IBM

eserver

xSeries 250

User's Reference

IBM® xSeries 250

User's Reference

SC21-P902-00

NOTE

Before using this information and the product it supports, be sure to read the general information in “Appendix A. Product warranties and notices,” on page 149.

First Edition (March 2001)

Contents

Safety

Before installing this product, read the Safety Information book.

Antes de instalar este produto, leia o Manual de Informações sobre Segurança.

安装本产品前请先阅读《安全信息》手册。

Prije instalacije ovog proizvoda pročitajte priručnik sa sigurnosnim uputama.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs hæftet med sikkerhedsforskrifter, før du installerer dette produkt.

Lue Safety Information -kirjanen, ennen kuin asennat tämän tuotteen.

Avant de procéder à l'installation de ce produit, lisez le manuel Safety Information.

Vor Beginn der Installation die Broschüre mit Sicherheitshinweisen lesen.

Πριν εγκαταστήσετε αυτό το προϊόν, διαβάστε το εγχειρίδιο Safety Information.

Przed zainstalowaniem tego produktu należy przeczytać broszurę Informacje Dotyczące Bezpieczeństwa.

Prima di installare questo prodotto, leggere l'opuscolo contenente le informazioni sulla sicurezza.

本製品を導入する前に、安全情報資料を御読みください。

이 제품을 설치하기 전에, 안전 정보 책자를 읽어보십시오.

Пред да го инсталирате овој производ прочитајте ја книгата со безбедносни информации.

Lees voordat u dit product installeert eerst het boekje met veiligheidsvoorschriften.

Les heftet om sikkerhetsinformasjon (Safety Information) før du installerer dette produktet.

Prije instalacije ovog proizvoda pročitajte priručnik sa sigurnosnim uputama.

Antes de instalar este produto, leia o folheto Informações sobre Segurança.

Перед установкой продукта прочтите брошюру по технике безопасности (Safety Information).

Pred inštaláciou tohto produktu si pre ítajte Informa nú brožúrku o bezpe nosti.

Preden namestite ta izdelek, preberite knjižico Varnostne informacije.

Antes de instalar este producto, lea la Información de Seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

在安裝本產品之前，也請先閱讀「安全性資訊」小冊子。

Installálás el tt olvassa el a Biztonsági el írások kézikönyvét !

Statement 1

Danger

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

To avoid a shock hazard:

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

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

Statement 2

CAUTION:

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

Do not:

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

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

Statement 3

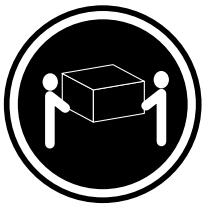
CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

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

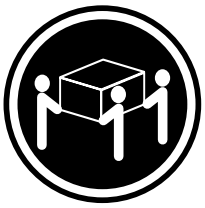
Danger

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

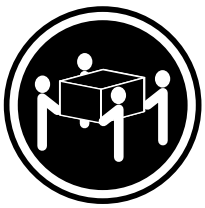
Statement 4



≥18 kg (39.7 lbs)



≥32 kg (70.5 lbs)

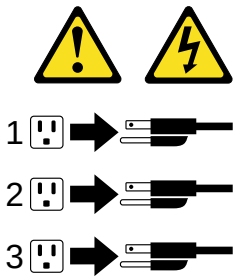


≥55 kg (121.2 lbs)

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.



Chapter 1. Introducing the IBM xSeries 250

Your IBM® @server xSeries 250 server is a high-performance server with the capability of microprocessor upgrade to a symmetric multiprocessing (SMP) server. It is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and large amounts of reliable data storage.

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

Your IBM xSeries 250 server comes with a three-year 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 xSeries 250 model and other IBM server products at the following World Wide Web address: http://www.ibm.com/eserver/xseries

Features and specifications

The following table provides a summary of the features and specifications for your xSeries 250 server.

Microprocessor:

- Intel® Pentium® III Xeon™
- 32 KB of level-1 cache
- 1 MB of level-2 cache (minimum)
- Expandable to four microprocessors

Memory:

- Maximum: 16 GB
- Type: ECC, SDRAM, Registered DIMMs
- Slots: 4-way interleaved, 16 slots

Drives standard:

- Diskette: 1.44 MB
- CD-ROM: IDE

Expansion bays:

- Hot-swap: 10 slim-high
- Non-hot-swap: Two 5.25-inch

LVD SCSI Backplane:

- Ultra160 capable
- Two SCSI channels, each with five connectors, in a split configuration
- Supports a maximum of 10 slim-high hard disk drives

PCI expansion slots:

- Four 33 MHz 64-bit hot-plug
- Two 66 MHz 64-bit non-hot-plug

Hot-swap power supplies:

250 Watt (115-230 V ac)

- Minimum: Two
- Maximum: Four
- Three for redundancy

Redundant cooling:

- Four hot-swap fan assemblies

Video:

- S3 video controller
- Compatible with SVGA and VGA
- 4 MB video memory

Size:

- Height: 356 mm (14 in.)
- Depth: 650 mm (25.6 in.)
- Width: 440 mm (17.3 in.)
- Weight: 34.4 kg (76 lb.) to 61 kg (134 lb.) depending upon configuration

Integrated functions:

- Advanced System Management processor
- Dual Ultra2 (LVD) SCSI controller, one external port, one internal port
- One 10BASE-T / 100BASE-TX AMD Ethernet controller
- Two serial ports
- One parallel port
- Two Universal Serial Bus ports
- Keyboard port
- Mouse port
- Video port
- One management port
- Two Advanced System Management Interconnect ports

Acoustical noise emissions:

- Sound power, idle: 6.3 bel maximum
- Sound power, operating: 6.3 bel maximum
- Sound pressure, idle: 49 dBa maximum
- Sound pressure, operating: 49 dBa maximum

Environment:

- Air temperature:
  - Server on: 10º to 35º C (50º to 95º F). Altitude: 0 to 914 m (3000 ft.)
  - Server on: 10º to 32º C (50º to 89.6º F). Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)
  - Server off: 10º to 43º C (50º to 110º F). Maximum altitude: 2133 m (7000 ft.)
- Humidity:
  - Server on: 8% to 80%
  - Server off: 8% to 80%

Heat output:

Approximate heat output in British Thermal Units (BTU) per hour

- Minimum configuration: 1023.9 BTU
- Maximum configuration: 2764.6 BTU

Electrical input:

- Sine-wave input (50-60 Hz) required
- Input voltage low range:
  - Minimum: 90 V ac
  - Maximum: 137 V ac
- Input voltage high range:
  - Minimum: 180 V ac
  - Maximum: 265 V ac
- Input kilovolt-amperes (kVA) approximately:
  - Minimum: 0.08 kVA
  - Maximum: 0.52 kVA

Table 1. Features and specifications.

Notices used in this book

The caution and danger notices also appear in the multilingual *Safety Information* book provided on the *IBM xSeries Documentation* CD that comes with your xSeries product. Each notice is numbered for easy reference to the corresponding notices in the safety book.

The following types of notices are used in this book:

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

What your xSeries 250 offers

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

- Impressive performance using an innovative approach to SMP

  Your server supports up to four Pentium III Xeon microprocessors. Your server comes with one microprocessor installed; you can install additional microprocessors to enhance performance and provide SMP capability.

- Large data-storage and hot-swap capabilities

  All models of the server support up to 10 slim-high hot-swap hard disk drives. This *hot-swap* feature enables you to remove and replace hard disk drives without turning off the server.

- Hot-plug peripheral component interconnect (PCI) adapter capabilities

  Your server has four *hot-plug* slots for Active PCI ™ adapters. With operating system support, you can replace failing hot-plug PCI adapters without turning off the server. If the *hot-add* feature is supported by your operating system and the PCI adapter, you can also add PCI adapters in these slots without turning off the server.

- Redundant cooling and power capabilities

  The redundant cooling and hot-swap capabilities of the fans in your server enable continued operation if one of the fans fails, because you can replace a failing fan without turning off the server.

  The server comes standard with two 250-watt power supplies. You can install one additional power supply to support redundancy for a typical configuration.

- Large system memory

  The memory bus in your server supports up to 16 GB of system memory. The memory controller provides error correcting code (ECC) support for up to 16 industry-standard, 3.3 V, 168-pin, 8-byte, registered, dual inline memory modules (DIMMs). The memory controller also provides Chipkill™ memory protection.

