xSeries 220

User's Reference

SC33-P246-70

Note: Before using this information and the product it supports, be sure to read the general information in Appendix A, “Warranty information,” on page 117 and Appendix B, “Notices,” on page 127.

Second Edition (October 2001)

Contents

Safety

Before installing this product, read the Safety Information.

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1

DANGER

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

To avoid a shock hazard:

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

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

Statement 2

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

Do not:

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

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

Statement 3

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

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

DANGER

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

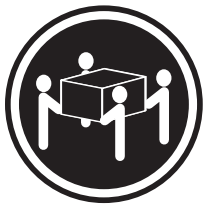
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

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

Statement 4

≥ 18 kg (39.7 lb)

≥ 32 kg (70.5 lb)

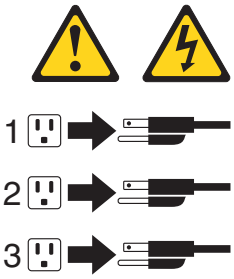


≥ 55 kg (121.2 lb)

CAUTION:
Use safe practices when lifting.

Statement 5

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



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 10

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

>82 kg (180 lb)

Chapter 1. Introducing the IBM xSeries 220

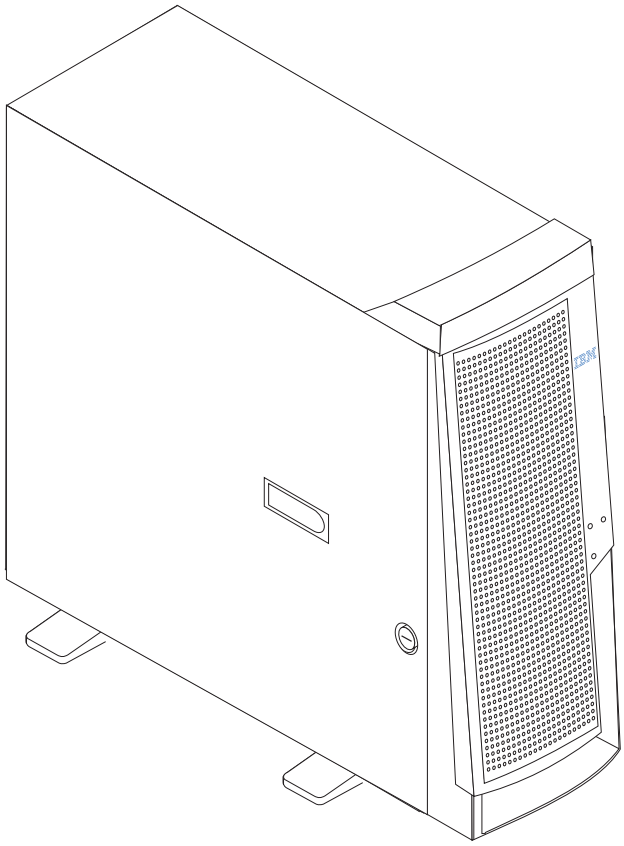
Your IBM® @server xSeries 220 is an affordable solution for entry-level server applications. It is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and large amounts of reliable data storage.

Your xSeries 220 contains several IBM X-Architecture™ technologies, which help increase server performance and reliability. The X-Architecture technologies provided in your server model include the most recent advancements in X-Architecture features. For more information about X-Architecture features refer to “What your xSeries 220 offers” on page 4, and “Reliability, availability, and serviceability features” on page 5. 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.

Your server comes with a limited warranty and IBM Server 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.

For service, assistance, or additional information on IBM Server Start Up Support and the World Wide Web, see “Getting help and service” on page 113.

The server serial number and model number are located on labels on the rear and the right front of the server. You will need these numbers when you register your server with IBM.



Features and specifications

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

Microprocessor:

- Intel® Pentium® III microprocessor with MMX™ technology and SIMD extensions
- 256 or 512 KB ECC, Level-2 cache
- 133 MHz front-side bus (FSB)
- Support for up to two microprocessors

Memory:

- Standard: 128 or 256 MB
- Maximum: 4 GB
- Type: 133 MHz, ECC, SDRAM, registered DIMMs
- Slots: Four DIMM connectors, noninterleaved

Drives standard:

- Diskette: 1.44 MB
- CD-ROM: 20X - 48X IDE
- Supports hot-swap SCSI hard disk drives (some models)

Expansion bays:

- Two 5.25-in. bays (one CD-ROM drive installed)
- Two 3.5-in. bays (one diskette drive installed)
- Three 3.5-in. slim bays available in drive cage (some models have a hard disk drive installed)

PCI expansion slots:

- Three 33 MHz/64-bit
- Two 33 MHz/32-bit

Power supply:

One 330 watt autosensing (115-230 V ac)

Video:

- S3 video controller (integrated on system board)
- Compatible with SVGA and VGA
- 8 MB SDRAM video memory

Size:

- Height: 470 mm (18.5 in.)
- Depth: 508 mm (20 in.)
- Width: 165 mm (6.5 in.)
- Weight: approximately 19.5 kg (43 lb) when fully configured or 15.9 kg (35 lb) minimum

Integrated functions:

- Ultra160 SCSI low voltage differential (LVD) controller
- One 10BASE-T/100BASE-TX Intel Ethernet controller on the system board with Wake on LAN® support
- Automatic BIOS Recovery (ABR)
- Automatic Server Restart (ASR)
- Two serial ports
- Parallel port
- Two Universal Serial Bus (USB) ports
- Keyboard port
- Mouse port
- IDE controller port
- Video port

Acoustical noise emissions:

- Sound power, idling: 5.9 bel maximum
- Sound power, operating: 6.1 bel maximum

Environment:

- Air temperature:
  - — 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:
  - — Server on: 8% to 80%
  - — Server off: 8% to 80%

Heat output:

Approximate heat output in British thermal units (Btu) per hour

- Minimum configuration: 341 Btu (100 watts)
- Maximum configuration: 1604 Btu (470 watts)

Electrical input:

- Sine-wave input (50-60 Hz) required
- Input voltage low range:
  - — Minimum: 100 V ac
  - — Maximum: 127 V ac
- Input voltage high range:
  - — Minimum: 200 V ac
  - — Maximum: 240 V ac
- Input kilovolt-amperes (kVA), approximately:
  - — Minimum: 0.08 kVA
  - — Maximum: 0.52 kVA

Table 1. Features and specifications.

Notices and statements used in this book

The caution and danger statements also appear in the multilingual *Safety Information* book provided on the *IBM xSeries Documentation* CD that comes with your xSeries product. Each 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 statement 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 xSeries 220 offers

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

- IBM X-Architecture technology
  The IBM X-Architecture features leverage proven, innovative IBM technologies to build the most powerful, and reliable Intel-processor-based servers in the world. The X-Architecture technology includes features such as Automatic Server Restart, Chipkill™ memory, Fibre Channel RAID storage, and Predictive Failure Analysis®.
- 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 system memory

  The memory bus in your server supports up to 4 GB of noninterleaved 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).
- System-management capabilities

  You can use the system-management software that is included with your server to manage the functions of the server locally and remotely. Your server is also enabled for the IBM Remote Supervisor Adapter. Refer to the documentation that comes with your system-management software for more information.
- Integrated network environment support

  Your server comes with an Ethernet controller on the system board. This Ethernet controller supports the Wake on LAN function and has an interface for connecting to 10-Mbps or 100-Mbps networks. The server automatically selects between 10BASE-T and 100BASE-TX environments. The controller provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN).
- 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 considerations in server design are reliability, availability, and serviceability (RAS). The RAS features help to ensure the integrity of the data that is stored on your server, the availability of the server when you need it, and the ease with which you can diagnose and repair problems.

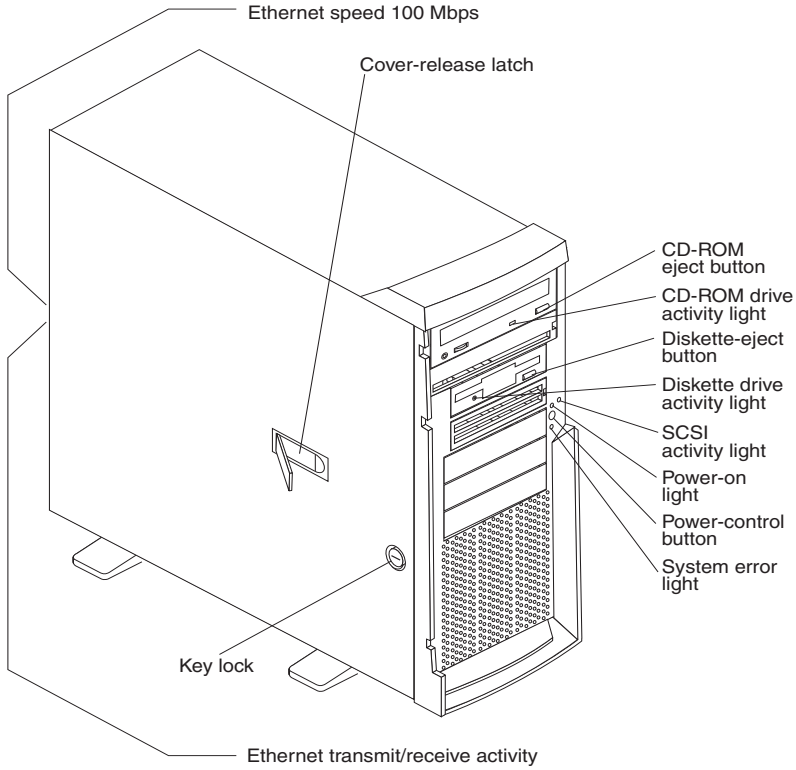
The following is an abbreviated list of the RAS features that your server supports:

- Automatic BIOS Recovery (ABR) which enables the server to recover if the BIOS code is defective or damaged
- Automatic Server Restart (ASR) after a power failure or system hang
- Customer support center 24 hours a day, 7 days a week[1]
- Cyclic redundancy check (CRC) on the small computer system interface (SCSI) bus, the diskette interface, and the Universal Serial Bus (USB)
- Diagnostic light-emitting diodes (LEDs)
- Error checking and correcting (ECC) memory
- Error codes, messages, and logs
- Hard disk drive Predictive Failure Analysis (PFA)
- Menu-driven setup, system configuration, optional redundant array of independent disks (RAID) configuration, and diagnostic programs
- Microprocessor built-in self-test (BIST) with internal error checking
- Optional IBM Remote Supervisor Adapter subsystem to provide control for remote system management
- Parity checking on the keyboard, serial, memory interface, and SCSI bus
- Power and temperature monitoring
- Power-on self-test (POST)
- Processor serial number access
- System error logging (POST)
- Upgradeable basic input/output system (BIOS) code and diagnostics
- Vital product data (VPD) on memory, system board, and hot-swap drive backplane
- Wake on LAN function through the onboard Ethernet controller

1. Service availability will vary by country. Response time will vary depending on the number and nature of incoming calls.

Server controls and indicators

This section identifies the controls and indicators on the front of your server.



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

CD-ROM drive activity light: When this light is on, it indicates that the CD-ROM drive is in use.

Diskette-eject button: Press this button to release a diskette from the drive.

Diskette-drive activity light: When this light is on, it indicates that the diskette drive is in use.

SCSI activity light: When this green light is flashing, the controller is accessing a SCSI device, for example, a hard disk drive.

Note: Hot-swap hard disk drives also have a green activity light. This light is also known as the SCSI hard disk drive activity light.

If your server has a ServeRAID™ controller and this 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.

Power-on light: When this green light is on, system power is present in the server.

Power-control button: Press this button to manually turn the server on or off.

System-error light: When this amber light is on, it indicates that a system error has occurred. An amber error light on the interior of the server, adjacent to the faulty component, will also be on to further isolate the error. (For more information, see Chapter 6, “Solving problems,” on page 71.)

Ethernet transmit/receive activity: When this light is on, there is activity between the server and the network. The Ethernet transmit/receive light is located on the Ethernet (RJ-45) connector on the rear of the server.

Key lock: Use the key that comes with your server to unlock the cover.

Ethernet speed 100 Mbps: When this light is on, the Ethernet speed is 100 Mbps. When the light is off, the Ethernet speed is 10 Mbps. The Ethernet speed light is located on the Ethernet (RJ-45) connector on the rear of the server.

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

Turning on the server

Turning on the server refers to the act of plugging the power cord of your server into the power source and starting the operating system.

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

- You can press the power-control button on the front of the server to start the server.

  Note: After you plug the power cord of your server into an electrical outlet, wait approximately 20 seconds before pressing the power-control button. During this time, the system is initializing; therefore, the power-control button does not respond.

- If the server is turned on and a power failure occurs, the server will start automatically when power is restored.
- The Wake on LAN feature will turn on the server at the set time (when a Magic Packet is received), provided that all of the following conditions are met:
  - AC power is present.
  - The server is either off or shut down from an Advanced Configuration and Power Interface (ACPI) operating system.
  - The Wake on LAN feature is enabled in the Configuration/Setup Utility program.

    Notes:

    1. For additional information on the Wake on LAN function, adapters, and cables, refer to the documentation that comes with the adapters.
    2. See “Ethernet ports” on page 68 for information on the Ethernet controller and Wake on LAN.

- If the IBM Remote Supervisor Adapter is installed in your server, the Remote Supervisor Adapter can turn on the server.
- The server has an Automatic BIOS Recovery (ABR) feature which allows recovery from defective BIOS in some cases.
- The server provides Automatic Server Restart (ASR) logic that supports restarting the system when there is an operating system hang.

Notes:

1. You can install a circular disk over the power-control button to prevent accidental manual power-off. This disk, known as the power-control button shield, comes with your server.
2. See “Choices available from the Configuration/Setup main menu” on page 12 for a description of the Configuration/Setup Utility program.
3. See “I/O connector locations” on page 60 for connector locations.

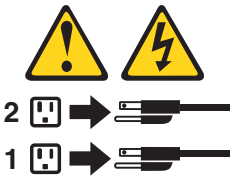
4. To enable or disable Automatic Server restart see “System-board jumpers and switches” on page 30.

Turning off the server

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

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.



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 turning off the server, 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.
- 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.

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 online 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 and parallel 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 that are attached to the integrated SCSI controller. See "Using the SCSISelect Utility program" on page 17 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. You can use this program to select operating-system wake-up support and to set menu wait times. See "Using the PXE Boot Agent Utility program" on page 19 for more information.

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

- **ServerGuide CDs**

  The ServerGuide CDs include software setup and installation tools that are 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. 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.

Using the Configuration/Setup Utility program

This section provides 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, do the following:

1. Turn on the server and watch the monitor screen.
2. When the message `Press F1 for Configuration/Setup` appears, press F1.

   Notes:

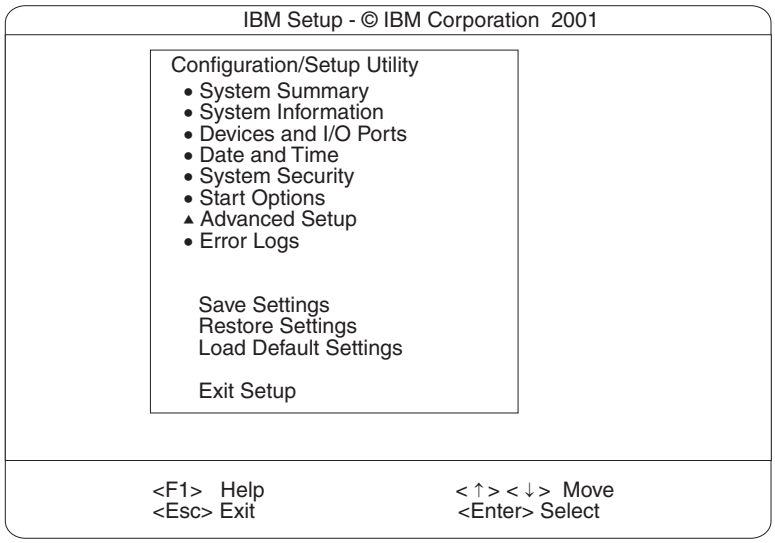
   a. You can set an administrator password through the Configuration/Setup Utility program only if the IBM Remote Supervisor Adapter is installed in your server.

b. If you have set both levels of passwords (user and administrator), you must type the administrator password to access the full Configuration/Setup Utility menu.

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 choices on some menus might differ slightly from the ones that are described in this book, depending on the BIOS version in your server.

Descriptions of the choices that are 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 that is installed.

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

  This choice appears on both the full and limited Configuration/Setup Utility menus.

- **System Information**

  Select this choice to display information about your server. Changes that you make on other menus might appear on this summary screen. You cannot edit any fields. The **System Information** choice appears only on the full Configuration/Setup Utility main menu.

  — **Product Data**

    Select this choice to view system information, such as the machine type and model, the server serial number, and the revision level or issue date of the BIOS that is stored in the flash electrically erasable programmable ROM (EEPROM).

- **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 passwords. This choice appears only on the full Configuration/Setup Utility main menu.

  You can implement two levels of password protection:

  — **Power-on Password**

  Select this choice to set or change a power-on password. See “Using passwords” on page 15 for more information.

  — **Administrator Password**

  Note: This choice is available on the Configuration/Setup Utility menu only if the optional IBM Remote Supervisor Adapter is installed in your server.

