IBM

@server

xSeries 226
Type 8648

Option Installation Guide

IBM

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xSeries 226
Type 8648

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Note:

Before using this information and the product it supports, read the general information in "Notices," on page 51.

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.

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.**

Statement 4:

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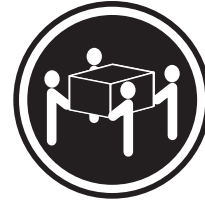
CAUTION:
Use safe practices when lifting.

Statement 5:

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

2

1

Statement 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 13:

DANGER

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

Statement 15:

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

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after handling.*

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. *Lávese las manos después de usar el producto.*

Important:

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

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

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

Chapter 1. Introduction

This *Option Installation Guide* contains instructions for installing, removing, and connecting optional devices that your server supports.

Related documentation

In addition to this *Option Installation Guide*, the following documentation comes with the server:

- *User's Guide*

  This document is in Portable Document Format (PDF) on the IBM® *xSeries*® *Documentation* CD. It contains general information about the server.

- *Installation Guide*

  This printed document contains instructions for setting up the server and basic instructions for installing some options.

- *Safety Information*

  This document is in PDF on the IBM *xSeries 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.

- *Hardware Maintenance Manual and Troubleshooting Guide*

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

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

Your 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 your server documentation. These updates are available from the IBM Web site. Complete the following steps to check for updated documentation and technical updates:

1. Go to http://www.ibm.com/pc/support/.
2. In the **Learn** section, click **Online publications**.
3. On the ″Online publications″ page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **xSeries 226**.
5. Click **Continue**.

Notices and statements used in this document

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

The following notices and statements are used in this document:

- **Notes:** 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 could 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.

Major components of the xSeries 226 Type 8648 server

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

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

The following illustration shows the major components in the server. The illustrations in this document might differ slightly from your hardware.
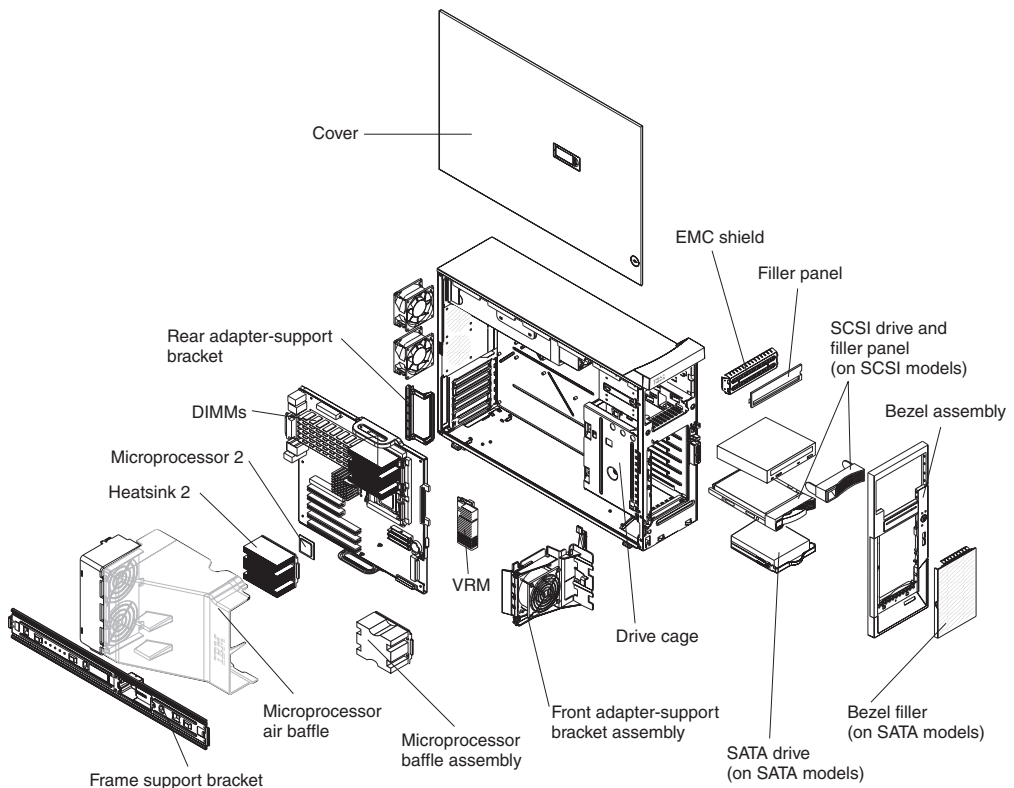
System-board internal connectors

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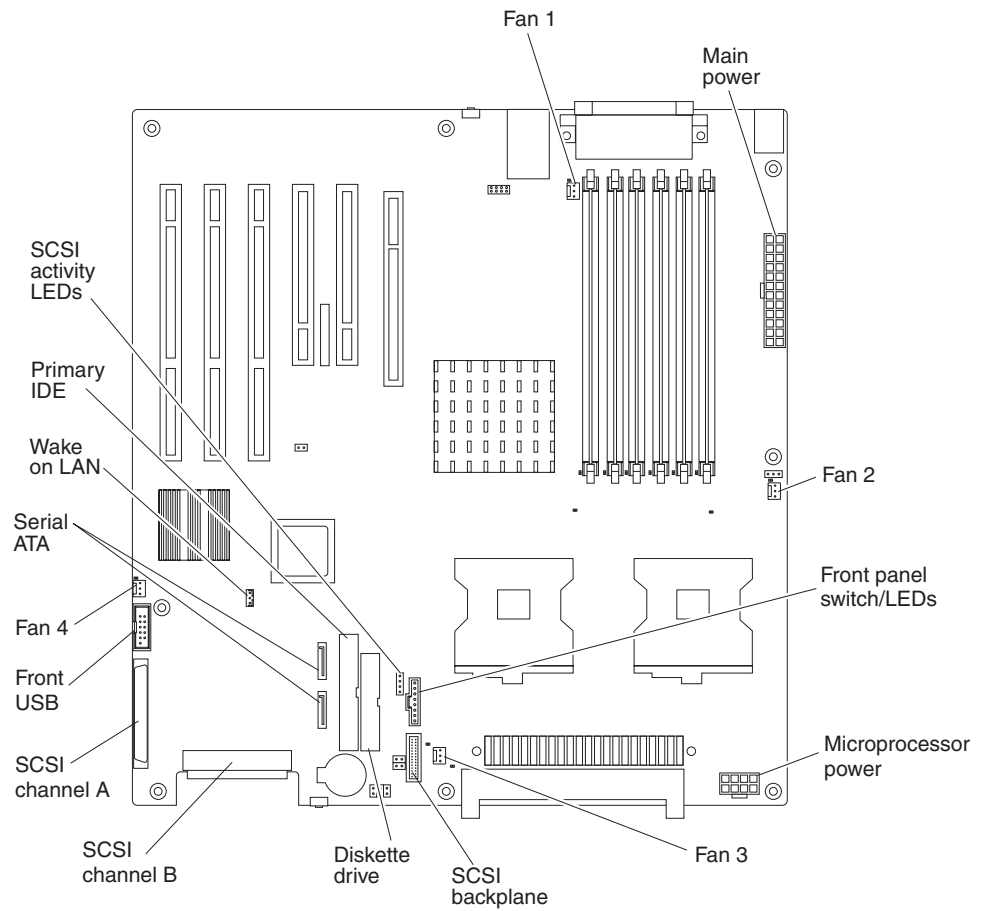
System-board external connectors

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

Mouse

Keyboard

Serial 1

Parallel

Video

USB 1

USB 2

Ethernet

Front USB
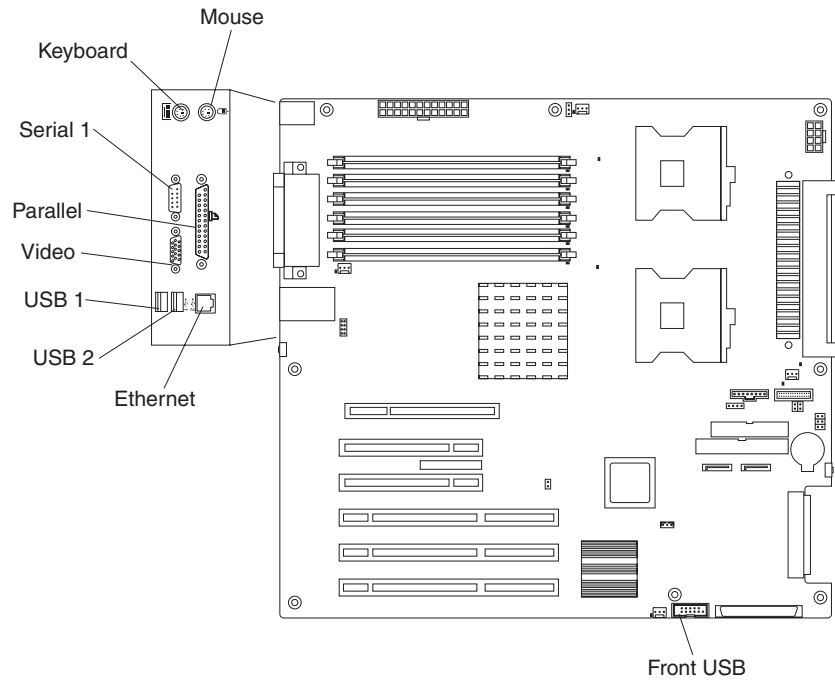
System-board LEDs

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

Fan 1 error LED

DIMM 6 error LED

DIMM 5 error LED

DIMM 4 error LED

DIMM 3 error LED

DIMM 2 error LED

DIMM 1 error LED

Fan 2 error LED

Fan 4 error LED

Fan 3 error LED (reserved)

Microprocessor 2 error LED

Microprocessor 1 error LED
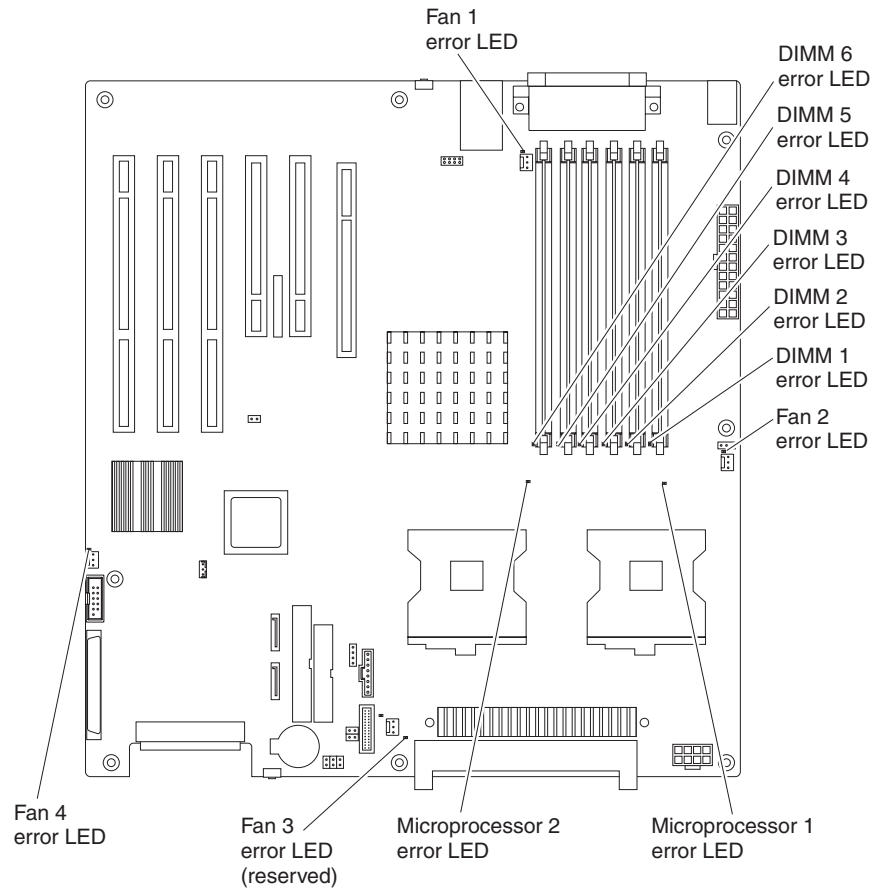
System-board option connectors

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

Slot 3 PCI
Slot 2 PCI
Slot 4 PCI-X
Slot 1 PCI Express x 16
Slot 5 PCI-X
Slot 6 PCI-X