Chipkill memory protection is a technology that protects the system from component failure on a DIMM.

- 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. Refer to the documentation that comes with your system-management software for more information.

  Your server comes with an Advanced System Management processor.

  Note: The Advanced System Management processor is sometimes referred to as the service processor.

  Refer to "Advanced System Management ports" on page 92 for more information.

- Integrated network environment support

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

- Redundant network-interface card

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

- IBM ServerGuide CDs

  The ServerGuide CDs 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 23.

Reliability, availability, and serviceability

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

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

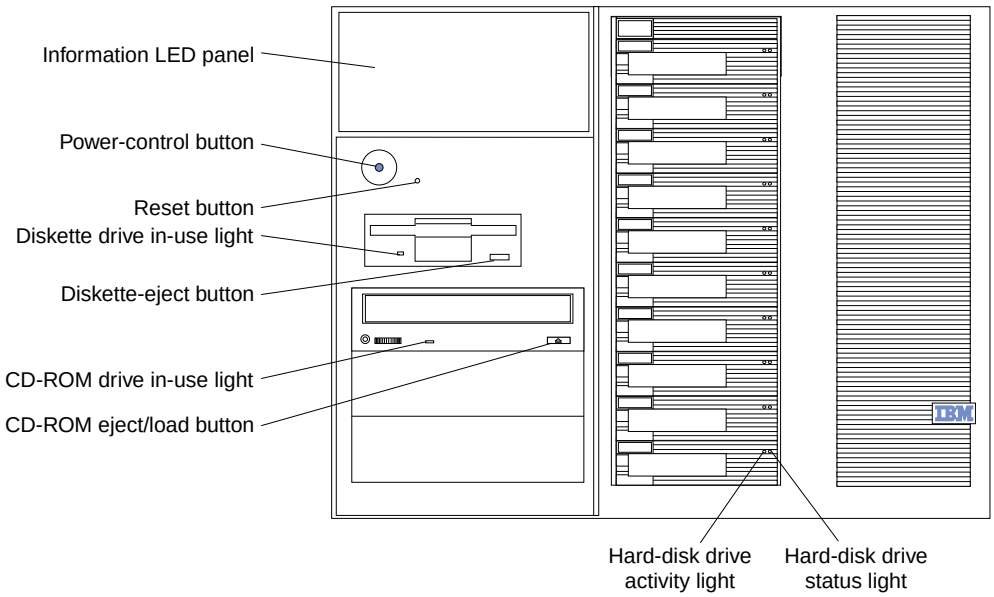
- Active PCI (hot-plug) adapter slots
- Alert on LAN™ capability
- Ambient temperature monitoring
- Automatic error retry / recovery
- Automatic restart after a power failure
- Backup basic input / output system (BIOS) switching under the control of the service processor
- Built-in, menu-driven electronically erasable programmable ROM (EEPROM) based diagnostics
- Built-in temperature / fan / voltages monitoring
- Chipkill memory protection
- Cooling fans with speed-sensing capability (hot-swap)

- Customer support center 24 hours per day, 7 days a week[1]
- Error codes and messages
- Error correcting code (ECC) L2 cache
- ECC FSBs
- ECC memory
- Fast power-on self-test (POST)
- Fault-resistant startup
- 45°C (113°F) normal operating temperature for hard disk drives
- Hot-plug Universal Serial bus (USB) keyboard and mouse
- Hot-swap drive bays
- Hot-swap hard disk drives
- Information and diagnostic light-emitting diode (LED) panels
- Integrated Advanced System Management processor subsystem provides control for remote system management
- Light Path Diagnostics™ (LED panel)
- Memory scrubbing and Predictive Failure Analysis™ (PFA) (background and real time)
- Menu-driven setup, system configuration, SCSISelect configuration, and diagnostic programs
- Microcode and diagnostic levels available
- NIC failover support
- Parity checking on the small computer system interface (SCSI) bus and PCI buses
- Power and temperature monitoring
- Power Managed - Advanced Configuration and Power Interface (ACPI) level
- Power-on self-test (POST)
- Power-supply redundancy monitoring
- Predictive Failure Analysis™ (PFA) alerts
- Processor serial number access
- Redundant Ethernet capabilities (with optional adapter)
- Redundant hot-swap cooling
- Redundant hot-swap power supplies
- Remote Connect
- Remote system problem-determination support
- Standard cables present detection
- Standby voltage for system management features and monitoring
- System auto-configuring from a configuration menu
- System error logging (POST and Advanced System Management processor)
- System management monitoring via Intra-Integrated Circuit (I^2C) bus
- Upgradable flash read-only memory (ROM) resident code
- Upgradable POST, basic input/output system (BIOS), diagnostics, and Advanced System Management processor microcode
- Vital Product Data (VPD) on processors, processor board, I/O board, power supplies, hard disk drive backplane, power backplane, and voltage regulator modules (VRMs)
- Wake on LAN™ capability
- Wake on Ring capability
- Windows NT failover support
- xSeries Server Management

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

Server controls and indicators

The following illustration shows the controls and indicators on the server.



Hard-disk drive status light: Each hot-swap drive has a status light. When this amber light is on continuously, the drive has failed. If an optional IBM ServeRAID™ adapter is installed in the server, when the light flashes slowly (one flash per second), the drive is being rebuilt. When the light flashes rapidly (three flashes per second), the controller is identifying the drive.

Hard-disk drive activity light: Each hot-swap drive has a hard-disk activity light. When this green light is flashing, the drive is being accessed.

CD-ROM eject/load button: Press this button to eject or retract the CD-ROM tray.

CD-ROM drive in-use light: When this light is on, the CD-ROM drive is being accessed.

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

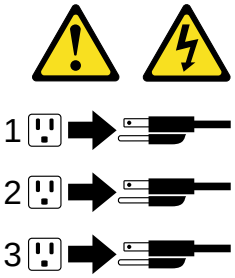
Diskette drive in-use light: When this light is on, the diskette drive is being accessed.

Reset button: Press this button to reset the server and run the power-on self-test (POST).

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

Statement 5

CAUTION:
The power control button on the device and 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.



Information LED panel: The lights on this panel give status information for your server. See “Information LED panel” on page 9.

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.

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.

  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. 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 Advanced System Management processor 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.
- If the server is turned on, a power failure occurs, and unattended-start mode is enabled in the Configuration/Setup Utility program, the server will start automatically when power is restored.
- If AC power is present, the server is off, and the wake-up feature is enabled in the Configuration/Setup Utility program, the wake-up feature will turn on the server at the set time.
- If AC power is present, the server is off, and ring-signal detect is enabled in the Configuration/Setup Utility program, you can turn on the server by telephone input.

- If your operating system supports the system-management software, the system-management software can turn on the server.
- If your operating system supports the Wake on LAN feature, the Wake on LAN feature will turn on the server at the set time.

  Note: For more detailed information about the Wake on LAN feature, refer to the documentation that comes with the Wake on LAN adapter and cables.

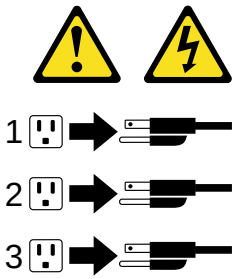
Turning off the server

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

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

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.



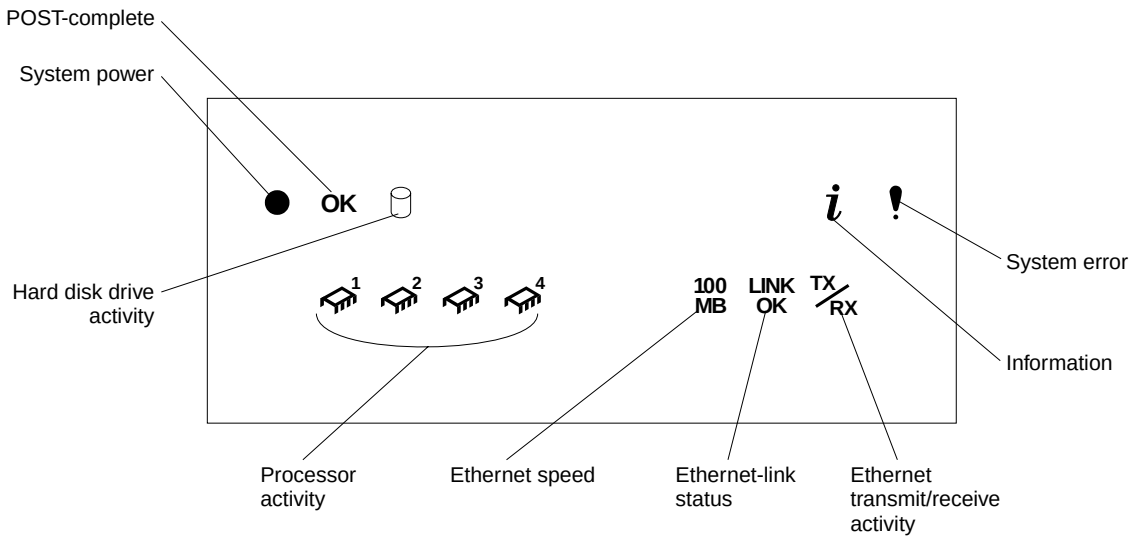
- You can press the power-control button on the front of the server. If this feature is supported by your operating system, this starts an orderly shutdown of the operating system, and places the server in standby mode.