  Select this choice to set or change an administrator password.

  Attention: If an administrator password is set and then forgotten, it cannot be overridden or removed. You must replace the system board.

  The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords and allow a power-on password to be changed by the user.

  See “Using passwords” on page 15 for more information.

- **Start Options**

  Select this choice to view or change the start options. Start options take effect when you start your server.

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

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

  If you have the appropriate Wake on LAN software installed and enabled in the server, the server uses the alternative startup sequence instead of the primary startup sequence. The default for Wake on LAN is **Disabled**.

  If the **Boot Fail Count** choice is enabled, you can restore the BIOS system defaults after three consecutive boot failures. If this choice is disabled, the BIOS system defaults can be loaded from the Configuration/Setup Utility main menu.

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

- **Advanced Setup**

  Select this choice to change values for advanced hardware features, such as cache control and PCI configuration.

A 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.

— **Processor Serial Number Access**

Select this choice to specify whether the microprocessor serial number in the microprocessor is readable.

— **System Partition Visibility**

Select this choice to specify whether the System Partition is visible. To make the System Partition visible, set this value to **Visible**. To make the System Partition invisible, set this value to **Hidden**. See Chapter 4, “Using the ServerGuide CDs,” on page 21 for additional information on the System Partition.

— **Core Chipset Control**

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

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

— **Cache Control**

Select this choice to enable or disable the microprocessor cache. In addition, you can define the microprocessor cache type as write-back (WB) or write-through (WT). Selecting write-back mode provides better system performance.

— **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, use the arrow keys to highlight the bank that you want to enable; then, use the arrow keys to select **Enable**.

Note: If a memory error is detected during normal operation, System Management Interrupt (SMI) can disable the memory.

— **PCI Bus Control**

Note: If the IBM Remote Supervisor Adapter is installed in your server, this feature is disabled; in this case, the **PCI Bus Control** choice is not available on the Configuration/Setup Utility menu.

Select this choice to assign IRQs and program the master latency timer.

— **PCI Slot/Device Information**

Note: This choice is available on the Configuration/Setup Utility menu only if the IBM Remote Supervisor Adapter is installed in your server.

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

Attention: You must use the menu selections to save custom settings for the **PCI Slot/Device Information** choice. The **Save Settings**, **Restore Settings**, and **Load Default Settings** choices on the main menu of the Configuration/Setup Utility do not save the PCI Slot/Device Information settings.

After making changes, select:

  - **Save and exit the PCI Utility** to save the changes and return to the **Advanced Setup** choice.
  - **Exit the PCI Utility without saving changes** to discard the changes, retain the current settings, and return to the **Advanced Setup** choice.

- **Error Logs**

  Select this choice to view or clear error logs.

  — Select **POST Error Log** to view the three most recent error codes and messages that the system generated during POST.

  — Select **Clear error logs** to clear the error logs.

- **Save Settings**

  Select this choice to save your customized settings.

- **Restore Settings**

  Select this choice to discard your changes and retain the current settings.

- **Load Default Settings**

  Select this choice to discard 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.

Using passwords

The **System Security** choice appears only on the full Configuration/Setup Utility menu. After you select this choice, you can implement two levels of password protection: power-on password and administrator password.

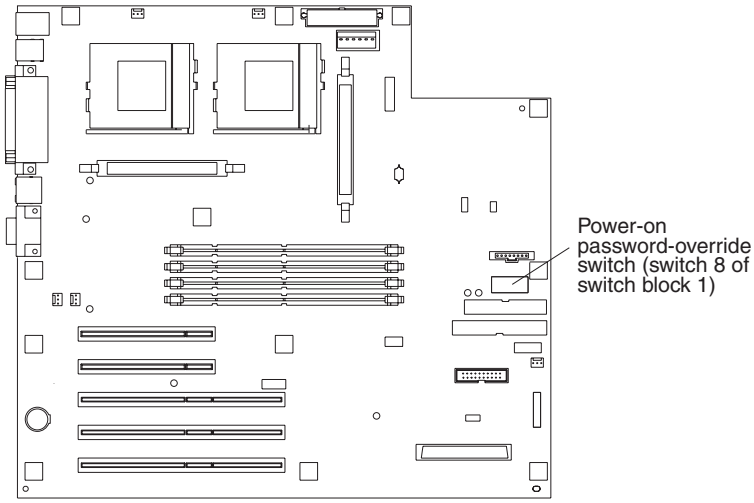
Power-on password

Select this choice to set a power-on password.

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:

- If an administrator password has been set, type the administrator password at the power-on prompt. (If necessary, see “Administrator password” on page 16 for details.) Start the Configuration/Setup Utility program, and change the power-on password.
- Start the Configuration/Setup Utility program, and change the power-on password.
- Change the position of the password-override switch as described in “Setting the password-override switch”.
- Remove the battery and then reinstall the battery.

Setting the password-override switch: The following illustration shows the location of the password-override switch (switch 8, which is the switch farthest to the right, on switch block 1) on the system board.



To set the password-override switch, do the following:

1. Review the information in “Before you begin” on page 31.
2. Turn off the server and peripheral devices, disconnect power cords and then all external cables; then, remove the cover. See “Removing the side cover” on page 40.
3. Change the setting of the password-override switch (switch 8 on switch block 1 on the system board) to the opposite side of the switch. This bypasses the power-on password.
4. Install the server cover (see “Installing the side cover” on page 59) and connect all external cables and power cords.
5. Restart the server.

Notes:

1. If you want the server to prompt for a password when you turn it on, you can start the Configuration/Setup Utility program and set the power-on password.
2. Changing the position of the password-override switch does not override the administrator password if an administrator password has been set.

Administrator password

Note: This choice is available on the Configuration/Setup Utility menu only if the optional IBM Remote Supervisor Adapter is installed in your server.

Select this choice to set an administrator password. The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords and allow a power-on password to be changed by the user.

Attention: If an administrator password is set and then forgotten, it cannot be overridden or removed. You must replace the system board.

The following table provides a summary of the password features.

Type of password	Results
Power-on password	• Type the password to complete the system startup. • All choices are available on the Configuration/Setup Utility main menu.
Administrator password	• No password is required to start the system. • Type the password to access the Configuration/Setup Utility program. • All choices are available on the Configuration/Setup Utility main menu.
Administrator *and* power-on password	• You can type either password to complete the system startup. • The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords and allow a power-on password to be changed by the user. • The power-on password provides access to a limited set of choices on the Configuration/Setup Utility main menu. This limited access might include changing or deleting the power-on password.

Table 2. Power-on and administrator password features.

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 instructions for starting the SCSISelect Utility and descriptions of the menu choices that are available.

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

Starting the SCSISelect Utility program

Complete the following steps 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 the `Would you like to configure the host adapter or run the SCSI disk utility?` question appears, make your selection and press Enter.
4. Use the arrow keys to select a choice from the menu:
   - Press Esc to return to the previous menu.
   - Press F5 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 on-screen instructions.

  You can view or change the following controller settings:

  — **Host Adapter SCSI ID**

  Select this choice to view the SCSI controller ID, which is usually 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 is the transfer rate for Ultra SCSI devices.

  – The transfer rate for Ultra160 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. These options include enabling support for large hard disk drives and support for drives with UltraSCSI speeds.

- **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 starts. After the drive that you want to view or format starts, press Ctrl+A.

Using the PXE Boot Agent Utility program

The PXE boot agent is a built-in, menu-driven configuration utility program that comes with your server. Depending on your server model, you can:

- Select whether to display the setup prompt
- Set menu wait time
- Select operating-system wake-up support

Attention: 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**

  Select this choice to change the order in which boot devices are queried.

  — Try local drives first, and then network (default)

  — Try network only

  — Try local drives only

  — Try network first, and then local drives

  Attention: 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 11 for more information.
- **Show setup prompt**

  Select this choice to either display the PXE setup prompt or disable it. **Disable** 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 99 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**

Note: The ServerGuide program requires a supported IBM server with an *enabled* startable (bootable) CD-ROM drive. Not all features are supported on all models.

- 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.

***Setup and Installation* CD** (continued)

- Creates a *Setup Replication Diskette* 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.

Note: Installation requires your NOS CD.

***System Updates and Applications* CD**

- 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.

***System Updates and Applications* CD** (continued)

- 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 diagnostics 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 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, refer to “Getting information, help, and service” on page 112 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 73 for more information.

- **Diagnostic programs and error messages**

  The server diagnostic programs are stored in upgradeable 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 85 for more information.

- **Diagnostic LEDs**

  Your server has light-emitting diodes (LEDs) to help you identify problems with server components. These LEDs are part of the diagnostics that are built into your server. Use the illuminated LEDs to identify the failing or incorrectly installed components. See “Diagnostic LEDs” on page 97 for more information.

- **Troubleshooting charts**

  These charts list problem symptoms and suggested steps to correct the problems. See the “Troubleshooting charts” on page 99 for more information.

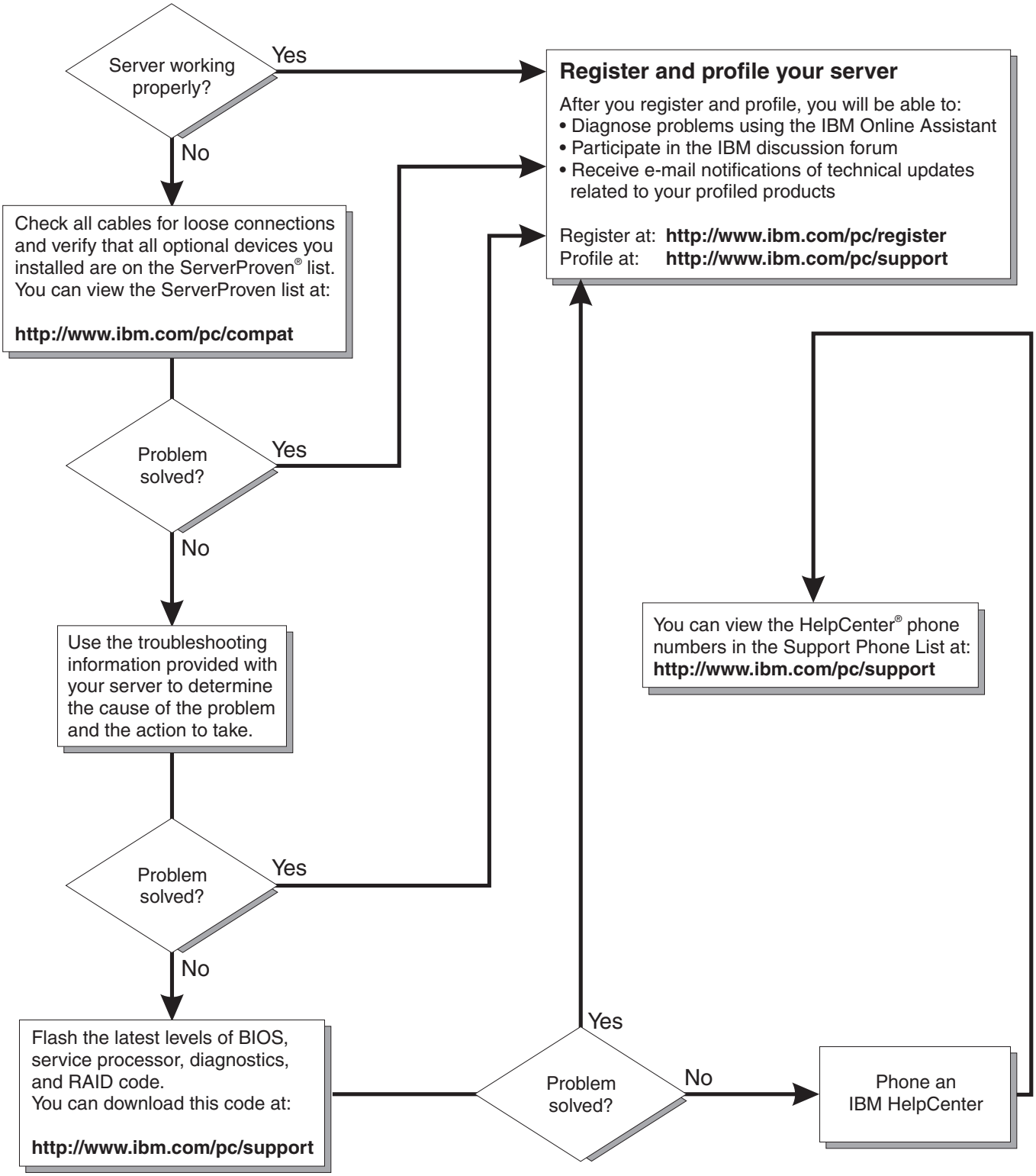
- **Customized support page**

  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, and the first window of your operating system or application program appears.

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 77 for more information.

Notes:

1. If you have a power-on 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

Beep codes are sounded in a series of long and short beeps.

The possible types of beep codes that your server might emit include the following:

No beeps
If no beep occurs after your server completes POST, call for service.

Continuous beep
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 beep
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 beeps
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 77 for descriptions of the text messages that might appear.

Three short beeps
A system-memory error has occurred. This combination occurs only if the video basic input/output system (BIOS) cannot display the error message. Replace the failing memory module.

Repeating short beeps
The system board might contain a failing component, your keyboard might be defective, or a key on the keyboard might be stuck. Ensure that:

- 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.

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.

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.

One long and one short beep
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 beeps
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.

One long and three short beeps
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 beeps
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.

POST beep codes

In addition to the beep codes that are described in “POST beep code descriptions” on page 73, your computer 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.

Table 13. POST beep codes.

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.	

Table 13. POST beep codes.

Beep code	Description	Action
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	Screen initialization 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.	
3-2-2	Parallel port test has failed.	
3-2-4	Comparison of CMOS memory size against actual has failed.	
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.
3-3-2	I2C bus has failed.	Turn off the server and then restart the server. If the problem remains, call for service.
3-3-3	No memory has been detected in the system. **Note:** 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**.	Reseat the memory modules or install a memory module. If the problem remains, call for service.

Table 13. POST beep codes.

Beep code	Description	Action
4-4-4	The I2C cable is attached and the IBM Remote Supervisor Adapter is not installed in PCI slot 2 or not functioning correctly.	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 IBM Remote Supervisor Adapter is installed in PCI slot 2. If it is not, remove IBM Remote Supervisor Adapter from the slot and reinstall it in PCI slot 2. 4. Verify that the IBM Remote Supervisor Adapter is functioning correctly. If it is not, remove it and call for service. If the problem remains, call for service.

POST error messages

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

Table 14. POST error messages.

POST message	Description
062	The server failed to start on three consecutive attempts. All caches are disabled. Repeatedly turning the server on and then off or resetting the server might cause this problem. **Action** Start the Configuration/Setup Utility program and verify that all settings are correct. Use the **Cache Control** selection in the Advanced Setup menu of the Configuration/Setup Utility program to enable the caches. If the problem remains, call for service. When the problem is corrected, be sure to enable the caches.
101 102 106	An error occurred during the system board and microprocessor test. **Action** Call for service.
114	An adapter read-only memory (ROM) error occurred. **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. If you cannot isolate and correct the problem, call for service.
129	An error was detected in the L1 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.
151	A real-time clock (RTC) error occurred. **Action** Call for service.
161	The real-time clock battery has failed. **Action** Replace the battery yourself, or call for service. 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.
162	A change in device configuration occurred. This error occurs under one or more of the following conditions: • 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. **Action** Verify that all external devices are turned on. You must turn on external devices before turning on the server. 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. If you cannot isolate and correct the problem, call for service.

Table 14. POST error messages.

POST message	Description
163	The time of day has not been set. **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. You can use the server until the system is serviced, but any application programs that use the date and time will be affected.
164	A change in the memory configuration occurred. This message might appear after you add or remove memory. **Note:** The server can be used with decreased memory capacity. **Action** 1. If POST error message 289 also occurred, follow the instructions for that error message first. 2. If you just installed or removed memory, run the Configuration/Setup Utility program; then, exit, saving the new configuration settings. If the message appears again, shut down the server, reseat the memory modules, and restart the server. If the problem remains, call for service.
175	A vital product data (VPD) error occurred. **Action** Call for service.
176 177 178	A security hardware error occurred. **Action** Check for indications that someone has tampered with the server. If no one has tampered with the server, 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; that is, the logon data fields are no longer available to the user.

Table 14. POST error messages.

POST message	Description
201	An error occurred during the memory controller test. This error can be caused by: • 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.
301 303	An error occurred during the keyboard and keyboard controller test. These error messages also might be accompanied by continuous beeping. **Action** Ensure that: • 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. 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. **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.
602	Invalid diskette boot record. **Action** 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. If the problem remains, call for service.
604	An error occurred during a diskette drive test. **Action** 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	A diskette drive configuration error occurred. **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. If the problem remains, call for service.

Table 14. POST error messages.