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

Battery
Microprocessor 2
Microprocessor 1

Remote Supervisor Adapter II
Microprocessor 2 VRM
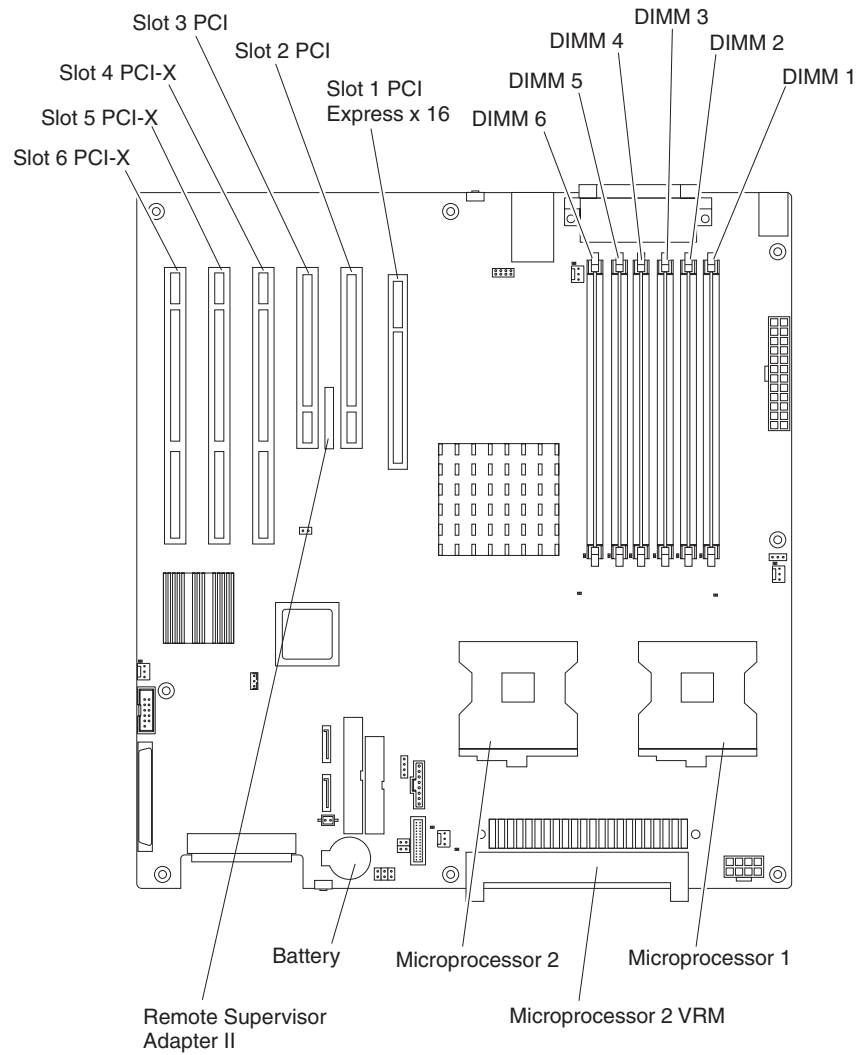
Chapter 2. Installing options

This chapter provides detailed instructions for adding hardware options to the server.

Installation guidelines

Before you begin installing options in your server, read the following information:

- Read the safety information beginning on page v and the guidelines in "Handling static-sensitive devices" on page 8. This information will help you work safely with the server and options.
- When you need to access the inside of the server to install options, you might find it easier to lay the server on its side.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the server to install or replace hot-swap drives or hot-plug Universal Serial Bus (USB) devices.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the server, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that if the server and operating system support hot-swap capability, you can remove or install the component while the server is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing and installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- For a list of supported options for the server, go to http://www.ibm.com/pc/compat/.

System reliability considerations

To help ensure proper system cooling and system reliability, make sure that:

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

- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor and heat sink.

Handling static-sensitive devices

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

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

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

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 is shut down; however, the server can respond to remote requests 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 20 seconds after the server is connected to ac power, the power-control button becomes active, and you can turn on the server and start the operating system by pressing the power-control button.

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

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If your operating system supports the systems-management software for an optional Remote Supervisor Adapter II, the systems-management software can turn on the server.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature can turn on the server.
- If an optional Remote Supervisor Adapter II is installed in the server, the server can be turned on from the Remote Supervisor Adapter II user interface.

Note: When 4 GB or more of memory (physical or logical) is installed, some memory is reserved for various system resources and is unavailable to the

operating system. The amount of memory that is reserved for system resources depends on the operating system, the configuration of the server, and the configured PCI options.

Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to remote requests to turn on the server. To remove all power from the server, you must disconnect it from the power source.
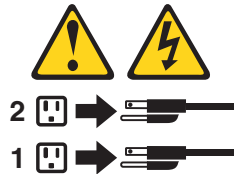
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

Statement 5:

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

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

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

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

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

- If an optional Remote Supervisor Adapter II is installed in the server, the server can be turned off from the Remote Supervisor Adapter II user interface.

- If the Wake on LAN feature turned on the server, the Wake on LAN feature can turn off the server.

- The server can turn itself off as an automatic response to a critical system failure.

Removing the side cover

Complete the following steps to remove the side cover:

1. Review the safety information beginning on page v and the "Installation guidelines" on page 7.

2. Turn off the server and all attached devices (see "Turning off the server" on page 9); then, disconnect all power cords and external cables.

3. Unlock the side cover; then, pull the cover-release latch away from the server and push the cover toward the rear of the server. Lift the side cover off the server and set it aside.

   Note: It might be easier to lay the server on its side first.
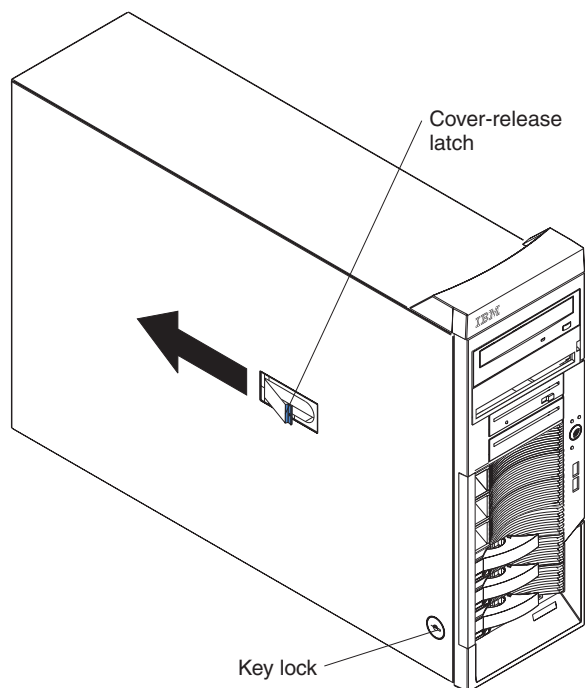
To replace the side cover, see "Replacing the side cover" on page 41.

Attention: For proper cooling and airflow, replace the cover before turning on the server. Operating the server with the cover removed might damage server components.

Removing the bezel

When working with some devices, such as additional optical drives, you must first remove the bezel to access the device.

Complete the following steps to remove the bezel:

1. Unlock the side-cover lock.
2. Remove the side cover (see "Removing the side cover" on page 10).
3. For hot-swap hard disk drive models, slide the lock bar to the left.
4. Locate the bezel-release lever; then, press the bezel-release lever toward the front of the server.
5. Pull the top of the bezel away from the chassis; then, push the bezel down to disengage the bottom tabs.
6. Remove the bezel from the server and store the bezel in a safe place.
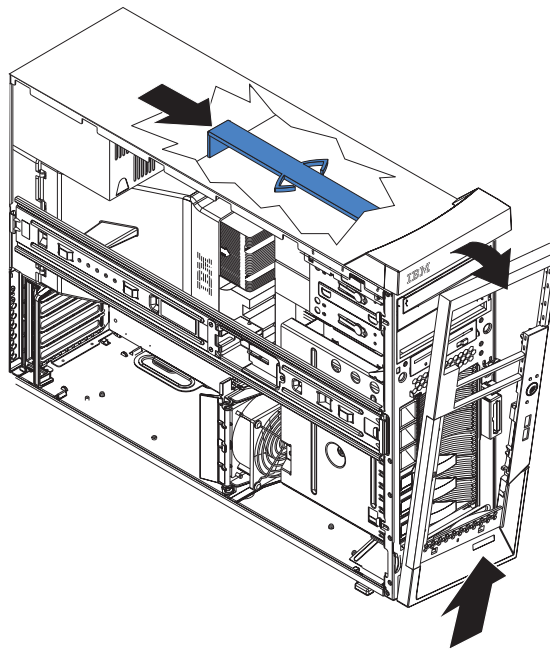
For instructions for replacing the bezel, see "Replacing the bezel" on page 41.

Removing and installing the support bracket

When working with some devices, such as hard disk drives, adapters, and memory modules, you must first remove the support bracket to access the device.

Complete the following steps to remove the support bracket:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Remove the side cover (see "Removing the side cover" on page 10).
3. Pull out on the rear end of the support bracket at a 45° angle.
4. Disengage the front end of the support bracket from the server and set the bracket aside.
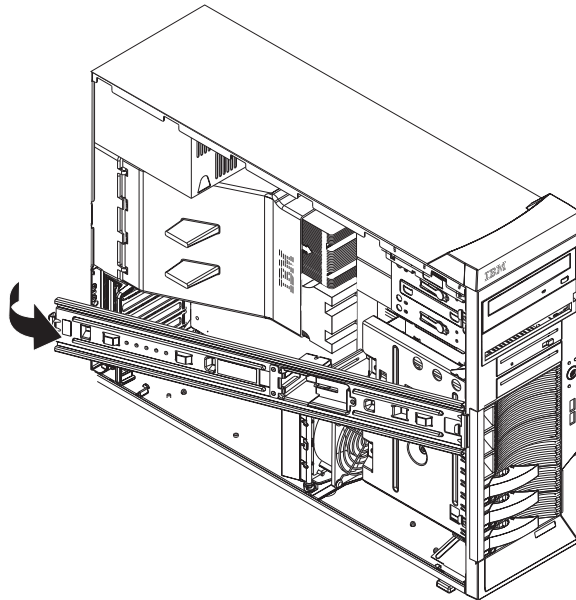
To reinstall the support bracket, reverse the previous steps.

Opening and closing the microprocessor air baffle

When working with some devices, such as microprocessors and memory modules, you must first open the microprocessor air baffle to access the device.

Complete the following steps to open the microprocessor air baffle:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Remove the side cover (see "Removing the side cover" on page 10).
3. Remove the support bracket (see "Removing and installing the support bracket").

4. Grasp the end of the airlow guide near the front of the server and rotate it out of the server.
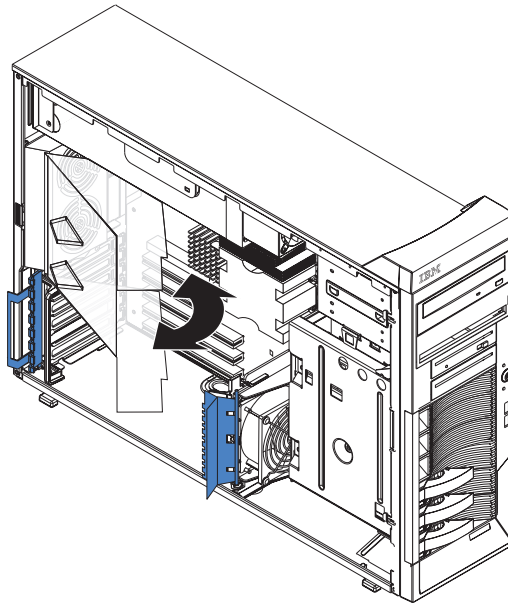
To completely remove the microprocessor air baffle, gently press the sides of the baffle at the chassis toward each other until the tabs at the rear of the baffle are free of the slots in the chassis. To replace the air baffle, gently press the sides of the baffle toward each other until you can insert the rear tabs into the slots in the rear of the chassis.

Complete the following steps to close the air baffle:
1. Rotate the air baffle to the closed position, carefully guiding the top side of the air baffle between the cables, so that the cables cross in the notch of the air baffle side and are not pinched by the baffle.
2. Press the air baffle into place.

Installing a memory module

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

- The server comes with either two 256 MB or two 512 MB memory DIMMs installed in DIMM 1 and DIMM 2 memory connectors. The second pair of DIMMs must be installed in DIMM 3 and DIMM 4 memory connectors and the third pair in DIMM 5 and DIMM 6 memory connectors.
- DIMMs must be installed in matched pairs. The DIMMs in each pair must be the same size, speed, type, and technology as each other but do not have to match the other pairs. You can mix compatible DIMMs from various manufacturers.
- Install only 1.8 V, 184-pin, double-data-rate 2 (DDR2), PC2-3200, registered, synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC), dual inline memory modules (DIMMs). These DIMMs must be compatible with the latest PC2-3200 SDRAM buffered DIMM specification. For a list of supported options for your server, go to http://www.ibm.com/pc/; then, select your country and navigate to the list of options for your server.
- The system board contains six DIMM connectors and supports two-way memory interleaving when the DIMMs are installed in pairs and functioning properly. If one DIMM in the pair fails, the computer runs in single-channel mode (non-interleaving). A failed DIMM must be replaced as soon as possible; otherwise, the computer will not start (boot).
- The DIMM-installation sequence is based on single-rank, double-rank, and mixing single-rank and double-rank memory DIMMs. *Single-rank* DIMMs are 256 MB, 512 MB, and 1 GB memory modules. *Double-rank* DIMMs are 2 GB memory modules. The following table lists the DIMM-installation sequence for the server maximum memory capacity using mixed single-rank and double-rank DIMMs.

