

System x3630 M4 Type 7158



Installation and User's Guide

System x3630 M4 Type 7158



Installation and User's Guide

Note: Before using this information and the product it supports, read the information in Appendix B, "Notices," on page 125, the *IBM Safety Information* and *Environmental Notices and User Guide* documents on the *IBM Documentation CD*, and the *Warranty Information* document.

The most recent version of this document is available at <http://www.ibm.com/systems/support/>.

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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.

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si 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.

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.

ཐོན་རྫས་འདི་བདེ་སྤྱོད་མ་བྱས་གོང་། རྫོང་གྲུ་ཡིད་གཟབ་
བྱ་འདྲ་མིན་ཡོད་པའི་འོད་སྟེར་བརྟུང་གོས།

Youq mwngz yungh canjbinj neix gaxgonq, itdingh aeu doeg aen canjbinj soengq cungj vahgangj ancien siusik.

Important:

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

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

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

Attention: Use No. 26 AWG or larger UL-listed or CSA certified telecommunication line cord.

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

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:

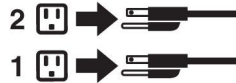
Use safe practices when lifting.

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 12:



CAUTION:

The following label indicates a hot surface nearby.



Statement 26:



CAUTION:

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



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

Statement 27:



CAUTION:
Hazardous moving parts are nearby.



Chapter 1. The System x3630 M4 Type 7158 server

This *Installation and User's Guide* contains instructions for setting up your IBM® System x3630 M4 Type 7158 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 x3630 M4 Type 7158 server is a 2S¹2U²-high server that is ideally suited for networking environments that require an optimized combination of cost, server configuration densities, functionality and efficiency.

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, see the printed *Warranty Information* document that comes with your 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 7 and “Reliability, availability, and serviceability features” on page 10.

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

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

The server may support up to four 3.5-inch simple-swap drives, eight 3.5-inch simple-swap or hot-swap drives or fourteen 3.5-inch hot-swap drives (for this configuration two of the 3.5-inch hot-swap hard disk drives are located at the rear of the server) using the supported drive backplane configurations. It supports 3.5-inch hot-swap Serial Attached SCSI (SAS) or SATA hard disk drives or 3.5-inch simple-swap SATA hard disk drives. The illustrations in this document might differ slightly from your hardware.

1. 2S represents two sockets

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

If firmware and documentation updates are available, you can download them from the IBM website. 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.

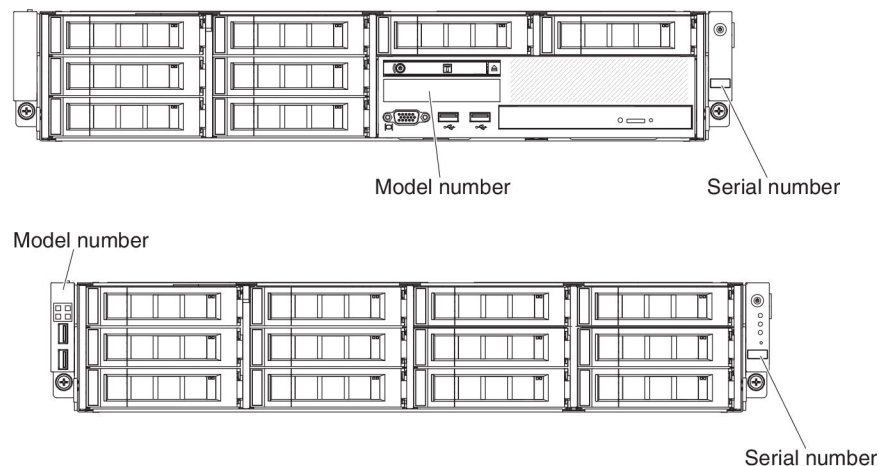
Note: Changes are made periodically to the IBM website. Procedures for locating firmware and documentation might vary slightly from what is described in this document.

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

Record information about the server in the following table.

Product name	IBM System x3630 M4 server
Machine type	7158
Model number	_____
Serial number	_____

The model number and serial number can be found on the front of the server. Depending on your server model, their respective locations can be found either in the following two illustrations.



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

For a list of supported optional devices for the server, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/>.

See the *Rack Installation Instructions* document on the IBM *Documentation* CD for complete rack installation and removal instructions.

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 the server, how to install supported optional devices, and how to configure the server. The following documentation also comes with the server:

- *Warranty Information*

This printed document contains the warranty terms and a pointer to the IBM Statement of Limited Warranty on the IBM website.

- *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.

- *Rack Installation Instructions*

This document contains instructions for installing the server in a rack.

- *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.

- *Environmental Notices and User 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.

- *Licenses and Attributions Documents*

This document is in PDF. It contains information about the open-source notices.

Depending on the server model, additional documentation might be included on the IBM *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 BladeCenter Tools Center is at <http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp>.

The server might have features that are not described in the documentation that 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 website. To check for updated documentation and technical updates, complete the following steps.

Note: Changes are made periodically to the IBM website. 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 x3630 M4** and click **Continue**.

Notices and statements in this document

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

The following notices and statements are used in this document:

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

Features and specifications

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

Racks are marked in vertical increments of 4.45 cm (1.75 inches). Each increment is referred to as a unit, or “U.” A 1-U-high device is 1.75 inches tall.

Notes:

1. Power consumption and heat output vary depending on the number and type of optional features installed and the power-management optional features in use.
2. The noise emission level stated is the declared (upper limit) sound power level, in bels, for a random sample of machines. All measurements are made in accordance with ISO 7779 and reported in conformance with ISO 9296.

Table 1. Features and specifications

<p>Microprocessor:</p> <ul style="list-style-type: none"> Supports multi-core Intel Xeon microprocessors, with integrated memory controller and Quick Path Interconnect (QPI) architecture Designed for LGA 1356 socket Scalable up to eight cores 32 KB instruction cache, 32 KB data cache, and up to 20 MB L3 cache that is shared among the cores Support for Intel Extended Memory 32/64 Technology (EM32/64T) <p>Note:</p> <ul style="list-style-type: none"> Use the Setup utility to determine the type and speed of the microprocessors. For a list of supported microprocessors, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/. <p>Memory (depending on the model):</p> <ul style="list-style-type: none"> Slots: 12 dual inline memory module connectors on the base system board (six per microprocessor). Minimum: 2 GB Maximum: 384 GB Type: 1066 MHz, 1333 MHz or 1600 MHz, ECC, single-rank or dual-rank <ul style="list-style-type: none"> UDIMM: 2 GB or 4 GB RDIMM: 2 GB, 4 GB, 8 GB, 16 GB, or 32 GB (when available) Chipkill supported <p>Drive Expansion bays (depending on the model):</p> <ul style="list-style-type: none"> Twelve 3.5-inch SAS/SATA hot-swap hard disk drive bays with option to add two more rear 3.5-inch SAS/SATA hot-swap hard disk drive bays Eight 3.5-inch SAS/SATA hot-swap hard disk drive bays Eight simple-swap 3.5-inch SATA hard disk drive Four simple-swap 3.5-inch SATA hard disk drive. <p>Note: For specific models that may be shipped initially with four hard disk drives, configuration may be able to expand to eight hard disk drives via Features on Demand (FoD).</p> <p>PCI expansion slots:</p> <p>Supports eight different PCI adapters and up to five PCI expansion slots depending on server model.</p> <ul style="list-style-type: none"> Riser 1 (1U PCI riser-card assembly) <ul style="list-style-type: none"> One full-height half-length PCIe3.0 Express x16 slot, x16 link speed One full-height half-length PCIe3.0 Express x8 slot, x8 link speed and one low-profile PCIe3.0 Express x8 slot, x8 link speed 	<p>PCI expansion slots (continued):</p> <ul style="list-style-type: none"> Riser 1 (2U PCI riser-card assembly): <ul style="list-style-type: none"> One full-height full-length PCIe3.0 Express x16 slot, x16 link speed One full-height full-length PCIe3.0 Express x16 slot, x8 link speed and one full-height half-length PCIe3.0 Express x16 slot, x8 link speed Riser 2 (1U PCI riser-card assembly): <ul style="list-style-type: none"> One low-profile PCIe3.0 Express x8 slot, x4 link speed One low-profile PCIe3.0 Express x8 slot, x8 link speed (Note: Second CPU must be attached to system board when using this slot) Riser 2 (2U PCI riser-card assembly): <ul style="list-style-type: none"> One low-profile PCIe3.0 Express x16 slot, x16 link speed (Note: Second CPU must be attached to system board when using this slot)and one low-profile PCIe3.0 Express x8 slot, x4 link speed Two low-profile PCIe3.0 Express x16 slot, x8 link speed (Note: Second CPU must be attached to system board when using these slots) and one low-profile PCIe3.0 Express x8 slot, x4 link speed <p>Integrated functions:</p> <ul style="list-style-type: none"> Integrated Management Module II (IMM2), which provides service processor control and monitoring functions, video controller, and remote keyboard, video, mouse, and remote hard disk drive capabilities Onboard Intel Powerville 4-port Gigabit Ethernet controller with Wake on Lan support (by default Ethernet 1 and 2 are enabled, to enable Ethernet 3 and 4, it is done through the Features on Demand (FoD)) Onboard PCH with LSI software RAID with support for RAID levels 0, 1 and 10 Light path diagnostics Eight Universal Serial Bus (USB) ports (two on front, four on rear of server, and two internal for an optional USB hypervisor flash device) One serial port One video port on rear of server Note: Maximum video resolution is 1600 x 1200 at 75 Hz. One front video port based on model. <p>Note: In messages and documentation, the term <i>service processor</i> refers to the integrated management module II (IMM2).</p>	<p>Integrated Video controller:</p> <ul style="list-style-type: none"> Matrox G200eR2 video on system board Compatible with SVGA and VGA DDR2-250MHz SDRAM video memory controller Video memory 16MB is not expandable No DVI connector Avocent digital video compression Maximum video resolution is 1600 x 1200 at 60 or 75 Hz <p>ServeRAID controllers:</p> <ul style="list-style-type: none"> ServeRAID M1115 SAS/SATA Controller for IBM System x ServeRAID M5110 SAS/SATA Controller for IBM System x ServeRAID M5120 SAS/SATA Controller for IBM System x ServeRAID H1110 SAS/SATA Controller for IBM System x ServeRAID M5100 Series Battery Kit for IBM System X ServeRAID C105 for IBM System X <p>ServeRAID controller upgrade:</p> <ul style="list-style-type: none"> ServeRAID M5100 Series 512MB Cache/RAID 5 Upgrade for IBM System x ServeRAID M5100 Series 512MB Flash/RAID 5 Upgrade for IBM System x ServeRAID M1100 Series Zero Cache/RAID 5 Upgrade for IBM System x ServeRAID M5100 Series Zero Cache/RAID 5 Upgrade for IBM System x ServeRAID M5100 Series RAID 6 Upgrade for IBM System x ServeRAID M5100 Series 1GB Flash/RAID Upgrade for IBM System x <p>Environment:</p> <ul style="list-style-type: none"> Air temperature: <ul style="list-style-type: none"> Server on: 5°C to 40°C (41°F to 104°F); altitude: 0 to 915 m (3000 ft). Server on: 5°C to 32°C (41°F to 89.6°F); altitude: 915 m (3000 ft) to 2134 m (7000 ft). Server on: 5°C to 28°C (41°F to 82.4°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°F to 140°F) Humidity: <ul style="list-style-type: none"> Server on: 8% to 85%; maximum dew point: 24°C; maximum rate of change: 5 °C/hr Server off: 8% to 80%; maximum dew point: 27°C Shipment: 5% to 100%
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Table 1. Features and specifications (continued)

<p>Environment (continued)</p> <ul style="list-style-type: none"> Design to ASHRAE Class A3, ambient of 35°C to 40°C, with relaxed support: <ul style="list-style-type: none"> Support cloud like workload with no performance degradation acceptable (Turbo-Off) Under no circumstance, can any combination of worst case workload and configuration result in system shutdown or design exposure at 40°C Particulate contamination: <p>Attention: Airborne particulates and reactive gases acting alone or in combination with other environmental factors such as humidity or temperature might pose a risk to the server. For information about the limits for particulates and gases, see "Particulate contamination" on page 127.</p> <p>Electrical input with hot-swap ac power supplies:</p> <ul style="list-style-type: none"> Sine-wave input (50 ~ 60 Hz) required Input voltage range automatically selected Input voltage low range: <ul style="list-style-type: none"> Minimum: 100 V ac Maximum: 127 V ac Input voltage high range: <ul style="list-style-type: none"> Minimum: 200 V ac Maximum: 240 V ac Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> Minimum: 0.22 kVA Maximum: 0.85 kVA 	<p>Size:</p> <ul style="list-style-type: none"> 2U Height: 86.5 mm (3.406 in.) Depth: <ul style="list-style-type: none"> EIA flange to rear: 720.2 mm (28.35 in.) Overall: 748.8 mm (29.5 in.) Width: <ul style="list-style-type: none"> With top cover: 447 mm (17.598 in.) Weight: approximately 16.4 kg (36.2 lb) to 28.2 kg (62.2 lb) depending on your configuration 	<p>System fans: Up to three</p> <p>Hot-swap power supplies (depending on the model):</p> <ul style="list-style-type: none"> Up to two hot-swap power supplies for redundancy support <ul style="list-style-type: none"> 550-watt ac 750-watt ac <p>Note: You cannot mix high-efficiency and non-high-efficiency power supplies in the server.</p> <p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> Sound power, idle: 6.6 bel Sound power, operating: 6.6 bel
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What your server offers

The server uses the following features and technologies:

- Features on Demand**

If a Features on Demand feature is integrated in the server or in an optional device that is installed in the server, you can purchase an activation key to activate the feature. For information about Features on Demand, see <http://www.ibm.com/systems/x/fod/>.

- Integrated Management Module II**

The integrated management module II (IMM2) is the second generation of the IMM. The IMM2 is the common management controller for IBM System x hardware. The IMM2 consolidates multiple management functions in a single chip on the server system board.

Some of the features that are unique to the IMM2 are enhanced performance, expanded compatibility with blade servers, higher-resolution remote video, expanded security options, and Feature on Demand enablement for hardware and firmware options.

For additional information, see "Using the integrated management module II" on page 106.

- 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 reliability, availability, and serviceability (RAS) capabilities; and basic input/output system (BIOS) compatibility support. UEFI replaces the 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 (Disk Operating System).

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

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

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

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

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

- **Multi-core processing**

The server supports up to two Intel Xeon™ E5-2400 series multi-core microprocessors. The server comes with only one microprocessor installed.

- **IBM Systems Director CD**

IBM Systems Director is a workgroup-hardware-management tool that you can use to centrally manage System x and xSeries servers. For more information, see the IBM Systems Director documentation on the *IBM Systems Director CD* and “IBM Systems Director” on page 11.

- **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>.

- **Active™ Memory**

The Active Memory feature improves the reliability of memory through memory mirroring. 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. For more information about installing DIMMs for memory mirroring, see “Installing a memory module” on page 71.

- **Large system-memory capacity**

The server supports up to a maximum of 384 GB of system memory. The server supports only industry-standard double-data-rate 3 (DDR3), 1066, 1333, or 1600 MHz, synchronous dynamic random-access memory (SDRAM) registered dual inline memory modules (DIMMs) with error correcting code (ECC). For further details, see *Problem Determination and Service Guide* on the IBM System x Documentation 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 97.

- **Integrated network support**

The server comes with an integrated 4-port Gigabit Ethernet controller, which supports connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network. In the initial server configuration, Ethernet 1 and Ethernet 2 are activated. To enable Ethernet 3 and Ethernet 4, a Features on Demand (FoD) key needs to be installed and activated. For more information, see “Configuring the Gigabit Ethernet controller” on page 110.

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

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

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

The hot-swap server models support a maximum of fourteen 3.5-inch hot-swap Serial Attached SCSI (SAS) hard disk drives or hot-swap Serial ATA (SATA) hard disk drives. The simple-swap server models support a maximum of eight 3.5-inch simple-swap SATA hard disk drives.

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

- **Light path diagnostics**

Light path diagnostics provides LEDs to help you diagnose problems. For more information about the light path diagnostics, see “Light path diagnostics panel” on page 16 and the *Problem Determination and Service Guide* on the IBM System x Documentation CD.

- **PCI adapter capabilities**

Based on the server configuration, the server may possibly support up to five PCI expansion slots. See “Installing an adapter on the PCI riser-card assembly” on page 61 for detailed information.

- **Active Energy Manager**

The IBM Active Energy Manager solution is an IBM Systems Director plug-in that measures and reports server power consumption as it occurs. This enables you to monitor power consumption in correlation to specific software application programs and hardware configurations. You can obtain the measurement values

through the systems-management interface and view them, using IBM Systems Director. For more information, including the required levels of IBM Systems Director and Active Energy Manager, see the IBM Systems Director documentation on the *IBM Systems Director CD*, or see <http://www.ibm.com/servers/systems/management/director/resources/>.

- **Redundant connection**

The IMM2 provides failover capability to a redundant Ethernet connection with the applicable application installed. If a problem occurs with the primary Ethernet connection, all Ethernet traffic that is associated with the primary connection is automatically switched to the optional redundant Ethernet connection. If the applicable device drivers are installed, this switching occurs without data loss and without user intervention.

- **Redundant cooling and optional power capabilities**

The server supports a maximum of two 550-watt or 750-watt hot-swap power supplies and three dual-motor non hot-swap fans, which provide redundancy for a typical configuration. The redundant cooling by the fans in the server enables continued operation if one of the fans fails. The server comes with one 550-watt or 750-watt hot-swap power supply and three non hot-swap fans.

Note: You cannot mix 550-watt and 750-watt power supplies in the server.

- **ServeRAID support**

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

- **Systems-management capabilities**

The server comes with an integrated management module II (IMM2). When the IMM2 is used with the systems-management software that comes with the server, you can manage the functions of the server locally and remotely. The IMM2 also provides system monitoring, event recording, and network alert capability. The system-management connector on the rear of the server is dedicated to the IMM2. The dedicated system-management connector provides additional security by separating the management network traffic from the production network. You can use the Setup utility to configure the server to use a dedicated systems-management network or a shared network.

Reliability, availability, and serviceability features

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

The server has the following RAS features:

- Automatic error retry and recovery
- Automatic restart after a power failure
- Built-in monitoring for fan, power, temperature, voltage, and power-supply redundancy
- Cable-presence detection on most connectors
- Chipkill memory protection
- Dual redundant UEFI server firmware images
- Error codes and messages
- Error correcting code (ECC) L2 cache and system memory
- Cooling fans with speed-sensing capability
- Hot-swap hard disk drives (for servers that support such drives)

- Information and light path diagnostics LED panels
- Integrated management module (service processor)
- Memory mirroring
- Menu-driven setup, system configuration, and redundant array of independent disks (RAID) configuration programs
- Parity checking or CRC checking on the serially-attached SCSI (SAS) bus and PCI buses
- Power management: compliance with Advanced Configuration and Power Interface (ACPI)
- Power-on self-test (POST)
- Predictive Failure Analysis (PFA) alerts on memory, SAS/SATA hard disk drives, fans, and power supplies
- Redundant Ethernet capabilities with failover support
- Redundant hot-swap power supplies
- Remote system problem-determination support
- Standby voltage for systems-management features and monitoring
- Startup (boot) from LAN through Preboot Execution Environment (PXE) boot agent utility or Dynamic Host Configuration Protocol/Boot Protocol (DHCP/BOOTP)
- System auto-configuring from the configuration menu
- System error logging (POST and service processor)
- Systems-management monitoring through the Inter-Integrated Circuit (I²C) bus
- Upgradeable POST, UEFI, diagnostics, service processor microcode, and read-only memory (ROM) resident code, locally or over the LAN
- Vital product data (VPD) on microprocessors, system board, power supplies, and SAS (hot-swap-drive) backplane
- Wake on LAN capability for remote power up

IBM Systems Director

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

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

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

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

- Discovering, navigating, and visualizing systems on the network with the detailed inventory and relationships to the other network resources

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

For more information about IBM Systems Director, see the IBM Systems Director Information Center at http://publib.boulder.ibm.com/infocenter/director/v6r1x/index.jsp?topic=/director_6.1/fqm0_main.html and the 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**.

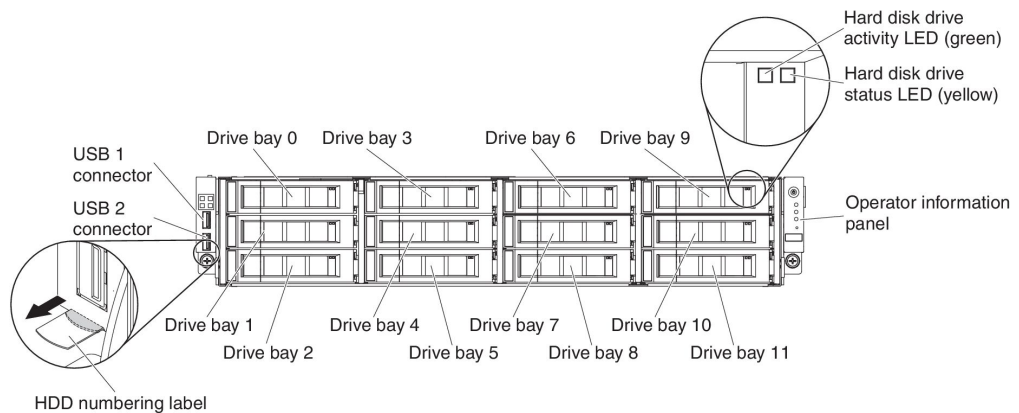
Server controls, LEDs, and power

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

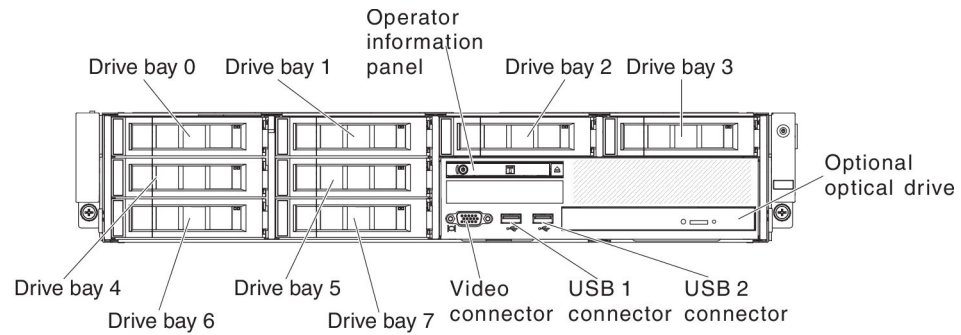
Front view

The following illustration shows the controls, connectors, and hard disk drive bays on the front of the server. The server configuration may be of the following seven:

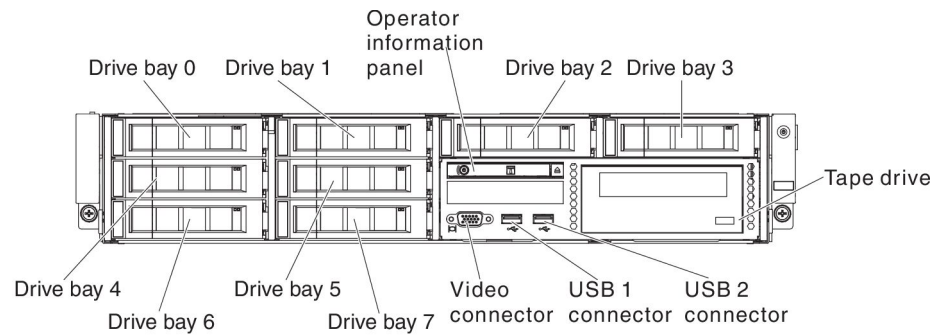
12 hot-swap hard-disk drive configuration:



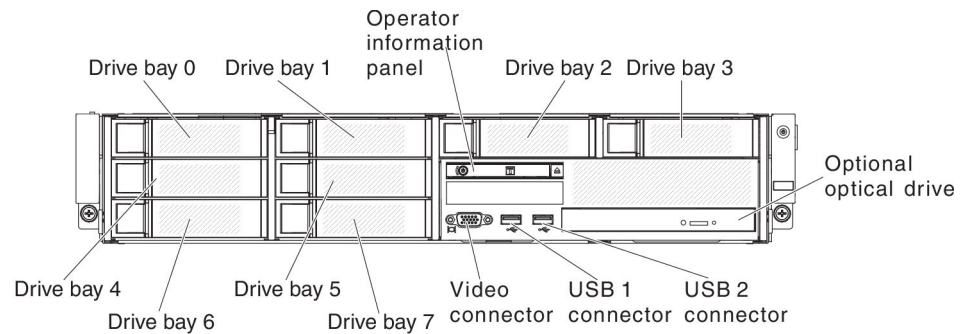
8 hot-swap hard-disk drive configuration with optical drive:



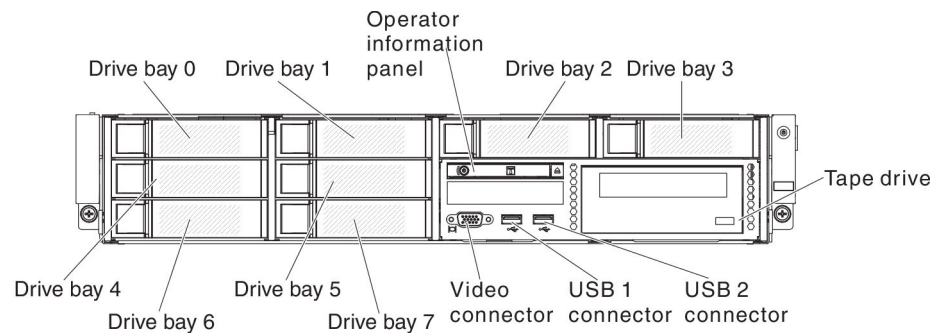
8 hot-swap hard-disk drive configuration with tape drive:



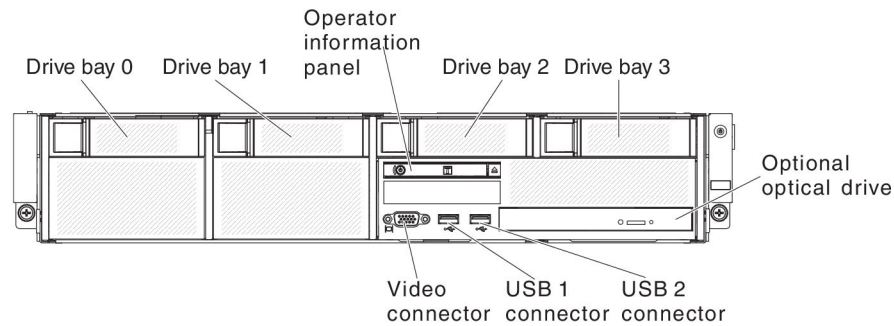
8 simple-swap hard-disk drive configuration with optical drive:



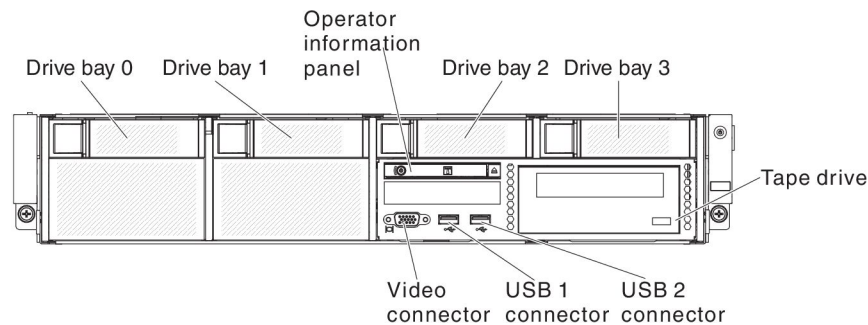
8 simple-swap hard-disk drive configuration with tape drive:



4 simple-swap hard-disk drive configuration with optical drive:



4 simple-swap hard-disk drive configuration with tape drive:



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

Hard disk drive activity LED (front panel): When this LED is flashing, it indicates that the drive is in use. This function is reserved for simple-swap models. For existing models, please see the hot-swap hard disk drive activity and status LEDs (green and yellow) that pass from the backplane as the indicators for any activity or warning.

Hard disk drive status LED (yellow): This yellow LED is used on hot-swap SAS/SATA hard disk drives. Each hot-swap hard disk drive has a status LED. When this LED is lit, it indicates that the drive has failed. When this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt as part of a RAID configuration. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

Operator information panel: This panel contains the power control button and light-emitting diodes (LEDs).

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

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

Operator information panel

Note: Based on the server configuration, the operator information panel may be located in the media cage or on the side of the server.

Illustration of operator information panel when located in the media cage:

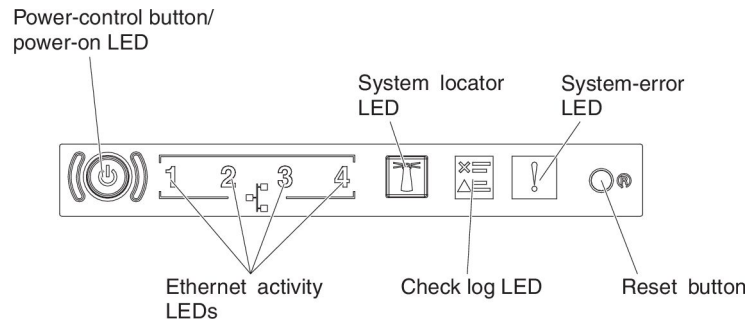
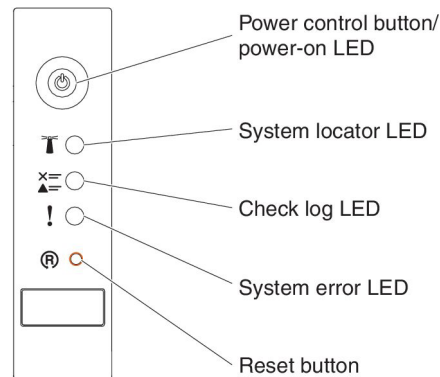


Illustration of operator information panel when located on the side of the chassis:



- Power-control button and power-on LED:** Press this button to turn the server on and off manually. The states of the power-on LED are as follows:
 - Off:** 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 5 to 10 seconds.
 - 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.
- Ethernet activity LEDs:** When any of these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port that corresponds to that LED.
- System-locator button/LED:** Use this blue LED to visually locate the server among other servers. A system-locator LED is also on the rear of the server. This LED is used as a presence detection button as well. You can use IBM Systems Director or IMM2 web interface to light this LED remotely. This LED is controlled by the IMM2. The locator button is pressed to visually locate the server among the others servers.
- Check log LED:** When this yellow LED is lit, it indicates that a system error has occurred. Check the error log for additional information. See the *Problem Determination and Service Guide* on the *System x Documentation* CD for more information about error logs.
- System-error LED:** When this yellow LED is lit, it indicates that a system error has occurred. A system-error LED is also on the rear of the server. An LED on the light path diagnostics panel on the operator information panel is also lit to help isolate the error. This LED is controlled by the IMM2.

- **Reset button:** Press this button to reset the server and run the power-on self-test (POST). You might have to use a pen or the end of a straightened paper clip to press the button.

