System x3650 M4 Type 7915

Installation and User's Guide

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Installation and User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix B, “Notices,” on page 159, the *IBM Safety Information* and *IBM Environmental Notices and User's Guide* on the IBM *System x Documentation* CD, and the *IBM Warranty Information* document that comes with your server.

Third Edition (September 2012)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

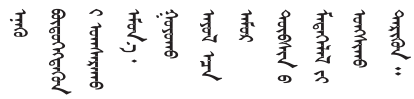
Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Bu ürünü kurmadan önce güvenlik bilgilerini okuyun.



ཐོན་རྫས་འདི་བདེ་སྒྲིད་མ་བྱས་གོང་། ·སྐྱར་ཡིད་ཡིད་གཟབ་
བྱ་འདུ་མིན་ཡོད་བའི་འོད་སྣེར་བལྟ་དགོས།

ھەزكۇر مەھسۇلاتنى ئورنىتىشتىن بۇرۇن بىخەتەرلىك ئۇچۇرلىرىنى ئوقۇپ چىقىڭ.

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

Statement 2:

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

Do not:

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

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

Statement 3:

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

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

DANGER

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

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

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

Statement 4:

≥ 18 kg (39.7 lb)

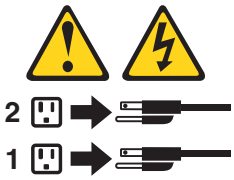
≥ 32 kg (70.5 lb)

≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5:

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



Statement 6:

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

Statement 8:

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

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

Statement 12:

CAUTION:
The following label indicates a hot surface nearby.

Statement 26:

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

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

Statement 27:

CAUTION:
Hazardous moving parts are nearby.

Chapter 1. The System x3650 M4 server

This *Installation and User's Guide* contains instructions for setting up your IBM® System x3650 M4 Type 7915 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 *System x Documentation* CD.

In addition to the instructions in Chapter 2, “Installing optional devices,” on page 31 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” on page 31.

The IBM System x3650 M4 Type 7915 server is a 2-U[1]-high server that is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, and flexibility.

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 *Warranty Information* document that comes with the server.

The server contains IBM X-Architecture® technologies, which help increase performance and reliability. For more information, see “What your server offers” on page 10 and “Reliability, availability, and serviceability features” on page 12.

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

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

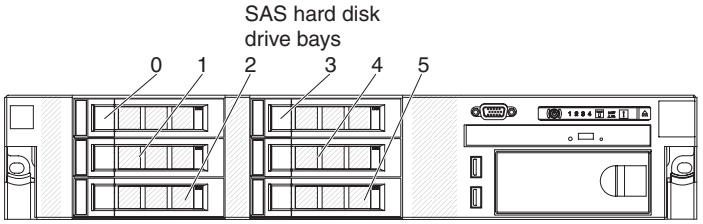
If firmware and documentation updates are available, you can download them from the IBM website. The server might have features that are not described in the documentation that comes with the server, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. To check for updates, go to http://www.ibm.com/supportportal/.

The server comes with either six 3.5-inch SATA or eight 2.5-inch SAS hot-swap hard disk drive bays. Most models contain a ServeRAID SAS controller and the

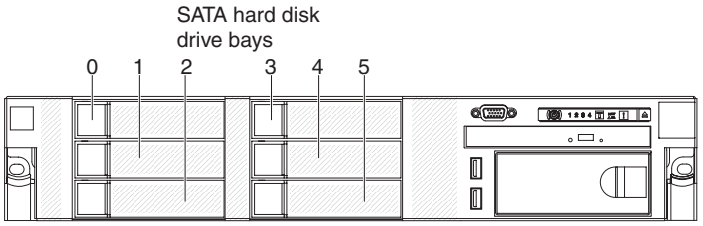
1. Racks are measured in vertical increments of 1.75 inches each. Each increment is called a “U”. A 1-U-high device is 1.75 inches tall.

2.5-inch models are capable of expansion to sixteen 2.5-inch SAS hot-swap hard disk drive bays.

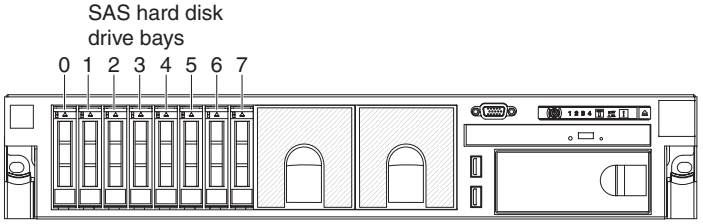
The following illustration shows a server with 3.5-inch SAS/SATA hot-swap hard disk drive bays.



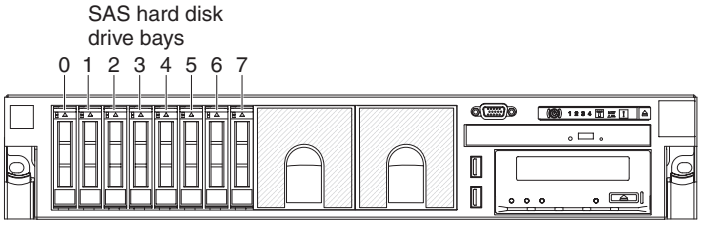
The following illustration shows a server with six 3.5-inch SATA simple-swap hard disk drive bays.



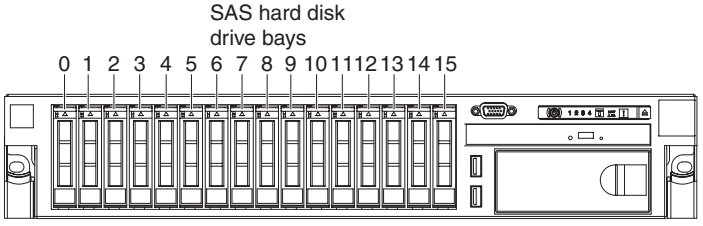
The following illustration shows a server with eight 2.5-inch SAS hard disk drive bays.



You can purchase an optional kit to install the tape drive.



You can purchase an optional kit to install the eight additional 2.5-inch SAS hard disk drive bays.



The SAS ID for each bay is printed on the server front, above each bay.

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

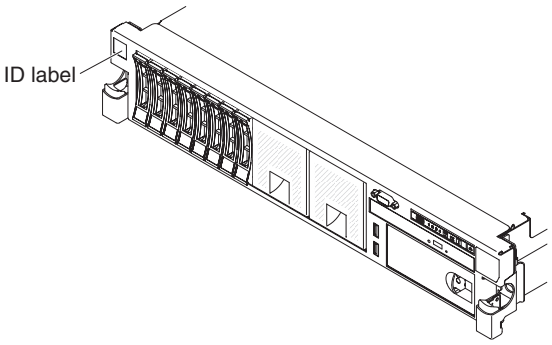
documentation that comes with the server, and the documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. To check for updates, go to http://www.ibm.com/supportportal/.

Record information about the server in the following table.

Product name	IBM System x3650 M4 server
Machine type	7915
Model number	_____
Serial number	_____

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

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



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

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

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

The IBM System x Documentation CD

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

Hardware and software requirements

The IBM *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 Crtl+F to use the Acrobat search function, or press Alt+F to use the xpdf search function within the document.

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

Related documentation

This *Installation and User's Guide* contains general information about the server, including how to set up 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 information about the terms of the warranty.
- *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 printed 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 *System x Documentation* CD.

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

The server might have features that are not described in the documentation that you received with the server. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. These updates are available from the IBM website. To check for updates, go to http://www.ibm.com/supportportal/.

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 that are installed and the power-management optional features that are 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

Microprocessor:
- Supports up to two Intel Xeon™ E5-2600 series multi-core microprocessors (one installed)
- Level-3 cache
- Two QuickPath Interconnect (QPI) links speed up to 8 GT per second

Note:
- Use the Setup utility to determine the type and speed of the microprocessors.
- For a list of supported microprocessors, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

Memory:
- Minimum: 2 GB
- Maximum: 768 GB
  - 64 GB using Unbuffered DIMMs (UDIMMs)
  - 384 GB using Registered DIMMs (RDIMMs)
  - 768 GB using Hyper Cloud DIMMs (HCDIMMs)
  - 768 GB using Load Reduced DIMMs (LRDIMMs)
- Type:
  - PC3-8500 (DDR3-1066), PC3-10600 (DDR3-1333), or PC3-12800 (DDR3-1600)
  - Single-rank, dual-rank, or quad-rank
  - Registered DIMM (RDIMM), Unbuffered DIMM (UDIMM), Hyper Cloud DIMMs (HCDIMM), or Load Reduced DIMM (LRDIMM)
- Slots: 24
- Supports (depending on the model):
  - 4 GB Unbuffered DIMMs
  - 2 GB, 4 GB, 8 GB, and 16 GB Registered DIMMs
  - 16 GB and 32 GB Hyper Cloud DIMMs (HCDIMM)
  - 32 GB Load Reduced DIMMs (LRDIMM)

SATA optical drives (optional):
- DVD-ROM
- Multi-burner

Tape drive (optional):
- Tape drive bay

Integrated functions:
- Integrated Management Module II (IMM2), which consolidates multiple management functions in a single chip.
- Intel I350AM4 Quad Port Gigabit Ethernet controller with Wake on LAN support
- Eight Universal Serial Bus (USB) 2.0 ports (two front and four rear of the chassis, one internal used for USB tape drive, and one internal used for Hypervisor USB key)
- Six network ports (four 1 Gb Ethernet ports on the system board and two additional ports when the optional IBM Dual-Port 10 Gb Network Daughter Card is installed)
- One System Management RJ-45 on the rear to connect to a systems management network. This system management connector is dedicated to the IMM2 functions.
- One serial port
- Two VGA adapters
- Light path diagnostics panel

Note: In messages and documentation, the term *service processor* refers to the integrated management module II (IMM2).

PCI expansion slots:

Supports three kinds of PCI riser cards:
- PCI riser-card assembly 1 (linked to Microprocessor 1)
  - One PCI Express Gen3 x16 (full-height, full-length), one PCI Express Gen3 x8 (full-height, half-length)
  - Three PCI Express Gen3 x8 (full-height, full-length) x 1, (full-height, half-length) x 2
  - Two PCI-X (full-height, full-length) x 1, (full-height, half-length) x 1; one PCI Express (full-height, half-length)
- PCI riser-card assembly 2 (linked to Microprocessor 2)
  - One PCI Express Gen3 x16 (full-height, full-length), one PCI Express Gen3 x8 (full-height, full-length)
  - Three PCI Express Gen3 x8 (full-height, full-length) x 2, (full-height, half-length) x 1
  - Two PCI-X (full-height, full-length) x 2, one PCI Express (full-height, half-length)

Hard disk drive expansion bays (depending on the model):
- Eight 2.5-inch hot-swap SAS/SATA hard disk drive bays with option to add eight more 2.5-inch hot-swap SAS/SATA hard disk drive bays
- Six 3.5-inch hot-swap SAS/SATA hard disk drive bays
- Six 3.5-inch simple-swap SATA hard disk drive bays

Video controller (integrated into IMM2):
- Matrox G200eR2 (two analog ports - one front and one rear that can be connected at the same time)
  Note: The maximum video resolution is 1600 x 1200 at 75 Hz.
  - SVGA compatible video controller
  - DDR3 528 SDRAM video memory controller
  - Avocent Digital Video Compression
  - 16 MB of video memory (not expandable)

ServeRAID controller (depending on the model):
- One on-board 8 ports SAS ServeRAID M5110e that provides RAID levels 0, 1, and 10
- A ServeRAID M5110e SAS/SATA adapter that provides RAID 0, 1, and 10. Optional upgrade:
  - RAID 5/50 (Zero Cache)
  - RAID 5/50 (512 MB Cache) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 (512 MB Flash) with optional FoD RAID 6/60 and SED upgrade
  - RAID 5/50 (1 GB Flash) with optional FoD RAID 6/60 and SED upgrade

Size (2U):
- Height: 86.5 mm (3.406 in.)
- Depth: EIA flange to rear - 714 mm (28.110 in.), Overall - 746 mm (29.370 in.)
- Width: With top cover - 445 mm (17.520 in.), With front bezel - 482.0 mm (18.976 in.)
- Weight: approximately 25 kg (55 lb) to 30 kg (65 lb) depending upon configuration

Table 1. Features and specifications (continued)

Electrical input with hot-swap ac power supplies:
- Sine-wave input (50 - 60 Hz) required
- Input voltage range automatically selected
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Input kilovolt-amperes (kVA) approximately:
  - Minimum: 0.14 kVA
  - Maximum: 1.022 kVA

Notes:

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

Environment: compliant with ASHRAE class A3 specifications.

Server on:
- Temperature:
  - 5°C to 40°C (41°F to 104°F)
  - Altitude: 0 to 950 m (3,117 ft); decrease the maximum system temperature by 1°C for every 175-m increase in altitude.
- Maximum altitude: 3,050 m (10,000 ft), 5°C to 28°C (41°F to 82°F)

  Attention:
  - Intel E5-2690 with heat sink (part number 94Y6695) and standard PCIe: Temperature: 5°C to 35°C (41°F to 95°F); Altitude: 0 to sea level
  - Intel E5-2690 with heat sink (part number 94Y6695) and one GPU (Quadro 2000/4000/6000): Temperature: 5°C to 30°C (41°F to 86°F); Altitude: 0 to sea level
  - Intel E5-2690 with heat sink (part number 81Y6697) and two GPUs (Quadro 2000/4000/6000): Temperature: 5°C to 25°C (41°F to 77°F); Altitude: 0 to sea level
  - Intel E5-2634 with heat sink (part number 94Y6695): Temperature: 5°C to 35°C (41°F to 95°F); Altitude: 0 to 914.4 m (3,000 ft)
  - Intel E5-2637 with heat sink (part number 69Y5270): Temperature: 5°C to 35°C (41°F to 95°F); Altitude: 0 to 914.4 m (3,000 ft)
- Humidity:
  - Non-condensing: -12°C dew point (10.4°F)
  - Relative humidity: 8% to 85%
- Maximum dew point: 24°C (75°F)
- Maximum rate of temperature change:
  - Tape drives: 5°C/hr (41°F/hr)
  - Hard disk drives: 20°C/hr (68°F/hr)

Environment: (continued)

Server off:
- Temperature: 5°C to 45°C (41°F to 113°F)
- Relative humidity: 8% to 85%
- Maximum dew point: 27°C (80.6°F)

Storage (non-operating):
- Temperature: 1°C to 60°C (33.8°F to 140.0°F)
- Maximum altitude: 3,050 m (10,000 ft)
- Relative humidity: 5% to 80%
- Maximum dew point: 29°C (84.2°F)

Shipment (non-operating):
- Temperature: -40°C to 60°C (-40°F to 140.0°F)
- Maximum altitude: 10,700 m (35,105 ft)
- Relative humidity: 5% to 100%
- Maximum dew point: 29°C (84.2°F)

Particulate contamination: 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 161.

Hot-swap fans:
- One microprocessor: 3 dual-motor hot-swap fans
- Two microprocessors: 4 dual-motor hot-swap fans

Power supply:
- Up to two hot-swap power supplies for redundancy support

  Maximum of two hot-swap power supplies for redundancy support
  - 550-watt ac
  - 750-watt ac
  - 900-watt ac

Note: You cannot mix power supplies of different wattages in the server.

Acoustical noise emissions:
- Declared sound power, idle: 6.3 bel
- Declared sound power, operating: greater than 7.0 bel

Heat output:
Approximate heat output:
- Minimum configuration: 419.68 Btu per hour (AC 123 watts)
- Maximum configuration: 3480.24 Btu per hour (AC 1020 watts)

What your server offers

The server uses the following features and technologies:

- **UEFI-compliant server firmware**

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

  Note: The server does not support DOS.

- **Integrated Management Module 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 150.

- **Multi-core processing**

  The server supports up to two Intel Xeon™ E5-2600 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 14.

- **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 *Documentation* CD

- **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/.

- **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 107.

  – **Large system-memory capacity**

    The memory bus supports up to 192 GB of system memory when registered DIMMs are installed. The server supports up to 48 GB if unbuffered DIMMs are installed. The memory controller supports error correcting code (ECC) for up to 18 industry-standard PC3-10600R-999, 800, 1067, and 1333 MHz, DDR3 (third-generation double-data-rate), synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

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

  The *ServerGuide Setup and Installation* CD, which you can download from the web, provides programs to help you set up the server and install a Windows operating system. The ServerGuide program detects installed optional hardware devices and provides the correct configuration programs and device drivers. For more information about the *ServerGuide Setup and Installation* CD, see “Using the ServerGuide Setup and Installation CD” on page 142.

- **Integrated network support**

  The server comes with an integrated dual-port Broadcom Gigabit Ethernet controller, which supports connection to a 10 Mbps, 100 Mbps, or 1000 Mbps network. For more information, see “Configuring the Ethernet controller” on page 154.

- **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 and hot-swap capability**

  The server supports up to eight or sixteen 2.5-inch, or six 3.5inch hot-swap hard disk drives in the hot-swap bays (depending on the model and optional devices installed). 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 “Operator information panel” on page 16 and the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.

- **PCI adapter capabilities**

  The server has six PCI interface slots which can support PCI Express or PCI-X adapters through an optional PCI riser card. See “Installing a PCI adapter” on page 60 for detailed information.

- **Redundant cooling and optional power capabilities**

  The server supports a maximum of two 750-watt or 900-watt hot-swap power supplies and up to four dual-motor hot-swap fans, which provide redundancy and hot-swap capability 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, 750-watt, or 900-watt hot-swap power supply and three fans.

  You must install the fourth fan when you install the second microprocessor in the server. You can order the second optional power supply for power redundancy.

  Note: You cannot mix different watts of power supplies in the server.

- **On-board SAS RAID support**

  The on-board 8 ports SAS RAID controller provides hardware redundant array of independent disks (RAID) support to create configurations. The standard on-board RAID provides RAID levels 0, 1, and 10.

- **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 physically separating the management network traffic from the production network. You can use the Setup utility to configure the server to use a dedicated systems-management network or a shared network.

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:

- 3-year parts and 3-year labor limited warranty for machine type 7915
- Automatic error retry and recovery

- Automatic restart on nonmaskable interrupt (NMI)
- Automatic restart after a power failure
- Backup basic input/output system switching under the control of the Integrated Management Module II (IMM2)
- Built-in monitoring for fan, power, temperature, voltage, and power-supply redundancy
- Cable-presence detection on most connectors
- Chipkill memory protection
- Diagnostic support for ServeRAID and Ethernet adapters
- Error codes and messages
- Error correcting code (ECC) L2 cache and system memory
- Hot-swap cooling fans with speed-sensing capability
- Hot-swap hard disk drives
- Information and light path diagnostics LED panels
- Integrated Management Module II (IMM2)
- Menu-driven setup, system configuration, and redundant array of independent disks (RAID) configuration programs
- Microprocessor built-in self-test (BIST), internal error signal monitoring, configuration checking, and microprocessor and voltage regulator module failure identification through light path diagnostics
- Memory mirroring support (memory mirroring are mutually exclusive of each other)
- 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 hot-swap power supplies and redundant dual-motor hot-swap fans
- Redundant Network Interface Card (NIC) support
- Remind button to temporarily turn off the system-error LED
- Remote system problem-determination support
- ROM-based diagnostics
- ROM checksums
- Serial Presence Detection (SPD) on memory, VPD, power supply, and hard disk drives backplane
- Single-DIMM isolation of excessive correctable error or multi-bit error by the Unified Extensible Firmware Interface (UEFI)
- Standby voltage for system-management features and monitoring
- Startup (boot) from LAN through remote initial program load (RIPL) or dynamic host configuration protocol/boot protocol (DHCP/BOOTP)
- System auto-configuring from the configuration menu
- System-error logging (POST and IMM2)
- Systems-management monitoring through the Inter-Integrated Circuit (I^2C) bus
- Upgradeable POST, Unified Extensible Firmware Interface (UEFI), diagnostics, IMM2 firmware, and read-only memory (ROM) resident code, locally or over the LAN
- Vital product data (VPD) on microprocessors, system board, power supplies, and SAS/SATA (hot-swap hard disk drive) backplane
- Wake on LAN capability

IBM Systems Director

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

Through a single user interface, IBM Systems Director provides consistent views for viewing managed systems, determining how these systems relate to one 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 setting 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 Update*Xpress* System Pack Installer

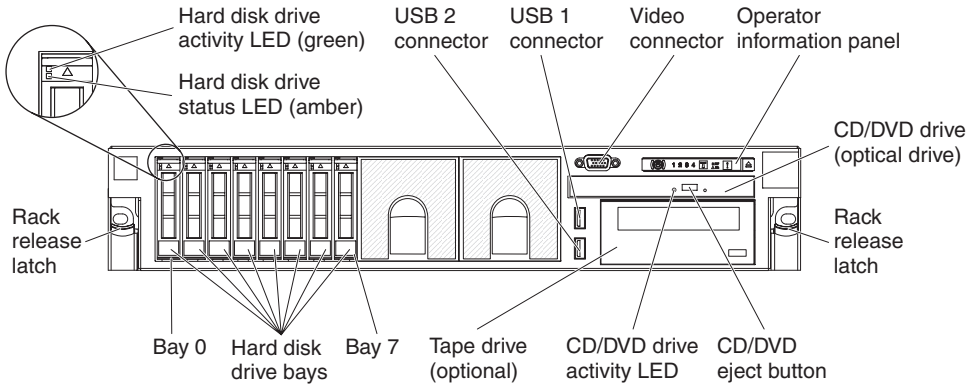
The Update*Xpress* System Pack Installer detects supported and installed device drivers and firmware in the server and installs available updates. For additional information and to download the Update*Xpress* System Pack Installer, go to the ToolsCenter for System x and BladeCenter at, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?lndocid=SERV-XPRESS&brandind=5000008.

Server controls, LEDs, and power

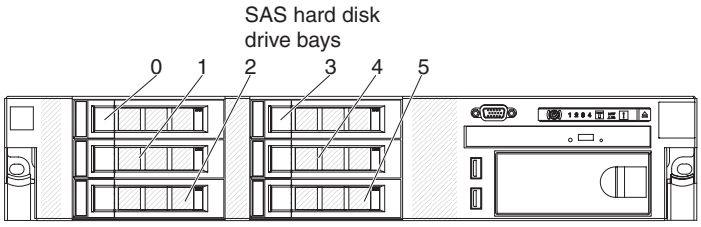
This section describes the controls and light-emitting diodes (LEDs) and how to turn the server on and off.

Front view

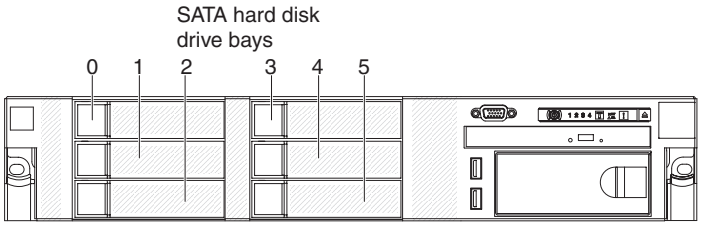
The following illustration shows the controls, LEDs, and connectors on the front of the 2.5-inch SAS/SATA hot-swap hard disk drive server model.



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



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



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

Hard disk drive status LED: Each 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.

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

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

Operator information panel: This panel contains controls, light-emitting diodes (LEDs), and connectors. For information about the controls and LEDs on the operator information panel, see “Operator information panel.”

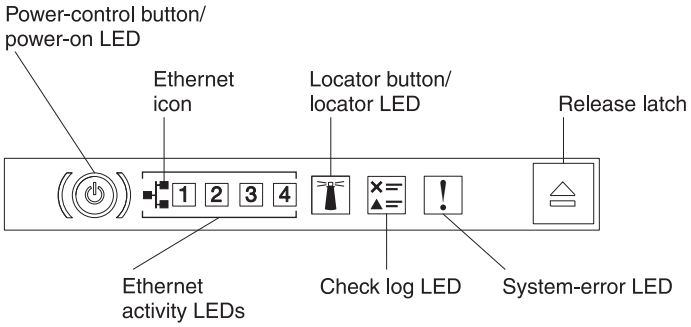
Rack release latches: Press these latches to release the server from the rack.

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

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

Operator information panel

The following illustration shows the controls and LEDs on the operator information panel.



The following controls and LEDs are on the operator information panel:

- **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 is 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

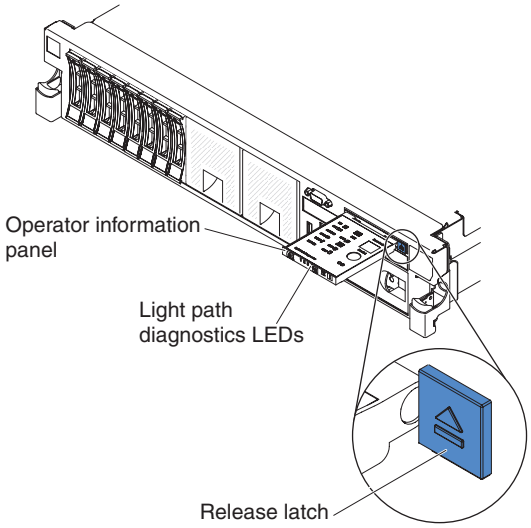
the light path diagnostics panel on the operator information panel or on the system board is also lit to help isolate the error. This LED is controlled by the IMM2.

Light path diagnostics panel

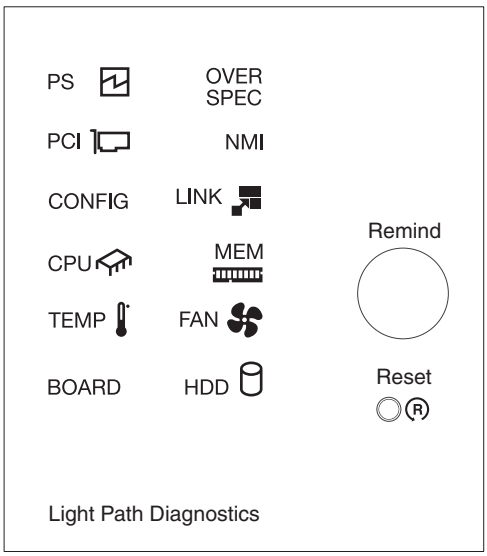
The light path diagnostics panel is located on the top of the operator information panel.

Note: The system service label on the underside of the cover also provides information about the location of the light path diagnostics LEDs.

To access the light path diagnostics panel, press the blue release latch on the 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 controls and LEDs on the light path diagnostics panel.



- **Remind button:** This button places the system-error LED/check log 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. The Reset button is in the lower right-hand corner of the light path diagnostics panel.

Light path diagnostics LEDs: The following table describes the LEDs on the light path diagnostics panel and suggested actions to correct the detected problems.

Table 2. Light path diagnostics panel LEDs

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.** • **If an action step is preceded by "(Trained technician only)," that step must be performed only by a trained technician.**		
LED	**Description**	**Action**
Check log LED	An error has occurred and cannot be isolated without performing certain procedures.	1. Check the IMM2 system event log and the system-error log for information about the error. 2. Save the log if necessary and clear the log afterwards.
System-error LED	An error has occurred.	1. Check the light path diagnostics LEDs and follow the instructions. 2. Check the IMM2 system event log and the system-error log for information about the error. 3. Save the log if necessary and clear the log afterwards.
PS	When only the PS LED is lit, a power supply has failed.	The system might detect a power supply error. Complete the following steps to correct the problem: 1. Check the power-supply with a lit yellow LED (see “Power-supply LEDs” on page 25). 2. Make sure that the power supplies are seated correctly and plugged in a good AC outlet. 3. Remove one of the power supplies to isolate the failed power supply. 4. Make sure that both power supplies installed in the server are of the same AC input voltage. 5. Replace the failed power supply (see “Installing a hot-swap ac power supply” on page 115).
	PS + CONFIG When both the PS and CONFIG LEDs are lit, the power supply configuration is invalid.	If the PS LED and the CONFIG LED are lit, the system issues an invalid power configuration error. Make sure that both power supplies installed in the server are of the same rating or wattage.

Table 2. Light path diagnostics panel LEDs (continued)

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.** • **If an action step is preceded by "(Trained technician only)," that step must be performed only by a trained technician.**		
LED	**Description**	**Action**
OVER SPEC	The system consumption reaches the power supply over-current protection point or the power supplies are damaged.	1. If the Pwr Rail (A, B, C, D, E, F, G, and H) error was not detected, complete the following steps: a. Use the IBM Power Configurator utility to determine current system power consumption. For more information and to download the utility, go to http://www-03.ibm.com/systems/bladecenter/resources/powerconfig.html. b. Replace the failed power supply (see “Installing a hot-swap ac power supply” on page 115). 2. If the Pwr Rail (A, B, C, D, E, F, G, and H) error was also detected, follow actions in the "Power problems" under the Troubleshooting tables and "Solving power problems" in the *Problem Determination and Service Guide*.
PCI	An error has occurred on a PCI card, a PCI bus, or on the system board. An additional LED is lit next to a failing PCI slot.	1. If the CONFIG LED is not lit, complete the following steps to correct the problem: a. Check the riser-card LEDs, the ServeRAID error LED, and the optional network adapter error LED to identify the component that caused the error. b. Check the system-error log for information about the error. c. If you cannot isolate the failing component by using the LEDs and the information in the system-error log, remove one component at a time; and restart the server after each component is removed. d. Replace the following components, in the order shown, restarting the server each time: • PCI riser cards • ServeRAID adapter • Optional network adapter • (Trained technician only) System board e. If the failure remains, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-CALL. 2. If the PCI LED and the CONFIG LED are lit, complete the following steps to correct the problem: a. Check the microprocessor installed is Intel E5-2690. b. Remove the high-power (>25 Watt) adapter. c. Check the system-error logs for information about the error. Replace any component that is identified in the error log.
NMI	A nonmaskable interrupt has occurred, or the NMI button was pressed.	1. Check the system-error log for information about the error. 2. Restart the server.

Table 2. Light path diagnostics panel LEDs (continued)

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **If an action step is preceded by "(Trained technician only)," that step must be performed only by a trained technician.**

LED	Description	Action
CONFIG	A hardware configuration error has occurred.	1. If the CONFIG LED and the PS LED are lit, the system issues an invalid power configuration error. Make sure that both power supplies installed in the server are of the same rating or wattage. 2. If the CONFIG LED and the PCI LED are lit, check the system-error logs for information about the error. Replace any component that is identified in the error log. 3. If the CONFIG LED and the CPU LED are lit, complete the following steps to correct the problem: a. Check the microprocessors that were just installed to make sure that they are compatible with each other (see “Installing a second microprocessor and heat sink” on page 101 for additional information about microprocessor requirements). b. (Trained technician only) Replace the incompatible microprocessor. c. Check the system-error logs for information about the error. Replace any component that is identified in the error log. 4. If the CONFIG LED and the MEM LED are lit, check the system-event log in the Setup utility or IMM2 error messages (see the *Problem Determination and Service Guide* for more information). 5. If the CONFIG LED and the HDD LED are lit, check the system-error logs for information about the error. Replace any component that is identified in the error log.
LINK	Reserved.	

Table 2. Light path diagnostics panel LEDs (continued)

- **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.**
- **If an action step is preceded by "(Trained technician only)," that step must be performed only by a trained technician.**

LED	Description	Action
CPU	When only the CPU LED is lit, a microprocessor has failed. When both the CPU and CONFIG LEDs are lit, the microprocessor configuration is invalid.	1. If the CONFIG LED is not lit, a microprocessor failure occurs, complete the following steps: a. (Trained technician only) Make sure that the failing microprocessor and its heat sink, which are indicated by a lit LED on the system board, are installed correctly. See “Installing a second microprocessor and heat sink” on page 101 for information about installation and requirements. b. (Trained technician only) Replace the failing microprocessor (see “Installing a second microprocessor and heat sink” on page 101). c. For more information, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-CALL. 2. If the CONFIG LED and the CPU LED are lit, the system issues an invalid microprocessor configuration error. Complete the following steps to correct the problem: a. Check the microprocessors that were just installed to make sure that they are compatible with each other (see “Installing a second microprocessor and heat sink” on page 101 for additional information about microprocessor requirements). b. (Trained technician only) Replace the incompatible microprocessor. c. Check the system-error logs for information about the error. Replace any component that is identified in the error log.
MEM	When only the MEM LED is lit, a memory error has occurred. When both the MEM and CONFIG LEDs are lit, the memory configuration is invalid.	**Note:** Each time you install or remove a DIMM, you must disconnect the server from the power source; then, wait 10 seconds before restarting the server. 1. If the CONFIG LED is not lit, the system might detect a memory error. Complete the following steps to correct the problem: a. Update the server firmware to the latest level (see the *Problem Determination and Service Guide* for more information). b. Reseat or swap the DIMMs. c. Check the system-event log in the Setup utility or IMM error messages (see the *Problem Determination and Service Guide* for more information). d. Replace the failing DIMM (see “Installing a memory module” on page 107). 2. If the MEM LED and the CONFIG LED are lit, check the system-event log in the Setup utility or IMM error messages (see the *Problem Determination and Service Guide* for more information).

Table 2. Light path diagnostics panel LEDs (continued)

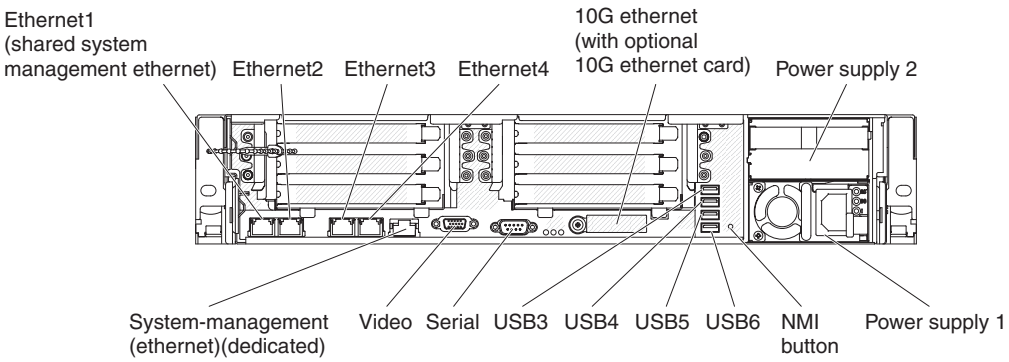
• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.** • **If an action step is preceded by "(Trained technician only)," that step must be performed only by a trained technician.**		
LED	**Description**	**Action**
TEMP	The system or the system component temperature has exceeded a threshold level. A failing fan can cause the TEMP LED to be lit.	1. Make sure that the heat sink is seated correctly. 2. Determine whether a fan has failed. If it has, replace it. 3. Make sure that the room temperature is not too high. See "Features and specifications" on page 7 for the server temperature information. 4. Make sure that the air vents are not blocked. 5. Make sure that the heat sink, the fan on the adapter, or the optional network adapter is seated correctly. If the fan has failed, replace it. 6. If the failure remains, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&lndocid=SERV-CALL.
FAN	A fan has failed, is operating too slowly, or has been removed. The TEMP LED might also be lit.	1. Reseat the failing fan, which is indicated by a lit LED near the fan connector on the system board. 2. Replace the failing fan (see "Installing a dual-motor hot-swap fan" on page 124).
BOARD	An error has occurred on the system board.	1. Check the LEDs on the system board to identify the component that caused the error. The BOARD LED can be lit due to any of the following reasons: • Battery • (Trained technician only) System board 2. Check the system-error log for information about the error. 3. Replace the failing component: • Battery • (Trained technician only) System board

Table 2. Light path diagnostics panel LEDs (continued)

• **Follow the suggested actions in the order in which they are listed in the Action column until the problem is solved.** • **If an action step is preceded by "(Trained technician only)," that step must be performed only by a trained technician.**		
LED	**Description**	**Action**
HDD	A hard disk drive has failed or is missing.	1. If the CONFIG LED is not lit, complete the following steps to correct the problem: a. Check the LEDs on the hard disk drives for the drive with a lit status LED and reseat the hard disk drive. b. Reseat the hard disk drive backplane. c. For more information, see the "Hard disk drive problems" under the Troubleshooting tables in the *Problem Determination and Service Guide*. d. If the error remains, replace the following components one at a time, in the order listed, restarting the server after each: 1) Replace the hard disk drive. 2) Replace the hard disk drive backplane. e. If the problem remains, go to http://www.ibm.com/systems/support/supportsite.wss/docdisplay?brandind=5000008&Indocid=SERV-CALL. 2. If the HDD LED and the CONFIG LED are lit, complete the following steps to correct the problem: a. Check the microprocessor installed is Intel E5-2690. If it is, check the 2.5-inch hard disk drives installed is lesser than eight. b. Check the system-error logs for information about the error. Replace any component that is identified in the error log.

Rear view

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



Ethernet connectors: Use either of these connectors to connect the server to a network. When you enable shared Ethernet for IMM2 in the Setup utility, you can access the IMM2 using either the Ethernet 1 or the system-management Ethernet (default) connector. See "Using the Setup utility" on page 145 for more information.

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

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

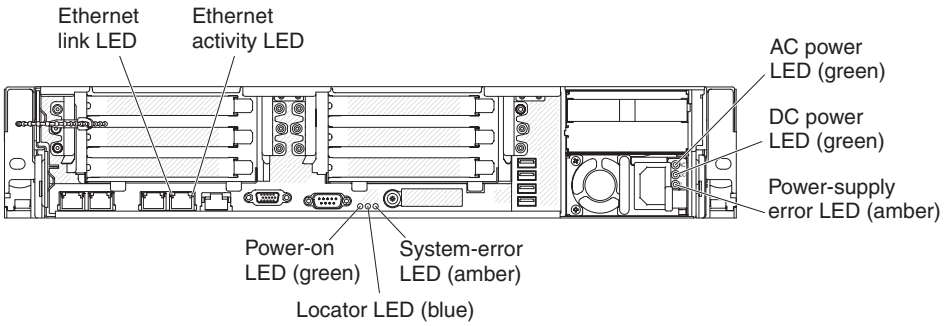
Serial connector: Connect a 9-pin serial device to this connector. The serial port is shared with the integrated management module II (IMM2). The IMM2 can take control of the shared serial port to redirect serial traffic, using Serial over LAN (SOL).

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

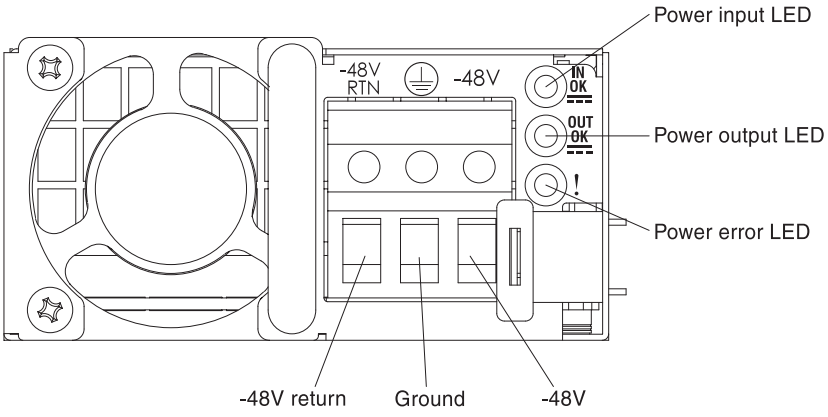
Note: The maximum video resolution is 1600 x 1200 at 75 Hz.

