

@serverTM

xSeries 232

Type 8668

(Redundant Cooling Models)

User's Reference



IBM xSeries 232



User's Reference

Note:

Before using this information and the product it supports, be sure to read the general information in Appendix A, "Warranty information," on page 135 and Appendix B, "Notices," on page 145.

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Safety

Before installing this product, read the Safety Information.

مج، يجب قراءة دات السلامة

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1



DANGER

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

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 2



CAUTION:

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

Do not:

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

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

Statement 3



CAUTION:

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

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



DANGER

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

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

Class 1 Laser Product

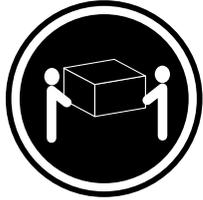
Laser Klasse 1

Laser Klass 1

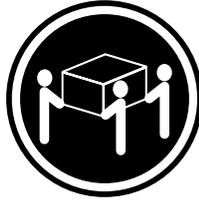
Luokan 1 Laserlaite

Appareil À Laser de Classe 1

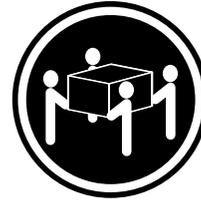
Statement 4



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



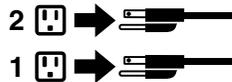
≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5



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



Statement 6



CAUTION:
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

Statement 8



CAUTION:

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



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

Statement 13



DANGER

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

Chapter 1. Introduction

Your IBM® eServer xSeries 232 is a high-performance, symmetric multiprocessing (SMP) server. It is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and reliable data storage.

Your xSeries 232 contains several IBM X-Architecture™ technologies, which help increase server performance and reliability. For more information about X-Architecture features, refer to “What your IBM xSeries 232 offers” on page 3. You can obtain more information about the IBM X-Architecture technologies and features at <http://www.pc.ibm.com/us/eserver/xseries/xarchitecture/index.html>.

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

Your IBM xSeries 232 server comes with a three-year limited warranty and 90-day IBM Start Up Support. If you have access to the World Wide Web, you can obtain up-to-date information about your server and other IBM server products at the following World Wide Web address:

<http://www.ibm.com/eserver/xseries/>

The information label containing the serial number, machine type, model number, and agency marks for your server is located as follows:

- Tower model** On the bottom of the server, on the rear of the server, and on the front of the server below the bezel
- Rack model** On the side of the server, on the rear of the server, and on the front of the server below the bezel

For service, assistance, or additional information on 90-day IBM Start Up Support and the World Wide Web, see Chapter 7, “Getting information, help, and service,” on page 131.

Features and specifications

Table 1 provides a summary of the features and specifications for your xSeries 232 server.

<p>Microprocessor:</p> <ul style="list-style-type: none"> • Intel® Pentium® III • 256 or 512 KB Level-2 cache • Supports up to two microprocessors <p>Memory:</p> <ul style="list-style-type: none"> • Maximum: 4 GB • Type: ECC, SDRAM, PC133, registered DIMMs • Slots: Four (two-way interleaved) <p>Drives standard:</p> <ul style="list-style-type: none"> • Diskette: 1.44 MB • CD-ROM: 48X IDE <p>Expansion bays:</p> <ul style="list-style-type: none"> • Hot-swap: Six slim high • Non-hot-swap: Three 5.25-inch (one used by CD-ROM drive) • You can install a drive-bay expansion kit to convert two of the 5.25-inch bays so that they support three hot-swap drives <p>PCI expansion slots:</p> <ul style="list-style-type: none"> • One 33 MHz/32-bit • Two 33 MHz/64-bit • Two 66 MHz/64-bit <p>Power supplies:</p> <p>Two 250-watt (115-230 V ac) power supplies with a maximum of three 250-watt units for power-supply redundancy</p>	<p>Acoustical noise emissions:</p> <ul style="list-style-type: none"> • Sound power, idling: 6.6 bel maximum • Sound power, operating: 6.8 bel maximum • Sound pressure, operating: 53 dBa maximum <p>Video:</p> <ul style="list-style-type: none"> • S3 video controller • Compatible with SVGA and VGA • 8 MB video memory <p>Size (rack model 5U)</p> <ul style="list-style-type: none"> • Height: 217 mm (8.5 in.) • Depth: 688 mm (27.1 in.) • Width: 440 mm (17.3 in.) • Weight: approximately 35.4 kg (78 lb) when fully configured <p>Size (tower model)</p> <ul style="list-style-type: none"> • Height: 440 mm (17.3 in.) • Depth: 700 mm (27.5 in.) • Width: 217 mm (8.5 in.) • Weight: approximately 37.64 kg (83 lb) when fully configured <p>Integrated functions:</p> <ul style="list-style-type: none"> • Ultra160 SCSI controller • One 10BASE-T and one 100BASE-TX Intel Ethernet controller with Alert on LAN™ and Wake on LAN® support • Two serial ports • Two Universal Serial Bus (USB) ports • Keyboard port • Mouse port • Video port • Integrated system management processor (ISMP) with two ISM (RS-485) RJ-45 connectors 	<p>Environment:</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> — Server on: 10° to 35°C (50.0° to 95.0°F). Altitude: 0 to 914 m (2998.7 ft) — Server on: 10° to 32°C (50.0° to 89.6°F). Altitude: 914 m (2998.7 ft) to 2133 m (6998.0 ft) — Server off: 10° to 43°C (50.0° to 109.4°F). Maximum altitude: 2133 m (6998.0 ft) • Humidity: <ul style="list-style-type: none"> — Server on: 8% to 80% — Server off: 8% to 80% <p>Heat output:</p> <p>Approximate heat output in British thermal units (Btu) per hour</p> <ul style="list-style-type: none"> • Minimum configuration: 683 Btu (200 watts) • Maximum configuration: 1877 Btu (550 watts) <p>Electrical input:</p> <ul style="list-style-type: none"> • Sine-wave input (50-60 Hz) required • Input voltage low range: <ul style="list-style-type: none"> — Minimum: 100 V ac — Maximum: 127 V ac • Input voltage high range: <ul style="list-style-type: none"> — Minimum: 200 V ac — Maximum: 240 V ac • Input kilovolt-amperes (kVA) approximately: <ul style="list-style-type: none"> — Minimum: 0.08 kVA — Maximum: 0.52 kVA
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Table 1. Features and specifications.

Notices and statements in this book

The caution and danger statements used in this book also appear in the multilingual *Safety Information* book provided on the *IBM Documentation* CD. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety book.

The following types of notices and statements are used in this book:

- **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 possible 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.

What your IBM xSeries 232 offers

The unique design of your server takes advantage of advancements in symmetric multiprocessing (SMP), data storage, and memory management. Your server combines:

- IBM X-Architecture technology
IBM X-Architecture leverages proven innovative IBM technologies to build the most powerful, and reliable Intel processor-based servers in the world.
- Impressive performance using an innovative approach to SMP
Your server supports up to two Pentium III microprocessors. Your server comes with one microprocessor installed; you can install an additional microprocessor to enhance performance and provide SMP capability.
- Large data-storage and hot-swap capabilities
All models of the server support up to six hot-swap hard disk drives. This *hot-swap* feature enables you to remove and replace hard disk drives without turning off the server.
The addition of an optional digital linear tape drive (DLT) enables quick backup of large amounts of data.
- IBM integrated system management processor (ISMP)
The integrated system management processor provides environmental monitoring for your server. When environmental conditions exceed thresholds or when system components fail, the ISMP lights the Light Path Diagnostics™ LEDs to indicate the location of the problem. Critical errors are also included in the error log.
If you have a Remote Supervisor Adapter installed on your Advanced System Management (ASM) interconnect network, you can view the system health; update the ISMP code; power on, power off, and restart the server; view the error log; view the vital product data; and send alerts over the ASM interconnect

network. To order an optional Remote Supervisor Adapter, contact your IBM Reseller or IBM marketing representative.

- Redundant cooling capability

The redundant cooling capability of the hot-swap fans in your server allows continued operation if one of the fans fails. You can also replace a failing hot-swap fan without turning off the server.

- Redundant power capabilities

Your server comes with two 250-watt power-supply units. These two power-supply units provide redundant power for many server configurations. For power loads above 250 watts, you can install a third optional power supply to provide a full 500 watts of power.

The NON LED on the system board is lit when the power load is 250 watts or greater with two power supplies, or when the power load is 500 watts or greater with three power supplies.

- Large system memory

The memory bus in your server supports up to 4 GB (GB equals approximately 1 000 000 000 bytes) of two-way interleaved system memory. The memory controller provides error correcting code (ECC) support for up to four industry-standard PC133, 3.3 V, 168-pin, 8-byte, registered, synchronous-dynamic-random access memory (SDRAM) dual inline memory modules (DIMMs).

- Integrated network environment support

Your server comes with an Ethernet controller on the system board. This Ethernet controller has an interface for connecting to 10-Mbps or 100-Mbps networks. The server automatically selects between 10BASE-T and 100BASE-TX. The controller provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN).

- Redundant network interface card

The addition of an optional, redundant network interface card (NIC) provides a failover capability to a redundant Ethernet connection. If a problem occurs with the primary Ethernet connection, all Ethernet traffic associated with this primary connection is automatically switched to the redundant NIC. This switching occurs without data loss and without user intervention.

- Optional PCI adapters

Your server uses peripheral component interconnect (PCI) bus architecture to provide compatibility with a wide range of existing hardware devices and software applications. Your server supports up to five PCI adapters in the expansion slots.

- IBM ServerGuide™ CDs

The ServerGuide CDs that are included with your server provide programs to help you set up your server and install the network operating system (NOS). The ServerGuide program detects the hardware options that are installed and provides the correct configuration programs and device drivers. In addition, the ServerGuide CDs include a variety of application programs for your server.

For more information about the ServerGuide CDs, see Chapter 4, “Using the ServerGuide CDs,” on page 21.

Reliability, availability, and serviceability features

Three of the most important features in server design are reliability, availability, and serviceability (RAS). These factors help to ensure the integrity of the data stored on your server; that your server is available when you want to use it; and that should a failure occur, you can diagnose and repair the failure with minimal inconvenience.

The following is an abbreviated list of the RAS features that your server supports:

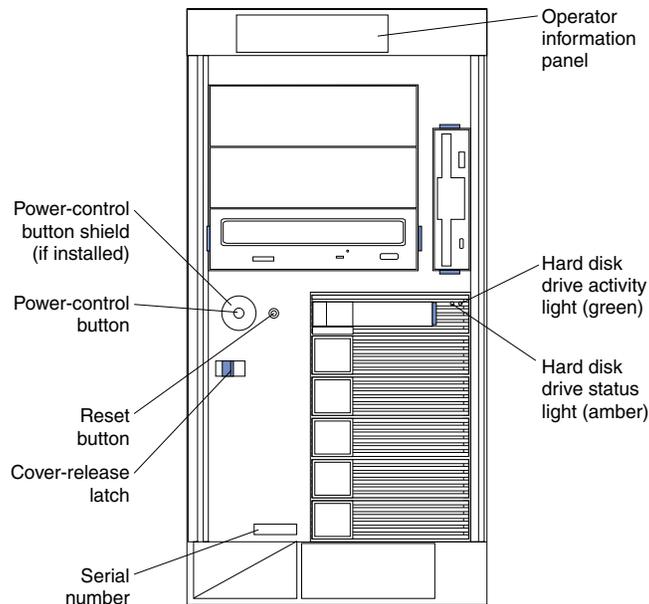
- Menu-driven setup, system configuration, RAID configuration, and diagnostic programs
- Power-on self-test (POST)
- ROM-resident diagnostics
- Integrated system management processor (ISMP)
- Predictive failure alerts
- Remote system problem-determination support
- Power and temperature monitoring
- Microprocessor built-in self-test (BIST)
- Internal error signal monitoring
- Configuration checking
- CPU/VRM failure identification through Light Path Diagnostics technology and alerting
- Diagnostic support of ServeRAID™ adapters and Ethernet adapters
- Hot-swap drive bays
- Error codes and messages and system error logging
- Upgradable BIOS, diagnostics, and ISMP code
- Automatic restart after a power failure
- Parity checking on the SCSI
- Error checking and correcting (ECC) memory
- Redundant hot-swap power-supply option
- Redundant hot-swap cooling
- Redundant Ethernet capabilities (with optional adapter)
- Vital product data (VPD) on processor complex, system board, power backplane, SCSI backplane, and each power supply
- Operator information panel and group of diagnostic LEDs on the system board
- Remind button to temporarily turn off LEDs for nonvital alerts
- Customer support center 24 hours per day, 7 days a week¹

¹.Service availability will vary by country. Response time varies; may exclude some holidays.

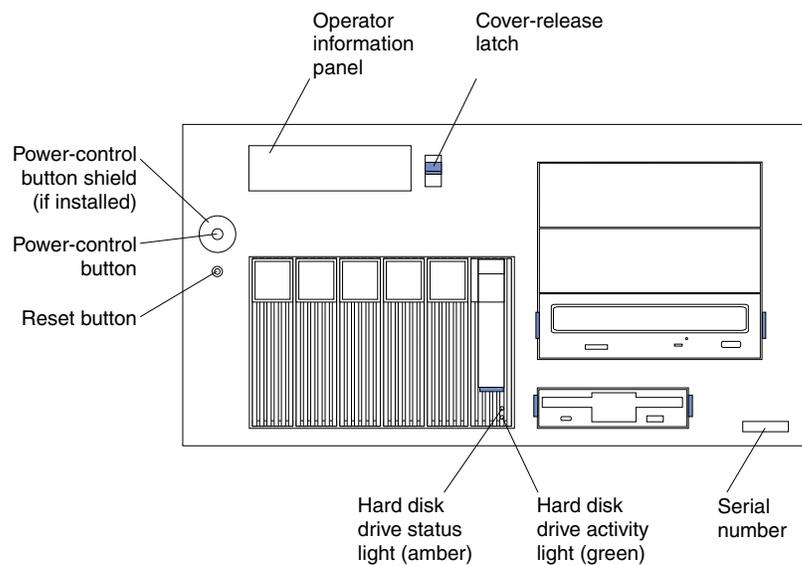
Server controls and indicators

The following illustrations show the controls and indicators on the front of the server.

Tower model



Rack model



Power-control button shield: You can install this circular disk over the power-control button to prevent accidental manual power-off. This disk is provided with your server.

Power-control button: Press this button to manually shut down and turn off the server.

Reset button: Press this button to reset the server and run the power-on self-test (POST). You might need to use a pen or the end of a straightened paper clip to press the button.

Operator information panel: The lights on this panel give status information for your server. See “Operator information panel” on page 8 for more information.

Cover-release latch: Slide this lever to release the cover.

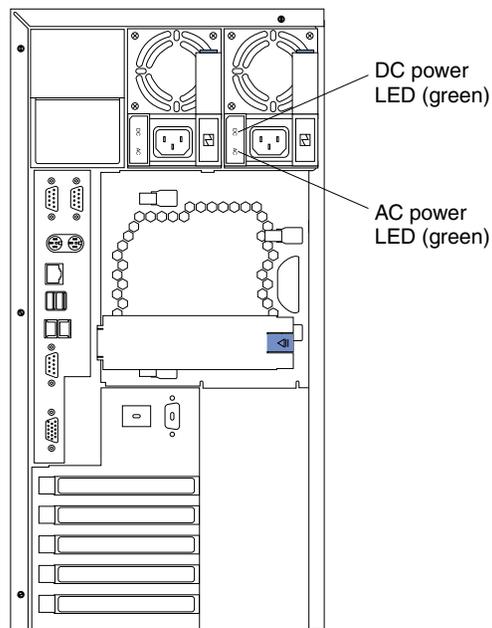
Serial number: This number uniquely identifies your server.

Hard disk drive status light: Each of the hot-swap drives has a hard disk drive status light. When this amber light is on continuously, the drive has failed.

If a ServeRAID adapter is installed and this amber light flashes slowly (one flash per second), the drive is being rebuilt. When the light flashes rapidly (three flashes per second), the controller is identifying the drive.

Hard disk drive activity light: Each of the hot-swap drives has a hard disk drive light. When this green light is flashing, the controller is accessing the drive.

**Rear view
(tower shown)**

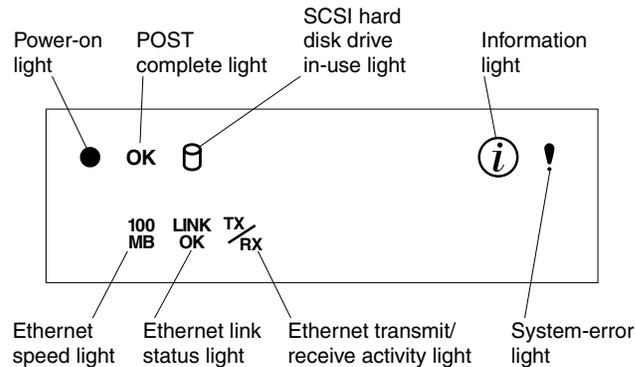


AC power light: This green light provides status information about the power supply. During typical operation, the ac power light is on. For any other combination of lights, see “Power-supply LEDs” on page 111.

DC power light: This green light provides status information about the power supply. During typical operation, the dc power light is on. For any other combination of lights, see “Power-supply LEDs” on page 111.

Operator information panel

The following illustration shows the location of the lights on the operator information panel on the front of the server (see “Server controls and indicators” on page 6).



Power-on light: This green LED lights when system power is present in the server. When this light flashes, the server is in Standby mode (the system power supply is turned off and current is present). If this light is not on, the power cord is not connected, the power supply has failed, or this LED has failed. See Chapter 6, “Solving Problems,” on page 85.

POST complete light: This green LED lights when the server completes the power-on self-test (POST).

SCSI hard disk drive in-use light: This green LED lights when there is activity on a hard disk drive.

Information light: This amber LED lights when the information log contains information about certain conditions in your server that might affect performance. For example, the light will be on if your server has multiple power supplies and does not have redundant power. An LED on the diagnostic panel on the system board will also be on.

System-error light: This amber LED lights when a system error occurs. An LED on the diagnostic panel on the system board will also be on to further isolate the error.

Ethernet speed light: This green LED lights when the Ethernet LAN speed is 100 Mbps during typical operation. When the system is powered off, the LED might remain lit.

Ethernet link status light: This green LED lights when there is an active connection on the Ethernet port during typical operation. When the system is powered off, the LED might remain lit.

Ethernet transmit/receive activity light: This green LED lights when there is transmit or receive activity to or from the server.

Turning on the server

After you plug the power cord of your server into the power supply and an electrical outlet, the server can be started in any of the following ways:

- You can press the power-control button on the front of the server to start the server.
- If the server is turned on, a power failure occurs, and unattended-start mode is enabled in the Configuration/Setup Utility program, the server will start automatically when power is restored.
- If ac power is present, the server is off, and the wake-up feature is enabled in the Configuration/Setup Utility program, the wake-up feature will turn on the server at the set time.
- If ac power is present, the system is off, and the Wake on LAN feature is enabled, the system can be turned on by a network wake-up frame from the onboard Intel Ethernet controller.
- If ac power is present, the system is off, and the system is connected to an ASM interconnect network, which contains at least one system with an optional Remote Supervisor Adapter installed, the system can be turned on from the Remote Supervisor Adapter user interface.
- If ac power is present, the system is off, and an optional Remote Supervisor Adapter is installed in the system, the system can be turned on from the Remote Supervisor Adapter user interface.

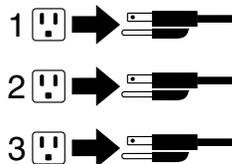
Turning off the server

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.



Turning off the server refers to the act of disconnecting the server from the power source.

You can turn off the server in any of the following ways:

- You can press the power-control button on the front of the server. This starts an orderly shutdown of the operating system, if this feature is supported by your operating system.

Note: After performing an orderly shutdown, wait at least 5 seconds before you press the power-control button to turn on the server again.

- You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the server and to force the power off. You can use this feature if the operating system stops functioning.
- If the system was turned on by the wake-up feature or Wake on LAN feature, you can turn it off by either a software runtime utility or by the fail-safe, power-down counter.
- You can disconnect the server power cords from the electrical outlets to shut off all power to the server.

Note: After disconnecting the power cords, wait approximately 15 seconds for your system to stop running. Watch for the power-on light to stop blinking.

- If the system is connected to an ASM interconnect network which contains at least one system with a Remote Supervisor Adapter installed, the system can be turned off from the Remote Supervisor Adapter user interface.
- If a Remote Supervisor Adapter is installed in the system, the system can be turned off from the Remote Supervisor Adapter user interface.

Chapter 2. Arranging your workspace

To get the most from your server, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets also can affect the way you arrange your workspace.

Comfort

Although no single working position is ideal for everyone, here are a few guidelines to help you find a position that suits you best.

Sitting in the same position for a long time can cause fatigue. A good chair can make a big difference. The backrest and seat should adjust independently and provide good support. The seat should have a curved front to relieve pressure on the thighs. Adjust the seat so that your thighs are parallel to the floor and your feet are either flat on the floor or on a footrest.

When using the keyboard, keep your forearms parallel to the floor and your wrists in a neutral, comfortable position. Try to keep a light touch on the keyboard and your hands and fingers relaxed. You can change the angle of the keyboard for maximum comfort by adjusting the position of the keyboard feet.

Adjust the monitor so the top of the screen is at, or slightly below, eye level. Place the monitor at a comfortable viewing distance, usually 51 to 61 cm (20 to 24 in.), and position it so you can view it without having to twist your body. Also position other equipment you use regularly, such as the telephone or a mouse, within easy reach.

Glare and lighting

Position the monitor to minimize glare and reflections from overhead lights, windows, and other light sources. Even reflected light from shiny surfaces can cause annoying reflections on your monitor screen. Place the monitor at right angles to windows and other light sources, when possible. Reduce overhead lighting, if necessary, by turning off lights or using lower wattage bulbs. If you install the monitor near a window, use curtains or blinds to block the sunlight. You might have to adjust the Brightness and Contrast controls on the monitor as the room lighting changes throughout the day.

Where it is impossible to avoid reflections or to adjust the lighting, an antiglare filter placed over the screen might be helpful. However, these filters might affect the clarity of the image on the screen; try them only after you have tried all other methods of reducing glare.

Dust buildup compounds problems that are associated with glare. Remember to clean your monitor screen periodically using a soft cloth that is moistened with a nonabrasive liquid glass cleaner.

Air circulation

Your server and monitor produce heat. Your server has one or more fans that pull in fresh air and force out hot air. The monitor lets hot air escape through vents. Blocking the air vents can cause overheating, which might result in a malfunction or damage. Place the server and monitor so that nothing blocks the air vents; usually, 15 cm (6

inches) of air space is sufficient. Also, make sure that the vented air is not blowing on someone else.

Electrical outlets and cable lengths

The location of electrical outlets and the length of power cords and cables that connect to the monitor, printer, and other devices might determine the final placement of your server.

When arranging your workspace:

- Avoid the use of extension cords. When possible, plug the server power cords directly into electrical outlets.
- Keep power cords and cables neatly routed away from walkways and other areas where they might get kicked accidentally.

For more information about power cords, refer to the power cord information in this on-line publication.

Chapter 3. Configuring your server

The following configuration programs are provided with your server:

- **Configuration/Setup Utility**

This program is part of the *basic input/output system* (BIOS) code that comes with your server. You can use this program to configure serial port assignments, change interrupt request (IRQ) settings, change the drive startup sequence, set the date and time, and set passwords. See “Using the Configuration/Setup Utility program” for more information.

- **SCSISelect Utility**

With the built-in SCSISelect Utility program, you can configure the devices attached to the integrated SCSI controller. See “Using the SCSISelect utility program” on page 18 for more information.

- **PXE Boot Agent Utility**

The Preboot eXecution Environment (PXE) Boot Agent Utility program is part of the BIOS code that comes with your server. Depending on your server model, you can use this program to change network startup (boot) protocols and startup order, to select operating-system wake-up support, and to set menu wait times.

Note: The network startup protocols and startup order options are not supported on this product.

See “Using the PXE Boot Agent Utility program” on page 19 for more information.

- **ServerGuide CDs**

The ServerGuide CDs include software setup and installation tools specifically designed for IBM xSeries servers. You can use these CDs during the initial installation of your server to configure the server hardware and simplify your network operating system installation. The ServerGuide CDs also contain a collection of application programs, which you can install after your server is up and running. See Chapter 4, “Using the ServerGuide CDs,” on page 21 for more detailed information.

- **ServeRAID programs**

The ServeRAID programs come with the optional ServeRAID adapters and with server models that have a ServeRAID adapter preinstalled. If your server has a ServeRAID adapter installed, you must use the ServeRAID configuration program to define and configure your disk-array subsystem *before* you install your operating system. Refer to the ServeRAID documentation provided on the *IBM xSeries 232 Documentation CD* for more information.

Using the Configuration/Setup Utility program

This section provides the instructions for starting the Configuration/Setup Utility program and descriptions of the menu choices that are available.

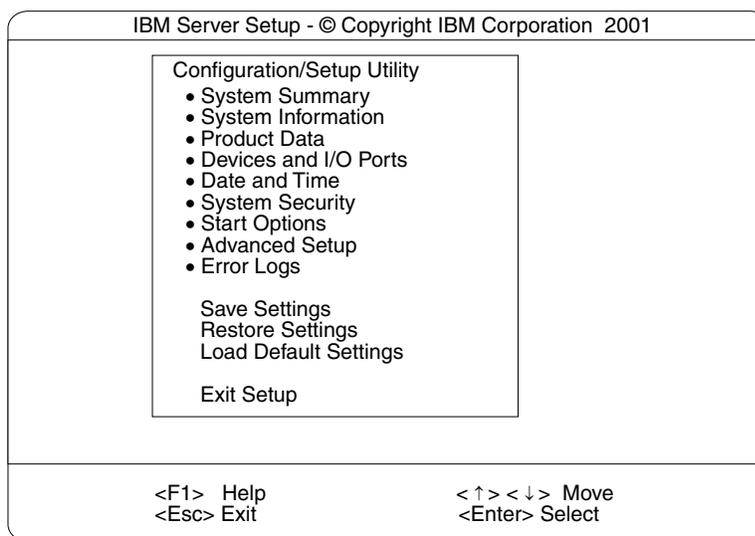
Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program:

1. Turn on the server and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1.
3. Follow the instructions that appear on the screen.

Choices available from the Configuration/Setup main menu

From the Configuration/Setup Utility main menu, you can select settings that you want to change. The Configuration/Setup Utility main menu is similar to the following.



Notes:

1. You can press F1 to display help information for a selected menu item.
2. The menu choices might differ depending on the types of passwords set for your system and IBM system-management adapters, or in the version of BIOS code installed on your server.

Descriptions of the choices available from the main menu are as follows:

- **System Summary**

Select this choice to display configuration information. This includes the type and speed of the microprocessors and the amount of memory installed.

Changes that you make to configuration settings appear on this summary screen. You cannot edit the fields.

- **Product Data**

Select this choice to view system information, such as the machine type and model, the server serial number, the system Universally Unique Identifier (UUID) number, the integrated system management processor revision level, and the revision level or issue date of the BIOS code stored in the flash electrically erasable programmable ROM (EEPROM).

Note: The server serial number is used as the name of the system on the ASM interconnect network for any remote alerts. For more information, refer to the system management adapter option documentation.

- **Devices and I/O Ports**

Select this choice to view or change the assignments for devices and input/output ports. This choice appears only on the full Configuration/Setup Utility main menu.

- **Date and Time**

Select this choice to set the system date and time.

The system time is in a 24-hour format (hour:minute:second).

- **System Security**

Select this choice to set or change a power-on password.

If you have an optional Remote Supervisor Adapter installed, you can also set the administrator password and the remote-control password.

After you set a power-on password, you can enable the unattended-start mode. This locks the keyboard and mouse but allows the system to start the operating system. The keyboard and mouse remain locked until you type the correct password. See “Using passwords” on page 17 for more information.

- **Start Options**

Select this choice to view or change the start options. This choice appears only on the full Configuration/Setup Utility main menu. Start options take effect when you start your server.

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

You can enable a virus-detection test that checks for changes in the master boot record at startup. You also can choose to run POST in the **Enhanced** mode or the **Quick** mode.

- **Startup Sequence Options**

The server uses a startup sequence to determine the device from which the operating system loads. For example, you can define a startup sequence that checks for a startable diskette in the diskette drive; then, it checks the hard disk drive in bay 1, and checks a network adapter.

- **Alert on LAN BIOS**

You can enable Alert on LAN support with this option. The default setting for this menu item is **Disabled**.

- **Advanced Setup**

Select this choice to change values for advanced hardware features, such as cache control and PCI configuration. This choice appears only on the full Configuration/Setup Utility main menu.

A warning message appears above the choices on this menu to alert you that the system might malfunction if these options are configured incorrectly. Follow the instructions on the screen carefully.

- **Core Chipset Control**

Select this choice to modify settings that control features of the core chipset on the system board.

Attention: Do not make changes here unless directed to do so by an IBM authorized service representative.

- **System Partition Visibility**

Select this choice to choose whether the System Partition is visible or hidden.

- **Memory Settings**

Select this choice to manually disable or enable a bank of memory.

If a memory error is detected during POST or memory configuration, the server can automatically disable the failing memory bank and continue operating with reduced memory capacity. If this occurs, you must manually enable the memory bank after the problem is corrected. Select **Memory Settings** from the **Advanced Setup** menu and use the arrow keys to highlight the bank that you want to enable; then, use the arrow keys to select **Enabled**.

— **CPU Options**

Select this choice to set the system cache type for all microprocessors.

— **PCI BUS Control**

Select this choice to view and identify system resources used by PCI devices. PCI devices automatically communicate with the server configuration information. This usually results in automatic configuration of a PCI device.

After making changes, select:

- **PCI MLT** to save the changes and return to the **Advanced Setup** menu.
- **PCI Interrupt Routing** to ignore the changes, restore the previous settings, and return to the **Advanced Setup** menu.

— **Integrated System Management Processor Settings**

Select this choice to set the server to automatically restart after a nonmaskable interrupt (NMI) occurs. The default setting for this menu item is **Enabled**.

• **Error Logs**

Select this choice to view the three most recent error codes and messages that the system generated during POST. You can also select **Clear error logs** to clear the contents of this log.

Note: System status messages available in the **System Error Log** in the Configuration/Setup Utility program are provided only for trained IBM service personnel.

• **Save Settings**

Select this choice to save your customized settings.

• **Restore Settings**

Select this choice to delete your changes and restore the previous settings.

• **Load Default Settings**

Select this choice to cancel your changes and restore the factory settings.

• **Exit Setup**

If you have made any changes, the program will prompt you to save the changes or exit without saving the changes.

Additional Configuration/Setup Utility menu choices

When you install an IBM Remote Supervisor Adapter in your server, you can view additional menu choices in the Configuration/Setup Utility program, such as:

• **System Information**

Select this choice to display information about your server.

• **PCI Slot Information**

Select this choice to view the properties of adapters installed in PCI slots.

• **Administrator Password**

Select this choice to set or change the administrator password.

