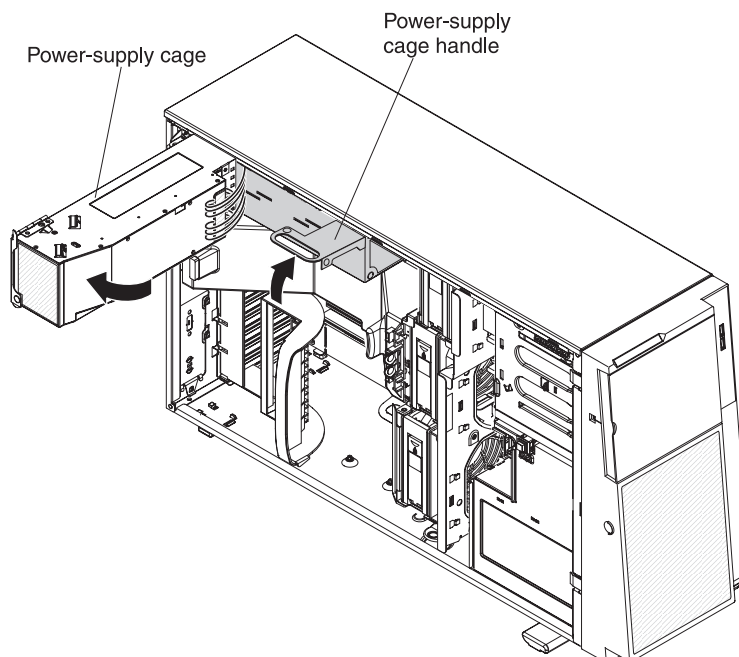
Opening the power-supply cage

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 37.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Press the release latch on the power supplies and pull them out of the power-supply cage.



4. Unlock and remove the left-side cover (see “Removing the left-side cover” on page 57 for more information).
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.

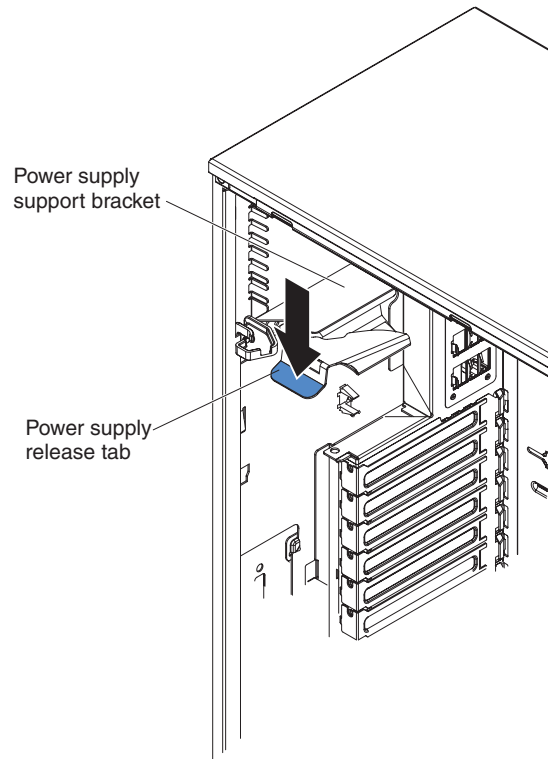


6. Let the power-supply cage rest on the rear power-supply latch bracket.

Closing the power-supply cage

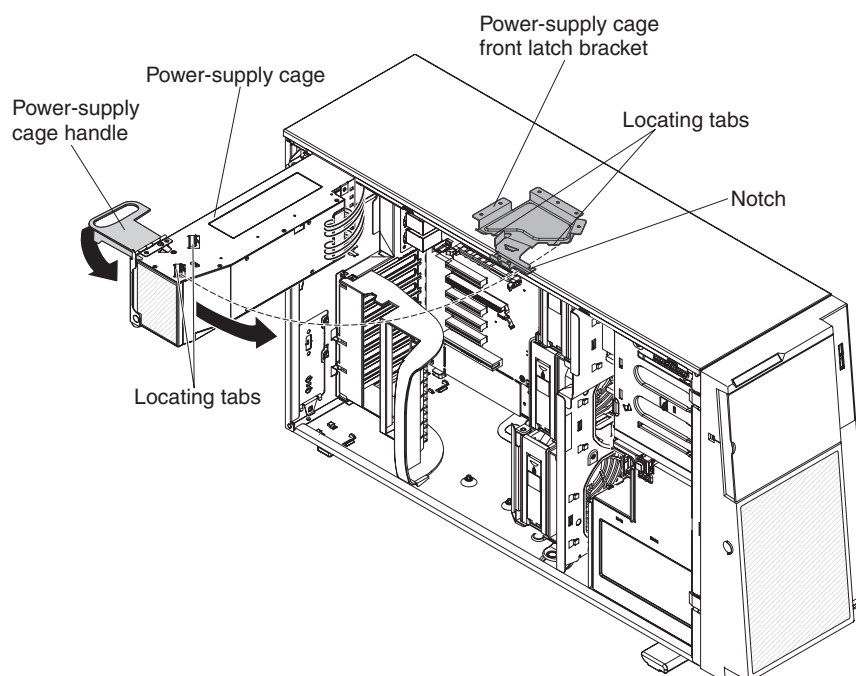
To return the power-supply cage to its closed position, complete the following steps:

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

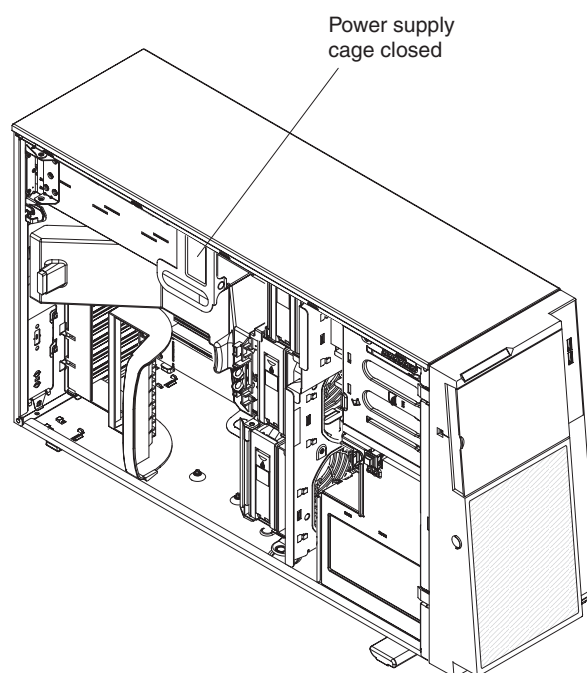


Attention: Be sure to move the cables out of the way of the power supply cage before you start to move the cage back into the server.

2. Carefully 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.



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 "Completing the installation" on page 105).
5. Install the hot-swap power supplies.
6. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the server.

Installing an adapter

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

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section. If you must change the switch or jumper settings on the adapter, follow the instructions that come with the adapter.
- Avoid touching the components and gold-edge connectors on the adapter.
- PCI slots 1 and 6 support half-length PCI adapters only.
- PCI slots 2, 3, 4, and 5 support full-height and full-length PCI adapters.
- The PCI Express extender card supports a full-length adapter.
- The PCI-X extender card supports two full-length adapters.
- PCI slots 1 and 5 support the RAID adapters.
- PCI slot 2 supports a VGA adapter.
- The PCI configuration:
 - Slot 1 is a PCI Express x8 slot with x8 links, PCI Express Base Specification Revision 2.0 compliant.
 - Slot 2 is a PCI Express x16 slot with x8 links, PCI Express Base Specification Revision 2.0 compliant.
 - Slots 3 and 4 are PCI Express x8 slots with x4 links, PCI Express Base Specification Revision 2.0 compliant.
 - Slot 5 is a PCI Express x8 slot with x8 links, PCI Express Base Specification Revision 2.0 compliant.
 - Slot 6 is a PCI 33/32 slot, PCI 2.2 compliant.
 - PCI Express extender card slot 7 is a PCI Express x8 slot with x4 links, PCI Express 1.0a compliant.

Note: The PCI Express extender card comes standard on the System x3500 M3 server.

- PCI-X extender card slots 7 and 8 are PCI-X slots with 64/32 bits, 133/100/66 MHz from PXH.
- The system scans PCI slots 1 through 6 to assign system resources. The system then starts (boots) the system devices in the following order, if you have not changed the default boot precedence: integrated Ethernet controller, ServeRAID-BR10i SAS adapter, and then PCI, PCI-X, and PCI Express slots.

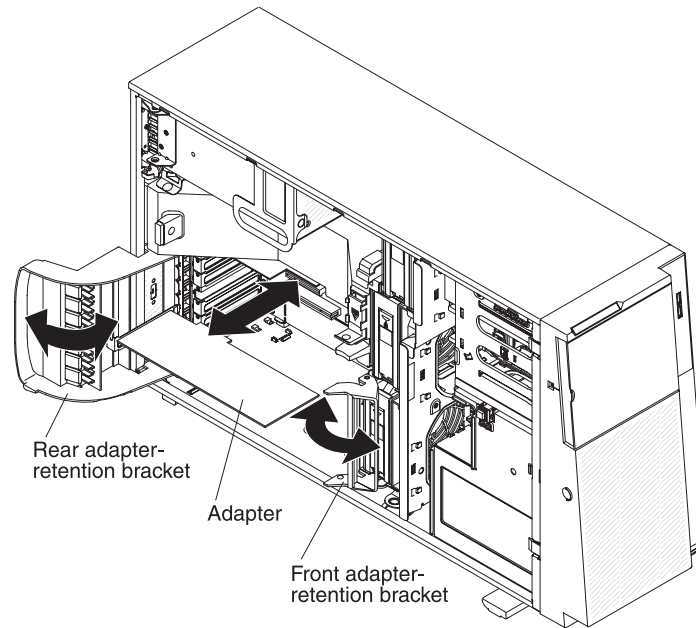
Note: To change the boot precedence for PCI and PCI-X devices, start the Setup utility and select **Start Options** from the main menu. See the “Starting the Setup utility” on page 109 for details about using the Setup utility.

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

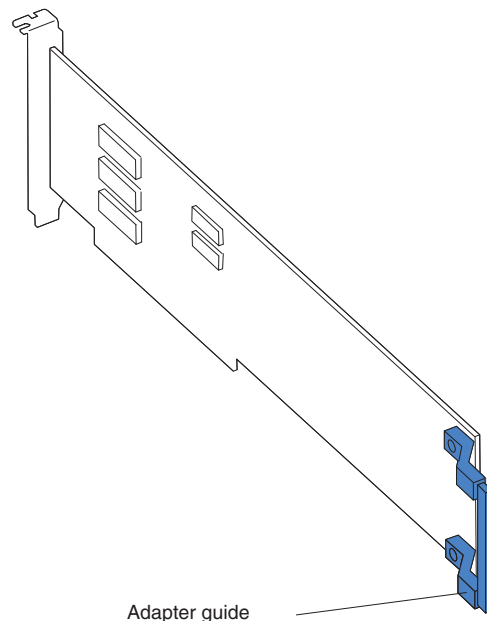
Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to stop, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when working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

To install an adapter, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables. Remove the left-side cover (see “Removing the left-side cover” on page 57 for more information).
3. See the documentation that comes with the adapter for any cabling instructions and information about jumper or switch settings. (It might be easier for you to route cables before you install the adapter.)
4. Rotate the adapter-retention brackets to the open position.
5. Remove the expansion-slot cover.



6. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter. Otherwise, continue with the next step.



7. Press the adapter *firmly* into the expansion slot, lower the adapter-retention bracket, and make sure that the bracket is in the closed position.

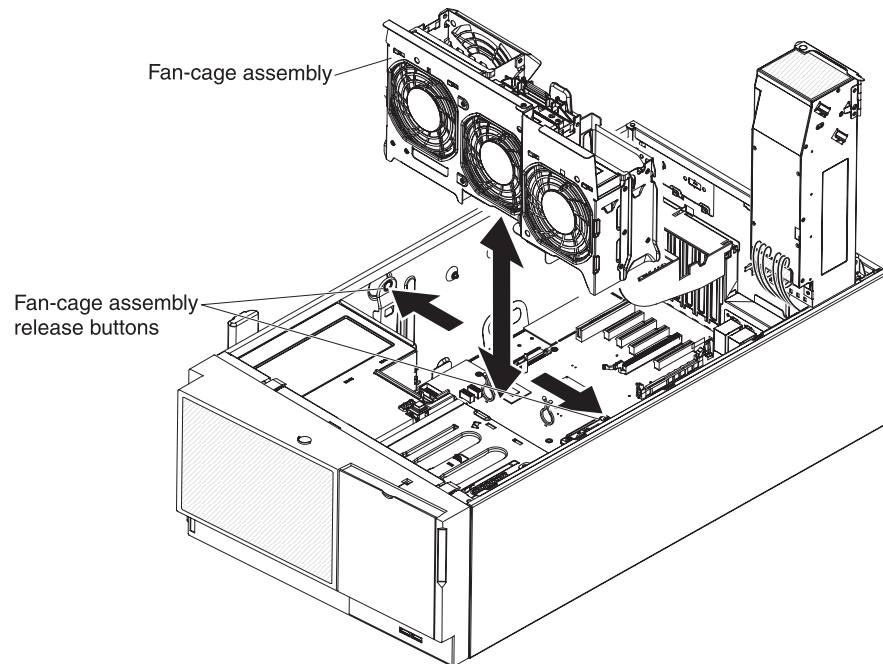
Attention: Incomplete insertion might cause damage to the system board or the adapter.