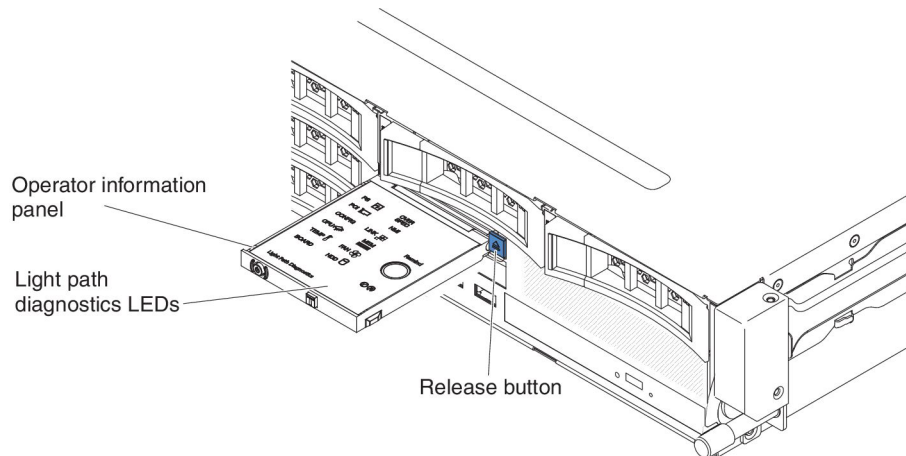
Note: Depending on the type of operator information panel installed in your server, the Reset button is on the operator information panel or the light path diagnostics panel.

Light path diagnostics panel

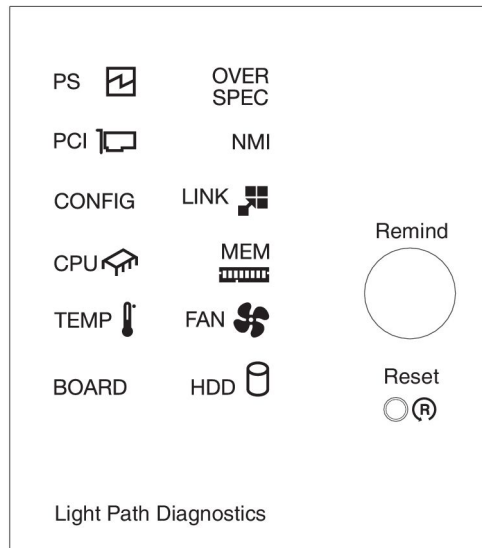
Note: The initial server configuration will not include the light path diagnostics panel. It is included when the operator information panel is upgraded to the advanced operator information panel.

The light path diagnostics panel is located on the top of the advanced operator information panel.

To access the light path diagnostics panel, press the blue release latch on the advanced operator information panel. Pull forward on the panel until the hinge of the operator information panel is free of the server chassis. Then pull down on the panel, so that you can view the light path diagnostics panel information.



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



- **Remind button:** This button places the system-error LED on the front information panel into Remind mode. In Remind mode, the system-error LED flashes every 2 seconds until the problem is corrected, the system is restarted, or a new problem occurs.

By placing the system-error LED indicator in Remind mode, you acknowledge that you are aware of the last failure but will not take immediate action to correct the problem. The remind function is controlled by the IMM2.

- **Reset button:** Press this button to reset the server and run the power-on self-test (POST). You might have to use a pen or the end of a straightened paper clip to press the button.

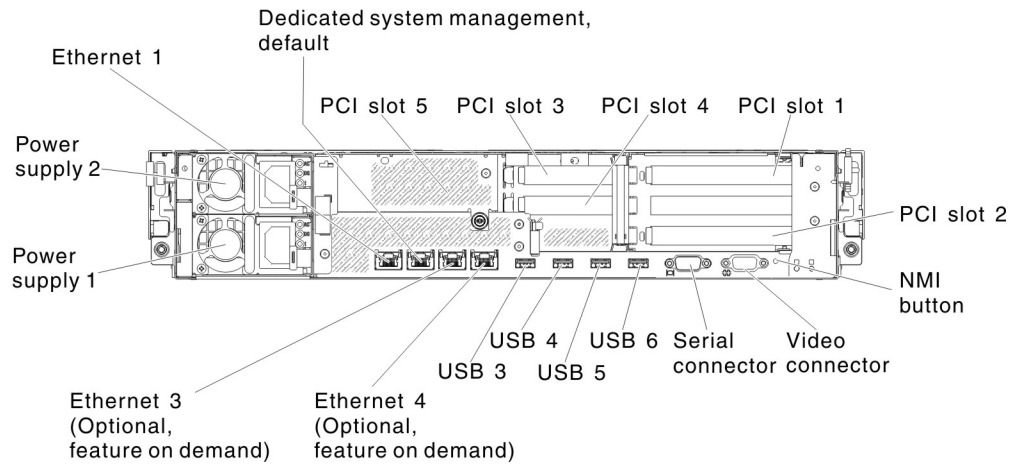
For further information on the light path diagnostics panel, see the *Problem Determination and Service Guide*.

Rear view

The following shows the connectors on the rear of the server. The server configuration may be of the following two:

Illustration when no rear hard disk drive is installed in server. The PCI riser card assembly for this server configuration is 2U.

IMM Network Interface Port, Dedicated



IMM Network Interface Port, Shared

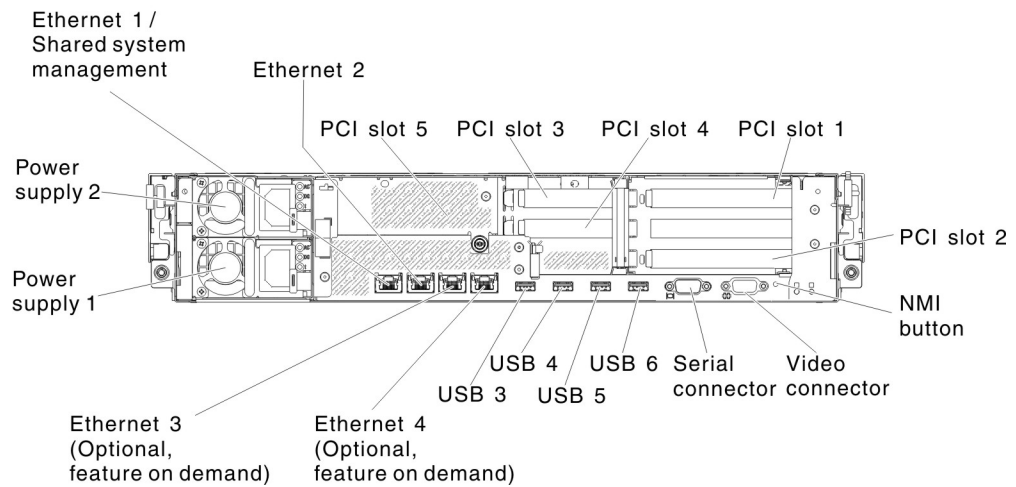
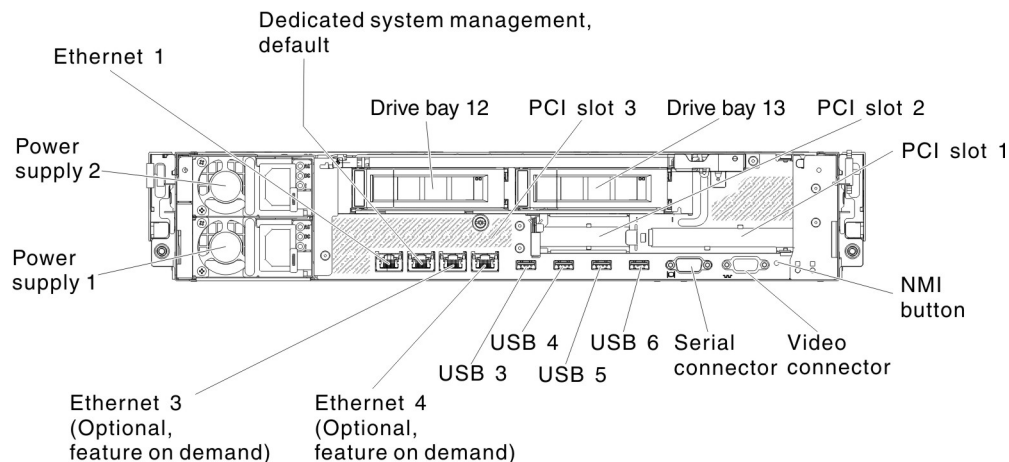
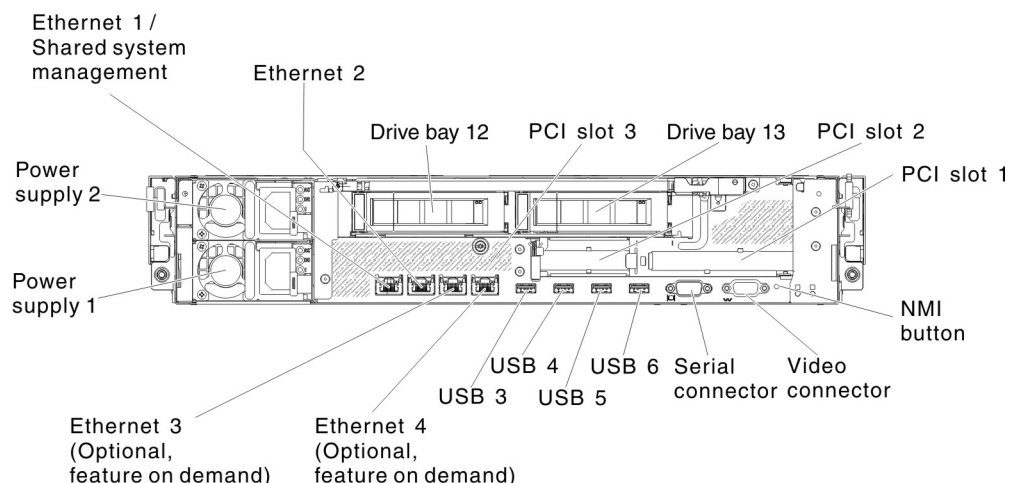


Illustration when two additional rear hot-swap hard disk drive is installed in server.
The PCI riser card assembly for this server configuration is 1U.

IMM Network Interface Port, Dedicated



IMM Network Interface Port, Shared



Ethernet and systems-management connectors:

IMM2 dedicated mode (default) :

In this mode, which is the default setting for the server, the Ethernet 2 connector connects to a network for full systems-management information control. A dedicated management network provides additional security by physically separating the management network traffic from the production network. Meanwhile, the Ethernet 1, Ethernet 3 and Ethernet 4 connectors are used to connect to the production network. See “Using the Setup utility” on page 99 for more information.

IMM2 shared mode :

In this mode, the Ethernet 1 connector is used to connect to both the management network and production network. Meanwhile, the Ethernet 2, Ethernet 3 and Ethernet 4 connectors are used to connect to the production network. See “Using the Setup utility” on page 99 for more information.

PCI slot connectors:

- **For 2U PCI riser card assembly:**

- **PCI slot 1:** Insert a full-height, full-length PCI Express adapter into this slot.
- **PCI slot 2:** Insert a full-height, half-length PCI Express adapter into this slot.
- **PCI slot 3:** Insert a low-profile PCI Express adapter into this slot.
- **PCI slot 4:** Insert a low-profile PCI Express adapter into this slot.
- **PCI slot 5:** Insert a low-profile PCI Express adapter into this slot.

For 1U PCI riser card assembly:

- **PCI slot 1:** Insert a full-height, half-length PCI Express adapter into this slot.
- **PCI slot 2:** Insert a low-profile PCI Express adapter into this slot.
- **PCI slot 3:** Insert a low-profile PCI Express adapter into this slot.

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

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

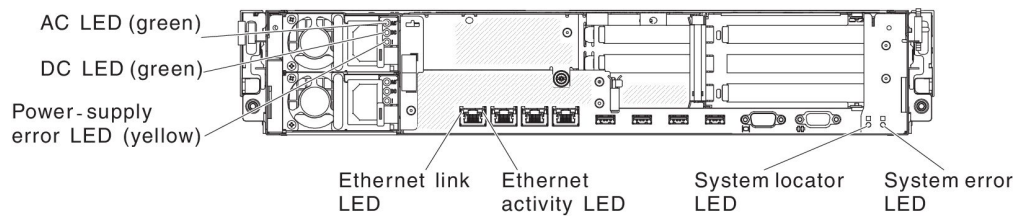
NMI button: Press this button to force a nonmaskable interrupt to the microprocessor. It allows you to blue screen the server and take a memory dump (use this button only when directed by the IBM service support). You might have to use a pen or the end of a straightened paper clip to press the button.

Serial connector: Connect a 9-pin serial device to this connector. The serial port is shared with the integrated management module II (IMM2). The IMM2 can take control of the shared serial port to perform text console redirection and to redirect serial traffic.

Video connector: Connect a monitor to this connector. The video connectors on the front and rear of the server can be used simultaneously.

Note: The maximum video resolution is 1600 x 1200 at 75 Hz.

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



Ethernet activity LEDs: When these LEDs are lit, they indicate that the server is transmitting to or receiving signals from the Ethernet LAN that is connected to the Ethernet port.

Ethernet link LEDs: When these LEDs are lit, they indicate that there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for the Ethernet port.

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 22.

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 22.

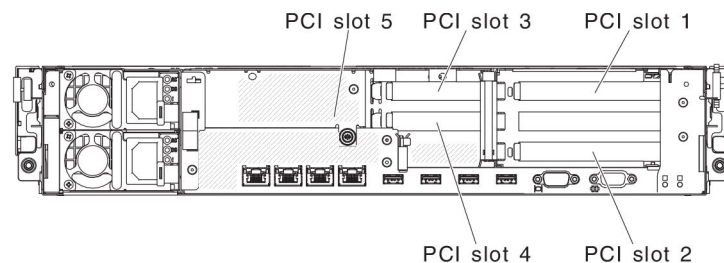
Power-supply error LED: When the power-supply error LED is lit, it indicates that the power supply has failed.

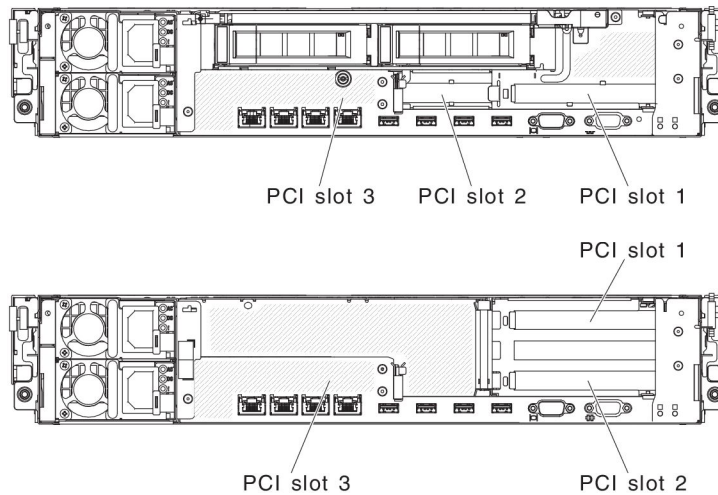
System-locator LED: Use this LED to visually locate the server among other servers. You can use IBM Systems Director or IMM2 web interface to light this LED remotely.

System-error LED: When this LED is lit, it indicates that a system error has occurred. An LED on the light path diagnostics panel is also lit to help isolate the error.

PCI riser-card adapter expansion slot locations

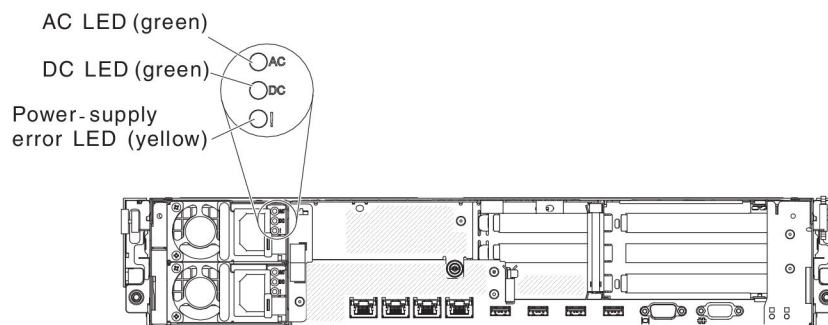
Based on the server configuration, the locations of the adapter expansion slots from the rear of the server may be either of the following.





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 suggested actions to correct the detected problems.

Table 2. Power-supply LEDs

Power-supply LEDs			Description	Action	Notes
AC (green)	DC (green)	Error (yellow)			
On	On	Off	Normal operation		
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. Replace the power supply. 3. (Trained service technician only) 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	On	Power supply is faulty but still operational	Replace the power supply.	

Server power features

When the server is connected to a power source but is not turned on, the operating system does not run, and all core logic except for the integrated management module II (IMM2) is shut down; however, the server can respond to requests from the IMM2, such as a remote request to turn on the server. The power-on LED flashes to indicate that the server is connected to power but is not turned on.

Turning on the server

Approximately 40 seconds after the server is connected to power, the power-control button becomes active, and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server and start the operating system by pressing the power-control button.

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

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.

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

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 power, the server can respond to requests from the IMM2, such as a remote request to turn on the server. While the server remains connected to power, one or more fans might continue to run. To remove all power from the server, you must disconnect it from the power source.

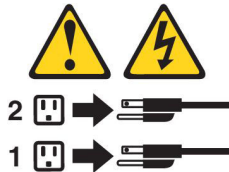
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

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 IMM2 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 IMM2.

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. 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*.
2. Shut down and restart the server multiple times to ensure that the server is correctly configured and functions correctly with the newly installed devices.
3. Save the DSA log as a file and send it to IBM. For information about transferring data and logs, see http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp?topic=/dsa/dsa_main.html.
4. 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/>.

How to send DSA data to IBM

Before you send diagnostic data to IBM, read the terms of use at <http://www.ibm.com/de/support/ecurep/terms.html>.

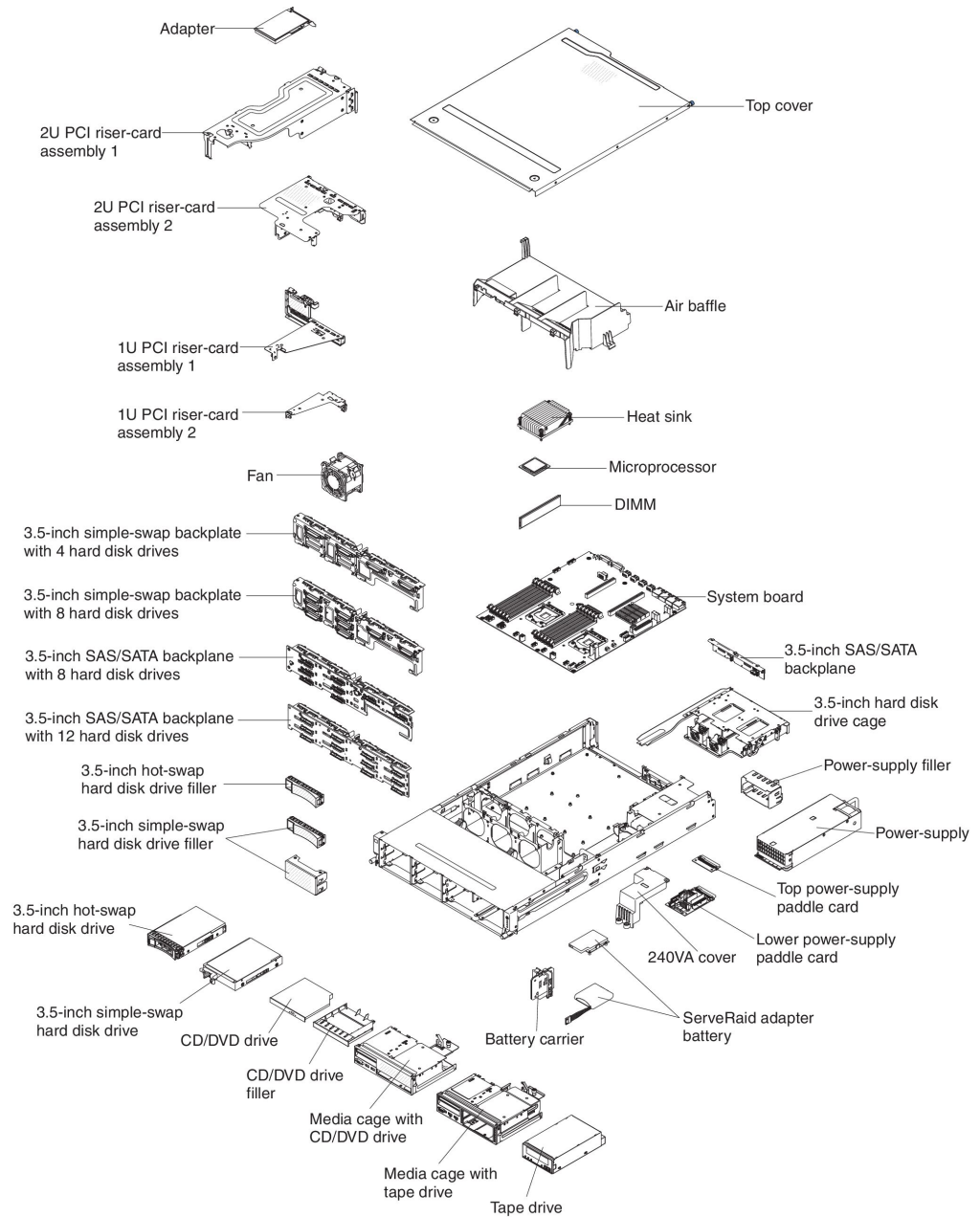
You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Server components

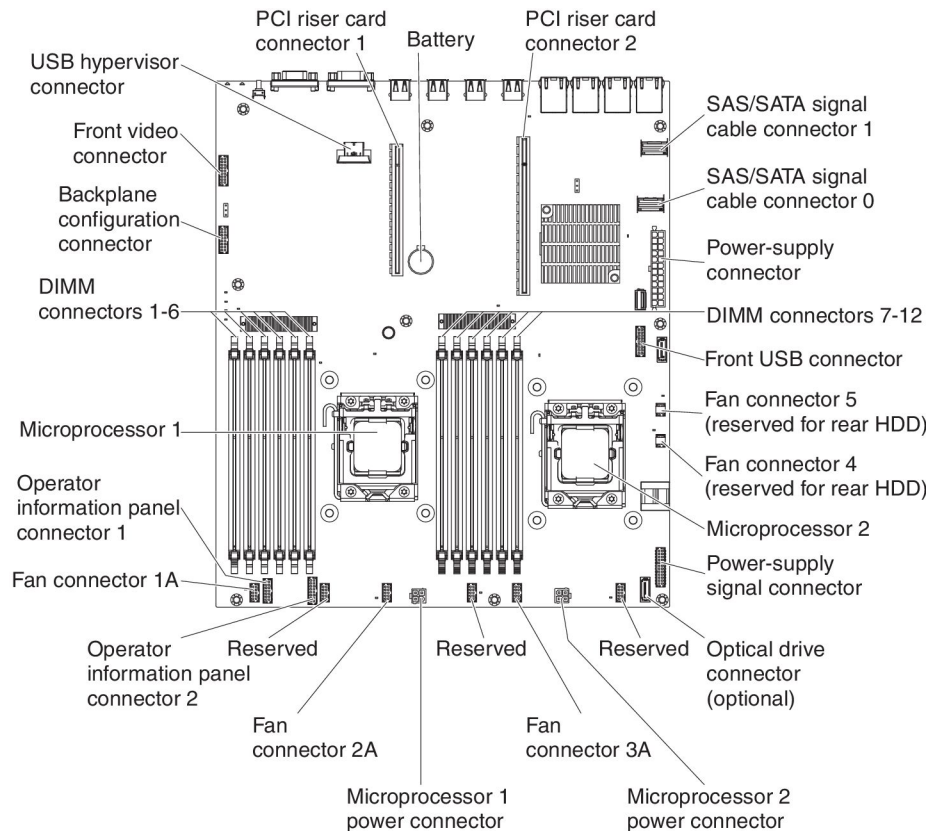
The following illustrations show the major components in the server.

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



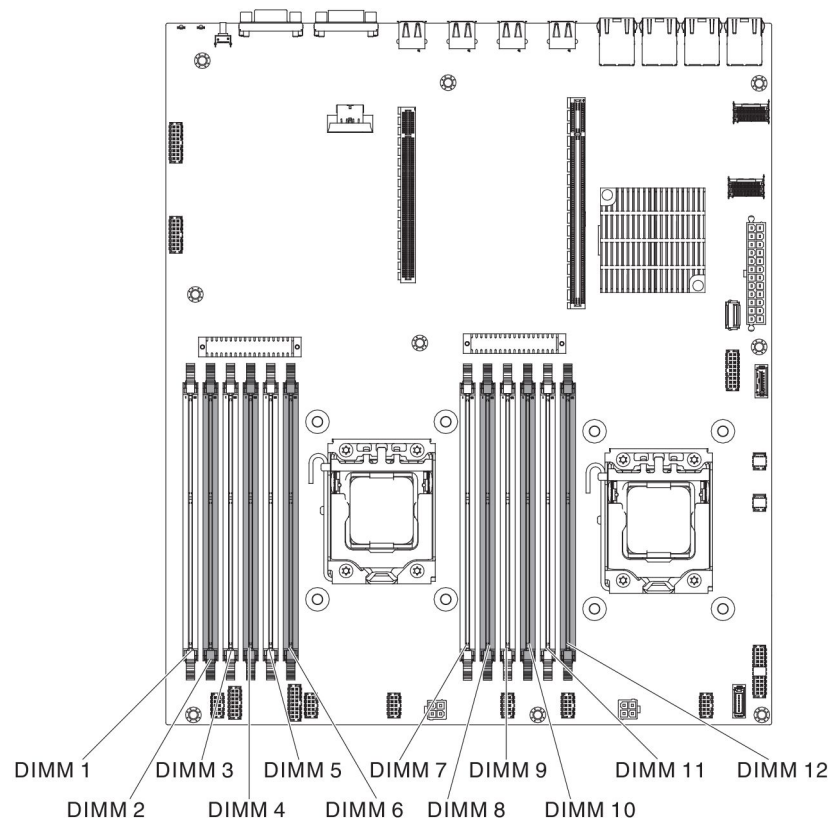
System-board internal connectors

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



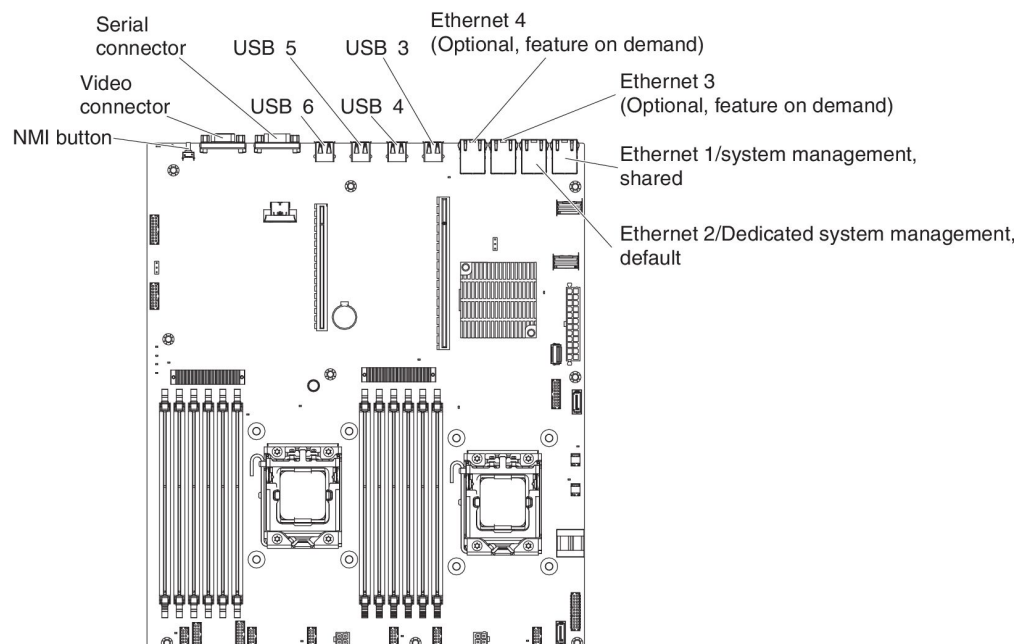
System-board DIMM connectors

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



System-board external connectors

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



System-board jumpers

This section describes the jumpers on the system board.

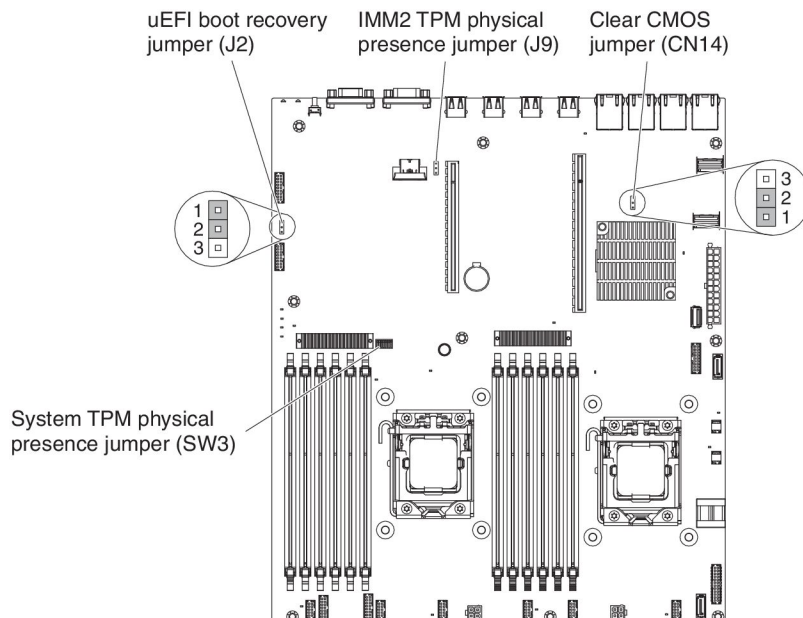


Table 3. System board jumpers

Jumper number	Jumper name	Jumper setting
CN14	Clear CMOS jumper	<ul style="list-style-type: none"> Pins 1 and 2: Normal (default) - This keeps the CMOS data. Pins 2 and 3: This clears the CMOS data such as power-on password and loads the default UEFI settings. <p>Note 2</p>
J2	UEFI boot recovery jumper	<ul style="list-style-type: none"> Pins 1 and 2: Normal (default) Loads the primary firmware ROM page. Pins 2 and 3: Loads the secondary (backup) firmware ROM page. <p>Notes 1 and 2</p>
<p>Notes:</p> <ol style="list-style-type: none"> If no jumper is present, the server responds as if the pins are set to 1 and 2. Changing the position of the UEFI recovery jumper from pins 1 and 2 to pins 2 and 3 before the server is turned on sets the UEFI recovery process. Do not change the jumper pin position after the server is turned on. This can cause an unpredictable problem. 		