• **Remote Control Security Settings**

Select this choice to set a remote-control password. When you set a remote-control password, you can also set the number of failed attempts to enter the correct remote-control password, and the duration before another attempt is allowed.

For a list of supported options for your server, refer to <http://www.ibm.com/pc/us/compat/> on the World Wide Web. To order an optional Remote Supervisor Adapter, contact your IBM Reseller or an IBM marketing representative.

Using passwords

The **System Security** choice appears only on the full Configuration/Setup Utility menu. After you select this choice, you can implement the protection level for the power-on password. If you have an optional Remote Supervisor Adapter installed, you can also implement the Administrator password and the Remote Control password. For complete details about the optional Remote Supervisor Adapter, refer to the documentation that comes with the adapter.

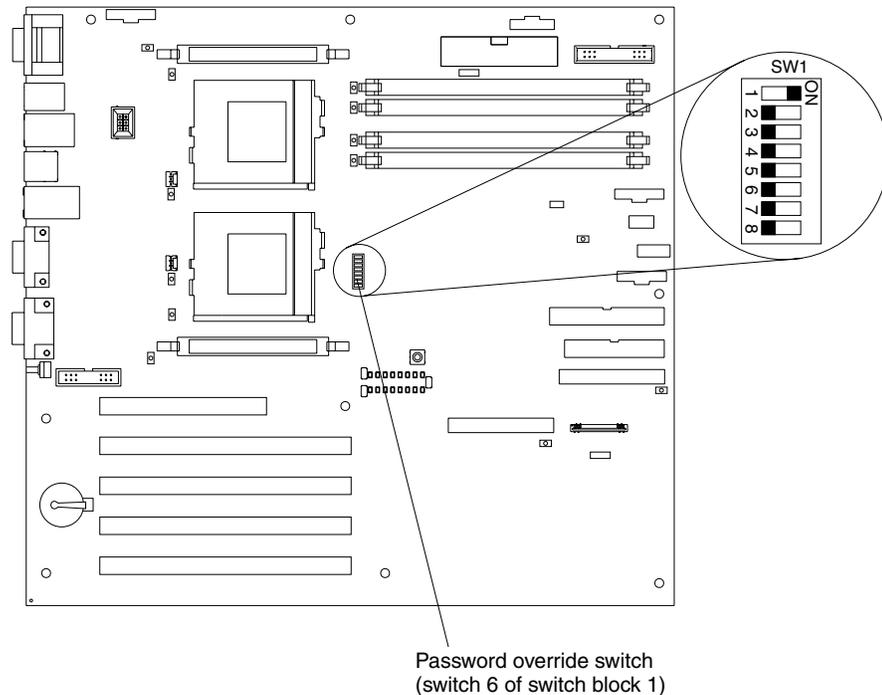
You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your power-on password. Keep a record of your password in a secure place. If you forget the power-on password, you can regain access to the server through one of the following methods:

- Change the position of the password override switch as described in “Setting the password override switch”.
- Remove the battery and then install the battery.

Setting the password override switch

The following illustration shows the location of the password override switch, switch 6 of switch block 1, on the system board.

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



To set the password override switch:

1. Review the information in “Before you begin” on page 35.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover. See “Removing the cover, door, and bezel” on page 43.

3. Change the setting of the password override switch (switch 6 on switch block 1 on the system board) to the opposite side of the switch.
4. Install the server cover and connect all external cables and power cords (see “Installing the cover, door, and bezel” on page 68).
5. Turn on the server.

Note: You can now start the Configuration/Setup Utility program and set a power-on password. Restart the server; then, press the F1 key to enter the Setup utility. Select **System Security** and change or delete the power-on password. If the power-on password is not changed or deleted, the old password will be reinstated the next time you start the server.

Using the SCSISelect utility program

SCSISelect is a built-in, menu-driven configuration utility program that you can use to:

- View the default SCSI IDs
- Locate and correct configuration conflicts

The following sections provide the instructions for starting the SCSISelect Utility and descriptions of the menu choices available.

Note: If your server has a RAID adapter installed, use the configuration method supplied with the RAID adapter to view or change SCSI settings for devices attached to the adapter.

Starting the SCSISelect utility program

To start the SCSISelect utility program:

1. Turn on the server.
2. When the <<< Press <CTRL><A> for SCSISelect™ Utility! >>> prompt appears, press Ctrl+A.
3. When prompted, select either channel A or channel B.
4. Use the arrow keys to select a choice from the menu.
 - Press Esc to return to the previous menu.
 - Press the F5 key to switch between color and monochrome modes (if your monitor permits).
5. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Choices available from the SCSISelect menu

The following choices appear on the SCSISelect Utility menu:

- **Configure/View Host Adapter Settings**

Select this choice to view or change the SCSI controller settings. To reset the SCSI controller to its default values, press F6; then, follow the instructions that appear on the screen.

You can view or change the following controller settings:

- **Host Adapter SCSI ID**

Select this choice to view the SCSI controller ID, normally 7.

- **SCSI Parity Checking**

Select this choice to view the assigned value of **Enabled**.

- **Host Adapter SCSI Termination**
Select this choice to view the assigned value of **Enabled**.
- **Boot Device Options**
Select this choice to configure startable device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.
- **SCSI Device Configuration**
Select this choice to configure SCSI device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.
Note: The Maximum Sync Transfer Rate represents the transfer rate for Ultra SCSI devices:
 - The transfer rate for Ultra3 SCSI LVD devices is 160.0 MBps.
 - The transfer rate for Ultra2 SCSI LVD devices is 80.0 MBps.
 - The transfer rate for Fast SCSI devices is 20.0 MBps.
- **Advanced Configuration Options**
Select this choice to view or change the settings for advanced configuration options.
- **SCSI Disk Utilities**
Select this choice to view the SCSI IDs that are assigned to each device or to format a SCSI device.
To use the utility program, select a drive from the list. Read the screens carefully before making a selection.
Note: If you press Ctrl+A before the selected drives are ready, an Unexpected SCSI Command Failure screen might appear. Restart the server and watch the SCSISelect messages as each drive spins up. After the drive that you want to view or format spins up, press Ctrl+A.

Using the PXE Boot Agent Utility program

The PXE Boot Agent Utility program is a built-in, menu-driven configuration utility program that you can use to:

- Select whether to display the setup prompt
 - Set menu wait time
 - Select operating-system wake-up support
- Note:** The network startup protocols and startup order options are not supported on this product.

The following sections provide instructions for starting the PXE Boot Agent Utility program and descriptions of the menu choices that are available.

Starting the PXE Boot Agent Utility program

To start the PXE Boot Agent Utility program:

1. Turn on the server.
2. When the Initializing Intel (R) Boot Agent Version X.X.XX PXE 2.0 Build XXX (WfM 2.0) prompt appears, press Ctrl+S.

Note: By default, you will have 2 seconds after the prompt appears on the screen to press Ctrl+S.

3. Use the arrow keys or press Enter to select a choice from the menu.
 - Press Esc to return to the previous menu.
 - Press the F4 key to exit.
4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Choices available from the PXE Boot Agent Utility menu

The following choices appear on the PXE Boot Agent Utility menu:

- **Network Boot Protocol**

PXE is the default value for this menu item.

Note: Do not change this value. There are no other network boot protocols supported.
- **Boot Order**

Note: This option is not supported on this product. To change the boot order, use the Configuration/Setup Utility program. See, "Using the Configuration/Setup Utility program" on page 13 for more information.
- **Show setup prompt**

Select this choice to either display the PXE setup prompt or disable it. **Disabled** is the default setting.

When this choice is enabled, Press Ctrl+S to enter the setup menu will appear on the screen under the initializing prompt.
- **Setup time wait menu**

Select this choice to set the amount of time (in seconds) that the system will pause during initialization for a Ctrl+S input.

 - 2 seconds (default)
 - 3 seconds
 - 5 seconds
 - 8 seconds
- **Legacy OS wake up support**

Select this choice to enable or disable the legacy operating-system wake-up support.

 - Disabled (default)
 - Enabled

Notes:

1. Use the default setting for Advanced Configuration and Power Interface (ACPI) aware operating systems, such as Microsoft® Windows® 2000 and Windows NT®.
2. If your server is running a non-ACPI operating system, you must set this selection to **Enabled** to use the Wake on LAN support.
3. When using a non-ACPI operating system, do not send a wake-up packet to the server while it is turned on. If a wake-up packet has been sent while the server is on and you are unable to turn the server off, see the "Power" section in the "Troubleshooting charts" on page 116 for more information.

Chapter 4. Using the ServerGuide CDs

The ServerGuide CDs include easy-to-use software setup and installation tools that are specifically designed for your IBM server. The ServerGuide Setup and Installation program detects the server model and hardware options that are installed and uses that information during setup to configure the hardware. The ServerGuide tools simplify network operating system (NOS) installations by providing updated device drivers, and in some cases, installing them automatically.

If a later version of the ServerGuide software is available, you can download a free image of the software, or you can purchase the ServerGuide CDs. To download the latest ServerGuide software, see the ServerGuide page on the IBM Support Web site at: <http://www.ibm.com/pc/qtechinfo/MIGR-4ZKPPT.html>

To purchase the latest ServerGuide CDs, see the ServerGuide Updates form that comes with your server library, or go to the ServerGuide fulfillment Web site at <http://www.ibm.com/pc/coupon/>.

The ServerGuide software has these features to make setup easier:

- An easy-to-use interface with online help
- Diskette-free setup, and configuration programs that are based on detected hardware
- Performance Optimizer program, which easily tunes your ServeRAID adapter settings for your server environment
- A system BIOS update program, which updates the BIOS code directly from the CD
- Device drivers that are provided for your server model and detected hardware
- NOS partition size and file-system type that are selectable during setup
- Powerful application programs and administration tools

Features at a glance

The following is a summary of ServerGuide features.

Note: Exact features and functions can vary with different versions of the ServerGuide software. To learn more about the version that you have, start the *Setup and Installation CD* and view the online Overview.

Setup and Installation CD	Setup and Installation CD (continued)	System Updates and Applications CD (continued)
<p>Note: The ServerGuide program requires a supported IBM server with an <i>enabled</i> startable (bootable) CD-ROM drive. Not all features are supported on all models.</p> <ul style="list-style-type: none"> • Sets system date and time. • Detects the ServeRAID adapter or controller and runs the ServeRAID configuration program. • Updates the licensed internal code (firmware) level without creating diskettes. • Checks the system BIOS code and microcode (firmware) levels of supported options to determine whether a later level is available from the CD. You can perform updates without the use of diskettes. • Provides the Performance Optimizer program to easily tune your ServeRAID adapter settings for your server environment. • Creates a System Partition on the default drive. You can run server-specific utility programs after setup. • Detects installed hardware options and provides updated device drivers for most adapters and devices. 	<ul style="list-style-type: none"> • Creates a <i>Setup Replication Diskette</i> for replicating setup selections for other servers of the same model. • Provides diskette-free installation for supported operating systems. • Provides a replicated installation path for multiple installations of supported operating systems. • Includes an online README file with links to tips for your hardware and NOS installation. <p>Note: Installation requires your NOS CD.</p> <p>System Updates and Applications CD</p> <ul style="list-style-type: none"> • Creates diagnostic, RAID, device driver, and other support diskettes from the CD; or with an Internet connection, you can check for an update from a dedicated IBM file transfer protocol (FTP) server. • Installs some updates without requiring diskettes. Where applicable, you can run executable files directly from the CD or unzip files to any drive on your server or another server on your network. 	<ul style="list-style-type: none"> • Includes a vast library of fully tested device drivers for your server. • Includes a search function to help you locate updates by title or keywords. • Installs powerful applications directly from the CD. See the CD label for a current list of applications.

Setup and configuration overview

When you use the *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 checks your system BIOS, service processors, and other system hardware to determine if system updates are available. The setup program provides a list of tasks that are required to set up your server model. On RAID servers, you can run the ServeRAID Manager program to create logical drives.

Note: Exact features and functions can vary with different versions of the ServerGuide software.

When you start the *Setup and Installation* CD, the following happens:

- You are prompted for your language, country, and keyboard layout. (This information is stored and later passed on to the NOS installation program.)
- The ServerGuide program displays choices for running the configuration programs. For example:
 - The Express Configuration method runs the required programs for your server, based on the hardware that is detected.
 - The Custom Configuration method displays all programs that are available for your server, and you decide which programs to run.
 - The Replicated Configuration method provides the option of duplicating your setup selections to other servers that are the same model.
- If you select the Custom Configuration method, the following programs are optional. If you select the Express Configuration method, some or all of these programs are run, depending on the hardware that is detected.
 - The Set Date and Time feature is provided so that you do not have to use the Configuration/Setup Utility program to access these settings.
 - The Clear Hard Disks program is provided so you can delete all partitions on all hard disk drives. If the server has a ServeRAID adapter installed, you can select to restore the configuration on the ServeRAID adapter to the factory default settings.
 - The ServerGuide program checks the server BIOS code and microcode (firmware) levels for supported options and then checks the CD for a newer level. CD content can be newer than the hardware. The ServerGuide program can perform a flash update of the BIOS code and supported microcode (firmware) options without the use of diskettes.
 - The ServeRAID program starts, leading you through the entire configuration process.
 - The Performance Optimizer program easily tunes your server for your environment.
 - The ServerGuide program creates a System Partition on the default drive.
- The ServerGuide program displays a confirmation summary, so that you will know when you have completed all the required tasks. Then, you are ready to install your NOS.

Notes:

1. Plug and Play adapters are configured automatically. Non-Plug and Play adapters or non-IBM adapters might require switch settings, additional device drivers, and installation after the NOS is installed. See the documentation that comes with the adapter.
2. Diagnostics for your server come in BIOS code or on a separate diagnostic CD.

System Partition

The ServerGuide program creates a 50 MB System Partition on the default drive. The System Partition contains server-specific utility programs such as service processor disk operating system (DOS) utilities, system diagnostics, flash BIOS updates, and other programs.

Note: Programs in the System Partition vary by server model, and not all server models run utility programs from the System Partition. To determine which ones do, start the *Setup and Installation* CD and view the online Overview.

After setup is complete, you can access programs in the System Partition by restarting the server and pressing Alt+F1 when the prompt is displayed. The System Partition menu displays the programs that are available on your server model.

Typical NOS installation

You can use the ServerGuide program to shorten your installation time. The ServerGuide program provides the necessary device drivers, based on the hardware that you have and the NOS that you are installing. The following is a brief explanation of a typical ServerGuide NOS installation.

Note: Exact features and functions can vary with different versions of the ServerGuide software.

- After you have completed the setup process, the operating-system installation program starts. (You will need your copy of the NOS CD to complete the installation.)
- The ServerGuide program stores information about the server model, service processor, hard disk controllers, and network adapters. It then checks the CD for newer device drivers. This information is stored and then passed to the NOS installation program.
- With some NOS installations, you can create a *NOS Replication Diskette* for setting up additional servers. The diskette will contain the Internet protocol (IP) address, server name, and other selections.
- The ServerGuide program presents NOS partition options that are based on your NOS selection and the installed hard disk drives.
- If you are installing the NOS from diskette, the ServerGuide program displays the required diskettes that you must create and the optional diskettes that you might want to create. The diskettes that you can create are the device-driver diskettes for the installed adapters or controllers.

The ServerGuide program prompts you to insert your NOS CD and restart the server. At this point, the installation program for the NOS takes control to complete the installation.

Setting up or updating multiple servers

You can use the ServerGuide program to create diskettes that help you set up or update multiple servers. You can modify information on the diskettes as you use them to set up or update other servers.

Note: Availability and function can vary by server model and by the hardware that is installed.

You can create a setup-replication diskette, which contains your hardware configuration selections. Use this diskette to replicate selections to other servers that are of the same model.

You can create a NOS-replication diskette, which contains information that you need to complete multiple installations. This feature supports systems running some operating systems.

Installing your NOS without ServerGuide

If you have already configured the server hardware and you decide not to use the ServerGuide program to install your NOS, download the latest NOS installation instructions:

1. Go to <http://www.ibm.com/pc/support>.
2. Click **Servers**.
3. From the **Family** field, select your server model.
4. Click **OS installation**. The available installation instructions are displayed.

Additional programs included with ServerGuide

As a convenience, the ServerGuide program comes with additional software to assist you with the server installation.

A variety of powerful applications are included with the ServerGuide software. Offerings can vary with the different versions of the ServerGuide software. Check the application CD labels for a list of applications, or start the *Setup and Installation* CD and view the online Overview.

Chapter 5. Installing options

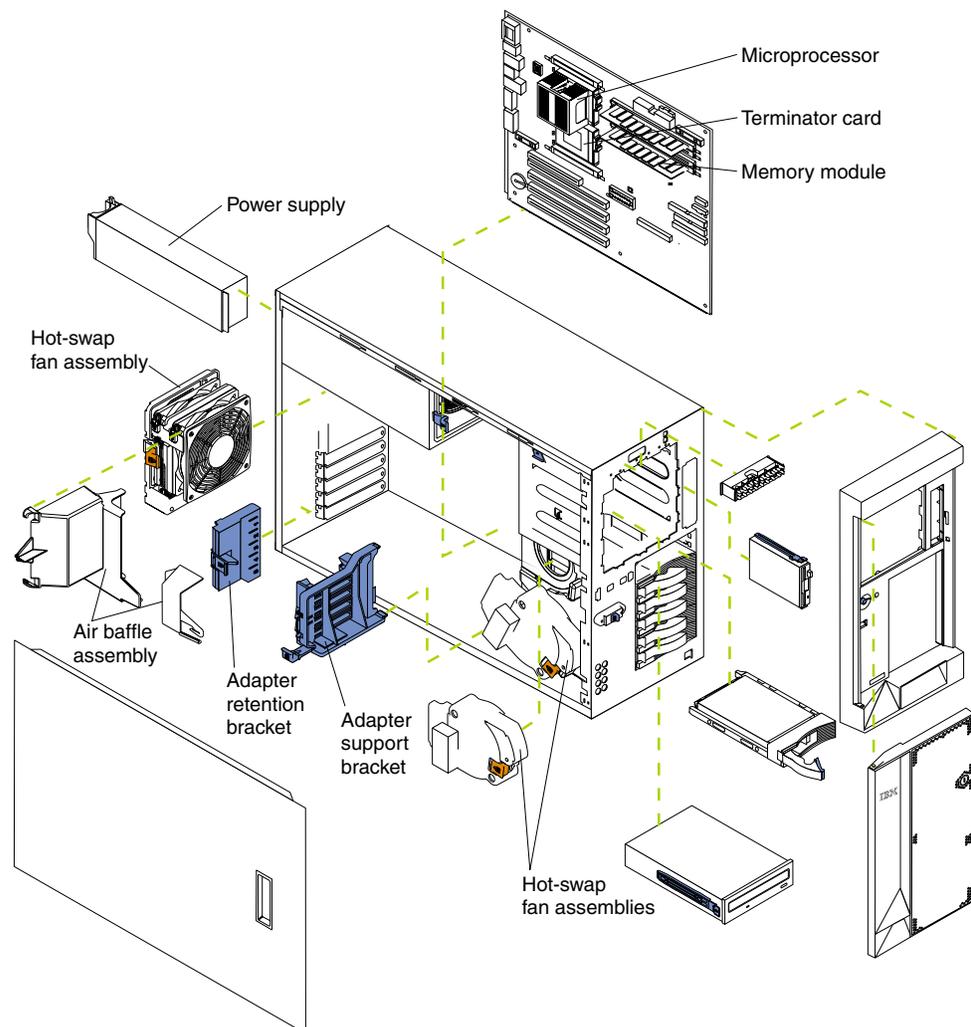
This chapter provides instructions to add options to your server. Some option-removal instructions are provided, in case you need to remove one option to install another.

Major components of the xSeries 232 server

The orange color on components and labels in your server identifies hot-swap components. You can install or remove hot-swap components while the system is running, provided that your system is configured to support this function. For complete information about installing or removing a hot-swap component, see the detailed procedures in this chapter.

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

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



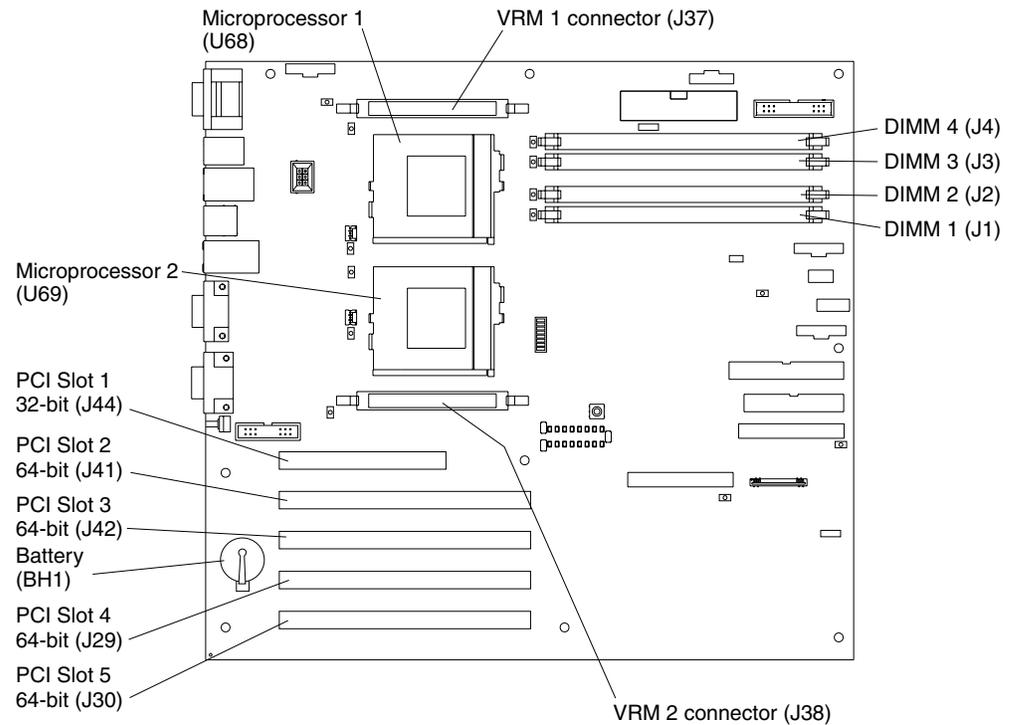
System board

The illustrations in the following sections show the connectors, switches, and LEDs on the system board.

System board option connectors

The following illustration identifies system board connectors for user-installable options.

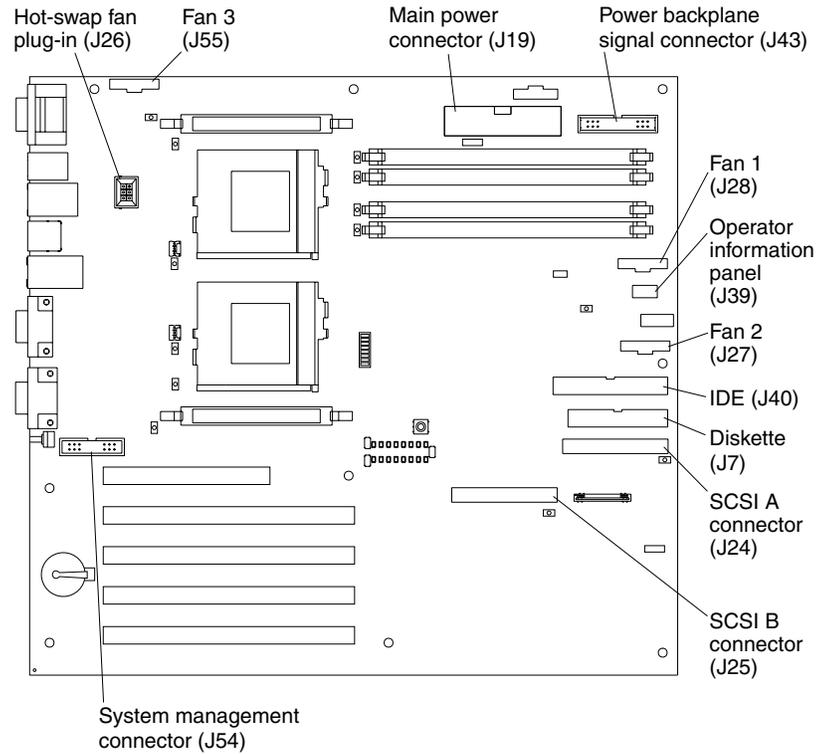
Note: The illustrations in this document might differ slightly from your hardware.



System board internal cable connectors

The following illustration identifies system board connectors for internal cables.

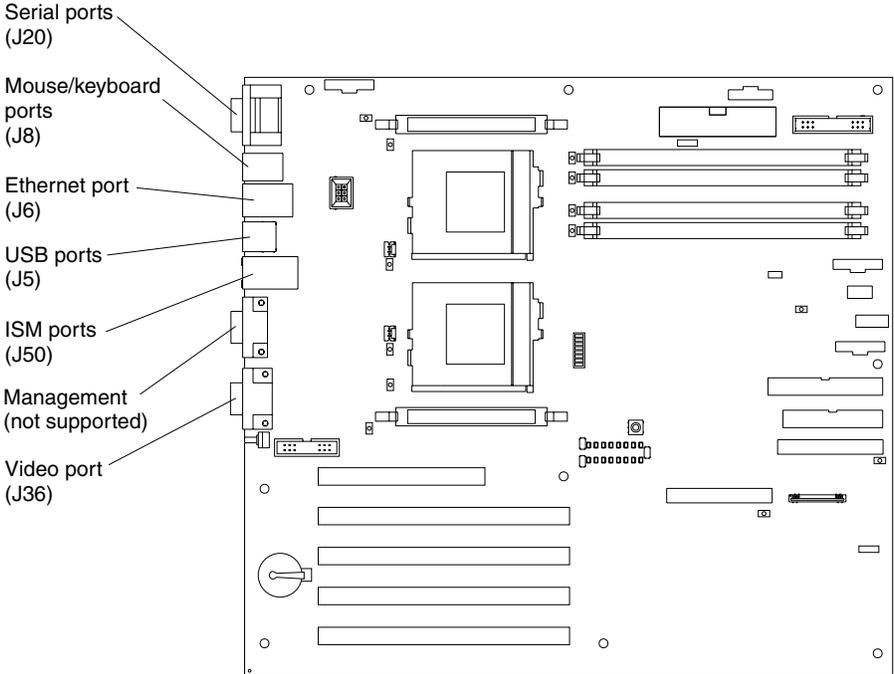
Note: The illustrations in this document might differ slightly from your hardware.



System board external port connectors

The following illustration identifies system board connectors for external devices.

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

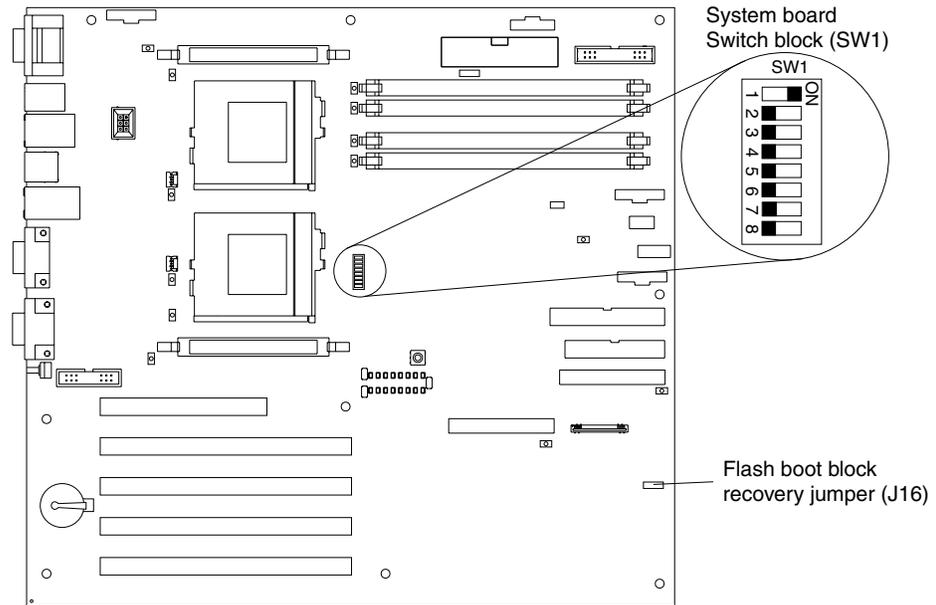


Note: ISM ports (ISM A and B) are used for the RS-485 interconnect network communications.

System board switches and jumpers

The following illustration identifies the switches and jumpers on the system board.

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



Note: Any jumper blocks on the system board that are not shown in the illustration are reserved.

Flash boot block recovery jumper

If the BIOS code has become damaged, such as from a power failure during a flash update, you can recover the BIOS code using the flash boot block recovery jumper and a BIOS flash diskette. See "Recovering BIOS code" on page 110 for information about the flash boot block recovery jumper.

System board switch block

The switch block contains microswitches 1 through 8. As pictured in this illustration, switch 1 is at the top of the switch block, and switch 8 is at the bottom. The Off position for each switch is the side nearer the microprocessor socket.

The following table describes the function for each switch.

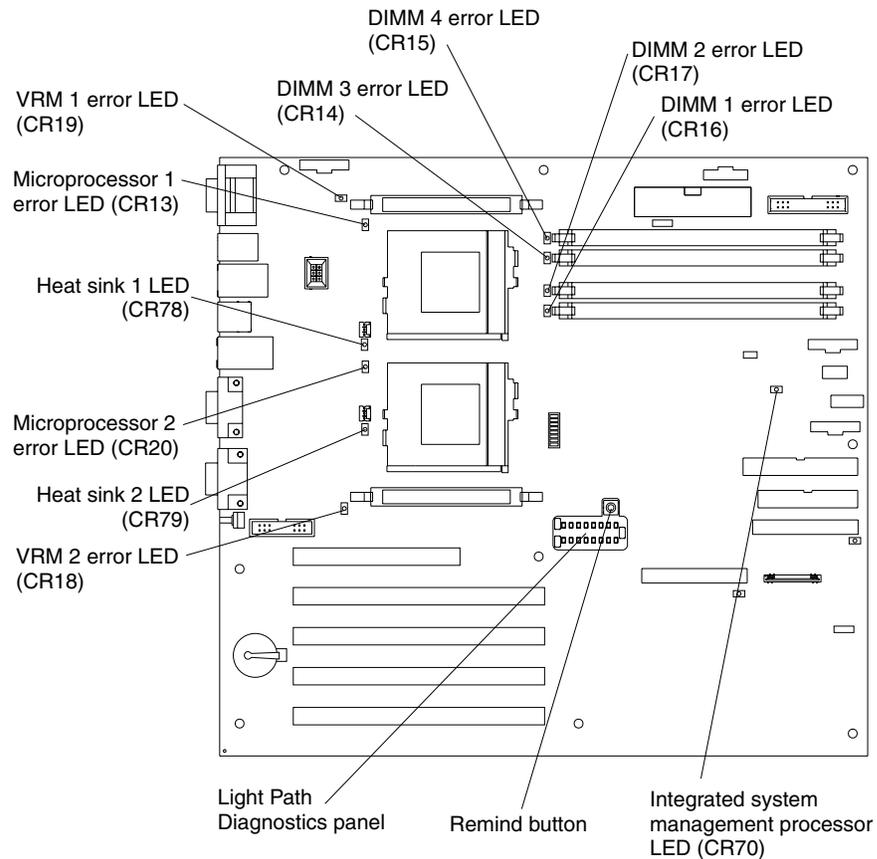
Switch number	Switch description
1-4	Reserved.
5	<p>Clock frequency selection. The default setting is Off.</p> <p>When this switch is On, the host bus speed is 100 MHz. When this switch is Off, the host bus speed is 133 MHz. The switch should always be set to Off to optimize the system performance. Setting switch 5 to On greatly reduces system performance.</p>
6	<p>Password override.</p> <p>Toggleing this switch allows one opportunity to enter the Setup Utility to change or delete the power-on password.</p>
7	Reserved. The default setting is Off.
8	<p>Power-on override. The default setting is Off (disabled).</p> <p>When On, overrides the power-on switch and forces power-on mode. The system will always start without the use of the power-on switch.</p> <p>Note: When the power-on switch is set to the On position, you cannot power off the server from the front panel.</p>

Table 2. Switches 1-8.