Notes:

1. Do not install four, 2 GB double-rank DIMMs for the server maximum capacity (8 GB) configuration, the server does not support it.
2. You can install pairs of 256 MB, 512 MB, 1 GB, and 2 GB DIMMs in the server, but for the server maximum capacity, you must use the DIMM-sequence in the table below.
3. You can install any combination of DIMM pairs in the server; however, you can install only two, 2 GB double-rank DIMMs in the computer and they must go in DIMM connectors 1 and 2. Do not install 2 GB double-rank DIMMs in any connectors other than DIMM connectors 1 and 2.
4. If you order memory DIMMs from IBM, the variable *2R* in the description indicates that the DIMM is a double-rank 2 GB DIMM.

Table 1. Maximum memory capacity (8 GB) and installation sequence mixing single-rank and double-rank DIMMs

DIMM pair	DIMM connectors	DIMM size	Rank
First pair	1, 2	2 GB	Double-rank
Second pair	3, 4	1 GB	Single-rank
Third pair	5, 6	1 GB	Single-rank

- The DIMM options that are available for your server are 256 MB, 512 MB, 1 GB, and 2 GB memory modules. The server supports a minimum of 256 MB and a maximum of 8 MB (when using 2 GB double-rank DIMMs) of system memory.

Important: Although the server supports a maximum of 8 GB of system memory, some Microsoft Windows operating systems recognize and support only a lesser amount of system memory, as shown in the following table.

Windows operating system	Maximum memory supported
Windows Server 2003, Web Edition	2 GB
Windows Server 2003, Standard Edition	4 GB

- The memory controller in the computer provides Chipkill™ memory protection if the DIMMs are 1 GB or larger, or if the computer is populated with 512 MB x4 DIMMs. Chipkill memory protection is a technology that protects the computer from a single chip failure on a DIMM.
- The amount of usable memory is reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The BIOS displays the total amount of installed memory and the amount of configured memory.

Complete the following steps to install a DIMM:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Remove the side cover (see "Removing the side cover" on page 10).
4. Remove the support bracket (see "Removing and installing the support bracket" on page 12).
5. Open the microprocessor air baffle (see "Opening and closing the microprocessor air baffle" on page 12).
6. Locate the DIMM connectors on the system board (see "System-board option connectors" on page 6 for the location of the DIMM connectors). Determine the connectors into which you will install the DIMMs.
7. Install the DIMMs in the sequence shown in the notes at the beginning of this section.

   Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.
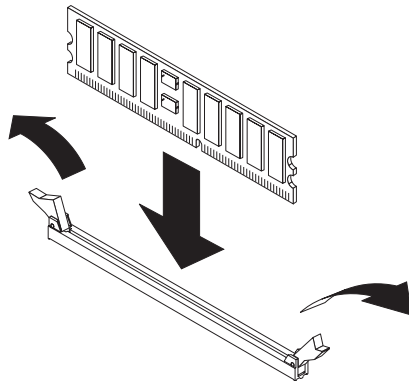
   a. Open the retaining clips and, if necessary, remove any existing DIMM.
   b. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then, remove the new DIMM from the package.
   c. Turn the DIMM so that the DIMM keys align correctly with the slot.
   d. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight

down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly installed. Open the retaining clips, remove the DIMM, and then reinsert it.

8. If you have other options to install or remove, do so now; otherwise, close the microprocessor air baffle (see "Opening and closing the microprocessor air baffle" on page 12), replace the support bracket (see "Removing and installing the support bracket" on page 12) and go to "Completing the installation" on page 41.
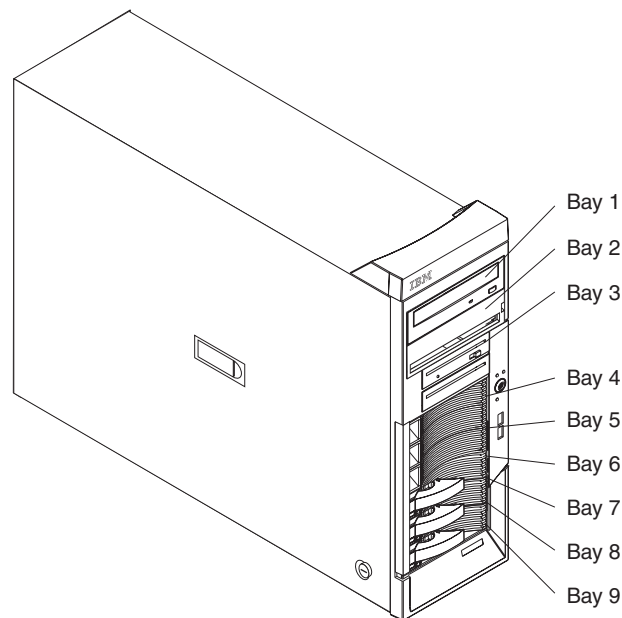
Installing a drive

Depending on your server model, one or more of the following drives might be installed in the server:
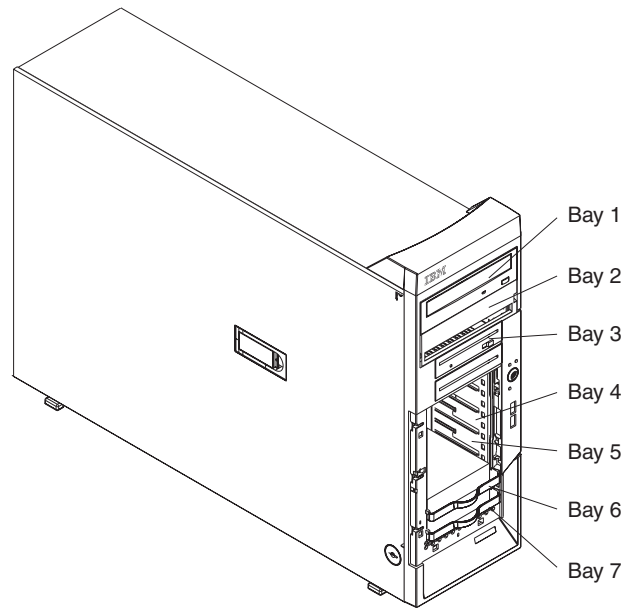- Diskette
- Hard disk drive
- CD-ROM

Internal drive bays

The server comes with an IDE CD-ROM drive in bay 1 and a 3.5-in., 1.44 MB diskette drive in bay 3. Some server models come with six hot-swap hard disk drive bays; other server models come with four simple-swap hard disk drive bays and a hard disk drive installed in bay 7.

Server with hot-swap hard disk drives

Bay 1
Bay 2
Bay 3
Bay 4
Bay 5
Bay 6
Bay 7
Bay 8
Bay 9

Server with simple-swap hard disk drives

Bay 1
Bay 2
Bay 3
Bay 4
Bay 5
Bay 6
Bay 7

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

*   Make sure that you have all the cables and other equipment that is specified in the documentation that comes with the drive.
*   Check the instructions that come with the drive to see whether you must set any switches or jumpers on the drive. If you are installing a SCSI device, be sure to set the SCSI ID for that device.
*   Diskette drives, tape drives, CD-ROM, CD-RW, and DVD drives are examples of removable-media drives. You can install removable-media drives in bays 1, 2, and 3 only.
*   The integrated IDE controller in the server supports up to two IDE devices.
*   You can install a 3.5-in. slim-high or 5.25-in. half-high removable-media drive, such as a tape backup drive, CD-RW drive, or DVD drive, in bay 2.
*   The server supports only one diskette drive.
*   To install a 3.5-in. drive in a 5.25-in. bay, you must use the 5.25-in. conversion kit. Contact IBM to order the conversion kit.
*   The electromagnetic interference (EMI) integrity and cooling of the server are protected by having all bays and PCI slots covered or occupied. When you install a drive or PCI adapter, save the EMC shield and filler panel from the bay or the PCI adapter slot cover in the event you later remove the option.
*   For a complete list of supported options for your server, go to http://www.ibm.com/pc/support/.

Installing a drive in bay 2

Complete the following steps to install a drive in bay 2:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Remove the side cover (see "Removing the side cover" on page 10).

4. Remove the support bracket (see "Removing and installing the support bracket" on page 12).

5. Remove the bezel (see "Removing the bezel" on page 11).

6. Use a screwdriver to pry the filler panel and EMC shield away from the server.

   Note: If you are installing a drive that contains a laser, observe the following safety precaution.
   Statement 3:

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

   • **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**

   • **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**
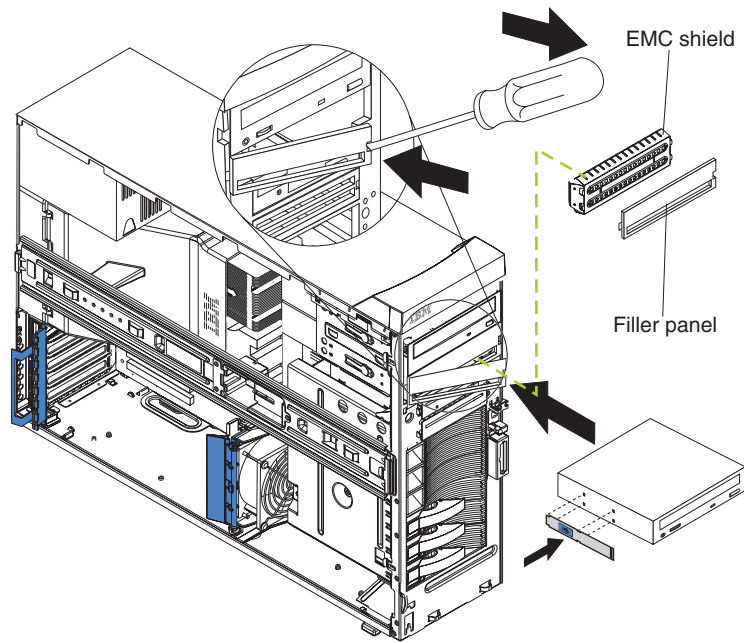

   DANGER

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

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

EMC shield

Filler panel

7. Touch the static-protective package containing the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.

8. Set any jumpers or switches on the drive according to the documentation that comes with the drive.

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

9. If you are installing a 3.5-in. drive in bay 2, attach the 5.25-in. conversion kit, which you can order from IBM, to the 3.5-in. drive.

10. Remove the large drive clip from the side of the drive cage for bays 1 through 3. Slide the drive clip toward the rear of the server; then, snap the drive clip into the screw holes on the side of the drive or conversion kit.

11. Slide the drive into the drive bay until it snaps in place.

12. Determine whether the drive is an IDE or SCSI device; then, connect one end of the applicable signal cable into the back of the drive and make sure that the other end of this cable is connected into the applicable IDE or SCSI connector on the system board.

    • If you are installing a SCSI removable-media drive, use the one-drop SCSI cable that comes with the drive and connect it to SCSI channel A (SCSI1). See "Power and signal cables for internal drives" on page 23 for additional information about cabling drives and "System-board internal connectors" on page 3 for the location of IDE and SCSI connectors on the system board.

    • If there are open connectors on the cable connecting an existing IDE drive, you can use this cable to connect the new drive.

13. Route the signal cable so that it does not block the airflow to the rear of the drives or over the microprocessor and memory.

14. If you have another drive to install or remove, do so now.

15. If you have other options to install or remove, do so now; otherwise, replace the support bracket (see "Removing and installing the support bracket" on page 12), replace the bezel (see "Replacing the bezel" on page 41), and then go to "Completing the installation" on page 41.

Installing a hot-swap SCSI hard disk drive in bay 4, 5, 6, 7, 8, or 9

Some server models support hot-swap hard disk drives. The SCSI ID for each hot-swap hard disk drive is printed on the hot-swap lock bar.

For increased security, the hot-swap drives and filler panels are locked in the server by the hot-swap lock bar. The hot-swap lock bar cannot be released to allow installation and removal of the hot-swap drives and filler panels unless the key lock on the server side cover is unlocked. The SCSI ID for each hot-swap hard disk drive is printed on the hot-swap lock bar.