Important:

- 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

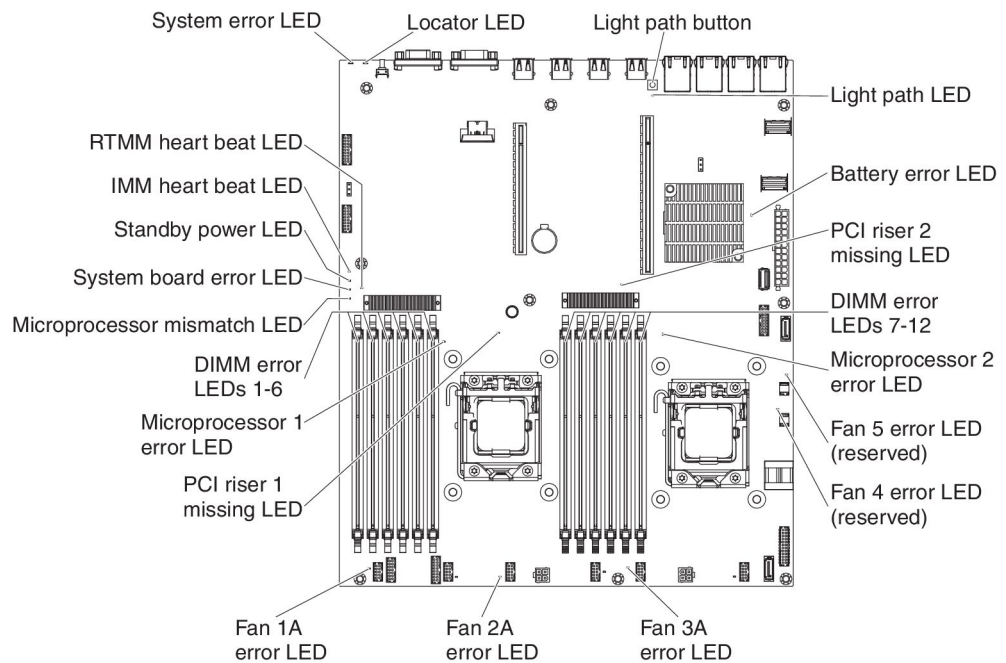
“Safety” on page vii, “Installation guidelines” on page 35, “Handling static-sensitive devices” on page 37, and “Turning off the server” on page 24.)

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

System-board LEDs

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

Note: Error LEDs remain lit only while the server is connected to power. If you disconnect power to the server, you can press and hold the light path diagnostics button to light the error LEDs on the system board.



LED name	Description
Error LEDs	When an error LED is lit, it indicates that the associated component has failed.
RTMM heartbeat LED	Power-on and power-off sequencing.
IMM 2 heartbeat LED	Indicates the status of the boot process of the IMM2. When the server is connected to power this LED flashes quickly to indicate that the IMM2 code is loading. When the loading is complete, the LED stops flashing briefly and then flashes slowly to indicate that the IMM2 is fully operational and you can press the power-control button to start the server.
Standby power LED	When this LED is flashing, it indicates that the server is connected to an ac power source. When this LED is lit, it indicates that the server is dc power on.
System board error LED	System-board has failed.
Microprocessor mismatch LED	When this LED is lit, it indicates that microprocessor 1 is not installed, or the microprocessors do not have the same cache size and type, and clock speed.
DIMM error LEDs	A memory DIMM has failed or is incorrectly installed.

LED name	Description
Microprocessor error LED	Microprocessor has failed, is missing, or has been incorrectly installed.
Light path LED	Indicates whether or not the lightpath button is functional. If the light path LED is lit after pressing the lightpath button, it indicates that the lightpath button is functioning properly. By contrast, if the lightpath LED is not lit when pressing the light path button, it means the lightpath button is not functioning properly.

PCI riser-card adapter expansion slot connectors

The following illustration shows the respective expansion slot connectors on the eight different types of PCI riser card assemblies that the server is capable of supporting.

Note: The specifications of the following slot labeling is defined in the following format.

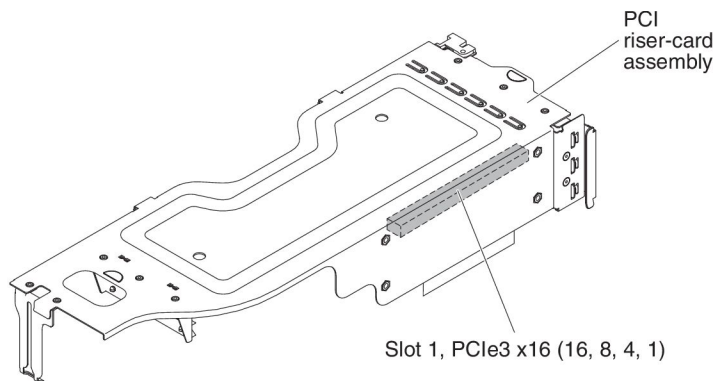
PCIe3 x *aa* (*b*, *c*, *d*, *e*)

where:

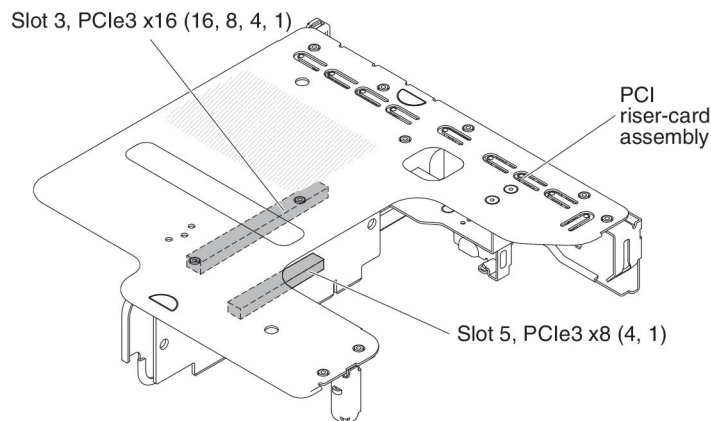
aa = Physical connector link width

b, *c*, *d*, *e* = Negotiable link width

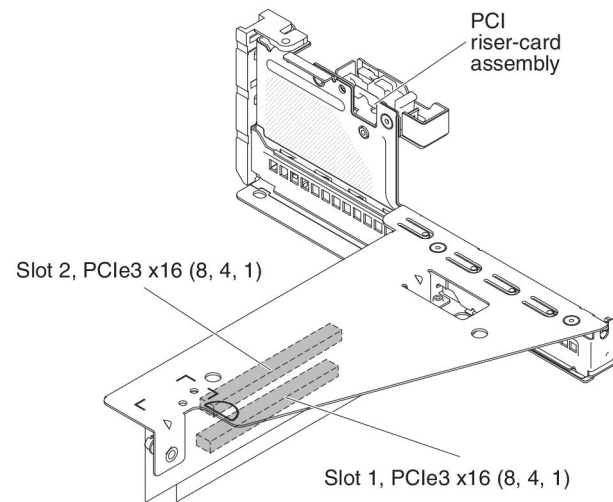
Type 1 PCI riser card



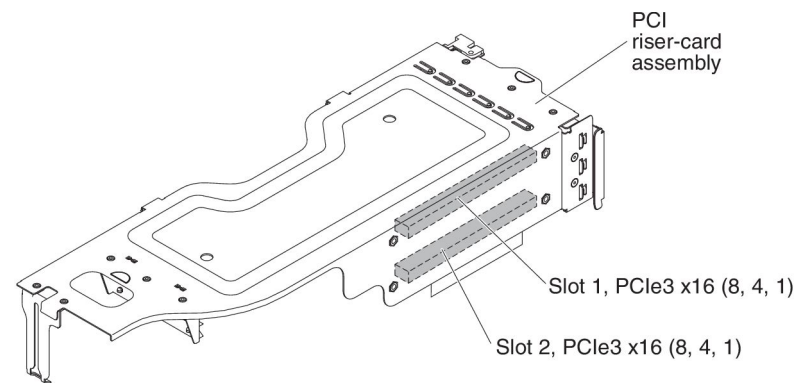
Type 2 PCI riser card



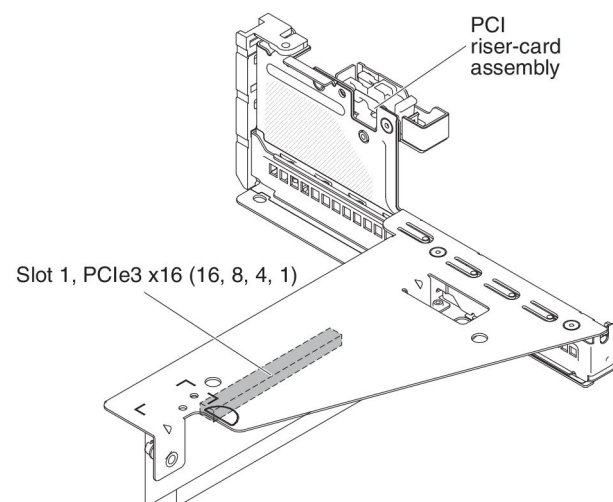
Type 3 PCI riser card



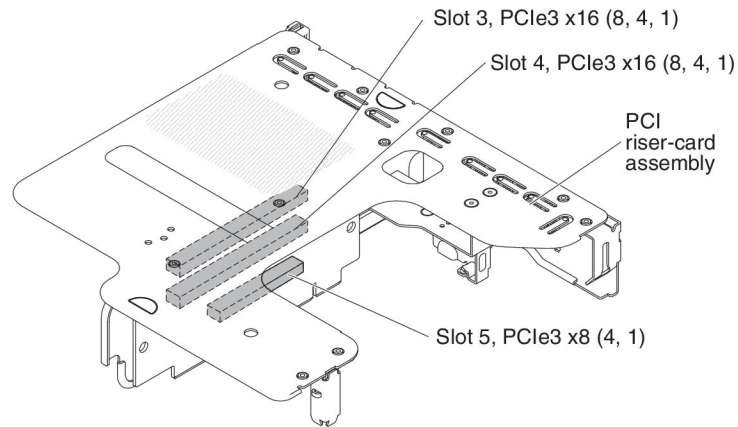
Type 4 PCI riser card



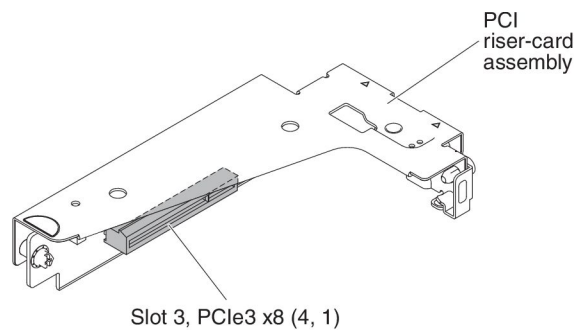
Type 5 PCI riser card



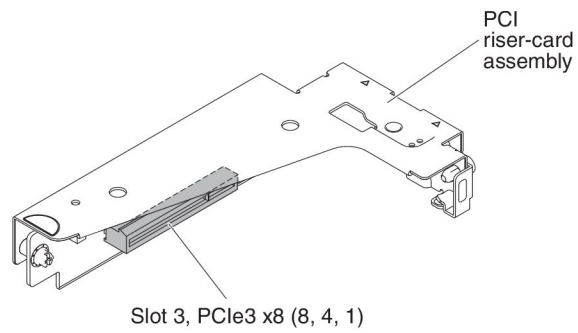
Type 6 PCI riser card



Type 7 PCI riser card



Type 8 PCI riser card



Installation guidelines

Attention:

- Static electricity that is released to internal server components when the server is powered-on might cause the system 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 removing or installing a hot-swap device.
- This product is not intended to be connected directly or indirectly by any means whatsoever to interfaces of public telecommunications networks, neither to be used in Public Services Network.

Before you install optional devices, read the following information:

- Read the safety information that begins on page vii, the guidelines in “Working inside the server with the power on” on page 36, and “Handling static-sensitive devices” on page 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 x3630 M4** to display the matrix of downloadable files for the server.

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

- 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 diagnostic information.
- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.
- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
 - Make sure that you can stand safely without slipping.
 - Distribute the weight of the object equally between your feet.
 - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
 - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.

- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- To view the error LEDs on the system board or internal components, use the light path diagnostics button on the system board when the server is not connected to power.
- You do not have to turn off the server to install or replace redundant hot-swap ac power supplies or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables or non-hot-swap optional devices or components.
- 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. It also indicates that non-hot-swap component that you need to turn off the server before performing any action on it.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the server, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/>.

System reliability guidelines

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

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

Working inside the server with the power on

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

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

- Avoid wearing loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie or scarf to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting wrist watches.
- Remove items from your shirt pocket, such as pens and pencils, that 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.
- The use of a grounding system is recommended. For example, wear an electrostatic-discharge wrist strap, if one is available. Always use an electrostatic-discharge wrist strap or other grounding system when working inside the server with the power on.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal surface on the outside of the server for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the server without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the server cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Internal cable routing and connectors

Hot-swap hard disk drive backplane cable connections

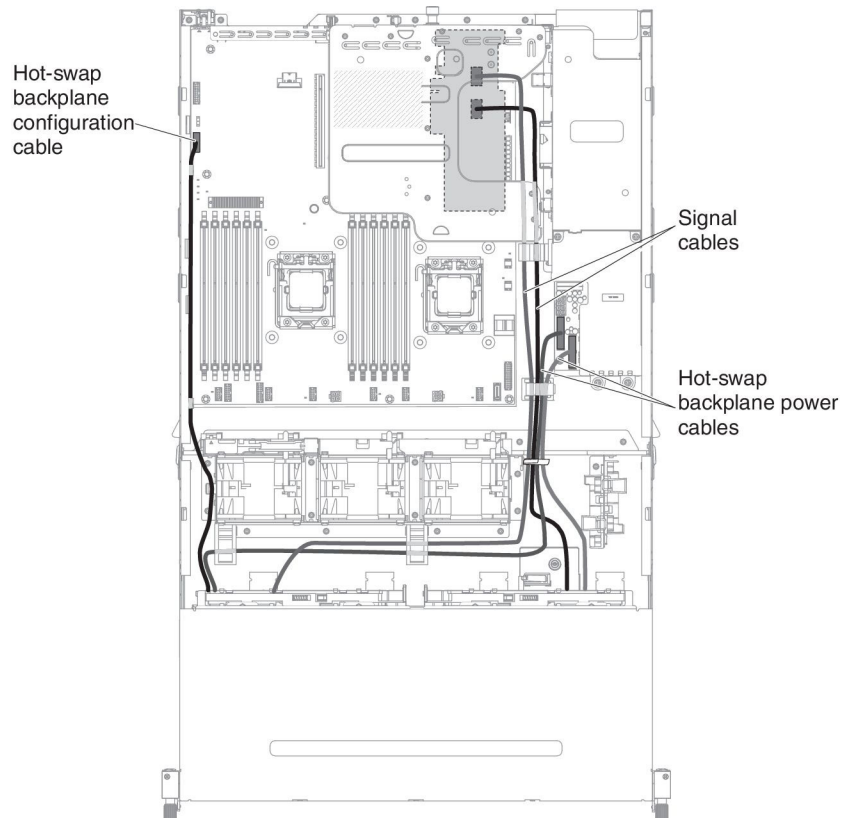
This section provides information about routing the cables when you install some components in the server.

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

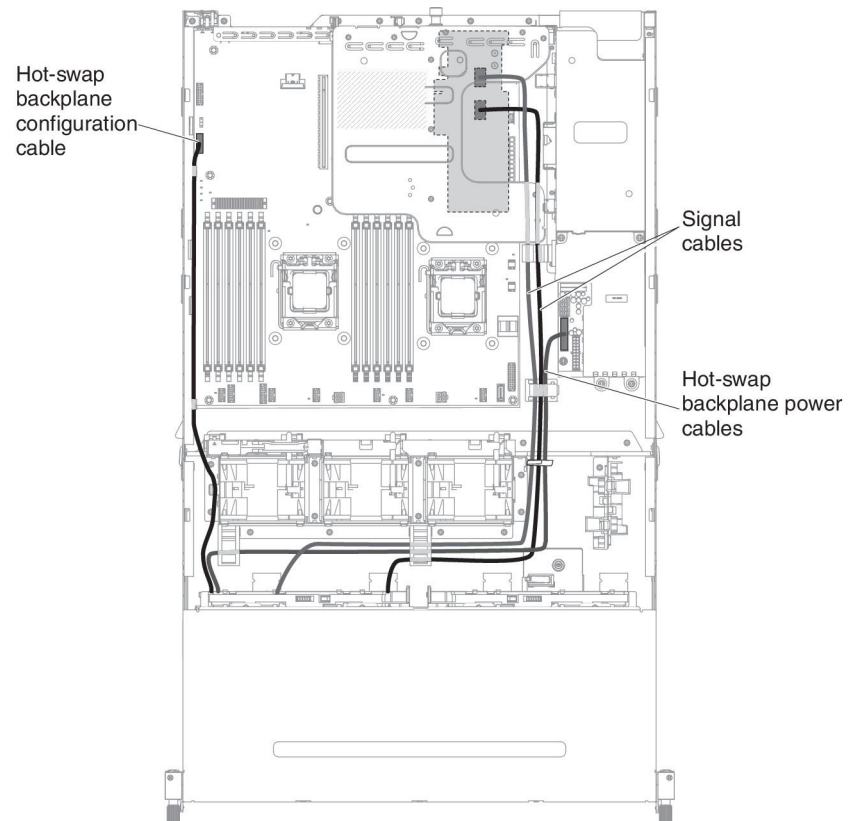
Notes:

1. When the hot-swap backplane is in use, make sure that Port 1 on the hardware ServeRAID or system board is connected to Port 1 on the backplane. Likewise, Port 0 on the hardware ServeRAID or system board should be connected to Port 0 on the backplane.
2. When the simple-swap backplate is in use, make sure that the cable marked with a SAS 1 sticker is attached to SAS/SATA 1 connector on the system board. Likewise, the cable marked with a SAS 0 sticker is attached to SAS/SATA 0 connector on the system board.

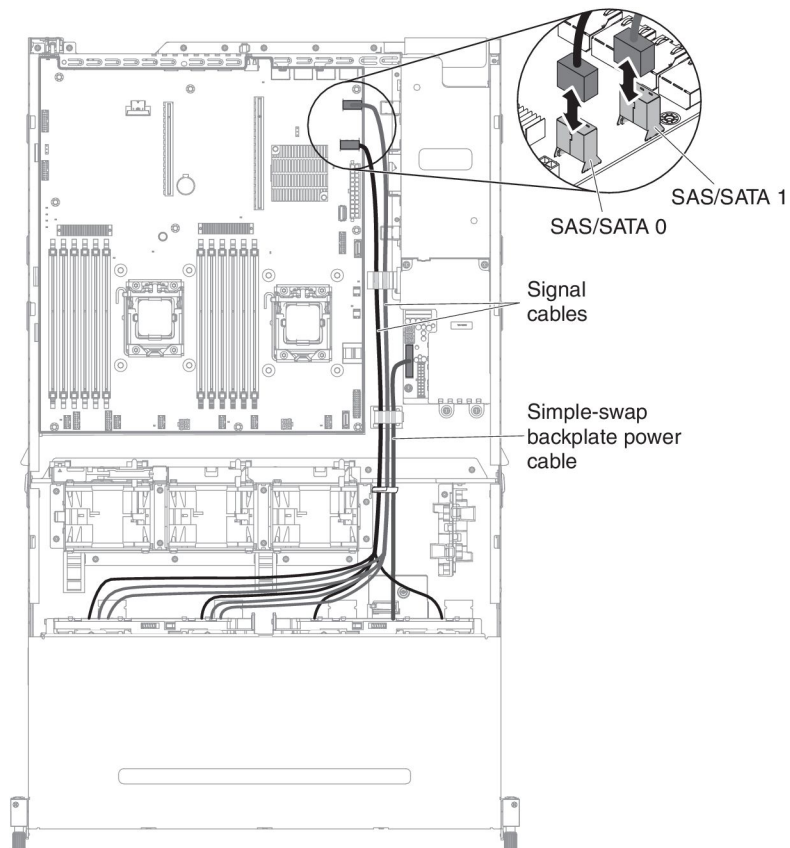
The following illustration shows the hardware ServeRAID cabling information for twelve 3.5-inch hot-swap drive backplane assemblies:



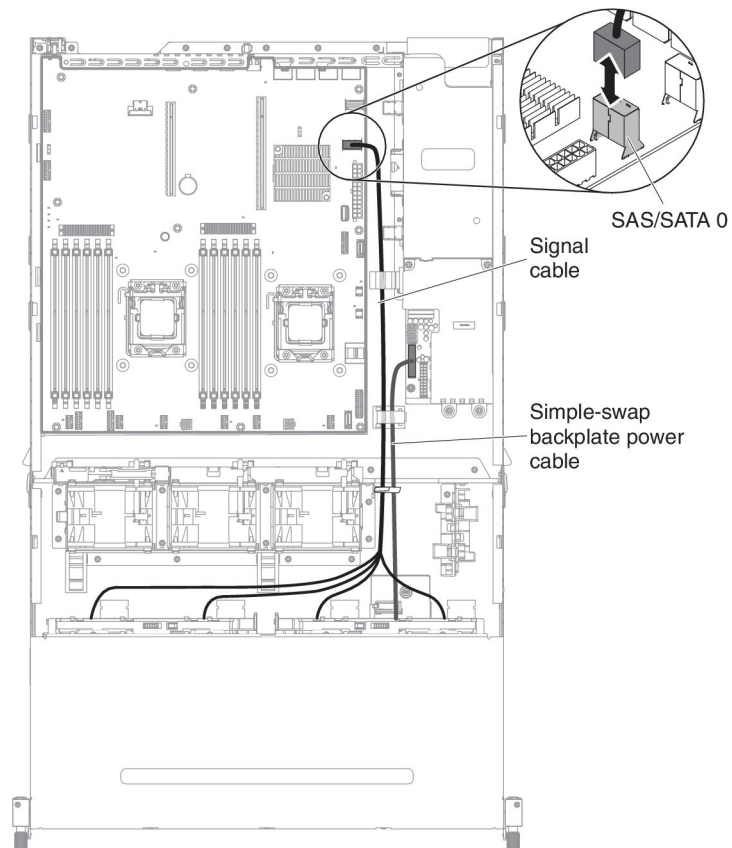
The following illustration shows the hardware ServeRAID cabling information for eight 3.5-inch hot-swap drive backplane assemblies:



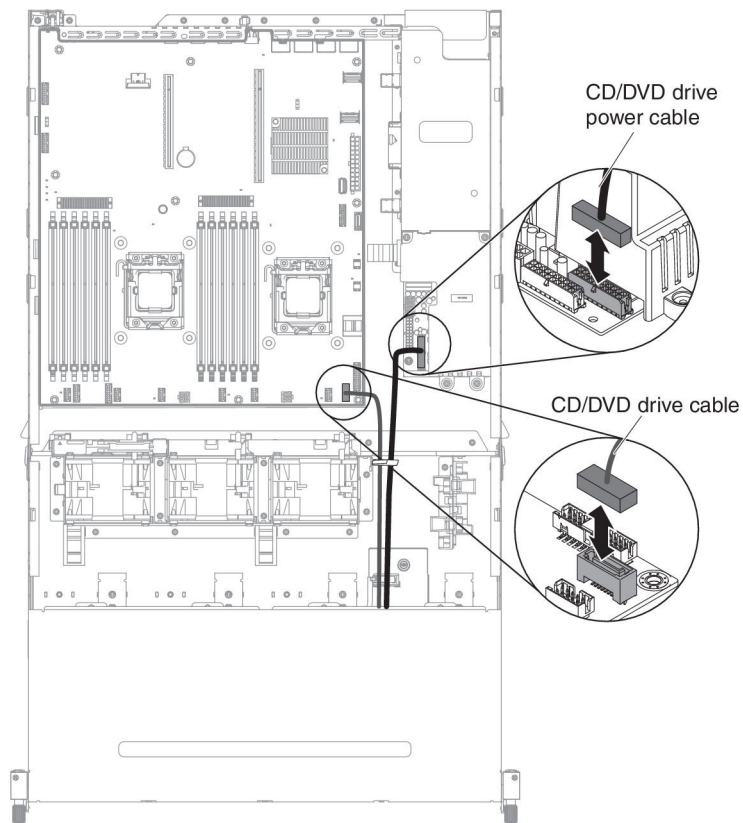
The following illustration shows the software ServeRAID cabling information for eight 3.5-inch simple-swap drive backplate assemblies:



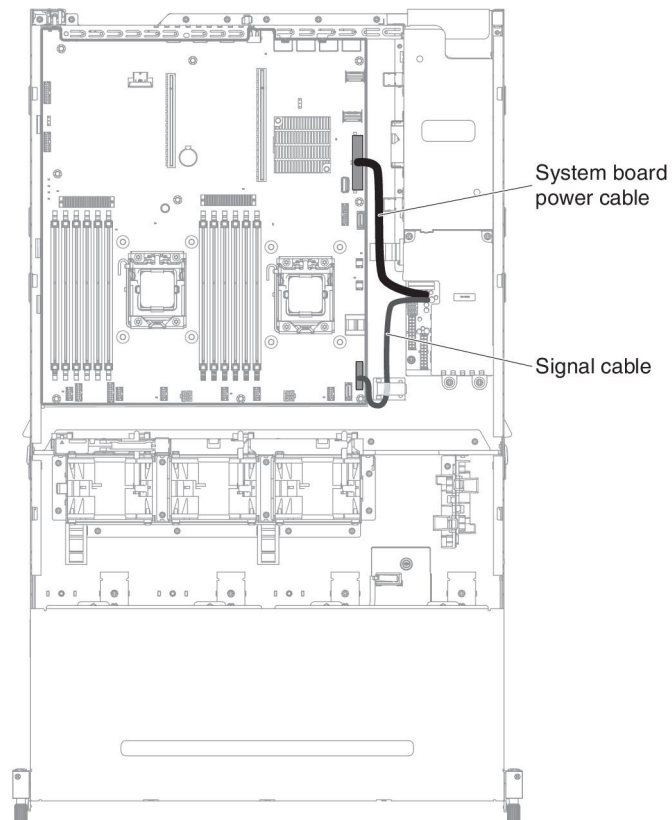
The following illustration shows the software ServeRAID cabling information for four 3.5-inch simple-swap drive backplate assemblies:



The following illustrations show the cabling information for the optional CD/DVD SATA drive:

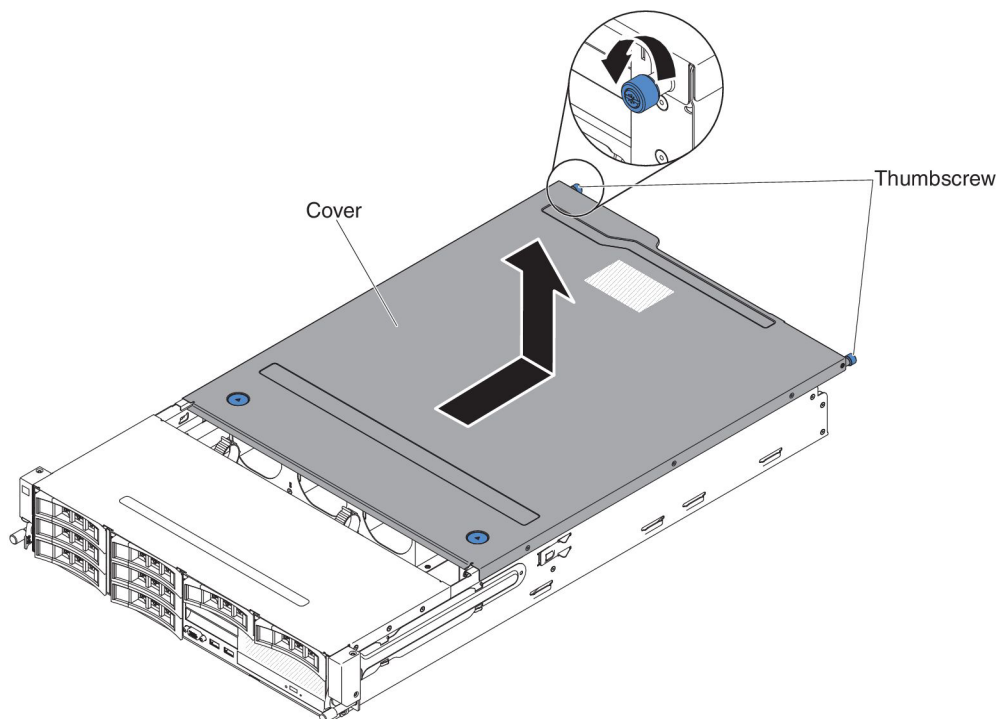


The following illustrations show the cabling information for the power paddle card:



Removing the server top cover

The following illustration shows how to remove the server top cover.



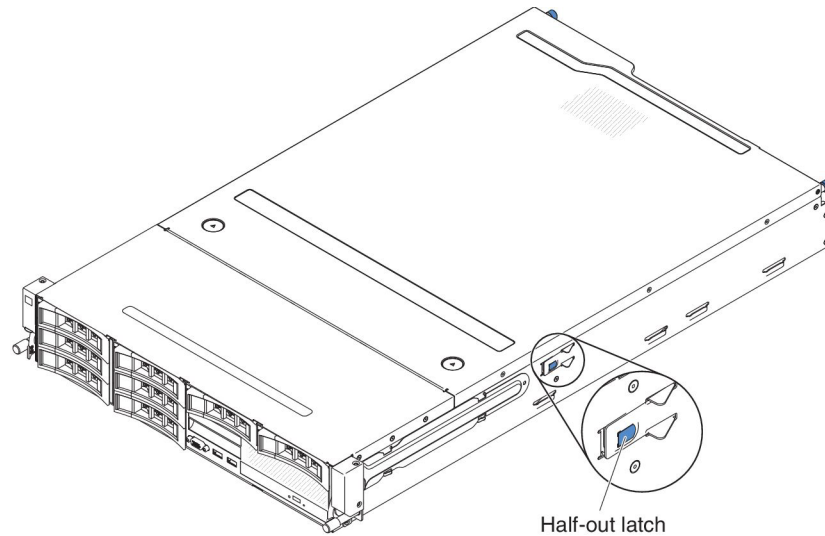
Important: Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the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

To remove the server top 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 install or remove a microprocessor, memory module, PCI adapter, battery, or other non-hot-swap optional device, turn off the server and all attached devices and disconnect all external cables and power cords (see “Turning off the server” on page 24).
3. If the server has been installed in a rack, loosen the two thumbscrews on the front of the server and remove the server out of the rack enclosure.

Attention:

- Two or more people are required to remove the system from a rack cabinet.
- To completely remove the server from the rack, press the latches on the sides on the slide rails.



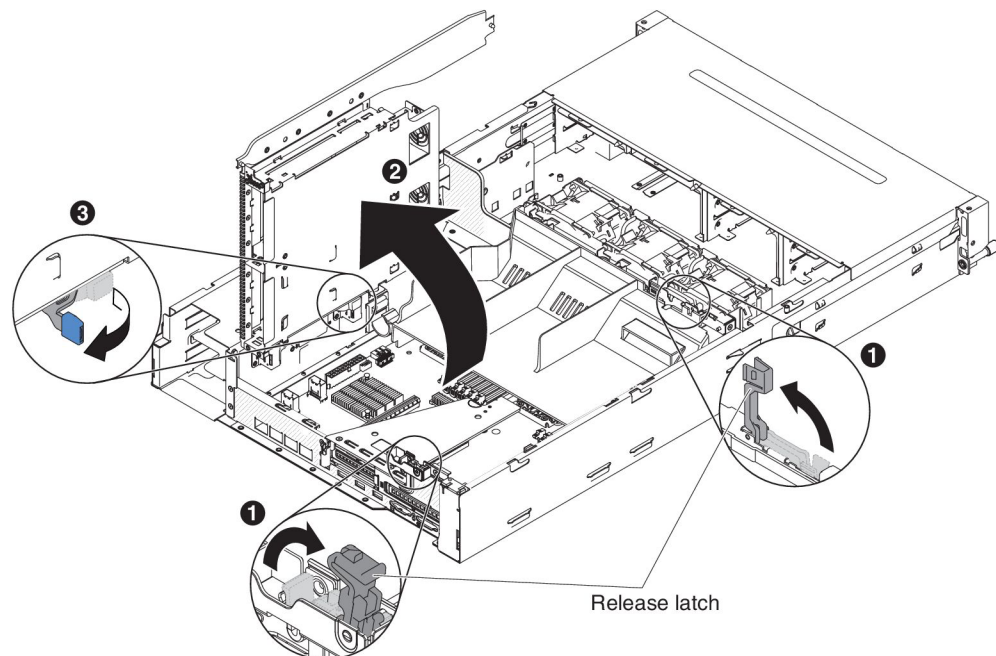
4. Loosen the two thumbscrews that secure the cover to the chassis.
5. Press on the two blue grip points and slide the cover toward the rear; then, lift the cover off the server. Set the cover aside.