Systems-management Ethernet connector: Use this connector to connect the server to a network for full systems-management information control. This connector is used only by the integrated baseboard management controller (iBMC). A dedicated management network provides additional security by physically separating the management network traffic from the production network. You can use the Setup utility to configure the server to use a dedicated systems management network or a shared network.

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



The following illustration shows the LEDs on a dc power supply.



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 the *Problem Determination and Service Guide* on the IBM *Documentation* CD.

DC power LED: Each hot-swap power supply has a dc power LED and an ac power LED. When the dc power LED is lit, it indicates that the power supply is supplying adequate dc power to the system. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *Documentation* CD.

IN OK power LED: Each hot-swap dc power supply has an IN OK power LED. When the IN OK power LED is lit, it indicates that sufficient power is coming into the power supply through the power cord. During typical operation, both the IN OK and OUT OK power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.

OUT OK power LED: Each hot-swap dc power supply has an OUT OK power LED. When the OUT OK power LED is lit, it indicates that the power supply is supplying adequate dc power to the system. During typical operation, both the IN OK and OUT OK power LEDs are lit. For any other combination of LEDs, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.

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

Note: Power supply 1 is the default/primary power supply. If power supply 1 fails, you must replace the power supply immediately.

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. This LED is the same as the system-error LED on the front of the server.

Locator LED: Use this LED to visually locate the server among other servers. You can use IBM Systems Director to light this LED remotely. This LED is the same as the system-locator LED on the front of the server.

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

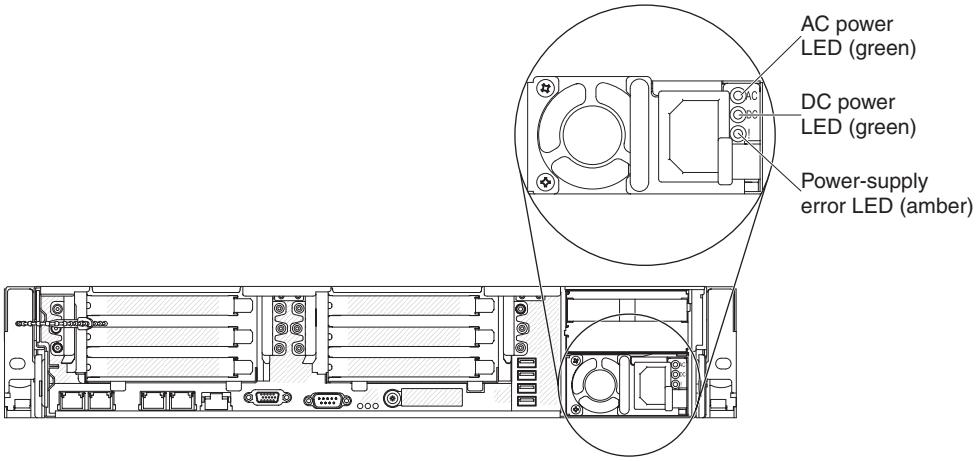
Flashing rapidly (4 times per second): The server is turned off and is not ready to be turned on. The power-control button is disabled. This will last approximately 5 to 10 seconds.

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.

Power-supply LEDs

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



The following table describes the problems that are indicated by various combinations of the power-supply LEDs and the power-on LED on the operator information panel and suggested actions to correct the detected problems.

AC power-supply LEDs					
AC	**DC**	**Error (!)**	**Description**	**Action**	**Notes**
On	On	Off	Normal operation.		
Off	Off	Off	No ac power to the server or a problem with the ac power source.	1. Check the ac power to the server. 2. Make sure that the power cord is connected to a functioning power source. 3. Restart the server. If the error remains, check the power-supply LEDs. 4. If the problem remains, replace the power-supply.	This is a normal condition when no ac power is present.
Off	Off	On	The power supply has failed.	Replace the power supply.	
Off	On	Off	The power supply has failed.	Replace the power supply.	
Off	On	On	The power supply has failed.	Replace the power supply.	

AC power-supply LEDs			Description	Action	Notes
AC	DC	Error (!)			
On	Off	Off	Power-supply not fully seated, faulty system board, or the power supply has failed.	1. Reseat the power supply. 2. Follow actions in the “Power problems” under the Troubleshooting tables in the *Problem Determination and Service Guide*. 3. If the OVER SPEC LED on the light path diagnostics is lit, follow the actions in “Light path diagnostics LEDs” on page 18. 4. If the OVER SPEC LED on the light path diagnostics is not lit, check the error LEDs on the system board and the IMM2 error messages. Follow steps in the “Power problems” under the Troubleshooting tables in the *Problem Determination and Service Guide* and “Solving Power problems” in the *Problem Determination and Service Guide* until the problem is solved.	Typically indicates a power-supply is not fully seated.
On	Off	On	The power supply has failed.	Replace the power supply.	
On	On	On	The power supply has failed.	Replace the power supply.	

Server power features

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

Turning on the server

Approximately 5 seconds after the server is connected to power, one or more fans might start running to provide cooling while the server is connected to power and the power-on button LED will blink quickly. Approximately 5 to 10 seconds after the server is connected to power, the power-control button becomes active (the power-on LED will blink slowly), and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server by pressing the power-control button.

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

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

Notes:

1. When 4 GB or more of memory (physical or logical) is installed, some memory is reserved for various system resources and is unavailable to the operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.
2. Ethernet 1 connector supports Wake on LAN feature.
3. When you turn on the server with the graphical adapters installed, the IBM logo displays on the screen after approximately 3 minutes. This is normal operation while the system loads.

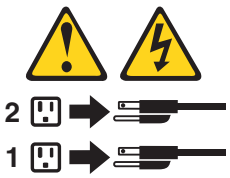
Turning off the server

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

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

Statement 5:

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



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

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will turn off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- The server can be turned off by Wake on LAN feature with the following limitation:

Note: When you install any PCI adapter, the power cords must be disconnected from the power source before you remove the PCI Express riser-card assembly and the PCI-X riser-card assembly. Otherwise, the Wake on LAN feature might not work.

- The integrated management module II (IMM2) can turn off the server as an automatic response to a critical system failure.

Chapter 2. Installing optional devices

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

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.

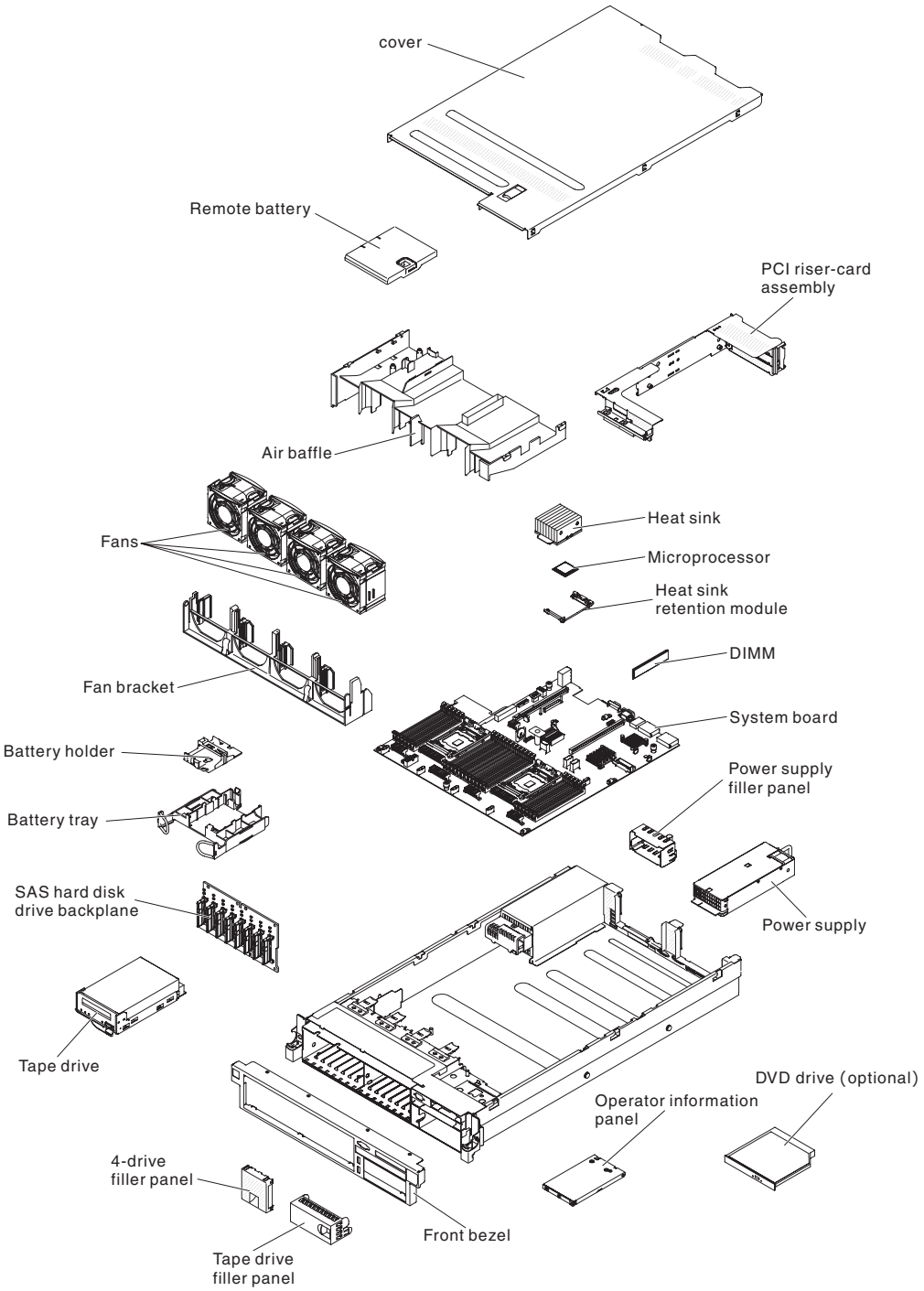
You can use any of the following methods to send diagnostic data to IBM:

- **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

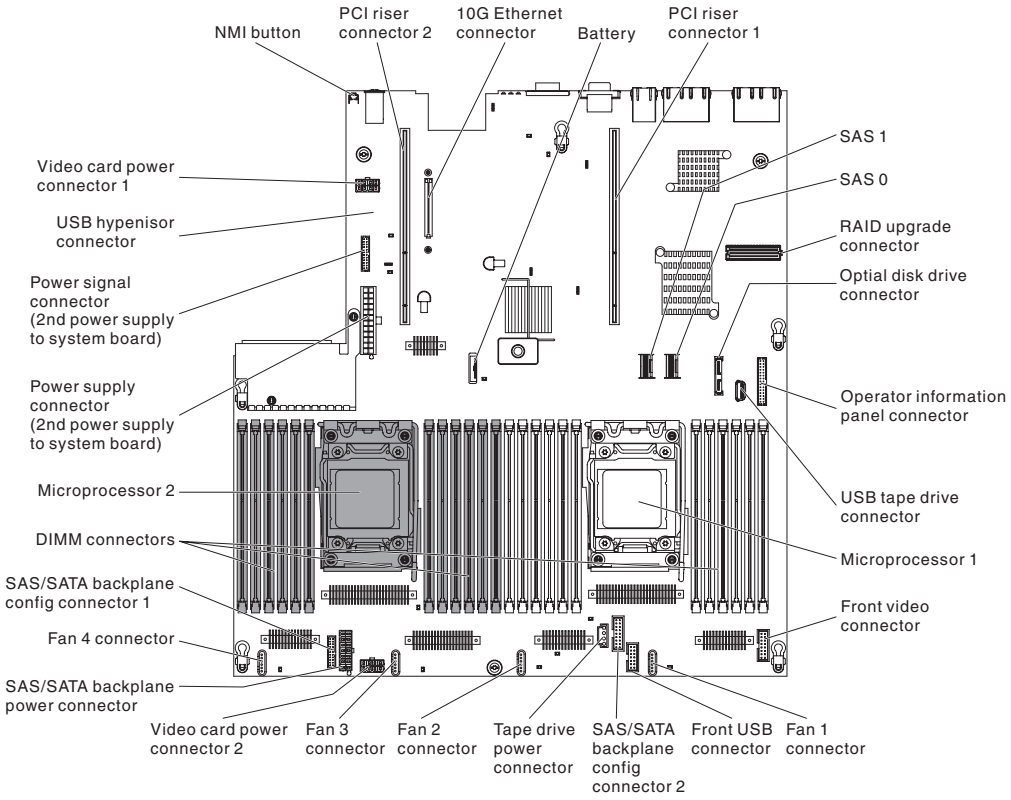
The following illustrations show the major components in the server.

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



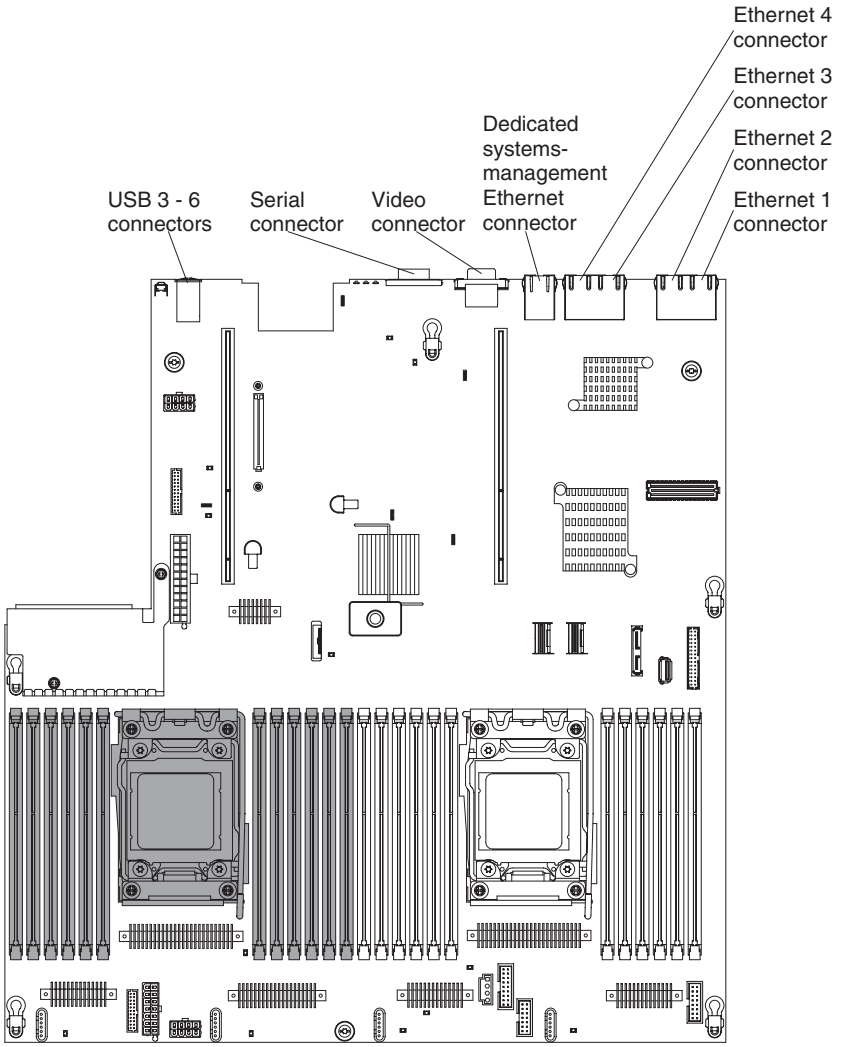
System-board internal connectors

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



System-board external connectors

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

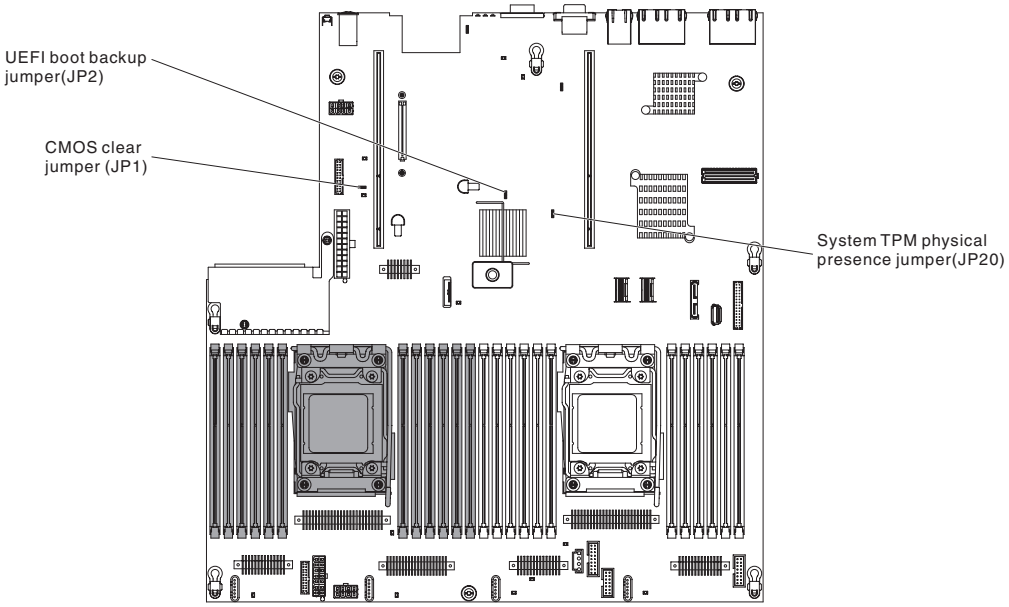


System-board switches and jumpers

The following illustration shows the location and description of the switches and jumpers.

Note: If there is a clear protective sticker on the top of the switch blocks, you must remove and discard it to access the switches.

The default positions for the UEFI and the IMM recovery jumpers are pins 1 and 2.



The following table describes the jumpers on the system board.

Table 3. System board jumpers

Jumper number	Jumper name	Jumper setting
JP1	CMOS clear jumper	• Pins 1 and 2: Normal (default). • Pins 2 and 3: Clears the real-time clock (RTC) registry.
JP2	UEFI boot backup jumper	• Pins 1 and 2: Normal (default). Loads the primary server firmware ROM page. • Pins 2 and 3: Loads the secondary (backup) server firmware ROM page.
JP20	System TPM physical presence jumper	• Pins 1 and 2: Normal (default). • Pins 2 and 3: Indicates a physical presence to the system TPM.
Note: Changing the position of the UEFI boot recovery jumper from pins 1 and 2 to pins 2 and 3 before the server is turned on alters which flash ROM page is loaded. Do not change the jumper pin position after the server is turned on. This can cause an unpredictable problem.		

The following table describes the functions of the SW3 switch block on the system board.

Table 4. System board SW3 switch block definition

Switch number	Default position	Description
1	Off	Reserved.
2	Off	Reserved.
3	Off	Power-on override. When this switch is toggled to On and then to Off, you force a power-on which overrides the power-on and power-off button on the server and they become nonfunctional.
4	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the server is turned on and starts the Setup utility so that you can change or delete the power-on password. You do not have to move the switch back to the default position after the power-on password in overridden. Changing the position of this switch does not affect the administrator password check if an administrator password is set. See “Passwords” on page 148 for additional information about passwords.

The following table describes the functions of the SW2 switch block on the system board.

Table 5. System board SW2 switch block definition

Switch number	Default position	Description
1	Off	Forced power permission overrides the IMM power-on checking process. (Trained service technician only).
2	Off	Reserved.
3	Off	Reserved.
4	Off	Reserved.

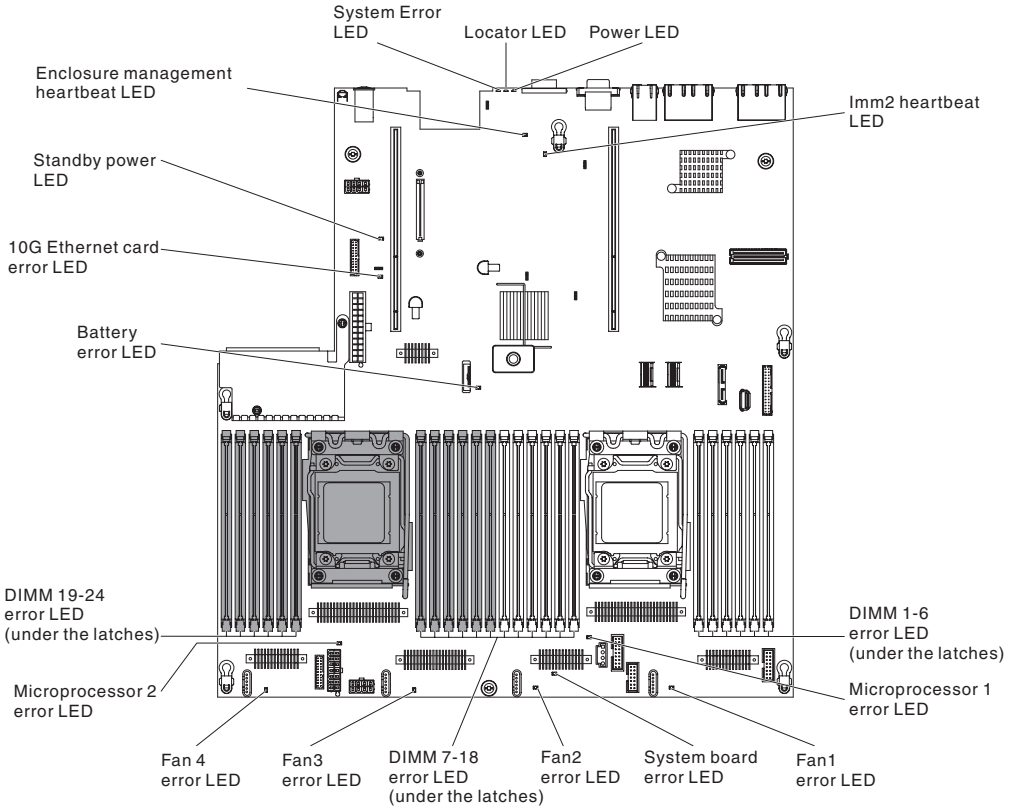
Important:

1. Before you change any switch settings or move any jumpers, turn off the server; then, disconnect all power cords and external cables. (Review the information in “Safety” on page vii, “Installation guidelines” on page 40, “Handling static-sensitive devices” on page 42, and “Turning off the server” on page 28.)
2. Any system-board switch or jumper blocks that are not shown in the illustrations in this document are reserved.

System-board LEDs

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

Note: Error LEDs remain lit only while the server is connected to power.



System pulse LEDs

The following LEDs are on the system board and monitor the system power-on and power-off sequencing and boot progress (see “System-board LEDs” for the location of these LEDs).

Table 6. System-pulse LEDs

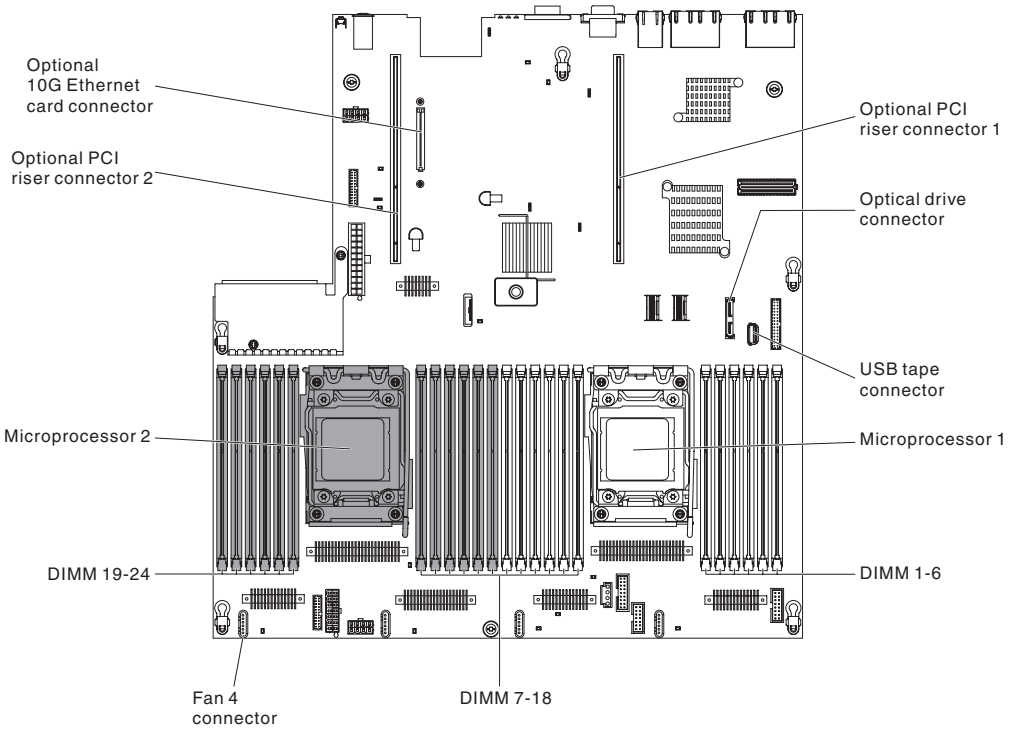
LED	Description	Action
RTMM heartbeat	Power-on and power-off sequencing.	1. If the LED blinks at 1Hz, it is functioning properly and no action is necessary. 2. If the LED is not blinking, (Trained technician only) replace the system board.

Table 6. System-pulse LEDs (continued)

LED	Description	Action
IMM2 heartbeat	IMM2 heartbeat boot process.	The following steps describe the different stages of the IMM2 heartbeat sequencing process. 1. When this LED is blinking fast (approximately 4Hz), this indicates, that the IMM2 code is in the loading process. 2. When this LED goes off momentarily, this indicates that the IMM2 code has loaded completely. 3. When this LED goes off momentarily and then starts blinking slowing (approximately 1Hz), this indicates that IMM2 is fully operational. You can now press the power-control button to power-on the server. 4. If this LED does not blink within 30 seconds of connecting a power source to the server, complete the following steps: a. (Trained technician only) Replace the system board.

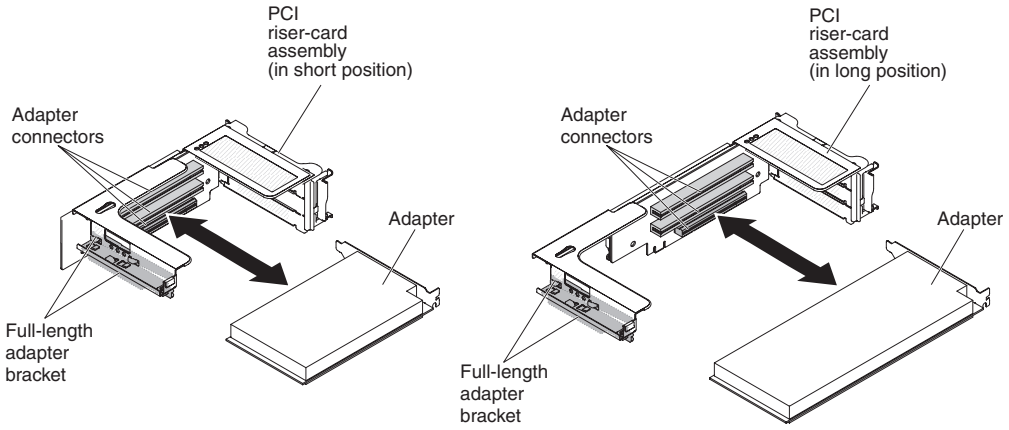
System-board optional device connectors

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



PCI riser-card adapter connectors

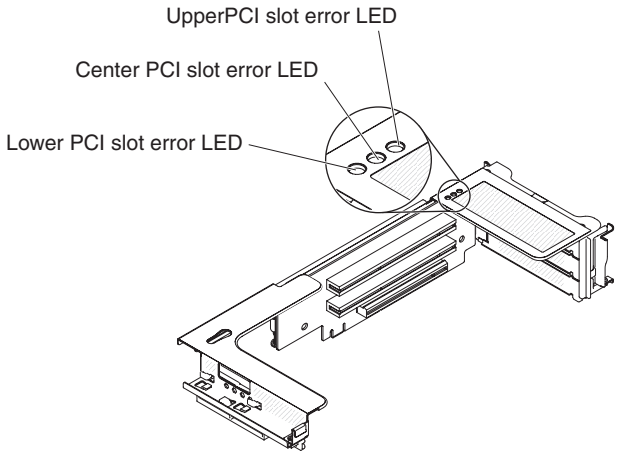
The following illustration shows the connectors on the PCI riser card for user-installable PCI adapters.



PCI riser-card assembly LEDs

The following illustration shows the light-emitting diodes (LEDs) on the PCI riser-card assembly.

Note: Error LEDs remain lit only while the server is connected to power.



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.

Before you install optional devices, read the following information:

- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Read the safety information that begins on page vii, the guidelines in "Working inside the server with the power on" on page 41, and "Handling static-sensitive devices" on page 42. 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, go to http://www.ibm.com/support/fixcentral/.

  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.

  For additional information about tools for updating, managing, and deploying firmware, see the ToolsCenter for System x and BladeCenter 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 *System x 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 server cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.
- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver, a small Phillips screwdriver, and a T8 torx screwdriver available.

- You do not have to turn off the server to install or replace hot-swap power supplies, dual-motor hot-swap fans, or hot-plug Universal Serial Bus (USB) devices. However, you must turn off the server before you perform any steps that involve removing or installing adapter cables and you must disconnect the power source from the server before you perform any steps that involve removing or installing a riser card.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- When you are finished working on the server, reinstall all safety shields, guards, labels, and ground wires.
- For a list of supported optional devices for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

System reliability guidelines

To help ensure proper 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 dual-motor hot-swap fan within 30 seconds of removal.
- You have replaced a hot-swap drive within 2 minutes of removal.
- You do not operate the server without the air baffle installed. Operating the server without the air baffle might cause the microprocessor to overheat.
- Microprocessor socket 2 always contains either a socket cover or a microprocessor and heat sink.
- You have installed the fourth and sixth fans when you installed the second microprocessor option.

Working inside the server with the power on

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

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

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

Handling static-sensitive devices

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

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

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

Internal cable routing and connectors

The following illustration shows the internal routing and connectors for the cables. The following notes describe additional information you must consider when you install or remove the cables:

- To remove the cables, slightly press the cables toward the chassis; then, pull to remove the cables from the connectors on the system board. Pulling the cable out of the connector by excessive force might cause damage to the cable or connector.
- To connect the cables on the system board, press evenly on the cables. Pressing on one side of the cable might cause damage to the cable or connector.

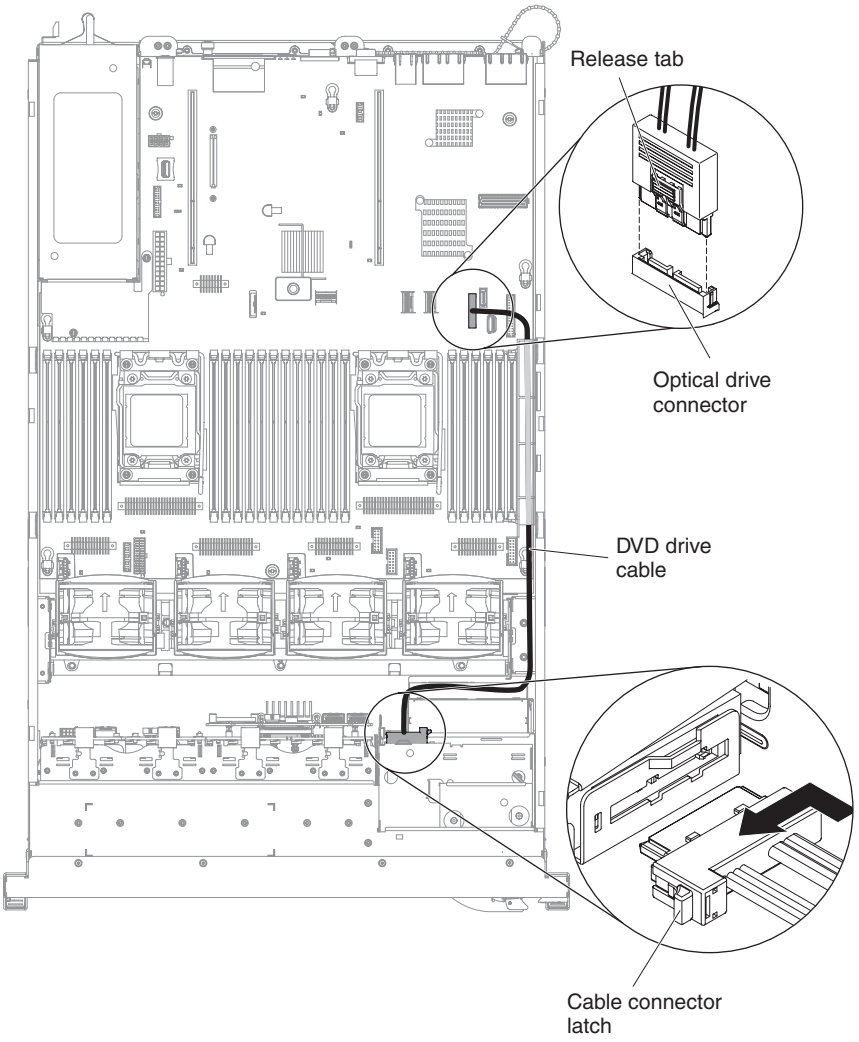
General

Optional optical drive cable connection

The following illustration shows the internal routing and connector for the optional optical drive cable.

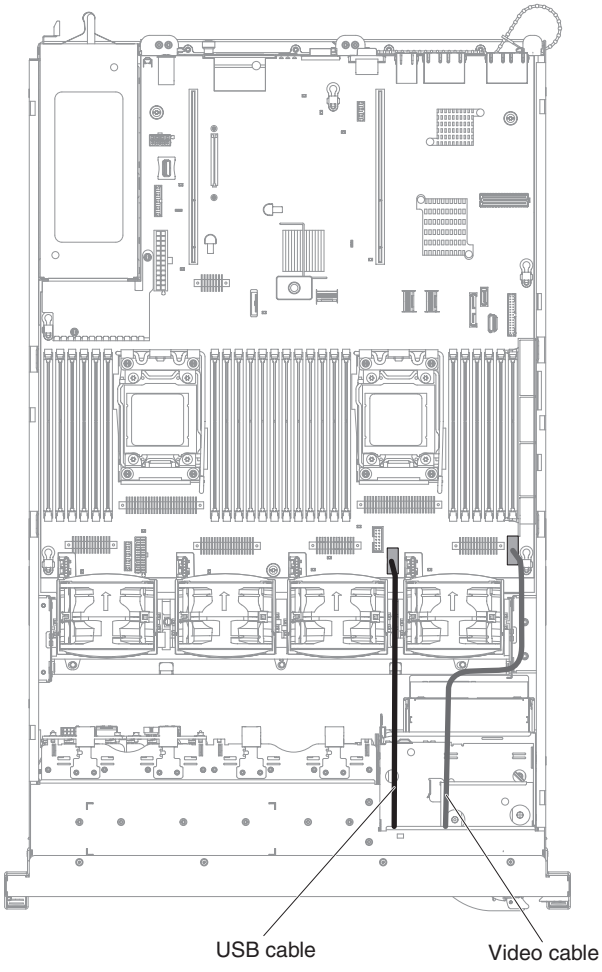
Notes:

1. To disconnect the optional optical drive cable, you must first press the connector release tab, and then disconnect the cable from the connector on the system board. Do not disconnect the cable by using excessive force. Failing to disconnect the cable properly may damage the connector on the system board. Any damage to the connector may require replacing the system board.
2. Follow the optical drive cable routing as the illustration shows. Make sure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.


Release tab
Optical drive connector
DVD drive cable
Cable connector latch

USB and video cable connection

The following illustration shows the internal routing and connectors for the front USB and video cables.

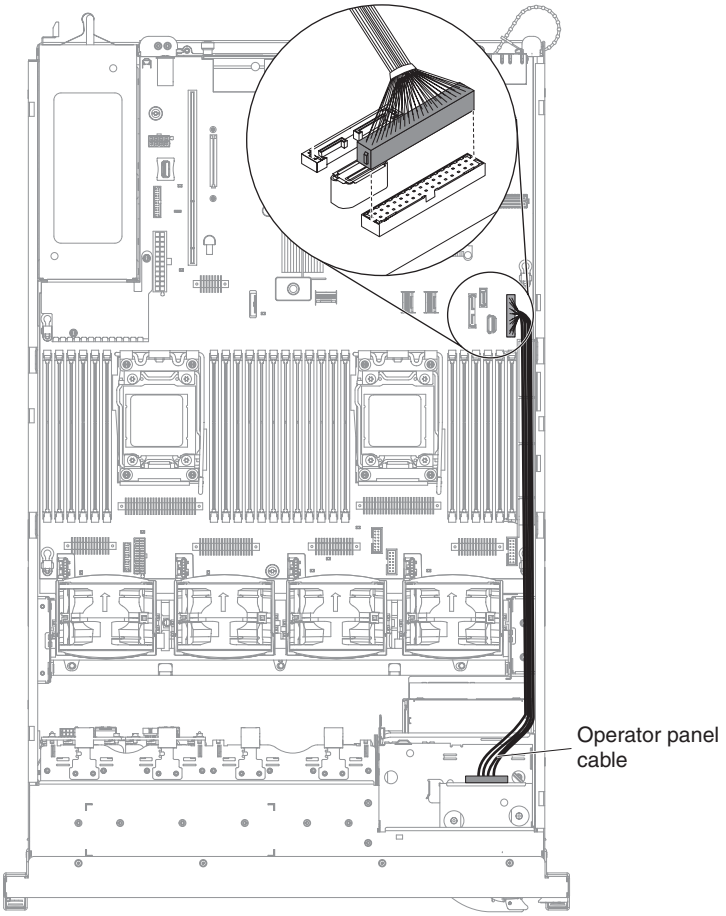


Operator information panel cable connection

The following illustration shows the internal routing and connector for the operator information panel cable. The following notes describe additional information you must consider when you install or remove the operator information panel cable:

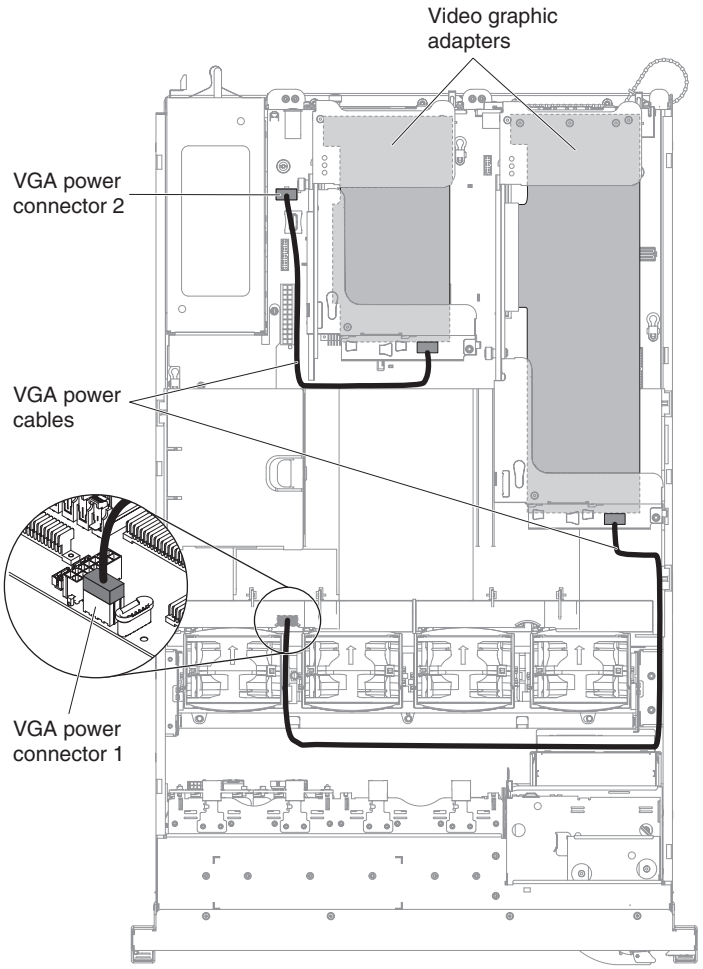
- You may remove the optional optical drive cable to obtain more room before you install or remove the operator information panel cable.
- To remove the operator information panel cable, slightly press the cable toward the chassis; then, pull to remove the cable from the connector on the system board. Pulling the cable out of the connector by excessive force might cause damage to the cable or connector.
- To connect the operator information panel cable on the system board, press evenly on the cable. Pressing on one side of the cable might cause damage to the cable or connector.