8. Connect any needed cables to the adapter.

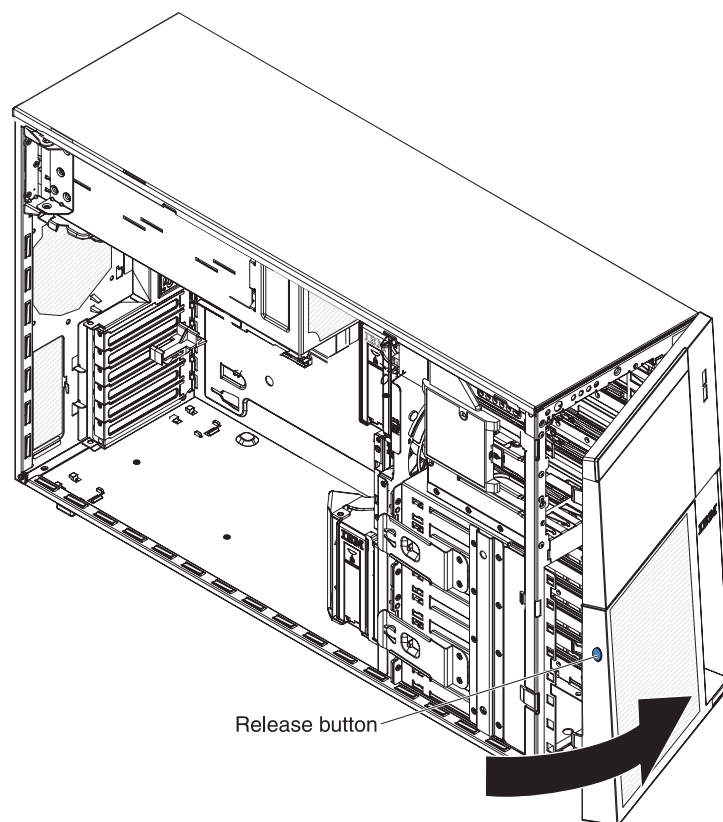
If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 105.

Installing a DVD drive

1. **To install a DVD drive on models with four 3.5-inch, eight 2.5-inch or sixteen 2.5-inch hard disk drives, complete the following steps:**
 - a. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
 - b. Turn off the server and peripheral devices and disconnect the power cords and all external cables.
 - c. Unlock and remove the left-side cover (see “Removing the left-side cover” on page 57).
 - d. Remove the fan cage assembly.



- e. Open the bezel by pressing the button on the left edge of the bezel, and rotate the left side of the bezel away from the server.



- f. 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.

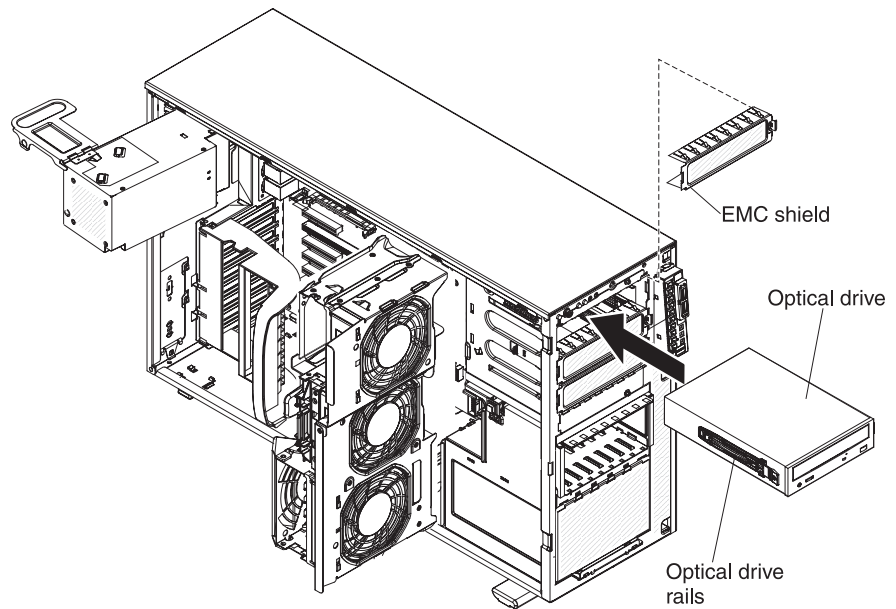


Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

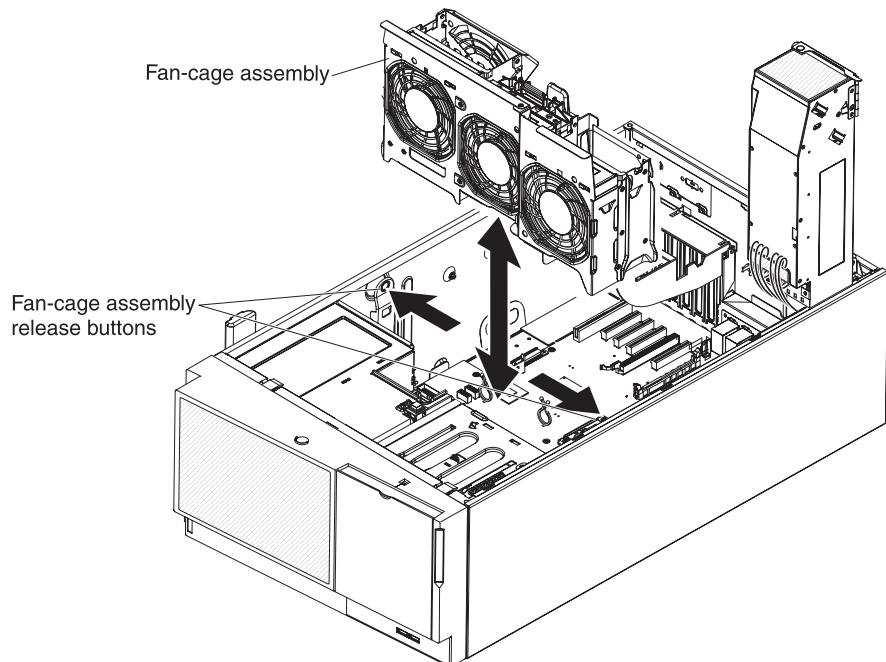
- g. Touch the static-protective package that contains the DVD drive to any unpainted metal surface on the server; then, remove the DVD drive from the package and place it on a static-protective surface.
- h. Set any jumpers or switches on the drive according to the documentation that comes with the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

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

- i. 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.



- j. 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.
- k. Connect power and signal cables to the drive and the connectors on the system board. (See “System-board internal connectors” on page 23 and “Internal cable routing and connectors” on page 38 for more information.)
- l. 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.
- m. Reinstall the fan cage assembly.



- n. Reinstall the air baffle (see “Installing the air baffle” on page 61).
- o. 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.

- p. If you have another drive to install or remove, do so now.
 - q. Replace the left-side cover and bezel; then, lock the side cover and bezel.
 - r. Reconnect the external cables and power cords.
2. **To install the UltraSlim DVD drive on models with eight 3.5-inch, complete the following steps:**
- Locate the documentation that comes with the drive and follow those instructions in addition to the instructions in this chapter.
 - Make sure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
 - The server supports one ultra-slim SATA optical drive.
- a. If you are replacing a drive, make sure that:
- You have all the cables and other equipment that are specified in the documentation that comes with the new drive.
 - You have checked the instructions that come with the new drive to determine whether you must set any switches or jumpers in the drive.
 - You have removed the blue optical drive rails from the side of the old drive and have them available for installation on the new 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

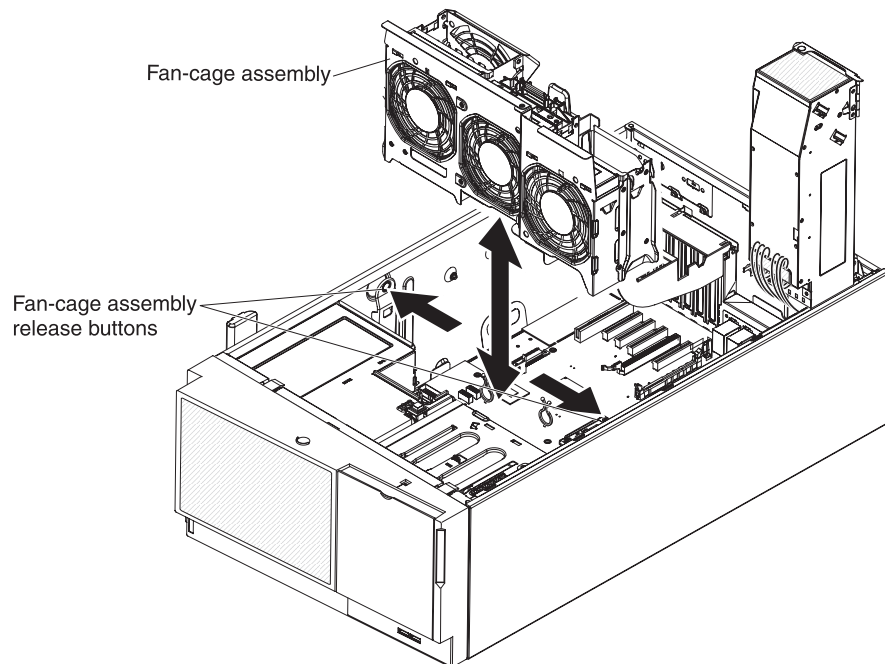
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

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

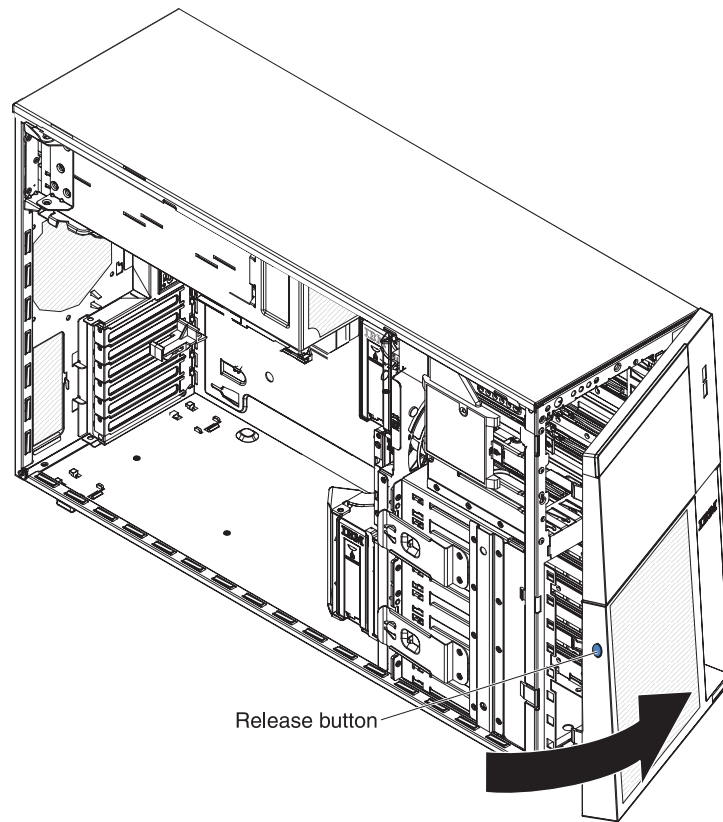


Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

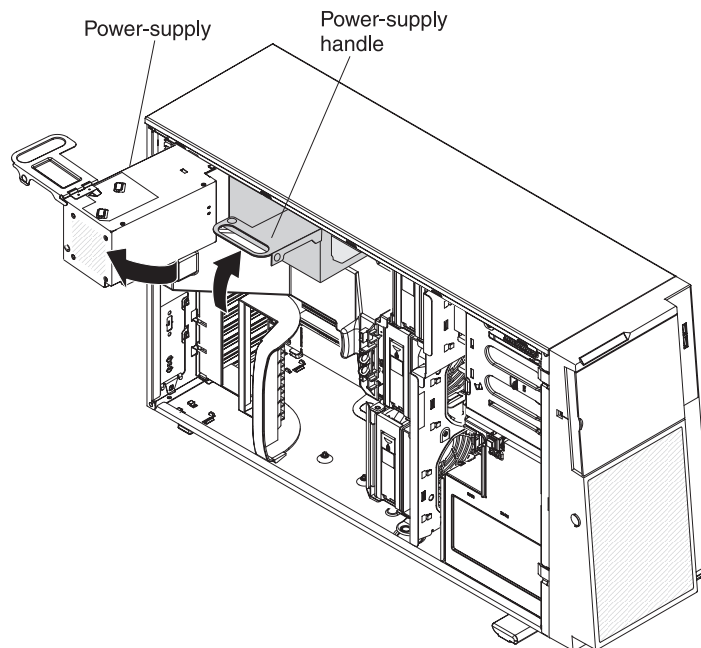
- b. Touch the static-protective package that contains the UltraSlim DVD drive to any unpainted metal surface on the server; then, remove the UltraSlim DVD drive from the package.
- c. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
- d. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
- e. Unlock and remove the left-side cover (see “Removing the left-side cover” on page 57).
- f. Remove the fan cage assembly.



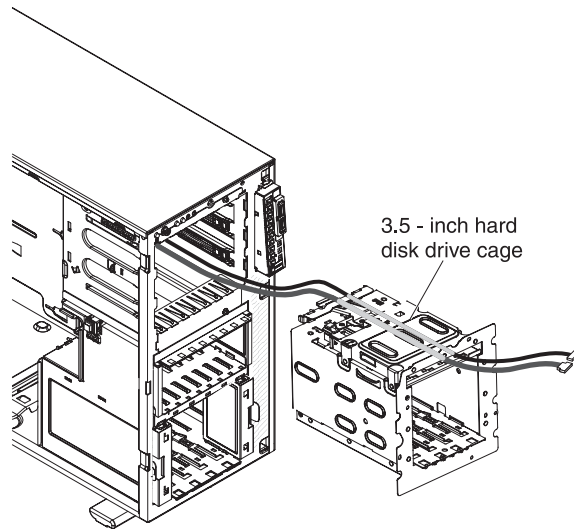
- g. Open the bezel by pressing the button on the left edge of the bezel, and rotate the left side of the bezel away from the server.