  Note: After turning off the server, wait at least five 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 four 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 about 15 seconds for your system to stop running. Watch for the power-on light on the information panel **t**o stop blinking.

Information LED panel

The following illustration shows the status lights on the Information LED panel.



System error light: This amber light is on when a system error occurs. A light on the diagnostics LED panel will also be on to further isolate the error. (For more information, see “Diagnostic panel LEDs” on page 126.)

Information light: When this amber light is on, the server power supplies are nonredundant or some other noncritical event has occurred. The event is recorded in the Event log. See “Choices available from the Configuration/Setup main menu” on page 14 for instructions on viewing the Event log.

Ethernet transmit/receive activity light: When this green light is on, there is activity between the server and the network.

Ethernet-link status light: When this green light is on, there is an active connection on the Ethernet port.

Ethernet speed 100 Mbps light: When this green light is on, the Ethernet speed is 100 Mbps. When the light is off, the Ethernet speed is 10 Mbps.

Processor activity lights: One or more of these green lights are on when there is microprocessor activity. The number of lights that are on indicates the number of microprocessors with activity.

Hard-disk drive activity light: This green light flickers when there is activity on a hard disk drive.

System power light: When this green light is on, power is present in the server. When this light flashes, the server is in standby mode (the system power supply is turned off and ac current is present). When this light is off, the power subsystem, the ac power, or a light has failed.

Attention: If the system power light is off, it does not mean there is no electrical current present in the server. The light might be burned out. To remove all electrical current from the server, you must unplug the server power cords from the electrical outlets or from the uninterruptible power device.

POST-complete light: This green light is on when the power-on self-test (POST) completes without any errors.

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, see “Power cords” on page 161.

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 attached to the integrated SCSI controller. See "Using the SCSISelect Utility program" on page 20 for more information.

- **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 23 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. Refer to the information that comes with your ServeRAID adapter for details on ServeRAID adapters and controllers.

Using the Configuration/Setup Utility program

This section provides the instructions needed to start the Configuration/Setup Utility program and descriptions of the menu choices available.

Starting the Configuration/Setup Utility program

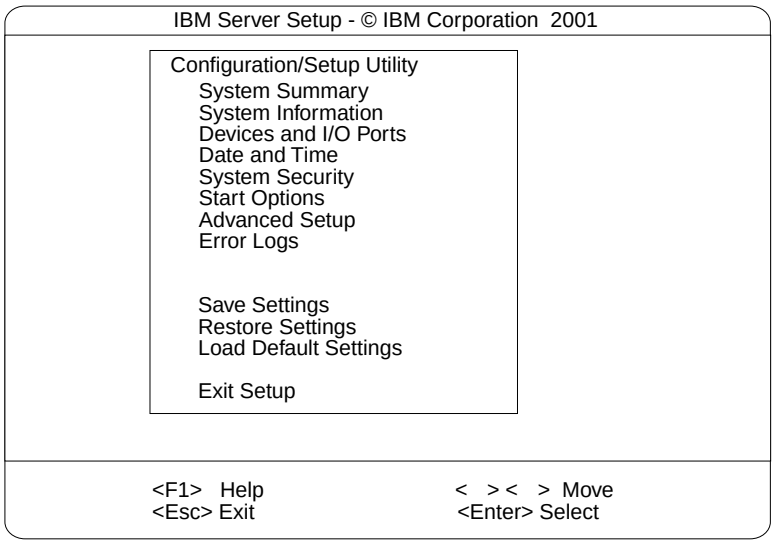
To start the Configuration/Setup Utility program:

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

   Note: If you have set both levels of passwords (user and administrator), you must enter the administrator password to access the full Configuration/Setup 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, depending on the BIOS version in your server.

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

- **System Summary**

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

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

  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 stored in the flash electronically erasable programmable ROM (EEPROM).

— **System Card Data**

Select this choice to view vital product data (VPD) for some server components.

- **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 and to change the system time sent to the Advanced System Management Processor (service processor) when the server is started. This choice appears only on the full Configuration/Setup Utility main menu.

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

  You can set a time delta to be added or subtracted from the system time that is sent to the service processor (Advanced System Management Processor) each time the server is started. Use the number keys to enter the hours and minutes and + or – to add or subtract from the system time. If you want the system clock time to be the same as the Advanced System Management Processor clock time, leave the value set at its default of 0.

- **System Security**

  Select this choice to set passwords or a system owner's name. 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 18 for more information.

  — **Administrator Password**

  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 processor 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 18 for more information.

  — **System Owner's Name**

  Select this choice to specify a system owner's name, which will display during POST. You can remove or change the name only from the System Security menu. You can use any combination of up to 16 characters for the system owner's name.

- **Start Options**

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

  You can select keyboard operating characteristics, such as the keyboard speed. You also can specify whether the keyboard number lock starts on or off. You also 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 loads. 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.

You also can select which PCI SCSI adapter is given boot precedence. The first drive that is attached to the selected adapter will be assigned drive number 80L and the operating system will start from that drive. The default for boot precedence is Disabled. The range of choices depends upon the number of PCI SCSI adapters installed in the server.

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

- **Advanced Setup**

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

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

  — **Processor Serial Number Access**

    Select this choice to identify if the microprocessor serial number in the microprocessor is readable.

  — **Core Chipset Control**

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

    Attention: Do not make changes here 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 will provide the maximum system performance.

  — **PCI Slot/Device Information**

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

    Attention: You must use the menu selections to save custom settings for the PCI Slot/Device Information choice. The save, restore 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 ignore the changes, restore the previous settings, and return to the Advanced Setup choice.

    PCI Device Control allows you to enable or disable the integrated SCSI, video, and Ethernet controllers. You can also enable or disable PCI slots from this menu.

    – The default setting is Enable for all the controllers and PCI slots. If you select Disable, the system will not configure the disabled device and the operating system will not see the device. (This is equivalent to unplugging the device.)

- If the on-board SCSI controller is disabled and no other controller and mass storage device are installed, operating system startup cannot occur.
- If the video controller is disabled and no video adapter is installed, the server will have no video capability. However, turning the server off and on three times without completing POST results in a default startup that enables video again.

— **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**.

- **System Service Processor Settings**

  Select this choice to enable or disable power supply redundancy monitoring.

- **Event/Error Logs**

  Select this choice to view or clear error logs.

  — Select **Clear error logs** to clear the error or event log.

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

  — Select **System Event/Error Log** to view the system event/error log. The system event/error log contains all the system error and warning messages that the system has generated. You can use the arrow keys to move between pages in the system event/error log.

- **Save Settings**

  Select this choice to save your customized settings.

- **Restore Settings**

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

- **Load Default Settings**

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

- **Exit Setup**

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

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 protection: power-on password and administrator password.

