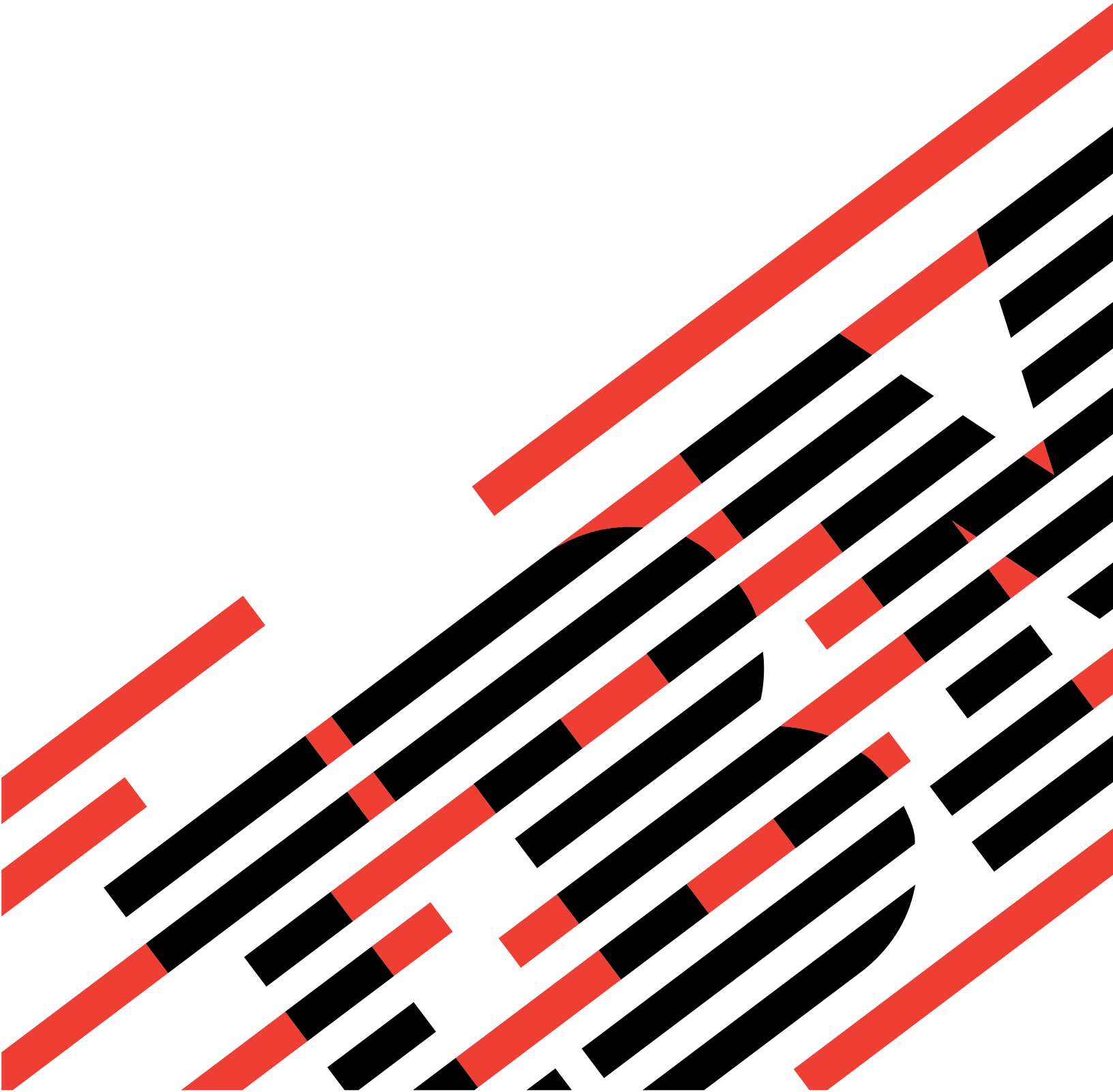
IBM

eserver

xSeries 445 Type 8870

Option Installation Guide



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Option Installation Guide

Note: Before using this information and the product it supports, read the general information in “Getting help and technical assistance”, on page 83.

First Edition (June 2003)

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)

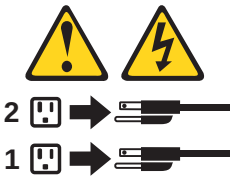
≥ 32 kg (70.5 lb)

≥ 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.



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)

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.

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.

Related publications

In addition to this *Option Installation Guide*, the following xSeries 445 documentation is provided with your server:

- *Installation Guide*

  This printed publication contains instructions for setting up your server and basic instructions for installing some options.
- *Rack Installation Instructions*

  This printed publication contains instructions for installing your server in a rack cabinet.
- *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.
- *User's Guide*
  This publication is in PDF on the IBM *xSeries Documentation* CD. It contains general information about your server.
- *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.

Major components of the xSeries 445 server

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

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

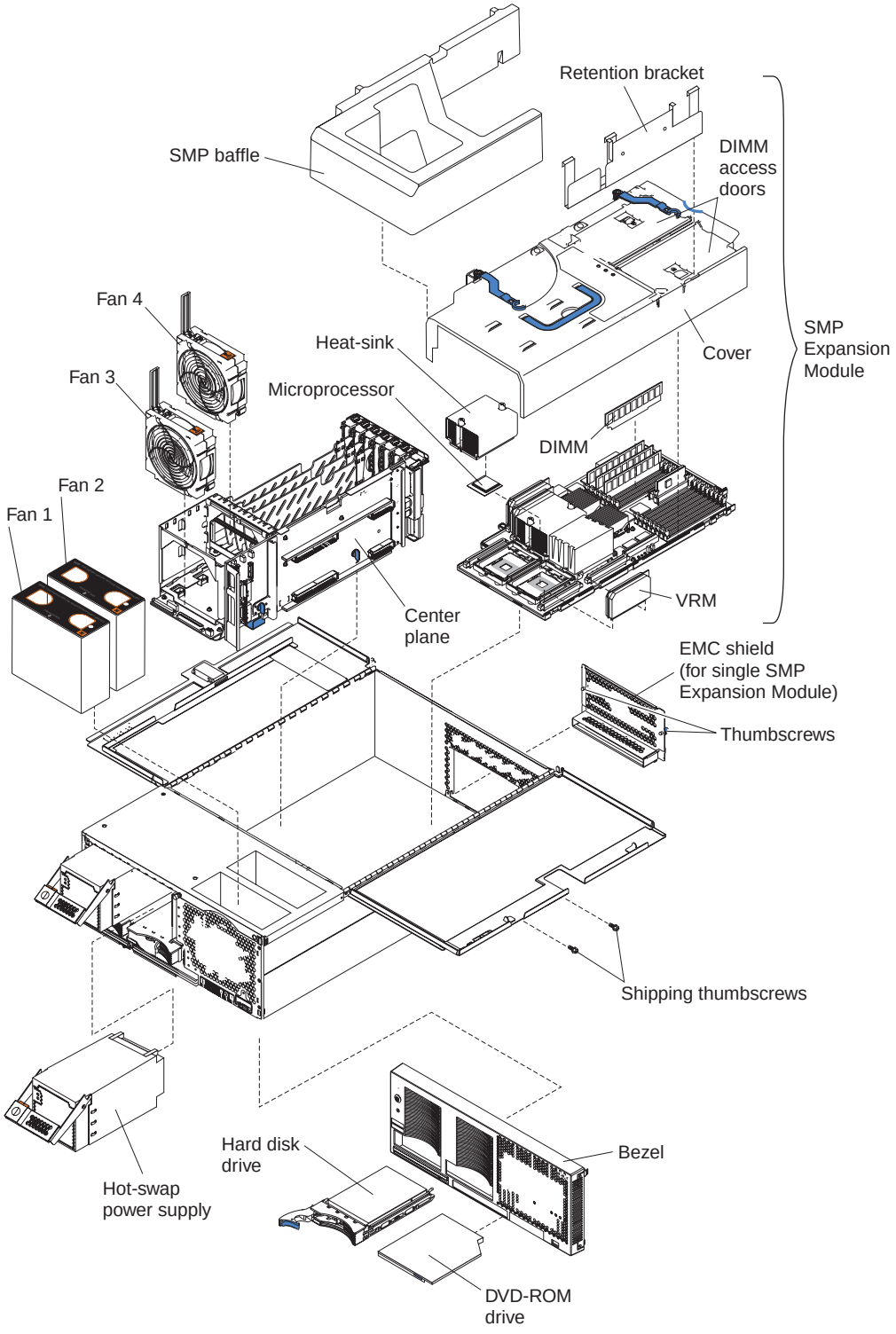


Figure 1. Major components of the xSeries 445 server

Center plane connectors and LEDs

The following illustrations identify the connectors and LEDs on the center plane. This center plane is used to connect the power and signal paths for the SMP Expansion Module, I/O board, and the Remote Supervisor Adapter.

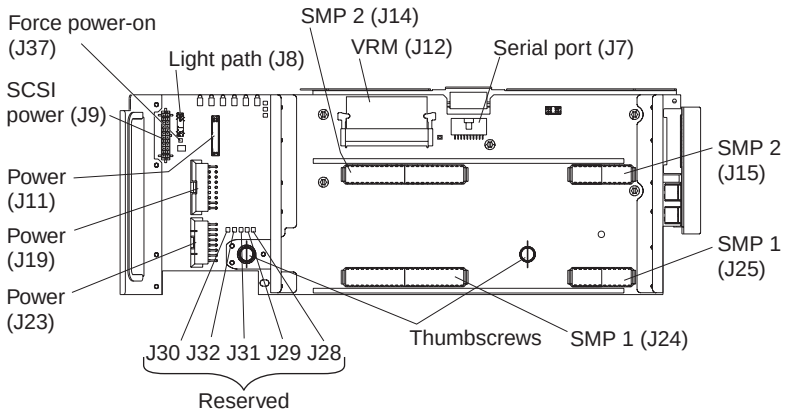


Figure 2. Center plane connectors

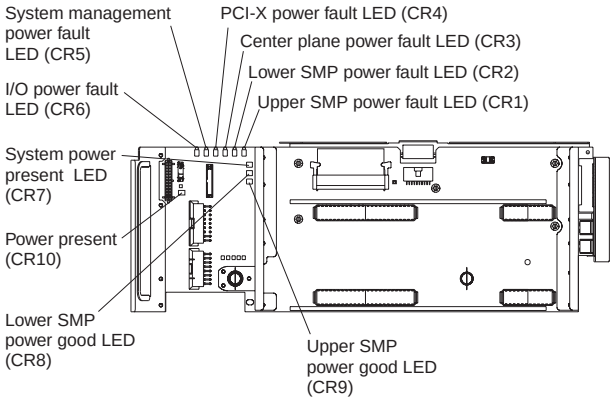


Figure 3. Center plane LEDs

SMP Expansion Module connectors and LEDs

The following illustrations identify the connectors, switches, and LEDs on the SMP Expansion Module.

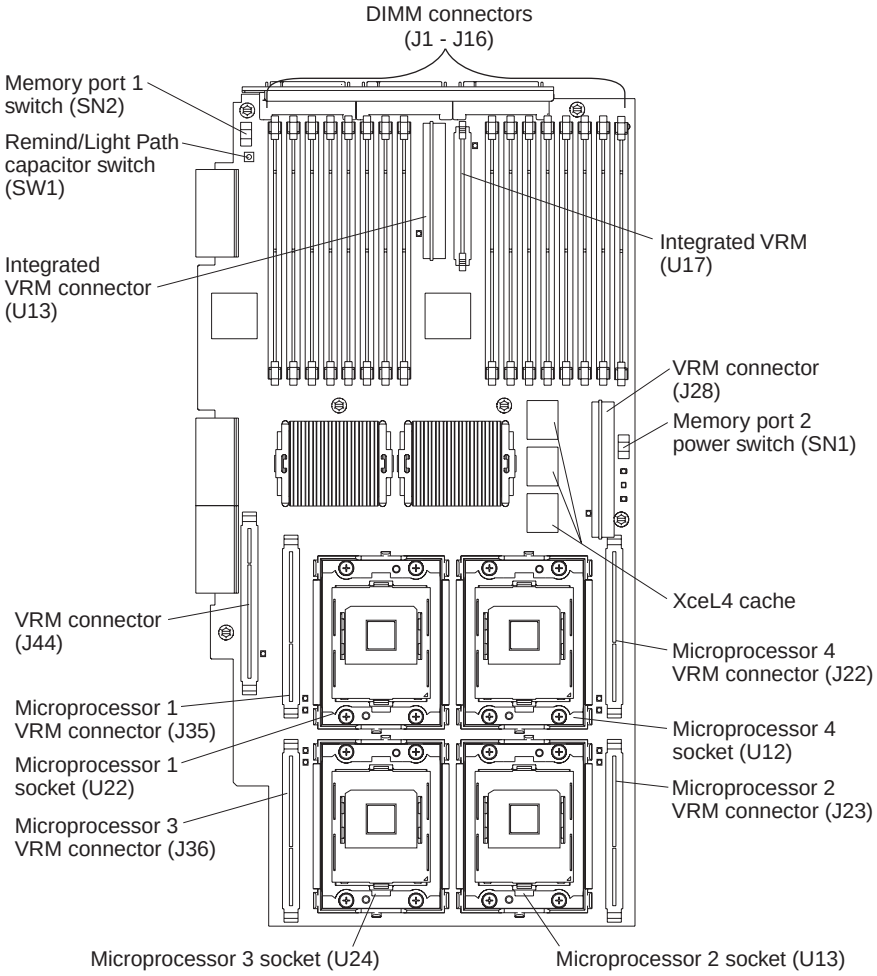


Figure 4. SMP Module connectors

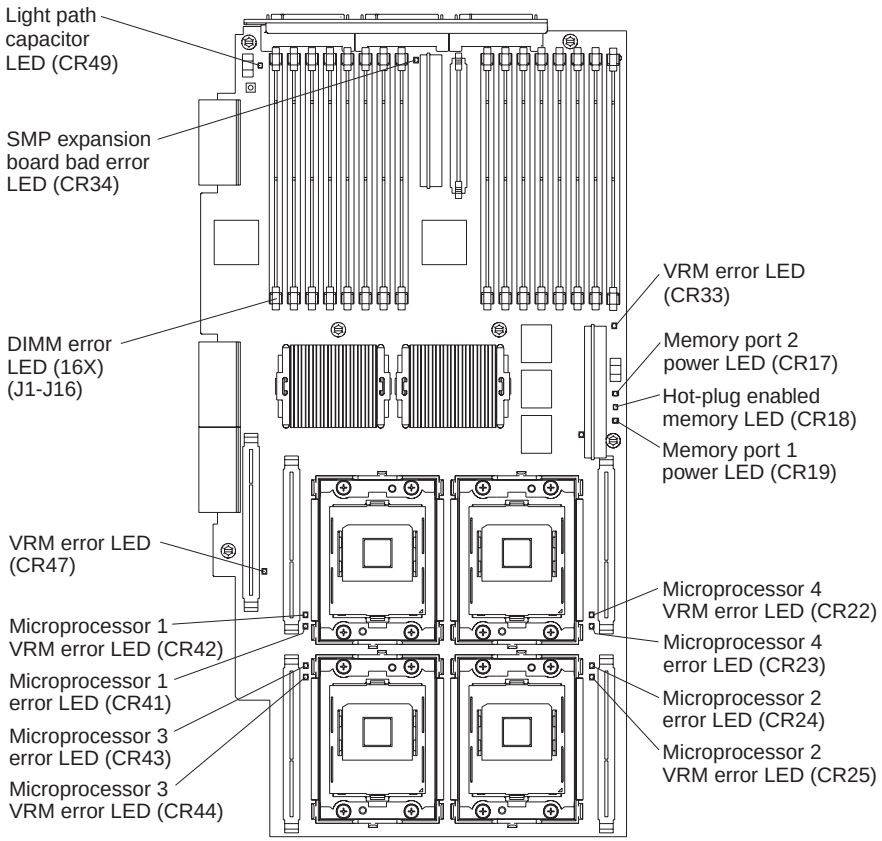


Figure 5. SMP Module LEDs

PCI-X planar internal connectors and LEDs

The following illustration identifies the internal connectors and LEDs on the PCI-X planar. This planar enables you to install adapters in the server.

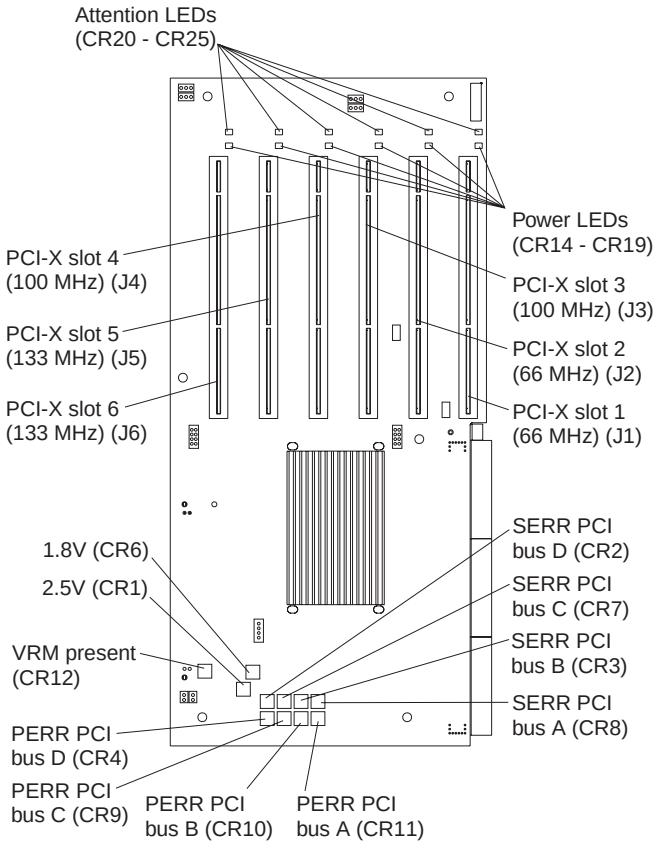


Figure 6. PCI-X board connectors and LEDs

I/O board internal connectors

The following illustration identifies the internal connectors on the I/O board. This board supports the input and output ports in the server.

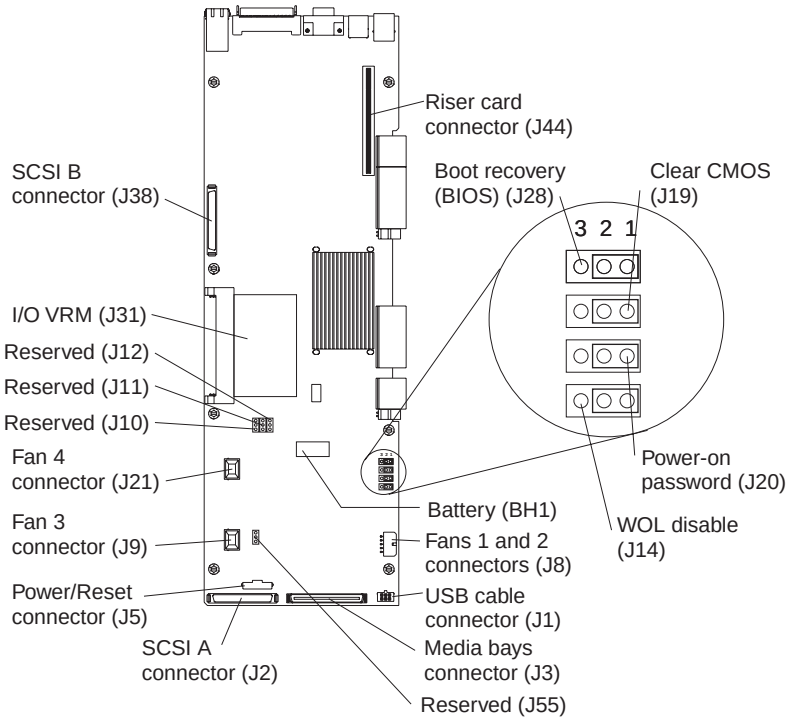


Figure 7. I/O board connectors

Remote Supervisor Adapter component locations

The following illustration identifies the connectors and LEDs on the Remote Supervisor Adapter.