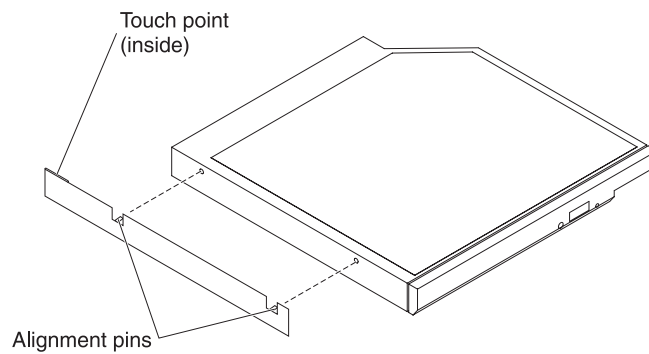
- h. Rotate the power-supply cage assembly out of the chassis. Lift up the power-supply cage handle and pull the power-supply cage assembly all the way up until the retainer latch locks the cage in place on the chassis.



- i. Disconnect the power and signal cables of the DVD drive from the system board.
- j. Pull the power and signal cables of the UltraSlim DVD drive through the slim slot on top of the 3.5-inch hard disk drive cage.



- k. Connect the power and signal cables to the UltraSlim DVD drive. (See “Internal cable routing and connectors” on page 38 for more information.)
- l. Attach the drive retention clip to the side of the new drive.

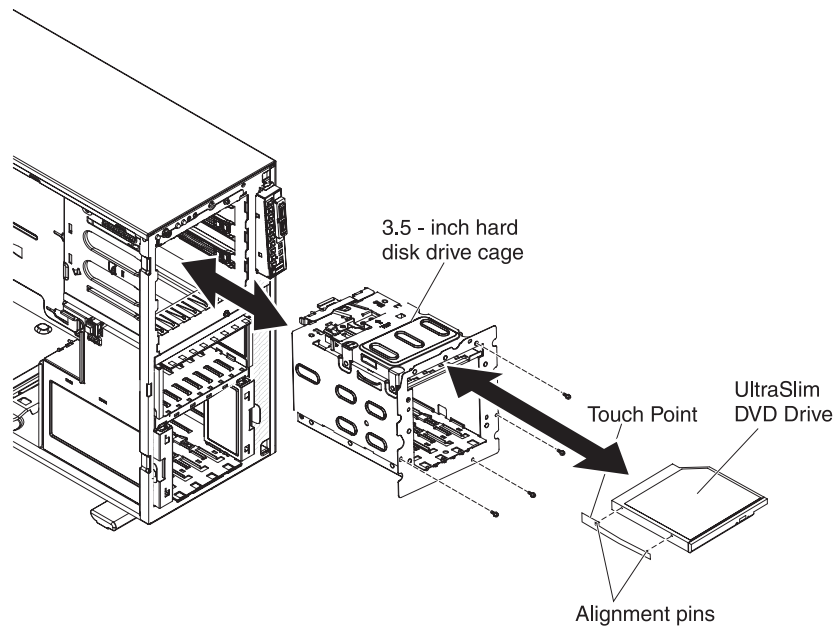


- m. Slide the UltraSlim DVD drive into the slim slot on top of the 3.5-inch disk drive cage until the drive clicks into place.

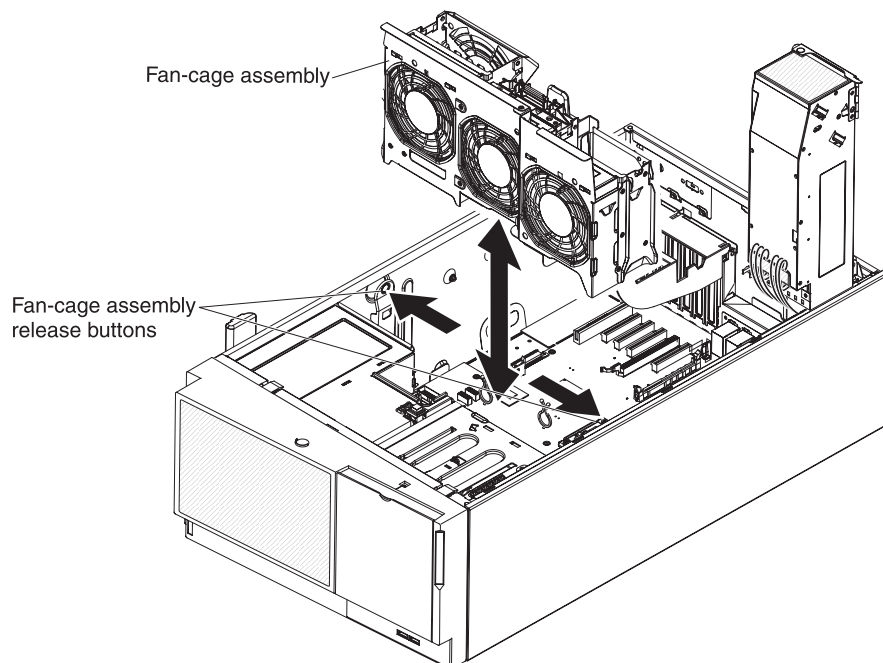
Note: Pull the power and signal cables of the UltraSlim DVD drive into the slim slot on top of the cage first. Make sure the cables are not stuck when you slide the UltraSlim DVD drive into the cage.

- n. Slide the 3.5-inch disk drive cage into the upper opening of the server along the lower edge of the opening.

Note: Pull the power and signal cables of the UltraSlim DVD drive into the upper opening of the server first. Make sure the cables are not stuck when you slide the disk drive cage into the server.



- o. Secure the 3.5-inch disk drive cage with the screws.
- p. Reconnect the power and signal cables of the UltraSlim DVD drive to the system board. (See “Internal cable routing and connectors” on page 38 for more information.)
- q. Reinstall the air baffle.
- r. Reinstall the fan cage assembly.



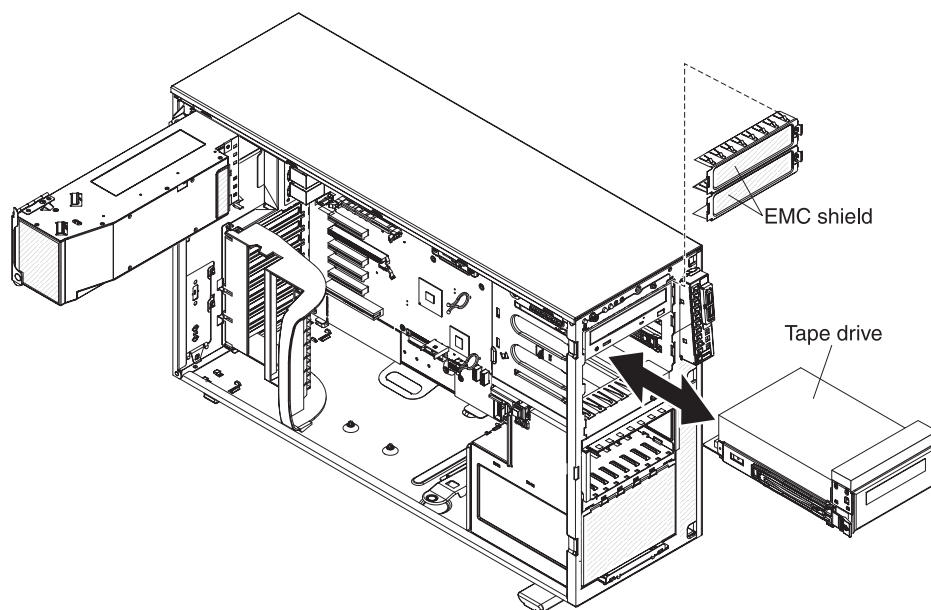
- s. Rotate the power-supply cage assembly back into the server. Press the power-supply cage release tab and rotate the power-supply cage assembly into the chassis.
- t. Close the bezel.
- u. Install and lock the left-side cover (see “Completing the installation” on page 105).

- v. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the server.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 105.

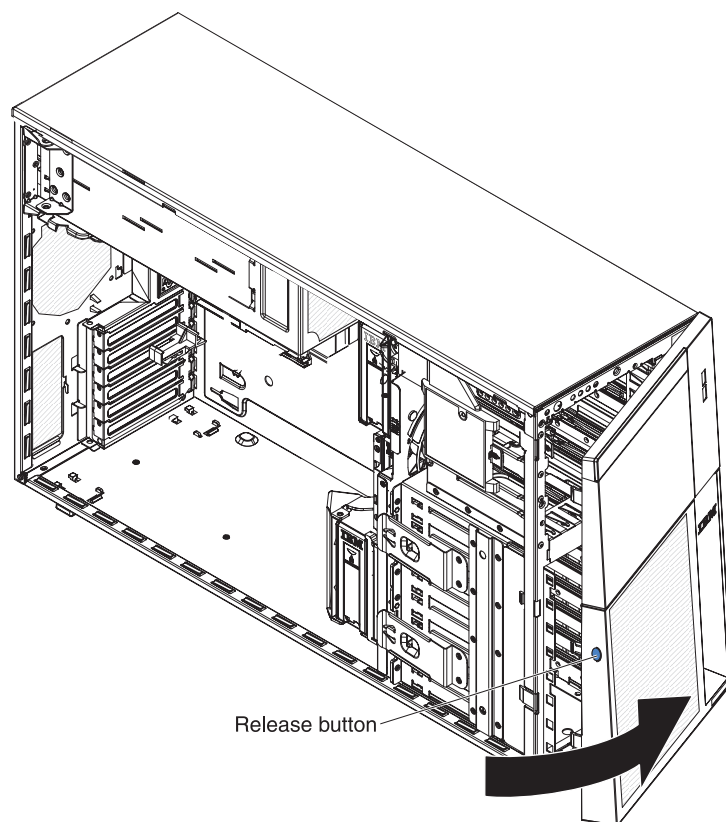
Installing a USB or SATA tape drive

The server supports USB and SATA tape drives. When you install a tape drive, be sure to connect the internal tape cable to the correct connector on the system board.

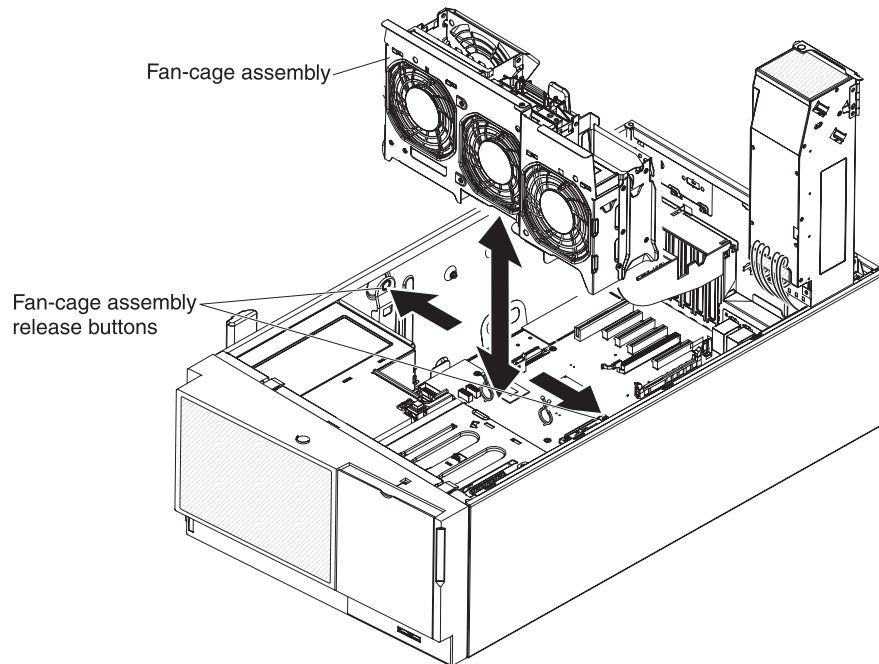


To install a tape drive, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Unlock and remove the left-side cover (see “Removing the left-side cover” on page 57 for more information).
4. Open the bezel by pressing the button on the left edge of the bezel, and rotate the left side of the bezel away from the server.



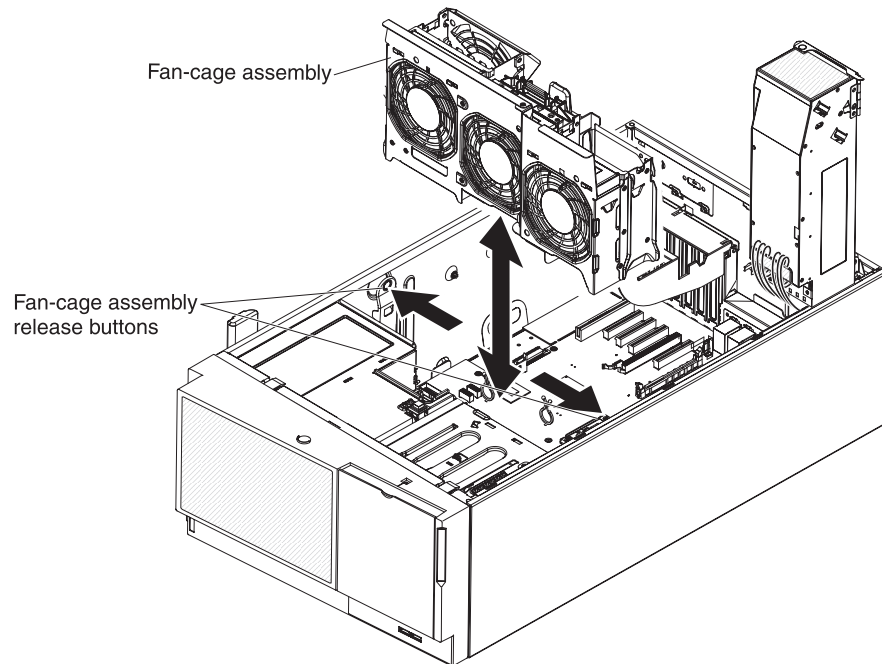
5. Remove the EMC shields from the drive bays.
6. Find the blue drive rails in the server bay and install one on each side of the tape drive.
7. Slide the tape drive into the server.
8. Close the bezel.
9. Remove the power supplies from the rear of the server.
10. Carefully lay the server down on its side.
11. Open the power-supply cage (see “Opening the power-supply cage” on page 64 for more information).
12. Remove the air baffle (see “Removing the air baffle” on page 60 for more information).
13. Remove the fan cage assembly.