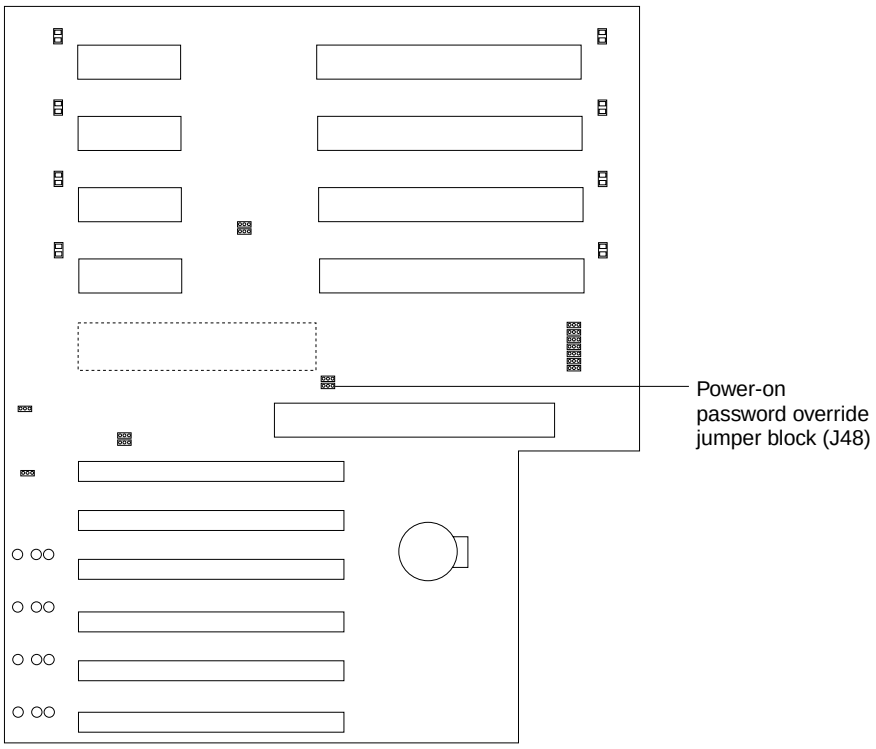
Power-on password

After you set a power-on password, you can enable the unattended-start mode. This locks the keyboard and mouse, but allows the server to start the operating system. The keyboard and mouse remain locked until you enter the correct 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. When a power-on password is set, POST does not complete until you enter the password. If you forget the power-on password, you can regain access to the server through one of the following methods:

- If an administrator password is set, enter the administrator password at the power-on prompt. Start the Configuration/Setup Utility program and change the power-on password.
- Remove the battery and then reinstall the battery (see “Replacing the battery” on page 143).
- Change the position of the password override switch. You can then start the Configuration/Setup Utility program and change the power-on password.

  The following illustration shows the location of the power-on password override jumper block (J48).



Administrator password

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 processor board.

The following table provides a summary of the password features.

Type of password	Results
Power-on password	• Enter 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. • Enter 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 enter 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
- Perform a low-level format on a SCSI hard disk

The following sections provide the instructions needed to start the SCSISelect Utility program and descriptions of the menu choices available.

Note: If your server has a redundant array of independent disks (RAID) adapter installed, use the configuration method supplied with the RAID adapter to view or change SCSI settings for attached devices.

Starting the SCSISelect Utility program

To start the SCSISelect Utility program:

1. Turn on the server.
2. When the `<<< Press <CTRL><A> for SCSISelect™ Utility! >>>` prompt appears, press Ctrl+A.

   Note: If an administrator password has been set, a prompt appears asking you to enter the password to start the SCSISelect Utility program.
3. When prompted, select either channel A or channel B.
4. Use the arrow keys to select a choice from the menu.
   - Press Esc to return to the previous menu.
   - Press the F5 key to switch between color and monochrome modes (if your monitor permits).
5. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Choices available from the SCSISelect menu

The following choices appear on the SCSISelect Utility menu:

- **Configure/View Host Adapter Settings**

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

- **Format Disk**

  Attention: The Low-Level Format program erases *all* data and programs.

  Select this choice to perform a low-level format on a hard disk drive. Depending on the hard disk drive capacity, the Low-Level Format program could take up to two hours.

  Use the Low-Level Format program:

  — When you are installing software that requires a low-level format

  — When you get recurring messages from the diagnostic tests directing you to run the Low-Level Format program on the hard disk drive

  — As a last resort before replacing a failing hard disk drive

  Note: If your server has a PCI RAID adapter installed, refer to the RAID adapter documentation for instructions for performing low-level formats on hard disk drives attached to the adapter.

  To start the Low-Level Format program:

  1. If the hard disk is working, make a backup copy of all the files and programs on the hard disk drive. (See your operating system information for instructions.)
  2. Select **Format Disk**; then, follow the instructions on the screen.

     Note: Hard disks normally contain more tracks than their stated capacity (to allow for defective tracks). A message appears on the screen if the defect limit is reached. If this happens, replace the hard disk drive.

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 NOS installations by providing updated device drivers, and in some cases, installing them automatically.

If a newer version of the ServerGuide software is available, you can purchase an update package. For details, 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 server for your environment
- A system BIOS update program, which updates the BIOS 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 level to determine whether a later level is available from the CD. You can update BIOS without creating diskettes.
- Updates firmware for Advanced System Management adapters and controllers.
- Provides the Performance Optimizer program to easily tune your server for your 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 Windows 2000, Windows NT, and NetWare operating systems.
- Provides a replicated installation path for multiple Windows 2000, Windows NT Server 4.0, and Windows Enterprise Edition, and Red Hat Linux.
- 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.)
- ServerGuide 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.
  - ServerGuide checks the server BIOS and microcode (firmware) levels for supported options and then checks the CD for a newer level. CD content can be newer than the hardware. ServerGuide can perform a flash update of the BIOS.
  - The ServeRAID configuration program starts, leading you through the entire configuration process.
  - The Performance Optimizer program easily tunes your server for your environment.
  - ServerGuide creates a System Partition on the default drive.
- ServerGuide 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 or on a separate diagnostics CD.

System Partition

ServerGuide 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 ServerGuide to shorten your installation time. ServerGuide 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.)
- ServerGuide 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.
- ServerGuide 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, ServerGuide 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.

ServerGuide prompts you to insert your NOS CD and restart the server. At this point, the installation program for the NOS (for example, Microsoft Windows 2000) takes control to complete the installation.

Setting up or updating multiple servers

You can use ServerGuide 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 your server name, domain name, and other information that you need to complete multiple installations. This feature supports systems running Windows 2000, Windows NT Server 4.0, and Red Hat Linux.

Installing your NOS without ServerGuide

If you have already configured the server hardware and you decide not to use ServerGuide 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 listed.

Additional programs included with ServerGuide

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

A variety of powerful applications are included with ServerGuide. 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.

Error symptoms

This section provides ServerGuide error symptoms and probable solutions.

***Setup and Installation* CD**	**Action**
Setup and Installation CD will not start.	• Ensure that the system is a supported server model with a startable (bootable) CD-ROM drive. • If the startup (boot) sequence settings have been altered, be sure that the CD-ROM is first in the startup sequence. • If more than one CD-ROM drive is installed, be sure that only one drive is set as the primary drive. Start the CD from the primary drive.
ServeRAID program cannot view all installed drives or cannot install NOS.	• Ensure that there are no duplicate SCSI IDs or IRQ assignments. • Ensure that the hard disk drive is connected properly.
The operating system installation program continuously loops.	Free up more space on the hard disk.
ServerGuide will not start your NOS CD.	Ensure that the NOS CD is supported by ServerGuide. See the *Setup and Installation* CD label for a list of supported NOS versions.
Cannot install NOS.	Ensure that the NOS is supported on your server. If the NOS is supported, either there is no logical drive defined (ServeRAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide setup and configuration program and ensure that the setup is complete.

***System Updates and Applications* CD**	**Action**
Get "time out" or "Unknown host" errors.	Ensure that you have access to the Internet through FTP directly.

Chapter 5. Installing options

This chapter provides instructions to help you add options to your server.