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

6. If you are instructed to return the server top cover, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Rotating the optional hot-swap rear hard disk drive cage up

To rotate the optional hot-swap hard disk drive cage up, 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 all power cords and external cables.
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. Open the two respective blue latches on the chassis **1**.
5. Slowly rotate the rear hard disk drive cage outwards until it stops **2**.
6. Shift the switch on the rear hard disk drive cage to the lock position to keep the hard disk drive cage fixed **3**.

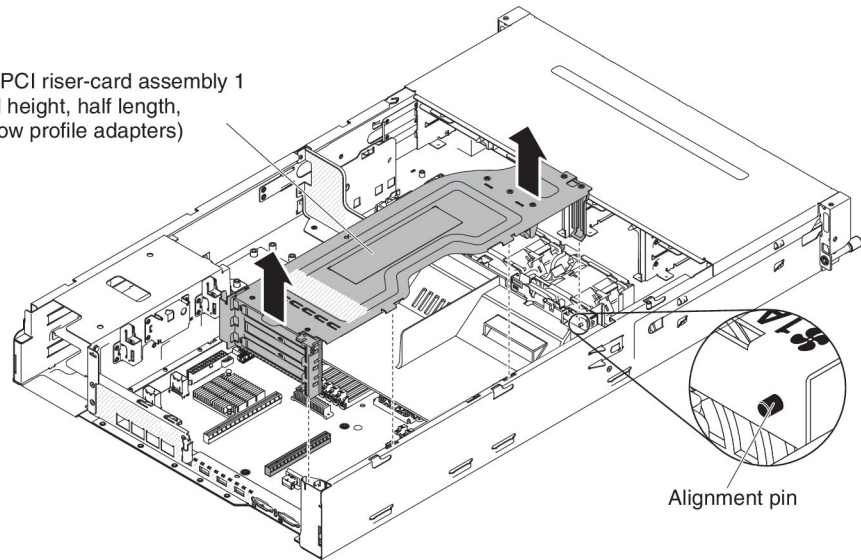
Removing the PCI riser-card assembly

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

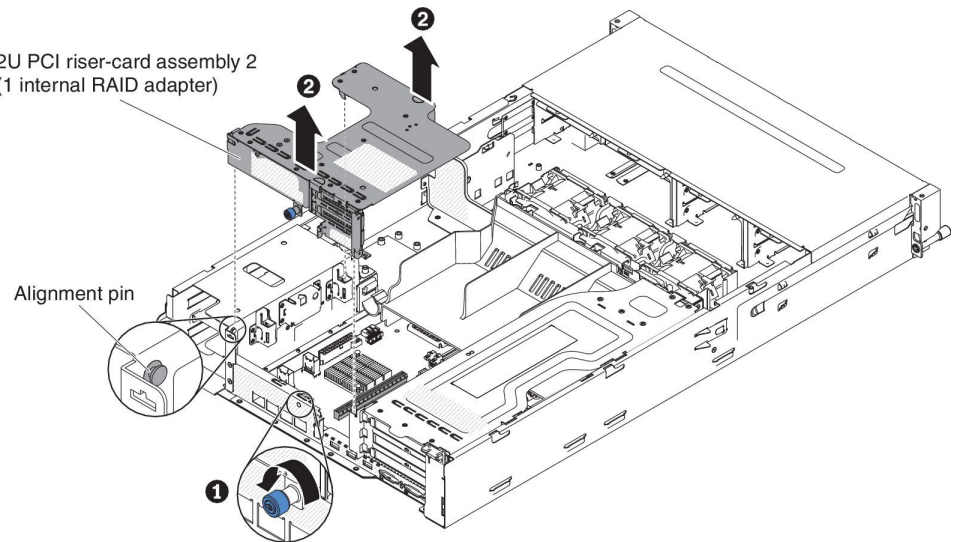
1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up”).
5. If an adapter is installed in the PCI riser-card assembly, disconnect any cables that are connected to the adapter
6. Grasp the front and rear of the PCI riser-card assembly at the blue touch-points and lift it out of the PCI riser connector on the system board.

For 2U riser cards:

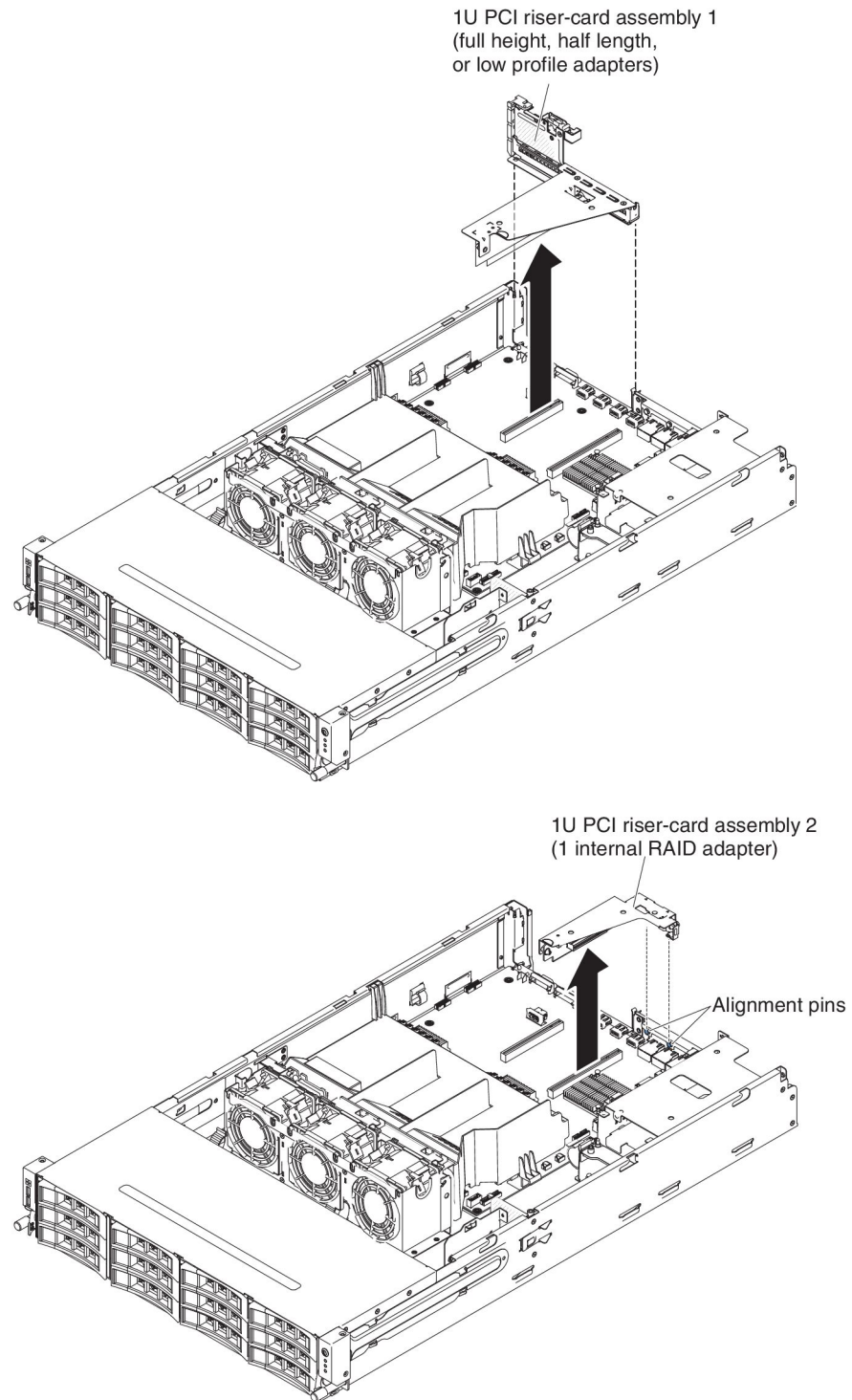
2U PCI riser-card assembly 1
(full height, half length,
or low profile adapters)



2U PCI riser-card assembly 2
(1 internal RAID adapter)

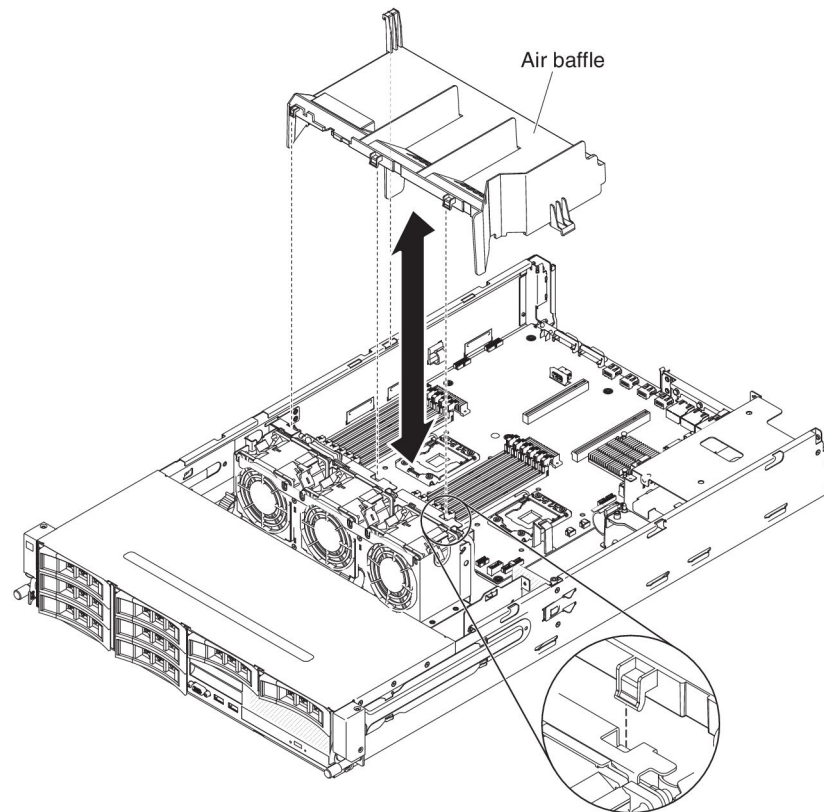


For 1U riser cards:



Removing the air baffle

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

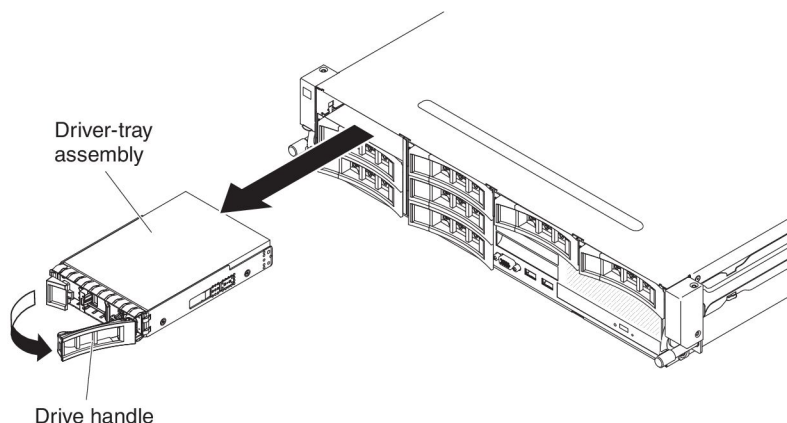


To remove the air baffle, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 24).
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
5. If necessary, remove the PCI riser-card assembly (see “Removing the PCI riser-card assembly” on page 46).
6. Grasp the top of the air baffle and lift it out of the server.

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

Removing a hot-swap hard disk drive



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

1. Read the safety information that begins on page vii, “Installation guidelines” on page 35, and “Handling static-sensitive devices” on page 37.
2. Press the release latch on the side of the drive front.
3. Grasp the handle and pull the hot-swap drive assembly out of the drive bay.

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

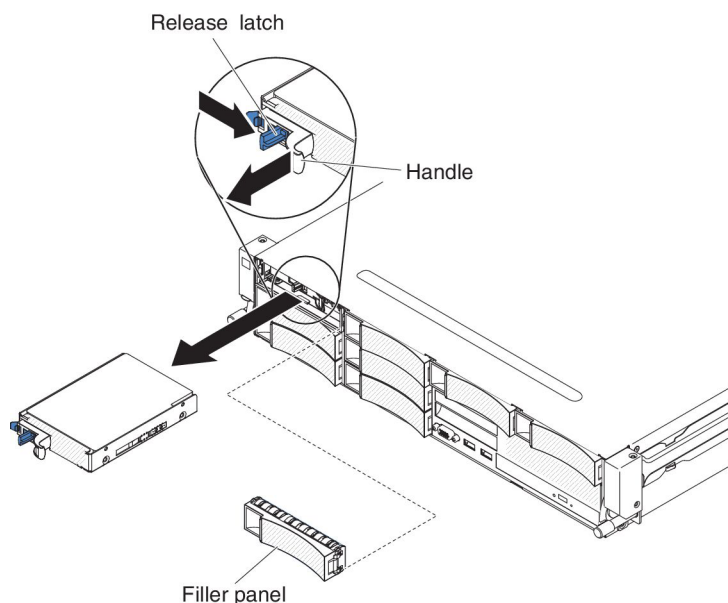
If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

Removing a simple-swap hard disk drive

Note: You must turn off the server before removing simple-swap drives in the server.

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

1. Read the safety information that begins on page vii, “Installation guidelines” on page 35, and “Handling static-sensitive devices” on page 37.
2. Turn off the server and all attached peripheral devices. Disconnect all power cords; then, disconnect all external cables as necessary to replace the device.
3. Remove the filler panel from the front of the server.
4. Locate the release tab (blue) on the hard disk drive; then, while you press the release tab to the right, grasp the handle and pull the drive out of the bay.

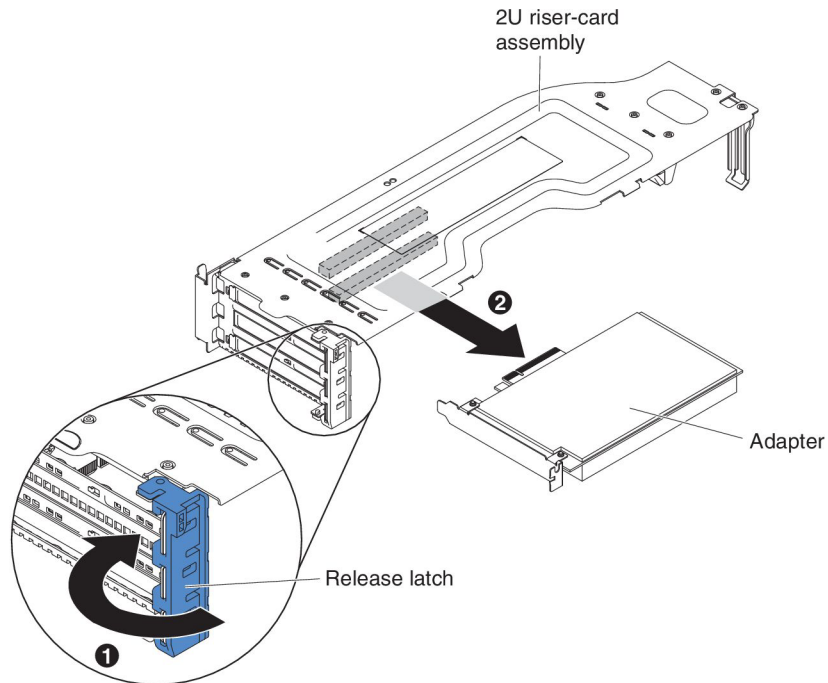


If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

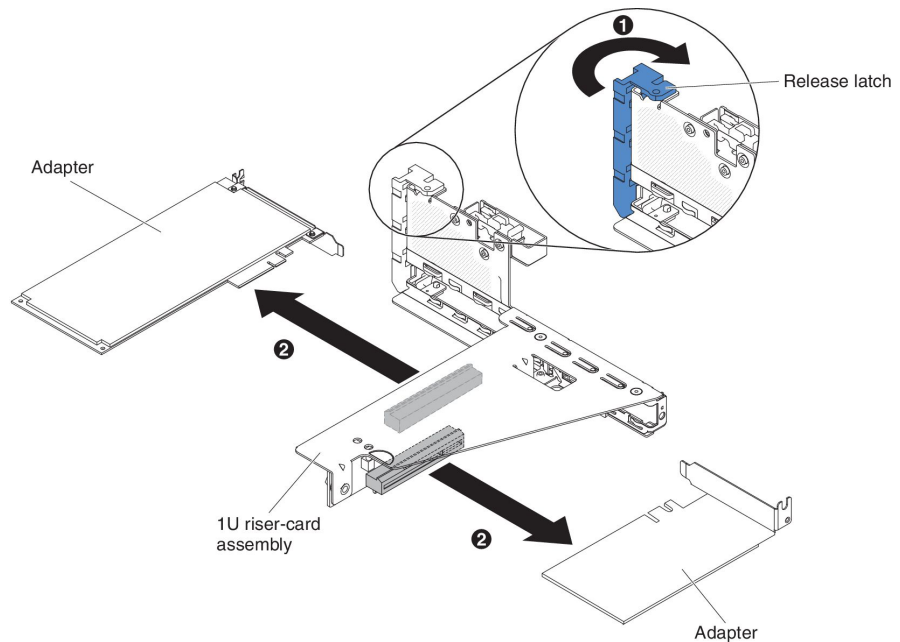
Removing an adapter from the PCI riser-card assembly

To remove an adapter from a PCI expansion slot, complete the following steps:

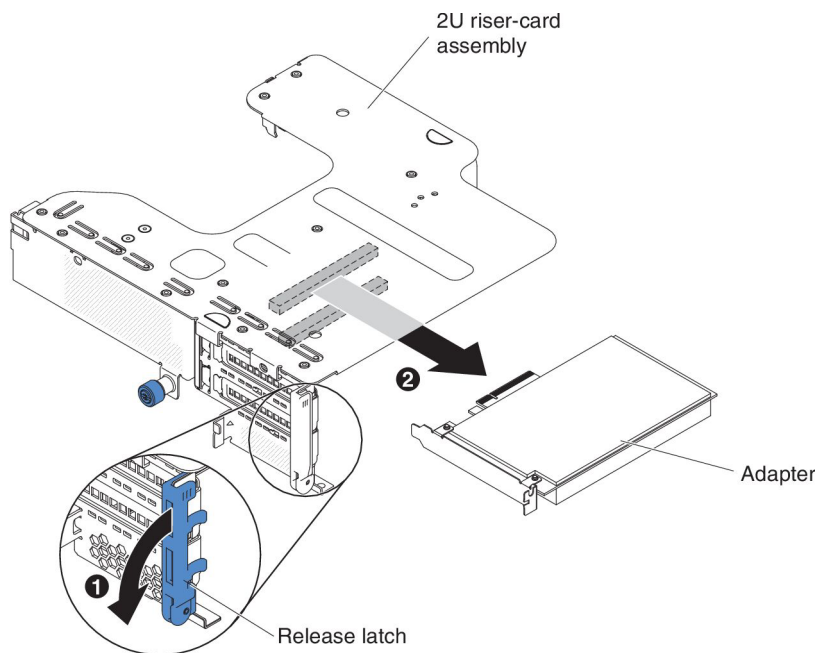
1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables.
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
5. Disconnect any cables from the adapter (make note of the cable routing, in case you reinstall the adapter later).
6. Remove the PCI riser-card assembly (see “Removing the PCI riser-card assembly” on page 46).
7. The following illustrates the steps for removing an adapter from different PCI riser-card assemblies:
 - For 2U PCI riser-card assembly 1:
 - a. Rotate the retention latch to the open position.
 - b. Carefully grasp the adapter by its top edge or upper corners, and pull the adapter from the PCI riser-card assembly.



- For 1U PCI riser-card assembly 1:
 - a. Rotate the retention latch to the open position.
 - b. Carefully grasp the adapter by its top edge or upper corners, and pull the adapter from the PCI riser-card assembly.



- For 2U PCI riser-card assembly 2:
 - a. To remove a adapter, lower the retention latch down to the open position.
 - b. Carefully grasp the adapter by its top edge or upper corners, and pull it from the PCI riser-card assembly.



- For 1U PCI riser-card assembly 2:

Note: For 1U PCI riser-card assembly 2, it only supports ServeRAID adapters (see “Removing a ServeRAID adapter from the PCI riser-card assembly”).

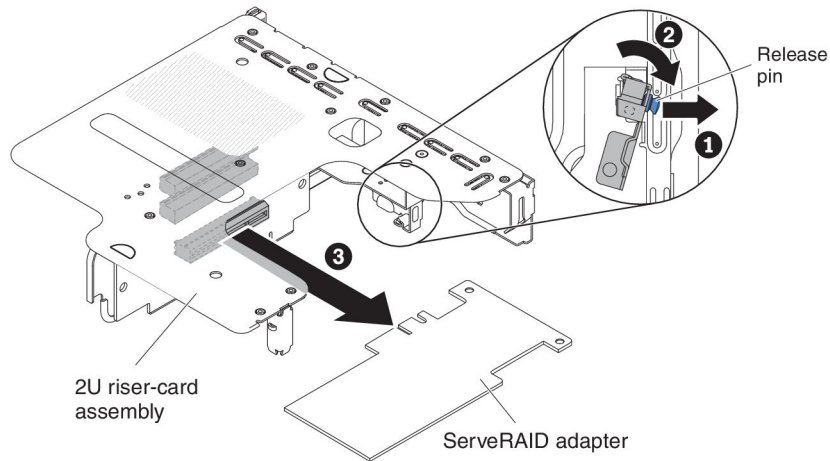
8. Place the adapter on a flat, static-protective surface.
9. If you are instructed to return the adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Removing a ServeRAID adapter from the PCI riser-card assembly

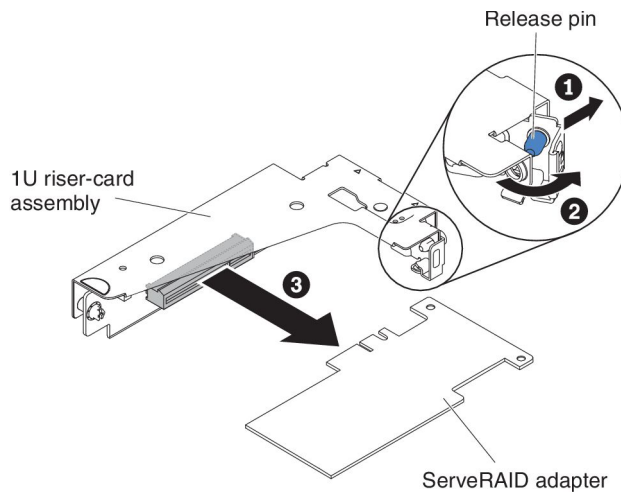
To remove a ServeRAID adapter from the PCI riser-card assembly, complete the following steps:

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 all power cords and external cables.
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
5. Remove PCI riser-card assembly 2 (see “Removing the PCI riser-card assembly” on page 46).
6. Pull the release pin to unlock the retention latch; then rotate the retention latch to the open position.
7. Carefully grasp the ServeRAID adapter by the edge and pull it out of PCI riser-card assembly 2.

For 2U riser card:



For 1U riser card:



8. If you are instructed to return the ServeRAID adapter, follow all packaging instructions, and use any packaging materials for shipping that are supplied to you.

Note: When the ServeRAID adapter is removed, software RAID will not be supported. This system does not support downgrade software RAID function from hardware RAID configuration.

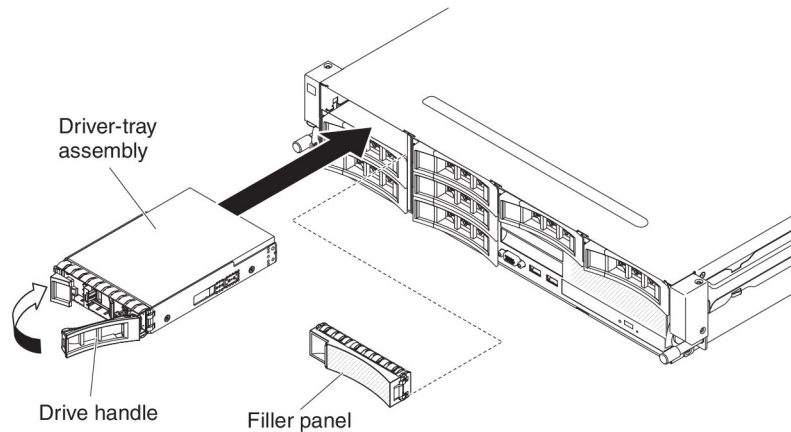
Installing a hot-swap hard disk drive

The following notes describe the type of hard disk drives that the server supports and other information that you must consider when you install a drive. For a list of supported drives, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/>.

- Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.
- Depending on the server model, your server may support up to eight 3.5-inch hot-swap SAS/SATA hard disk drives or fourteen 3.5-inch hot-swap SAS/SATA hard disk drives (for this configuration two 3.5-inch hot-swap SAS/SATA hard disk drives are located at the rear of the server).

- All hot-swap drives in the server should have the same throughput speed rating. Using hard disk drives with different speed ratings will cause all drives to operate at the throughput speed of the slowest drive.

The following illustration shows how to install a hot-swap hard disk drive.



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

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

1. Read the safety information that begins on page vii, "Installation guidelines" on page 35, and "Handling static-sensitive devices" on page 37.
2. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
3. Remove the drive filler panel from one of the empty hot-swap bays.
4. Install the hard disk drive in the hot-swap bay:
 - a. Orient the drive as shown in the illustration.
 - b. Make sure that the tray handle is open.
 - c. Align the drive assembly with the guide rails in the bay.
 - d. Gently push the drive assembly into the bay until the drive stops.
 - e. Push the tray handle to the closed (locked) position.
 - f. If the system is turned on, check the hard disk drive status LED to verify that the hard disk drive is operating correctly.

After you install a hard disk drive, the green activity LED flashes as the disk spins up. The yellow LED turn off after about 1 minute. If the new drive starts to rebuild, the yellow LED flashes slowly and the green activity LED remains lit during the rebuild process. If the yellow LED remains lit, see the *Problem Determination and Service Guide* on the IBM Documentation CD for hard disk drive problem solutions.

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

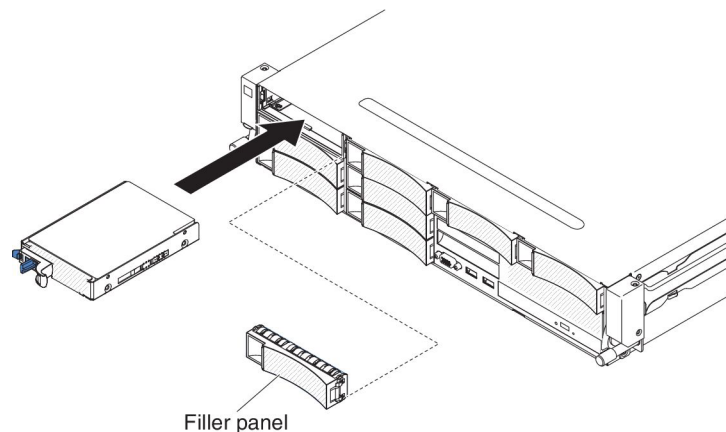
If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 89.

Installing a simple-swap hard disk drive

Note: You must turn off the server before installing simple-swap drives in the server.

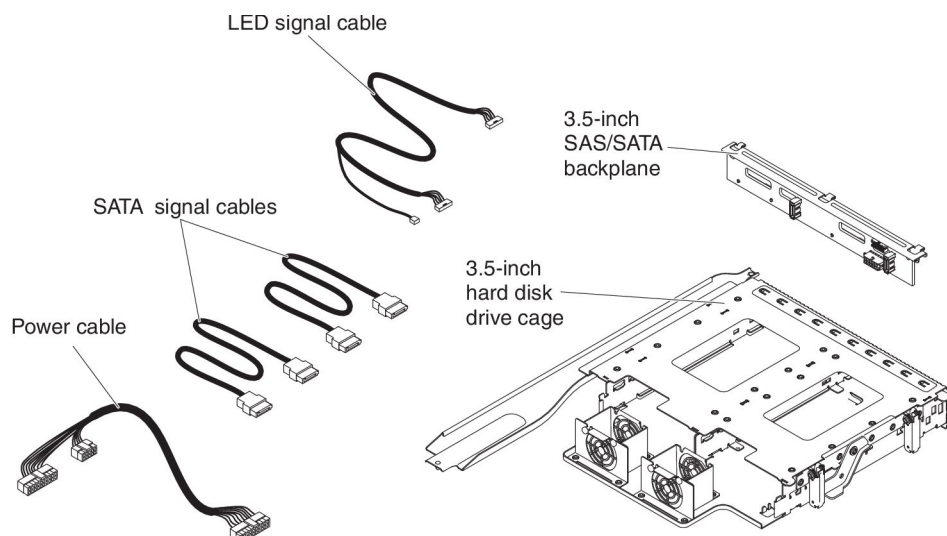
To install a simple-swap hard disk drive, complete the following steps:

1. Read the safety information that begins on page vii, “Installation guidelines” on page 35, and “Handling static-sensitive devices” on page 37.
2. Turn off the server and all attached peripheral devices. Disconnect all power cords; then, disconnect all external cables as necessary to replace the device.
3. If installing a new drive, touch the static-protective package that contains the new drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
4. Remove the filler panel from the front of the server.
5. Gently push the drive assembly into the drive bay until the drive clicks into place.



6. Reinstall the filler panel that you removed.
7. Turn on the peripheral devices and the server.

Installing an optional hot-swap rear hard disk drive cage

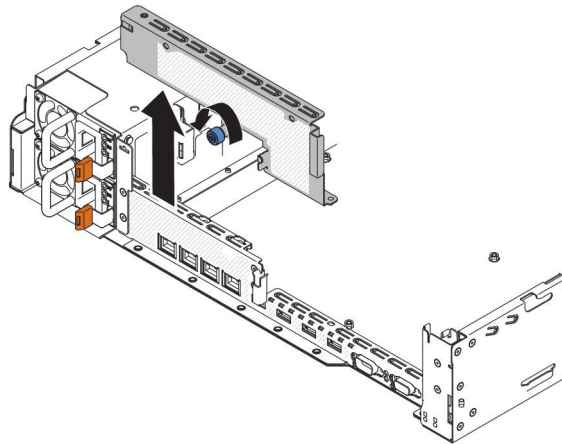


Note: Fan connector 4 and Fan connector 5 are currently reserved for future possible use with the rear hard disk drives.