  Attention: Failing to install or remove the cable with care may damage the connectors on the system board. Any damage to the connectors may require replacing the system board.



VGA cable connections

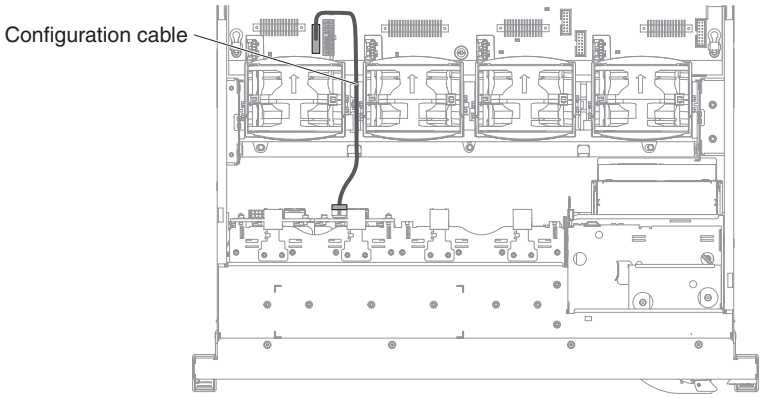
The following illustration shows the internal routing and connectors for the video graphic adapter (VGA) cables.



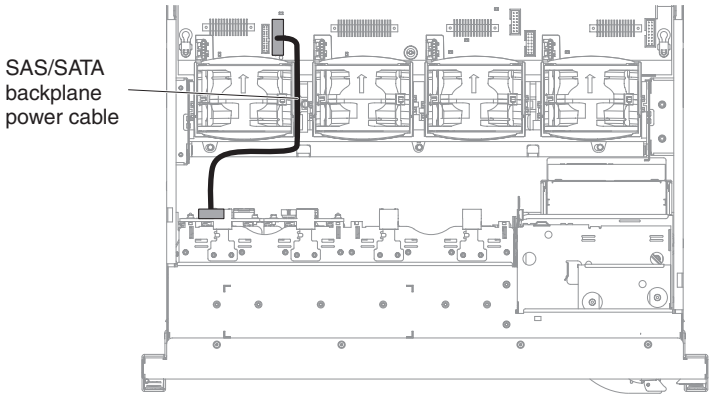
2.5-inch hard disk drive cable connection

8-drive-capable model

Configuration cable connection: The following illustration shows the internal routing for the configuration cable.



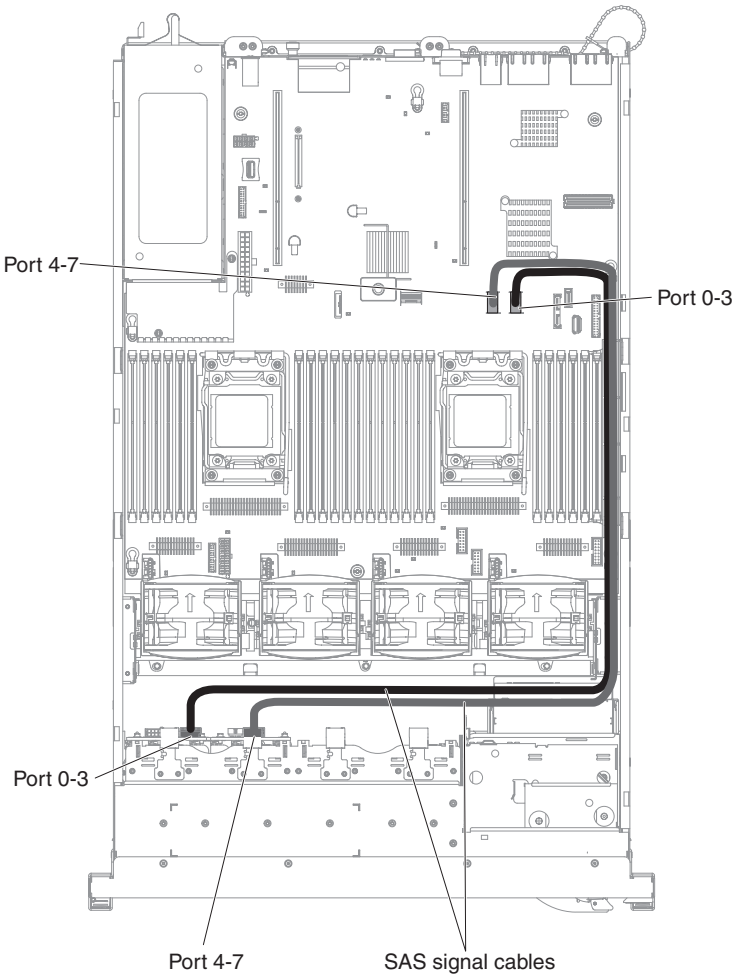
Power cable connection: The following illustration shows the internal routing for the hard disk drive power cable.



Hard disk drive cable connection: The following illustration shows the internal routing and connectors for the two SAS signal cables.

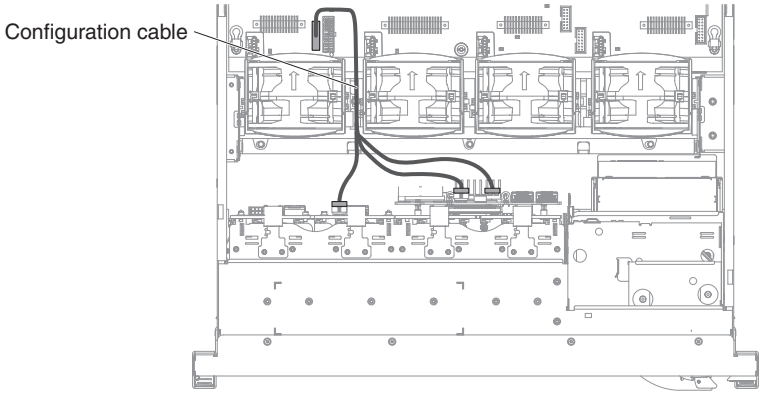
Notes:

1. To connect the SAS signal cables, make sure that you first connect the signal cable, and then the power cable and configuration cable.
2. To disconnect the SAS signal cables, make sure that you first disconnect the power cable, and then the signal cable and configuration cable.

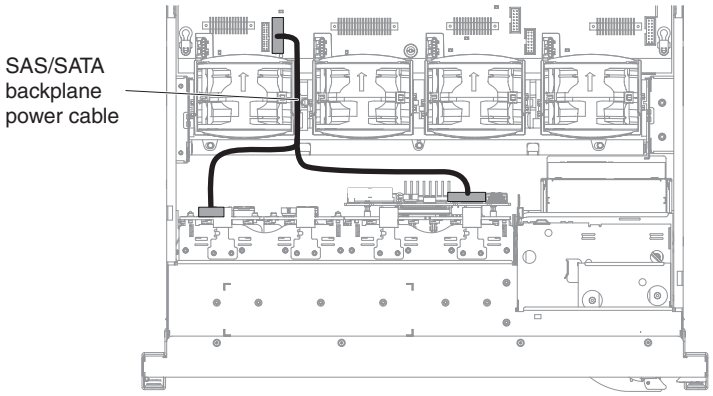


16-drive-capable model

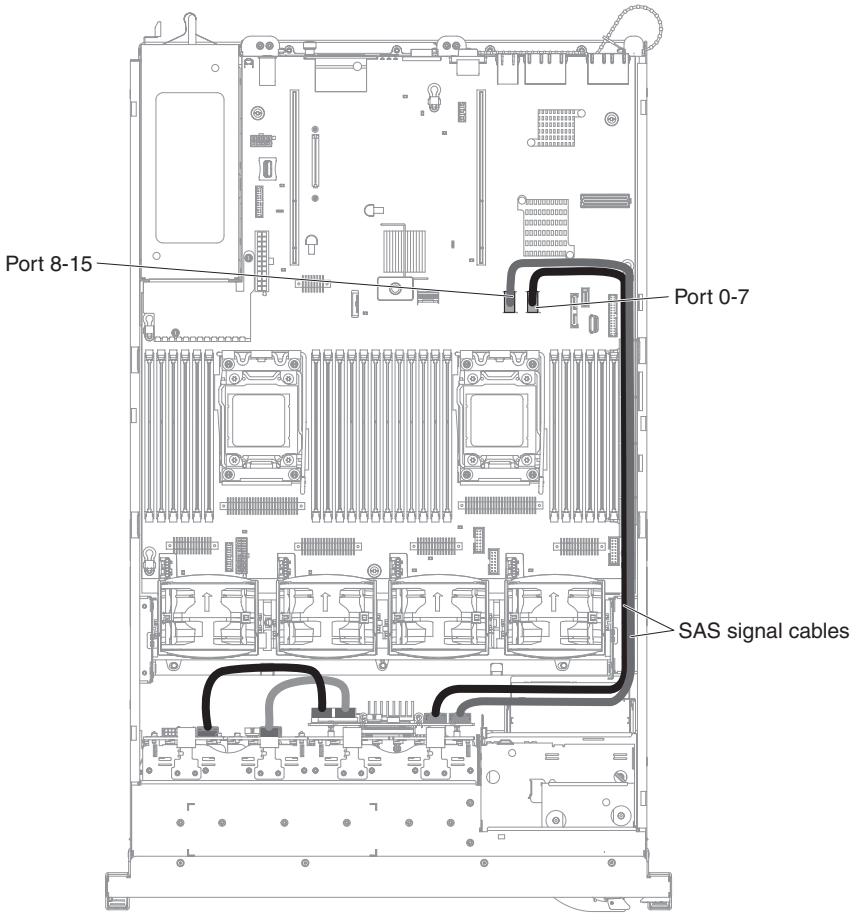
Configuration cable connection: The following illustration shows the internal routing for the configuration cable.



Power cable connection: The following illustration shows the internal routing for the hard disk drive power cable.



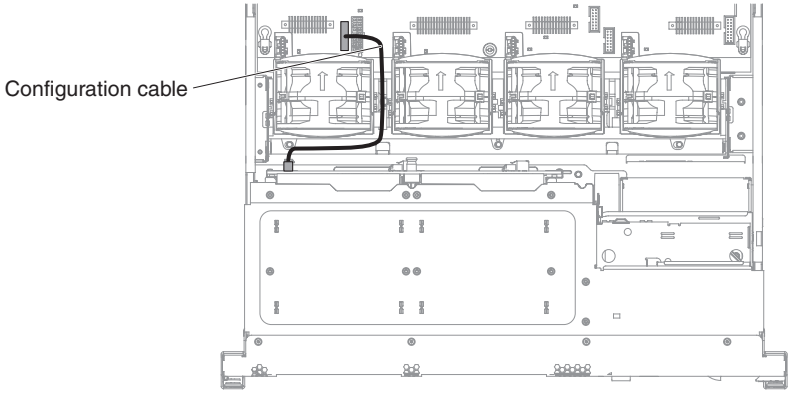
Hard disk drive cable connection: The following illustration shows the internal routing and connectors for the two SAS signal cables.



3.5-inch hard disk drive cable connection

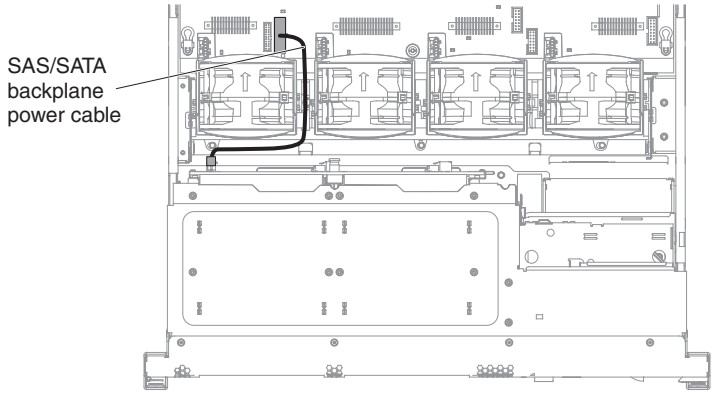
Configuration cable connection

The following illustration shows the internal routing for the configuration cable.



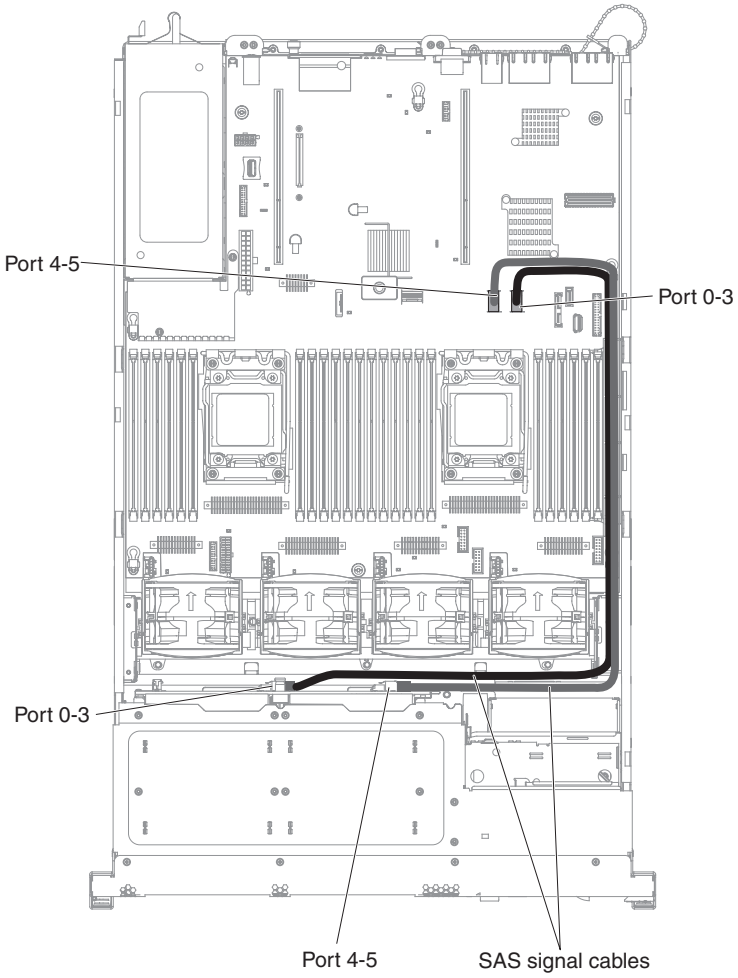
Power cable connection

The following illustration shows the internal routing for the hard disk drive power cable.



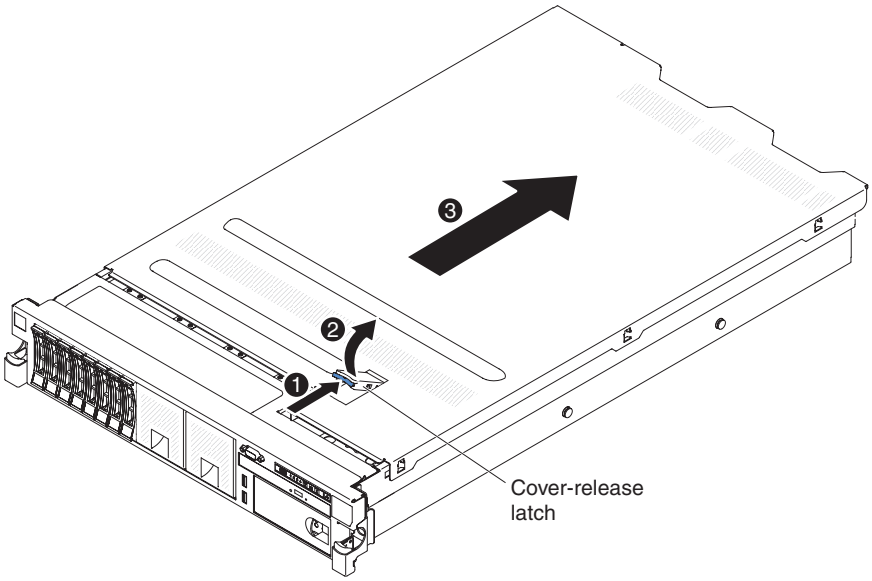
Hard disk drive cable connection

The following illustration shows the internal routing and connectors for the two SAS signal cables.



Removing the cover

The following illustration shows how to remove the cover.



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

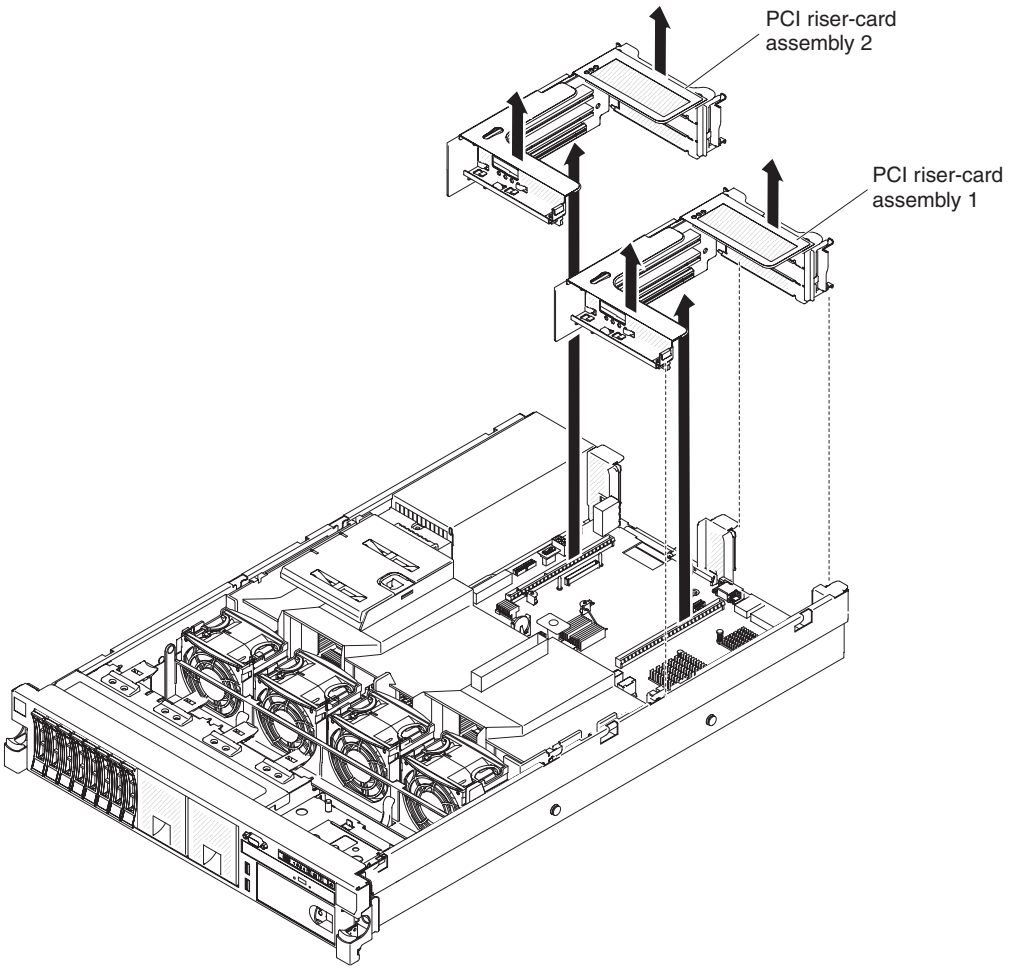
To remove the cover, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. If you are planning to view the error LEDs that are on the system board and components, leave the server connected to power and go directly to step 4.
3. 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 28).
4. Press the blue latch **1** on the top (in the center of the front of the server) and lift the cover-release latch **2**. Slide the cover toward the rear **3** and 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. If you operate the server for extended periods of time (over 30 minutes) with the cover removed, the IMM turns off the server.

Removing a PCI riser-card assembly

The server comes with one riser-card assembly (with option to add one more) that each contains two to three PCI slots. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of riser-card assemblies that you can use with the server.



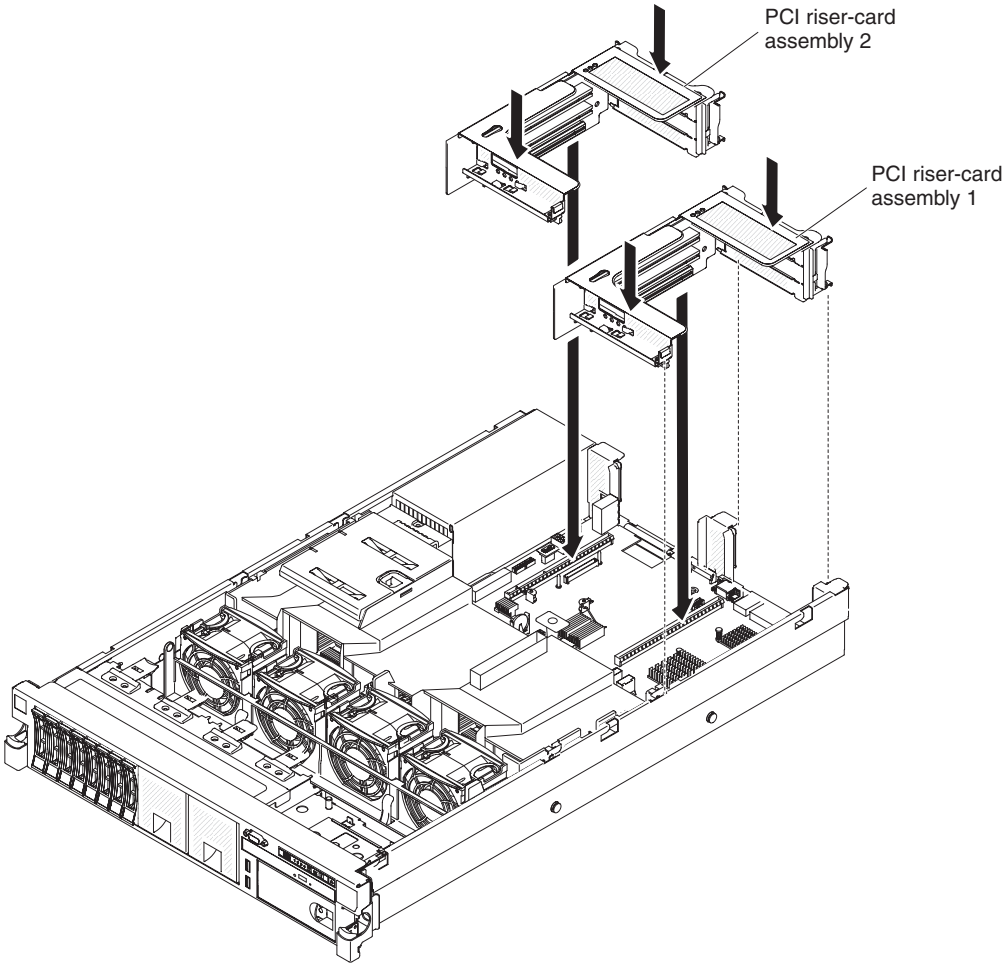
To remove the riser-card assembly, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables.
3. Remove the cover (see “Removing the cover” on page 54).
4. Grasp the assembly at the front tab and rear edge and lift it to remove it from the server. Place the riser-card assembly on a flat, static-protective surface.

Installing a PCI riser-card assembly

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

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

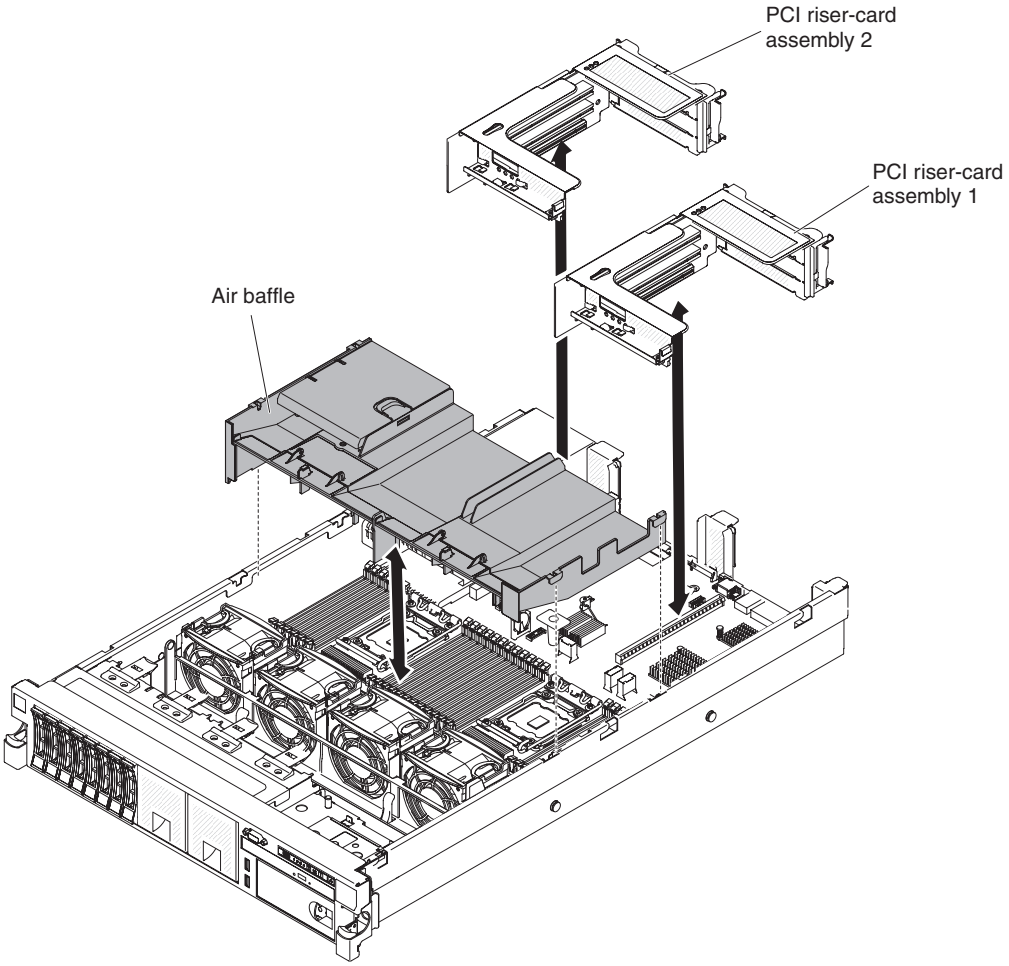


1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Make sure that the server and all peripheral devices are turned off and that the power cords and all external cables are disconnected.
3. Reinstall any adapters and reconnect any internal cables that you removed in other procedures.
4. Align the PCI riser-card assembly with the selected PCI riser-card connector on the system board:
   - PCI riser-card connector 1: Carefully fit the two alignment slots on the side of the assembly onto the two alignment brackets in the side of the chassis.
   - PCI riser-card connector 2: Carefully align the bottom edge (the contact edge) of the riser-card assembly with the PCI riser-card connector on the system board.
5. Press down on the assembly. Make sure that the riser-card assembly is fully seated in the riser-card connector on the system board.

If you have other devices to install, do so now. Otherwise, go to “Completing the installation” on page 135.

Removing the air baffle

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



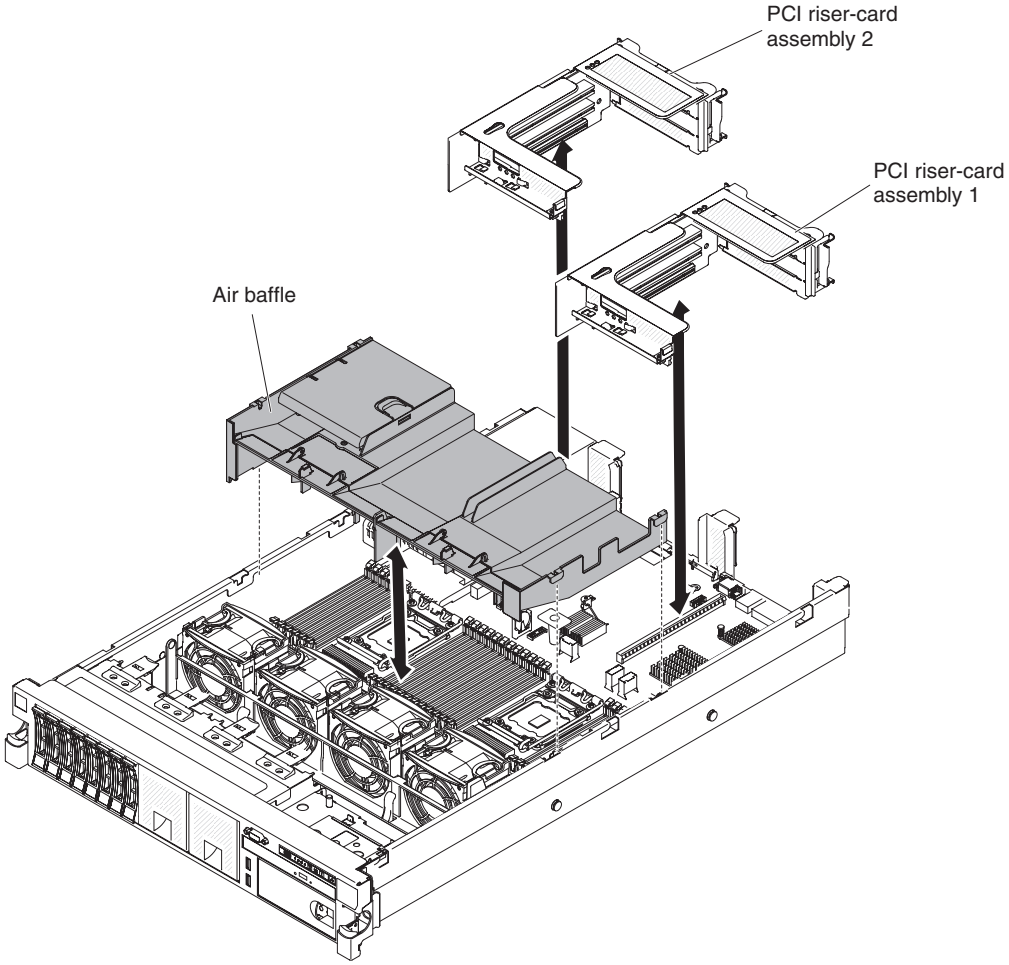
To remove the air baffle, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the cover (see “Removing the cover” on page 54).
4. Remove PCI riser-card assembly 1, if needed (see “Removing a PCI riser-card assembly” on page 55).
5. Place your fingers under the front and back of the top of the air baffle; then, lift the air baffle out of the server.

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

Installing the air baffle

The following illustration shows how to install the air baffle.



To install the air baffle, complete the following steps:

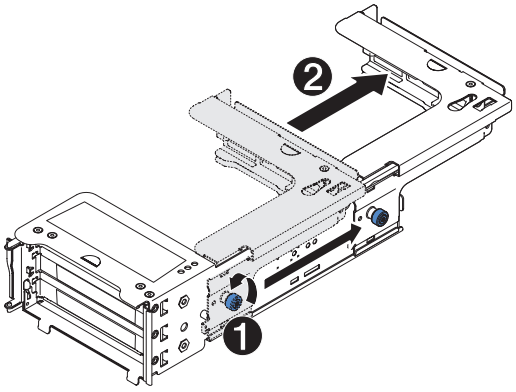
1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Make sure that the server and peripheral devices are turned off (see “Turning off the server” on page 28) and that all power cords and external cables are disconnected.
3. Remove the cover (see “Removing the cover” on page 54).
4. Make sure that PCI riser-card assembly 1 is removed if it is in long position and sitting on the air baffle (see “Removing a PCI riser-card assembly” on page 55).
5. Align the air baffle with the two slots on both sides of chassis.
6. Lower the air baffle into place.
7. Install PCI riser-card assembly 1, if needed (see “Installing a PCI riser-card assembly” on page 56.

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.

Stretching a PCI riser-card assembly

Note: It is not necessary to capture adaptor card with the full-length adaptor bracket when installing half length adaptor cards.

If you are installing a full-length adapter in the upper riser-card PCI slot, you must first stretch the PCI riser-card assembly.

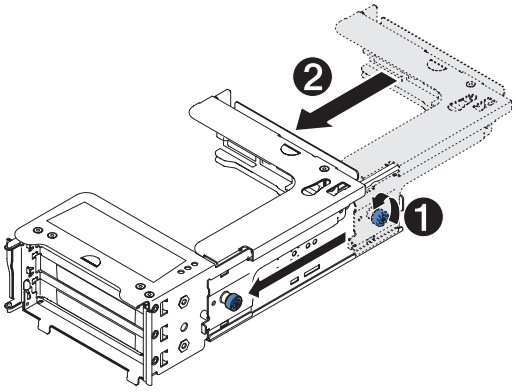


To stretch the riser-card assembly, complete the following steps:

1. Orient the riser-card assembly as shown.
2. Rotate the thumb screw **1**, which is close by the PCI slot end, counterclockwise and lengthen the PCI riser-card assembly **2**.
3. Fasten the thumbscrew.
4. Return to the adapter-installation instructions.

Shrinking a PCI riser-card assembly (for half-length adapters)

If you are removing a full-length adapter in the upper riser-card PCI slot and will replace it with a shorter adapter or no adapter, you must shrink the full-length PCI riser-card assembly.



To shrink the full-length PCI riser-card assembly, complete the following steps:

1. Rotate the thumb screw **1**, which is far from the PCI slot end, counterclockwise and shorten the PCI riser-card assembly **2**.
2. Fasten the thumbscrew.
3. Return to “Installing a PCI adapter” on page 60 or “Installing a PCI riser-card assembly” on page 56, as applicable.

Installing a PCI adapter

The following illustration shows the PCI adapter expansion slots from the rear of the server.

Maximal card dimension supported in each slot (rear view)

1	Full height , up to full length	4	Full height , up to full length
2	Full height, half length	5	Full height , up to full length
3	Full height, half length	6	Full height, half length

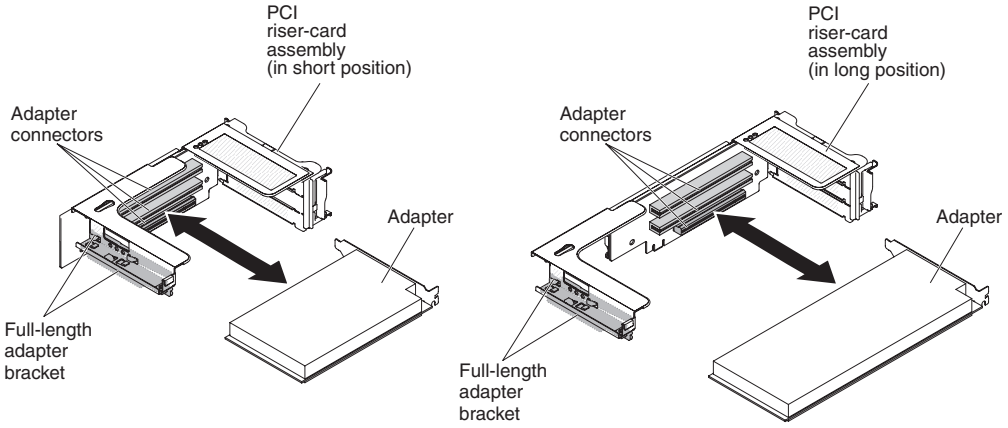
(Riser 1) (Riser 2)

Note: If you are installing a ServeRAID-M5110, ServeRAID-M5120, or an IBM LLM-SM dual port 10GbE SFP+ adapter, it can only be installed in PCI slot 1, 2, 4, or 5.

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

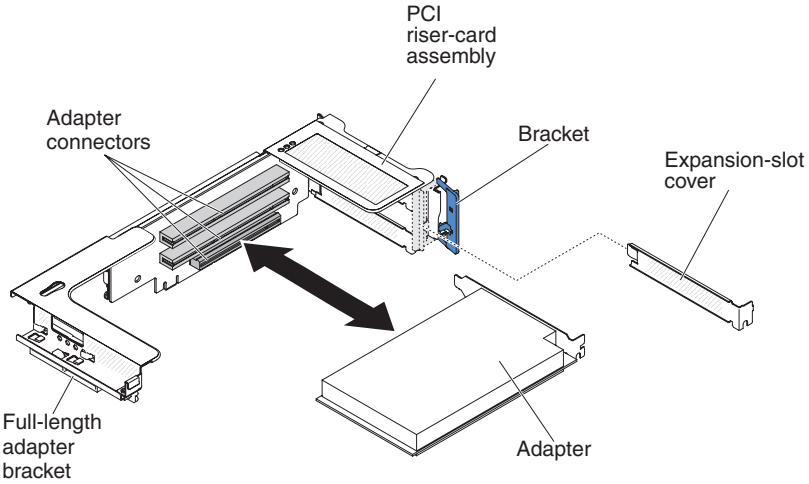
- To confirm that the server supports the adapter that you are installing, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section.
- The server provides two internal SAS connectors and two SAS/SATA RAID riser-card slots on the system board. See “System-board optional device connectors” on page 38 for the location of the internal SAS/SATA RAID connector and SAS/SATA RAID riser-card slots. You can install an optional IBM ServeRAID SAS/SATA adapter in the slot. For configuration information, see the ServeRAID documentation at http://www.ibm.com/systems/support/,
- Some high performance video adapters are supported by your server. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for more information.
- 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.
- Do not install memory modules more than 128 GB when Quadro 600 is installed.
- Any high-definition video-out connector or stereo connector on any add-on video adapter is not supported
- The server does not support full-length, full-height PCI adapters or legacy 5V PCI adapters.
- When you install any PCI adapter, the power cords must be disconnected from the power source before you remove the PCI Express riser-card assembly and the PCI-X riser-card assembly. Otherwise, the active power management event signal will be disabled by the system-board logic, and the Wake on LAN feature might not work. However, after the server is powered-on locally, the active power manager active power management event signal will be enabled by the system-board logic.