POST message	Description
962	A parallel-port configuration error occurred. **Action** If you changed a hardware option, make sure that the parallel-port setting is correct in the Configuration/Setup Utility program. If the setting is not correct, change it. If the problem remains, call for service.
998	Automatic Restart or AC power restored **Action** None
999	System recovered from backup BIOS **Action** Flash BIOS (for more information refer to “BIOS and Automatic BIOS Recovery” on page 95).
11*xx* (where *xx* is any two-digit number)	An error occurred during the system-board serial port test. **Action** If you have a modem, serial printer, or other serial device attached to your server, verify that the serial cable is connected correctly. If it is, use the following procedure: 1. Turn off the server. 2. Disconnect the serial cable from the serial port. 3. Wait 5 seconds; then, turn on the server. If the POST error message does not reappear, either the serial cable or the device is probably failing. See the documentation that comes with the serial device for additional testing information. If the POST error message reappears, call for service.
1162	The serial port configuration conflicts with another device in the system. **Action** 1. Make sure that the IRQ and I/O port assignments needed by the serial port are available. 2. If all interrupts are being used by adapters, you might need to remove an adapter to make an interrupt available to the serial port, or force other adapters to share an interrupt.
1800	A PCI adapter has requested a hardware interrupt that is not available. **Action** 1. Make sure that the PCI adapter and all other adapters are set correctly in the Configuration/Setup Utility program. If the interrupt resource settings are not correct, change the settings. 2. If all interrupts are being used by other adapters, you might need to remove an adapter to make an interrupt available to the PCI adapter, or force other adapters to share an interrupt.

Table 14. POST error messages.

POST message	Description
1962	No valid startup devices were found. The system cannot find the startup drive or operating system. **Action** Be sure that the drive you want to start from is in the startup sequence. 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? **Yes** Exit from this screen; then, select **Exit Setup** to exit from 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 from the Configuration/Setup menu. Restart the server. 3. Is an operating system installed? **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. If the same error message appears, call for service.
2400	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). **Action** Verify that the monitor is connected correctly to the video connector. If the monitor is connected correctly, call for service.
2462	A video memory configuration error occurred. **Action** Make sure that the monitor cables are correctly and securely connected to the server. If the problem remains, call for service.
5962	An IDE CD-ROM configuration error occurred. **Action** Check the signal and power cable connections to the CD-ROM drive. If the problem remains, call for service.
8603	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. **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. **Action** Ensure that the keyboard and mouse (pointing device) are attached to the correct connectors. If they are connected correctly, use the following procedure: 1. Turn off the server. 2. Disconnect the mouse from the server. 3. Turn on the server. 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. 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.
00012000	Processor machine check. **Action** 1. Update the system BIOS code. 2. If the problem remains, replace the microprocessor.

Table 14. POST error messages.

POST message	Description
00019501	Processor 1 is not functioning. **Action** Replace microprocessor 1. If the problem remains, call for service.
00019502	Processor 2 is not functioning. **Action** Replace microprocessor 2. If the problem remains, call for service.
00019701	Processor 1 failed the built-in self-test. **Action** Replace microprocessor 1. If the problem remains, call for service.
00019702	Processor 2 failed the built-in self-test. **Action** Replace microprocessor 2. If the problem remains, call for service.
00180100	A PCI adapter has requested memory resources that are not available. **Action** 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 in the Start Options menu in the Configuration/Setup Utility. Ensure that the adapter is early in the boot priority order so that it is allocating 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 resource settings are not correct, change the settings. 3. 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 provided with the adapter.
00180200	A PCI adapter has requested an I/O address that is not available, or the PCI adapter might be defective. **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. 2. If the I/O port resource settings are correct, the PCI adapter might be defective. Call for service.
00180300	A PCI adapter has requested a memory address that is not available, or the PCI adapter might be defective. **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. 2. If the memory resource settings are correct, the PCI adapter might be defective. Call for service.
00180400	A PCI adapter has requested a memory address that is not available. **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.

Table 14. POST error messages.

POST message	Description
00180500	A PCI adapter ROM error occurred. **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. If you cannot isolate and correct the problem, call for service.
00180600	A PCI-to-PCI bridge error occurred. More than one PCI bus tried to access memory below 1 MB. **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. If you cannot isolate and correct the problem, call for service.
00180700	*xxxxyyyy* planar PCI device does not respond or disabled by user (where *xxxx* is the PCI vendor ID and *yyyy* is the PCI device ID). **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.
00180800	An unsupported PCI device is installed. **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. If the problem remains, call for service.
00181000	PCI error. **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. If the problem remains, call for service.
01295085	The ECC checking hardware test failed. **Action** Call for service.
01298001	No update data is available for processor 1. **Action** Update the system BIOS code to a level that supports the microprocessors installed in the server.
01298002	No update data is available for processor 2. **Action** Update the system BIOS code to a level that supports the microprocessors installed in the server.
01298101	The update data for processor 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 processor 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.
I9990301	A hard disk drive error occurred. **Action** Call for service.

Table 14. POST error messages.

POST message	Description
I9990305	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.
I9990650	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.

POST error log

The POST error log contains the three most recent error codes and messages that the system generated during POST.

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

Small computer system interface messages

If you receive a SCSI error message, one or more of the following might be causing the problem:

- A failing SCSI device (adapter, drive, controller)
- 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.

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

You will get these messages only when running the SCSISelect Utility.

Diagnostic programs and error messages

The server diagnostic programs are stored in upgradeable 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 *Hardware Maintenance Manual*.)

iii is the three-digit device ID. (These codes are for trained service personnel and are described in the *Hardware Maintenance Manual*.)

date is the date that the diagnostic test was run and the error was 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) shown in the previous list.

Result can be one of the following:

- **Passed** This result occurs when the diagnostic test is completed 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 because of the system configuration.
Warning	This result occurs when a possible problem is reported during the diagnostic test, such as when a device that is to be tested is not installed.

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 interface 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.

When the tests are completed, you can view the test log by selecting **Utility** from the top of the screen.

If the diagnostic tests do not detect a hardware error but the problem remains during normal 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

The test log will not contain any information until after the diagnostic program has run.

Note: If you already are running the diagnostic programs, begin with step 3.

To view the test log:

1. Turn on the server and watch the screen.

   If the server is on, shut down your operating system and restart the server.

2. When the message `F2 for Diagnostics` appears, press F2.

   If a power-on password is set, the server prompts you for it. Type the appropriate password; then, press Enter.

3. When the Diagnostic Programs screen appears, select **Utility** from the top of the screen.

4. Select **View Test Log** from the list that appears; then, follow the instructions on the screen.

   The system maintains the test-log data while the server is powered on. When you turn off the power to the server, the test log is cleared.

Diagnostic error message tables

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

Important: If diagnostic error messages appear that are not listed in the following tables, make sure that your server has the latest levels of BIOS, ServeRAID, and diagnostics microcode installed.

Table 15. Diagnostic error message tables.

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	
014	Parallel port		Integrated parallel 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.	1. Turn off the server. 2. Replace the USB keyboard and mouse with a standard keyboard and mouse. 3. Turn on the server. 4. Run the diagnostic test again. 5. If the test still ends with no USB devices attached, follow Failed action below.
		Failed	System board	Call for service.
020	PCI interface	Failed	System board	Call for service.
030	SCSI interface	Failed	SCSI adapter in slot *n* failed register/counter/ power test (where *n* is the slot number of the failing adapter)	Refer to the information provided with the adapter for instructions. If the problem remains, call for service.
			SCSI controller on system board failed register/counter/power test	Call for service.

Table 15. Diagnostic error message tables.

Code	Function	Result	Text message	Action
035	ServeRAID	Aborted	Test setup error: No ServeRAID adapter found on system board or PCI bus	Make sure that 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 *n*; adapter/drive configuration error (where *n* is the slot number of the failing adapter)	Run the ServeRAID Configuration Utility. If the problem remains, replace the ServeRAID adapter in slot *n*.
			Adapter in slot *n*; internal error (where *n* is the slot number of the failing adapter)	If the problem remains, call for service.
			Logical drive *m* on adapter in slot *n* (where *m* is the number of the failing logical drive and *n* is the slot number of the adapter)	
			On system board; internal error	Run the ServeRAID Configuration Utility. If the problem remains, call for service.
			On system board; adapter/drive configuration error	
			Logical drive on system board adapter	
			Adapter in slot *n*; memory allocation error (where *n* 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 *n*; POST error (where *n* is the slot number of the failing adapter)	Replace the ServeRAID adapter in slot *n*. If the problem remains, call for service.
			Adapter in slot *n*; PCI configuration error (where *n* is the slot number of the failing adapter)	
			SCSI drive on adapter in slot *n*, SCSI ID *m* (where *n* is the slot number of the adapter and m 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 15. Diagnostic error message tables.

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)	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. If the problem remains, call for service.
			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)	1. Reseat the microprocessor. 2. If the problem remains, replace the microprocessor. If the problem remains, call for service.
			Processor in socket id *xyz* is defective (where *xyz* identifies the microprocessor that is causing the error message)	Replace the microprocessor. If the problem remains, call for service.
			Test setup error: Application microprocessor not installed or BIOS setup problem	1. Verify that the application microprocessor is installed and seated correctly. 2. If your server does not have the latest level BIOS code installed, update the BIOS code. 3. If the problem remains, replace the application microprocessor and run the test again. If the problem remains, call for service.
	Microprocessor	Failed	VRM corresponding to Microprocessor in socket *xyz* is defective (where *xyz* identifies the microprocessor whose VRM is causing the error message)	Replace the VRM. If the problem remains, call for service.
			VRM corresponding to Microprocessor in socket id *xyz* is not installed (where *xyz* identifies the microprocessor whose VRM is causing the error message)	Install a VRM. If the problem remains, call for service.

Table 15. Diagnostic error message tables.

Code	Function	Result	Text message	Action
166	System Management	Failed	I2C cable is disconnected. Reconnect I2C cable between ASM adapter and system board.	Reseat I2C cable between Advanced System Management adapter (in PCI slot 2/J31) and system board (J32). If the problem remains, call for service.
			Unable to communicate with ASM adapter. It may be busy. Run the test again. Communication with the ASM adapter has failed. Unable to restart Advanced System Management adapter. Restart ASM Error. After restarting, ASM communication was lost. Unplug & cold boot to reset ASM.	1. Rerun the diagnostic test. 2. Disconnect all server and option power cords from server, wait 30 seconds, reconnect, and retry. 3. Reseat Advanced System Management adapter. If the problem remains, call for service.
			I2C Bus Error(s). See System Error/Event Log for details from both ASMPROC and DIAGS messages.	1. Disconnect all server and option power cords from server, wait 30 seconds, reconnect, and retry. 2. Reseat I2C cables between: a. Advanced Systems Management adapter (in PCI slot 2/J31) and planar (J32) b. DASD I2C on system board (J43) and Yugo DASD backplane if installed. 3. Reseat Advanced System Management adapter (in PCI slot 2/J31). If the problem remains, call for service.
			BIOS indicates ASM is unreachable. Ensure ASM adapter is properly seated in its supported slot.	Reseat Advanced System Management adapter in PCI slot 2/J31. If the problem remains, call for service.
			Advanced System Management BIST indicate failed tests.	1. Ensure latest firmware levels for ASM and BIOS. 2. Disconnect all server and option power cords from server, wait 30 seconds, reconnect, and retry. 3. Reseat Advanced System Management adapter (in PCI slot 2/J31). If the problem remains, call for service.

Table 15. Diagnostic error message tables.

Code	Function	Result	Text message	Action
175	System thermal	Failed	Fan # *n* (where *n* is the number of the failing fan)	Replace the indicated fan.
			Temperature sensed on processor board is out of range	Call for service.
180	Status display	Failed	Any failure message	Call for service.
201	System memory	Failed	DIMMs in location DIMM *n* (where *n* 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	
202	System 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)	1. If your server does not have the latest level BIOS code installed, update the BIOS code to the latest level 2. Run the diagnostic program again. 3. If the problem remains, replace the failing processor. If the problem remains, call for service.
			Test setup error: Unknown hardware problem associated with microprocessor in socket id *xyz.* (where *xyz* identifies the microprocessor that is causing the error message)	
		Failed	Microprocessor in socket ID *xyz* (where *xyz* identifies the microprocessor that is causing the error message)	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 cache. If the problem remains, call for service.
206	Diskette drive	Failed	Internal diskette drive bay	Call for service.

Table 15. Diagnostic error message tables.

Code	Function	Result	Text message	Action
215	CD-ROM	Failed	On system board.	Call for service.
		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.
217	Hard disk drive	Failed	BIOS drive # *n* (where n is the drive bay number)	Call for service.
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 *n* on adapter *m* (where *n* is the number of the device and *m* 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 *n* on adapter *m.* (where *n* is the number of the device and *m* is the adapter number)	
			The unload/eject test failed for device *n* on adapter *m* (where *n* is the number of the device and *m* is the adapter number)	
			The unload/eject push button test failed for device *n* on adapter *m* (where *n* is the number of the device and *m* is the adapter number)	
			The Read/Write Self-diagnostic failed for device *n* on adapter *m* (where *n* is the number of the device and *m* is the adapter number)	Insert a new tape cartridge; then, run the diagnostic test again. Refer to the information that is provided with the tape drive. If the problem remains, call for service.
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.

Table 15. Diagnostic error message tables.

Code	Function	Result	Text message	Action
405	Ethernet	Failed	In PCI slot *n* (where *n* is the PCI slot number in which the failing Ethernet adapter is installed)	Replace the Ethernet adapter in slot *n*. If the problem remains, call for service.
			On system board	Call for service.
415	Analog/digital modem	Not applicable	No modem was detected	1. Verify that the modem is properly attached to the server. 2. If the problem remains, replace the modem. If the problem remains, call for service.
			PCI modem detected but not enabled	1. Change the configuration to enable the modem. 2. If the problem remains, replace the modem. If the problem remains, call for service.
		Failed	Modem reset failed	Replace the modem. If the problem remains, call for service.
			No dialtone detected	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. If the problem remains, call for service.

BIOS and Automatic BIOS Recovery

Your server has a primary and secondary BIOS page, which are used to start your server. The server normally starts using the primary BIOS page. However, this page might become damaged if power is lost during a flash update or by some other problem. When this occurs, the system is restarted using the secondary BIOS page. In this section you will find the information on the feature that performs this action and the instructions for recovering the primary BIOS code.

Automatic BIOS Recovery

The Automatic BIOS Recovery (ABR) feature allows the system to start when the primary BIOS is damaged (for example, if the BIOS is damaged when the server loses power during the flash update) by using a backup or secondary BIOS page. When this occurrs, the system is restarted using its default settings and the following POST message is displayed on the screen:

ABR caused boot from backup POST/BIOS image

>> BIOS Version 1.00 <<

Primary BIOS needs to be flashed.

Recovering the BIOS code

If the BIOS code has become damaged, you can recover the primary BIOS code using a BIOS flash diskette.

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/, select **IBM Server Support**, and make the selections for your server.
- Contact your IBM service representative.

To recover the BIOS code, do the following:

1. Shutdown the server.
2. Insert the BIOS flash diskette into the diskette drive.
3. Restart the server. The system begins the power-on self-test (POST).
4. Follow the instructions on the screen to update the BIOS code.
5. Remove the diskette and restart the server when the flash update is complete.

Identifying problems using status LEDs

Your server has LEDs to help you identify problems with some server components. These LEDs are part of the diagnostics that are built into the server. Use the illuminated LEDs to identify the failing or incorrectly installed components.

Front panel and system board LEDs

The system-error LED is on the front panel inside the server. All of the remaining error LEDs are on the system board, adjacent to the failing components. See “Diagnostic LEDs” on page 97 for information on identifying problems using these LEDs.

The meanings of these LEDs are as follows:

CPU 1	Microprocessor number 1 (connector U12) fault
CPU 2	Microprocessor number 2 (connector U11) fault
Fan 1	Fan number 1 (connector J10) failure (see note 1)
Fan 2	Fan number 2 (connector J18) failure (see note 1)
Fan 3	Fan number 3 (connector J3) failure (see note 1)
Fan 4	Fan number 4 (connector J2) failure (see note 1)
DIMM 1	DIMM number 1 (connector DIMM 1) fault
DIMM 2	DIMM number 2 (connector DIMM 2) fault
DIMM 3	DIMM number 3 (connector DIMM 3) fault
DIMM 4	DIMM number 4 (connector DIMM 4) fault
VRM 1	Microprocessor VRM number 1 (connector J42) fault (see note 1)
VRM 2	Microprocessor VRM number 2 (connector J12) fault (see note 1)

Notes:

1. The fan and VRM LEDs will be illuminated only if the IBM Remote Supervisor Adapter is installed in the server.
2. The server does not support user-replaceable power supplies or fans.

Diagnostic LEDs

You can use the diagnostic LEDs built into your server to quickly identify the type of system error that occurred. Your server is designed so that LEDs remain illuminated when the server shuts down, provided that the power supplies are operating properly. This feature helps you to isolate the problem if an error causes the server to shut down.

Table 16. Diagnostic LEDs.