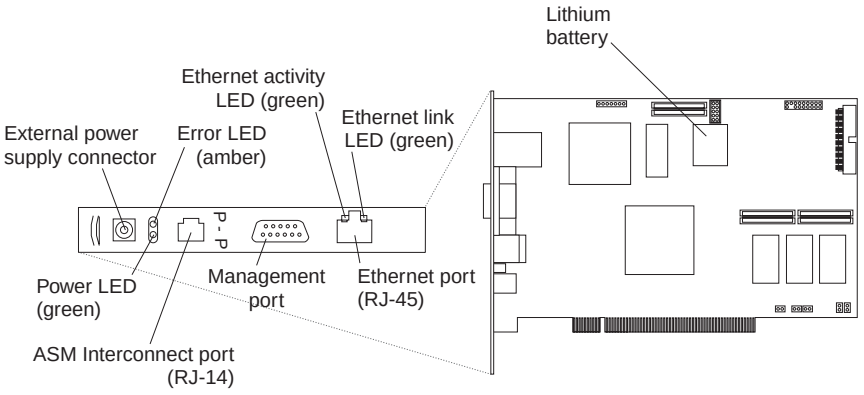


Figure 8. Remote Supervisor Adapter connectors and LEDs

Chapter 2. Installing options

This chapter provides instructions for installing hardware options in your server. Some option-removal instructions are provided in case you need to remove one option to install another. For a list of supported options for your server, see the ServerProven® list at http://www.ibm.com/pc/compat/.

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 10. This information will help you work safely with your server and options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and other devices that you will connect to the server.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap fans, or hot-plug Universal Serial Bus (USB) devices.
- The orange color on components and labels identifies hot-swap or hot-plug components. You can install or remove hot-swap and hot-plug components while the server is running, provided that the server is configured to support this capability. See the instructions in this chapter for more information about removing and installing hot-swap and hot-plug components.
- The blue color on components and labels indicates touch points, where a component can be gripped, a latch moved, and so on.
- For a list of supported options for your server, go to http://www.ibm.com/pc/compat/.

System reliability guidelines

To help ensure proper 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 in it.
- If the server has only one SMP Expansion Module installed, the SMP baffle is installed during normal operation.
- There is adequate space around the server to allow the server cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the server. Do not place objects in front of the fans.
- Do not leave open spaces above or below an installed server in a rack cabinet. To prevent damage to server components, always install a blank filler panel to cover the open space and to ensure proper air circulation.
- You have followed the cabling instructions that come with optional adapters.
- You have replaced a failed fan within 48 hours.
- You have replaced a hot-swap drive within 2 minutes of removal.
- Microprocessor socket 2 always contains either a microprocessor baffle or a microprocessor and heat sink.

Working inside the server with power on

Your server supports hot-swap or hot-replace 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 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 printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- 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 your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Safety information

Before installing this product, read the Safety Information.

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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.
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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)

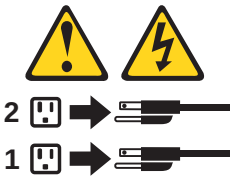
≥ 32 kg (70.5 lb)

≥ 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.



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)

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 9.
2. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.

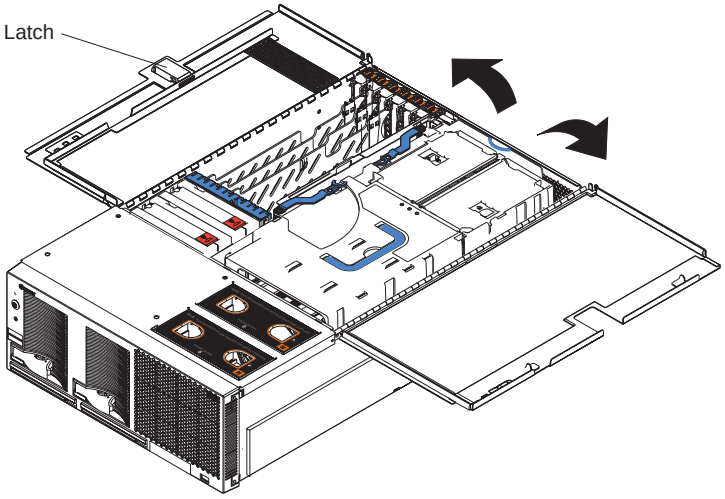


Figure 9. Opening the cover

3. Pull the release latch on the left half of the top cover to the right.
4. Using the finger hole in the release latch, open the left half of the cover; then, open the right half 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 (more than 30 minutes) with the cover open might damage server components.

Removing and replacing the bezel

Complete the following steps to remove and replace the server bezel:

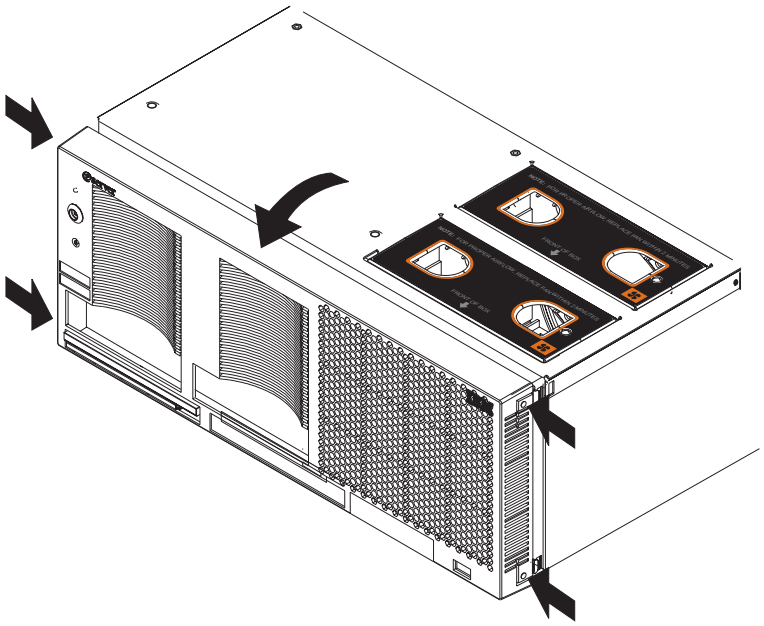


Figure 10. Removing the bezel

1. Removing the bezel.
   a. Press on the two tabs at the top edge of the bezel, and pull the top of the bezel slightly away from the server.
   b. 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.
2. Replace the bezel.
   a. Align the four tabs with the slots in the server chassis.
   b. Press firmly against the front of the bezel until it snaps into place.

Removing and replacing a hot-swap power supply

You can remove and replace the two hot-swap power supplies in your server without turning off the server. This section provides instructions for removing and installing the hot-swap power supplies.The following notes and safety information contains information you must consider when removing or installing a hot-swap power supply:

- During normal operation, both power supplies must be installed for proper operation and cooling.
- The xSeries 445 server requires a 220 V power connection for full power-supply redundancy. Whenever possible, use a 220 V connection for all configurations. However, you can use a 110 V connection, but without power-supply redundancy.

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.

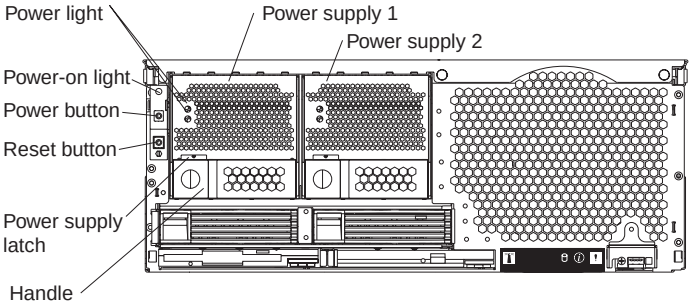


Figure 11. Hot-swap power supply

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 9.
2. Remove the front bezel (see “Removing and replacing the bezel” on page 17 for instructions on removing the front bezel).

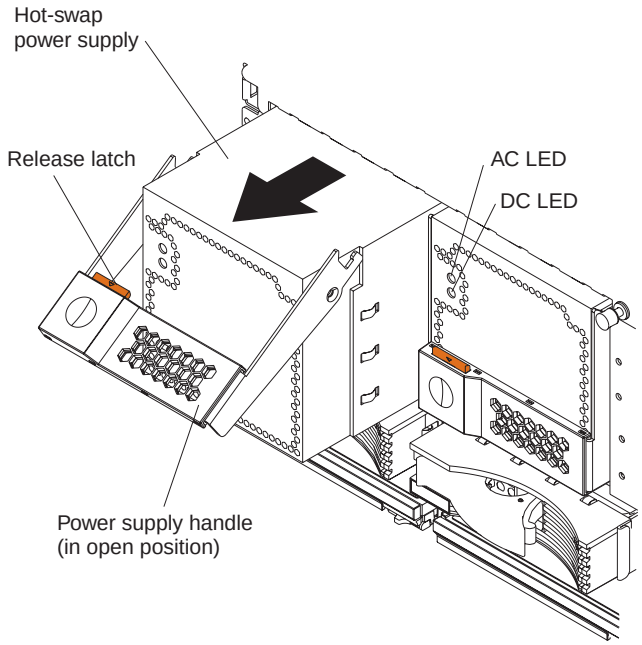


Figure 12. Removing a power supply

3. Press the release latch; then, lift the handle on the power supply to the open position and remove the power supply.

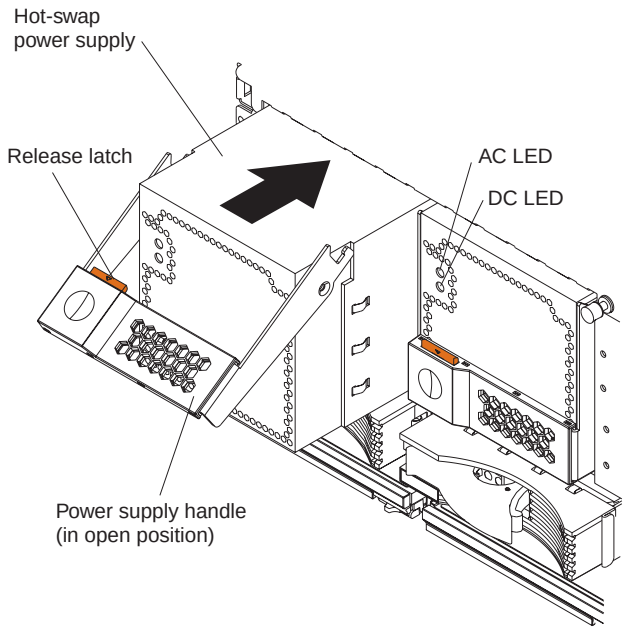


Figure 13. Installing a power supply

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 17 for instructions).

PCI and PCI-X adapters

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

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

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

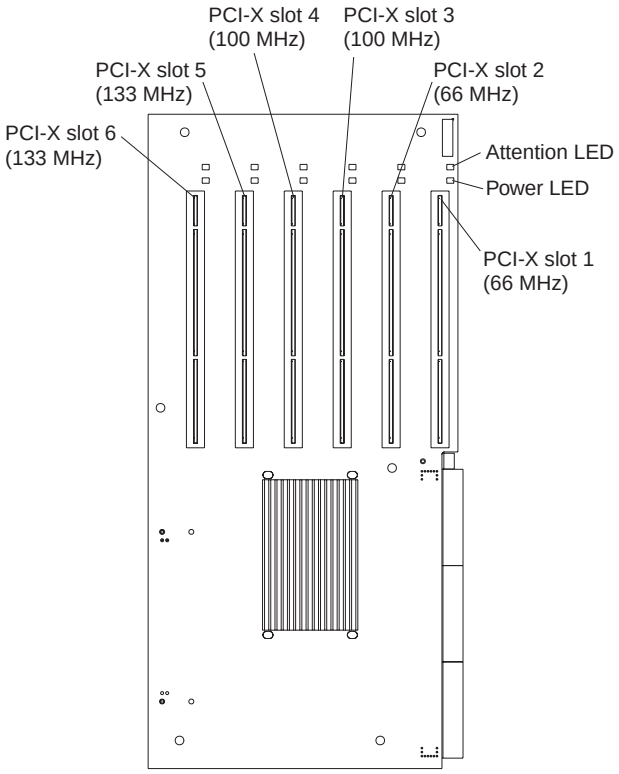


Figure 14. PCI-X slots

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this chapter.
- 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 long adapters have extension handles or brackets installed. Before installing the adapter, you must remove the extension handle or bracket.

- Your server uses a rotational interrupt technique to configure PCI-X adapters. You can use this technique to install PCI-X adapters that currently do not support sharing of PCI-X interrupts.
- Your server scans devices and PCI-X slots to assign system resources in the following order: DVD-ROM drive; disk drives; integrated SCSI devices; PCI-X slots 1, 2, 3, 4, 5, 6; and the integrated Ethernet controller. If an RXE-100 enclosure is attached to the server, the scan continues in sequence with PCI slots 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, and 18.
- You can use the Configuration/Setup Utility program to change the sequence and have the server scan one of the first six PCI slots before it scans the integrated devices. You cannot change the scan sequence of the PCI slots in an RXE-100 enclosure.
- You can install both PCI and PCI-X adapters in the same bus. However, if you install a PCI adapter and a PCI-X adapter in 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 in the same bus, the bus speed will match that of the slowest adapter.
- If a single 133 MHz adapter is installed in PCI-X Bus B (slot 3 and 4) and the other slot in PCI-X Bus B is empty, the adapter will operate at 133 MHz.
- Your server supports six hot-plug 64-bit adapters in the expansion slots located on the PCI-X board.

  Note: You can add up to 12 PCI-X slots to your server by connecting your server to a remote I/O expansion enclosure. For more information about the expansion enclosure and how to connect your server to it, see the documentation that comes with your expansion enclosure.

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

- Your server supports 3.3 V adapters; it does not support 5.0 V adapters.
- Do not install a PCI-X adapter in PCI-X slot 1 if you are going to install the serial port that comes with your server. See “Installing the serial port” on page 25 for instruction for installing the serial port.

Complete the following steps to install an adapter:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.

2. Use the operating system to disable the Active PCI-X slot; then, insert or remove a hot-plug PCI or PCI-X adapter. Some operating systems do not support the enabling and disabling of a PCI-X slot. If your operating system does not support this function, then turn off your server, and disconnect all power cords and external cables before proceeding.
3. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
4. Open the top cover.

   Note: Inside your server there are six PCI-X slots: two 66 MHz, two 100 MHz, and two 133 MHz. Before attempting to install a new adapter, be sure there is an available slot for it. If you need additional PCI-X slots, you can purchase a Remote Expansion Enclosure either from your IBM marketing representative or authorized reseller.

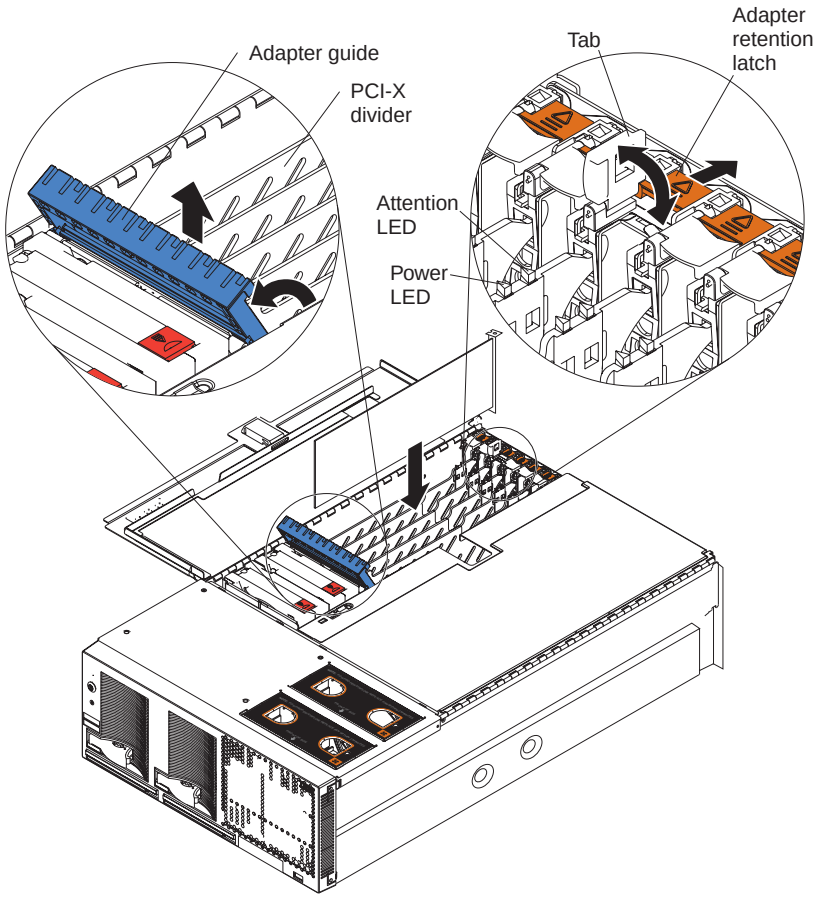


Figure 15. PCI-X slot components

5. See the documentation that comes with your adapter for any cabling instructions; then, set any jumpers or switches as described by the adapter manufacturer.

   Note: Route adapter cables before you install the adapter.
6. Install the adapter:
   a. 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 and the PCI-X divider. If you are hot-swapping a PCI or PCI-X adapter do not remove the PCI-X divider.

d. Carefully grasp the adapter by its top edge or upper corners and align it with the connector on the PCI-X board.

e. If necessary remove the extension handles or bracket before installing a long adapter.

Attention: When you install an PCI-X adapter, make sure that the adapter is correctly seated in the connector slot. Improperly seated adapters might cause damage to the board, the riser card, or the adapter.

f. Press the adapter *firmly* into the adapter connector.

g. If necessary reinstall the PCI-X dividers between the Active PCI-X adapter slots.

h. Push down on the blue adapter guide to keep the adapter steady.

i. Close the tab. The orange adapter retention latch will click into place, securing the adapter.

7. Connect the internal cables to the adapter. If you are installing a ServeRAID™ adapter, see “Cabling a ServeRAID adapter” for instructions.
8. If you have other options to install or remove, do so now.
9. Close the cover on the server; then, reinstall the server in the rack and connect all external cables.
10. Enable the slot or turn on the server, depending on your operating system.

Cabling a ServeRAID adapter

Some xSeries 445 models come with an optional IBM ServeRAID adapter installed to control the internal hot-swap hard disk drives. If you are installing an optional IBM ServeRAID adapter, see the ServeRAID documentation and the cabling information in this section to install the ServeRAID adapter.

Servers that do not come with an IBM ServeRAID adapter installed come with two SCSI cables:

- One end of the first SCSI cable is attached to the connector on the SCSI backplane on the I/O board, and the other end is attached to the connector for the integrated SCSI controller behind fans 3 and 4.
- The second SCSI cable is preinstalled along the inside of the server and both ends are loose inside the server. When you install a ServeRAID adapter, you will connect this cable to the adapter and to the SCSI backplane on the I/O board.

The following procedure describes the internal cabling for installing a ServeRAID adapter.

Important: When installing multiple ServeRAID adapters in a server that has the PCI-X slot enabled for high scan (boot) priority, make sure that the ServeRAID adapter controlling the startup (boot) drive is installed in a PCI slot that is scanned before the PCI slots that contain the other ServeRAID adapters. See “PCI and PCI-X adapters” on page 20.

Complete the following steps to cable the ServeRAID adapter:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.

2. Turn off the server and disconnect all power cords and external cables; then, open the server cover (see “Opening the cover” on page 16).
3. Remove fans 3 and 4, which are located just behind the PCI-X slots.
4. Disconnect the short SCSI cable from the SCSI backplane and the integrated SCSI controller on the I/O board; then, store this short cable in a safe place for future use.
5. Install the ServeRAID adapter in a PCI-X slot (see“PCI and PCI-X adapters” on page 20).
6. Locate one end of the preinstalled SCSI cable and connect it to the ServeRAID adapter.