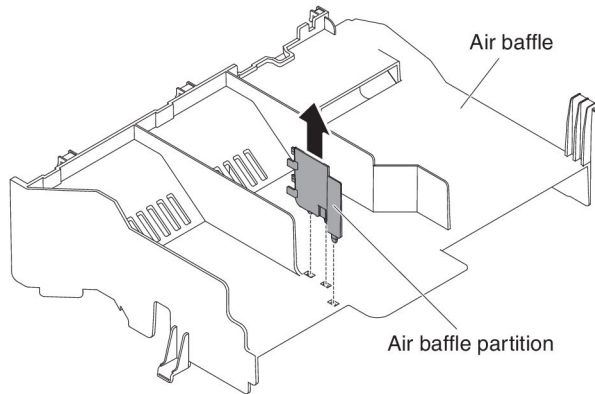
To install the optional rear hot-swap hard disk drive cage, complete the following steps:

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 all power cords and external cables.
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If a drive filler cage is installed in the chassis, loosen the screw that secures the drive filler cage to the chassis; then, rotate the drive filler clockwise and remove the drive filler out of the bay from the server. Go to step 8.

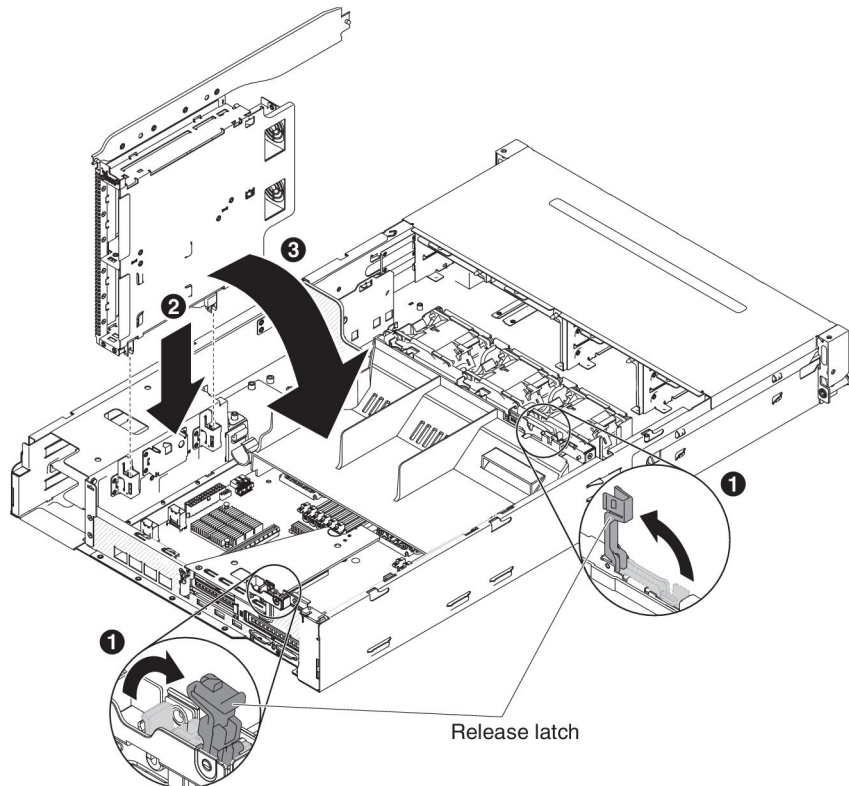
Note: If 2U PCI riser-card assemblies are installed in the server, go to step 5.



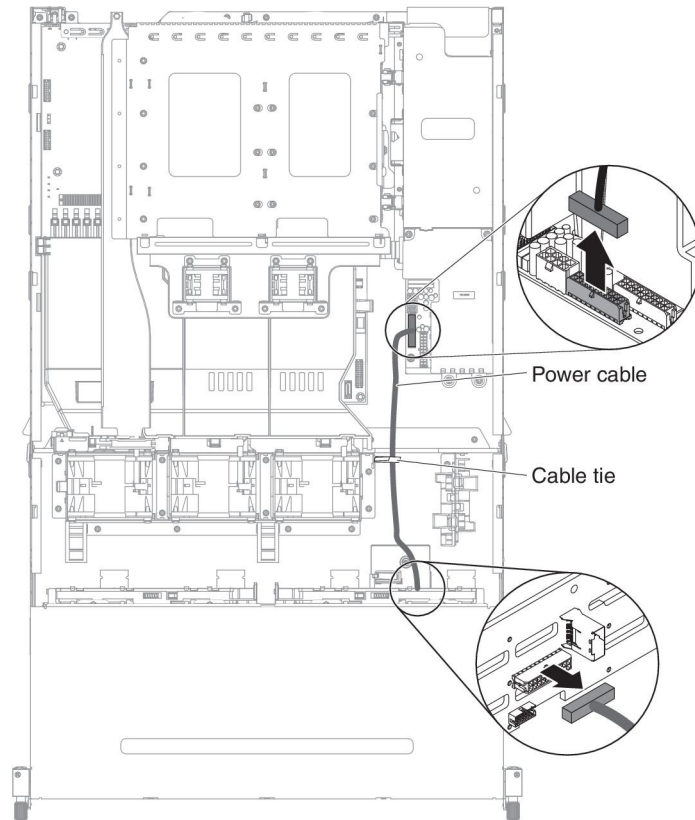
5. If the 2U PCI riser-card assembly is installed in the server, remove all 2U PCI riser-card assembly and adapters (see “Removing the PCI riser-card assembly” on page 46), “Removing an adapter from the PCI riser-card assembly” on page 51) and “Removing a ServeRAID adapter from the PCI riser-card assembly” on page 53).
6. Install the removed adapters and/or ServeRAID adapter into the relevant 1U PCI riser-card assembly (see “Installing an adapter on the PCI riser-card assembly” on page 61) and “Installing a ServeRAID adapter on the PCI riser-card assembly” on page 64).
7. Install the 1U PCI riser-card assembly (see “Installing the PCI riser-card assembly” on page 90).
8. If an air baffle partition is installed in the air baffle, remove it from the air baffle.



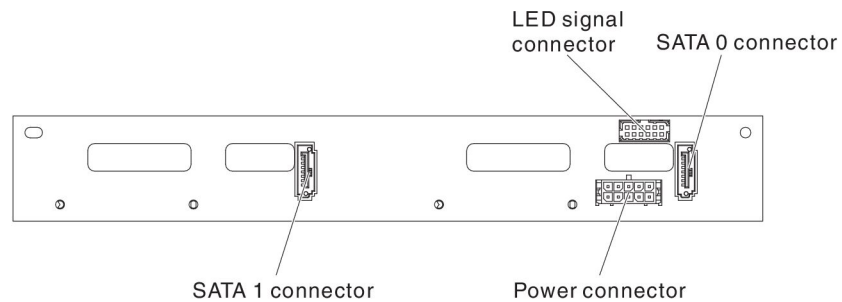
9. Open the two respective blue latches on the chassis **1** .
10. Align the two moveable levers of the rear hard disk drive cage with the two chassis support brackets. Slide the cage into the chassis support brackets until it firmly sits into place **2** . Then, rotate the cage inward until it firmly sits into place **3** .



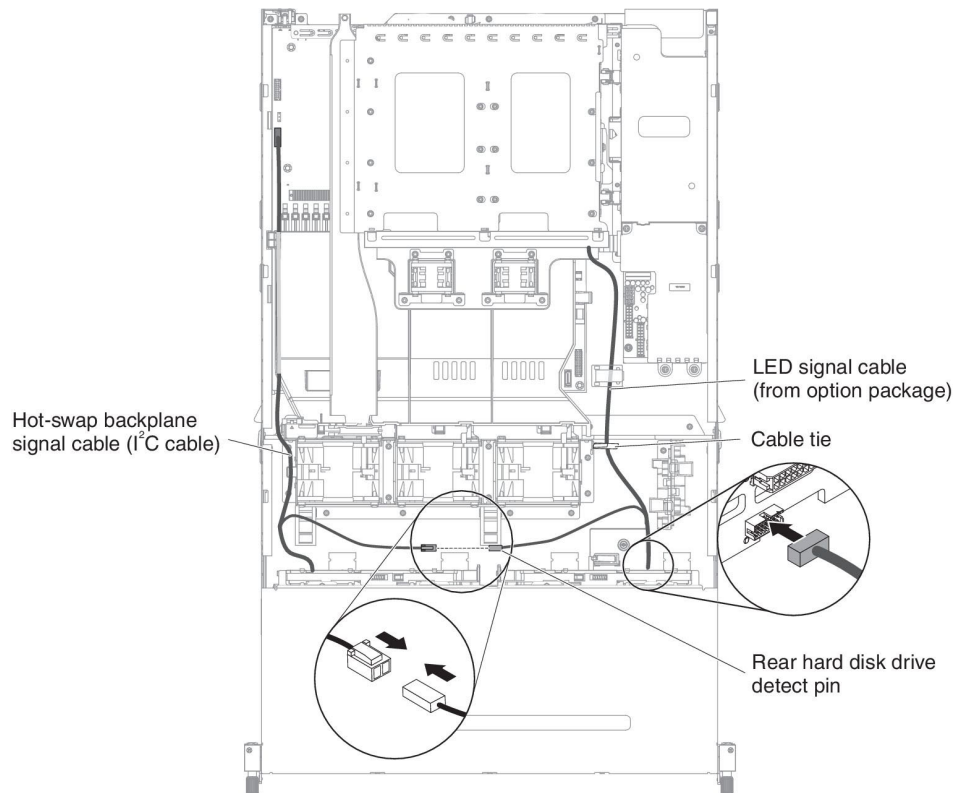
11. Close the latches on the chassis.
12. Remove the power cable that currently connects the hot-swap hard disk drive backplane in the server to the power-paddle card.



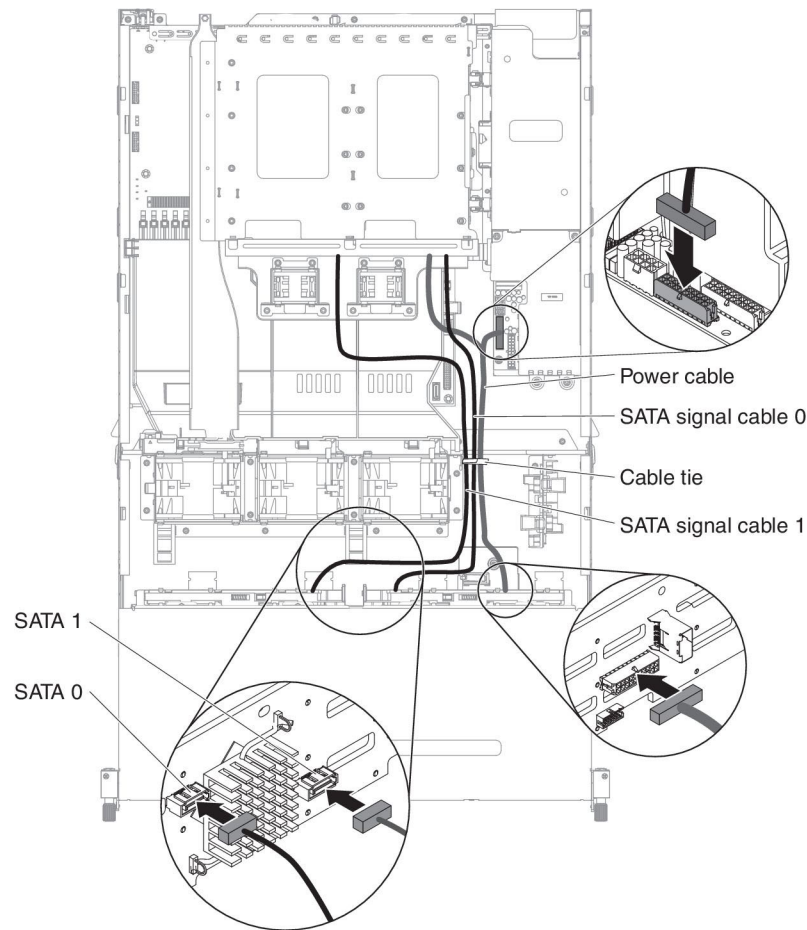
13. Connect the LED signal, SATA signal and power cables to the hot-swap backplane from the option package.



14. Insert the hot-swap backplane onto the rear hard disk drive cage (see "Installing the hot-swap backplane on the optional rear hard disk drive cage" on page 69).
15. Connect the other end of the LED signal cable to the hot-swap hard disk drive backplane in the server.
16. Find the rear hard disk drive detect pin of the hot-swap backplane signal (I²C) cable located near the system fan cage; then, connect with the rear hard disk drive detect pin of the LED signal cable from the option package.



17. Connect the other end of the SATA signal and power cables to the power paddle card and hot-swap hard disk drive backplane in the server. Make sure the labels of both connectors are matched.



Note: Make sure the cables are routed in the proper locations without blocking the airflow. It is recommended to press all the cables downwards to make the cable routing easier. Secure the cables with any cable retention clips.

18. If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

Installing an adapter on the PCI riser-card assembly

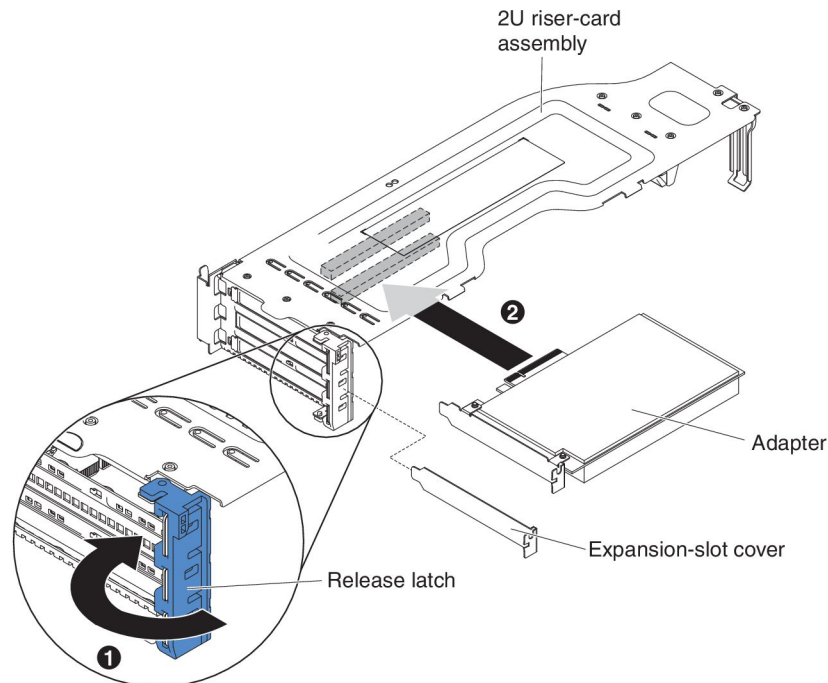
The following notes describe the types of adapters that the server supports and other information that you must consider when you install an adapter:

- To confirm that server supports the adapter that you are installing, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/..>
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section.
- Do not set the maximum digital video adapter resolution above 1600 x 1200 at 75 Hz for an LCD monitor. This is the highest resolution that is supported for any add-on video adapter that you install in the server.
- Any high-definition video-out connector or stereo connector on any add-on video adapter is not supported.
- The server does not support PCI-X adapters or legacy 5 V PCI adapters.
- The server provides two PCI riser slots on the system board, supporting 1U and 2U riser-card assembly. The 1U riser-card assembly may provide up to two PCI Express Gen3 adapter slots, while the 2U riser-card assembly may provide up to

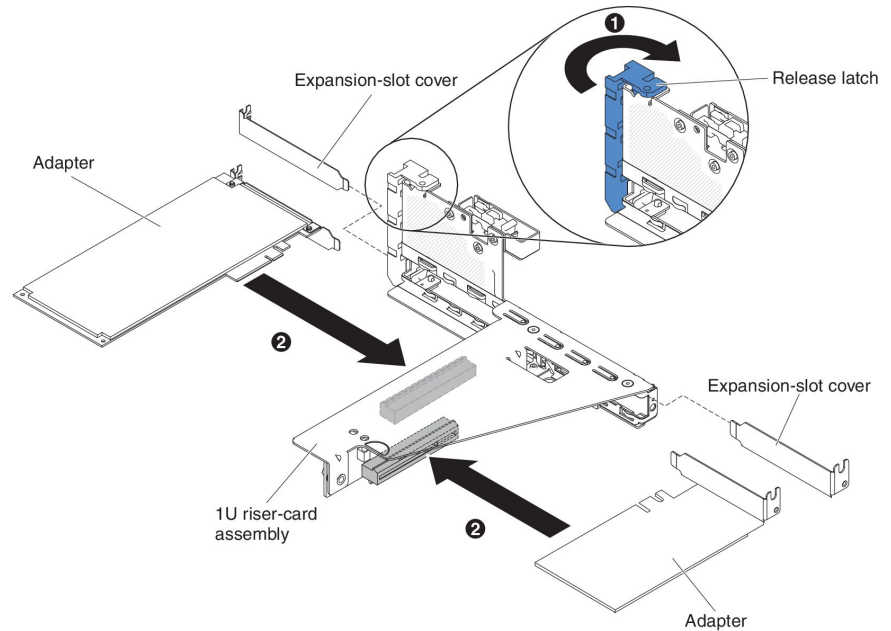
three PCI Express Gen3 adapter slots. See “PCI riser-card adapter expansion slot locations” on page 21 for the location of the respective PCI-e slots on the riser card assembly. Regarding the respective PCI-e slots on the riser-card assembly and system board, the microprocessor to which each slot is connected and the supported adapters that you can install in each slot, please see the *Problem Determination and Service Guide* .

To install an adapter, complete the following steps:

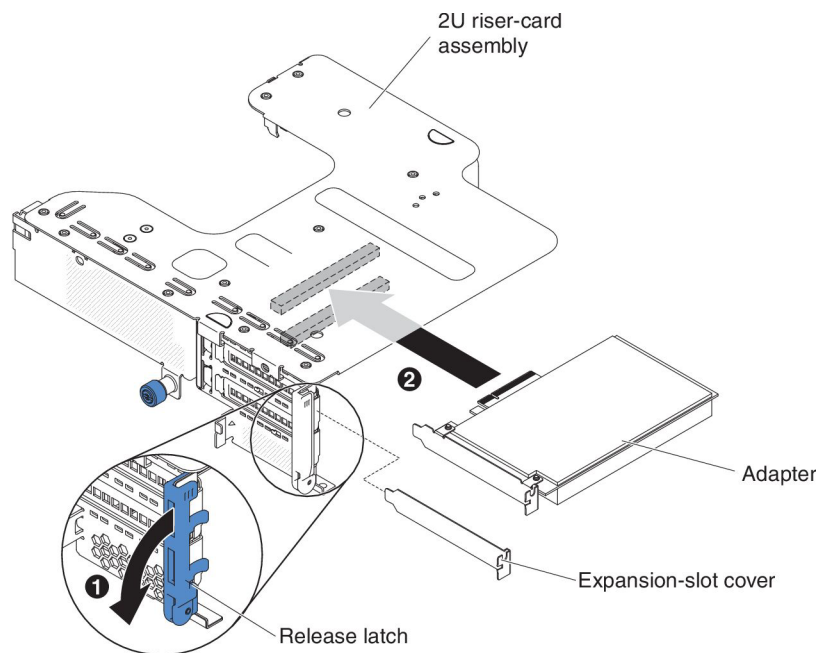
1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 24).
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
5. Remove the PCI riser-card assembly (see “Removing the PCI riser-card assembly” on page 46).
6. Determine which expansion slot you will use for the adapter.
7. The following illustrates the steps for removing an adapter from different PCI riser-card assemblies:
 - For 2U PCI riser-card assembly 1
 - a. Rotate the retention latch to the open position. Insert the adapter into the PCI riser-card assembly, aligning the edge connector on the adapter with the connector on the PCI riser-card assembly. Press the edge of the connector firmly into the PCI riser-card assembly. Make sure that the adapter snaps into the PCI riser-card assembly securely.
 - b. Rotate the retention latch to the close position. Make sure the retention latch engages the adapter securely; then, push in the release pin to lock the retention latch in place.



- For 1U PCI riser-card assembly 1:
 - a. Rotate the retention latch to the open position. Insert the adapter into the PCI riser-card assembly, aligning the edge connector on the adapter with the connector on the PCI riser-card assembly. Press the edge of the connector firmly into the PCI riser-card assembly. Make sure that the adapter snaps into the PCI riser-card assembly securely.
 - b. Rotate the retention latch to the close position. Make sure the retention latch engages the adapter securely.



- For 2U PCI riser-card assembly 2:
 - a. Rotate down the retention latch to the open position. Insert the adapter or ServeRAID adapter into the riser-card assembly, aligning the edge connector on the adapter with the connector on the riser-card assembly. Press the edge of the connector firmly into the riser-card assembly. Make sure that the adapter snaps into the riser-card assembly securely.
 - b. Rotate the retention latch to the close position. Make sure the retention latch engages the adapter securely.



- For 1U PCI riser-card assembly 2:

Note: For 1U PCI riser-card assembly 2, it only supports ServeRAID adapters (see “Installing a ServeRAID adapter on the PCI riser-card assembly”).

8. Connect any required cables to the adapter.

Attention:

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

9. Install the PCI riser-card assembly (see “Installing the PCI riser-card assembly” on page 90).
10. Perform any configuration tasks that are required for the adapter.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

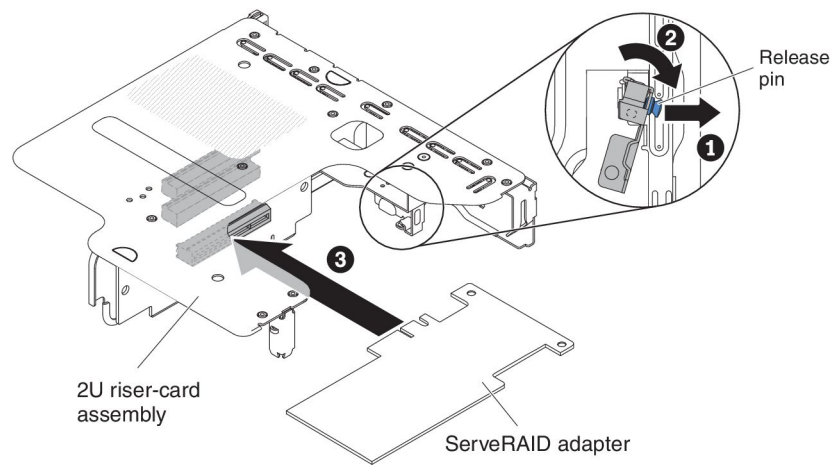
Installing a ServeRAID adapter on the PCI riser-card assembly

To install a ServeRAID adapter on the PCI riser-card assembly, complete the following steps:

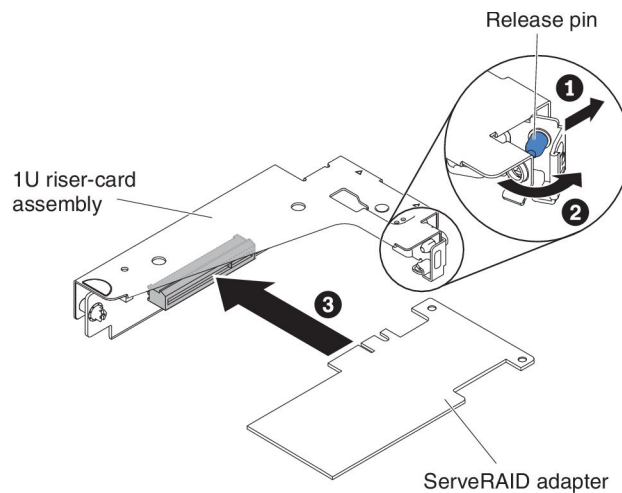
1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Make sure that the server is turned off, all external cables and power cords are disconnected, and the cover has been removed.
3. If you are installing a new or replacement ServeRAID adapter, touch the static-protective package that contains the new ServeRAID adapter to any unpainted metal surface on the server. Then, remove the ServeRAID adapter from the package.

4. If you are installing a new or replacement ServeRAID adapter that uses a battery, complete the following steps:
 - a. Remove the battery from the ServeRAID adapter package or the battery package.
 - b. Install the battery and connect the battery to the ServeRAID controller as instructed in the documentation that comes with the ServeRAID controller or the battery, or see “Installing a ServeRAID adapter battery on the remote battery tray” on page 66.
5. Pull the release pin to unlock the retention latch; then rotate the retention latch to the open position.
6. Align the ServeRAID adapter so that the keys align correctly with the connector on PCI riser-card assembly 2.
7. Insert the ServeRAID adapter into the connector on the riser-card until it is firmly seated.

For 2U riser card:



For 1U riser card:



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

8. Connect any required cables to the ServeRAID adapter.

Attention:

- When you route cables, do not block any connectors or the ventilated space around any of the fans.
 - Make sure that cables are not routed on top of components that are under the PCI riser-card assembly.
 - Make sure that cables are not pinched by the server components.
9. Rotate the retention latch to the closed position, making sure the retention latch engages the ServeRAID adapter. Then, push in the release pin to lock the retention latch in place.
 10. Install PCI riser-card assembly 2 (see “Installing the PCI riser-card assembly” on page 90).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

Notes:

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

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

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

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

2. When you restart the server, you are given the opportunity to import the existing RAID configuration to the new ServeRAID adapter.

Installing a ServeRAID adapter battery on the remote battery tray

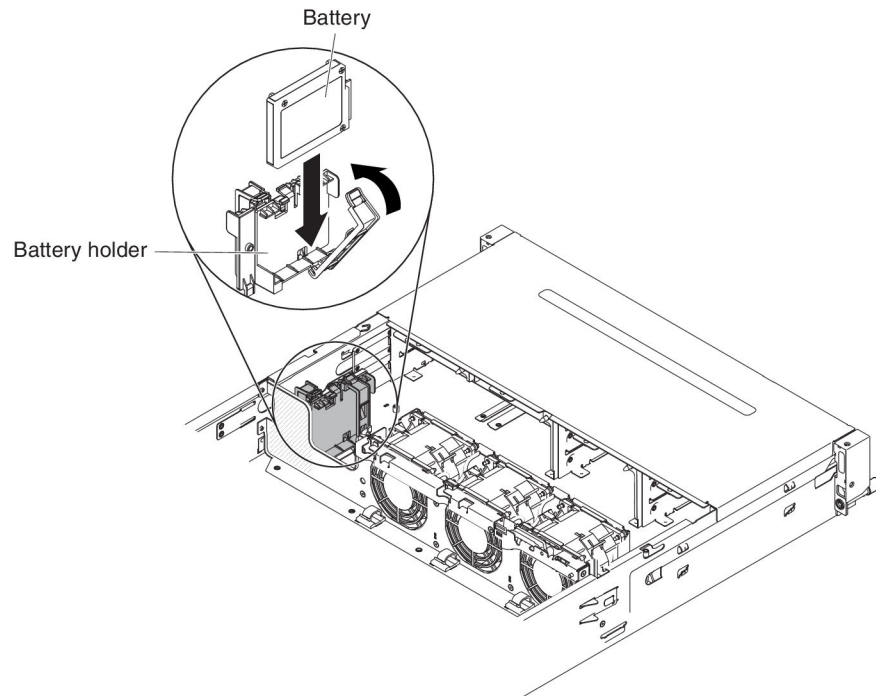
The Intelligent Battery Backup Unit (iBBU) is an optional battery for the ServeRAID adapter. It is referred to as the *battery* throughout this section. You must purchase the remote battery cable and install the battery at a distance from the ServeRAID adapter to avoid overheating.

You can install up to two batteries on the remote battery trays on the PC riser-card assembly.

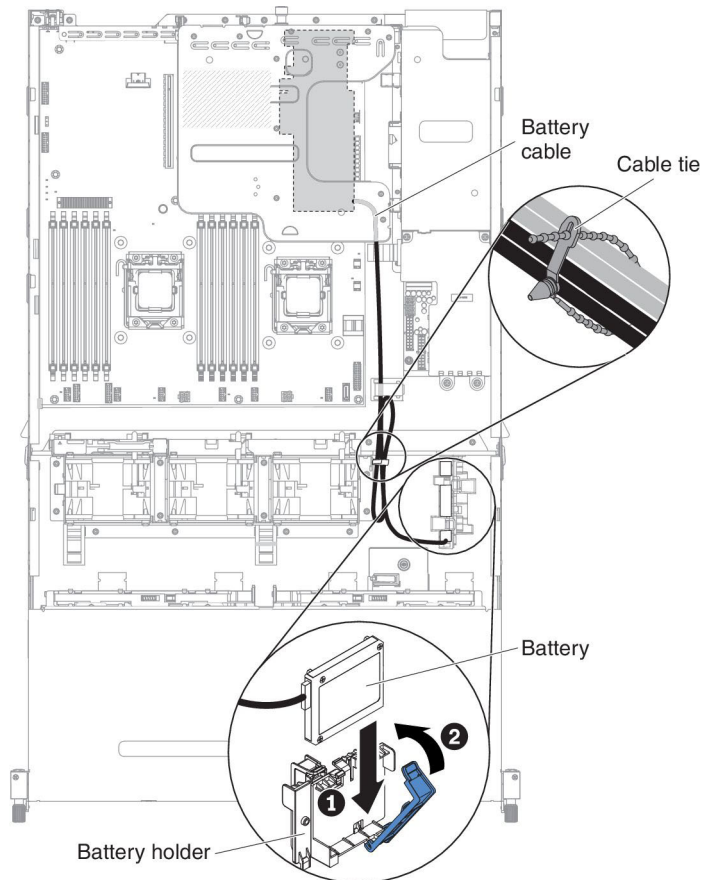
To install a battery on the remote battery tray, complete the following steps:

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 all power cords and external cables (see “Turning off the server” on page 24).
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. Install the battery in the RAID battery tray:
 - a. Orient the battery as shown in the following illustration; then, lower the battery into the RAID battery tray. If the battery comes with a battery carrier, ensure that battery carrier posts align with the rings on the battery mounting slot so that the battery carrier is secure in the slot.

- b. Push the battery retention clip back to its vertical position until it snaps into place, thereby securing the battery.



5. Connect the remote battery cable to the remote battery cable connector on the ServeRAID adapter. Route the remote battery cable in the server as shown in the following illustration.



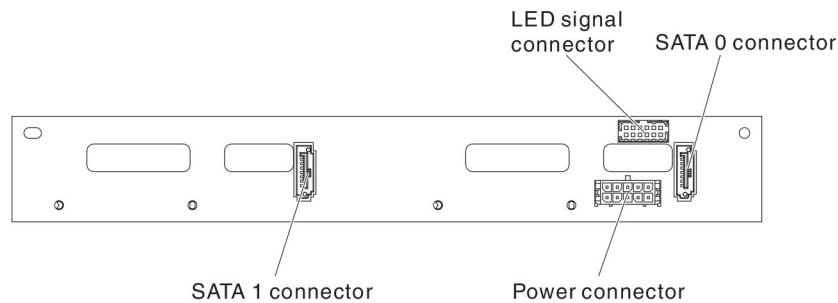
Attention: Make sure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

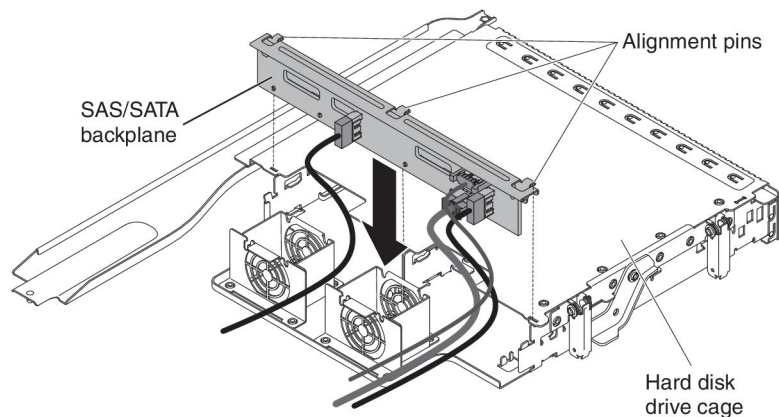
Installing the hot-swap backplane on the optional rear hard disk drive cage

To install the hot-swap backplane for the optional rear hard disk drive cage, 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 all power cords and external cables (see “Turning off the server” on page 24).
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. Connect the LED signal, SATA signal and power cables to the backplane.