Before you install a hot-swap hard disk drive, read the following information:

- Inspect the drive tray for signs of damage.
- Make sure that the drive is correctly installed in the tray.
- To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each drive bay.
- All hot-swap drives in the server must have the same speed rating; if you mix speed ratings, all drives will operate at the speed of the slowest drive.
- You do not have to turn off the server to install hot-swap drives in the hot-swap drive bays.
- Set the drive jumpers either to disable auto-start or to delay startup, to prevent overtaxing the system power supply by all drives trying to spin up at once.
- Install hot-swap hard disk drives in this sequence: bay 9, bay 8, bay 7, bay 6, bay 5, and bay 4.
- If your server has an optional RAID adapter, see the documentation that comes with the adapter for instructions for installing a hard disk drive.
- Each hot-swap drive has two LEDs: the hard disk drive activity LED and the hard disk drive status LED. When the green hard disk drive activity LED is flashing, it indicates that the controller is accessing the hard disk drive. When the amber hard disk drive status LED is lit continuously, it indicates that the drive is faulty and must be replaced. When the amber hard disk drive status LED is flashing, it indicates that the drive is being rebuilt.

The server hot-swap bays are connected to a SCSI backplane. This backplane is the printed circuit board behind the bay. The backplane controls the SCSI IDs for the hot-swap drives.

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

Filler panel

Drive-tray
assembly

Drive tray-handle
(in open position)
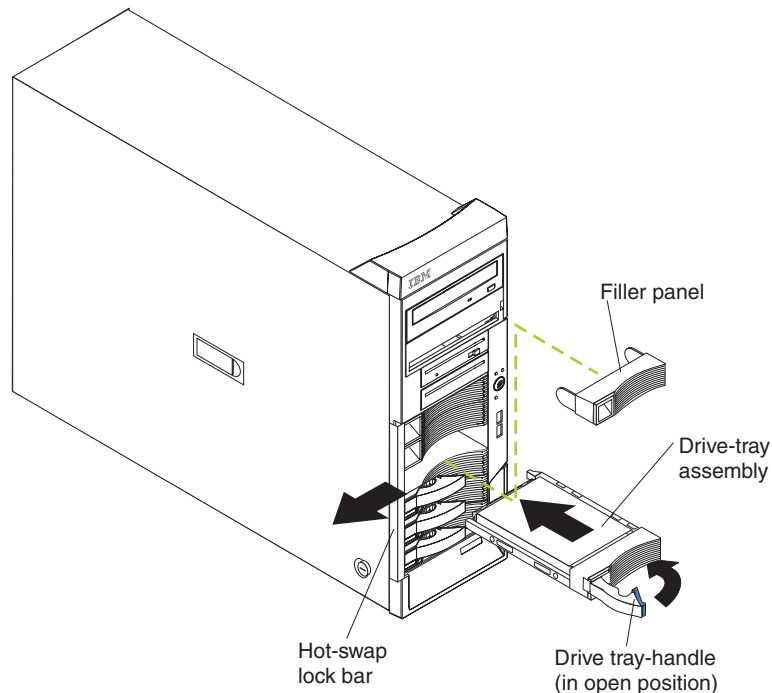
Hot-swap
lock bar

Complete the following steps to install a hot-swap hard disk drive.

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

1. Read the safety information beginning on page v and the "Installation guidelines" on page 7.
2. Unlock the side cover.
3. Slide the drive-bay lock bar to the left to access the drive bays.
4. Remove the filler panel from one of the empty hot-swap bays by inserting your finger into the depression at the left side of the filler panel and pulling it away from the server.
5. Install the hard disk drive in the hot-swap bay:
   a. Make sure that the tray handle is open (that is, perpendicular to the drive).
   b. Align the drive assembly with the guide rails in the bay.
   c. Gently push the drive assembly into the bay until the drive stops.
   d. Push the tray handle to the closed (locked) position.
   e. Check the hard disk drive status indicator to make sure that the hard disk drive is operating properly. (You might have to restart the server before the drive is recognized.) If the amber hard disk drive status LED for a drive is lit continuously, it indicates that the drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, it indicates that the drive is being accessed.

   Note: If the server is configured for RAID operation using an optional ServeRAID™ adapter, you might have to reconfigure the disk arrays after installing hard disk drives. See the ServeRAID documentation on the IBM *ServeRAID Support* CD for additional information about RAID operation and complete instructions for using ServeRAID Manager.

6. If you are installing additional hot-swap hard disk drives, do so now; otherwise, replace the hot-swap lock bar.

7. If you have other options to install or remove, do so now; otherwise go to "Completing the installation" on page 41.

SCSI IDs for hot-swap hard disk drives

The hot-swap-drive backplane controls the SCSI IDs for the internal hot-swap drive bays. The SCSI ID for each hot-swap hard disk drive is printed on the hot-swap lock bar. The following table lists the SCSI IDs for the hard disk drives and backplane that are connected to one channel in hot-swap hard disk drive models. In the typical configuration, the standard hard disk drives and backplane are connected to channel B.

Device	SCSI ID
Drive bay 9	0
Drive bay 8	1
Drive bay 7	2
Drive bay 6	3
Drive bay 5	4
Drive bay 4	5
Adaptec AIC 7902 controller	7
Hot-swap backplane	8

Installing a simple-swap Serial ATA hard disk drive in bay 4, 5, 6, or 7

Some server models support simple-swap Serial ATA (SATA) hard disk drives, which are easily accessible from the front of the server. Drives are installed starting at the bottom, in bay 7. Additional drives are then installed in bays 6, 5, and 4.

Before you install a simple-swap SATA hard disk drive, read the following information:

- Read the documentation that comes with the drive for cabling instructions.
- You can install two simple-swap SATA hard disk drives in the server.

  Note: You can install a third and fourth SATA drive if you install an optional ServeRAID-7t S-ATA adapter in the server. The optional ServeRAID-7t S-ATA adapter comes with two cables that you can use to cable the third and fourth SATA drives. In addition, if you install the optional ServeRAID-7t S-ATA adapter to add a third and fourth drive, all four SATA drives must then be connected to the ServeRAID-7t S-ATA adapter instead of to the system board. See "Installing an adapter" on page 29 and "Cabling an optional SATA adapter" on page 34 for instructions, or see the optional ServeRAID-7t S-ATA adapter documentation.

- Install simple-swap SATA hard disk drives in this sequence: bay 7, bay 6, bay 5, and bay 4.
- Bays 4, 5, 6, and 7 are simple-swap bays and do not require cabling.

Complete the following steps to install a simple-swap hard disk drive:

1. Read the safety information beginning on page v and the "Installation guidelines" on page 7.

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

3. Unlock the side cover (the bezel filler will not disengage from the server if the cover is locked).
4. Grasp the recess area on the bezel filler and rotate the bezel filler outward until it disengages from the server.

Recessed area

Bezel filler
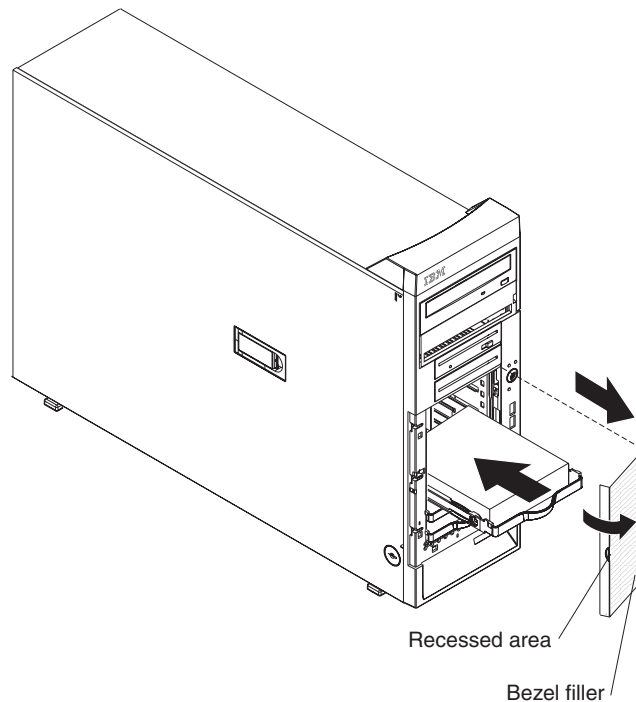
5. Touch the static-protective package containing the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
6. Align the drive assembly with the guide rails in the bay (the connector end of the drive goes in first).
7. Gently slide the drive assembly into the drive bay until the drive attaches to the connector on the back panel (you should hear a click).
8. If you have other options to install or remove, do so now. Otherwise, replace the bezel filler; then, see "Completing the installation" on page 41.

Power and signal cables for internal drives

Your server uses cables to connect parallel IDE, simple-swap Serial ATA, and SCSI devices to the power supply and to the system board. (See "System-board internal connectors" on page 3 for the location of system-board connectors.) Review the following information before connecting power and signal cables to internal drives:

- The drives that are preinstalled in the server come with power and signal cables attached. If you replace any drives, remember or label which cable is attached to which drive.
- When you install a drive, make sure that one of the signal cable drive connectors is connected to the drive and that the connector at the other end of the signal cable is connected to the system board.
- If you have only one IDE device on a cable, it must be set as a master device.
- If two IDE devices are used on a single cable, one must be designated as the master device and the other as the subordinate device; otherwise, the server might not recognize some of the IDE devices. The master and subordinate designation is determined by switch or jumper settings on each IDE device.

The following cables are provided:

- **Power cables:** Four-wire power cables connect the drives to the power supply. At the end of these cables are plastic connectors that can be attached to different drives; these connectors vary in size. Use either a four-wire power cable or Serial ATA power cable with Serial ATA drives, but do not use both at the same time (use one or the other). For SCSI hot-swap drives, a special power cable connects the SCSI backplane to the power supply.
- **Signal cables:** Signal cables are typically flat cables, also called ribbon cables, that connect parallel IDE, Serial ATA, SCSI, and diskette drives to the system board. Two or three types of signal cables come with the server:
  - **IDE:** The wider IDE signal cable has three connectors. One of these connectors is attached to the drive, one is a spare, and the third is attached to the primary IDE connector on the system board. The spare connector can be used to connect an additional IDE drive to the server.

    The CD-ROM drive is attached to an ATA 100 signal cable. ATA 100 signal cables are color-coded. The blue connector is attached to the system board. The black connector is attached to the master IDE device. The gray middle connector is attached to the subordinate IDE device.
  - **Diskette drive:** The narrower signal cable has two connectors. One is attached to the diskette drive, and the other is connected to the connector (FDD1) on the system board.
  - **Serial ATA (SATA):** The narrower, black signal cable has two connectors. One is connected to a simple-swap Serial ATA drive, and the other is attached to the connector on the system board. Each simple-swap Serial ATA drive comes with a cable. If you install an additional simple-swap Serial ATA drive, you will need an additional cable.

    If you install the optional ServeRAID-7t S-ATA controller to add a third and fourth SATA drive, all four SATA drives must then be connected to the ServeRAID-7t S-ATA controller instead of the system board. The optional ServeRAID-7t S-ATA controller comes with two cables that you can use to cable the third and fourth SATA drives. See the optional ServeRAID-7t S-ATA controller documentation for cabling instructions.
  - **SCSI:** A round SCSI cable connects the SCSI backplane to the SCSI channel B connector on the system board. The maximum cable length that supports Ultra320 SCSI hard disk drives is 61 cm (24 in.).

Installing an external SCSI connector

To install an external SCSI connector on the rear of the computer, install an external SCSI interface option. For a list of supported external SCSI interface options for your computer, go to http://www.ibm.com/pc/compat/.

The external SCSI interface option contains a SCSI cable with a connector at one end and another connector on the other end. Complete the following steps to install and route the SCSI cable in the computer:

1. Turn off the computer and all peripheral devices. Disconnect all power cords; then, disconnect all external signal cables from the computer.
2. Remove the computer cover (see "Removing the side cover" on page 10).
3. Remove the support bracket (see "Removing and installing the support bracket" on page 12).

4. Open the front adapter-support bracket and remove the rear adapter-retention bracket from the PCI-X slots (see "Installing an adapter" on page 29 for instructions). You might also have to remove longer adapters for access to the SCSI connectors on the system board.

5. Connect the SCSI signal cable end labeled "PLANAR" to the connector for SCSI channel A on the system board. See "System-board internal connectors" on page 3 for the location of the SCSI channel A connector.

6. Route the SCSI cable to the adapter slot that has the special SCSI-knockout slot cover on the back of the computer (see "Connecting the cables" on page 42 for an illustration of the SCSI-knockout slot cover, normally in PCI slot 3). Make sure the cable does not block the flow of air to the hard disk drives.

   Note: You can move the special SCSI-knockout slot cover to a different slot if needed.

7. Remove the SCSI-connector knockout from the PCI-X slot cover; then, insert the external SCSI connector on the SCSI cable into the knockout opening and secure it with the attached screws.

8. Replace any adapters you removed in step 4. Close the front adapter-support bracket and replace the rear adapter-retention bracket.

9. Replace the support bracket (see "Removing and installing the support bracket" on page 12).

10. Replace the cover (see "Replacing the side cover" on page 41).

11. Reconnect the external cables and power cords. Turn on the attached devices, and turn on the computer.

12. Use the SCSISelect program to configure SCSI channel A (see the *User's Guide* for information about using the SCSISelect program).