System board LED, diagnostic panel, and Remind button locations

The following illustration identifies LEDs, diagnostic panels, and the Remind button on the system board. You might need to refer to this illustration when solving problems with the server.

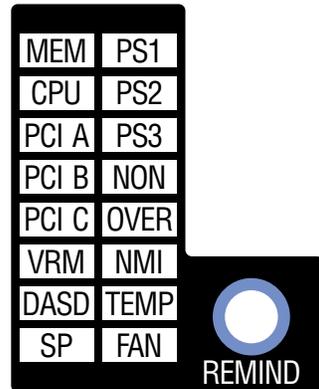
Note: The illustrations in this document might differ slightly from your hardware.



Note: The power-on LED located on the operator information panel is lit when system power is present in the server.

Light Path Diagnostics panel

The Light Path Diagnostics LEDs are described in the following table. For more information, refer to “Identifying problems using status LEDs” on page 111.



Diagnostic panel LED	Description
PS1	Power supply 1 failure or removed.
PS2	Power supply 2 failure or removed.
PS3	Power supply 3 failure or removed.
NON	Server power supplies are no longer redundant (applicable only with redundant power feature).
OVER	Overspecification. The system has exceeded the power capabilities (max. rating) of the installed power-supply units.
NMI	Nonmaskable interrupt occurred.
TEMP	System temperature exceeded maximum limit. Other LEDs will be on to identify the area of over temperature (such as CPUx, CPU, DASD LEDs).
FAN	Fan failure, or fan is operating slowly or has been removed. This LED is turned on when any of the Light Path LED's mounted directly on the fan assemblies are turned on by the integrated system management processor.
MEM	A memory failure occurred. This LED is turned on by the hardware when any of the Light Path LED's located near the memory (DIMM) are turned on by the integrated system management processor.
CPU	A CPU failure occurred. This LED is turned on by the hardware when either of the two Light Path LED's located near the appropriate CPU socket is turned on by the integrated system management processor.
PCI A	Error occurred on an adapter in PCI slot 1 or on one of the PCI devices integrated on the system board.
PCI B	Error occurred on an adapter in PCI slot 2 or 3 or on one of the PCI devices integrated on the system board.
PCI C	Error occurred on an adapter in PCI slot 4 or 5 or on one of the PCI devices integrated on the system board.
SP	An error has been detected in the integrated system management processor.
VRM	A VRM failure occurred. This LED is turned on by the hardware when either of the two Light Path LED's located near the appropriate VRM is turned on by the integrated system management processor.
DASD	System board or SCSI hot-swap hard disk drive failure, hard disk drive removed from either standard or optional expansion hot-swap bay DASD backplane, or hard disk drive temperature has exceeded maximum limit (in this case, the TEMP and System error LEDs will be lit).

Table 3. Diagnostic panel LEDs.

Remind button

You can use the Remind button to place the front panel system-error light into the Remind mode. By pressing the button, you acknowledge the failure but indicate that you will not take immediate action. If a new failure occurs, the system-error light will turn on again.

In the Remind mode, the system-error light blinks every 2 seconds. The system-error light remains in Remind mode until one of the following situations occurs:

- All known problems are resolved
- The system is restarted
- A new problem occurs

You can use the Remind button to delay server maintenance until a later time. Also, resetting the system-error light enables the LED to react to another error. If the LED is still blinking from the first error, it will mask additional errors.

Before you begin

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

- Become familiar with the information provided in “Handling static-sensitive devices” on page 36, and read the safety statements in “Safety information” on page 37. These guidelines will help you work safely while working with your server or options.
- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap drives, or hot-swap fans.
- The orange color on components and labels in your server indicates hot-swap components. You can install or remove hot-swap components while the system is running, provided that your system is configured to support this function. For complete details about installing or removing a hot-swap component, see the information provided in this chapter.
- The blue color on components and labels identifies touch points where a component can be gripped, a latch moved, and so on.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options that you intend to install.
- Back up all important data before you make changes to disk drives.
- Have a small, flat-blade screwdriver available.
- For a list of supported options for your server, refer to <http://www.ibm.com/pc/us/compat/> on the World Wide Web.

System reliability considerations

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

- Each of the drive bays has either a drive or a filler panel installed.
- Each of the power supply bays has either a power supply or a filler panel installed.
- The cover is in place during typical operations or is removed for no longer than 30 minutes while the server is operating.
Note: On the tower model only, the front door can be removed permanently without affecting system reliability.
- There is space around the server to enable the server cooling system to work properly.
 - On a tower model, leave approximately 127 mm (5 inches) of space around the front and rear of the server.
 - On a rack model, refer to the documentation that comes with the rack.
- A removed hot-swap drive is replaced within 2 minutes of removal.
- Cables for optional adapters are routed according to the instructions provided with the adapters.
- A failed fan must be replaced immediately.

Working inside the server with the power on

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

Note: Operating the server for more than 30 minutes with the top cover removed might damage server components.

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

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.

- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least 2 seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package first. Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather; heating reduces indoor humidity and increases static electricity.

Safety information

Before installing this product, read the Safety Information.

مج، يجب قراءة دات السلامة

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 přečtete příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по технике безопасности.

Pred inštaláciou tohto zariadenia si pečítajte Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1



DANGERElectrical current from power, telephone, and communication cables

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

is hazardous.

To avoid a shock hazard:

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

To Connect:

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

To Disconnect:

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

Statement 2



CAUTION:

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

Do not:

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

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

Statement 3



CAUTION:

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

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



DANGERSSome laser products contain an embedded Class 3A or Class 3B laser

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

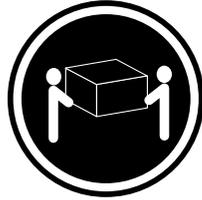
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

diode. Note the following.

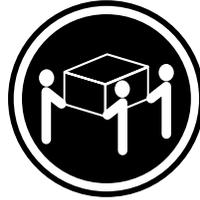
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

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

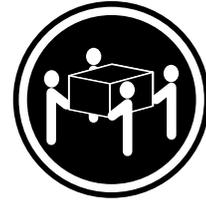
Statement 4



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



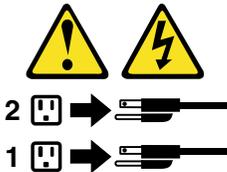
≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5



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



Statement 6



CAUTION:
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

Statement 8



CAUTION:

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



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

Statement 13



DANGEROverloading a branch circuit is potentially a fire hazard and a shock

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

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

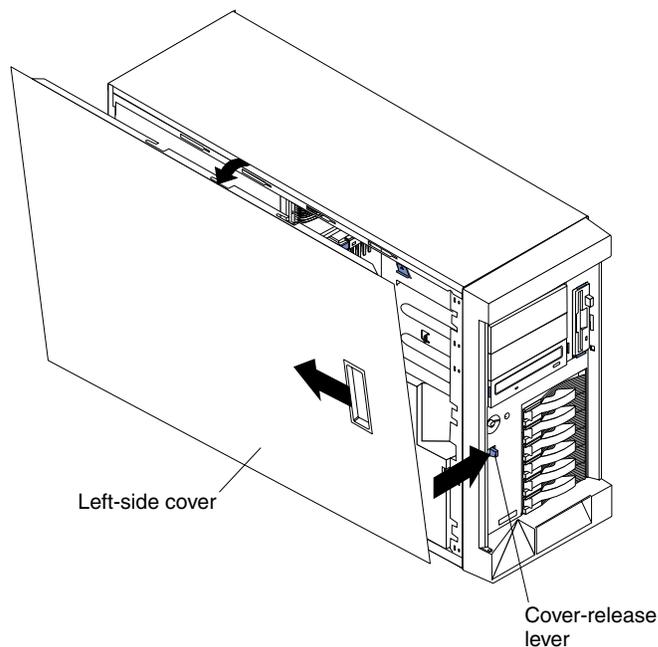
Removing the cover, door, and bezel

The following sections describe how to remove the cover, the door (for tower models), and the bezel.

Removing the left-side cover (tower model)

Notes:

1. To remove or install a hot-swap hard disk drive or hot-swap power supply, it is not necessary to remove the cover.
2. The illustrations in this document might differ slightly from your hardware.



To remove the left-side cover of the tower model:

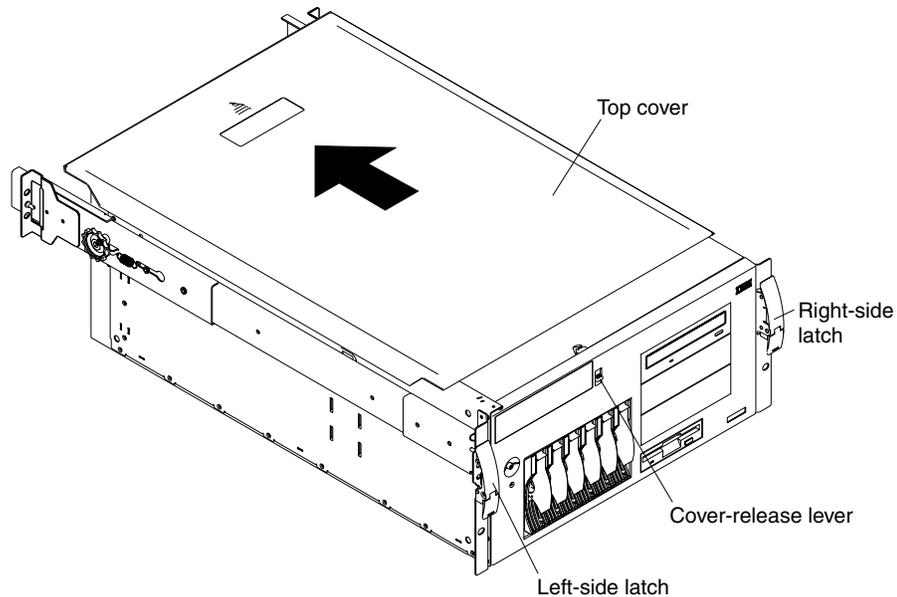
1. Review the information in “Before you begin” on page 35.
2. If you are planning to install or remove any part other than a hot-swap hard disk drive, hot-swap power supply, or a hot-swap fan, turn off the server and all attached devices, and disconnect all external cables and power cords.
3. Slide the cover-release lever on the front of the server to release the cover; then, slide the cover toward the rear of the server approximately 25 mm (1 inch). Move the top edge of the cover out from the server; then, lift the cover off the server. Set the cover aside.

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

Removing the cover (rack model)

Notes:

1. To remove or install a hot-swap hard disk drive or hot-swap power supply, it is not necessary to remove the cover.
2. The illustrations in this document might differ slightly from your hardware.



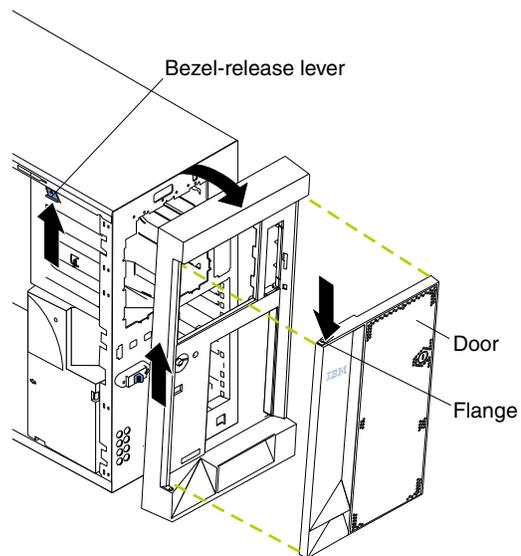
To remove the server top cover:

1. Review the information in “Before you begin” on page 35.
2. If you are planning to install or remove any part other than a hot-swap hard disk drive, hot-swap power supply, or a hot-swap fan, turn off the server and all attached devices, and disconnect all external cables and power cords.
3. Release the left and right side latches and pull the server out of the rack enclosure until both slide rails lock.
Note: When the server is in the locked position, you can reach the cables on the back of the server.
4. Move the cover-release lever down while sliding the top cover toward the rear of the server approximately 25 mm (1 inch). Lift the cover off the server and set the cover aside.

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

Removing the server door and bezel (tower model)

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



To remove the server door:

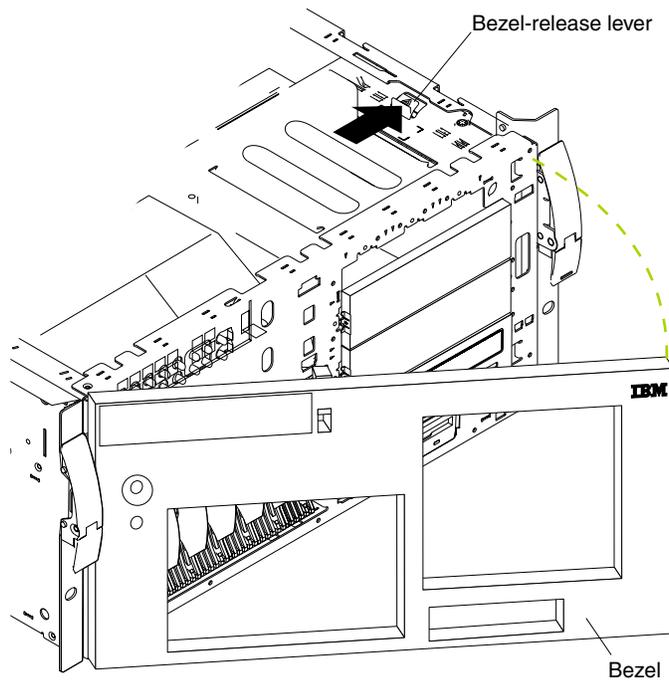
1. Unlock and open the server door.
2. Locate the flange on the top edge of the door.
3. Press down on the flange while pressing out on the door; then, lift the server door up and off the hinge. Set the door aside in a safe place.

To remove the bezel:

1. If you have not done so already, remove the left-side cover. See “Removing the left-side cover (tower model)” on page 44 for details.
2. Push the blue bezel-release lever in the direction shown in the illustration.
3. Lift the bezel tabs out of the slots, and pull the bezel away from the server front. Store the bezel in a safe place.

Removing the bezel (rack model)

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



To remove the bezel:

1. If you have not done so already, remove the top cover. See “Removing the cover (rack model)” on page 45 for details.
2. Move the blue bezel-release lever in the direction shown in the illustration.
3. Lift the bezel tabs out of the slots, and pull the bezel away from the server front. Store the bezel in a safe place.

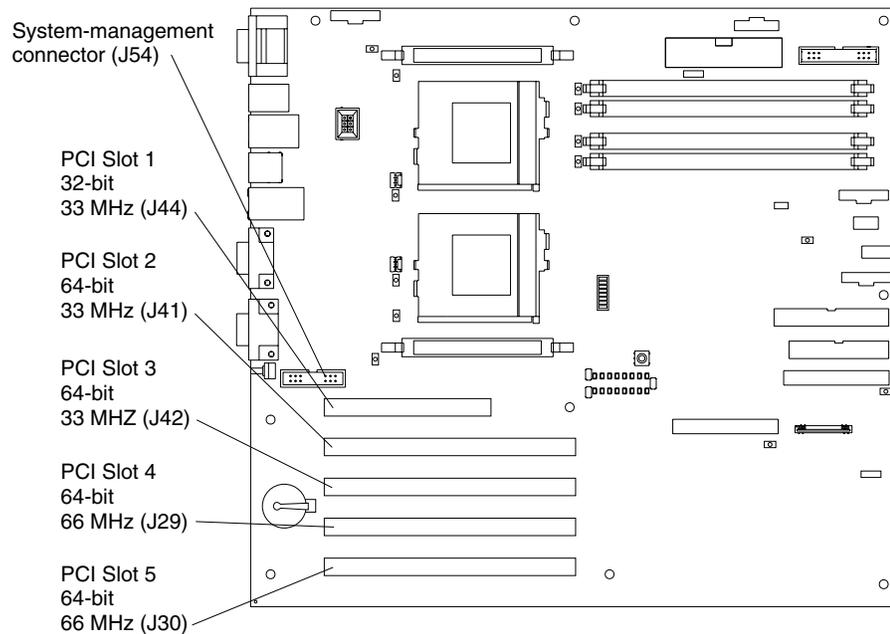
Working with adapters

You can install up to five peripheral component interconnect (PCI) adapters in the expansion connectors, called slots, on the system board.

Your server comes with an integrated video controller, which is a component on the system board. When you install a video adapter, the server BIOS code automatically disables the integrated video controller.

The following illustration shows the location of the PCI expansion slots and system-management connector on the system board.

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



Adapter considerations

Before you install adapters, review the following:

- Locate the documentation that comes with the adapter and follow those instructions in addition to the instructions given in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter.
- You can install full-length adapters in all expansion slots.
- You can install a 32-bit adapter or device in any of the PCI slots.
- Your server supports 5.0V signalling or universal PCI adapters in slots 1, 2, and 3; it supports 3.3V signalling or universal PCI adapters in slots 4 and 5.

Note: Some full-length adapters with attached daughterboards might interfere with SCSI channel B if installed in slot 1. Install this type of adapter in slot 2, 3, 4, or 5.

- You might require additional power supplies if you add adapters that have electrical current requirements that exceed the installed power-supply capabilities.

- Your server uses a rotational interrupt technique to configure PCI adapters. Therefore, you can install a variety of PCI adapters that currently do not support sharing of PCI interrupts.
- The optional IBM Remote Supervisor Adapter must be installed in PCI slot 1 only. Use the ribbon cable that comes with the adapter to connect the adapter to the system-management connector (J54) on the system board. The external power adapter that comes with the adapter is not required with this server.
- PCI slot 1 is on PCI bus A, PCI slots 2 and 3 are on PCI bus B, and PCI slots 4 and 5 are on PCI bus C.

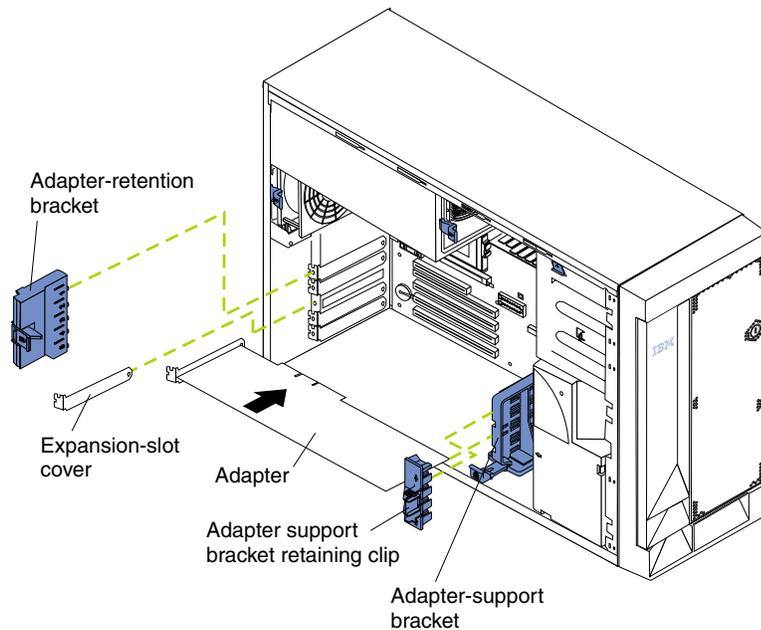
Note: PCI bus A is often referred to as bus 0; PCI bus B is often referred to as bus 1; and PCI bus C is often referred to as bus 2.

- The system scans PCI slot 1, the system board Ethernet, PCI slots 2 through 5, and then the system board SCSI channels A and B, if you have not changed the boot precedence from the default.

You can use the Configuration/Setup Utility program to change the boot precedence for your server. Select **Start Options** from the Configuration/Setup Utility program main menu.

Installing an adapter

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



To install an adapter:

1. Review the information in “Before you begin” on page 35, in “Safety information” on page 37, and “Handling static-sensitive devices” on page 36.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover. See “Removing the cover, door, and bezel” on page 44 for details.
3. Determine which expansion slot you will use for the adapter.

Note: Check the instructions that come with the adapter for any requirements or restrictions.

4. Remove the expansion-slot cover:
 - a. Press the arrow on the adapter-retention bracket release tab and remove the bracket.
 - b. Slide the expansion-slot cover out of the server. Store it in a safe place for future use.

Attention: Expansion-slot covers must be installed in all vacant slots. This maintains the electronic emissions characteristics of the system and ensures proper cooling of system components.

5. Refer to the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route any cables before you install the adapter.
6. Remove the adapter from the static-protective package.

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

7. Place the adapter, component-side up, on a flat, static-protective surface.
8. Set any jumpers or switches as described by the adapter manufacturer.
9. Install the adapter:
 - a. If you are installing a full-length adapter, remove the adapter support bracket retaining clip.
 - b. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the system board.
 - c. Press the adapter *firmly* into the expansion slot.

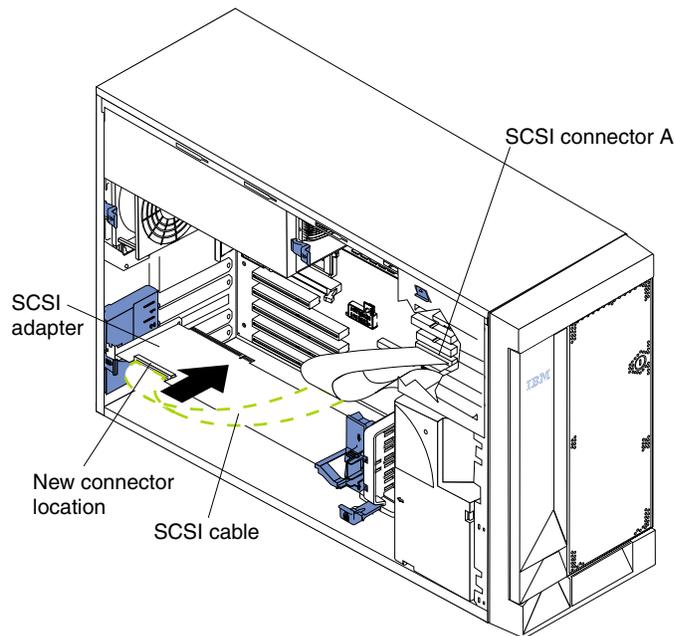
Attention: When you install an adapter in the server, be sure that it is completely and correctly seated in the system board connector before you apply power. Incomplete insertion might cause damage to the system board or the adapter.

10. Replace the retaining clip on the adapter-support bracket, if you removed it.
11. Align the bottom tabs of the adapter-retention bracket with the holes at the top of the expansion slots, and press the adapter-retention bracket into the holes until it clicks into the locked position.
12. Connect any needed cables to the adapter.

Attention: Route cables so that the flow of air from the fans is not blocked. In addition, route any cables plugged into the PCI adapter under adjacent adapters so they are not pinched between the top of the adapter and the top cover.

The following illustration shows the rerouting of the SCSI cable if you install a ServeRAID adapter (remove the cable from SCSI connector A (J24) on the system board and connect it to the ServeRAID adapter).

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



13. If you have other options to install or remove, do so now; otherwise, go to "Installing the cover, door, and bezel" on page 70.

Installing internal drives

Different types of drives enable your system to read multiple types of media and store more data. Several types of drives are available, such as:

- Diskette (already installed)
- Hard disk
- CD-ROM (already installed)
- Tape, including digital linear tape (DLT)

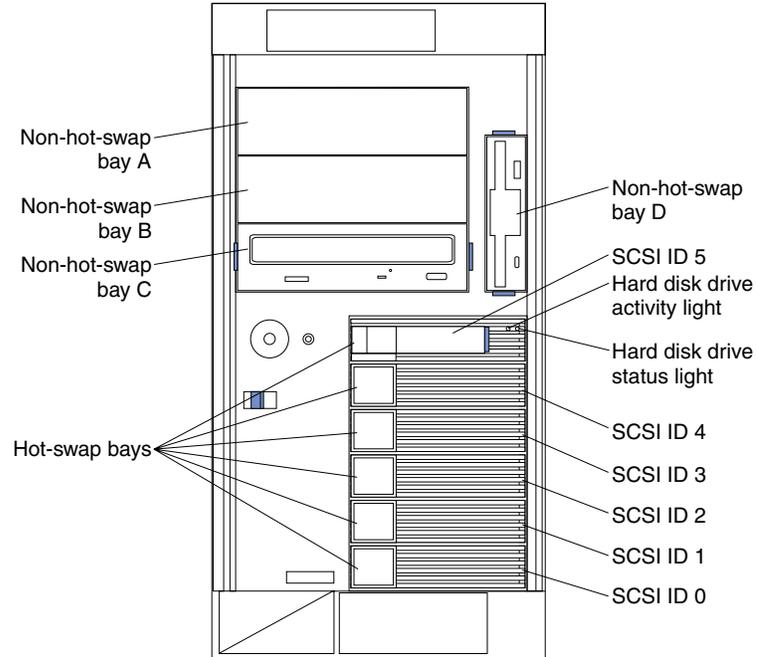
Note: The SCSI IDs for the slim-high and hot-swap drives are located on the bezel, immediately adjacent to the hot-swap drive bays.

Internal drive bays

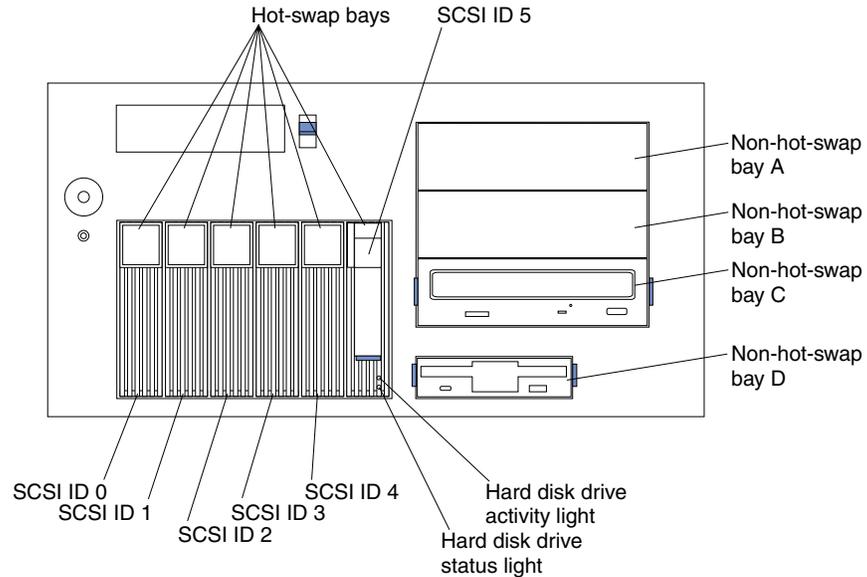
Internal drives are installed in *bays*. The bays of the xSeries 232 server are in the front of the server, as shown in the following illustrations.

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

Tower model



Rack model



Hot-swap drives

Your server contains hardware that enables you to continue to operate your system while a hard disk drive is removed or installed. These drives are known as hot-swap drives.

Each hot-swap drive that you plan to install must have a hot-swap-drive tray attached. Hot-swap-drive trays come with the hot-swap drives.

- Your server supports six slim (1-inch) line, SCSI LVD, 3.5-inch hot-swap hard disk drives in the hot-swap bays.
- The hot-swap bays are connected to a SCSI *backplane*. This backplane is the printed circuit board behind the bay.
- The backplane controls the SCSI IDs for the hot-swap drives.

Non-hot-swap drives

Diskette drives, tape drives, and CD-ROM drives are non-hot-swap drives. To remove or install a non-hot-swap drive, you must turn off the server first. Non-hot-swap drives are installed in bays A, B, C, and D only.

- Your server comes with a preinstalled 3.5-inch, 1.44 MB diskette drive in bay D and a preinstalled IDE CD-ROM drive in bay C.
- The xSeries 232 server supports only one diskette drive.
- The diskette drive uses 1 MB and 2 MB diskettes. For optimum use, format 1 MB diskettes to 720 KB, and format 2 MB diskettes to 1.44 MB.
- Bays A and B come without devices installed. These bays are for 5.25-inch, half-high, removable-media drives, such as tape backup drives. You can combine bays A and B into a single full-high bay.
- If you are installing a SCSI device with a 50-pin connector in one of the empty non-hot-swap bays (bays A and B), you need a 68-pin to 50-pin converter. To order the converter, contact your IBM reseller or IBM marketing representative.

Note: The server electromagnetic interference (EMI) integrity and cooling are both protected by having bays A and B covered or occupied. When you install a drive, save the filler panel from the bay, in case you later remove the drive and do not replace it with another.

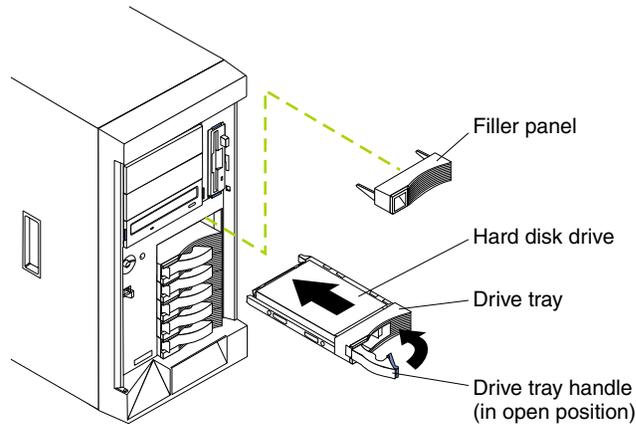
Preinstallation steps (all bays)

Before you install drives in your server, verify that you have all the cables and any other equipment specified in the documentation that comes with the internal drive. You might also need to perform certain preinstallation activities. Some of the steps are required only during the initial installation of an option.

1. Read “Safety” on page vii, “Handling static-sensitive devices” on page 36, and the documentation that comes with your drive.
2. Choose the bay in which you want to install the drive.
3. Check the instructions that come with the drive to see if you need to set any switches or jumpers on the drive.
4. To install the drive, go to “Installing a hot-swap drive” on page 54 or to “Installing a non-hot-swap drive” on page 56, as appropriate.

