IBM System x3500 Type 7977

# User's Guide

IBM

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# User's Guide

**Note:** Before using this information and the product it supports, read the general information in "Notices," on page 73 and the *Warranty and Support Information* document on the IBM *System x Documentation* CD.

# 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.

**Important:**

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

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

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

**Statement 1:**



**DANGER**

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**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.**

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

**Statement 2:**



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

*Do not:*
- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

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

**Statement 3:**



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

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

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



**DANGER**

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

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



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

**Statement 4:**

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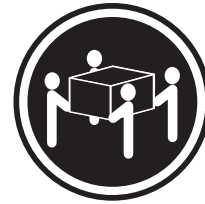
**CAUTION:**
**Use safe practices when lifting.**

**Statement 5:**

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

2

1

**Statement 8:**



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



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

**Statement 11:**



**CAUTION:**
**The following label indicates sharp edges, corners, or joints nearby.**



**Statement 17:**



**CAUTION:**
**The following label indicates moving parts nearby.**



**Attention:** This product is suitable for use on an IT power distribution system whose maximum phase to phase voltage is 240 V under any distribution fault condition.

**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. The System x3500 server

The IBM® System x3500 Type 7977 server is a 5-U[1]-high high performance server. It can be upgraded to a symmetric multiprocessing (SMP) server through a microprocessor upgrade. It is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and large amounts of reliable data storage.

Performance, ease of use, reliability, and expansion capabilities were key considerations in the design of the server. These design features make it possible for you to customize the system hardware to meet your needs today and provide flexible expansion capabilities for the future.

The server comes with a limited warranty. For information about the terms of the warranty and getting service and assistance, see the *Warranty and Support Information* document.

The server contains IBM Enterprise X-Architecture technologies, which help increase performance and reliability. For more information, see "What your server offers" on page 4 and "Reliability, availability, and serviceability" on page 5.

You can obtain up-to-date information about the server and other IBM server products at http://www.ibm.com/eserver/xseries/.

## Related documentation

This *User's Guide* contains general information about the server, including how to install supported options and how to configure the server. The following documentation also comes with the server:

- *Installation Guide*

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

- *Warranty and Support Information*

  This document is in Portable Document Format (PDF) on the IBM *System x Documentation* CD. It contains information about the terms of the warranty and getting service and assistance.

- *Safety Information*

  This document is in PDF on the IBM *System x Documentation* CD. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Problem Determination and Service Guide*

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

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

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1. Racks are measured in vertical increments of 4.45 cm (1.75 inches) each. Each increment is called a ″U.″ A 1-U-high device is 1.75 inches tall.

The server might have features that are not described in the documentation that comes with the server. The documentation might be updated occasionally to include information about those features, or technical updates might be available to provide additional information that is not included in the server documentation. These updates are available from the IBM Web site. To check for updated documentation and technical updates, complete the following steps.

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

1. Go to http://www.ibm.com/support/.
2. Under **Search technical support**, type `System x3500`, and click **Search**.

## Notices and statements in this document

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

The following notices and statements are used in this document:

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

# Features and specifications

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

*Table 1. Features and specifications*

**Microprocessor:**
- Intel® Xeon™ dual-core or two Clovertown quad-core with 4096 KB (minimum) Level-2 cache
  **Important:** Do not mix dual-core and quad-core processors in the same system.
- Support for up to two microprocessors
- Support for Intel Extended Memory 64 Technology (EM64T)

**Note:** Use the Configuration/Setup Utility program to determine the type and speed of the microprocessors.

**Memory:**
- Minimum: 1 GB depending on server model, expandable to 48 GB
- Type: 667 MHz, PC2-5300, ECC Fully Buffered DIMMs (FBD) with double data rate (DDR) II, SDRAM
- Connectors: Twelve 240-pin dual inline memory module (DIMM) connectors

**Drives:**
- IDE:
  - DVD (standard)
  - CD, CD-RW, DVD/CD-RW (optional)
  - Maximum of two devices can be installed
- Diskette (optional): External USB 1.44 MB
- Supported hard disk drives:
  - Serial Attached SCSI (SAS)
  - Serial Advanced Technology Attachment (SATA)

**Expansion bays:**
- Eight hot-swap SAS, 3.5-inch bays
- Three half-high 5.25-inch bays (DVD drive installed)
  **Note:** Full-high devices such as an optional tape drive will occupy two half-high 5.25-inch bays.

**PCI and PCI-X expansion slots:**
- Six PCI expansion slots
  - Three PCI Express x8 (two x8 links and one x4 link)
  - One PCI 33 MHz/32-bit
  - Two PCI-X 2.0 133 MHz/64-bit slots

**Upgradeable microcode:**
System BIOS, service processor, BMC, and SAS microcode

**Power supply:**
**Note:** To upgrade to two 835-watt hot-swap power supplies, install the redundant power and cooling option kit. Kit includes one 835-watt power-supply and three hot-swap fans.
- Standard: One 835-watt 110 V or 240 V ac input dual-rated power supply
- Upgradeable to two 835-watt hot-swap power supplies

**Hot-swap fans:**
- Three (standard)
- Upgradeable to six fans (for redundant cooling)

**Note:** To upgrade to redundant cooling, install the redundant power and cooling option kit. Kit includes one 835-watt hot-swap power-supply and three hot-swap fans.

**Size:**
- Tower
  - Height: 440 mm (17.3 in.)
  - Depth: 747 mm (29.4 in.)
  - Width: 218 mm (8.6 in.)
  - Weight: approximately 38 kg (84 lb) when fully configured or 20 kg (42 lb) minimum
- Rack
  - 5 U
  - Height: 218 mm (8.6 in.)
  - Depth: 696 mm (27.4 in.)
  - Width: 424 mm (16.7 in.)
  - Weight: approximately 34 kg (75 lb) when fully configured or 20 kg (42 lb) minimum

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

**Integrated functions:**
- Baseboard management controller (Intelligent Platform Management Interface (IPMI) 2.0 compliant)
- Service processor support for Remote Supervisor Adapter II SlimLine
- Light path diagnostics
- ServeRAID-8k SAS Controller, 512 MB with battery backup, that supports RAID levels 0, 1, 1E, 5, 6, and 10
- Four Universal Serial Bus (USB) ports (2.0)
  - Two on rear of server
  - Two on front of server
- Broadcom 5721 and 5721KFB3 10/100/1000 Gigabit Ethernet controllers
- ATI PCI ES1000 video
  - 16 MB video memory
  - VGA and SVGA compatible
- ATA-100 single-channel IDE controller (bus mastering)
- Vitesse VSC7250 SAS/SATA RAID controller
- Mouse connector
- Keyboard connector
- Serial connector

**Acoustical noise emissions:**
- Sound power, idle: 5.5 bel declared
- Sound power, operating: 6.0 bel declared

**Environment:**
- Air temperature:
  - Server on: 10° to 35°C (50.0° to 95.0°F); altitude: 0 to 2134 m (7000 ft)
  - Server off: -40° to 60°C (-40.0° to 140.4°F); maximum altitude: 2134 m (7000 ft)
- Humidity:
  - Server on: 8% to 80%
  - Server off: 8% to 80%

**Heat output:**

Approximate heat output in British thermal units (Btu) per hour:
- Minimum configuration: 2013 Btu (590 watts per hour)
- Maximum configuration: 2951 Btu (865 watts per hour)

**Electrical input:**
- Sine-wave input (50-60 Hz) required
- Input voltage low range:
  - Minimum: 100 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 200 V ac
  - Maximum: 240 V ac
- Approximate input kilovolt-amperes (kVA):
  - Minimum: 0.60 kVA
  - Maximum: 0.88 kVA

**Notes:**

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

2. These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate.

# What your server offers

The server uses the following features and technologies:

- **Baseboard management controller**

  The baseboard management controller provides basic service-processor environmental monitoring functions. If an environmental condition exceeds a threshold or if a system component fails, the baseboard management controller lights LEDs to help you diagnose the problem.

- *Device Driver and IBM Enhanced Diagnostics* **CD**

  The server comes with a *Device Driver and IBM Enhanced Diagnostics* CD, which you can use to diagnose problems.

- **IBM Director**

  IBM Director is a workgroup-hardware-management tool that you can use to centrally manage System x® servers. For more information, see the IBM Director documentation on the *IBM Director* CD.

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

  The *ServerGuide Setup and Installation* CD that comes with the server provides programs to help you set up the server and install a Windows operating system. The ServerGuide program detects installed hardware options and provides the correct configuration programs and device drivers. For more information about the *ServerGuide Setup and Installation* CD, see "Using the ServerGuide Setup and Installation CD" on page 51.

- **Integrated network support**

  The server comes with two integrated Broadcom 5721 series Gigabit Ethernet controllers, which supports connection to a 10-Mbps, 100-Mbps, or 1000-Mbps network. For more information, see "Configuring the Broadcom Gigabit Ethernet controller" on page 66.

- **Intelligent Platform Management Interface (IPMI) 2.0**

  IPMI 2.0 support providing secure remote power on/power off and several standard alerts for components such as fans, voltage, and temperature.

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

  The server supports up to eight 25.4-mm (1-inch) slim-high, 3.5-inch hot-swap hard disk drives in the hot-swap bays. With the hot-swap feature, you can add, remove, or replace hard disk drives without turning off the server.

- **Large system-memory capacity**

  The server supports up to 48 GB of system memory. The memory controller supports error correcting code (ECC) for up to 12 single-sided industry-standard PC-5300, 677 megahertz (MHz), 1.8 V, 240-pin, fully buffered, double-data-rate (DDR) II, synchronous dynamic random access memory (SDRAM) dual inline memory modules (DIMMs).

- **Light path diagnostics**

  Light path diagnostics provides LEDs to help you diagnose problems. For more information, see the section about light path diagnostics in the *Problem Determination and Service Guide* on the *IBM System x Documentatio*n CD.

- **Memory mirroring**

  Memory mirroring replicates and stores data in DIMMs within two branches simultaneously. To support memory mirroring, you must have at least two pairs of DIMMs installed (a pair in each branch). Pairs of DIMMs that are next to each other (for example, DIMM slot 1 and DIMM slot 4) within the channels of the same branch must be identical pairs of full-buffered, dual inline memory modules (DIMMs).

- **Online-spare memory**

  Online-spare memory disables a failed rank pair of DIMMs from the system configuration and activates an online-spare rank pair of DIMMs to replace the failed rank pair of DIMMs. For an online-spare pair of DIMMs to be activated, you must enable this feature and have installed an additional pair of DIMMs of the same speed, type, size (or larger), and technology as the failed pair of DIMMs. For more information, see

- **PCI-X adapter capabilities**

  The server has two slots for PCI-X 64-bit adapters.

- **PCI Express x4 adapter capabilities**

  The server has one slot for PCI Express x4 adapters. These slots accept x8 adapters, but the adapters will operate as x4 adapters.

- **PCI Express x8 adapter capabilities**

  The server has two slots for PCI Express x8 adapters.

- **Redundant cooling and power capabilities**

  The server supports up to two 835-watt hot-swap power supplies. If the server comes with only one power supply, you can install an additional power supply with three redundant hot-swap cooling fans to add redundant power and cooling capabilities. If the maximum load on the server is less than 835 watts and a problem occurs with one of the power supplies, the other power supply can meet the power requirements. The redundant cooling of the fans enables continued operation if one of the fans fails.

- **ServeRAID™ support**

  The server supports ServeRAID adapters to create redundant array of independent disks (RAID) configurations.

- **Symmetric multiprocessing (SMP)**

  The server supports up to two Intel Xeon dual core microprocessors. If the server comes with only one microprocessor, you can install an additional microprocessor to enhance performance and provide SMP capability.

- **Systems-management capabilities**

  The server comes with a Remote Supervisor Adapter II SlimLine, which provides service-processor functions in addition to those that the baseboard management controller provides. When this adapter is used with the systems-management software that comes with the server, you can manage the functions of the server locally and remotely. The Remote Supervisor Adapter II SlimLine also provides system monitoring, event recording, and dial-out alert capability.

## Reliability, availability, and serviceability

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

The server has the following RAS features:
- 3-year parts, 3-year labor limited warranty
- Advanced Configuration and Power Interface (ACPI)
- Advanced Desktop Management Interface (DMI) features
- Automatic error retry or recovery
- Automatic memory downsizing on error detection
- Automatic restart on nonmaskable interrupt (NMI)

- Automatic Server Restart (ASR) logic supporting a system restart when the operating system becomes unresponsive
- Automatic server restart after a power failure, based on the BIOS setting
- Availability of microcode level
- Boot-block recovery
- Built-in, menu-driven setup, system configuration, and redundant array of independent disks (RAID) configuration
- Built-in monitoring for fan, power, temperature, and voltage
- CD-based diagnostic programs
- Cooling fans with speed-sensing capability
- Customer support center that is available 24 hours a day, 7 days a week[2]
- Diagnostic support of ServeRAID adapters
- Error codes and messages
- Error correcting code (ECC) double-data-rate (DDR) synchronous dynamic random access memory (SDRAM) with serial presence detect (SPD)
- Error logging of POST failures
- Hot-swap SAS hard disk drives
- Integrated Ethernet controllers
- Intelligent Platform Management Interface (IPMI) 2.0
- Support for the optional IBM Remote Supervisor Adapter II
- Key-lock support for physical security
- Memory change messages posted to the error log
- Power-on self-test (POST)
- Predictive Failure Analysis® (PFA) alerts
- Read-only memory (ROM) checksums
- Redundant Ethernet capabilities (requires an optional Ethernet adapter) with failover support
- Standby voltage for system-management features and monitoring
- System auto-configuring from the configuration menu
- System-error LED on the front bezel and diagnostics LEDs on the system board
- Upgradeable microcode for POST, BIOS, and read-only memory (ROM) resident code, locally or over a LAN
- Vital product data (VPD); includes serial-number information and replacement part numbers, stored in nonvolatile memory, for easier remote maintenance
- Wake on LAN® capability

# IBM Director

With IBM Director, a network administrator can perform the following tasks:
- View the hardware configuration of remote systems, in detail
- Monitor the usage and performance of critical components, such as microprocessors, disks, and memory
- Centrally manage individual or large groups of IBM and non-IBM Intel-processor-based servers, desktop computers, workstations, and mobile computers on a variety of platforms

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2. Service availability will vary by country. Response time varies; may exclude holidays.

IBM Director provides a comprehensive entry-level workgroup hardware manager. It includes the following key features:

- Advanced self-management capabilities for maximum system availability.
- Multiple operating-system platform support, including Microsoft® Windows® 2000 Server, Windows XP Professional, Red Hat Linux, SUSE Linux, and Novell NetWare. For a complete list of operating systems that support IBM Director, see the IBM Director Compatibility Document. This document is in Portable Document Format (PDF) at http://www.ibm.com/pc/support/site.wss/ document.do?Indocid=MIGR-61788. It is updated every 6 to 8 weeks.
- Support for IBM and non-IBM servers, desktop computers, workstations, and mobile computers.
- Support for systems-management industry standards.
- Integration into leading workgroup and enterprise systems-management environments.
- Ease of use, training, and setup.

IBM Director also provides an extensible platform that supports advanced server tools that are designed to reduce the total cost of managing and supporting networked systems. By deploying IBM Director, you can achieve reductions in ownership costs through the following benefits:

- Reduced downtime
- Increased productivity of IT personnel and users
- Reduced service and support costs

For more information about IBM Director, see the documentation on the *IBM Director* CD that comes with the server, the IBM Director Information Center at http://publib.boulder.ibm.com/infocenter/eserver/v1r2/topic/diricinfo/ fqm0_main.htm, and the IBM System x Systems Management Web page at http://www.ibm.com/ servers/eserver/xseries/systems_management/, which presents an overview of IBM Systems Management and IBM Director.

## The Update*Xpress* program

The Update*Xpress* program is available for most System x servers and server options. It detects supported and installed device drivers and firmware in the server and installs available updates. You can download the Update*Xpress* program from the Web at no additional cost, or you can purchase it on a CD. To download the program or purchase the CD, go to http://www.ibm.com/servers/eserver/xseries/systems_management /ibm_director/extensions/xpress.html.

# Front view

The following illustration shows the controls and LEDs on the front of the server.

**Note:** The front bezel door is not shown so that the drive bays are visible.
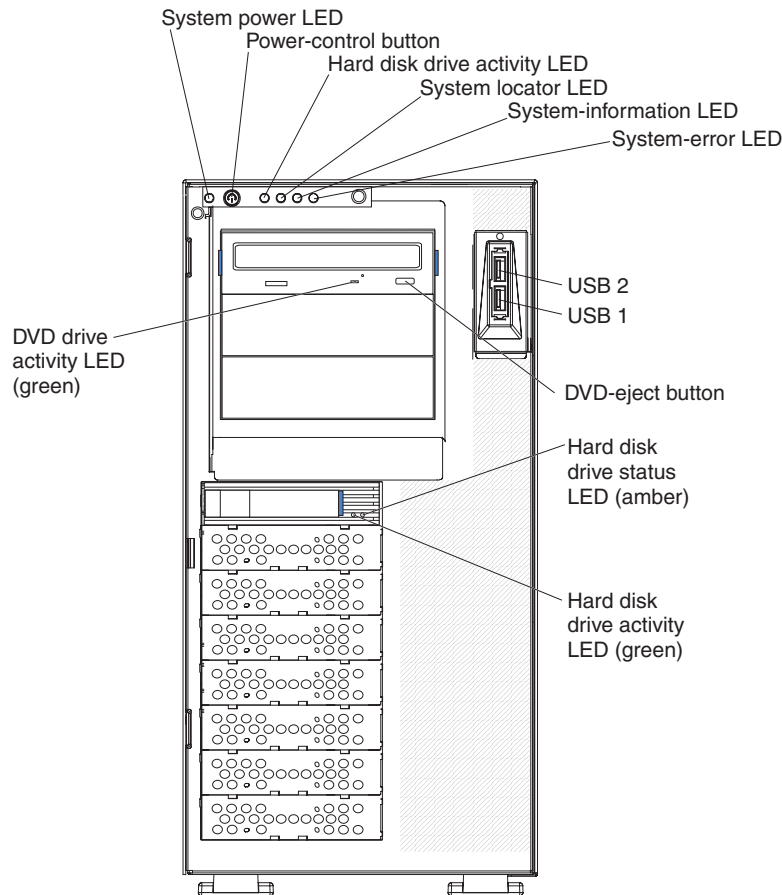


**System Power-on LED:** When this LED is lit and not flashing, it indicates that the server is turned on. When this LED is flashing, it indicates that the server is turned off and still connected to an ac power source. When this LED is off, it indicates that ac power is not present, or the power supply or the LED itself has failed. A power LED is also on the rear of the server.