System Error LED (front panel)	System board LED	Cause	Action
On A system error was detected. Check to see which of the LEDs on the system board are on.	None	The system error log is 75% or more full or a Predictive Failure Analysis® (PFA) alert was logged. This also could be caused by a microprocessor thermal problem.	Check the system error log and correct any problems. See "Choices available from the Configuration/Setup main menu" on page 12 for information about clearing the error log. Disconnecting the server from all power sources for at least 20 seconds will turn off the system error LED. Check mounting of the processor fan sinks.
On	DIMM 1, DIMM 2, DIMM 3, or DIMM 4	A memory error occurred.	1. Check the DIMM error LEDs on the system board. 2. Replace the DIMM indicated by the lit DIMM error LED.
On	CPU 1 or CPU 2	One of the microprocessors has failed, or a microprocessor is installed incorrectly.	1. Check the microprocessor error LEDs on the system board. If a microprocessor error LED is on for a microprocessor connector that has a terminator card installed instead of a microprocessor, the microprocessors are not installed in the correct order. See "Installing and removing a microprocessor" on page 55 for information about the correct order for installing microprocessors. Otherwise, continue with the next step. 2. Turn off the server, reseat the microprocessor indicated by the lit microprocessor error LED, and restart the server. 3. If the problem remains, replace the microprocessor. If the problem remains, have the system serviced.
On	Fan 1, Fan 2, Fan 3, or Fan 4	One of the fans has failed or is operating too slowly.	The LED on the failing fan will be lit. Contact an IBM service technician to replace the fan.

Table 16. Diagnostic LEDs.

System Error LED (front panel)	System board LED	Cause	Action
On	VRM 1 or VRM 2	One of the microprocessor VRMs has failed, or a microprocessor VRM is installed in the wrong connector.	1. Check the microprocessor VRM error LEDs on the system board. If a microprocessor VRM error LED is on for a microprocessor VRM connector that has a terminator card installed instead of a microprocessor, the microprocessor VRMs are not installed in the correct order. See “Installing and removing a microprocessor” on page 55 for information about the correct order for installing microprocessor VRMs. Otherwise, continue with the next step. 2. Turn off the server, reseat the microprocessor VRM indicated by the lit microprocessor VRM error LED, and restart the server. 3. If the problem remains, replace the microprocessor VRM. If the problem remains, have the system serviced.
Off	None	The diagnostic LEDs have not detected a system error.	None

Troubleshooting charts

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

Important: If diagnostic error messages appear that are not listed in the following tables, make sure that your server has the latest levels of BIOS, ServeRAID, and diagnostics microcode installed.

See “Starting the diagnostic programs” on page 86 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 17. Troubleshooting charts.

Device	Suggested action
CD-ROM drive	Verify that: • The primary IDE channel is enabled in the Configuration/Setup Utility program. • All cables and jumpers are installed correctly. • The correct device driver is installed for the CD-ROM drive.
CD-ROM drive is not recognized.	
Diskette drive	If there is a diskette in the drive, verify that: • The diskette drive is enabled in the Configuration/Setup Utility program. • The diskette is good and not damaged. (Try another diskette if you have one.) • The diskette contains the necessary files to start the system. • 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.
Diskette drive in-use light stays on, or the system bypasses the diskette drive.	
Other devices	Call for service.
Problems such as broken cover locks or indicator lights not working.	
Intermittent problems	Verify that: • All cables and cords are connected securely to the rear of the system and attached options. • When the system is turned on, air is flowing from the rear of the system at the fan grille. If there is no airflow, the fan is not working. This causes the system to overheat and shut down. • 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.	

Table 17. Troubleshooting charts.

Device	Suggested action
Keyboard, mouse, or pointing-device All or some keys on the keyboard do not work.	• Make sure that the keyboard cable is properly connected to the system. • Make sure that the system and the monitor are turned on. • Try using another keyboard. If the problem remains, call for service.
The mouse or pointing device does not work.	• Verify that the mouse or pointing-device cable is securely connected and the device drivers are installed correctly. • Try using another mouse or pointing device. If the problem remains, call for service.
USB keyboard, mouse, or pointing-device All or some keys on the keyboard do not work.	• Make sure that the keyboard USB cable is properly connected to the system. • Make sure that the system and the monitor are turned on. • Ensure that the USB mouse and keyboard support are enabled in BIOS. • Try using another keyboard. If the problem remains, call for service.
The mouse or pointing device does not work.	• Make sure that the mouse or pointing-device USB cable is properly connected to the system. • Make sure that the system and the monitor are turned on. • Ensure that the USB mouse and keyboard support are enabled in BIOS. • Try using another mouse or pointing-device. If the problem remains, call for service.
Memory The amount of memory displayed is less than the amount of memory installed.	Verify that: • The memory modules are seated properly. • You have installed the correct type of memory. • If you changed the memory, you must update the memory configuration with the Configuration/Setup Utility program. • All banks of memory on the DIMMs are enabled. The system might have automatically disabled a DIMM bank if it detected a problem, or a DIMM bank could have been manually disabled. If you still cannot find the problem, call for service.
Monitor The monitor works when you turn on the system, but goes blank when you start some application programs.	Verify that: • The primary monitor cable is connected to the video port. • You installed the necessary device drivers for the applications. Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, refer to the information that comes with the monitor for adjusting and testing instructions. If the items above are correct and the screen remains blank, call for service.
The screen is blank.	Verify that: • The system power cord is plugged into the server and a working electrical outlet. • The monitor cables are connected properly. • The monitor is turned on and the brightness and contrast controls are adjusted correctly. If the items above are correct and the screen remains blank, call for service.
Only the cursor appears.	Call for service.

Table 17. Troubleshooting charts.

Device	Suggested action
Wavy, unreadable, rolling, distorted screen, or screen jitter.	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. **Notes:** 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, contact your IBM reseller or IBM marketing representative. If the problem remains, call for service.
Wrong characters appear on the screen.	If the wrong language is displayed, update the BIOS code with the correct language. If the problem remains, call for service.
Option	Verify that: • The option is designed for the server. Refer to the "Server Support" flowchart for information about obtaining ServerProven compatibility information from the World Wide Web. • You followed the installation instructions that came with the option. • The option is installed correctly. • You have not loosened any other installed options or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. If the problem remains, call for service.
An IBM option that was just installed does not work.	
An IBM option that used to work does not work now.	Verify that all of the option hardware and cable connections are secure. If the option comes with its own test instructions, use those instructions to test the option. If the failing option is a SCSI option, verify that: • The cables for all external SCSI options are connected correctly. • The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • All external SCSI options are turned on. You must turn on external SCSI options before turning on the server. If the problem remains, call for service.
Power	Verify that: • The power cables are properly connected to the server. • The electrical outlet functions properly. • The type of memory installed is correct. • If you just installed an option, remove it, and restart the server. If the server now turns on, you might have installed more options than the power supply supports. If the problem remains, call for service.
The system does not power on.	

Table 17. Troubleshooting charts.

Device	Suggested action
Serial port The number of serial ports identified by the operating system is less than the number of serial ports installed.	Verify that: • Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports is disabled. • The serial-port adapter, if you installed one, is seated properly. If the problem remains, call for service.
A serial device does not work.	Verify that: • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. If the problem remains, call for service.
Software Suspected software problem.	To determine if problems are caused by the software, verify that: • Your system 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. • The software is designed to operate on your system. • Other software works on your system. • The software that you are trying to use works on another system. 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. If the items above are correct and the problem remains, contact your place of purchase.
Universal Serial Bus (USB) ports A USB device does not work.	Verify that: • 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 the USB device might not work during POST. • The correct USB device driver is installed. • Your operating system supports USB devices. If the problem remains, call for service.

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 18. Ethernet troubleshooting chart.

Ethernet controller problem	Suggested action
The server stops running when loading device drivers.	The PCI BIOS interrupt settings are incorrect. Check the following: • Determine if the IRQ setting assigned to the Ethernet controller is also assigned to another device in the Configuration/Setup Utility program. 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. • Make sure that you are using the most recent device driver available from the World Wide Web. • Run the network diagnostic program. If the problem remains, call for service.
The LAN activity light does not light (when available).	Check the following: • 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.	Check the following: • 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.	Check the following: • Make sure that the cable is connected to the Ethernet controller. • Make sure that your PCI system BIOS 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. 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 adapter or the other device. If the problem remains, call for service.
The Ethernet controller stopped working without apparent cause.	Check the following: • 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. If the problem remains, call for service.

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 NT)

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 19. NetWare driver messages for the Ethernet controller.

Message	Description
Couldn't allocate resources.	**Explanation:** An unknown error has occurred when trying to allocate needed resources for the AFT Module. **Action:** • Check the system configuration. If the problem remains, contact your network supplier. • Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.
AFT group for primary adapter in slot *nnn* already exists.	**Explanation:** An attempt was made to rebind an adapter already in an AFT group. **Action:** Check the AFT slot numbers for existing AFT teams. If the problem remains, contact your network supplier.
Error locating device control table (DCT) addresses in internal table. Make sure that you have loaded LAN drivers after loading AFT.NLM.	**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. **Action:** Load the device driver for the supported adapter and try loading the AFT module again. If the problem remains, contact your network supplier.
Insufficient number of arguments specified.	**Explanation:** The appropriate or expected number of parameters was not entered in a command. **Action:** Check the parameters required for the given command. If the problem remains, contact your network supplier.
Duplicate slot numbers detected.	**Explanation:** An attempt has been made to bind the same slot number more than once. **Action:** Check the slot numbers entered during the bind. Adapter slot numbers must be valid and unique. If the problem remains, contact your network supplier.
'*xxx*' is not supported for AFT team.	**Explanation:** A bind command has been issued for adapters not supported by AFT.NLM. **Action:** Make sure that you attempt to bind only adapters supported by AFT.NLM.
Primary and Secondary adapters do not match. AFT group is not created.	**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. **Action:** Verify that all the adapters bound in a team are of the same classification.
Requested number of Secondary cards are not found.	**Explanation:** The number of adapters specified in the bind command could not be located. **Action:** Verify the numbers and slot locations of the adapters to be bound. If the problem remains, contact your network supplier.

Table 19. NetWare driver messages for the Ethernet controller.

Message	Description
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.	**Explanation:** Binding of protocol failed. Protocol is either not bound to any adapter or is bound to more than one adapter in the group. **Action:** Ensure that the protocol is bound to only one adapter in an AFT team.
Error identifying slot numbers for the specified board names.	**Explanation:** The mapping between the board name entered and the slot number for an adapter could not be established. **Action:** Check the board name for the adapter before issuing the bind command. If the problem remains, contact your network supplier.
Can't unbind specified slot from AFT group. Make sure that the slot you specified is for the primary adapter in an AFT group.	**Explanation:** The number entered in the unbind command was not the primary adapter in an AFT group. **Action:** Reissue the unbind command and specify the slot number for the primary adapter.
LAN adapter at slot *nnnn* (Port 0x*aa*) failed to reset. Check the state of the adapter.	**Explanation:** The adapter that you specified could not be initialized. **Action:** 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. If the problem remains, contact your network supplier.
AFT is not supported on this version of NetWare.	**Explanation:** The NetWare operating system on your system is not a version supported by AFT. **Action:** Load and bind AFT only on supported versions of NetWare (currently version 4.11 and above).
Failed to allocate resources tags.	**Explanation:** An unknown error has occurred when trying to allocate needed resources for the AFT module. **Action:** Check system configuration. If the problem remains, contact your network supplier.
Please unload all LAN drivers before unloading AFT.NLM.	**Explanation:** An attempt was made to unload the AFT.NLM module before unloading the adapter driver. **Action:** Unload the adapter driver before unloading the AFT module.

NDIS 4.0 (Windows NT) 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 20. NDIS (Windows NT) driver messages for the Ethernet controller.

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

Table 20. NDIS (Windows NT) driver messages for the Ethernet controller.

Error code (hex)	Description
0x16	**Explanation:** Single adapter found, but multiple instances tried to load. **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.
0x17	**Explanation:** Slot parameter not specified in the registry. **Action:** Remove the adapter driver and reinstall it. If the problem remains, call for service.
All other 4-character hexadecimal codes	**Action:** Call for service.

Ethernet teaming messages: This section displays the messages associated with Ethernet teaming.

Table 21. NDIS (Windows NT) driver teaming messages for the Ethernet controller.

Event ID	Type	Description
01	Error	**Explanation:** Team name and physical adapter name are the same. This is an invalid configuration. **Action:** Reconfigure the adapter team by double-clicking the **PROSet** icon in the control panel.
02	Error	**Explanation:** Unable to allocate required resources. **Action:** Free some memory resources and restart.
03	Error	**Explanation:** Unable to read required registry parameters. **Action:** Reconfigure the adapter team by double-clicking the **PROSet** icon in the control panel.
04	Error	**Explanation:** Unable to bind to physical adapter. **Action:** Reconfigure the adapter team by double-clicking the **PROSet** icon in the control panel.
05	Error	**Explanation:** Unable to initialize an adapter team **Action:** Reconfigure the adapter team by double-clicking the **PROSet** icon in the control panel.
06	Informational	**Explanation:** Team *nn*. Primary adapter is initialized. **Action:** None.
07	Informational	**Explanation:** Team *nn*. Secondary adapter is initialized. **Action:** None.
08	Informational	**Explanation:** Team *nn*. Virtual adapter or team is initialized. **Action:** None.
09	Informational	**Explanation:** Team *nn*. Primary adapter is switching over. **Action:** None.
10	Warning	**Explanation:** Team *nn*. Adapter link down. **Action:** Make sure the adapter is functioning properly.
11	Informational	**Explanation:** Team *nn*. Secondary adapter took over. **Action:** None.
12	Warning	**Explanation:** Team *nn*. 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 *nn*. Secondary adapter has rejoined the team. **Action:** None.
14	Informational	**Explanation:** Team *nn*. Secondary adapter link is up. **Action:** None.

Table 21. NDIS (Windows NT) driver teaming messages for the Ethernet controller.

Event ID	Type	Description
15	Error	**Explanation:** Team *nn*. 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 *nn*. An adapter has reestablished the link. Network connection has been restored. **Action:** None.
17	Informational	**Explanation:** Team *nn*. Preferred primary adapter has been detected. **Action:** None.
18	Informational	**Explanation:** Team *nn*. Preferred secondary adapter has been detected. **Action:** None.
19	Informational	**Explanation:** Team *nn*. Preferred primary adapter took over. **Action:** None.
20	Informational	**Explanation:** Team *nn*. Preferred secondary adapter took over. **Action:** None.
21	Warning	**Explanation:** Team *nn*. 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

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

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

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

Statement 2

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

Do not:

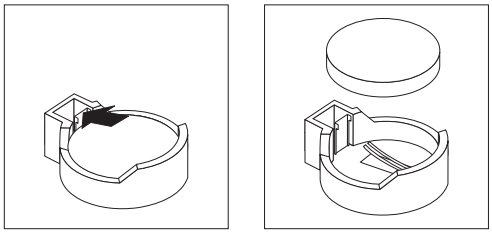
- **Throw or immerse into water.**
- **Heat to more than 100 C (212 F)**
- **Repair or disassemble**

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

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

Do the following to replace the battery:

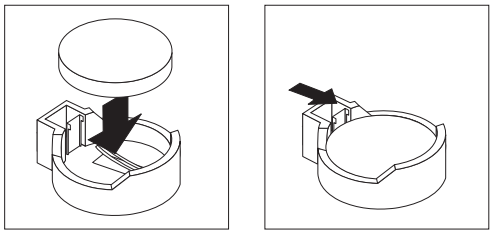
1. Follow any special handling and installation instructions supplied with the replacement battery.
2. Turn off the computer and all attached devices, and disconnect power cords and then all external cables; then remove the server cover.
3. Do the following to remove the battery:
   a. Use one fingernail to press the top of the battery clip away from the battery. The battery pops up when released.
   b. Use your thumb and index finger to lift the battery from the socket.



4. Do the following to insert the new battery:

a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.

b. Press the battery down into the socket until it clicks into place. Make sure the battery clip holds the battery securely.



5. Replace the cover and connect all device and signal cables, and then connect power cords.
6. Turn on the system.
7. Start the BIOS Setup Utility program and set configuration parameters.
   - Set the system date and time.
   - Set passwords if necessary.
   - Save the configuration.

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.ibmlink.ibm.com/public/applications/publications/cgibin/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 hardware 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 time will vary depending on the number and complexity of incoming calls.

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

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	02-482 9202
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, contact your IBM reseller or IBM marketing representative.

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.