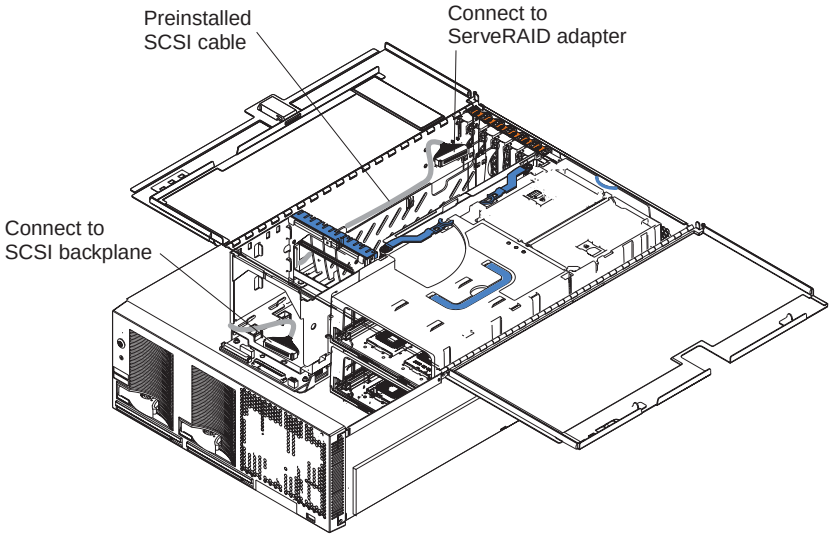


Figure 16. Location of preinstalled SCSI cable

7. Locate the other end of the preinstalled SCSI cable and connect it to the SCSI backplane.

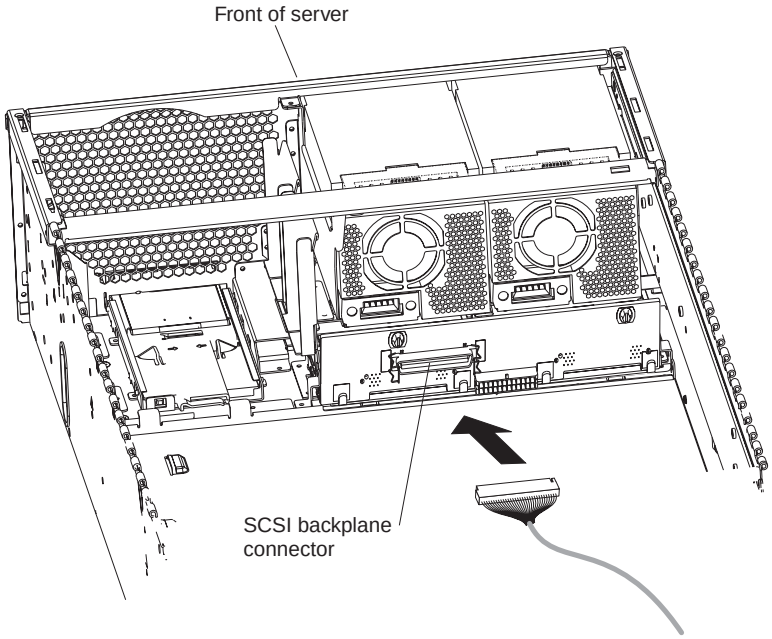


Figure 17. Connecting the SCSI cable to the SCSI backplane

8. Reinstall fans 3 and 4.
9. If you have other options to install or remove, do so now.
10. Close the cover on the server; then, reinstall the server in the rack and connect all external cables.
11. Turn on the server.

Installing the serial port

Included with your server is a serial port that you can install at any time. This section provides the instructions for installing the serial port.

Note: The serial port will occupy PCI-X slot one.

Complete the following steps to install the serial port:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.
2. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
3. Open the top cover.

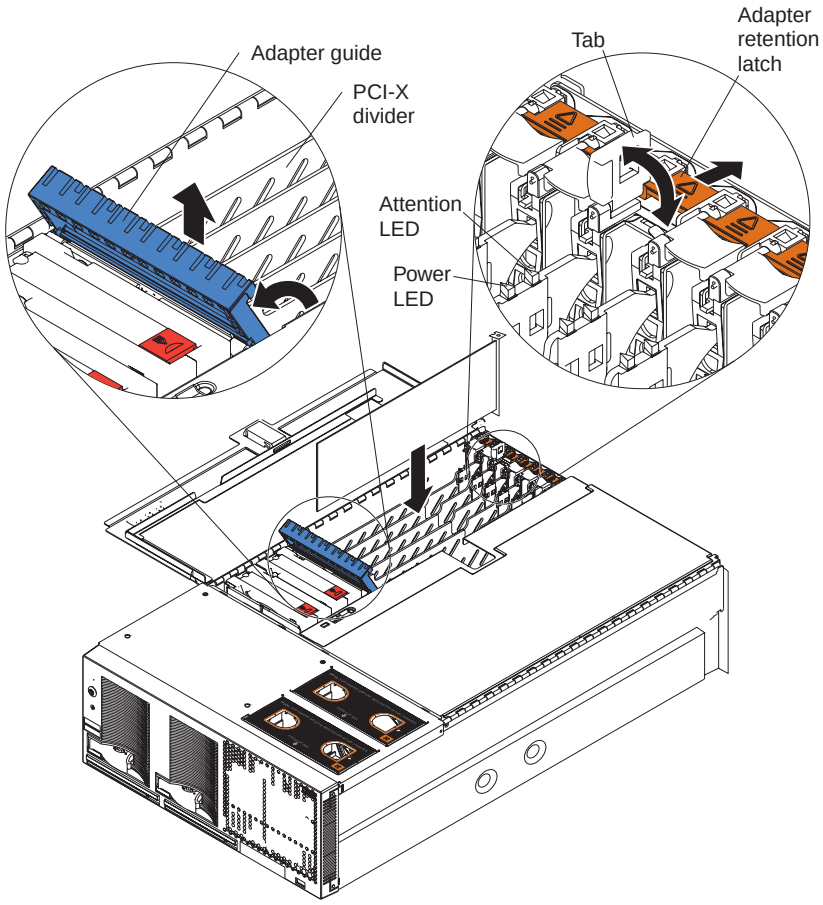


Figure 18. PCI-X slot components

4. Open the blue adapter guide by lifting the front edge, as shown in the illustration.
5. Remove the PCI-X slot cover and the PCI-X divider from slot one.

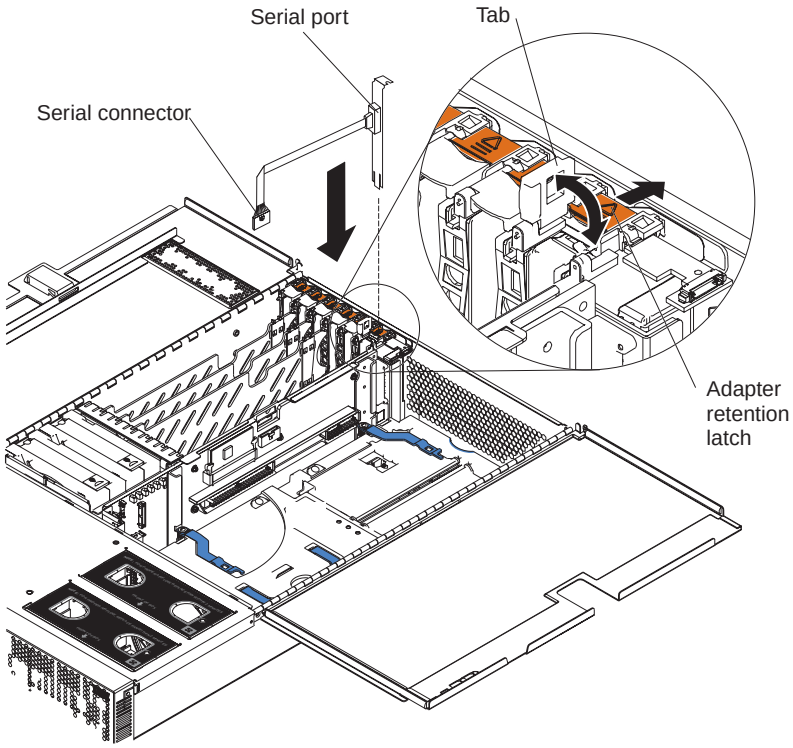


Figure 19. Insert the serial port into PCI-X slot 1

6. Insert the serial port into the opening.
7. Close the tab; then, push down on the blue adapter retention latch until it clicks into place.

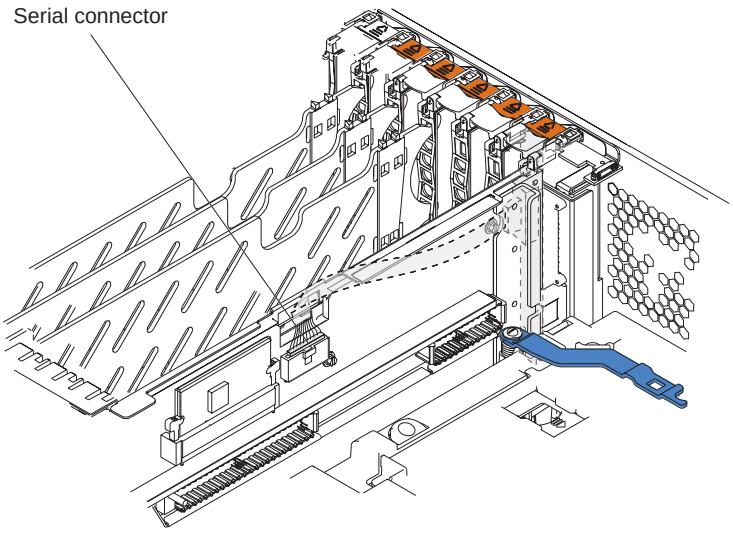


Figure 20. Route the serial port ribbon cable through the slot

8. Route the ribbon cable through the lower slot in the center of the server.
9. Connect the serial ports ribbon to the connector on the center planar.
10. If you have other options to install or remove, do so now.
11. Close the top cover.

12. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.
13. Connect all external cables and turn on the server.

Note: Use the Configuration/Setup Utility program to configure the serial port.

Installing or replacing a drive

This section provides the instructions for installing and replacing a hot-swap hard disk drive, diskette drive, and DVD-ROM drive.

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 on handling these devices, see “Handling static-sensitive devices” on page 10.

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.
2. Inspect the drive for any signs of damage.
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.

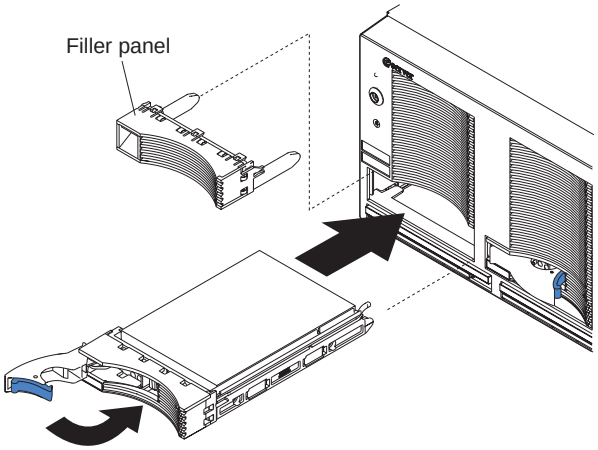


Figure 21. Installing a hard disk drive

Note: When the hard disk drive activity LED is on, it indicates that the hard disk drive is in use. When the drive is connected to the integrated SCSI controller with RAID capabilities, a flashing status LED indicates that the drive is a secondary drive in a mirrored pair and the drive is being synchronized. When the drive is connected to an optional ServeRAID controller, a slowly flashing (one flash per second) status LED indicates

that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the controller is identifying the drive.

6. If you have other options to install or remove, do so now.

Diskette drive

The following notes contain information that you must consider when installing diskette drive:

- Your xSeries 445 server supports the installation of up to two diskette drives.
- If only one diskette drive is installed, it must be installed in the right drive bay.

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

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.

   Attention: The IDE drives installed in your server are not hot-swappable.
2. Turn off the server and disconnect the power cord from the back of the server.
3. Push the diskette drive eject button to the right.
4. Using the tab, pull the diskette drive partially out of the server; then, grasp the drive and remove it from the server.
5. Install the new diskette drive:
   a. Inspect the drive for any signs of damage.
   b. Slide the drive into the left drive bay until it stops.

      Note: In the unlikely event that no other IDE drives are installed, the diskette drive must be installed in the right external removable media bay.

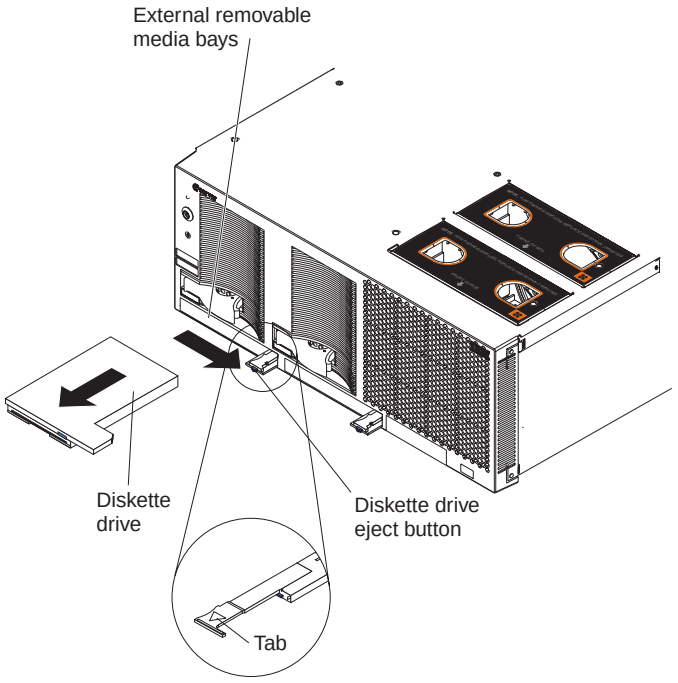


Figure 22. Installing a diskette disk drive

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

DVD-ROM drive

The following notes contain information that you must consider when installing a DVD-ROM:

- Your xSeries 445 server supports the installation of up to two DVD-ROM drives.
- If no other IDE drives are installed, the diskette drive must be installed in the right external removable media bay. DVD-ROM drives can be installed in either external removable media bay.

Complete the following steps to remove and install a DVD-ROM drive in your server:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.

   Attention: The IDE drives installed in your server are not hot-swappable.
2. Turn off the server and disconnect the power cords from the back of the server.
3. Push the DVD-ROM eject button to the right.
4. Using the tab, pull the DVD-ROM drive partially out of the server; then, grasp the drive and remove it from the server.
5. Install the new DVD-ROM drive:
   a. Inspect the drive for any signs of damage.
   b. Slide the DVD-ROM drive into the drive bay until it stops.

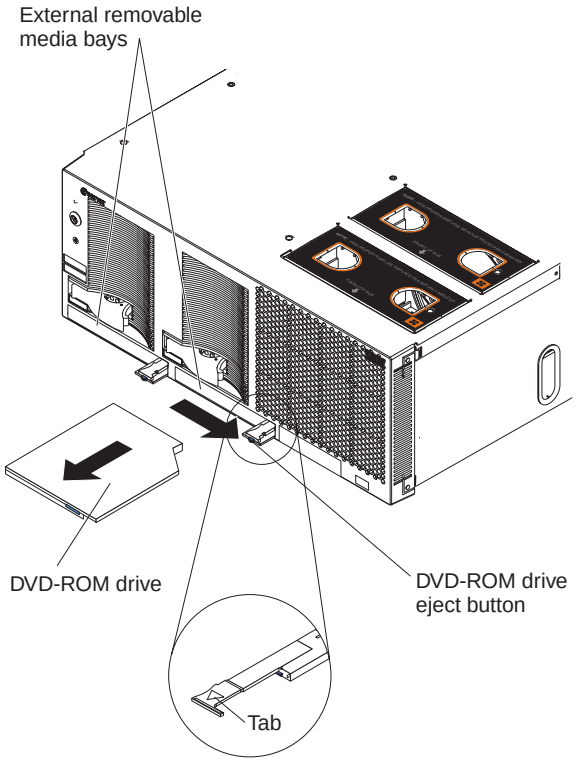


Figure 23. Installing a DVD-ROM drive

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

SMP Expansion Module

The SMP Expansion Module contains the XceL4™ system cache, DIMMs, microprocessors, and voltage regulator modules (VRMs) needed to run your server. This section contains the information needed to install and remove the SMP Expansion Module, microprocessors, VRMs, and DIMMs.

The following notes describe components in the SMP Expansion Module and other information that you must consider when installing an SMP Expansion Module:

- Use two hands to install or remove an SMP Expansion Module. Do not allow the expansion module to come in contact with the center planar while lifting it out or putting into the server.
- For your server to operate properly, there must be a minimum of one SMP Expansion Module installed.
- An SMP Expansion Module must contain at least one microprocessor and two DIMMs.
- If there is only one SMP Expansion Module installed in the server, an SMP baffle must be installed in place of the upper SMP Expansion Module to ensure proper cooling of the server.
- When the minimum number of microprocessors are installed in the SMP Expansion Module, a microprocessor baffle must be installed in microprocessor socket 4 to ensure proper cooling within the server.
- Before removing or installing SMP Expansion Modules, you must remove the retention bracket or brackets and electromagnetic compatibility (EMC) shield from the rear of the server.
- You must run the Configuration/Setup Utility program whenever you remove or replace an SMP Expansion Module or one of its associated options.

Removing and Installing the SMP Expansion Module and cover

This section describes how to remove and install an SMP Expansion Module and its cover.

Removing the SMP Expansion Module and cover

Complete the following steps to remove an SMP Expansion Module from the server and to remove the SMP Expansion Module cover:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.
2. Turn off the server and peripheral devices, disconnect the power cords and all external cables from the SMP Expansion Module.
3. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
4. Open the top cover.
5. If necessary, remove the SMP baffle.
6. Remove the retention bracket from the server:
   a. Remove the shipping thumbscrews from the right side of the server.

      Note: There are two shipping thumbscrews per retention bracket.

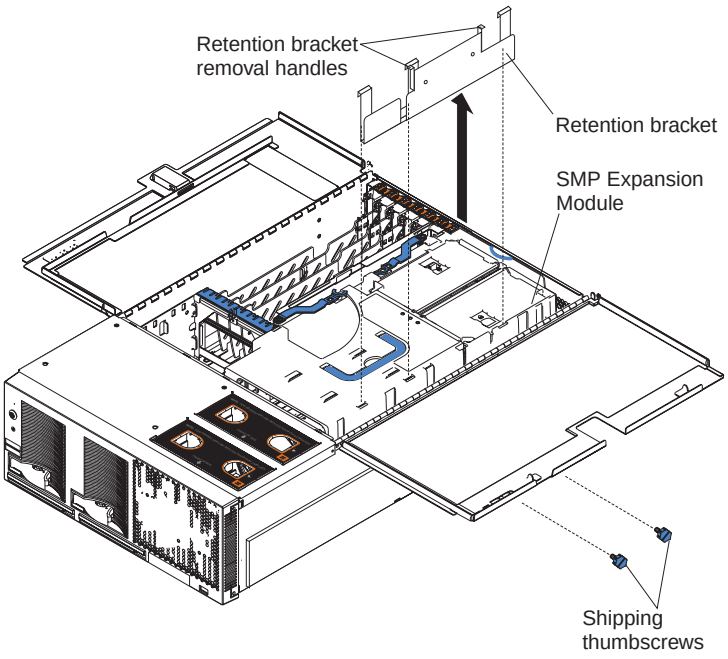


Figure 24. Removing the retention bracket and shipping thumbscrews

   b. Grasp the retention bracket by the removal handles and lift it up and out of the server. Store the retention bracket or brackets in a safe place for use later.

      Note: If there is one SMP Expansion Module installed, you will need to remove the SMP baffle from the server; then, remove the retention bracket from the lower SMP Expansion Module as described in steps 3a and 3b.

7. Loosen the blue thumbscrews securing the EMC shield; then, remove the EMC shield from the server.

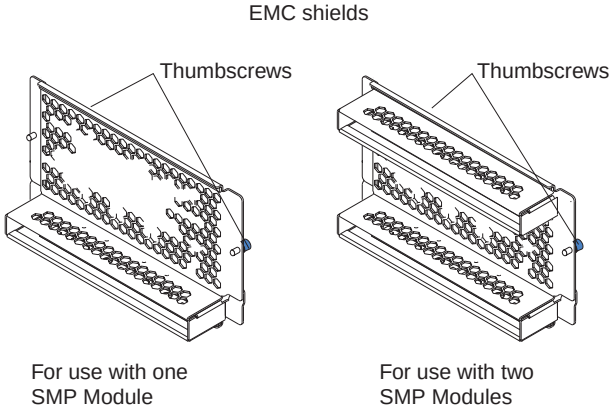


Figure 25. EMC shields

8. Grasp each of the locking levers on the top of the SMP Expansion Module, and lift them up slightly.
9. Working from the right side of the server, rotate the two locking levers toward you until they are fully extended, as shown.