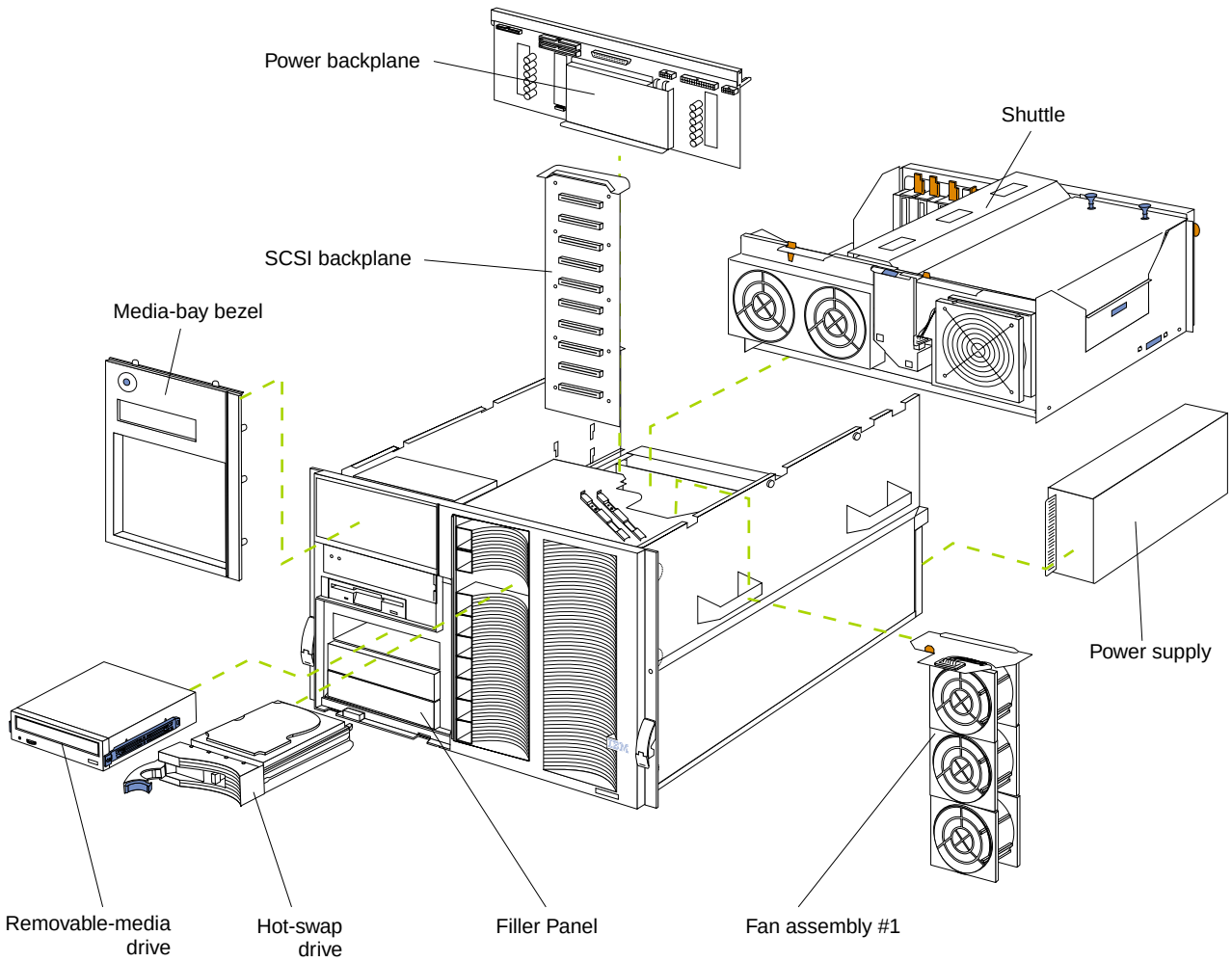
Major components of the xSeries 250 server

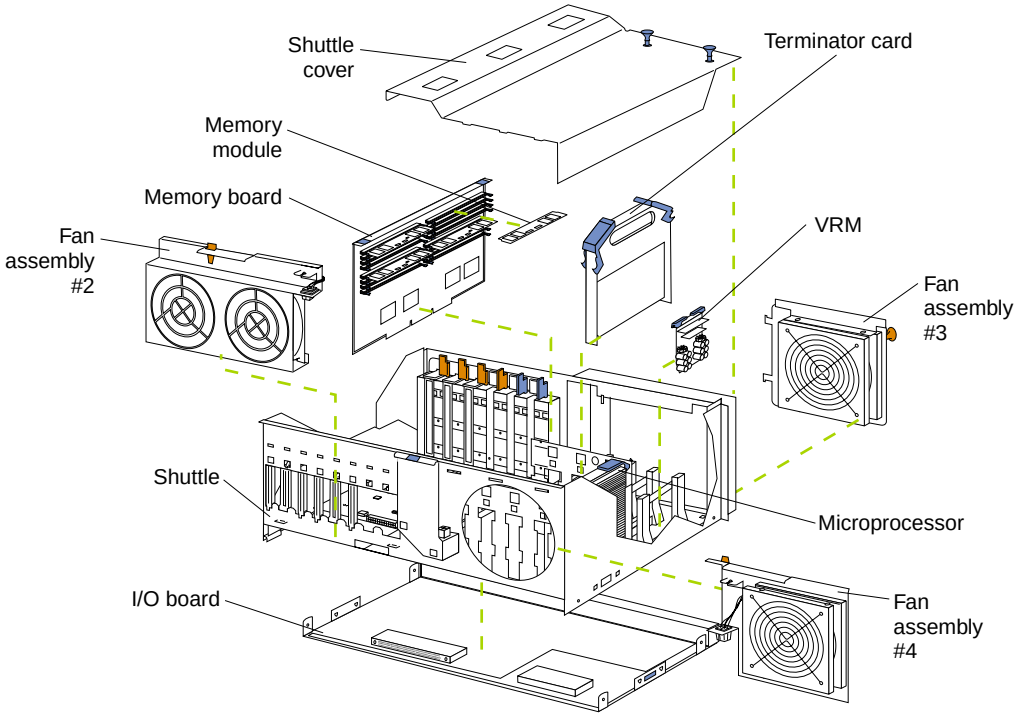
The orange color on components and labels in your server identifies hot-swap or hot-plug components. This means that you can install or remove the components while the system is running, provided that your system is configured to support this function. For complete information about installing or removing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

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

The following illustrations show the locations of the major components in your server.

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




Shuttle cover
Terminator card
Memory module
Memory board
Fan assembly #2
VRM
Fan assembly #3
Shuttle
Microprocessor
I/O board
Fan assembly #4

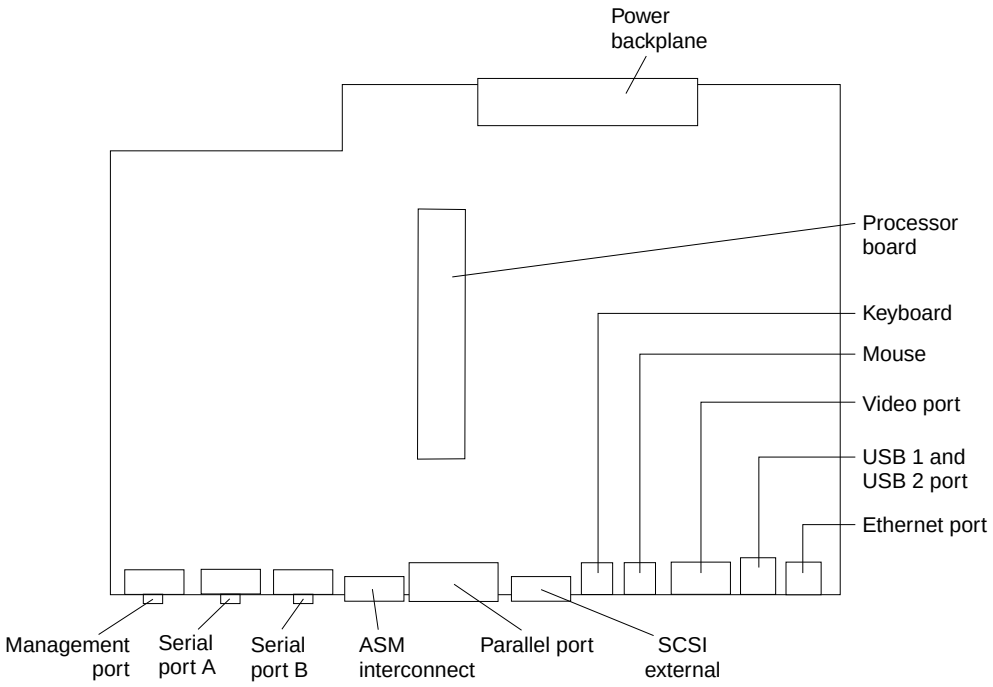
Component locations

This section provides illustrations of the I/O board, processor board, and memory board component locations.

I/O board component locations

The following illustration shows the location of the input/output connectors on the I/O board.

