



xSeries 450

Option Installation Guide

SC88-P919-40





@server

xSeries 450

Option Installation Guide

SC88-P919-40

Note: Before using this information and the product it supports, read the general information in “Notices”, on page 45.

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

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

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:



DANGER

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

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 2:



CAUTION:

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

Do not:

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

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

Statement 3:



CAUTION:

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

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

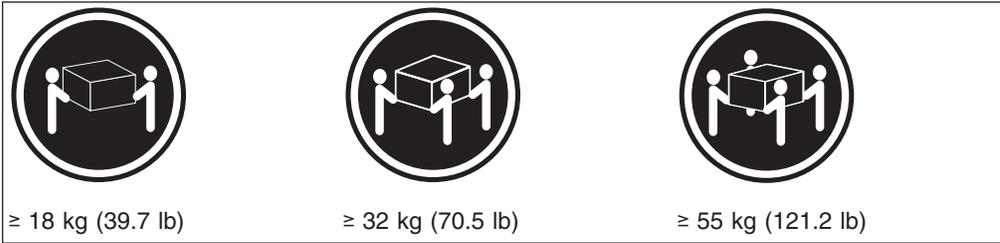


DANGER

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

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

Statement 4:

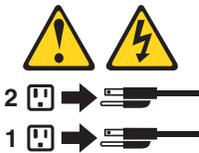


CAUTION:
Use safe practices when lifting.

Statement 5:



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



Statement 8:



CAUTION:

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



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

Statement 10:



CAUTION:

Do not place any object weighing more than 82 kg (180 lb) on top of rack-mounted devices.



>82 kg (180 lb)

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.***

Chapter 1. Introduction

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

The latest version of this publication is available from the IBM® Web site. Complete the following steps to display a list of publications for your server:

1. From <http://www.ibm.com>, click **Support & downloads**.
2. Click **Search technical support**.
3. In the **Enter PC machine type and model** field, type 8688 and click **Submit**.
4. On the left side of the "xSeries™ 450 8688 support" page, click **Online publications**.
5. From the **Online publications by category** menu, select the category of publications you want to display.

Related publications

In addition to this *Option Installation Guide*, the following xSeries 450 documentation is provided with your server:

- *User's Guide*

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

- *Installation Guide*

This printed publication contains instructions for setting up your server and basic instructions for installing some options.

- *Safety Information*

This publication 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* book.

- *Rack Installation Instructions*

This printed publication contains instructions for installing your server in a rack.

- *Hardware Maintenance Manual and Troubleshooting Guide*

This publication 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 publications might be included on the IBM *xSeries Documentation CD*.

Notices and statements used in this book

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

The following notices and statements are used in the documentation:

- **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.

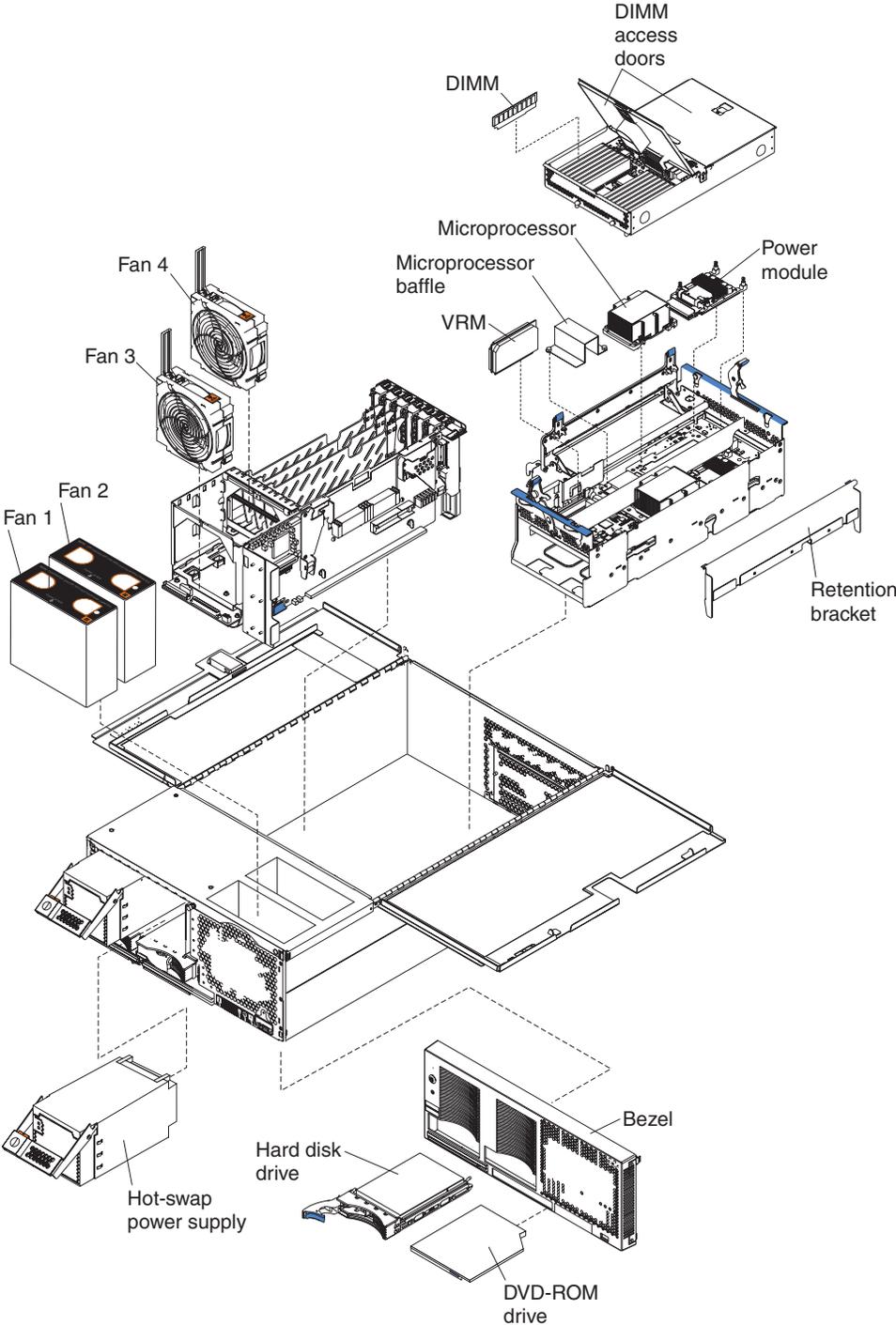
Major components of the xSeries 450

The orange color on components and labels in the server indicates hot-swap or hot-plug components. You can install or remove these components while the server is running, provided that the server is configured to support hot-swap and hot-plug features.

The blue color on components and labels indicates touch points, where a component can be gripped, a latch moved, and so on.

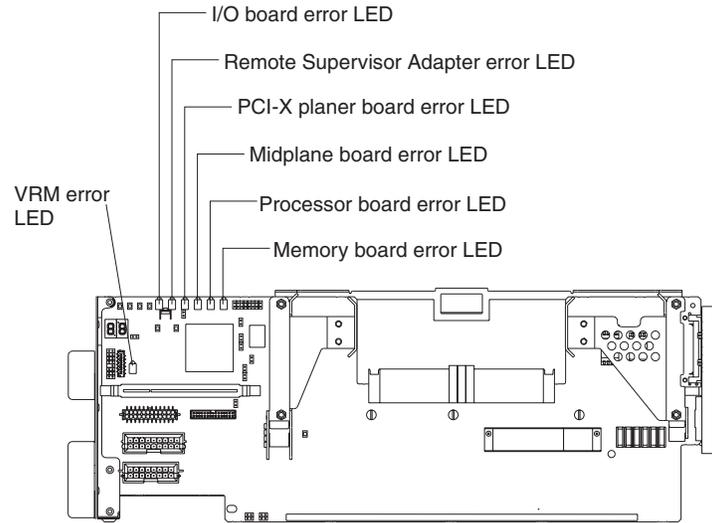
The following illustration shows the location of major components in your server.

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



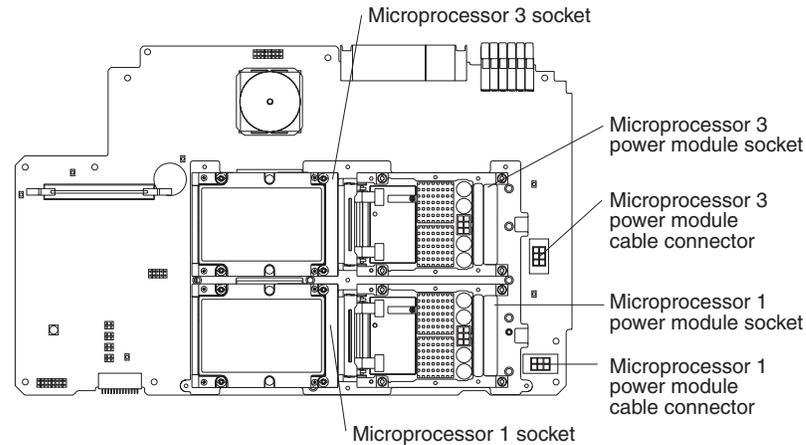
Midplane board LEDs

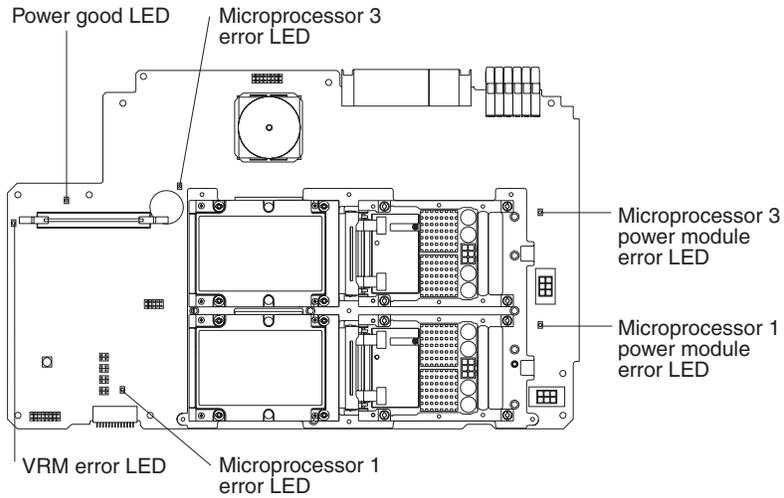
The following illustration shows the LEDs on the midplane board.