The following illustration shows the adapter connectors on the PCI riser-card assembly.



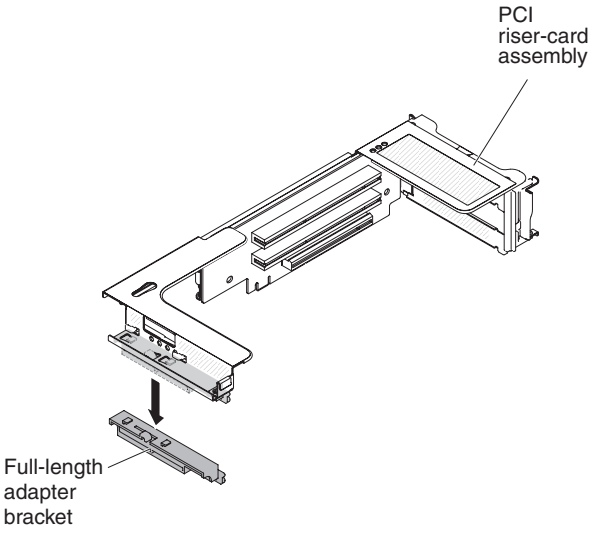
To install a PCI adapter, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the cover (see “Removing the cover” on page 54).
4. Determine which expansion slot you will use for the adapter.
5. If you are installing an adapter in PCI expansion slot 1, 2, or 3, remove PCI riser-card assembly 1; if you are installing an adapter in PCI expansion slot 4, 5, or 6, remove PCI riser-card assembly 2. See “Removing a PCI riser-card assembly” on page 55.
6. Rotate the bracket out of the way.
7. Slide the expansion-slot cover out of the PCI riser-card assembly expansion slot.



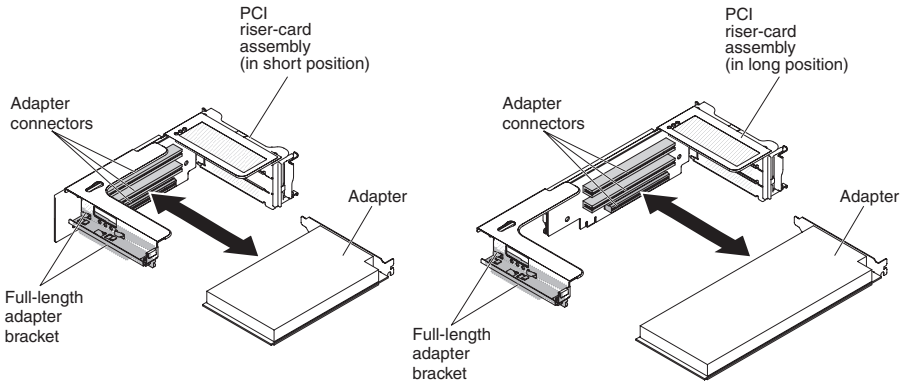
8. Install the adapter:
   a. For riser 1: if the adapter is a full-length adapter for the upper expansion slot in the riser card, remove the full-length-adapter bracket from underneath the top of the riser-card assembly and insert it in the end of the upper expansion slot of the riser-card assembly. See “Stretching a PCI riser-card assembly” on page 59 for instructions.
   b. For riser 2: if the adapter is a full-length adapter for the upper expansion slot in the riser card, the bracket is on the cage by default. Insert it in the

end of the upper expansion slot of the riser-card assembly. See “Stretching a PCI riser-card assembly” on page 59 for instructions.



c. Align the adapter with the PCI connector on the riser card and the guide on the external end of the riser-card assembly.

d. Press the adapter firmly into the PCI connector on the riser card.

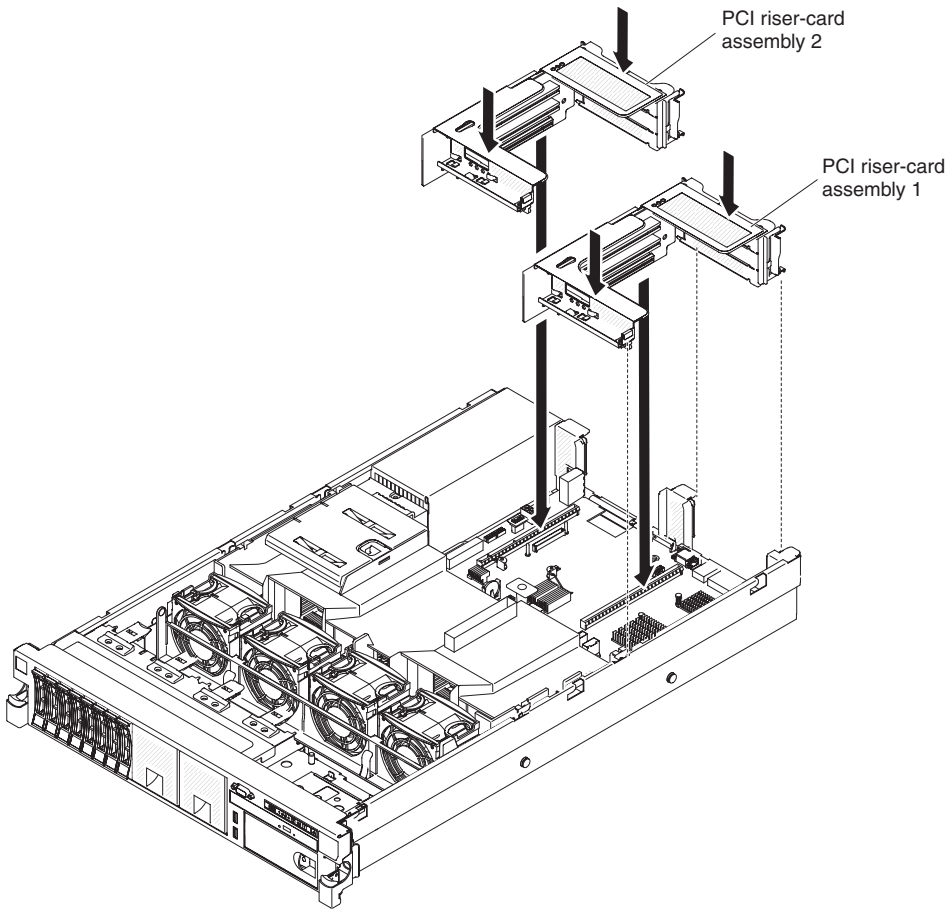


9. Connect any required cables to the adapter.

   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.

10. Align the PCI riser-card assembly with the selected PCI riser-card connector on the system board.



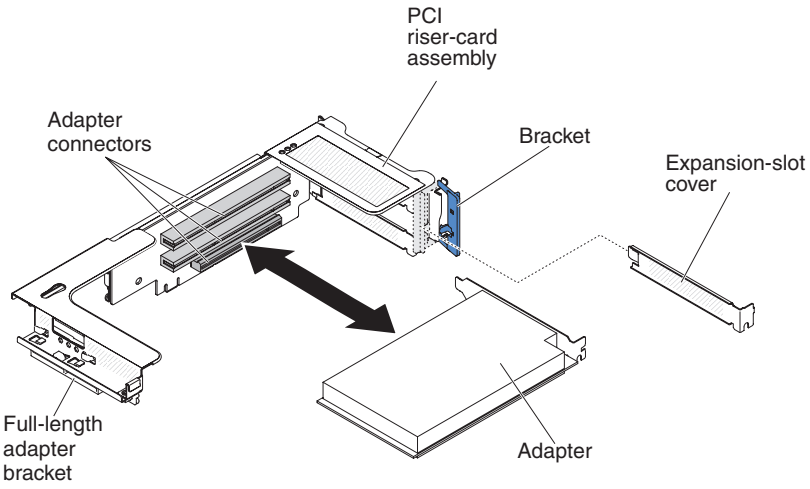
- PCI riser-card connector 1: Carefully fit the two alignment slots on the side of the assembly onto the two alignment brackets in the side of the chassis; align the rear of the assembly with the guides on the rear of the server.
- PCI riser-card connector 2: Carefully align the bottom edge (the contact edge) of the riser-card assembly with the PCI riser-card connector on the system board; align the rear of the assembly with the guides on the rear of the server.

11. Press down on the assembly. Make sure that the riser-card assembly is fully seated in the PCI riser-card connector on the system board.
12. Perform any configuration tasks that are required for the adapter.

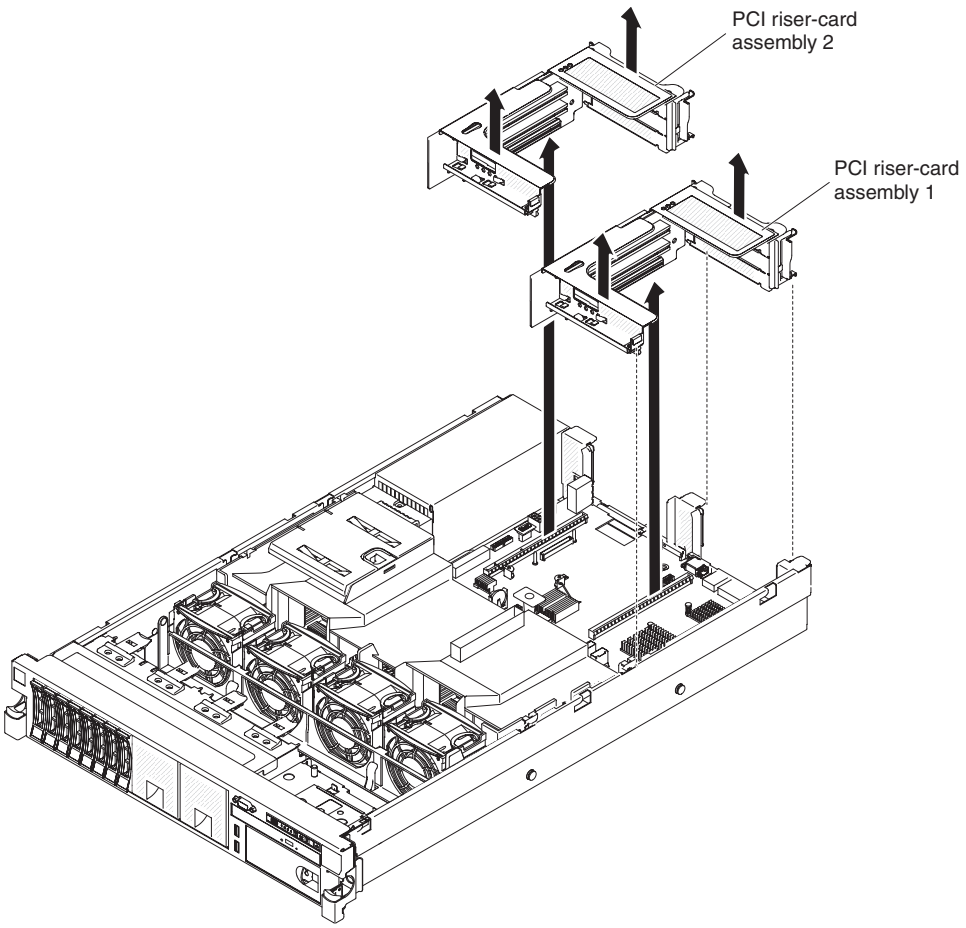
If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Removing a PCI adapter

To remove an adapter from a PCI riser-card assembly, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Press down on the left and right side rack latches and slide the server out of the rack enclosure until both slide rails lock; then, remove the cover (see “Removing the cover” on page 54).



4. Remove the PCI riser-card assembly that contains the adapter (see “Removing a PCI riser-card assembly” on page 55).
5. Disconnect any cables from the adapter (make note of the cable routing, in case you reinstall the adapter later).
6. Carefully grasp the adapter by its top edge or upper corners, and pull the adapter from the PCI expansion slot.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing a hard disk drive

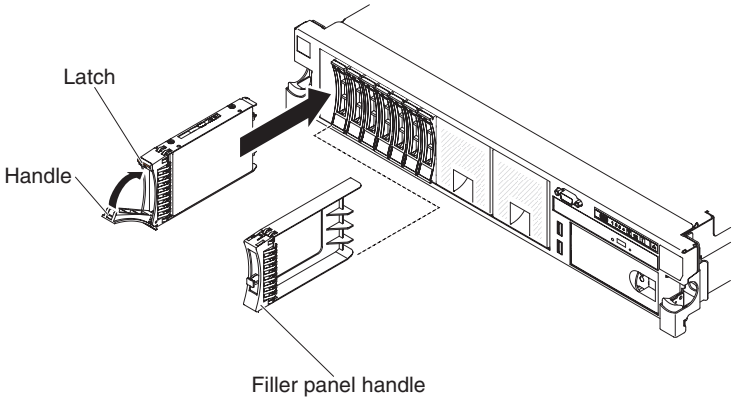
The following notes describe the type of hard disk drives that the server supports and other information that you must consider when you install a drive.

Important: Do not install a SCSI hard disk drive in this server.

- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Make sure that you have all the cables and other equipment that are specified in the documentation that comes with the drive.
- Locate the documentation that comes with the hard disk drive and follow those instructions in addition to the instructions in this chapter.

- The server supports six 3.5-inch or eight 2.5-inch hot-swap hard disk drives installed on Ultra-Slim hard disk drive trays. An optional 8-drive-bay 2.5-inch hard disk drive kit is available for 16-drive-capable server models. For a list of supported hard disk drives, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.
- All hot-swap drives in the server should have the same throughput speed rating. Using hard disk drives with different speed ratings will cause all drives to operate at the throughput speed of the slowest drive.
- The ID that is assigned to each bay is printed on the front of the server, above the drive bay.

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



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

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

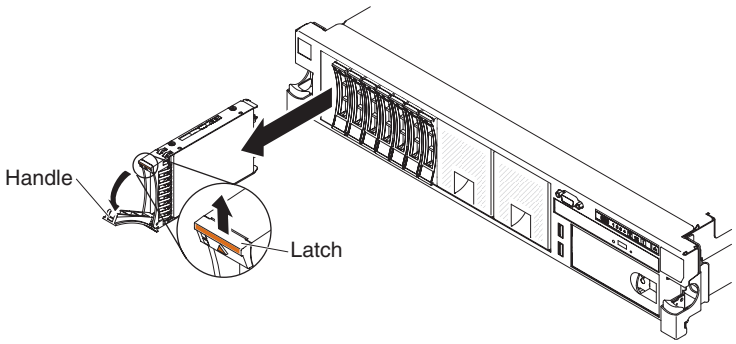
1. Read the safety information that begins on page vii, “Installation guidelines” on page 40, and “Handling static-sensitive devices” on page 42.
2. Remove the filler panel from one of the empty hot-swap bays: Grasp the filler panel handle and pull the filler panel away from the server.
3. Install the 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 135.

Removing a 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 40, and "Handling static-sensitive devices" on page 42.
2. Press up on the release latch at the top of the drive front.
3. Move the handle on the drive to the open position (perpendicular to the drive).
4. Pull the hot-swap drive assembly out of the bay approximately 25 mm (1 in.). Wait approximately 45 seconds while the drive spins down before you remove the drive assembly completely from the 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 135.

Installing a SAS/SATA 8 Pac HDD option

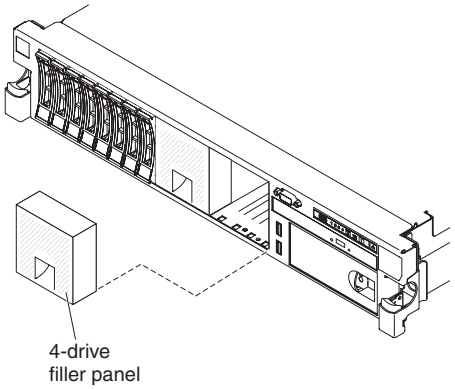
If the server is a 16-drive-capable model with eight hard disk drive bays installed, you can install an IBM System x3650 M4 Hot-swap SAS/SATA 8 Pac HDD option. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported optional devices. To order a SAS/SATA 8 Pac HDD option, contact your IBM marketing representative or authorized reseller.

The SAS/SATA 8 Pac HDD option kit contains the following components:

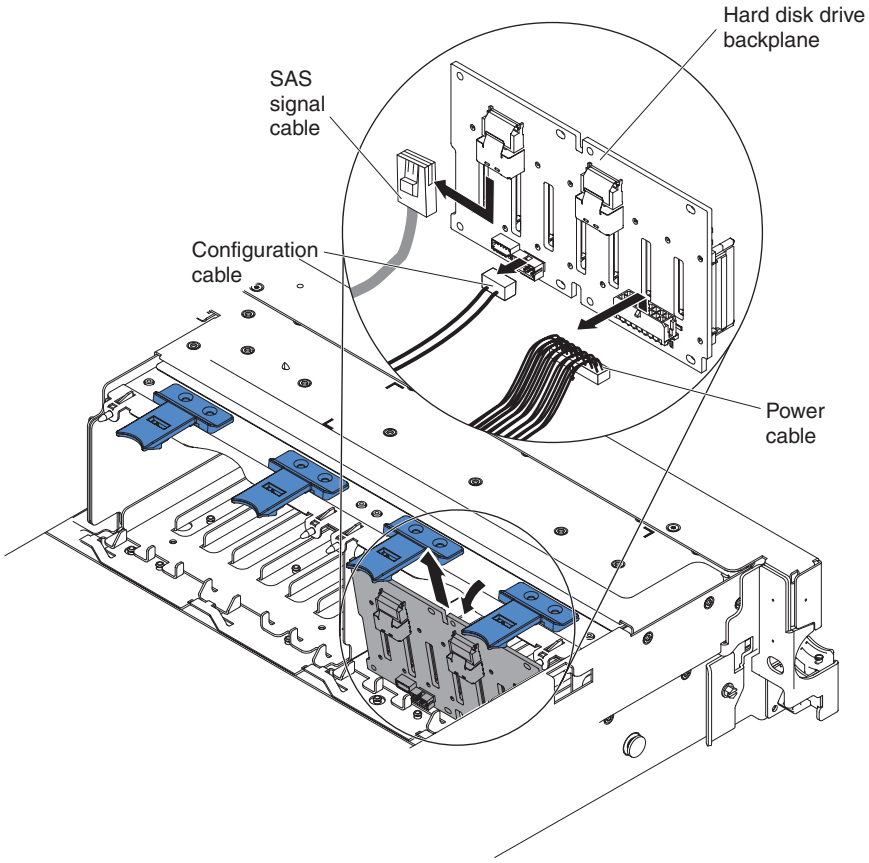
- One 2.5-inch hard disk drive backplane
- One SAS expander adapter
- Two M3 x 5 screws
- Two SAS signal cables which attached to the expander adapter

To install a 8-disk-drive optional hard disk drive backplane in a 16-drive-capable server model, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the server cover (see “Removing the cover” on page 54).
4. Remove the two 4-drive filler panels that are to the right of drive bay 8, beneath the IDs 8 - 15 on the front bezel.



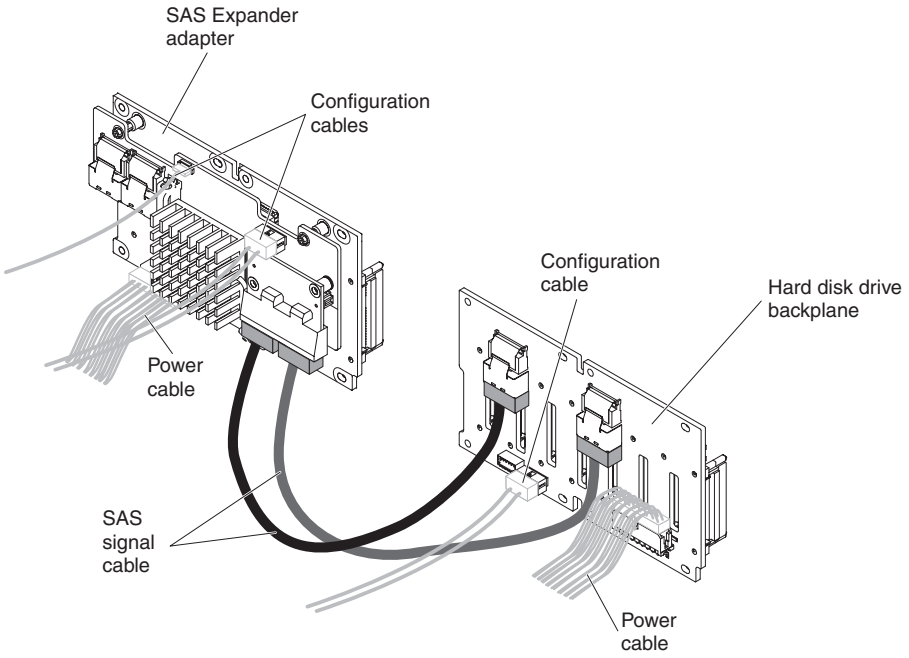
5. To obtain more working room, remove fans 2 and 3 (see “Removing a dual-motor hot-swap fan” on page 123).
6. Pull the hard disk drives or fillers out of the server slightly to disengage them from the backplanes. For more information, see“Removing a hard disk drive” on page 67.
7. Disconnect the SAS signal cables from the system board. Leave the other end of the SAS signal cables connected to the hard disk drive backplanes.
8. Remove hard disk drive backplane 1 from the server.



a. From backplane 1, disconnect the following cables in the order listed:
   - Power cable 1
   - SAS signal cable 2
   - Configuration cable 3

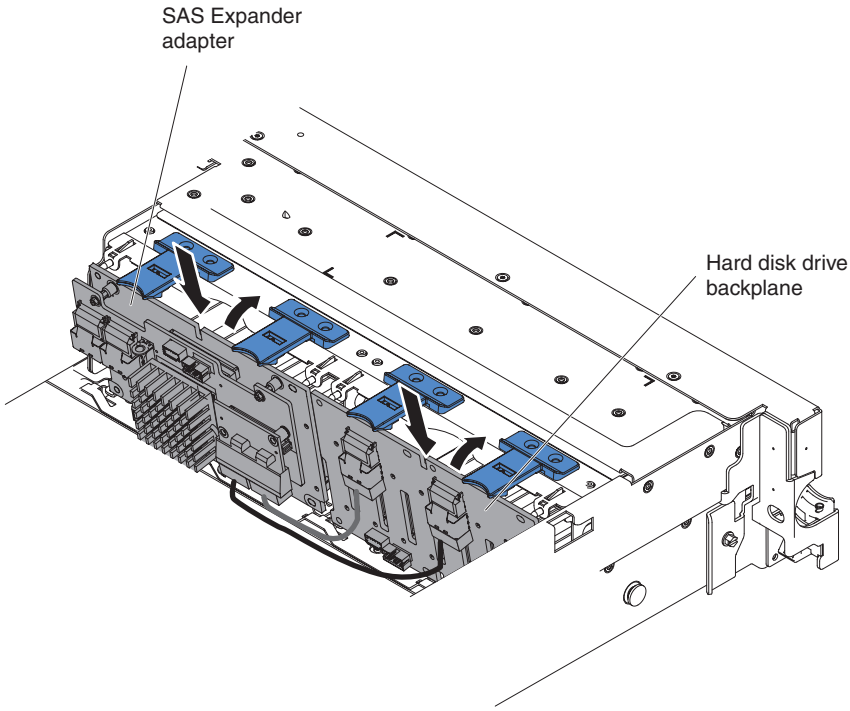
b. Lift backplane 1 out of the server by pulling it toward the rear of the server and then lifting it up.

9. Install the new backplane in slot 2:
   a. Connect the SAS signal cable to new backplane 2. The new backplane comes with the option kit.
   b. Connect the configuration cable to backplane 2.
   c. Connect the cables which come with the option kit to backplane 1.



d. Connect the configuration cable and the power cable back to backplane 1.

e. Angle the new backplane and place the bottom edge into the slots for backplane 2 on the chassis next to the optical drive.

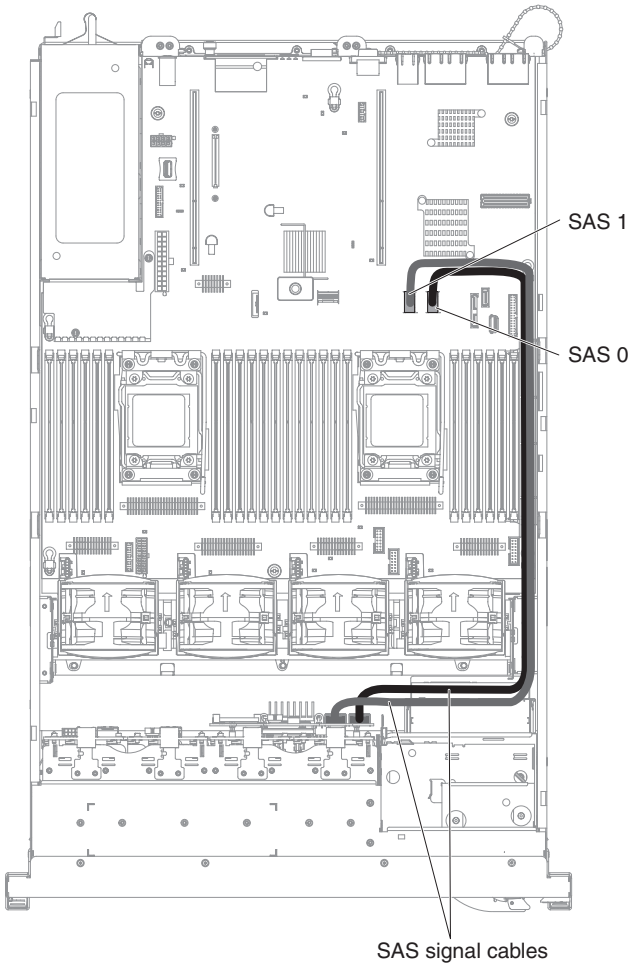


f. Angle the backplane and place the bottom edge into the slots for backplane 1 on the chassis.

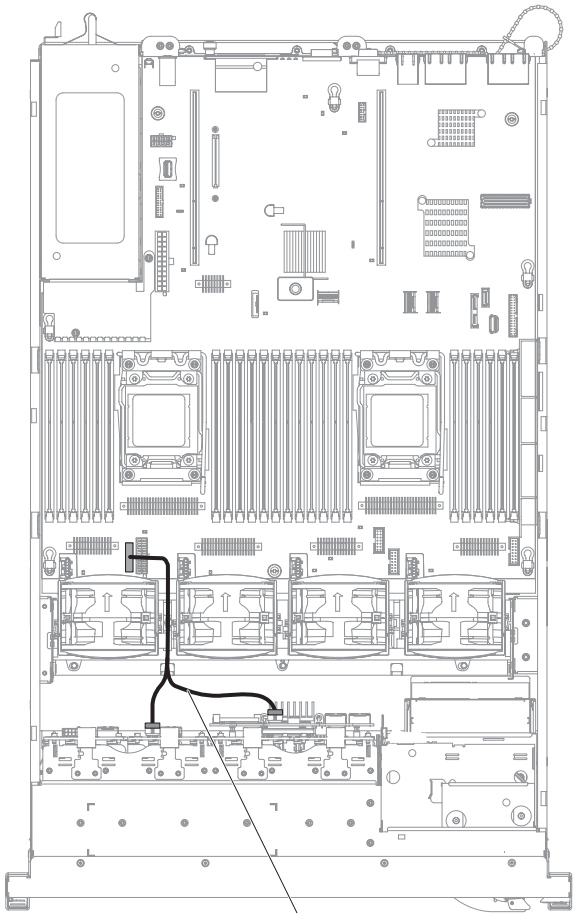
g. Rotate the backplane upright so that the bracket goes underneath the latch and tabs on the chassis and is engaged into the slots on the backplane bracket.

10. Connect the loose end of the SAS signal cables to the system board. Route the cable underneath the cable retention features on the baffle. See the

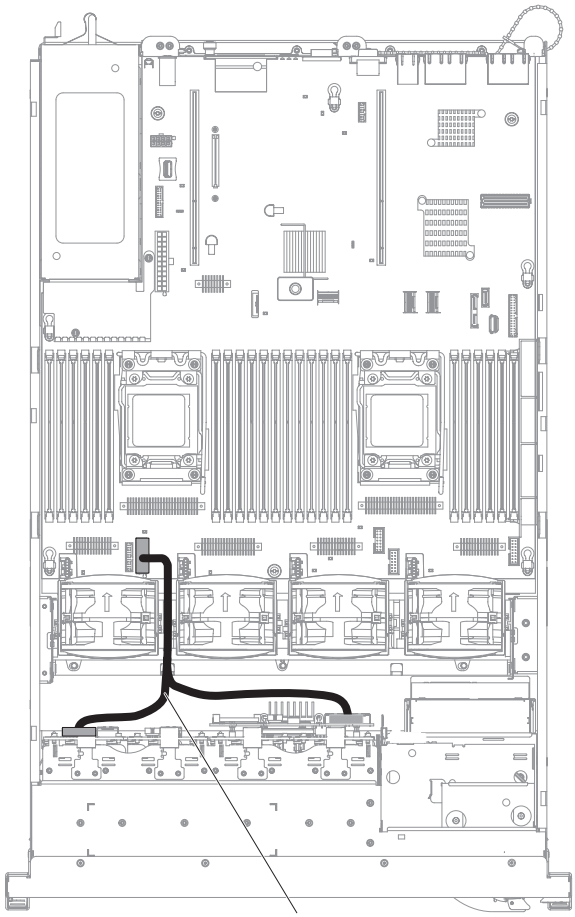
illustration.



11. Make sure that the configuration cable is connected to the backplanes and system board.



12. Make sure that the SAS power cable is connected to the backplanes and system board.



13. If you removed any fans, install them.
14. Insert the hard disk drives and the fillers the rest of the way into the bays.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing a SAS/SATA 8 Pac HDD with a ServeRAID adapter option

If the server is a 16-drive-capable model with eight hard disk drive bays installed, you can install an IBM System x3650 M4 Hot-swap SAS/SATA 8 Pac HDD with a ServeRAID adapter option. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported optional devices. To order a SAS/SATA 8 Pac HDD with a ServeRAID adapter option, contact your IBM marketing representative or authorized reseller.

The SAS/SATA 8 Pac HDD with a ServeRAID adapter option kit contains the following components:

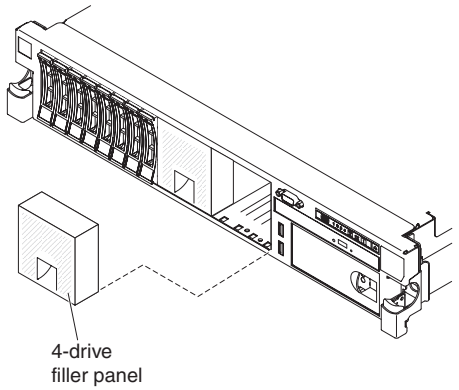
- Eight blank EMC fillers
- Two SAS signal cables
- One configuration cable
- One internal power cable
- One 2.5-inch hard disk drive backplane
- One RAID adapter (part number 00D7082 or 46M0912)

Note: RAID adapter comes in a different option kit. Touch the static-protective package to any unpainted metal surface on the server.

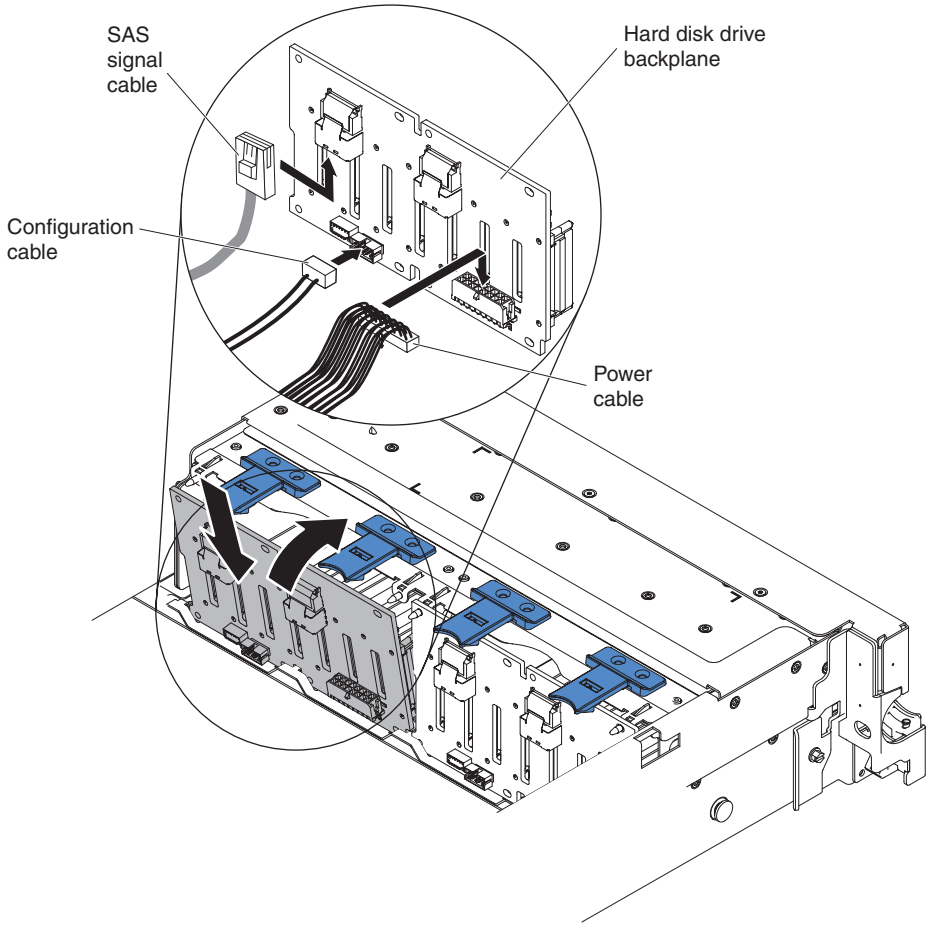
To install the RAID configuration with 2 x 8 2.5-inch HDDs support option in the server, complete the following steps.

Note: You can install the RAID adapter into PCI riser-card assembly 1 only.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the server cover (see “Removing the cover” on page 54).
4. Remove the two 4-drive filler panels that are to the right of drive bay 8, beneath the IDs 8 - 15 on the front bezel.



5. To obtain more working room, remove fans 2 and 3 (see “Removing a dual-motor hot-swap fan” on page 123).
6. Install the new backplane in slot 2:



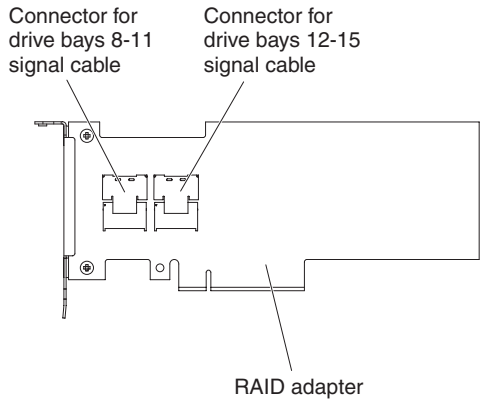
a. Connect the following cables in the order listed:
   - Configuration cable **1**
   - SAS signal cable **2**
   - Power cable **3**

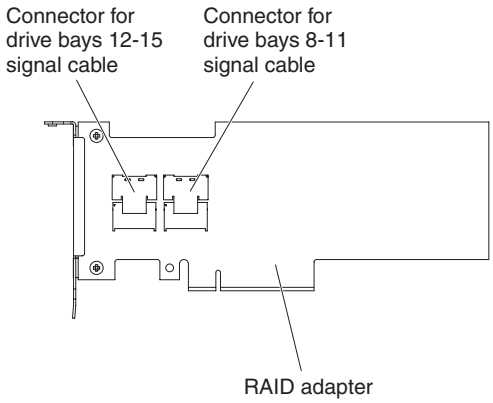
b. Angle the new backplane and place the bottom edge into the slots for backplane 2 on the chassis next to the optical drive.

c. Rotate the backplane upright so that the bracket goes underneath the latch and tabs on the chassis and is engaged into the slots on the backplane bracket.

7. Touch the static-protective package that contains the RAID adapter to any unpainted metal surface on the server. Then, remove the RAID adapter from the package.
8. Remove the PCI riser-card assembly 1 (see “Removing a PCI riser-card assembly” on page 55).
9. Install the RAID adapter in the connector on the PCI riser card (see “Installing a PCI adapter” on page 60).