14. If the tape drive came with screws, secure the drive to the server chassis, using the supplied screws.
15. Connect one end of the tape drive cable to the USB or SATA connector on the system board, depending upon the type of tape drive that you are installing; then, route the cable through the cable holders on the inside of the server and connect the opposite end of the cable to the back of the tape drive (see "Internal cable routing and connectors" on page 38 for more information.)

Note: If you are installing an RDX internal USB tape drive, use the SATA-to-traditional power converter cable to serve as a bridge between the optical power cable and the power connector on the RDX tape drive.

16. Connect the power cable to the tape drive and to the connector on the system board (see "Internal cable routing and connectors" on page 38 for more information.)
17. Reinstall the fan cage assembly.



18. Reinstall the air baffle (see “Installing the air baffle” on page 61.)
19. Reinstall or close the power-supply cage (see “Closing the power-supply cage” on page 65 for more information).
20. Reinstall the power supplies.
21. Replace the left-side cover; then, lock the side cover and bezel.
22. Reconnect the external cables and power cords.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 105.

Installing a hot-swap hard disk drive

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

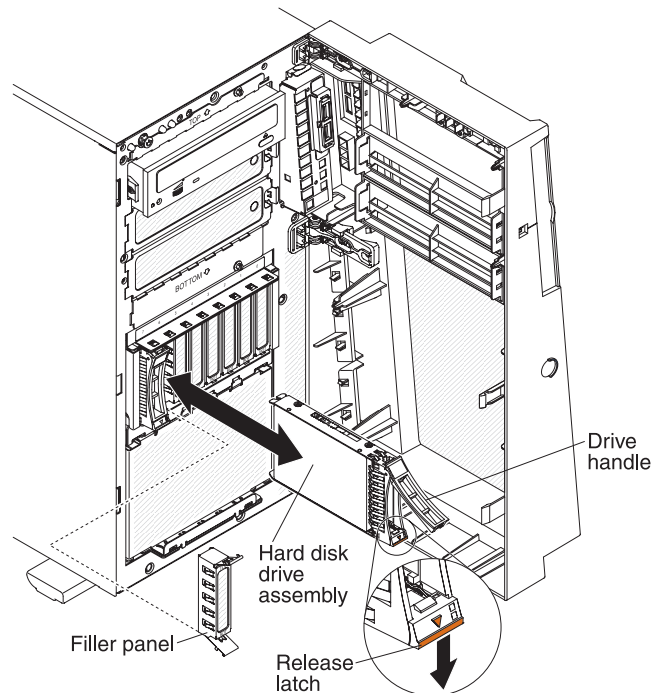
- The server supports up to twenty-four 2.5-inch, SAS/SATA hot-swap hard disk drives or up to eight 3.5-inch, SAS/SATA hot-swap hard disk drives in the standard hot-swap bays depending on your model.

Note:

- SAS expander card does not support 3 GB RAID adapters.
- When using ServeRAID adapter M1015 to support more than sixteen 2.5-inch hard disk drives, the maximum number of RAID supported drives is 16. All the other drives will remain JBOD (the drives are presented to the operating system without a RAID configuration).
- If the server is configured for RAID operation using a ServeRAID adapter, you might have to reconfigure your disk arrays after you install drives. See the ServeRAID adapter documentation for additional information about RAID operation and complete instructions for using the ServeRAID adapter.
- The hot-swap drives are arranged horizontally in the standard hard disk drive cage.
- On models with 2.5-inch hard disk drives, the drive numbers are 0 through 7 (right to left). 8 through 15 (right to left). 16 through 23 (right to left). When you install hard disk drives, start with drive 0.
- On models with four 3.5-inch hard disk drives, the drive numbers are 0 through 3 (left to right). On models with eight 3.5-inch hard disk drives, hard disk drive cage for drive 4 through 7 (left to right) is added.
- For a list of supported optional devices for the server, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.
- Inspect the drive tray for signs of damage.
- Make sure that the drive is correctly installed in the tray.
- See the documentation for the ServeRAID adapter for instructions for installing a hard disk drive.

Note: For proper cooling, do not install any card in the slot next in sequence to a ServeRAID adapter with battery backup module (for example, if a ServeRAID adapter with battery backup module is installed in slot 2, do not install any card in slot 3).

- All hot-swap drives in the server must have the same throughput speed rating; using drives with different speed ratings might cause all drives to operate at the speed of the slowest drive.
- To minimize the possibility of damage to the hard disk drives when you are installing them in a rack configuration, install the server in the rack before you install the hard disk drives.
- You do not have to turn off the server to install hot-swap drives in the hot-swap drive bays. However, you must turn off the server when you perform any steps that involve installing or removing cables.
- The drive ID of each hot-swap hard disk drive is printed on the hard disk drive cage.



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 35.
2. Remove the filler panel from one of the empty hot-swap bays.
3. Make sure that the drive handle is open; then, slide the hard disk drive into the hot-swap bay.
4. Push the drive handle in until it latches.

Notes:

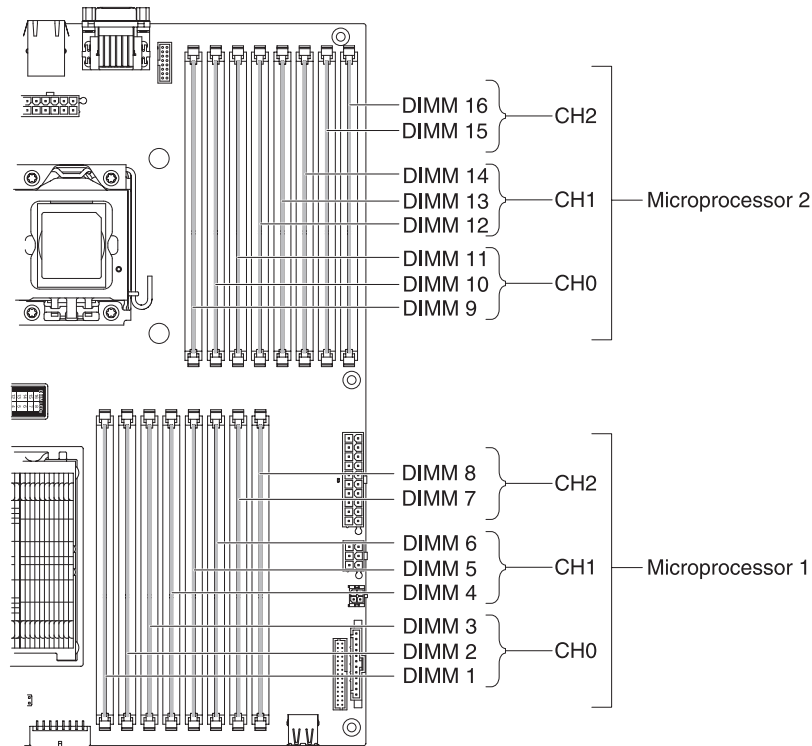
1. When you turn on the server, check the hard disk drive status LEDs to verify that the hard disk drive is operating correctly.
If the amber hard disk drive status LED is lit continuously, that drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.
2. If the server is configured for RAID operation through an optional ServeRAID adapter, you might have to reconfigure your disk arrays after you install hard disk drives. See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information about RAID operation and complete instructions for using ServeRAID Manager.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 105.

Installing a memory module

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

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



- The server supports industry-standard double-data-rate 3 (DDR3), 800, 1066, or 1333 MHz, PC3-10600R-999 (single-, dual-, or quad-rank), registered, synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC). See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported memory modules for the server.
- At least one DIMM must be installed for the server to operate, but three DIMMs per microprocessor improves server performance.
- When two microprocessors are installed in the server, distribute the DIMMs between the two microprocessors to improve server performance.
- The server supports a maximum of 16 single-, dual-, or quad-rank DIMMs. The maximum number of quad-rank DIMMs the server supports is 12.
- The maximum number of single-, dual-rank, ECC supported UDIMM the server supports is 12.
- The memory controller has three registered DIMM channels per microprocessor (channels 0, 1, and 2). Channels 0 and 1 support three DIMMs, and channel 2 supports two DIMMs.
- Install DIMMs starting with the connector farthest from the microprocessor within each channel.
- When you install a quad-ranked DIMM in a channel with single- or dual-ranked DIMMs, install the quad-ranked DIMM in the connector farthest from the microprocessor.

- The server supports 1 GB, 2 GB, 4 GB, 8 GB, and 16 GB DIMMs, with a minimum of 1 GB and a maximum of 192 GB of system memory.

For 32-bit operating systems only: Some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI devices.

Note: If you install a ServeRAID-M1015 SAS/SATA adapter, make sure at least 2 GB of memory is installed in the server before you run DSA from a bootable CD.

- The maximum operating speed of the server is determined by the slowest DIMM in the server.
- The server can operate in three modes: sparing, mirroring and independent channel modes.

Note: Memory sparing is only available for Intel Xeon 5600 series microprocessor.

In two-DIMM-per-channel configuration, a server with an Intel Xeon X5600 series microprocessor automatically operates with a maximum memory speed of up to 1333 MHz when one of the following conditions is met:

- Two 1.5 V single-rank or dual-rank RDIMMs are installed in the same channel. In the Setup utility, **Memory speed** is set to **Max performance** mode
- Two 1.35 V single-rank or dual-rank RDIMMs are installed in the same channel. In the Setup utility, **Memory speed** is set to **Max performance** and **LV-DIMM power** is set to **Enhance performance** mode. The 1.35 V RDIMMs will function at 1.5 V

The following notes describe the types of DIMMs that the server supports and other information that you must consider when you install DIMMs.

- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.
- The server supports only industry-standard double-data-rate 3 (DDR3), 800, 1066, or 1333 MHz, PC3-10600R-999, registered or unbuffered, synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC). See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported memory modules for the server.
- The specifications of a DDR3 DIMM are on a label on the DIMM, in the following format.

ggg eRxff-PC3-wwwwm-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

www 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

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), dual-rank (*n*=2), or quad-rank (*n*=4).

- The following rules apply to DDR3 DIMM speed as it relates to the number of DIMMs in a channel:
 - When you install 1 DIMM per channel, the memory runs at 1333 MHz
 - When you install 2 DIMMs per channel, the memory runs at 1066 MHz
 - When you install 3 DIMMs per channel, the memory runs at 800 MHz
 - All channels in a server run at the fastest common frequency
 - Do not install registered and unbuffered DIMMs in the same server
- The maximum memory speed is determined by the combination of the microprocessor, DIMM speed, and the number of DIMMs installed in each channel.
- In two-DIMM-per-channel configuration, a server with an Intel Xeon X5600 series microprocessor automatically operates with a maximum memory speed of up to 1333 MHz when one of the following conditions is met:
 - Two 1.5 V single-rank or dual-rank RDIMMs are installed in the same channel. In the Setup utility, **Memory speed** is set to **Max performance** mode
 - Two 1.35 V single-rank or dual-rank RDIMMs are installed in the same channel. In the Setup utility, **Memory speed** is set to **Max performance** and **LV-DIMM power** is set to **Enhance performance** mode. The 1.35 V RDIMMs will function at 1.5 V
- The server supports a maximum of 16 single-rank or dual-rank RDIMMs. The server supports up to 12 single-rank or dual-rank UDIMMs or quad-rank RDIMMs.
- The server supports three single-rank or dual-rank DIMMs per channel on channel 0 and 1, two single-rank or dual-rank DIMMs on channel 2. The server supports a maximum of two quad-rank RDIMMs per channel. The following table shows an example of the maximum amount of memory that you can install using ranked DIMMs:

Table 5. Maximum memory installation using ranked DIMMs

Number of DIMMs	DIMM type	DIMM size	Total memory
12	Single-rank UDIMMs	2 GB	24 GB

Table 5. Maximum memory installation using ranked DIMMs (continued)

Number of DIMMs	DIMM type	DIMM size	Total memory
12	Dual-rank UDIMMs	4 GB	48 GB
16	Single-rank RDIMMs	2 GB	32 GB
16	Dual-rank RDIMMs	2 GB	32 GB
16	Dual-rank RDIMMs	4 GB	64 GB
16	Dual-rank RDIMMs	8 GB	128 GB
12	Quad-rank RDIMMs	16 GB	192 GB

- The RDIMM options that are available for the server are 1 GB, 2 GB, 4 GB, 8 GB, and 16 GB. The server supports a minimum of 1 GB and a maximum of 192 GB of system memory using RDIMMs.

For 32-bit operating systems only: Some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI devices.

- The UDIMM options that are available for the server are 1 GB, 2 GB and 4 GB. The server supports a minimum of 1 GB and a maximum of 48 GB of system memory using UDIMMs.

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 Chapter 3, “Configuring the server,” on page 107.

- When you install one quad-rank RDIMM in a channel, install it in the DIMM connector furthest away from the microprocessor.
- Do not install one quad-rank RDIMM in one channel and three RDIMMs in another channel.

Independent channel mode

The server requires at least one installed DIMM. The server comes with a minimum of two 1 GB DIMMs, installed in connectors 3 and 6. Connector 3 (in channel 0) and connector 6 (in channel 1) are the farthest connectors from microprocessor 1 in those channels. When you install additional DIMMs, install them in the order shown in Table 6, to maintain server performance.