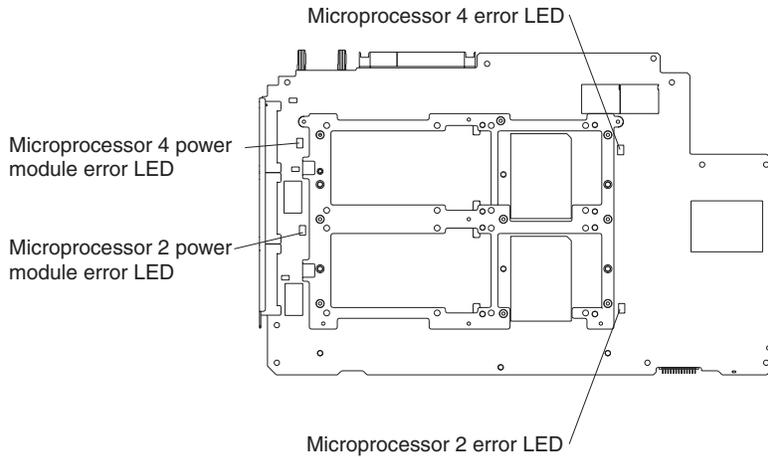
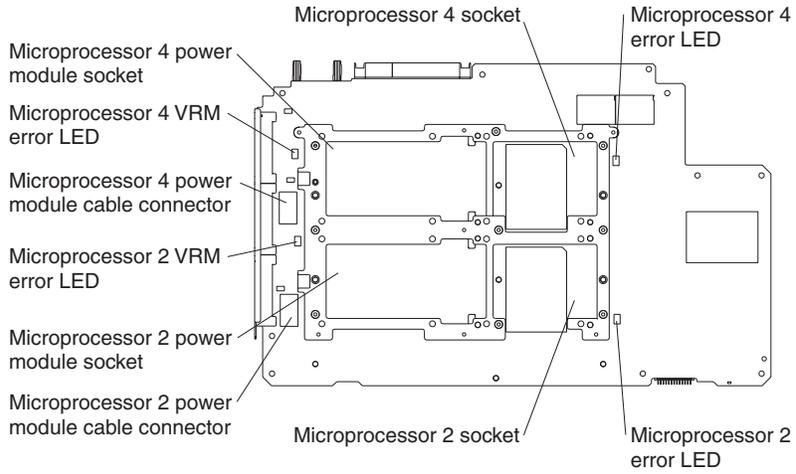
Processor board internal connectors and LEDs

The following illustrations show the internal connectors and LEDs on the processor board.



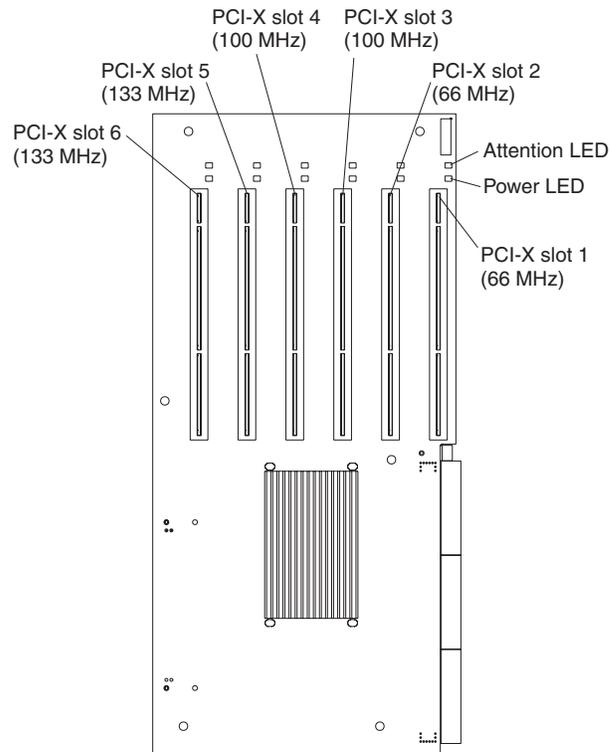


Reverse side



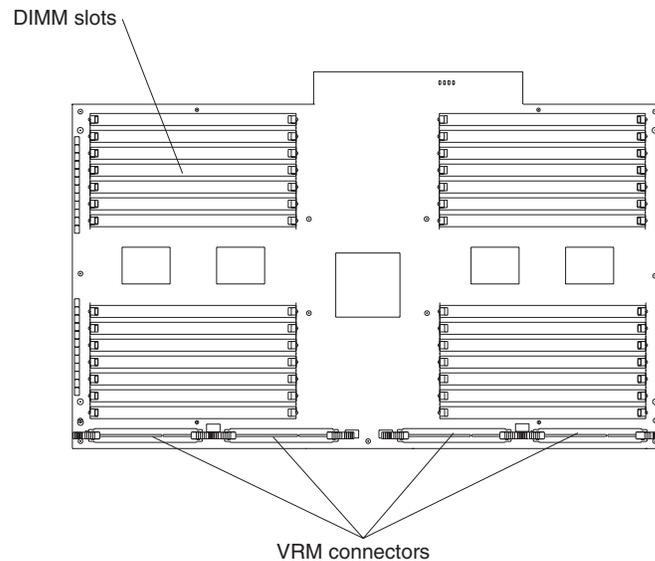
PCI-X board internal connectors and LEDs

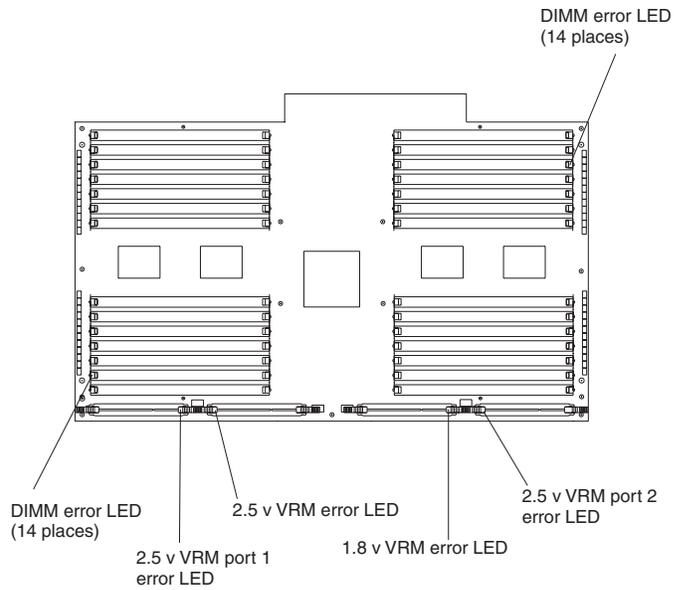
The following illustration shows the internal connectors and LEDs on the PCI-X board.



Memory board internal connectors and LEDs

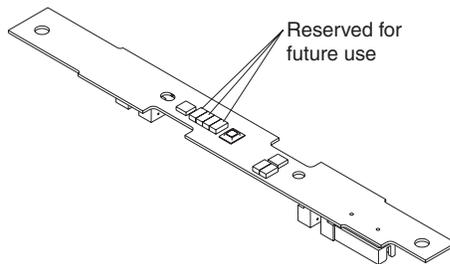
The following illustrations show the internal connectors and LEDs on the memory board.





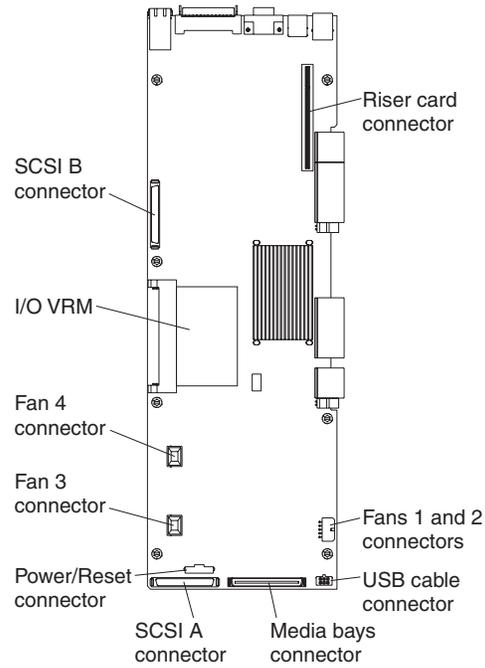
Memory switch card LEDs

The following illustration shows the LEDs on the memory switch card.



I/O-board internal connectors

The following illustration shows the internal connectors on the I/O board.



Chapter 2. Installing options

This chapter provides detailed instructions for installing hardware options in your server.

Installation guidelines

Before you begin to install 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 12. This information will help you work safely with your server or options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other devices that you will connect to the server.
- Back up all important data before you make changes to disk drives.
- For a list of supported options for your server, go to <http://www.ibm.com/pc/us/compat/>.

Note: Some preconfigured servers have a unique list of supported options. See the software documentation provided with those servers for more information.

System reliability considerations

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

- Each of the drive bays has either a drive or a filler panel installed.
- There is space around the server to allow the cooling system to work properly.
- Cables for optional adapters are routed according to the instructions that are provided with the adapters.
- All microprocessors have the same cache size and type, and the same clock speed.
- For proper cooling, do not leave the cover open for more than 15 minutes.
- A failed fan is replaced within 48 hours.
- The top cover is closed during normal operation.
- Do not remove a defective power supply until a replacement is available.
- For redundant and hot-swappable operation, the power supplies are connected to 200-240 V ac.

Working inside a server with power on

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

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

- Take care to avoid dropping any metallic objects, such as paper clips, hair pins, or screws, into the server.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective package 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 printed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its anti-static package, touch it to an unpainted metal part of the system unit 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 system unit without setting down the device. If it is necessary to set down the device, place it in its static-protective package. Do not place the device on your system unit cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.
- Wear a properly grounded wrist strap against your skin to help eliminate static electricity from your body.

Server power features

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

Turning on the server

Approximately 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 ac power is present, the server can be turned on from the Remote Supervisor Adapter user interface.
- The Wake on LAN[®] feature can turn on the server.

Notes:

1. The power supplies are hot-swappable and redundant only at 200-240 V ac.
2. Both power supplies must be connected to the power source for operation at 100-127 V ac.
3. During normal operation, both power supplies must be installed for proper operation.

4. While the server is powering up, the power-on LED on the front of the server is lit. When the server is connected to ac power but is not turned on, the power-on LED on the front of the server flashes.

Turning off the server

When you turn off the server and leave it connected to ac power, the server can respond to requests from the service processor, such as a remote request to turn on the server. To remove all power from the server, you must disconnect it from the power source.

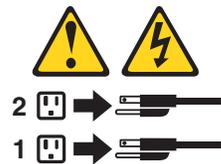
Some operating systems require an orderly shutdown before you turn off the server. See your operating-system documentation for information about shutting down the operating system.

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 the server is connected to an Advanced System Management interconnect network, the server can be turned off from the Remote Supervisor Adapter user interface.