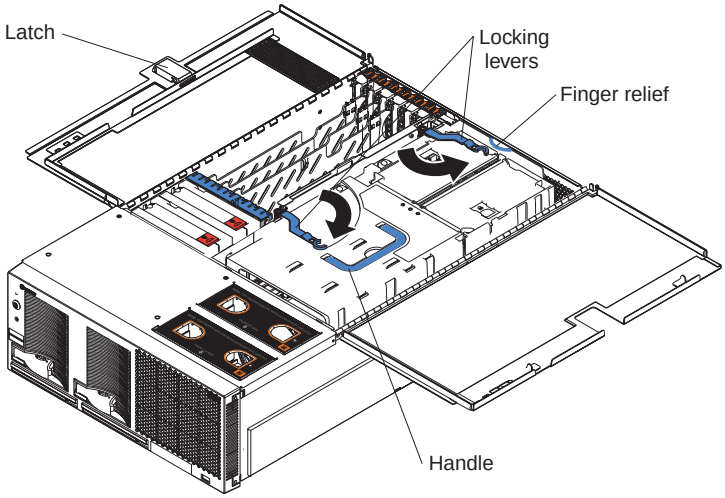


Figure 26. Rotate the locking levers to remove the SMP Expansion Module

Attention: When removing the SMP Expansion Module from the server, lift it out carefully, taking care not to damage the components on the center plane.

10. Use the handle and the finger relief on the SMP Expansion Module cover to carefully lift the SMP Expansion Module out of the server.
11. Remove the SMP Expansion Module cover:
    a. Place the SMP Expansion Module on a flat, level surface.

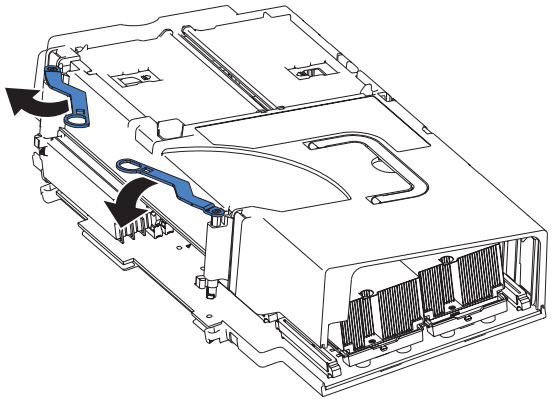


Figure 27. Fully extending the locking levers to remove the SMP Expansion Module cover

b. Rotate the two locking levers until they are fully extended beyond the edge of the SMP Expansion Module cover. Do not force the locking levers past the position shown in the illustration.

c. Using the locking levers, lift the front edge of the cover off the SMP Expansion Module.

d. Lift the cover off the SMP Expansion Module.

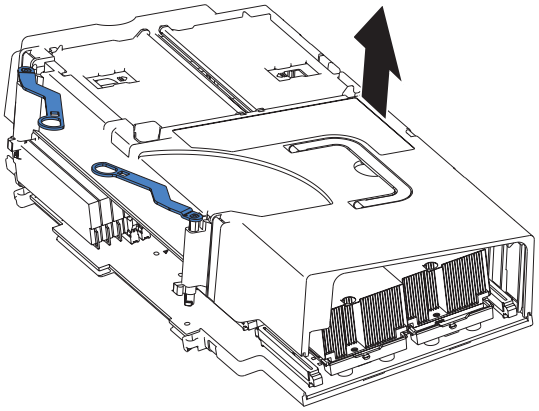


Figure 28. Lifting the cover off

Installing the SMP Expansion Module and cover

The following notes contain information that you must considered when installing the SMP Expansion Module:

- If there are two SMP Expansion Modules installed in your server, you must install the retention brackets for each of the SMP Expansion Module.
- If the server is going to shipped or moved over a long distance, you must reinstall the retention brackets and shipping thumbscrews for each SMP Expansion Module.

Complete the following steps to install the SMP Expansion Module cover and the SMP Expansion Module:

1. Install the cover on the SMP Expansion Module:
   a. Set the cover on top of the expansion module.

b. Extend the locking levers as shown in the illustration; then, let the cam on the front of the cover fall into the cam opening on the SMP Expansion Module circuit board.

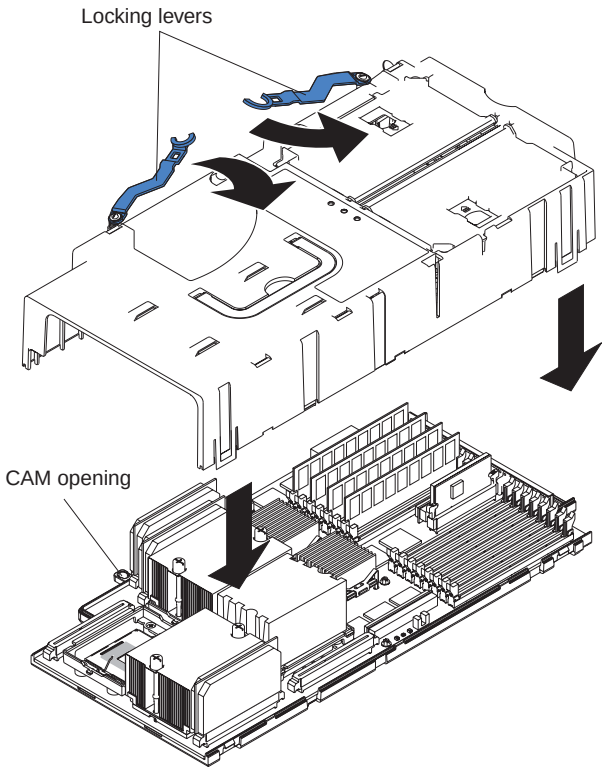


Figure 29. Installing the SMP Expansion Module cover

c. Release the locking levers and align the rear of the cover with the rear edge of the circuit board.

d. Press down on the cover until it snaps into place.

e. Lift slightly on the locking levers and rotate them back until they stop.

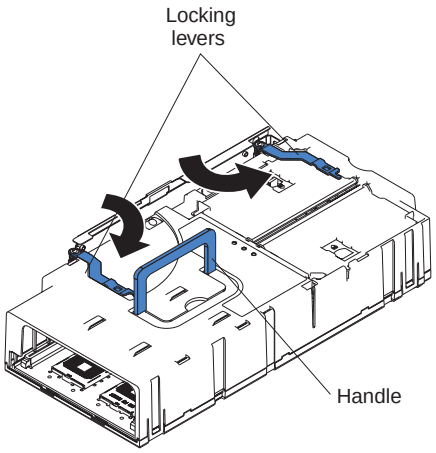


Figure 30. Locking lever position for installing the SMP Expansion Module

2. Install the SMP Expansion Module into the server:

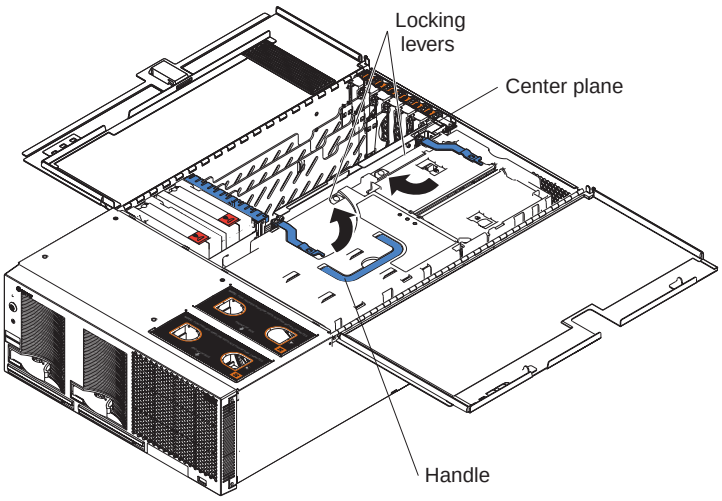


Figure 31. SMP Expansion Module locking lever position

a. Lift the SMP Expansion Module by its handle and use the finger relief to hold the SMP Expansion Module steady.
b. Being careful not to damage the components on the center planar, lower the SMP Expansion Module into the server.
c. Release the handle and slide the SMP Expansion Module toward the center planar until it stops.

d. Rotate the SMP Expansion Module locking levers forward until the SMP Expansion Module is securely fastened in place. See the following illustration.

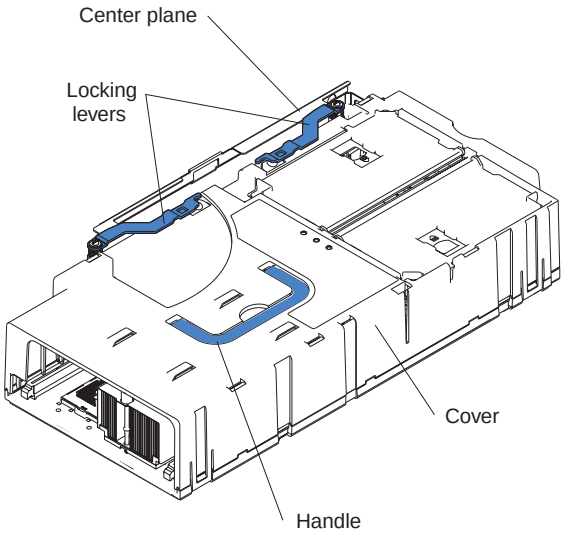


Figure 32. Locking lever position when the SMP Expansion Module is installed

3. Install the EMC shield on the rear of the server; then, hand tighten the blue thumbscrews to secure the EMC shield.

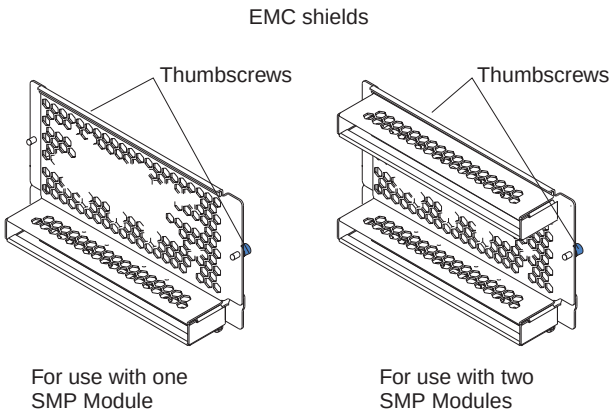


Figure 33. EMC shields

4. If you have other options to install or remove, do so now.
5. Close the top cover.
6. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.
7. Connect all external cables and turn on the server.
8. Turn on the server.

Memory Module

This section contains instructions on installing, adding, hot-adding, removing, and hot-replacing memory modules. It includes information about memory mirroring and Memory ProteXion features of the Active Memory technology.

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 comes with a minimum of two 512 MB DIMMs installed in slots 1, and 3 in the SMP Expansion Module and supports 512 MB, 1 GB, and 2 GB DIMMs, for a maximum of 64 GB of system memory depending on your configuration.
- IBM periodically makes updates available to provide enhancements to the standard features of your server. Currently, your xSeries 445 server supports the memory mirroring and Memory ProteXion features of the Active Memory technology. Check the IBM support Web site occasionally to make sure that you have the most current levels of system software installed.
- The hot-add memory feature enables you to add DIMMs without turning off the server. This feature is supported only in those servers using Windows Server 2003 Enterprise or Datacenter editions.
- To use the hot-add memory feature you must first disable memory mirroring in the Configuration/Setup Utility program, and there cannot be any DIMMs present in the port in which you want to add DIMMs.
- The hot-replace memory feature allows you to replace DIMMs of the same type, size, and clock speed without turning off the server.
- To use the hot-replace memory feature you must enable memory mirroring in the Configuration/Setup Utility program.
- When using memory mirroring, all of the DIMMs in each memory port must be the same size and clock speed.
- Damaged or faulty DIMMs can be replaced without having to replace all the DIMMs in the bank. Ensure the new DIMM is the same size and clock speed as the other DIMMs in the bank.
- See the ServerProven list at http://www.ibm.com/pc/compat/ for a list of memory modules for use with your server. For optimum performance, balance the amount memory between the two ports.
- When installing or removing DIMMs, it must be done in pairs and in the following order.

Table 1. Memory

Port	Bank	Slot number
1	1	1, 3
2	1	9, 11
1	2	2, 4
2	2	10, 12
1	3	5, 7
2	3	13, 15
1	4	6, 8
2	4	14, 16

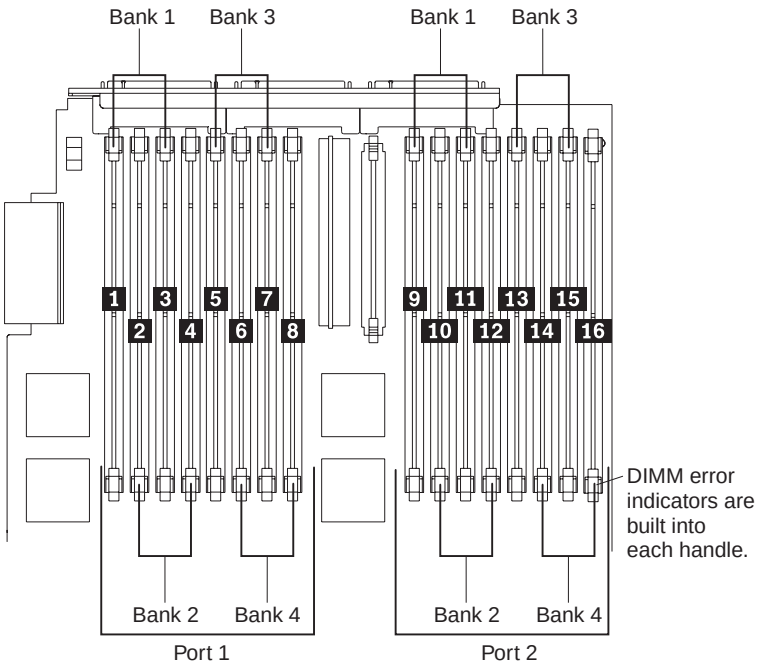


Figure 34. DIMM banks

- Each pair or bank of DIMMs must be of the same size and clock speed.
- When you install or remove a bank of DIMMs, the server configuration information changes. Therefore, you must change and save the new configuration information by using the Configuration/Setup Utility program. When you restart the server, the server displays a message indicating that the memory configuration has changed. Start the Configuration/Setup Utility program and select **Save Settings**. If you need instructions, see ″Chapter 2. Configuring the server″ in the *User's Guide* on the *IBM Documentation* CD.
- The illustrations in this document might differ slightly from your hardware.

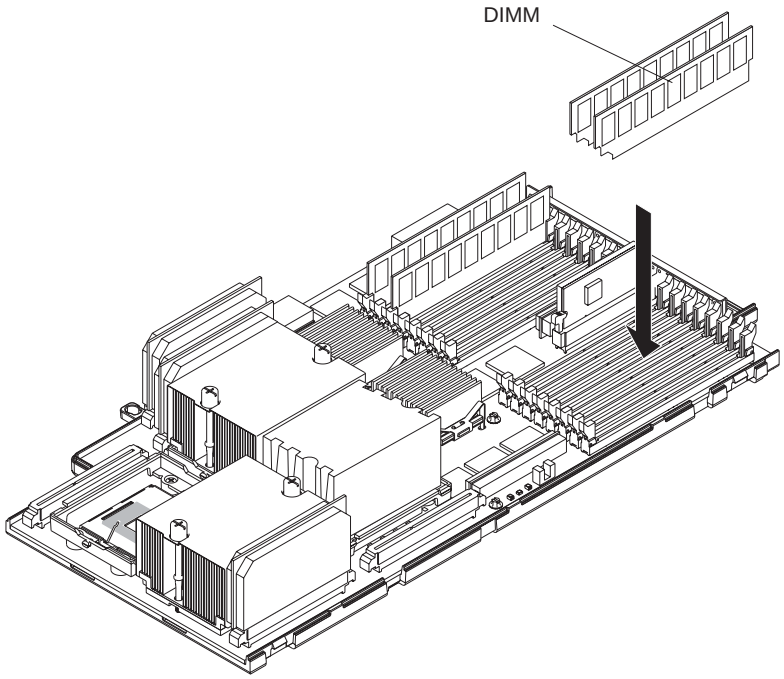


Figure 35. DIMM installation

Active Memory

Active Memory is an IBM technology that improves the reliability of the DIMMs through memory mirroring, memory scrubbing, and Memory ProteXion™ features.

The following notes describe the Active Memory features:

- Memory mirroring enables you to improve the reliability of the memory in your server by creating a mirror of the data in memory port 1 and storing it in memory port 2.

  Note: For memory mirroring to work, you must have DIMMs of the same size and clock speed in both memory ports.

  Complete the following steps to enable memory mirroring:

  1. Check your operating system documentation to make sure that it supports memory mirroring.
  2. Install DIMMs of the same size and clock speed in the two memory ports.
  3. Enable memory mirroring in the Configuration/Setup Utility program:
     a. Turn on the server and watch the monitor screen.
     b. When the message `Press F1 for Configuration/Setup` appears, press F1.
     c. From the Configuration/Setup Utility main menu, select **Advanced Setup**.
     d. Select **Memory Settings**.
     e. Select **Memory Mirroring Settings**.
     f. **Enable** the SMP Module memory mirroring setting from within this window.
     g. Save and exit the Configuration/Setup Utility program.

When memory mirroring is enabled, the data that is written to memory is stored in two locations. One copy is kept in the memory port 1 DIMMs, while a second copy is kept in the memory port 2 DIMMs. During the execution of the read command, the data is read from the DIMM with the least number of reported memory errors through Memory scrubbing, which is enabled with memory mirroring.

If memory scrubbing determines that a DIMM is damaged beyond use, read and write operations are redirected to the remaining good DIMMs. Memory scrubbing then reports the damaged DIMM and the Light Path Diagnostics feature displays the error. After the damaged DIMM is replaced, memory mirroring then copies the mirrored data back into the new DIMM.

- Memory scrubbing is an automatic daily test of all the system memory that detects and reports memory errors that might be developing before they cause a server outage.

  Note: Memory scrubbing and Memory ProteXion technology work with each other and do not require memory mirroring to be enabled to work.

  When an error is detected, memory scrubbing determines whether the error is recoverable. If it is recoverable, Memory ProteXion is enabled and the data that was stored in the damaged locations is rewritten to a new location. The error is then reported so that preventive maintenance can be performed. Provided that there are enough good locations to enable the correct operation of the server, no further action is taken other than recording the error in the error logs.

  If the error is not recoverable, memory scrubbing sends an error message to the Light Path Diagnostics feature, which then lights the applicable LEDs to guide you to the damaged DIMM. If memory mirroring is enabled, the mirrored copy of the data in the mirrored DIMM is used to refresh the new DIMM after it is installed.
- Memory ProteXion reassigns memory bits to new locations within memory when recoverable errors have been detected.

  When a recoverable error is found by memory scrubbing, the Memory ProteXion feature writes the data that was to be stored in the damaged memory locations to spare memory locations within the same DIMM.

Removing and replacing DIMMs

Complete the following steps to remove and replace a DIMM in the SMP Expansion Module with the server turned off.

Attention: When working with DIMMs or other options, you might need to remove one or both of the SMP Expansion Modules. See “Hot-replace DIMMs” on page 43 for information on how to hot-replace DIMMs with the server turned on.

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.
2. Turn off the server and peripheral devices, disconnect the power cords, and all external cables from the SMP Expansion Module.
3. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
4. Open the top cover.
5. If necessary, remove the top SMP Expansion Module or SMP baffle from the server. See “Removing the SMP Expansion Module and cover” on page 32 for instructions.

6. Open the DIMM access door that covers the DIMM you will be removing.

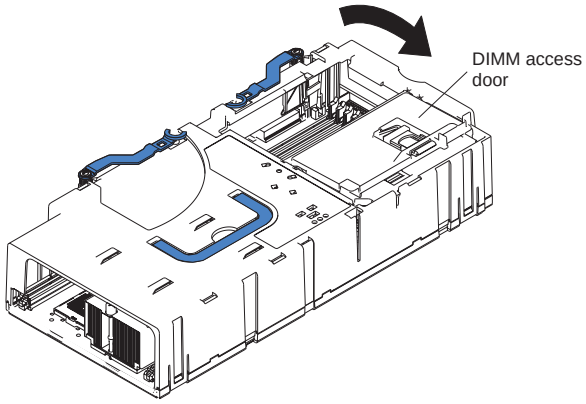


Figure 36. Opening the DIMM access door

7. Open the retaining clip on each end of the DIMM connector.
8. Lift the DIMM straight up and out of the SMP Expansion Module.
9. Install a new DIMM:
   a. 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.

   b. Insert the DIMM into the connector by aligning the DIMM edges with the slots at each end of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. Be sure that the retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

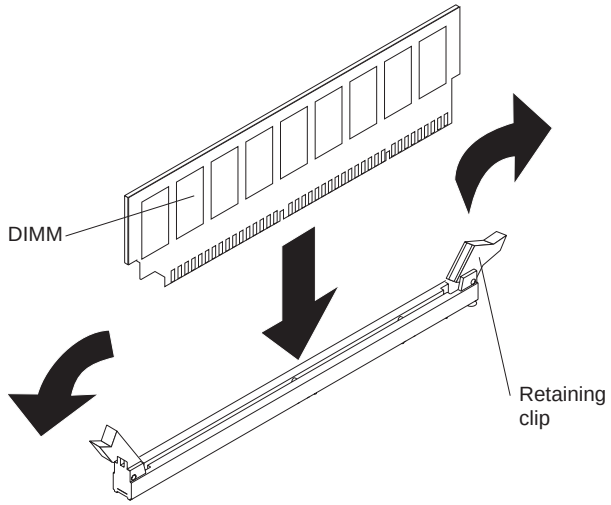


Figure 37. Inserting a DIMM into a DIMM slot

      Attention: If there is a gap between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.

   c. Repeat steps 9a and 9b for each DIMM.