**Power-control button:** Press this button to turn the server on and off manually. A power-control-button shield comes with the server. You can install this disk-shaped shield to prevent the server from being turned off accidentally.

**Hard disk drive activity LED:** When this LED is flashing, it indicates that a hard disk drive is in use.

**System locator LED:** Use this LED to visually locate the server among other servers. You can use IBM Director to light this LED remotely.

**System-information LED:** When this amber LED is on, the server power supplies are nonredundant, or some other noncritical event has occurred. The event is recorded in the error log. Check the light path diagnostic panel for more information (see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD).

**System-error LED:** When this amber LED is lit, it indicates that a system error has occurred. Use the diagnostic LED panel and the system service label on the inside of the left-side cover to further isolate the error. See the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for additional information.

**USB 1 connector:** Connect a USB devices to these connectors.

**USB 2 connector:** Connect a USB devices to these connectors.

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

**Hard disk drive status LED:** When this LED is lit, it indicates that the associated hard disk drive has failed. If an optional RAID adapter is installed in the server and the LED flashes slowly (one flash per second), the drive is being rebuilt. If the LED flashes rapidly (three flashes per second), the controller is identifying the drive.

**Hard disk drive activity LED:** When this LED is flashing, it indicates that the drive is in use.

**Hard disk drive status LED:** On some server models, each hot-swap hard disk drive has a status LED. When this LED is lit, it indicates that the drive has failed. If an optional IBM ServeRAID controller is installed in the server, when this LED is flashing slowly (one flash per second), it 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.

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

# Rear view

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

Power cord

Mouse

Keyboard

Serial 1
(COM 1)

Parallel

Video

USB 4

Ethernet 10/100/1000

USB 3

Ethernet 10/100/1000

RJ-45
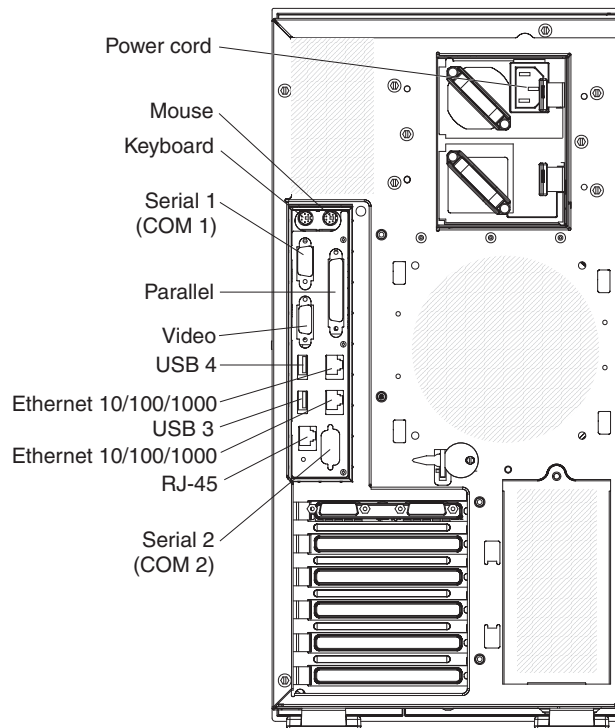
Serial 2
(COM 2)

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

**Mouse connector:** Connect a mouse or other PS/2 device to this connector.

**Keyboard connector:** Connect a PS/2 keyboard to this connector.

**COM 1 connector:** Connect a 9-pin serial device to this connector.

**Parallel connector:** Connect a parallel device to this connector.

**Video connector:** Connect a monitor to this connector.

**USB 3 connector:** Connect a USB device to this connector.

**Ethernet connector:** Use this connector to connect the server to a network.

**USB 4 connector:** Connect a USB device to this connector.

**Ethernet connector:** Use this connector to connect the server to a network.

**RJ-45:** Use this connector to connect the optional Remote Supervisor Adapter II
SlimLine to a network.

**COM 2 connector:** Connect a 9-pin serial device to this connector. This connector
can also be redirected in the Configuration/Setup Utility program for use with the
baseboard management controller (BMC) or Remote Supervisor Adapter II SlimLine

to control the server remotely. Do not connect any 9-pin serial devices to this connector when it is configured for use with the BMC or Remote Supervisor Adapter II SlimLine.

## Server power features

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

## Turning on the server

Approximately 20 seconds after the server is connected to ac power, the power-control button becomes active, and one or more fans might start running to provide cooling while the server is connected to power. You can turn on the server and start the operating system by pressing the power-control button.

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

- If a power failure occurs while the server is turned on, the server will restart automatically when power is restored.
- If the server is connected to an Advanced System Management interconnect network that contains at least one server with an optional Remote Supervisor Adapter installed, the server can be turned on from the Remote Supervisor Adapter user interface.
- If your operating system supports the systems-management software for an optional Remote Supervisor Adapter, the systems-management software can turn on the server.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature can turn on the server.

## Turning off the server

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

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

**Statement 5:**

**CAUTION:**
**The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.**
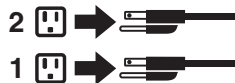
The server can be turned off in any of the following ways:

- You can turn off the server from the operating system, if your operating system supports this feature. After an orderly shutdown of the operating system, the server will be turned off automatically.
- You can press the power-control button to start an orderly shutdown of the operating system and turn off the server, if your operating system supports this feature.
- If the operating system stops functioning, you can press and hold the power-control button for more than 4 seconds to turn off the server.
- If the server is connected to an Advanced System Management interconnect network that contains at least one server with an optional Remote Supervisor Adapter installed, the server can be turned off from the Remote Supervisor Adapter user interface.
- If an optional Remote Supervisor Adapter is installed in the server, the server can be turned off from the Remote Supervisor Adapter user interface.
- The integrated system management processor can turn off the server as an automatic response to a critical system failure.
- You can turn off the server through a request from the service processor.

# Chapter 2. Installing options

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

## Server components

The following illustration shows the major components in the server.

Power supply

Power supply filler

Control panel assembly

Power supply cage

Drive bay EMC shield

DIMM air duct

USB cable assembly

Heat sink retention bracket

DIMMs

DVD drive

Microprocessor

Heatsink

Heat sink filler

SAS backplane

Fan assembly

Hard disk drive EMC shield

Hot-swap fan

Hard disk drive

Processor baffle

System board

Bezel

ServeRAID 8k

VRM

Cover
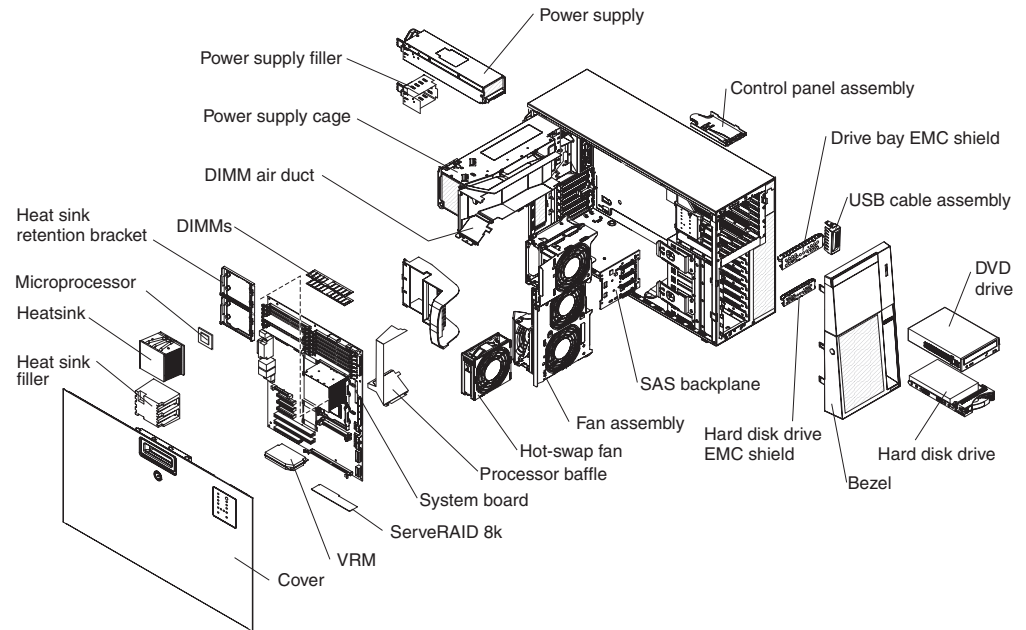
# System-board internal connectors

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

Power 1
Power 2
Power 3
Power switch
Internal USB tape
DIMM 12
DIMM 11
DIMM 6
DIMM 5
DIMM 10
IDE
DIMM 4
DIMM 9
DIMM 3
DIMM 8
DIMM 2
DIMM 7
DIMM 1
Front USB
Rear fan (optional)
Microprocessor 1
SAS 1 power
Remote Supervisor Adapter
SAS 2 power
Microprocessor 2
PCI-E x8 with x8 links slot 1
PCI-E x8 with x8 links slot 2
SAS 1
VRM
PCI-E x8 with x8 links slot 3
SAS 2
Battery
PCI-X slot 4
ServeRAID-8k
PCI-X slot 5
PCI slot 6
Wake-On-LAN
Switch Block 3 (SW3)
Reserved

## System-board switches and LEDs

The following illustration shows the switches and LEDs on the system board.

DIMM
error LEDs
1 thru 12

Microprocessor
mismatch
LED

Slot 1
error LED

Slot 2
error LED

Slot 3
error LED

Slot 4
error LED

Slot 5
error LED

Slot 6
error LED

Microprocessor 1
error LED

Microprocessor 2
error LED

VRM error
LED

Battery error LED

BMC heartbeat
LED

ServeRAID-8k
error LED
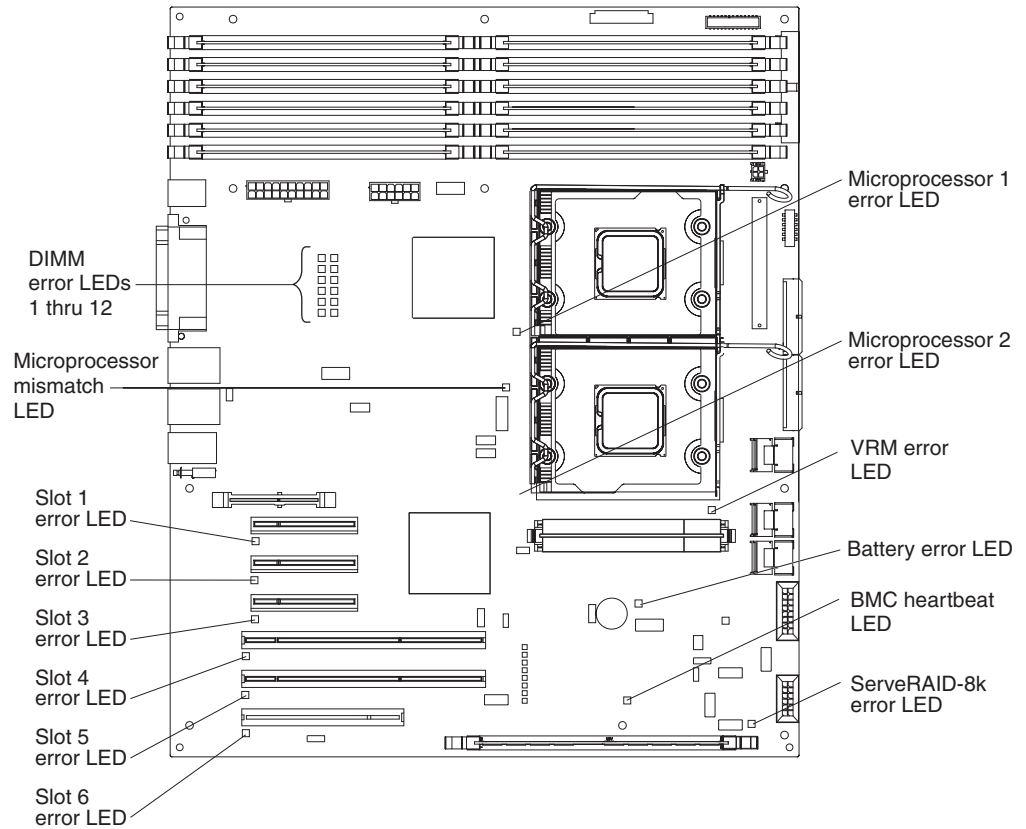
## System-board external connectors

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

Mouse

Keyboard

Serial 1
(COM 1)

LPT

VGA

USB 4

RJ45

USB 3

RJ45

NMI

Serial 2
(COM 2)
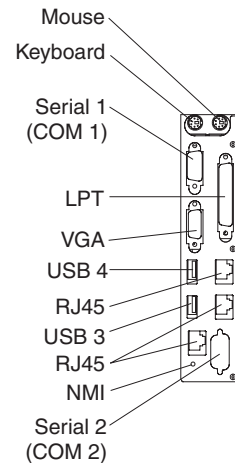
## Light path diagnostics panel

The following illustration shows the remind button and the LEDs on the light path diagnostics panel. The light path diagnostics panel is inside the server under the left-side cover and the error LEDs are also visible through the left-side cover.
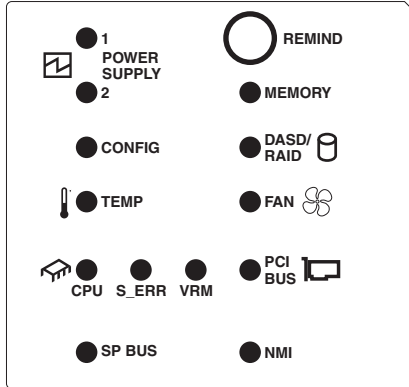
Use the remind button on the light path diagnostic panel to acknowledge that an error has occurred without taking further action. When you push the remind button, the system error LED will flash every 2 seconds until the error is fixed. If another error occurs, the system error LED will then stop flashing and return to a solid on state.

For more information about light path diagnostics, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD.

The following table lists the light path diagnostics LEDs, the problems that they indicate, and actions to solve the problems.

| LED | Problem | Action |
|---|---|---|
| POWER SUPPLY 1 | Lit LED: Power supply 1 has failed. | 1. Remove ac power from the server.<br>2. Replace the power supply; then, reconnect the server to ac power and restart the server. |
| | Flashing LED: Power supply 1 was removed in a redundant power-supply configuration. | Install a new power supply in the PS1 location. |
| POWER SUPPLY 2 | Lit LED: Power supply 2 has failed. | 1. Remove ac power from the server.<br>2. Replace the power supply; then, reconnect the server to ac power and restart the server. |
| | Flashing LED: Power supply 2 was removed in a redundant power supply configuration. | Install a new power supply in the PS2 location. |
| CONFIG | Microprocessor configuration error | • Mismatched microprocessors, remove and install two microprocessor of the same core, cache size, type, and clock speed.<br>• Check the system error log for information indicating incompatible components. |
| TEMP | The system temperature has exceeded a threshold level. | • Determine whether a fan has failed. If it has, replace it.<br>• Make sure that the room temperature is not too high. See "Features and specifications" on page 3 for temperature information.<br>• Make sure that the air vents are not blocked. |
| CPU | A microprocessor has failed. | If a lit LED on the system board indicates a problem with a microprocessor, make sure that the microprocessor is installed correctly. See the *User's Guide* on the IBM *System x Documentation* CD for information about installing a microprocessor. |

| LED | Problem | Action |
|---|---|---|
| S_ERR | Reserved | |
| VRM | The VRM or integrated VRD has failed. | • Remove ac power from the server, and then restart the server.<br>• If the LED next to the VRM is lit, replace the pluggable VRM.<br>• If the LED next to the integrated VRD is lit, call for service. |
| SERVICE PROCESSOR BUS | The service processor has failed. | • Reseat the Remote Supervisor Adapter II SlimLine.<br>• Update the system and Remote Supervisor Adapter II SlimLine firmware.<br>• Remove ac power from the server, and then restart the server. |
| MEMORY | A memory error has occurred. | Replace the failing DIMM, which is indicated by the lit LED on the system board. |
| DASD/RAID | A hard disk drive, integrated SAS controller, or integrated RAID error has occurred.This LED is also lit when a hard disk drive is removed from the server. | • Check the LEDs on the hard disk drives and replace the indicated drive.<br>• Check the LEDs on the system board and replace the indicated component.<br>• If a hard disk drive LED remains lit after being replaced, call for service. |
| FAN | A fan has failed or is operating too slowly. A failing fan can also cause the TEMP LED to be lit. | Replace the failing fan, indicated by the lit LED. |
| PCI BUS | An error has occurred on a PCI bus. | • Check the system error log for information about the error.<br>• If you cannot isolate the failing adapter through the information in the system error log, remove one adapter at a time from the failing PCI bus, and restart the server after each adapter is removed.<br><br>If the problem remains, call for service. |
| NMI | A machine check error has occurred. | Check the error log to diagnose the condition. |

# Installation guidelines

Before you install options, read the following information:

- Read the safety information that begins on page vii and the guidelines in "Handling static-sensitive devices" on page 19. This information will help you work safely.

- When you install your new server, take the opportunity to download and apply the most recent firmware updates. This step will help to ensure that any known issues are addressed and that your server is ready to function at maximum levels of performance. To download firmware updates for your server, go to http://www.ibm.com/support/ and click **Downloads and drivers**.

- Before you install optional hardware, make sure that the server is working correctly. Start the server, and make sure that the operating system starts, if an operating system is installed, or that a 19990305 error code is displayed, indicating that an operating system was not found but the server is otherwise working correctly. If the server is not working correctly, see the *Problem Determination and Service Guide* on the IBM *System x Documentation* CD for information on how to run diagnostics.

- Observe good housekeeping in the area where you are working. Place removed covers and other parts in a safe place.

- If you must start the server while the cover is removed, make sure that no one is near the server and that no tools or other objects have been left inside the server.

- Do not attempt to lift an object that you think is too heavy for you. If you have to lift a heavy object, observe the following precautions:
  - Make sure that you can stand safely without slipping.
  - Distribute the weight of the object equally between your feet.
  - Use a slow lifting force. Never move suddenly or twist when you lift a heavy object.
  - To avoid straining the muscles in your back, lift by standing or by pushing up with your leg muscles.

- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and other devices.

- Back up all important data before you make changes to disk drives.

- Have a small flat-blade screwdriver available.

- You do not have to turn off the server to install or replace hot-swap power supplies, hot-swap hard disk drives, hot-swap fans, or hot-plug Universal Serial Bus (USB) devices.