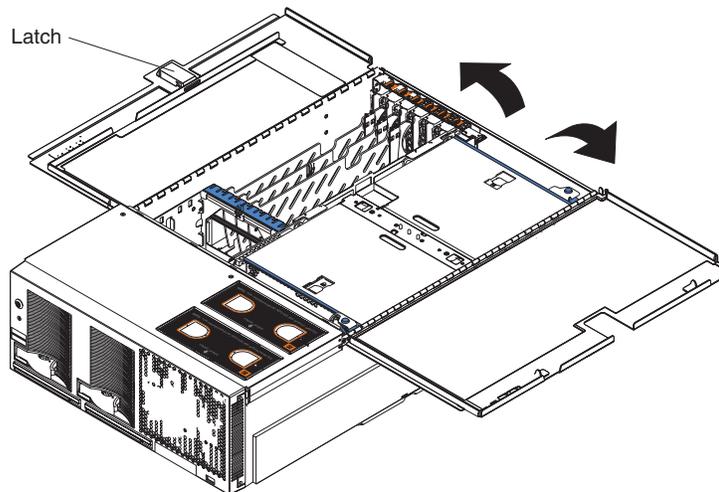
Notes:

1. You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the server. You can use this feature if the operating system stops functioning.
2. If you disconnect the server from the power source, wait approximately 15 seconds for the server to stop running before you open the cover. Watch for the power-on LED on the front of the server to stop flashing.

Opening the cover

Complete the following steps to open the server cover:

1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Slide the server out from the rack.



3. Pull the release latch on the left side of the top cover to the right.
4. Using the finger hole in the release latch, open the left side of the cover; then, open the right side of the cover.

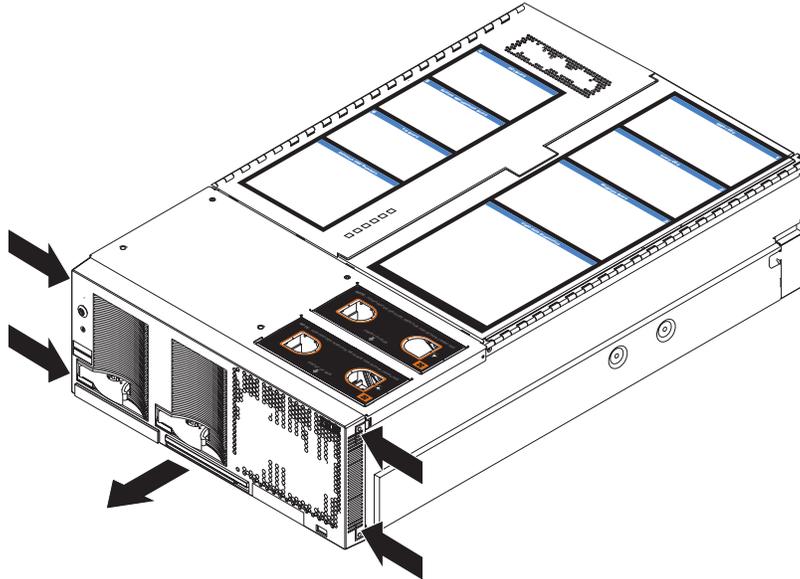
Attention: For proper cooling and airflow, close the cover before turning on the server. Operating the server for extended periods of time (over 15 minutes) with the cover open might damage server components.

Removing and replacing the bezel

Complete the following steps to remove the bezel:

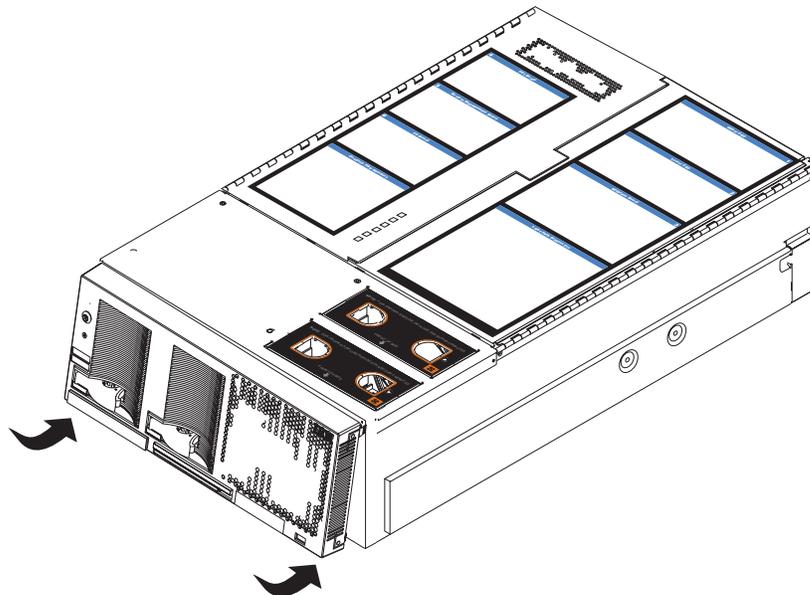
1. Press on the two tabs at the top edge of the bezel, and pull the top of the bezel slightly away from the server.

2. Press on the two tabs at the bottom edge of the bezel, and pull the bezel off the server. Store the bezel in a safe place.



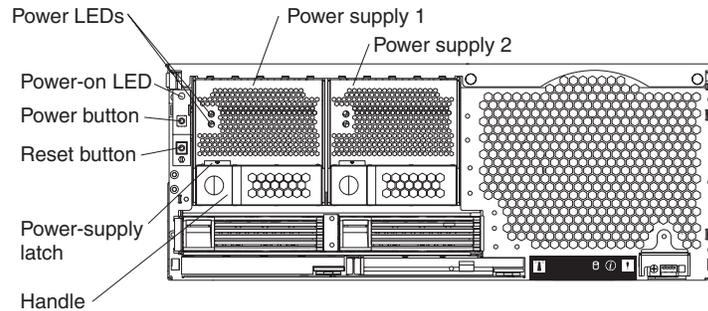
Complete the following steps to replace the bezel:

1. Align the four tabs on the bezel with the slots in the server chassis.
2. Press firmly against the front of the bezel until it snaps into place.



Removing and replacing a hot-swap power supply

Your server comes with two hot-swap power supplies, which you can remove and replace without turning off the server. The following illustration shows the locations of the power supplies on the front of the server.



Before you remove or replace a power supply, review the following information.

Notes:

1. The power supplies are hot-swappable and redundant only at 200-240 V ac.
2. Both power supplies must be connected to the power source for operation at 100-127 V ac.
3. During normal operation, both power supplies must be installed for proper operation and cooling.

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.

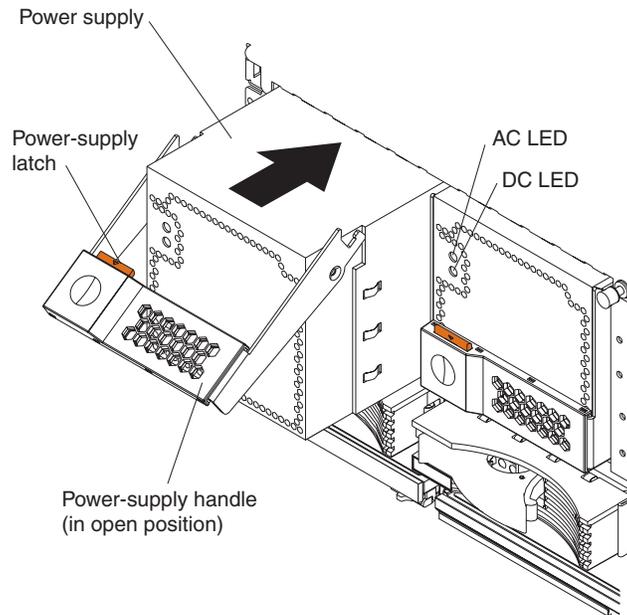


Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Complete the following steps to remove and replace a power supply:

1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Remove the front bezel (see “Removing and replacing the bezel” on page 14 for instructions about removing the front bezel).

3. To remove the power supply from the server, press the latch; then, lift the handle on the power supply to the open position and pull the power supply out from the server.
4. Install the new power supply:



- a. Place the handle on the power supply in the open position.
 - b. Slide the power supply into the chassis and press the handle to the closed position.
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.
 6. Replace the front bezel on the server (see “Removing and replacing the bezel” on page 14 for instructions).

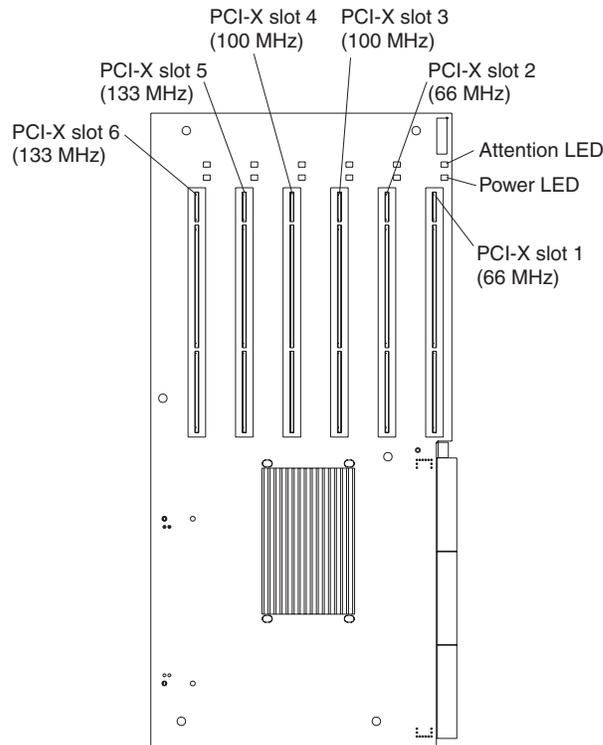
Installing an adapter

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

Attention: Before you remove or replace the Remote Supervisor Adapter or clear the nonvolatile random access memory (NVRAM), be sure to make a backup copy of the nonvolatile EFI variables. See “Backing up and restoring the nonvolatile variables” on page 39 for more information.

- The following illustration shows the location and bus speeds of the PCI-X expansion slots on the PCI-X board.

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



- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section. If you need to change the switch settings or jumper settings on your adapter, follow the instructions that come with the adapter.
- Video adapters are not supported.
- Some full-length adapters have extension handles or brackets installed. Before installing the adapter, you must remove the extension handle or bracket.
- Your server supports six hot-plug 64-bit adapters in the expansion slots on the PCI-X board, as shown in the following table.

Bus	Slot	Supported adapter speed (MHz)
A	1	66
A	2	66
B	3	100 (133 if slot 4 is empty)
B	4	100 (133 if slot 3 is empty)
C	5	133
D	6	133

- You can install both PCI and PCI-X adapters on the same bus. However, if you install a PCI adapter and a PCI-X adapter on the same bus, the PCI-X features of the PCI-X adapter will be disabled, and the adapter will function as a PCI adapter.
- You can install PCI or PCI-X adapters of speeds faster than what is labeled for a particular PCI-X bus. For example, if you install two 133 MHz adapters into slots that are labeled as 100 MHz slots, the adapters will operate at 100 MHz.
- If you install a 33 MHz and a 66 MHz adapter on the same bus, the bus speed will match that of the slowest adapter.

- If a single 133 MHz adapter is installed on PCI-X bus B (slots 3 and 4) and the other slot on PCI-X bus B is empty, the adapter will operate at 133 MHz.
- Your server supports 3.3 V and universal adapters; it does not support 5.0 V adapters.
- The system scans PCI-X slots to assign system resources. The system attempts to start the first device found. The search order is: PCI-X slots 1, 2, 6, 5, 3, and 4. If an optional remote I/O enclosure is attached, the scan continues with PCI-X slots 11, 12, 9, 10, 7, 8, 17, 18, 15, 16, 13, and 14.