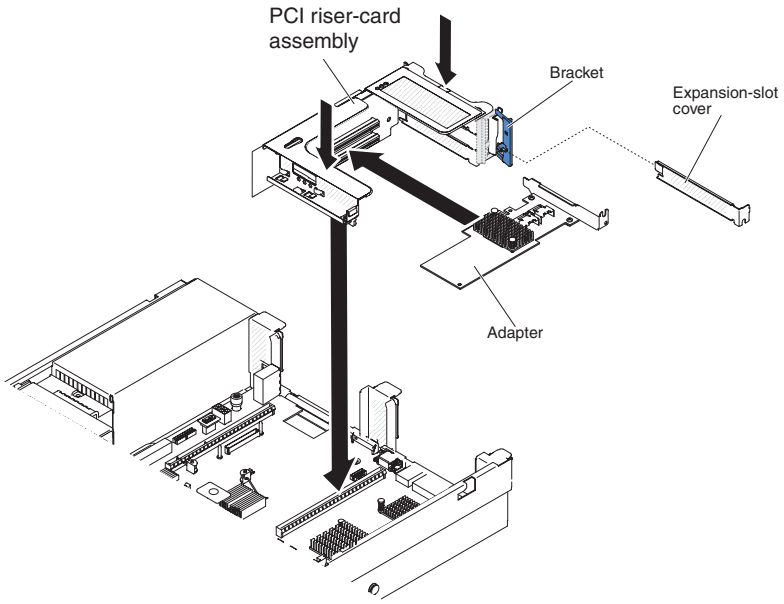
   Note: While installing the RAID adapter (part number 00D7082) into PCI riser-card assembly, it can be installed in slot 1 or slot 2 only.
   Attention: Incomplete insertion might cause damage to the server or the adapter.
10. Connect the SAS signal cables to the connectors on the RAID adapter:



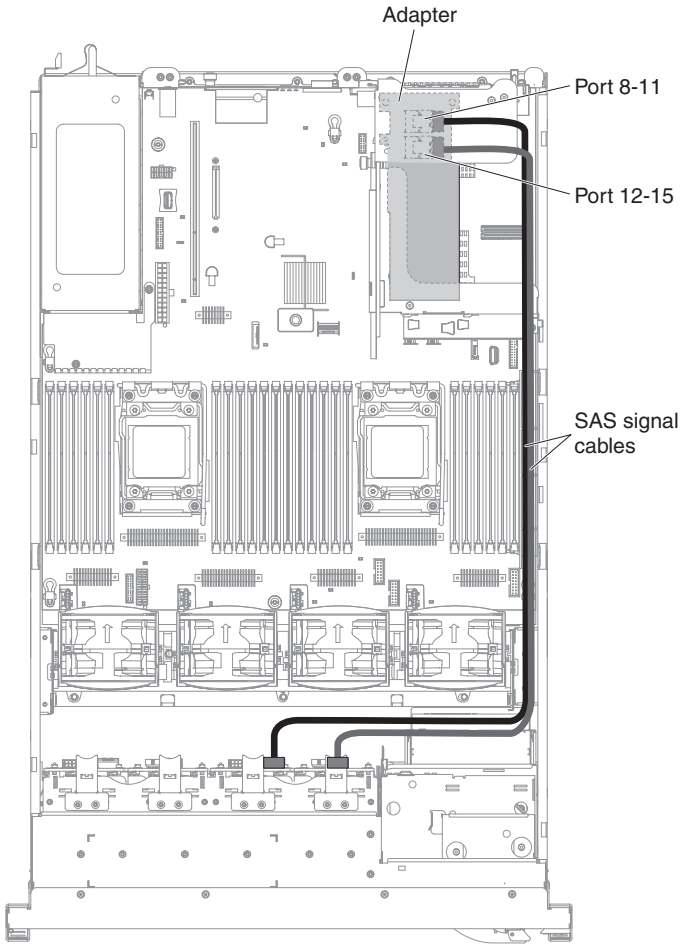


a. Connect a SAS signal cable that comes with the option kit to the RAID adapter connector for drive bays 8-11.
b. Connect another SAS signal cable to the other SAS connector for drive bays 12-15.

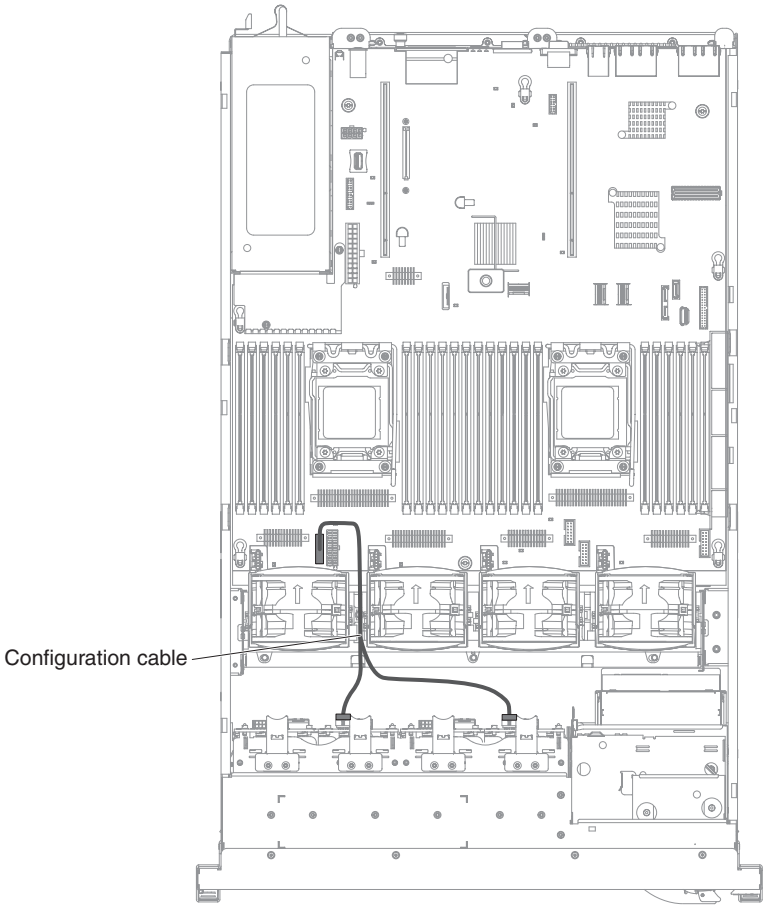
11. Align and install the PCI riser-card assembly in the server (see “Installing a PCI riser-card assembly” on page 56).



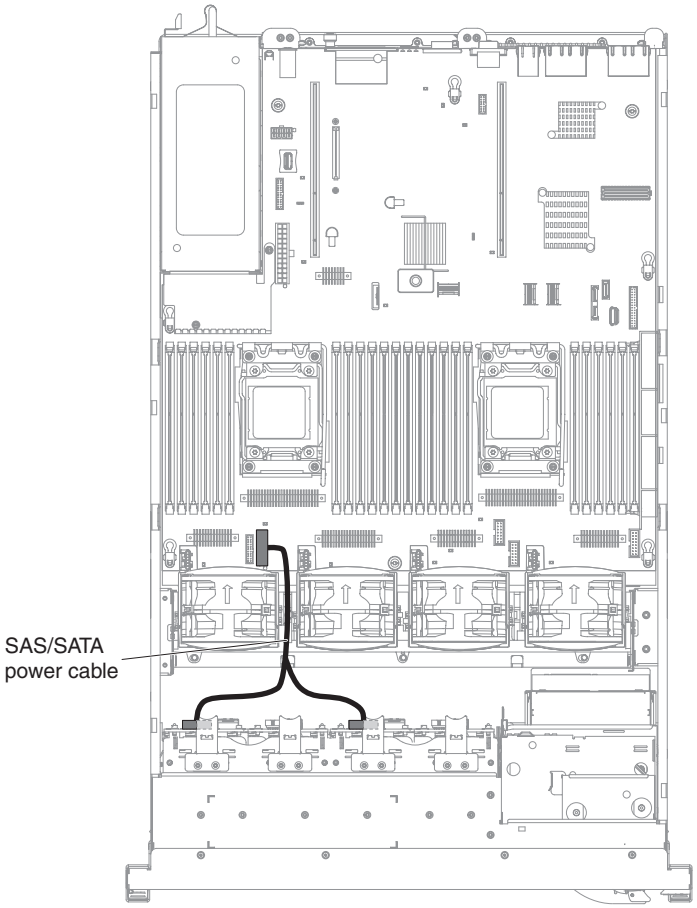
12. Route the cables underneath the cable retention (taking the RAID adapter, part number 46M0912, as an example).



13. Make sure that the configuration cable is connected to the backplanes and system board.



14. Make sure that the SAS power cable is connected to the backplanes and system board.



15. If you removed any fans, install them.
16. Insert the hard disk drives and the fillers the rest of the way into the bays.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing a SAS/SATA 8 Pac HDD with 2 6 GB performance optimized HBA adapters option

If the server is a 16-drive-capable model with eight hard disk drive bays installed, you can install an IBM System x3650 M4 Hot-swap SAS/SATA 8 Pac HDD with 2 6 GB performance optimized HBA adapters option. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported optional devices. To order a SAS/SATA 8 Pac HDD with 2 6 GB performance optimized HBA adapters option, contact your IBM marketing representative or authorized reseller.

The SAS/SATA 8 Pac HDD with 2 6 GB performance optimized HBA adapters option kit contains the following components:

Note: You must purchase the SAS cable option (part number 00D9532) before installing this kit.

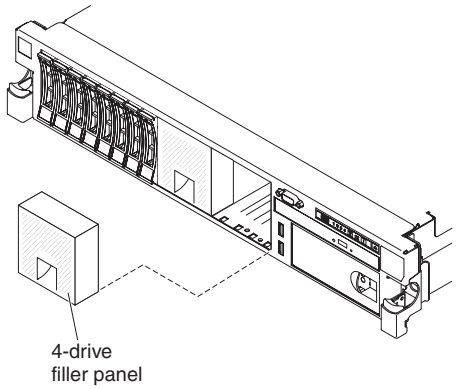
- Eight blank EMC fillers
- SAS signal cables (including the ones from the SAS cable option)
- One configuration cable
- One internal power cable

- One 2.5-inch hard disk drive backplane
- Two RAID adapters (part number 46M0912)

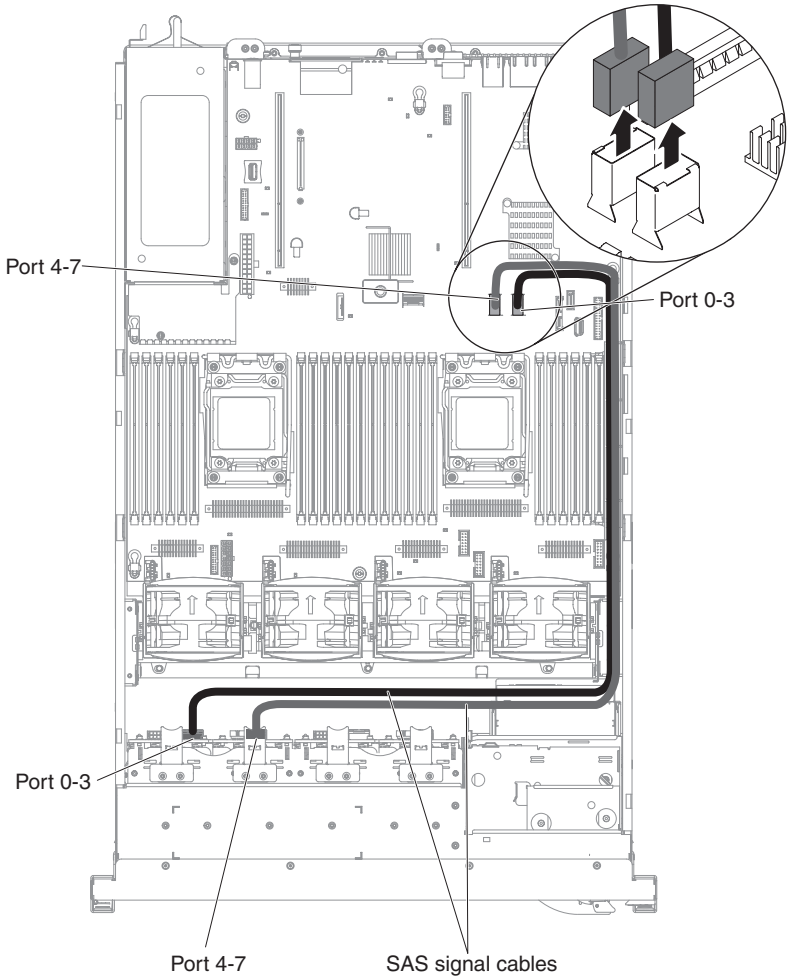
  Note: RAID adapters come in a different option kits. Touch the static-protective packages to any unpainted metal surface on the server.

To install a SAS/SATA 8 Pac HDD with 2 6 GB performance optimized HBA adapters option in the server, complete the following steps.

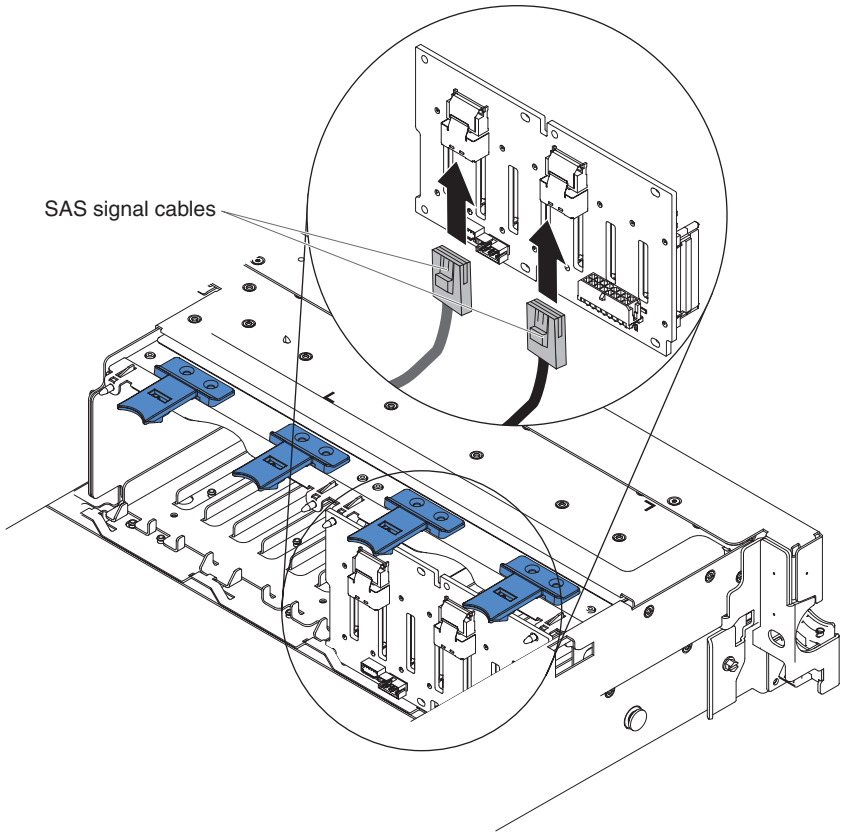
1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the server cover (see “Removing the cover” on page 54).
4. Remove the two 4-drive filler panels that are to the right of drive bay 8, beneath the IDs 8 - 15 on the front bezel.



5. To obtain more working room, remove fans 2 and 3 (see “Removing a dual-motor hot-swap fan” on page 123).
6. Remove the 2 SAS cables which connect both the backplane and the system board.

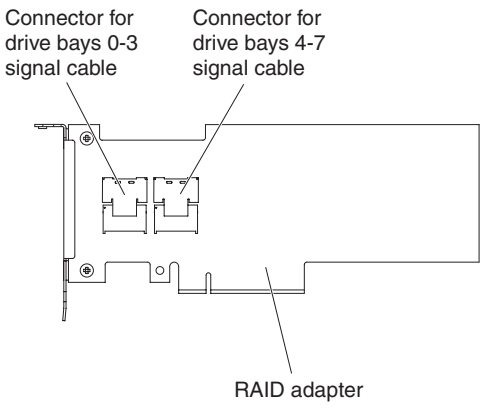


7. Take out the 2 SAS cables (925 mm) from the SAS cable option and connect them to the backplane.

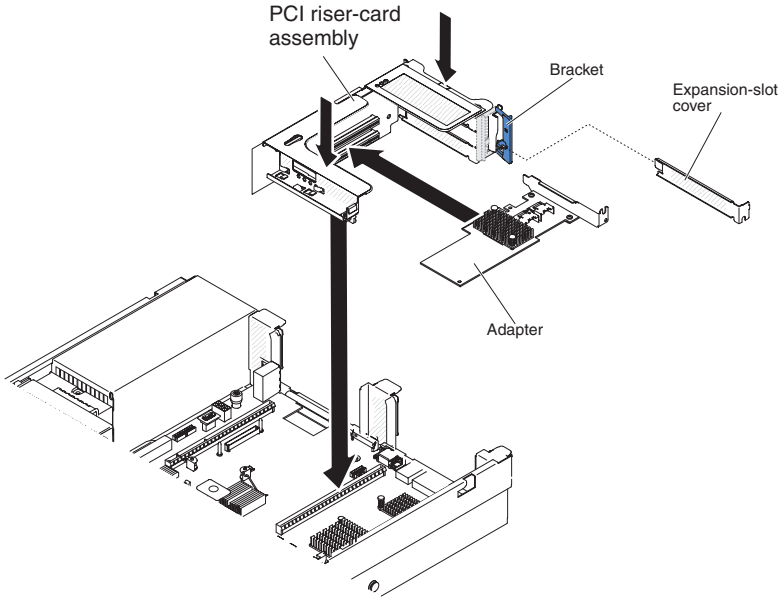


8. Touch the static-protective package that contains the RAID adapter to any unpainted metal surface on the server. Then, remove the RAID adapter from the package.
9. Remove the PCI riser-card assembly 1 (see “Removing a PCI riser-card assembly” on page 55).
10. Install the RAID adapter in the connector on the PCI riser card (see “Installing a PCI adapter” on page 60).

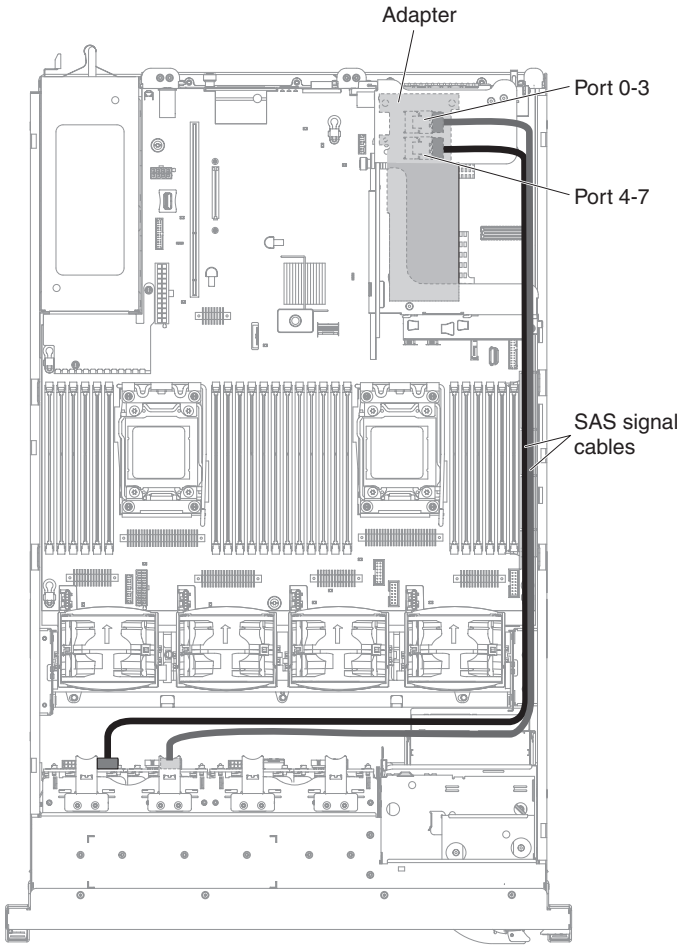
    Attention: Incomplete insertion might cause damage to the server or the adapter.
11. Connect the SAS signal cables to the connectors on the RAID adapter:
    a. Connect a SAS signal cable to the RAID adapter connector for drive bays 0-3.
    b. Connect another SAS signal cable to the other SAS connector for drive bays 4-7.



12. Align and install the PCI riser-card assembly in the server (see “Installing a PCI riser-card assembly” on page 56).

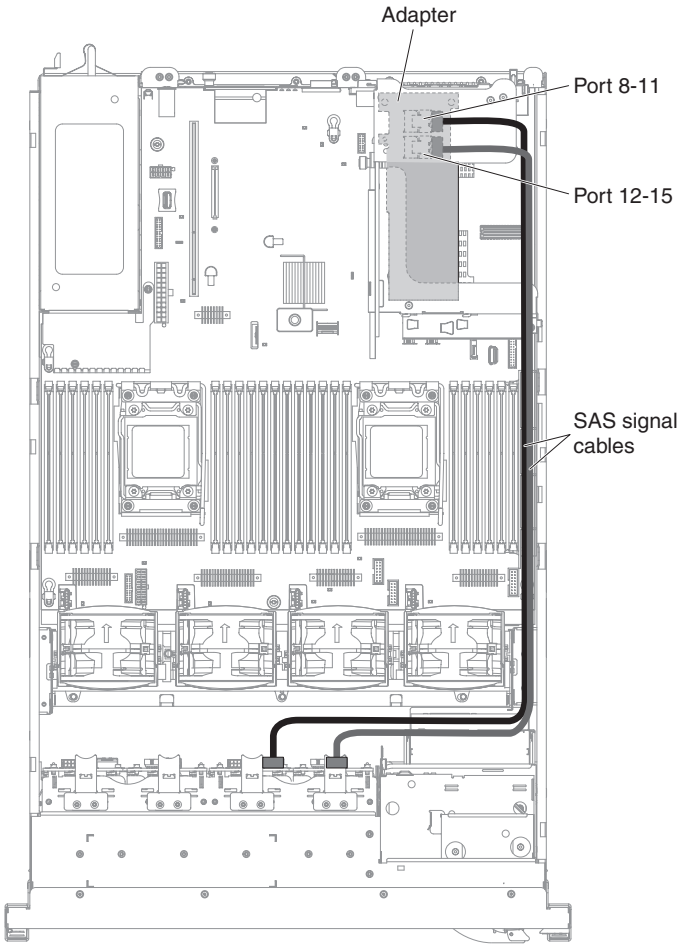


13. Route the cables underneath the cable retention.



14. Refer from step 6 on page 74 for installing the second backplane, arranging the cable routing, installing the fans, and installing the hard disk drives. The

illustration below is the cable routing for the second set of RAID adapter and backplane.



If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing 2 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option

To order 2 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option, contact your IBM marketing representative or authorized reseller.

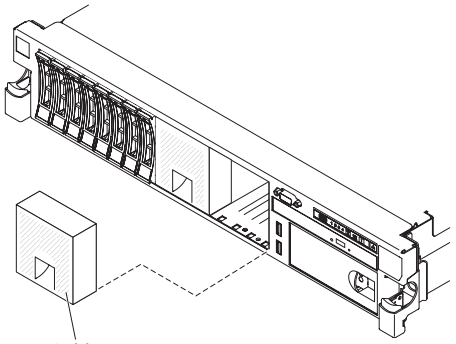
The 2 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option kit contains the following components:

- Four SAS signal cables
- Two configuration cables
- One internal power cable
- Two eXFlash 1.8-inch drive cage and backplane assemblies
- Two RAID adapters (part number 46M0912)

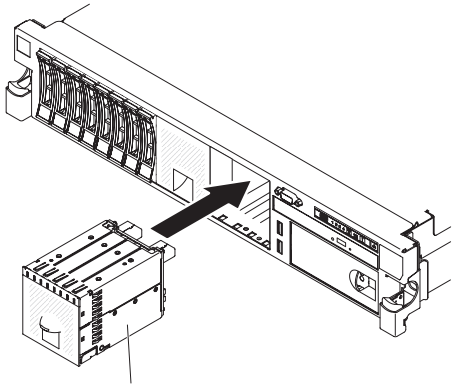
Note: RAID adapters come in a different option kits. Touch the static-protective packages to any unpainted metal surface on the server.

To install the 2 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option in the server, complete the following steps.

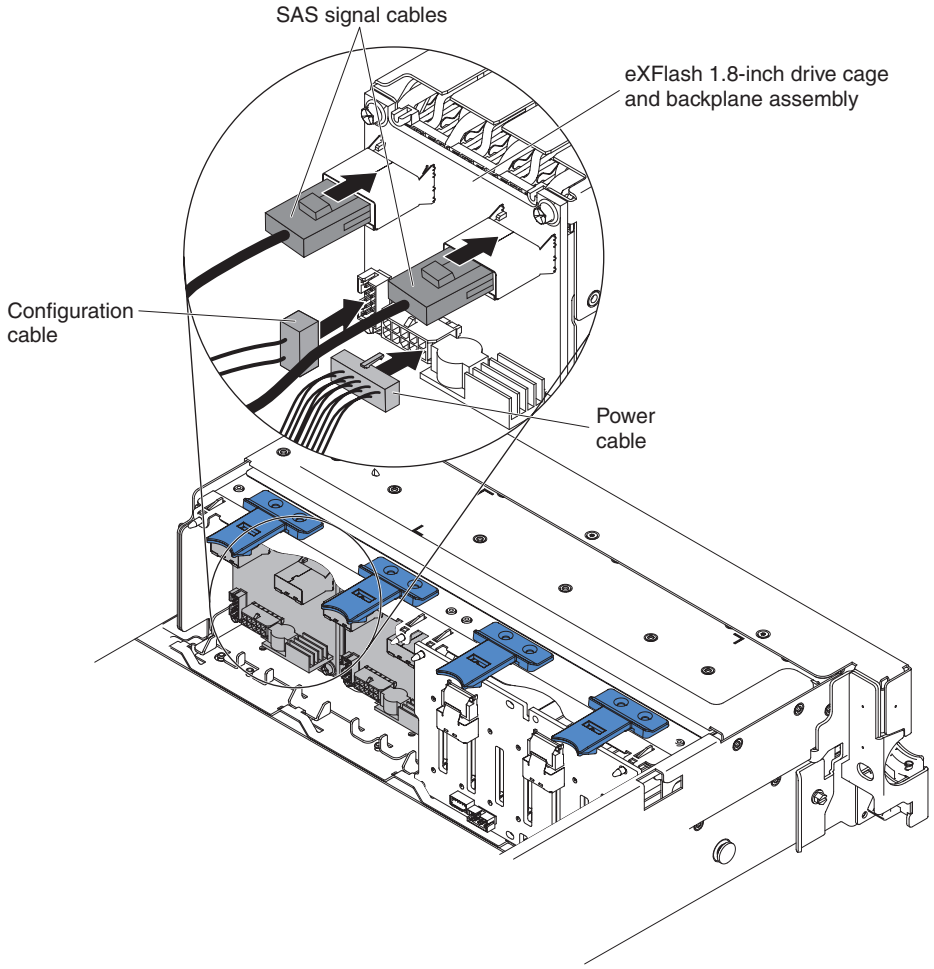
1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the server cover (see “Removing the cover” on page 54).
4. Remove the two 4-drive filler panels that are to the right of drive bay 8, beneath the IDs 8 - 15 on the front bezel.



5. To obtain more working room, remove fans 2 and 3 (see “Removing a dual-motor hot-swap fan” on page 123).
6. Install the new backplane assemblies.

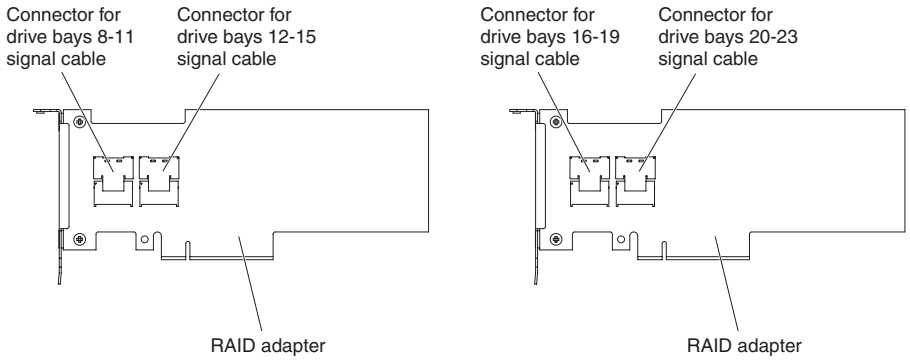


7. Connect the following cables in the order listed:
   - Configuration cable **1**
   - SAS signal cables **2**
   - Power cable **3**



8. Touch the static-protective package that contains the RAID adapter to any unpainted metal surface on the server. Then, remove the RAID adapter from the package.
9. Remove the PCI riser-card assembly 1 (see “Removing a PCI riser-card assembly” on page 55).
10. Install both RAID adapters in the connectors on the PCI riser card (see “Installing a PCI adapter” on page 60).

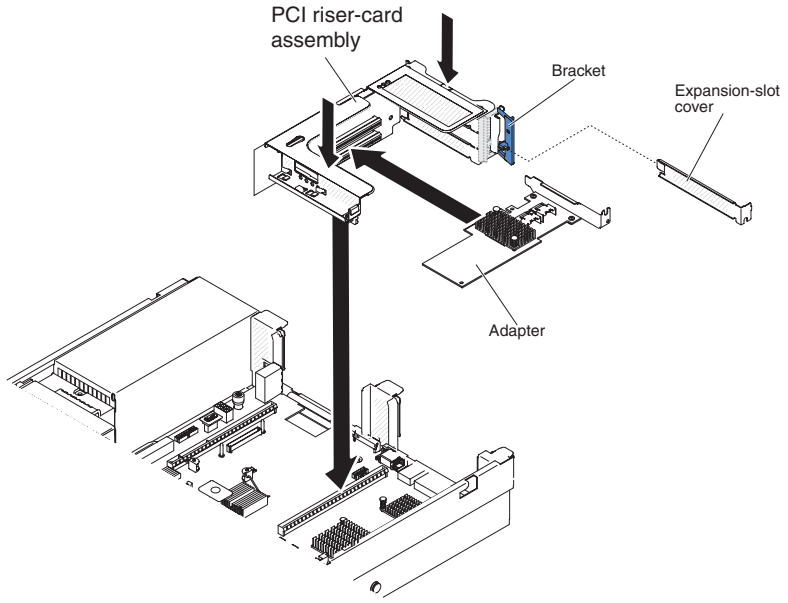
    Attention: Incomplete insertion might cause damage to the server or the adapter.
11. Connect the SAS signal cables to the connectors on the RAID adapter:
    a. Connect a SAS signal cable that comes with the option kit to the RAID adapter connector for drive bays 8-11.
    b. Connect another SAS signal cable to the other SAS connector for drive bays 12-15.



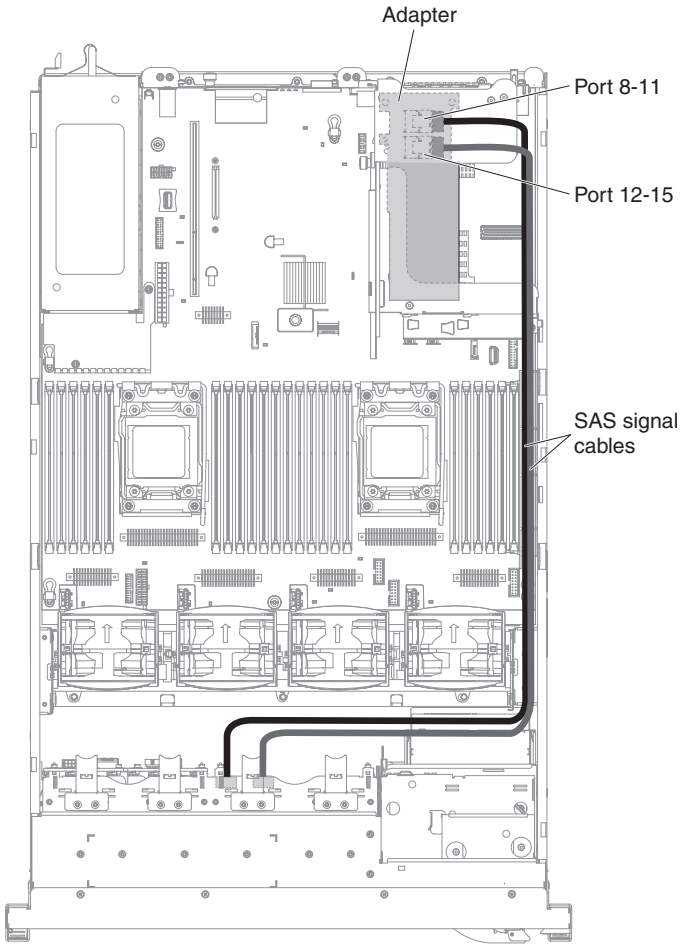
c. Connect a SAS signal cable that comes with the option kit to the RAID adapter connector for drive bays 16-19.

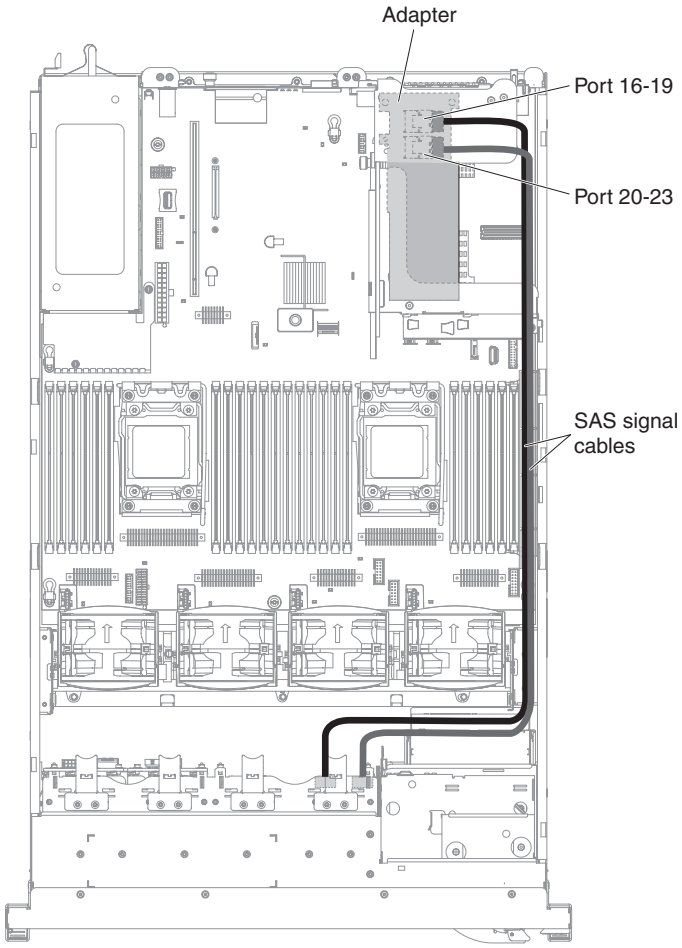
d. Connect a SAS signal cable that comes with the option kit to the RAID adapter connector for drive bays 20-23.

12. Align and install the PCI riser-card assembly 1 in the server (see “Installing a PCI riser-card assembly” on page 56).

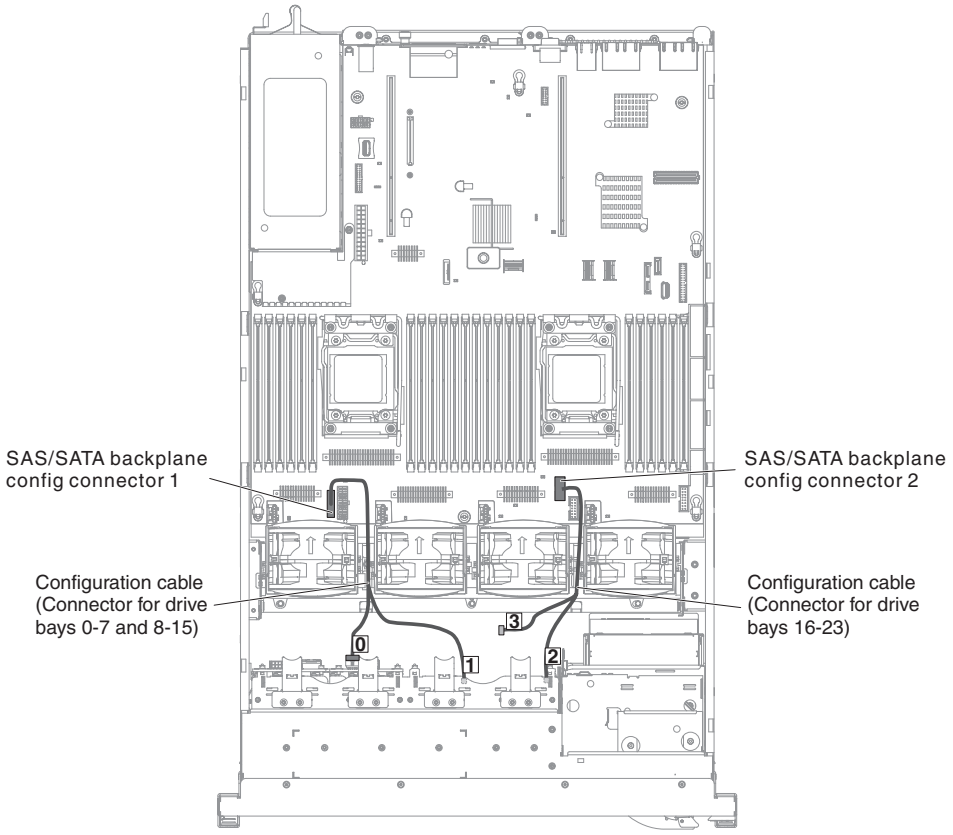


13. Route the cables underneath the cable retention.


Adapter
Port 8-11
Port 12-15
SAS signal cables

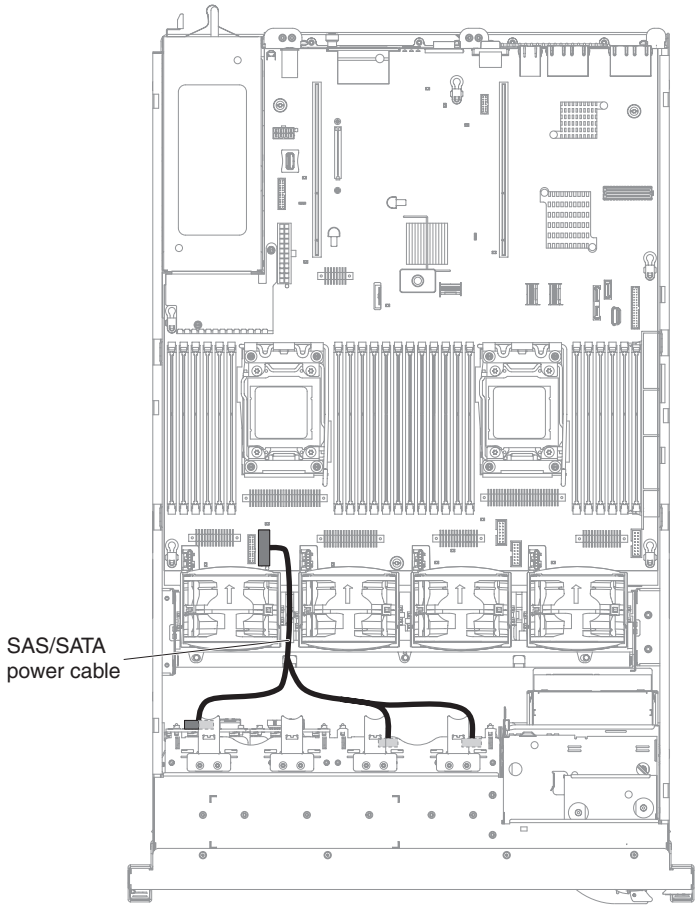


14. Make sure that the configuration cable is connected to the backplanes and system board.



Note: Leave the cable segment with the label **3** unconnected.

15. Make sure that the SAS power cable is connected to the backplanes and system board.



16. If you removed any fans, install them.
17. Insert the hard disk drives and the fillers the rest of the way into the bays.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing 4 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option

To order 4 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option, contact your IBM marketing representative or authorized reseller.