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

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

- When you have to access the inside of the server, you might find it easier to lay the server on its side.

- You can install a maximum of two IDE devices in the server.

- For a list of supported options for the server, go to http://www.ibm.com/servers/eserver/serverproven/compat/us/.

## System reliability guidelines

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

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

## Working inside the server with the power on

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

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

## Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Wear an electrostatic-discharge wrist strap, if one is available.
- Handle the device carefully, holding it by its edges or its frame.

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

# Removing the bezel

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

The following illustration shows how to remove the bezel from the server.

**Notes:**

1. The left-side cover does not have to be removed to remove the bezel from the server.
2. The left-side cover lock must be unlocked to open or remove the bezel.



Complete the following steps to remove the bezel:

1. Read the safety information beginning on page v and "Installation guidelines" on page 18.

2. Using the supplied key, unlock the left-side cover and bezel.

3. Press on the bezels left edge, and rotate the left side of the bezel away from the server. Rotate the left edge of the bezel out beyond 90°; then, pull the bezel away from the server.
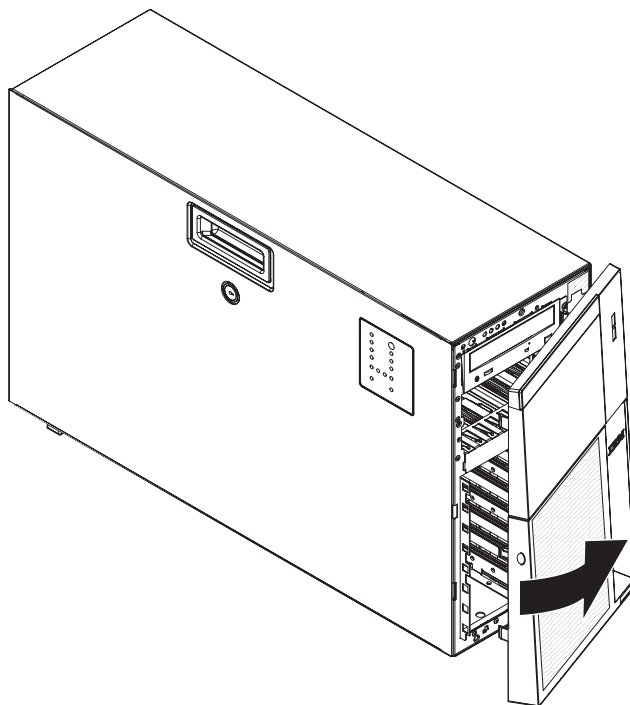
## Removing the left-side cover

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



Cover release latch
Lock
Left-side cover
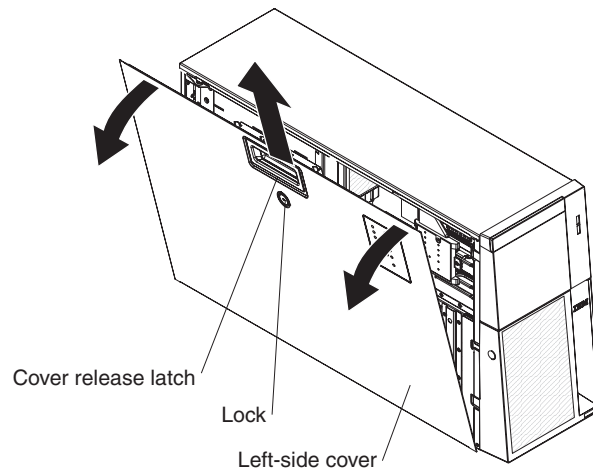
To remove the cover, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.

2. Turn off the server and all attached devices.

3. Disconnect all external cables and power cords.

4. Using the supplied key, unlock the left-side cover.

5. Pull the cover-release latch down and rotate the top edge of the cover away from the server.

   **Attention:** For proper cooling and airflow, replace the cover before turning on the server. Operating the server for extended periods of time (more than 30 minutes) with the cover removed might damage server components.

6. Remove the left-side cover from the server.

## Installing an adapter

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

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions in this section. If you must change the switch or jumper settings on the adapter, follow the instructions that come with the adapter.

- Avoid touching the components and gold-edge connectors on the adapter.

- PCI slot 6 supports half-length 5.0 V PCI adapters only.

- PCI slot 1 supports half-length 3.3V PCI adapters only.
- PCI slots 2 through 5 support full-length 3.3 V signaling adapters only.
- The PCI configuration:
  - Slot 1 is a PCI-Express x8 slot with x4 links, PCI Express 1.0a compliant.
  - Slot 2 and 3 are PCI-Express x8 slots with x8 links, PCI Express 1.0a compliant.
  - Slots 4 and 5 are PCI-X 133/64 slots, PCI-X 2.0 compliant.
  - Slot 6 is a PCI 33/32 slot, PCI 2.2 compliant.

  **Note:** The ServeRAID-8k SAS Controller overrides the standard functionality of the integrated SAS/SATA controller with RAID capabilities.
- The system scans PCI slots 1 through 6 to assign system resources. The system then starts (boots) the system devices in the following order, if you have not changed the default boot precedence: integrated Ethernet controller, ServeRAID-8k SAS Controller, and then PCI, PCI-X, and PCI-Express slots.

  **Note:** To change the boot precedence for PCI and PCI-X devices, start the Configuration/Setup Utility program and select **Start Options** from the main menu. See the "Using the Configuration/Setup Utility program" on page 46 for details about using the Configuration/Setup Utility program.
- The server uses a rotational interrupt technique to configure PCI adapters so that you can install PCI adapters that do not support sharing of PCI interrupts.

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

To install an adapter, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables. Remove the left-side cover.
3. See the documentation that comes with the adapter for any cabling instructions and information about jumper or switch settings. (It might be easier for you to route cables before you install the adapter.)
4. Open the front and rear adapter retention clips.
5. Remove the expansion-slot cover.

Retention clip

Rear adapter
retention bracket

Adapter

Front adapter
retention bracket
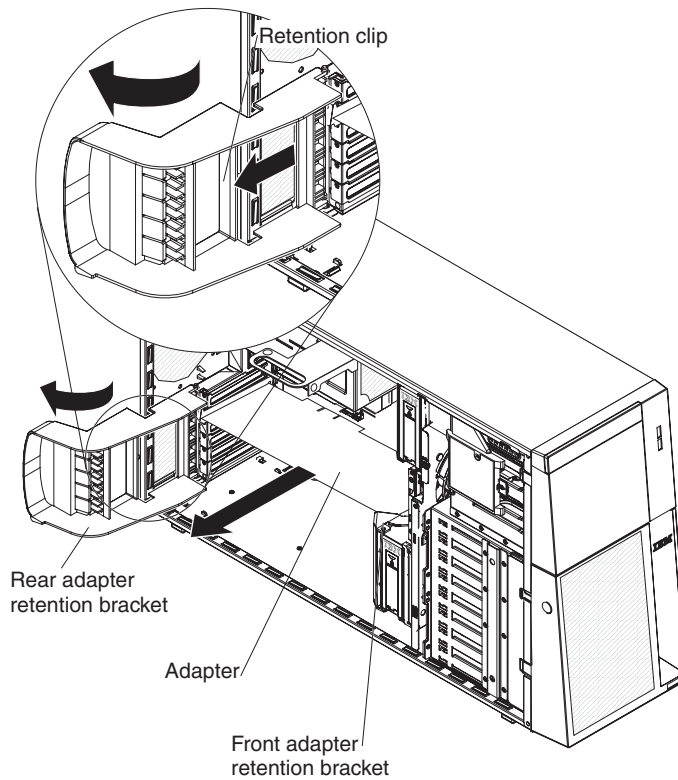
6. If you are installing a full-length adapter, remove the blue adapter guide (if any) from the end of the adapter; then, lift the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.



Adapter guide
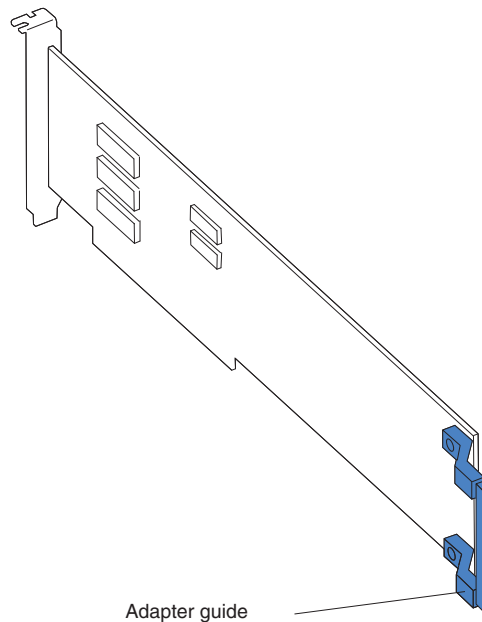
7. Press the adapter *firmly* into the expansion slot, lower the adapter-retention latch, and make sure that the latch is in the closed position.

   **Attention:** Incomplete insertion might cause damage to the system board or the adapter.

8. Connect any needed cables to the adapter.

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

## Installing a DVD drive



Optical drive
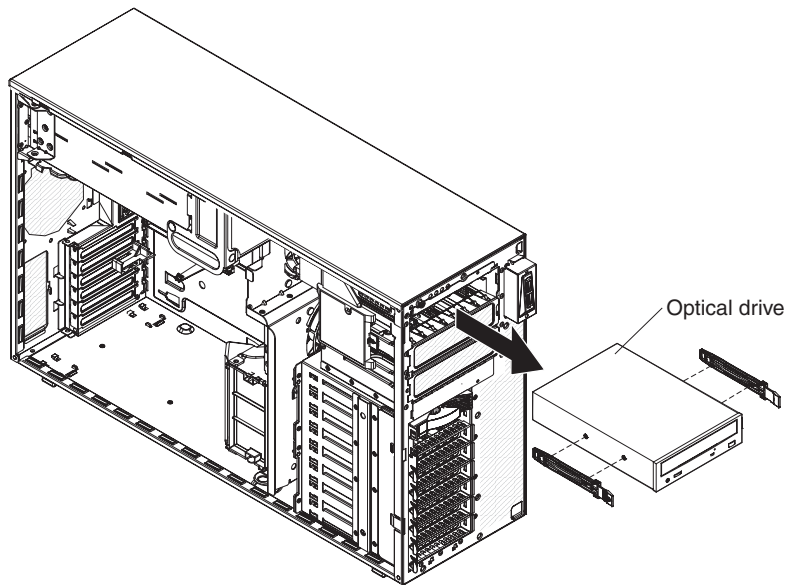
To remove a DVD drive, complete the following steps:
1.  Read the safety information that begins on page v and "Installation guidelines" on page 18.
2.  Turn off the server and peripheral devices, and disconnect the power cords and all external cables necessary to replace the device.
3.  Unlock and remove the left-side cover (see "Removing the left-side cover" on page 21).
4.  Press on the bezel retention tab at the center of the bezels left edge, and rotate the left side of the bezel away from the server; then, pull the bezel away from the server.
5.  Disconnect the DVD drive cable from the system board.
6.  Grasp the blue tabs on each side of the drive and press them inward while pulling the drive out of the server.

To install a DVD drive, complete the following steps:
1.  Read the safety information that begins on page v and "Installation guidelines" on page 18.
2.  Connect the DVD drive cable to the system board.
3.  Slide the drive into the server to engage the drive.
4.  Replace the left-side cover and bezel; then, lock the side cover and bezel.
5.  Reconnect the external cables and power cords.

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

## Installing a full high tape drive
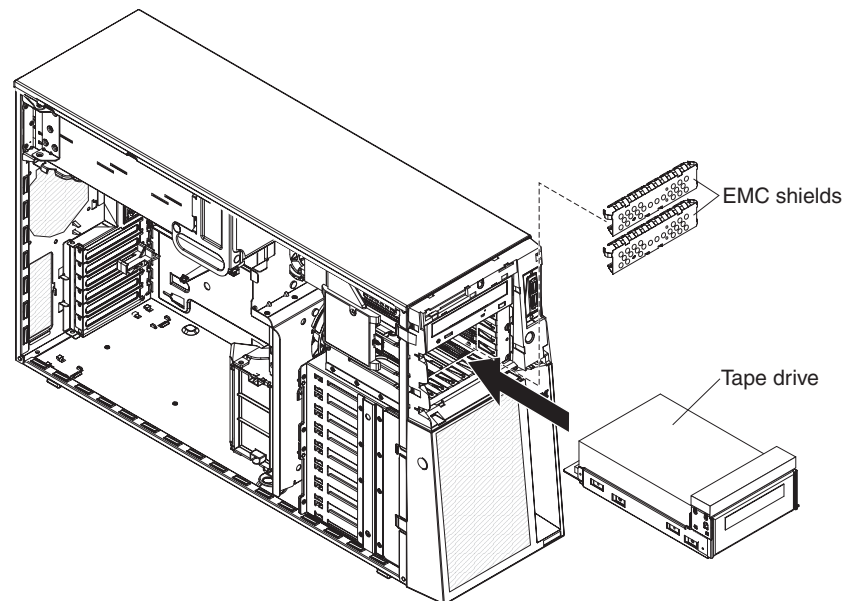


To install a full high tape drive, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables necessary to replace the device.
3. Unlock and remove the left-side cover (see "Removing the left-side cover" on page 21).
4. Press on the bezel retention tab at the center of the bezels left edge, and rotate the left side of the bezel away from the server; then, pull the bezel away from the server.
5. Connect the full high tape drive cable to the system board.
6. Slide the drive into the server and connect the IDE cable to the drive.
7. Using the supplied screws secure the drive to the server chassis.
8. Replace the left-side cover and bezel; then, lock the side cover and bezel.
9. Reconnect the external cables and power cords.

## Installing a hot-swap hard disk drive

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

- The server supports up to eight 1-inch (26 mm) slim-high, 3.5-inch, hot-swap hard disk drives in the standard hot-swap bays.
- The hot-swap bays are arranged vertically in the standard hard disk drive cage; the bay numbers are 0 through 7 (from top to bottom).
- For a list of supported options for the server, see http://www.ibm.com/servers/eserver/serverproven/compat/us/.
- Inspect the drive tray for signs of damage.
- Make sure that the drive is correctly installed in the tray.
- See the documentation for the ServeRAID-8k SAS Controller for instructions for installing a hard disk drive.

- All hot-swap drives in the server must have the same throughput speed rating; mixing speed ratings might cause all drives to operate at the lower throughput speed.
- To minimize the possibility of damage to the hard disk drives when you are installing them in a rack configuration, install the server in the rack before installing the hard disk drives.
- You do not have to turn off the server to install hot-swap drives in the hot-swap drive bays. However, you must turn off the server when performing any steps that involve installing or removing cables.
- The drive ID for each hot-swap hard disk drive is printed on the bezel.

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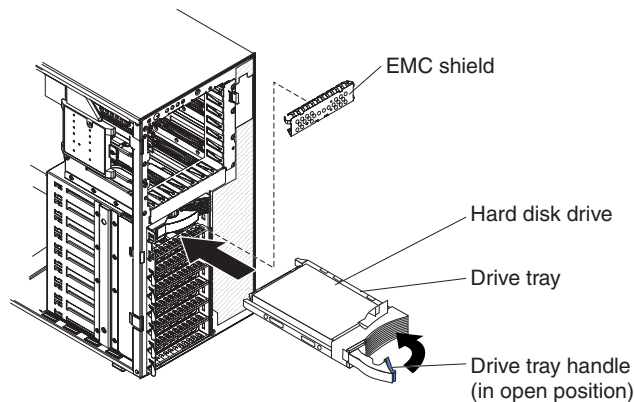


1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Remove the bezel from the server.
3. Open the drive tray handle and pull the drive out of the server.

To install a hot-swap hard disk drive, complete the following steps:
1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Remove the filler panel from one of the empty hot-swap bays.
3. Make sure that the tray handle is open; then, install the hard disk drive into the hot-swap bay.

**Notes:**

1. When you turn on the server, check the hard disk drive status LEDs to verify that the hard disk drive is operating properly.

   If the amber hard disk drive status LED is lit continuously, that drive is faulty and must be replaced. If the green hard disk drive activity LED is flashing, the drive is being accessed.
2. If you plan to configure the servercordcord for RAID operation through the ServeRAID-8k SAS Controller controller, you must configure the disk arrays before installing the operating system. See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information about RAID operation and complete instructions for using ServeRAID Manager.

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

# Installing an IBM Remote Supervisor Adapter II SlimLine

An optional IBM Remote Supervisor Adapter II SlimLine can be installed only in its dedicated connector on the system board. The Remote Supervisor Adapter II SlimLine is not cabled to the system board.

To install a Remote Supervisor Adapter II SlimLine, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Remove the left-side cover.
4. Carefully lay the server over on its right side and remove the left side cover.



Adapter retention bracket

Remote Supervisor Adapter II SlimLine retention tab

Remote Supervisor Adapter II SlimLine
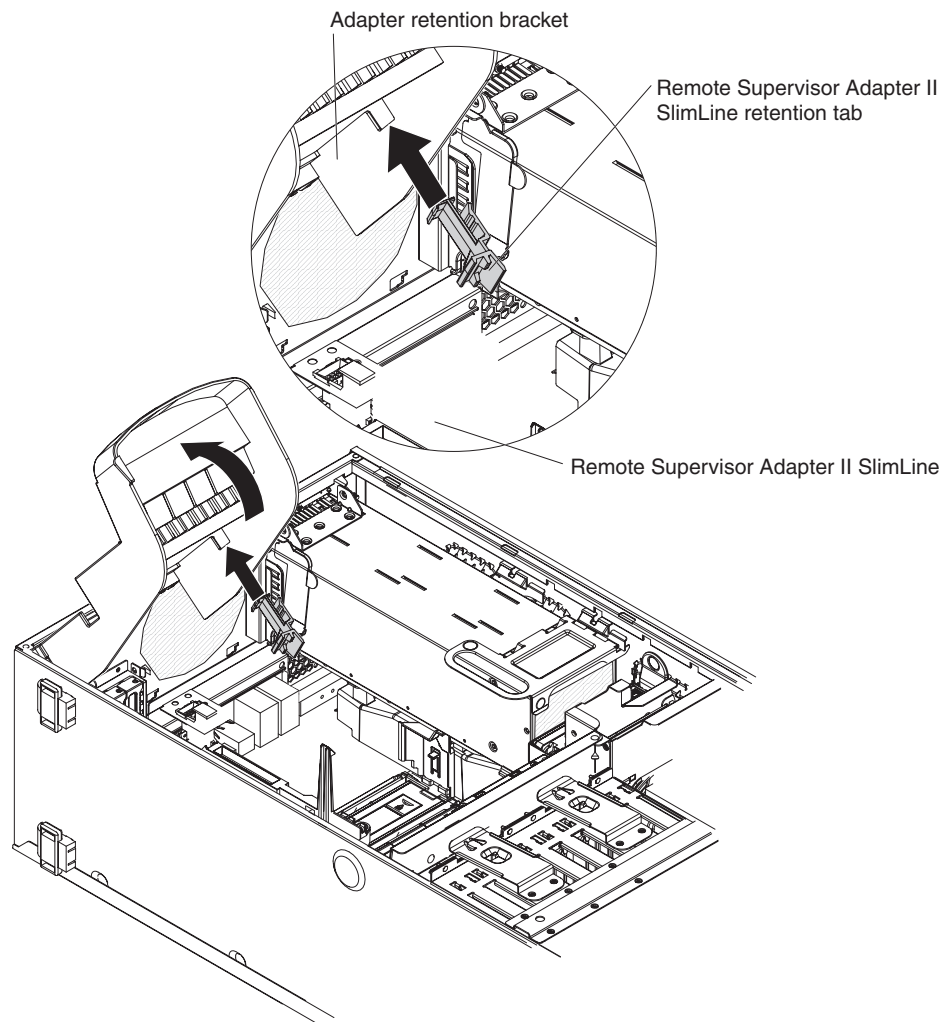
5. Open the rear adapter retention bracket and install the Remote Supervisor Adapter II SlimLine retention tab on the bracket by clipping it onto the rear adapter retention bracket.