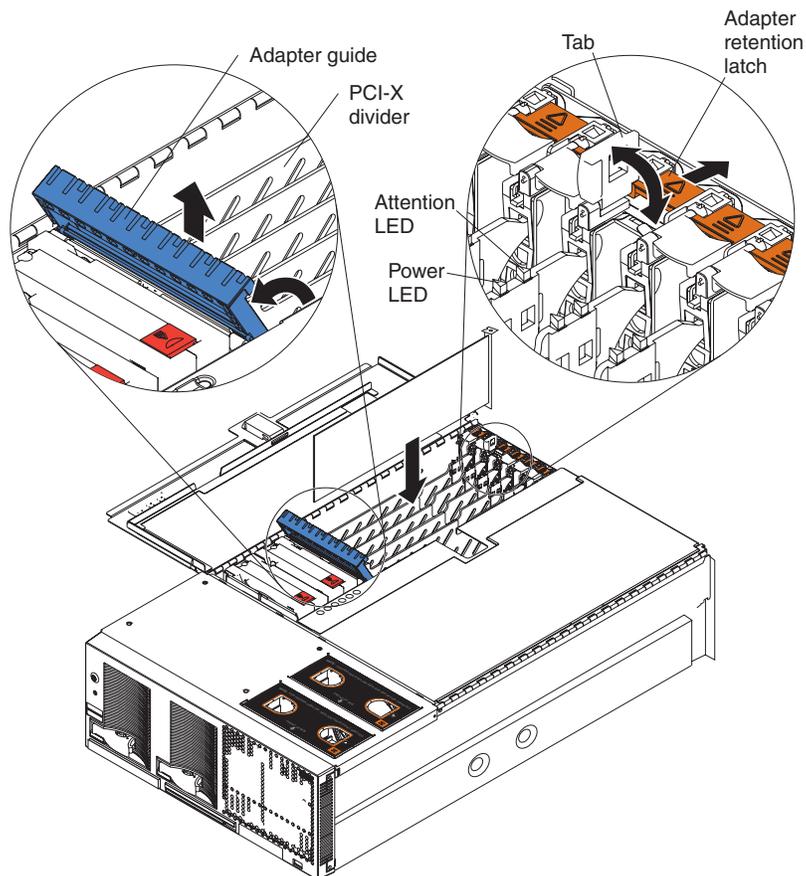
Complete the following steps to install an adapter:

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 12.

1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Disable the PCI-X slot through your operating system before you insert or remove a PCI or PCI-X adapter.

Note: Some operating systems do not support the enabling and disabling of a PCI-X slot. If your operating system does not support this function, turn off the server and peripheral devices, and disconnect the power cords and all external devices from the back of the server before proceeding.

3. Open the top cover.



4. Follow the cabling instructions, if any, that come with the adapter. Route the adapter cables before you install the adapter.

5. Follow the instructions that come with the adapter to set jumpers or switches, if any.
6. Install the adapter:
 - a. If you are installing a full-length adapter, open the blue adapter guide by lifting the front edge, as shown in the illustration.
 - b. Push the orange adapter-retention latch toward the rear of the server and open the tab.
 - c. Remove the expansion-slot cover.
 - d. Carefully grasp the adapter by its top edge or upper corners, and align it with the connector on the PCI-X board.

Note: Some long adapters have extension handles or brackets. Before installing a long adapter, you must remove the extension handle or bracket.
 - e. Press the adapter *firmly* into the adapter connector.

Attention: When you install an adapter, be sure the adapter is correctly seated in the connector. Improperly seated adapters might cause damage to the PCI-X board or to the adapter.
 - f. Push down on the blue adapter guide to keep the adapter steady.
 - g. Close the tab; then, push down on the blue adapter-retention latch until it clicks into place, securing the adapter.
7. Connect the internal cables to the adapter.
8. If you disabled the slot in step 1, enable the slot.
9. If you have other options to install or remove, do so now. Otherwise, go to “Completing the installation” on page 36.

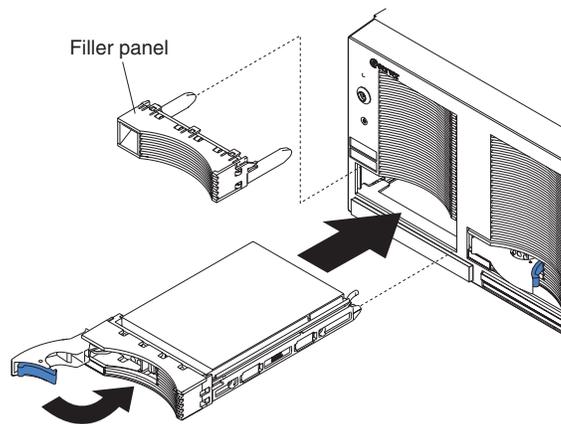
Installing a hot-swap hard disk drive

Complete the following steps to install or replace a hot-swap hard disk drive:

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 12.
 - Before you hot-swap a drive, make sure it is defective. If you partially or completely remove a good drive instead of a defective one, your server might lose valuable data.
1. Inspect the drive for any signs of damage.
 2. Read the safety information beginning on page v and “Installation guidelines” on page 11.
 3. Check the instructions that come with the drive for more information about installing your drive.

4. Remove the filler panel or defective hard disk drive from the hard disk drive bay.



5. Install the new hard disk drive in the drive bay:
 - a. Ensure that the handle on the hard disk drive tray is in the open position.
 - b. Slide the drive into the bay until it stops.
 - c. Push the handle on the front of the hard disk drive closed.
 - d. Check the hard disk drive status LED to verify that the hard disk drive is operating properly.

If the amber hard disk drive error LED for a drive is lit continuously, that individual drive is faulty and needs to be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.
6. If you have other options to install or remove, do so now.

Installing a 1.44 MB diskette drive

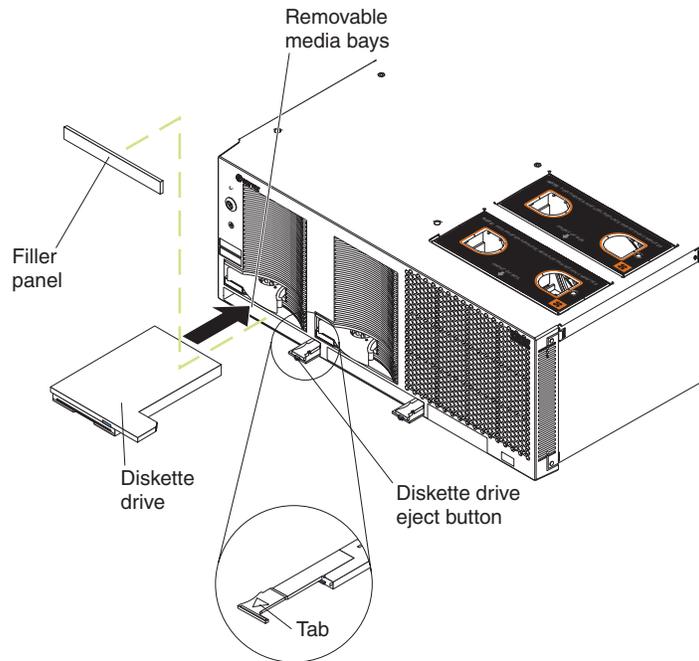
The following notes describe the type of diskette drive that your server supports and other information that you must consider when installing a diskette drive:

- Your xSeries 450 server supports one diskette drive.
- The diskette drive must be installed in the left drive bay.
- The IDE drives installed in your server are not hot-swappable.
- Your operating system must support a diskette drive.

Complete the following steps to install a diskette drive in your server:

1. Review the information in “Safety” on page v, and “Installation guidelines” on page 11.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external devices from the back of the server.
3. Inspect the drive for any signs of damage.

- Slide the drive into the left drive bay until it stops.



- If you have other options to install or remove, do so now. Otherwise, connect the power cords and turn on the server.

Complete the following steps to remove a diskette drive from your server:

- Read the safety information beginning on page v and “Installation guidelines” on page 11.
- Turn off the server and peripheral devices, and disconnect the power cords and all external devices from the back of the server.
- Push the drive-eject button to the right.
- Using the tab, pull the diskette drive partially out of the server; then, grasp the drive and remove it from the server.
- If you have other options to install or remove, do so now. Otherwise, connect the power cords and turn on the server.

Installing a CD-ROM or DVD-ROM drive

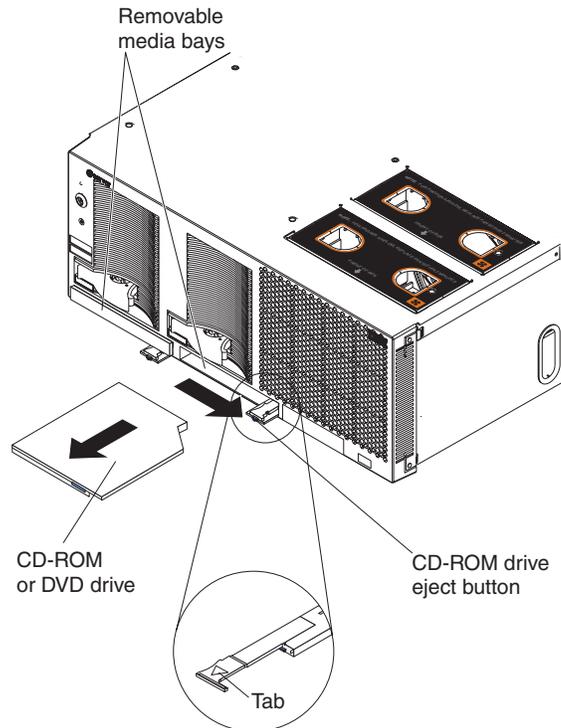
The following notes describe the types of CD-ROM or DVD-ROM drives that your server supports and other information that you must consider when installing a CD-ROM or DVD-ROM drive:

- Your xSeries 450 server supports up to two CD-ROM drives, or two DVD-ROM drives, or a combination.
- If you have only one IDE device installed, it must be installed in the right removable-media bay. CD-ROM or DVD-ROM drives can be installed in either removable-media bay.

Complete the following steps to install a CD-ROM or DVD-ROM drive in your server:

- Read the safety information beginning on page v and “Installation guidelines” on page 11.
- Turn off the server and peripheral devices, and disconnect the power cords and all external devices from the back of the server.

3. Push the drive-eject button to the right.
4. Inspect the drive for any signs of damage.
5. Slide the CD-ROM or DVD-ROM drive into the drive bay until it stops.



6. If you have other options to install or remove, do so now. Otherwise, connect the power cords and turn on the server.

Complete the following steps to remove a CD-ROM or DVD-ROM drive in your server:

1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external devices from the back of the server.
3. Push the drive-eject button to the right.
4. Using the tab, pull the CD-ROM or DVD-ROM drive partially out of the server; then, grasp the drive and remove it from the server.
5. If you have other options to install or remove, do so now. Otherwise, connect the power cords and turn on the server.