Installing an additional microprocessor

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

- The server comes with one microprocessor and supports up to two microprocessors.
- Read the documentation that comes with the microprocessor to determine whether you must update the basic input/output system (BIOS) code in the server. To download the most current level of BIOS code for the server, go to http://www.ibm.com/pc/support/.
- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems, go to http://www.ibm.com/pc/compat/.
- The microprocessors must have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical. You can use the Configuration/Setup Utility program to determine the specific type of microprocessor that is in the server.
- Terminator cards are not required for empty microprocessor sockets. However, for airflow, an empty microprocessor socket must contain a microprocessor baffle.
- The microprocessor speeds are automatically set for this server; therefore, you do not have to set any microprocessor frequency-selection jumpers or switches.
- The system board contains an integrated voltage regulator for microprocessor 1; you must install a voltage regulator module (VRM) on the system board when you install microprocessor 2. The VRM comes in the microprocessor option kit.
- If you must replace a microprocessor, call for service.

- For additional illustrations of the system-board components, see "System-board option connectors" on page 6.

The following illustration shows how to install an additional microprocessor.
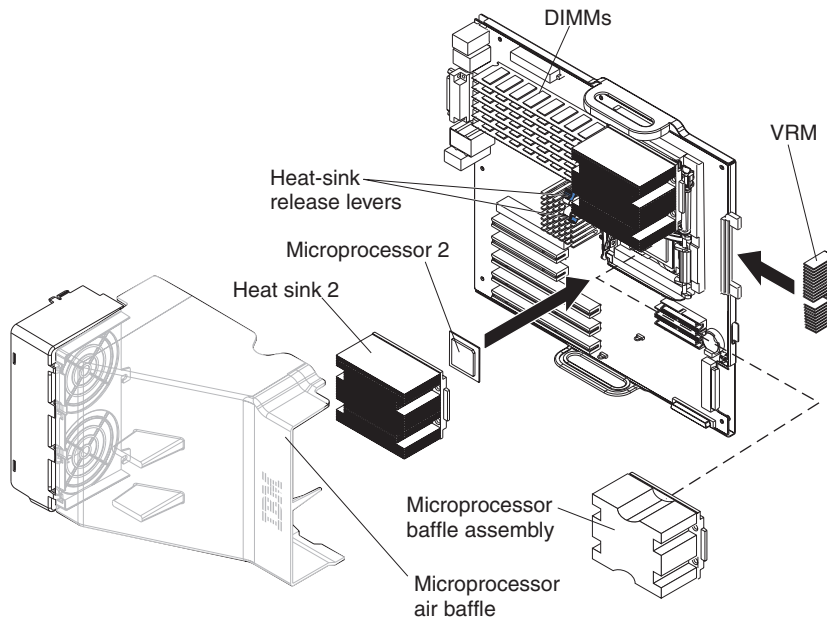
Complete the following steps to install a microprocessor:

1. Read the safety information beginning on page v and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Remove the side cover. See "Removing the side cover" on page 10.
4. Remove the support bracket. See "Removing and installing the support bracket" on page 12.
5. Open the microprocessor air baffle. See "Opening and closing the microprocessor air baffle" on page 12.
6. Remove the microprocessor baffle assembly from the second microprocessor socket.
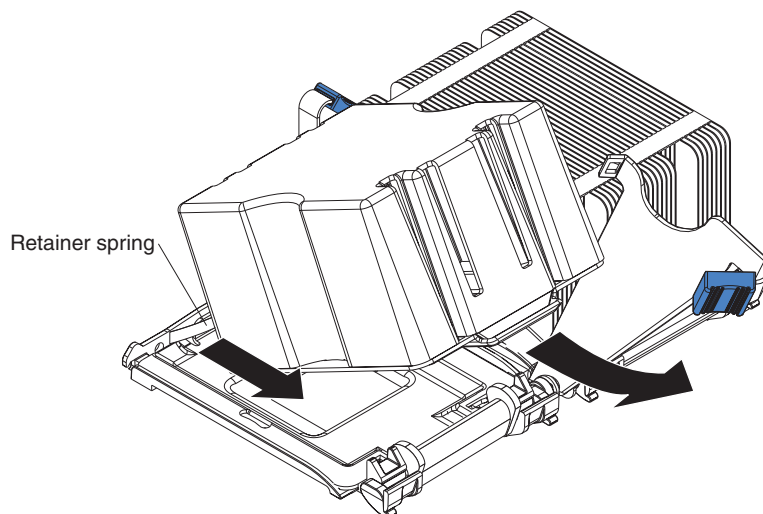
a. Press down on the blue touch point of the heat-sink release lever, then lift the lever up as far as it will go (135°) to release the baffle assembly.

b. Grasp the front of the baffle assembly and tip it up toward the rear of the server while pulling the rear flange out of the heat-sink retention module; then, lift the baffle assembly up and out of the server.

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 8.

7. If the second microprocessor socket is covered with protective film or a label, peel and remove the film or label.

8. Install the microprocessor:

a. Touch the static-protective package containing the new microprocessor to any *unpainted* metal surface on the server; then, remove the microprocessor from the package.

b. Pull out and lift up on the microprocessor-release lever to unlock the microprocessor socket.

   Attention:

   1) Do not use excessive force when pressing the microprocessor into the socket.

   2) Make sure that the microprocessor is oriented and aligned correctly with pin number 1 in the socket before you try to close the microprocessor-release lever. The following illustration shows the alignment marks for both microprocessors and sockets.
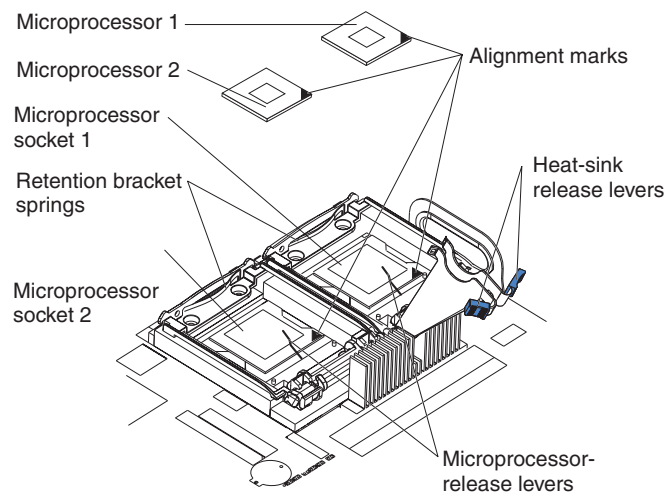
c. Center the microprocessor over the microprocessor socket. Align the triangle on the corner of the microprocessor with the triangle on the corner of the socket and carefully press the microprocessor into the socket.

d. Carefully close the microprocessor-release lever to secure the microprocessor in the socket.

Attention: Do not set the heat sink down after you remove the plastic cover and do not touch the thermal grease on the bottom of the heat sink. Touching the thermal grease will contaminate it. If the thermal grease on the microprocessor or heat sink becomes contaminated, contact your service technician.
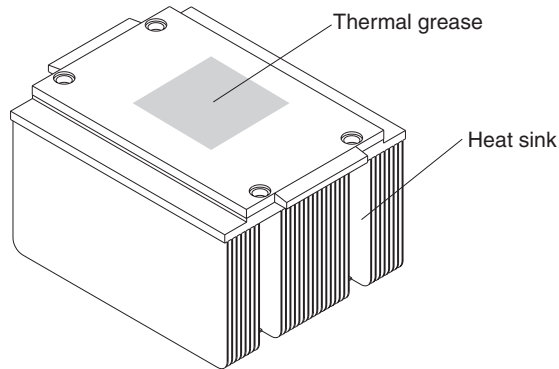
9. Install the heat sink on the microprocessor.

   a. Make sure that the heat-sink-release lever is in the fully open position (135°).

   b. Orient the heat sink so that the thermal grease patch is nearer the rear of the server (directly above the microprocessor).

   c. Remove the plastic cover from the bottom of the heat sink.
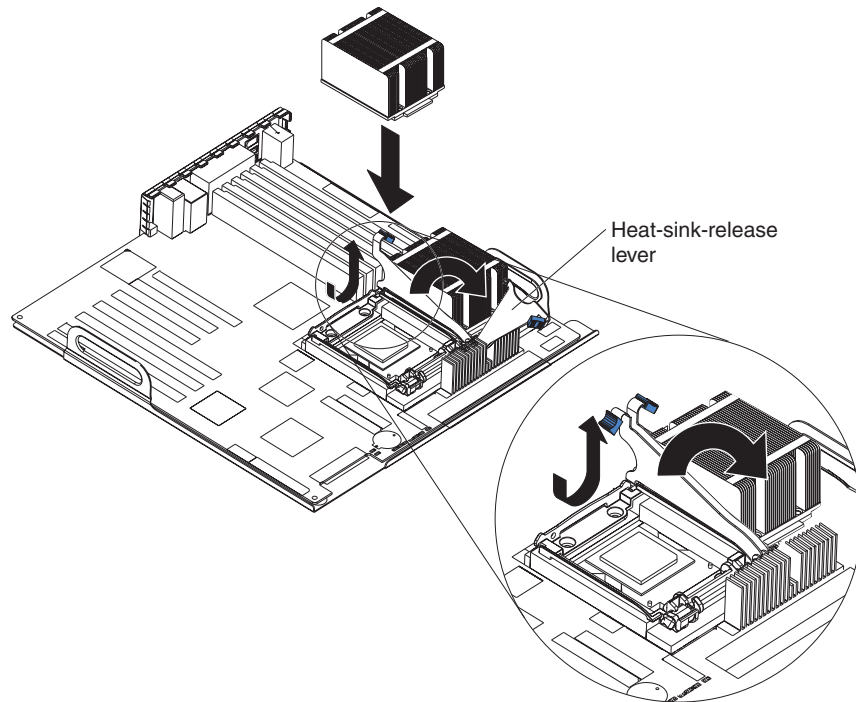
   d. Align the heat sink, grease side down, with the microprocessor and retention bracket.

   e. Slide the rear flange of the heat sink into the opening beneath the retention-bracket spring.

   f. With the heat sink on top of the microprocessor, press firmly on the heat sink so that it slips into the retention bracket.

> **Note:** When the heat sink is seated correctly, the heat-sink-release lever starts to cam toward the rear of the server.

   g. Close the heat-sink-release lever by pressing it down, then toward the microprocessor, then up until it hooks on the retention bracket. You might notice an audible snap as you rotate the lever, due to the spring force beneath the microprocessor; this is normal.

10. Insert the voltage regulator module (VRM) into the VRM connector (see the illustration on page 26).

   a. Open the retaining clips on the VRM connector.

   b. Touch the static-protective package containing the VRM to any unpainted metal surface on the server. Then, remove the new VRM from the package.

> **Note:** The VRM support bracket is attached to the VRM.

   c. Align the VRM with the VRM connector.

   d. Slide the VRM into the connector. The support bracket hooks into the chassis and the retaining clips snap into the locked position when the VRM is firmly seated in the connector.

11. If you have other options to install, do so now; otherwise, close the microprocessor air baffle (see "Opening and closing the microprocessor air baffle" on page 12), replace the frame-support bracket (see "Removing and installing the support bracket" on page 12) and go to "Completing the installation" on page 41.

Installing an adapter

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

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section. If you must change the switch setting or jumper settings on the adapter, follow the instructions that come with the adapter.
- Read the documentation that comes with your operating system.
- The server comes with three PCI slots and three PCI-X slots.

Slot number	Comments
Slot 1	• PCI Express x16 • Supports any PCI Express adapter that is in the ServerProven list (go to http://www.ibm.com/pc/compat/ for the list of supported adapters)
Slot 2	• PCI 32-bit, 33 MHz, 5 V signalling • Supports half-length PCI adapter • Supports Remote Supervisor Adapter II
Slot 3	• PCI 32-bit, 33 MHz, 5 V signalling • Supports full-length PCI adapter
Slot 4	• PCI-X 64-bit, 133 MHz, 3.3 V signalling • Supports full-length PCI or PCI-X adapter
Slot 5	• PCI-X 64-bit, 100 MHz, 3.3 V signalling • Supports ServeRAID 6i+ adapter • Supports full-length PCI or PCI-X adapter
Slot 6	• PCI-X 64-bit, 100 MHz, 3.3 V signalling • Supports full-length PCI or PCI-X adapter

- You can install any supported PCI Express adapter in slot 1. For a list of supported PCI Express adapters for your server, go to http://www.ibm.com/pc/compat/.
- You can install full-length adapters in PCI and PCI-X slots 3, 4, 5, and 6.
- You can install only 32-bit adapters in the 32-bit PCI slots 2 and 3, and 64-bit adapters in the 64-bit PCI-X slots 4, 5, and 6.
- The PCI bus configuration is as follows:
  - PCI slot 1 is on the PCI Express x16 graphic bus.
  - The 32-bit PCI slots 2 and 3 and the integrated ATI Radeon 7000M video controller are on the 33 MHz PCI bus.
  - The 64-bit PCI-X slot 4 is on the 133 MHz PCI-X bus, channel B.
  - The 64-bit PCI-X slots 5 and 6 and the integrated Adaptec 7902 SCSI controller are on the 100 MHz PCI-X bus, channel A. If an optional ServeRAID 6i+ adapter is installed, it overrides the standard functionality of the integrated SCSI controller with RAID capabilities and forces PCI-X slots 5 and 6 to 66 MHz.
- The optional IBM Remote Supervisor Adapter II can be installed only in PCI slot 2. Use the ribbon cable that comes with this adapter to connect it to the Remote Supervisor Adapter II connector on the system board.
- If you install the optional IBM Remote Supervisor Adapter II, you must disconnect the video (monitor) cable from the server video connector and connect it to the optional Remote Supervisor Adapter II.
- The optional ServeRAID 6i+ adapter can be installed only in PCI-X slot 5.
- The server scans the PCI Express x16 expansion slot 1, PCI expansion slots 2 and 3, and PCI-X expansion slots 4 through 6 to assign system resources. Then, the server starts the PCI devices in the following order, if you have not changed the default startup sequence: PCI Express x16 expansion slot 1; system-board integrated drive electronics (IDE), Serial ATA (SATA), or SCSI devices (including the optional ServeRAID 6i+ adapter); and then PCI-X expansion slots 4 through 6.
- For a list of supported options for your server, go to http://www.ibm.com/pc/support/.