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



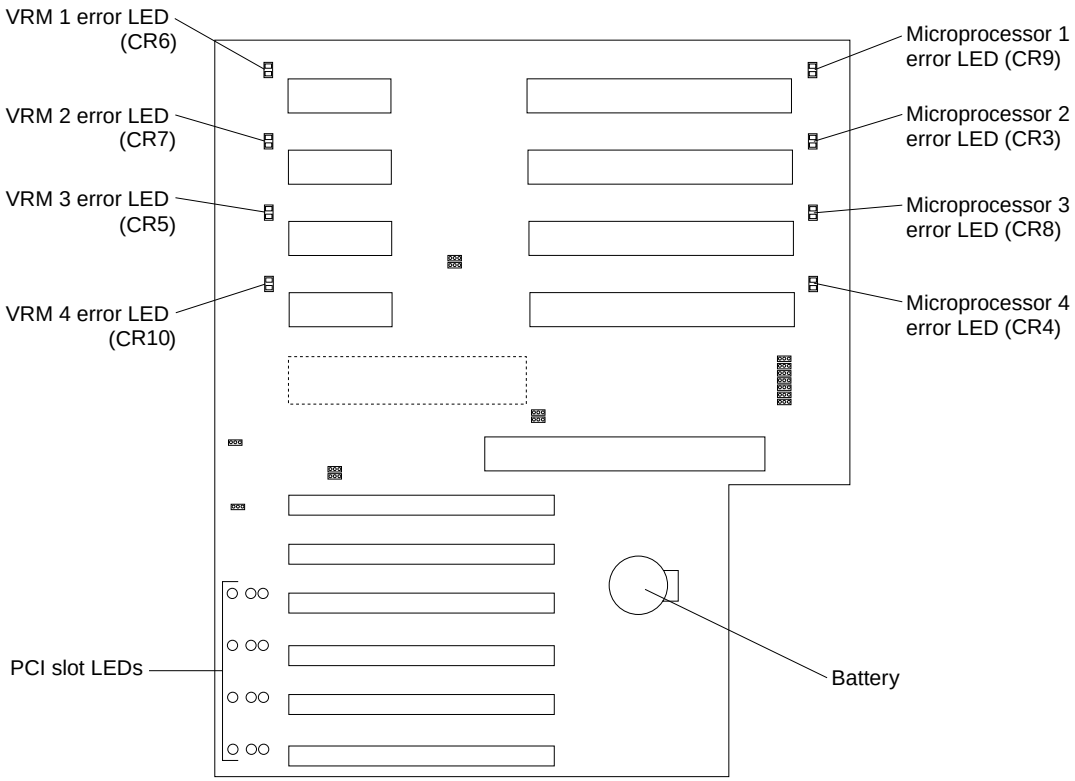
Processor board component locations

The following illustrations show the location of the LEDs, connectors, and jumpers on the processor board.

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

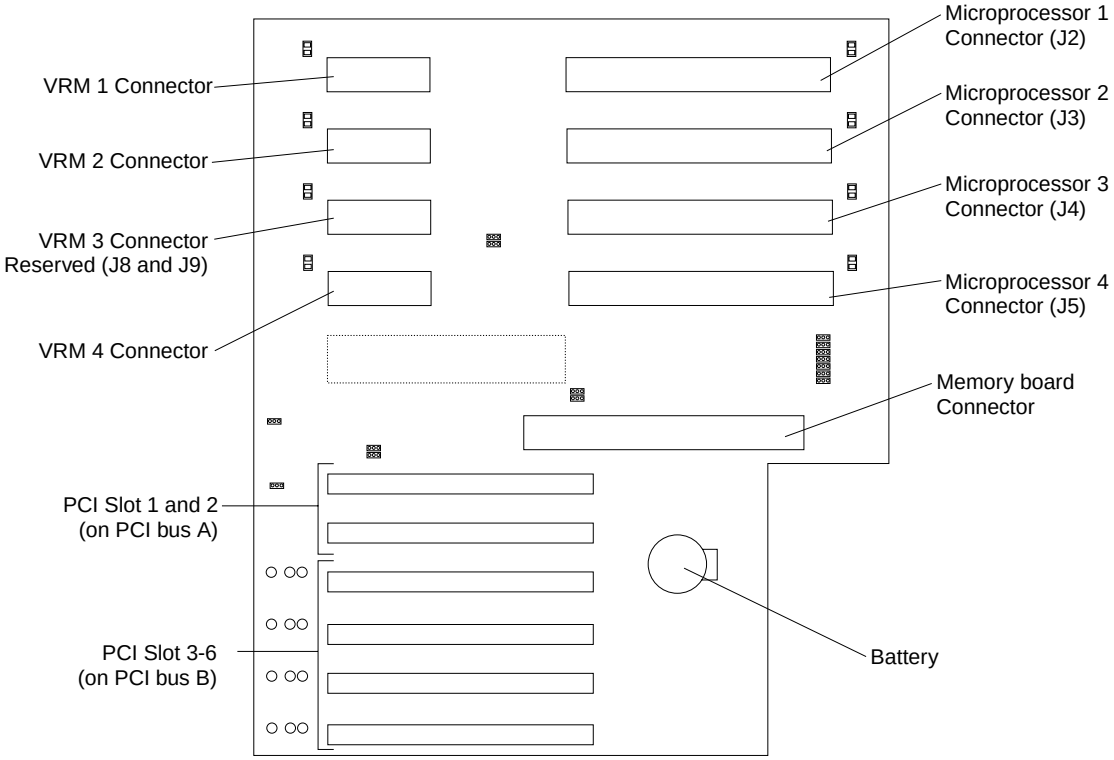
Processor board LEDs

The following illustration shows the location of the LEDs.



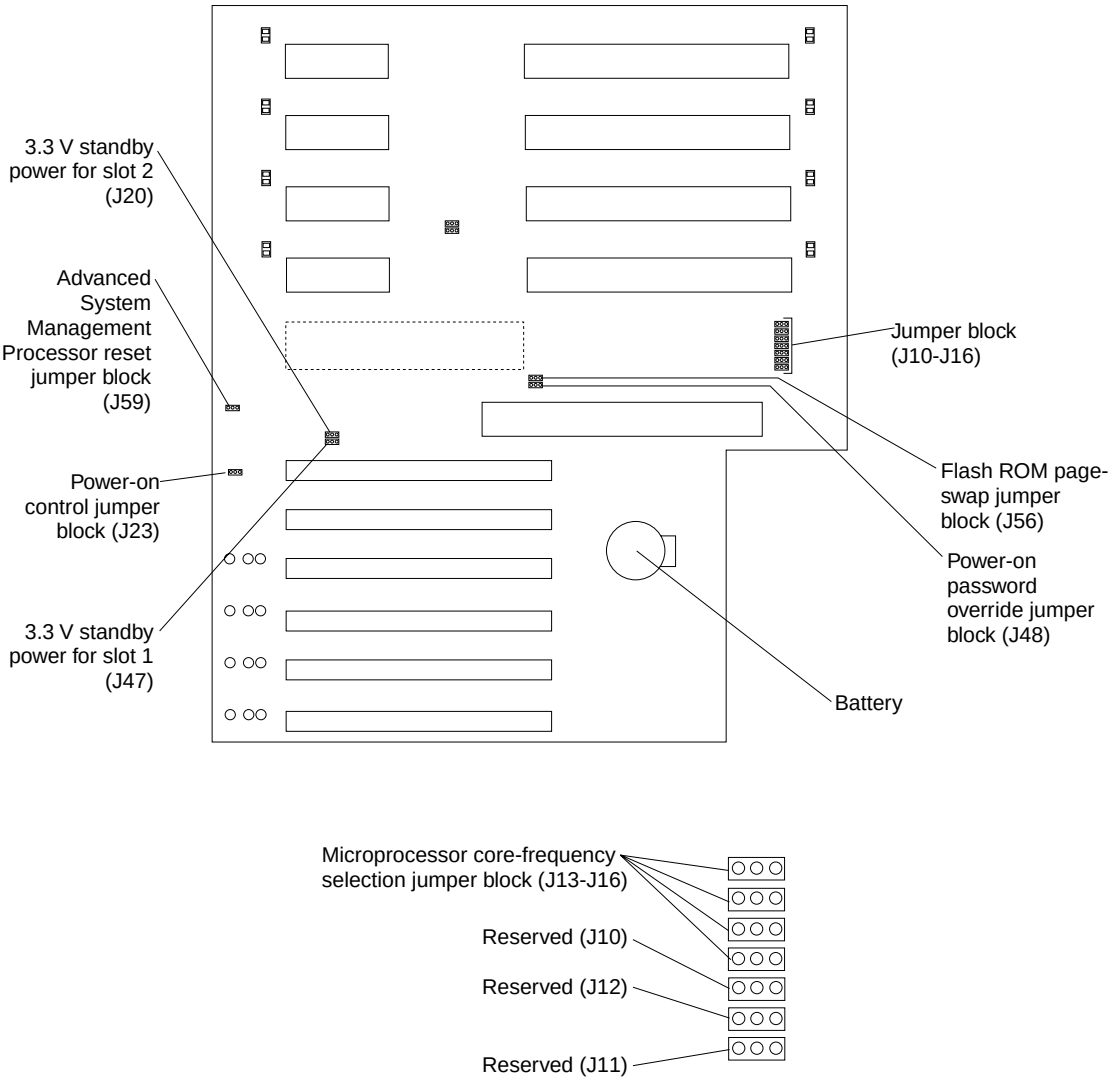
Processor board connectors

The following illustration shows the location of the connectors.