Installing a hot-swap drive

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



To install a drive in a hot-swap drive bay:

Attention:

- To maintain proper system cooling, do not operate the server for more than 2 minutes without either a drive or a filler panel installed in each bay.
- When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, review “Handling static-sensitive devices” on page 36.

1. If your server is a tower model, unlock and open the server door.

Attention: To maintain proper system cooling, do not operate the server for more than 2 minutes without either a drive or a filler panel installed in each bay.

2. Remove the filler panel from one of the empty hot-swap bays by inserting your finger into the depression at the left side of the filler panel and pulling it away from the server.
3. Install the hard disk drive in the hot-swap bay:
 - a. Ensure the tray handle is open (that is, perpendicular to the drive).
 - b. Align the rails on the drive assembly with the guide rails in the drive bay.
 - c. Gently push the drive assembly into the bay until the drive connects to the backplane.
 - d. Push the tray handle toward the closed position until it locks the drive in place.
4. Check the hard disk drive status indicators to verify that the hard disk drives are operating properly (see “Internal drive bays” on page 52 for the location of the status indicators).
 - If the amber light is on continuously, the drive has failed.
 - If you have a RAID adapter installed:
 - When the amber light flashes slowly (one flash per second), the drive is being rebuilt.
 - When the amber light flashes rapidly (three flashes per second), the controller is identifying the drive.
5. If your server is a tower model, close and lock the server door.

Note: If your server has a RAID adapter installed, refer to the information provided with the RAID adapter for information about adding a drive.

Replacing a drive in a hot-swap bay

You do not have to turn off the server to remove or install the hot-swap drives.

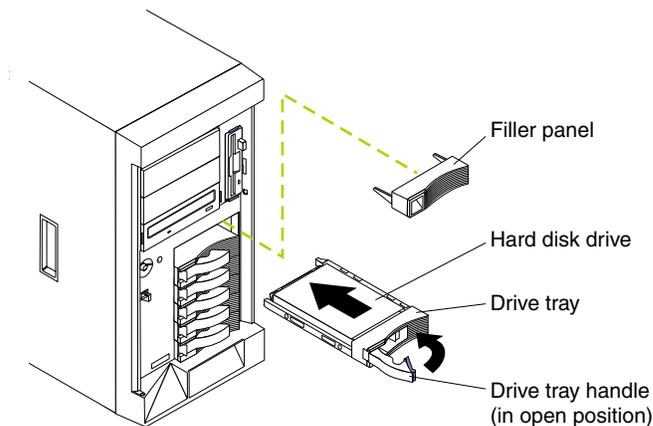
Attention:

1. Before you remove a hot-swap hard disk drive that is not defective, back up all important data.
2. To avoid damage to a hard disk drive, *do not* remove the drive from the hot-swap bay until it has had time to spin down (approximately 30 seconds). Handle the drive carefully.
3. Before you replace a hot-swap drive, make sure it is defective. If you partially or completely remove a good drive instead of a defective one, your server might lose data.

This situation is especially relevant if your server has a RAID adapter installed and you assigned RAID level 1 or 5 to the logical drives in your disk array. The RAID adapter can rebuild the data that you need, provided that certain conditions are met. Refer to the information provided with the RAID adapter for further details.

Refer to the following illustration of the tower model while you perform the steps in this procedure.

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



To replace a drive in a hot-swap bay:

1. Before you begin, do the following:
 - Read the documentation that comes with your drive.
 - If your server has a RAID adapter installed, review the information provided with the RAID adapter for information about replacing a drive.
2. If your server is a tower model, unlock and open the server door.

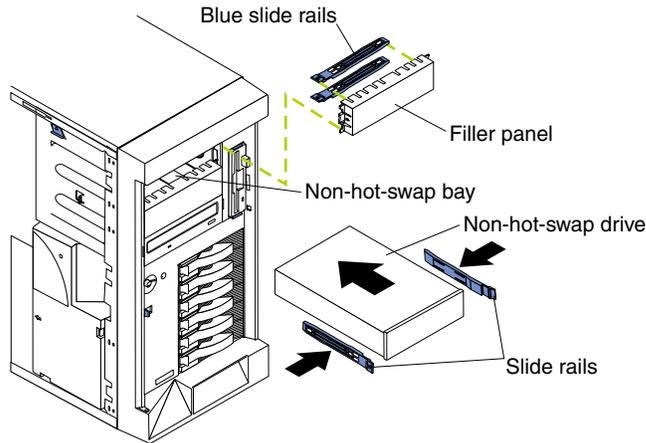
Attention: To maintain proper system cooling, do not operate the server for more than 2 minutes without either a drive or a filler panel installed for each bay.
3. Locate the defective drive (look for an amber hard disk drive status light on the front of the drive).
4. Remove the defective hard disk drive. Move the handle on the drive to the open position (perpendicular to the drive), and pull the hot-swap drive assembly from the bay.

5. Install the hard disk drive in the hot-swap bay:
 - a. Ensure the tray handle is open (that is, perpendicular to the drive).
 - b. Align the rails on the drive assembly with the guide rails in the drive bay.
 - c. Gently push the drive assembly into the bay until the drive connects to the backplane.
 - d. Push the tray handle toward the closed position until it locks the drive in place.
6. Check the hard disk drive status indicators to verify that the hard disk drive is installed properly (see “Internal drive bays” on page 52 for the location of the status lights).
 - When the amber light is on continuously, the drive has failed.
 - If you have a RAID adapter installed:
 - When the amber light flashes slowly (one flash per second), the drive is being rebuilt.
 - When the amber light flashes rapidly (three flashes per second), the controller is identifying the drive.
7. If your server is a tower model, close and lock the server door.

Installing a non-hot-swap drive

Notes:

1. The server electromagnetic interference (EMI) integrity and cooling are both protected by having the non-hot-swap bays covered or occupied. When you install a drive, save the filler panel from the bay, in case you later remove the drive and do not replace it with another.
2. The illustrations in this document might differ slightly from your hardware.



To install a non-hot-swap drive (5.25-inch, removable media) in one of the non-hot-swap bays:

1. Read the information in “Preinstallation steps (all bays)” on page 53.
2. Turn off the server and peripheral devices and then remove the cover and the bezel (see “Removing the cover, door, and bezel” on page 44 for details).
3. Remove the filler panel from the bay opening by pulling the filler panel away from the server. You do not need the filler panel when you have a drive installed in the bay.

4. If the drive that you are installing is a laser product, observe the following safety precaution.

Statement 3



CAUTION:

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

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



DANGER Some laser products contain an embedded Class 3A or Class 3B

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.

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

5. Touch the static-protective package containing the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.
6. Set any jumpers or switches on the drive according to the documentation that comes with the drive.
7. Install rails on the drive.
 - If you are installing a standard-size drive:
 - a. Pull the blue slide rails off the back of the filler panel.
 - b. Clip the rails onto the sides of the drive.
 - If you are installing a digital linear tape (DLT) backup drive, use the metal slide rails and screws that come in the box that contains the server documentation.
8. Align the rails on the drive with the guide rails in the drive bay.

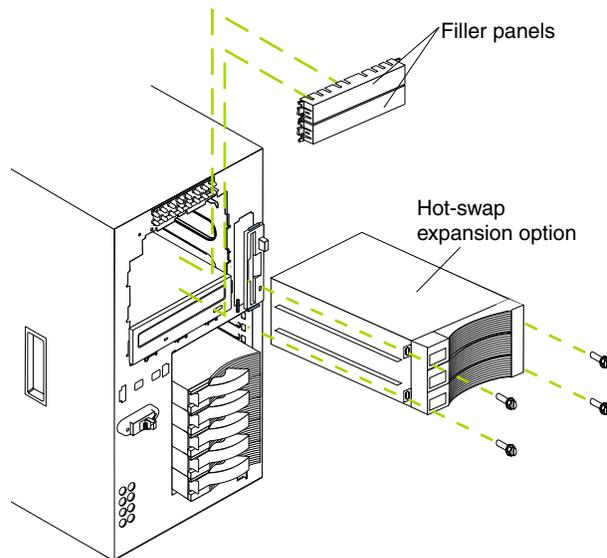
9. Push the drive into the bay until it clicks into place.

10. If the drive is an IDE device:
 - a. Make sure the drive is not a hard disk drive.
 - b. Plug a connector on the IDE cable into the back of the drive.
 - c. Make sure the other end of the IDE cable is plugged into the IDE connector on the system board.
 - d. Go to step 12.
11. If the drive is a SCSI device:
 - a. Make sure the drive is not a hard disk drive.
 - b. Connect one of the connectors on the SCSI cable to the back of the drive.
 - c. Connect the other end of the SCSI cable to the SCSI channel B connector on the system board, or to an optional SCSI adapter, as appropriate. See “System board internal cable connectors” on page 29 for the location of the SCSI connectors. See also “Ultra160 SCSI ports” on page 82 for information about SCSI connections and devices.
12. Connect a power cable to the back of the device. Power cables for non-hot-swap drives come installed in your server. The connectors are keyed and can be inserted only one way.
13. If you are installing another non-hot-swap drive, do so at this time. Otherwise, continue with the next step.
14. If you have other options to install or remove, do so now; otherwise, replace the cover (see “Installing the cover, door, and bezel” on page 70 for details).

Installing an xSeries 3-Pack Ultra160 Hot-Swap Expansion Kit

You can install an xSeries 3-Pack Ultra160 Hot-Swap Expansion Kit in your server to support three additional hot-swap hard disk drives.

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



To install an xSeries 3-Pack Ultra160 Hot-Swap Expansion Kit:

1. Review the information in “Before you begin” on page 35, in “Safety information” on page 37, and “Handling static-sensitive devices” on page 36.

2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover and bezel. (See “Removing the cover, door, and bezel” on page 44.)
3. Release the side rails to remove the filler panels from the bays below the CD-ROM drive.
4. Refer to the documentation provided with the option to assemble the hot-swap expansion option.
5. Slide the hot-swap expansion option into the bays, and attach it to the server with the screws provided in the kit.
6. Refer to the documentation provided with the option to complete the installation of the option. (See “System board internal cable connectors” on page 29 for locations of the cable connectors on the system board.)
7. If you have other options to install or remove, do so now; otherwise, go to “Installing the cover, door, and bezel” on page 70.

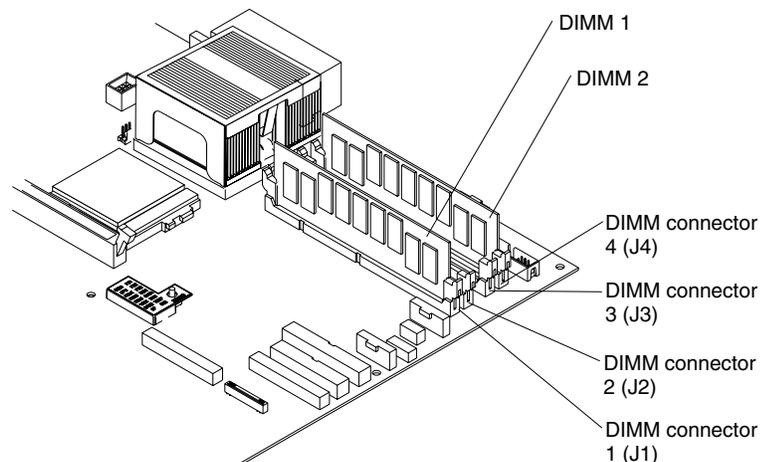
Installing memory modules

Adding memory to your server is an easy way to make programs run faster. You can increase the amount of memory in your server by installing options called *memory-module kits*. Each kit contains one industry-standard, dual inline memory module (DIMM). Your server supports a two-way interleaved memory configuration. You must install matched pairs of memory kits. The set in slots 1 and 4 do not need to be the same size as the set in slots 2 and 3.

Notes:

1. Your server comes with two DIMMs installed in DIMM connectors 1 and 4. Install additional DIMMs as instructed in the documentation that comes with your option.
2. Your xSeries 232 server supports 128 MB, 256 MB, 512 MB, and 1 GB DIMMs. You must install the DIMMs in pairs of the same size. Place pair 1 in slots 1 and 4 and pair 2 in slots 2 and 3. Refer to the ServerProven® list on the World Wide Web at <http://www.ibm.com/pc/compat/> for information about memory modules for use with your server.
3. Installing or removing DIMMs changes the configuration information in the server. Therefore, after installing or removing a DIMM, you must save the new configuration information in the Configuration/Setup Utility program. When you restart the server, the system displays a message indicating that the memory configuration has changed. Start the Configuration/Setup Utility program and select **Save Settings**.

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

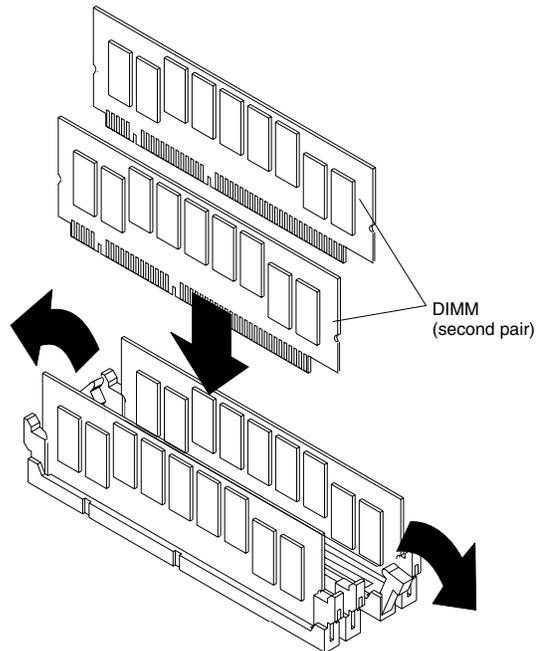


To install a DIMM:

1. Review the information in “Before you begin” on page 35, “Safety information” on page 37, and “Handling static-sensitive devices” on page 36. Also review the documentation that comes with your option.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover. (See “Removing the cover, door, and bezel” on page 44.)
3. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package. You must install memory in matched pairs: the first pair must be in slots 1 and 4, and the second pair must be in slots 2 and 3.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.

4. Install the DIMM:
 - a. Turn the DIMM so that the pins and keys align correctly with the connector.



- b. Insert the DIMM into the connector by pressing on one edge of the DIMM and then on the other edge of the DIMM. Make sure to press the DIMM straight into the connector. Make sure that the retaining clips snap into the closed position.
 - c. Make sure the retaining clips are in the closed position. If a gap exists between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.
5. Repeat steps 3 through 4 for the second DIMM; then, continue with step 6.
 6. If you have other options to install or remove, do so now; otherwise, go to the “Installing the cover, door, and bezel” on page 70.

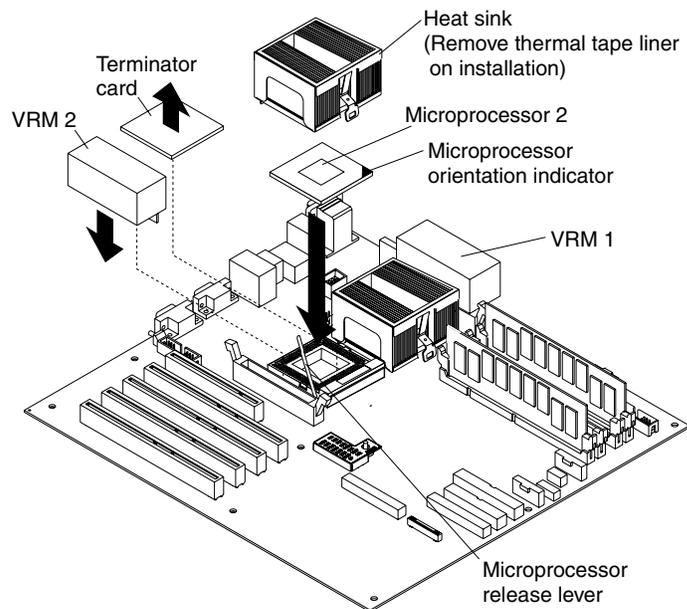
Installing a microprocessor kit

Your server comes with one microprocessor installed on the system board. If you install an additional microprocessor, your server can operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load between the microprocessors. This enhances performance for database and point-of-sale applications, integrated manufacturing solutions, and other applications.

Notes:

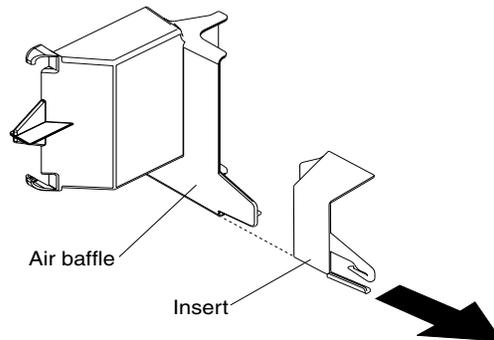
1. Before you install a new microprocessor, review the documentation that comes with the microprocessor, so that you can determine whether you need to update the server basic input/output system (BIOS) code. The latest level of BIOS code for your server is available through the World Wide Web at www.ibm.com/pc/support/.
2. Obtain an SMP-capable operating system (optional). For a list of supported operating systems, see <http://www.ibm.com/pc/compat/> on the World Wide Web.
3. Your server comes with one microprocessor installed in the microprocessor connector (U68) that is closest to the power supply. This is the startup (boot) microprocessor. A microprocessor installed in connector U69 is microprocessor 2. If more than one microprocessor is installed, the microprocessor installed in microprocessor connector U69 is the startup microprocessor, and the microprocessor installed in U68 is the application microprocessor.

Attention: To avoid damage and ensure proper server operation when you install a new or additional microprocessor, use microprocessors that have the same cache size, type, and clock speed. You must also install the same type of heat sink that comes shipped in your server. See the ServerProven list at <http://www.ibm.com/pc/compat/> for a list of microprocessors for use with your server.



To install an additional microprocessor:

1. Review the safety precautions in Statement 1 and Statement 5 in “Safety information” on page 37 and “Handling static-sensitive devices” on page 36.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover (see “Removing the cover, door, and bezel” on page 44 for details).
3. Remove the air-baffle assembly from the fan assembly located on the rear of the server.



4. Remove the air-baffle insert from the air-baffle assembly before you install the additional microprocessor. Store the air-baffle insert in a safe place for future use.

Attention: If your server uses only one microprocessor, the air-baffle insert must remain clipped onto the air-baffle assembly to ensure proper airflow over the microprocessor.

5. Pull out and lift up the release lever and remove the terminator card from the microprocessor connector. Store the terminator card in a safe place, such as the static-protective package that your new microprocessor comes in. You will need to install it again, if you ever remove the microprocessor and do not replace it.
6. Install the microprocessor:

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

- b. Line up the microprocessor pins over the microprocessor connector and carefully press the microprocessor into the connector.

Note: Use the orientation indicator located on the microprocessor to properly align the microprocessor over the microprocessor connector, if available.

- c. Press down and latch the release lever.

Note: To remove a microprocessor, pull upward on the microprocessor release lever and then lift the microprocessor off the connector.

7. Install the voltage regulator module (VRM) included in the microprocessor kit.

Attention: When installing or replacing a VRM, use only a VRM specified for use with the xSeries 232 server. Use of other VRMs might cause your server to overheat.

- a. Center the VRM over the VRM connector. Make sure that the VRM is oriented and aligned correctly.

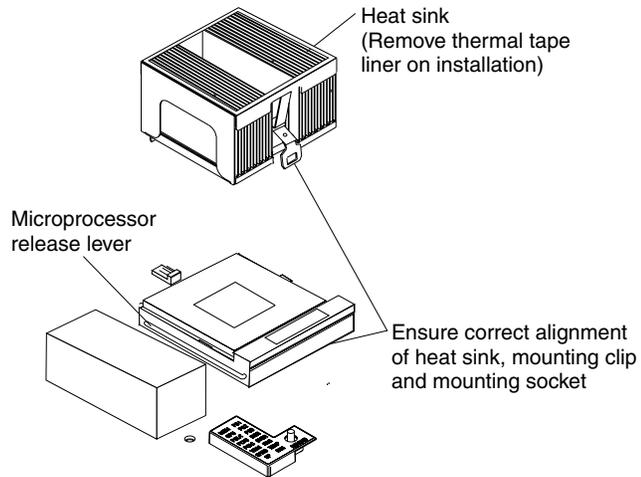
- b. Press the VRM into the connector.

Note: If you remove the microprocessor later, remember to install the terminator card in the appropriate microprocessor connector and remove the VRM.

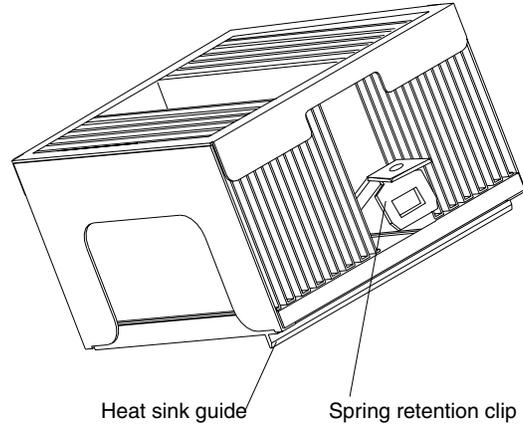
8. Install the heat sink:

Attention: You must install the same type of heat sink that comes shipped in your server.

- a. Remove the thermal tape liner from the underside of the heat sink and discard it.
- b. Align and place the heat sink on the top of the microprocessor.



Make sure the heat-sink guide fits between the microprocessor and the microprocessor socket.

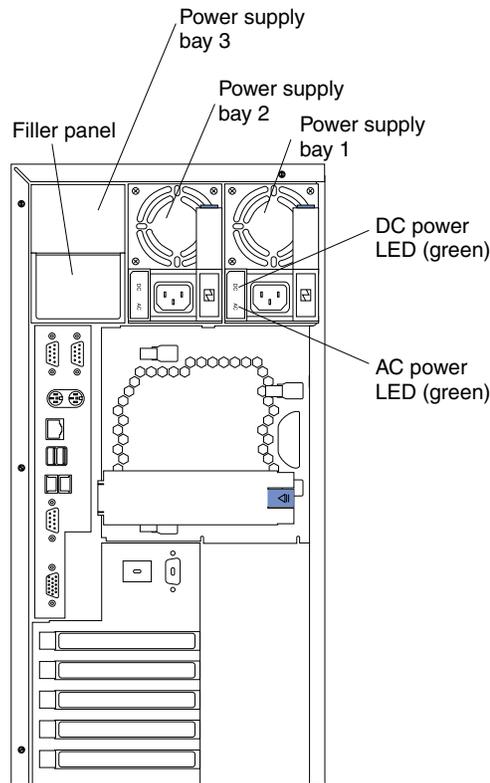


- c. Press down and latch the spring retention clip on the back of the heat sink (the side facing the back of the server).
 - d. Press down and latch the spring retention clip on the front of the heat sink (the side facing the front of the server).
9. Reinstall the air-baffle assembly over the fan assembly located on the rear of the server and rest the baffle body over the microprocessors.
10. If you have other options to install or remove, do so now; otherwise, go to "Installing the cover, door, and bezel" on page 70.

Installing or removing a power supply

Your server comes with two 250-watt power supplies. Each power supply has two status indicators; see the following illustration for information about the status indicators and power-supply bay locations.

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



Filler panels

To maintain proper airflow, keep filler panels in place on empty power-supply bays as shown.

Power supply bay 1

Your server comes with a power supply installed in this bay. LED PS1 on the system board diagnostic panel refers to this power supply. See “System board LED, diagnostic panel, and Remind button locations” on page 33 for more information about the diagnostic panel.

Power supply bay 2

Your server comes with a power supply installed in this bay. LED PS2 on the system board diagnostic panel refers to this power supply. See “System board LED, diagnostic panel, and Remind button locations” on page 33 for more information about the diagnostic panel.

Power supply bay 3

If you install an optional power supply in this bay, LED PS3 on the system board diagnostic panel refers to this power supply. See “System board LED, diagnostic panel, and Remind button locations” on page 33 for more information about the diagnostic panel.

AC power LED

This light provides status information about the power supply. During typical operation, the ac power LED is on. See “Power-supply LEDs” on page 111 for more information.

DC power LED

This light provides status information about the power supply. During typical operation, the dc power LED is on. See “Power-supply LEDs” on page 111 for more information.

Statement 8



CAUTION:

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



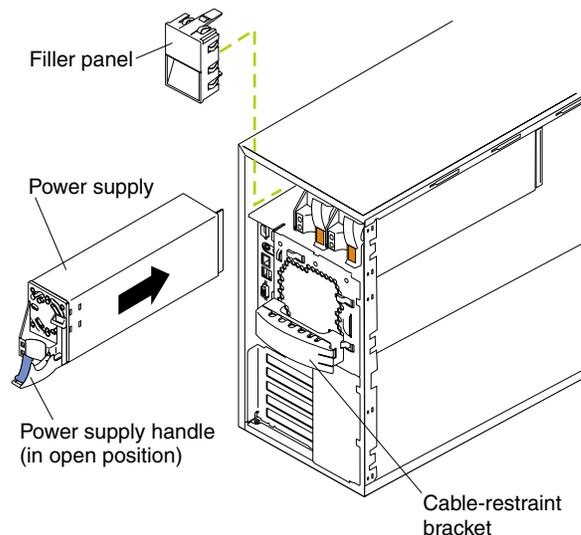
Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Adding a hot-swap power supply

You can add a third 250-watt power supply to ensure complete power redundancy. After you install a power supply, verify that the power-supply status indicators (ac power light and dc power light) are lit, indicating that the power supply is operating properly.

Notes:

1. You do not need to turn off the power to the server to install hot-swap power supplies.
2. The illustrations in this document might differ slightly from your hardware.



To install a hot-swap power supply:

1. Remove the filler panel from the empty power-supply bay by inserting your finger into the depression on the filler panel and pulling it away from the server. Save the filler panel in case you remove the power supply at a later time.

Attention: During typical operation, each power-supply bay must have either a power supply or filler panel installed for proper cooling.

2. Install the power supply in the bay:
 - a. Place the handle on the power supply in the open position (that is, perpendicular to the power supply) and slide the power supply into the chassis.
 - b. Gently close the handle to seat the power supply in the bay.
3. Plug the power cord into the power cord connector located on the rear of the power supply.
4. Route the power cord through the cable-restraint bracket.
5. Plug the power cord into a properly grounded electrical outlet.
6. Verify that the dc power light and ac power light on the power supply are lit, indicating that the power supply is operating correctly.
7. If you have other options to install or remove, do so now.

Removing a hot-swap power supply

If you have a hot-swap power-supply backplane and have installed power supplies, you normally have power redundancy and hot-swappability. However, if the load on your server requires the capacity of all installed power supplies, you do not have redundancy or hot-swappability and must turn off the server before removing any of your power supplies.

Important: If you do not have power redundancy, and you remove a power supply while the system is running, your system will immediately power off.

To remove a power supply:

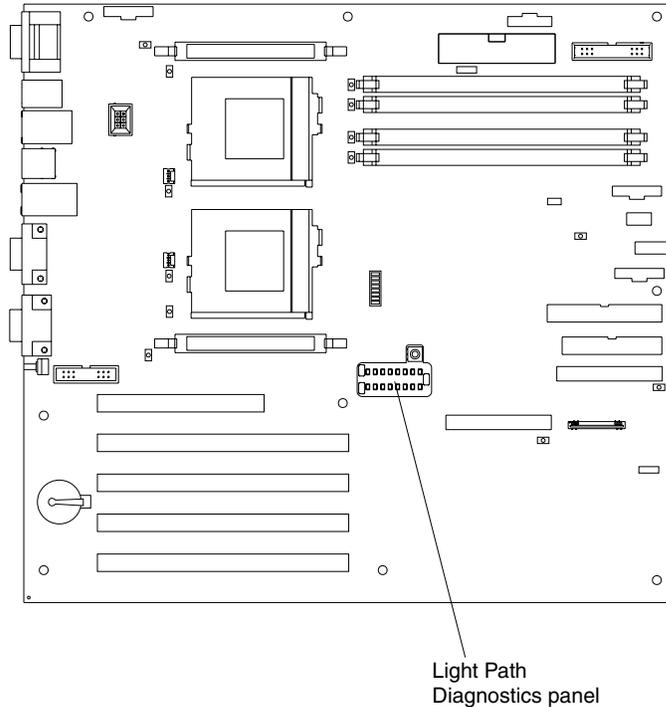
1. Check the Information light operation information panel on the front of the server. If on, check the NON (nonredundant) LED (CR24) on the diagnostic panel on the system board.

- a. If the NON LED is lit, you do not have redundancy. *Turn off the server* and peripheral devices; then, continue with step 2 on page 68.

Note: The Information light on the operator information panel on the front of the server also will be on. See “Operator information panel” on page 8 for the location and contents of the operator information panel.

- b. If you have more than one power supply installed and the NON LED is not lit, you have redundancy and do not need to turn off the server. Continue with step 2 on page 68.

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



2. Unplug the power cord from the electrical outlet. Then, remove the other end of the power cord from the power supply.

CAUTION:

Be careful when you remove the power supply; the power supply might be too hot to handle comfortably.

Statement 12



CAUTION:

The following label indicates a hot surface nearby.



3. Remove the power supply.
4. Install a replacement power supply.
5. Plug the power cord for the power supply into the power cord connector. Route the power cord through the cable-restraint bracket. Then, plug the other end of the cord into a properly grounded outlet.
6. If you turned off the server in step 1a on page 67, turn on the server and peripheral devices.
7. Verify that the ac power light and dc power light are lit, indicating that the power supply is operating correctly.

Replacing a hot-swap fan assembly

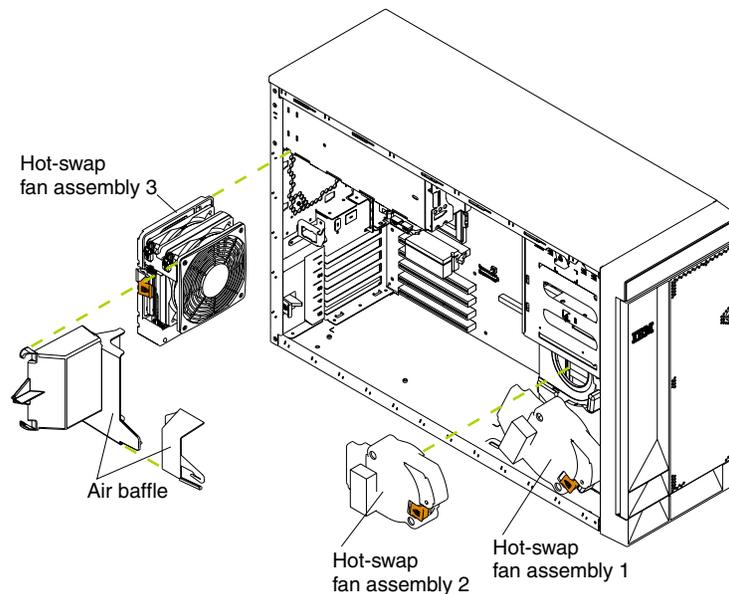
Your server comes with three hot-swap fan assemblies.