10. Close the DIMM access door.
11. If necessary, reinstall either the top SMP Expansion Module or SMP baffle in the server. See “Installing the SMP Expansion Module and cover” on page 34 for instructions.
12. Close the top cover.
13. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.
14. Connect all external cables and turn on the server.

Note: When you install or remove banks of DIMMs, the server configuration information changes. Therefore, you must change and save the new configuration information by using the Configuration/Setup Utility program. See the *User's Guide* on the *Documentation* CD.

Hot-replace DIMMs

This section includes the instructions needed to hot-replace DIMMs in your server SMP Expansion Module with the power on.

Note: Before you attempt to hot-replace a DIMM, make sure that the new DIMM is the same size and clock speed and that memory mirroring is enabled.

Attention: If two SMP Expansion Modules are installed in a server, you cannot hot-replace or hot-add the DIMMs in the lowest SMP Expansion Module. To gain access to the DIMMs of a lower SMP Expansion Module, you must first remove the upper SMP Expansion Module, which requires you to turn off the server. See “Removing and replacing DIMMs” on page 41 for information about how to remove and replace DIMMs while the server is turned off.

Complete the following steps to hot-replace a DIMM in your server SMP Expansion Module:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.
2. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
3. Open the top cover.
4. If necessary, remove the SMP baffle.
5. Open the DIMM access door on the SMP Expansion Module.

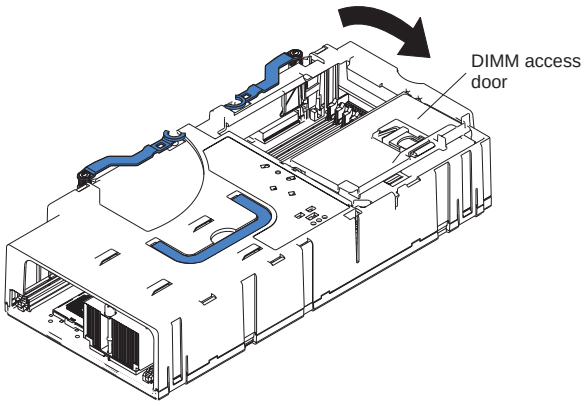


Figure 38. Opening the DIMM access door

6. Open the retaining clip on each end of the DIMM connector.
7. Lift the DIMM to be hot-replaced straight up and out of the SMP Expansion Module.
8. Install the new DIMM:
   a. 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.

   b. Insert the DIMM into the connector by aligning the DIMM edges with the slots at each end of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. Be sure that the retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

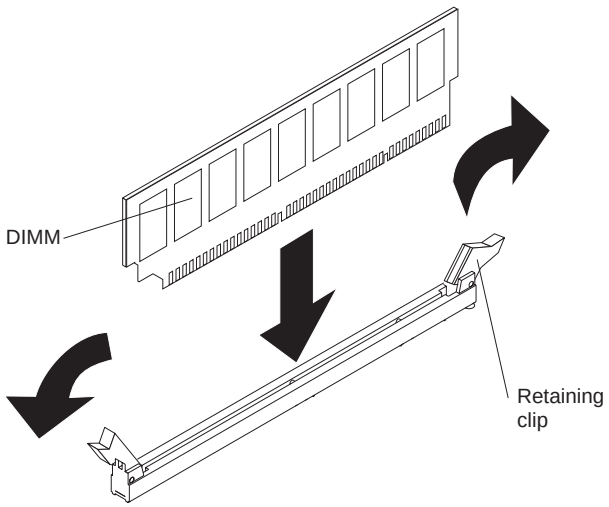


Figure 39. Inserting a DIMM into a DIMM slot

      Attention: If there is a gap between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.

   c. Repeat steps 8a and 8b for each DIMM.
9. Close the DIMM access door.
10. If necessary, reinstall the SMP baffle.
11. Close the top cover.
12. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.

Hot-add DIMMs

This section provides the instructions for hot-adding DIMMs to your server SMP Expansion Module with the power on.

Notes:

1. Ensure that you hot-add two DIMMs at a time, and that the new DIMMs are the same size and clock speed.
2. Ensure that memory mirroring is disabled, and that the port which you intend to add DIMMs is empty. To disable memory mirroring, complete the following steps:
   a. Start the Configuration/Setup Utility program.

b. Select **Advanced Setup** from the menu.
c. Select **Memory Settings**.
d. Select **Memory Mirroring Settings**.
e. **Disable** the SMP Module memory mirroring setting from within this window.
f. Save and exit the Configuration/Setup Utility program.

Attention: If two SMP Expansion Modules are installed in a server, you cannot hot-replace or hot-add the DIMMs in the lowest SMP Expansion Module. To gain access to the DIMMs of a lower SMP Expansion Module, you must first remove the upper SMP Expansion Module, which requires you to turn off the server. See "Removing and replacing DIMMs" on page 41 for information on how to remove and replace DIMMs while the server is turned off.

Complete the following steps to hot-add DIMMs to your server SMP Expansion Module:

1. Read the safety information beginning on page v and "Installation guidelines" on page 9.
2. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
3. Open the top cover.
4. If necessary, remove the SMP baffle.
5. Open the DIMM access door on the SMP Expansion Module.

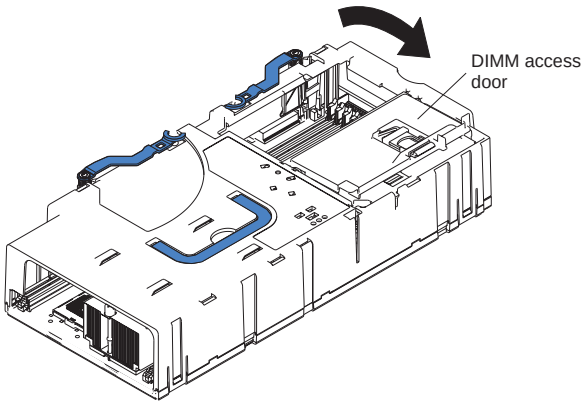


Figure 40. Opening the DIMM access door

6. Open the retaining clip on each end of the DIMM connector.
7. Add new DIMMs:
   a. 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.
   b. Insert the DIMM into the connector by aligning the DIMM edges with the slots at each end of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. Make sure that the retaining clips snap into the locked position when the DIMM is firmly seated in the connector.

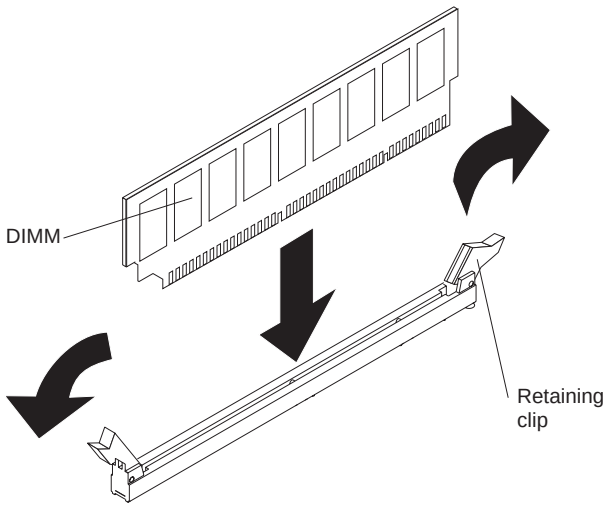


Figure 41. Inserting a DIMM into a DIMM slot

Attention: If there is a gap between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.

c. Repeat steps 7a and 7b for each DIMM.

8. Close the DIMM access door.
9. If necessary, reinstall the SMP baffle.
10. Close the top cover and slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.

Installing and replacing a microprocessor

This section describes how to install and remove microprocessors and VRMs.

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

- Read the documentation that comes with the microprocessor to determine whether you need to update the basic input/output system (BIOS) code in your server. To download the most current level of BIOS code for the server, go to http://www.ibm.com/pc/support/.
- If your server comes with Intel Xeon MP microprocessors, obtain an SMP-capable operating system. For a list of supported operating systems, go to http://www.ibm.com/pc/us/compat/.
- To order additional microprocessor or SMP Expansion Module options, contact your IBM marketing representative or authorized reseller.
- To avoid damage and ensure proper server operation after you install a replacement or an additional microprocessor, use a microprocessor that has the same cache size and type, clock speed, and internal and external clock frequencies as the microprocessors already installed in the individual SMP Expansion Module. For a list of microprocessors supported by your server, see the ServerProven list at http://www.ibm.com/pc/compat/.
- The microprocessor in socket 1 of the bottom SMP Expansion Module is the startup (boot) microprocessor.
- An air baffle or microprocessor must be installed in microprocessor socket 4, depending on your configuration.

- If you are adding Intel Xeon MP microprocessors, populate the empty microprocessor sockets in numeric order, starting with socket 1. If you install the microprocessors in the wrong order, the server will not start.

  Attention: You must make sure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board. See Figure 44 on page 49.
- Always install the heat sink that comes with the microprocessor.
- Server models that come with Intel Xeon DP microprocessors support a maximum of two microprocessors per SMP Expansion Module, installed in microprocessor sockets 1 and 4.
- Intel Xeon DP microprocessors are supported in microprocessor sockets 1 and 4 only. Intel Xeon MP microprocessors are supported in microprocessor sockets 1, 2, 3, and 4.Figure 42 shows the location of the startup microprocessor and its VRM on the system board. It also shows the microprocessor baffles and the VRM slots for the other microprocessor sockets.

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

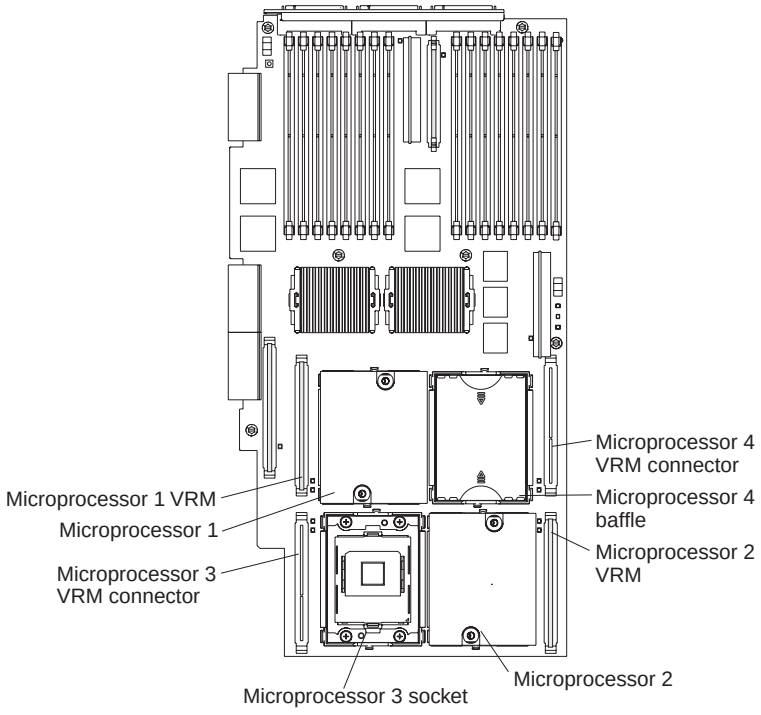


Figure 42. Microprocessor connector and component locations

Complete the following steps to install a microprocessor:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.
2. Turn off the server and peripheral devices, disconnect the power cords, and disconnect all external cables from the SMP Expansion Module.
3. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
4. Open the top cover.
5. If necessary, remove the SMP baffle or top SMP Expansion Module.

6. Remove the SMP Expansion Module in which you plan to install the microprocessor; then, remove the module cover and determine the socket where the microprocessor is to be installed. For details, see “Removing and Installing the SMP Expansion Module and cover” on page 32.
7. Determine which type of microprocessors are installed in your server. The easiest way to do this is by the locations of the installed microprocessors in the SMP Expansion Module. If the microprocessors are installed only in connectors 1 and 4, your server came with Intel Xeon DP microprocessors. If the microprocessors are installed in any other connectors, such as 1 and 2 or 1,2, and 3, your server came with Intel Xeon MP microprocessors.

   Note: If your server contains only one SMP Expansion Module, remove the SMP baffle above it to gain access to the module. If your server contains two SMP Expansion Modules, remove the top module to gain access to the bottom or lower SMP Expansion Module.

   Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see “Handling static-sensitive devices” on page 10.
8. If you are installing a new microprocessor, go to step 9; otherwise, continue:
   a. Verify that you have selected the correct microprocessor to be replaced. The LED beside the failing microprocessor will be lit.

      Attention: Before attempting to remove the heat sink from the microprocessor, note that the heat-conducting grease between the heat sink and the microprocessor might have formed a strong bond. Do not force the components apart; doing so can damage the microprocessor pins. If the heat sink does not separate from the microprocessor easily, loosen one heat sink captive mounting screw first. This allows one corner of the heat sink to be lifted off of the microprocessor; then, you can loosen the other captive mounting screw and remove the heat sink.

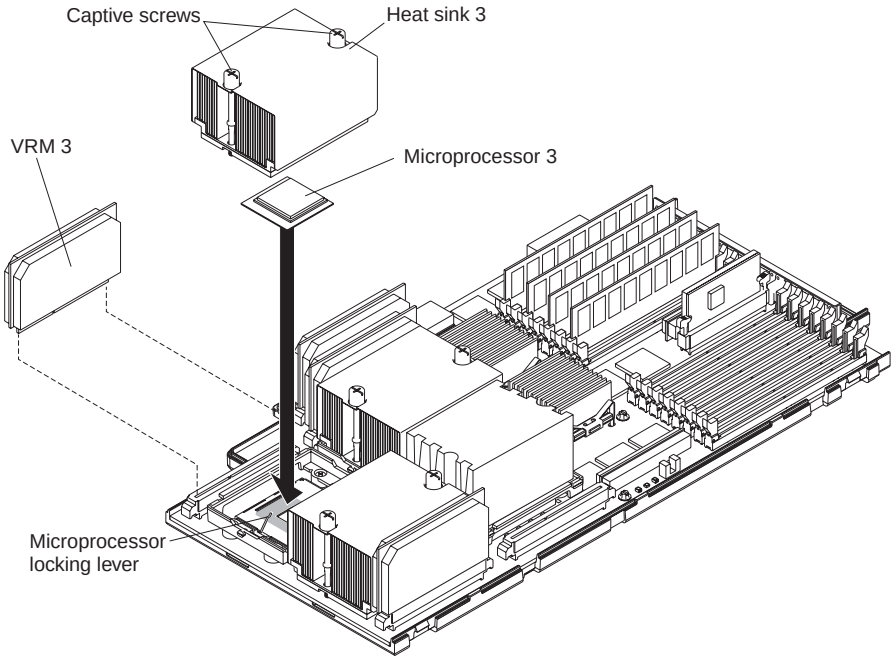


Figure 43. Microprocessor installation

b. Using a screwdriver, loosen the two captive mounting screws on the heat sink, alternating between screws until they release from the SMP board; then, remove the heat sink.

c. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (approximately a 135° angle), as shown.

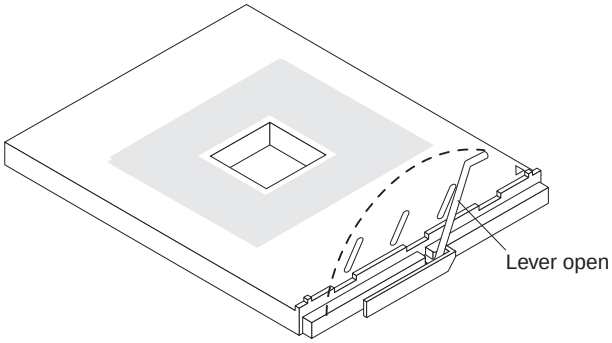


Figure 44. Microprocessor locking lever fully open

9. Install the VRM that comes with the microprocessor kit in the slot adjacent to the microprocessor you are replacing or installing. Some microprocessor options contain a VRM with a clip to secure the VRM in the slot. This clip is not needed for installation and can be discarded.

   a. If you are replacing a failed VRM, complete the following steps:

      1) Verify that you have selected the correct VRM to be replaced. The LED next to the failing VRM will be lit.

      2) Grasp the VRM at both upper corners and lift it out of the slot.

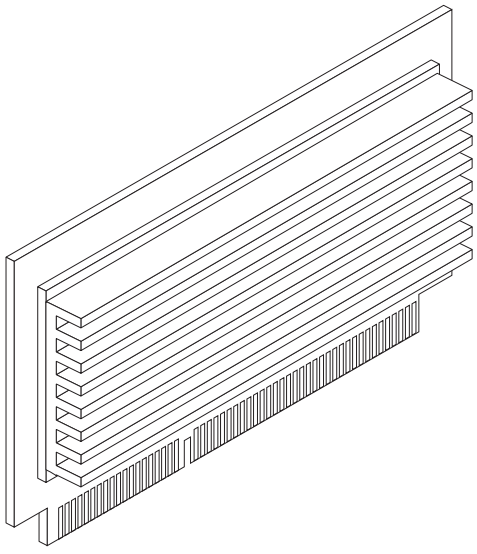


Figure 45. Microprocessor VRM

   b. Holding the new VRM by the upper corners, plug it *firmly* into the slot.

10. If necessary, remove the microprocessor baffle from the microprocessor socket. Keep the microprocessor baffle for possible future use.

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

    Important: When installing Intel Xeon DP microprocessors, you must install them in the following order: socket 1 then socket 4. When installing Intel Xeon MP microprocessors, you must install them in the following order: sockets 1, 2, 3, and then 4.

    a. Remove the protective label from the microprocessor socket.
    b. Rotate the locking lever on the microprocessor socket from its closed and locked position until it stops or clicks in the fully open position (approximately 135° angle), as shown.

       Attention: You must ensure that the locking lever on the microprocessor socket is in the fully open position before you insert the microprocessor in the socket. Failure to do so might result in permanent damage to the microprocessor, microprocessor socket, and system board.

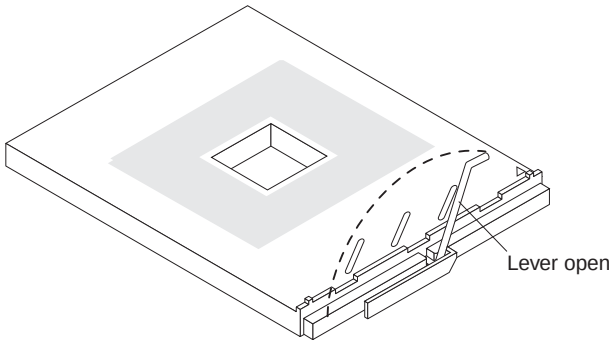


Figure 46. Microprocessor locking lever fully open

    c. Align the triangle icon on the microprocessor with the triangle icon on the socket and press the microprocessor gently into the socket.

       Attention: Make sure that the microprocessor is aligned correctly before you proceed. To avoid bending the pins on the microprocessor, do not use excessive force when pressing it into the socket.
    d. Close the locking lever to secure the microprocessor.
13. Install the heat sink:
    a. Remove the heat sink from its package and detach the protective cover from the bottom of the heat sink

       Attention: Do not disturb or contaminate the heat-conducting grease on the bottom of the new heat sink. Doing so damages its heat-conducting capability and exposes the new microprocessor to overheating.