See "System-board option connectors" on page 6 for the locations of expansion slots on the system board.

Complete the following steps to install an adapter:

1. Read the safety information beginning on page v, and "Installation guidelines" on page 7.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the side cover. See "Removing the side cover" on page 10.
3. Follow the cabling instructions, if any, that come with the adapter. Route the adapter cables before you install the adapter.
4. Follow the instructions that come with the adapter to set jumpers or switches, if any.
5. Remove the frame-support bracket. See "Removing and installing the support bracket" on page 12.

6. Rotate the rear adapter-retention bracket to the open (unlocked) position and remove it from the server. Rotate the front adapter-support bracket to the open position. If you are installing a smaller adapter, remove only the rear adapter-retention bracket.

7. Remove the expansion-slot cover. From the rear of the server, press on the slot cover. Grasp it and pull it out of the expansion slot. Store it in a safe place for future use.

   Notes:

   a. If you are installing an adapter into slot 3, move the expansion-slot cover with the SCSI knockout to a vacant adapter slot.

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

8. Touch the static-protective package containing the adapter to any unpainted metal surface on the server. Then, remove the adapter from the static-protective package. Avoid touching the components and gold-edge connectors on the adapter.

9. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter.
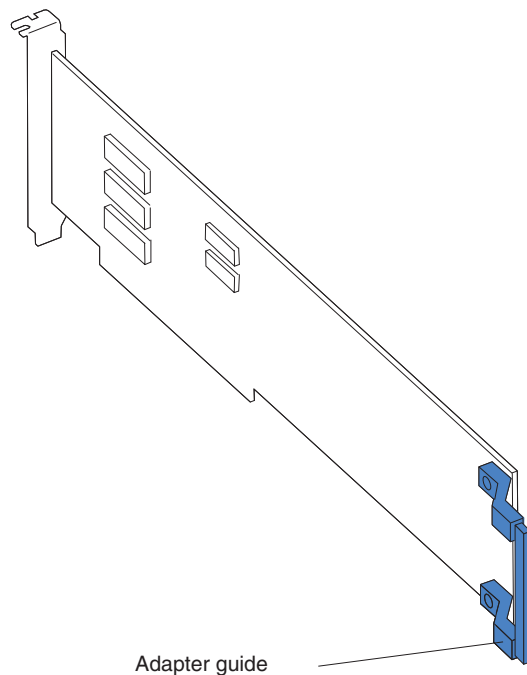
Adapter guide

10. Carefully grasp the adapter by the top edge or upper corners, and align it with the expansion-slot guides; then, press the adapter *firmly* into the expansion slot. Move the adapter directly from the static-protective package to the expansion slot.

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

Rear adapter-retaining bracket

Expansion-slot cover

Adapter

Front adapter-retaining bracket
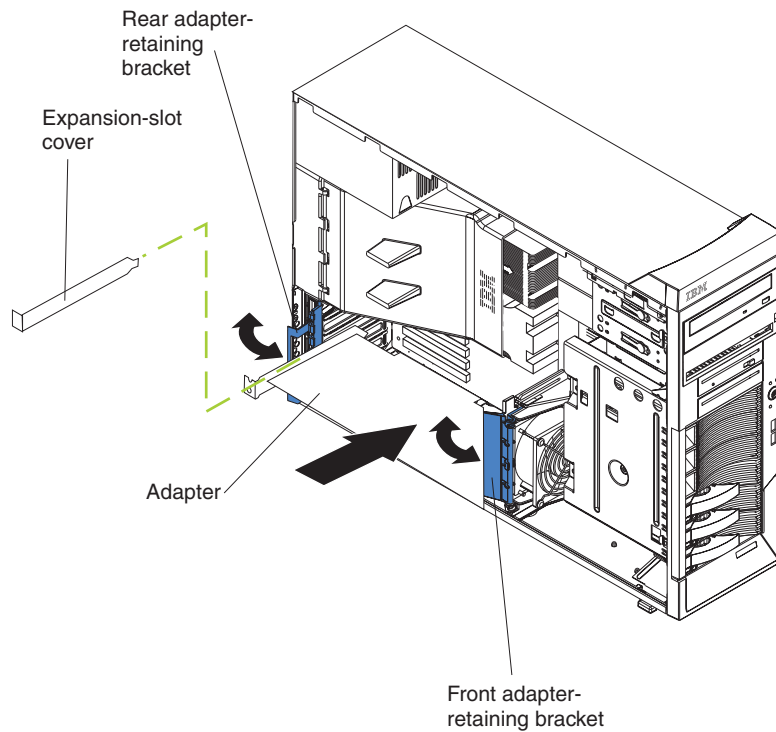
11. Connect required cables to the adapter. Route cables so that they do not block the flow of air from the fans. If you are installing an optional SCSI adapter, see "Cabling an optional SCSI adapter" on page 33 for additional information.

12. If you have other adapters to install or remove, do so now.

13. If you have installed a full-length adapter, rotate the front adapter-support bracket to the closed (locked) position.

14. Reinstall the rear adapter-retention bracket; then, rotate the bracket to the closed (locked) position.

    Note: If any adapters in the server are large or have heavy cables attached to them, you can remove the rear adapter-retention bracket and secure all of the adapters with expansion-slot screws. The expansion-slot screws are stored on the frame-support bracket.

15. If you have other options to install, do so now; otherwise, replace the frame-support bracket (see "Removing and installing the support bracket" on page 12) and go to "Completing the installation" on page 41.

Cabling an optional SCSI adapter

If your server model supports internal SCSI hard disk drives, you can install an optional SCSI adapter to control them. With a SCSI adapter installed, you can configure the internal hard disk drives into disk arrays that use higher levels of RAID functionality than the integrated SCSI controller. You can also cable a SCSI adapter to external hard disk drives. See your SCSI adapter option documentation for complete instructions for installing a SCSI adapter and for additional information about SCSI adapters.

Notes:

1. This information in this section does not apply to the ServeRAID 6i+ adapter, which uses the integrated SCSI controller with RAID capabilities on the system board.

2. If your server model supports internal SATA hard disk drives, installing an optional SCSI adapter enables you to add external SCSI tape drives to the server. The information in this section does not apply to a SCSI adapter that will be used to add external SCSI tape drives.

3. An optional SCSI adapter or cable option is required to connect external SCSI devices.

Complete the following steps to cable an optional SCSI adapter:

1. Install the SCSI adapter (see "Installing an adapter" on page 29).

2. Connect the SCSI signal cable to the adapter and to one or more of the signal-cable connectors on the rear of the SCSI devices.

3. Connect the SCSI-activity-indicator cable to the adapter and to the SCSI LED connector (JSCSI) on the system board. See "System-board internal connectors" on page 3 for the location of the SCSI LED connector.
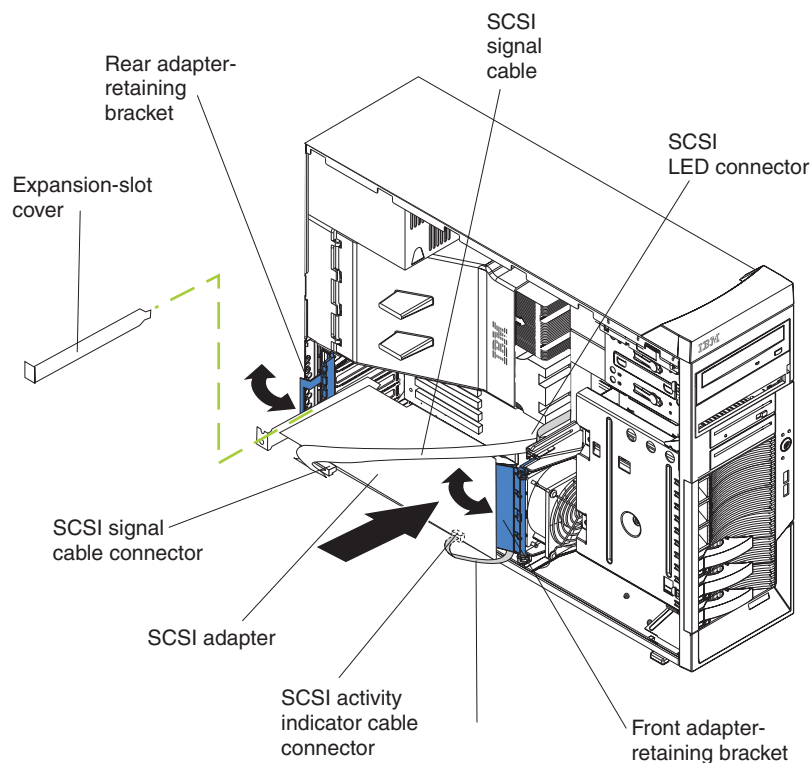
4. Complete the installation of the optional SCSI adapter.

Cabling an optional SATA adapter

If your server model supports internal SATA hard disk drives, the integrated SATA controller supports only two hard disk drives. You can install an optional ServeRAID-7t S-ATA adapter in your server to support up to four SATA hard disk drives and to control them. With a ServeRAID-7t S-ATA adapter installed, you can configure the internal hard disk drives into disk arrays that use higher levels of RAID functionality than the integrated SATA controller. See your ServeRAID-7t S-ATA adapter option documentation for complete instructions for installing a SATA adapter in your server and for additional information about SATA adapters.

Complete the following steps to cable an optional SATA adapter:

1. Install the SATA adapter (see "Installing an adapter" on page 29).

2. Disconnect the two SATA cables from the system board Serial ATA connectors and connect them to the SATA adapter. These are the signal cables for the SATA drives in bays 7 and 6. See "System-board internal connectors" on page 3 for the location of the Serial ATA connectors on the system board.
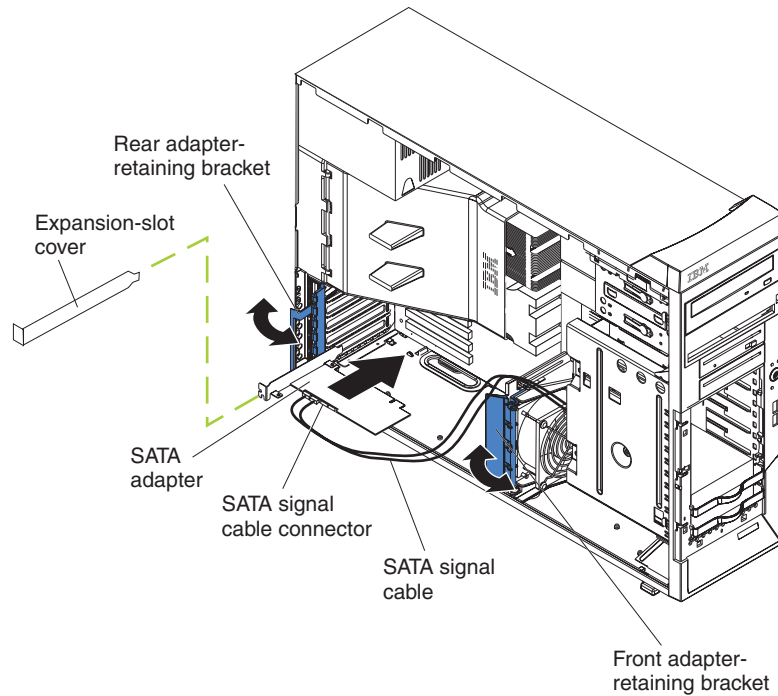
3. Complete the followings steps to connect the SATA signal cables that come with the adapter to the SATA back panel on the hard disk drive cage.