Installing memory

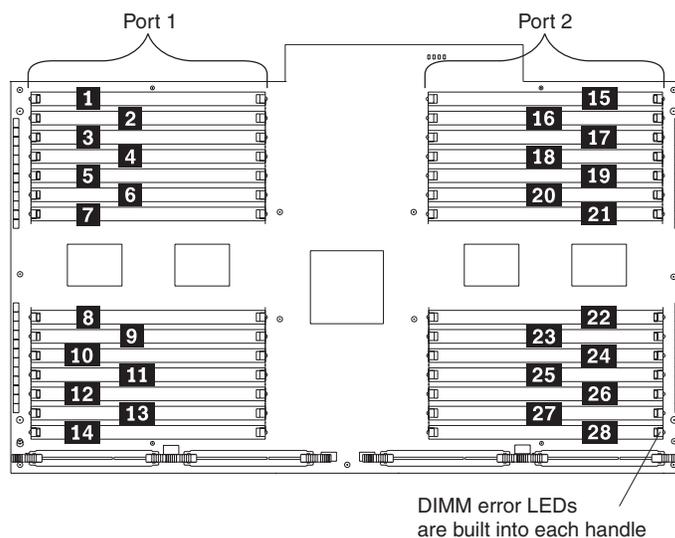
The following notes describe the types of dual inline memory modules (DIMMs) that your server supports and other information that you must consider when installing DIMMs:

- Your server supports 512 MB, 1 GB, and 2 GB DIMMs, for a maximum of 40 GB of system memory. Your server supports up to twenty-eight 2.5 V, 184 pin, PC2100, ECC DDR SDRAM, 133 MHZ DIMMs. Go to the ServerProven[®] list at <http://www.ibm.com/pc/compat/> for a list of memory modules you can use with your server.

- Your server supports a maximum of only 20 DIMMs (10 per port) if any connector contains a 2 GB DIMM. Your server supports a maximum of 28 DIMMs (14 per port) if only 512 MB and 1 GB DIMMs are installed.
- Your server comes with a minimum of two 512 MB DIMMs, installed in slots 1 and 14. When installing additional DIMMs, you must install two DIMMS at a time, in the order shown in the following table to maintain performance.

Table 1. DIMM installation sequence

Pair	DIMM connectors (Port 1)	Pair	DIMM connectors (Port 2)
1	1 and 14	2	15 and 28
3	4 and 11	4	18 and 25
5	2 and 13	6	16 and 27
7	5 and 10	8	19 and 24
9	3 and 12	10	17 and 26
11	6 and 9	12	20 and 23
13	7 and 8	14	21 and 22



- Each DIMM in a pair must be of the same size and technology to ensure that the server will operate properly.
- When using memory mirroring, you must install two pairs of DIMMs at a time. The four DIMMs in each bank must be identical. The following table shows the pairs that are in each bank. See Table 1 for the DIMM connector pair assignments.

Table 2. Memory mirroring DIMM installation sequence

Bank	DIMM pairs	Bank	DIMM pairs
1	1 and 2	5	9 and 10
2	3 and 4	6	11 and 12
3	5 and 6	7	13 and 14
4	7 and 8		

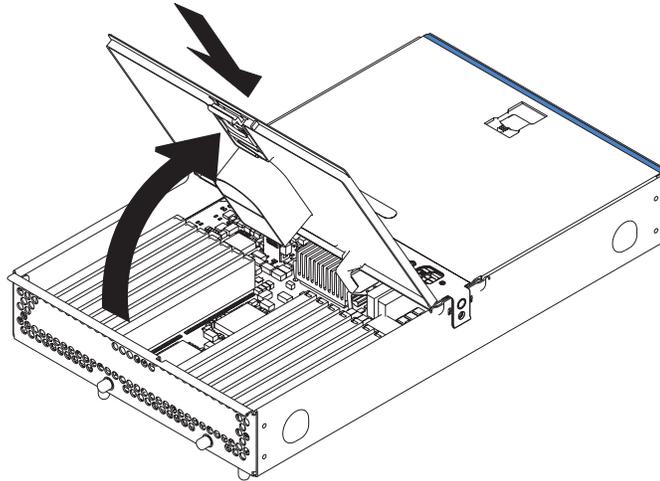
- When you install or remove DIMMs, the server configuration information changes. When you restart the server, the system displays a message indicating that the memory configuration has changed.

Complete the following steps to install a DIMM in your server:

1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables; then, open the server cover.

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 12.

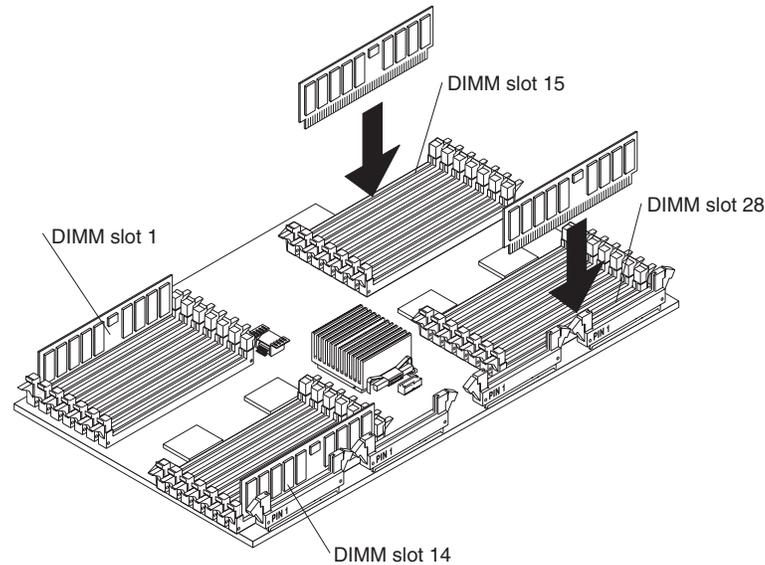
3. Open the DIMM access door that covers the DIMM connector into which you will be installing the DIMM.



4. Install the new DIMM:
 - a. Open the retaining clip on each end of the DIMM connector.
 - b. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.

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

retaining clips, remove the DIMM, and then reinsert it.



5. Close the DIMM access door.
6. If you have other options to install or remove, do so now.
7. Close the server cover. See “Completing the installation” on page 36.

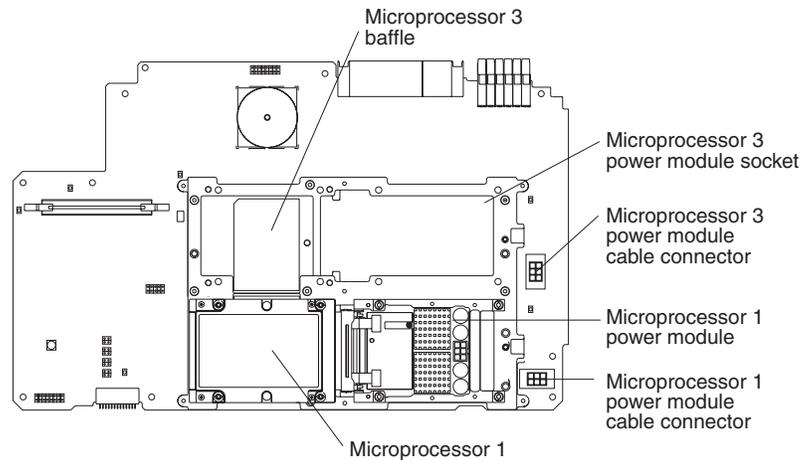
Installing and replacing a microprocessor and power module

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

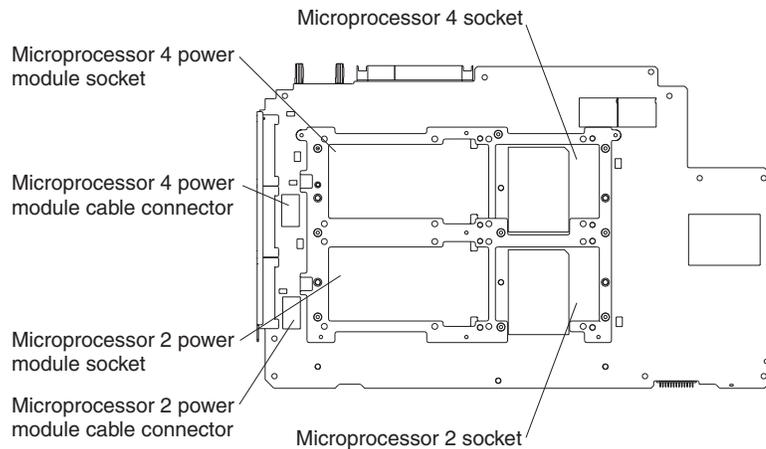
- Your server supports up to four Intel® Itanium® 2 microprocessors.
- Read the documentation that comes with the microprocessor to determine whether you need to update the server system abstraction layer/extensible firmware interface (SAL/EFI) code. To download the most current level of SAL/EFI code for the server, go to <http://www.ibm.com/pc/support/> on the World Wide Web.
- (Optional) Obtain an SMP-capable operating system. For a list of supported operating systems, go to <http://www.ibm.com/pc/us/compat/>.
- You will need the following tools:
 - 2.5-mm hex (Allen) wrench (provided with the microprocessor option)
 - T15 Torx wrench (provided with the microprocessor option)
- To order additional microprocessor options, contact your IBM marketing representative or authorized reseller.
- Populate the microprocessor sockets in numeric order. Install the first microprocessor in microprocessor socket 1, the second microprocessor in microprocessor socket 2, and so on.
- The following illustrations show the locations of the microprocessor connectors on the processor board.

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

Front side



Reverse side



Important: To ensure proper server operation after you install replacement or additional microprocessors, install only microprocessors that have the same cache size and type, and the same clock speed. For a list of microprocessors supported by your server, go to the ServerProven list at <http://www.ibm.com/pc/us/compat/>.

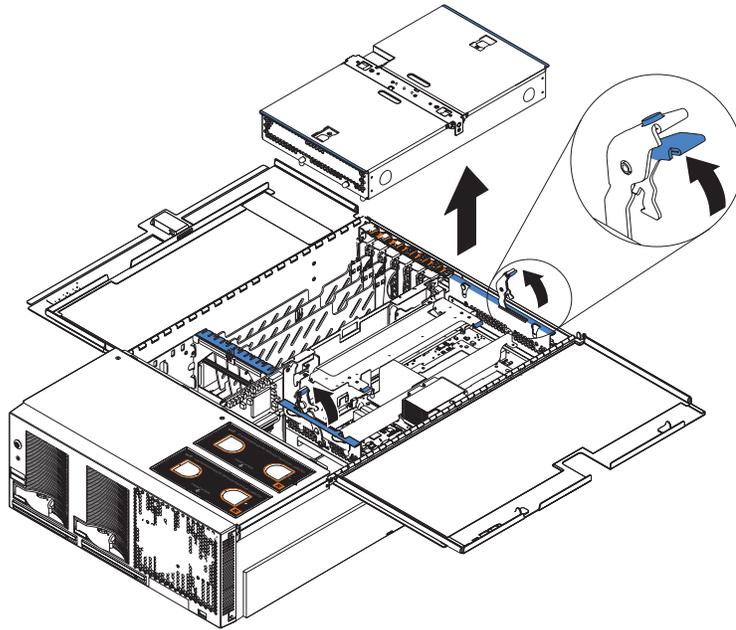
Complete the following steps in the prescribed order to install and replace a microprocessor:

Attention: Failure to complete the following steps in the prescribed order might cause damage to the microprocessor pins and cause the microprocessor to fail.