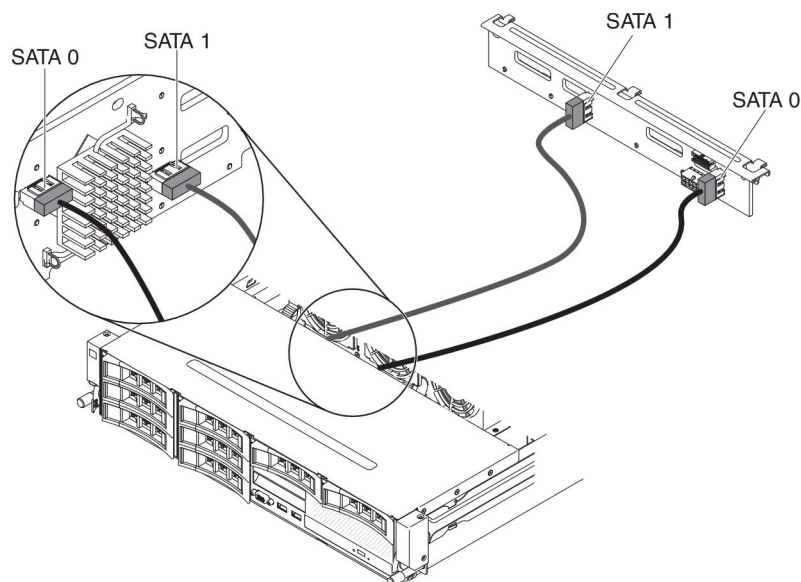


5. Align the backplane with the slot on the optional rear hard disk drive cage.
6. Lower the backplane into the optional rear hard disk drive cage. Make sure the three alignment pins securely engages the three holes on the hard disk drive cage.



7. For information on how to connect the relevant cabling on the backplane to the server, please refer to “Installing an optional hot-swap rear hard disk drive cage” on page 56.

Note: Make sure that Port 1 is connected to Port 1 for both backplanes. Likewise, Port 0 is connected to Port 0 for both backplanes.



8. Install the hot-swap hard disk drives in the optional rear hard disk drive cage (see “Installing a hot-swap hard disk drive” on page 54).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

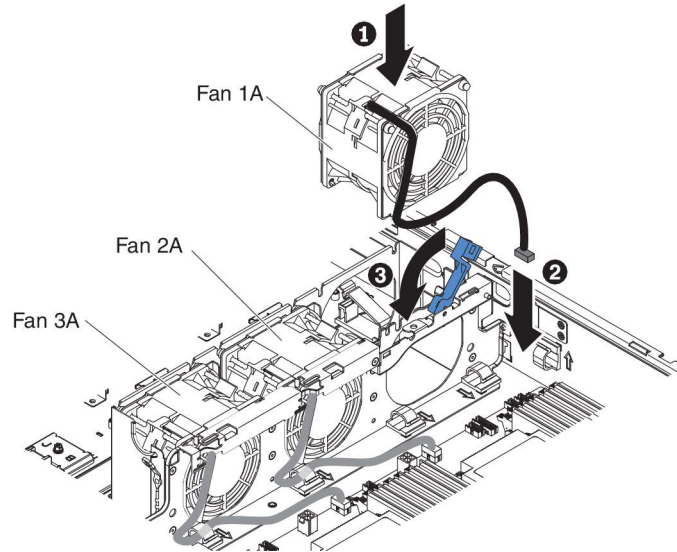
Installing a system fan

For proper cooling, the server requires that all fans in the system be operating at all times.

Attention: To ensure proper server operation, if a fan fails, replace the fan immediately.

See “System-board internal connectors” on page 28 for the locations of the fan cable connectors.

1. Touch the static-protective package that contains the new fan to any unpainted metal surface on the server. Then, remove the new fan from the package.
2. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
3. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 24).
4. Remove the server top cover (see “Removing the server top cover” on page 44).
5. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
6. Remove the PCI riser-card assembly (see “Removing the PCI riser-card assembly” on page 46).
7. Remove the air baffle (see “Removing the air baffle” on page 49).
8. Installing Fan 1A:



9. Pull up the blue handle on the system fan cage.
10. Orient the fan so that the fan cable points to the system board.
11. Lower the fan into the fan slot in the server and ensure that it is seated correctly.
12. Connect the system fan cable to the connector on the system board.
13. Insert the system fan cable into the cable retainer clip.
14. Return the blue handle back to its horizontal position.
15. If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

Installing Fan 2A or 3A:

1. Orient the fan so that the fan cable points to the system board.
2. Lower the fan into the fan slot in the server and ensure that it is seated correctly.
3. Connect the system fan cable to the connector on the system board.
4. Insert the system fan cable into the cable retainer clip.
5. If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

Installing a memory module

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

- To confirm that the server supports the DIMM that you are installing, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/> for a list of supported memory modules for the server.
- 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), 1066, 1333, or 1600 MHz, synchronous dynamic random-access memory (SDRAM) registered dual inline memory modules (DIMMs) with error correcting code (ECC).

- The specifications of a DDR3 DIMM are on a label on the DIMM, in the following format.

ggg eRxff-PC3-wwwwwm-aa-bb-cc-dd

where:

ggg is the total capacity of the DIMM (for example, 1GB, 2GB, or 4GB)

e is the number of ranks

1 = single-rank

2 = dual-rank

4 = quad-rank

ff is the device organization (bit width)

4 = x4 organization (4 DQ lines per SDRAM)

8 = x8 organization

16 = x16 organization

wwwww is the DIMM bandwidth, in MBps

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

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

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

12800 = 12.80 GBps (PC3-1600 SDRAMs, 8-byte primary data bus)

14900 = 14.93 GBps (PC3-1866 SDRAMs, 8-byte primary data bus)

17000 = 17.06 GBps (PC3-2133 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)

L = Load Reduction DIMM (LR-DIMM)

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

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

- Do not install registered and unbuffered DIMMs in the same server.
- The server supports 1.35-volt (low-voltage) and 1.5-volt DIMMs.
- The server supports a maximum of 12 DIMMs (single-rank, dual-rank, or quad-rank) on the base system board. If you mix single-rank, dual-rank, or quad-rank DIMMs in the server, quad-rank DIMMs must be installed first. When one quad-rank DIMM is installed, it must be installed in DIMM slot 1.

Note: To determine the type of a DIMM, see the label on the DIMM. The information on the label is in the format *xxx nRxxx PC3-xxxxx-xx-xx-xx-xx*. The numeral in the fourth numerical position indicates whether the DIMM is single-rank (*n*=1) or dual-rank (*n*=2).

- The DIMM options that are available for the server are 4 GB, 8 GB, 16 GB, and 32 GB (when available).
- The server supports memory sparing. Memory sparing reserves memory capacity for failover in the event of a DIMM failure, and the reserved capacity is deducted from the total available memory. Memory sparing provides less redundancy than memory mirroring does. If a predetermined threshold of correctable errors is reached, the contents of the failing DIMM are copied to the spare memory, and

the failing DIMM or rank is disabled. To enable memory sparing through the Setup utility, select System Settings > Memory.

- The server system board supports a minimum of 2 GB and a maximum of 384 GB of system memory.

Note: The amount of usable memory is reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. To view the total amount of installed memory and the amount of configured memory, run the Setup utility. For additional information, see Chapter 3, “Configuring the server,” on page 95

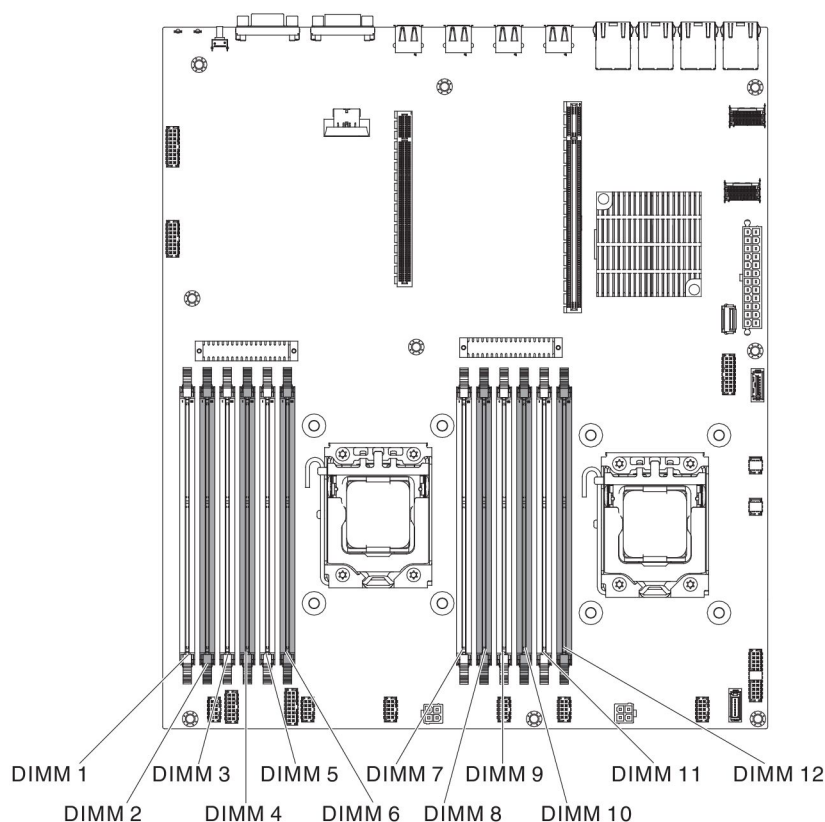
- The following table shows the DIMM connectors that are associated with each microprocessor:

Table 4. DIMM connectors associated with each microprocessor

Microprocessor	DIMM connectors associated with the microprocessor
Microprocessor 1	1 through 6
Microprocessor 2	7 through 12

- When you replace a DIMM, the server provides automatic DIMM enablement capability without you having to go to Setup to enable the new DIMM manually.
- The maximum operating speed of the server is determined by the slowest DIMM installed in the server.
- The server provides single-socket memory mirroring support. Memory channel 2 is mirrored exactly to channel 3. This mirroring provides redundancy in memory but reduces the total memory capacity to one third. Channel 1 DIMM connectors 1, 2, 7, and 8 are not used in memory-mirroring mode.
- A minimum of one DIMM must be installed for each microprocessor. For example, you must install a minimum of two DIMMs if the server has two microprocessors installed.
- The server comes with a minimum of one DIMM installed in slot 1. When you install additional DIMMs, install them in the order shown in the information in the following tables to optimize system performance.
- The server supports independent mode, rank sparing mode, and mirroring mode.

DIMM installation sequence



When you install additional DIMMs, install them in the order shown in Table 5, to maintain performance.

Table 5. Non-mirroring (normal) mode DIMM installation sequence

Number of installed microprocessors	DIMM connector population sequence
1	1, 3, 5, 2, 4, 6
2	1, 7, 3, 9, 5, 11, 2, 8, 4, 10, 6, 12

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

Table 6. DIMM connectors on each memory channel

Microprocessor	Memory channel	DIMM connectors
Microprocessor 1	Channel 1	1, 2
	Channel 2	3, 4
	Channel 3	5, 6

Table 7. DIMM connectors on each memory channel

Microprocessor	Memory channel	DIMM connectors
Microprocessor 2	Channel 1	7, 8
	Channel 2	9, 10
	Channel 3	11, 12

Memory mirroring

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 99. When you use the memory mirroring feature, consider the following information:

- DIMMs must be installed in pairs. The DIMMs in each pair must be the same size and type.
- The maximum available memory is reduced to one third of the installed memory when memory mirroring is enabled. For example, if you install 96 GB of memory, only 32 GB of addressable memory is available when you use memory mirroring.
- Channel 1 DIMM connectors 1, 2, 7, and 8 are not used in memory-mirroring mode.

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

Table 8. DIMM population sequence (memory-mirroring mode)

Number of Installed Microprocessors	DIMM connector
1	3, 5
	4, 6
2	3, 5
	9, 11
	4, 6
	10, 12
Note: DIMM connectors 1, 2, 7, and 8 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.

Rank sparing

When you use the memory mirroring feature, consider the following information:

- In rank sparing mode, one rank of a DIMM in each populated channel is reserved as spare memory. The spare rank is not available as active memory. When the active rank memory fails, its content is copied to the spare rank memory which becomes active. The spare rank must have identical or larger memory capacity than all the other ranks on the same channel.
- DIMMs must be installed in sets of three. The DIMMs in each set must be the same size and type.
- The following table lists the DIMM installation sequence for rank sparing mode when one or two microprocessors is installed in the server:

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

Table 9. Memory online-spare mode DIMM population sequence

Number of installed microprocessors	DIMM connector
1	1, 2 3, 4 5, 6
2	1, 2 7, 8 3, 4 9, 10 5, 6 11, 12

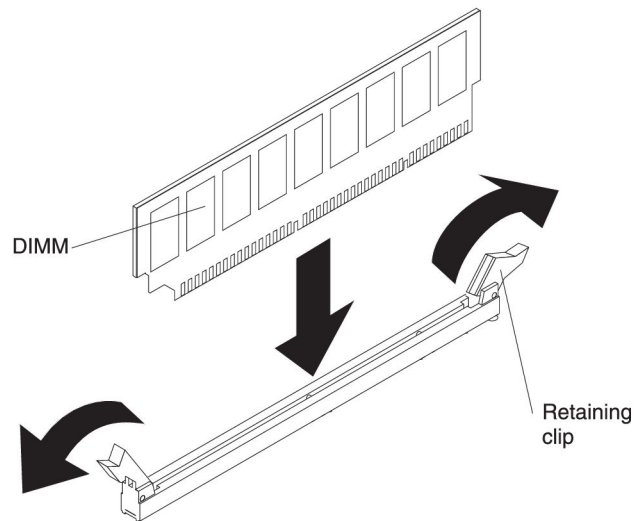
Installing a DIMM

To install a DIMM, complete the following steps:

Note: The odd-numbered DIMM connectors are white-colored, while the even-numbered DIMM connectors are black-colored.

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 cord and all external cables (see “Turning off the server” on page 24).
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
5. Remove the PCI riser-card assembly (see “Removing the PCI riser-card assembly” on page 46).
6. Remove the air baffle (see “Removing the air baffle” on page 49).
7. Carefully flip open the retaining clip on each end of the DIMM connector.

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



8. Touch the static-protective package that contains the DIMM to any unpainted metal surface on 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 end 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.

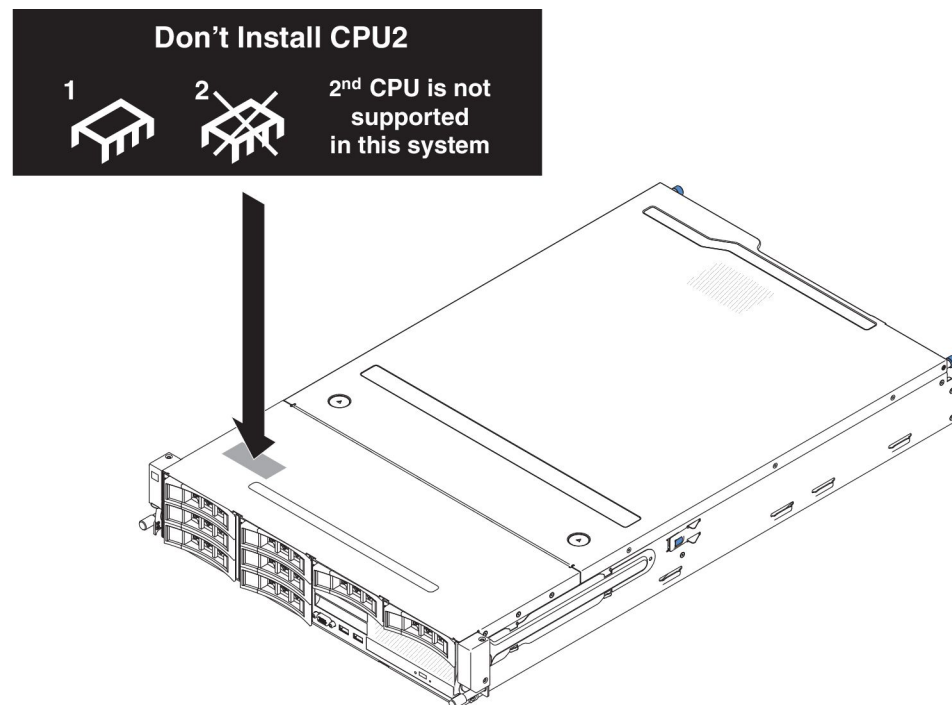
Important: If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89. Go to the Setup utility and make sure all the installed DIMMs are present and enabled.

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 Intel Xeon scalable multi-core microprocessors which are designed for the LGA 1356 socket. Scalable up to eight cores with an integrated memory controller, quick-path interconnect and shared last cache. See <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/>. for a list of supported microprocessors.
- If you are installing microprocessor Intel E5-1403, E5-1407 or Intel E5-1410, attach the microprocessor information label on the front of the server as the following illustration shows.



- 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 x3630 M4** 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/systems/info/x86servers/serverproven/compat/us/>.
- To order additional microprocessor optional devices, contact your IBM marketing representative or authorized reseller.

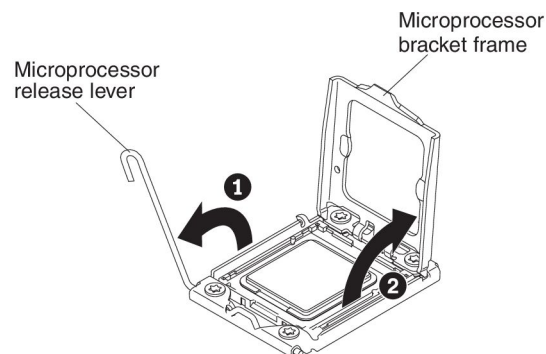
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If you have to replace a microprocessor, call for service.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) 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.

Attention:

- A startup (boot) microprocessor must always be installed in microprocessor socket 1 on the system board.
- 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.

To install an additional 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 disconnect all power cords and external cables (see “Turning off the server” on page 24).
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
5. Remove the PCI riser-card assembly (see “Removing the PCI riser-card assembly” on page 46).
6. Remove the air baffle (see “Removing the air baffle” on page 49).
7. Locate the second microprocessor socket on the system board (see “System-board internal connectors” on page 28).
8. Release the microprocessor release lever by pressing down on the end, moving it to the side, and releasing it to the open (up) position.
9. Open the microprocessor bracket frame by lifting up the tab on the top edge. Keep the bracket frame in the open position.

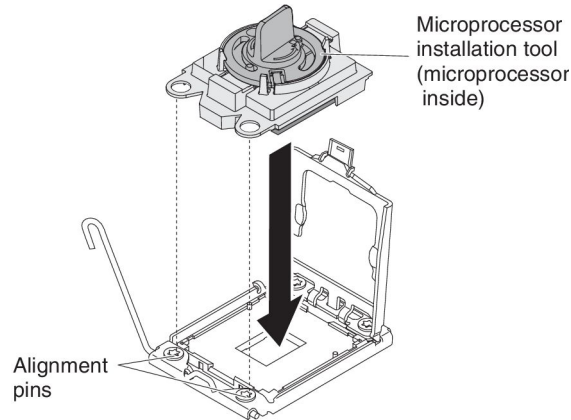


Attention: Do not touch the connectors on the microprocessor and the microprocessor socket.

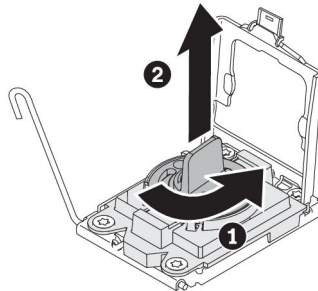
10. The microprocessor is preinstalled in the installation tool, release the sides of the cover and remove the cover from the installation tool.
11. Install the microprocessor:

- a. Align the holes on the microprocessor installation tool with the screws on the microprocessor bracket, then place the microprocessor installation tool down over the microprocessor. Twist the handle clockwise to attach the tool to the microprocessor.

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

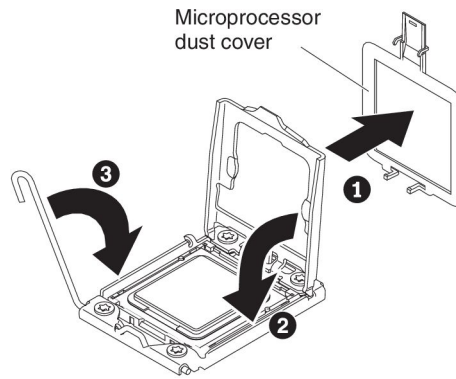


- b. Twist the handle on the microprocessor tool counterclockwise to insert the microprocessor into the socket.



Attention:

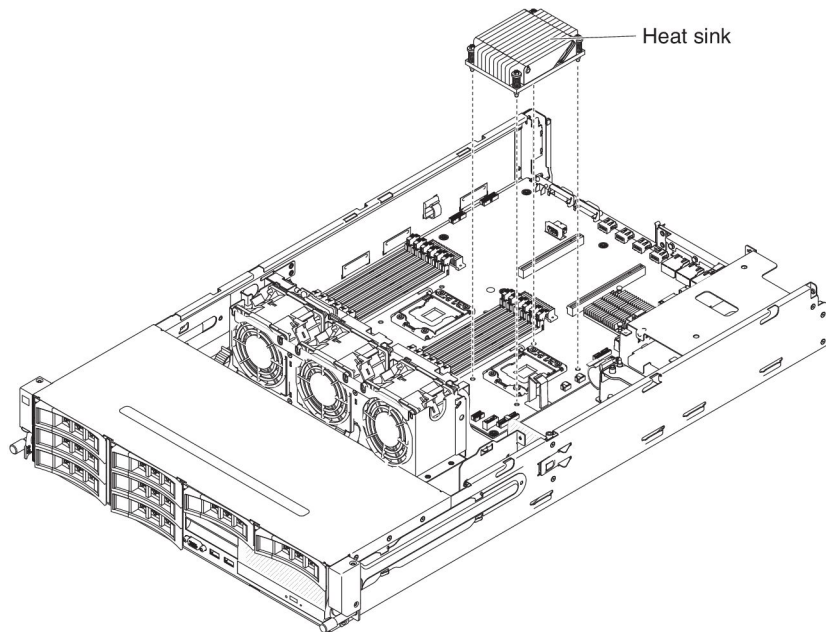
- Do not press the microprocessor into the socket.
 - Do not touch exposed pins of the microprocessor socket. The pins on the socket are fragile. Any damage to the pins may require replacing the system board.
 - Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the microprocessor retainer.
 - Do not touch the thermal material on the bottom of the heat sink or on top of the microprocessor. Touching the thermal material will contaminate it and destroys its even distribution. If the thermal material on the microprocessor or heat sink becomes contaminated, you must replace the thermal grease.
- c. Remove the microprocessor dust cover and store it in a safe place.
 - d. Close the microprocessor bracket frame.
 - e. Close the microprocessor release lever by pressing down on the end, moving it back under the release lever holder underneath the microprocessor bracket.



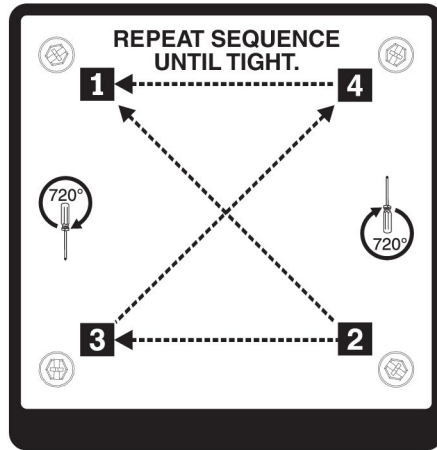
12. Install a heat sink on the microprocessor:

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 “Thermal grease” on page 83.

- a. Remove the plastic protective cover from the bottom of the heat sink.
- b. Align the screw holes on the heat sink with the holes on the system board; then, place the heat sink on the microprocessor with the thermal-grease side down.



- c. Press firmly on the captive screws and tighten them with a screwdriver. The follow illustration shows the sequence in tightening the screws, which is also shown on top of the heat sink. Begin with the screw labeled as "1", then "2", "3" and finally "4". If possible, each screw should be rotated two full rotations at a time. Repeat until the screws are tight. Do not overtighten the screws by using excessive force. If you are using a torque wrench, tighten the screws to 8.5 Newton-meters (Nm) to 13 Nm (6.3 foot-pounds to 9.6 foot-pounds).



If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

Thermal grease

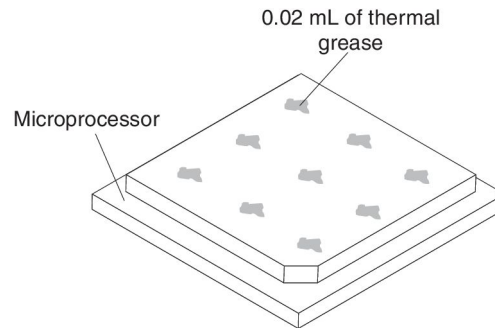
The thermal grease must be replaced whenever the heat sink has been removed from the top of the microprocessor and is going to be reused or when debris is found in the grease.

To replace damaged or contaminated thermal grease on the microprocessor and heat exchanger, complete the following steps:

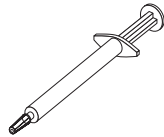
1. Place the heat-sink assembly on a clean work surface.
2. Remove the cleaning pad from its package and unfold it completely.
3. Use the cleaning pad to wipe the thermal grease from the bottom of the heat exchanger.

Note: Make sure that all of the thermal grease is removed.

4. Use a clean area of the cleaning pad to wipe the thermal grease from the microprocessor; then, dispose of the cleaning pad after all of the thermal grease is removed.



5. Use the thermal-grease syringe to place nine uniformly spaced dots of 0.02 mL each on the top of the microprocessor.



Note: 0.01mL is one tick mark on the syringe. If the grease is properly applied, approximately half (0.22 mL) of the grease will remain in the syringe.

Installing a hot-swap power supply

The following items describe the type of power supply that the server supports and other information that you must consider when you install a power supply:

- To confirm that the server supports the power supply that you are installing, see <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/>.
- The server comes standard with one 550-watt or 750-watt hot-swap power supply. The input voltage is 110 V ac or 220 V ac auto-sensing.

Note: You cannot mix 110 V ac and 220 V ac, or 550-watt and 750-watt power supplies in the server, it is not supported.

- These power supplies are designed for parallel operation. In the event of a power-supply failure, the redundant power supply continues to power the system. The server supports a maximum of two power supplies.
- The server can run fully configured with one power supply. For redundancy support, you must install the second hot-swap power supply.

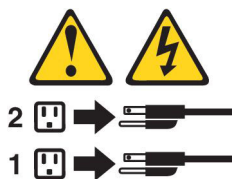
Note: You cannot mix high-efficiency and non-high-efficiency power supplies in the server.

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:



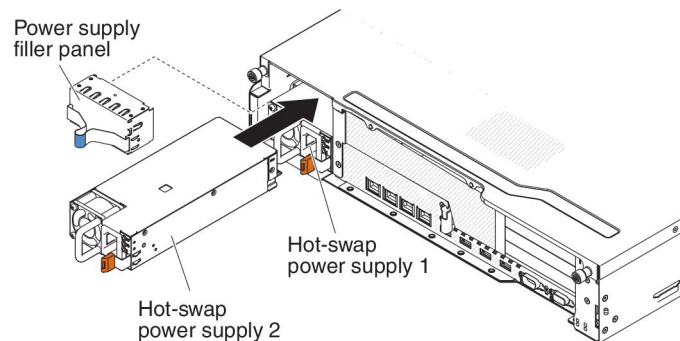
CAUTION:

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.

Attention: During normal operation, each power-supply bay must contain either a power supply or power-supply filler for proper cooling.



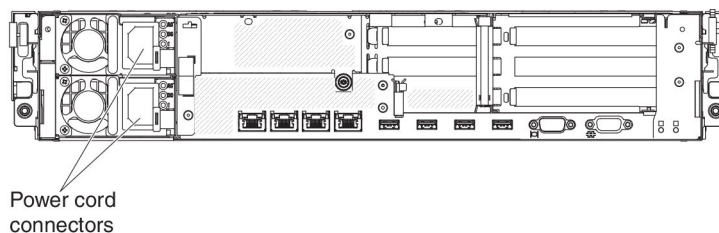
To install an ac power supply, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Remove the power-supply filler panel from the empty power-supply bay by pinching the side clip and pulling the power-supply filler panel from the bay. Save the power-supply filler panel in case you remove the power supply at a later time.

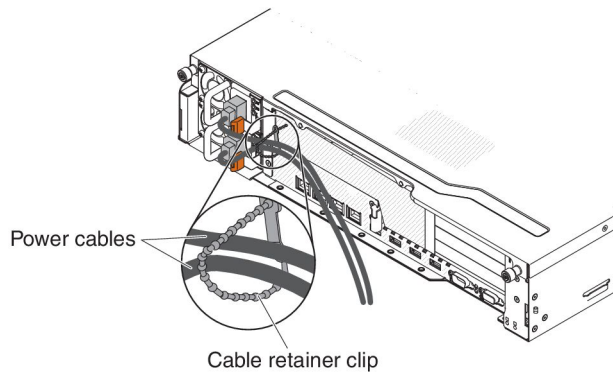
Important: During normal operation, each power-supply bay must contain either a power supply or power-supply filler panel for proper cooling.

3. Slide the ac power supply into the bay until the retention latch clicks into place.
4. Connect the power cord for the new ac power supply to the power-cord connector on the power supply.

The following illustration shows the ac power-supply connectors on the rear of the server.



5. Route the power cord through the cable retainer clip so that it does not accidentally become disconnected.



6. Connect the power cord to a properly grounded electrical outlet.
7. If the server is powered on, make sure that the error LED on the power supply is not lit, and that the dc power LED and ac power LED on the power supply are lit, indicating that the power supply is operating correctly.
8. If you are replacing a power supply with one of a different wattage in the server, apply the new power information label provided over the existing power information label on the server. Power supplies in the server must be with the same power rating or wattage to ensure that the server will operate correctly.