Note:

- Memory sparing is only available for Intel Xeon 5600 series microprocessor.
- If you have configured the server to use memory mirroring or sparing, do not use the order shown in this table; use the installation order that is shown in Table 8 on page 91.
- If you install a ServeRAID-M1015 SAS/SATA adapter, make sure at least 2 GB of memory is installed in the server before you run DSA from a bootable CD.

Table 6. DIMM installation sequence for independent channel mode

Installed microprocessors	DIMM connector population sequence
Microprocessor 1	3, 6, 8, 2, 5, 7, 1, 4
Microprocessor 1 and Microprocessor 2	3, 11, 6, 14, 8, 16, 2, 10, 5, 13, 7, 15, 1, 9, 4, 12

Memory-mirroring mode

Memory-mirroring mode replicates and stores data on two pairs of DIMMs within two channels simultaneously. If a failure occurs, the memory controller switches from the primary pair of memory DIMMs to the backup pair of DIMMs. You must enable memory mirroring through the Setup utility. For details about enabling memory mirroring, 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 connector in channel 1. The two DIMMs in each pair must be identical in size, type, rank (single, dual, or quad), and organization. They do not have to be identical in speed. The channels run at the speed of the slowest DIMM in any of the channels. See Table 8 on page 91 for the DIMM connectors that are in each pair.
- Channel 2, DIMM connectors 7, 8, 15, and 16 are not used in memory-mirroring mode.
- The maximum amount of available memory is reduced to half of the amount of installed memory when memory mirroring is enabled. For example, if you install 64 GB of memory, only 32 GB of addressable memory is available when you use memory mirroring.

The following illustration shows the memory channel interface layout with the DIMM installation sequence for memory-mirroring mode. The numbers within the boxes indicate the DIMM population sequence in pairs within the channels, and the numbers next to the boxes indicate the DIMM connectors within the channels. For example, the following illustration shows that the first pair of DIMMs (indicated by 1s inside the boxes) should be installed in DIMM connector 3 on channel 0 and DIMM connector 6 on channel 1. DIMM connectors 7, 8, 15, and 16 on channel 2 are not used in memory-mirroring mode.

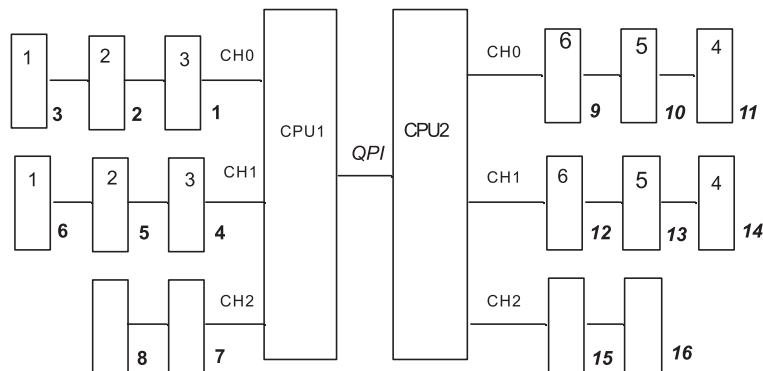


Figure 8. Memory channel interface layout

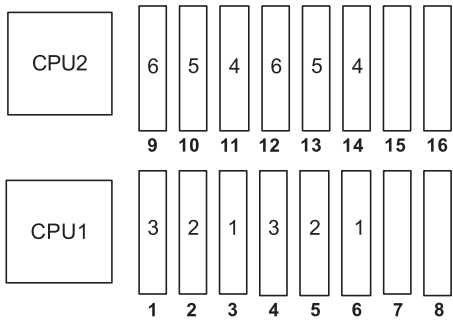
The following table lists the DIMM connectors on each memory channel.

Table 7. Connectors on each memory channel

Memory channel	DIMM connectors
Channel 0	1, 2, 3, 9, 10, 11
Channel 1	4, 5, 6, 12, 13, 14
Channel 2 (not used in memory mirroring)	7, 8, 15, 16

The following illustration shows the memory connector layout that is associated with each microprocessor. For example, DIMM connectors 9, 10, 11, 12, 13, 14, 15, and 16 (DIMM connectors are shown underneath the boxes) are associated with microprocessor 2 socket (CPU2), and DIMM connectors 1, 2, 3, 4, 5, 6, 7, and 8 are associated with microprocessor 1 socket (CPU1). The numbers within the boxes indicate the installation sequence of the DIMM pairs. For example, the first DIMM pair (indicated within the boxes by 1s) should be installed in DIMM connectors 3 and 6, which are associated with microprocessor 1 (CPU1).

Note: You can install DIMMs for microprocessor 2 as soon as you install microprocessor 2; you do not have to wait until all of the DIMM connectors for microprocessor 1 are filled.



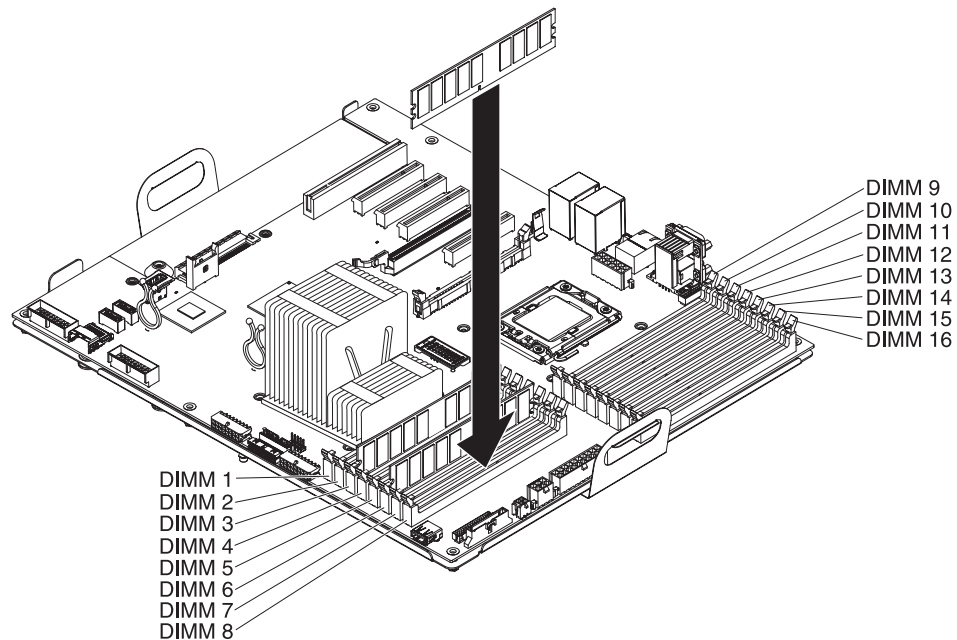
The following table lists the installation sequence for installing DIMMs in memory-mirroring mode.

Table 8. 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	1	1, 4
Fourth pair of DIMMs	2	14, 11
Fifth pair of DIMMs	2	13, 10
Sixth pair of DIMMs	2	12, 9
Note: DIMM connectors 7, 8, 15, and 16 are not used in memory-mirroring mode.		

When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.

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



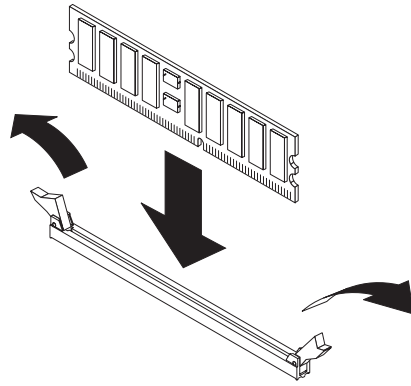
Attention: Static electricity that is released to internal server components when the server is powered-on might cause the server to stop, which might result in the loss of data. To avoid this potential problem, always use an electrostatic-discharge wrist strap or other grounding system when you work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

To install a DIMM, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices; then, disconnect the power cords and all external cables.
3. Remove the left-side cover (see “Removing the left-side cover” on page 57).
4. Remove the hot-swap power supply or power supplies from the server.
5. Pull up the power-supply cage handle, and then swing the power-supply cage out of the server (see “Opening the power-supply cage” on page 64 for more information).
6. Remove the air baffle from the server (see “Removing the air baffle” on page 60 for more information).
7. Open the retaining clip on each end of the DIMM connector.

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

8. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.



9. Turn the DIMM so that the DIMM keys align correctly with the connector.
10. 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 inserted; open the retaining clips, remove the DIMM, and then reinsert it.
11. Reinstall the air baffle (see “Installing the air baffle” on page 61 for more information).
12. Reinstall the power-supply cage.
13. Reinstall the left-side cover (see “Completing the installation” on page 105).
14. Reinstall the power supplies.
15. Reconnect the power cords and external cables.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 105.

Memory sparing

The server supports memory sparing. This feature disables the failed memory from the system configuration and activates a DIMM to replace the failed active DIMM. You can enable either memory sparing or memory mirroring in the Setup utility (see “Using the Setup utility” on page 108). When you use the memory sparing feature, consider the following information:

- The memory sparing feature is supported on server models with an Intel Xeon™ 5600 series microprocessor.
- When you enable the memory sparing feature, you must install three DIMMs per microprocessor at a time. The first DIMM must be in channel 0, the second DIMM in channel 1, and the spare DIMM in channel 2. The DIMMs must be identical in size, type, rank, and organization, but not in speed. The channels run at the speed of the slowest DIMM in any of the channels.
- The maximum available memory is reduced to 2/3 of the installed memory when memory sparing mode is enabled. For example, if you install 72 GB of memory using RDIMMs, only 48 GB of addressable memory is available when you use memory sparing.

The following table shows the installation sequence for installing DIMMs for each microprocessor and the sparing DIMM in memory online-spare mode:

Table 9. Memory sparing mode DIMM population sequence

DIMMs	Number of installed microprocessors	DIMM slots
1st set of DIMMs	1	3, 6, 8
2nd set of DIMMs	1	2, 5, 7
3rd set of DIMMs	2	11, 14, 16
4th set of DIMMs	2	10, 13, 15

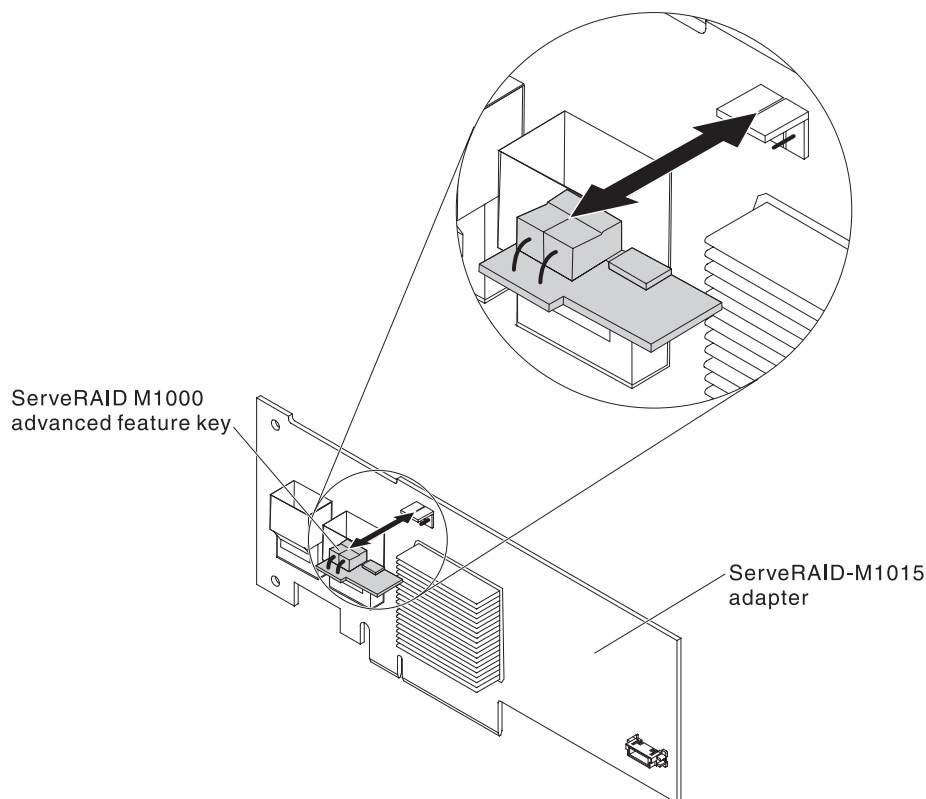
Notes:

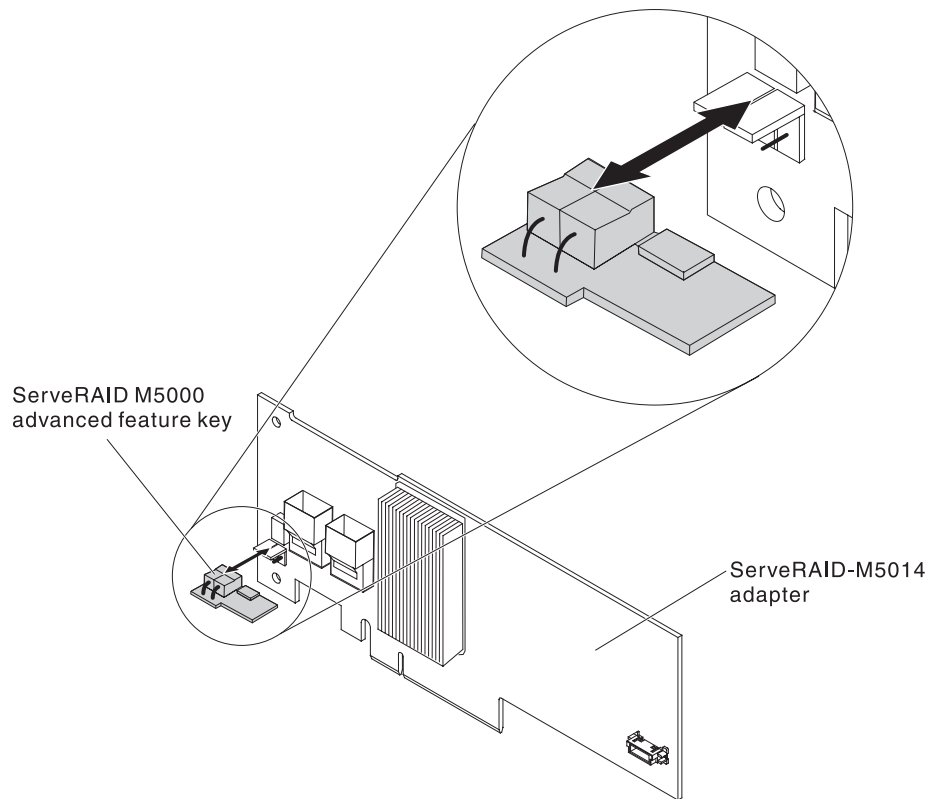
1. The 3rd and 4th sets of DIMMs can be installed right after microprocessor 2 is installed even 1st and 2nd sets of DIMM slots are not full.
2. DIMM slots 1, 4, 9, and 12 are not used in memory sparing mode.