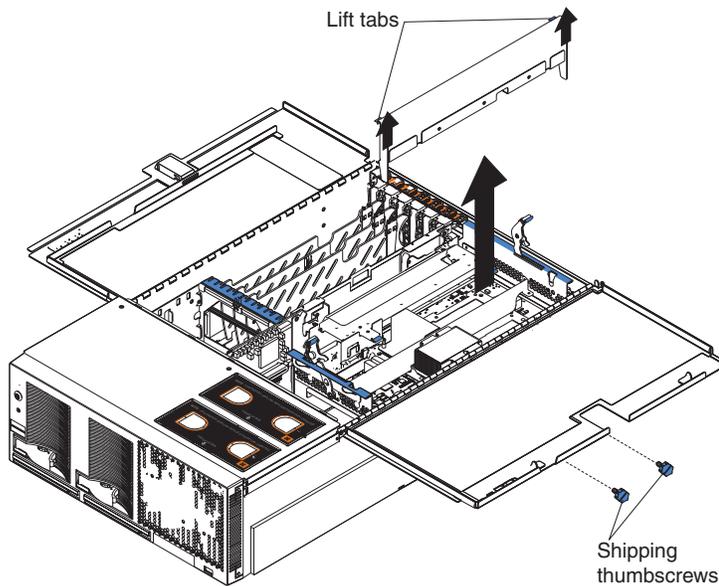
1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables; then, open the cover.
3. Remove the memory-board assembly from the server:

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 12.

- a. Pull up on the levers to detach the memory-board assembly.
- b. Carefully remove the memory-board assembly from the server and set it aside.



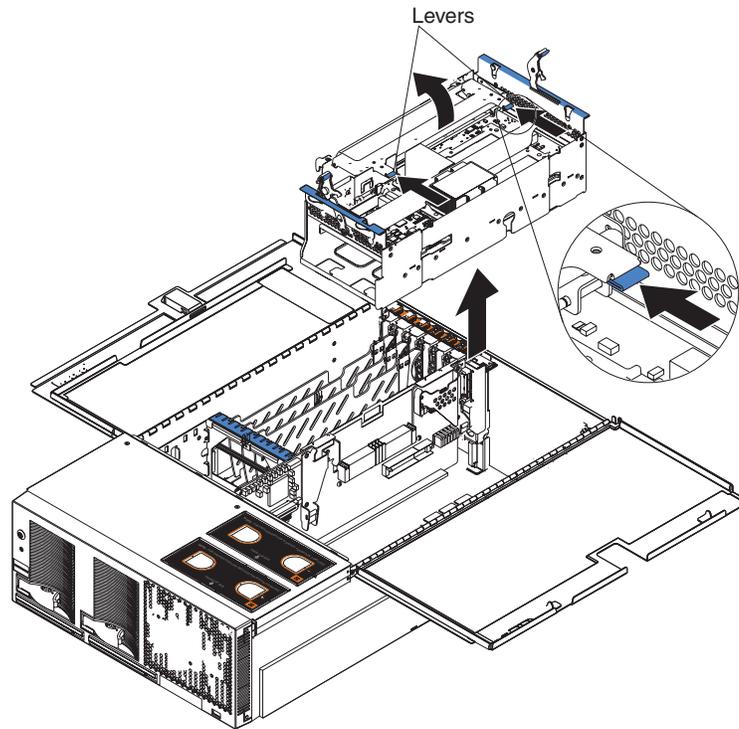
4. Remove the shipping thumbscrews from the right side of the server.
5. Lift the retention bracket from the server.



6. Remove the processor-board assembly from the server:

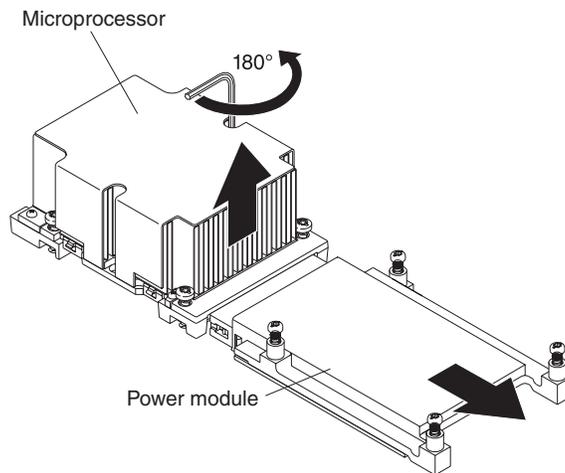
Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling these devices, see “Handling static-sensitive devices” on page 12.

 - a. Press to unlock the levers securing the processor-board assembly and pull up on the levers to release the processor-board assembly.
 - b. Slide the assembly toward the right side of the server.
 - c. Carefully remove the processor-board assembly from the server and place it on a flat, level surface.



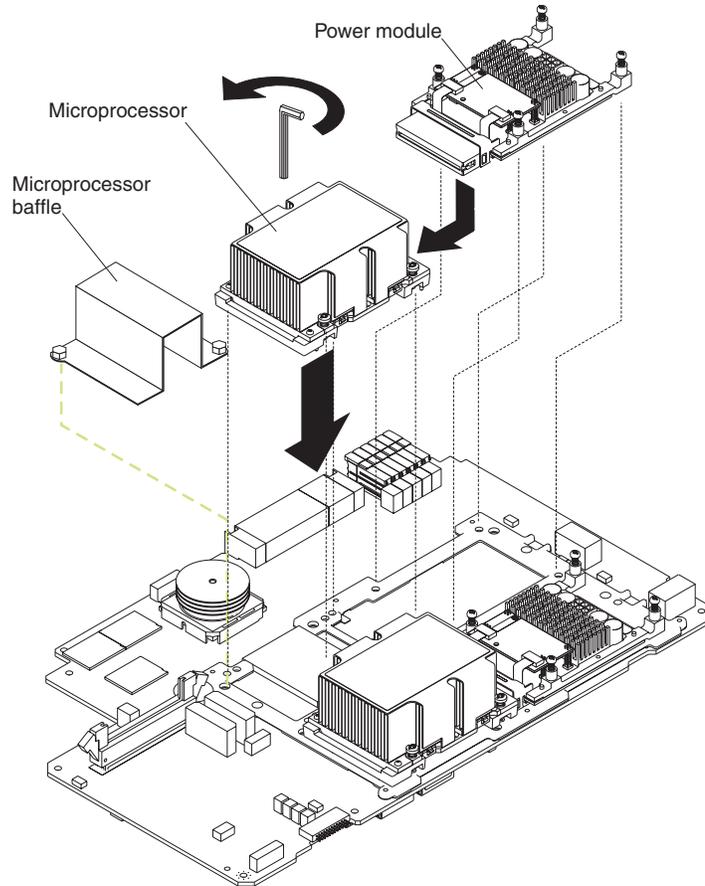
7. If you are installing a new microprocessor, go to step 8; otherwise, continue:

Attention: Failure to complete the instructions in the prescribed order might cause damage to the microprocessor pins and cause the microprocessor to fail.



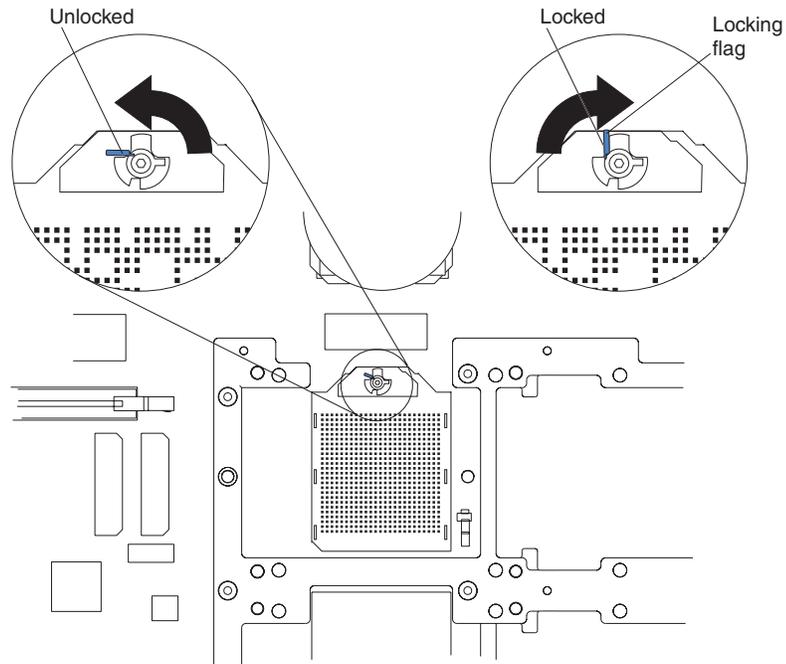
- a. Using the T-handled Torx wrench provided with the microprocessor option, completely loosen the power-module screws.
 - b. Slide the power module from the microprocessor and remove the power module.
 - c. Completely loosen the heat-sink screws.
 - d. Use the hex wrench provided with the microprocessor option to open the socket lock and remove the microprocessor.
8. Install the microprocessor and power module:

- a. Remove the microprocessor baffle from the microprocessor socket. Keep the microprocessor baffle for future use.
 - b. Remove the protective tape covering the microprocessor socket, if present.
- Attention:** Inserting the microprocessor in a locked connector might damage the pins and cause the microprocessor to fail.



- c. Ensure that the socket lock is in the fully open (unlocked) position to permit plugging in the microprocessor. Use the hex wrench provided with the microprocessor option to open the lock, if necessary.

Note: Examine the socket lock of an installed microprocessor to identify the locking flag in the locked position.



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 12.

- d. Touch the static-protective package containing the microprocessor to any unpainted metal surface on the server. Then, remove the microprocessor and power module from the package.