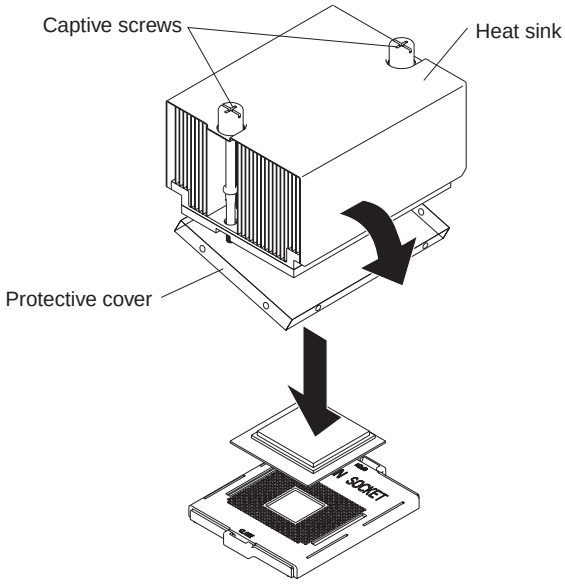


Figure 47. Aligning the heat sink over the microprocessor

b. Align the heat sink over the microprocessor; then, carefully set it down on top of the microprocessor.

c. Using a screwdriver, secure the heat sink to the microprocessor socket on the SMP board using the two captive mounting screws. Press firmly on the screws and tighten them, alternating between them. Do not overtighten the screws.

14. Install the SMP Expansion Module cover; then, install the SMP Expansion Module in the server. For details, see “Installing the SMP Expansion Module and cover” on page 34.
15. If you have other options to install or remove, do so now.
16. Close the top cover.
17. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.
18. Connect all external cables.
19. Turn on the server.
    Important: If your server will not start after you replace or install a microprocessor, you might have installed a microprocessor in the wrong socket or installed a microprocessor of a different type, or the VRM is not seated properly. Make sure that you have installed the microprocessor in the correct location and that it is of the same type. Also ensure that the VRM is properly seated in the slot.

    Note: When you install or remove microprocessors, the server configuration information changes. Therefore, you must change and save the new configuration information by using the Configuration/Setup Utility program. See the *User's Guide* on the IBM *xSeries Documentation* CD.

Replacing and troubleshooting fans

Your xSeries 445 server has four hot-swap fan assemblies, two 150 mm x 38 mm, and two 150 mm x 51 mm fans. The two 150 mm x 38 mm fans (fan 3 and fan 4) are located just in front of the PCI-X planar and are used to cool the power supplies, PCI-X slots, and the I/O board. 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 SMP Expansion Modules. See the following illustration.

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

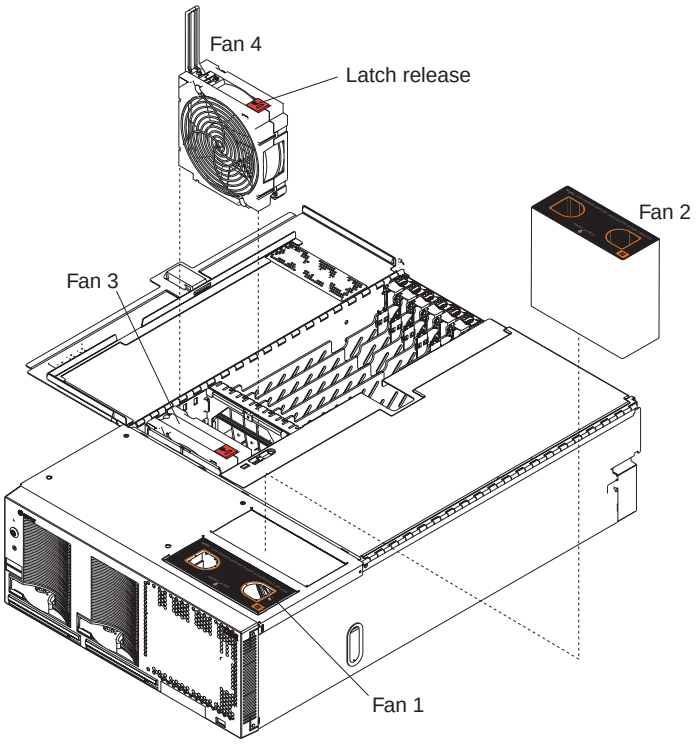


Figure 48. Fans

Each fan has an LED located on the top-left side. When the fan is operating correctly, this LED is off. If a fan stops working, the Light Path Diagnostics feature will light a 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 applicable procedure, remove and replace the fan.

Replacing fans 1 and 2

As shown in the following illustration, fans 1 and 2 are located on the right side of the server and cool the SMP Expansion Modules. These fans are redundant, meaning that if one fails, the remaining fan will temporarily speed up to properly cool the SMP Expansion Modules. In the event of a failure, replace the malfunctioning fan within 48 hours.

Complete the following steps to replace fans 1 and 2:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.

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

2. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
3. 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.

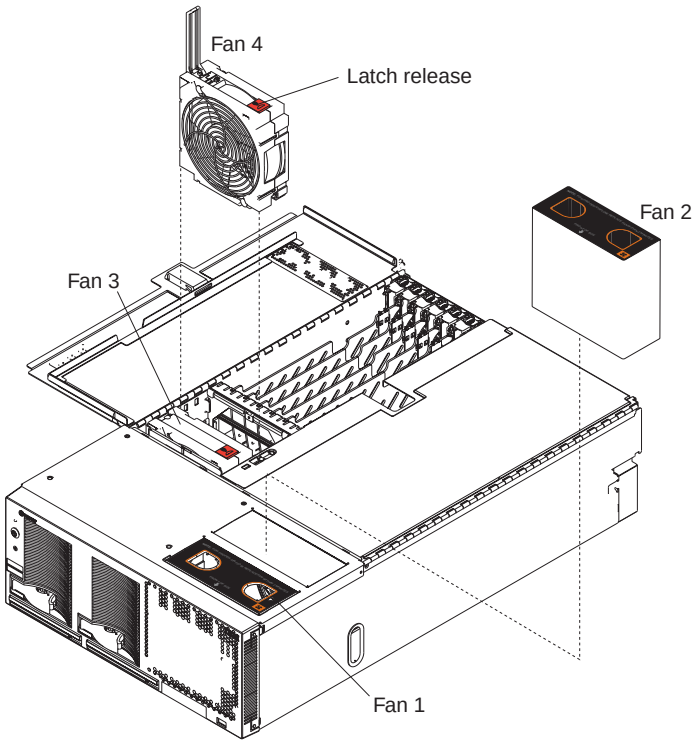


Figure 49. Fans

   b. Lift the fan out of the server.
4. Orient the new fan so that the arrow on the top of the fan is pointing toward the front of the server.
5. Push the replacement fan assembly into the server until it clicks into place.
6. If you have other options to install or remove, do so now.
7. Close the server cover. See “Closing the cover” on page 57.
8. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.

Replacing fans 3 and 4

As shown in the illustration, fan 3 and fan 4 are located in front of the I/O board and the PCI-X slots. These fans are redundant, meaning that if one fails, the remaining fan will temporarily speed up to properly cool the I/O components in the server. In the event of a failure, you must replace the malfunctioning fan within 48 hours.

Complete the following steps to replace fans 3 and 4:

1. Read the safety information beginning on page v and “Installation guidelines” on page 9.

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

2. Pull out on the quick release latches on each side of the server; then, pull the server out of its rack enclosure until it stops.
3. 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.

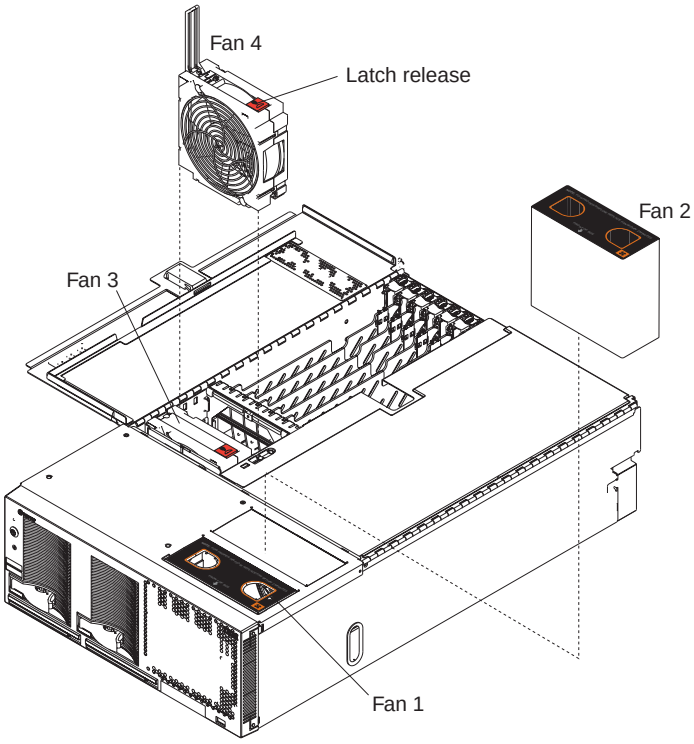


Figure 50. Fans

   b. Grasp the handle and lift the fan out of the server.
4. Orient the new fan so that the latch release on the top of the fan is to the right side of the server.
5. With the handle raised, push the replacement fan assembly into the server until it clicks into place.
6. Push the handle down until it clicks into place under the latch release.
7. If you have other options to install or remove, do so now.
8. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.

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 9; then, follow any special handling and installation instructions supplied with the replacement battery.
2. Turn off the server and peripheral devices, disconnect the power cords, and all external cables from the server; then, open the cover (see “Opening the cover” on page 16 for details).
3. Remove fans 3 and 4 from the server (see “Replacing fans 3 and 4” on page 53 for details).
4. While standing in front of the server, locate the battery on the I/O planar just under the leading edge of the PCI-X planar. With the fans removed the battery is visible from the front of the server.

5. 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.

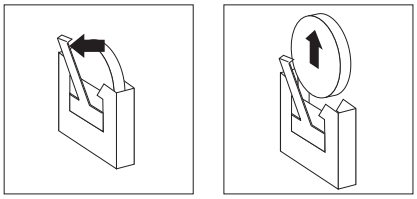


Figure 51. Removing the battery

6. Insert the new battery:
   a. Position the battery so that the positive (+) symbol is facing away from you.
   b. Use one finger to press the top of the battery clip away from the battery.
   c. Press the battery into the socket until it clicks into place. Make sure that the battery clip holds the battery securely.

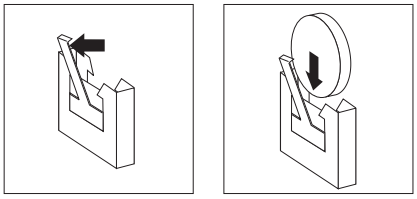


Figure 52. Installing the battery

7. Install fans 3 and 4 in the server (see “Replacing fans 3 and 4” on page 53 for details).
8. Close the server cover, and connect the cables.
9. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.
10. Turn on the server.
11. Start the Configuration/Setup Utility program and set configuration parameters.
    - Set the system date and time.
    - Set the power-on password.
    - Reconfigure your server.

Closing the cover

Complete the following steps to install the server cover:

1. 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.

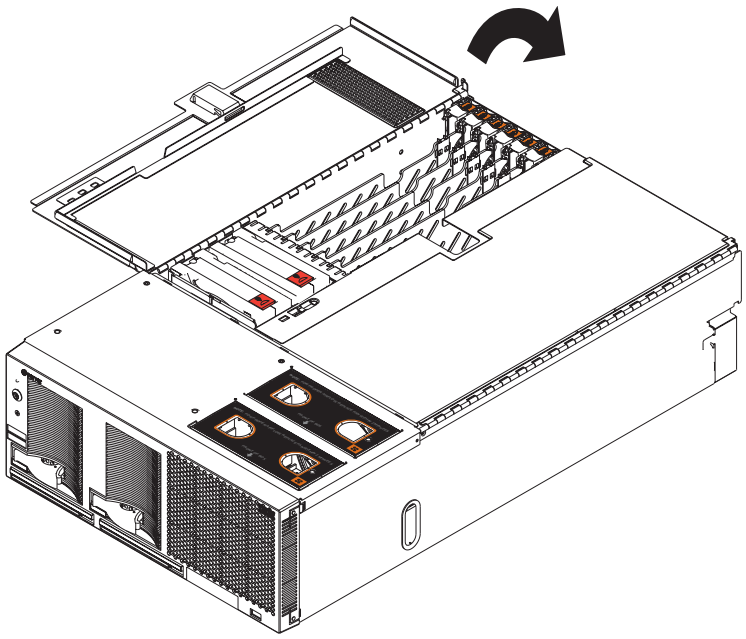


Figure 53. Closing the cover

2. Reconnect all external cables and power cords to the server; then, connect the power cords to properly grounded electrical outlets. See Chapter 3, “I/O connectors and LEDs”, on page 75 for connector locations.
3. Slide the server into the rack enclosure until it stops; then, secure the server in the rack enclosure using the quick release latches.
4. Turn on your server.

Connecting the cables

This section describes how to connect cables to the SMP Expansion Port, system power connectors, RXE Expansion Port, SCSI connector, USB connector, video connector, mouse connector, keyboard connector, Ethernet connector, and RXE Management port for up to 16-way operation.

For details about the locations and functions of all of the ports, LEDs, and connectors see Chapter 3, “I/O connectors and LEDs”, on page 75.

Notes:

1. The information in this publication is for single and dual server configurations using up to 16 microprocessors and four SMP Expansion Modules.
2. There are two different SMP Expansion cables used to connect the SMP Expansion Modules:
   a. 2.5 m (8.2 feet) copper clad (comes in the IBM @server xSeries 445 Two-chassis 16-way Scalability Kit)
   b. 25.4 cm (10 inches) black clad
3. Before connecting RXE or SMP Expansion cables to the server, make sure that the protective cover is removed from the connectors on each end.
4. See the following illustration to locate the connectors on the back of your server. The illustrations in this document might differ slightly from your hardware.

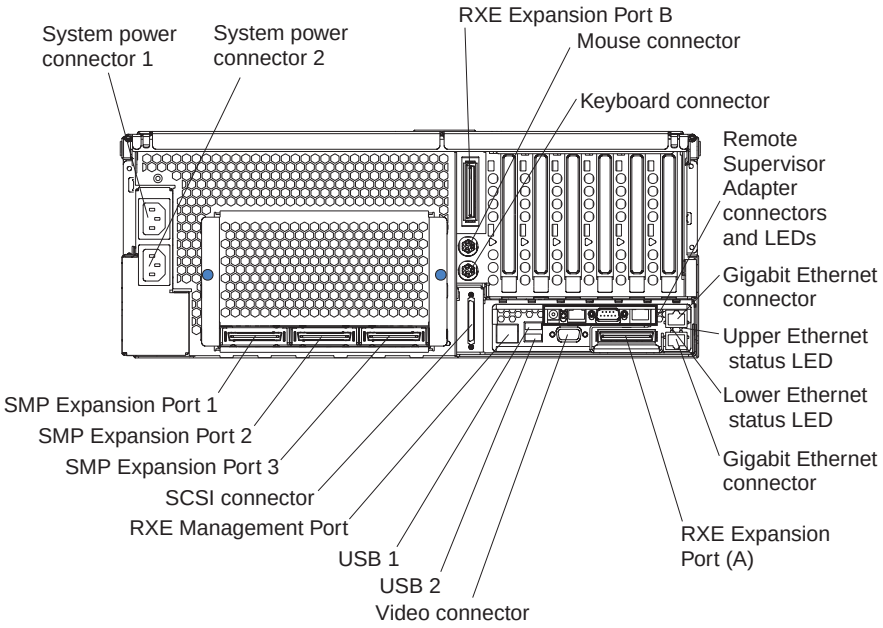


Figure 54. Rear view of server

5. If your server model comes with an operating system, such as Microsoft® Windows® 2000 Datacenter Server or VMware ESX server, see the software documentation provided with your software for additional cabling instructions.

To effectively manage the cables on this server, keep groups of cables secured together, and do not run cables across the back of the server. Use cable ties to bundle similar cables together. Use hook-and-loop fasteners to secure the cable bundles to the vertical rails of the rack cabinet.

Attention: Do not secure cables too tightly. Overtightening can cause internal damage to the cables.

SMP Expansion Port cabling

Your server has either three or six SMP Expansion Ports located on the back of the server, depending on your configuration. Configurations that use only one SMP Expansion Module do not require any cabling of the SMP Expansion Ports. The cabling information in this section is for configurations using up to four SMP Expansion Modules in two servers.

If you are installing a server with one SMP Expansion Module skip this section. Continue to “One server with one SMP Expansion Module” on page 64 in the RXE Expansion Port section and complete that procedure.

One server with two SMP Expansion Modules

Complete the following steps to cable two SMP Expansion Modules in a single server together, using the two 25.4 cm (10 inches) SMP expansion Cables, for up to 8-way operation. In the illustration, the SMP Expansion Modules are numbered 0 and 1, from bottom to top. The SMP Expansion Ports are numbered 1 through 3, from left to right. If your server comes with two SMP Expansion Modules, the SMP Expansion cables are included with the server. If you purchased a second SMP Expansion Module, the cables are included with the option.

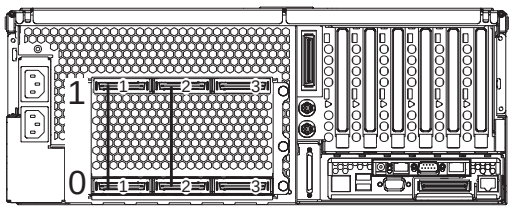


Figure 55. SMP Expansion Module numbering

1. Remove the protective covers from the connectors on the ends of the cables.

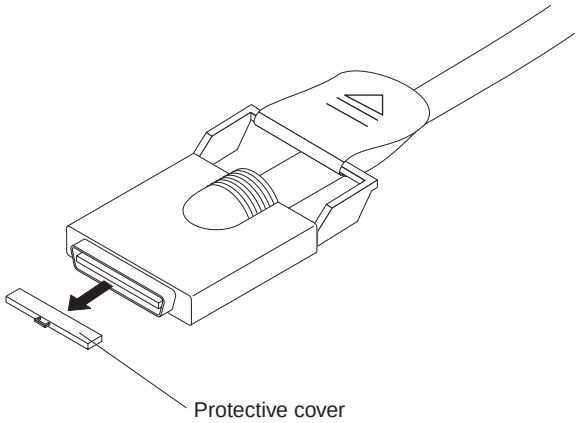


Figure 56. SMP Expansion cable with protective cover

2. Connect one end of a 25.4 cm (10 inches) SMP Expansion cable to port 1 of SMP Expansion Module 0; then, connect the opposite end of the cable to port 1 of SMP Expansion Module 1.

3. Connect one end of the second 25.4 cm (10 inches) SMP Expansion cable to port 2 of SMP Expansion Module 0; then, connect the opposite end of the cable to port 2 of SMP Expansion Module 1.
4. Go to “One server with two SMP Expansion Modules” on page 65 in the ″RXE Expansion Port cabling″ section and complete that procedure.

   Notes:

   a. When multiple cables are connected between the SMP Expansion Module ports, SMP data is interleaved between the cables for better performance.
   b. The server will start and operate with one cable attached between the two SMP Expansion Modules.

Two servers with four SMP Expansion Modules (16-way)

Complete the following steps to cable four SMP Expansion Modules and two servers together, using the four 2.5 m (8.2 feet) and two 25.4 cm (10 inches) SMP expansion cables that came with your servers, for up to 16-way operation. In the illustration, the SMP Expansion Modules are numbered 0 through 3, from primary to secondary. The SMP Expansion Ports are numbered 1 through 3, left to right.

1. Remove the protective covers from the connectors on the ends of the cables.

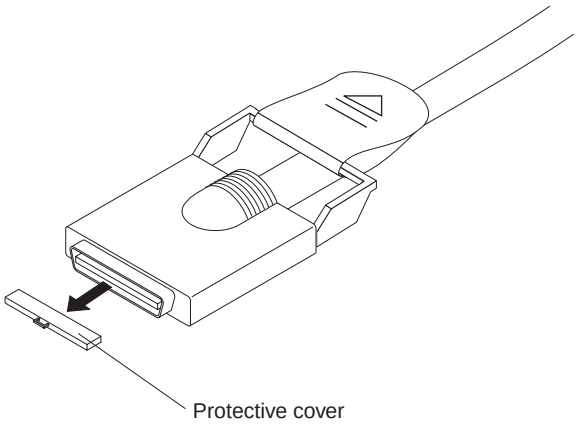


Figure 57. SMP Expansion cable with protective cover

2. Label each end of the 2.5 m (8.2 feet) SMP Expansion cables according to where they will be connected to each server. See the following illustration. The SMP Expansion module numbering shown in the following illustration is for reference purposes only. These numbers do not appear on the servers.