Installing an optional ServeRAID adapter advanced feature key

To install an optional ServeRAID adapter advanced feature key, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the left-side cover (see “Removing the left-side cover” on page 57).
4. Rotate the adapter-retention brackets to the open position.
5. Align the upgrade key with the connector on the ServeRAID adapter and push it into the connector until it is firmly seated.



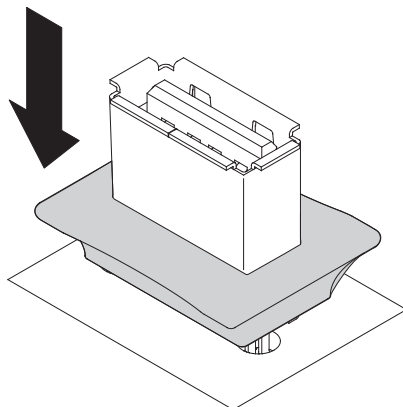


6. Close the rear adapter-retention bracket.
7. Install and lock the left-side cover (see “Completing the installation” on page 105).
8. Reconnect the external cables and power cords; then, turn on the attached devices and turn on the server.

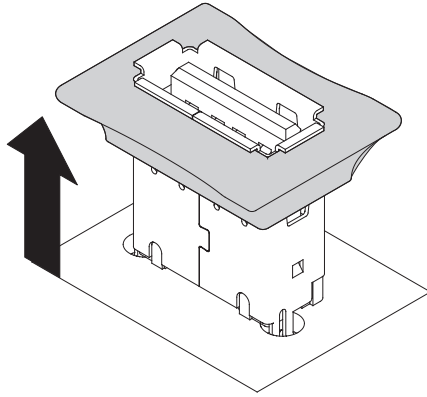
Installing a USB embedded hypervisor flash device

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

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the left-side cover (see “Removing the left-side cover” on page 57).
4. Unlock the retention latch by pushing it down toward the system board.



5. Align the flash device with the USB connector on the system board and push it into the USB connector until it is firmly seated.
6. Return the retention latch to the locked position by pulling it away from the system board.



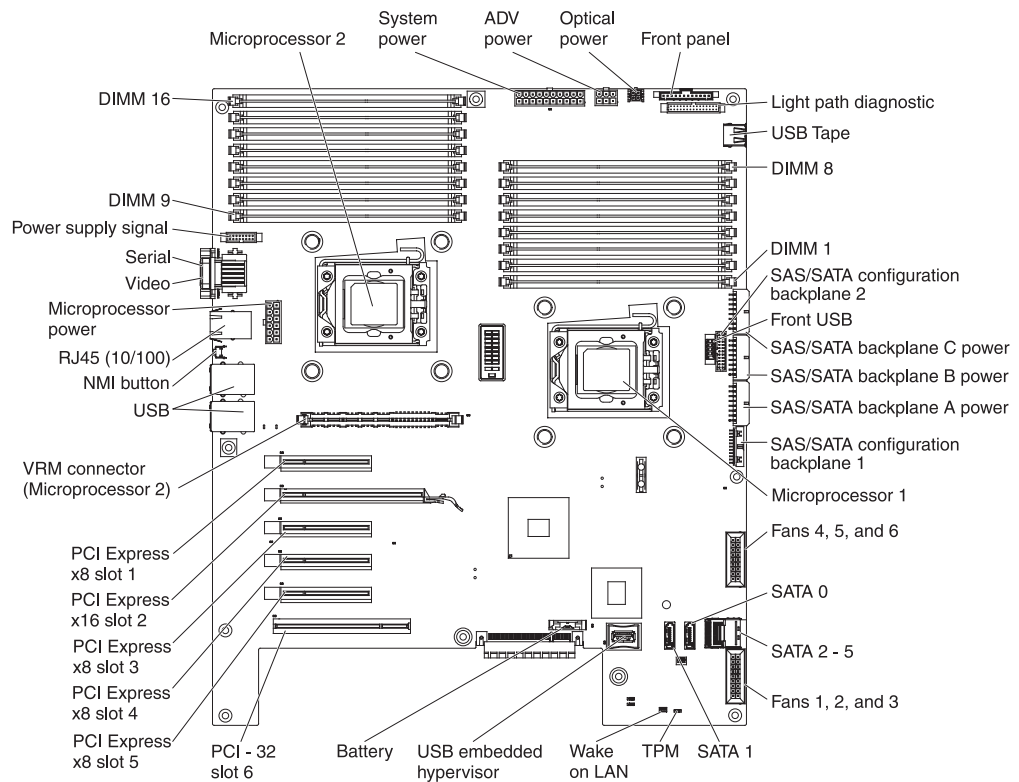
7. Reconnect the power cord and any cables that you removed.
8. Install and lock the left-side cover (see “Completing the installation” on page 105).
9. Turn on the peripheral devices and the server.

Installing a second microprocessor

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

- The server supports certain Intel Xeon scalable multi-core microprocessors, which are designed for the LGA 1366 socket. These microprocessors are 64-bit dual-core or quad-core microprocessors with an integrated memory controller, quick-path interconnect, and shared last cache. See <http://www.ibm.com/servers/eserver/serverproven/compat/us/> for a list of supported microprocessors.
- The server supports up to two microprocessors. If the server comes with one microprocessor, you can install a second microprocessor.
- Both microprocessors must have the same QuickPath Interconnect (QPI) link speed, integrated memory controller frequency, core frequency, power segment, cache size, and type.
- Read the documentation that comes with the microprocessor to determine whether you must update the server firmware for the server. To download the most current level of server firmware and many other code updates for your server, complete the following steps:
 1. Go to <http://www.ibm.com/systems/support/>.
 2. Under **Product support**, click **System x**.
 3. Under **Popular links**, click **Software and device drivers**.
 4. Click **System x3500 M3** to display the matrix of downloadable files for the server.
- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems and optional devices, see <http://www.ibm.com/servers/eserver/serverproven/compat/us/>.
- To order additional microprocessor optional devices, contact your IBM marketing representative or authorized reseller.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If you have to replace a microprocessor, call for service.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink.
- Do not remove the first microprocessor from the system board to install the second microprocessor.
- Some models support dual-core processors and quad-core processors. Do not use dual-core processors and quad-core processors in the same system. Install all dual-core or all quad-core processors in the server.

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



Attention:

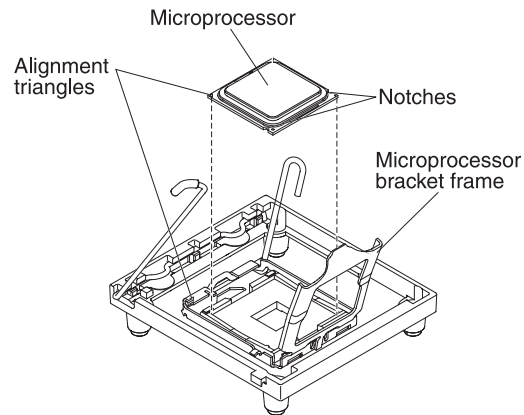
1. A startup (boot) microprocessor must always be installed in microprocessor socket 1 on the system board.
2. To ensure correct server operation when you install an additional microprocessor, use microprocessors that are compatible and install at least one DIMM in a DIMM connector for microprocessor 2 (starting with the connector farthest from the microprocessor). (See “Installing a memory module” on page 86 for more information.)

To install a microprocessor, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices; then, disconnect the power cords and all external cables. Remove the left-side cover (see “Removing the left-side cover” on page 57 for more information).
3. Remove the hot-swap power supplies from the server.
4. Open the power-supply cage (see “Opening the power-supply cage” on page 64 for more information).
5. Remove the air baffle (see “Removing the air baffle” on page 60 for more information).
6. Locate the second microprocessor socket on the system board.

Attention: The microprocessor retention latch is spring-loaded when the microprocessor is in place. Releasing the latch too quickly or allowing it to spring upward can damage the microprocessor and surrounding components.

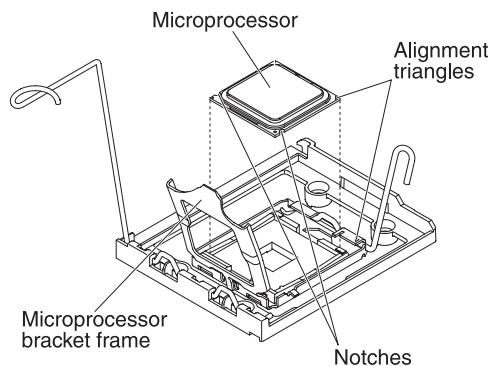
7. Release the microprocessor retention latch by pressing down on the end, moving it to the side, and slowly releasing it to the fully open (up) position.



8. Open the microprocessor bracket frame by lifting up the tab on the top edge.

Attention:

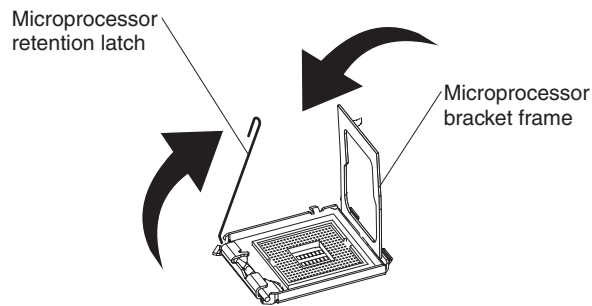
- a. Do not touch the microprocessor contacts; handle the microprocessor by the edges only. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
 - b. Handle the microprocessor carefully. Dropping the microprocessor during installation or removal can damage the contacts.
 - c. Do not use excessive force when you press the microprocessor into the socket.
 - d. Make sure that the microprocessor is oriented, aligned, and positioned in the socket before you try to close the lever.
9. 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.
 - c. Align the microprocessor with the socket. The microprocessor has two notches that are keyed to two tabs on the sides of the socket. A triangle-shaped indicator on one corner of the microprocessor points to a 45-degree angle on one corner of the socket.



- d. Carefully place the microprocessor into the socket. Do not use excessive force when you press the microprocessor into the socket.

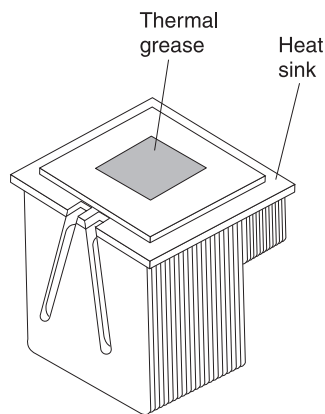
Note: The microprocessor fits only one way on the socket.

10. Close the microprocessor bracket frame; then, close the microprocessor retention latch and lock it securely in place.

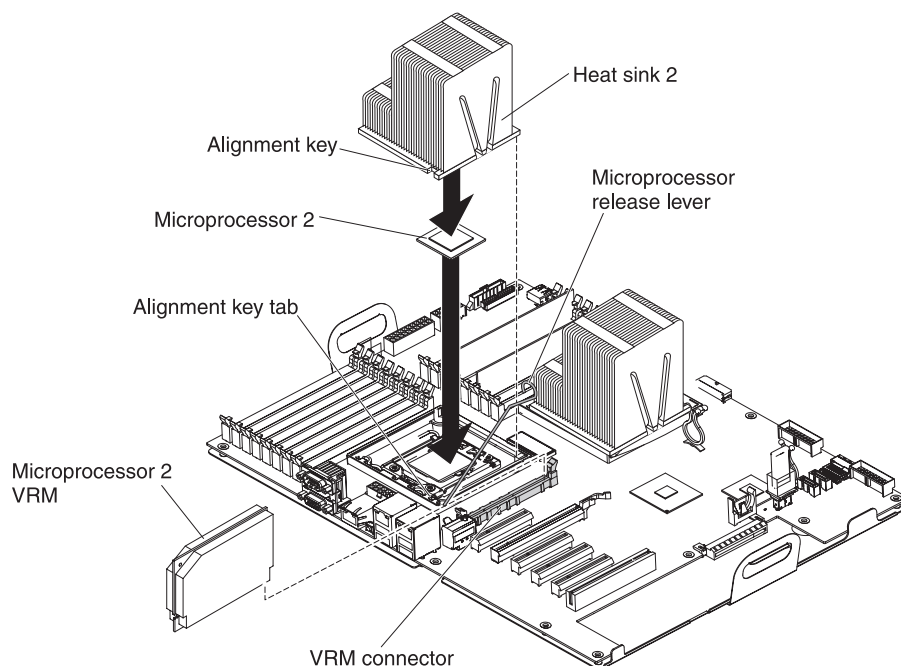


11. Close the microprocessor-release lever to secure the microprocessor.
12. Install a heat sink on the microprocessor.

Attention: Do not touch the thermal grease on the bottom of the heat sink or set down the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it. If the thermal grease is contaminated, call IBM service and support to request a replacement thermal grease kit. For information about installing the replacement thermal grease, see the *Problem Determination and Service Guide*.