Attention:

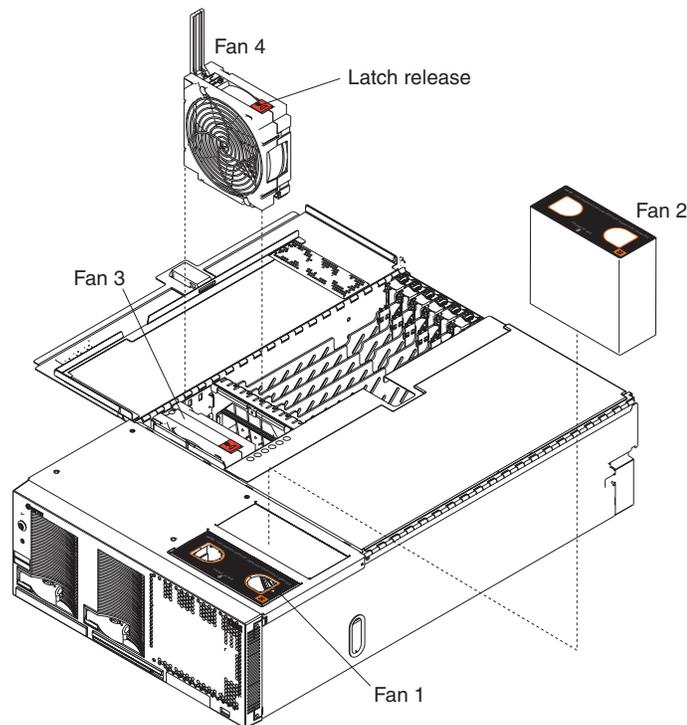
- 1) Forcing the microprocessor socket lock clockwise beyond the closed position might damage the socket locking mechanism. Before you install a microprocessor in the socket, use the hex wrench provided with the microprocessor option to close and open the socket lock to observe the locking flag in the closed position. Also, note the resistance of the locking mechanism in the closed position. When installing the microprocessor, do not force the socket lock clockwise beyond the closed position. If you need to see the microprocessor socket lock clearly, shine a flashlight over the microprocessor connector.
 - 2) Ensure that the microprocessor is aligned and seated correctly before you proceed. To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.
- e. Insert the microprocessor gently into the connector. The microprocessor rests flat on the retention mechanism when properly seated.
 - f. Lock the socket lock, using the hex wrench provided with the microprocessor option.
 - g. Tighten the heat-sink screws to secure the microprocessor, using the T-handled Torx wrench provided with the microprocessor option.
 - h. Slide the power module gently into the microprocessor.
 - i. Tighten the power-module screws to secure the power module.

- j. Plug the power-module cable into the power module and into the adjacent power-module cable connector.
9. Carefully install the processor-board assembly and retention bracket.
10. Carefully install the memory-board assembly.
11. If you have other options to install or remove, do so now. Otherwise, go to “Completing the installation” on page 36.

Replacing and troubleshooting fans

Your xSeries 450 server has four hot-swap fan assemblies, two 150 mm x 51 mm fans and two 150 mm x 38 mm fans. The two 150 mm x 51 mm fans (fan 1 and fan 2) are located toward the front of the server and are used to cool the memory board and processor board. The two 150 mm x 38 mm fans (fan 3 and fan 4) are located just behind the PCI-X board and are used to cool the power supplies, PCI-X slots, and other components.

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



Each fan has an LED to help you detect a problem. When the fan is operating correctly, this LED is off. If a fan stops working, the Light Path Diagnostics feature will light the System-error LED on the front of the server, indicating that there is a problem and guide you to the defective fan. When this occurs, first identify the defective fan; then, using the appropriate procedure, remove and replace the fan.

Replacing fan 1 or 2

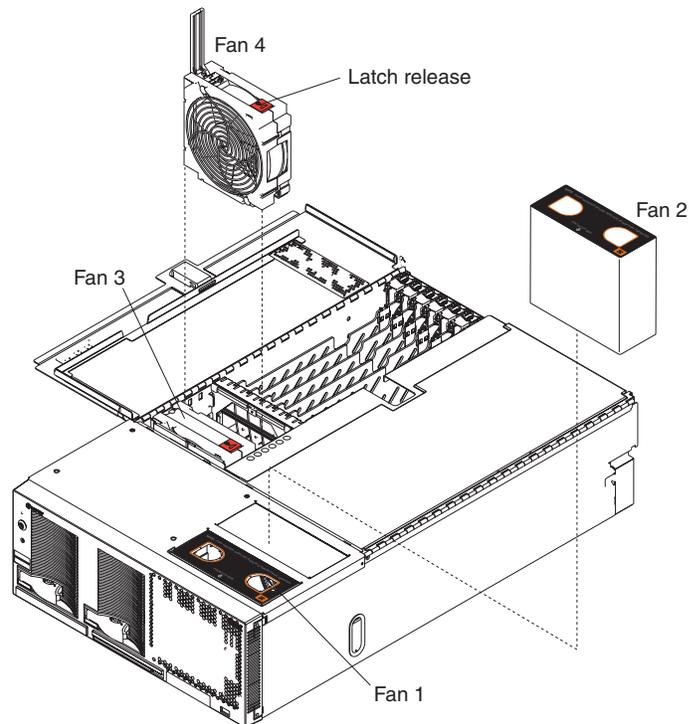
As shown in the illustration, fans 1 and 2 are located on the right side of the server. These fans are redundant, meaning that if one fails, the remaining fan will temporarily speed up to properly cool the server components.

Attention: All fans must be replaced within 48 hours of failing.

Complete the following steps to replace fan 1 or 2:

1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Remove the fan from the server:
 - a. Place your fingers into the two finger holes on the top of the fan and squeeze them together.

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



- b. Lift the fan out of the server.
3. Turn the new fan so that the LED on the top of the fan is to the right side of the server.
 4. Push the replacement fan assembly into the server until it clicks into place.
 5. If you have other options to install or remove, do so now.
 6. Close the server cover. See “Closing the cover” on page 37.

Replacing fan 3 or 4

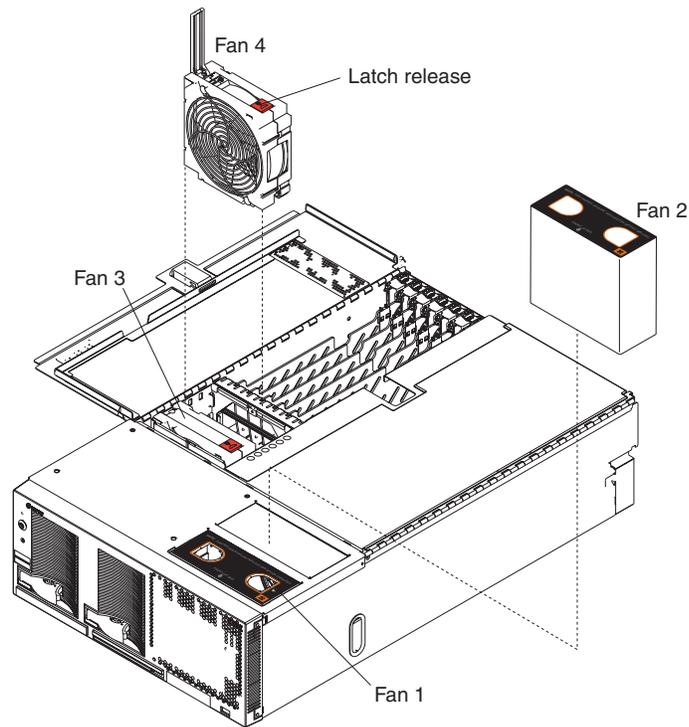
As shown in the illustration, these two fans (fan 3 and fan 4) are located in front of the PCI-X slots. These fans are redundant, meaning that if one fails, the remaining fan will temporarily speed up to properly cool server components.

Attention: All fans must be replaced within 48 hours of failing.

Complete the following steps to replace fan 3 or 4:

1. Read the safety information beginning on page v and “Installation guidelines” on page 11.
2. Remove the fan from the server:
 - a. Press the latch release to the right and let the handle come up.

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



- b. Grasp the handle and lift the fan out of the server.
3. Turn the new fan so that the latch release on the top of the fan is to the right side of the server.
4. With the handle raised, push the replacement fan assembly into the server until it clicks into place.
5. Push the handle down until it clicks into place under the latch release.
6. If you have other options to install or remove, do so now.
7. Close the server cover. See “Closing the cover” on page 37.

Replacing the battery

When replacing the battery you must replace it with a lithium battery of the same type, from the same manufacturer. To avoid possible danger, read and follow the safety statement below.

To order replacement batteries, call 1-800-772-2227 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:

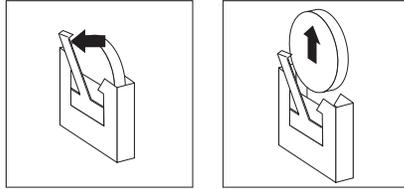
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

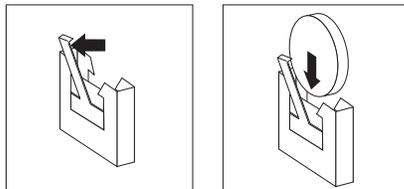
Complete the following steps to replace the battery:

1. Read the safety information beginning on page v and “Installation guidelines” on page 11. Follow any special handling and installation instructions supplied with the replacement battery.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables from the server; then, open the cover (see “Opening the cover” on page 14 for details).
3. Remove fans 3 and 4 from the server (see “Replacing fan 3 or 4” on page 33 for details).

4. Remove the battery:
 - a. Use one finger to press the top of the battery clip away from the battery.
 - b. Lift and remove the battery from the socket.



5. Insert the new battery:
 - a. Use one finger to press the top of the battery clip away from the battery.
 - b. Press the battery into the socket until it clicks into place. Make sure that the battery clip holds the battery securely.



6. Install fans 3 and 4 in the server (see “Replacing fan 3 or 4” on page 33 for details).
7. Close the server cover, and connect the cables.
8. Turn on the server.
9. Start the Configuration/Setup Utility program and set configuration parameters.
 - Set the system date and time.
 - Set the power-on password.
 - Reconfigure your server.

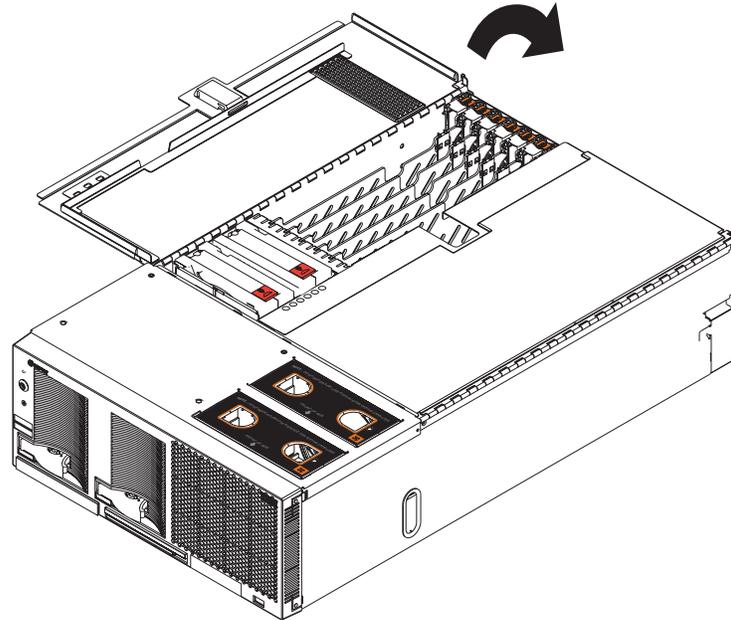
Completing the installation

To complete your installation, close the server cover, install your server in a rack, reconnect all cables that you disconnected earlier, and for certain options, run the Configuration/Setup Utility program. Follow the instructions in this section.