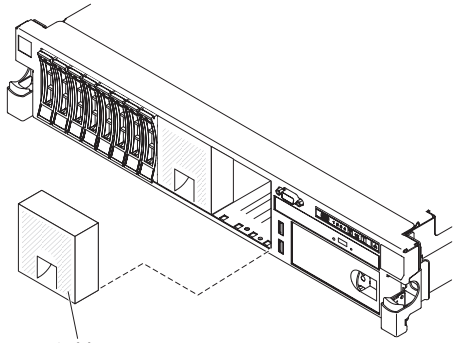
The 4 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option kit contains the following components:

- Four SAS signal cables
- One configuration cable
- Two eXFlash 1.8-inch drive cage and backplane assemblies
- Two RAID adapters (part number 46M0912)

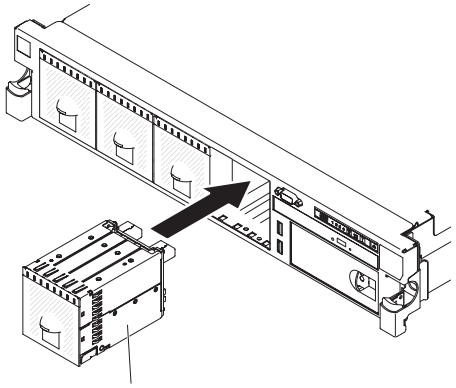
  Note: RAID adapters come in a different option kits. Touch the static-protective packages to any unpainted metal surface on the server.

To install the 4 x 8 1.8-inch SSDs with 2 6 GB performance optimized HBA adapters option in the server, complete the following steps.

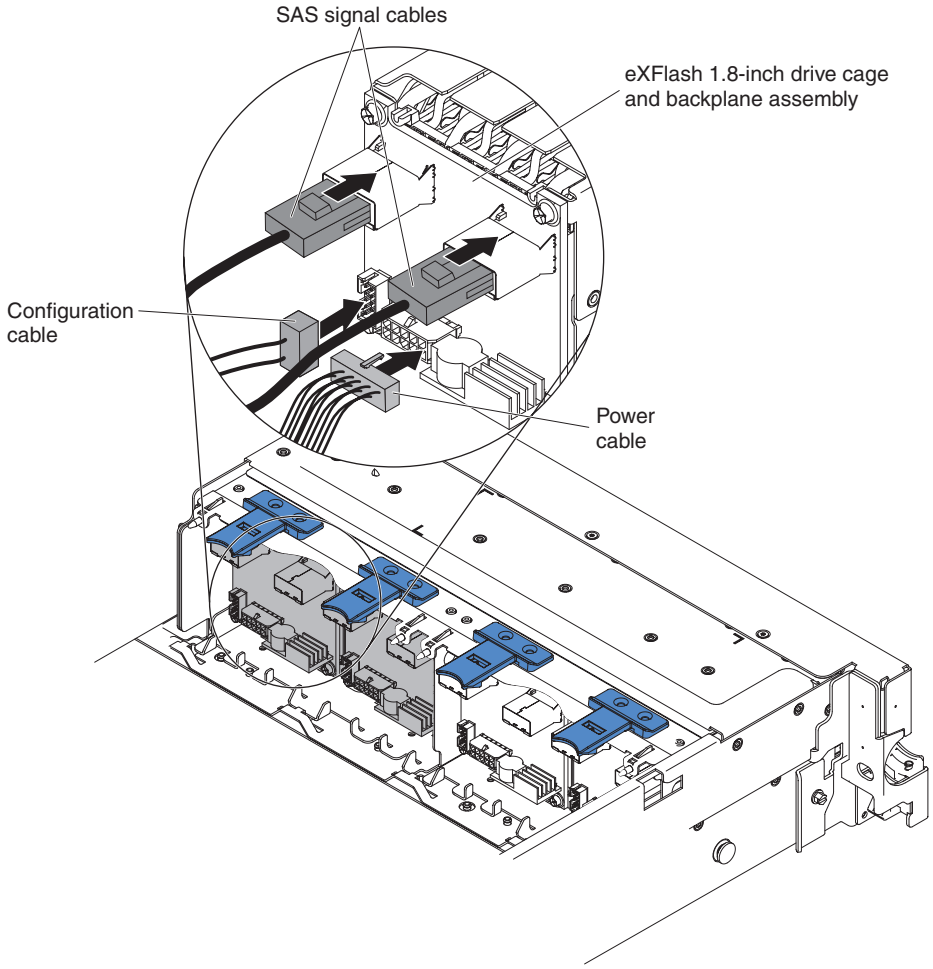
1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the server cover (see “Removing the cover” on page 54).
4. Remove the two 4-drive filler panels that are to the right of drive bay 8, beneath the IDs 8 - 15 on the front bezel.



5. To obtain more working room, remove fans 2 and 3 (see “Removing a dual-motor hot-swap fan” on page 123).
6. Install the new backplane assemblies.

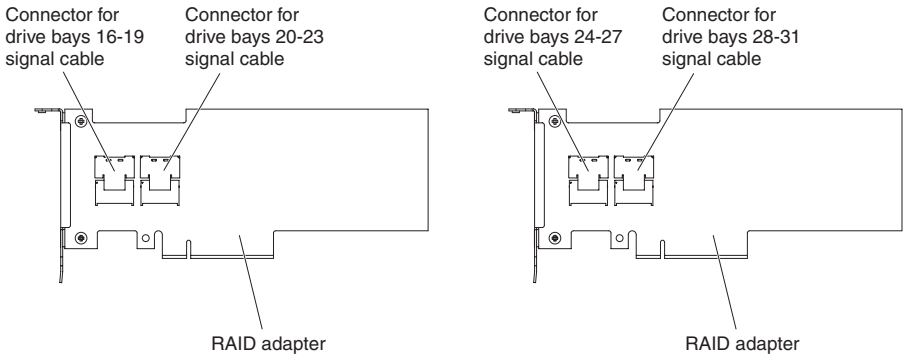


7. Connect the following cables in the order listed:
   - Configuration cable **1**
   - SAS signal cables **2**
   - Power cable **3**



8. Touch the static-protective package that contains the RAID adapter to any unpainted metal surface on the server. Then, remove the RAID adapter from the package.
9. Remove the PCI riser-card assembly 2 (see “Removing a PCI riser-card assembly” on page 55).
10. Install both RAID adapters in the connectors on the PCI riser card (see “Installing a PCI adapter” on page 60).

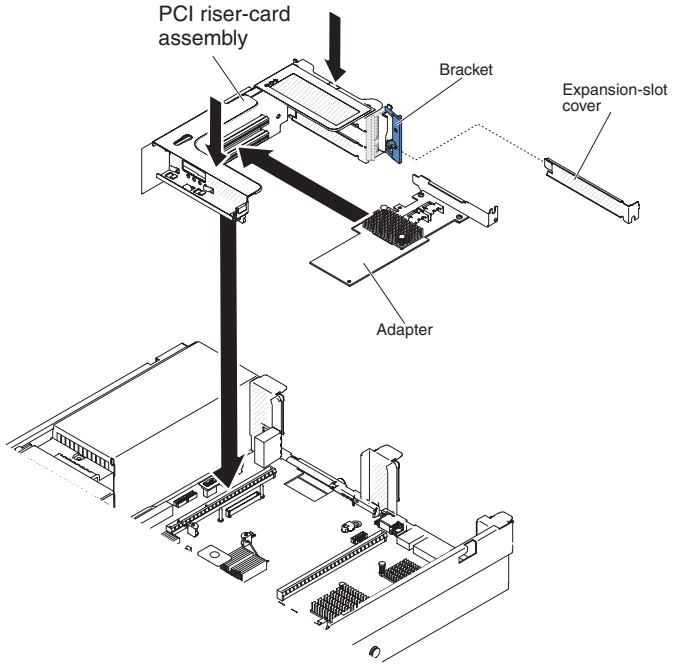
    Attention: Incomplete insertion might cause damage to the server or the adapter.
11. Connect the SAS signal cables to the connectors on the RAID adapter:
    a. Connect a SAS signal cable that comes with the option kit to the RAID adapter connector for drive bays 16-19.
    b. Connect another SAS signal cable to the other SAS connector for drive bays 20-23.



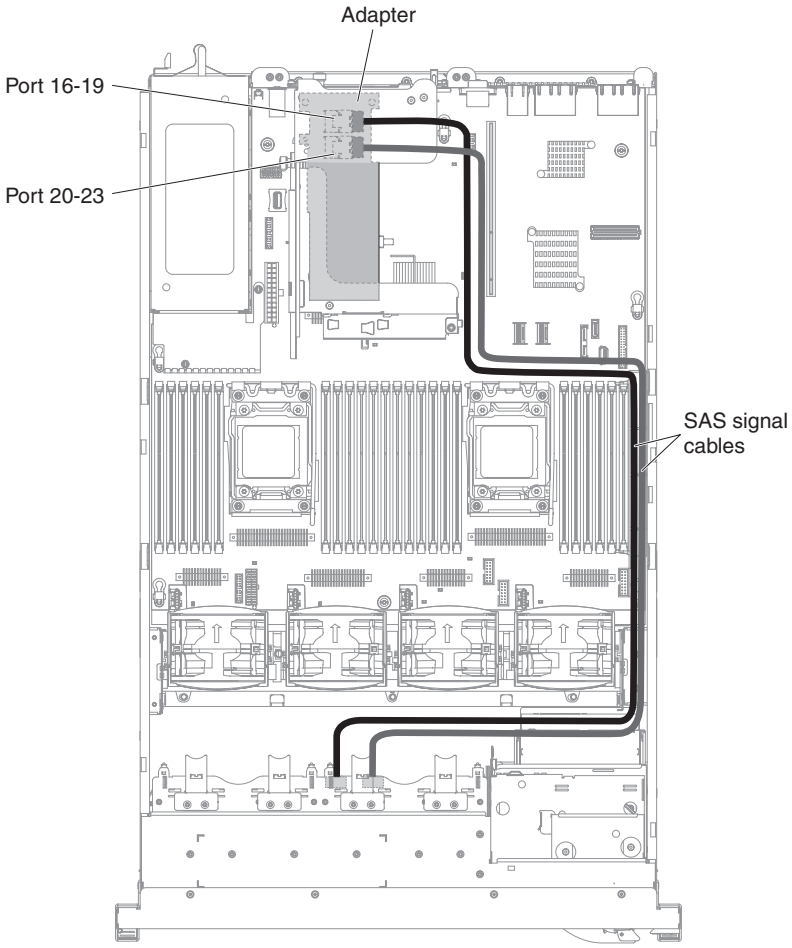
c. Connect a SAS signal cable that comes with the option kit to the RAID adapter connector for drive bays 24-27.

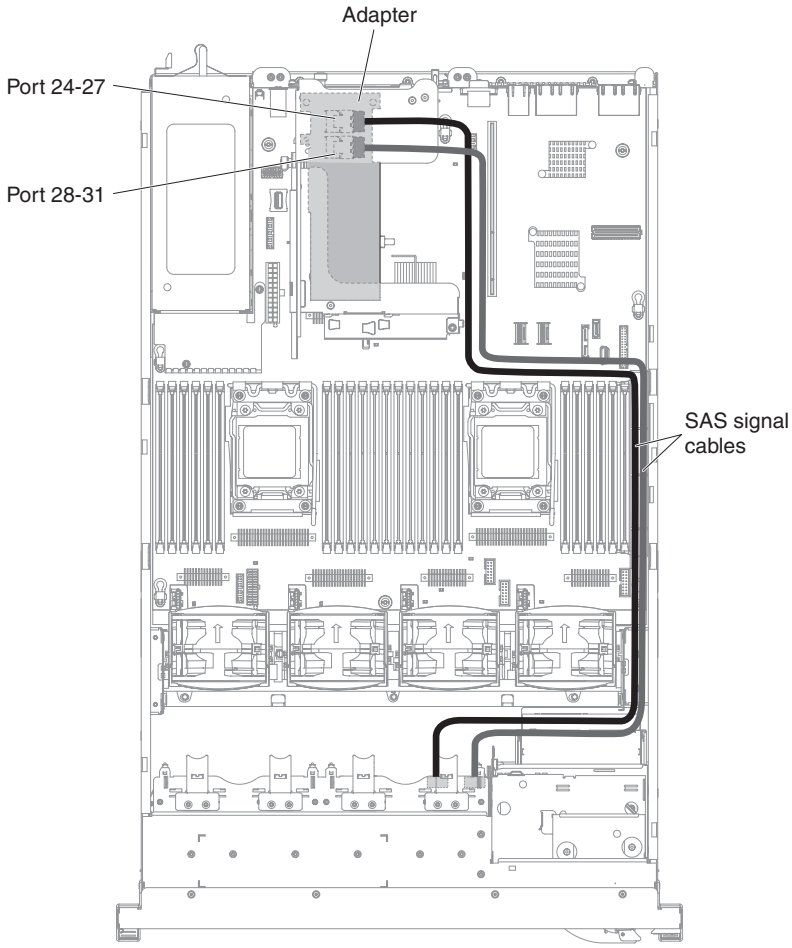
d. Connect a SAS signal cable that comes with the option kit to the RAID adapter connector for drive bays 28-31.

12. Align and install the PCI riser-card assembly 2 in the server (see “Installing a PCI riser-card assembly” on page 56).

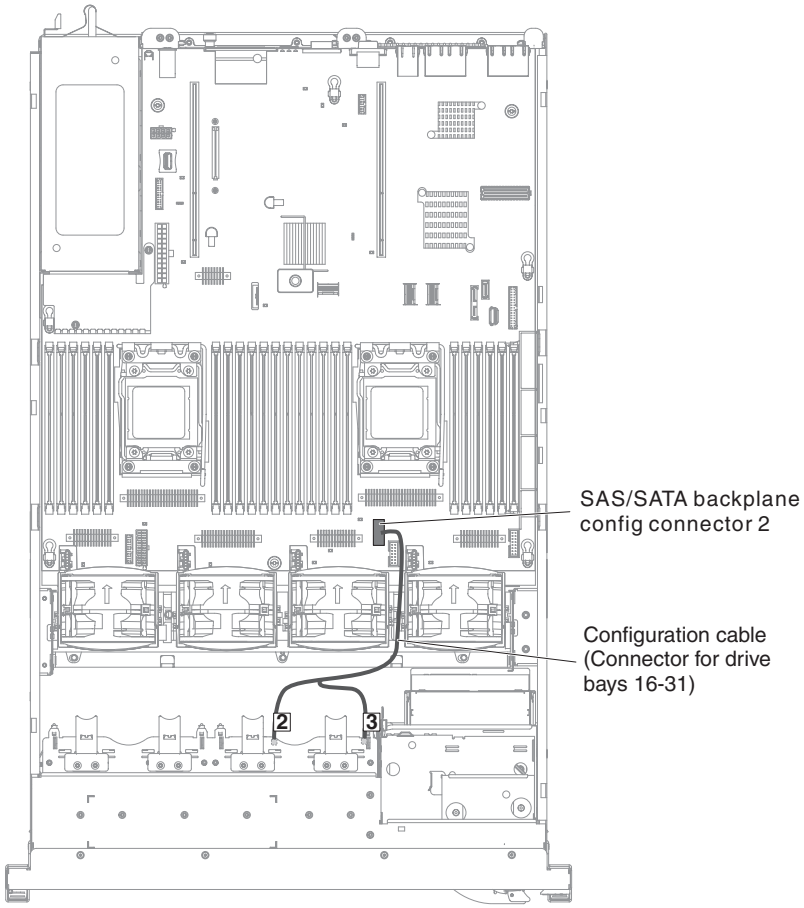


13. Route the cables underneath the cable retention.

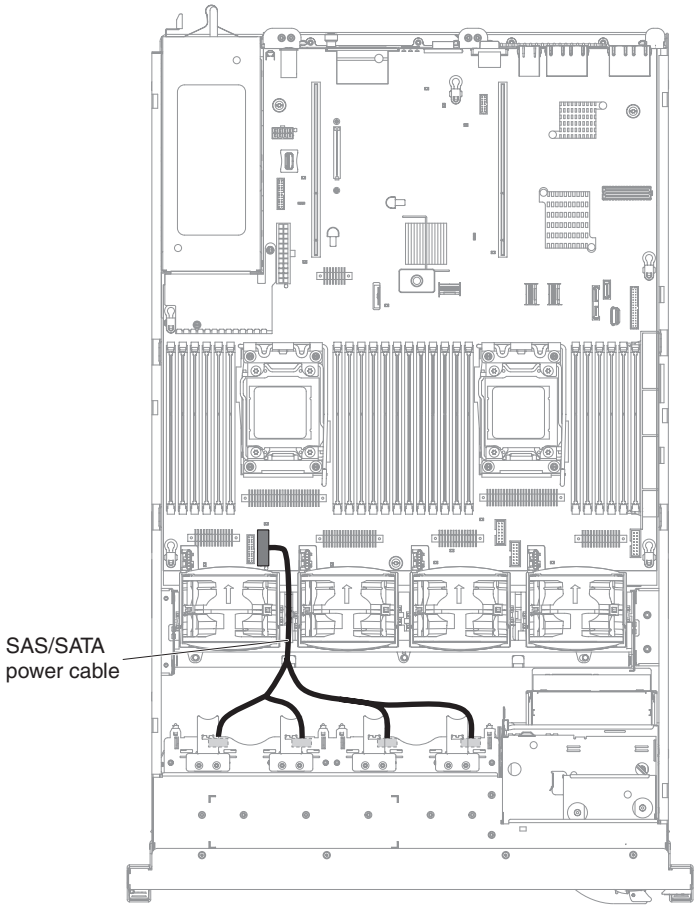

Adapter
Port 16-19
Port 20-23
SAS signal cables



14. Make sure that the configuration cable is connected to the backplanes and system board.



15. Make sure that the SAS power cable is connected to the backplanes and system board.



16. If you removed any fans, install them.
17. Insert the hard disk drives and the fillers the rest of the way into the bays.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing an optional tape drive

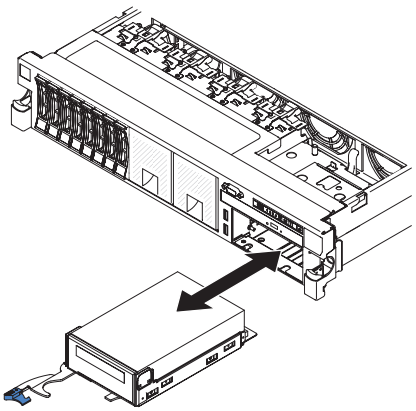
The IBM System x3650 M4 RDX-DDS internal enablement kit is used to install an IBM tape drive in an IBM System x3650 M4 server. The IBM System x3650 M4 RDX-DDS internal enablement kit is compatible only with the following tape drives:

- IBM DDS Generation 5 (DDS/5) SATA tape drive
- IBM DDS Generation 6 (DDS/6) USB tape drive
- IBM RDX USB Removable Hard Disk Drive

The RDX-DDS internal enablement kit contains the following components:

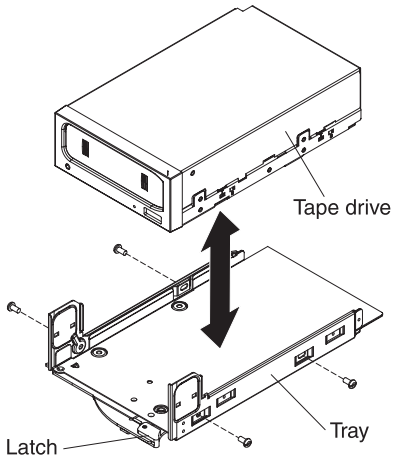
- One tape enablement tray
- One SAS signal cable (for USB tape drive only)
- One tape drive power cable
- Four M3 x 6 screws

The following illustration shows how to install an optional tape drive.

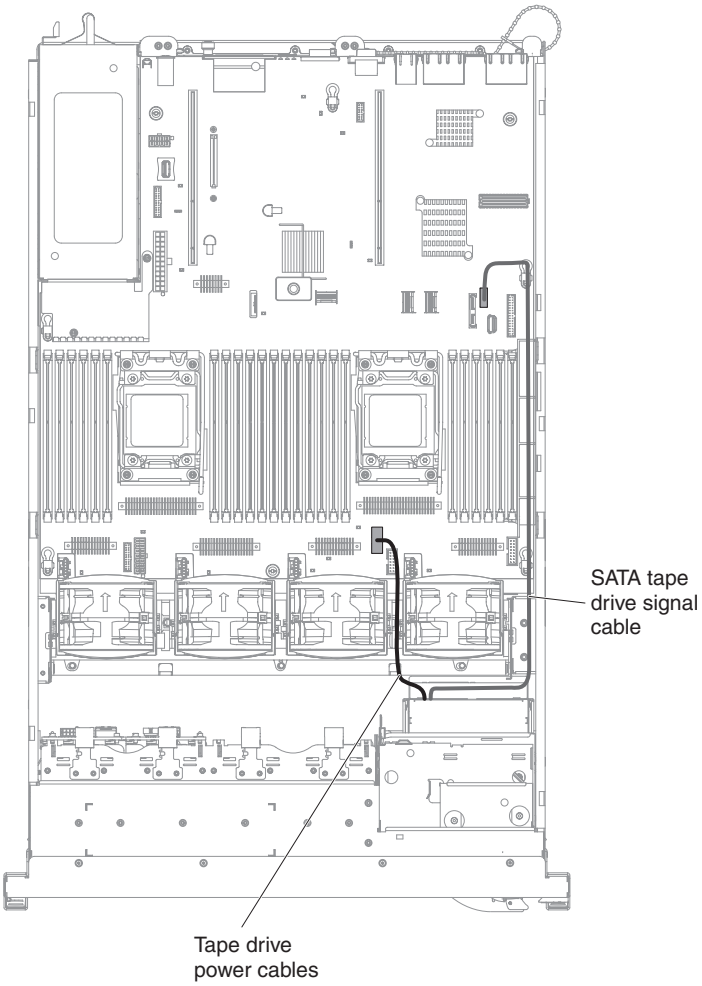


To install a SATA or USB tape drive, complete the following steps:

1. Read the safety information that begins on page vii, “Installation guidelines” on page 40, and “Handling static-sensitive devices” on page 42.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Install the tape drive on the tray as shown in the following illustration. If the tape drive comes with a metal spacer attached, remove the spacer before you install the tape drive on the tray.



4. Prepare the drive according to the instructions that come with the drive, setting any switches or jumpers.
5. Connect the following tape enablement kit cables to the connectors on the system board:
   - SAS signal cables into the SAS connectors on the system board
   - Tape drive power cable to the system board



6. Slide the tape-drive assembly most of the way into the tape-drive bay.
7. Connect the SAS signal cable and the power cable to the back of the tape drive.

   Attention: Make sure that all the cables are positioned underneath the tape-drive assembly before you insert the assembly in the tape-drive bay. Otherwise, the cables might be damaged.
8. Slide the tape-drive assembly the rest of the way into the tape-drive bay.
9. Push the latch to the closed (locked) position.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing a second microprocessor and heat sink

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

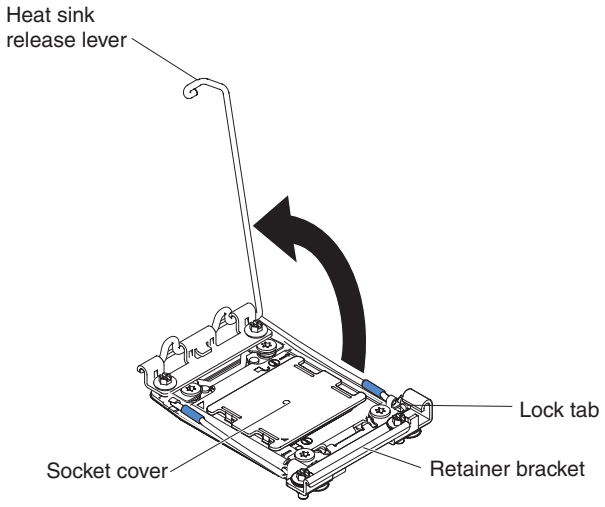
- Always use the microprocessor installation tool to remove a microprocessor. Failing to use the microprocessor installation tool may damage the microprocessor sockets on the system board. Any damage to the microprocessor sockets may require replacing the system board.
- Microprocessors are to be installed only by trained service technicians.
- The server supports up to two Intel Xeon™ E5-2600 series multi-core microprocessors, which are designed for the LGA 2011 socket. See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported microprocessors.
- Do not mix dual-core, quad-core, and six-core microprocessors in the same server.
- The first microprocessor must always be installed in microprocessor socket 1 on the system board.
- When one microprocessor is installed, the air baffle must be installed to provide proper system cooling.
- Do not remove the first microprocessor from the system board when you install the second microprocessor.
- When you install the second microprocessor, you must also install additional memory and the fourth fan. See “Installing a memory module” on page 107 for details about the installation sequence.
- To ensure proper server operation when you install an additional microprocessor, use microprocessors that have the same QuickPath Interconnect (QPI) link speed, integrated memory controller frequency, core frequency, power segment, internal cache size, and type.
- Mixing microprocessors of different stepping levels within the same server model is supported.
- When mixing microprocessors with different stepping levels within the same server model, you do not have to install the microprocessor with lowest stepping level and features in microprocessor socket 1.
- Both microprocessor voltage regulator modules are integrated on the system board.
- If you have to replace a microprocessor, call for service.
- Read the documentation that comes with the microprocessor to determine whether you have to update the server firmware. To download the latest level of server firmware and other code updates for the server, go to http://www.ibm.com/support/fixcentral/.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- If the thermal-grease protective cover (for example, a plastic cap or tape liner) is removed from the heat sink, do not touch the thermal grease on the bottom of the heat sink or set down the heat sink. For details, see the information about thermal grease in the *Problem Determination and Service Guide*.

  Note: Removing the heat sink from the microprocessor destroys the even distribution of the thermal grease and requires replacing the thermal grease.
- To order an additional optional microprocessor, contact your IBM marketing representative or authorized reseller.

To install an additional microprocessor and heat sink, complete the following steps:

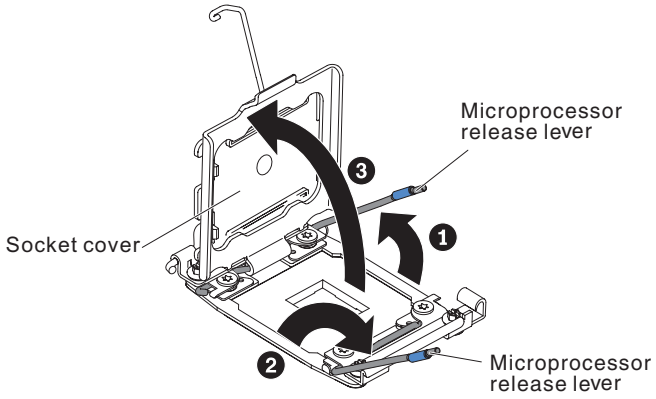
1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect the power cords and all external cables (see “Turning off the server” on page 28).

   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 42.
3. Remove the cover (see “Removing the cover” on page 54).
4. Remove the air baffle (see “Removing the air baffle” on page 57).
5. Locate microprocessor socket 2 on the system board.
6. Rotate the heat sink release lever to the open position.



7. Open the microprocessor socket release levers and retainer:
   a. Identify which release lever is labeled as the first release lever to open and open it.
   b. Open the second release lever on the microprocessor socket.
   c. Open the microprocessor retainer.

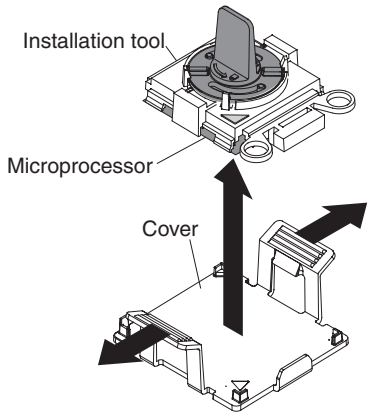
      Attention: Do not touch the connectors on the microprocessor and the microprocessor socket.



8. Install the microprocessor on the microprocessor socket:

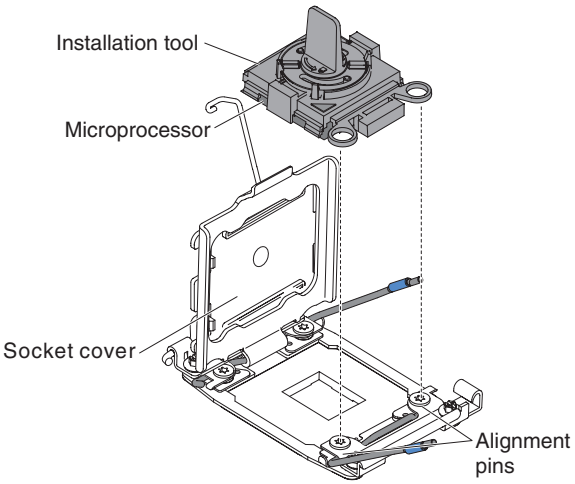
a. Touch the static-protective package that contains the new microprocessor to any *unpainted* on the chassis or any *unpainted* metal surface on any other grounded rack component; then, carefully remove the microprocessor from the package.

b. Release the sides of the cover and remove the cover from the installation tool. The microprocessor is preinstalled on the installation tool.

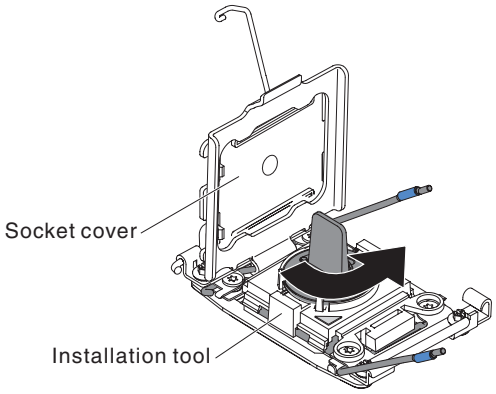


Note: Do not touch the microprocessor contacts. Contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.

c. Align the installation tool with the microprocessor socket. The installation tool rests flush on the socket only if properly aligned.



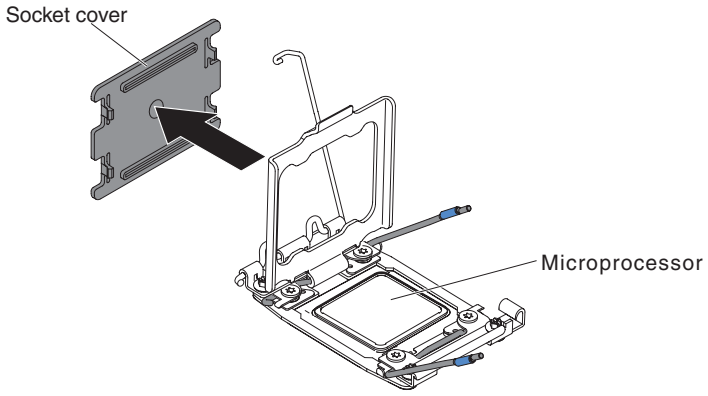
d. Twist the handle on the microprocessor tool counterclockwise to insert the microprocessor into the socket. The microprocessor is keyed to ensure that the microprocessor is installed correctly. The microprocessor rests flush on the socket only if properly installed.



Attention:

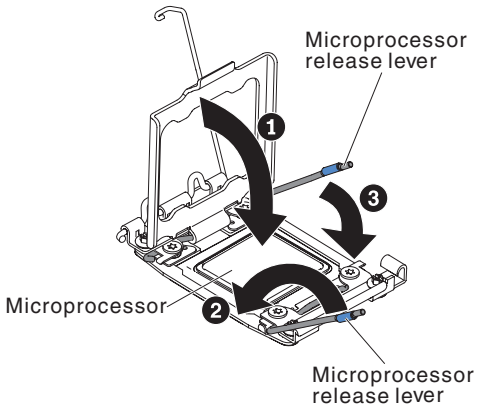
- Do not press the microprocessor into the socket.
- Make sure that the microprocessor is oriented and aligned correctly in the socket before you try to close the microprocessor retainer.
- Do not touch the thermal material on the bottom of the heat sink or on top of the microprocessor. Touching the thermal material will contaminate it. If the thermal material on the microprocessor or heat sink becomes contaminated, contact your service technician.

9. Remove the microprocessor socket dust cover, tape, or label from the surface of the microprocessor socket, if one is present. Store the socket cover in a safe place.



Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 42.

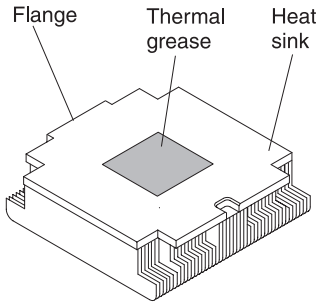
10. Close the microprocessor socket release levers and retainer:
    a. Close the microprocessor retainer on the microprocessor socket.
    b. Identify which release lever is labeled as the first release lever to close and close it.
    c. Close the second release lever on the microprocessor socket.



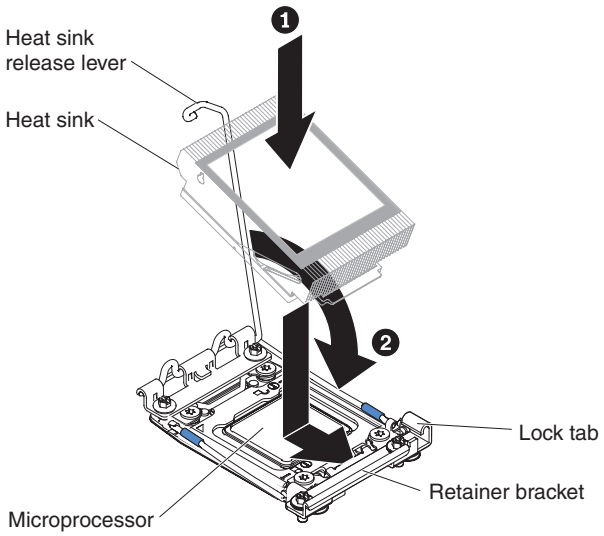
11. Install the heat sink:

    Attention:

    - Do not set down the heat sink after you remove the plastic cover.
    - Do not touch the thermal grease on the bottom of the heat sink after you remove the plastic cover. Touching the thermal grease will contaminate it. See “Thermal grease” on page 106 for more information. If the thermal material on the microprocessor or heat sink becomes contaminated, contact your service technician.



    a. Remove the plastic protective cover from the bottom of the heat sink.
    b. Position the heat sink over the microprocessor. The heat sink is keyed to assist with proper alignment.
    c. Align and place the heat sink on top of the microprocessor in the retention bracket, thermal material side down.
    d. Press firmly on the heat sink.
    e. Rotate the heat sink release lever to the closed position and hook it underneath the lock tab.



12. If you installed the second microprocessor, install the fourth fan (see “Installing a dual-motor hot-swap fan” on page 124).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

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.

When you are installing the heat sink on the same microprocessor that it was removed from, make sure that the following requirements are met:

- The thermal grease on the heat sink and microprocessor is not contaminated.
- Additional thermal grease is not added to the existing thermal grease on the heat sink and microprocessor.

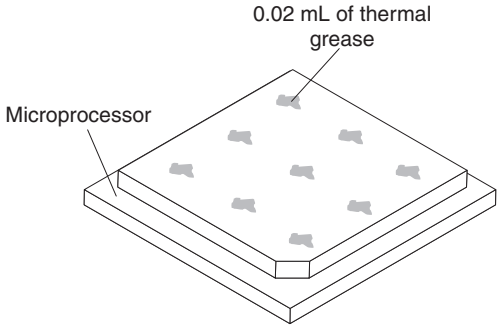
Notes:

- Read the safety information on page vii.
- Read the “Installation guidelines” on page 40.
- Read “Handling static-sensitive devices” on page 42.

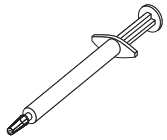
To replace damaged or contaminated thermal grease on the microprocessor and heat exchanger, complete the following steps:

1. Place the heat sink 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 sink.

   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 9 uniformly spaced dots of 0.02 mL each on the top of the microprocessor. The outermost dots must be within approximately 5 mm of the edge of the microprocessor; this is to ensure uniform distribution of the grease.



Note: If the grease is properly applied, approximately half of the grease will remain in the syringe.

6. Install the heat sink onto the microprocessor as described in 11 on page 105.

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 adapter that you are installing, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message that indicates that the memory configuration has changed.
- The server supports only industry-standard double-data-rate 3 (DDR3), 800, 1066, or 1333 MHz, PC3-6400, PC3-8500, or PC3-10600 registered or unbuffered, synchronous dynamic random-access memory (SDRAM) dual inline memory modules (DIMMs) with error correcting code (ECC). See http://www.ibm.com/servers/eserver/serverproven/compat/us/ for a list of supported memory modules for the server.
  - The specifications of a DDR3 DIMM are on a label on the DIMM, in the following format.

    ggggg eRxff PC3*v-wwwwwm-aa-bb-ccd*

    where:

    ggggg is the total capacity of the DIMM (for example, 256MB, 512MB, 1GB, 2GB, or 4GB)

    eR is the number of ranks

    1R = single-rank

    2R = dual-rank

    4R = quad-rank

    xff is the device organization (bit width)

x4 = x4 organization (4 DQ lines per SDRAM)

x8 = x8 organization

x16 = x16 organization

v is the SDRAM and support component supply voltage (VDD)

Blank = 1.5 V operable

L = 1.35 V operable, 1.5 V operable

U = 1.25 V operable, 1.25 V endurant

wwwww is the DIMM bandwidth, in MBps

6400 = 6.40 GBps (DDR3-800 SDRAMs, 8-byte primary data bus)

8500 = 8.53 GBps (DDR3-1066 SDRAMs, 8-byte primary data bus)

10600 = 10.66 GBps (DDR3-1333 SDRAMs, 8-byte primary data bus)

12800 = 12.80 GBps (DDR3-1600 SDRAMs, 8-byte primary data bus)

14900 = 14.93 GBps (DDR3-1866 SDRAMs, 8-byte primary data bus)

17000 = 17.06 GBps (DDR3-2133 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)

aa is the CAS latency, in clocks at maximum operating frequency

bb is the JEDEC SPD Revision Encoding and Additions level

cc is the reference design file for the design of the DIMM

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

Note: To determine the type of a DIMM, see the label on the DIMM. The information on the label is in the format xxxxx nRxxx PC3v-xxxxx-xx-xx-xxx. The numeral in the sixth numerical position indicates whether the DIMM is single-rank (n=1), dual-rank (n=2), or quad-rank (n=4).