   Note: If you have placed the server on its side, adjust the instructions accordingly.

   a. Reach beneath the drive cage and push downward on the drive-cage-release latch; then, rotate the drive cage outward until the drive cage locks in the vertical position.

b. Remove the two screws from the large connector on the SATA cable that comes with the ServeRAID-7t S-ATA adapter.
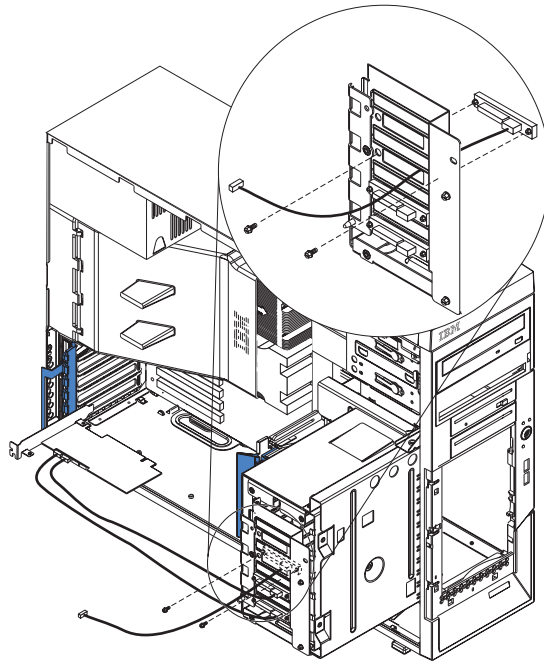
c. Thread the large connector into the small back-panel opening on the rear of a bay; then, orient the connector so that the blue signal cable is toward the front or outside of the server (see the previous illustration) and gently pull the connector into place.

d. Secure the connector with the two screws you removed in step 3b.

e. Connect the power-cable drop to the connector. The connectors are keyed and can be inserted only one way.

f. Repeat steps 3b through 3e for the second SATA cable that comes with the ServeRAID-7t S-ATA adapter.

g. Press in on the drive-cage release tab and rotate the drive cage partially back into the server. Press the drive-cage release latch and rotate the drive cage the rest of the way back into the server, allowing the release latch to spring back into position.

h. Route the SATA cables through the upper slot in the front adapter-support-bracket assembly; then, connect the other end of the SATA cables to the ServeRAID-7t S-ATA adapter.

4. Complete the installation of the optional SATA adapter.

Installing a security rope clip

To help prevent hardware theft, you can add a security rope clip and cable to the server. After you add the security cable, make sure that it does not interfere with other cables that are connected to the server.

Before you begin, obtain the following items:
- A flat-blade screwdriver
- An adjustable wrench
- A 19 mm (0.75 in.) rope clip or wire rope (similar to National Manufacturing number 3230, stock number 176-735)

- Threaded nuts that fit the rope clip
- A security cable
- A lock, such as a combination lock or padlock

Complete the following steps to install a rope clip:

1. Turn off the server and all attached devices. Disconnect all external cables and power cords; then, remove the side cover. See "Removing the side cover" on page 10.

2. Use a screwdriver to remove the two metal knockouts.

3. Insert the rope clip through the rear panel; then, attach and tighten the nuts.

4. Thread the cable through the rope clip and around an object that is not part of or permanently secured to the building structure or foundation, and from which the cable cannot be removed. Fasten the cable ends together with a lock. After you add the security cable, make sure that it does not interfere with other cables that are connected to the server.

Rope clip
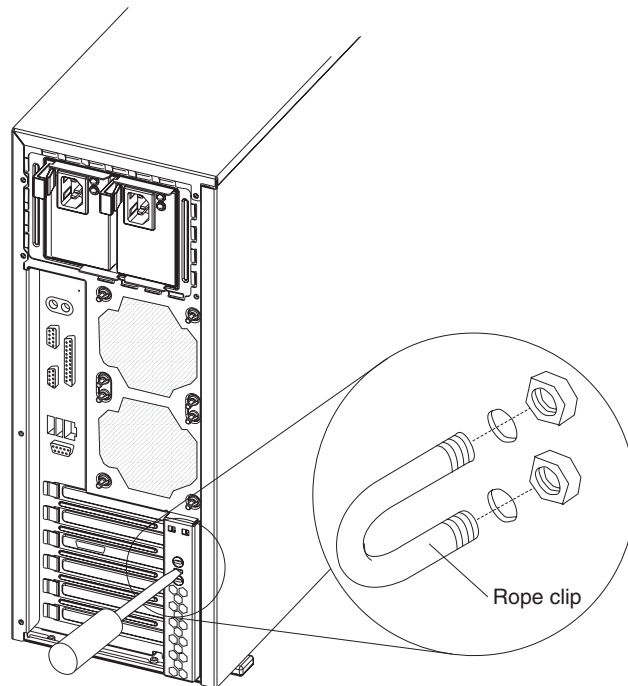
5. If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 41.

Replacing the battery

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following instructions.

Note: In the U. S., call 1-800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

To order replacement batteries, call 1-800-426-7378 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

Note: After you replace the battery, you must reconfigure your server and reset the system date and time.
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.**

Complete the following steps to replace the battery:

1. Review the safety information beginning on page v and "Installation guidelines" on page 7.
2. Follow any special handling and installation instructions supplied with the replacement battery.
3. Turn off the server and all attached devices.
4. Disconnect all power cords; then, disconnect all external cables.
5. Remove the side cover and frame-support bracket (see "Removing the side cover" on page 10 and "Removing and installing the support bracket" on page 12).
6. Remove any adapters that impede access to the battery.
7. Remove the battery:
   a. Use a fingernail to press the top of the battery clip away from the battery. The battery pops up when released.
   b. Use your thumb and index finger to lift the battery from the socket.
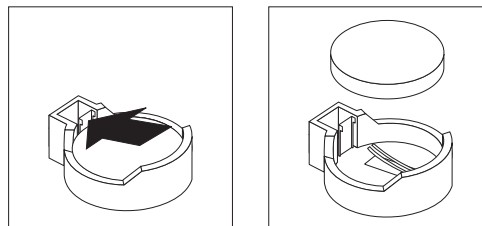
8. Insert the new battery:
   a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.

b. Press the battery down into the socket until it clicks into place. Make sure the battery clip holds the battery securely.
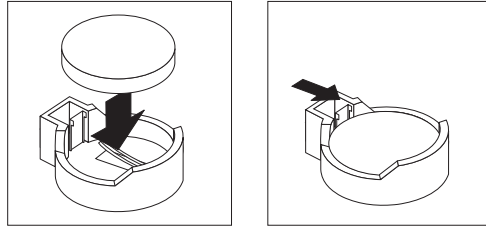
9. Replace the frame-support bracket and side cover. (See "Removing and installing the support bracket" on page 12 and "Replacing the side cover" on page 41).

10. Connect all external cables; then, connect the power cords.

11. Turn on the server.

12. Start the Configuration/Setup Utility program and set configuration parameters as needed. See the *User's Guide* on the IBM *xSeries Documentation* CD.

Replacing a hot-swap power supply

Some SCSI models of your server come with two hot-swap power supplies. You do not need to turn off the server to replace a hot-swap power supply, but you must replace only one power supply at a time.

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

Statement 8:

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

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

Statement 12:

CAUTION:
The following label indicates a hot surface nearby.

Complete the following steps to replace a hot-swap power supply:

1. Review the safety information beginning on page v and "Installation guidelines" on page 7.

2. Press the orange release lever on the selected power supply; then, pull the power supply out of the bay and set it aside.
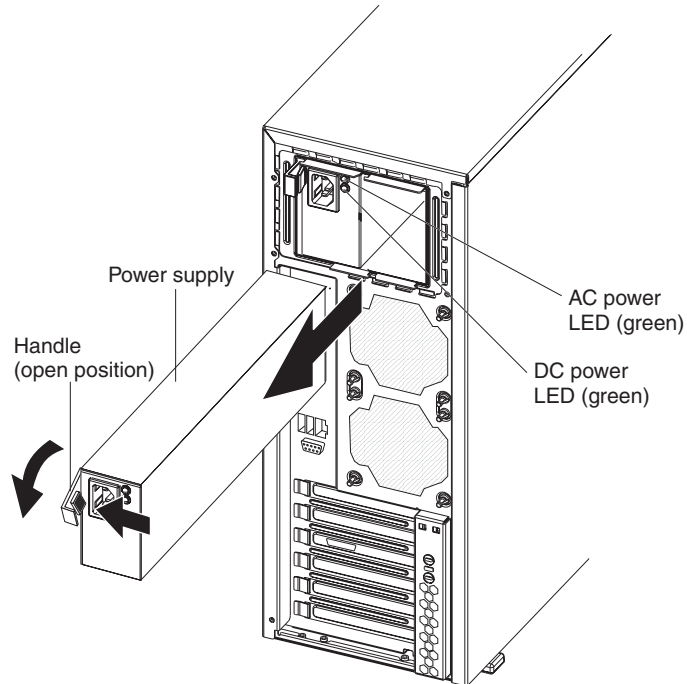
3. Make sure the power-supply handle is in the open position; then, slide the power supply all the way into the chassis before placing the power-supply handle into the locked position.
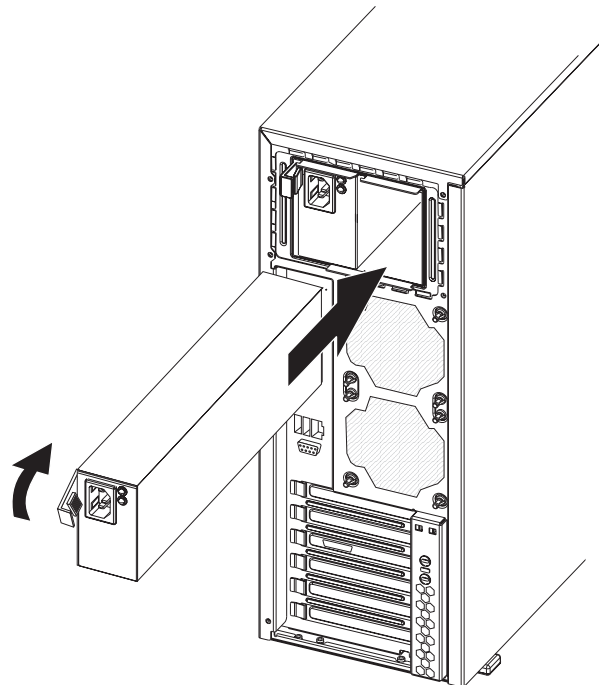
4. If the server is not on, turn on the server.

5. Verify that the dc power LED and the ac power LED on the power supply are lit, indicating that the power supply is operating properly.

Completing the installation

To complete the installation, you must reinstall the bezel, reinstall the frame-support bracket (see "Removing and installing the support bracket" on page 12), reinstall the side cover, connect all the cables and, for certain options, run the Configuration/Setup Utility program. Follow the instructions in this section.

Replacing the bezel

Complete the following steps to replace the bezel.
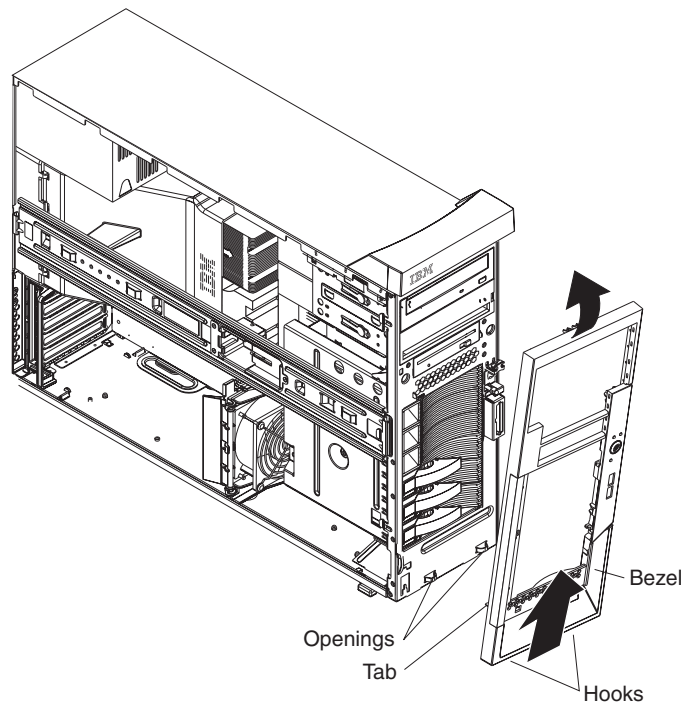
Note: For hot-swap hard disk drive models, make sure the side cover is unlocked; then, slide the lock bar on the bezel to the left (unlocked) before you begin.