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

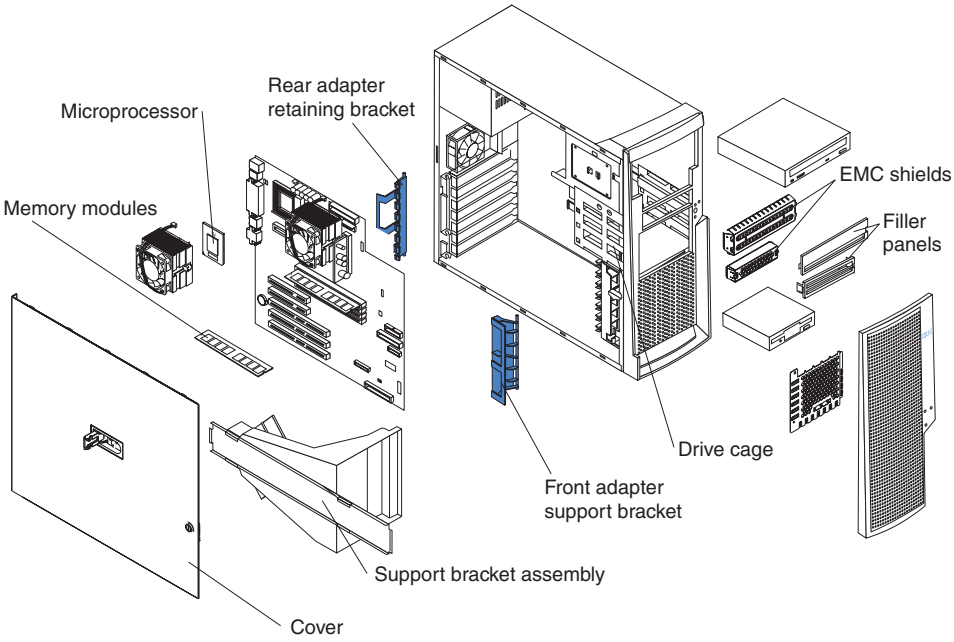
Chapter 5. Installing options

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

Major components of the xSeries 220 server

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

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

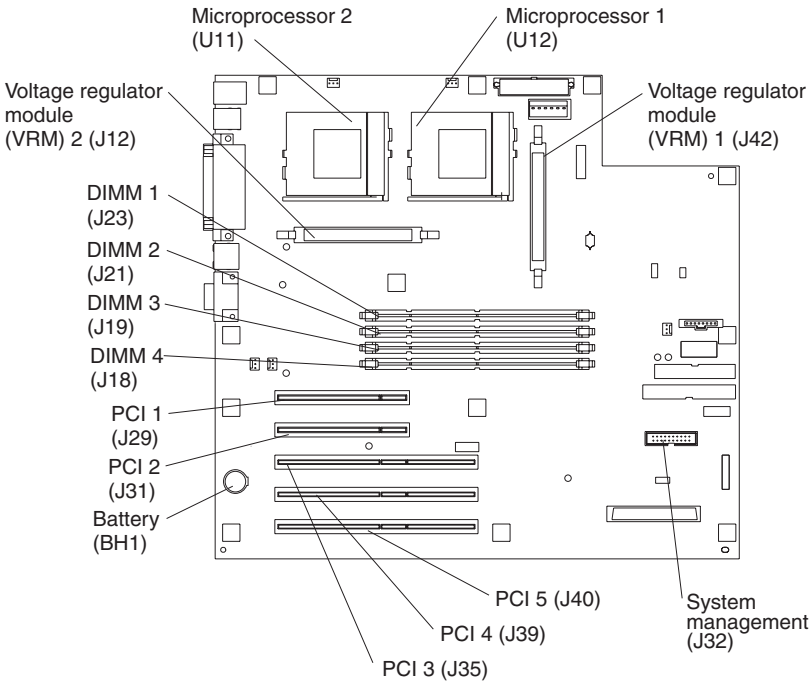


System board

The illustrations in the following sections show the components on the system board.

System-board option connectors

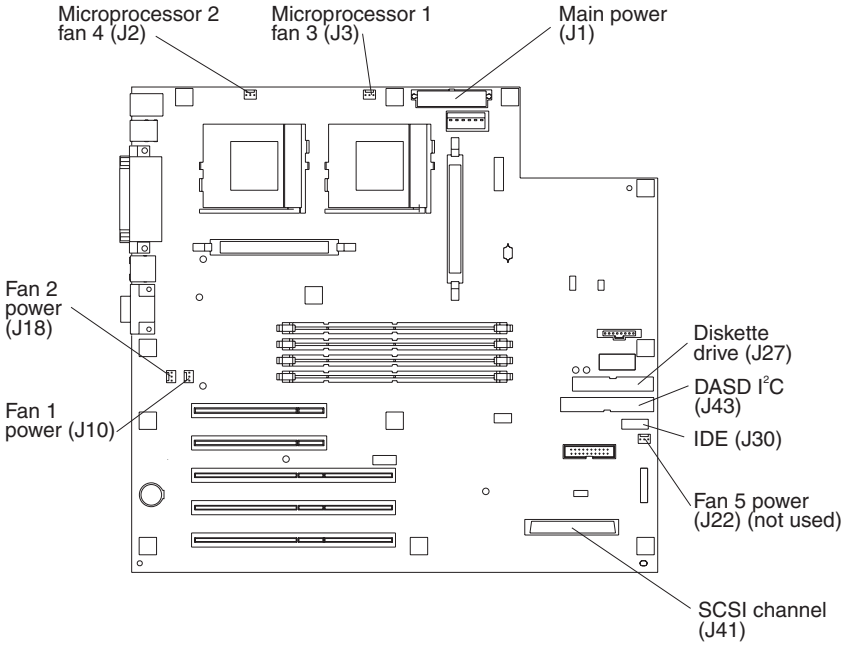
The following illustration identifies system-board connectors for user-installable options.



Note: If your server and operating system support system-management functions, and if the IBM Remote Supervisor Adapter is installed in your server, the system-management connector (J32) is dedicated for use by the Remote Supervisor Adapter.

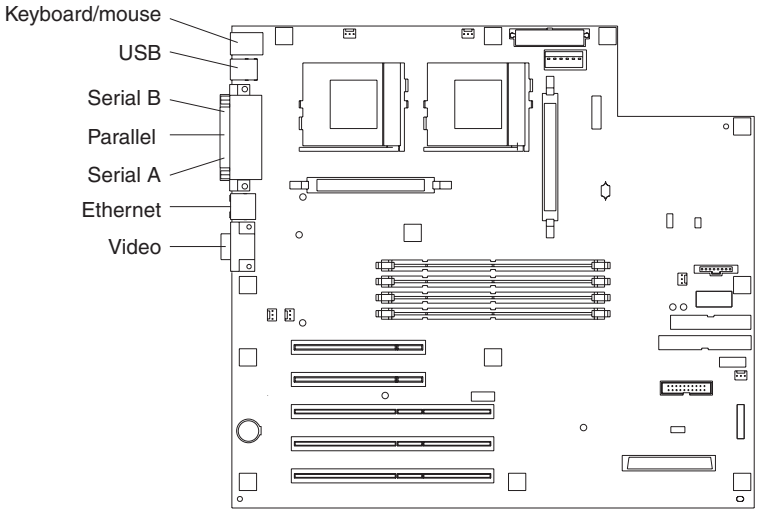
System-board internal cable connectors

The following illustration identifies system-board connectors for internal cables.



System-board external port connectors

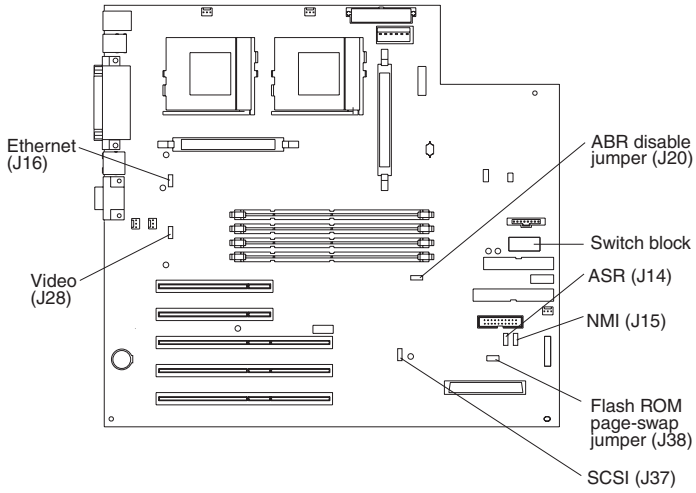
The following illustration identifies the external port connectors on the rear of the server.



Note: For information on adding external SCSI devices to your server, see “SCSI cabling requirements” on page 66.

System-board jumpers and switches

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



System-board jumper blocks

Any jumper blocks on the system board that are not shown in the illustration are reserved. For normal operation of the system, the default jumpers shown in the following table should be installed. To disable the functions listed in the table, install a jumper (except for J38).

Jumper	Description	Default
J14	Automatic Server Restart (ASR)	No jumper
J15	Forces an NMI signal	No jumper
J16	On-board Ethernet controller	No jumper
J20	Automatic BIOS Recovery (ABR)	No jumper
J28	On-board Video controller	No jumper
J33	Reserved	
J37	On-board SCSI controller	No jumper
J38	Flash ROM page jumper	Jumper pins 2 and 3

Table 3. Jumper descriptions.

Flash ROM

Flash ROM page jumper J38 determines whether primary or secondary (backup) POST/BIOS code is used by the system to start up. The default setting for J38 is a jumper between pins 2 and 3 (primary POST/BIOS). For secondary POST/BIOS, place a jumper between pins 1 and 2 of J38. Changing the jumper position after system power-on is not permitted, it may cause unpredictable problems.

Automatic Server Restart (ASR)

To enable Automatic Server Restart a special device driver must be loaded. This device driver enables the ASR watch-dog timer and then periodically resets it (within 5 minutes). If not reset, the ASR watch-dog timer will expire and boot the system. The watch-dog timer will re-arm itself after reset. To disable the ASR hardware, a jumper must be installed between pins 1 and 2 of J14. The default is no jumper installed (ASR enabled).

System-board switch block

The switch block contains microswitches 1 through 8. As pictured in the previous illustration, switch 8 is at the right of the switch block, and switch 1 is at the left.

The following table describes the function for each switch. The default setting is Off for all switches in the switch block.

Switch number	Switch description
8	Power-on password-override switch When toggled to the side that is opposite the default position, bypasses the power-on password, if one is set.
7	Reserved
6	Reserved
5	Force power on
4	Reserved
3	Reserved
2	Reserved
1	Reserved

Table 4. Switches 1 through 8.

Before you begin

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

- Become familiar with the safety and handling guidelines under “Handling static-sensitive devices” on page 32, and read the safety statements in “Safety information” on page 33. These guidelines will help you work safely while working with your server or options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other 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/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.
- The cover is in place during normal operation.

- There is space around the server to enable the server cooling system to work properly. Leave approximately 127 mm (5 in.) of space around the front and rear of the server.
- Cables for optional adapters are routed according to the instructions that are provided with the adapters.
- A failed fan is replaced immediately.

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. Do not place the device on your system-unit cover or on a metal table.
- Take additional care when handling devices during cold weather, because heating reduces indoor humidity and increases static electricity.

Safety information

Before installing this product, read the Safety Information.

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 pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

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

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1

Danger

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

To avoid a shock hazard:

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

To connect:	To disconnect:
1. Turn everything OFF. 2. First, attach all cables to devices. 3. Attach signal cables to connectors. 4. Attach power cords to outlets. 5. Turn device ON.	1. Turn everything OFF. 2. First, remove power cords from outlets. 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:

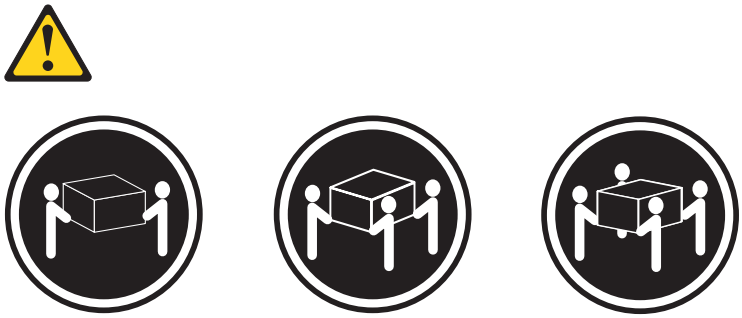
- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous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

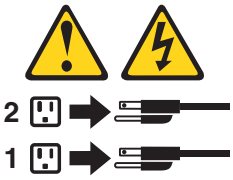


≥18 kg (39.7 lbs) ≥32 kg (70.5 lbs) ≥55 kg (121.2 lbs)

CAUTION:
Use safe practices when lifting.

Statement 5

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



Statement 8

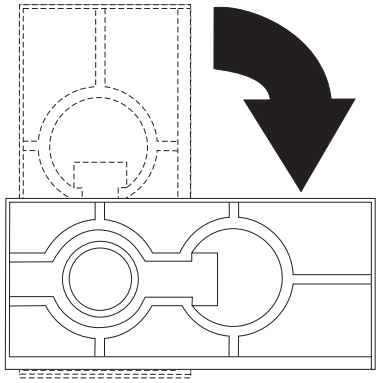
CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

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

Rotating the stabilizing feet

The feet attached to the bottom cover rotate 90 degrees to provide additional stability for your server.

Place the server in an upright position; then, rotate the feet a quarter turn away from the server. Carefully position the server on its feet.

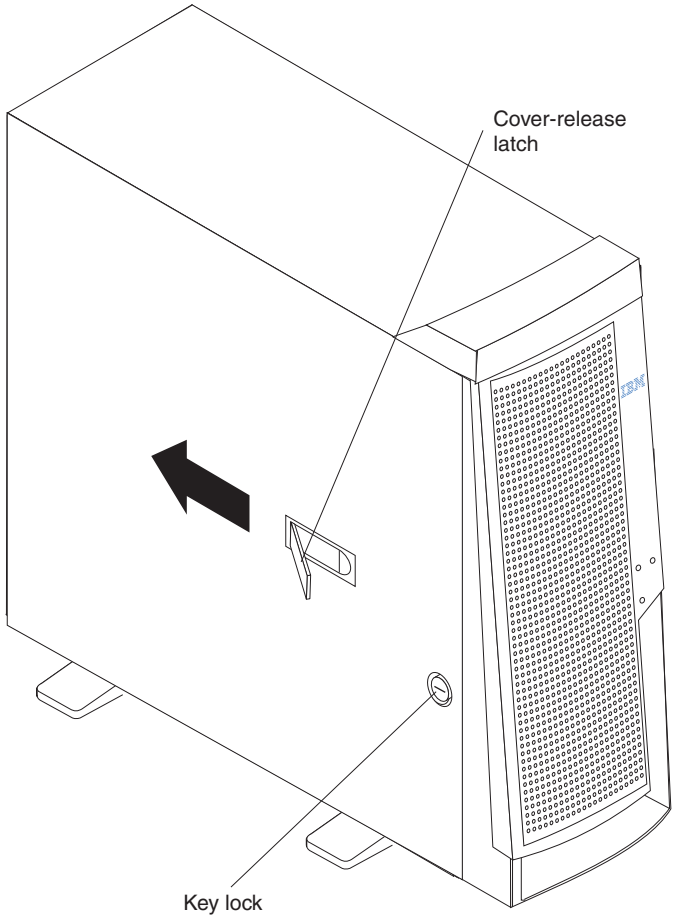


When you need to access the inside of the server to install options, you might find it easier to place the server on its side, so that the system board is facing you. If you do so, rotate the feet in towards the server, so that they do not break off due to the weight of the server.

Removing the side cover

The following information describes how to remove the side cover.

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

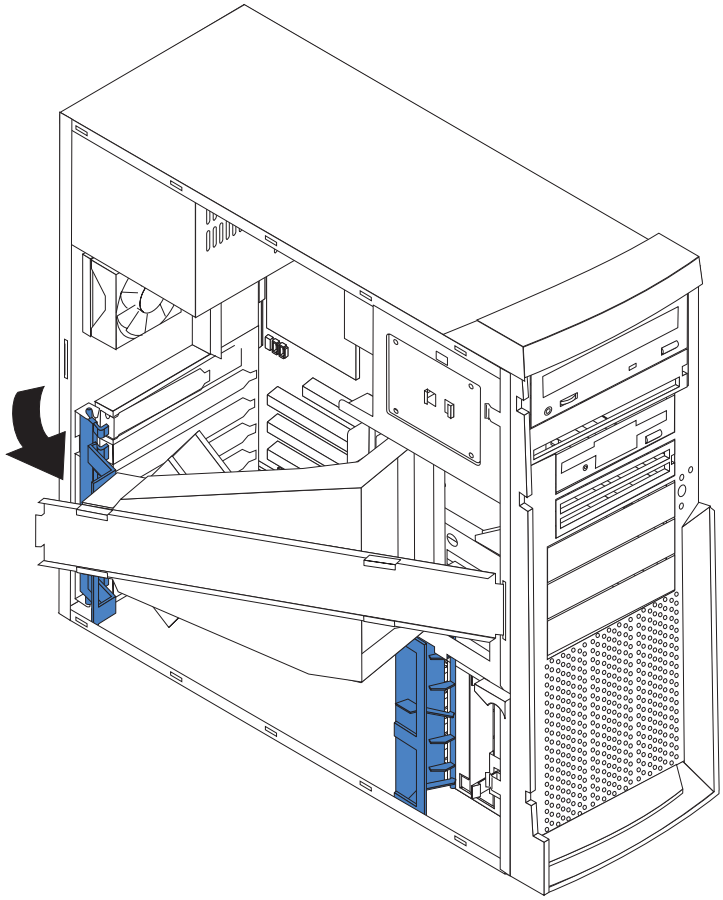


To remove the side cover from the server, do the following:

1. Review the information in “Before you begin” on page 31.
2. Turn off the server and all attached devices, and disconnect power cords and then all external cables.
3. If necessary, unlock the server cover.
4. Rotate the stabilizing feet on the bottom of the server, and place the server on its side to install or remove components (see “Rotating the stabilizing feet” on page 39).
5. Pull out on the cover-release latch; then, slide the cover toward the rear of the server and remove it.

Removing the support-bracket assembly

When working with some options such as hard disk drives and microprocessors, you must first remove the support-bracket assembly to access the location of the option. The support-bracket assembly consists of a support bracket, an air baffle, and a fan.