- The following rules apply to DDR3 RDIMM speed as it relates to the number of RDIMMs in a channel:
  - When you install 1 RDIMM per channel, the memory runs at 1333 MHz
  - When you install 2 RDIMMs per channel, the memory runs at 1066 MHz
  - When you install 3 RDIMMs per channel, the memory runs at 800 MHz

    Note: For hyper cloud DIMMs, the memory runs at 1333 MHz at performance mode.
  - All channels in a server run at the fastest common frequency.
  - Do not install registered, unbuffered, and load reduction DIMMs in the same server
- The maximum memory speed is determined by the combination of the microprocessor, DIMM speed, DIMM type, Operating Modes in UEFI settings, and the number of DIMMs installed in each channel.
- In two-DIMM-per-channel configuration, a server with an Intel Xeon™ E5-2600 series microprocessor automatically operates with a maximum memory speed of up to 1333 MHz when the following conditions is met:
  - Two 1.35 V single-rank, dual-ranl, or quad-rank UDIMMs, RDIMMs or LRDIMMs are installed in the same channel. In the Setup utility, **Memory**

speed is set to **Max performance** and **LV-DIMM power** is set to **Enhance performance** mode. The 1.35 V UDIMMs, RDIMMs or LRDIMMs will function at 1.5 V.

- The server supports a maximum of 16 dual-rank UDIMMs. The server supports up to two UDIMMs per channel.
- The server supports a maximum of 24 single-rank, dual-rank, or 16 quad-rank RDIMMs. The server does not support three quad-rank RDIMMs in the same channel.
- The following table shows an example of the maximum amount of memory that you can install using ranked DIMMs:

Table 7. Maximum memory installation using ranked DIMMs

Number of DIMMs	DIMM type	DIMM size	Total memory
16	Dual-rank UDIMMs	4 GB	64 GB
24	Single-rank RDIMMs	2 GB	48 GB
24	Single-rank RDIMMs	4 GB	96 GB
24	Dual-rank RDIMMs	8 GB	192 GB
24	Dual-rank RDIMMs	16 GB	384 GB
24	Quad-rank HCDIMMs	32 GB	768 GB
16	Quad-rank RDIMMs	16 GB	256 GB
24	Quad-rank LRDIMMs	32 GB	768 GB

- The UDIMM option that is available for the server is 4 GB. The server supports a minimum of 4 GB and a maximum of 64 GB of system memory using UDIMMs.
- The RDIMM options that are available for the server are 2 GB, 4 GB, 8 GB, and 16 GB. The server supports a minimum of 2 GB and a maximum of 384 GB of system memory using RDIMMs.
- The HCDIMM options that are available for the server are 16 GB and 32 GB. The server supports a minimum of 16 GB and a maximum of 768 GB of system memory using HCDIMMs.

  Note: Do not mix the 16 GB HCDIMM and the 32 GB HCDIMM in the server.
- The LRDIMM option that is available for the server is 32 GB. The server supports a minimum of 32 GB and a maximum of 768 GB of system memory using LRDIMMs.

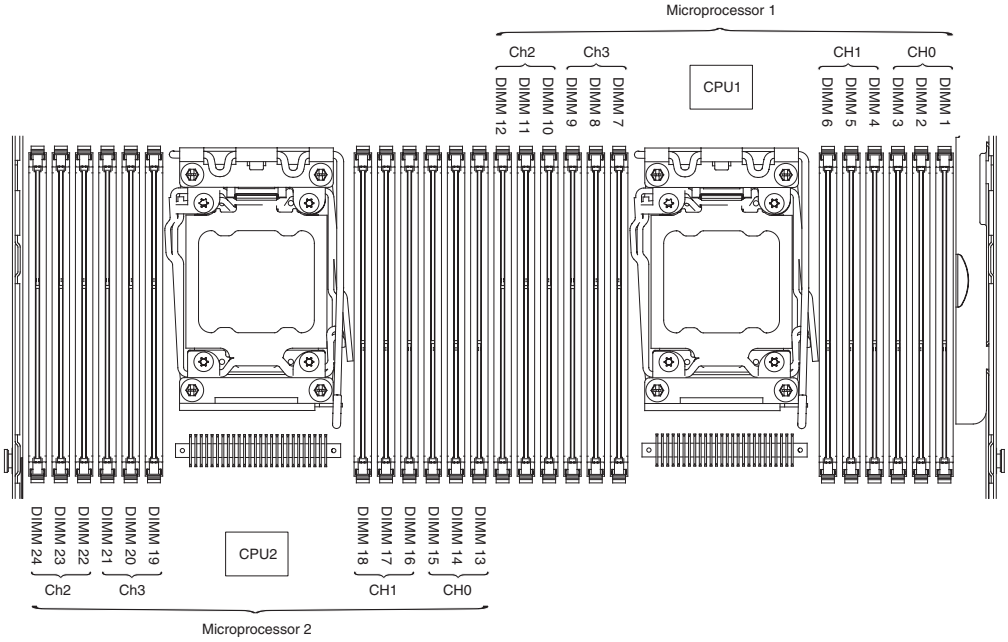
  Note: The amount of usable memory is reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. To view the total amount of installed memory and the amount of configured memory, run the Setup utility. For additional information, see Chapter 3, “Configuring the server,” on page 141.
- A minimum of one DIMM must be installed for each microprocessor. For example, you must install a minimum of two DIMMs if the server has two microprocessors installed. However, to improve system performance, install a minimum of four DIMMs for each microprocessor.
- DIMMs in the server must be the same type (RDIMM, UDIMM, or LRDIMM) to ensure that the server will operate correctly.
- When you install one quad-rank DIMM in a channel, install it in the DIMM connector furthest away from the microprocessor.

- For UDIMMs, DIMM connectors 3, 6, 7, and 10 for microprocessor 1 and DIMM connectors 15, 18, 19, and 22 for microprocessor 2 are not used.

Notes:

1. You can install DIMMs for microprocessor 2 as soon as you install microprocessor 2; you do not have to wait until all of the DIMM slots for microprocessor 1 are filled.
2. DIMM slots 13-24 are reserved for microprocessor 2; thus, DIMM slots 13-24 are enabled when microprocessor 2 is installed.

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



DIMM installation sequence

Depending on the server model, the server may come with a minimum of one 2 GB or 4 GB DIMM installed in slot 1. When you install additional DIMMs, install them in the order shown in the following table to optimize system performance. In non-mirroring mode, all three channels on the memory interface for each microprocessor can be populated in any order and have no matching requirements.

Important: If you have configured the server to use memory mirroring, do not use the order in Table 8; go to “Memory mirrored channel” on page 111 and use the installation order shown there.

Table 8. Non-mirroring (normal) mode DIMM installation sequence

Number of installed microprocessor	DIMM connector population sequence
One microprocessor installed	1, 4, 9, 12, 2, 5, 8, 11, 3, 6, 7, 10
Two microprocessors installed	1, 13, 4, 16, 9, 21, 12, 24, 2, 14, 5, 17, 8, 20, 11, 23, 3, 15, 6, 18, 7, 19, 10, 22

Memory mirrored channel

Memory mirrored channel 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. To enable memory mirrored channel through the Setup utility, select **System Settings → Memory**. For more information, see “Using the Setup utility” on page 145. When you use the memory mirrored channel feature, consider the following information:

- When you use memory mirrored channel, you must install a pair of DIMMs at a time. The two DIMMs in each pair must be identical in size, type, and rank (single, dual, or quad), and organization, but not in speed. The channels run at the speed of the slowest DIMM in any of the channels.
- The maximum available memory is reduced to half of the installed memory when memory mirrored channel is enabled. For example, if you install 64 GB of memory using RDIMMs, only 32 GB of addressable memory is available when you use memory mirrored channel.
- For UDIMMs, DIMM connectors 3, 6, 7, and 10 for microprocessor 1 and DIMM connectors 15, 18, 19, and 22 for microprocessor 2 are not used in memory mirrored channel mode.

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

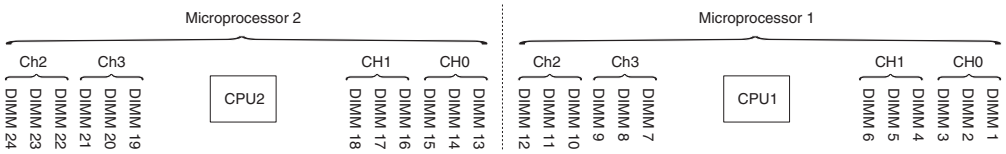


Figure 1. Memory channel interface layout

The following table shows the installation sequence for installing DIMMs in memory-mirroring mode:

Table 9. Memory mirrored channel mode DIMM population sequence

Number of DIMMs	Number of installed microprocessor	DIMM connector
First pair of DIMMs	1	1, 4
Second pair of DIMMs	1	9, 12
Third pair of DIMMs	1	2, 5
Fourth pair of DIMMs	1	8, 11
Fifth pair of DIMMs	1	3, 6
Sixth pair of DIMMs	1	7, 10
Seventh pair of DIMMs	2	13, 16
Eighth pair of DIMMs	2	21, 24
Ninth pair of DIMMs	2	14, 17
Tenth pair of DIMMs	2	20, 23
Eleventh pair of DIMMs	2	15, 18
Twelfth pair of DIMMs	2	19, 22
Note: DIMM connectors 3, 6, 7, 10, 15, 18, 19, and 22 are not used in memory mirrored channel mode when UDIMMs are installed in the server.		

Memory rank sparing

The memory rank sparing feature disables the failed memory from the system configuration and activates a rank sparing DIMM to replace the failed active DIMM. You can enable rank sparing memory in the Setup utility, select **System Settings → Memory**. For more information, see “Using the Setup utility” on page 145. When you use the memory rank sparing feature, consider the following information:

- The memory rank sparing feature is supported on server models with an Intel Xeon™ 5600 series microprocessor.
- The maximum available memory is reduced when memory rank sparing mode is enabled.

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

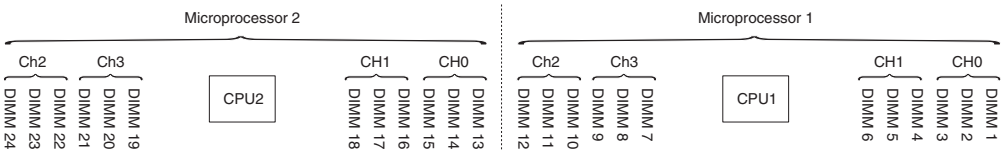


Figure 2. Connectors on each memory channel

Follow the installation sequence for rank sparing mode:

- Install at least one quad-rank DIMM in a channel.
- Install at least two single-rank or dual-rank DIMMs in a channel.

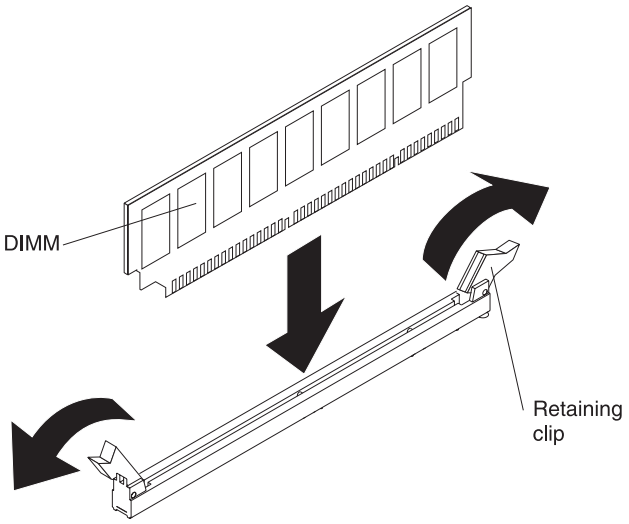
You can install DIMMs for the microprocessor 2 once the microprocessor 2 is installed. You do not need to wait until all of the DIMM connectors for microprocessor 1 are filled. The following table shows the installation sequence for memory rank sparing mode:

Table 10. Memory rank sparing mode DIMM population sequence

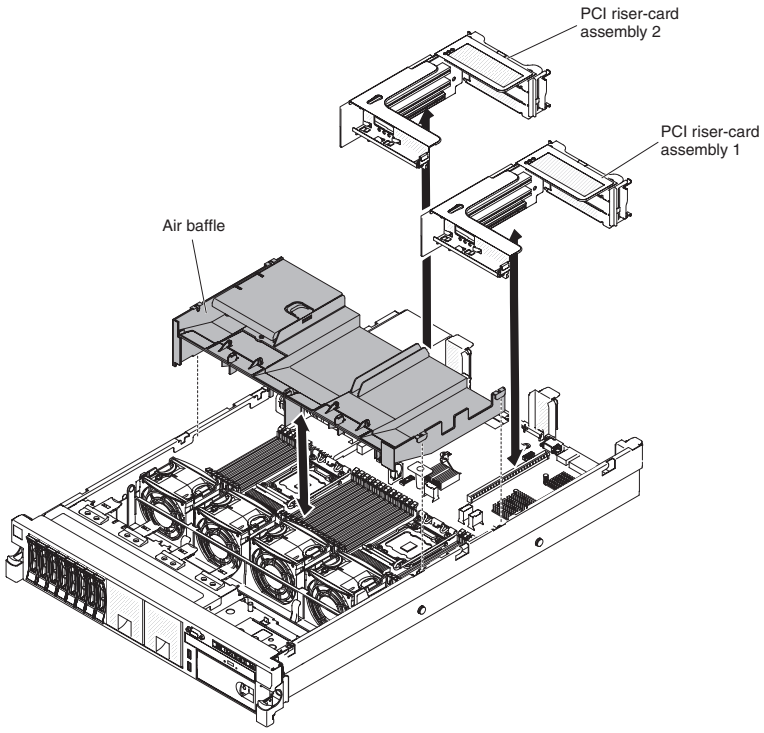
Number of DIMMs	Number of installed microprocessor	DIMM connector
First pair of DIMMs	1	1, 2
Second pair of DIMMs	1	4, 5
Third pair of DIMMs	1	8, 9
Fourth pair of DIMMs	1	11, 12
Fifth pair of DIMMs	1	7, 10
Sixth pair of DIMMs	1	3, 6
Seventh pair of DIMMs	2	13, 14
Eighth pair of DIMMs	2	16, 17
Ninth pair of DIMMs	2	20, 21
Tenth pair of DIMMs	2	23, 24
Eleventh pair of DIMMs	2	19, 22
Twelfth pair of DIMMs	2	15, 18
Note: DIMM connectors 3, 6, 7, 10, 15, 18, 19, and 22 are not used in memory rank sparing mode when UDIMMs are installed in the server.		

Installing a DIMM

To install a DIMM, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices, and disconnect the power cord and all external cables (see “Turning off the server” on page 28).
3. Remove the server cover (see “Removing the cover” on page 54).



4. If PCI riser-card assembly 1 contains one or more adapters, remove riser-card assembly 1 (see “Removing a PCI riser-card assembly” on page 55).
5. Remove the DIMM air baffle (see “Removing the air baffle” on page 57).

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
6. Open the retaining clip on each end of the DIMM connector.

7. Touch the static-protective package that contains the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.
8. Turn the DIMM so that the DIMM keys align correctly with the connector.
9. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. 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.
10. Install the DIMM air baffle (see “Installing the air baffle” on page 58).
11. Install PCI riser-card assembly 2, if you removed it (see “Installing a PCI riser-card assembly” on page 56).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135. Go to the Setup utility and make sure all the installed DIMMs are present and enabled.

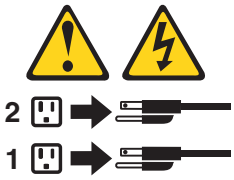
Installing a hot-swap ac power supply

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

- Make sure that the devices that you are installing are supported. For a list of supported optional devices for the server, see http://www.ibm.com/systems/info/x86servers/serverproven/compat/us/.
- Before you install an additional power supply or replace a power supply with one of a different wattage, you may use the IBM Power Configurator utility to determine current system power consumption. For more information and to download the utility, go to http://www-03.ibm.com/systems/bladecenter/resources/powerconfig.html.
- The server comes with one hot-swap 12-volt output power supply that connects to power supply bay 1. The input voltage is 100-127 V ac or 200-240 V ac auto-sensing.
- Power supplies in the server must be with the same power rating or wattage to ensure that the server will operate correctly. For example, you cannot mix 750-watt and 900-watt power supplies in the server.
- Power supply 1 is the default/primary power supply. If power supply 1 fails, you must replace the power supply with the same wattage immediately.
- You can order an optional power supply for redundancy.
- 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.

Statement 5:

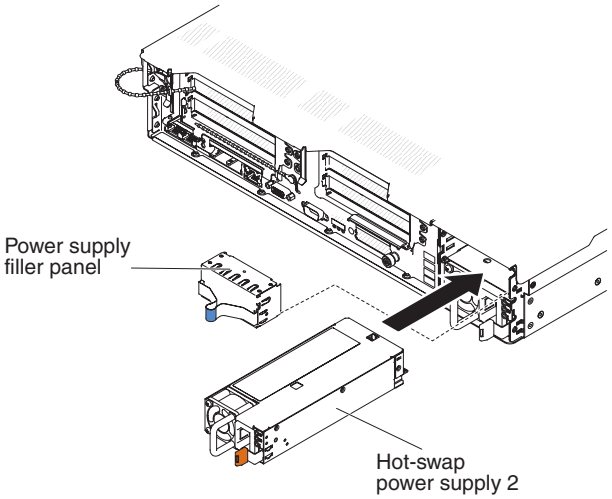
CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from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



Statement 8:

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

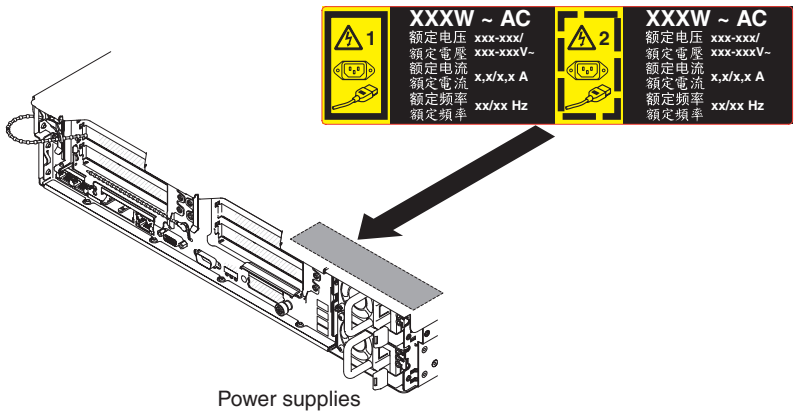
Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.



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 40.
2. Remove the power-supply blank from the empty power-supply bay by pinching the side clip and pulling the power-supply blank from the bay. Save the power-supply blank 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 blank for proper cooling.
3. 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.



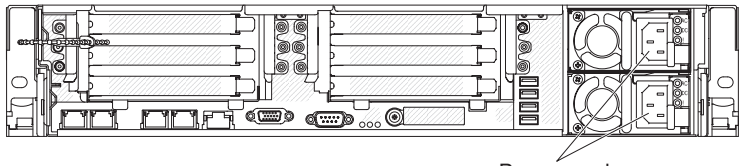
Power supplies

4. Slide the ac power supply into the bay until the retention latch clicks into place. Make sure that the power supply connects firmly into the power-supply connector.

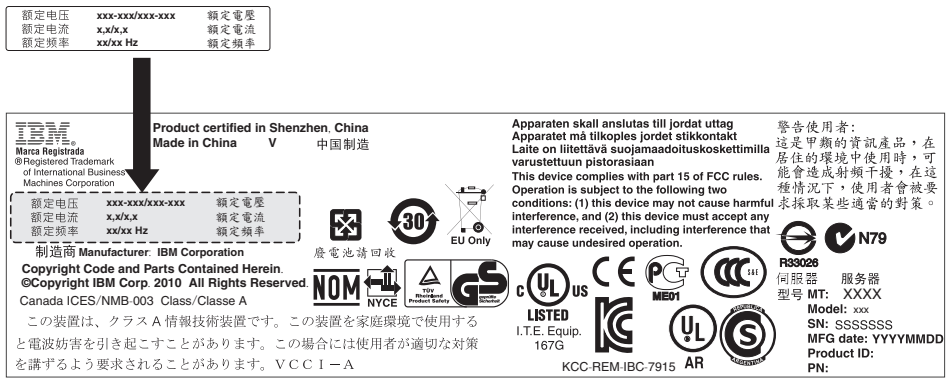
   Attention: Do not install power supplies of different watt in the server.

5. 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.


Power cord connectors

6. Route the power cord through the clip next to power-supply and through any cable clamps on the rear of the server, to prevent the power cord from being accidentally pulled out when you slide the server in and out of the rack.
7. Connect the power cord to a properly grounded electrical outlet.
8. Make sure that the ac power LED and the dc power LED on the ac power supply are lit, indicating that the power supply is operating correctly. The two green LEDs are to the right of the power-cord connector.
9. 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.



10. (IBM Business Partners only) Restart the server. Confirm that it starts correctly and recognizes the newly installed devices, and make sure that no error LEDs are lit.
11. (IBM Business Partners only) Complete the additional steps in “Instructions for IBM Business Partners” on page 31.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing a hot-swap dc power supply

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

- Before you install an additional power supply or replace a power supply with one of a different wattage, you may use the IBM Power Configurator utility to determine current system power consumption. For more information and to download the utility, go to http://www-03.ibm.com/systems/bladecenter/resources/powerconfig.html.
- The server comes with one hot-swap 12-volt output power supply that connects to power supply bay 1. The input voltage is -48 V dc or -60 V dc auto-sensing.
- Before you install a dc power supply in the server, you must remove all ac power supplies. Do not use both ac and dc power supplies in the same server. Install up to two dc power supplies or up to two ac power supplies, but not a combination.
- Power supply 1 is the default/primary power supply. If power supply 1 fails, you must replace the power supply with the same wattage immediately.
- You can order an optional power supply for redundancy.
- 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.
- It is the customer's responsibility to supply the necessary power cable.

  To reduce the risk of electric shock or energy hazards:

  – **Use a circuit breaker that is rated at 25 amps.**
  – **Use 2.5 mm^2 (12 AWG) at 90° C copper wire.**
  – **Torque the wiring-terminal screws to 0.50 ~ 0.60 newton-meters (4.43 ~ 5.31 inch-pounds).**

  For more information, see Statement 34 on page 121.
- If the power source requires ring terminals, you must use a crimping tool to install the ring terminals to the power cord wires. The ring terminals must be UL approved and must accommodate the wire that is described in the above-mentioned note .

Statement 29:

CAUTION: This equipment is designed to permit the connection of the earthed conductor of the dc supply circuit to the earthing conductor at the equipment.

This equipment is designed to permit the connection of the earthed conductor of the dc supply circuit to the earthing conductor at the equipment. If this connection is made, all of the following conditions must be met:

- This equipment shall be connected directly to the dc supply system earthing electrode conductor or to a bonding jumper from an earthing terminal bar or bus to which the dc supply system earthing electrode conductor is connected.
- This equipment shall be located in the same immediate area (such as, adjacent cabinets) as any other equipment that has a connection between the earthed conductor of the same dc supply circuit and the earthing conductor, and also the point of earthing of the dc system. The dc system shall not be earthed elsewhere.
- The dc supply source shall be located within the same premises as this equipment.
- Switching or disconnecting devices shall not be in the earthed circuit conductor between the dc source and the point of connection of the earthing electrode conductor.

Statement 31:

DANGER

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

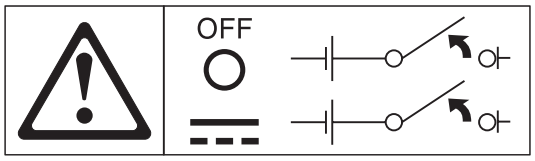
To avoid a shock hazard:

- **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 power source.**
- **Connect to properly wired power sources 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 ac power cords, dc power sources, network connections, telecommunications systems, and serial cables before you open the device covers, unless you are instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when you install, move, or open covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn OFF all power sources and equipment that is to be attached to this product. 2. Attach signal cables to the product. 3. Attach power cords to the product. • For ac systems, use appliance inlets. • For dc systems, ensure correct polarity of -48 V dc connections: RTN is + and -48 V dc is -. Earth ground should use a two-hole lug for safety. 4. Attach signal cables to other devices. 5. Connect power cords to their sources. 6. Turn ON all the power sources.	1. Turn OFF all power sources and equipment that is to be attached to this product. • For ac systems, remove all power cords from the chassis power receptacles or interrupt power at the ac power distribution unit. • For dc systems, disconnect dc power sources at the breaker panel or by turning off the power source. Then, remove the dc cables. 2. Remove the signal cables from the connectors. 3. Remove all cables from the devices.

Statement 33:

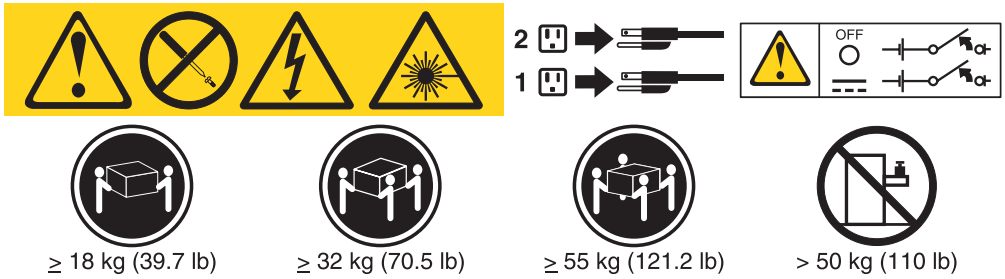
CAUTION:
This product does not provide a power-control button. Turning off blades or removing power modules and I/O modules does not turn off electrical current to the product. The product also might have more than one power cord. To remove all electrical current from the product, make sure that all power cords are disconnected from the power source.



Statement 34:

CAUTION:
To reduce the risk of electric shock or energy hazards:

- **This equipment must be installed by trained service personnel in a restricted-access location, as defined by the NEC and IEC 60950-1, First Edition, The Standard for Safety of Information Technology Equipment.**
- **Connect the equipment to a properly grounded safety extra low voltage (SELV) source. A SELV source is a secondary circuit that is designed so that normal and single fault conditions do not cause the voltages to exceed a safe level (60 V direct current).**
- **Incorporate a readily available approved and rated disconnect device in the field wiring.**
- **See the specifications in the product documentation for the required circuit-breaker rating for branch circuit overcurrent protection.**
- **Use copper wire conductors only. See the specifications in the product documentation for the required wire size.**
- **See the specifications in the product documentation for the required torque values for the wiring-terminal screws.**

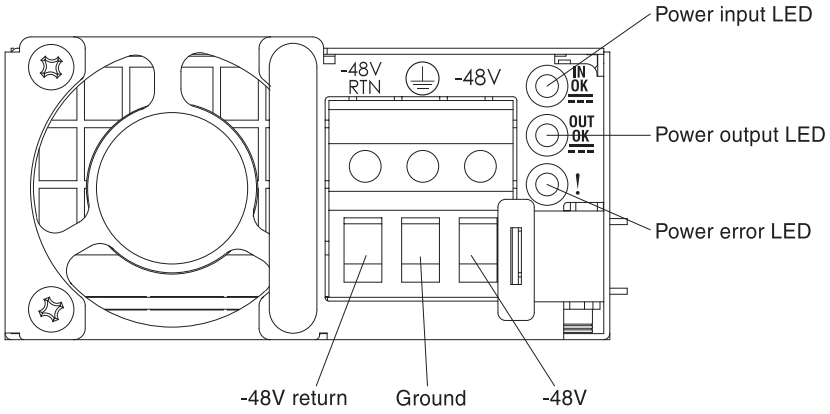


Important: Be sure to read the multilingual safety instructions on the CD that comes with the server before you use the product.

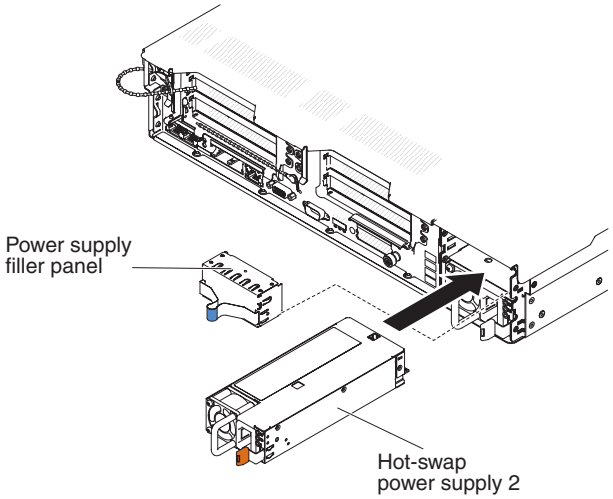
To install a hot-swap dc power supply, complete the following steps:

Attention: Only trained service personnel other than IBM service technicians are authorized to install and remove the -48 volt dc power supply, and make the connections to and disconnections from the -48 volt dc power source. IBM service technicians are not certified or authorized to install or remove the -48 volt power cable. The customer is responsible for ensuring that only trained service personnel install or remove the -48 volt power cable.

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Touch the static-protective package that contains the hot-swap power supply to any unpainted metal surface on the server; then, remove the power supply from the package and place it on a static-protective surface.
3. Turn off the circuit breaker for the dc power source to which the new power supply will be connected. Disconnect the power cord from the dc power source.
4. Attach the dc power cable to the new power supply. Make sure the wires are connected securely to the -48V, ground, and -48V return terminals.

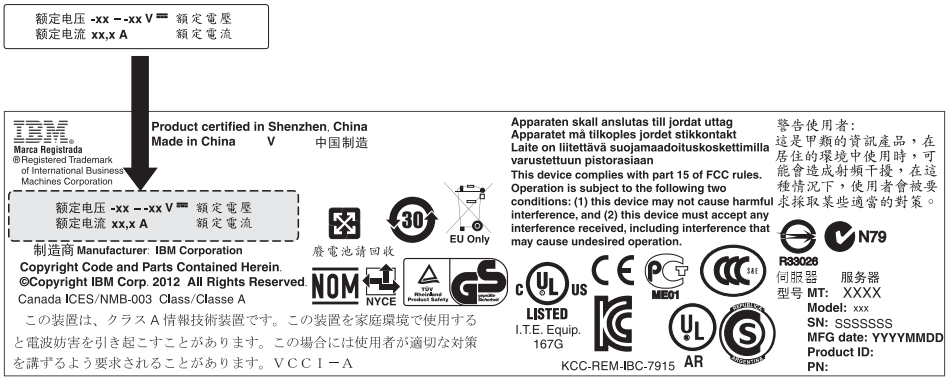


5. If you are installing a hot-swap power supply into an empty bay, remove the power-supply filler from the power-supply bay.



6. Grasp the handle on the rear of the power supply and slide the power supply forward into the power-supply bay until it clicks. Make sure that the power supply connects firmly into the power-supply connector.

7. Route the power cord through the handle and cable tie if any, so that it does not accidentally become unplugged.
8. Connect the other ends of the dc power cable to the dc power source. Cut the wires to the correct length, but do not cut them shorter than 150 mm (6 inch). If the power source requires ring terminals, you must use a crimping tool to install the ring terminals to the power cord wires. The ring terminals must be UL approved and must accommodate the wires that are described in note 118. The minimum nominal thread diameter of a pillar or stud type of terminal must be 4 mm; for a screw type of terminal the diameter must be 5.0 mm.
9. Turn on the circuit breaker for the dc power source to which the new power supply is connected.
10. Make sure that the green power LEDs on the power supply are lit, indicating that the power supply is operating correctly.
11. 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.



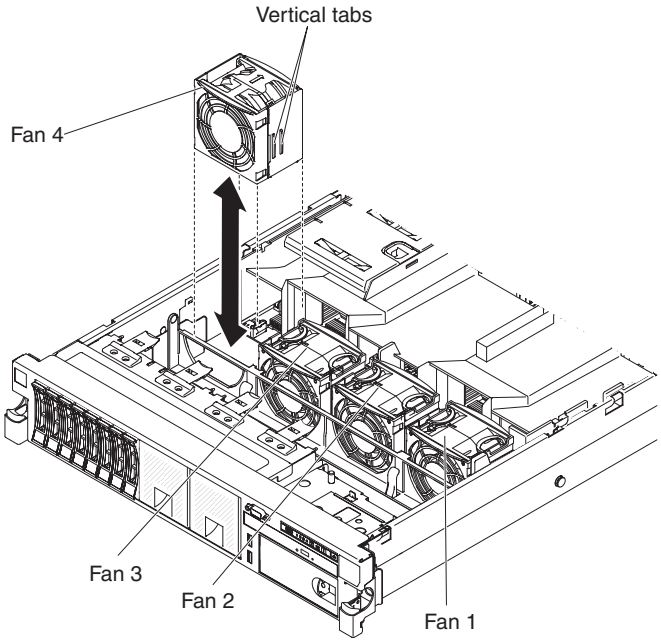
12. If you are adding a power supply to the server, attach the redundant power information label that comes with this option on the server cover near the power supplies.

Removing a dual-motor hot-swap fan

The server comes with four replaceable fans.

Attention: To ensure proper server operation and cooling, if you remove a fan with the system running, you must install a replacement fan within 30 seconds or the system will shut down.

To remove a replaceable fan, complete the following steps.



1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Leave the server connected to power.
3. Slide the server out of the rack and remove the cover (see “Removing the cover” on page 54). The LED near the failing fan will be lit.

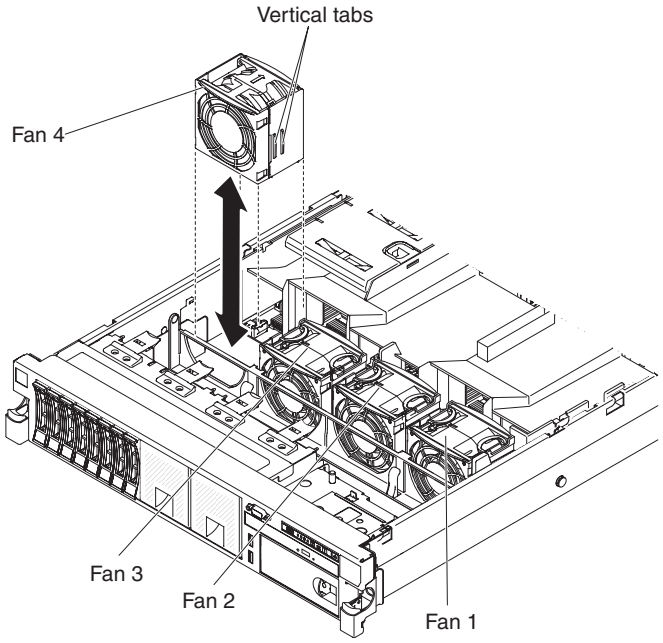
   Attention: To ensure proper system cooling, do not remove the top cover for more than 30 minutes during this procedure.
4. Rotate the air baffle up.
5. Lift the fan out of the server.
6. Replace the fan within 30 seconds (see “Installing a dual-motor hot-swap fan”).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Installing a dual-motor hot-swap fan

The server comes with four replaceable double fans. For proper cooling, the server requires that all four fans be installed at all times.

Attention: To ensure proper server operation, if a fan fails, replace it within 30 seconds. Have a replacement fan ready to install as soon as you remove the failed fan.



To install any of the four replaceable fans, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. If you have not done so already, slide the server out of the rack and remove the cover (see “Removing the cover” on page 54).

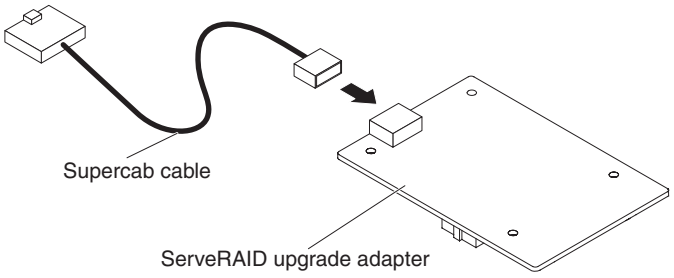
   Attention: To ensure proper system cooling, do not remove the top cover for more than 30 minutes during this procedure.
3. Rotate the air baffle up.
4. Orient the new fan over its position in the fan bracket so that the connector on the bottom aligns with the fan connector on the system board.
5. Align the vertical tabs on the fan with the slots on the fan cage bracket.
6. Push the new fan into the fan connector on the system board. Press down on the top surface of the fan to seat the fan fully. Make sure that the yellow LED next to the fan connector on the system board is off.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

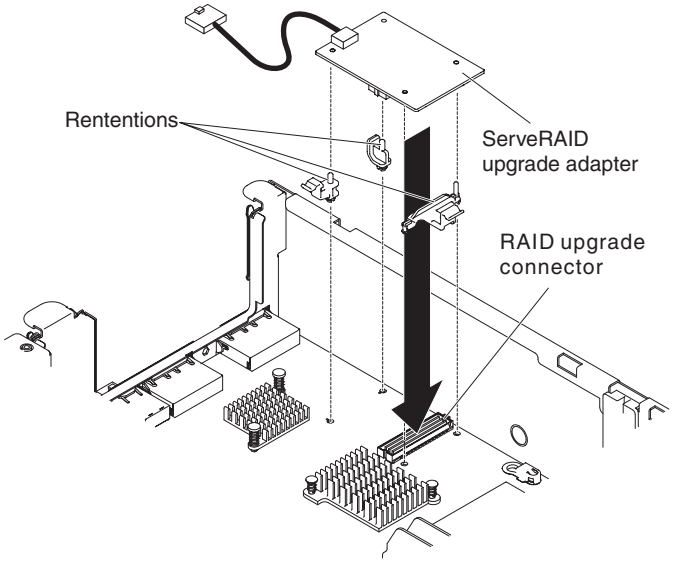
Installing an optional ServeRAID upgrade adapter

To install an optional ServeRAID adapter upgrade adapter, complete the following steps:

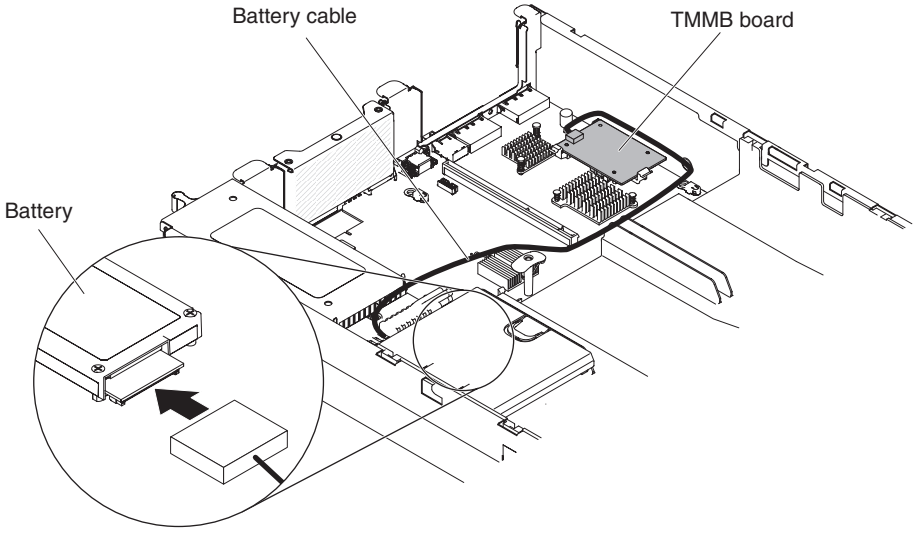
1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the cover (see “Removing the cover” on page 54).
4. Connect the supercap cable to the ServeRAID upgrade adapter.