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



- d. Slide the rear flange of the heat sink into the opening in the retainer bracket.
 - e. Press down firmly on the front of the heat sink until it is seated securely.
 - f. Rotate the heat-sink release lever to the closed position and hook it underneath the lock tab.
13. Install a VRM in the connector next to microprocessor socket 2 (see “System-board internal connectors” on page 23 for the VRM connector location).
- Note:** A VRM must be installed when a second microprocessor is installed in order to power on the server.
- a. Open the retaining clips on each end of the VRM connector.
 - b. Turn the VRM so that the keys align with the connector.
 - c. Insert the VRM into the connector by aligning the edges of the VRM with the slots at the end of the VRM connector. Firmly press the VRM straight down into the connector by applying pressure on both ends of the VRM simultaneously. The retaining clips snap into the locked position when the VRM is seated in the connector.
14. Reinstall the air baffle (see “Installing the air baffle” on page 61).
 15. Close the power-supply cage (see “Closing the power-supply cage” on page 65).
 16. Reinstall the hot-swap power supplies.
 17. Reinstall the left-side cover (see “Completing the installation” on page 105).
 18. Reconnect the external cables and power cords.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 105.

Installing a redundant power supply and fans

You can install a second 920-watt hot-swap power supply. This upgrade option includes a hot-swap power supply and three hot-swap fans. You must also purchase a second power cord to connect the power supply to a power source.

To install the redundant power and cooling option, complete the following steps:

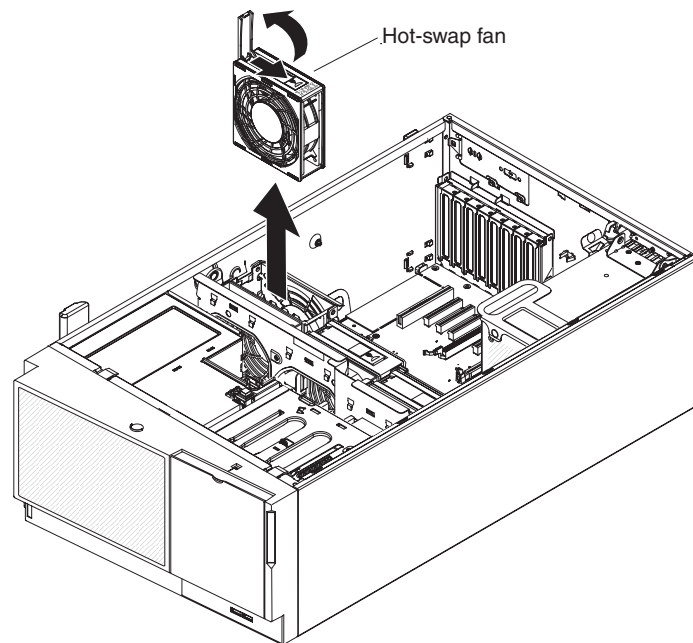
1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Remove the left-side cover (see “Removing the left-side cover” on page 57 for more information).

Attention: To ensure proper system cooling, do not leave the cover off the server for more than 2 minutes.

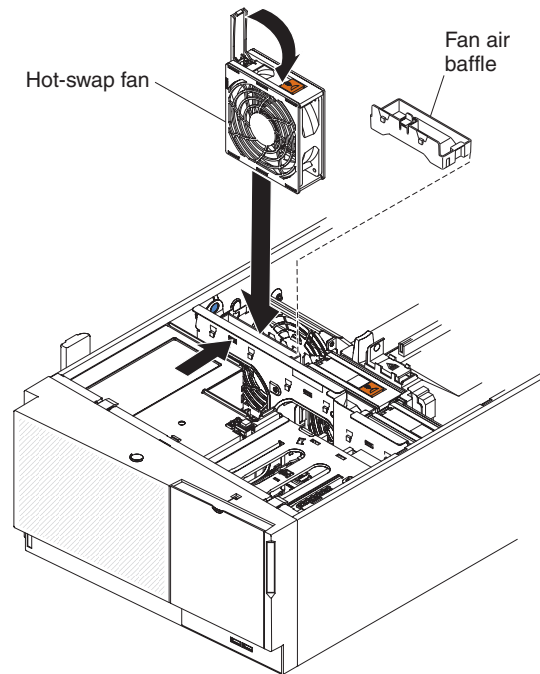
3. Carefully lay the server on its side so that it is lying flat and facing up.

Note: Do not allow the server to fall over.

4. Remove the three fan air baffles from the fan bays of the fan cage assembly with your finger. Slide the orange release tab in the direction indicated by the arrow on top of the fan to unlock the fan handle. Grasp the fan handle and pull the fan out of the fan cage assembly.



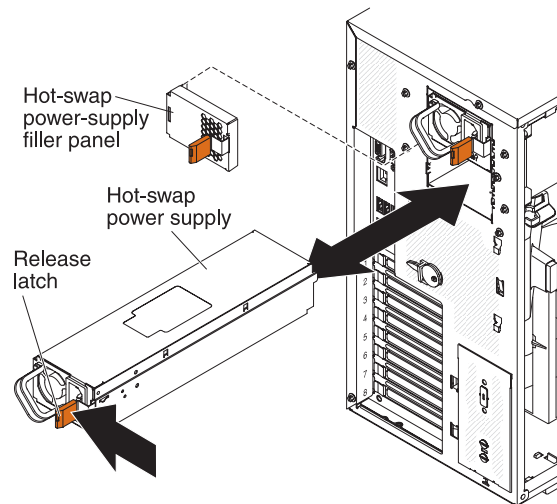
5. If you are instructed to return the hot-swap fan, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.
6. Touch the static-protective package that contains the hot-swap fan to any unpainted metal surface on the server; then, remove the fan from the package and place it on a static-protective surface.
7. Align the fan over the fan slot and lower the fan into the slot in the fan cage.
8. Press down on the fan until it locks into place; then close the handle to the locked position.



Note: Replace a hot-swap fan within 30 seconds of removal.

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.

9. Remove the power-supply filler from the second power-supply bay.



10. 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.
11. Install the left-side cover (see “Completing the installation” on page 105).
12. 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.

13. 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.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 105.

Completing the installation

To complete the installation, complete the following steps:

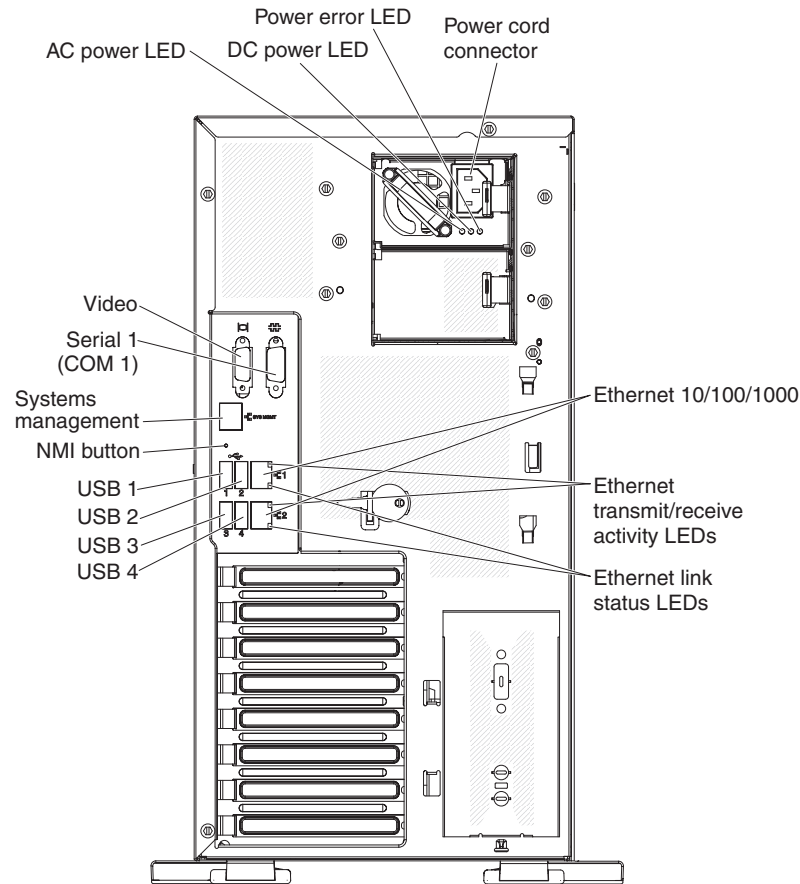
1. If the bezel is open, insert the bezel hinges into the slots on the server chassis and close the bezel.
2. Position the left-side cover over the server.
3. Place the bottom edge of the cover onto the bottom edge of the server.
4. Rotate the top edge of left-side cover toward the server; then, press down on the cover handle until it clicks into place.
5. Rotate the bezel to its fully closed position.
6. Using the supplied key, lock the left-side cover and bezel.
7. Connect the cables and power cords. For more information, see “Connecting the cables.”

Connecting the cables

Notes:

1. Be sure to turn off the server before you connect any cables to or disconnect any cables from the server or hot-plug adapter.
2. For additional cabling instructions, see the documentation that comes with the optional devices. It might be easier for you to route any cables before you install certain optional devices.
3. Cable identifiers are printed on the cables that come with the server and optional devices. Use these identifiers to connect the cables to the correct connectors. For example, the hard disk drive cables are labeled “HDD option.”

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



Updating the server configuration

When you start the server for the first time after you add or remove a device, you might receive a message that the configuration has changed. The Setup utility starts automatically so that you can save the new configuration settings. For more information, see Chapter 3, “Configuring the server,” on page 107.

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

The server comes with at least one microprocessor. If more than one microprocessor is installed, the server can operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. For more information, see “Typical operating-system installation” on page 118 and the operating-system documentation.

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

For information about configuring the integrated Gigabit Ethernet controller, see “Configuring the Gigabit Ethernet controller” on page 122.

Chapter 3. Configuring the server

The following configuration programs come with the server:

- **Setup utility**

The Setup utility (formerly called the Configuration/Setup Utility program) is part of the IBM System x Server 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 Selection Menu program**

The Boot Selection Menu program is part of the IBM System x 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.

- **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 adapter with RAID capabilities, and to simplify the installation of your operating system. For information about obtaining and using this CD, see “Using the ServerGuide Setup and Installation CD” on page 116.

- **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 118 and the *IMM User's Guide* on the IBM Web Site.

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

The remote presence and blue-screen capture feature are integrated into the integrated management module (IMM). You can use these features to access the network remotely and to mount or unmount drives or images on the client system. For information about how to enable the remote presence function, see “Using the remote presence capability and blue-screen capture” on page 120.

- **VMware ESXi embedded hypervisor**

The VMware ESXi embedded hypervisor is available on the server models that come with an installed the USB embedded hypervisor flash device. The USB flash device is installed in the USB connector on the system board. Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. For more information about using the embedded hypervisor, see “Using the embedded hypervisor” on page 120.

- **Ethernet controller configuration**

For information about configuring the Ethernet controller, see “Configuring the Gigabit Ethernet controller” on page 122.

- **LSI Configuration Utility program**

Use the LSI Configuration Utility program to configure the integrated SAS/SATA adapter with RAID capabilities and the devices that are attached to it. For information about using this program, see “Using the LSI Configuration Utility program” on page 122.

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

Table 10. 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 1068E)	LSI Utility (Setup utility, press Ctrl+H), ServerGuide	CFGGEN configuration for IBM and LSI basic and integrated RAID adapters IBM BladeCenter and System x
ServeRAID-BR10iL v2 adapter (LSI 1064E)	LSI Utility (Setup utility, press Ctrl+H), ServerGuide	CFGGEN configuration for IBM and LSI basic and integrated RAID adapters IBM BladeCenter and System x
ServeRAID-MR10i adapter (LSI 1078)	MegaRAID BIOS Configuration Utility, ServerGuide	MegaRAID Storage Manager (MSM), Director
ServeRAID-M5014 adapter (LSI SAS2108)	MegaRAID BIOS Configuration Utility, ServerGuide	MegaRAID Storage Manager (MSM), Director
ServeRAID-M5015 adapter (LSI SAS2108)	MegaRAID BIOS Configuration Utility, ServerGuide	MegaRAID Storage Manager (MSM), Director
ServeRAID-M1015 adapter (LSI SAS2008)	MegaRAID BIOS Configuration Utility, ServerGuide	MegaRAID Storage Manager (MSM), Director

- **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 information about using this program, see “IBM Advanced Settings Utility program” on page 124.

Using the Setup utility

Use the Setup utility, formerly called the Configuration/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 20 seconds 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 the settings to view or change.

Setup utility menu choices

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

- **System Information**

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

This choice is on the full Setup utility menu only.

- **System Summary**

Select this choice to view configuration information, including the ID, speed, and cache size of the 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 choices 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.

- **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. To configure memory mirroring or sparing, select **System Settings → Memory**, and then select **Memory Channel Mode → Mirroring**.

Note: Memory sparing is only available for Intel Xeon 5600 series microprocessor.