Attention: Immediately replace a fan that has failed to help ensure proper cooling.

The following illustrations show the replacement of a hot-swap fan assembly. Refer to these illustrations while performing the steps in this procedure.

Notes:

1. You do not need to turn off the power to the server to replace a hot-swap fan assembly.
2. The illustrations in this document might differ slightly from your hardware.



To replace the fan assembly:

1. Review the safety precautions in Statement 1 and Statement 5 in “Safety information” on page 37 and “Handling static-sensitive devices” on page 36.
2. Remove the cover. See “Removing the cover, door, and bezel” on page 44 for details.
3. Determine which fan assembly to replace by checking the LED on each fan; a lit LED indicates the fan to replace.
4. Remove the fan assembly.

Attention: The air-baffle should not be removed from the system for more than 2 minutes to avoid microprocessor overheating.

- a. If you are removing fan assembly 1 or fan assembly 2, press the release latch to the unlocked position; then, remove the fan assembly from the server.
 - b. If you are removing fan assembly 3, you must first lift and remove the air-baffle assembly from the server. Then, press the release latch to the unlocked position and remove the fan assembly from the server.
5. Slide the replacement fan assembly into the server until it clicks into place.
 6. If you removed the air-baffle assembly, replace it now.
 7. Verify that the FAN LED on the diagnostic panel is not lit. If the FAN LED is lit, reseat the fan.

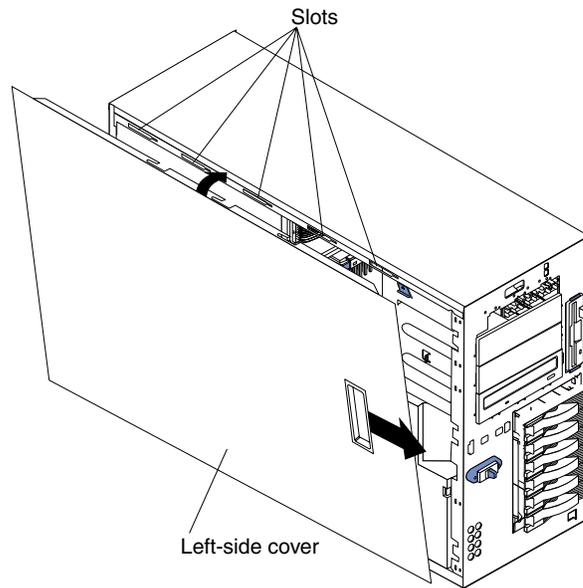
8. If you have other options to install or remove, do so now; otherwise, go to “Installing the cover, door, and bezel”.

Installing the cover, door, and bezel

If you have a tower model, continue with “Installing the cover (tower model)”. If you have a rack model, go to “Installing the cover (rack model)” on page 72.

Installing the cover (tower model)

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

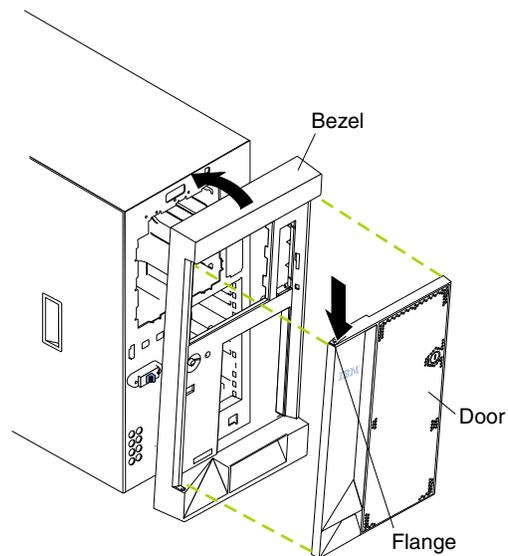


To install the server left-side cover:

1. Align the cover with the left side of the server, approximately 25 mm (1 inch) from the front of the server; place the bottom of the cover on the bottom rail of the chassis.
2. Insert the tabs at the top of the cover into the slots at the top of the server.
3. Hold the cover against the server, and slide the cover toward the front of the server until the cover clicks into place.

Installing the bezel and front door (tower model)

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



To install the bezel:

1. Place the tabs at the bottom edge of the bezel in the slots at the bottom front of the server.
2. Press the top of the bezel toward the server until it clicks into place.

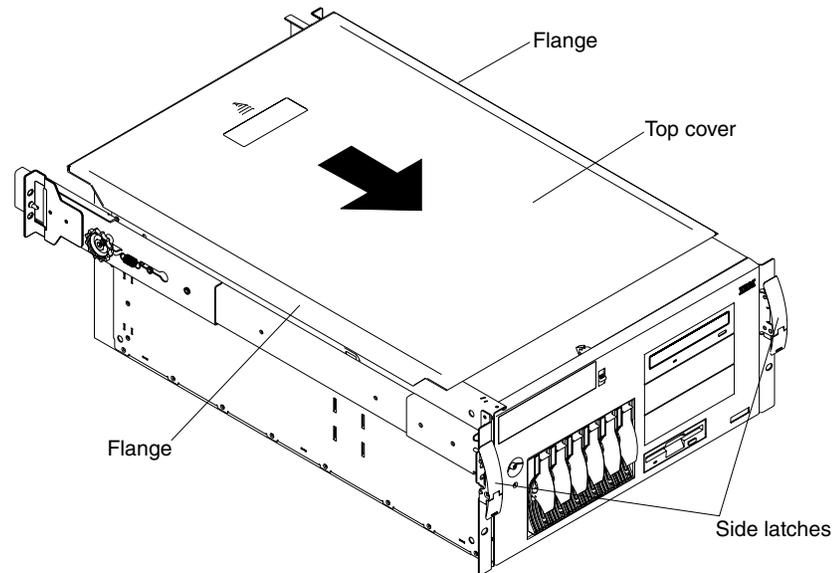
To install the server door:

1. Set the door on the bottom hinge.
2. Press the flange downward while pressing the top of the door toward the server, until the flange connects with the top hinge. Then, release the flange.
3. Close and lock the server door.

Attention: Be sure to maintain a clearance of at least 127 mm (5 inches) on the front and rear of the server to allow for air circulation.

Installing the cover (rack model)

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

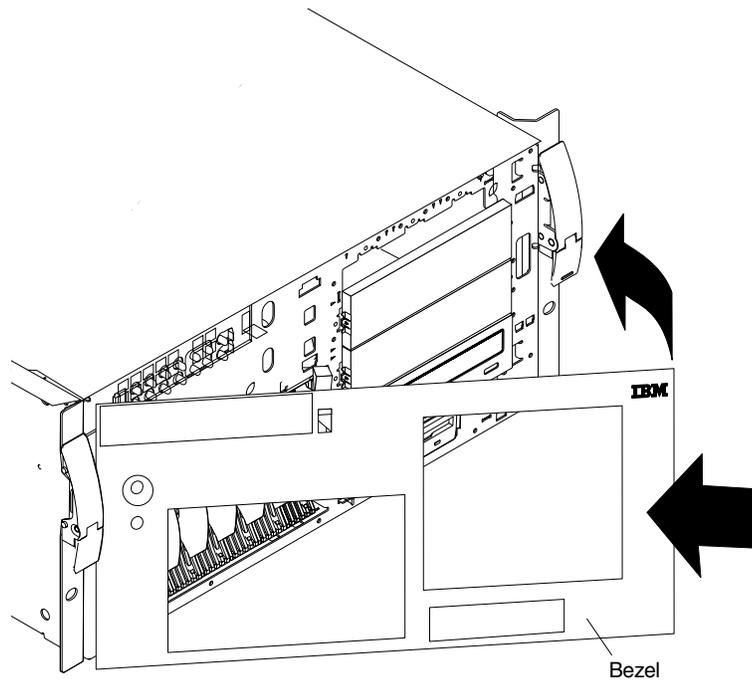


To install the server top cover:

1. Align the top cover with the top of the server, approximately 25mm (1 inch) from the front of the server; the flanges on the left and right sides of the cover should be on the outside of the server chassis.
2. Hold the cover against the server, and slide the cover toward the front of the server until the cover clicks into place.

Installing the bezel (rack model)

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



To install the bezel:

1. Place the tabs on the left side of the bezel in the slots at the left front of the server.
2. Press the right end of the bezel toward the server until the bezel clicks into place.

Connecting external options

If you install a SCSI adapter, you can attach a SCSI storage expansion enclosure to your server. You can attach additional external options to the input/output connectors on the rear of the server. See “Input/output ports” on page 75 for additional information.

To attach an external device:

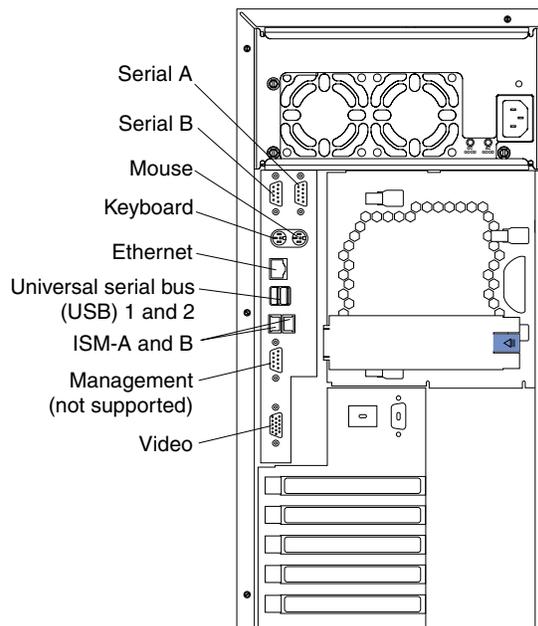
1. Read “Before you begin” on page 35 and the documentation that comes with your options.
2. Turn off the server and all attached devices.
3. Follow the instructions that come with the option to prepare it for installation and to connect it to the server.

Note: If you are attaching a SCSI device, see “Ultra160 SCSI ports” on page 82 for SCSI ID and cabling information.

Input/output connector locations

The following illustration shows the input/output connectors (ports) on the rear of the server. For pin assignments and other details about these connectors, see “Input/output ports” on page 75.

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



Note: The ISM ports are dedicated for use by the system-management subsystem.

Input/output ports

Your server has the following input/output (I/O) ports:

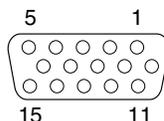
- One video port
- Two integrated system management (RS-485) ports
- One management port (not supported)
- Two Universal Serial Bus (USB) ports
- One Ethernet port
- One keyboard port
- One auxiliary pointing device (mouse) port
- Two serial ports
- Dual-channel Ultra160 ports (internal connectors only)

Video port

Your server comes with an integrated super video graphics array (SVGA) video controller. This controller is not removable, but you can disable it by installing a PCI video adapter.

Note: If you install a PCI video adapter, the server BIOS code will automatically disable the integrated video controller.

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



Pin	Signal	Pin	Signal	Pin	Signal
1	Red	6	Ground	11	Not connected
2	Green or monochrome	7	Ground	12	DDC SDA
3	Blue	8	Ground	13	Horizontal synchronization (Hsync)
4	Not connected	9	+5 V dc DDC	14	Vertical synchronization (Vsync)
5	Ground	10	Ground	15	DDC SCL

Table 4. Video-port connector pin-number assignments.

Integrated system management interconnect ports

The integrated system management (ISM) ports (ISM-A and ISM-B) use a dual RJ-45 connector to interconnect ISM processors of several servers through an optional Remote Supervisor Adapter.

Note: ISM ports (ISM A and B) are used for the RS-485 interconnect network communications.

Refer to the Remote Supervisor Adapter option documentation for detailed information about the ASM interconnect network.

Universal Serial Bus ports

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

Notes:

1. If you attach a standard (non-USB) keyboard to the keyboard connector, the USB ports and devices will be disabled during the power-on self-test (POST).
2. If you install a USB keyboard that has a mouse port, the USB keyboard emulates a mouse and you will not be able to disable the mouse settings in the Configuration/Setup Utility program.

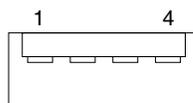
USB cables and hubs

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

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

USB-port connectors

Each USB port has an external connector on the rear of the server for attaching USB-compatible devices.



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

Pin	Signal
1	+5 V VCC
2	-Data
3	+Data
4	Ground

Table 5. USB-port connector pin-number assignments.

Ethernet ports

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

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

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

Configuring the Ethernet controllers

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

The Ethernet controllers are PCI Plug and Play devices. You do not need to set any jumpers or configure the controllers for your operating system before you use the Ethernet controllers. However, you must install a device driver to enable your operating system to address the Ethernet controllers. The device drivers are provided on the ServerGuide CDs.

Failover for redundant Ethernet

The IBM 10/100 Ethernet Adapter or the IBM 10/100 EtherJet™ PCI family of adapters are optional redundant network interface cards (NICs) that you can install in your server. If you install this NIC and connect it to the same logical segment as the primary Ethernet controller, you can configure the server to support a *failover* function. You can configure either one of the integrated Ethernet controllers or the NIC as the primary Ethernet controller. In failover mode, if the primary Ethernet controller detects a link failure, all Ethernet traffic associated with it is switched to the redundant (secondary) controller. This switching occurs without any user intervention. When the primary link is restored to an operational state, the Ethernet traffic switches back to the primary Ethernet controller.

High-performance Ethernet Modes

Your Ethernet controllers support optional modes, such as teaming, priority packets, and virtual LANs, which provide higher performance and throughput for your server.

Teaming mode: Your Ethernet controllers provide options, called *teaming options*. These options increase throughput and fault tolerance when running with Windows NT 4.0 or NetWare 4.1x or later.

- **Adapter fault tolerance (AFT)** provides automatic redundancy for your adapter. If the primary adapter fails, the secondary adapter takes over. Adapter fault tolerance supports from two to four adapters per team.
- **Adaptive load balancing (ALB)** enables you to balance the transmission data flow among two to four adapters. ALB also includes the AFT option. You can use ALB with any 100BASE-TX switch.
- **Cisco Fast Ether Channel (FEC)** creates a team of two to four adapters to increase transmission and reception throughput. FEC also includes the AFT option. You can use FEC only with a switch that has FEC capability.

Teaming requires you to install both integrated Ethernet controllers. For additional information about the teaming modes, refer to the documentation that comes with these additional adapters.

Priority Packet mode: Priority Packet is a traffic-prioritization utility that enables you to set up filters to process high-priority traffic before normal traffic. You can send information from critical nodes or applications with an indicated priority. Because you set this priority at the host or entry point of the network, the network devices can base forwarding decisions on priority information defined in the packet.

Priority Packet information is available on the IBM Networking Web site at <http://www.ibm.com/networking/support/>.

Priority Packet prioritizes traffic based on priority filters. These are parameters you assign to outgoing (transmit) packets. Using the priority-filter wizard, you can set up predefined or custom priority filters based on a node (MAC) address, Ethernet type, or by various properties of the protocol and port. Priority Packet provides two different methods for prioritizing traffic: IEEE 802.1p tagging and High Priority Queue.

IEEE 802.1p is an IEEE standard for tagging, or adding additional bytes of information to packets with different priority levels. Packets are tagged with 4 additional bytes, which increase the packet size and indicate a priority level. When you send these packets out on the network, the higher priority packets are transferred first. Priority packet tagging (also known as Traffic Class Expediting) enables the adapter to work with other elements of the network (such as switches and routers) to deliver priority packets first. You can assign specific priority levels from 0 (low) to 7 (high).

You can assign values to packets based on their priorities when you use the IEEE 802.1p standard for packet tagging. This method requires a network infrastructure that supports packet tagging. The routing devices receiving and transferring these packets on your network must support 802.1p for tagging to be effective.

After you set up the priority filter in Priority Packet, you must start IBMSet and select **802.1p/802.1Q Tagging** on the Advanced page.

Note: IEEE 802.1p tagging increases the size of the packets it tags. Some hubs and switches will not recognize the larger packets and will drop them. Check your hub or switch documentation to see if they support 802.1p. (You can configure the switch to strip the tags from the packets and send it on to the next destination as normal traffic.) If these devices do not support 802.1p or if you are not sure, use High Priority Queue (HPQ) to prioritize network traffic.

The requirements for effectively using IEEE 802.1p tagging are:

- The other devices receiving and routing 802.1p tagged packets must support 802.1p.
- The adapters on these devices must support 802.1p. The Ethernet controller in your server, all IBM Netfinity 10/100 Ethernet Security Adapters, and IBM 10/100 Ethernet Server Adapters support 802.1p.
- The adapter cannot be assigned to an adapter team.
- If you are setting up VLANs and packet tagging on the same adapter, 802.1p/802.1Q Tagging must be enabled on the IBMSet Advanced page.

If your network infrastructure devices do not support IEEE 802.1p or you are not sure, you can still define filters and send packets as high priority. While High Priority Queue (HPQ) does not provide the precise priority levels of 802.1p tagging, it does assign traffic as either high or low priority and sends high-priority packets first. Therefore, if there are multiple applications on a system sending packets, the packets from the application with a filter are sent out first. HPQ does not change network routing, nor does it add any information to the packets.

To assign HPQ, you can specify it using Priority Packet when you create or assign a filter.

To effectively use HPQ, the adapter cannot be assigned to an adapter team.

Virtual LAN mode: A virtual LAN (VLAN) is a logical grouping of network devices put together as a LAN, regardless of their physical grouping or collision domains. Using VLANs increases network performance and improves network security.

VLANs offer you the ability to group users and devices together into logical workgroups. This can simplify network administration when connecting clients to servers that are geographically dispersed across a building, campus, or enterprise network.

Normally, VLANs are configured at the switch and any computer can be a member of one VLAN per installed network adapter. Your Ethernet controller supersedes this by communicating directly with the switch, enabling multiple VLANs on a single network adapter (up to 64 VLANs).

To set up VLAN membership, your Ethernet controller must be attached to a switch that has VLAN capability. You also need to use Windows NT 4.0 or later, or Novell NetWare 4.1x or later.

Notes:

1. Windows NT versions prior to 4.0 do not support VLANs.
2. VLANs require Windows NT 4.0 with Service Pack 3.0 and the NDIS driver from Microsoft.
3. In Windows NT, VLANs cannot be implemented on controllers that have been configured for teaming options. NetWare can support teaming options and VLANs on the same adapters.

To join a VLAN from Windows NT 4.0:

1. Create a VLAN on the switch. Use the parameters you assign there to join the VLAN from the server. Refer to your switch documentation for more information.
2. Double-click the **Network** icon in the Control Panel window.
3. On the Adapters page, select the adapter you want to be on the VLAN and click **Properties**.
4. In IBMSet, click **Join VLAN**. Note that VLANs cannot be assigned to adapters that are already defined to have an adapter teaming option.
5. Type the VLAN ID and VLAN name. The VLAN ID must match the VLAN ID of the switch. The ID range is from 1 to 1000. The VLAN name is for information only and does not need to match the name on the switch.
6. Click **Join VLAN**. Repeat steps 3 through 5 for each VLAN you want the server to join. The VLANs you add are listed on the Adapters page.
7. Click **Close** and restart the computer.

Ethernet port connector

The following table and illustration show the pin-number assignments for the RJ-45 connector. These assignments apply to both 10BASE-T and 100BASE-TX devices.

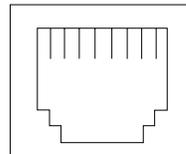


Table 6. Ethernet RJ-45 connector pin-number assignments..

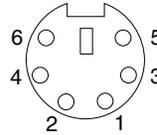
Pin	Signal	Pin	Signal
1	Transmit data+	5	Not connected
2	Transmit data-	6	Receive data -
3	Receive data+	7	Not connected
4	Not connected	8	Not connected

Keyboard port

There is one keyboard port on the rear of your server.

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

The following table shows the pin-number assignments for the keyboard connector on the rear of your server.



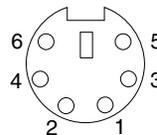
Pin	I/O	Signal
1	I/O	Data
2	N/A	Reserved
3	N/A	Ground
4	N/A	+5 V dc
5	I/O	Keyboard clock
6	N/A	Reserved

Table 7. Keyboard connector pin-number assignments .

Auxiliary-device (pointing device) port

The system board has one auxiliary-device port that supports a mouse or other pointing device.

The following table shows the pin-number assignments for the auxiliary-device connector on the rear of your server.



Pin	Signal
1	Data
2	Not connected
3	Ground
4	+5 V dc
5	Clock
6	Not connected

Table 8. Auxiliary-device connector pin-number assignments .

Serial ports

Your server has two standard serial ports, Serial port A and Serial port B. The operating system can use both serial ports, Serial port A and Serial port B.

Some application programs require specific ports, and some modems function properly only at certain communication port addresses. You might need to use the Configuration/Setup Utility program to change communication port address assignments to prevent or resolve address conflicts.

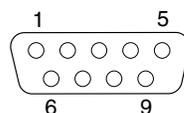
Viewing or changing the serial-port assignments

To view or change the serial-port assignments:

1. Restart the server and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1.
3. From the main menu, click **Devices and I/O Ports**; then, press Enter.
4. Select the serial port; then, use the arrow keys to advance through the settings available.
5. Select **Save Settings**; then, select **Exit Setup** to exit from the Configuration/Setup Utility main menu.

Serial-port connectors

The following table shows the pin-number assignments for the 9-pin, male D-shell serial-port connectors on the rear of your server. These pin-number assignments conform to the industry standard.



Pin	Signal	Pin	Signal
1	Data carrier detect	6	Data set ready
2	Receive data	7	Request to send
3	Transmit data	8	Clear to send
4	Data terminal ready	9	Ring indicator
5	Signal ground		

Table 9. Serial-port connectors pin-number assignments.

Ultra160 SCSI ports

Your server has an integrated dual-channel Ultra160 small computer system interface (SCSI) controller. This controller supports two independent Ultra 160/m SCSI channels, both internal. Each of these channels supports up to 15 SCSI devices. In addition, this controller uses:

- Double-transition clocking to achieve high transfer rates
- Domain-name validation to negotiate compatible data transfer speeds with each device
- Cyclic redundancy checking (CRC), instead of the usual parity checking, to significantly improve data reliability
- An active terminator on the system board for SCSI bus termination

A SCSI cable connects the SCSI channel A connector to the hot-swap drive backplane. If you obtain an additional SCSI cable, the SCSI channel B connector is available for connecting non-hot-swap SCSI drives in the 5.25-inch bays.

If you install a SCSI adapter in your server, you can use its SCSI connector to connect different types of small computer system interface (SCSI) devices.

Note: If you install a PCI RAID adapter to configure and manage the internal hot-swap drives, you must move the SCSI cable from the system board SCSI channel A connector to an internal channel connector on the RAID adapter.

SCSI cabling requirements

If you plan to attach external SCSI devices, you must order additional SCSI cables. To select and order the correct cables for use with external devices, contact your IBM reseller or IBM marketing representative.

For information about the maximum length of SCSI cable between the terminated ends of the cable, refer to the American National Standards Institute (ANSI) SCSI standards. Adhering to these standards will help ensure that your server operates properly.

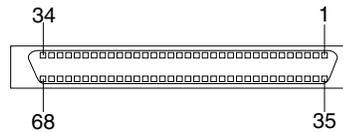
Setting SCSI IDs

Each SCSI device connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs.

The hot-swap-drive backplane controls the SCSI IDs for the internal hot-swap drive bays. However, when you attach SCSI devices to the external SCSI connector, you must set a unique ID for the device. Refer to the information that is provided with the device for instructions to set its SCSI ID.

SCSI connector pin-number assignments

The following table shows the pin-number assignments for the 68-pin SCSI connectors.



Pin	Signal	Pin	Signal
1	+Data 12	35	-Data 12
2	+Data 13	36	-Data 13
3	+Data 14	37	-Data 14
4	+Data 15	38	-Data 15
5	+Data P1	39	-Data P1
6	+Data 0	40	-Data 0
7	+Data 1	41	-Data 1
8	+Data 2	42	-Data 2
9	+Data 3	43	-Data 3
10	+Data 4	44	-Data 4
11	+Data 5	45	-Data 5
12	+Data 6	46	-Data 6
13	+Data 7	47	-Data 7
14	+Data P	48	-Data P
15	Ground	49	Ground
16	DIFFSENS	50	Ground
17	Term power	51	Term power
18	Term power	52	Term power
19	Reserved	53	Reserved
20	Ground	54	Ground
21	+Attention	55	-Attention
22	Ground	56	Ground
23	+Busy	57	-Busy
24	+Acknowledge	58	-Acknowledge
25	+Reset	59	-Reset
26	+Message	60	-Message
27	+Select	61	-Select
28	+Control/Data	62	-Control/Data
29	+Request	63	-Request
30	+Input/Output	64	-Input/Output
31	+Data 8	65	-Data 8
32	+Data 9	66	-Data 9
33	+Data 10	67	-Data 10
34	+Data 11	68	-Data 11

Table 10. 68-pin SCSI connector pin-number assignments.

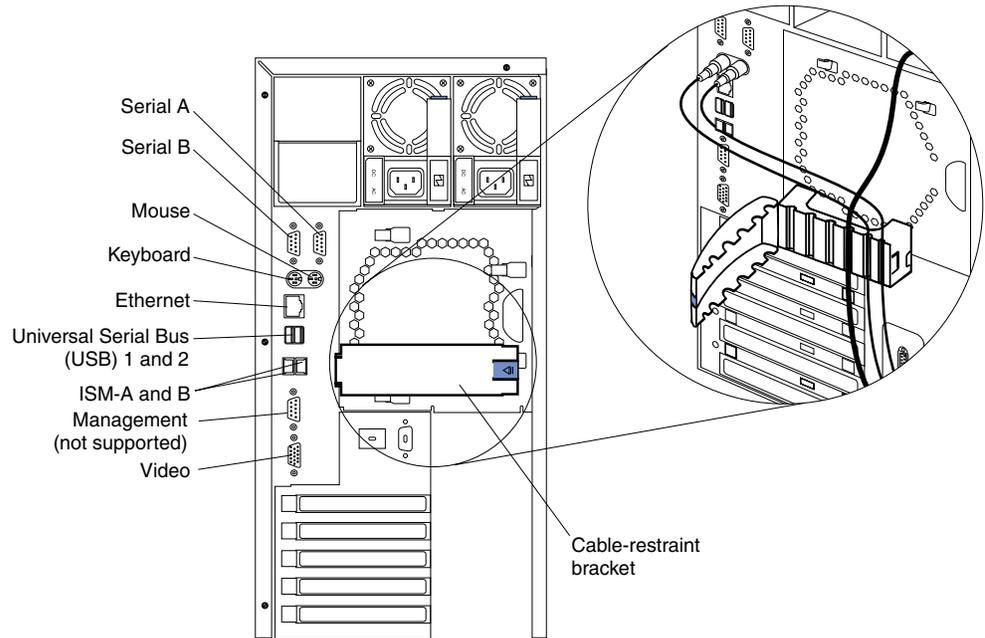
Cabling the server

When you cable the server, be sure to route the power cables, mouse, and keyboard cables through the cable-restraint bracket on the rear of the server.

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

Cabling the tower model

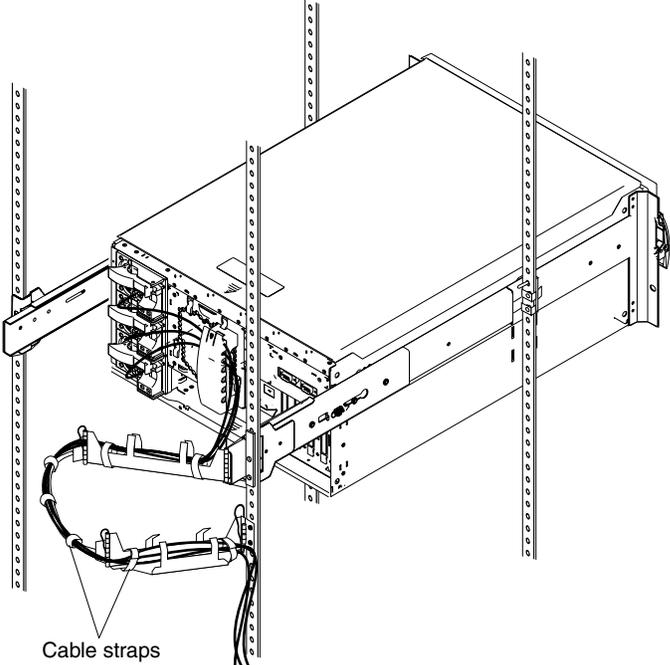
The following illustration shows how to route cables through the cable-restraint bracket located on the rear of the tower model.



Note: ISM ports (ISM A and B) are used for the RS-485 interconnect network communications.

Cabling the rack model

The following illustration shows how to route cables through the cable-restraint bracket and the cable-management assembly located on the rear of the rack model.



Chapter 6. Solving Problems

This section provides basic troubleshooting information to help you resolve some common problems that might occur with your server.

If you cannot locate and correct the problem using the information in this section, see Chapter 7, “Getting information, help, and service,” on page 131 for more information.

Diagnostic tools overview

The following tools are available to help you identify and resolve hardware-related problems:

- **POST beep codes, error messages, and error logs**

The power-on self-test (POST) generates beep codes and messages to indicate successful test completion or the detection of a problem. See “POST” on page 87 for more information.

- **Light Path Diagnostics**

Your server has light-emitting diodes (LEDs) to help you identify problems with server components. These LEDs are part of the Light Path Diagnostics feature that is built into your server. By following the path of lights, you can quickly identify the type of system error that occurred. See “Identifying problems using status LEDs” on page 111 for more information.

- **Diagnostic programs and error messages**

The server diagnostic programs are stored in upgradable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of your server. See “Diagnostic programs and error messages” on page 99 for more information.

- **Troubleshooting charts**

These charts list problem symptoms, along with suggested steps to correct the problems. See “Troubleshooting the Ethernet controller” on page 120 for more information.