1. Insert the two hooks on the bottom rear of the bezel onto the matching openings on the server chassis.
2. Insert the tab on the left side of the bezel into the matching hole on the chassis left front.
3. Push the top of the bezel toward the server until the two tabs at the top of the bezel snap into place.
4. For hot-swap hard disk drive models, slide the lock bar to the right. The hot-swap lock bar locks when you lock the side cover key lock.
5. Lock the side cover.

Replacing the side cover

If you removed the support bracket or bezel, reinstall it before you replace the side cover. See "Removing and installing the support bracket" on page 12 and "Replacing the bezel."

Note: The rear adapter retaining bracket rests against the server side cover. You might find it easier to lay the server on its side to replace the side cover.

Complete the following steps to replace the side cover:

1. Before installing the cover, check 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
2. Make sure the cover-release latch is in the unlocked (opened) position.
3. Insert the tabs inside the cover into the slots on the server chassis.
4. Make sure that each tab on the side cover is in its corresponding slot.
5. Close the cover-release latch to secure the side cover in place.
6. Lock the side cover.

Connecting the cables

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

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

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

Note: The power supply might be different on some models.
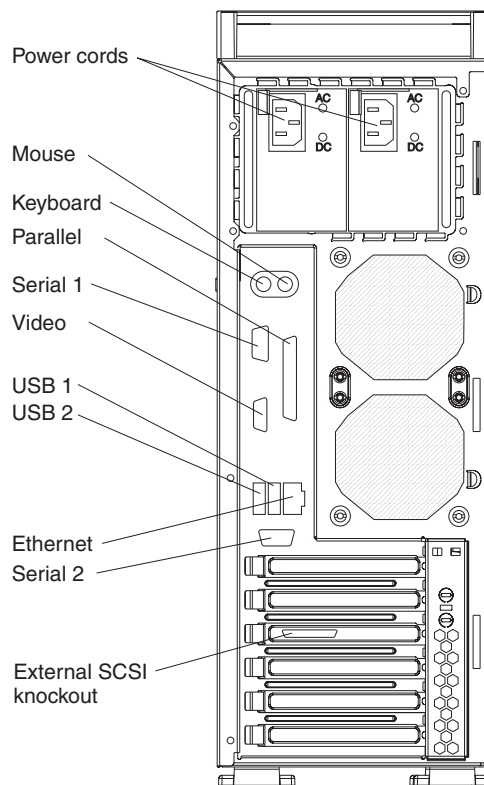
Updating the server configuration

When you start the server for the first time after you add or remove an internal option or an external SCSI device, you might receive a message that the configuration has changed. The Configuration/Setup Utility program starts automatically so that you can save the new configuration settings. See the *User's Guide* for additional information.

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

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

Connecting external options

If you install an optional SCSI adapter, you can attach external SCSI devices, such as a SCSI storage expansion enclosure, to your server.

Note: If your server model supports internal (simple-swap) SATA hard disk drives, installing an optional SCSI adapter enables you to add only external SCSI tape drives to the server.

Complete the following steps to attach an external device:
1. Review the safety information beginning on page v, "Installation guidelines" on page 7, and the documentation that comes with your options.
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the option to prepare it for installation and to connect it to the server.

Note: If you are attaching an external SCSI device, see "Ultra320 SCSI connector" on page 47 for information about SCSI cabling and SCSI IDs.

Installing the server in a rack

An optional Tower-to-Rack Kit is needed to convert your server from a tower model to a rack model. You can then install the server in a rack cabinet. To order a Tower-to-Rack Kit for your server, contact your IBM marketing representative or authorized reseller.

Chapter 3. Input/output connectors

The server has the following input/output (I/O) connectors:
- One mouse
- One keyboard
- One parallel
- Two serial
- One video
- One Ethernet (RJ-45)
- One Ultra320 SCSI (some models)
- Four Universal Serial Bus (USB) V 2.0 (two on front and two on rear)

The following illustration shows the locations of these connectors.
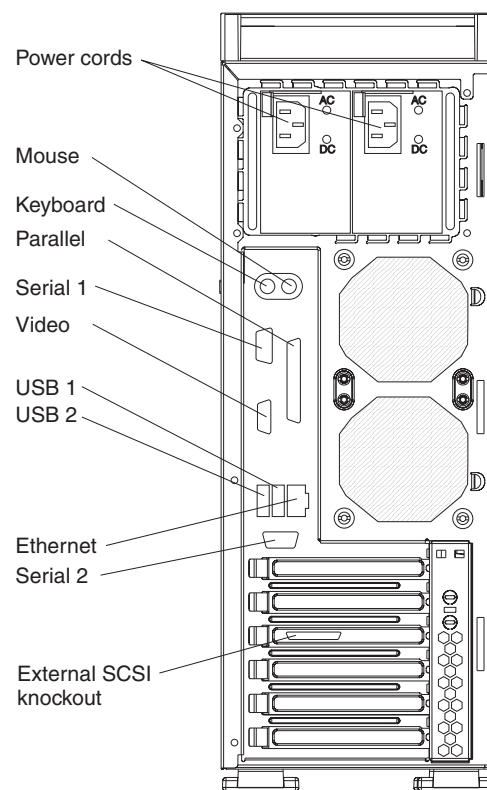
The following sections describe these connectors.

If you have an optional Remote Supervisor Adapter II (systems-management adapter) installed in PCI slot 2, the server also has an additional Ethernet connector, an additional serial connector, and an Advanced System Management (ASM) Interconnect connector. See the documentation that comes with the Remote Supervisor Adapter II for more information about the ASM Interconnect network. In addition, if you install the optional Remote Supervisor Adapter II, you must disconnect the video cable from the system board and connect it to the optional Remote Supervisor Adapter II.

Auxiliary-device (pointing-device) connector

Use this connector to connect a mouse or other pointing device. The following illustration shows an auxiliary-device connector.

```
      6 ( ○  □  ○ ) 5
      4 ( ○      ○ ) 3
          ○   ○
          2   1
```
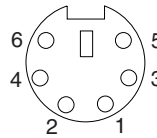
Ethernet (RJ-45) connector

The following illustration shows an Ethernet connector.

```
Activity LED                    Link LED
(green)                         (green)


          8           1
```
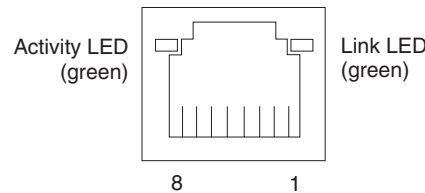
Connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to this connector. The 100BASE-TX and 1000BASE-T Fast Ethernet standards require Category 5 or higher cabling.

For more information about the Ethernet controller, see the *User's Guide*.

Keyboard connector

Use this connector to connect a PS/2 (non-USB) keyboard to the server. The following illustration shows a keyboard connector.

```
      6 ( ○  □  ○ ) 5
      4 ( ○      ○ ) 3
          ○   ○
          2   1
```
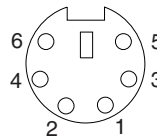
If you attach a keyboard to this connector, USB ports and devices are disabled during the power-on self-test (POST).

Parallel connector

Use this connector to connect a parallel device. The following illustration shows a parallel connector.

```
  13                          1
  ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
   ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○ ○
  25                          14
```
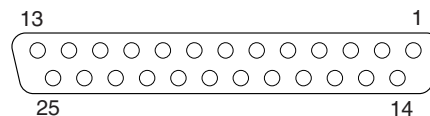
The parallel connector supports three standard Institute of Electrical and Electronics Engineers (IEEE) 1284 modes of operation: Standard Parallel Port (SPP), Enhanced Parallel Port (EPP), and Extended Capability Port (ECP). If you configure the parallel port to operate in bidirectional mode, it supports the ECP and EPP modes of operation. To configure the parallel port, use the **Devices and I/O Ports** option in the Configuration/Setup Utility program. See the *User's Guide* for more information. If you configure the parallel port to operate in bidirectional mode, use an IEEE 1284-compliant cable that does not exceed 3 meters (9.8 ft).

Serial connectors

Use the serial connectors to connect serial devices. The following illustration shows a serial connector.

```
  1         5
 ○ ○ ○ ○ ○
  ○ ○ ○ ○
  6       9
```
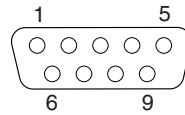
Ultra320 SCSI connector

You can install up to four internal SCSI devices in some models of the server. These models come with one SCSI cable that is connected from the internal SCSI connector to the standard hot-swap-drive backplane. You can attach additional internal SCSI devices to the other internal SCSI connector, or you can use the connector to attach external SCSI devices. To connect external SCSI devices, remove the SCSI knockout from the rear of the server and secure the free end of an optional cable in the new opening.

If you want to attach external SCSI devices to the server without using the internal SCSI channel, you must install an optional SCSI adapter.

Notes:
1. External SCSI devices connected to internal SCSI channel will operate asynchronously.
2. If you install a PCI RAID adapter to configure and manage the internal hot-swap drives, you must move the SCSI cable from the system-board SCSI connector to an internal channel connector on the RAID adapter. See "Cabling an optional SCSI adapter" on page 33 for additional information.

An optional external SCSI connector might be installed on the rear of the server. Use this connector to connect external SCSI devices. The following illustration shows a SCSI standard 68-pin, female D-shell SCSI connector.

```
  34                        1
 ┌────────────────────────┐
 │ □□□□□□□□□□□□□□□□□□□□□□ │
 │ □□□□□□□□□□□□□□□□□□□□□□ │
 └────────────────────────┘
  68                       35
```
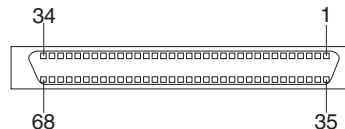
Your server has a dual-channel SCSI controller. This dual-channel controller supports two independent, Ultra320 SCSI channels that support up to 15 SCSI devices each. The SCSI connectors for the channels are on the system board. The controller has the following features:
- Double-transition clocking to achieve up to 320 MBps (megabytes per second) data-transfer rates
- Domain name validation to negotiate compatible data-transfer speeds with each device
- Cyclic-redundancy checking (CRC) to improve data reliability
- An active terminator for SCSI bus termination

Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that

different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs.

The hot-swap-drive backplane controls the SCSI IDs for the internal hot-swap drive bays. However, when you attach an external SCSI device to an optional SCSI adapter, you must set a unique ID for the device. See the information that comes with the device for instructions to set its SCSI ID.

You can attach external SCSI devices using an optional SCSI adapter. To select and order the correct adapter for use with external devices, contact your IBM marketing representative or authorized reseller. When using an optional SCSI adapter, you must also connect the SCSI adapter to the SCSI LED connector on the system board to receive an indication of SCSI hard disk drive activity.

Note: On server models that support SATA hard disk drives, you can attach only an external SCSI tape drive to an optional SCSI adapter.
See "System-board internal connectors" on page 3 for the location of the SCSI connectors. For information about the maximum length of SCSI cable, see the American National Standards Institute (ANSI) SCSI standards on the ANSI Web site at http://www.ansi.org/. Adhering to these standards will help to ensure that your server operates correctly.

Universal Serial Bus connectors

Use a Universal Serial Bus (USB) 2.0 connector to connect a USB device. USB 2.0 technology transfers data at up to 480 Mb per second (Mbps) with a maximum of 127 devices and a maximum signal distance of 5 meters (16 ft) per segment (if the device that is attached to the server is a USB 2.0 device). If multiple USB devices are attached to the server, the USB hub must be 2.0; otherwise, all USB 2.0 devices will transfer data at 12 Mbps. Using Plug and Play technology, USB devices are configured automatically. The following illustration shows a USB connector.
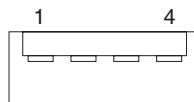
Use a 4-pin cable to connect a device to a USB connector. If you need to connect more USB devices than the server has USB connectors for, use a USB hub to connect additional devices.

If you connect a PS/2 (non-USB) keyboard to the keyboard connector, USB ports and devices are disabled during POST.

If you connect a USB keyboard that has a mouse port, the keyboard emulates a mouse, and you cannot disable the mouse settings in the Configuration/Setup Utility program.

Video connector

Use the video connector to connect a monitor to the server. The connector is dark blue to help you identify it. The following illustration shows an industry-standard 15-pin analog video connector on the rear of the server.
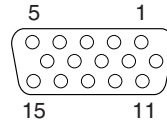
Appendix. Notices

This information was developed for products and services offered in the U.S.A.

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IBM @server xSeries 226 Type 8648

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Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

* Reorient or relocate the receiving antenna.
* Increase the separation between the equipment and receiver.
* Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
* Consult an IBM authorized dealer or service representative for help.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Proper cables and connectors are available from IBM authorized dealers. 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.

Responsible party:
International Business Machines Corporation
New Orchard Road
Armonk, NY 10504
Telephone: 1-919-543-2193

 Tested To Comply
With FCC Standards
FOR HOME OR OFFICE USE

Industry Canada Class B emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

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IBM power cords for a specific country or region are usually available only in that country or region.

IBM power cord part number	Used in these countries and regions
02K0546	China

IBM power cord part number	Used in these countries and regions
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Maceo, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil

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