- **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 adapter, 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 the UEFI to interact with PCI mass storage devices that are not 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. **Enabled** is the default.
 - **Commands on USB Interface Preference**
Select this choice to enable or disable the Ethernet over USB interface on IMM. **Enabled** is the default.
 - **Network Configuration**
Select this choice to view the system management network interface port, the IMM MAC address, the current IMM IP address, and 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; and save the network changes.
 - **Reset IMM to Defaults**
Select this choice to view or reset IMM to the default settings.
- **Adapters and UEFI Drivers**
Select this choice to view information about the adapters and device drivers in the server that are compliant with EFI 1.10 and UEFI 2.0.
- **Network**
Select this choice to view or configure the network options, such as the iSCSI, PXE, and network devices. There might be additional configuration choices for optional network devices that are compliant with UEFI 2.1 and later.
- **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 the startup sequence of system devices.,
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, or select a one-time boot. 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 media in a CD-RW/DVD drive, then checks the hard disk drive, and then the network adapter.
- **System Event Logs**
Select this choice to view the system-event log and POST event log. For information about these logs, see "Event logs" in the *Problem Determination and Service Guide*.

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

- **POST Event Viewer**

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

- **System Event Log**

Select this choice to view the error messages in the system-event log.

- **Clear System Event Log**

Select this choice to clear the system-event log.

- **User Security**

Select this choice to set, change, or clear passwords. See “Passwords” on page 114 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. For more information, see “Power-on password” on page 114.

- **Clear Power-on Password**

Select this choice to clear a power-on password. For more information, see “Power-on password” on page 114.

- **Set Administrator Password**

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 115.

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.

- **Clear Administrator Password**

Select this choice to clear an administrator password. For more information, see “Administrator password” on page 115.

- **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.

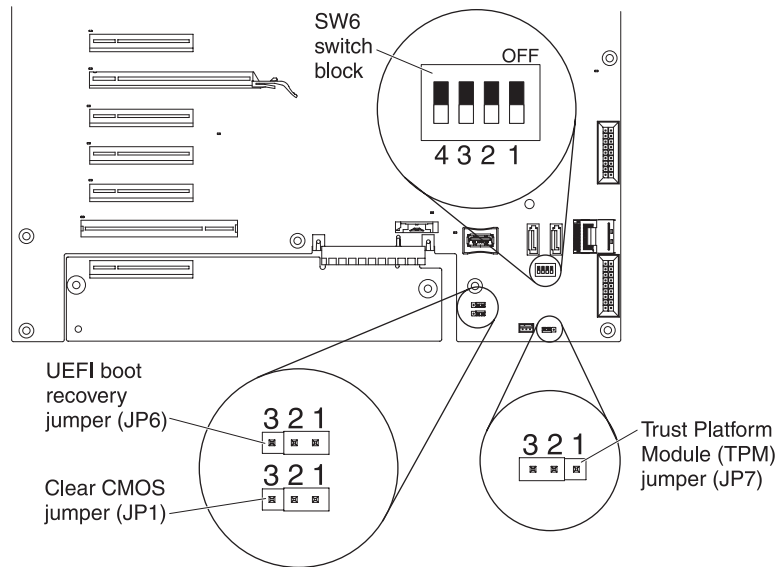
Power-on password

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.

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

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

- If an administrator password is set, type the administrator password at the password prompt. Start the Setup utility and reset the power-on password.
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.
- Remove the battery from the server and then reinstall it. See the *Problem Determination and Service Guide* on the IBM *Documentation* CD for instructions for removing the battery.
- Change the position of the power-on password switch (enable switch 2 of the system board switch block (SW6)) to bypass the power-on password check (see the following illustration).



Attention: Before you change any switch settings or moving any jumpers, turn off the server; then, disconnect all power cords and external cables. See the safety information that begins on page vii. Do not change settings or move jumpers on any system-board switch or jumper blocks that are not shown in this document.

While the server is turned off, move switch 2 of the switch block (SW6) to the On position to enable the power-on password override. You can then start the Setup utility and reset the power-on password. You do not have to return the switch to the previous position.

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

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, you must type the administrator password for 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 Selection Menu program

The Boot Selection Menu program is used to temporarily redefine the first startup device without changing boot options or settings in the Setup utility.

To use the Boot Selection Menu program, complete the following steps:

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

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

Starting the backup server firmware

The system board contains a backup copy area for the server firmware. This is a secondary copy of server firmware that you update only during the process of updating IBM System x 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 UEFI boot recovery 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 UEFI boot recovery 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.

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 or integrated SCSI controller with RAID capabilities
- Device drivers that are provided for the 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 RAID configuration program (with LSI chip sets for ServeRAID adapters only)
- Checks the microcode (firmware) levels of a ServeRAID adapter and determines whether a later level is available from the CD
- Detects installed optional hardware devices 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 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 integrated SCSI controller with RAID capabilities, you can run the SCSI RAID configuration program to create logical drives.

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

When you start the *ServerGuide Setup and Installation* CD, the program prompts you to complete the following tasks:

- Select your language.
- Select your keyboard layout and country.
- View the overview to learn about ServerGuide features.
- View the readme file to review installation tips for your operating system and adapter.
- Start the operating-system installation. You will need your operating-system CD.

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

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

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

Typical operating-system installation

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

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

1. After you have completed the setup process, the operating-system installation program starts. (You will need your operating-system CD to complete the installation.)
2. The ServerGuide program stores information about the server model, service processor, hard disk drive controllers, and network adapters. Then, the program checks the CD for newer device drivers. This information is stored and then passed to the operating-system installation program.
3. The ServerGuide program presents operating-system partition options that are based on your operating-system selection and the installed hard disk drives.
4. The ServerGuide program prompts you to insert your operating-system CD and restart the server. At this point, the installation program for the operating system takes control to complete the installation.

Installing your operating system without using ServerGuide

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

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

1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product support**, click **System x**.
3. From the menu on the left side of the page, click **System x support search**.
4. From the **Task** menu, select **Install**.
5. From the **Product family** menu, select **System x3500 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 remote presence function in a single chip.

The IMM supports the following basic systems-management features:

- Active Energy Manager.
- Alerts (in-band and out-of-band alerting, PET traps - IPMI style, SNMP, e-mail).
- Auto Boot Failure Recovery.

- Automatic Server Restart (ASR) when POST is not complete or the operating system hangs and the OS watchdog timer times out. The IMM might be configured to watch for the OS watchdog timer and restart the server after a timeout, if the ASR feature is enabled. Otherwise, the system administrator can generate an NMI by pressing an NMI button on the information panel for an operating-system memory dump. ASR is supported by IPMI.
- Boot sequence manipulation.
- Command-line interface.
- Configuration save and restore.
- 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.
- Environmental monitor with fan speed control for temperature, voltages, fan failure, and power supply failure.
- Intelligent Platform Management Interface (IPMI) Specification V2.0 and Intelligent Platform Management Bus (IPMB) support.
- Invalid system configuration (CNFG) LED support.
- Light path diagnostics LEDs to report errors that occur with fans, power supplies, microprocessor, hard disk drives, and system errors.
- NMI detection and reporting.
- Operating-system failure blue screen capture.
- PCI configuration data.
- PECI 2 support.
- Power/reset control (power-on, hard and soft shutdown, hard and soft reset, schedule power control).
- Query power-supply input power.
- ROM-based IMM firmware flash updates.
- Serial over LAN (SOL).
- Serial redirect.
- System-event log.
- When one of the two microprocessors reports an internal error, the server disables the defective microprocessor and restarts with the one good microprocessor.

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

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

The command-line interface provides direct access to server management functions through the IPMI 2.0 protocol. Use the command-line interface to issue commands to control the server power, view system information, and identify the server. You can also save one or more commands as a text file and run the file as a script.

- **Serial over LAN**

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

Using the embedded hypervisor

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

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

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

1. Turn on the server.

Note: Approximately 20 seconds after the server is connected to AC power, the power-control button becomes active.

2. When the prompt <F1> Setup is displayed, press F1.
3. From the Setup utility main menu, select **Boot Manager**.
4. Select **Add Boot Option**; then, select **Embedded Hypervisor**. Press Enter, and then select Esc.
5. Select **Change Boot Order** and then select **Commit Changes**; then, press Enter.
6. Select **Save Settings** and then select **Exit Setup**.

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

1. Turn on the server.

Note: Approximately 20 seconds after the server is connected to AC power, the power-control button becomes active.

2. Insert the VMware Recovery CD into the DVD drive.
3. Follow the instructions on the screen.

For additional information and instructions, see the *VMware ESXi Server 3i Embedded Setup Guide*

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).

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.

Obtaining the IP address for the Web interface access

To access the Web interface and use the remote presence feature, you need the IP address for the IMM. You can obtain the IMM IP address through the Setup utility. To locate the IP address, complete the following steps:

1. Turn on the server.

Note: Approximately 20 seconds 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 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 on a computer that connects to the server and in the **address** or **URL** field, type the IP address or host name of the IMM to which you want to connect.

Notes:

- a. If you are logging on to the IMM for the first time after installation, the IMM defaults to DHCP. If a DHCP host is not available, the IMM uses the default static IP address 192.168.70.125.
- b. You can obtain the DHCP-assigned IP address or the static IP address from the server UEFI or from your network administrator.

The Logon page is displayed.

2. 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 the system administrator. All logon attempts are documented in the IMM event log. A welcome page opens in the browser.

Note: The IMM is set initially with a user name of USERID and password of PASSWORD (passw0rd with a zero, not the letter O). You have read/write access. For enhanced security, change this default password during the initial configuration.

3. On the Welcome page, type a timeout value (in minutes) in the field that is provided. The IMM logs you off 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 browser opens the System Status page, which displays the server status and the server health summary.

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. Enable and disable the Broadcom Gigabit Ethernet Utility program from the Setup utility.

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**.

Configuring the Gigabit Ethernet controller

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

You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers. To find updated information about configuring the controllers, complete the following steps.

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

1. Go to <http://www.ibm.com/systems/support/>.
2. Under **Product support**, click **System x**.
3. Under **Popular links**, click **Software and device drivers**.
4. From the **Product family** menu, select **System x3500 M3** and click **Go**.

Using the 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 adapter 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 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 adapter 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. 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. 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 ServeRAID adapter treats them as if they all have the capacity of the smallest hard disk drive.
- If you use an integrated SAS/SATA adapter 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 ServeRAID adapter, see the documentation that comes with the adapter 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 20 seconds 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 **System Settings → Adapters and UEFI drivers**.
4. Select **Please refresh this page first** and press Enter.
5. To perform storage-management tasks, see the SAS adapter documentation, which you can download from the disk controller and RAID software matrix:
 - a. Go to <http://www.ibm.com/systems/support/>.
 - b. Under **Product support**, click **System x**.
 - c. Under **Popular links**, click **Storage Support Matrix**.

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 adapter (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 adapter (channel) for which you want to create an array.
2. Select **RAID Properties**.
3. Select the type of array that you want to create.
4. In the RAID Disk column, use the Spacebar or Minus (-) key to select **Yes** (select) or **No** (deselect) to select or deselect a drive from a RAID disk.
5. Continue to select drives, using the Spacebar or Minus (-) key, until you have selected all the drives for your array.
6. Press C to create the disk array.
7. Select **Save changes then exit this menu** to create the array.
8. Exit the Setup utility.

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 server to access the Setup utility.

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

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

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

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

Updating IBM Systems Director

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

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

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

1. Check for the latest version of IBM Systems Director:
 - a. Go to <http://www.ibm.com/systems/management/director/downloads.html>.
 - b. If a newer version of IBM Systems Director than what comes with the server is shown in the drop-down list, follow the instructions on the Web page to download the latest version.
2. Install the IBM Systems Director program.

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

1. Make sure that you have run the Discovery and Inventory collection tasks.
2. On the Welcome page of the IBM Systems Director Web interface, click **View updates**.
3. Click **Check for updates**. The available updates are displayed in a table.
4. Select the updates that you want to install, and click **Install** to start the installation wizard.

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

1. Make sure that you have run the Discovery and Inventory collection tasks.
2. On a system that is connected to the Internet, go to <http://www.ibm.com/eserver/support/fixes/fixcentral/>.
3. From the **Product family** list, select **IBM Systems Director**.
4. From the **Product** list, select **IBM Systems Director**.
5. From the **Installed version** list, select the latest version, and click **Continue**.
6. Download the available updates.
7. Copy the downloaded files to the management server.
8. On the management server, on the Welcome page of the IBM Systems Director Web interface, click the **Manage** tab, and click **Update Manager**.
9. Click **Import updates** and specify the location of the downloaded files that you copied to the management server.
10. Return to the Welcome page of the Web interface, and click **View updates**.
11. Select the updates that you want to install, and click **Install** to start the installation wizard.

Appendix A. Getting help and technical assistance

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

Before you call

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

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

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

You can receive hardware service through your IBM reseller or IBM Services. To locate a reseller authorized by IBM to provide warranty service, go to <http://www.ibm.com/partnerworld/> and click **Find a Business Partner** on the right side of the page. For IBM support telephone numbers, see <http://www.ibm.com/planetwide/>. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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

IBM Taiwan product service

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

IBM Taiwan product service contact information:

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

Appendix B. Notices

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

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

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

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

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

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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 server or parts on implementation of appropriate remedial measures to mitigate such environmental contamination. Implementation of such remedial measures is a customer responsibility.

Table 11. 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 71.04-1985³• Silver: Corrosion rate of less than 300 Å in 30 days

¹ ASHRAE 52.2-2008 - *Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size*. Atlanta: American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.

² The deliquescent relative humidity of particulate contamination is the relative humidity at which the dust absorbs enough water to become wet and promote ionic conduction.

³ ANSI/ISA-71.04-1985. *Environmental conditions for process measurement and control systems: Airborne contaminants*. Instrument Society of America, Research Triangle Park, North Carolina, U.S.A.

Documentation format

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

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

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.

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Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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.

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Responsible manufacturer:

International Business Machines Corp.
New Orchard Road
Armonk, New York 10504
914-499-1900

European Community contact:

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

Germany Class A statement

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

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IBM Deutschland
Technical Regulations, Department M456
IBM-Allee 1, 71137 Ehningen, Germany
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高調波ガイドライン適合品

Japanese Electronics and Information Technology Industries Association (JEITA)
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種情況下，使用者會被要
求採取某些適當的對策。

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