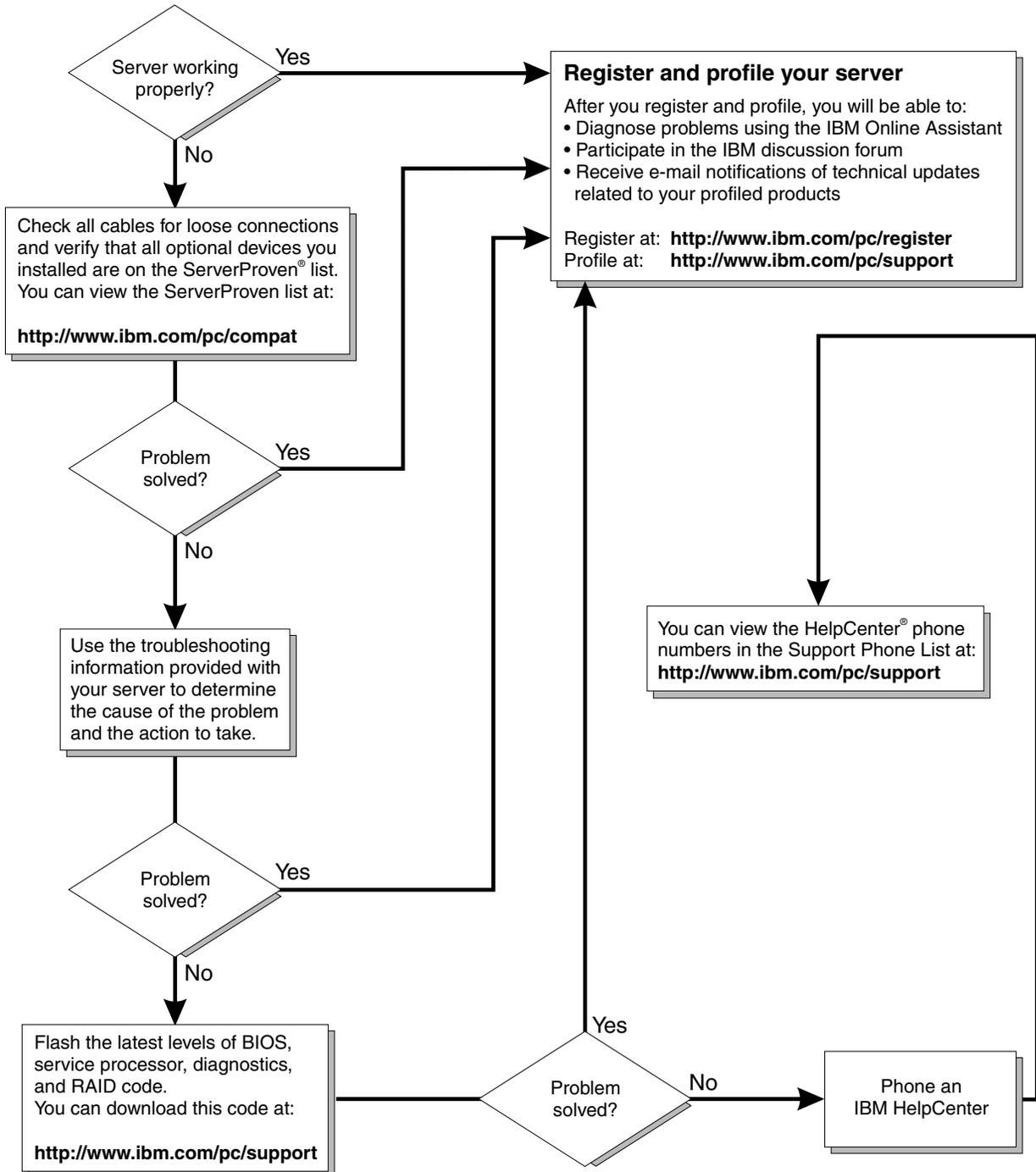
- **Customized support page**

You can create a customized support page that is specific to your hardware, complete with frequently asked questions, parts information, technical hints and tips, and downloadable files. In addition, you can choose to receive electronic mail (e-mail) notifications whenever new information becomes available about your registered products.

After you register and profile your xSeries products, you can diagnose problems using the IBM Online Assistant, and you can participate in the IBM discussion forum. For more detailed information about registering and creating a customized profile for your IBM products, visit the following addresses on the Web:

- <http://www.ibm.com/pc/register>
- <http://www.ibm.com/pc/support>

Server Support



POST

When you turn on the server, it performs a series of tests to check the operation of server components and some of the options installed in the server. This series of tests is called the power-on self-test, or POST.

If POST finishes without detecting any problems, a single beep sounds, the first screen of your operating system or application program appears and the system POST complete (OK) light is illuminated on the operator information panel.

If POST detects a problem, more than one beep sounds and an error message appears on your screen. See “POST beep code descriptions” and “POST error messages” on page 90 for more information.

Notes:

1. If you have a power-on password or administrator password set, you must type the password and press Enter, when prompted, before POST will continue.
2. A single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After you correct the cause of the first error message, the other error messages usually will not occur the next time you run the test.

POST beep code descriptions

POST emits one beep to signal successful completion. If POST detects a problem during startup, other beep codes might occur. You can use the following beep code descriptions to help identify and resolve problems that are detected during startup.

Beep code	Descriptions of the POST beep codes
No beep	If no beep occurs after your server completes POST (that is, after the system POST complete (OK) light on the operator information panel is illuminated), call for service.
Continuous	Your startup (boot) microprocessor has failed, or your system board or speaker subsystem might contain a failing component. If the system continues through POST with no errors, call for service. If no video appears, the startup microprocessor has failed; replace the startup microprocessor.
One short	One beep indicates that your server successfully completed POST. POST detected no configuration or functional errors. One beep also occurs after your server completes POST if you type an incorrect power-on password.
Two short	POST encountered an error. The Configuration/Setup Utility program will display additional information; follow the instructions that appear on the screen. See “POST error messages” on page 90 for descriptions of the text messages that might appear.
Three short	A system memory error has occurred. This combination occurs only if the video basic input/output system (BIOS) code cannot display the error message. Replace the failing memory module.
Repeating short	<p>The system board might contain a failing component, your keyboard might be defective, or a key on the keyboard might be stuck. Ensure that:</p> <ul style="list-style-type: none">• Nothing is resting on the keyboard and pressing a key.• No key is stuck.• The keyboard cable is connected correctly to the keyboard and to the correct connector on the server. <p>Running the diagnostic tests can isolate the server component that failed, but you must have your system serviced. If the error message remains, call for service.</p> <p>Note: If you just connected a new mouse or other pointing device, turn off the server and disconnect that device. Wait at least 5 seconds; then, turn on the server. If the error message goes away, replace the device.</p>

Table 11. POST beep code descriptions.

Beep code	Descriptions of the POST beep codes
One long and one short	POST encountered an error on a video adapter. If you are using the integrated video controller, call for service. If you are using an optional video adapter, replace the failing video adapter.
One long and two short	A video I/O adapter ROM is not readable, or the video subsystem is defective. If you hear this beep combination twice, both the system board and an optional video adapter have failed the test. This beep combination might also indicate that the system board contains a failing component. If the problem remains, call for service.
One long and three short	The system board video subsystem has not detected a monitor connection to the server. Ensure that the monitor is connected to the server. If the problem remains, replace the monitor.
Two long and two short	POST does not support the optional video adapter. This beep combination occurs when you install a video adapter that is incompatible with your server. Replace the optional video adapter with one that the server supports, or use the integrated video controller.
All other beep codes	<ol style="list-style-type: none"> 1. Verify that the system memory modules are installed correctly. 2. Turn off the server; then, restart the server. If the problem remains, call for service.

Table 11. POST beep code descriptions.

Post beep codes

In addition to the beep codes beginning on page 87, your server might emit beep codes that are described in the following table. For example, a 1-2-3 beep code is one beep, a pause, two consecutive beeps, another pause, and three more consecutive beeps.

Beep code	Description	Action	
1-1-2	Microprocessor register test has failed.	Call for service.	
1-1-3	CMOS write/read test has failed.		
1-1-4	BIOS ROM checksum has failed.		
1-2-1	Programmable Interval Timer test has failed.		
1-2-2	DMA initialization has failed.		
1-2-3	DMA page register write/read test has failed.		
1-2-4	RAM refresh verification has failed.	Reseat the memory modules or install a memory module. If the problem remains, call for service.	
1-3-1	First 64 Kb RAM test has failed.		
1-3-2	First 64 Kb RAM parity test has failed.		
1-4-3	Interrupt vector loading test has failed.	Call for service.	
2-1-1	Secondary DMA register test has failed.		
2-1-2	Primary DMA register test has failed.		
2-1-3	Primary interrupt mask register test has failed.		
2-1-4	Secondary interrupt mask register test has failed.		
2-2-1	Interrupt vector loading has failed.		
2-2-2	Keyboard controller test has failed.		
2-2-3	CMOS power failure and checksum checks have failed.		
2-2-4	CMOS configuration information validation has failed.		
2-3-1 3-3-2	Screen initialization has failed. I2C bus has failed.		Turn off the server and then restart the server. If the problem remains, call for service.
2-3-2	Screen memory test has failed.		Call for service.
2-3-3	Screen retrace tests have failed.		
2-3-4	Search for video ROM has failed.		
2-4-1	Screen test indicates the screen is operable.		
3-1-1	Timer tick interrupt test has failed.		
3-1-2	Interval timer channel 2 test has failed.		
3-1-3	RAM test has failed above address hex 0FFFF.		
3-1-4	Time-of-Day clock test has failed.		
3-2-1	Serial port test has failed.		
3-2-4	Comparison of CMOS memory size against actual has failed.		

Table 12. POST beep codes.

3-3-1	A memory size mismatch has occurred.	Reseat the memory modules or install a memory module. If the problem remains, call for service.
3-3-3	No memory has been detected in the system. Important: In some memory configurations, the 3-3-3 beep code might sound during POST, followed by a blank screen. If this occurs, you must restart the server three times to force the system BIOS to reset the memory connector or bank of connectors from Disabled to Enabled .	
4-4-4	The I2C cable is attached and the optional system-management adapter is not installed in PCI slot 1 or not functioning correctly.	<ol style="list-style-type: none"> 1. Turn off the server. 2. Verify that the cable is installed correctly. If it is not, disconnect the cable and reconnect it correctly. 3. Verify that the optional system-management adapter is installed in PCI slot 1. If it is not, remove the system-management adapter from the slot and reinstall it in PCI slot 1. 4. Verify that the optional system-management adapter is functioning correctly. If it is not, remove it and call for service. <p>If the problem remains, call for service.</p>

Table 12. POST beep codes.

POST error messages

The following tables provide information about the POST error messages that can appear during startup.

POST message	Description
062	<p>The server failed to start on three consecutive attempts.</p> <p>All caches are disabled. Repeatedly turning the server on and then off or resetting the server might cause this problem.</p> <p>Action: Start the Configuration/Setup Utility program and verify that all settings are correct. Use the Cache Control or CPU options selection in the Advanced Setup menu of the Configuration/Setup Utility program to enable the caches.</p> <p>If the problem remains, call for service. When the problem is corrected, be sure to enable the caches.</p>
101 102 106	<p>An error occurred during the system board and microprocessor test.</p> <p>Action: Call for service.</p>
114	<p>An adapter read-only memory (ROM) error occurred.</p> <p>Action: Remove the options. If you can start the server without the options installed, reinstall each option one at a time and retest after each is reinstalled. When an option fails, replace it.</p> <p>If you cannot isolate and correct the problem, call for service.</p>

Table 13. POST error messages.

POST message	Description
129	<p>An error was detected in the L1 cache of one of the microprocessors.</p> <p>Action: 1. If you just installed a microprocessor, verify that the microprocessor is installed and seated correctly.</p> <p>2. If the problem remains, call for service.</p>
151	<p>A real-time clock (RTC) error occurred.</p> <p>Action: Call for service.</p>
161	<p>The real-time clock battery has failed.</p> <p>Action: Replace the battery yourself, or call for service.</p> <p>You can use the server until you replace the battery. However, you must run the Configuration/Setup Utility program and set the time and date and other custom settings each time you turn on the server.</p>
162	<p>A change in device configuration occurred. This error occurs under one or more of the following conditions:</p> <ul style="list-style-type: none"> • A new device has been installed. • A device has been moved to a different location or cable connection. • A device has been removed or disconnected from a cable. • A device is failing and is no longer recognized by the server as being installed. • An external device is not turned on. • An invalid checksum is detected in the battery-backed memory. <p>Action: Verify that all external devices are turned on. You must turn on external devices before turning on the server.</p> <p>If you did not add, remove, or change the location of a device, a device is probably failing. Running the diagnostic program might isolate the failing device.</p> <p>If you cannot isolate and correct the problem, call for service.</p>
163	<p>The time of day has not been set.</p> <p>Action: Set the correct date and time. If the date and time are set correctly and saved, but the 163 error message reappears, call for service.</p> <p>You can use the server until the system is serviced, but any application programs that use the date and time will be affected.</p>
164	<p>A change in the memory configuration occurred. This message might appear after you add or remove memory.</p> <p>Note: The server can be used with decreased memory capacity.</p> <p>Action: 1. If POST error message 289 also occurred, follow the instructions for that error message first.</p> <p>2. If you just installed or removed memory, run the Configuration/Setup Utility program; then, exit, saving the new configuration settings.</p> <p>If the message appears again, shut down the server, reseal the memory modules, and restart the server.</p> <p>If the problem remains, call for service.</p>
175	<p>A vital product data (VPD) error occurred.</p> <p>Action: Call for service.</p>
176 177	<p>A security hardware error occurred.</p> <p>Action: Check for indications that someone has tampered with the server. If no one has tampered with the server, call for service.</p>

Table 13. POST error messages.

POST message	Description
178	An EEPROM on the system board cannot be read. Action: Call for service.
184	The power-on password information stored in your server has been removed. Action: From the Configuration/Setup Utility program main menu, select System Security . Then, follow the instructions on the screen. If this information cannot be restored, call for service.
185	A power failure damaged the stored information about the drive-startup sequence. Action: From the Configuration/Setup Utility program main menu, select Start Options ; then, follow the instructions on the screen. If this information cannot be restored, call for service.
186	A system board or hardware error occurred. Action: Call for service.
187	The VPD serial number is not set. Action: The system serial number is set in the VPD EEPROM at the time of manufacturing. If the system board has been replaced, the system serial number will be invalid and should be set. From the main menu of the Configuration/Setup Utility program, select System Information , and then select Product Data . If the problem remains, call for service.
188	A vital product data (VPD) error occurred. Action: Call for service.
189	An attempt has been made to access the server with invalid passwords. After three incorrect attempts, the server locks up. Action: Restart system.
201	An error occurred during the memory controller test. This error can be caused by: <ul style="list-style-type: none"> • Incorrectly installed memory • A failing memory module • A system board problem Action: 1. If you just installed memory, verify that the new memory is correct for your server. Also verify that the memory is installed and seated correctly. 2. If the problem remains, call for service.
229	An error was detected in the L2 cache of one of the microprocessors. Action: 1. If you just installed a microprocessor, verify that the microprocessor is installed and seated correctly. 2. If the problem remains, call for service.
289	An error occurred during POST memory tests, and a failing DIMM was disabled. Note: You can use the server with decreased memory. Action: 1. If you just installed memory, verify that the new memory is correct for your server. Also verify that the memory is installed and seated correctly. Start the Configuration/Setup Utility program, and select Memory Settings from the Advanced Setup menu to enable the DIMM. 2. If the problem remains, replace the failing DIMM. If the problem remains, call for service.

Table 13. POST error messages.

POST message	Description
301 303	<p>An error occurred during the keyboard and keyboard controller test. These error messages also might be accompanied by continuous beeping.</p> <p>Action: Ensure that:</p> <ul style="list-style-type: none"> • Nothing is resting on the keyboard and pressing a key. • No key is stuck. • The keyboard cable is connected correctly to the keyboard and to the correct connector on the server. <p>Running the diagnostic tests can isolate the server component that failed, but you must have your system serviced. If the error message remains, call for service.</p> <p>Note: If you just connected a new mouse or other pointing device, turn off the server and disconnect that device. Wait at least 5 seconds; then, turn on the server. If the error message goes away, replace the device.</p>
602	<p>Invalid diskette boot record.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. Replace the diskette. 2. If the problem remains, make sure that the diskette drive cables are correctly and securely connected. 3. If the problem remains, replace the diskette drive. <p>If the problem remains, call for service.</p>
604	<p>An error occurred during a diskette drive test.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. Verify that the Configuration/Setup Utility program correctly reflects the type of diskette drive that you have installed. 2. Run the diagnostic tests. If the diagnostic tests fail, call for service.
662	<p>A diskette drive configuration error occurred.</p> <p>Action: If you removed a diskette drive, make sure that the diskette drive setting is correct in the Configuration/Setup Utility program. If the setting is not correct, change it.</p> <p>If the problem remains, call for service.</p>
1301	<p>Cable to Information LED panel not detected.</p> <p>Action: Make sure that the cable to the operator information panel is connected.</p> <p>If the problem remains, call for service.</p>
1302	<p>Cable to Power and Reset pushbuttons not detected.</p> <p>Action: Make sure that the cable to the Power and Reset buttons is connected.</p> <p>If the problem remains, call for service.</p>
1303	<p>I2C cable to power backplane not detected.</p> <p>Action: Make sure that the cable to the power backplane is connected.</p> <p>If the problem remains, call for service.</p>
1304	<p>Cable to diagnostic LED panel not detected.</p> <p>Action: Make sure that the cable to the diagnostic LED panel is connected.</p> <p>If the problem remains, call for service.</p>

Table 13. POST error messages.

POST message	Description
1600	<p>The integrated system management processor is not functioning.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. Verify that the jumpers for the system-management processor are set correctly. 2. Disconnect the server from all electrical sources, wait for 30 seconds, reconnect the server to the electrical sources, and restart the server. <p>If the problem remains, call for service.</p>
1601	<p>An integrated system management processor flash update is needed.</p> <p>Action: Download and install the latest integrated system management processor flash update.</p>
1962	<p>No valid startup devices were found. The system cannot find the startup drive or operating system.</p> <p>Action: Be sure that the drive you want to start from is in the startup sequence.</p> <ol style="list-style-type: none"> 1. Select Start Options from the Configuration/Setup Utility program main menu. If you are unable to set the startup sequence, call for service. 2. Check the list of startup devices in the Startup device data fields. Is the drive you want to start from in the startup sequence? <ul style="list-style-type: none"> Yes Exit from this screen; then, select Exit Setup to exit the Configuration/Setup menu. Go to step 3. No Follow the instructions on the screen to add the drive; then, save the changes and exit the Configuration/Setup menu. Restart the server. 3. Is an operating system installed? <ul style="list-style-type: none"> Yes Turn off the server. Go to step 4. No Install the operating system in your server; then, follow your operating system instructions to shut down and restart the server. 4. During server startup, watch for messages indicating a hardware problem. <p>If the same error message appears, call for service.</p>
2400	<p>An error occurred during the testing of the video controller on the system board. This error can be caused by a failing monitor, a failing system board, or a failing video adapter (if one is installed).</p> <p>Action: Verify that the monitor is connected correctly to the video connector. If the monitor is connected correctly, call for service.</p>
2462	<p>A video memory configuration error occurred.</p> <p>Action: Make sure that the monitor cables are correctly and securely connected to the server.</p> <p>If the problem remains, call for service.</p>
5962	<p>An IDE CD-ROM configuration error occurred.</p> <p>Action: Check the signal and power cable connections to the CD-ROM drive.</p> <p>If the problem remains, call for service.</p>

Table 13. POST error messages.

POST message	Description
8603	<p>An error occurred during the mouse (pointing device) controller test. The addition or removal of a mouse, or a failing system board can cause this error.</p> <p>Note: This error also can occur if electrical power was lost for a very brief period and then restored. In this case, turn off the server for at least 5 seconds; then, turn it back on.</p> <p>Action: Ensure that the keyboard and mouse (pointing device) are attached to the correct connectors. If they are connected correctly, use the following procedure:</p> <ol style="list-style-type: none"> 1. Turn off the server. 2. Disconnect the mouse from the server. 3. Turn on the server. <p>If the POST error message does not reappear, the mouse is probably failing. See the documentation that comes with the mouse for additional testing information. If the problem remains, replace the mouse or pointing device.</p> <p>If the POST error message reappears, run the diagnostic tests to isolate the problem. If the diagnostic tests do not find a problem and the POST error message remains, call for service.</p>
00012000	<p>Processor machine check.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. Update the system BIOS code. 2. If the problem remains, replace the microprocessor.
00019501	<p>Processor 1 is not functioning.</p> <p>Action: Replace microprocessor 1.</p> <p>If the problem remains, call for service.</p>
00019502	<p>Processor 2 is not functioning.</p> <p>Action: Replace microprocessor 2.</p> <p>If the problem remains, call for service.</p>
00019701	<p>Processor 1 failed the built-in self-test.</p> <p>Action: Replace microprocessor 1.</p> <p>If the problem remains, call for service.</p>
00019702	<p>Processor 2 failed the built-in self-test.</p> <p>Action: Replace microprocessor 2.</p> <p>If the problem remains, call for service.</p>
00180100	<p>A PCI adapter has requested memory resources that are not available.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. If the PCI adapter that is requesting the memory resources is the start (boot) device, you might need to change the order of the adapters in the PCI slots. Memory is allocated to devices in the order that is specified in the Boot Priority option from the Start Options menu in the Configuration/Setup Utility. Ensure that the adapter is early in the boot priority order so that it is allocated the necessary memory resources. 2. Make sure that the PCI adapter and all other adapters are set correctly in the Configuration/Setup Utility program. If the memory resources are not correct, change the settings. 3. If all memory resources are being used and either integrated SCSI or integrated Ethernet are not being utilized, you may disable either or both integrated SCSI or integrated Ethernet in the Configuration/Setup Utility. 4. If all memory resources are being used, you might need to remove an adapter to make memory available to the PCI adapter. Disabling the adapter BIOS on the adapter might correct the error. Refer to the documentation that comes with the adapter.

Table 13. POST error messages.

POST message	Description
00180200	<p>A PCI adapter has requested an I/O address that is not available, or the PCI adapter might be defective.</p> <p>Action: 1. Make sure that the I/O address for the PCI adapter and all other adapters are set correctly in the Configuration/Setup Utility program.</p> <p>2. If the I/O port resource settings are correct, the PCI adapter might be defective. Call for service.</p>
00180300	<p>A PCI adapter has requested a memory address that is not available, or the PCI adapter might be defective.</p> <p>Action: 1. Make sure that the memory address for all other adapters are set correctly in the Configuration/Setup Utility program. If the memory resource settings are not correct, change the settings.</p> <p>2. If the memory resource settings are correct, the PCI adapter might be defective. Call for service.</p>
00180400	<p>A PCI adapter has requested a memory address that is not available.</p> <p>Action: If all memory addresses are being used, you might need to remove an adapter to make memory address space available to the PCI adapter. Disabling the adapter BIOS on the adapter might correct the error. Refer to the documentation provided with the adapter.</p>
00180500	<p>A PCI adapter ROM error occurred.</p> <p>Action: Remove the PCI adapters. If you can start the server without the adapters, reinstall each adapter one at a time and retest after each is reinstalled. When an adapter fails, replace it.</p> <p>If you cannot isolate and correct the problem, call for service.</p>
00180600	<p>A PCI-to-PCI bridge error occurred. More than one PCI bus tried to access memory below 1 MB.</p> <p>Action: Remove the PCI adapter that has the PCI bridge. If you can start the server without the adapter, reinstall and retest the adapter. If the adapter fails, replace it.</p> <p>If you cannot isolate and correct the problem, call for service.</p>
00180700	<p>xxxxyyyy planar PCI device does not respond or was disabled by user (where xxxx is the PCI vendor ID and yyyy is the PCI device ID).</p> <p>Action: Start the Configuration/Setup Utility program, select Devices and I/O Ports, and make sure that the device is enabled. If the problem remains, call for service.</p>
00180800	<p>An unsupported PCI device is installed.</p> <p>Action: Remove the PCI adapters. If you can start the server without the adapters, reinstall each adapter one at a time and retest after each is reinstalled. When an adapter fails, replace it.</p> <p>If the problem remains, call for service.</p>
00181000	<p>PCI error.</p> <p>Action: Remove the PCI adapters. If you can start the server without the adapters, reinstall each adapter one at a time and retest after each is reinstalled. When an adapter fails, replace it.</p> <p>If the problem remains, call for service.</p>
01295085	<p>The ECC checking hardware test failed.</p> <p>Action: Call for service.</p>
01298001	<p>No update data is available for microprocessor 1.</p> <p>Action: Update the system BIOS code to a level that supports the microprocessors installed in the server.</p>

Table 13. POST error messages.

POST message	Description
01298002	No update data is available for microprocessor 2. Action: Update the system BIOS code to a level that supports the microprocessors installed in the server.
01298101	The update data for microprocessor 1 is incorrect. Action: Update the system BIOS code to a level that supports the microprocessors installed in the server.
01298102	The update data for microprocessor 2 is incorrect. Action: Update the system BIOS code to a level that supports the microprocessors installed in the server.
01298200	Microprocessor speed mismatch. Action: The microprocessors installed do not run at the same speed; install microprocessors with identical speeds.
19990301	A hard disk drive error occurred. Action: If an amber hard disk drive status light is on, replace the drive. If no light is on, or if the problem remains after replacing the drive, call for service.
19990305	POST could not find an operating system. Action: Install an operating system. If you have already installed the operating system, check the drive startup sequence. If the drive sequence is correct, run the diagnostic tests to verify that the hard disk drive is functioning correctly. If there is a problem with the hard disk drive (such as a bad sector), you might need to reinstall the operating system. If you cannot reinstall the operating system, call for service.
19990650	AC power has been restored. Action: No action is required. This message appears each time ac power is restored to the server after an ac power loss.
Other Numbers	POST found an error. Action: Follow the instructions on the screen.

Table 13. POST error messages.

Error logs

The POST error log contains the three most recent error codes and messages that the system generated during POST. The system error log contains messages issued during POST and system status messages from the integrated system management processor.

You can view the contents of the error logs from the Configuration/Setup Utility program or from the diagnostic programs.

- Start the Configuration/Setup Utility program; then, select **Error Logs** from the main menu. See “Starting the Configuration/Setup Utility program” on page 13 for more information.

Note: System status messages available in the **System Error Log** in the Configuration/Setup Utility program are provided only for trained IBM service personnel.

- Start the diagnostic programs; select **Hardware Info** from the top of the diagnostic programs screen; select **System Error Log** from the list that appears; then, follow the instructions on the screen. See “Starting the diagnostic programs” on page 101 for more information.

To view the contents of the error logs, start the Configuration/Setup Utility program; then, select **Error Logs** from the main menu.

ServerGuide problems

Look for the symptom in the left column of the chart. Probable solutions to the problem are in the right column.

Table 14. Setup and Installation CD.

Symptom	Suggested action
<i>Setup and Installation</i>	<ul style="list-style-type: none">• Ensure that the system is a supported server with a startable (bootable) CD-ROM drive.• If the startup (boot) sequence settings have been altered, ensure that the CD-ROM drive is first in the startup sequence.• If more than one CD-ROM drive is installed, ensure that only one drive is set as the primary drive. Start the CD from the primary drive.
ServeRAID program cannot view all installed drives - or - cannot install NOS.	<ul style="list-style-type: none">• Ensure that there are no duplicate SCSI IDs or IRQ assignments.• Ensure that the hard disk drive is connected properly.
The Operating System Installation program continuously loops.	Make more space available on the hard disk.
ServerGuide will not start <i>your</i> NOS CD.	Ensure that the NOS CD you have is supported by the ServerGuide program. See the <i>Setup and Installation</i> CD label for a list of supported NOS versions.
Cannot install NOS - option is unavailable.	Ensure that the NOS is supported on your server. If the NOS is supported, either there is no logical drive defined (ServeRAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide setup and configuration program, and ensure that setup is complete.

Table 15. System Updates and Applications CD.

Symptom	Suggested action
Get "time out" or "Unknown host" errors	Be sure you have access to the Internet through FTP directly.

Small computer system interface messages

If you receive a SCSI error message while using the SCSISelect Utility, use the following list to determine the possible cause of the error and what action to take.

Note: If your system does not have a hard disk drive, ignore any message that indicates that the BIOS code is not installed.

One or more of the following might be causing the problem.

- A failing SCSI device (adapter or drive)
- An improper SCSI configuration
- Duplicate SCSI IDs in the same SCSI chain
- An improperly installed SCSI terminator
- A defective SCSI terminator
- An improperly installed cable
- A defective cable

To solve the problem, verify that:

- The external SCSI devices are turned on. External SCSI devices must be turned on *before* the server.
- The cables for all external SCSI devices are connected correctly.
- The last device in each SCSI chain is terminated properly.
- The SCSI devices are configured correctly.

If the above items are correct, run the diagnostic programs to obtain additional information about the failing device. If the error remains or recurs, call for service.

Diagnostic programs and error messages

The server diagnostic programs are stored in upgradable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of your server.

Diagnostic error messages indicate that a problem exists; they are not intended to be used to identify a failing part. Troubleshooting and servicing of complex problems that are indicated by error messages should be performed by trained service personnel.

Sometimes the first error to occur causes additional errors. In this case, the server displays more than one error message. Always follow the suggested action instructions for the *first* error message that appears.

The following sections contain the error codes that might appear in the detailed test log and summary log when running the diagnostic programs.

The error code format is as follows:

fff-ttt-iii-date-cc-text message

where:

fff	is the three-digit function code that indicates the function being tested when the error occurred. For example, function code 089 is for the microprocessor.
ttt	is the three-digit failure code that indicates the exact test failure that was encountered. (These codes are for trained service personnel and are described in the <i>Hardware Maintenance Manual</i> .)
iii	is the three-digit device ID. (These codes are for trained service personnel and are described in the <i>Hardware Maintenance Manual</i> .)
date	is the date that the diagnostic test was run and the error recorded.
cc	is the check value that is used to verify the validity of the information.
text message	is the diagnostic message that indicates the reason for the problem.

Text messages

The diagnostic text message format is as follows:

Function Name: Result (test specific string)

where:

Function Name	is the name of the function being tested when the error occurred. This corresponds to the function code (fff) given in the previous list.
Result	can be one of the following: <ul style="list-style-type: none">Passed This result occurs when the diagnostic test completes without any errors.Failed This result occurs when the diagnostic test discovers an error.User Aborted This result occurs when you stop the diagnostic test before it is complete.Not Applicable This result occurs when you specify a diagnostic test for a device that is not present.Aborted This result occurs when the test could not proceed; for example, because of the system configuration.Warning This result occurs when a possible problem is reported during the diagnostic test, such as when a device driver is not found.
test specific string	This is additional information that you can use to analyze the problem.

Starting the diagnostic programs

You can press F1 while running the diagnostic programs to obtain help information. You also can press F1 from within a help screen to obtain online documentation from which you can select different categories. To exit from the help information and return to where you left off, press Esc.

To start the diagnostic programs:

1. Turn on the server and watch the screen.
2. When the message F2 for Diagnostics appears, press F2.
3. Type the appropriate password; then, press Enter.
4. Select either **Extended** or **Basic** from the top of the screen.
5. When the Diagnostic Programs screen appears, select the test you want to run from the list that appears; then, follow the instructions on the screen.

Notes:

- a. If the server stops during testing and you cannot continue, restart the server and try running the diagnostic programs again. If the problem remains, call for service.
- b. The keyboard and mouse (pointing device) tests assume that a keyboard and mouse are attached to the server.
- c. If you run the diagnostic programs with no mouse attached to your server, you will not be able to navigate between test categories using the **Next Cat** and **Prev Cat** buttons. All other functions provided by mouse-selectable buttons are also available using the function keys.
- d. You can test the USB keyboard by using the regular keyboard test. The regular mouse test can test a USB mouse. Also, you can run the USB hub test only if there are no USB devices attached.
- e. You can view server configuration information (such as system configuration, memory contents, interrupt request (IRQ) use, direct memory access (DMA) use, device drivers, and so on) by selecting **Hardware Info** from the top of the screen.