Remote Supervisor II
SlimLine adapter

Remote Supervisor II
SlimLine adapter retainer clip

Remote Supervisor II
SlimLine adapter support bracket
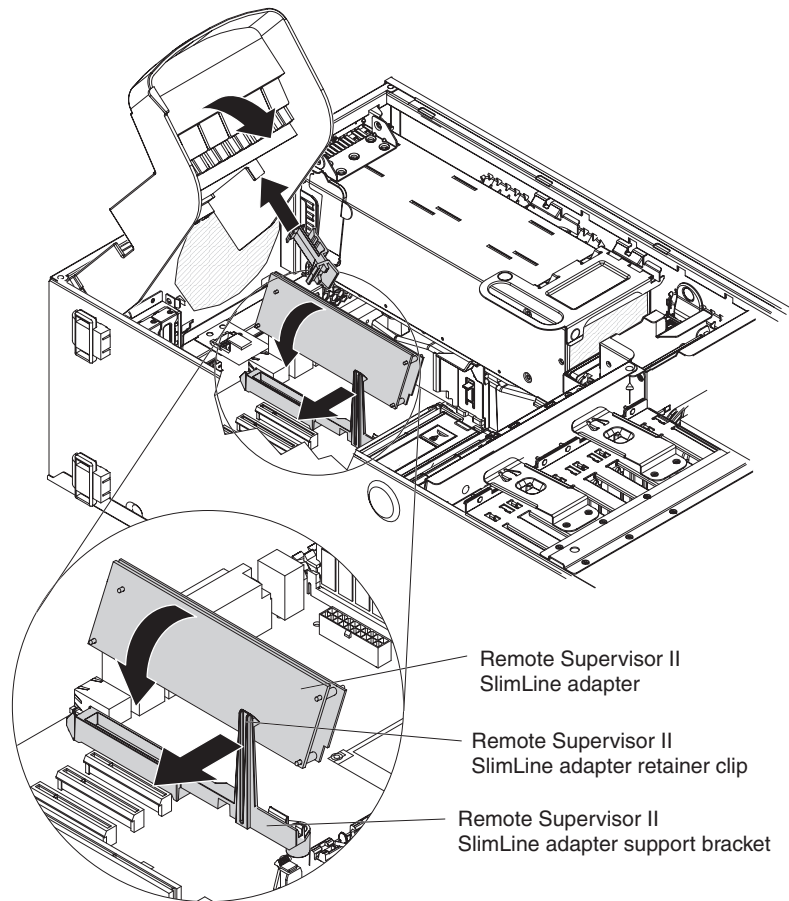
6. Carefully grasp the Remote Supervisor Adapter II SlimLine by its top edge or upper corners, and align it with the Remote Supervisor Adapter II SlimLine guide and the connector on the system board.

   **Attention:** Incomplete insertion might cause damage to the system board or the adapter.

7. Press the Remote Supervisor Adapter II SlimLine *firmly* into the connector and under the retention clip on the Remote Supervisor Adapter II SlimLine support bracket.

8. Close the rear adapter retention bracket.

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

## Installing a memory module

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:

- The server supports up to 12 667 MHz, 1.8 V, 240-pin, PC2-5300 single-stacked or double-stacked double-data-rate (DDR) II, fully buffered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest 5300 SDRAM Fully Buffered DIMM (FBD) specification. For a list of supported options for the server, go to http://www.ibm.com/servers/eserver/serverproven/compat/us/.

- There must be at least one pair of DIMMs installed for the server to operate.

- When you install additional DIMMs, be sure to install them in pairs. All the DIMM pairs must be the same size and type.
- The memory controller has four fully buffered DIMM channels that are organized into two branches. Each branch has two channels, and each channel controls two DIMMs. DIMMs that are next to each other (for example, DIMM slot 1 and DIMM slot 4) within the channels of a branch must be identical in size, type, speed, and technology. However, the DIMMs in the slots above or below each other within the channels of a branch do not have to be identical (for example, the DIMMs in DIMM slot 1 and DIMM slot 2 do not have to be identical). The following illustration shows how the memory controller is organized into branches and channels with two pairs of DIMMs installed.
- You do not have to save new configuration information when you install or remove DIMMs.
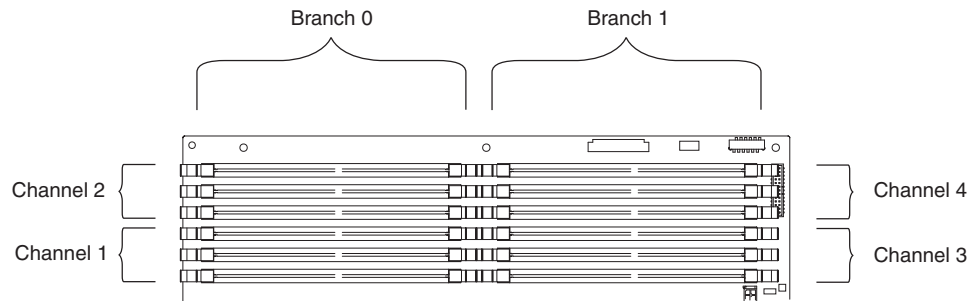


- Two memory branches are split between the 12 DIMM slots. DIMM slots 1 through 6 are on branch 0, and DIMM slots 7 through 12 are on branch 1.
- The server can operate in two major modes: mirroring and non-mirroring (normal). The server can also operate in a single-channel mode when one DIMM is installed.
- The server supports memory mirroring (mirroring mode) and online-spare memory.
  - Memory mirroring replicates and stores data on DIMMs within two branches simultaneously. You must enable memory mirroring through the Configuration/Setup Utility program (see "Using the Configuration/Setup Utility program" on page 46). To enable memory mirroring in the Configuration/Setup Utility program, select **Devices and I/O Ports** → **Advanced Chipset Control** → **Memory Branch Mode**. Use the arrow keys to change the Memory Branch Mode setting to Mirror; then, save your changes. When you use memory mirroring, consider the following information:
    - The maximum available memory is reduced to 16 GB, instead of the 32 GB available in non-mirroring mode.
    - The minimum memory configuration is four identical DIMMs. You must install identical pairs of fully buffered, dual-inline memory modules (DIMMs) in all four DIMM connectors (same size, type, speed, and technology). These DIMMs must span across both branches and all four channels. For example, when you install the first four DIMMs, you must install two DIMMs in branch 0 (one in channel 0 and one in channel 1) and two DIMMs in branch 1 (one in channel 2 and one in channel 3). See Table 2 on page 30 for the DIMM installation sequence.
    - When you upgrade the server to eight DIMMs, the DIMMs that are next to each other (for example, DIMM connector 1 and DIMM connector 4) within the channels of a branch must be identical in size, type, speed, and technology. However, the DIMMs in the connectors above or below each

other within the channels of a branch do not have to be identical to each other (for example, the DIMMs in DIMM connector 1 and DIMM connector 2).

- Both branches operate in dual-channel mode.

  The following table shows the DIMM configuration upgrade sequence for operating in mirroring mode.

*Table 2. DIMM upgrade configuration sequence in mirroring mode*

| Number of DIMMs | DIMM connectors |
|---|---|
| 4 | 1, 4, 7, 10 |
| 8 | 1, 4, 7, 10, 2, 5, 8, 11 |
| 12 | 1, 4, 7, 10, 2, 5, 8, 11, 3, 6, 9, 12 |

– Online-spare memory disables a failed rank pair of DIMMs from the system configuration and activates an online-spare rank pair of DIMMs to replace the failed rank pair of DIMMs. For an online-space pair of DIMMs to be activated, you must enable this feature and have installed an additional rank pair of DIMMs of the same speed, type, size (or larger), and technology as the failed pair of DIMMs. You must enable the feature through the Configuration/Setup Utility program. To enable online-spare memory in the Configuration/Setup Utility program, select Devices and I/O Ports → Advanced Chipset Control → Memory Branch Mode. Use the arrow keys to change the setting for Branch 0 Rank Sparing or Branch 1 Rank Sparing to Enabled ; then, save your changes. See "Using the Configuration/Setup Utility program" on page 46 for additional information. When you use online-spare memory, you must consider the following information:

- You cannot enable online-spare memory while the server is operating in mirroring mode.

- The minimum memory configuration is two single-rank DIMMs installed in branch 0, DIMM connector 1 (in channel 0) and connector 4 (in channel 1); however, online-sparing is not supported with this configuration.

- To support online-sparing in branch 0, you must add a second pair of DIMMs. The spare pair of DIMMs can be single-rank or double-rank and must be the same speed, type, size (or larger), and technology as the failed pair of DIMMs. The spare pair must be installed in branch 0, DIMM connector 2 (in channel 0) and connector 5 (in channel 1). However, if the DIMMs are double-rank and you install the spare pair of DIMMs in branch 1, DIMM connector 7 (channel 2) and connector 10 (channel 3) rather than branch 0, then branch 1 will support online-sparing and branch 0 will not. - Branch 0 and branch 1 operate independently.

• The following notes apply when the server operates in non-mirroring mode (normal mode):

– DIMMs must be installed in matched pairs. If you install a second pair of DIMMs in DIMM connector 7 and DIMM connector 10, they do not have to be the same size, speed, type, and technology as the DIMMs in DIMM connector 1 and DIMM connector 4. However, the size, speed, type, and technology of the DIMMs that you install in DIMM connector 7 and DIMM connector 10 must match each other.

– The following table shows the DIMM upgrade configuration sequence for operating in non-mirrored mode (normal mode).

*Table 3. 5. DIMM upgrade configuration sequence in non-mirroring mode*

| Number of DIMMs | DIMM connectors |
|---|---|
| 2 | 1, 4 |
| 4 | 1, 4, 7, 10 |
| 6 | 1, 4, 7, 10, 2, 5 |
| 8 | 1, 4, 7, 10, 2, 5, 8, 11 |
| 10 | 1, 4, 7, 10, 2, 5, 8, 11, 3, 6 |
| 12 | 1, 4, 7, 10, 2, 5, 8, 11, 3, 6, 9, 12 |

- The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. To view the total amount of installed memory and the amount of configured memory, run the Configuration/Setup Utility program and select System Summary from the menu. For additional information, see Chapter 3, "Configuring the server," on page 45.
- The following tables show examples of maximum memory capacity when the server operates in mirroring and non-mirroring modes, using identical single-rank, x8 technology or double-rank, x4 technology DIMMs. The memory capacity is dependent on the size and technology of the DIMMs that you install.

*Table 4. Example of the memory capacity when identical x8 technology single-rank DIMMs are used*

| DIMMs installed | x8 single-rank technology | Memory available in mirroring mode | Memory available in non-mirroring mode |
|---|---|---|---|
| 8 | 512 MB | 2 GB | 4 GB |
| 8 | 1 GB | 4 GB | 8 GB |
| 8 | 2 GB | 8 GB | 16 GB |

*Table 5. Example of the memory capacity when identical x4 technology double-rank DIMMs are used*

| DIMMs installed | x4 double-rank technology | Memory available in mirroring mode | Memory available in non-mirroring mode |
|---|---|---|---|
| 8 | 512 MB | 8 GB | 16 GB |
| 8 | 1 GB | 16 GB | 32 GB |

- When you restart the server after adding or removing a DIMM, the server displays a message that the memory configuration has changed.
- If a problem with a DIMM is detected, light path diagnostics will light the system-error LED on the front of the server, indicating that there is a problem and guide you to the defective DIMM. When this occurs, first identify the defective DIMM; then, remove and replace the DIMM.

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

The following illustration shows how to install DIMMs on the system board.

DIMM4
DIMM3
DIMM 2
DIMM 1
DIMM 6
DIMM 5
DIMM 10
DIMM 7
DIMM 12
DIMM11
DIMM 9
DIMM 8
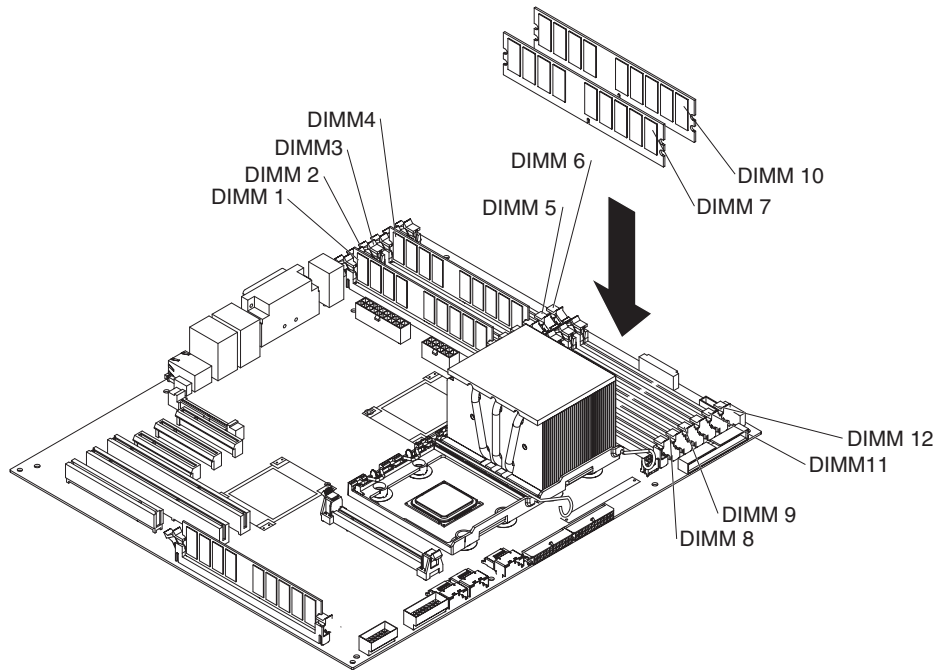
To remove a DIMM, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables.
3. Remove the power-supply or power supplies from the server.
4. Raise the power-supply cage out of the way:
   a. Press in on the power-supply latch bracket, which is on the left side of the server when you are facing the rear of the server.
   b. Lift the end of the power-supply cage and rotate the cage up until it stops. The tab on the rear power-supply latch bracket clicks into place when the cage is completely out of the way.
   c. Let the power-supply cage rest on the rear power-supply latch bracket.

   **Attention:** To avoid breaking the DIMM retaining clips or damaging the DIMM connectors, open and close the clips gently.
5. Open the retaining clip on each end of the DIMM connector; then, remove the DIMM from the server.

To install a DIMM, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Turn off the server and peripheral devices; then, disconnect the power cords and all external cables. Remove the cover.
3. Remove the power-supply or power supplies from the server.
4. Raise the power-supply cage out of the way:
   a. Press in on the power-supply latch bracket, which is on the left side of the server when you are facing the rear of the server.

b. Lift the end of the power-supply cage and rotate the cage up until it stops. The tab on the rear power-supply latch bracket clicks into place when the cage is completely out of the way.

c. Let the power-supply cage rest on the rear power-supply latch bracket.

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

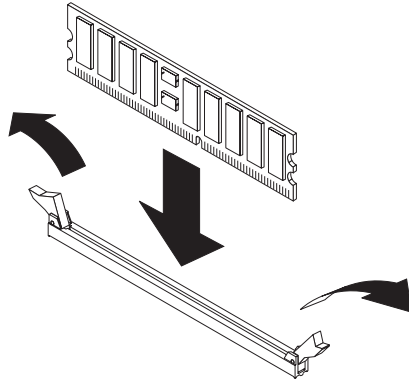5. Open the retaining clip on each end of the DIMM connector.

6. Touch the static-protective package containing the DIMM to any unpainted metal surface on the outside of the server. Then, remove the DIMM from the package.



7. Turn the DIMM so that the DIMM keys align correctly with the slot.

8. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.

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

## Installing a microprocessor

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

- For a list of supported options for the server, go to http://www.ibm.com/us/ compat/.

- The server supports Intel Xeon dual or quad core 1.6 GHz or higher microprocessors in each socket. If you are installing two microprocessors, they must be the same cache size and type, and the same clock speed.

- Some models support dual-core processors and quad-core processors. Do not mix dual-core processors and quad-core processors in the same system. Install all dual-core or all quad-core processors in the server.

- To ensure that the server operates correctly, use microprocessors that have the same cache and type, and the same clock speed. The microprocessor internal and external clock frequencies must be identical. You can use the Configuration/Setup Utility program to determine the specific type of microprocessor that is installed on the system board.

- Read the documentation that comes with the microprocessor to determine whether you must update the basic input/output system (BIOS) code in the server. To download the most current level of BIOS code for the server, go to http://www.ibm.com/support/.
- Obtain an SMP-capable operating system. For a list of supported operating systems, go to http://www.ibm.com/servers/eserver/serverproven/compat/us/.
- You can use the Configuration/Setup Utility program to determine the specific type of microprocessor in the server.

To install a microprocessor, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.
2. Turn off the server and peripheral devices; then, disconnect the power cords and all external cables. Remove the cover.