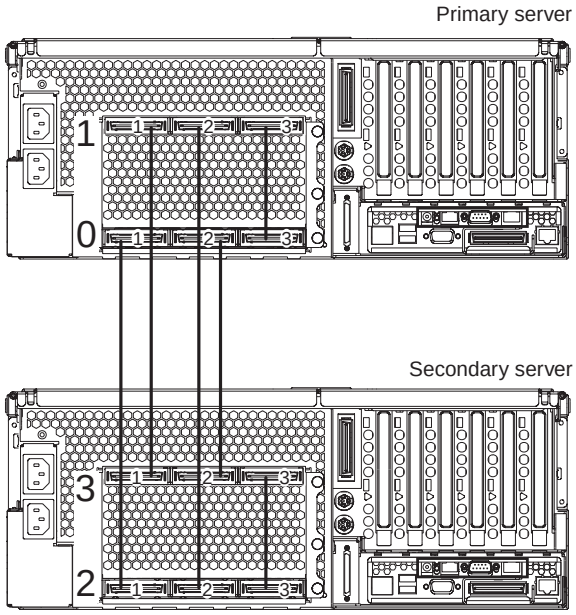


Figure 58. 16-way SMP Expansion port cabling

3. Connect the SMP Expansion cables to the primary server:
   a. Connect one end of a 2.5 m (8.2 feet) SMP Expansion cable to port 1 of SMP Expansion Module 0 on the primary server; then, route the cable through the cable-management arm.

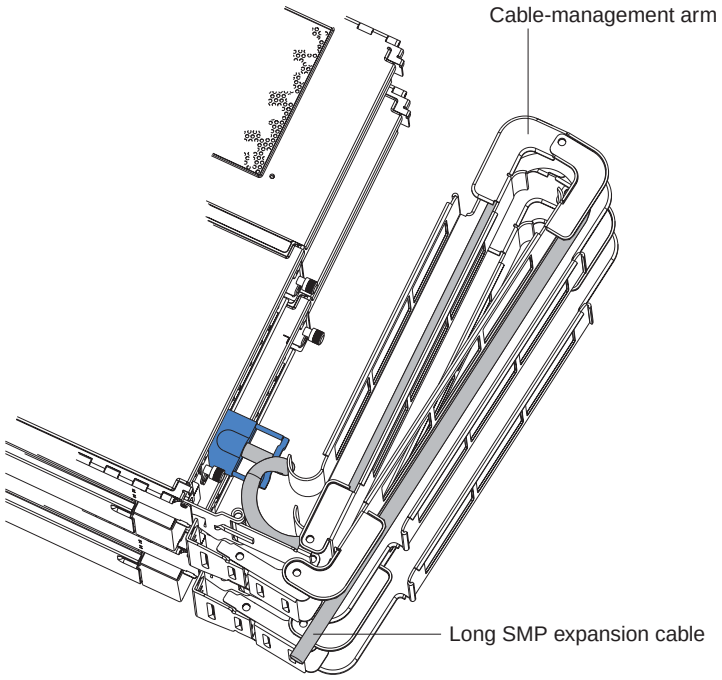


Figure 59. Routing cables through the cable management arm

   b. Connect one end of a 2.5 m (8.2 feet) SMP Expansion cable to port 2 of SMP Expansion Module 0 on the primary server; then, route the cable beside the first cable in the cable-management arm.

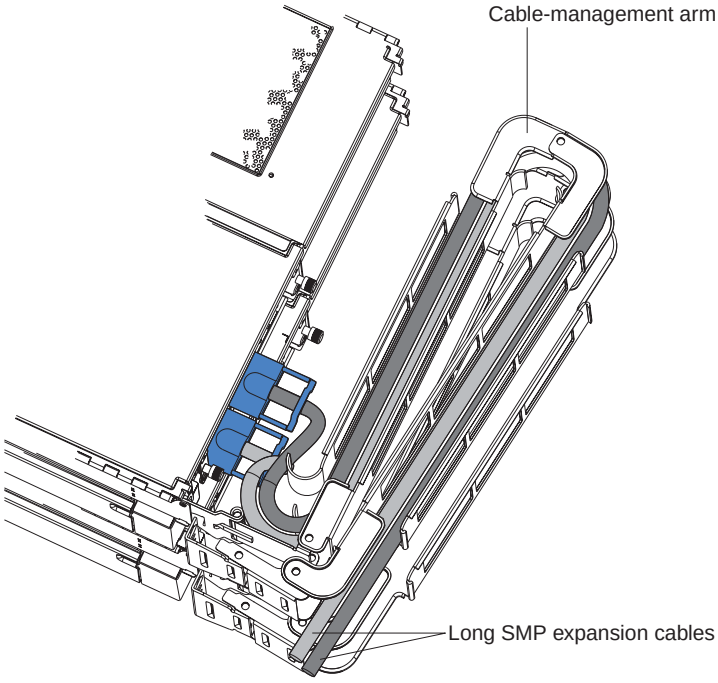


Figure 60. Routing cables through the cable management arm

c. Connect one end of a 2.5 m (8.2 feet) SMP Expansion cable to port 1 of SMP Expansion Module 1 on the primary server; then, route the cable through the cable-management arm as in step 3a on page 61.

d. Connect one end of a 2.5 m (8.2 feet) SMP Expansion cable to port 2 of SMP Expansion Module 1 on the primary server; then, route the cable through the cable-management arm as in step 3b on page 61.

e. Verify that a 25.4 cm (10 inches) SMP Expansion cable is connected between port 3 of SMP Expansion Module 0 and port 3 of SMP Expansion Module 1.

4. Connect the SMP Expansion cables to the secondary server:

   a. Locate the SMP Expansion cable that is connected to port 1 of SMP Expansion Module 0 on the primary server; then, connect the opposite end of the cable to port 1 of SMP Expansion Module 2. Next, route the cable through the secondary cable-management arm.

   b. Locate the SMP Expansion cable that is connected to port 2 of SMP Expansion Module 1 on the primary server; then, connect the opposite end of the cable to port 2 of SMP Expansion Module 2. Next, route the cable through the secondary cable-management arm.

   c. Locate the SMP Expansion cable that is connected to port 1 of SMP Expansion Module 1 on the primary server; then, connect the opposite end of the cable to port 1 of SMP Expansion Module 3. Next, route the cable through the secondary cable-management arm.

   d. Locate the SMP Expansion cable that is connected to port 2 of SMP Expansion Module 0 on the primary server; then, connect the opposite end of the cable to port 2 of SMP Expansion Module 3. Next, route the cable through the secondary cable-management arm.

   e. Verify that a 25.4 cm (10 inches) SMP Expansion cable is connected between port 3 of SMP Expansion Module 2 and port 3 of SMP Expansion Module 3.

5. Connect the Remote Supervisor Adapter Ethernet port on each server to a network or to each other with an Ethernet crossover cable. This connection is needed so that the Remote Supervisor Adapters can communicate and perform the necessary functions for the two servers to create or delete scalable partitions.
6. Route any remaining cables through the cable-management arms.
7. Secure the cables in the cable-management arms with the hook-and-loop straps that come with your server.
8. Go to “16-way configuration” on page 67 in the ″RXE Expansion Port cabling″ section of this publication and complete that procedure.

RXE Expansion Port cabling

Your server has two RXE Expansion Ports located on the rear of the server. Use these ports to connect the server to a remote I/O enclosure and to expand the number of PCI-X slots that are available for use by the server. For detailed information about cabling the RXE Expansion Ports, see the documentation that comes with the remote I/O enclosure.

One server with one SMP Expansion Module

If your server has one SMP Expansion Module installed, complete the following steps. For information about cabling the RXE Management Ports, see “RXE Management Port cabling” on page 69.

1. Remove the protective covers from the connectors on the ends of the cables.

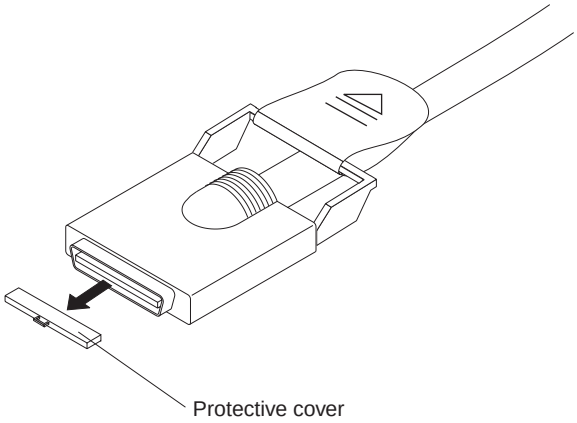


Figure 61. RXE Expansion cable with protective cover

2. Using an RXE Expansion cable, connect one end of the cable to RXE Expansion Port A on the server.

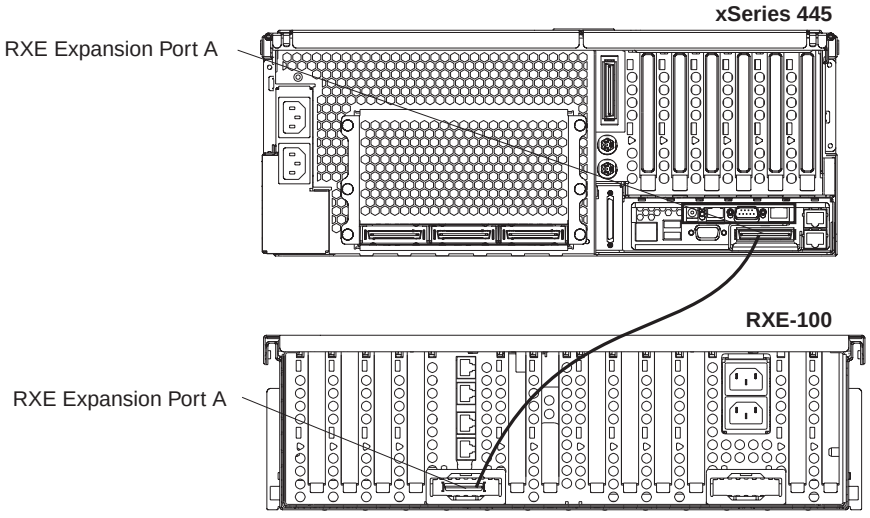


Figure 62. RXE Expansion Port cabling a server with one SMP Expansion Module

3. Connect the opposite end of the cable to an RXE Expansion Port on the remote I/O enclosure.
4. Go to “One server” on page 69 in the ″RXE Management Port cabling″ section and complete that procedure.

One server with two SMP Expansion Modules

If your server has two SMP Expansion Modules installed complete the following steps. For information about cabling the RXE Management Ports, see “RXE Management Port cabling” on page 69.

1. Remove the protective covers from the connectors on the ends of the cables.

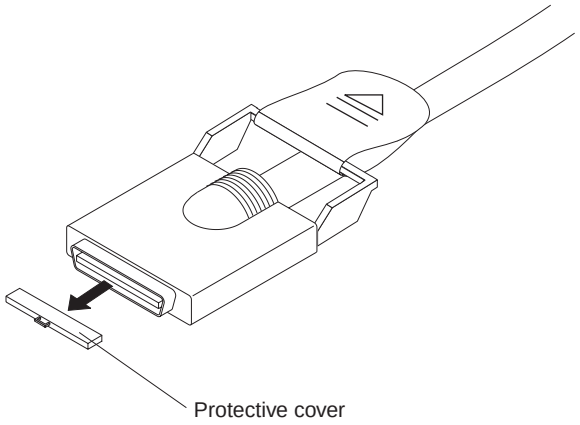


Figure 63. RXE Expansion cable with protective cover

2. Using an RXE Expansion cable, connect one end of the cable to RXE Expansion Port B on the server.

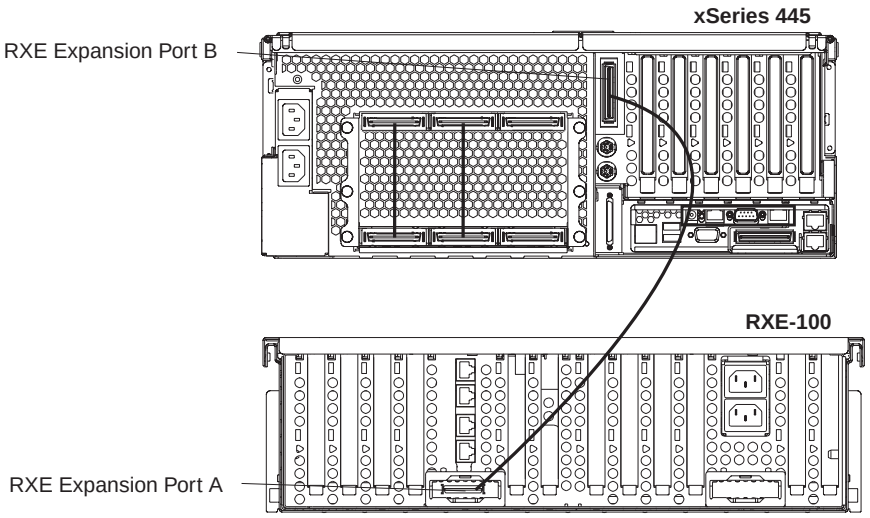


Figure 64. RXE Expansion port cabling a server with two SMP Expansion Modules

3. Connect the opposite end of the cable to an RXE Expansion Port on the remote I/O enclosure.

   Notes:

   a. When two SMP Expansion Modules are installed, both of the RXE Expansion ports are active.

   b. To increase reliability connect a second RXE Expansion cable from the server RXE Expansion Port A to the remote I/O enclosure RXE Expansion Port B. This will create a redundant data path if either of the two cables fail.

4. Go to “One server” on page 69 in the ″RXE Management Port cabling″ section and complete the procedure.

Two stand-alone servers

To cable two stand-alone servers to a single remote I/O enclosure complete the following steps. For information about cabling the RXE Management Ports, see “RXE Management Port cabling” on page 69.

1. Determine which server will be connected to port A of the remote I/O enclosure and which will be connected to port B.
2. Remove the protective covers from the connectors on the ends of the cables.

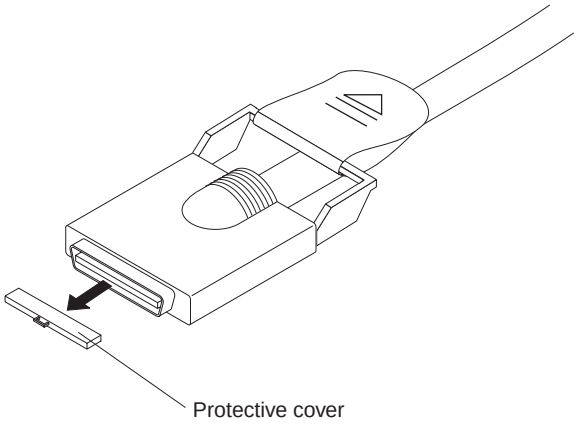


Figure 65. RXE Expansion cable with protective cover

3. Using an RXE Expansion cable, connect one end of the cable to RXE Expansion Port A on the remote I/O enclosure.

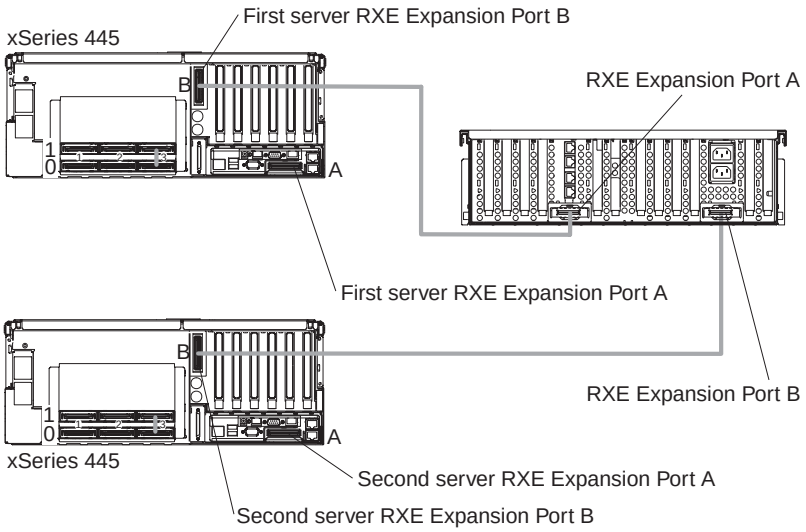


Figure 66. RXE Expansion Port cabling of two stand-alone xSeries 445 servers to a single remote I/O enclosure

4. Connect the opposite end of the cable to RXE Expansion Port A or B on the first server.

   Note: If the server has one SMP Expansion Module installed you must connect the RXE Expansion cable to RXE Expansion Port A on the server. If server has two SMP Expansion Modules installed, connect the cable to RXE Expansion Port B.

5. Using an RXE Expansion cable, connect one end of the cable to RXE Expansion Port B on the remote I/O enclosure.
6. Connect one opposite end of the cable to RXE Expansion Port A or B on the second server.

   Note: When two SMP Expansion Modules are installed, both of the RXE Expansion ports are active.
7. Go to “Two stand-alone servers” on page 70 in the ″RXE Management Port cabling″ section and complete that procedure.

16-way configuration

Complete the following steps to connect an IBM RXE-100 Remote Expansion Enclosure to a 16-way system. For information about cabling the RXE Management Ports, see “RXE Management Port cabling” on page 69.

1. Remove the protective covers from the connectors on the ends of the cables.

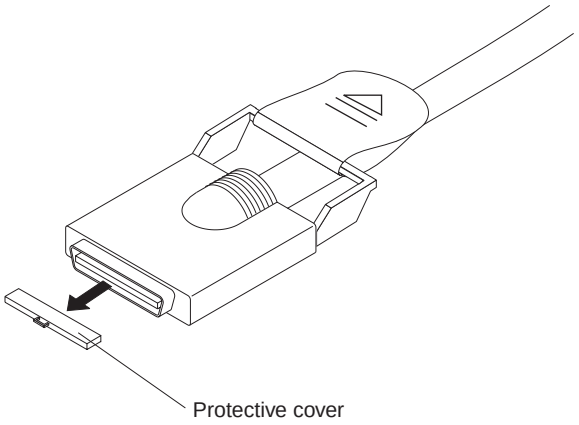


Figure 67. RXE Expansion cable with protective cover

2. Using an RXE Expansion cable, connect RXE Expansion Port A on the primary server to RXE Expansion Port A on the secondary server.

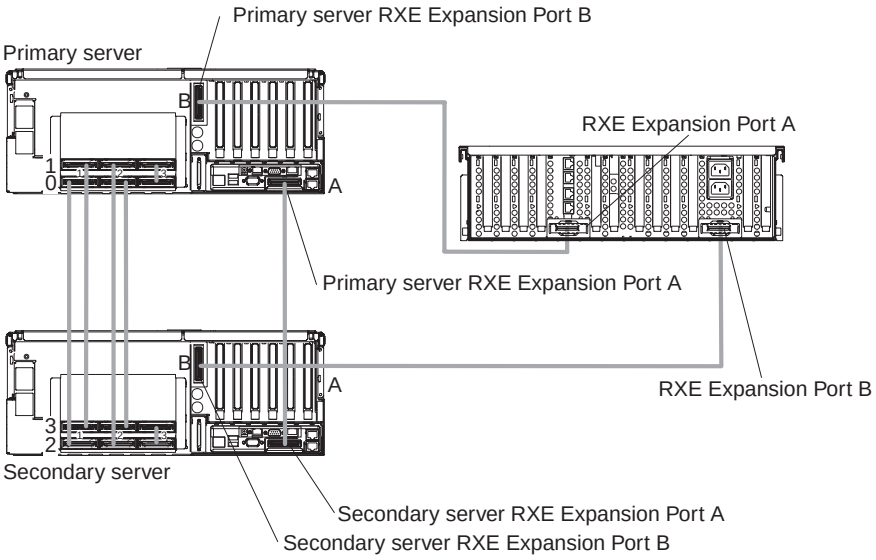


Figure 68. RXE Expansion Port cabling in a 16-way configuration

3. Using an RXE Expansion cable, connect RXE Expansion Port B on the primary server to RXE Expansion Port A on the RXE-100.
4. Using an RXE Expansion cable, connect RXE Expansion Port B on the secondary server to the RXE Expansion Port B on the RXE-100.
5. Go to “16-way configuration” on page 71 in the ″RXE Management Port cabling″ section and complete that procedure.

RXE Management Port cabling

Your server has one RXE Management Port located on the back of the server. Use this port to connect the server to the management port of an optional remote I/O enclosure. This port is used to manage the PCI-X slots in a remote I/O enclosure, including slot assignments and managing access. For details about how the server and remote I/O enclosure work together, see the documentation that comes with the enclosure.

One server

Complete the following steps to cable the RXE Management Port on the server to a remote I/O enclosure RXE Management Port.