If the diagnostic problems do not detect any hardware errors but the problem remains during typical server operations, a software error might be the cause. If you suspect a software problem, refer to the information that comes with the software package.

Viewing the test log

When the tests have completed, you can view the test log by selecting **Utility** from the top of the screen and then selecting **View Test Log**.

Notes:

1. You can view the test log only while you are in the diagnostic programs. When you exit the diagnostic programs, the test log is cleared (saved test logs are not affected). To save the test log so that you can view it later, click **Save Log** on the diagnostic programs screen and specify a location and name for the saved log file.
2. To save the test log to a diskette, you must use a diskette that you have formatted yourself; this function does not work with preformatted diskettes. If the diskette has sufficient space for the test log, the diskette may contain other data.

Diagnostic error message tables

The following tables provide descriptions of the error messages that might appear when you run the diagnostic programs.

Attention: If diagnostic error messages appear that are not listed in the following tables, make sure your server has the latest levels of BIOS code, ISMP firmware, ServeRAID, and diagnostics or call for service

Note: Not all messages in this table apply to your server.

Code	Function	Result	Text message	Action
001	Core system	Failed	Processor board, ECC Test	Call for service.
			System board	
005	Video port		Processor and system boards	
011	Serial port		Integrated serial port	
015	USB interface	Aborted	Can NOT test USB interface while it is in use. Note: If you have a USB keyboard or mouse attached, you cannot run the diagnostic program for the USB interface.	<ol style="list-style-type: none"> 1. Turn off the server. 2. Disconnect all USB devices from the server. Replace any USB keyboard and mouse. 3. Turn on the server. 4. Run the diagnostic test again. 5. If problem remains, call for service
		Failed	USB interface failed	Call for service.
020	PCI interface	Failed	System board	Call for service.
			PCI slot latch mechanism is defective.	<p>Make sure the tab and latch on hot-plug PCI slot <i>n</i> are closed correctly.</p> <p>If the problem remains, call for service.</p>
030	SCSI interface	Failed	SCSI adapter in slot <i>n</i> failed register/counter/ power test (where <i>n</i> is the slot number of the failing adapter)	<p>Refer to the information provided with the adapter for instructions.</p> <p>If the problem remains, call for service.</p>
			SCSI controller on system board failed register/counter/power test	Call for service.

Table 16. Diagnostic error messages.

Code	Function	Result	Text message	Action
035	ServeRAID	Aborted	Test setup error: No ServeRAID adapter found on system board or PCI bus	Make sure the ServeRAID adapter is properly installed. If the problem remains, replace the ServeRAID adapter. If the problem remains, call for service.
		Failed	Adapter in slot <i>n</i> ; adapter/drive configuration error (where <i>n</i> is the slot number of the failing adapter)	Run the ServeRAID Configuration Utility. If the problem remains, replace the ServeRAID adapter in slot <i>n</i> .
			Adapter in slot <i>n</i> ; internal error (where <i>n</i> is the slot number of the failing adapter)	If the problem remains, call for service.
			Logical drive <i>m</i> on adapter in slot <i>n</i> (where <i>m</i> is the number of the failing logical drive and <i>n</i> is the slot number of the adapter)	
			On system board; internal error	Run the ServeRAID Configuration Utility.
			On system board; adapter/drive configuration error	If the problem remains, call for service.
			Logical drive on system board adapter	
			Adapter in slot <i>n</i> ; memory allocation error (where <i>n</i> is the slot number of the failing adapter)	Call for service.
			On system board; memory allocation error	
			On system board; PCI configuration error	
			On system board; POST error	
			Adapter in slot <i>n</i> ; POST error (where <i>n</i> is the slot number of the failing adapter)	Replace the ServeRAID adapter in slot <i>n</i> . If the problem remains, call for service.
			Adapter in slot <i>n</i> ; PCI configuration error (where <i>n</i> is the slot number of the failing adapter)	
			SCSI drive on adapter in slot <i>n</i> , SCSI ID <i>m</i> (where <i>n</i> is the slot number of the adapter and <i>m</i> is the SCSI ID of the drive)	Check the cable and power connections on the drive. If the problem remains, call for service.
075	Power supply	Failed	Voltage sensed by the system is out of range	Call for service.

Table 16. Diagnostic error messages.

Code	Function	Result	Text message	Action
089	Microprocessor	Failed	Invalid microprocessor in slot xyz or BIOS setup problem (where xyz identifies the microprocessor that is causing the error message)	<ol style="list-style-type: none"> 1. Check the system error log for the related error messages. 2. If your server does not have the latest level BIOS code installed, update the BIOS code. 3. If the problem remains, replace the xyz microprocessor and run the test again. <p>If the problem remains, call for service.</p>
			Processor in socket id xyz is installed but not functioning (where xyz identifies the microprocessor that is causing the error message)	
			Microprocessor in socket id xyz (where xyz identifies the microprocessor that is causing the error message) Note: The microprocessor error LED associated with the microprocessor will be lit.	<ol style="list-style-type: none"> 1. Reseat the microprocessor. 2. If the problem remains, replace the microprocessor. <p>If the problem remains, call for service.</p>
			Processor in socket id xyz is defective (where xyz identifies the microprocessor that is causing the error message)	<p>Replace the microprocessor.</p> <p>If the problem remains, call for service.</p>
089	Microprocessor	Failed	Test setup error: Application microprocessor not installed or BIOS setup problem	<ol style="list-style-type: none"> 1. Verify that the Application microprocessor is installed and seated correctly. 2. Check the system error log for related error messages. 3. If your server does not have the latest level BIOS code installed, update the BIOS code. 4. If the problem remains, replace the application microprocessor and run the test again. <p>If the problem remains, call for service.</p>
			VRM corresponding to Microprocessor in socket xyz is defective (where xyz identifies the microprocessor whose VRM is causing the error message)	<p>Replace the VRM.</p> <p>If the problem remains, call for service.</p>
			VRM corresponding to Microprocessor in socket id xyz is not installed (where xyz identifies the microprocessor whose VRM is causing the error message)	<p>Install a VRM.</p> <p>If the problem remains, call for service.</p>
091	RXE Expansion port	Failed	Ping rate failure	Verify that cables are connected correctly and securely, and try again.
			Receive threshold	
			Transmit threshold	
			Connection error	If the problem remains, call for service.

Table 16. Diagnostic error messages.

Code	Function	Result	Text message	Action
092	Scalability port	Failed	Ping rate failure	Verify that cables are connected correctly and securely, and try again. If the problem remains, call for service.
			Receive threshold	
			Transmit threshold	
			Connection error	
165	Service processor	Failed	Service processor BIST indicate failed tests.	Disconnect all server and option power cords from the server, wait 30 seconds, reconnect, and try again. If problem remains, call for service.
			Unable to restart service processor.	
			I2C Bus Error(s). See System Error Log for details from both SERVPROC and DIAGS messages.	
			I2C Busses xyz bad or devices on these busses are functioning incorrectly (where xyz identifies the busses that are causing the error message)	
			Failed I2C Bus xyz bad or devices on this bus are functioning incorrectly (where xyz identifies the busses that are causing the error message)	
			Service processor is temporarily unreachable or not installed.	
166	System Management	Failed	Integrated System Management Processor Self Test Result failed test: x (where x identifies part of the subsystem experiencing problems, x = [ROM, RAM, flash])	Flash (or reflash) latest firmware levels. Call for service.
			I2C Bus Error(s)	If a Remote Supervisor Adapter is installed, reconnect I2C cable between Remote Supervisor Adapter and system board. Call for service.
			I2C cable is disconnected.	Reconnect I2C cable between the Remote Supervisor Adapter and system board. Call for service if the problem remains.
			BIOS indicates ASM is unreachable. Ensure the Remote Supervisor Adapter is properly seated in its supported slot.	Ensure the optional Remote Supervisor Adapter is seated in PCI Slot 1 (J44).
			Unable to communicate with ASM adapter. It may be busy. Communication with the ASM adapter has failed.	Rerun the test. Call for service if the problem remains.
			ASM BIST indicate failed tests. Unable to restart ASM adapter.	Disconnect all external server and option power cords from server, wait 30 seconds, reconnect, and retry. Call for service if the problem remains.

Table 16. Diagnostic error messages.

Code	Function	Result	Text message	Action
175	System thermal	Failed	Fan # <i>n</i> (where <i>n</i> is the number of the failing fan) Note: The fan LED on the diagnostic LED panel will be lit.	Replace the indicated fan
			Temperature sensed on processor board is out of range	If one of the fan LEDs on the diagnostic LED panel is on, replace the indicated fan. If the problem remains, call for service.
180	Status display	Failed	LED on diagnostic panel	Call for service.
			LED on front panel	
			LED on hot-swap SCSI backplane	
			LED on system board	
			LED on fan	Replace faulty fan.
201	System memory	Failed	DIMMs in location DIMM <i>n</i> (where <i>n</i> is the number of the socket that contains the failing DIMM)	1. Reseat the failing DIMM. 2. If the problem remains, replace the DIMM. If the problem remains, call for service.
			Test setup error: Corrupt BIOS in ROM	If your server does not have the latest level BIOS code installed, update the BIOS code to the latest level. If the problem remains, call for service.
			Test setup error: Corrupt DMI BIOS, information in BIOS is not as expected	

Table 16. Diagnostic error messages.

Code	Function	Result	Text message	Action
202	Processor cache	Aborted	Test setup error: BIOS cannot access VPD information	If your server does not have the latest level BIOS code installed, update the BIOS code to the latest level and run the diagnostic program again. If the problem remains, call for service.
			Test setup error: Corrupt DMI BIOS. Information in BIOS is not as expected	
			Test setup error: No L2 cache detected on microprocessor socket id xyz or BIOS setup problem (where xyz identifies the microprocessor that is causing the error message)	
		Test setup error: Unknown hardware problem associated with microprocessor in socket id xyz. (where xyz identifies the microprocessor that is causing the error message)	3. If the problem remains, replace the failing microprocessor. If the problem remains, call for service.	
		Failed	Microprocessor in socket ID xyz (where xyz identifies the microprocessor that is causing the error message) Note: The indicated microprocessor LED will be on.	1. Reseat the identified microprocessor. 2. If the problem remains, replace the microprocessor. If the problem remains, call for service.
		Warning	Test setup error: Cache is disabled. Use system setup to enable before retrying the test	Use the Cache Control choice from the Advanced Setup menu to enable the microprocessor cache. If the problem remains, call for service.
203	External cache	Aborted	Test setup error: Hardware problem associated with microprocessor/system board	Call for service.
		Failed	Data pattern test failure	
			Directory test failure	
			Set associativity test failure	
		Warning	External cache is disabled	Run the Configuration/Setup Utility and enable the external cache, then rerun the test. If the problem persists, call for service.
206	Diskette drive	Failed	Internal diskette drive bay	Call for service.
215	CD-ROM	Aborted	The CD-ROM drive is not present.	Verify that the cables are properly connected to the CD-ROM drive. If the problem remains, call for service.
		Failed	On system board.	Call for service.
217	Hard disk drive	Failed	BIOS drive # n (where n is the drive bay number)	Call for service.

Table 16. Diagnostic error messages.

Code	Function	Result	Text message	Action
264	Magnetic tape drive	Aborted	Test setup error: No tape drive found	Check the cable and power connections to the drive. Refer to the information that is provided with the tape drive. If the problem remains, call for service.
		Failed	The load/mount test failed for device <i>n</i> on adapter <i>m</i> (where <i>n</i> is the number of the device and <i>m</i> is the adapter number)	Refer to the information provided with the tape drive. If the problem remains, call for service. Note: The push button test is applicable only to SCSI tape drives that have a push button.
			The Self-diagnostic failed for device <i>n</i> on adapter <i>m</i> . (where <i>n</i> is the number of the device and <i>m</i> is the adapter number)	
			The unload/eject test failed for device <i>n</i> on adapter <i>m</i> (where <i>n</i> is the number of the device and <i>m</i> is the adapter number)	
			The unload/eject push button test failed for device <i>n</i> on adapter <i>m</i> (where <i>n</i> is the number of the device and <i>m</i> is the adapter number)	
			The Read/Write Self-diagnostic failed for device <i>n</i> on adapter <i>m</i> (where <i>n</i> is the number of the device and <i>m</i> is the adapter number)	
301	Keyboard	Failed	On system board keyboard test failed	1. Verify that the keyboard cable is connected. 2. If the problem remains, replace the keyboard cable. If the problem remains, call for service.
302	Mouse	Failed	On system board pointing device test failed.	Replace the pointing device. If the problem remains, call for service.
305	Video monitor		Any message	Refer to the information that came with the monitor.
405	Ethernet	Failed	In PCI slot <i>n</i> (where <i>n</i> is the PCI slot number in which the failing Ethernet adapter is installed)	Replace the Ethernet adapter in slot <i>n</i> . If the problem remains, call for service.
			On system board	Call for service.

Table 16. Diagnostic error messages.

Code	Function	Result	Text message	Action
415	Analog/digital modem	Not applicable	No modem was detected	<ol style="list-style-type: none"> 1. Verify that the modem is properly attached to the server. 2. If the problem remains, replace the modem. <p>If the problem remains, call for service.</p>
			PCI modem detected but not enabled	<ol style="list-style-type: none"> 1. Change the configuration to enable the modem. 2. If the problem remains, replace the modem. <p>If the problem remains, call for service.</p>
		Failed	Modem reset failed	<p>Replace the modem.</p> <p>If the problem remains, call for service.</p>
			No dialtone detected	<ol style="list-style-type: none"> 1. Make sure that the phone line attached to the modem has a dial tone. (Connect a phone to the line and listen, if necessary.) If there is no tone, have the phone line serviced. 2. If the problem remains, replace the modem. <p>If the problem remains, call for service.</p>

Table 16. Diagnostic error messages.

Recovering BIOS code

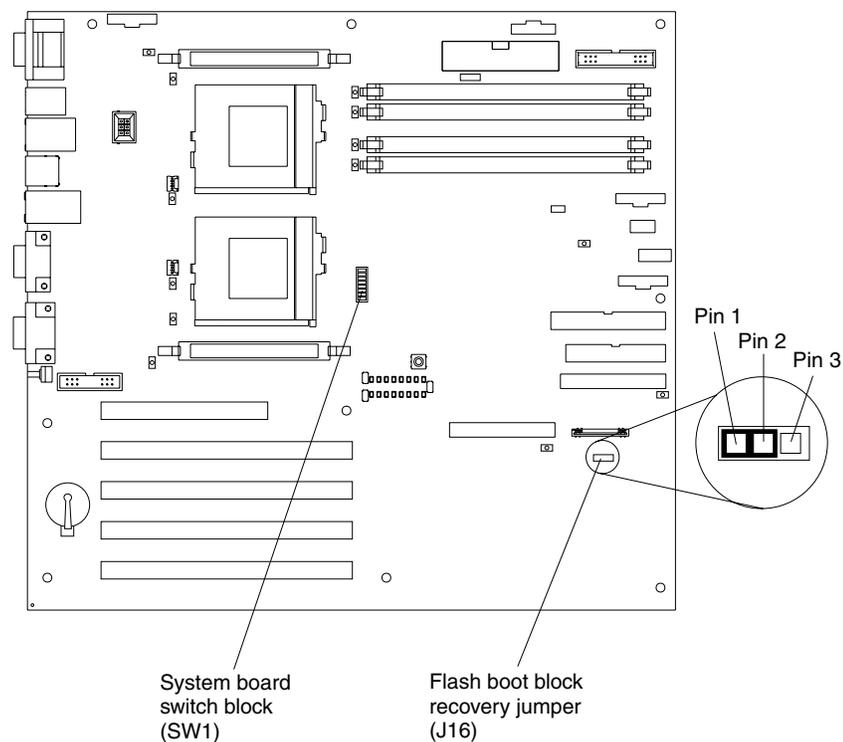
If the BIOS code has become damaged, such as from a power failure during a flash update, you can recover the BIOS using the flash boot block recovery jumper and a BIOS flash diskette.

Note: You can obtain a BIOS flash diskette from one of the following sources:

- Use the ServerGuide program to make a BIOS flash diskette.
- Download a BIOS flash diskette from the World Wide Web. Go to <http://www.ibm.com/pc/support/>, click **IBM Server Support**, and make the selections for your server.
- Contact your IBM service representative.

The flash memory of your server contains a protected area that cannot be overwritten. The recovery boot block is a section of code in this protected area that enables the server to start up and to read a flash diskette. The flash utility recovers the system BIOS code from the BIOS recovery files on the diskette.

The following illustration shows the location of the flash boot block recovery jumper on the system board.



To recover the BIOS:

1. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover.
2. Locate the flash boot block recovery jumper block (J16) on the system board.
3. Move the jumper to pins 1 and 2 to enable BIOS recovery mode.
4. Insert the BIOS flash diskette into the diskette drive.
5. Restart the server.

The Recovery Boot screen appears. A progress report, Loading data from diskette *xx%*, is displayed. When programming is underway, a further progress report, Programming block *n of 7 yy%*, is displayed. When the procedure completes, the message Recovery complete, remove the diskette and return boot block switch to the off position before rebooting is displayed.

6. Remove the flash diskette from the diskette drive.
7. Turn off the server.
8. Move the jumper on the boot-block jumper block to pins 2 and 3 to return to normal startup mode.
9. Restart the server.

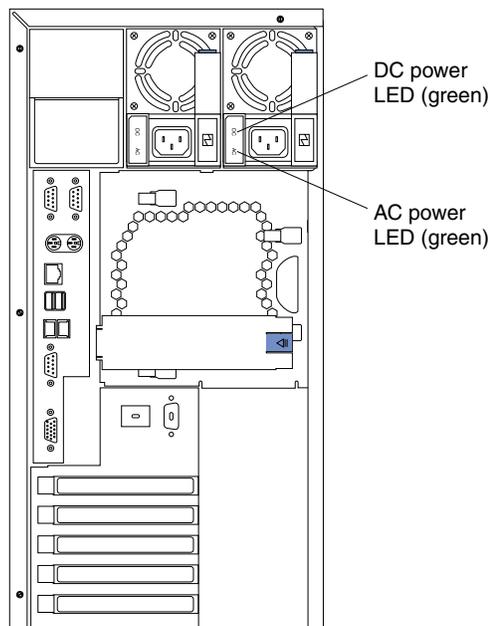
Identifying problems using status LEDs

If the system-error light in the operator information panel on the front of the server is on, one or more LEDs inside the server or on the power supplies will be on. Use the Light Path Diagnostics feature to identify the type of error that occurred.

You can use the Light Path Diagnostics feature built into your server to quickly identify the type of system error that occurred. Your server is designed so that any LEDs that are illuminated remain illuminated when the server shuts down, as long as the ac power source is good and the power supplies can supply +5 V dc current to the server. This feature helps you isolate the problem, if an error causes the server to shut down. See “Light Path Diagnostics table” on page 113.

Power-supply LEDs

The ac and dc power LEDs on the power supply provide status information about the power supply.



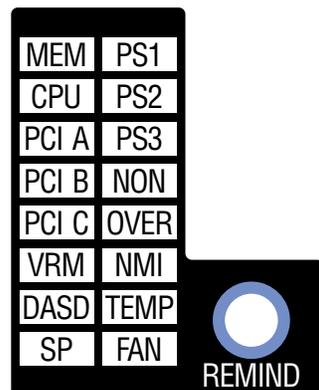
The following table describes the ac and dc power LEDs.

Table 17. Power supply LEDs.

AC power LED	DC power LED	Description and action
On	On	The power supply is on and operating correctly.
On	Off	<p>There is a dc power problem.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. The power-control button on the front of the server is in the Off position. Action: Press the power-control button to start the server. 2. The power supply has failed. Action: Replace the power supply. <p>If the problem remains, have the system serviced.</p>
Off	Off	<p>There is an ac power problem.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. There is no ac power to the power supply. Actions: Verify that: <ul style="list-style-type: none"> • The power cord is properly connected to the server. • The power outlet functions properly. 2. The power supply has failed. Action: Replace the power supply. <p>If the problem remains, have the system serviced.</p>

Light Path Diagnostics panel

The following illustration shows the LEDs on the diagnostic panel on the system board. See “Light Path Diagnostics table” on page 113 for information on identifying problems using these LEDs.



Light Path Diagnostics table

The system-error LED on the operator information panel is lit when certain system errors occur. If the system-error LED on your server is lit, use the following table to help determine the cause of the error and the action you should take.

Lit LED on diagnostic panel	Cause	Action
PS1	Power supply 1 has failed or has been removed.	Replace power supply 1.
PS2	Power supply 2 has failed or has been removed.	Replace power supply 2.
PS3	Power supply 3 has failed or has been removed.	Replace power supply 3.
NON	Power supply redundancy has been lost. Note: This LED will not be lit if your server has only one power supply; however, the power is not redundant with only one power supply installed.	<ul style="list-style-type: none"> Check the PS1, PS2, and PS3 LEDs and replace any indicated power supply. Install an additional power supply or remove optional devices from the server.
OVER	The system has exceeded the power capabilities of the installed power supply.	Install an optional additional power supply, or remove optional devices from the server.
NMI	A nonmaskable interrupt occurred.	<ol style="list-style-type: none"> If the PCI A, PCI B, or PCI C LED is on, follow the instructions for those LEDs. If the PCI A, PCI B or PCI C LED is not on, restart the server. <p>If the problem remains, have the system serviced.</p>
TEMP	The system temperature has exceeded a threshold level.	<ol style="list-style-type: none"> Check to see if a fan has failed. If it has, replace the fan. Make sure the room temperature is not too hot. (See "Features and specifications" on page 2.) <p>If the problem remains, have the system serviced.</p>
FAN	A fan has failed or is operating too slowly. Note: A failing fan can also cause the TEMP LED to be on.	Check the LEDs on the fan assemblies and replace the indicated fan assembly.
MEM	A memory error occurred.	<ol style="list-style-type: none"> Check the DIMM failure LEDs on the system board. Replace the DIMM indicated by the lit DIMM failure LED.
CPU	One of the microprocessors has failed, or a microprocessor is installed in the wrong connector.	<ol style="list-style-type: none"> Check the microprocessor failure LEDs on the system board. If a microprocessor failure LED is on, make sure the microprocessor is installed correctly (see "Installing a microprocessor kit" on page 60) and seated correctly. If the problem remains, replace the microprocessor. <p>If the problem remains, have the system serviced.</p>

Table 18. Light Path Diagnostics.

Lit LED on diagnostic panel	Cause	Action
PCI A	An error occurred on PCI bus A. An adapter in PCI slot 1 on the system board caused the error.	<p>If a Remote Supervisor Adapter is installed, check the error log for additional information. If the error log indicates a problem with the integrated Ethernet controller or the integrated SCSI controller, have your system serviced.</p> <p>If the problem remains, have the system serviced.</p>
PCI B	An error occurred on PCI bus B. An adapter in PCI slot 2 or 3 or the system board caused the error.	<ol style="list-style-type: none"> 1. If a Remote Supervisor Adapter is installed, check the error log for additional information. 2. If you cannot isolate the failing adapter from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus B (PCI slots 2, and 3) and restarting the server after each adapter is removed. <p>If the problem remains, have the system serviced.</p>
PCI C	An error occurred on PCI bus C. An adapter in PCI slots 4 and 5 or on the system board caused the error.	<ol style="list-style-type: none"> 1. If a Remote Supervisor Adapter is installed, check the error log for additional information. 2. If you cannot isolate the failing adapter from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus C (PCI slots 4, and 5) and restarting the server after each adapter is removed. <p>If the problem remains, have the system serviced.</p>
VRM	One of the VRMs on the system board has failed.	<p>Check the VRM failure LEDs on the system board. If either the VRM1 or VRM2 Failure LED is on:</p> <ol style="list-style-type: none"> 1. Turn off the server, reseal the VRM, and restart the server. 2. If the problem remains, replace the VRM. <p>If the problem still remains, have the system serviced.</p>
DASD	SCSI hot-swap failure or one or more hot-swap drives has been removed.	<ol style="list-style-type: none"> 1. Reinstall the hard disk drives to their original location. 2. If an amber LED on a hot-swap hard disk drive is on, replace the hard disk drive. 3. Run the diagnostic programs. Replace any identified failing device. 4. If the error log indicates a temperature problem and the fans are working correctly, reseal the cable connector to the DASD I2C connector (J9). <p>If the problem still remains, have the system serviced.</p>

Table 18. Light Path Diagnostics.

Lit LED on diagnostic panel	Cause	Action
SP	Integrated system management processor error detected.	An error occurred in the ISMP. <ol style="list-style-type: none"> 1. Turn off the server and disconnect the ac power cord. 2. Wait at least 10 seconds before reconnecting the ac power cord and restarting the server. 3. Flash the ISMP code again. If the problem remains, have the system serviced.

Table 18. Light Path Diagnostics.

Troubleshooting charts

You can use the troubleshooting charts in this section to find solutions to problems that have definite symptoms.

If you cannot find the problem in the troubleshooting charts, go to “Starting the diagnostic programs” on page 101 to test the server. If you have run the diagnostic test programs or if running the tests does not reveal the problem, call for service.

Look for the symptom in the left column of the chart. Instructions and probable solutions to the problem are in the right column. If you have just added new software or a new option and your server is not working, do the following before using the troubleshooting charts:

- Remove the software or device that you just added.
- Run the diagnostic tests to determine if your server is running correctly.
- Reinstall the new software or new device.

Table 19. Troubleshooting charts.

Symptom	Suggested action
CD-ROM drive problems	Verify that:
CD-ROM drive is not recognized.	<ol style="list-style-type: none"> 1. The IDE channels are enabled in the Configuration/Setup Utility program. 2. All cables and jumpers are installed correctly. 3. The correct device driver is installed for the CD-ROM drive.
Diskette drive problems	If there is a diskette in the drive, verify that:
Diskette drive in-use light stays on, or the system bypasses the diskette drive.	<ol style="list-style-type: none"> 1. The diskette drive is enabled in the Configuration/Setup Utility program. 2. The diskette is good and not damaged. (Try another diskette if you have one.) 3. The diskette contains the necessary files to start the server. 4. Your software program is working properly. If the diskette drive in-use light stays on, or the system continues to bypass the diskette drive, call for service.

Table 19. Troubleshooting charts.

Symptom	Suggested action
Expansion enclosure problems	Verify that: <ol style="list-style-type: none"> 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. 3. Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. For more information, see your SCSI and expansion enclosure documentation.
The SCSI expansion enclosure used to work, but does not work now.	
Hard disk drive problems	<ol style="list-style-type: none"> 1. Remove the first drive not recognized and try the hard disk drive diagnostic test again. 2. If the remaining drives are recognized, replace the drive you removed with a new one.
Not all drives are recognized by the hard disk drive diagnostic test.	
System stops responding during hard disk drive diagnostics.	
General problems	Call for service.
Problems such as broken cover locks or indicator lights not working.	
Intermittent problems	Verify that: <ol style="list-style-type: none"> 1. All cables and cords are connected securely to the rear of the server and attached options. 2. When the server is turned on, air is flowing from the rear of the server at the fan grill. If there is no air flow, the fan is not working. This causes the server to overheat and shut down. 3. Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. If the items above are correct, call for service.
A problem occurs only occasionally and is difficult to detect.	
Keyboard, mouse, or pointing-device problems.	<ol style="list-style-type: none"> 1. Make sure that the keyboard cable is properly connected to the server. 2. Make sure that the server and the monitor are turned on. 3. Try using another keyboard. If the items above are correct, call for service.
All or some keys on the keyboard do not work.	
The mouse or pointing device does not work.	
	<ol style="list-style-type: none"> 1. Verify that the mouse or pointing-device cable is securely connected and the device drivers are installed correctly. 2. Try using another mouse or pointing device. If the problem remains, call for service.

Table 19. Troubleshooting charts.

Symptom	Suggested action
<p>Memory problems</p> <p>The amount of system memory displayed is less than the amount of physical memory installed.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The memory modules are seated properly. 2. You have installed the correct type of memory. 3. If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program. 4. All banks of memory on the DIMMs are enabled. The server might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. <p>Look in the POST error log for error message 289:</p> <ul style="list-style-type: none"> • If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If the DIMM was disabled by the user or by POST: <ol style="list-style-type: none"> 1. Start the Configuration/Setup Utility program. 2. Enable the DIMM. 3. Save the configuration and restart the server. • If you continue to get this error, replace the DIMM. <p>If the problem remains, call for service.</p>
<p>Microprocessor problems</p> <p>The server emits a continuous tone during POST.</p>	<p>The startup (boot) microprocessor is not working properly.</p> <p>Verify that the startup microprocessor is seated properly. If it is, replace the startup microprocessor.</p> <p>If the problem remains, call for service.</p>
<p>Monitor problems</p> <p>Testing the monitor.</p>	<p>Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information that comes with the monitor for adjusting and testing instructions.</p> <p>If you still cannot find the problem, call for service.</p>
<p>The screen is blank.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The server power cord is plugged into the server and a working electrical outlet. 2. The monitor cables are connected properly. 3. The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. <p>Note: In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank display screen. If this occurs and the Boot Fail Count feature in the Start Options of the Configuration/Setup Utility program is set to Enabled (its default setting), you must restart the server three times to force the system BIOS to reset the CMOS values to the default configuration (memory connector or bank of connectors Enabled).</p> <p>If the items above are correct and the screen remains blank, call for service.</p>
<p>Only the cursor appears.</p>	<p>Call for service.</p>
<p>The monitor works when you turn on the server, but goes blank when you start some application programs.</p>	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The primary monitor cable is connected to the server. 2. You installed the necessary device drivers for the applications. <p>If the items above are correct and the screen remains blank, call for service.</p>

Table 19. Troubleshooting charts.

Symptom	Suggested action
<p>The screen is wavy, unreadable, rolling, distorted, or has screen jitter.</p>	<p>If the monitor self-tests show the monitor is working properly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). 2. Non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, see your IBM reseller or IBM marketing representative. <p>If the problem remains, call for service.</p>
<p>Wrong characters appear on the screen.</p>	<p>If the wrong language is displayed, update the BIOS code with the correct language.</p> <p>If the problem remains, call for service.</p>
<p>Option problems</p>	<p>Verify that:</p>
<p>An IBM option that was just installed does not work.</p>	<ol style="list-style-type: none"> 1. The option is designed for the server. See the "Server Support" flowchart for information about obtaining ServerProven™ compatibility information from the World Wide Web. 2. You followed the installation instructions that came with the option. 3. The option is installed correctly. 4. You have not loosened any other installed options or cables. 5. You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. <p>If the problem remains, call for service.</p>
<p>An IBM option that used to work does not work now.</p>	<p>Verify that all of the option hardware and cable connections are secure.</p> <p>If the option comes with its own test instructions, use those instructions to test the option.</p> <p>If the failing option is a SCSI option, verify that:</p> <ol style="list-style-type: none"> 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. 3. Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. <p>If the problem remains, call for service.</p>
<p>Power problems</p>	<p>Verify that:</p>
<p>The server does not power on.</p>	<ol style="list-style-type: none"> 1. The power cables are properly connected to the server. 2. The electrical outlet functions properly. 3. The type of memory installed is correct. 4. If you just installed an option, remove it, and restart the server. If the server now powers on, you might have installed more options than the power supply supports. <p>If the problem remains, call for service.</p>

Table 19. Troubleshooting charts.