   **Attention:** The microprocessor retention latch is spring-loaded when the microprocessor is in place. Releasing the latch too quickly or allowing it to spring upward can damage the microprocessor and surrounding components.
3. Remove the microprocessor air duct from the fan cage:
   a. Grasp the two pinch points on the top of the air duct and squeeze them together.
   b. Lift the air duct up and out of the server and set it aside.
4. Release the microprocessor retention latch by pressing down on the end, moving it to the side, and slowly releasing it to the open (up) position.



Microprocessor release lever (fully open)

Microprocessor bracket frame
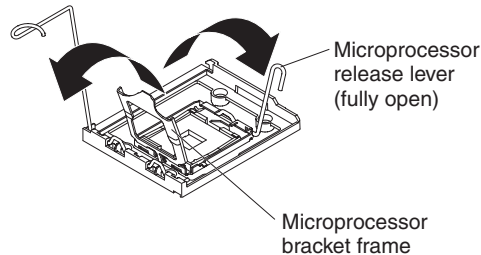
5. Open the microprocessor bracket frame by lifting up the tab on the top edge.

   **Attention:** Use the vacuum tool that comes with the replacement part to install or remove the microprocessor. Dropping the microprocessor during removal or installation can damage the contacts. Also, contaminants on the microprocessor contacts, such as oil from your skin, can cause connection failures between the contacts and the socket.
6. Install the microprocessor by using the vacuum tool and completing the following steps.

Vacuum tool

Microprocessor
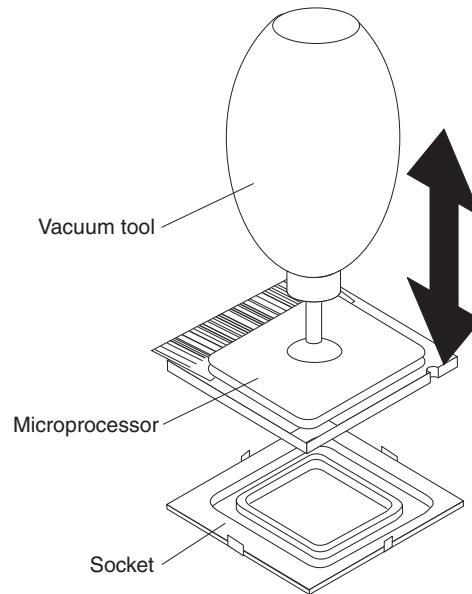
Socket

a. Squeeze and hold the bladder of the tool; then, place the suction cup on the microprocessor and release the bladder.

   **Note:** To maintain proper orientation between the microprocessor and the microprocessor socket during installation, observe the following information:

   • The microprocessor has two notches that are keyed to two tabs on the sides of the socket.

   • A triangle-shaped indicator on one corner of the microprocessor points to a 45-degree angle on one corner of the socket.

b. Using the tool, carefully place the microprocessor into the socket.

c. Squeeze the bladder of the tool to release the microprocessor from the suction cup.

7. Close the microprocessor bracket frame; then, close the microprocessor retention latch and lock it securely in place.



Microprocessor retention latch

Microprocessor bracket frame
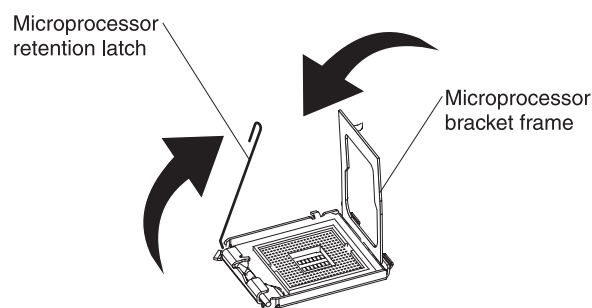
8. Close the microprocessor-release lever to secure the microprocessor.

9. Make sure that the heat-sink release lever is open.

10. If necessary, remove the cover from the bottom of the heat sink.

11. Place the tab on the heat sink into the slot in the retention bracket; then, rotate the heat sink into place and close the heat-sink release lever.

    **Note:** If you are installing an additional microprocessor in microprocessor socket 2, you must also install a VRM.

12. If necessary, install a VRM in the connector.

a. Open the retaining clips on each end of the VRM connector.

   b. Turn the VRM so that the keys align with the slot.

   c. Insert the VRM into the connector by aligning the edges of the VRM with the slots at the end of the VRM connector. Firmly press the VRM straight down into the connector by applying pressure on both ends of the VRM simultaneously. The retaining clips snap into the locked position when the VRM is seated in the connector.

13. Reinstall the microprocessor air duct.

14. Reinstall the left-side cover.

15. Reconnect external cables and power cords.

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

## Installing redundant power and cooling

You can install a second 835-watt hot-swap power-supply. This upgrade option includes a hot-swap power supply, two hot-swap fans, a fan structure with an air duct and a single hot-swap fan installed, and a fan power cable. You must also purchase a second power cord to connect the power-supply to the power source.

To install the redundant power and cooling option, complete the following steps:

1. Read the safety information that begins on page v and "Installation guidelines" on page 18.

2. Turn off the server and peripheral devices, and disconnect the power cords and all external cables. Remove the left-side cover.

3. Remove all adapters.



Fan cage assembly release buttons
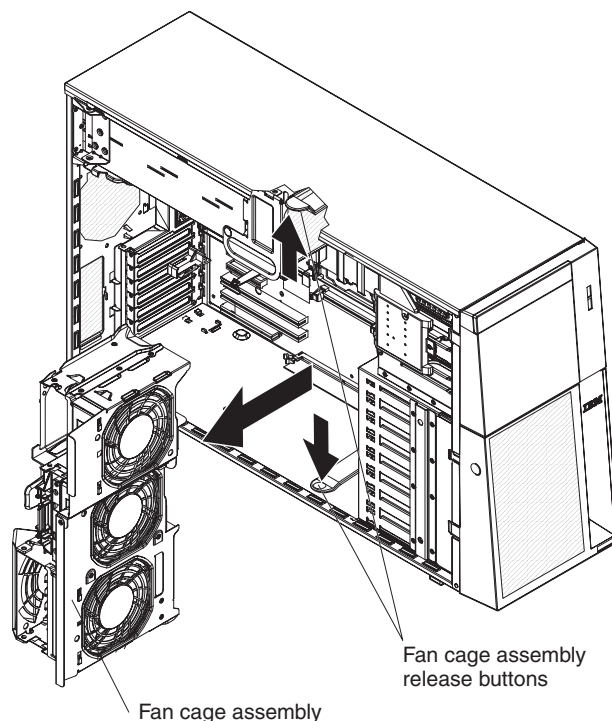
Fan cage assembly

4. Remove the fan cage from the server:

a. Press the fan cage assembly release button on each side of the server. The fan cage assembly rises up slightly when the buttons have been fully pressed and the fan cage is released.

b. Lift the fan cage assembly out of the server.

5. Install the fan power cable.

**Note:** The following illustration shows the underside of the fan cage. Fans 3 and 5 are shown at the top of the illustration.



12-pin connector
(installed from reverse side)

Fan 5 connector
(installed from
this side)

Cable clamp

Cable routing
channel

Cable clamps

Fan 4 connector
(installed from
this side)

a. Turn the fan cage assembly over and place it on a flat surface. Position the fan cage as shown in the illustration.

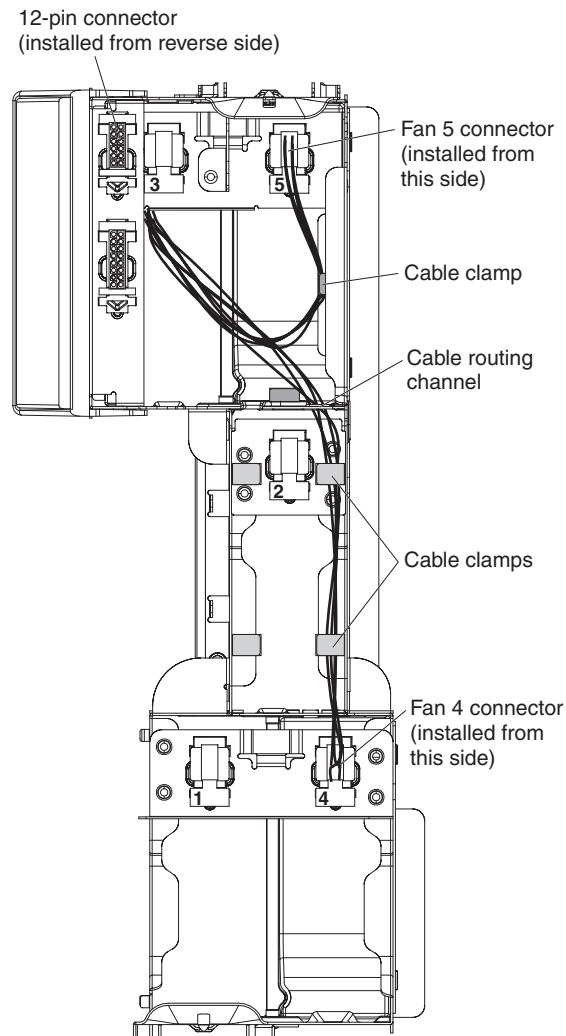b. Press the 12-pin power connector on the supplied fan power cable into the empty hole in the fan cage next to the fan 3 connector. When this connector is installed, the connector pins should be facing you.

c. Route the shorter of the two lengths of cables to the nearest hole under fan 3 and install the connector in the hole; then, secure the cable in the cable clamp on the fan cage.

d. Route the longer length of cables through the cable routing channel and the two cable clamps in the cable routing channel.

e. Install the connector in the hole in the fan cage assembly for fan 4.

6. Turn the fan cage assembly over and install the assembly in the server.

Fan air baffle
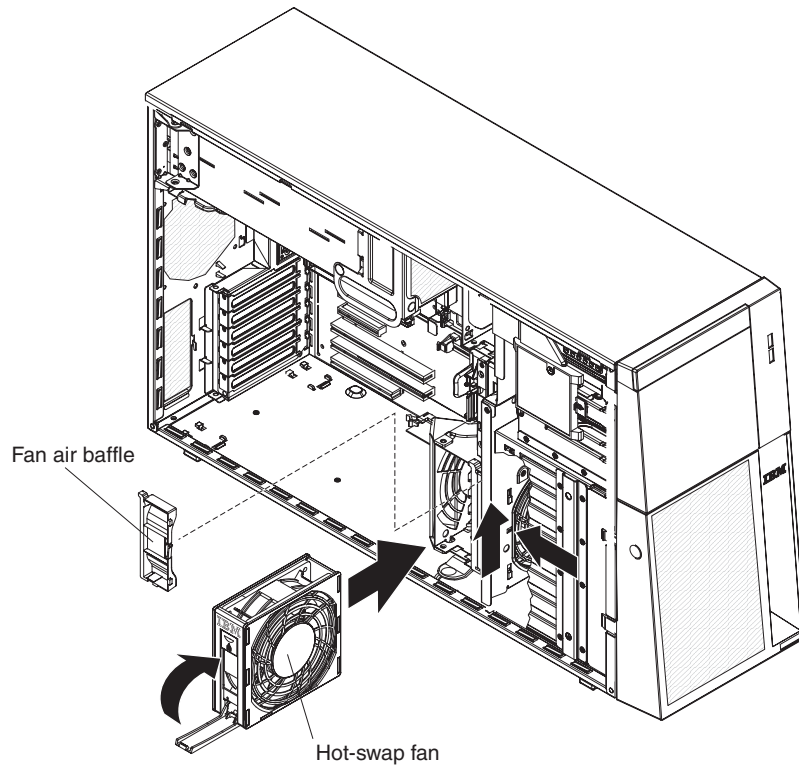
Hot-swap fan

7. Remove the fan air baffle from the fan cage assembly by pushing in on the tab on the back of the air baffle; then, push the baffle to the left and lift it out of the fan cage assembly.

8. Install two hot-swap fans in the empty bays of the fan cage assembly.



Power supply
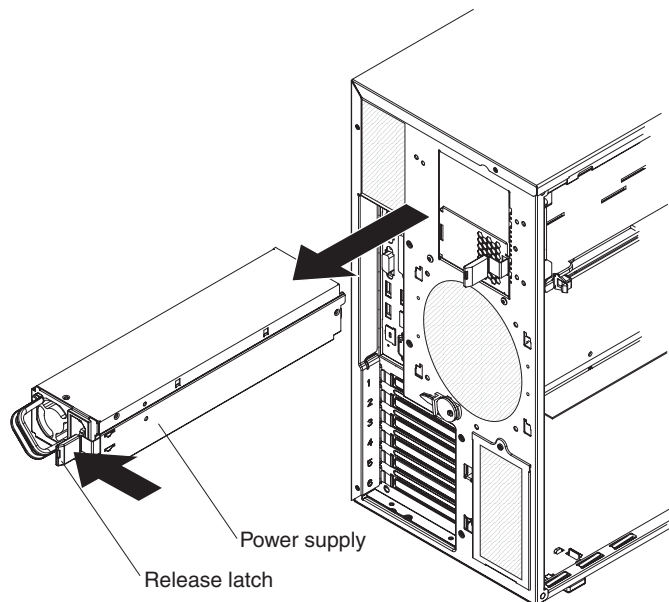
Release latch

9. Remove the power-supply and power supply filler from the server by pressing down on the release latch while you pull out.

Power-supply
cage assembly

Power-supply
cage handle
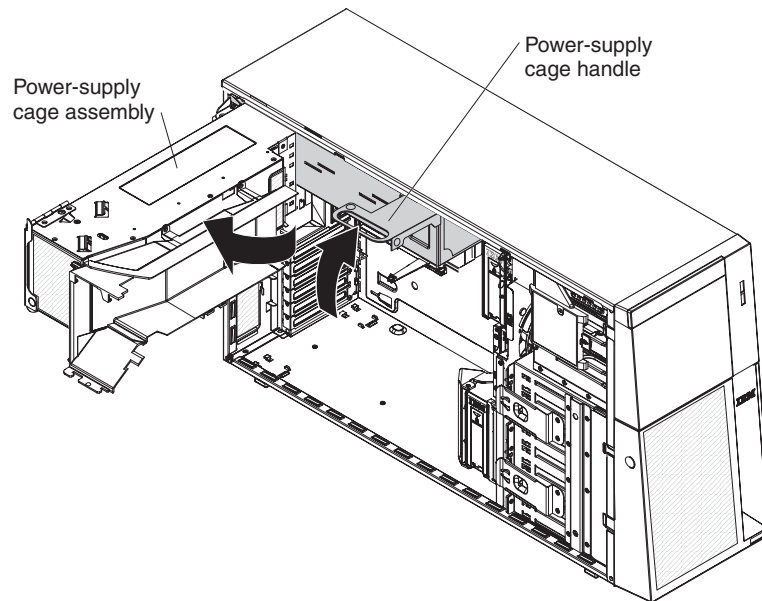
10. Lift the power-supply cage handle on the rear of the power-supply cage, and
    rotate the power-supply cage out of the way until it latches in place. Let the
    power-supply cage rest on the rear power-supply structure support bracket.

11. Install the transition duct on the edge of the DIMM air baffle.



DIMM air baffle

Transition duct
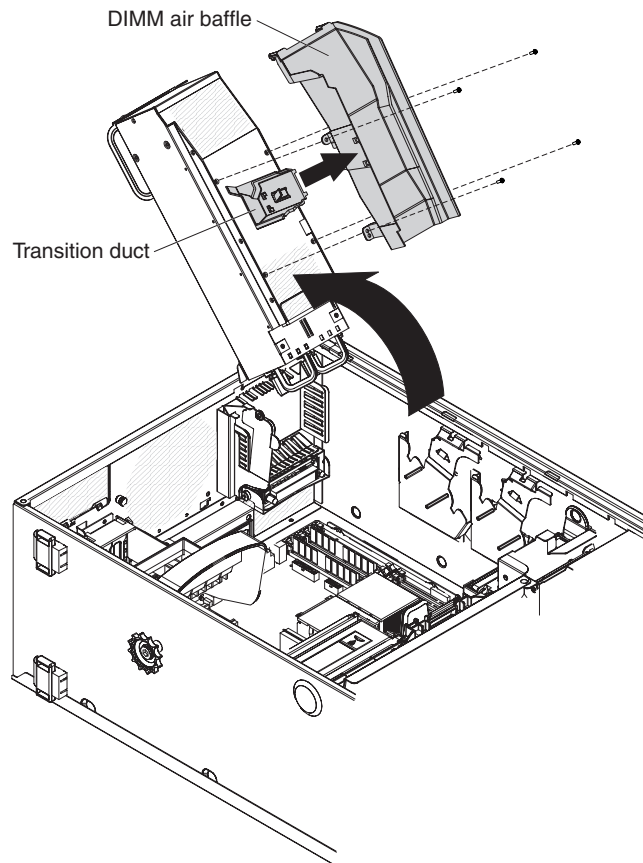
a. Remove the four screws that secure the DIMM air baffle to the
   power-supply cage.

b. Push the DIMM air baffle toward the rear of the server until the positioning pins on the DIMM air baffle are clear of the holes in the power-supply cage.

c. Position the transition duct so that the two tabs are directly over the slots on the side of the DIMM air baffle.

d. Slide the transition duct into the slots until it clicks into place.

12. Reinstall the DIMM air baffle onto the power-supply cage.



Power supply support bracket

Power supply release tab
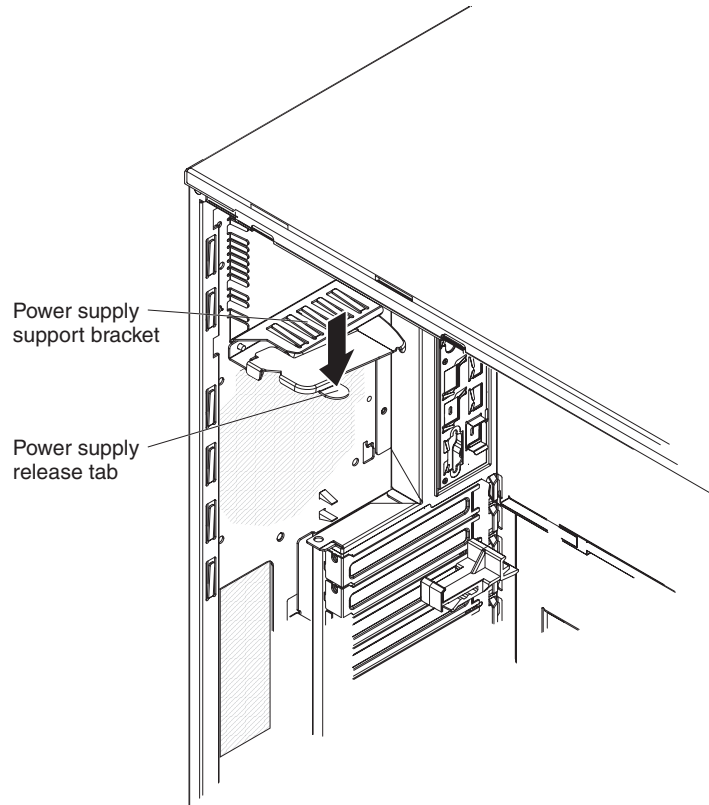
13. Raise the power-supply cage slightly and press and hold the release tab on the rear power-supply support bracket; then, lower the power-supply structure into position. The power-supply cage is not shown in the illustration for clarity.