To remove the support-bracket assembly, do the following:

1. Review the safety precautions in “Safety information” on page 33.
2. Turn off the server and all attached devices and disconnect all power cords; then, disconnect all external cables.
3. Remove the side cover (see “Removing the side cover” on page 40 for details).
4. Disconnect the fan cable (connector J10) from the system board. (See “System-board internal cable connectors” on page 29 for connector locations.)

   Note: Remember to reconnect this cable after you reinstall the support-bracket assembly.
5. Carefully pull up on the end of the support-bracket assembly that is closer to the rear of the server; then, rotate and lift the support-bracket assembly out of the server.
6. Store the support-bracket assembly in a safe place.

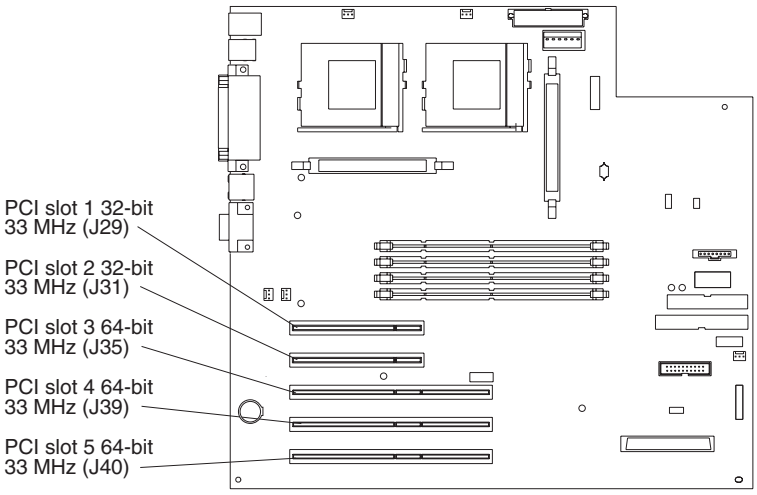
Working with adapters

You can install up to five peripheral component interconnect (PCI) adapters in the PCI slots on the system board of your server. See the xSeries 220 ServerProven list at http://www.ibm.com/pc/compat/ for a list of PCI adapters that your server supports.

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

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

The following illustration shows the location of the PCI slots on the system board.



Adapter considerations

Before you install adapters, review the following:

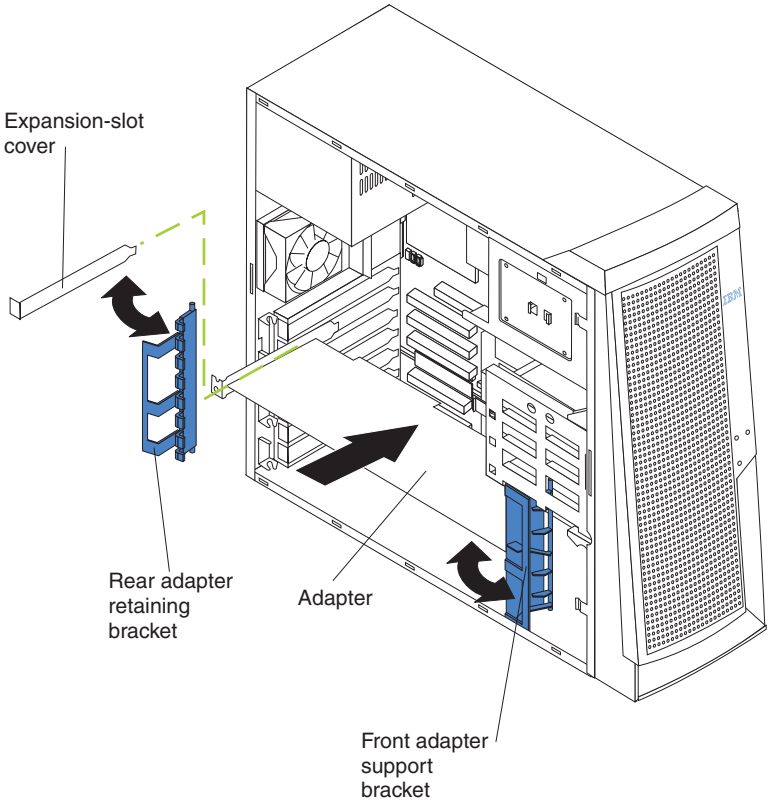
- Locate the documentation that comes with the adapter, and follow those instructions in addition to the instructions given in this chapter. If you need to change switch or jumper settings on your adapter, follow the instructions that come with the adapter.
- You can install full-length adapters in all PCI slots.
- You can install a 32-bit adapter in any of the PCI slots, but you might want to install it in a 32-bit slot and use the 64-bit slots for 64-bit adapters.
- Your server supports 5.0 V and universal PCI adapters; it does not support 3.3 V adapters.
- Your server uses a rotational interrupt technique to configure PCI adapters. You can use this technique to install a variety of PCI adapters that currently do not support sharing of PCI interrupts.

- The server has two PCI buses. PCI slots 1 and 2 are on PCI bus A, and PCI slots 3, 4, and 5 are on PCI bus B.

  Note: PCI bus A is sometimes referred to as bus 0; PCI bus B is sometimes referred to as bus 1.

  The system scans PCI slots 1 through 5 to assign system resources; then, the system starts (boots) the PCI devices in the following order: PCI slots 1 and 2, system board SCSI devices, and then PCI slots 3 through 5.
- If you plan to use the IBM Remote Supervisor Adapter in the server, you must install the IBM Remote Supervisor Adapter in PCI slot 2. Only PCI slot 2 supports the IBM Remote Supervisor Adapter. For additional information on the IBM Remote Supervisor Adapter, refer to the documentation that comes with the adapter.

Installing an adapter



Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see “Handling static-sensitive devices” on page 32.

To install an adapter, do the following:

1. Review the safety precautions in Statement 1 and Statement 5 in “Safety information” on page 33 and the information in “Adapter considerations” on page 42.
2. Turn off the server and all attached devices, and disconnect all power cords; then, disconnect all external cables and remove the side cover. See “Removing the side cover” on page 40 for details.
3. Carefully remove the support-bracket assembly from the server (see “Removing the support-bracket assembly” on page 41). Store the cover and the support-bracket assembly in a safe place.

4. Determine which PCI slot you will use for the adapter.

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

5. Remove the rear adapter retaining bracket from the server. If you are installing a full-length adapter, rotate the front adapter-support bracket to the open (unlocked) position.
6. Remove the expansion-slot cover. Store it in a safe place for future use.

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

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

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

9. Place the adapter, component-side up, on a flat, static-protective surface.
10. Set any jumpers or switches as described by the adapter manufacturer.
11. Install the adapter:
    a. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the system board.
    b. 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.

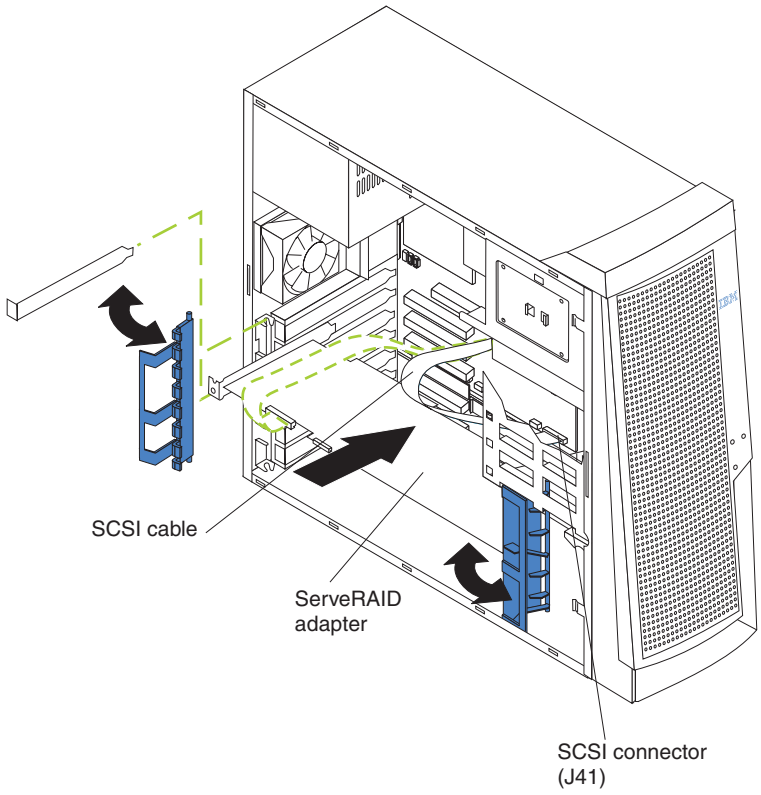
    c. When the adapter is fully seated, release the front adapter-support bracket by pushing inward on the latch. Make sure that the front adapter-support bracket holds the adapter securely in place.
    d. If you opened the front adapter-support bracket, rotate it to the closed (locked) position; then, reinstall the rear adapter retaining bracket in the server.

    Note: You can also install a ServeRAID adapter in non-hot-swap models; however non-hot-swap models do not support hot-swap hard disk drives.

12. Connect any needed cables to the adapter.

    Attention: Route cables so that they do not block the flow of air from the fans.

The following illustration shows how to reroute the SCSI cable. If you install a ServeRAID adapter and intend to use it with hot-swap hard disk drives, remove the cable from the internal SCSI connector (J41) on the system board and connect it to the ServeRAID adapter.



13. If you have other options to install or remove, do so now; otherwise, replace the support-bracket assembly; then, go to “Installing the side cover” on page 59.

Installing internal drives

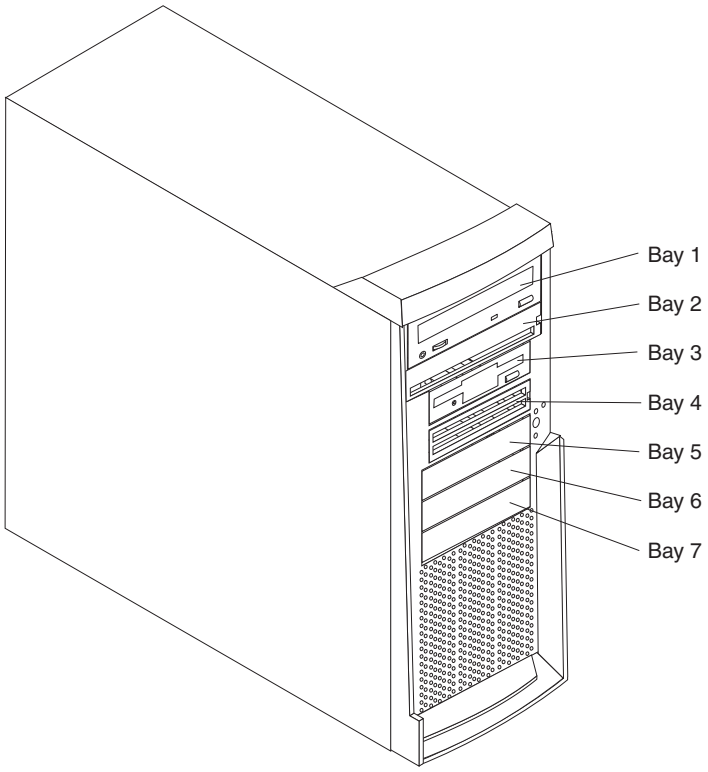
Different types of drives enable your system to read multiple types of media and store more data. Several types of drives are available, such as:

- Diskette (preinstalled)
- Hard disk (preinstalled on some models)
- CD-ROM (preinstalled)
- Tape

Internal drive bays

Internal drives are installed in *bays*. The bays of the xSeries 220 server are in the front of the server, as shown in the following illustration.

Note: The illustrations in this document might differ slightly from your hardware. Bays 5, 6, and 7 differ according to model.



To remove or install a drive, you must turn off the server first, unless you are removing or installing a hot-swap hard disk drive. Diskette drives, tape drives, and CD-ROM drives are removable-media drives. You can install removable-media drives in bays 1, 2, 3, and 4. You can install SCSI hard disk drives in bays 4, 5, 6, and 7.

- Your server comes with a 3.5-inch, 1.44 MB diskette drive in bay 3, an integrated drive electronics (IDE) CD-ROM drive in bay 1, and a hard disk drive in bay 7 (in some models).
- The xSeries 220 server supports five 3.5-inch drives; however, the 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.
- The xSeries 220 server supports two 5.25-inch drives and four SCSI hard disk drives. The server does not support IDE hard disk drives. Some models support hot-swap hard disk drives. Other models support only non-hot-swap hard disk drives. Refer to the documentation that comes with your server for additional information.

  Your server supports four 1-inch (26 mm) slim, 3.5-inch SCSI hard disk drives in the hard disk drive bays (4, 5, 6, and 7). You can install four non-hot-swap hard disk drives in the models that have the standard non-hot-swap drive cage. You can install three hot-swap hard disk drives and one non-hot-swap hard disk drive in the models that come with the hot-swap drive cage. Both the non-hot-swap and hot-swap drive cages hold a maximum of three hard disk drives. The drive cages comprise bays 5, 6, and 7.
- Bay 2 comes without a device installed. This bay is for a 5.25-inch, half-high, removable-media drive, such as a tape backup drive.
- Bay 4 is for a 3.5-inch, slim, removable-media drive or SCSI hard disk drive.

Note: The electromagnetic interference (EMI) integrity and cooling of the server are both protected by having bays 1 through 4 covered or occupied. When you

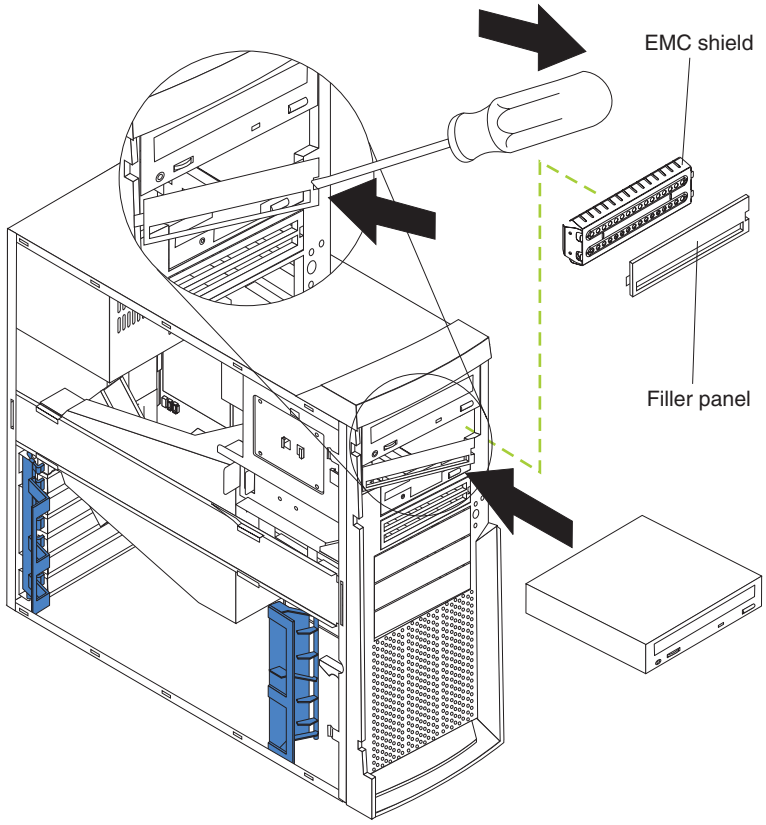
install a drive, save the filler panel from the bay, in case you later remove the drive and do not replace it with another.

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 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 32, 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.

Installing a drive in bay 1, 2, 3, or 4



To install a drive in bay 1, 2, 3, or 4, do the following:

1. Read the information in “Preinstallation steps (all bays)”.
2. Turn off the server and all attached devices, and disconnect power cords and then all external cables; then, remove the side cover (see “Removing the side cover” on page 40 for details).
3. Insert a screwdriver into the slot on the right side of the filler panel, and remove the filler panel from the server.
4. Insert a screwdriver into the slots on the front of the electromagnetic compatibility (EMC) shield, and remove the EMC shield from the bay.

5. If the drive 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

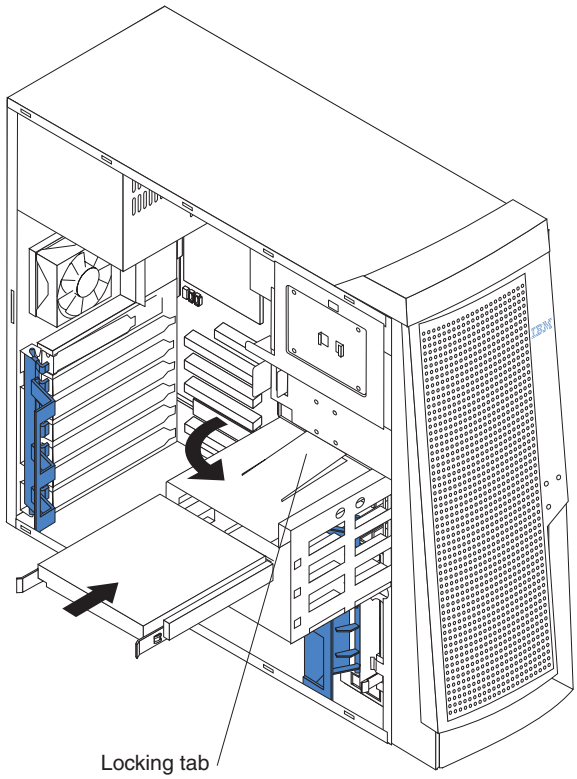
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following. Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

6. 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.
7. Set any jumpers or switches on the drive according to the documentation that comes with the drive.
8. Push the drive into the bay. If your drive has electronic components exposed, pay particular attention to the angle at which you push the drive into the bay to prevent damage to the drive.
9. If the drive is an IDE device, plug one connector of the IDE cable into the back of the drive and the other end of the cable into the IDE connector (J30) on the system board.