Attention: For proper cooling and airflow, close the server cover before or shortly after turning on the server. Operating the server for extended periods of time (over 15 minutes) with the server cover open might damage server components.

Closing the cover

Close the cover by first closing the right side; then, close the left side and press down to latch the two halves of the cover in place.



Installing the server in a rack

Detailed cabling instructions, including the use of the cable management arm (which comes with the server) are in the *Rack Installation Instructions* provided with the server.

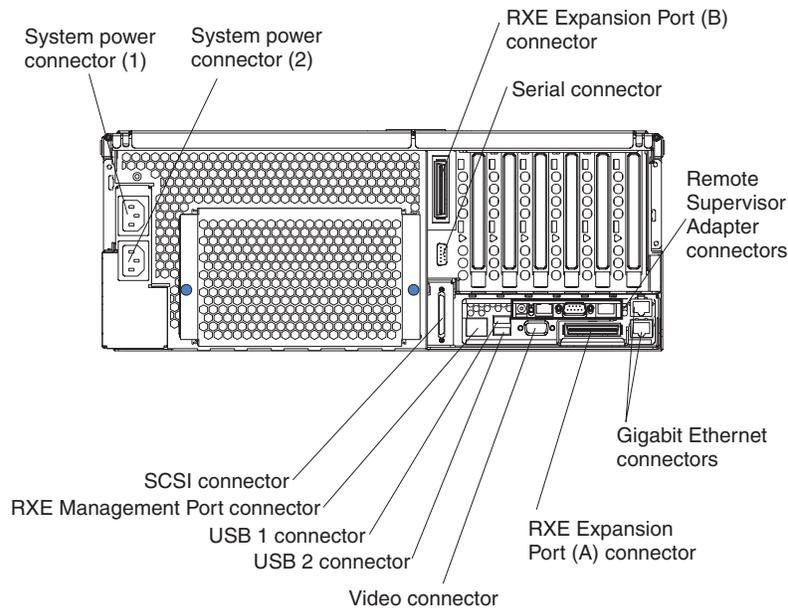
Connecting the cables

Notes:

1. You must turn off the server before connecting any cables to or disconnecting any cables from the server.
2. See the documentation that comes with your external options for additional cabling instructions. It might be easier for you to route any cables before you connect the devices to the server.
3. If you have just plugged the power cords of the server into an electrical outlet, you must wait 30 seconds before pressing the power-control button.

The following illustration shows the locations of the input and output connectors on your server. See Chapter 3, “Input/output connectors”, on page 41 for descriptions

of the I/O connectors.



Updating your server configuration

When you start your server for the first time after you add or remove an internal option or an external SCSI device, you might see a message telling you that the configuration has changed. See the *User's Guide* on the IBM *xSeries Documentation* CD for more information about the Configuration/Setup Utility program.

Some options have device drivers that you need to install. See the documentation that comes with your option for information about installing any required device drivers.

If your server comes with two microprocessors or if your server comes with one microprocessor and you have installed one or more additional microprocessors, your server can now operate as an SMP server. Therefore, you might need to upgrade your operating system to support SMP. See the *User's Guide* on the IBM *xSeries Documentation* CD and your operating-system documentation for additional information.

If you have a RAID configuration on your server using the integrated SCSI controller and you have installed or removed a hard disk drive, you might need to reconfigure your disk arrays. See the *User's Guide* on the IBM *xSeries Documentation* CD for more information about the LSI Logic Configuration Utility program.

If you install a different type of RAID adapter in your server, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

The internal hard disk drives can connect only to the integrated SCSI controller with RAID capabilities.

Backing up and restoring the nonvolatile variables

The Extensible Firmware Interface (EFI) in the xSeries 450 stores its variables with nonvolatile attributes in NVRAM on the Remote Supervisor Adapter. Before you remove or replace the Remote Supervisor Adapter or clear the NVRAM, be sure to make a backup copy of the nonvolatile EFI variables. After you install a new Remote Supervisor Adapter, you must restore the EFI variables previously stored in NVRAM. The EFI variables stored in NVRAM on the Remote Supervisor Adapter include the following:

- Console definitions
- Boot options / Drivers
- Boot order / Timeout

You can use the xSeries 450 Backup and Restore utilities to backup or restore the nonvolatile EFI variables stored in NVRAM.

Creating a backup copy of the nonvolatile EFI variables

Complete the following steps to create a backup copy of the EFI variables:

1. Ensure that the formatted media where you plan to store the backup file is installed.
2. Start the server.
3. Select **EFI shell** from the EFI Boot Manager startup options.

Note: If EFI shell is not a choice on the list, the server has a customized startup configuration. Contact the System Administrator for further instructions.

4. Change to the file system for the formatted media where you want to store the backup copy.
5. Type the following EFI command to create a backup copy of the EFI variables:

```
backup filename
```

(Where *filename* is the name you want to assign to the backup copy, for example, efibckup.001.)

6. Type one of the following EFI commands to verify that the backup file was created successfully:

```
dir or Is
```

The backup procedure is now completed.

Restoring the nonvolatile EFI variables

Complete the following steps to restore the nonvolatile EFI variable settings:

1. Ensure that the formatted media that contains the backup copy of the EFI variables is installed.
2. Start the server.
3. Select **EFI shell** from the EFI Boot Manager startup options.

Note: If EFI shell is not a choice on the list, the server has a customized startup configuration. Contact the System Administrator for further instructions.

4. Change to the file system that contains the backup copy of the EFI variables.
5. Type one of the following EFI commands to verify that the backup file was created successfully:

dir or Is

6. Type the following EFI command to restore the EFI variables:
restore *filename*
(Where *filename* is the name you assigned to the backup copy.)
7. When the message "Delete existing non-volatile efi variables? [y/n]" appears, type:
Y
8. Type the following EFI command to reset the system:
reset

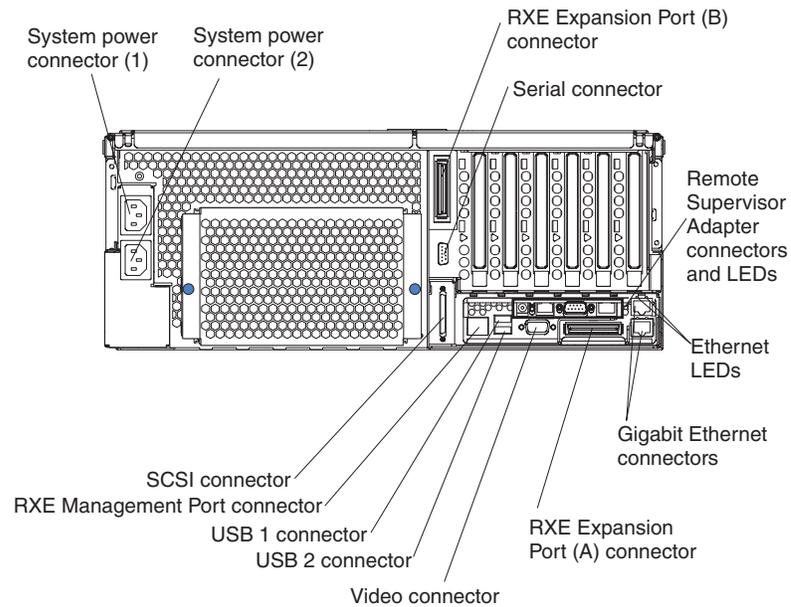
The restore procedure is now completed.

Chapter 3. Input/output connectors

Your server has the following input/output connectors:

- Two Gigabit Ethernet (RJ-45)
- Two RXE Expansion Port
- One RXE Management Port
- One SCSI
- One serial
- Three Universal Serial Bus (USB)
- One video

The following illustration shows the locations of these connectors.

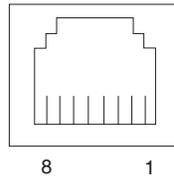


The following sections describe these connectors.

Your server also has an additional Ethernet connector, an additional serial connector, and an Advanced System Management (ASM) Interconnect connector. See the Remote Supervisor Adapter documentation on the IBM *xSeries Documentation* CD for more information.

Gigabit Ethernet connectors

The following illustration shows a Gigabit Ethernet connector.

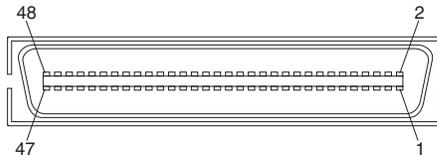


Connect a Category 3, 4, or 5 unshielded twisted-pair cable to this connector. The 100BASE-TX and 1000BASE-T Fast Ethernet standards require Category 5 or higher cabling.

See the *User's Guide* on the IBM *xSeries Documentation* CD for more information about the Ethernet controller.

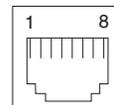
RXE Expansion Port connectors

Use the RXE Expansion Port connectors to connect your server to a remote I/O enclosure. The following illustration shows a RXE Expansion Port connector.



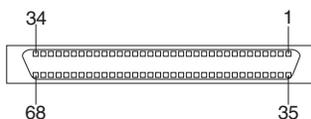
RXE Management Port connector

Use the RXE Management Port connector to connect your server to a remote I/O enclosure. The following illustration shows a RXE Management Port connector.



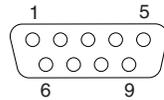
SCSI connector

The integrated dual-channel Ultra320 small computer system interface (SCSI) controller supports one internal and one external independent SCSI connector. The internal connector is integrated on the I/O board. The external connector is on the rear of the server. The following illustration shows an external SCSI connector.



Serial connector

Use a serial connector to connect a serial device. The following illustration shows a serial connector.

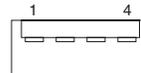


Configure a serial console device to accept the following settings:

Baud rate	115,200
Data bit	8
Parity	None
Stop bits	1
Flow control	None

Universal Serial Bus connectors

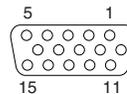
Use a Universal Serial Bus (USB) connector to connect a USB device. USB technology transfers data at up to 12 Mb per second (Mbps) with a maximum of 127 devices and a maximum signal distance of 5 meters (16 ft) per segment. Using Plug and Play technology, USB devices are configured automatically. The following illustration shows a USB connector.



Use a 4-pin cable to connect devices to USB 1, USB 2, and USB 3. If you plan to attach more than three USB devices, you must use a hub to connect the devices.

Video connector

The integrated video controller provides the video connector. The connector is on the rear of the server. The following illustration shows a video connector.



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

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

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

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

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

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<http://www.ibm.com/ibm/environment/products/prp.shtml>.

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries, contact your local waste disposal facility.

In the United States, IBM has established a collection process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the

equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

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

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

Taiwanese Class A warning statement

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

Chinese Class A warning statement

聲 明
此为 A 级产品。在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对其干扰采取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

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Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT,

three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

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
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

IBM power cord part number	Used in these countries and regions
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
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

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