Rear fan assembly with baffle
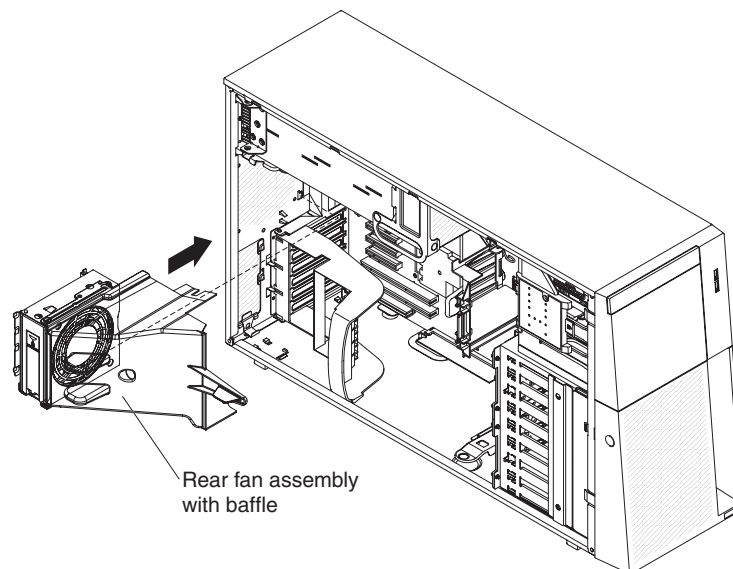
14. Install the rear fan and fan structure on the chassis.
    a. Align the clips on the rear fan assembly with the holes in the chassis.
    b. Slide the assembly toward the power-supply cage until it stops.

Rear Fan
Connector
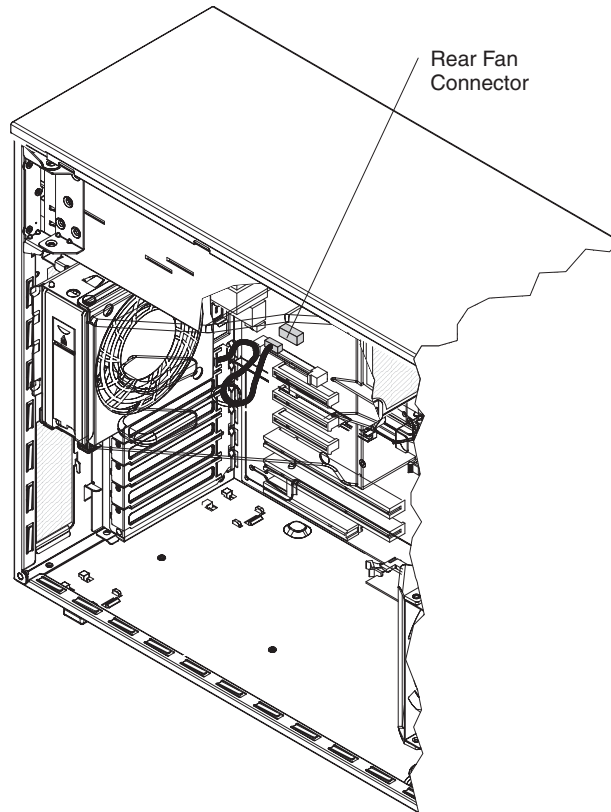
    c. Connect the fan power cable to the connector on the system board.
15. Install the adapters.
16. Install the left-side cover.
17. Install the power supplies into the server. Push each power supply until it stops and clicks into place.
18. Connect one end of each power cord into the connector on the back of each power supply, and connect the other end of each power cord to a properly grounded electrical outlet.
19. Make sure that the ac power LED on the top of each power supply is lit, indicating that the power supply is operating correctly. If the server is turned on, make sure that the dc power LED on the top of the power supply is lit also.
20. Reconnect the external cables.

If you have other options to install or remove, do so now. Otherwise, go to "Completing the installation."

## Completing the installation

To complete the installation, complete the following steps:
1. Insert the bezel hinges into the slots on the server chassis and close the bezel.
2. Position the left-side cover over the server with the handle away from you.
3. Place the bottom edge of the cover onto the bottom edge of the server.

4. Rotate the top edge of left-side cover toward the server; then, press down on the cover until it clicks into place.
5. Rotate the bezel to its fully closed position.
6. Using the supplied key, lock the left-side cover and bezel.
7. Connect the cables and power cords. For more information, see "Connecting the cables."

# Connecting the cables

**Notes:**

1. Make sure you turn off the server before connecting any cables to or disconnecting any cables from the server or hot-plug adapter.
2. For additional cabling instructions, see the documentation that comes with the options. It might be easier for you to route any cables before you install certain options.
3. Cable identifiers are printed on the cables that come with the server and options. Use these identifiers to connect the cables to the correct connectors. For example, the hard disk drive cables are labeled "HDD option."

The following illustration shows the location of the input and output connectors on the rear of the server.
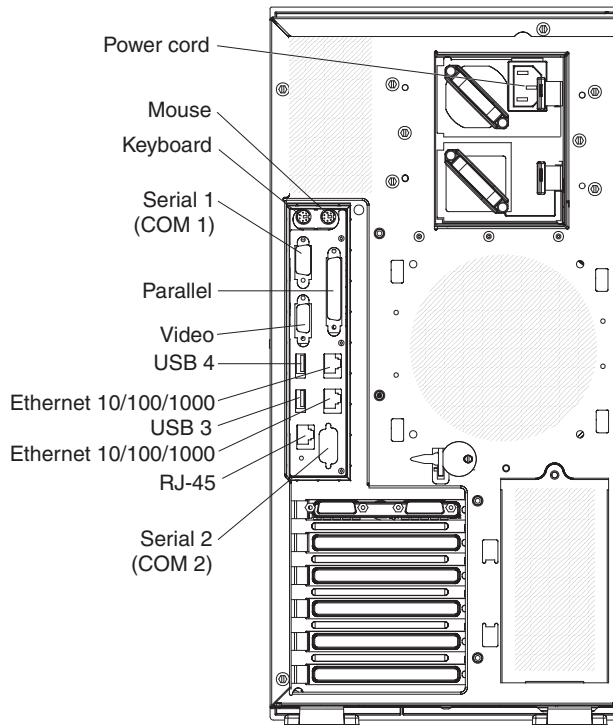


# Updating the server configuration

When you start the server for the first time after you add or remove an internal option or external device, you might receive a message that the configuration has changed. The Configuration/Setup Utility program starts automatically so that you can save the new configuration settings. For more information, see Chapter 3, "Configuring the server," on page 45.

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

The server comes with at least one microprocessor. If more than one microprocessor is installed, the server can operate as a symmetric multiprocessing (SMP) server. You might have to upgrade the operating system to support SMP. For more information, see "Using the ServerGuide Setup and Installation CD" on page 51 and the operating-system documentation.

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

If you have installed a Remote Supervisor Adapter to manage the server remotely, see the *Remote Supervisor Adapter User's Guide*, which comes with the adapter, for information about setting up, configuring, and using the adapter.

For information about configuring the integrated Gigabit Ethernet controller, see "Configuring the Broadcom Gigabit Ethernet controller" on page 66.

# Chapter 3. Configuring the server

The following configuration programs come with the server:

- **Configuration/Setup Utility program**

  The Configuration/Setup Utility program is part of the basic input/output system (BIOS) code. Use it to configure serial port assignments, change interrupt request (IRQ) settings, change the startup-device sequence, set the date and time, and set passwords. For information about using this utility program, see "Using the Configuration/Setup Utility program" on page 46.

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

  The ServerGuide program provides software-setup tools and installation tools that are designed for the server. Use this CD during the installation of the server to configure basic hardware features, such as an integrated SAS controller with RAID capabilities, and to simplify the installation of the operating system. For information about using this CD, see "Using the ServerGuide Setup and Installation CD" on page 51.

- **Baseboard management controller**

  Use these programs to configure the baseboard management controller, to update the firmware and sensor data record/field replaceable unit (SDR/FRU) data, and to remotely manage a network. For information about using these programs, see "Using the baseboard management controller" on page 53.

- **Boot Menu program**

  The Boot Menu program is part of the BIOS code. Use it to override the startup sequence that is set in the Configuration/Setup Utility program and temporarily assign a device to be first in the startup sequence, see "Using the Boot Menu program" on page 65.

- **Broadcom Gigabit Ethernet Utility program**

  The Broadcom Gigabit Ethernet Utility program is part of the BIOS code. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in your startup sequence. Enable the Broadcom Gigabit Ethernet Utility from the Configuration/Setup Utility program. For information, see "Enabling the Broadcom Gigabit Ethernet Utility program" on page 65.

- **Ethernet controller configuration**

  For information about configuring the Ethernet controller, see "Configuring the Broadcom Gigabit Ethernet controller" on page 66.

- **Remote Supervisor Adapter II SlimLine configuration**

  For information about setting up and cabling the Remote Supervisor Adapter II SlimLine, see "Setting up the Remote Supervisor Adapter II SlimLine" on page 66.

- **ServeRAID Manager**

  ServeRAID Manager is available as a stand-alone program and as an IBM Director extension. Use the ServeRAID Manager to define and configure the disk-array subsystem *before* you install the operating system. For information about using this program, see "Using ServeRAID Manager" on page 69.

- **IBM Director**

  IBM Director is a workgroup-hardware-management tool that you can use to centrally manage servers. If you plan to use IBM Director to manage the server, you must check for the latest applicable IBM Director updates and interim fixes.

For information about updating IBM Director, see "Updating IBM Director" on page 71. For more information about IBM Director, see the IBM Director documentation on the *IBM Director* CD.

## Using the Configuration/Setup Utility program

Use the Configuration/Setup Utility program to perform the following tasks:

- View configuration information
- View and change assignments for devices and I/O ports
- Set the date and time
- Set and change passwords and Remote Control Security settings
- Set the startup characteristics of the server and the order of startup devices
- Set and change settings for advanced hardware features
- Set and change settings for the baseboard management controller (BMC)
- View and clear error logs

## Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program, complete the following steps:

1. Turn on the server.
2. When the prompt `Press F1 for Configuration/Setup` appears, press F1. If you have set both a power-on password and an administrator password, you must type the administrator password to access the full Configuration/Setup Utility menu. If you do not type the administrator password, a limited Configuration/Setup Utility menu is available.
3. Select settings to view or change.

## Configuration/Setup Utility menu choices

The following choices are on the Configuration/Setup Utility main menu. Depending on the version of the BIOS code, some menu choices might differ slightly from these descriptions.

- **System Summary**

    Select this choice to view configuration information, including the type, speed, and cache sizes of the microprocessors and the amount of installed memory. When you make configuration changes through other options in the Configuration/Setup Utility program, the changes are reflected in the system summary; you cannot change settings directly in the system summary.

    This choice is on the full and limited Configuration/Setup Utility menu.

    – **Processor Summary**

        Select this choice to view the processor information, including the type, speed, and cache size of the microprocessor.

- **System Information**

  Select this choice to view information about the server. When you make changes through other options in the Configuration/Setup Utility program, some of those changes are reflected in the system information; you cannot change settings directly in the system information.

  This choice is on the full Configuration/Setup Utility menu only.

- **Devices and I/O Ports**

  Select this choice to view or change assignments for devices and input/output (I/O) ports.

  Select this choice to enable or disable integrated Ethernet controllers and all standard ports (such as serial, USB, and parallel). **Enable** is the default setting for all controllers. If you disable a device, it cannot be configured, and the operating system will not be able to detect it (this is equivalent to disconnecting the device). If you disable the integrated Ethernet controller and no Ethernet adapter is installed, the server will have no Ethernet capability. If you disable the integrated USB controller, the server will have no USB capability; to maintain USB capability, make sure that **Enabled** is selected for the **USB Support** and **USB 2.0 Support** options.

  Select this choice to enable and configure serial remote video and keyboard redirection, and to set other remote console values.

  This choice is on the full Configuration/Setup Utility menu only.

  - **Parallel Port Setup**

    Select this choice to enable or disable the parallel port and to adjust the parallel port resources and features.

  - **Remote Console Redirection**

    Select this choice to enable and configure serial remote video and keyboard redirection.

  - **System MAC Addresses**

    Select this choice to view the servers System MAC Addresses.

  - **Advanced Chipset Control**

    Select this choice to modify settings that control features of the core chip set on the system board and to configure memory features.

    **Attention:** Do not make changes in the **Advanced Chipset Control** option unless directed to do so by an IBM authorized service representative.

  - **Video**

    Select this choice to view the video information.

- **Date and Time**

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

- **System Security**

  Select this choice to set password settings. See "Passwords" on page 50 for more information about passwords. You can also enable the chassis-intrusion detector to alert you each time that the server cover is removed.

  - **Administrator Password**

    This choice is on the Configuration/Setup Utility menu only if an optional IBM Remote Supervisor Adapter II Slimline is installed.

    Select this choice to set or change an administrator password. An administrator password is intended to be used by a system administrator; it limits access to the full Configuration/Setup Utility menu. If an administrator password is set, the full Configuration/Setup Utility menu is available only if

you type the administrator password at the password prompt. For more information, see "Administrator password" on page 51.

– **Power-on Password**

Select this choice to set or change a power-on password. See "Power-on password" on page 50 for more information.

- **Start Options**

Select this choice to view or change the start options. Changes in the start options take effect when you restart the server.

You can set keyboard operating characteristics, such as whether the server starts with the keyboard number lock on or off. You can enable the server to run without a monitor, or keyboard.

This choice is on the full Configuration/Setup Utility menu only.

– **Startup Sequence Options**

The startup sequence specifies the order in which the server checks devices to find a boot record. The server starts from the first boot record that it finds. If the server has Wake on LAN hardware and software and the operating system supports Wake on LAN functions, you can specify a startup sequence for the Wake on LAN functions. You can also specify whether an integrated controller or a PCI adapter has boot precedence.

If you enable the boot fail count, the BIOS default settings will be restored after three consecutive failures to find a boot record.

- **Advanced Setup**

Select this choice to change settings for advanced hardware features.

**Important:** The server might malfunction if these options are incorrectly configured. Follow the instructions on the screen carefully.

This choice is on the full Configuration/Setup Utility menu only.

– **CPU Options**

Select this choice to enable or disable Hyper-Threading, the pre-fetch queue, C1 enhanced mode, and no-execute mode memory protection.

The default setting for Hyper-Threading is **Enabled**.

– **PCI Bus Control**

Select this choice to view the system resources that are used by the installed PCI, PCI Express, or PCI-X devices.

– IPMI
Select this choice to view or clear the system event log. Make changes to the serial/modem device commands, the POST watchdog settings and to view the LAN settings.

- **IPMI Specification Version**
This is a nonselectable menu item that displays the IPMI and BMC version.

- **BMC Hardware/Firmware Version**
This is a nonselectable menu item that displays the BMC firmware version.

- **Clear System Event Log**
Enable or disable the system event log clearing. If system event log clearing is enabled, it will reset to disabled once the BMC system-event log is cleared. **Disabled** is the default setting.

- **Existing Event Log number**
This is a nonselectable menu item that displays the number of entries in the system-event log.

- **BIOS POST Watchdog**
  Enable or disable the BMC POST watchdog. **Disabled** is the default setting.
- **POST Watchdog Timeout**
  Set the BMC POST watchdog timeout value. **5 minutes** is the default setting.
- **System Event Log**
  Select this choice to view the BMC system-event log, which contains all system error and warning messages that have been generated. Use the arrow keys to move between pages in the log. If an optional IBM Remote Supervisor Adapter II is installed, the full text of the error messages is displayed; otherwise, the log contains only numeric error codes. Run the diagnostic program to get more information about error codes that occur. For instructions, see the diagnostic information in the *Problem Determination and Service Guide* on the IBM *System x3500 Documentation* CD. Select **Clear System Event Log** to clear the BMC system-event log.

  **Important:** If the system-error LED on the front of the server is lit but there are no other error indications, clear the BMC system-event log. This log does not clear itself, and if it begins to fill up, the system-error LED will be lit. Also, after you complete a repair or correct an error, clear the BMC system-event log to turn off the system-error LED on the front of the server.
- **Serial /Modem Device Commands**
  Select this choice to change the serial port sharing and access mode.
  - **Serial Port Sharing**
    Enable or disable serial port sharing. **Enabled** is the default setting.
  - **Serial Port Access Mode**
    Share, disable, pre-boot only, or always available. **Shared** is the default setting.
- **LAN Settings**
  Select this choice to view the baseboard management controller network configuration information.

– **NMI Options**
Select this choice to enable or disable the NMI reboot. **Enabled** is the default setting.

- **Error Logs**

  Select this choice to view or clear error logs.

  – **POST Error Log**

  Select this choice to view the three most recent error codes and messages that the system generated during POST. For more information on error logs see, IPMI on page 48.

  – **System Event/Error Log**

  Select this choice to view error codes and messages that the system generated during POST and all system status messages from the service processor. Select **Clear error logs** to clear the system event/error log. For more information on error logs see, IPMI on page 48.

  **Important:** If the system-error LED on the front of the server is lit but there are no other error indications, clear the system event/error log. This log does not clear itself, and if it begins to fill up, the system-error LED will be lit. Also, after you complete a repair or correct an error, clear the system event/error log to turn off the system-error LED on the front of the server.

- **Save Settings**

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

- **Restore Settings**

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

- **Load Default Settings**

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

- **Exit Setup**

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

# Passwords

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

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

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

If you set a power-on password for a user and an administrator password for a system administrator, you can type either password to complete the system startup. A system administrator who types the administrator password has access to the full Configuration/Setup Utility menu; the system administrator can give the user authority to set, change, and delete the power-on password. A user who types the power-on password has access to only the limited Configuration/Setup Utility menu; the user can set, change, and delete the power-on password, if the system administrator has given the user that authority.

## Power-on password

If a power-on password is set, when you turn on the server, the system startup will not be completed until you type the power-on password. You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the password.