5. Attach the three pegs to the ServeRAID upgrade adapter and install the ServeRAID upgrade adapter into the system board.



6. Connect the other end of the supercap cable to the battery.



Note: Make sure the battery is seated properly (see “Installing a ServeRAID SAS controller battery on the remote battery tray” on page 127).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

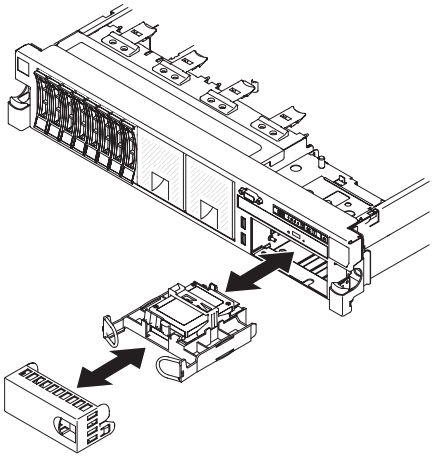
Installing a ServeRAID SAS controller battery on the remote battery tray

Note: For brevity, in this documentation the Intelligent Battery Backup Unit (iBBU) is often referred to as the *battery*.

When you install any ServeRAID SAS controller that comes with batteries, it is sometimes necessary to install the batteries in another location in the server to prevent the batteries from overheating. The batteries must be installed near the fan cage.

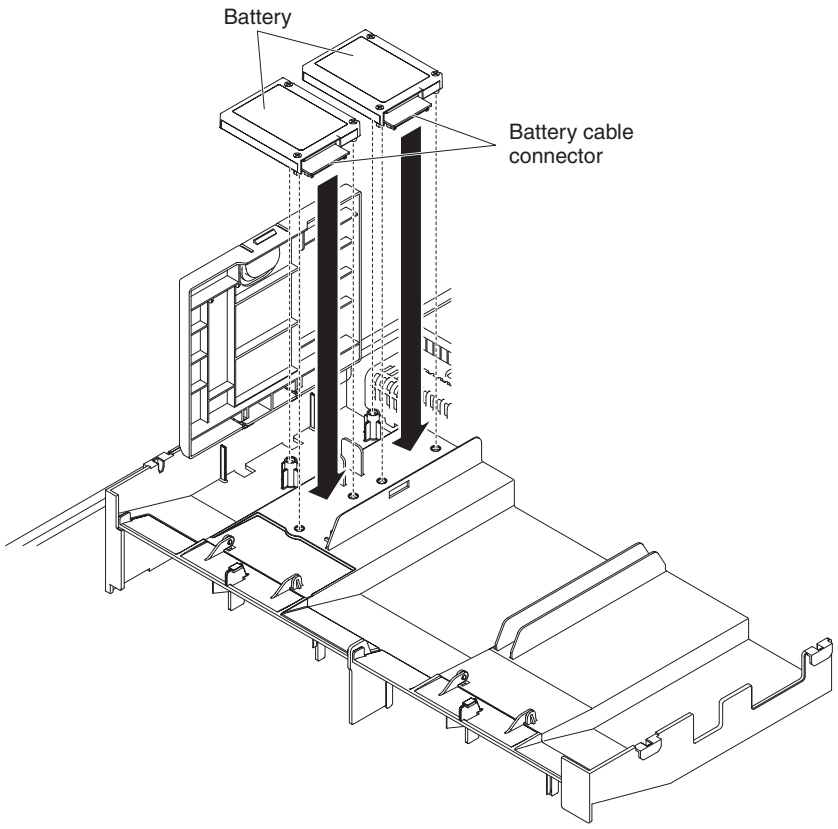
To install a ServeRAID SAS controller battery in the server, complete the following steps:

Note: If you are installing ServeRAID-M5100 Series 512 MB cache RAID 5 upgrade that comes with a battery, you must install the battery in ServeRAID SAS controller remote battery retention instead (see "Installing an optional ServeRAID SAS controller battery holder" on the Problem Determination and Service Guide).



1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the cover (see “Removing the cover” on page 54).
4. Connect one end of the battery cable to the ServeRAID SAS controller battery connector.
5. Route the remote battery cable along the chassis.

   Attention: Make sure that the cable is not pinched and does not cover any connectors or obstruct any components on the system board.
6. Install the battery near the fan cage:
   a. Align the battery cable connector with the slot on the battery holder. Place the battery into the battery holder and make sure that the battery holder engages the battery securely.



Note: The positioning of the remote battery depends on the type of remote battery that you install.

b. Connect the other end of the battery cable to the battery cable connector on the battery.

c. Place the battery retention clip underneath while pressing the release tab toward the front of the server until it snaps in place to hold the battery retention clip firmly in place.

Note: The battery must recharge for at least 6 hours under normal operating conditions. To protect your data, the ServeRAID controller firmware changes the write policy to write-through until the battery unit is sufficiently charged. When the battery unit is charged, the ServeRAID controller firmware changes the write policy to write-back.

If you have other devices to install or remove, do so now. Otherwise, go to "Completing the installation" on page 135.

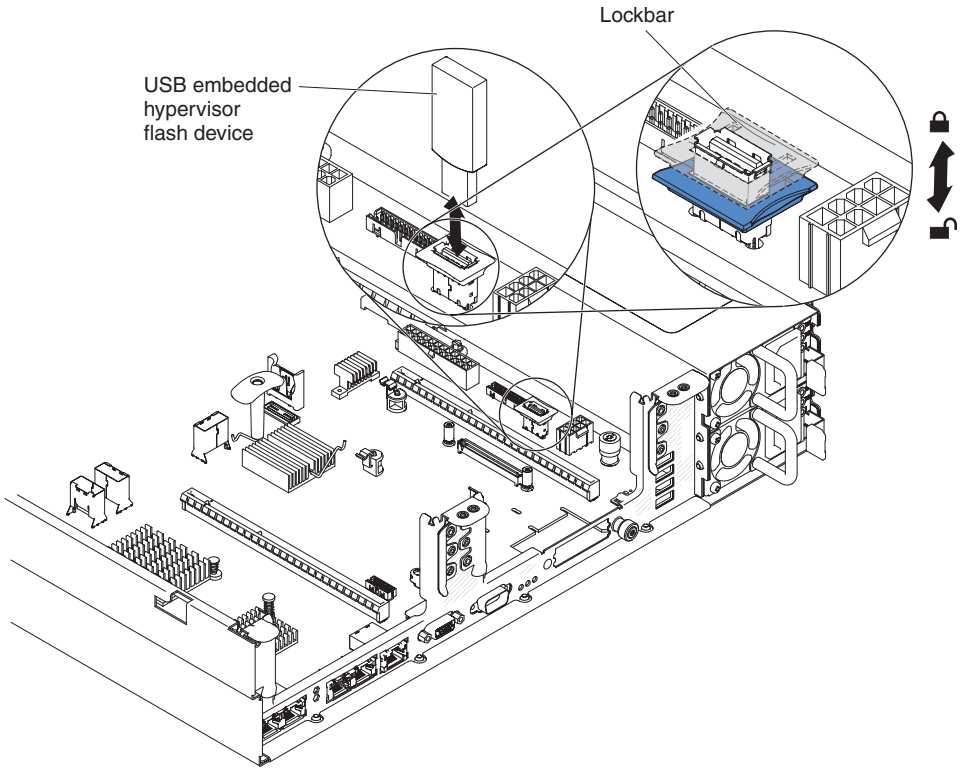
Installing a USB hypervisor memory key

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 40.

2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the cover (see “Removing the cover” on page 54).
4. Remove PCI riser-card assembly (see “Removing a PCI riser-card assembly” on page 55).
5. Align the flash device with the connector on the system board and push it into the USB connector until it is firmly seated.
6. Press down on the retention latch to lock the flash device into the USB connector.



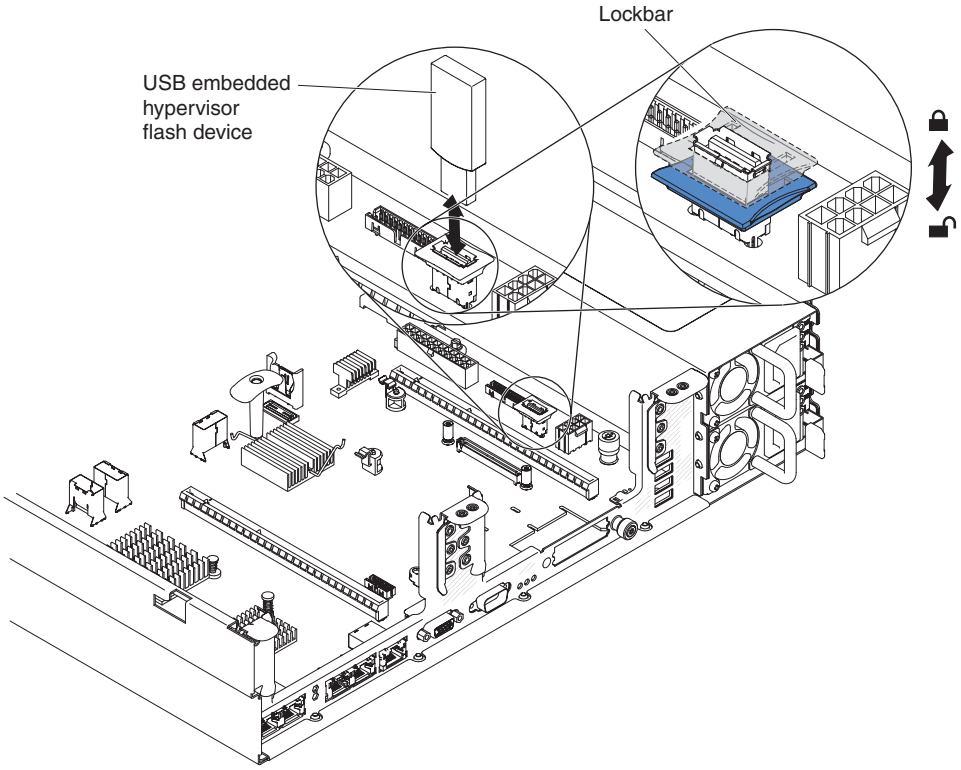
If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Note: You must configure the server to boot from the hypervisor USB drive. See Chapter 3, “Configuring the server,” on page 141 for information about enabling the embedded hypervisor.

Removing a USB hypervisor memory key

To remove the USB hypervisor memory key, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect all power cords and external cables (see “Turning off the server” on page 28).
3. Remove the cover (see “Removing the cover” on page 54).
4. Remove the flash device:



   a. Unlock the retention latch on the USB connector by squeezing the two retention clips toward each other.
   b. Open the retention latch.
   c. Grasp the flash device and pull to remove it from the connector.

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

Note: You must configure the server not to look for the hypervisor USB drive. See Chapter 3, “Configuring the server,” on page 141 for information about disabling hypervisor support.

Installing the optional dual-port network adapter

You can purchase one of the following dual-port network adapters to add two additional network ports in the server. To order a dual-port network adapter option, contact your IBM marketing representative or authorized reseller.

Table 11. Supported dual-port network adapters on the network connector

Dual-port network adapter	Option part number	FRU part number	Remark
Mellanox ConnectX-3 dual-port QDR/FDR10 mezz card	90Y6338	90Y4956	
Qlogic dual-port 10GbE SFP+ Embedded VFA	90Y6454	90Y5099	Two microprocessors installed required.
Emulex dual-port 10GbE SFP+ Embedded VFA III	90Y6456	90Y5100	
Dual-port FDR embedded adapter	00D4143	90Y6606	

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 configure network adapters, complete the following steps:
  1. From the Setup utility main menu (see “Using the Setup utility” on page 145), select **System Settings** → **Network**.
  2. From the **Network Device List**, select **one network adapter**.

     Note: You might need to enter each item (displaying MAC address) to see detailed information.
  3. Press Enter to configure the network adapter settings.
- To convert the NIC/iSCSI/FCoE for Emulex Dual Port 10GbE SFP+ Embedded VFA III, complete the following steps:
  1. From the Setup utility main menu (see “Using the Setup utility” on page 145), select **System Settings** and press Enter.
  2. Select **Network** and press Enter.
  3. From the **Network Device List**, select **Emulex network adapter**.

     Note: You might need to enter each item (displaying MAC address) to see detailed information.
  4. Press Enter to configure Emulex network adapter, select **Personality** and press Enter to change the settings.
     - NIC
     - iSCSI (enabled after FoD installed)
     - FCoE (enabled after FoD installed)
- To download the latest version of drivers for iSCSI and FCoE from the IBM website, complete the following steps:
  1. Go to http://www.ibm.com/support/fixcentral/.
  2. From the **Product support**, select **System x**.
  3. From the **Product family** menu, select **System x3650 M4** and your machine type.
  4. From the **Operating system** menu, select your operating system, and then click **Search** to display the available drivers.

5. Download the latest version of drivers.
   – Emulex iSCSI Device Driver for Windows 2008
   – Emulex FCoE Device Driver for Windows 2008

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

- Port 0 on the Emulex Dual Port 10GbE SFP+ Embedded VFA III can be configured as shared system management.
- When the server is in standby mode, both ports on the Emulex Dual Port 10GbE SFP+ Embedded VFA III function at 100M connection speed with Wake on LAN feature.

The server supports Emulex dual port 10GbE SFP+ Embedded VFA III adapter. You can purchase a dual-port network adapter to add two additional network ports in the server. To order a dual-port network adapter option, contact your IBM marketing representative or authorized reseller.

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 configure network adapters, complete the following steps:
  1. From the Setup utility main menu (see “Starting the Setup utility” on page 145), select **System Settings** and press Enter.
  2. Select **Network** and press Enter.
  3. From the **Network Device List**, select **one network adapter**.

     Note: You might need to enter each item (displaying MAC address) to see detailed information.
  4. Press Enter to configure the network adapter settings.
- To convert the NIC/iSCSI/FCoE for Emulex dual port 10GbE SFP+ Embedded VFA III adapter, complete the following steps:
  1. From the Setup utility main menu (see “Starting the Setup utility” on page 145), select **System Settings** and press Enter.
  2. Select **Network** and press Enter.
  3. From the **Network Device List**, select **Emulex network adapter**.

     Note: You might need to enter each item (displaying MAC address) to see detailed information.
  4. Press Enter to configure Emulex network adapter, select **Personality** and press Enter to change the settings.
     – NIC
     – iSCSI (enabled after FoD installed)
     – FCoE (enabled after FoD installed)
- To download the latest version of drivers for iSCSI and FCoE from the IBM website, complete the following steps:
  1. Go to http://www.ibm.com/support/fixcentral/.
  2. From the **Product support**, select **System x**.
  3. From the **Product family** menu, select **System x3650 M4** and your machine type.
  4. From the **Operating system** menu, select your operating system, and then click **Search** to display the available drivers.

5. Download the latest version of drivers.
   - Emulex iSCSI Device Driver for Windows 2008
   - Emulex FCoE Device Driver for Windows 2008

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

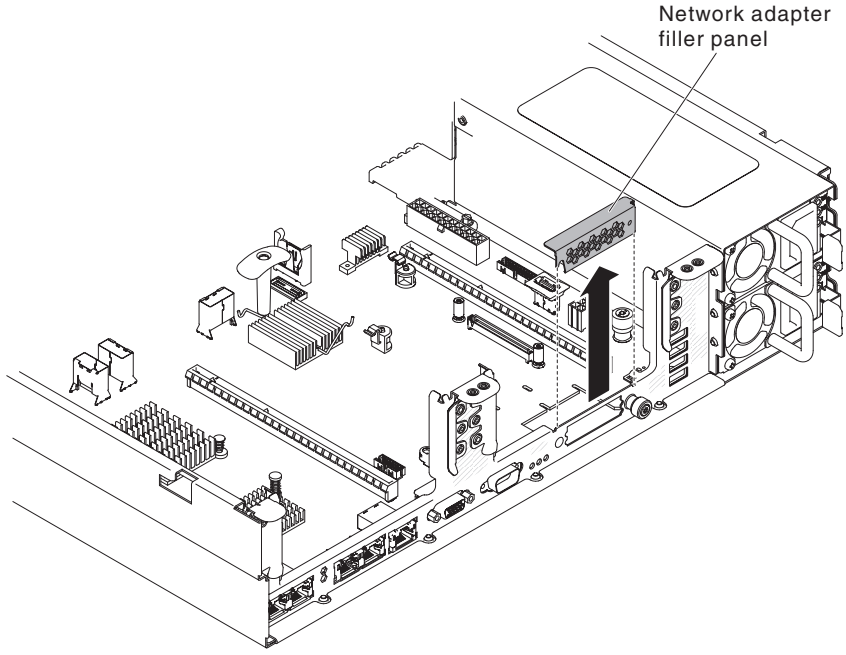
- Port 0 on the Emulex dual port 10GbE SFP+ Embedded VFA III adapter can be configured as shared system management.
- When the server is in standby mode, both ports on the Emulex dual port 10GbE SFP+ Embedded VFA III adapter function at 100M connection speed with Wake on LAN feature.

The Emulex dual port 10GbE SFP+ Embedded VFA III adapter is automatically disabled if one of the following errors occurs:

- An error log indicates a temperature warning for the Ethernet adapter.
- All power supplies are removed or the server is disconnected from the power source.

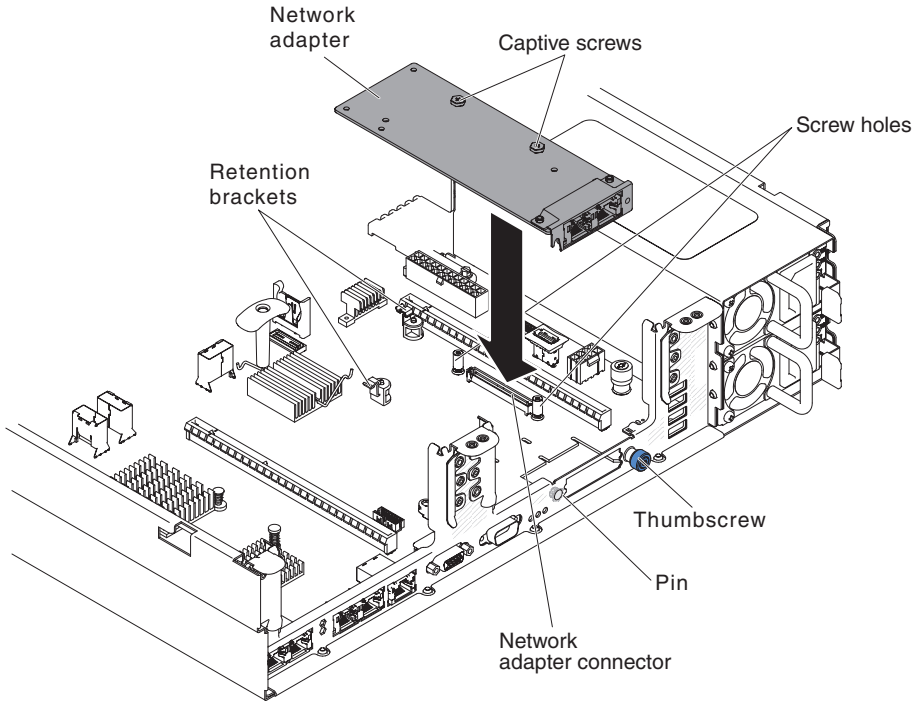
To install the network adapter, complete the following steps:

1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Turn off the server and peripheral devices and disconnect the power cords.
3. Remove the cover (see “Removing the cover” on page 54).
4. Remove the PCI riser-card assembly (if installed) from PCI riser connector 2 (see “Removing a PCI riser-card assembly” on page 55).
5. Remove the adapter filler panel on the rear of the chassis (if it has not been removed already).



6. Touch the static-protective package that contains the new adapter to any unpainted metal surface on the server. Then, remove the adapter from the package.

7. Align the adapter so that the port connectors on the adapter line up with the pin and thumbscrew on the chassis; then, align the connector of the adapter with the adapter connector on the system board.



8. Press the adapter firmly until the pin, standoffs, and retention brackets engage the adapter. Make sure the adapter is securely seated on the connector on the system board.

   Attention: Make sure the port connectors on the adapter are aligned properly with the chassis on the rear of the server. An incorrectly seated adapter might cause damage to the system board or the adapter.

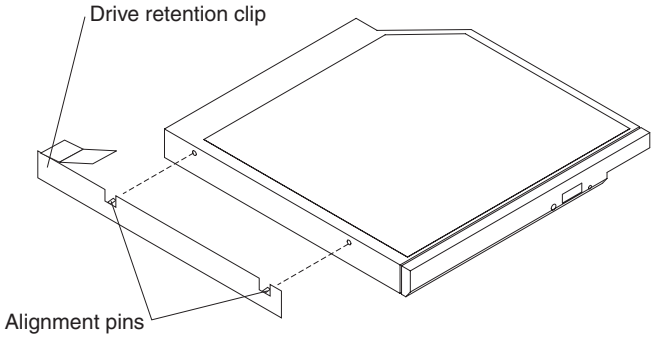
9. Fasten the thumbscrew.
10. Reinstall the PCI riser-card assembly in PCI riser connector 2 if you have removed it previously (see “Installing a PCI riser-card assembly” on page 56).

If you have other devices to install or remove, do so now. Otherwise, go to “Completing the installation” on page 135.

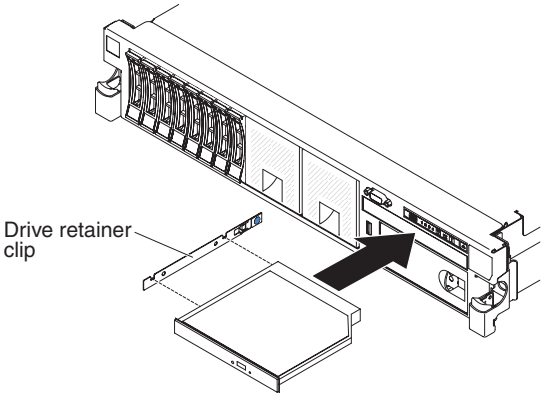
Installing an optional DVD drive

For a list of supported optional optical disk drives for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.

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



1. Read the safety information that begins on page vii and “Installation guidelines” on page 40.
2. Make sure that the server is turned off, all external cables and power cords are disconnected, and the cover has been removed. For more information, see “Turning off the server” on page 28 and “Removing the cover” on page 54.
3. Remove the optical drive filler panel if it is installed. Locate the blue release tab on the rear of the optical drive filler panel; then, while you press the tab, push the optical drive filler panel out of the drive bay. Save the optical drive filler panel for future use.



4. Attach the drive-retention clip to the side of the drive.
5. Slide the drive into the DVD drive bay until the drive clicks into place.

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

Completing the installation

To complete the installation, complete the following steps:

1. If you removed the DIMM air baffle, install it (see “Installing the air baffle” on page 58).
2. If you removed either of the PCI riser-card assemblies, replace the riser-card assemblies (see “Installing a PCI riser-card assembly” on page 56).

3. If you removed the server cover, replace it (see “Replacing the server cover” on page 137).
4. Install the server in a rack. See the *Rack Installation Instructions* that come with the server for complete rack installation and removal instructions.
5. To attach peripheral devices and connect the power cords, see “Connecting the external cables” on page 138.

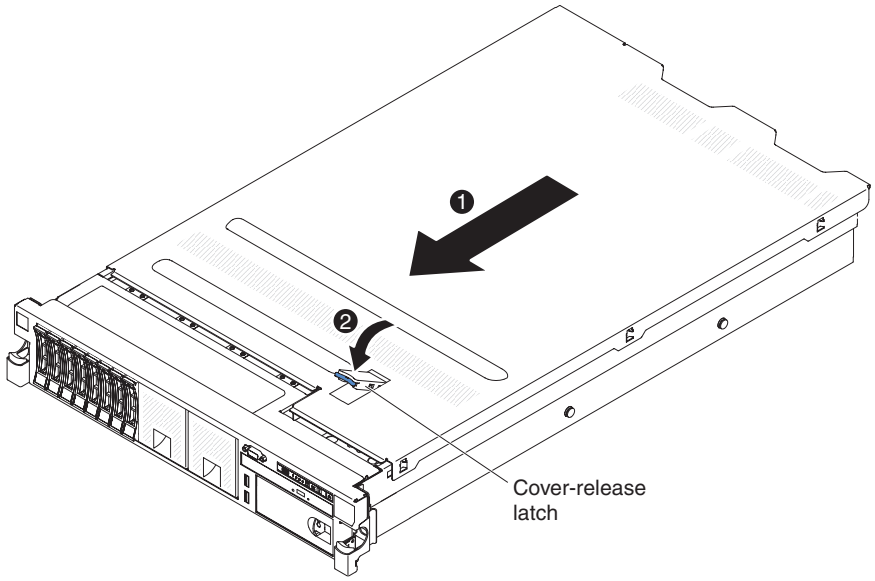
Replacing the server cover

To replace the server cover, complete the following steps:

1. Make sure that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server. Also, make sure that all internal cables are correctly routed.

   Important: Before you slide the cover forward, make sure that all the tabs on 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 very difficult to remove the cover later.

2. Place the cover-release latch in the open (up) position.

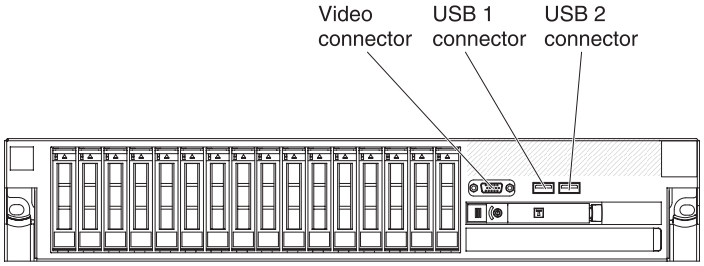


3. Insert the bottom tabs of the top cover into the matching slots in the server chassis.
4. Press down on the cover-release latch to slide the cover forward and lock the cover in place.
5. Slide the server into the rack.

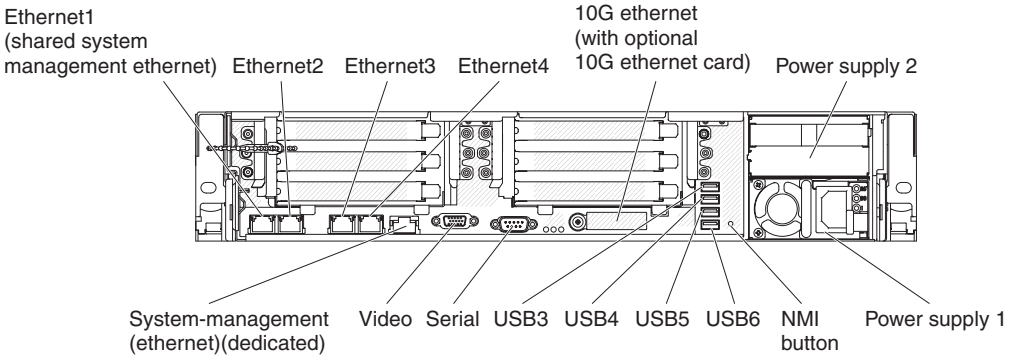
Connecting the external cables

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

Front view



Rear view



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

If the server comes with an installed operating system, see the documentation that comes with the operating system for additional cabling instructions.

Updating the server configuration

When you start the server for the first time after you add or remove an internal device, external SAS device, or USB keyboard or mouse, you might receive a message that the configuration has changed. After the POST fails three times, the Setup utility starts automatically so that you can save the new configuration settings. For more information, see Chapter 3, “Configuring the server,” on page 141.

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

The server comes with at least one multi-core microprocessor, which enables the server to operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP.

If you have installed or removed a hard disk drive, see “Configuring RAID arrays” on page 155.

If you have installed a USB hypervisor memory key on the SAS riser-card, see the user's guide that comes with the hypervisor memory key. Hypervisor enables guest operating systems to function on the server.

For information about configuring the integrated Gigabit Ethernet controller, see “Configuring the Ethernet controller” on page 154.

Chapter 3. Configuring the server

The following configuration programs come with the server:

- **Setup utility**

  The UEFI (formerly BIOS) Setup Utility program is part of the basic input/output system firmware. Use it to change interrupt request (IRQ) settings, change the startup-device sequence, set the date and time, and set passwords. For information about using this program, see “Starting the Setup utility” on page 145.

- **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 150.

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

  The ServerGuide program provides software-setup tools and installation tools that are designed for the server. Use this CD during the installation of the server to configure basic hardware features, such as an integrated SAS/SATA controller with RAID capabilities, and to simplify the installation of your operating system. For information about using this CD, see “Using the ServerGuide Setup and Installation CD” on page 142.

- **Integrated Management Module II**

  Use the integrated management module II (IMM2) for configuration, to update the firmware and sensor data record/field replaceable unit (SDR/FRU) data, and to remotely manage a network. For information about using the IMM2, see “Using the integrated management module II” on page 150.

- **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 152.

- **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 system board. Hypervisor is virtualization software that enables multiple operating systems to run on a host system at the same time. For more information about using the embedded hypervisor, see “Using the embedded hypervisor” on page 153.

- **Ethernet controller configuration**

  For information about configuring the Ethernet controller, see “Configuring the Ethernet controller” on page 154.

- **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 155.

- **LSI Configuration Utility program**

  Use the LSI Configuration Utility program to configure the integrated SAS/SATA controller with RAID capabilities and the devices that are attached to it. For information about using this program, see “Configuring RAID arrays” on page 155.

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

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

Server configuration	RAID array configuration (before operating system is installed)	RAID array management (after operating system is installed)
ServeRAID-H1110 adapter	LSI Utility (Setup utility, press Ctrl+C), ServerGuide, Human Interface Infrastructure (HII)	MegaRAID Storage Manager (MSM), SAS2IRCU (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	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-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
IBM 6Gb Performance Optimized HBA		

Notes:

1. For more information about the Human Interface Infrastructure (HII) and SAS2IRCU, go to http://www-947.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5088601.
2. For more information about the MegaRAID, go to http://www-947.ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5073015.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides software setup tools and installation tools that are designed for your server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. Use this CD during the initial installation of the server to simplify the operating-system installations by providing updated device drivers and, in some cases, installing them automatically. To

download the CD, go to http://www.ibm.com/support/entry/portal/docdisplay?lndocid=SERV-GUIDE and click **IBM Service and Support Site**.

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

To start the *ServerGuide Setup and Installation* CD, complete the following steps:

1. Insert the CD, and restart the server. If the CD does not start, see "ServerGuide Problems" in the *Problem Determination and Service Guide* on the *System x Documentation* CD.
2. Follow the instructions on the screen to:
   a. Select your language.
   b. Select your keyboard layout and country.
   c. View the overview to learn about ServerGuide features.
   d. View the readme file to review installation tips for your operating system and adapter.
   e. Start the operating-system installation. You will need your operating-system CD.

The ServerGuide program has the following features:

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

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

ServerGuide features

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

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

The ServerGuide program performs the following tasks:

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

Setup and configuration overview

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

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

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

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

Typical operating-system installation

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

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

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

Installing your operating system without using ServerGuide

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

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/supportportal/.
2. Under **Product support**, click **System x**.
3. From the menu on the left side of the page, click **System x support search**.
4. From the **Task** menu, select **Install**.
5. From the **Product family** menu, select **System x3650 M4**.

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

Using the Setup utility

Use the Unified Extensible Firmware Interface (UEFI), formerly BIOS, Setup Utility program to perform the following tasks:

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

Starting the Setup utility

To start the Setup utility, complete the following steps:

1. Turn on the server.

   Note: Approximately 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. If you have set an administrator password, you must type the administrator password to access the full Setup utility menu. If you do not type the administrator password, a limited Setup utility menu is available.
3. Select settings to view or change.

Setup utility menu choices

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

- **System Information**

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

  – **System Summary**

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

  – **Product Data**

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

  This choice is on the full Setup utility menu only.
- **System Settings**

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

– **Processors**

  Select this choice to view or change the processor settings.

– **Memory**

  Select this choice to view or change the memory settings.

– **Devices and I/O Ports**

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

– **Power**

  Select this choice to view or change power capping to control consumption, processors, and performance states.

– **Operating Modes**

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

– **Legacy Support**

  Select this choice to view or set legacy support.

  - **Force Legacy Video on Boot**

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

  - **Rehook INT 19h**

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

  - **Legacy Thunk Support**

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

– **Integrated Management Module**

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

  - **Commands on USB Interface Preference**

    Select this choice to enable or disable the Ethernet over USB interface on IMM2.

  - **Network Configuration**

    Select this choice to view the system management network interface port, the IMM2 MAC address, the current IMM2 IP address, and the host name; define the static IMM2 IP address, subnet mask, and gateway address; specify whether to use the static IP address or have DHCP assign the IMM2 IP address; save the network changes; and reset the IMM2.

  - **Reset IMM to Defaults**

    Select this choice to view or reset IMM2 to the default settings.

  - **Reset IMM**

    Select this choice to reset IMM2.

– **System Security**

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

– **Adapters and UEFI Drivers**

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

- **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, 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” on page 148 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 148 for more information.

  – **Clear Power-on Password**

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

  - **Set Admin 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 149.

  - **Clear Admin Password**

    Select this choice to clear an administrator password. For more information, see “Administrator password” on page 149.

- **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.

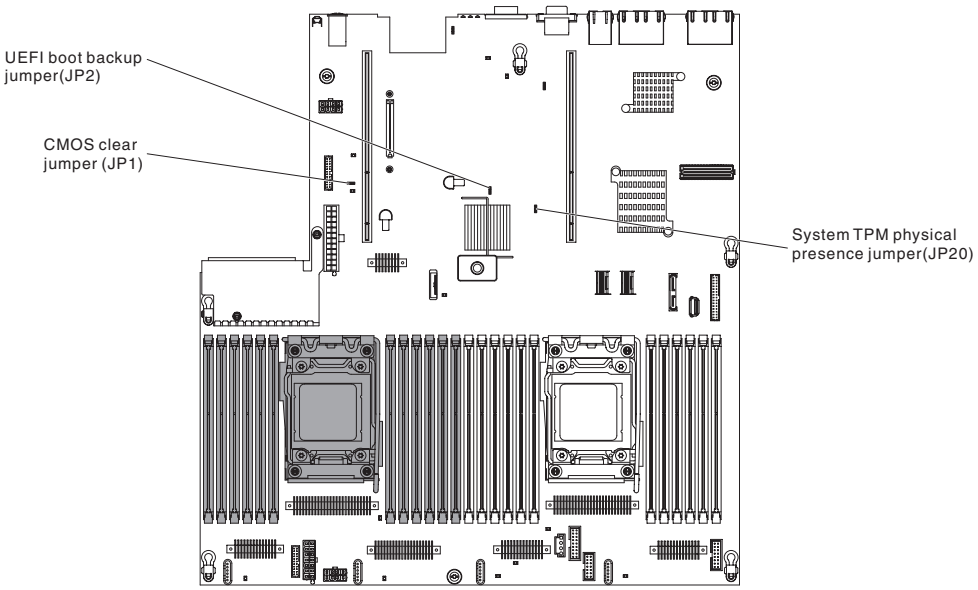
Power-on password

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 switches and jumpers" on page 35 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 block that is 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

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

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

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

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

Starting the backup server firmware

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

To force the server to start from the backup copy, turn off the server; then, place the 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 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-947.ibm.com/support/entry/portal/docdisplay?brand=5000008&lndocid=MIGR-5086346.

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.
- Auto Boot Failure 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 IMM 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 IMM for the first time, you can obtain the user name and password from your system administrator. All login attempts are documented in the event log.

   Note: The IMM2 is set initially with a user name of USERID and password of PASSW0RD (passw0rd with a zero, not the letter O). You have read/write access. You must change the default password the first time you log on.
3. On the Welcome page, type a timeout value (in minutes) in the field that is provided. The 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 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 IMM memory and mapping it to the server as a virtual drive

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

Enabling the remote presence feature

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

1. Install the 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.

Note: You have to reactivate features after replacing the system board.

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.

Configuring the Ethernet controller

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

You do not have to set any jumpers or configure the controllers. However, you must install a device driver to enable the operating system to address the controllers.

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

Enabling Features on Demand Ethernet software

You can activate the Features on Demand (FoD) software upgrade key for Fibre Channel over Ethernet (FCoE) and iSCSI storage protocols that is integrated in the integrated management module. For more information and instructions for activating the Features on Demand Ethernet software key, see the *IBM Features on Demand User's Guide*. To download the document, go to http://www.ibm.com/systems/x/fod/, log in, and click **Help**.

Enabling Features on Demand RAID software

Integrated into the integrated management module is a Features on Demand RAID software upgrade key that you can activate to get support for RAID levels 5 and 50 or 6 and 60 (depending on the Features on Demand key). For more information and instructions for activating the Features on Demand RAID software key, see the *IBM*

Features on Demand User's Guide. To download the document, go to http://www.ibm.com/systems/x/fod/, log in, and click **Help**.

Configuring RAID arrays

Through the Setup utility, you can access utilities to configure RAID arrays. The specific procedure for configuring arrays depends on the RAID controller that you are using. For details, see the documentation for your RAID controller. To access the utility for your RAID controller, complete the following steps:

1. Turn on the server.

   Note: Approximately 10 seconds after the server is connected to power, the power-control button becomes active.
2. When prompted, `<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 **System Settings → Storage**.
4. Press Enter to refresh the list of device drivers.
5. Select the device driver for your RAID controller and press Enter.
6. Follow the instructions in the documentation for your RAID controller.

IBM Advanced Settings Utility program

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

You can also use the ASU program to configure the optional remote presence features or other 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.ibm.com/support/entry/portal/docdisplay?lndocid=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.

The Update*Xpress* System Pack Installer

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

Appendix A. Getting help and technical assistance

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

Before you call

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

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

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

Using the documentation

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

Getting help and information from the World Wide Web

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

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

Software service and support

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

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

Hardware service and support

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

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

IBM Taiwan product service

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

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

Appendix B. Notices

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Important notes

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

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

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

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

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

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

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

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

Particulate contamination

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

Table 13. Limits for particulates and gases

Contaminant	Limits
Particulate	• The room air must be continuously filtered with 40% atmospheric dust spot efficiency (MERV 9) according to ASHRAE Standard 52.2[1]. • Air that enters a data center must be filtered to 99.97% efficiency or greater, using high-efficiency particulate air (HEPA) filters that meet MIL-STD-282. • The deliquescent relative humidity of the particulate contamination must be more than 60%[2]. • The room must be free of conductive contamination such as zinc whiskers.
Gaseous	• Copper: Class G1 as per ANSI/ISA 71.04-1985[3] • Silver: Corrosion rate of less than 300 Å in 30 days

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

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

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

Documentation format

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

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

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

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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.

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

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

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

Generelle Informationen:

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

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Japan Electronics and Information Technology Industries Association (JEITA) statement

高調波ガイドライン適合品

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

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