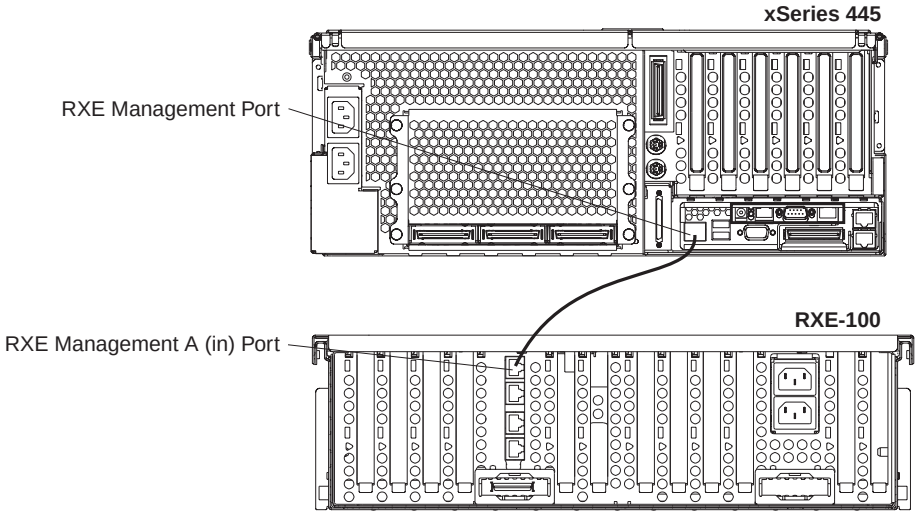


Figure 69. Cabling RXE Management Port - one server

1. Using an RXE Management cable, connect one end of the cable to the RXE Management Port on the server.
2. Connect the opposite end of the cable to the RXE Management A (in) Port on the remote I/O enclosure. The RXE Management Port cabling is the same for a server with two SMP Expansion Modules
3. Connect all remaining external cables to the servers; then, go to ″Creating a scalable partition″ in the *User's Guide* on the IBM *xSeries Documentation* CD and follow the instructions for creating a scalable partition.

Two stand-alone servers

Complete the following steps to cable the RXE Management Ports of two stand-alone servers to a remote I/O enclosure RXE Management Port.

Note: The configuration shown in the following illustration is two 8-way servers that are independent of each other. Notice that there are no interconnecting cables between the two servers.

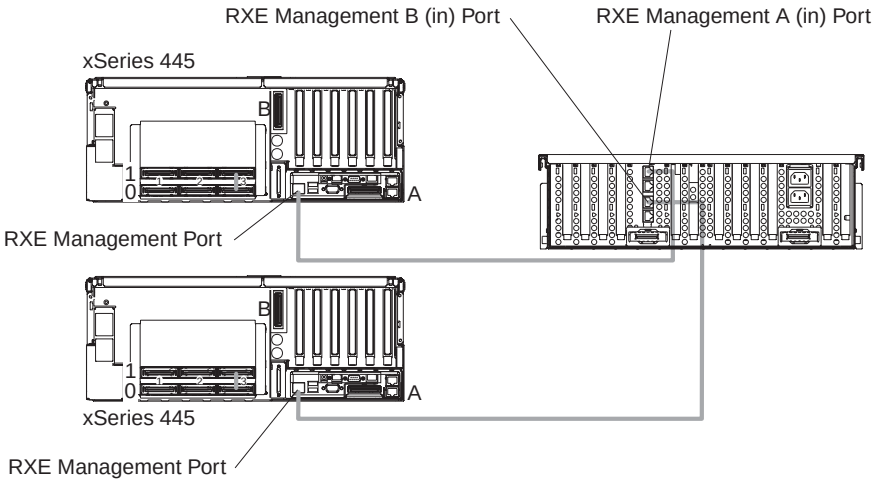


Figure 70. Cabling an RXE Management port - two stand-alone servers

1. Using an RXE Management cable, connect one end of the cable to the RXE Management Port on one of the servers.
2. Connect the opposite end of the cable to the RXE Management A (in) Port on the remote I/O enclosure. The RXE Management Port cabling is the same for a server with two SMP Expansion Modules.
3. Repeat steps 1 and 2 for the second server.
4. Connect all remaining external cables to the servers; then, go to ″Creating a scalable partition″ in the *User's Guide* on the IBM *xSeries Documentation* CD and follow the instructions for creating a scalable partition.

16-way configuration

Complete the following steps to connect an IBM RXE-100 Remote Expansion Enclosure to a 16-way configuration.

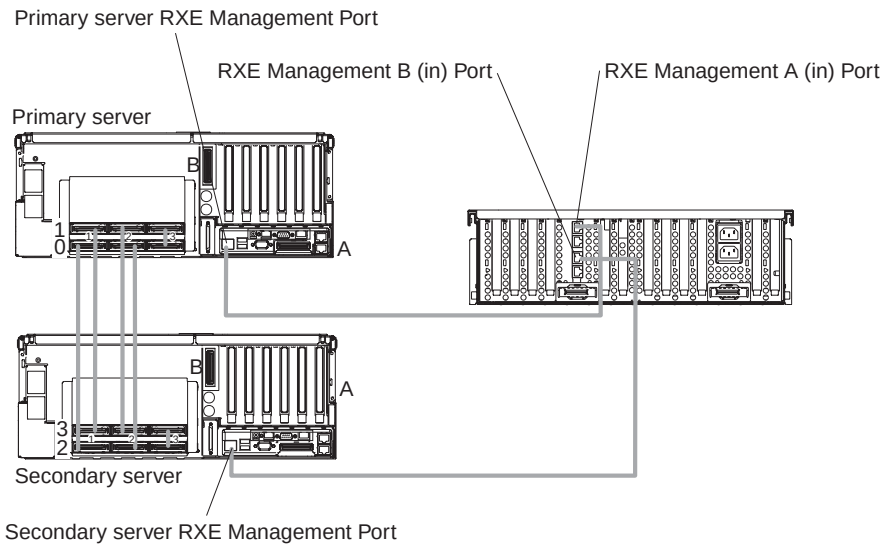


Figure 71. Cabling an RXE Management Port - 16-way configuration

1. Using an RXE Management cable, connect the RXE Management Port on the primary server to RXE Management Port A (in) on the RXE-100.
2. Using an RXE Management cable, connect the RXE Management Port on the secondary server to the RXE Management Port B (in) on the RXE-100.
3. Connect all remaining external cables to the servers; then, go to ″Creating a scalable partition″ in the *User's Guide* on the IBM *xSeries Documentation* CD and follow the instructions for creating a scalable partition.

Power cabling

Your server uses two power cords that can be connected to a primary power unit inside the rack cabinet, such as a properly grounded power distribution unit or uninterruptible power supply, or to an external source, such as a properly grounded electrical outlet.

Complete the following steps to attach the power-supply cords:

1. Connect a power-supply cord to one of the system power connectors on the rear of the server.
2. Connect the other end of the power-supply cord to a properly grounded electrical outlet or a primary power unit inside the rack cabinet.

   Note: Connecting the power-supply cords to an electrical outlet might cause the server to start automatically. This is an acceptable action. See ″Turning on the server″ in the *User's Guide* on the IBM *xSeries Documentation* CD for detailed information about turning on the server.
3. Repeat steps 1 and 2 for the second cable.

   Note: The xSeries 445 server requires a 220 V power connection for full power-supply redundancy. Whenever possible, use a 220 V connection for all configurations. However, you can use a 110 V connection, but without power-supply redundancy.

SCSI cabling

Your server has one SCSI connector located on the back of the server. Use this connector to connect the server to an optional SCSI device such as one of the IBM FAStT series of extended enclosures. For detailed information about this option and how to connect it to your server, see the documentation that comes with the option.

USB cabling

Your server has three USB connectors, one on the front and two on the back of the server. Use these connectors to connect the server to an optional USB device. For detailed information about this USB option and how to connect it to your server, see the documentation that comes with the option.

Video cabling

Your server has one video connector located on the back of the server. Use this connector to connect the server to a monitor or optional console switch. For detailed information about this option and how to connect it to your server, see the documentation that comes with the option.

Mouse cabling

Your server has one mouse connector located on the back of the server. Use this connector to connect a mouse to the server. For detailed information about this option and how to connect it to your server, see the documentation that comes with the option.

Keyboard cabling

Your server has one keyboard connector on the back of the server. Use this port to connect the server to a keyboard or optional console switch. You can also connect a USB keyboard to the server using one of the USB connectors. After installing a USB keyboard, you might need to use the Configuration/Setup Utility program to enable keyboardless operation and prevent the POST error message 301 from being displayed during startup. For detailed information about this option and how to connect it to your server, see the documentation that comes with the option.

Gigabit Ethernet cabling

Your server has two Ethernet connectors on the back of the server. Use these connectors to connect the server to a LAN.

Note: A third Ethernet connector is located on the Remote Supervisor Adapter. This connector is used for specific supervisory functions and should not be confused with the Gigabit Ethernet connector located next to the USB connectors.

Remote Supervisor Adapter cabling

Your server comes with a Remote Supervisor Adapter. For information about cabling the Remote Supervisor Adapter connectors, see the *User's Guide* on the IBM *xSeries Documentation* CD.

Chapter 3. I/O connectors and LEDs

This chapter provides the information about the I/O connectors and indicators on the server.

Your server has the following I/O connectors:

- Universal Serial Bus (USB) connectors
- Keyboard connector
- Video connector
- Auxiliary-device (pointing device) connector
- System management connectors
- RXE Expansion Ports
- SCSI connectors
- SMP Expansion Ports
- Remote Supervisor Adapter connectors
  - One ASM interconnect (peer-to-peer) port (RJ-14)
  - One Ethernet port (remote server management using network, RJ-45)
  - One management port (remote server management using modem)
- Ethernet connectors

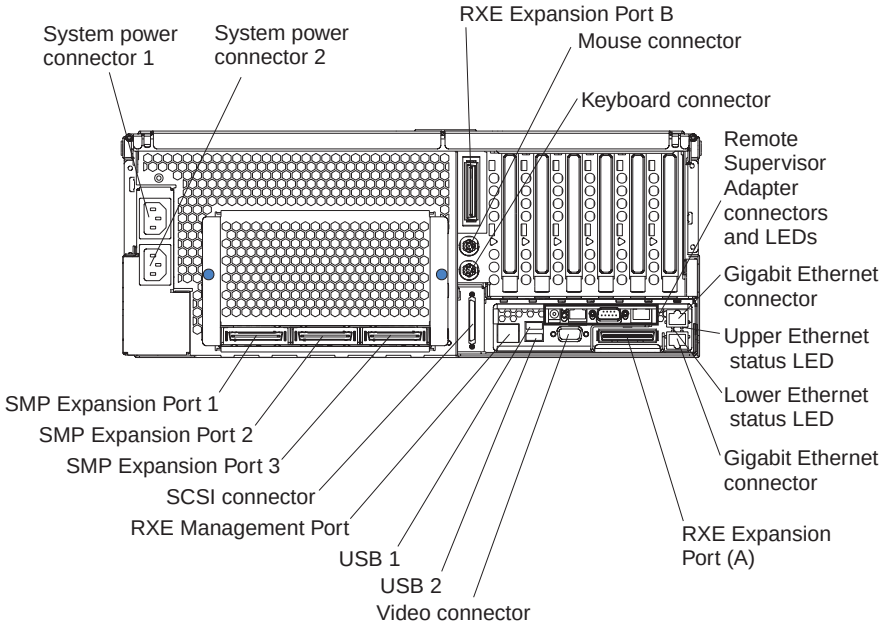


Figure 72. Rear view of xSeries 445

Universal Serial Bus connectors

Your server has three Universal Serial Bus (USB) connectors, which are configured automatically. USB is a serial interface standard for telephony and multimedia devices. It uses Plug and Play technology to determine the type of device attached to the connector.

USB cables and hubs

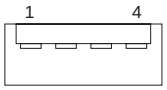
You need a 4-pin cable to connect devices to USB 1, USB 2, and USB 3. If you plan to attach more than three USB devices, you must use a hub to connect the devices. The hub provides multiple connectors for attaching additional external USB devices.

USB technology provides up to 12 Mbps speed with a maximum of 127 external devices and a maximum signal distance of 5 meters (16 ft) per segment.

USB-port connectors

There are two USB-port connectors on the rear of the server and one USB-port connector on the front. These USB-port connectors are used to attach USB compatible devices to the server.

The following illustration shows the pin-number assignments for the USB-port connectors on your server.

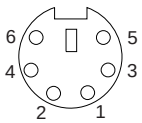


Keyboard connector

There is one keyboard connector on the rear of the server.

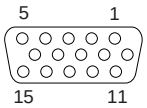
Note: If you attach a standard keyboard to the keyboard connector, the USB connectors and devices will be disabled during the power-on self-test (POST).

The following illustration shows the pin-number assignments for the keyboard connector on the end of the cable.



Video connector

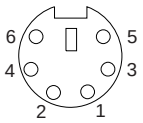
The following illustration shows the pin-number assignments for the 15-pin analog video connector on the rear of the server.



Auxiliary-device (pointing device) connector

There is one auxiliary-device connector that supports a mouse or other pointing device located on the rear of the server just under the keyboard connector.

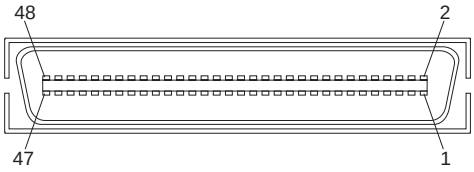
The following illustration shows the pin-number assignments for the auxiliary-device connector on the end of the cable.



RXE Expansion Port

There are two RXE Expansion Ports that are used to connect your server to a remote I/O enclosure.

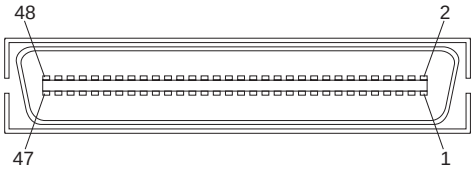
The following illustration shows the pin-number assignments for the RXE Expansion Port on the end of the cable.



SMP Expansion Port

There are up to six SMP Expansion Ports that are used to interconnect the SMP Modules in your server.

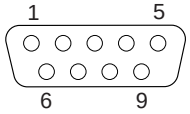
The following illustration shows the pin-number assignments for the SMP Expansion Port on the end of the cable.



Serial Port

The serial port comes with your server in the same box which contained this publication and other components.

The following illustration shows the pin-number assignments for the serial port.



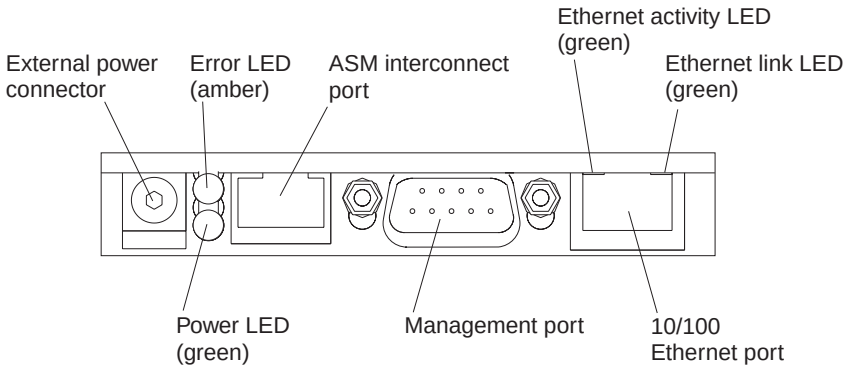
Remote Supervisor Adapter communication connectors

The server has four communication connectors that are used by the Remote Supervisor Adapter. Three of the connectors are located on the adapter and one is located at the lower left corner of the rear panel (as viewed from the rear).

If you want to use the Remote Supervisor Adapter to manage the server remotely or to connect the server to another server, connect the appropriate cables to the Remote Supervisor Adapter connectors.

To enable remote server management through a network, use the Remote Supervisor Adapter Ethernet port (RJ-45). To enable remote server management using a modem, use the Remote Supervisor Adapter management port. To connect the server with another server, use the ASM interconnect port (RJ-14). See the Remote Supervisor Adapter documentation on the *IBM Documentation* CD for more information.

The following illustration shows the communication connectors on the Remote Supervisor Adapter.



External power connector
This connector provides power to the Remote Supervisor Adapter, independent of the server power supply.

Note: This connector is not supported on this server.

Error LED
The amber Error LED indicates an error on the Remote Supervisor Adapter.

Advanced System Management (ASM) interconnect port
Attach an ASM Interconnect module (which comes with the server) to this port to connect the Remote Supervisor Adapter to the other devices on the ASM Interconnect network.

Ethernet activity LED
This green light, located on the left of the Ethernet port, lights when there is activity on the Ethernet LAN connected to the Ethernet port.

Ethernet link LED
This green light, located on the right of the Ethernet port, lights when there is an active link connection on the Ethernet controller for the Ethernet port.

10/100 Ethernet port
Connect a category 3 or category 5 Ethernet cable to this port to enable a

LAN connection or TELNET session. The Ethernet port LEDs on the Remote Supervisor Adapter indicate the link is good and activity is taking place on the network.

Management port

Connect a serial cable to this port to enable system management through a modem, or connect a null modem cable to enable system management through a workstation or laptop computer.

Power LEDs

The green power LED indicates the status of the power connection.

Gigabit Ethernet port

Your server comes with an integrated Gigabit Ethernet controller. This controller provides an interface for connecting to 10-Mbps, 100-Mbps, or 1000-Mbps networks and provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN).

To access the Ethernet port, connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to the RJ-45 connector on the rear of your server.

Note: The 100BASE-TX/1000BASE-T Fast Ethernet standard requires that the cabling in the network be Category 5 or higher.

The Ethernet (RJ-45) connector has two lights. The upper Ethernet status LED is on the right and displays the link and activity status for the upper Gigabit Ethernet port. When the LED is green the link is active. When the LED blinks green and amber there is activity on the Ethernet LAN. The lower Ethernet status LED is on the left and displays the link and activity status for the lower Gigabit Ethernet port. When the LED is green the link is active. When the LED blinks green and amber there is activity on the Ethernet LAN. See the *User's Guide* on the *IBM Documentation* CD.

Configuring the Gigabit Ethernet controller

The server comes with an integrated Ethernet controller. This controller provides an interface for connecting to 10-Mbps, 100-Mbps, or 1000-Mbps networks and provides full duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN).

When you connect your server to the network, the Ethernet controller automatically detects the data-transfer rate (10-Mbps, 100-Mbps, or 1000-Mbps) on the network and then sets the controller to operate at the appropriate rate. In addition, if the Ethernet ports that your server is connected to support auto-negotiation, the Gigabit Ethernet controller will set the appropriate duplex state. That is, the Ethernet controller will adjust to the network data rate, whether the data rate is standard Ethernet (10BASE-T), Fast Ethernet (100BASE-TX/1000BASE-T), half duplex (HDX), or full duplex (FDX). The controller supports half-duplex (HDX) and full-duplex (FDX) modes at both speeds.

Note: See the documentation on the *Broadcom NetXtreme Gigabit Ethernet Software* CD that came with your server for information about configuring the Ethernet controller.

Ethernet port connectors

The following illustration shows the dual Ethernet port RJ-45 connectors.

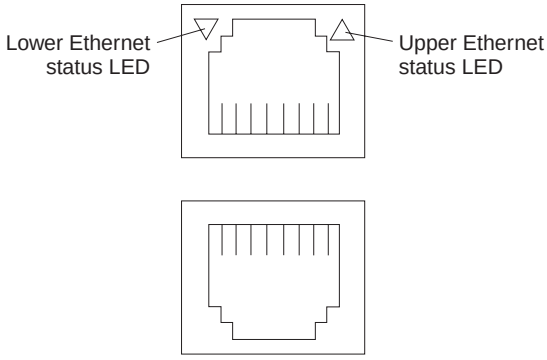


Figure 73. Gigabit Ethernet port

Appendix. Getting help and technical assistance

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

Before you call

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

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM Support Web site at http://www.ibm.com/pc/support/ to check for technical information, hints, tips, and new device drivers.
- Use an IBM discussion forum on the IBM Web site to ask questions.

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

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, readme files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/pc/support/ and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is http://www.ibm.com/eserver/xseries/. The address for IBM IntelliStation information is http://www.ibm.com/pc/intellistation/.

You can find service information for your IBM products, including supported options, at http://www.ibm.com/pc/support/.

Software service and support

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

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

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to http://www.ibm.com/planetwide/ for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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

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