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

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

- If an administrator password is set, type the administrator password at the password prompt. Start the Configuration/Setup Utility program and reset the power-on password.
- Remove the server battery and then reinstall it. For instructions for removing the battery, see the *Problem Determination and Service Guide* on the IBM *System x3500 Documentation* CD.
- Change the pin position of the clear CMOS jumper (SW4) on the system board to bypass the power-on password check.

### Administrator password

If an administrator password is set, you must type the administrator password for access to the full Configuration/Setup Utility menu. You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for the password. The **Administrator Password** choice is on the Configuration/Setup Utility menu only if an optional IBM Remote Supervisor Adapter II is installed.

### Resetting passwords

If you forget the power-on password, you can change the pin position of the clear CMOS jumper (SW4) on the system board to bypass the power-on password check. This enables you to reset the power-on password. However, if you forget the administrator password, you must replace the system board.

## Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD contains a setup and installation program that is designed for your server. The ServerGuide program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. The ServerGuide program simplifies operating-system installations by providing updated device drivers and, in some cases, installing them automatically.

**Note:** The ServerGuide program works only with 32-bit Windows operating systems.

If the *ServerGuide Setup and Installation* CD did not come with the server, you can download the latest version of the ServerGuide program. You can download a free image of the *ServerGuide Setup and Installation* CD, or you can purchase the CD. To download the image, go to the IBM ServerGuide Web page at http://www.ibm.com/pc/qtechinfo/MIGR-4ZKPPT.html. To purchase the latest *ServerGuide Setup and Installation* CD, go to the ServerGuide fulfillment Web site at http://www.ibm.com/servers/eserver/xseries/systems_management/sys_migration/serverguide/sub.html.

The ServerGuide program has the following features:
- An easy-to-use interface
- Diskette-free setup, and configuration programs that are based on detected hardware
- ServeRAID Manager program, which configures your ServeRAID adapter or integrated SAS/SATA controller with RAID capabilities
- Device drivers that are provided for the server model and detected hardware
- File-system type that is selectable during setup

## ServerGuide features

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

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

The ServerGuide program performs the following tasks:

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

## Setup and configuration overview

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

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

When you start the *ServerGuide Setup and Installation* CD, the program prompts you to complete the following tasks:

- Select your language.
- Select your keyboard layout and country.
- View the overview to learn about ServerGuide features.
- View the readme file to review installation tips for your operating system and adapter.
- Start the operating-system installation. You will need your operating-system CD.

## Typical operating system installation

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

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

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

# Installing your operating system without ServerGuide

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

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

1. Go to http://www.ibm.com/support/.
2. Under **Search technical support**, type 7977 and click **Search**.
3. Select the instructions for your operating system.

# Using the baseboard management controller

The baseboard management controller provides environmental monitoring for the server. If environmental conditions exceed thresholds or if system components fail, the baseboard management controller lights LEDs to help you diagnose the problem and also records the error in the System Event/Error log.

The baseboard management controller also provides the following remote server management capabilities through the OSA SMBridge management utility program:

- **Command-line interface (IPMI Shell)**

  The command-line interface provides direct access to server management functions through the IPMI protocol. Use the command-line interface to issue commands to control the server power, view system information, and identify the server. You can also save one or more commands as a text file and run the file as a script.

- **Serial over LAN**

  Establish a Serial over LAN (SOL) connection to manage servers from a remote location. You can remotely view and change the BIOS settings, restart the server, identify the server, and perform other management functions. Any standard Telnet client application can access the SOL connection.

# Enabling and configuring SOL using the OSA SMBridge management utility program

To enable and configure the server for SOL by using the OSA SMBridge management utility program, you must update and configure the BIOS code; update and configure the baseboard management controller (BMC) firmware; update and configure the Ethernet controller firmware; and enable the operating system for an SOL connection.

## BIOS update and configuration

Complete the following steps to update and configure the BIOS code to enable SOL:

1. Update the BIOS code:
   a. Download the latest version of the BIOS code from http://www.ibm.com/support/.
   b. Update the BIOS code, following the instructions that come with the update file that you downloaded.
2. Update the BMC firmware:
   a. Download the latest version of the BMC firmware from http://www.ibm.com/support/.

b. Update the BMC firmware, following the instructions that come with the update file that you downloaded.

3. Configure the BIOS settings:

   a. Restart the server and press F1 when prompted to start the Configuration/Setup Utility program.

   b. Select **Devices and I/O Ports**; then, make sure that the values are set as follows:

      - **Serial Port A**: Auto-configure
      - **Serial Port B**: Auto-configure

   c. Select **Remote Console Redirection**; then, make sure that the values are set as follows:

      - **Remote Console COM Port**: COM 2
      - **Remote Console Baud Rate**: 19200 or higher
      - **Remote Console Connection Type**: VT100
      - **Remote Console Connect**: Direct
      - **Remote Console Flow Control**: Hardware
      - **Remote Console Active After Boot**: Enabled

   d. Press Esc twice to exit the **Remote Console Redirection** and **Devices and I/O Ports** sections of the Configuration/Setup Utility program.

   e. Select **Advanced Setup**; then, select **Baseboard Management Controller (BMC) Settings**.

   f. Set **BMC Serial Port Access Mode** to **Dedicated**.

   g. Press Esc twice to exit the **Baseboard Management Controller (BMC) Settings** and **Advanced Setup** sections of the Configuration/Setup Utility program.

   h. Select **Save Settings**; then, press Enter.

   i. Press Enter to confirm.

   j. Select **Exit Setup**; then, press Enter.

   k. Make sure that **Yes, exit the Setup Utility** is selected; then, press Enter.

## Linux configuration

For SOL operation on the server, you must configure the Linux® operating system to expose the Linux initialization (booting) process. This enables users to log in to the Linux console through an SOL session and directs Linux output to the serial console. See the documentation for your specific Linux operating-system type for information and instructions.

Use one of the following procedures to enable SOL sessions for your Linux operating system. You must be logged in as a root user to perform these procedures.

***Red Hat Enterprise Linux ES 2.1 configuration:***

**Note:** This procedure is based on a default installation of Red Hat Enterprise Linux ES 2.1. The file names, structures, and commands might be different for other versions of Red Hat Linux.

Complete the following steps to configure the general Linux parameters for SOL operation when using the Red Hat Enterprise Linux ES 2.1 operating system.

**Note:** Hardware flow control prevents character loss during communication over a serial connection. You must enable it when using a Linux operating system.

1. Add the following line to the end of the `# Run gettys in standard runlevels` section of the /etc/inittab file. This enables hardware flow control and enables users to log in through the SOL console.

   ```
   7:2345:respawn:/sbin/agetty -h ttyS0 19200 vt102
   ```

2. Add the following line at the bottom of the /etc/securetty file to enable a user to log in as the root user through the SOL console:

   ```
   ttyS0
   ```

*LILO configuration:*  If you are using LILO, complete the following steps:

1. Complete the following steps to modify the /etc/lilo.conf file:

   a. Add the following text to the end of the first `default=linux` line

      ```
      -Monitor
      ```

   b. Comment out the `map=/boot/map` line by adding a # at the beginning of this line.

   c. Comment out the `message=/boot/message` line by adding a # at the beginning of this line.

   d. Add the following line before the first `image=` line:

      ```
      # This will allow you to only Monitor the OS boot via SOL
      ```

   e. Add the following text to the end of the first `label=linux` line:

      ```
      -Monitor
      ```

   f. Add the following line to the first `image=` section. This enables SOL.

      ```
      append="console=ttyS0,19200n8 console=tty1"
      ```

   g. Add the following lines between the two `image=` sections:

      ```
      # This will allow you to Interact with the OS boot via SOL
      image=/boot/vmlinuz-2.4.9-e.12smp
          label=linux-Interact
          initrd=/boot/initrd-2.4.9-e.12smp.img
          read-only
          root=/dev/hda6
          append="console=tty1 console=ttyS0,19200n8 "
      ```

The following examples show the original content of the /etc/lilo.conf file and the content of this file after modification.

| Original /etc/lilo.conf contents |
| --- |
| ```
prompt
timeout=50
default=linux
boot=/dev/hda
map=/boot/map
install=/boot/boot.b
message=/boot/message
linear
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
image=/boot/vmlinuz-2.4.9-e.12
    label=linux-up
    initrd=/boot/initrd-2.4.9-e.12.img
    read-only
    root=/dev/hda6
``` |

**Modified /etc/lilo.conf contents**

```
prompt
timeout=50
default=linux-Monitor
boot=/dev/hda
#map=/boot/map
install=/boot/boot.b
#message=/boot/message
linear
# This will allow you to only Monitor the OS boot via SOL
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux-Monitor
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
    append="console=ttyS0,19200n8 console=tty1"
# This will allow you to Interact with the OS boot via SOL
image=/boot/vmlinuz-2.4.9-e.12smp
    label=linux-Interact
    initrd=/boot/initrd-2.4.9-e.12smp.img
    read-only
    root=/dev/hda6
    append="console=tty1 console=ttyS0,19200n8 "
image=/boot/vmlinuz-2.4.9-e.12
    label=linux-up
    initrd=/boot/initrd-2.4.9-e.12.img
    read-only
    root=/dev/hda6
```

2. Run the **lilo** command to store and activate the LILO configuration.

When the Linux operating system starts, a `LILO boot:` prompt is displayed instead of the graphical user interface. Press Tab at this prompt to install all of the boot options that are listed. To load the operating system in interactive mode, type `linux-Interact` and then press Enter.

*GRUB configuration:* If you are using GRUB, complete the following steps to modify the /boot/grub/grub.conf file:

1. Comment out the `splashimage=` line by adding a # at the beginning of this line.
2. Add the following line before the first `title=` line:

   `# This will allow you to only Monitor the OS boot via SOL`
3. Append the following text to the first `title=` line:

   `SOL Monitor`
4. Append the following text to the `kernel/` line of the first `title=` section:

   `console=ttyS0,19200 console=tty1`
5. Add the following five lines between the two `title=` sections:

   `# This will allow you to Interact with the OS boot via SOL`
   `title Red Hat Linux (2.4.9-e.12smp) SOL Interactive`
   `    root (hd0,0)`

```
        kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=tty1
            console=ttyS0,19200
            initrd /initrd-2.4.9-e.12smp.img
```

**Note:** The entry that begins with `kernel /vmlinuz` is shown with a line break after `console=tty1`. In your file, the entire entry must all be on one line.

The following examples show the original content of the /boot/grub/grub.conf file and the content of this file after modification.

**Original /boot/grub/grub.conf contents**

```
#grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE:  You have a /boot partition.  This means that
#          all kernel and initrd paths are relative to /boot/, eg.
#          root (hd0,0)
#           kernel /vmlinuz-version ro root=/dev/hda6
#           initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=10
splashimage=(hd0,0)/grub/splash.xpm.gz
title Red Hat Enterprise Linux ES (2.4.9-e.12smp)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12smp.img
title Red Hat Enterprise Linux ES-up (2.4.9-e.12)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12 ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12.img
```

**Modified /boot/grub/grub.conf contents**