額定電圧 xxx-xxx/xxx-xxx x,x/x,x	額定電壓 xxx-xxx/xxx-xxx x,x/x,x	額定電流 xx/xx Hz	額定電流 xx/xx Hz
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この装置は、クラス A 情報技術装置です。この装置を家庭環境で使用する
と電波妨害を引き起こすことがあります。この場合には使用者が適切な対策
を講ずるよう要求されることがあります。VCCI-A

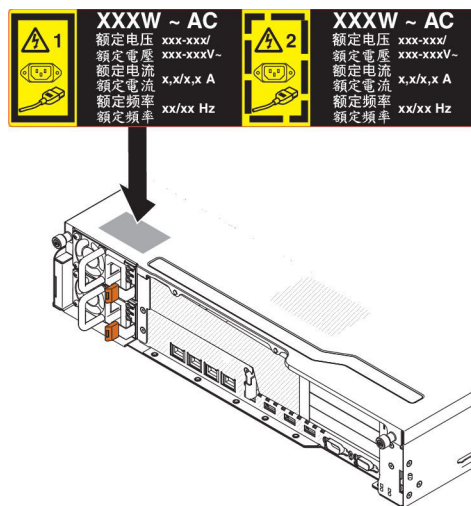
Apparaten skall anslutas till jordat uttag
Apparatet må tilkoples jordat stikkontakt
Laite on liitettävä suojamaadoituskoskettimilla
varustettuun pistorasiaan
This device complies with part 15 of FCC rules.
Operation is subject to the following two
conditions: (1) this device may not cause harmful
interference, and (2) this device must accept any
interference received, including interference that
may cause undesired operation.

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

廢電池請回收
EU Only
NYCE
GS
UL
CE
PC
ME01
LISTED
I.T.E. Equip.
167G
KCC-REM-IBC-7915
AR

R33026
伺服器 服務器
型号 MT: XXXX
Model: xxx
SN: SSSSSSS
MFG date: YYYYMMDD
Product ID:
PN:

9. If you are adding a power supply to the server, attach the redundant power information label that comes with this option on the server cover near the power supplies.



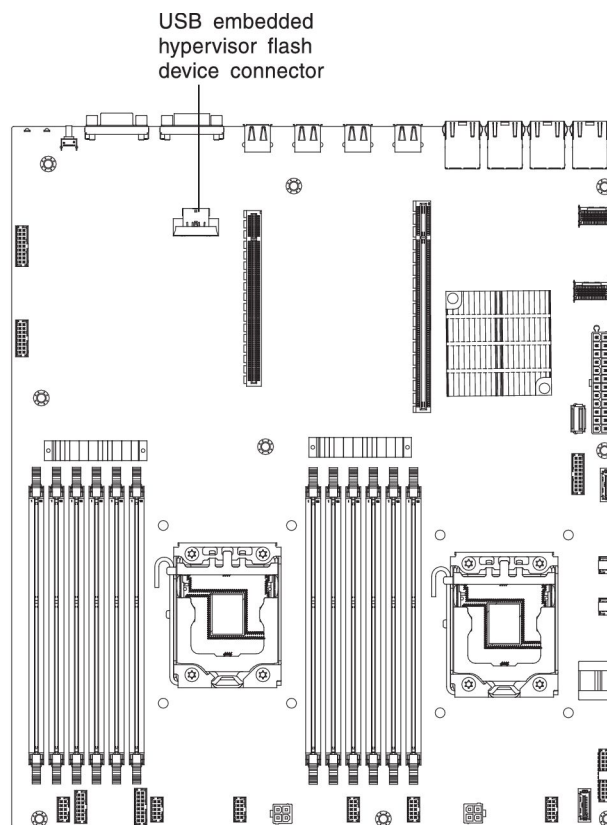
10. If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

Installing a USB hypervisor memory key

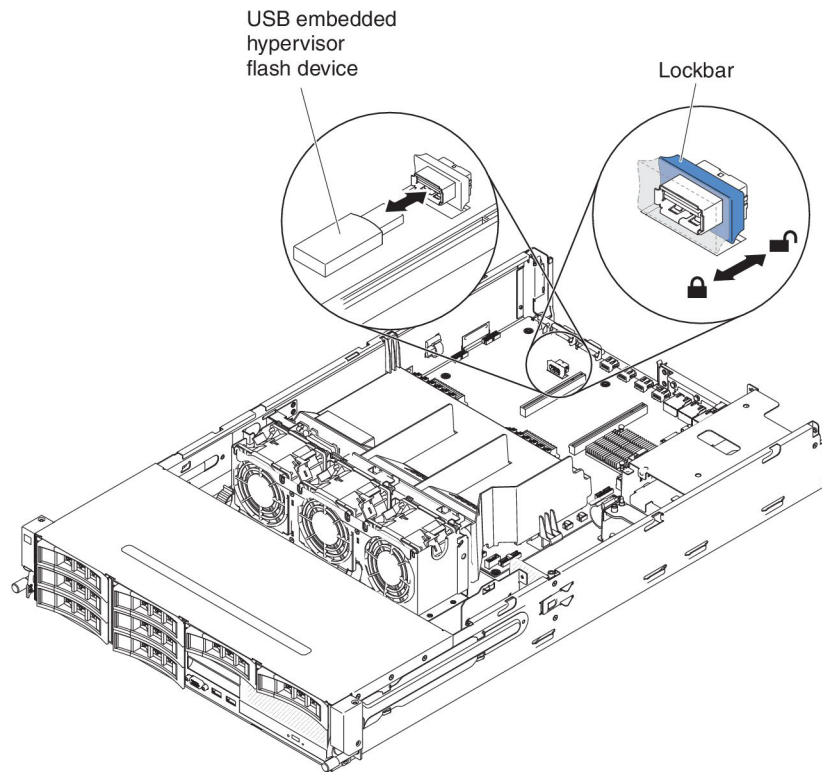
Hypervisor is a virtualization platform that enables multiple operating systems to run on a host computer at the same time. Support for hypervisor is available with the purchase and installation of an optional USB hypervisor memory key, with embedded hypervisor software.

To install the USB hypervisor memory 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 all power cords and external cables (see “Turning off the server” on page 24).
3. Remove the server top cover (see “Removing the server top cover” on page 44).
4. If you have the optional hot-swap rear hard disk drive cage installed, rotate it up (see “Rotating the optional hot-swap rear hard disk drive cage up” on page 46).
5. Remove PCI riser-card assembly 1 (see “Removing the PCI riser-card assembly” on page 46).
6. Locate the USB hypervisor connector on the USB connector board in the server.



7. Slide the lockbar on the flash device connector to the unlocked position.



8. Align the USB flash device with the connector on the system board and push it into the connector until it is firmly seated.
9. Slide the lockbar toward the riser-card assembly to the locked position until it is seated firmly.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 89.

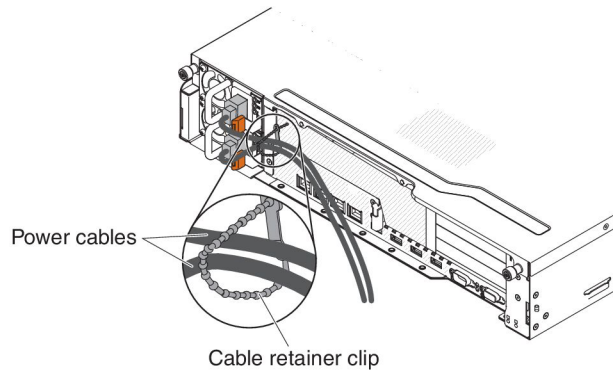
Note: You must configure the server to boot from the hypervisor USB drive. See Chapter 3, “Configuring the server,” on page 95 for information about enabling the embedded hypervisor.

Completing the installation

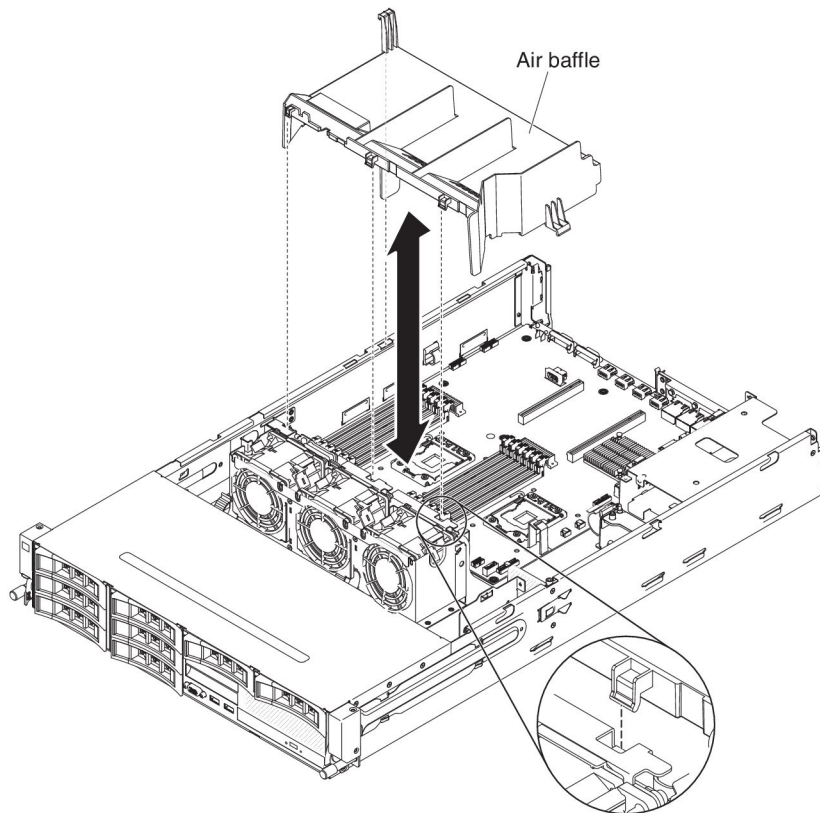
To complete the installation, complete the following steps:

1. If you removed the air baffle, install it (see “Installing the air baffle” on page 90).
2. If you removed the PCI riser-card assemblies, replace the riser-card assemblies (see “Installing the PCI riser-card assembly” on page 90).
3. If you have the optional hot-swap rear hard disk drive cage installed, rotate it down (see “Rotating the optional hot-swap rear hard disk drive cage down” on page 93).
4. If you removed the server top cover, replace it (see “Installing the server top cover” on page 93).
5. Install the server in a rack. See the *Rack Installation Instructions* that come with the server for complete rack installation and removal instructions.
6. To attach peripheral devices and connect the power cords, see “Front view” on page 12.

Note: Remember to route the power cord through the cable retainer clip so that it does not accidentally become disconnected.



Installing the air baffle



To replace the air baffle, complete the following steps:

1. Align the tabs on the air baffle with the slots on the chassis.
2. Lower the air baffle into the server. Make sure that the tabs on the air baffle are inserted into the holes on the chassis.

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

If you have other devices to install, do so now. Otherwise, go to “Completing the installation” on page 89.

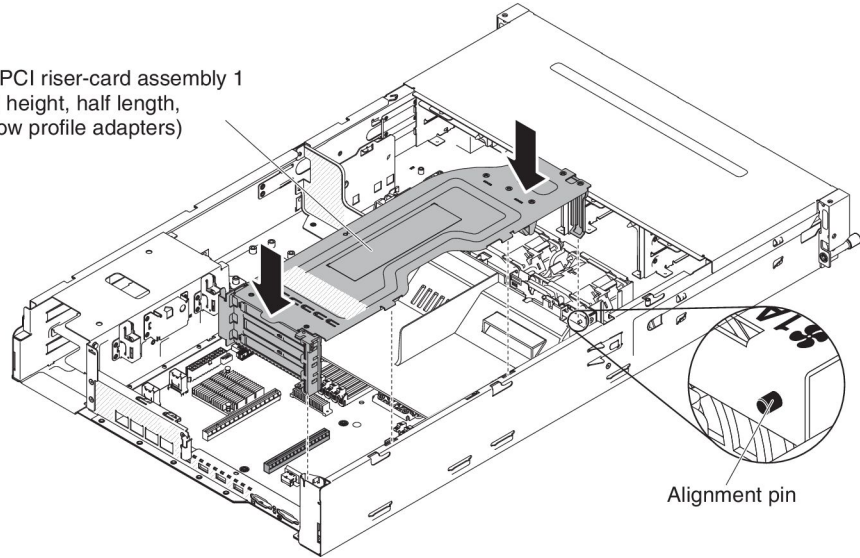
Installing the PCI riser-card assembly

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

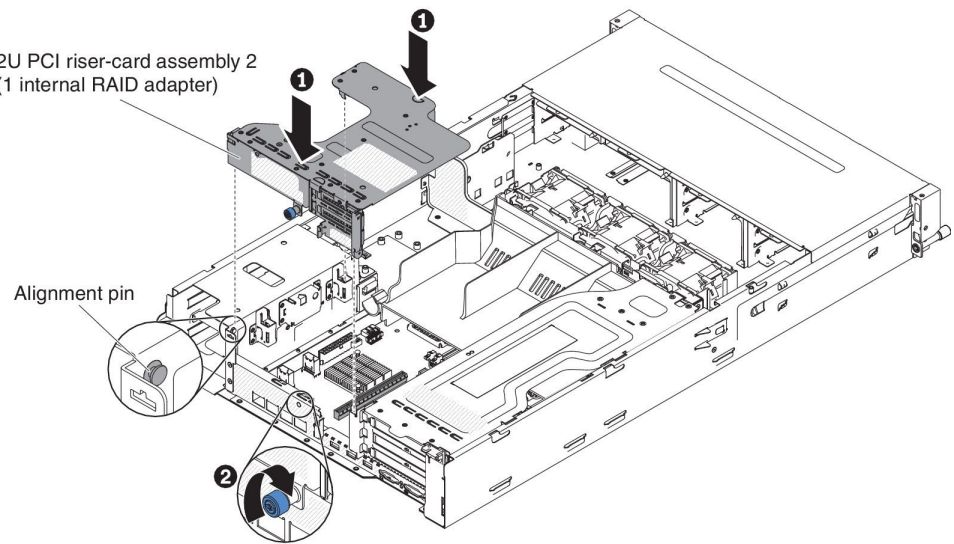
1. Read the safety information that begins on page vii and “Installation guidelines” on page 35.
2. Make sure that the server and all peripheral devices are turned off and that the power cords and all external cables are disconnected.
3. Reinstall any adapters and reconnect any internal cables that you removed in other procedures.
4. Align the PCI riser-card assembly with the alignment pin and the guide rails on the chassis.

For 2U riser card assemblies:

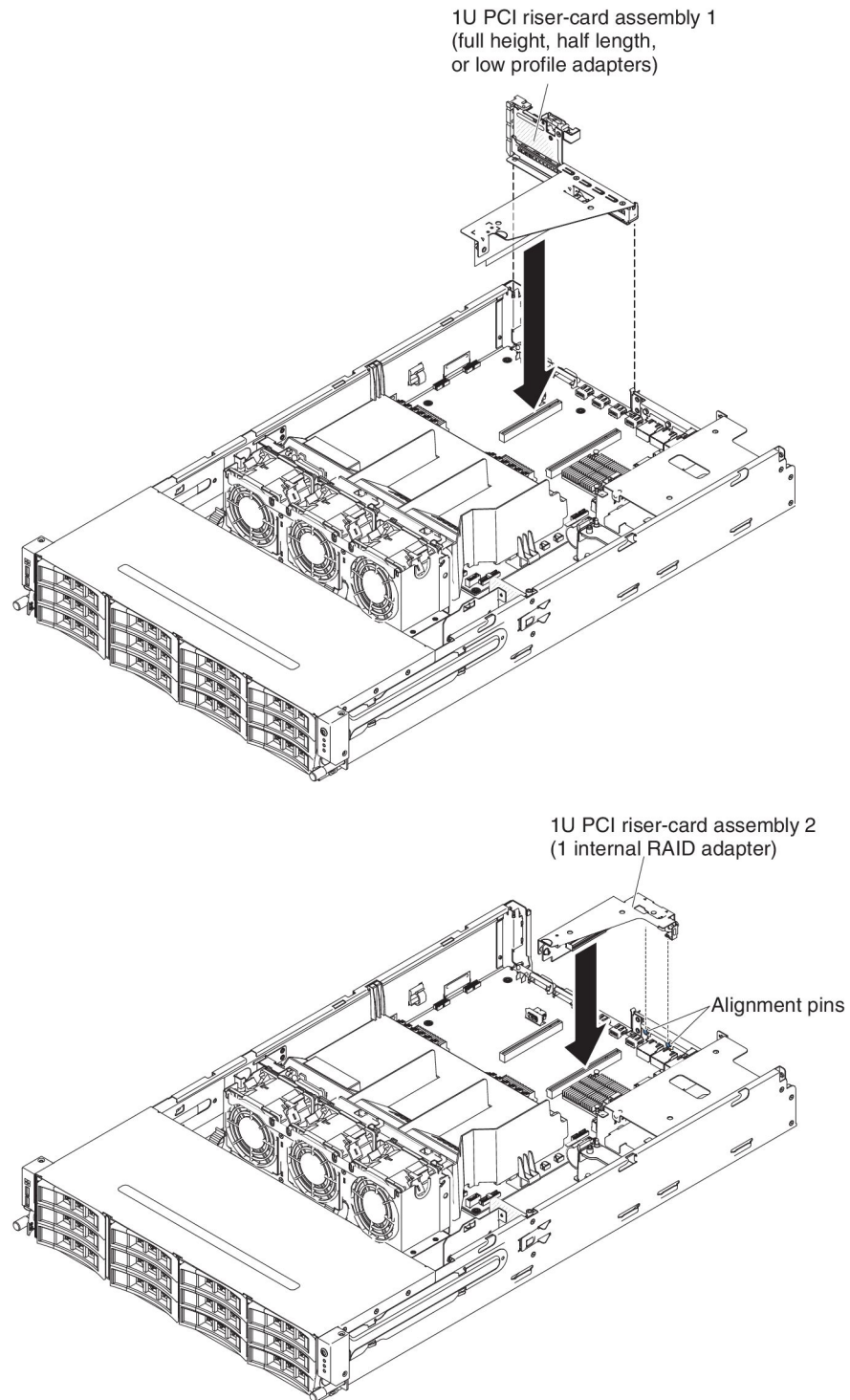
2U PCI riser-card assembly 1
(full height, half length,
or low profile adapters)



2U PCI riser-card assembly 2
(1 internal RAID adapter)



For 1U riser card assemblies:



5. Press down on the blue touch points on the PCI riser-card assembly to install the assembly in the server. Make sure that the PCI riser-card assembly is fully seated in the PCI connectors on the system board.

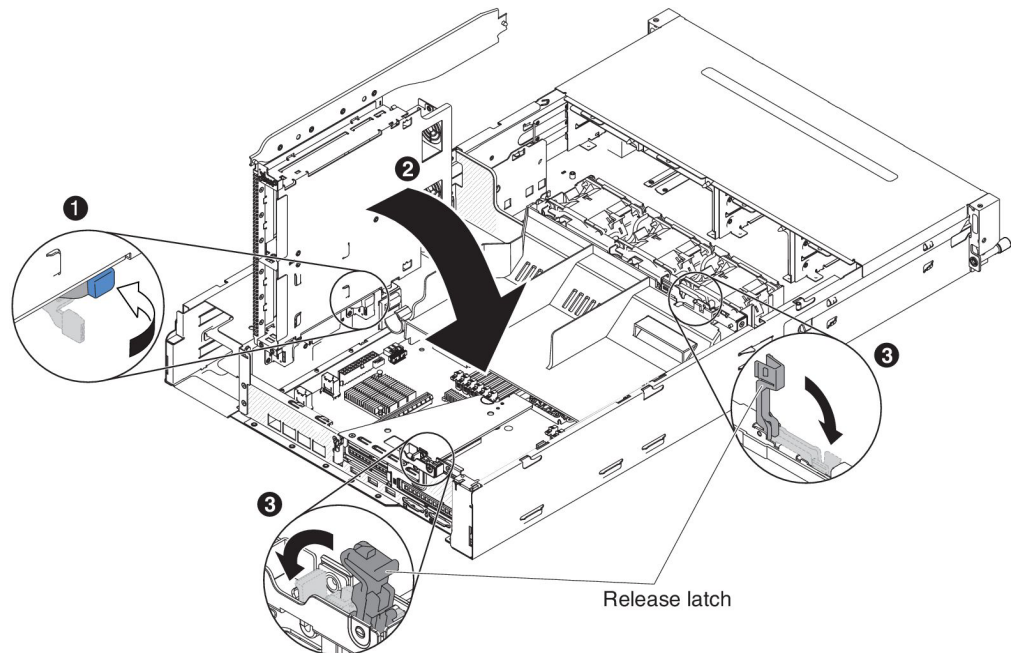
Attention: Make sure that the cables are not pinched.

If you have other devices to install, do so now. Otherwise, go to “Completing the installation” on page 89.

Rotating the optional hot-swap rear hard disk drive cage down

Read the safety information that begins on page vii and “Installation guidelines” on page 35.

To rotate the optional hot-swap hard disk drive cage down, complete the following steps.



1. Shift the switch on the rear hard disk drive cage to the unlock position **1**.
2. Slowly rotate the cage downwards until it sits into place **2**.
3. Close the blue latches on the chassis **3**.

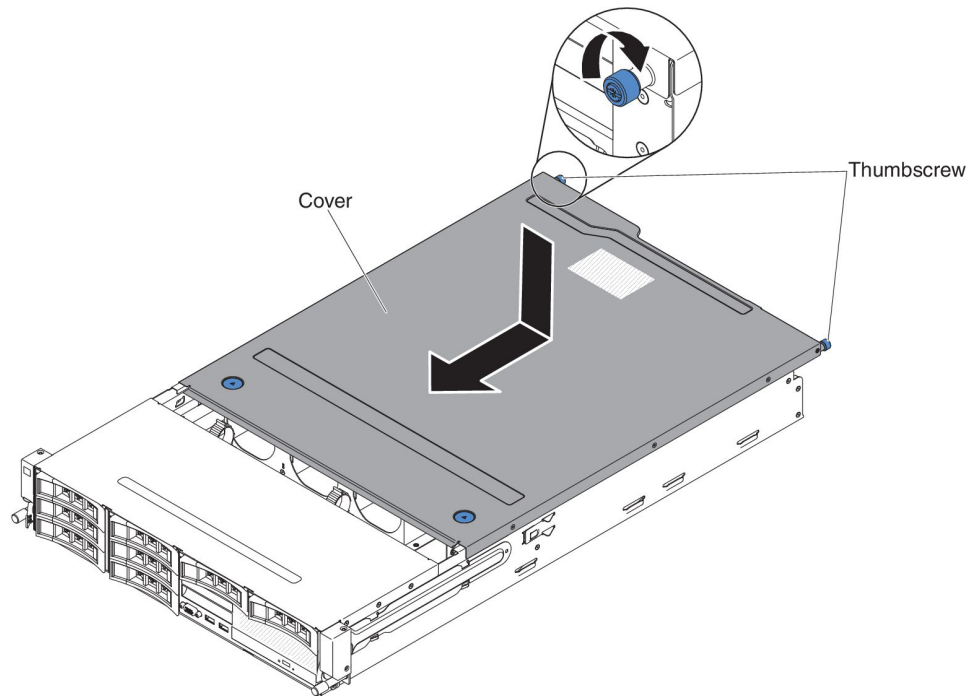
Installing the server top cover

To install the server top cover, complete the following steps:

1. Make sure that all internal cables are correctly routed.
2. Align the cover over the server (toward the rear of the server) until the cover edges slip into position over the chassis.

Attention: Before sliding the cover forward, make sure that all the tabs on both the front, rear, and side of the cover engage the chassis correctly. If all the tabs do not engage the chassis correctly, it will be hard to remove the cover later.

3. Slide the cover forward toward the front of the server until the cover is completely closed.



4. Tighten the thumbscrews on the rear of the cover to secure the cover to the chassis.
5. Install the server into the rack enclosure and tighten the two front thumbscrews to secure the server in the rack.

Attention: Two or more people are required to install the system in a rack cabinet.

Updating the server configuration

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

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

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

For information about configuring the integrated Gigabit Ethernet controller, see “Configuring the Gigabit Ethernet controller” on page 110.

Chapter 3. Configuring the server

The following configuration programs come with the server:

Updating the firmware

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

You can install code updates that are packaged as an UpdateXpress System Pack or UpdateXpress CD image. An UpdateXpress System Pack contains an integration-tested bundle of online firmware and device-driver updates for your server. Use UpdateXpress System Pack Installer to acquire and apply UpdateXpress System Packs and individual firmware and device-driver updates. For additional information and to download the UpdateXpress System Pack Installer, go to the ToolsCenter for System x and BladeCenter at <http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp> and click **UpdateXpress System Pack Installer**.

When you click an update, an information page is displayed, including a list of the problems that the update fixes. Review this list for your specific problem; however, even if your problem is not listed, installing the update might solve the problem.

Be sure to separately install any listed critical updates that have release dates that are later than the release date of the UpdateXpress System Pack or UpdateXpress image.

The firmware for the server is periodically updated and is available for download from the IBM website. To check for the latest level of firmware, such as UEFI firmware, vital product data (VPD) code, device drivers, and integrated management module firmware, go to <http://www.ibm.com/support/fixcentral/>.

Attention: Before you update the firmware, be sure to back up any data that is stored in the Trusted Platform Module (TPM), in case any of the TPM characteristics are changed by the new firmware. For instructions, see your encryption software documentation.

Download the latest firmware for the server; then, install the firmware, using the instructions that are included with the downloaded files.

When you replace a device in the server, you might have to either update the firmware that is stored in memory on the device or restore the pre-existing firmware from a diskette or CD image.

- UEFI firmware is stored in ROM on the system board.
- IMM2 firmware is stored in ROM on the IMM2 on the system board.
- Ethernet firmware is stored in ROM on the Ethernet controller.
- ServeRAID firmware is stored in ROM on the ServeRAID adapter.
- SATA firmware is stored in ROM on the integrated SATA controller.
- SAS/SATA firmware is stored in ROM on the SAS/SATA controller on the system board.

Configuring the server

The *ServerGuide* program provides software-setup tools and installation tools that are designed for the server. Use this CD during the installation of the server to configure basic hardware features, such as an integrated SAS/SATA controller with RAID capabilities, and to simplify the installation of your operating system. For information about using this CD, see “Using the ServerGuide Setup and Installation CD” on page 97.

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

- **Setup utility**

The Setup utility is part of the basic input/output system firmware. Use it to change interrupt request (IRQ) settings, change the startup-device sequence, set the date and time, and set passwords. For information about using this program, see “Using the Setup utility” on page 99.

- **Boot Manager program**

The Boot Manager program is part of the server firmware. Use it to override the startup sequence that is set in the Setup utility and temporarily assign a device to be first in the startup sequence. For more information about using this program, see “Using the Boot Manager program” on page 105.

- **Integrated management module II**

Use the integrated management module II (IMM2) for configuration, to update the firmware and sensor data record (SDR) data, and to remotely manage a network. For information about using IMM2, see “Using the integrated management module II” on page 106.

- **VMware ESXi embedded hypervisor**

The VMware ESXi embedded hypervisor is available on the server models that come with an installed USB embedded hypervisor flash device. The USB flash device is installed in the USB connector on the SAS/SATA RAID riser-card. 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 108.

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

The remote presence and blue-screen capture feature are integrated into the Integrated Management Module II (IMM2). The Integrated Management Module Advanced Upgrade is required to enable the remote presence functions. When the optional Integrated Management Module Advanced Upgrade is installed in the server, it activates the remote presence functions. Without the Integrated Management Module Advanced Upgrade, you will not be able to access the network remotely to mount or unmount drives or images on the client system. However, you will still be able to access the web interface without the Integrated Management Module Advanced Upgrade. You can order the optional IBM Integrated Management Module Advanced Upgrade, if one did not come with your server. For more information about how to enable the remote presence function, see “Using the remote presence capability and blue-screen capture” on page 109.

- **Ethernet controller configuration**

For information about configuring the Ethernet controller, see “Configuring the Gigabit Ethernet controller” on page 110.

- **Configuring RAID arrays**

For information about configuring RAID arrays, see “Configuring RAID arrays” on page 110.

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

Use this program as 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. For more information about using this program, see “IBM Advanced Settings Utility program” on page 113.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides software setup tools and installation tools that are designed for your server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically. To download the CD, go to <http://www.ibm.com/support/entry/portal/docdisplay?Indocid=SERV-GUIDE> and click **IBM Service and Support Site**.

The ServerGuide program has the following features:

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

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

ServerGuide features

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

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

The ServerGuide program performs the following tasks:

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

Setup and configuration overview

When you use the *ServerGuide Setup and Installation* CD, you do not need setup diskettes. You can use the CD to configure any supported IBM server model. The setup program provides a list of tasks that are required to set up your server model. On a server with a ServeRAID adapter or SAS/SATA controller with RAID capabilities, you can run the SAS 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, go to <http://www.ibm.com/supportportal/> to download the latest operating-system installation instructions from the IBM website.

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
- Change interrupt request (IRQ) settings
- Resolve configuration conflicts

Starting the Setup utility

To start the Setup utility, complete the following steps:

1. Turn on the server.

Note: Approximately 40 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.
3. Select the settings to view or change.

Setup utility menu choices

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

- **System Information**

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

- **System Summary**

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

- **Product Data**

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

This choice is on the full Setup utility menu only.

- **System Settings**

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

- **Adapters and UEFI Drivers**

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

- **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, select **System Settings → Memory → Memory Mode → Mirrored**.

- **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 controllers, SATA optical drive channels, PCI slots, and video controller. 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.

- **Active Energy Manager**

Select this choice to enable or disable power capping. If you enable power capping, the Active Energy Manager program will limit the maximum power that is consumed by the server.

Note: It is available only when **System Settings → Processors → Processor Performance States** is enabled.

- **Power/Performance Bias**

Select this choice to determine how the power management of the microprocessor is controlled. You can choose either Platform Controlled (system) or OS Controlled (operating system) to control the setting. Not all operating systems support this feature.

- **Platform Controlled Type**

Select this choice to determine how to balance between performance and power consumption. Choosing Maximum Performance will disable power management functions and allow the most aggressive use of turbo. Choosing Minimal Power will maximize the use of power management features for least power consumption and disable turbo.

Note: It is available only when **System Settings → Power → Power/Performance Bias → Platform Controlled** is enabled.

- **Workload Configuration**

Select this choice to determine how to balance between I/O bandwidth and balanced workload. Choosing I/O sensitive will get higher I/O bandwidth while expansion cards are used. Choosing Balanced will allow enough frequency for workload while the microprocessor cores are idle.

- **Operating Modes**

Select this choice to view or change the operating profile (performance and power utilization). This choice specifies a preset operating mode to configure the server for maximum power savings, maximum efficiency, and maximum performance.

- **Choose Operating Mode**

Select the operating mode based on your preference. Power savings and performance are also highly dependent on hardware and software running on the system. When a present mode is selected, the low-level settings are not changeable and will be grayed out.

- **Memory Speed**

Select the desired memory speed. Maximum performance mode maximizes performance. Balanced mode offers a balance between performance and power. Minimal power mode maximizes power savings.

- **Memory Power Management**

Select this choice to enable or disable power management on memory. If you choose Disabled, it will provide maximum performance but minimum power savings. If you choose Automatic, it is suitable for most applications.

- **Proc Performance States**

Select this choice to enable or disable processor performance states. Enabling processor performance states (Intel Speedstep Technology) saves power by reducing speed and voltage as the microprocessor utilized is reduced.

Note: Some operating systems must have the correct power profile selected to take advantage of this feature.

- **C1 Enhance Mode**

Select this choice to enable or disable C1E (C1 Enhanced) state. Enabling C1E (C1 Enhanced) state can save power by halting CPU cores that are idle.

Note: An operating system that supports C1E state must be installed to take advantage of this feature. Changing this setting will be effective after the next system reboot.