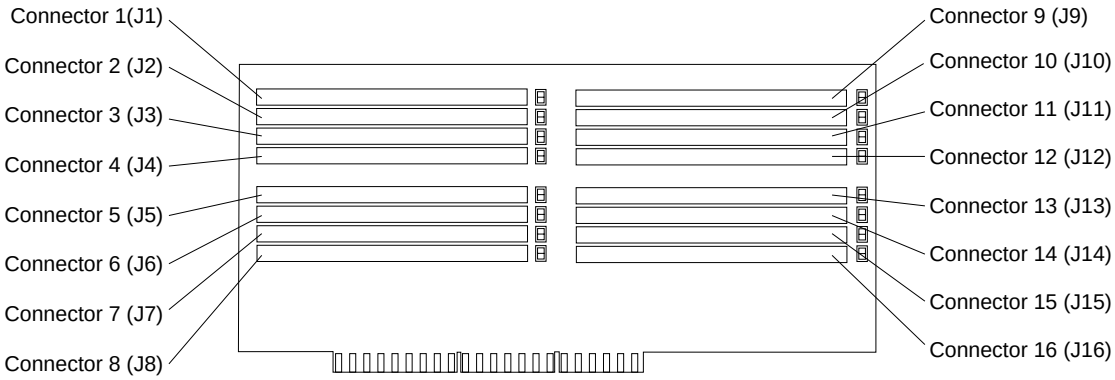
Processor board jumpers

The following illustration shows the location of the jumpers.

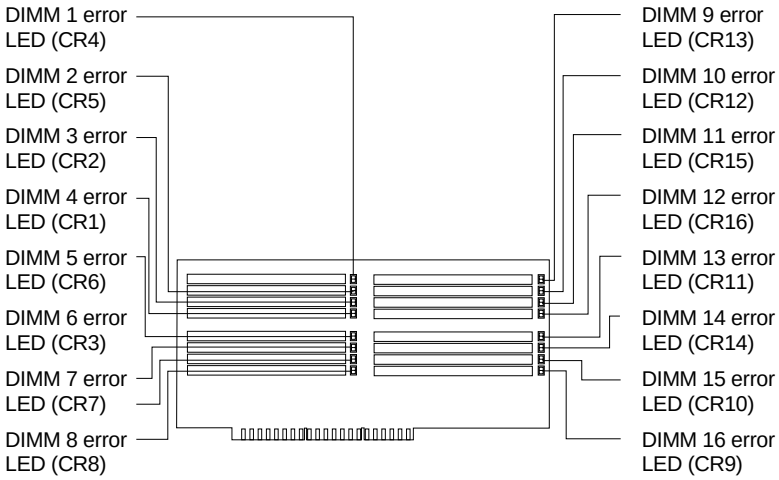


Memory board component locations

The following illustration shows the location of the DIMM connectors on the memory board.



The following illustration shows the location of the error LEDs on the memory board.



Before you begin

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

- Become familiar with the safety and handling guidelines provided in the Safety Information book, the requirements specified in “Safety information statements” on page 38, and the information in“Handling static-sensitive devices” on page 37. These guidelines will help you work safely while working with your server or options.
- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap drives, hot-swap fans, Active peripheral component interconnect (PCI) (hot-plug) adapters, or hot-plug USB devices.
- The orange color on components and labels in your server identify hot-swap or hot-plug components. This means that you can install or remove the component while the system is running, provided that your system is configured to support this function.
- The blue color on components and labels identify touch points where you can grip a component, move a latch, and so on.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options that you intend to install.
- Back up all important data before you make changes to hard disk drives.
- For a list of supported options for the xSeries 250, refer to http://www.ibm.com/pc/us/compat on the World Wide Web.

System reliability considerations

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

- Each of the drive bays has either a drive or a filler panel installed.
- Each of the power supply bays has either a power supply or a filler panel installed.
- There are at least 50 mm (2 inches) of ventilated space at the sides of the server and 100 mm (4 inches) at the rear of the server.
- The top cover is in place during normal operation.
- The top cover is removed for no longer than 30 minutes while the server is operating.
- The processor housing cover over the processor and memory area is removed for no longer than 10 minutes while the server is operating.
- A removed hot-swap drive is replaced within 10 minutes of removal.
- Cables for optional adapters are routed according to the instructions provided with the adapters.
- A failed fan is replaced within 48 hours.

Working inside the server with the power on

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

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

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and 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 two 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 on its static-protective package. (If your device is an adapter, place it component side up.) 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 statements

Before installing this product, read the Safety Information book.

مج، يجب قراءة دات السلامة

Antes de instalar este produto, leia o Manual de Informações sobre Segurança.

安装本产品前请先阅读《安全信息》手册。

Prije instalacije ovog proizvoda pročitajte priručnik sa sigurnosnim uputama.

Læs hæftet med sikkerhedsforskrifter, før du installerer dette produkt.

Lue Safety Information -kirjanen, ennen kuin asennat tämän tuotteen.

Avant de procéder à l'installation de ce produit, lisez le manuel Safety Information.

Vor Beginn der Installation die Broschüre mit Sicherheitshinweisen lesen.

Πριν εγκαταστήσετε αυτό το προϊόν, διαβάστε το εγχειρίδιο Safety Information.

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

Przed zainstalowaniem tego produktu należy przeczytać broszurę Informacje Dotyczące Bezpieczeństwa.

Prima di installare questo prodotto, leggere l'opuscolo contenente le informazioni sulla sicurezza.

本製品を導入する前に、安全情報資料を御読みください。

이 제품을 설치하기 전에, 안전 정보 책자를 읽어보십시오.

Пред да го инсталирате овој производ прочитајте ја книгата со безбедносни информации.

Lees voordat u dit product installeert eerst het boekje met veiligheidsvoorschriften.

Les heftet om sikkerhetsinformasjon (Safety Information) før du installerer dette produktet.

Prije instalacije ovog proizvoda pročitajte priručnik sa sigurnosnim uputama.

Antes de instalar este produto, leia o folheto Informações sobre Segurança.

Перед установкой продукта прочтите брошюру по технике безопасности (Safety Information).

Pred inštaláciou tohto produktu si pre ítajte Informa nú brožúrku o bezpe nosti.

Preden namestite ta izdelek, preberite knjižico Varnostne informacije.

Antes de instalar este producto, lea la Información de Seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

在安裝本產品之前，也請先閱讀「安全性資訊」小冊子。

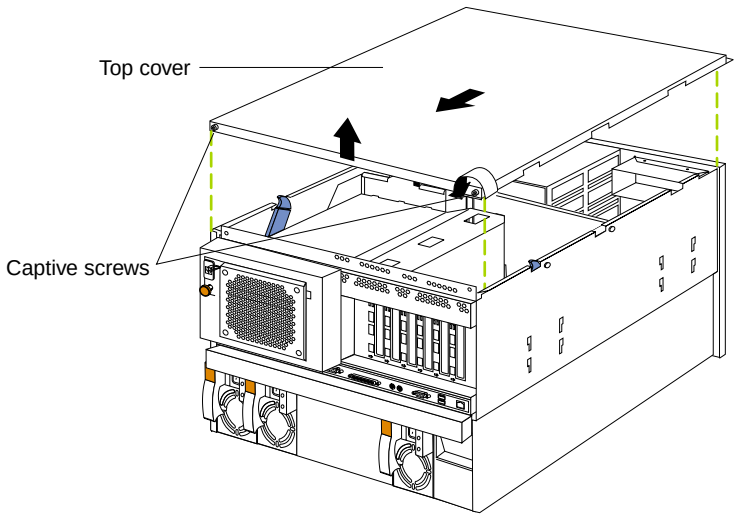
Installálás el tt olvassa el a Biztonsági el írások kézikönyvét !