```
#grub.conf generated by anaconda
#
# Note that you do not have to rerun grub after making changes to this file
# NOTICE:  You have a /boot partition.  This means that
#          all kernel and initrd paths are relative to /boot/, eg.
#          root (hd0,0)
#          kernel /vmlinuz-version ro root=/dev/hda6
#          initrd /initrd-version.img
#boot=/dev/hda
default=0
timeout=10
# splashimage=(hd0,0)/grub/splash.xpm.gz
# This will allow you to only Monitor the OS boot via SOL
title Red Hat Enterprise Linux ES (2.4.9-e.12smp) SOL Monitor
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=ttyS0,19200 console=tty1
    initrd /initrd-2.4.9-e.12smp.img
# This will allow you to Interact with the OS boot via SOL
title Red Hat Linux (2.4.9-e.12smp) SOL Interactive
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12smp ro root=/dev/hda6 console=tty1 console=ttyS0,19200
    initrd /initrd-2.4.9-e.12smp.img
title Red Hat Enterprise Linux ES-up (2.4.9-e.12)
    root (hd0,0)
    kernel /vmlinuz-2.4.9-e.12 ro root=/dev/hda6
    initrd /initrd-2.4.9-e.12.img
```

You must restart the Linux operating system after completing these procedures for the changes to take effect and to enable SOL.

***SUSE SLES 8.0 configuration:***

**Note:** This procedure is based on a default installation of SUSE Linux Enterprise Server (SLES) 8.0. The file names, structures, and commands might be different for other versions of SUSE LINUX.

Complete the following steps to configure the general Linux parameters for SOL operation when using the SLES 8.0 operating system.

**Note:** Hardware flow control prevents character loss during communication over a serial connection. You must enable it when using a Linux operating system.

1. Add the following line to the end of the `# getty-programs for the normal runlevels` section of the /etc/inittab file. This enables hardware flow control and enables users to log in through the SOL console.

   `7:2345:respawn:/sbin/agetty -h ttyS0 19200 vt102`

2. Add the following line after the `tty6` line at the bottom of the /etc/securetty file to enable a user to log in as the root user through the SOL console:

   `ttyS0`

3. Complete the following steps to modify the /boot/grub/menu.lst file:

a. Comment out the `gfxmenu` line by adding a # in front of the word `gfxmenu`.

b. Add the following line before the first `title` line:

    ```
    # This will allow you to only Monitor the OS boot via SOL
    ```

c. Append the following text to the first `title` line:

    ```
    SOL Monitor
    ```

d. Append the following text to the `kernel` line of the first `title` section:

    ```
    console=ttyS0,19200 console=tty1
    ```

e. Add the following four lines between the first two `title` sections:

    ```
    # This will allow you to Interact with the OS boot via SOL
    title linux SOL Interactive
        kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791
        console=tty1 console=ttyS0,19200
        initrd (hd0,1)/boot/initrd
    ```

The following examples show the original content of the /boot/grub/menu.lst file and the content of this file after modification.

| Original /boot/grub/menu.lst contents | Notes |
|---|---|
| `gfxmanu (hd0,1)/boot/message`<br>`color white/blue black/light-gray`<br>`default 0`<br>`timeout 8`<br><br>`title linux`<br>`  kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791`<br>`  initrd (hd0,1)/boot/initrd`<br>`title floppy`<br>`  root`<br>`  chainloader +1`<br>`title failsafe`<br>`  kernal (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp`<br>`disableapic maxcpus=0 3`<br><br>`  initrd (hd0,1)/boot/initrd.shipped` | <br><br><br><br><br>1<br><br><br><br><br>1 |
| **Note 1:** The kernel line is shown with a line break. In your file, the entire entry must all be on one line. | |

| Modified /boot/grub/menu.lst contents | Notes |
|---|---|
| `#gfxmanu (hd0,1)/boot/message`<br>`color white/blue black/light-gray`<br>`default 0`<br>`timeout 8`<br><br>`# This will allow you to only Monitor the OS boot via SOL`<br>`title linux SOL Monitor`<br>`  kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 console=ttyS1,19200`<br>`console=tty1`<br>`  initrd (hd0,1)/boot/initrd`<br>`# This will allow you to Interact with the OS boot via SOL`<br>`title linux SOL Interactive`<br>` kernel (hd0,1)/boot/vmlinuz root=/dev/hda2 acpi=oldboot vga=791 console=tty1 console=ttyS0,19200`<br>` initrd (hd0,1)/boot/initrd`<br>`title floppy` | <br><br><br><br><br><br><br>1 |

| Modified /boot/grub/menu.lst contents | Notes |
|---|---|
| ```<br>  root<br>  chainloader +1<br>title failsafe<br>  kernel (hd0,1)/boot/vmlinuz.shipped root=/dev/hda2 ide=nodma apm=off vga=normal nosmp<br>disableapic maxcpus=0 3<br><br>  initrd (hd0,1)/boot/initrd.shipped<br>``` | 1 |
| **Note 1:** The kernel line is shown with a line break. In your file, the entire entry must all be on one line. | |

You must restart the Linux operating system after completing these procedures for the changes to take effect and to enable SOL.

## Microsoft Windows 2003 Standard Edition configuration

**Note:** This procedure is based on a default installation of the Microsoft Windows 2003 operating system.

Complete the following steps to configure the Windows 2003 operating system for SOL operation. You must be logged in as a user with administrator access to perform this procedure.

1. Complete the following steps to determine which boot entry ID to modify:
   a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.
   b. In the `Boot Entries` section, locate the boot entry ID for the section with an OS friendly name of Windows Server 2003, Standard. Write down the boot entry ID for use in the next step.

2. To enable the Microsoft Windows Emergency Management System (EMS), at a Windows command prompt, type

   `bootcfg /EMS ON /PORT COM1 /BAUD 19200 /ID `*`boot_id`*

   where *boot_id* is the boot entry ID from step 1b; then, press Enter.

3. Complete the following steps to verify that the EMS console is redirected to the COM2 serial port:
   a. Type `bootcfg` at a Windows command prompt; then, press Enter to display the current boot options for your server.
   b. Verify the following changes to the bootcfg settings:
      - In the `Boot Loader Settings` section, make sure that `redirect` is set to `COM2` and that `redirectbaudrate` is set to `19200`.
      - In the `Boot Entries` section, make sure that the `OS Load Options:` line has `/redirect` appended to the end of it.

The following examples show the original bootcfg program output and the output after modification.

| Original bootcfg program output |
|---|
| Boot Loader Settings<br>---------------------------<br>timeout: 30<br>default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>Boot Entries<br>----------------<br>Boot entry ID: 1<br>OS Friendly Name: Windows Server 2003, Standard<br>Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>OS Load Options: /fastdetect |

| Modified bootcfg program output |
|---|
| Boot Loader Settings<br>---------------------------<br>timeout: 30<br>default: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>redirect: COM1<br>redirectbaudrate: 19200<br>Boot Entries<br>----------------<br>Boot entry ID: 1<br>OS Friendly Name: Windows Server 2003, Standard<br>Path: multi(0)disk(0)rdisk(0)partition(1)\WINDOWS<br>OS Load Options: /fastdetect /redirect |

You must restart the Windows 2003 operating system after completing this procedure for the changes to take effect and to enable SOL.

## Installing the OSA SMBridge management utility program

Complete the following steps to install the OSA SMBridge management utility program on a server running a Windows operating system:

1. Go to http://www.ibm.com/support/ and download the utility program and create the OSA BMC Management Utility CD.
2. Insert the OSA BMC Management Utility CD into the drive. The InstallShield wizard starts, and a window similar to that shown in the following illustration opens.

3. Follow the prompts to complete the installation.

   The installation program prompts you for a TCP/IP port number and an IP address. Specify an IP address, if you want to limit the connection requests that will be accepted by the utility program. To accept connections from any server, type `INADDR_ANY` as the IP address. Also specify the port number that the utility program will use. These values will be recorded in the smbridge.cfg file for the automatic startup of the utility program.

Complete the following steps to install the OSA SMBridge management utility program on a server running a Linux operating system. You must be logged in as a root user to perform these procedures.

1. Go to http://www.ibm.com/support/ and download the utility program and create the OSA BMC Management Utility CD.

2. Insert the OSA BMC Management Utility CD into the drive.

3. Type `mount/mnt/cdrom`.

4. Locate the directory where the installation RPM package is located and type `cd/mnt/cdrom`.

5. Type the following command to run the RPM package and start the installation:

   `rpm -ivh smbridge-2.0-XX.rpm`

6. Follow the prompts to complete the installation. When the installation is complete, the utility copies files to the following directories:

   /etc/init.d/SMBridge
   /etc/smbridge.cfg
   /usr/sbin/smbriged
   /var/log/smbridge/Liscense.txt
   /var/log/smbridge/Readme.txt

The utility starts automatically when the server is started. You can also locate the /ect/init.d directory to start the utility and use the following commands to manage the utility:

smbridge status
smbridge start
smbridge stop
smbridge restart

# Using the baseboard management controller utility programs

Use the baseboard management controller utility programs to configure the baseboard management controller, download firmware updates and SDR/FRU updates, and remotely manage a network.

### Using the baseboard management controller configuration utility program

Use the baseboard management controller configuration utility program to view or change the baseboard management controller configuration settings. You can also use the utility program to save the configuration to a file for use on multiple servers.

Complete the following steps to start the baseboard management controller configuration utility program:

1. Insert the configuration utility diskette into the diskette drive and restart the server.
2. From a command-line prompt, type `bmc_cfg` and press Enter.
3. Follow the instructions on the screen.

### Using the baseboard management controller firmware update utility program

Use the baseboard management controller firmware update utility disk to update the baseboard management controller firmware and SDR/FRU data. The firmware update utility updates the baseboard management controller firmware and SDR/FRU data only and does not affect any device drivers.

**Note:** To ensure proper server operation, be sure to update the server baseboard management controller firmware before updating the BIOS code.

To update the firmware, if the Linux or Windows operating-system update package is available from the World Wide Web and you have obtained the applicable update package, follow the instructions that come with the update package.

### Using the OSA SMBridge management utility program

Use the OSA SMBridge management utility program to remotely manage and configure a network. The utility program provides the following remote management capabilities:

- **CLI (command-line interface) mode**

  Use CLI mode to remotely perform power-management and system identification control functions over a LAN or serial port interface from a command-line interface. Use CLI mode also to remotely view the System Event/Error log.

  Use the following commands in CLI mode:

  – **identify**

    Control the system-locator LED on the front of the server.

  – **power**

    Turn the server on and off remotely.

  – **sel**

    Perform operations with the BMC System Event Log.

- – **sysinfo**

    Display general system information that is related to the server and the baseboard management controller.
- **Serial over LAN**

  Use the Serial over LAN capability to remotely perform control and management functions over a Serial over LAN (SOL) network. You can also use SOL to remotely view and change the server BIOS settings.

  At a command prompt, type `Telnet localhost 623` to access the SOL network. Type `help` at the `smbridge>` prompt for more information.

  Use the following commands in an SOL session:
  - – **connect**

    Connect to the LAN. Type `connect -ip` *ip_address* `-u` *username* `-p` *password*.
  - – **identify**

    Control the system-locator LED on the front of the server.
  - – **power**

    Turn the server on and off remotely.
  - – **reboot**

    Force the server to restart.
  - – **sel get**

    Display the System Event/Error log.
  - – **sol**

    Configure the SOL function.
  - – **sysinfo**

    Display system information that is related to the server and the globally unique identifier (GUID).

# Using the Boot Menu program

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

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

1. Turn off the server.
2. Restart the server.
3. Press F12.
4. Select the startup device.

The next time that the server is started, it returns to the startup sequence that is set in the Configuration/Setup Utility program.

# Enabling the Broadcom Gigabit Ethernet Utility program

The Broadcom Gigabit Ethernet Utility is part of the BIOS code. You can use it to configure the network as a startable device, and you can customize where the network startup option appears in the startup sequence.

To enable the Broadcom Gigabit Ethernet Utility program, complete the following steps:

1. From the Configuration/Setup Utility main menu, select **Devices and I/O Ports** and press Enter.
2. Select **Planar Ethernet** and use the Right Arrow (→) key to set it to **Enabled**.
3. Select **Save Settings** and press Enter.

# Configuring the Broadcom Gigabit Ethernet controller

The Ethernet controller is integrated on the system board. It provides an interface for connecting to a 10-Mbps, 100-Mbps, or 1-Gbps network and provides full duplex (FDX) capability, which enables simultaneous transmission and reception of data on the network. If the Ethernet port in the server supports auto-negotiation, the controller detects the data-transfer rate (10BASE-T, 100BASE-TX, or 1000BASE-T) and duplex mode (full-duplex or half-duplex) of the network and automatically operates at that rate and mode.

You do not have to set any jumpers or configure the controller. However, you must install a device driver to enable the operating system to address the controller. To find updated information about configuring the controller, complete the following steps.

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

1. Go to http://www.ibm.com/support/.
2. Under **Search technical support**, type 7977, and click **Search**.
3. In the **Additional search terms** field, type ethernet, and click **Go**.

# Setting up the Remote Supervisor Adapter II SlimLine

You use the optional Remote Supervisor Adapter II SlimLine to obtain enhanced system management capabilities, above those of the embedded BMC. The Remote Supervisor Adapter II SlimLine has a dedicated Ethernet connection at the rear of the server.

This section describes how to set up, cable, and configure the Remote Supervisor Adapter II SlimLine so that you can manage the server remotely.

In addition to the information in this section, see the *IBM Remote Supervisor Adapter II User's Guide* for information about how to configure and use the Remote Supervisor Adapter II SlimLine to manage the server remotely through the Web-based interface or the text-based interface.

**Note:** The Web-based interface and text-based interface do not support double-byte character set (DBCS) languages.

## Requirements

Make sure that the following Remote Supervisor Adapter II SlimLine requirements are met:

- The Web interface Remote Disk function requires the client system to be running Microsoft Windows 2000 or later. The Web interface Remote Control features require the Java™ 1.4 Plug-in or later. The following Web browsers are supported:
  - Microsoft Internet Explorer version 5.5 or later with the latest Service Pack
  - Netscape Navigator version 7.0 or later
  - Mozilla version 1.3 or later

- If you plan to configure Simple Network Management Protocol (SNMP) trap alerts on the Remote Supervisor Adapter II SlimLine, install and compile the management information base (MIB) on your SNMP manager.
- You will need an Internet connection to the client system to download software and firmware from the IBM Support Web site during the installation process. The Remote Supervisor Adapter II SlimLine firmware and the SNMP MIB are available on the *ServerGuide Setup and Installation* CD; the latest versions are available at http://www.ibm.com/pc/support/.

## Cabling the Remote Supervisor Adapter II SlimLine

You can manage the server remotely through the Remote Supervisor Adapter II SlimLine using the dedicated system-management Ethernet connector on the rear of the server.

For additional information about network configuration, go to the *Remote Supervisor Adapter II Installation Guide*.

Complete the following steps to cable the Remote Supervisor Adapter II SlimLine:

1. Connect one end of a Category 3 or Category 5 Ethernet cable to the dedicated system-management Ethernet connector. See "Rear view" on page 10 for the location of the system-management Ethernet connector.
2. Connect the other end of the cable to the network.

## Installing the Remote Supervisor Adapter II SlimLine firmware

The software and firmware files that you need are contained in one system service package installation kit. The kit contains the following files:

- Software and firmware installation instructions
- BIOS code update with support for the Remote Supervisor Adapter II SlimLine
- Diagnostics code update
- Remote Supervisor Adapter II SlimLine device drivers
- Remote Supervisor Adapter II SlimLine firmware update
- Integrated service processor firmware update
- Video device driver
- Firmware-update utility program

Complete the following steps to download and install the software and firmware.

**Note:** changes are made periodically to the IBM Web site. The actual procedure might vary slightly from what is described in this document.

1. Go to http://www.ibm.com/support/.
2. In the left navigation pane, click **Downloads and drivers**.
3. In the **Search** field, type **Remote Supervisor Adapter II SlimLine firmware** and click **Search**.
4. Select the system service package for the operating system that is running on the server in which the Remote Supervisor Adapter II SlimLine is installed.
5. Click the file link to download the system service package to *d*:\ibmssp, where *d* is the hard disk drive letter. (Create the directory if necessary.)
6. Extract the files into *d*:\ibmssp. See the readme.txt file, which is included with the extracted files, for a list of the files in the package.

7. Follow the instructions in *Remote Supervisor Adapter II Installation Instructions*, which is in Portable Document Format (PDF) in *d*:\ibmssp, to install the software and firmware.

8. Restart the server after the software and firmware are installed.

## Completing the setup

See the *IBM Remote Supervisor Adapter II User's Guide* on the IBM *Documentation* CD for instructions for completing the configuration, including the following procedures:

- Configuring the Ethernet ports
- Defining login IDs and passwords
- Selecting the events that will receive alert notifications
- Monitoring remote server status using the Remote Supervisor Adapter II SlimLine Web-based interface
- Controlling the server remotely
- Attaching a remote diskette drive, CD drive, or disk image to the server

After you configure the adapter, use the Web-based interface to create a backup copy of the configuration so that you can restore the configuration, if you have to replace the adapter. For more information, see the *Remote Supervisor Adapter II User's Guide*.

## Using the Adaptec RAID Configuration Utility program

Use the Adaptec RAID Configuration Utility programs to perform the following tasks:

- Configure a redundant array of independent disks (RAID) array
- View or change the RAID configuration and associated devices

When you are using the Adaptec RAID Configuration Utility programs to configure and manage arrays, consider the following information:

- Hard disk drive capacities affect how you create arrays. Drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.
- To help ensure signal quality, do not mix drives with different speeds and data rates.
- To update the firmware and BIOS code for an optional ServeRAID SAS controller, you must use the IBM *ServeRAID Support* CD that comes with the ServeRAID option.

## Starting the Adaptec RAID Configuration Utility program

To start the Adaptec RAID Configuration Utility program, complete the following steps:

1. Turn on the server.

2. When the prompt `<<< Press <CTRL><A> for Adaptec RAID Configuration Utility! >>>` appears, press Ctrl+A.

3. To select a choice from the menu, use the arrow keys to highlight it and press Enter.

## Adaptec RAID Configuration Utility menu choices

The following choices are on the Adaptec RAID Configuration Utility menu:

- **Array Configuration Utility**

  Select this choice to create, manage, or delete arrays, or to initialize drives.

- **SerialSelect Utility**

  Select this choice to configure the controller interface definitions or to configure the physical transfer and SAS address of the selected drive.

- **Disk Utilities**

  Select this choice to format a disk or verify the disk media. Select a device from the list and read the instructions on the screen carefully before making a selection.

## Creating a RAID array

To create a RAID array, complete the following steps:

1. Start the Adaptec RAID Configuration Utility program.
2. Select **Array Configuration Utility**.
3. From the Main menu, select **Create Array**.

   **Note:** Hard disk drives in an array can have different capacities, but the RAID controller treats them as if they all have the capacity of the smallest hard disk drive.

4. From the list of available drives, select the drives that you want to include in the array and press Enter.
5. From the list of RAID levels available, select the one you want to use.
6. Follow the instructions on the screen to complete the configuration; then, select **Done** to exit.
7. Restart the server.

## Viewing the array configuration

To view information about the RAID array, complete the following steps:

1. Start the Adaptec RAID Configuration Utility program.
2. Select **Array Configuration Utility**.
3. From the Main menu, select **Manage Arrays**.
4. Select an array and press Enter.
5. To exit from the program, press Esc.

## Using ServeRAID Manager

Use ServeRAID Manager, which is on the *IBM ServeRAID Support* CD, to:

- Configure a redundant array of independent disks (RAID) array
- Restore a SAS hard disk drive to the factory-default settings, erasing all data from the disk
- View your RAID configuration and associated devices
- Monitor the operation of your RAID controller

To perform some tasks, you can run ServeRAID Manager as an installed program. However, to configure the SAS and RAID controllers and perform an initial RAID configuration on the server, you must run ServeRAID Manager in Startable CD mode, as described in the instructions in this section. If you install a different type of

RAID adapter in the server, use the configuration method described in the instructions that come with that adapter to view or change SAS settings for attached devices.

See the ServeRAID documentation on the *IBM ServeRAID Support* CD for additional information about RAID technology and instructions for using ServeRAID Manager to configure your SAS and RAID controllers. Additional information about ServeRAID Manager is also available from the **Help** menu. For information about a specific object in the ServeRAID Manager tree, select the object and click **Actions"** **Hints and tips**.

# Configuring the controller

By running ServeRAID Manager in Startable CD mode, you can configure the controller before you install your operating system. The information in this section assumes that you are running ServeRAID Manager in Startable CD mode.

To run ServeRAID Manager in Startable CD mode, turn on the server; then, insert the CD into the DVD-ROM drive. If ServeRAID Manager detects an unconfigured controller and ready drives, the Configuration wizard starts.

In the Configuration wizard, you can select express configuration or custom configuration. Express configuration automatically configures the controller by grouping the first two physical drives in the ServeRAID Manager tree into an array and creating a RAID level-1 logical drive. If you select custom configuration, you can select the two physical drives that you want to group into an array and create a hot-spare drive.

### Using express configuration

Complete the following steps to use express configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Express configuration**.
3. Click **Next**. The "Configuration summary" window opens.
4. Review the information in the "Configuration summary" window. To change the configuration, click **Modify arrays**.
5. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.
6. Exit from ServeRAID Manager and remove the CD from the DVD-ROM drive.
7. Restart the server.

### Using custom configuration

Complete the following steps to use custom configuration:

1. In the ServeRAID Manager tree, click the controller.
2. Click **Custom configuration**.
3. Click **Next**. The "Create arrays" window opens.
4. From the list of ready drives, select the two drives that you want to group into the array.
5. Click the icon on the toolbar to add the selected drives to the array.
6. If you want to configure a hot-spare drive, complete the following steps:
   a. Click the **Spares** tab.
   b. Select the physical drive that you want to designate as the hot-spare drive, and the icon on the toolbar to add the selected drives.

7. Click **Next**. The "Configuration summary" window opens.

8. Review the information in the "Configuration summary" window. To change the configuration, click **Back**.

9. Click **Apply**; then, click **Yes** when asked if you want to apply the new configuration. The configuration is saved in the controller and in the physical drives.

10. Exit from ServeRAID Manager and remove the CD from the DVD-ROM drive.

11. Restart the server.

## Viewing the configuration

You can use ServeRAID Manager to view information about RAID controllers and the RAID subsystem (such as arrays, logical drives, hot-spare drives, and physical drives). When you click an object in the ServeRAID Manager tree, information about that object appears in the right pane. To display a list of available actions for an object, click the object and click **Actions**.

## Updating IBM Director

If you plan to use IBM Director to manage the server, you must check for the latest applicable IBM Director updates and interim fixes.

To install the IBM Director updates and any other applicable updates and interim fixes, complete the following steps.

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

1. Check for the latest version of IBM Director:

    a. Go to http://www.ibm.com/servers/eserver/xseries/systems_management/ xseries_sm/dwnl.html.

    b. If the drop-down list shows a newer version of IBM Director than what comes with the server, follow the instructions on the Web page to download the latest version.

2. Install the IBM Director program.

3. Download and install any applicable updates or interim fixes for the server:

    a. Go to http://www.ibm.com/support/.

    b. Click **Downloads and drivers**.

    c. From the **Category** list, select **xSeries (Intel and AMD processor-based)**.

    d. From the **Sub-category** list, select **System x3500** and click **Continue**.

    e. In the **Search within results** field, type `director` and click **Search**.

    f. Select any applicable update or interim fix that you want to download.

    g. Click the link for the executable (.exe) file to download the file, and follow the instructions in the readme file to install the update or interim fix.

    h. Repeat steps 3f and 3g for any additional updates or interim fixes that you want to install.

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# Important notes

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

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

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

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

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

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

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

# Product recycling and disposal

This unit must be recycled or discarded according to applicable local and national regulations. IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of product return programs and services in several countries to assist equipment owners in recycling their IT products. Information on IBM product recycling offerings can be found on IBM's Internet site at http://www.ibm.com/ibm/environment/products/prp.shtml.



**Notice:** This mark applies only to countries within the European Union (EU) and Norway.

This appliance is labeled in accordance with European Directive 2002/96/EC concerning waste electrical and electronic equipment (WEEE). The Directive determines the framework for the return and recycling of used appliances as

applicable throughout the European Union. This label is applied to various products to indicate that the product is not to be thrown away, but rather reclaimed upon end of life per this Directive.

注意: このマークは EU 諸国およびノルウェーにおいてのみ適用されます。

この機器には、EU 諸国に対する廃電気電子機器指令 2002/96/EC(WEEE) のラベルが貼られています。この指令は、EU 諸国に適用する使用済み機器の回収とリサイクルの骨子を定めています。このラベルは、使用済みになった時に指令に従って適正な処理をする必要があることを知らせるために種々の製品に貼られています。

**Remarque:** Cette marque s'applique uniquement aux pays de l'Union Européenne et à la Norvège.

L'etiquette du système respecte la Directive européenne 2002/96/EC en matière de Déchets des Equipements Electriques et Electroniques (DEEE), qui détermine les dispositions de retour et de recyclage applicables aux systèmes utilisés à travers l'Union européenne. Conformément à la directive, ladite étiquette précise que le produit sur lequel elle est apposée ne doit pas être jeté mais être récupéré en fin de vie.

# Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml or contact your local waste disposal facility.

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

In the Netherlands, the following applies.



For Taiwan: Please recycle batteries.



廢電池請回收

# Electronic emission notices

## Federal Communications Commission (FCC) statement

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

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

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

## Industry Canada Class A emission compliance statement

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

**Avis de conformité à la réglementation d'Industrie Canada**

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

## Australia and New Zealand Class A statement

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

## United Kingdom telecommunications safety requirement

**Notice to Customers**

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

## European Union EMC Directive conformance statement

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

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN

55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

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

## Taiwanese Class A warning statement

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

## Chinese Class A warning statement

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

## Japanese Voluntary Control Council for Interference (VCCI) statement

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に
基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を
引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求
されることがあります。

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IBM®

Part Number: 31R1173

Printed in USA