   If the drive is a SCSI device, plug one connector of the SCSI cable into the back of the drive and make sure that the other end of the cable is connected to the SCSI connector (J41) on the system board.

   Note: Ensure that you route the SCSI cable so that it does not block the airflow to the rear of the drives or over the microprocessors.
10. Connect a power cable to the back of the drive. The connectors are keyed and can be inserted only one way.
11. If you are installing another drive, do so now. Otherwise, continue with the next step.
12. If you have other options to install or remove, do so now; otherwise, replace the cover (see “Installing the side cover” on page 59 for details).

Installing a non-hot-swap hard disk drive in bay 5, 6, or 7



To install a non-hot-swap hard disk drive in bay 5, 6, or 7, do the following:

1. Read the information in “Preinstallation steps (all bays)” on page 47.
2. Turn off the server and all attached devices, and disconnect all power cords; then, disconnect all external cables and remove the side cover (see “Removing the side cover” on page 40 for details).
3. Remove the support-bracket assembly (see “Removing the support-bracket assembly” on page 41).
4. Rotate the drive cage upward. If your server has a hard disk drive installed in the drive cage, disconnect the cables from the rear of the drive.
5. Remove the plastic bag that contains the drive rails and screws from inside the drive cage.
6. Install rails on each drive:
   a. Pull the blue slide rails out of the plastic bag.
   b. Install the screws on the sides of the drive.
   c. Align the rails on the drive with the guide rails in the drive bay.
   d. Push the drive into the bay until it clicks into place.
7. Rotate the drive cage up slightly, depress the locking tab, then rotate the drive cage downward until it snaps into place.
8. Connect the SCSI and power cables to the rear of the drives.

   Note: Ensure that you route the SCSI cable so that it does not block the airflow to the rear of the drives or over the microprocessors.
9. If you have other options to install or remove, do so now; otherwise, replace the support-bracket assembly; then, go to “Installing the side cover” on page 59.

Installing a hot-swap hard disk drive in bay 5, 6, or 7

If you purchased a hot-swap model, your server contains hardware that you can use to replace a failed hard disk drive without turning off the server. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives. If these drives are connected to an optional controller, such as a ServeRAID controller, that supports this function, and if one of these drives becomes defective, the ServeRAID controller can rebuild the data from that drive onto another hot-swap drive. Refer to the information that comes with your ServeRAID controller for details.

Each hot-swap drive has two indicator lights: the hard disk drive activity light and the hard disk drive status light. When the green hard disk drive activity light is flashing, the controller is accessing the hard disk drive. When this occurs, the SCSI activity light on the front of the server is also illuminated. The SCSI activity light is illustrated and described in "Server controls and indicators" on page 6. If the amber hard disk drive status light for a drive is lit continuously, that individual drive is faulty and requires replacement. When the hard disk drive status light indicates a drive fault, you can replace a hot-swap drive without turning off the server.

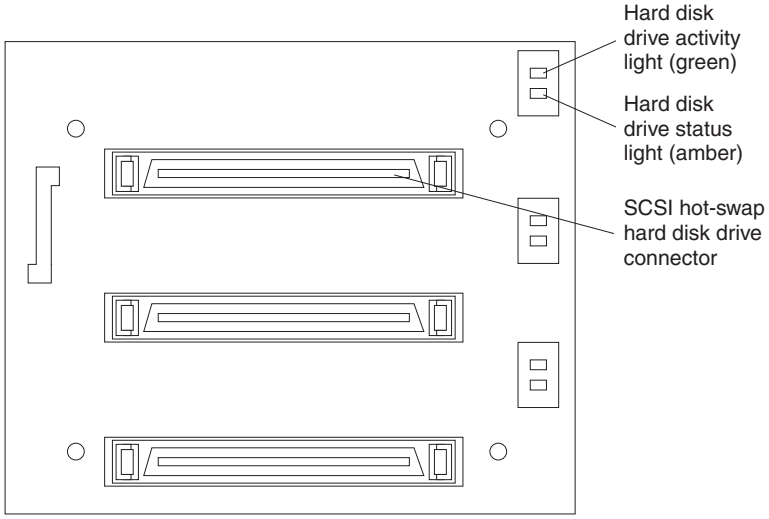
Note: The hard disk drive activity light is also known as the SCSI hard disk drive activity light.

Each hot-swap drive that you plan to install comes mounted in a hot-swap-drive tray. The drive must have a single connector attachment (SCA) connector. Hot-swap-drive trays come with hot-swap drives.

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.

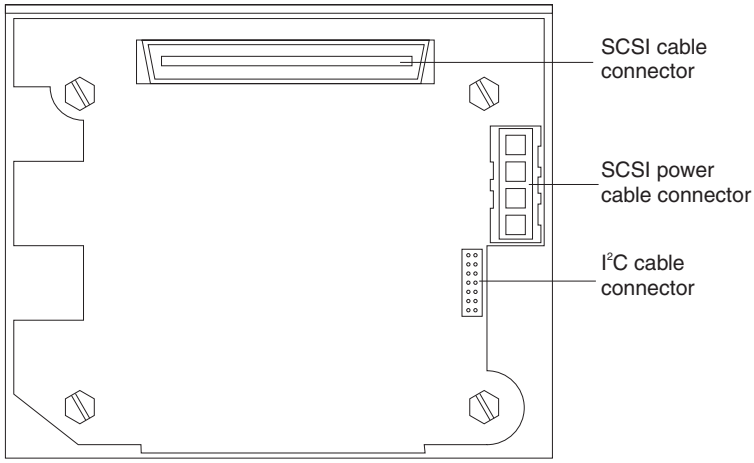
The following illustration shows the hot-swap-drive backplane component locations, as viewed from the front of the server.

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

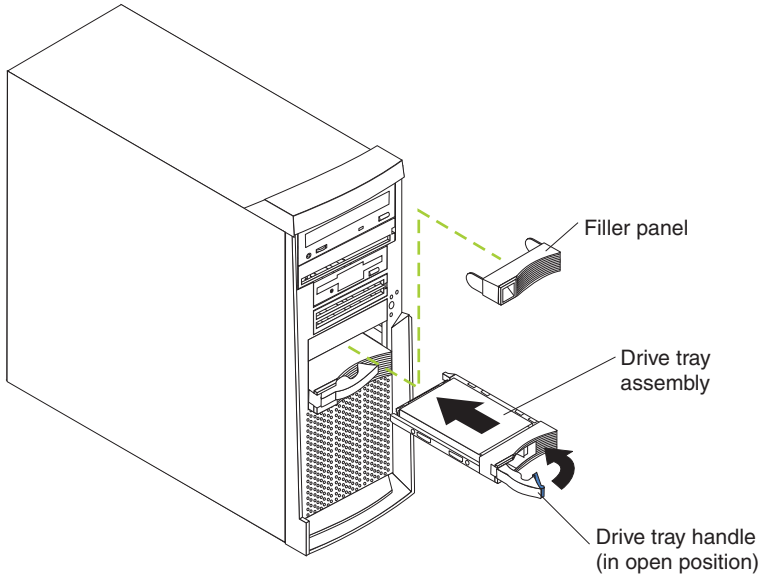


Note: The hard disk drive activity light and hard disk drive status light on the backplane match the hard disk drive activity light and hard disk drive status light on the hot-swap drive.

The following illustration shows the rear connectors on the hot-swap-drive backplane, as viewed from the rear of the server.



The following illustration shows how to install a hot-swap hard disk drive in the server. When you install hot-swap hard disk drives, install them in the following order: bay 7, bay 6, and bay 5.



Attention:

- When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see “Handling static-sensitive devices” on page 32.
- To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each bay.

To install a hot-swap hard disk drive in bay 5, 6, or 7, do the following:

1. Review “Before you begin” on page 31.
2. Read the information in “Preinstallation steps (all bays)” on page 47.

   Note: You do not have to turn off the server to install hot-swap hard disk drives in these bays.
3. 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.
4. Install the hard disk drive in the hot-swap bay:

a. Ensure that the tray handle is open (that is, perpendicular to the drive).

b. Align the drive-tray assembly with the guide rails in the bay.

c. Gently push the drive-tray assembly into the bay until the drive stops.

d. Push the tray handle to the closed (locked) position.

e. Check the hard disk drive status light to verify that the hard disk drive is operating properly.

   If the amber hard disk drive status light for a drive is lit continuously, that individual drive is faulty and needs to be replaced. If the green hard disk drive activity light is flashing, the drive is being accessed.

Note: If your server has a ServeRAID controller, you might need to reconfigure your disk arrays after installing hard disk drives. Refer to the information that comes with your ServeRAID controller.

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

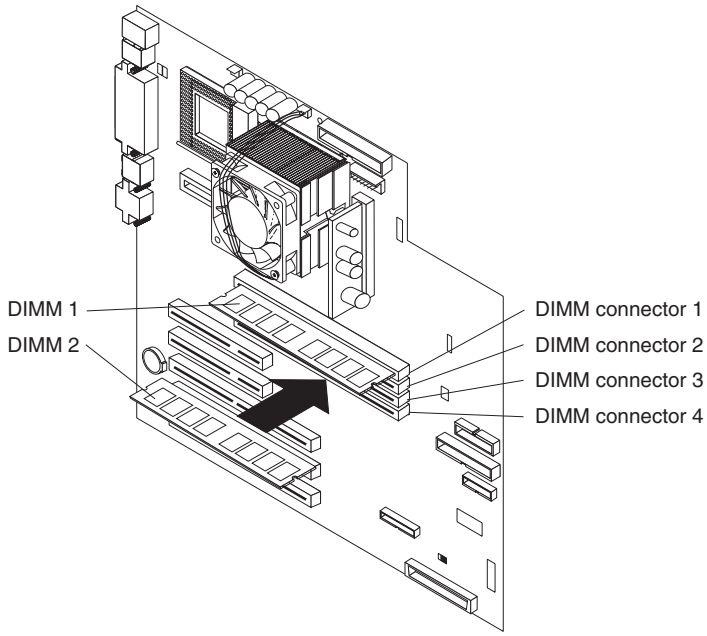
Installing memory modules

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 uses a noninterleaved memory configuration.

Your server comes with a DIMM that is installed on the system board in DIMM connector 1 (labeled DIMM 1).

Notes:

1. When installing additional memory modules, install the second memory module in the connector labeled DIMM 2, the third in connector DIMM 3, and the fourth in connector DIMM 4. (See the following illustration for memory-connector locations.)
2. Your xSeries 220 server supports 128 MB, 256 MB, 512 MB, and 1 GB DIMMs. These DIMMs can be installed in any memory slot. Your server supports a minimum of 128 MB and a maximum of 4 GB of system memory. See the ServerProven™ list at http://www.ibm.com/pc/compat/ for a list of 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 by using 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.** See Chapter 3, “Configuring your server,” on page 11 for more information.
4. The illustrations in this document might differ slightly from your hardware.



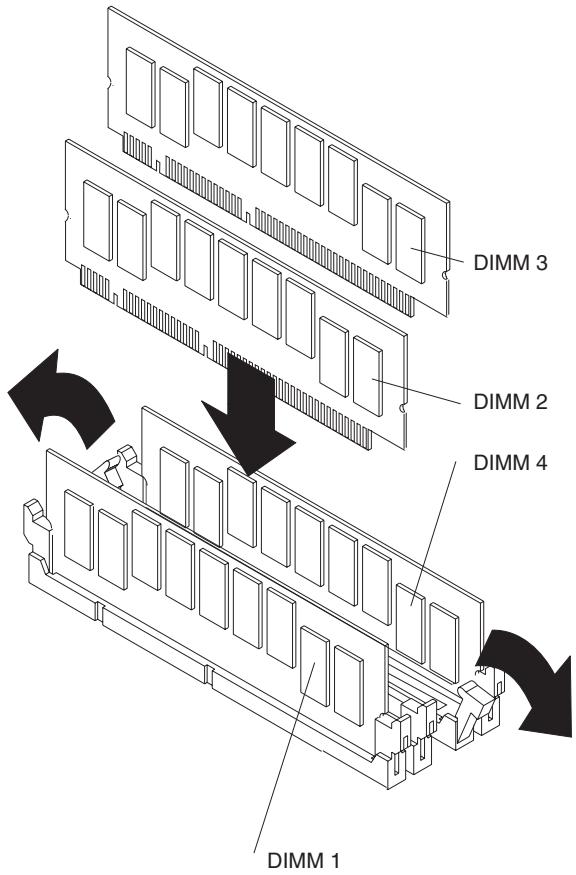
Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see “Handling static-sensitive devices” on page 32.

To install a DIMM, do the following:

1. Review the safety precautions in Statement 1 and Statement 5 in “Safety information” on page 33.
2. Review the information in “Before you begin” on page 31 and the documentation that comes with your option.
3. Turn off the server and all attached devices, and disconnect all power cords; then, disconnect all external cables and remove the side cover (see “Removing the side cover” on page 40 for details).
4. Select the connector in which to install the DIMM.
5. Touch the static-protective package containing the DIMM to any unpainted metal surface on the server. Then, remove the DIMM from the package.

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

   a. Open the retaining clips on the connector.



b. Turn the DIMM so that the pins align correctly with the connector.

c. Firmly press the DIMM straight down into the connector by applying pressure on both ends of the DIMM simultaneously.

d. Make sure that 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.

7. If you have other options to install or remove, do so now; otherwise, go to "Installing the side cover" on page 59.

Note: When you restart the server, the system displays a message indicating that the memory configuration has changed.

- If you installed additional memory, start the Configuration /Setup Utility program and select **Save Settings**.
- If you just replaced a failed DIMM, you must start the Configuration /Setup Utility program, select **Advanced Setup**, select **Memory Settings**, highlight the connector or bank of connectors that you want to enable, then select **Enable**.
- 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 code to reset the memory connector or bank of connectors from **Disabled** to **Enabled**.

Installing and removing a microprocessor

Your server comes with one microprocessor, which is installed on the system board. If you install an additional microprocessor kit, 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. Refer to “Getting help and service” on page 113 for the appropriate World Wide Web addresses.
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, which is installed in microprocessor connector U12 (the microprocessor connector that is furthest from the power supply). This is the startup (boot) microprocessor. If you install a microprocessor in microprocessor connector U11, that one becomes the startup microprocessor, and the microprocessor that is installed in microprocessor connector U12 is the application microprocessor. You must also install a VRM when you install a microprocessor.
4. The illustrations in this document might differ slightly from your server.
5. If necessary, see “System-board option connectors” on page 28 for connector locations.

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 and type and the same clock speed. Microprocessor internal clock frequencies and external clock frequencies must be identical. See the ServerProven list at http://www.ibm.com/pc/compat for a list of microprocessors for use with your server.
- When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see “Handling static-sensitive devices” on page 32.

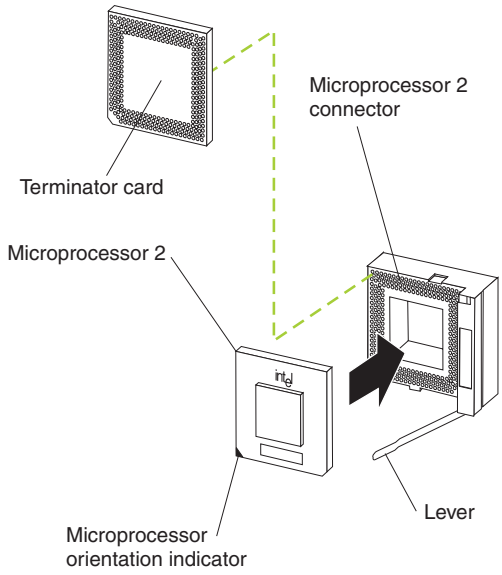
Installing a microprocessor

To install an additional microprocessor, do the following:

1. Review the safety precautions in Statement 1 and Statement 5 in “Safety information” on page 33.
2. Turn off the server and all attached devices, and disconnect all power cords; then, disconnect all external cables and remove the side cover (see “Removing the side cover” on page 40 for details).
3. Carefully remove the support bracket assembly from the server (see “Removing the support-bracket assembly” on page 41). Store the cover and the support-bracket assembly in a safe place.
4. Lift the release lever and remove the terminator card from the microprocessor connector.
5. 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.