Symptom	Suggested action
The server does not power off.	<p>Verify if you are using an ACPI or non-ACPI operating system.</p> <p>If you are using a non-ACPI operating system:</p> <ol style="list-style-type: none"> 1. Press Ctrl+Alt+Delete. 2. Turn off the system by using the power-control button. <p>If the problem remains or if you are using an ACPI-aware operating system, call for service.</p>
Serial port problems	Verify that:
The number of serial ports identified by the operating system is less than the number of serial ports installed.	<ol style="list-style-type: none"> 1. Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports is disabled. Note: The management connector is the same as a serial-port connector, but it is not supported. 2. The serial-port adapter, if you installed one, is seated properly. <p>If the problem remains, call for service.</p>
A serial device does not work. For more information about the serial port see "Serial ports" on page 80.	<p>Verify that:</p> <ol style="list-style-type: none"> 1. The device is compatible with the server. 2. The serial port is enabled and is assigned a unique address. 3. Make sure that the device is not connected to the management port C. Note: The management connector is the same as a serial-port connector, but it is not supported. <p>If the problem remains, call for service.</p>
Software problem	To determine if problems are caused by the software, verify that:
Suspected software problem.	<ol style="list-style-type: none"> 1. Your server has the minimum memory requirements needed to use the software. For memory requirements, refer to the information that comes with the software. Note: If you have just installed an adapter or memory, you might have a memory address conflict. 2. The software is designed to operate on your server. 3. Other software works on your server. 4. The software that you are using works on another system. <p>If you received any error messages when using the software program, refer to the information that comes with the software for a description of the messages and solutions to the problem.</p> <p>If the items above are correct and the problem remains, contact your place of purchase.</p>
Universal Serial Bus (USB) port problems	Verify that:
A USB device does not work.	<ol style="list-style-type: none"> 1. You are not trying to use a USB device during POST if you have a standard (non-USB) keyboard attached to the keyboard port. Note: If a standard (non-USB) keyboard is attached to the keyboard port, the USB is disabled and no USB device will work during POST. 2. The correct USB device driver is installed. 3. Your operating system supports USB devices. <p>If the problem remains, call for service.</p>

Troubleshooting the Ethernet controller

This section provides troubleshooting information for problems that might occur with the 10/100 Mbps Ethernet controller.

Network connection problems

If the Ethernet controller cannot connect to the network, check the following:

- Make sure that the cable is installed correctly.

The network cable must be securely attached at all connections. If the cable is attached but the problem remains, try a different cable.

If you set the Ethernet controller to operate at 100 Mbps, you must use Category 5 cabling.

If you directly connect two workstations (without a hub), or if you are not using a hub with X ports, use a crossover cable.

Note: To determine whether a hub has an X port, check the port label. If the label contains an X, the hub has an X port.

- Determine if the hub supports auto-negotiation. If not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Check the LAN activity light (if available) on the rear of the server. The LAN activity light is illuminated when the Ethernet controller sends or receives data over the Ethernet network. If the LAN activity light is off, make sure that the hub and network are operating and that the correct device drivers are loaded.
- Make sure that you are using the correct device drivers, supplied with your system.
- Check for operating-system-specific causes for the problem.
- Make sure that the device drivers on the client and system are using the same protocol.
- Test the Ethernet controller.

The way you test the Ethernet controller depends on which operating system you are using (see the Ethernet controller device driver README file).

Ethernet controller troubleshooting chart

You can use the following troubleshooting chart to find solutions to 10/100 Mbps Ethernet controller problems that have definable symptoms.

Table 20. Ethernet troubleshooting chart.

Ethernet controller problem	Suggested action
The server stops running when loading device drivers.	<p>The PCI BIOS interrupt settings are incorrect.</p> <p>Check the following:</p> <ul style="list-style-type: none"> • Determine if the IRQ setting assigned to the Ethernet controller is also assigned to another device in the Configuration/Setup Utility program. <p>Although interrupt sharing is allowed for PCI devices, some devices do not function well when they share an interrupt with a dissimilar PCI device. Try changing the IRQ assigned to the Ethernet controller or the other device. For example, for NetWare Versions 3 and 4, it is recommended that disk controllers not share interrupts with LAN controllers.</p> <ul style="list-style-type: none"> • Make sure that you are using the most recent device driver available from the World Wide Web. • Run the network diagnostic program. <p>If the problem remains, call for service.</p>
The LAN activity light does not light (when available).	<p>Check the following:</p> <ul style="list-style-type: none"> • Make sure that you have loaded the network device drivers. • The network might be idle. Try sending data from this workstation. • Run diagnostics on the LEDs.
Data is incorrect or sporadic.	<p>Check the following:</p> <ul style="list-style-type: none"> • Make sure that you are using Category 5 cabling when operating the system at 100 Mbps. • Make sure that the cables do not run close to noise-inducing sources like fluorescent lights.
The Ethernet controller stopped working when another adapter was added to the system.	<p>Check the following:</p> <ul style="list-style-type: none"> • Make sure that the cable is connected to the Ethernet controller. • Make sure that your PCI system BIOS code is current. • Reseat the adapter. • Determine if the IRQ setting assigned to the Ethernet adapter is also assigned to another device in the Configuration/Setup Utility program. <p>Although interrupt sharing is allowed for PCI devices, some devices do not function well when they share an interrupt with a dissimilar PCI device. Try changing the IRQ assigned to the Ethernet controller or the other device.</p> <p>If the problem remains, call for service.</p>
The Ethernet controller stopped working without apparent cause.	<p>Check the following:</p> <ul style="list-style-type: none"> • Run diagnostics for the Ethernet controller. • Try a different connector on the hub. • Reinstall the device drivers. Refer to your operating system documentation and to the ServerGuide information. <p>If the problem remains, call for service.</p>

Table 20. Ethernet troubleshooting chart.

Ethernet controller problem	Suggested action
Ethernet Link Status light does not light (when available).	<p>Check the following:</p> <ul style="list-style-type: none"> • Make sure that the hub is turned on. • Check all connections at the Ethernet controller and the hub. • Check the cable. A crossover cable is required unless the hub has an X designation. • Use another port on the hub. • If the hub does not support auto-negotiation, manually configure the Ethernet controller to match the hub. • If you manually configured the duplex mode, make sure that you also manually configure the speed. • Run diagnostics on the LEDs. <p>If the problem remains, call for service.</p>

Ethernet controller messages

The integrated Ethernet controller might display messages from the following device drivers:

- Novell NetWare or IntraNetWare system open data-link interface (ODI)
- Network driver interface specification (NDIS) adapter for level 4.0 (Windows)

Novell NetWare or IntraNetWare system ODI driver teaming messages

This section provides explanations of the error messages for the Novell NetWare or IntraNetWare system ODI driver, and suggested actions to resolve each problem.

Table 21. NetWare driver messages for the Ethernet controller.

Message	Description
Couldn't allocate resources.	<p>Explanation: An unknown error has occurred when trying to allocate needed resources for the AFT Module.</p> <p>Action:</p> <ul style="list-style-type: none"> • Check the system configuration. If the problem remains, call for service. • Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.
AFT group for primary adapter in slot <i>nnn</i> already exists.	<p>Explanation: An attempt was made to rebind an adapter already in an AFT group.</p> <p>Action: Check the AFT slot numbers for existing AFT teams. If the problem remains, call for service.</p>
Error locating device control table (DCT) addresses in internal table. Make sure that you have loaded LAN drivers after loading AFT.NLM.	<p>Explanation: The bind command was entered prior to loading the device driver. The device driver must be loaded after loading AFT.NLM, but before any bind command can be issued.</p> <p>Action: Load the driver for the supported controller and try loading the AFT module again. If the problem remains, call for service.</p>
Insufficient number of arguments specified.	<p>Explanation: The appropriate or expected number of parameters was not entered in a command.</p> <p>Action: Check the parameters required for the given command. If the problem remains, call for service.</p>

Table 21. NetWare driver messages for the Ethernet controller.

Message	Description
Duplicate slot numbers detected.	<p>Explanation: An attempt has been made to bind the same slot number more than once.</p> <p>Action: Check the slot numbers entered during the bind. Adapter slot numbers must be valid and unique. If the problem remains, call for service.</p>
'xxx' is not supported for AFT team.	<p>Explanation: A bind command has been issued for adapters not supported by AFT.NLM.</p> <p>Action: Make sure that you attempt to bind only adapters supported by AFT.NLM.</p>
Primary and Secondary adapters do not match. AFT group is not created.	<p>Explanation: A bind command was entered for an adapter team that is a combination of system and client adapters. An AFT team must be a grouping of the same classification of adapter.</p> <p>Action: Verify that all the adapters bound in a team are of the same classification.</p>
Requested number of Secondary cards are not found.	<p>Explanation: The number of adapters specified in the bind command could not be located.</p> <p>Action: Verify the numbers and slot locations of the adapters to be bound. If the problem remains, call for service.</p>
Failed to create AFT group. Make sure that the drivers for supported adapters are loaded, primary adapter is bound to protocols, and secondary adapter is not bound to any protocols.	<p>Explanation: Binding of protocol failed. Protocol is either not bound to any adapter or is bound to more than one adapter in the group.</p> <p>Action: Ensure that the protocol is bound to only one adapter in an AFT team.</p>
Error identifying slot numbers for the specified board names.	<p>Explanation: The mapping between the board name entered and the slot number for an adapter could not be established.</p> <p>Action: Check the board name for the adapter before issuing the bind command. If the problem remains, call for service.</p>
Can't unbind specified slot from AFT group. Make sure that the slot you specified is for the primary adapter in an AFT group.	<p>Explanation: The number entered in the unbind command was not the primary adapter in an AFT group.</p> <p>Action: Reissue the unbind command and specify the slot number for the primary adapter.</p>
LAN adapter at slot <i>nnnn</i> (Port 0xaa) failed to reset. Check the state of the adapter.	<p>Explanation: The adapter that you specified could not be initialized.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. Load the device driver for the supported adapter. 2. Check that the adapter is seated properly in the slot and try loading the AFT module again. <p>If the problem remains, call for service.</p>
AFT is not supported on this version of NetWare.	<p>Explanation: The NetWare on your system is not a version supported by AFT.</p> <p>Action: Load and bind AFT only on supported versions of NetWare (currently version 4.11 and above).</p>
Failed to allocate resources tags.	<p>Explanation: An unknown error has occurred when trying to allocate needed resources for the AFT module.</p> <p>Action: Check system configuration. If the problem remains, call for service.</p>
Please unload all LAN drivers before unloading AFT.NLM.	<p>Explanation: An attempt was made to unload the AFT.NLM module before unloading the adapter device driver.</p> <p>Action: Unload the adapter device driver before unloading the AFT module.</p>

NDIS 4.0 (Windows) driver messages

This section contains the error messages for the NDIS 4.0 drivers. The explanation and recommended action are included with each message.

Table 22. NDIS (Windows NT) driver messages for the Ethernet controller.

Error code (hex)	Description
0x00	<p>Explanation: The driver could not register the specified interrupt.</p> <p>Action: Using the Configuration/Setup Utility program, make sure that a PCI interrupt is assigned to your Ethernet adapter, and that Ethernet is enabled.</p>
0x01	<p>Explanation: One of the PCI adapters did not get the required resources.</p> <p>Action: Using the Configuration/Setup Utility program, make sure that a PCI interrupt is assigned to your Ethernet adapter, and that Ethernet is enabled.</p>
0x02	<p>Explanation: Bad node address (multicast address).</p> <p>Action: Make sure the locally administered address is valid, if one is specified. The address cannot be a multicast address.</p>
0x03	<p>Explanation: Failed self-test.</p> <p>Action: Make sure a cable is attached to the Ethernet connector. If the problem remains, call for service.</p>
0x0D	<p>Explanation: Could not allocate enough memory for transmit queues.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. From the Windows NT desktop, click Start → Control Panel → Networks → Adapters. 2. Click your IBM Ethernet adapter from the list. 3. Click Properties → Advanced. 4. Lower the resource values that apply to the transmit queue.
0x0E	<p>Explanation: Could not allocate enough memory for receive queue.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. From the Windows NT desktop, click Start → Control Panel → Networks → Adapters. 2. Click your IBM Ethernet adapter from the list. 3. Click Properties → Advanced. 4. Lower the resource values that apply to the receive queue.
0x0F	<p>Explanation: Could not allocate enough memory for other structures.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. From the Windows NT desktop, click Start → Control Panel → Networks → Adapters. 2. Click your IBM Ethernet adapter from the list. 3. Click Properties → Advanced. 4. Lower the value for the resource named in the message.
0x10	<p>Explanation: Did not find any Ethernet controllers.</p> <p>Action: Using the Configuration/Setup Utility program, make sure that Ethernet is enabled.</p>
0x11	<p>Explanation: Multiple Ethernet controllers found, but none matched the required ID.</p> <p>Action: Using the Configuration/Setup Utility program, make sure that Ethernet is enabled.</p>
0x13	<p>Explanation: Did not find any Ethernet controllers that matched the required subven/subdev.</p> <p>Action: Using the Configuration/Setup Utility program, make sure that Ethernet is enabled.</p>

Table 22. NDIS (Windows NT) driver messages for the Ethernet controller.

Error code (hex)	Description
0x16	<p>Explanation: Single adapter found, but multiple instances tried to load.</p> <p>Action: Using the Configuration/Setup Utility program, make sure that Ethernet is enabled, and that the slot containing the IBM xSeries 300 10/100 Ethernet Adapter or the IBM 10/100 EtherJet PCI adapter is enabled.</p>
0x17	<p>Explanation: Slot parameter not specified in the registry.</p> <p>Action: Remove the adapter driver and reinstall it. If the problem remains, call for service.</p>
All other 4-character hexadecimal codes	<p>Action: Call for service.</p>

Ethernet teaming messages

This section displays the messages associated with Ethernet teaming.

Table 23. NDIS (Windows NT) driver teaming messages for the Ethernet controller.

Event ID	Type	Description
01	Error	<p>Explanation: Team name and physical adapter name are the same. This is an invalid configuration.</p> <p>Action: Reconfigure the adapter team by double-clicking the PROSet icon in the control panel.</p>
02	Error	<p>Explanation: Unable to allocate required resources.</p> <p>Action: Free some memory resources and restart.</p>
03	Error	<p>Explanation: Unable to read required registry parameters.</p> <p>Action: Reconfigure the adapter team by double-clicking the PROSet icon in the control panel.</p>
04	Error	<p>Explanation: Unable to bind to physical adapter.</p> <p>Action: Reconfigure the adapter team by double-clicking the PROSet icon in the control panel.</p>
05	Error	<p>Explanation: Unable to initialize an adapter team</p> <p>Action: Reconfigure the adapter team by double-clicking the PROSet icon in the control panel.</p>
06	Informational	<p>Explanation: Team <i>nn</i>. Primary adapter is initialized.</p> <p>Action: None.</p>
07	Informational	<p>Explanation: Team <i>nn</i>. Secondary adapter is initialized.</p> <p>Action: None.</p>
08	Informational	<p>Explanation: Team <i>nn</i>. Virtual adapter or team is initialized.</p> <p>Action: None.</p>
09	Informational	<p>Explanation: Team <i>nn</i>. Primary adapter is switching over.</p> <p>Action: None.</p>

Table 23. NDIS (Windows NT) driver teaming messages for the Ethernet controller.

Event ID	Type	Description
10	Warning	Explanation: Team <i>nn</i> . Adapter link down. Action: Make sure the adapter is functioning properly.
11	Informational	Explanation: Team <i>nn</i> . Secondary adapter took over. Action: None.
12	Warning	Explanation: Team <i>nn</i> . Secondary adapter is deactivated from the team. Action: Make sure the secondary adapter is functioning properly and that the adapter cable is securely connected to the LAN.
13	Informational	Explanation: Team <i>nn</i> . Secondary adapter has rejoined the team. Action: None.
14	Informational	Explanation: Team <i>nn</i> . Secondary adapter link is up. Action: None.
15	Error	Explanation: Team <i>nn</i> . The last adapter has lost its link. Network connection has been lost. Action: Shut down the server and replace the adapters; then, restart the server to reestablish the connection.
16	Informational	Explanation: Team <i>nn</i> . An adapter has reestablished the link. Network connection has been restored. Action: None.
17	Informational	Explanation: Team <i>nn</i> . Preferred primary adapter has been detected. Action: None.
18	Informational	Explanation: Team <i>nn</i> . Preferred secondary adapter has been detected. Action: None.
19	Informational	Explanation: Team <i>nn</i> . Preferred primary adapter took over. Action: None.
20	Informational	Explanation: Team <i>nn</i> . Preferred secondary adapter took over. Action: None.
21	Warning	Explanation: Team <i>nn</i> . Primary adapter does not sense any probes. Possible reason: partitioned team. Action: Make sure the cables of the adapter team are connected to the same LAN segment. Reconfigure the team if necessary.

Replacing the battery

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

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

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with

normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

To order replacement batteries, call 1-800-772-2227 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

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

Statement 2



CAUTION:

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

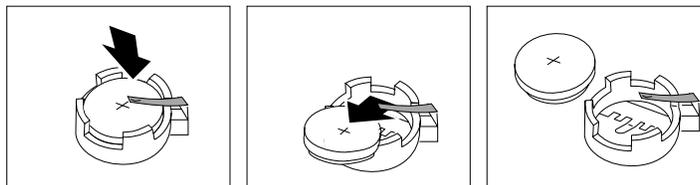
Do not:

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

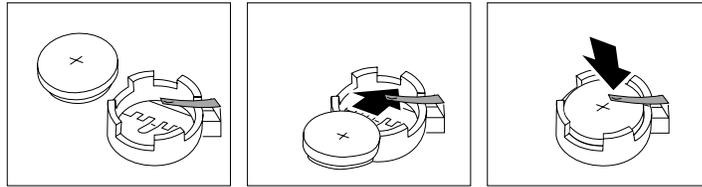
Dispose of the battery as required by local ordinances or regulations.

To replace the battery:

1. Read “Before you begin” on page 35, and follow any special handling and installation instructions supplied with the replacement battery.
2. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the server cover.
3. Remove the battery:
 - a. Use one finger to lift the battery clip over the battery.
 - b. Use one finger to slightly slide the battery out from its socket. The spring mechanism will push the battery out toward you as you slide it from the socket.
 - c. Use your thumb and index finger to pull the battery from under the battery clip.
 - d. Ensure that the battery clip is touching the base of the battery socket by pressing gently on the clip.



4. Insert the new battery:
 - a. Tilt the battery so that you can insert it into the socket, under the battery clip.
 - b. As you slide it under the battery clip, press the battery down into the socket.



5. Reinstall the server cover and connect the cables.

Note: Wait approximately 20 seconds after you plug the power cord of your server into an electrical outlet for the power-control button to become active.
6. Turn on the server.
7. Start the Configuration/Setup Utility program and set configuration parameters.
 - Set the system date and time.
 - Set the power-on password.
 - Reconfigure your server.

Chapter 7. Getting information, help, and service

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

Getting information

Information about your IBM server product and preinstalled software, if any, is available in the documentation that comes with your server. That documentation includes printed books, online books, README files, and help files. In addition, information about IBM products is available on the World Wide Web and through the IBM Automated Fax System.

Using the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM products and support. The address for the IBM Personal Computing home page is <http://www.ibm.com/pc/>.

You can find support information for your IBM products at <http://www.ibm.com/pc/support/>.

If you click **Profile** from the support page, you can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable Files. In addition, you can choose to receive e-mail notifications whenever new information becomes available about your registered products.

You also can order publications through the IBM Publications Ordering System at <http://www.elink.ibm.com/public/applications/publications/cgi-bin/pbi.cgi>.

Getting information by fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada, you can receive, by fax, marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs).

You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine. In the U.S. and Canada, to access the IBM Automated Fax System, call 1-800-426-3395.

Getting help and service

If you have a problem with your server product, you will find a wide variety of sources available to help you.

Using the documentation and diagnostic programs

Many problems can be solved without outside assistance. If you experience a problem with your server product, the first place to start is the troubleshooting information in your IBM documentation. If you suspect a software problem, see the

documentation, including README files and online help, that comes with the operating system or application program.

Most IBM server products come with a set of diagnostic programs that you can use to help you identify hardware problems. See the troubleshooting information in your IBM documentation for instructions on using the diagnostic programs.

The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to <http://www.ibm.com/pc/support/> and follow the instructions.

Calling for service

If you have tried to correct the problem yourself and still need help, during the warranty period, you can get help and information by telephone through the IBM HelpCenter®. The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make selected Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts. All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources.
- Configuration of BIOS as part of an installation or upgrade.
- Changes, modifications, or upgrades to device drivers.
- Installation and maintenance of network operating systems (NOS).
- Installation and maintenance of application programs.

Refer to your IBM Statement of Limited Warranty for a full explanation of IBM warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m.

Note: Response times vary; may exclude some holidays.

In addition, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface adapters
- Installing and configuring network adapters

Please have the following information ready when you call:

- Machine type and model
- Serial numbers of your IBM hardware products
- Description of the problem

- Exact wording of any error messages
- Hardware and software configuration information

Telephone numbers

Phone numbers are subject to change without notice. For the most up-to-date phone numbers, go to <http://www.ibm.com/pc/support/> and click **Support Phone List**.

Country		Telephone number
Austria	Österreich	01-24 592 5901
Belgium - Dutch	Belgie	02-210 9820
Belgium - French	Belgique	02-210 9800
Canada	Toronto only	416-383-3344
Canada	Canada - all other	1-800-565-3344
Denmark	Danmark	45 20 82 00
Finland	Suomi	09-22 931 840
France	France	02 38 55 74 50
Germany	Deutschland	07032-1549 201
Ireland	Ireland	01-815 9202
Italy	Italia	02-7031 6101
Luxembourg	Luxembourg	298-977 5063
Netherlands	Nederland	020-514 5770
Norway	Norge	23 05 32 40
Portugal	Portugal	21-791 51 47
Spain	España	91-662 49 16
Sweden	Sverige	08-477 4420
Switzerland	Schweiz/Suisse/Svizzera	058-333 0900
United Kingdom	United Kingdom	01475-555 055
U.S.A. and Puerto Rico	U.S.A. and Puerto Rico	1-800-772-2227

In all other countries or regions, contact your IBM reseller or IBM marketing representative.

International Warranty Service

If you travel with your server product or relocate it to a country where your server machine type is sold and serviced by IBM or by IBM resellers who are authorized to perform warranty service, International Warranty Service is available for your server product.

Service methods and procedures vary by country, and some services might not be available in all countries. International Warranty Service is delivered through the method of service (such as depot, carry-in, or on-site service) that is provided in the servicing country. Service centers in certain countries might not be able to service all

models of a particular machine type. In some countries, fees and restrictions might apply at the time of service.

To determine whether your server product is eligible for International Warranty Service and to view a list of the countries where service is available, go to <http://www.ibm.com/pc/support/>, and click **Warranty Lookup**. Eligible IBM server products are identified by their four-digit machine types. For more information about International Warranty Service, see Service Announcement 601-034 at <http://www.ibm.com/>. Click **Support & downloads**, click **Announcement letters**, and click **Announcements search**. In the **Search by letter number only** field, type 601-034, and click **Search**.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region.

For more information about these services, contact your IBM marketing representative.

Appendix A. Warranty information

This section contains the warranty period for your product, information about obtaining warranty service and support, and the IBM Statement of Limited Warranty.

Warranty period

Contact your place of purchase for warranty service information. Some IBM Machines are eligible for on-site warranty service depending on the country or region where service is performed.

Machine - IBM @server xSeries 232 Type 8668

Warranty Period* - Parts - 3 years, labor - 3 years

** Contact your place of purchase for warranty service information. Some IBM Machines are eligible for On-site warranty service depending on the country where service is performed.*

Warranty service and support

With the original purchase of an IBM server product, you have access to extensive support. During the IBM Machine warranty period, you may call IBM or your reseller for problem-determination assistance under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.

The following items are not covered under warranty service:

- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of non-IBM software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of machine code or licensed internal code that is designated as customer installable.

If you do not register your server with IBM, you might be required to present proof of purchase to obtain warranty service.

Before you call for service

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your server and software.

Most computers, operating systems, and application programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. The information that comes with your server also describes the diagnostic tests that you can perform.

If you suspect a software problem, refer to the information for the operating system or application program.

Calling for service

Please have the following information ready:

- Machine type, model, and serial number
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

To find the telephone number for the HelpCenter nearest you, see Chapter 7, “Getting information, help, and service,” on page 131.

IBM Statement of Limited Warranty Z125-4753-06 8/2000

This warranty statement consists of two parts: Part 1 and Part 2. Be sure to read Part 1 and the country-unique terms in Part 2 that apply to your country or region.

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term "Machine" does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications"). The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded.

Extent of Warranty

The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

Items Not Covered by Warranty

IBM does not warrant uninterrupted or error-free operation of a Machine.

Any technical or other support provided for a Machine under warranty, such as assistance via telephone with "how-to" questions and those regarding Machine set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND**.

Warranty Service

To obtain warranty service for a Machine, contact IBM or your reseller. If you do not register your Machine with IBM, you may be required to present proof of purchase.

During the warranty period, IBM or your reseller, if approved by IBM to provide warranty service, provides without charge certain types of repair and exchange service to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. At its discretion, IBM or your reseller will 1) either repair or exchange the failing Machine and 2) provide the service either at your location or a service center. IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Some parts of IBM Machines are designated as Customer Replaceable Units (called "CRUs"), e.g., keyboards, memory, or hard disk drives. IBM ships CRUs to you for replacement by you. You must return all defective CRUs to IBM within 30 days of your receipt of the replacement CRU. You are responsible for downloading designated Machine Code and Licensed Internal Code updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to

1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
 - a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides;
 - b. secure all programs, data, and funds contained in a Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations; and
 - d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

Limitation of Liability

Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST SAVINGS, EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Governing Law

Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Part 2 - Country-unique Terms

AMERICAS

BRAZIL

Governing Law: *The following is added after the first sentence:*

Any litigation arising from this Agreement will be settled exclusively by the court of Rio de Janeiro.

NORTH AMERICA

Warranty Service: *The following is added to this Section:*

To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

The IBM Warranty for Machines: *The following paragraph is added to this Section:*
The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this Section:*

Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State or Territory.

CAMBODIA, LAOS, AND VIETNAM

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*
laws of the State of New York.

The following is added to this Section:

Disputes and differences arising out of or in connection with this Agreement shall be finally settled by arbitration which shall be held in Singapore in accordance with the rules of the International Chamber of Commerce (ICC). The arbitrator or arbitrators designated in conformity with those rules shall have the power to rule on their own competence and on the validity of the Agreement to submit to arbitration. The arbitration award shall be final and binding for the parties without appeal and the arbitral award shall be in writing and set forth the findings of fact and the conclusions of law.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator.

The two arbitrators appointed by the parties shall appoint a third arbitrator before proceeding upon the reference. The third arbitrator shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the ICC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

The English language version of this Agreement prevails over any other language version.

HONG KONG AND MACAU

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*

laws of Hong Kong Special Administrative Region.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this Section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence;
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

JAPAN

Governing Law: *The following sentence is added to this Section:*

Any doubts concerning this Agreement will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

NEW ZEALAND

The IBM Warranty for Machines: *The following paragraph is added to this Section:*

The warranties specified in this Section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this Section:*

Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces this Section:*

Both you and IBM consent to the application of the laws of the State of New York (except when local law requires otherwise) to govern, interpret, and enforce all your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Any disputes arising from or in connection with this Agreement will first be resolved by friendly negotiations, failing which either of us has the right to submit the dispute to the China International Economic and Trade Arbitration Commission in Beijing, the PRC, for arbitration in accordance with its arbitration rules in force at the time. The arbitration tribunal will consist of three arbitrators. The language to be used therein will be English and Chinese. An arbitral award will be final and binding on all the parties, and will be enforceable under the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958).

The arbitration fee will be borne by the losing party unless otherwise determined by the arbitral award.

During the course of arbitration, this Agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES:

The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

Warranty Service:

If you purchase an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM. If you purchase an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase an IBM Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM authorized service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM authorized service provider.

Governing Law:

The applicable laws that govern, interpret and enforce rights, duties, and obligations of each of us arising from, or relating in any manner to, the subject matter of this Statement, without regard to conflict of laws principles, as well as Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided, except that in 1) Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Former Yugoslav Republic of Macedonia, Romania, Slovakia, Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, the laws of Austria apply; 2) Estonia, Latvia, and Lithuania, the laws of Finland apply; 3) Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Mali, Mauritania, Morocco, Niger, Senegal, Togo, and Tunisia, this Agreement will be construed and the legal relations between the parties will be determined in accordance with the French laws and all disputes arising out of this Agreement or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 4) Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe, this Agreement will be governed by English Law and disputes relating to it will be submitted to the exclusive jurisdiction of the English courts; and 5) in Greece, Israel, Italy, Portugal, and Spain any legal claim arising out of this Statement will be brought before, and finally settled by, the competent court of Athens, Tel Aviv, Milan, Lisbon, and Madrid, respectively.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

The IBM Warranty for Machines: *The following replaces the first sentence of the first paragraph of this Section:*

The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this Section:

The minimum warranty period for Machines is six months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

Extent of Warranty: *The second paragraph does not apply.*

Warranty Service: *The following is added to this Section:*

During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this Section:*

The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2:

IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this Section:*

as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this Section:*

In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: *(items 1 and 2 unchanged).*

IRELAND

Extent of Warranty: *The following is added to this Section:*

Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces items one and two of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and
2. the amount of any other actual direct damages, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY

Limitation of Liability: *The following replaces the second sentence in the first paragraph:*

In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than:

1. *(unchanged)*
2. as to any other actual damage arising in all situations involving nonperformance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim.

Applicability of suppliers and resellers (unchanged).

The following replaces the third paragraph of this Section:

Unless otherwise provided by mandatory law, IBM and your reseller are not liable for any of the following: *(items 1 and 2 unchanged)* 3) indirect damages, even if IBM or your reseller is informed of their possibility.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this Section:*

IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces items 1 and 2 of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;
2. the amount of any other actual direct damages or loss, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim;

The following item is added to this paragraph:

3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section:

IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

Appendix B. Notices

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

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

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NetBAY	Wake on LAN
NetView	xSeries
OS/2 WARP	X-Architecture

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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 1000000 bytes, and GB stands for approximately 1000000000 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.

IBM makes no representation or warranties regarding non-IBM products and services that are ServerProven®, including but not limited to the implied warranties of merchantability and fitness for a particular purpose. These products are offered and warranted solely by third parties.

Unless otherwise stated, IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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

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.

Taiwan electrical emission 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。

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。

Power cords

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

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

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

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

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

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

IBM power cord part number	Used in these countries and regions
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa
13F9979	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0033	Antigua, Bahrain, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Ethiopia, Italy, Libya, Somalia
14F0087	Israel
1838574	Thailand

IBM power cord part number	Used in these countries and regions
6952301	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

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