- **QPI Link Frequency**

Select this choice to determine the desired microprocessor QPI link frequency. Maximum performance mode maximizes performance. Balanced mode offers a balance between performance and power. Minimal power maximizes power savings.

- **Turbo Mode**

Select this choice to enable or disable turbo mode. Enabling turbo mode can boost the overall microprocessor performance when all microprocessor cores are not fully utilized. A microprocessor core can run above its rated frequency for a short period of time when it is in turbo mode.

- **CPU C-States**

Select this choice to enable or disable ACPI C2 Processor Power states. It will be effective after the next system reboot.

- **Package ACPI CState Limit**

Select this choice to determine the level of C-state. Selecting a higher C-state limit allows the microprocessors to consume less power when they are idle. If you experience problems with legacy operating systems, set the ACPI Cstate limit to C2.

- **Power/Performance Bias**
Select this choice to determine how the power management of the microprocessor is controlled. You can choose either Platform Controlled (system) or OS Controlled (operating system) to control the setting. Not all operating systems support this feature.
- **Platform Controlled Type**
Select this choice to determine how to balance between performance and power consumption. Choosing Maximum Performance will disable power management functions and allow the most aggressive use of turbo. Choosing Minimal Power will maximize the use of power management features for least power consumption and disable turbo.
- **Legacy Support**
Select this choice to view or set legacy support.
 - **Force Legacy Video on Boot**
Select this choice to force INT video support, if the operating system does not support UEFI video output standards.
 - **Rehook INT 19h**
Select this choice to enable or disable devices from taking control of the boot process. The default is **Disable**.
 - **Legacy Thunk Support**
Select this choice to enable or disable UEFI to interact with PCI mass storage devices that are non-UEFI compliant.
 - **Infinite Boot Retry**
Select this choice to enable or disable Infinitely retry the Legacy Boot order.
 - **BBS Boot**
Select this choice to enable or disable legacy boot in BBS manner.
- **System Security**
Select this choice to view or configure Trusted Platform Module (TPM) support.
- **Integrated Management Module**
Select this choice to view or change the settings for the integrated management module.
 - **Power Restore Policy**
Select this choice to view or enable the POST watchdog timer.
 - **Commands on USB Interface Preference**
Select this choice to enable or disable the Ethernet over USB interface on IMM.
 - **Network Configuration**
Select this choice to view the system management network interface port, the IMM MAC address, the current IMM IP address, and the host name; define the static IMM IP address, subnet mask, and gateway address; specify whether to use the static IP address or have DHCP assign the IMM IP address; save the network changes; and reset the IMM.
 - **Reset IMM to Defaults**
Select this choice to view or reset IMM to the default settings.
 - **Reset IMM**
Select this choice to reset the IMM settings.
- **Recovery**

Select this option to configure recovery settings.

- **Storage**

Select this option to see all the storage device settings.

- **Network**

Select this choice to view or configure the network device options, such as iSCSI, PXE, and network devices. There might be additional configuration choices for optional network devices that are compliant with UEFI 2.1 and later.

- **Driver Health**

Select this option to view the status of the controllers in the system as reported by their corresponding drivers.

- **Date and Time**

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

This choice is on the full Setup utility menu only.

- **Start Options**

Select this choice to view or change the start options, including the startup sequence, keyboard NumLock state, PXE boot option, and PCI device boot priority. Changes in the startup options take effect when you start the server.

The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. If the server has Wake on LAN hardware and software and the operating system supports Wake on LAN functions, you can specify a startup sequence for the Wake on LAN functions. For example, you can define a startup sequence that checks for a disc in the CD-RW/DVD drive, then checks the hard disk drive, and then checks a network adapter.

This choice is on the full Setup utility menu only.

- **Boot Manager**

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

- **System Event Logs**

Select this choice to enter the System Event Manager, where you can view the error messages in the system event logs. You can use the arrow keys to move between pages in the error log.

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

Important: If the system-error LED on the front of the server is lit but there are no other error indications, clear the IMM2 system-event log. Also, after you complete a repair or correct an error, clear the IMM2 system-event log to turn off the system-error LED on the front of the server.

- **POST Event Viewer**

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

- **System Event Log**

Select this choice to view the IMM2 system event log.

- **Clear System Event Log**

Select this choice to clear the IMM2 system event log.

- **User Security**

Select this choice to set, change, or clear passwords. See “Passwords” 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 105 for more information.

- **Clear Power-on Password**

Select this choice to clear a power-on password. For more information, see “Power-on password” on page 105 for more information.

- **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 105.

- **Clear Administrator Password**

Select this choice to clear an administrator password. For more information, see “Administrator password” on page 105.

- **Save Settings**

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

- **Restore Settings**

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

- **Load Default Settings**

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

- **Exit Setup**

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

Passwords

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

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

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

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

set, change, and delete the power-on password. A user who types the power-on password has access to only the limited Setup utility menu; the user can set, change, and delete the power-on password, if the system administrator has given the user that authority.

Power-on password: If a power-on password is set, when you turn on the server, you must type the power-on password to complete the system startup. You can use any combination of 6 - 20 printable ASCII characters for the password.

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

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

- If an administrator password is set, type the administrator password at the password prompt. Start the Setup utility and reset the power-on password.
- Remove the battery from the server and then reinstall it. See the *Problem Determination and Service Guide* on the IBM System x Documentation CD for instructions for removing the battery.
- Change the position of the power-on password switch (enable switch 4 of the system board switch block (SW3) to bypass the power-on password check (see "System-board jumpers" on page 30 for more information).

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

The default for all of the switches on switch block (SW3) is Off.

While the server is turned off, move switch 4 of the switch block (SW3) 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 switch does not affect the administrator password.

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

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

Using the Boot Manager program

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

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

1. Turn off the server.
2. Restart the server.

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

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

Starting the backup server firmware

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

To force the server to start from the backup copy of the server firmware, turn off the server; then, place the JP2 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 JP2 jumper back to the primary position (pins 1 and 2).

Using the integrated management module II

The integrated management module II (IMM2) is the second generation of the IMM. Unlike the first generation of IMM, the IMM2 has three levels of firmware: basic, standard, and premium. The level of IMM2 firmware in your server depends on the server platform. IMM2 basic firmware provides server management through the Intelligent Platform Management Interface (IPMI). IMM2 standard firmware provides basic functionality plus the ability to manage servers through other user interfaces, such as the web, Telnet, Secure Shell (SSH), and Simple Network Management Protocol (SNMP). IMM2 premium firmware provides standard functionality plus remote-presence capability.

Some servers that come with IMM2 basic or standard firmware might have an option to upgrade the IMM2 firmware to a higher level. If you add the service processor upgrade option to IMM2 basic firmware, the result is IMM2 standard functionality. If you add the remote presence upgrade option to IMM2 standard firmware, the result is IMM2 premium functionality.

Note: You cannot upgrade IMM2 basic firmware directly to IMM2 premium firmware by using the remote presence upgrade option. You must use the service processor upgrade option to upgrade to IMM2 standard firmware and then use the remote presence upgrade option to upgrade to IMM2 premium firmware.

For more information about the IMM2, see the Integrated Management Module II User's Guide at <http://www.ibm.com/systems/support/supportsite.wss/docdisplay?Indocid=MIGR-5079770&brandind=5000008>.

The IMM2 supports the following basic systems-management features:

- Environmental monitor with fan speed control for temperature, voltages, fan failure, and power supply failure.
- DIMM error assistance. The Unified Extensible Firmware Interface (UEFI) disables a failing DIMM that is detected during POST, and the IMM2 lights the associated system error LED and the failing DIMM error LED.

- System-event log (SEL).
- ROM-based IMM2 firmware flash updates.
- Automated boot recovery (ABR).
- Nonmaskable interrupt (NMI) detection and reporting.
- Automatic Server Restart (ASR) when POST is not complete or the operating system hangs and the operating system watchdog timer times-out. The IMM2 might be configured to watch for the operating system watchdog timer and reboot the system after a timeout, if the ASR feature is enabled. Otherwise, the IMM2 allows the administrator to generate a nonmaskable interrupt (NMI) by pressing an NMI button on the system board for an operating-system memory dump. ASR is supported by IPMI.
- Intelligent Platform Management Interface (IPMI) Specification V2.0 and Intelligent Platform Management Bus (IPMB) support.
- Invalid system configuration (CNFG) LED support.
- Serial over LAN (SOL).
- PECI 2 support.
- Power/reset control (power-on, hard and soft shutdown, hard and soft reset, schedule power control).
- Alerts (in-band and out-of-band alerting, PET traps - IPMI style, SNMP, e-mail).
- Operating-system failure blue screen capture.
- Configuration save and restore.
- PCI configuration data.
- Boot sequence manipulation.

The IMM2 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.

Obtaining the IP address for the IMM2

To access the web interface, you need the IP address for IMM2. You can obtain the IMM2 IP address through the Setup utility. The server comes with a default IP address for the IMM2 of 192.168.70.125. To locate the IP address, complete the following steps:

1. Turn on the server.

Note: Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active.

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

3. From the Setup utility main menu, select **System Settings**.
4. On the next screen, select **Integrated Management Module**.
5. On the next screen, select **Network Configuration**.
6. Find the IP address and write it down.
7. Exit from the Setup utility.

Logging on to the web interface

To log onto 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 IMM2 to which you want to connect.

Note: The IMM2 defaults to DHCP. If a DHCP host is not available, the IMM2 assigns a static IP address of 192.168.70.125.

2. On the Login page, type the user name and password. If you are using the IMM2 for the first time, you can obtain the user name and password from your system administrator. All login attempts are documented in the event log.

Note: The IMM2 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. You must change the default password the first time you log on.

3. On the Welcome page, type a timeout value (in minutes) in the field that is provided. The IMM2 will log you off of the web interface if your browser is inactive for the number of minutes that you entered for the timeout value.
4. Click **Continue** to start the session. The System Health page provides a quick view of the system status.

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 5 to 10 seconds after the server is connected to 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* to recover the flash device image. To recover the flash device image, complete the following steps:

1. Turn on the server.

Note: Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active.

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

For additional information and instructions, see the *ESXi Embedded and vCenter Server Setup Guide* at http://www.vmware.com/pdf/vsphere4/r40_u1/vsp_40_u1_esxi_e_vc_setup_guide.pdf.

Using the remote presence capability and blue-screen capture

The remote presence and blue-screen capture features are integrated functions of the Integrated Management Module II (IMM2). When the optional IBM Integrated Management Module Advanced Upgrade is installed in the server, it activates the remote presence functions. The Integrated Management Module Advanced Upgrade is required to enable the integrated remote presence and blue-screen capture features. Without the Integrated Management Module Advanced Upgrade, you will not be able to access the network remotely to mount or unmount drives or images on the client system. However, you can still access the web interface without the upgrade.

After the Integrated Management Module Advanced Upgrade is installed in the server, it is authenticated to determine whether it is valid. If the key is not valid, you receive a message from the web interface (when you attempt to start the remote presence feature) indicating that the Integrated Management Module Advanced Upgrade is required to use the remote presence feature.

The remote presence feature provides the following functions:

- Remotely viewing video with graphics resolutions up to 1600 x 1200 at 75 Hz, regardless of the system state
- Remotely accessing the server, using the keyboard and mouse from a remote client
- Mapping the CD or DVD drive, diskette drive, and USB flash drive on a remote client, and mapping ISO and diskette image files as virtual drives that are available for use by the server
- Uploading a diskette image to the IMM2 memory and mapping it to the server as a virtual drive

The blue-screen capture feature captures the video display contents before the IMM2 restarts the server when the IMM2 detects an operating-system hang condition. A system administrator can use the blue-screen capture to assist in determining the cause of the hang condition.

Enabling the remote presence feature

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

1. Install the Integrated Management Module Advanced Upgrade.
2. Turn on the server.

Note: Approximately 20 to 40 seconds after the server is connected to power, the power-control button becomes active.

For more information on Features on Demand (FoD), including instructions for automating the activation and installation of the activation key by using IBM ToolsCenter or IBM Director, see the IBM System x Features on Demand User's Guide at <http://www.ibm.com/systems/x/fod/> under the Help section. Please note that the server may need to be restarted to activate the feature.

Enabling the Intel Gigabit Ethernet Utility program

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

Configuring the Gigabit Ethernet controller

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

By default the server has enabled Ethernet 1 and Ethernet 2. Ethernet 3 and Ethernet 4 can be enabled by the Features on Demand (FoD). Please note that the server may need to be restarted to activate the feature. Meanwhile, when switching from dedicated mode (Ethernet 2) to shared mode (Ethernet 1), followed by the activation of Ethernet 3 and Ethernet 4 via the Features on Demand (FoD) or vice versa, remember to first unplug and subsequently plug back the power cable or cables to the server (power cycle). For more information on Features on Demand (FoD), including instructions for automating the activation and installation of the activation key by using IBM ToolsCenter or IBM Director, see the IBM System x Features on Demand User's Guide at <http://www.ibm.com/systems/x/fod/> under the Help section.

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 device drivers and information about configuring the Ethernet controllers, go to <http://www.ibm.com/supportportal/>.

Configuring RAID arrays

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

The following table lists the different 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-H1110 adapter	LSI Utility (Setup utility, press Ctrl+C), ServerGuide, Human Interface Infrastructure (HII)	MegaRAID Storage Manager (MSM), SAS2IRCUI (Command Line) Utility for Storage Management
ServeRAID-M1115 adapter	MegaRAID BIOS Configuration Utility (press Ctrl+H to start), pre-boot CLI (press Ctrl+P to start), ServerGuide, HII	MegaRAID Storage Manager (MSM), MegaCLI (Command Line Interface), and IBM Director
ServeRAID-M5110 adapter; ServeRAID-M5120 adapter	MegaRAID BIOS Configuration Utility (press Ctrl+H to start), pre-boot CLI (press Ctrl+P to start), ServerGuide, HII	MegaRAID Storage Manager (MSM), MegaCLI, and IBM Director
ServeRAID-C105	HII	MegaRAID Storage Manager (MSM), MegaCLI, and IBM Director

Notes:

1. For more information about Problem Determination and Service Guide for ServeRAID M controllers, see <http://www-947.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5085607>.
2. For more information about Configuration and Options Guide (COG), see <http://www-947.ibm.com/support/entry/portal/docdisplay?Indocid=SCOD-3ZVQ5W&brandind=5000019>.
3. For further details on creating a software RAID array of hard disk drives, please see the ServeRAID C105 documentation at <http://www-947.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5089068>
4. When the ServeRAID adapter is removed, software RAID will not be supported. This system does not support downgrade software RAID function from hardware RAID configuration.

Starting the LSI Configuration Utility program

Use these instructions to start the LSI Configuration Utility program.

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

1. Turn on the server, and make sure that the server is the owner of the keyboard, video, and mouse.
2. When the prompt message is displayed, you may perform either of the following:
 - a. **ServeRAID H1110:** press CTRL+C.
 - b. **ServeRAID M5110, ServeRAID M5120, or ServeRAID M1115:** press CTRL+H.

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

Starting the Human Interface Infrastructure (HII) Configuration Application

Use these instructions to start the Human Interface Infrastructure (HII) configuration utility program.

To start the Human Interface Infrastructure (HII) configuration utility program, complete the following steps:

1. Turn on the server.

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

2. When prompted, <F1 Setup> is displayed, press F1. If you have set an administrator password, you are prompted to type the password.
3. Under **System Settings**, select **Storage**.

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

Creating RAID of hard disk drives (C105 only)

Notes:

1. If a ServeRAID adapter is installed in the server, ServeRAID C105 will not work.
2. ServeRAID C105 uses HII only for configuration and there is no legacy configuration utility.

To create RAID of hard disk drives (C105 only), complete the following steps:

1. Turn on the server.

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

2. When prompted, <F1 Setup> is displayed, press F1. If you have set an administrator password, you are prompted to type the password.
3. Under **System Settings**, select **Storage**.
4. Under **Storage**, select **ServeRAID C105**.
5. Under **Configuration Options**, select **Virtual Drive Management** → **Create Configuration**.
6. Select the type of array that you want to create.
7. Select **Select Drives** and use space key to select all the drives for your array.
8. Select **Apply Change** to create the array.
9. When the prompt Success is displayed, select **OK** to continue.
10. After the system auto skips to the next screen, select **Save Configuration**.
11. When the prompt Creating Virtual Drives will cause the data lost on the associated Drives to be permanently deleted is displayed, use space key to select **Yes** to continue.
12. Select **OK** to continue.
13. To initialize virtual disk, select **ServeRAID C105** → **Virtual Drive Management** → **Select Virtual Drive Operation**.
14. Select **Start Operation**.
15. Select **Yes** to confirm.

16. Select **OK** to continue.
17. When the prompt Success is displayed, select **OK**.

Notes:

1. For further details on creating a software RAID array of hard disk drives, please see the ServeRAID C105 documentation at <http://www-947.ibm.com/support/entry/portal/docdisplay?Indocid=MIGR-5089068>.
2. Some specific models may be shipped initially with four hard disk drives. Configuration may be able to expand to eight hard disk drives via Features on Demand (FoD). Please note that the server may need to be restarted to activate the feature. For more information on Features on Demand (FoD), including instructions for automating the activation and installation of the activation key by using IBM ToolsCenter or IBM Systems Director, see the *IBM Features on Demand User's Guide* at <http://www.ibm.com/systems/x/fod/> under the Help section.
3. Software RAID is not supported in VMware 5 and VMware 4.1.
4. Software RAID is not supported in legacy configuration.
5. In order to install the legacy OS in the software RAID, you have to set the **SCU Controller** as the first device in the option ROM execution order.

IBM Advanced Settings Utility program

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

You can also use the ASU program to configure FoD features to Enable the optional remote presence features or other IMM2 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 IMM2 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-947.ibm.com/support/entry/portal/docdisplay?Indocid=TOOL-ASU>.

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 website. 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/software/director/downloads/index.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/support/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.

Updating the Universal Unique Identifier (UUID)

The Universal Unique Identifier (UUID) must be updated when the system board is replaced. Use the Advanced Settings Utility to update the UUID in the UEFI-based server. The ASU is an online tool that supports several operating systems. Make sure that you download the version for your operating system. You can download the ASU from the IBM website. To download the ASU and update the UUID, go to <http://www.ibm.com/supportportal/>.

1. Download the Advanced Settings Utility (ASU):
 - a. Go to <http://www-947.ibm.com/support/entry/portal/docdisplay?brand=50000008&Indocid=TOOL-CENTER>.
 - b. Scroll down to **Configuration** and click **Advanced Settings Utility**.
 - c. In the next window under Related Information, click the **Advanced Settings Utility** link and download the ASU version for your operating system.
2. ASU sets the UUID in the Integrated Management Module II (IMM2). Select one of the following methods to access the Integrated Management Module II (IMM2) to set the UUID:
 - Online from the target system (LAN or keyboard console style (KCS) access)

- Remote access to the target system (LAN based)
 - Bootable media containing ASU (LAN or KCS, depending upon the bootable media)
3. Copy and unpack the ASU package, which also includes other required files, to the server. Make sure that you unpack the ASU and the required files to the same directory. In addition to the application executable (asu or asu64), the following files are required:
 - For Windows based operating systems:
 - ibm_rndis_server_os.inf
 - device.cat
 - For Linux based operating systems:
 - cdc_interface.sh
 4. After you install ASU, use the following command syntax to set the UUID:


```
asu set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value>-kcs [access_method]
```

Where:

<uuid_value>

Up to 16-byte hexadecimal value assigned by you.

[access_method]

The access method that you selected to use from the following methods:

- Online authenticated LAN access, type the command:


```
[host <imm_internal_ip>] [user <imm_user_id>] [password <imm_password>]
```

Where:

imm_internal_ip

The IMM2 internal LAN/USB IP address. The default value is 169.254.95.118.

imm_user_id

The IMM2 account (1 of 12 accounts). The default value is USERID.

imm_password

The IMM2 account password (1 of 12 accounts). The default value is PASSWORD (with a zero 0 not an O).

Note: If you do not specify any of these parameters, ASU will use the default values. When the default values are used and ASU is unable to access the IMM2 using the online authenticated LAN access method, ASU will automatically use the unauthenticated KCS access method.

The following commands are examples of using the userid and password default values and not using the default values:

Example that does not use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value> --user <user_id> --password <password>
```

Example that does use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value>
```

- Online KCS access (unauthenticated and user restricted):
You do not need to specify a value for *access_method* when you use this access method.

Example:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value>
```

The KCS access method uses the IPMI/KCS interface. This method requires that the IPMI driver be installed. Some operating systems have the IPMI driver installed by default. ASU provides the corresponding mapping layer. See the *Advanced Settings Utility Users Guide* for more details. You can access the ASU Users Guide from the IBM website.

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

- a. Go to <http://www-947.ibm.com/support/entry/portal/docdisplay?brand=5000008&Indocid=TOOL-CENTER>.
 - b. Scroll down to Configuration and Click Advanced Settings Utility
- Remote LAN access, type the command:

Note: When using the remote LAN access method to access IMM2 using the LAN from a client, the *host* and the *imm_external_ip* address are required parameters.

```
host <imm_external_ip> [user <imm_user_id>[[password <imm_password>]]
```

Where:

imm_external_ip

The external IMM2 LAN IP address. There is no default value. This parameter is required.

imm_user_id

The IMM2 account (1 of 12 accounts). The default value is USERID.

imm_password

The IMM2 account password (1 of 12 accounts). The default value is PASSWORD (with a zero 0 not an O).

The following commands are examples of using the userid and password default values and not using the default values:

Example that does not use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value> host <imm_ip>  
user <user_id> password <password>
```

Example that does use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoUUID <uuid_value> host <imm_ip>
```

- Bootable media:

You can also build a bootable media using the applications available through the Tools Center website at <http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp>. From the left pane, click **IBM System x and BladeCenter Tools Center**, then click **Tool reference** for the available tools.

5. Restart the server.

Updating the DMI/SMBIOS data

The Desktop Management Interface (DMI) must be updated when the system board is replaced. Use the Advanced Settings Utility to update the DMI in the UEFI-based server. The ASU is an online tool that supports several operating systems. Make sure that you download the version for your operating system. You can download the ASU from the IBM website. To download the ASU and update the DMI, go to <http://www.ibm.com/supportportal/>.

1. ASU sets the DMI in the Integrated Management Module II (IMM2). Select one of the following methods to access the Integrated Management Module II (IMM2) to set the DMI:
 - Online from the target system (LAN or keyboard console style (KCS) access)
 - Remote access to the target system (LAN based)
 - Bootable media containing ASU (LAN or KCS, depending upon the bootable media)
2. Copy and unpack the ASU package, which also includes other required files, to the server. Make sure that you unpack the ASU and the required files to the same directory. In addition to the application executable (asu or asu64), the following files are required:
 - For Windows based operating systems:
 - ibm_rndis_server_os.inf
 - device.cat
 - For Linux based operating systems:
 - cdc_interface.sh
3. After you install ASU, Type the following commands to set the DMI:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>-kcs [access_method]
asu set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model>-kcs [access_method]
asu set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>-kcs [access_method]
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>-kcs [access_method]
```

Where:

<m/t_model>

The server machine type and model number. Type mtm xxxxyyy, where xxxx is the machine type and yyy is the server model number.

< system model>

The system model. Type system yyyyyyy, where yyyyyyy is the product identifier such as x3550M3.

<s/n>

The serial number on the server. Type sn zzzzzzz, where zzzzzzz is the serial number.

<asset_method>

The server asset tag number. Type asset
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa, where
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaa is the asset tag number.

[access_method]

The access method that you select to use from the following methods:

- Online authenticated LAN access, type the command:
[host <imm_internal_ip>] [user <imm_user_id>] [password
<imm_password>]

Where:

imm_internal_ip

The IMM2 internal LAN/USB IP address. The default value is 169.254.95.118.

imm_user_id

The IMM2 account (1 of 12 accounts). The default value is USERID.

imm_password

The IMM2 account password (1 of 12 accounts). The default value is PASSWORD (with a zero 0 not an O).

Note: If you do not specify any of these parameters, ASU will use the default values. When the default values are used and ASU is unable to access the IMM2 using the online authenticated LAN access method, ASU will automatically use the following unauthenticated KCS access method.

The following commands are examples of using the userid and password default values and not using the default values:

Examples that do not use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
--user <imm_user_id> --password <imm_password>
asu set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model>
--user <imm_user_id> --password <imm_password>
asu set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> --user <imm_user_id>
--password <imm_password>
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
--user <imm_user_id> --password <imm_password>
```

Examples that do use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
asu set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model>
asu set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
```

- Online KCS access (unauthenticated and user restricted):

You do not need to specify a value for *access_method* when you use this access method.

The KCS access method uses the IPMI/KCS interface. This method requires that the IPMI driver be installed. Some operating systems have the IPMI driver installed by default. ASU provides the corresponding mapping layer. See the *Advanced Settings Utility Users Guide* at <http://www-947.ibm.com/support/entry/portal/docdisplay?Indocid=TOOL-ASU> for more details.

The following commands are examples of using the userid and password default values and not using the default values:

Examples that do not use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model>
asu set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model>
asu set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n>
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag>
```

- Remote LAN access, type the command:

Note: When using the remote LAN access method to access IMM2 using the LAN from a client, the *host* and the *imm_external_ip* address are required parameters.

```
host <imm_external_ip> [user <imm_user_id>] [password <imm_password>]
```

Where:

imm_external_ip

The external IMM2 LAN IP address. There is no default value. This parameter is required.

imm_user_id

The IMM2 account (1 of 12 accounts). The default value is USERID.

imm_password

The IMM2 account password (1 of 12 accounts). The default value is PASSWORD (with a zero 0 not an O).

The following commands are examples of using the userid and password default values and not using the default values:

Examples that do not use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> --host <imm_ip>
--user <imm_user_id> --password <imm_password>
asu set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model> --host <imm_ip>
--user <imm_user_id> --password <imm_password>
asu set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> --host <imm_ip>
--user <imm_user_id> --password <imm_password>
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> --host <imm_ip>
--user <imm_user_id> --password <imm_password>
```

Examples that do use the userid and password default values:

```
asu set SYSTEM_PROD_DATA.SysInfoProdName <m/t_model> --host <imm_ip>
asu set SYSTEM_PROD_DATA.SysInfoProdIdentifier <system model> --host <imm_ip>
asu set SYSTEM_PROD_DATA.SysInfoSerialNum <s/n> --host <imm_ip>
asu set SYSTEM_PROD_DATA.SysEncloseAssetTag <asset_tag> --host <imm_ip>
```

- Bootable media:

You can also build a bootable media using the applications available through the Tools Center website at <http://publib.boulder.ibm.com/infocenter/toolsctr/v1r0/index.jsp>. From the left pane, click **IBM System x and BladeCenter Tools Center**, then click **Tool reference** for the available tools.

4. Restart the server.

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. Use this information to obtain additional information about IBM and IBM products, determine what to do if you experience a problem with your IBM system or optional device, and determine 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.
- Check for updated firmware and operating-system device drivers for your IBM product. The IBM Warranty terms and conditions state that you, the owner of the IBM product, are responsible for maintaining and updating all software and firmware for the product (unless it is covered by an additional maintenance contract). Your IBM service technician will request that you upgrade your software and firmware if the problem has a documented solution within a software upgrade.
- If you have installed new hardware or software in your environment, check <http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/> to make sure that the hardware and software is supported by your IBM product.
- Go to <http://www.ibm.com/supportportal/> to check for information to help you solve the problem.
- Gather the following information to provide to IBM Support. This data will help IBM Support quickly provide a solution to your problem and ensure that you receive the level of service for which you might have contracted.
 - Hardware and Software Maintenance agreement contract numbers, if applicable
 - Machine type number (IBM 4-digit machine identifier)
 - Model number
 - Serial number
 - Current system UEFI and firmware levels
 - Other pertinent information such as error messages and logs
- Go to http://www.ibm.com/support/entry/portal/Open_service_request/ to submit an Electronic Service Request. Submitting an Electronic Service Request will start the process of determining a solution to your problem by making the pertinent information available to IBM Support quickly and efficiently. IBM service technicians can start working on your solution as soon as you have completed and submitted an Electronic Service Request.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the documentation that is provided with your IBM product. The documentation that comes with IBM systems also describes the diagnostic tests that you can perform. Most systems, operating systems, and programs come with documentation that

contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the documentation for the operating system or program.

Using the documentation

Information about your IBM system and preinstalled software, if any, or optional device is available in the documentation that comes with the product. That documentation can include printed documents, online documents, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/supportportal/>. 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, up-to-date information about IBM systems, optional devices, services, and support is available at <http://www.ibm.com/supportportal/>. The address for IBM System x 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/systems/intellistation/>.

How to send Dynamic System Analysis data to IBM

Use the IBM Enhanced Customer Data Repository to send diagnostic data to IBM. Before you send diagnostic data to IBM, read the terms of use at <http://www.ibm.com/de/support/ecurep/terms.html>.

You can use any of the following methods to send diagnostic data to IBM:

- **Standard upload:** http://www.ibm.com/de/support/ecurep/send_http.html
- **Standard upload with the system serial number:** http://www.ecurep.ibm.com/app/upload_hw
- **Secure upload:** http://www.ibm.com/de/support/ecurep/send_http.html#secure
- **Secure upload with the system serial number:** https://www.ecurep.ibm.com/app/upload_hw

Creating a personalized support web page

At <http://www.ibm.com/support/mynotifications/>, you can create a personalized support web page by identifying IBM products that are of interest to you. From this personalized page, you can subscribe to weekly email notifications about new technical documents, search for information and downloads, and access various administrative services.

Software service and support

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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 Business Partners** on the right side of the page. For IBM support telephone numbers, see <http://www.ibm.com/planetwide/>. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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

IBM Taiwan product service

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

IBM Taiwan product service contact information:

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

Appendix B. Notices

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

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

Important notes

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

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

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

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

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

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

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IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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

Particulate contamination

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

Table 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.

German Ordinance for Work gloss statement

The product is not suitable for use with visual display work place devices according to clause 2 of the German Ordinance for Work with Visual Display Units.

Das Produkt ist nicht für den Einsatz an Bildschirmarbeitsplätzen im Sinne § 2 der Bildschirmarbeitsverordnung geeignet.

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

*Information Development
IBM Corporation
205/A015
3039 E. Cornwallis Road
P.O. Box 12195
Research Triangle Park, North Carolina 27709-2195
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In the request, be sure to include the publication part number and title.

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Electronic emission notices

When you attach a monitor to the equipment, you must use the designated monitor cable and any interference suppression devices that are supplied with the monitor.

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

European Union EMC Directive conformance statement

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 Deutschland GmbH
Technical Regulations, Department M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

Germany Class A statement

Deutschsprachiger EU Hinweis:

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

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

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“Warnung: Dieses ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funk-Störungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen zu ergreifen und dafür aufzukommen.”

Deutschland: Einhaltung des Gesetzes über die elektromagnetische Verträglichkeit von Geräten

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

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

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Einhaltung der EMV Vorschriften ist der Hersteller:

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

Der verantwortliche Ansprechpartner des Herstellers in der EU ist:

IBM Deutschland GmbH
Technical Regulations, Abteilung M372
IBM-Allee 1, 71139 Ehningen, Germany
Telephone: +49 7032 15 2941
Email: lugi@de.ibm.com

Generelle Informationen:

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

VCCI Class A statement

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を講ずるよう要求されることがあります。 VCCI-A

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Japan Electronics and Information Technology Industries Association (JEITA) statement

高調波ガイドライン適合品

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

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