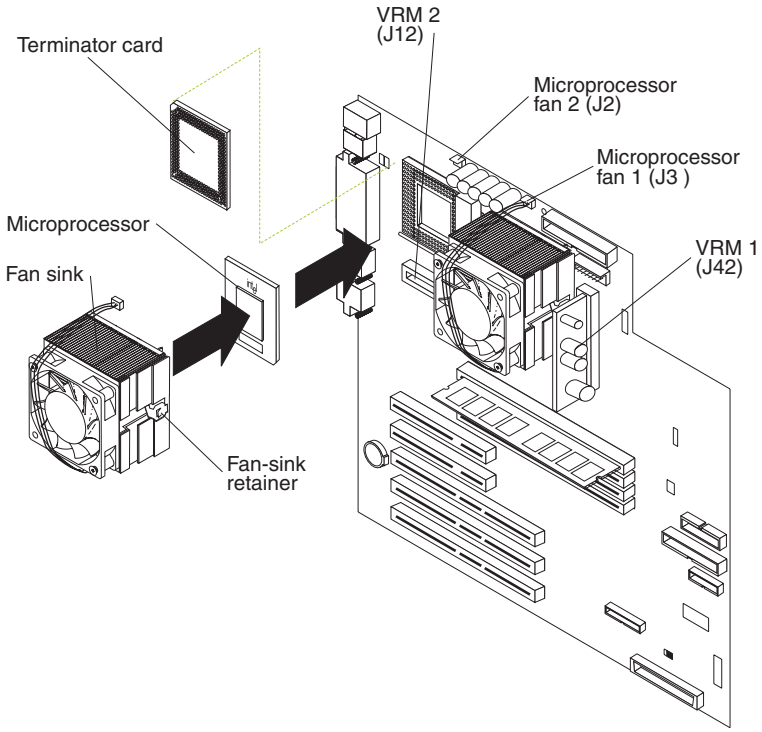
b. Orient the microprocessor over the microprocessor connector, as shown in the following illustration. Carefully press the microprocessor into the connector.



Attention: To avoid bending the pins, do not use excessive force when pressing the microprocessor into the connector.

6. Push the release lever down to lock the microprocessor into place.

7. Install a fan sink onto the microprocessor and connect the fan-sink power cable to the system board:



   a. Peel the plastic protective strip off the bottom of the fan sink. Make sure that the square of thermal material is still on the bottom of the fan sink.
   b. Align and place the fan sink on top of the microprocessor.
   c. Align and place the fan-sink retainer (clip) over the fan sink.
   d. Press down on the fan-sink retainer to snap it into place in the slot on the microprocessor, over the fan sink.
   e. Connect the built-in fan-sink power cable to the appropriate connector on the system board:
      - If you installed the microprocessor in connector U11, connect the fan-sink power cable to connector J2.
      - If you installed the microprocessor in connector U12, connect the fan-sink power cable to connector J3.

8. Place the terminator card in the static-protective package that your new microprocessor was shipped in, and store it in a safe place. You will need to install the terminator card again if you ever remove the microprocessor and do not replace it with another microprocessor.
9. Install the VRM that is included in the microprocessor kit.

   Attention: Use of other VRMs might cause your server to overheat.

   a. Center the VRM over the appropriate VRM connector:
      1) If you installed the microprocessor in connector U11, press down on the latches on either side of connector J12, and install the VRM in connector J12.

2) If you installed the microprocessor in connector U12, press down on the latches on either side of connector J42, and install the VRM in connector J42.

b. Make sure that the VRM is oriented and aligned correctly.

c. 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 to remove the VRM from the appropriate VRM connector.

10. If you have other options to install or remove, do so now; otherwise, replace the support-bracket assembly; then, go to "Installing the side cover" on page 59.

Removing a microprocessor

To remove a microprocessor, do the following:

Note: Do not use any tools when removing the microprocessor.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details on handling these devices, see "Handling static-sensitive devices" on page 32.

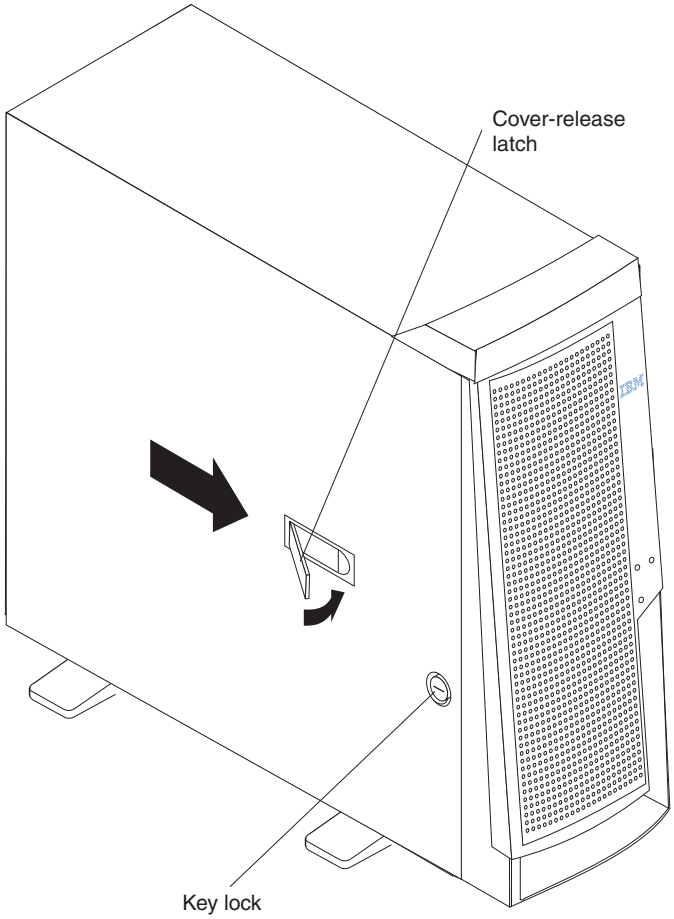
1. Review the safety precautions in Statement 1 and Statement 5 in "Safety information" on page 33.
2. Turn off the server and all attached devices, and disconnect power cords and then all external cables; then, remove the side cover (see "Removing the side cover" on page 40 for details).
3. Carefully remove the support-bracket assembly from the server (see "Removing the support-bracket assembly" on page 41). Store the cover and the support-bracket assembly in a safe place.
4. Remove the fan sink.
   a. Press down on the clip to remove the fan-sink retainer from the fan sink.
   b. Firmly grasp the fan sink and lift it off the microprocessor.
   c. Disconnect the fan-sink power cable from the appropriate connector on the system board:
      - If you are removing the microprocessor from connector U11, disconnect the fan-sink power cable from connector J2.
      - If you are removing the microprocessor from connector U12, disconnect the fan-sink power cable from connector J3.
5. Lift up the release lever and remove the microprocessor from the connector. Store the microprocessor in a static-protective package for possible future use.
6. If you are installing a new microprocessor, go to "Installing a microprocessor" on page 55.
7. If you are not replacing the microprocessor:
   a. Reinstall the terminator card in the empty microprocessor connector.
   b. Press the release lever down to lock the terminator card into place.
   c. Remove the VRM from the appropriate VRM connector:
      - If you removed the microprocessor from connector U11, press down on the latches on either side of connector J12, and remove the VRM from connector J12.
      - If you removed the microprocessor from connector U12, press down on the latches on either side of connector J42, and remove the VRM from connector J42.

8. If you have other options to install or remove, do so now; otherwise, replace the support-bracket assembly; then, go to “Installing the side cover”.

Installing the side cover

The following information describes the cover installation procedure.

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



Note: If you removed the support-bracket assembly after you removed the cover, reinstall it before you install the cover.

To install the server side cover:

1. Clear any cables that might impede the replacement of the cover.
2. Align the bottom tabs of the side cover with the matching slots in the server chassis; then, insert the tabs into the slots.
3. Close the cover-release latch to pull the cover forward and lock the cover in place.
4. Make sure that the stabilizing feet are rotated outward so that they properly support the server (see “Rotating the stabilizing feet” on page 39).
5. Reconnect the external cables and cords to the server; then, plug the power cords into properly grounded electrical outlets.

Connecting external options

You can attach a SCSI storage expansion enclosure to your server if you install an optional SCSI adapter in one of the five PCI adapter slots on the system board.

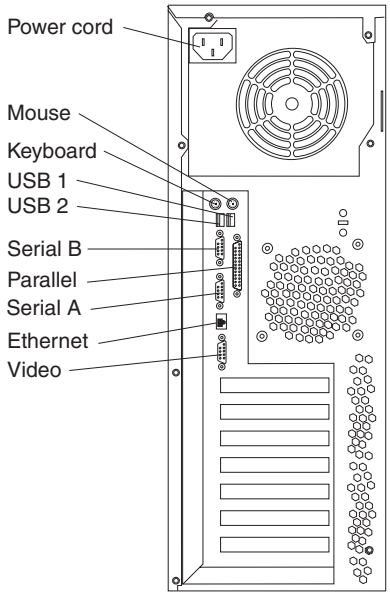
To attach an external device, do the following:

1. Read “Before you begin” on page 31 and the documentation that comes with your options.
2. Be sure that your server and all attached devices are turned off.
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 “SCSI port” on page 66 for SCSI ID and cabling information.

I/O connector locations

The following illustration shows the external input/output connectors (ports) on the rear of the server. The SCSI and system-management connectors are internal and located on the system board (see “System-board internal cable connectors” on page 29 and “System-board option connectors” on page 28, respectively for connector locations). For pin assignments and other details about these connectors, see “Input/output ports” on page 61.



Input/output ports

This section provides information about the following input/output (I/O) ports on your server:

- One parallel port
- Two serial ports
- Two Universal Serial Bus (USB) ports
- One keyboard port
- One auxiliary pointing-device (mouse) port
- One video port
- One SCSI port (on the system board)
- One Ethernet port
- One communication connector dedicated to the IBM Remote Supervisor Adapter

Notes:

1. You can set an administrator password through the Configuration/Setup Utility program only if the IBM Remote Supervisor Adapter is installed in your server.
2. The **Devices and I/O Ports** choice appears only on the full Configuration/Setup Utility menu. If you have set both levels of passwords (user and administrator), you must type the administrator password to access the full Configuration/Setup Utility menu.

Parallel port

Your server has one parallel port. This port supports three standard Institute of Electrical and Electronics Engineers (IEEE) 1284 modes of operation: Standard Parallel Port (SPP), Enhanced Parallel Port (EPP), and Extended Capability Port (ECP).

Viewing or changing the port assignments

You can use the Configuration/Setup Utility program to configure the parallel port as bidirectional, that is, so that data can be both read from and written to a device. In bidirectional mode, the server supports the ECP and EPP modes.

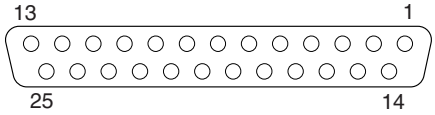
To view or change the parallel-port assignment, do the following:

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, select **Devices and I/O Ports**; then, press Enter.
4. Select the parallel port; then, use the arrow keys to advance through the available settings.

   Note: When you configure the parallel port as bidirectional, use an IEEE 1284-compliant cable. The maximum length of the cable must not exceed 3 meters (9.8 feet).
5. Select **Save Settings**; then, select **Exit Setup** to exit from the Configuration/Setup Utility main menu.

Parallel port connector

The following table shows the pin-number assignments for the 25-pin, female D-shell parallel-port connector on the rear of the server.



Pin	I/O	SPP/ECP Signal	EPP Signal
1	O	-STROBE	-WRITE
2	I/O	Data 0	Data 0
3	I/O	Data 1	Data 1
4	I/O	Data 2	Data 2
5	I/O	Data 3	Data 3
6	I/O	Data 4	Data 4
7	I/O	Data 5	Data 5
8	I/O	Data 6	Data 6
9	I/O	Data 7	Data 7
10	I	-ACK	-ACK
11	I	BUSY	-WAIT
12	I	PE (paper end)	PE (paper end)
13	I	SLCT (select)	SLCT (select)
14	O	-AUTO FD (feed)	-AUTO FD
15	I	-ERROR	-ERROR
16	O	-INIT	-INIT
17	O	-SLCT IN	-SLCT IN
18	-	Ground	Ground
19	-	Ground	Ground
20	-	Ground	Ground
21	-	Ground	Ground
22	-	Ground	Ground
23	-	Ground	Ground
24	-	Ground	Ground
25	-	Ground	Ground

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

Serial ports

Your server has two standard serial (communication) ports: serial port A and serial port B.

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

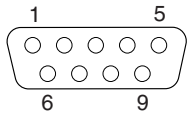
Viewing or changing the serial-port assignments

To view or change the serial-port assignments, do the following:

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, select **Devices and I/O Ports**; then, press Enter.
4. Select the serial port; then, use the arrow keys to advance through the available settings.
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 the 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 6. Serial-port connector pin-number assignments.

Universal Serial Bus ports

Your server has two Universal Serial Bus (USB) ports, which are configured automatically. USB is a serial interface standard for telephony and multimedia devices. It uses Plug and Play technology to determine the type of device that is 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 megabits-per-second (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 the server.

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

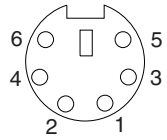
Table 7. USB-port connector pin-number assignments.

Keyboard port

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



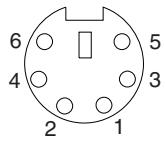
Pin	I/O	Signal
1	I/O	Data
2	N/A	Reserved
3	N/A	Ground
4	N/A	+5 V dc
5	I/O	Clock
6	N/A	Reserved

Table 8. Keyboard connector pin-number assignments .

Auxiliary-device (pointing device) port

The rear of the server 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 the server.



Pin	Signal
1	Data
2	Reserved
3	Ground
4	+5 V dc
5	Clock
6	Reserved

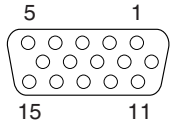
Table 9. Auxiliary-device connector pin-number assignments .

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 the server.



Pin	Signal	Pin	Signal	Pin	Signal
1	Analog red	6	Red return	11	Not connected
2	Analog green or monochrome	7	Green return	12	DDC SDA
3	Analog blue	8	Blue return	13	Horizontal synchronization (Hsync)
4	Not connected	9	PIN	14	Vertical synchronization (Vsync)
5	Digital return	10	Digital return	15	DDC SCL

Table 10. Video-port connector pin-number assignments.

SCSI port

Your server has an integrated small computer system interface (SCSI) controller with an internal connector (J41) on the system board. This controller supports an Ultra160 SCSI internal channel. This channel 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

If you install a SCSI adapter in your server, you can use its SCSI connector to connect different types of SCSI devices.

Note: If you install a PCI RAID adapter, you can move the SCSI cable from the system-board SCSI connector to an internal channel connector on the RAID adapter if you want the RAID adapter to control the internal drives.

SCSI cabling requirements

For non-hot-swap drive models, you can install five internal SCSI devices by using the SCSI cable that comes with the server. For hot-swap drive models, you can install three hot-swap drives plus one non-hot-swap drive by using the SCSI cable that comes with the server. If you plan to attach external SCSI devices, you must install an optional SCSI adapter and order additional SCSI cables. To select and order the correct cables for use with internal or 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

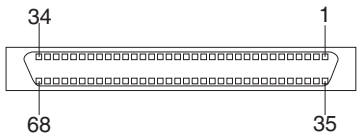
Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs. SCSI IDs for hot-swap drives are automatically set by the hot-swap backplane. For hot-swap drives, bay 7 has ID 0, bay 6 has ID 1, and bay 5 has ID 2. For non-hot-swap drives, refer to the information that comes with the drives for instructions to set their SCSI IDs.

External SCSI devices

To install external SCSI devices, you must first install an optional SCSI PCI adapter. 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 connector.



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	+Data1	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	-Data9
33	+Data 10	67	-Data 10
34	+Data 11	68	-Data 11

Table 11. 68-pin SCSI 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.

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 2 to 4 adapters per team.
- **Adaptive load balancing** (ALB) enables you to balance the transmission data flow among 2 to 4 adapters. ALB also includes the AFT option. You can use ALB with any 100BASE-TX switch.
- **Cisco Fast EtherChannel** (FEC) creates a team of 2 to 4 adapters to increase transmission and reception thoughput. FEC also includes the AFT option. You can only use FEC 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 priority 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 launch 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 Plans 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 Plans 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 the 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, allowing 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 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 tab, select the adapter you want to be on the VLAN and select **Properties**.
4. In IBMSet, select **Join VLAN**. Note that VLANs cannot be assigned to adapters that are already defined to have an adapter teaming option.
5. Enter 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. Select **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 tab.
7. Select **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.

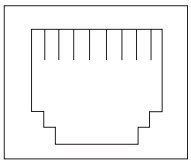


Table 12. Ethernet RJ-45 connector pin-number assignments..

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

Appendix A. Warranty information

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

Warranty period

The warranty period varies by country or region.

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.

A warranty period of 3 years on parts and 1 year on labor means that IBM will provide warranty service without charge for:

1. parts and labor during the first year of the warranty period
2. parts only, on an exchange basis, in the second and third years of the warranty period.

   IBM will charge you for any labor it provides in performance of the repair or replacement.

IBM @server xSeries 220 **Machine type** 8646

Country or region	**Warranty period**
United States and Canada	Parts - 3 years, labor - 1 year
All Others	Parts - 3 years, labor - 3 years

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 "Telephone numbers" in “Getting information, help, and service” on page 112.

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.

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Predictive Failure Analysis	xSeries

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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 1000000 bytes, and GB stands for 1000000000 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

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Power cords

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

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

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

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

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

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

IBM power cord part number	Used in these countries and regions
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

Index

Numerics

A

B

C

D

E

F

G

N

O

P

R

S

T

U

V

W