Removing the server top cover and bezel

Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.

Removing the top cover

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

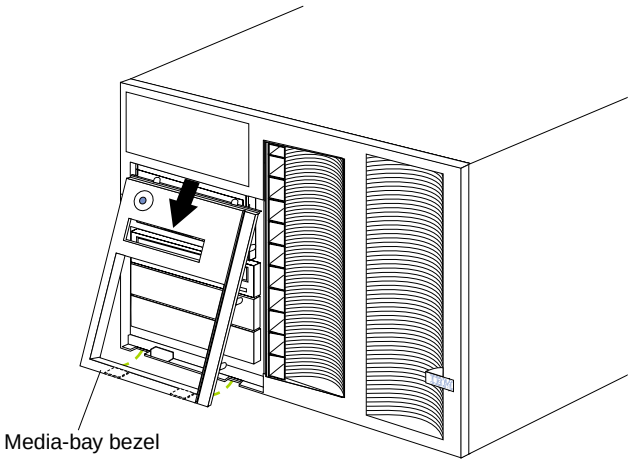


To remove the server top cover:

1. Loosen the two captive screws on the back edge of the top cover.
2. Slide the top cover slightly toward the rear of the server. Lift the cover off the server and set the cover aside.

   Attention: For proper cooling and airflow, replace the top cover after installing or removing an option. Operating the server for extended periods of time (over 30 minutes) with the top cover removed might damage server components.

Removing the media-bay bezel



To remove the media-bay bezel:

1. Release the two tabs at the bottom edge of the media-bay bezel and pull the bottom of the bezel slightly away from the server.
2. Pull the media-bay bezel down to release the two tabs at the top edge of the bezel. Store the bezel in a safe place.

Working with adapters

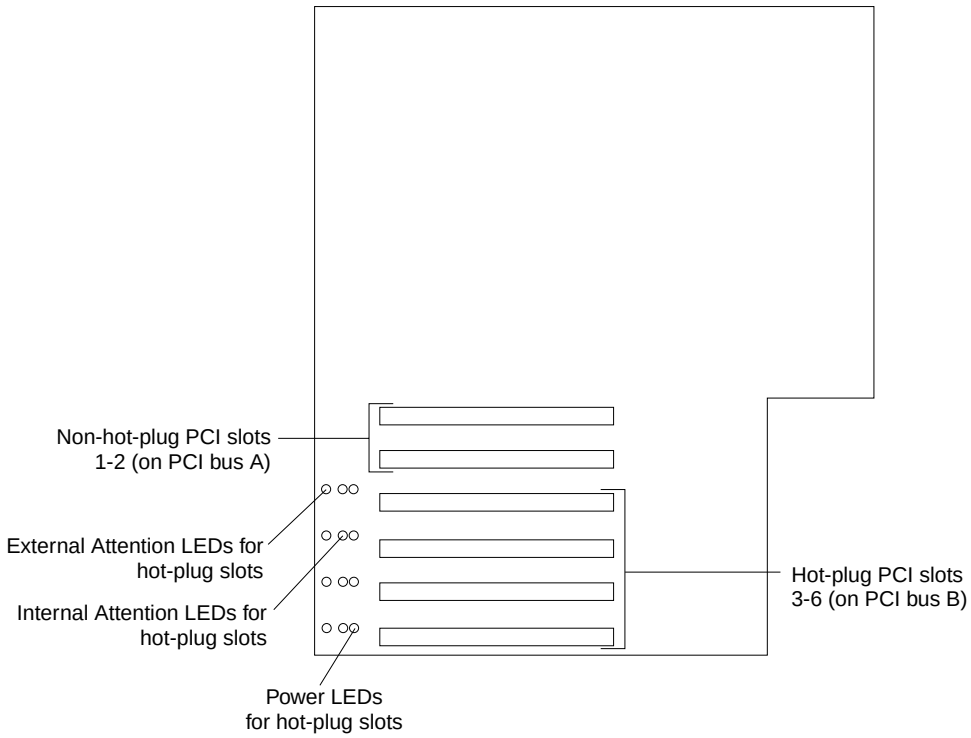
You can install up to six PCI adapters in the expansion connectors on the processor board.

Your server comes with an integrated super video graphics array (SVGA) video controller, which is not removable. If you want to disable this controller and use a video adapter instead, you can install a video adapter in an expansion slot. When you install a PCI video adapter, the server BIOS automatically disables the integrated video controller.

Note: Video adapters are supported in all six PCI slots.

The following illustration shows the location of the 64-bit PCI expansion slots on the processor board.

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



Adapter considerations

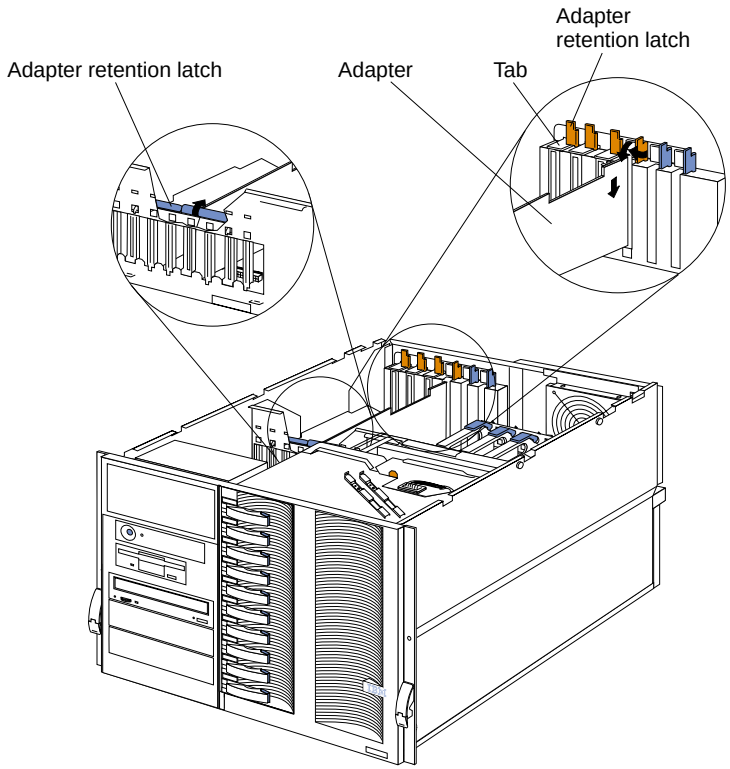
Before you continue with the adapter-installation procedure:

- Review the documentation that comes with the adapter and follow those instructions in addition to the instructions given in this chapter. If you need to change the switch or jumper settings on your adapter, follow the instructions that come with the adapter documentation.
- Slots 3 through 6 support 5.0V, 3.3V, and universal PCI adapters.

  Note: Universal PCI adapters support both 3.3V and 5.0V operation.
- Slots 1 and 2 support 3.3 V and universal non-hot-plug PCI adapters only.
- Your server uses a rotational interrupt technique to configure PCI adapters. Because of this technique, you can install a variety of PCI adapters that currently do not support sharing of PCI interrupts.
- The system scans PCI slots 1 through 6 to assign system resources; then, the system starts (boots) the PCI devices in the following order: processor board devices, slots 1 and 2, and then slots 3 through 6.
- The performance of the PCI adapters depends on the types of adapters in your system.

Installing a hot-plug PCI adapter (slots 3 through 6)

Refer to the following illustration to install a hot-plug PCI adapter.



To install a hot-plug PCI adapter:

Attention:

- Do not remove a hot-plug adapter before performing the operating-system-defined procedure for disabling the hot-plug PCI slot that contains the adapter. Failure to do so might cause your system to lock up. Refer to your operating system documentation.
- 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 37.

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. Remove the top cover (see “Removing the server top cover and bezel” on page 40).
3. Determine which expansion slot you will use for the adapter.

   Note: You can install hot-plug PCI adapters in PCI slots 3 through 6 only.
4. Disable the selected PCI slot from your operating system. (Refer to the documentation that comes with your operating system for information about disabling a hot-plug PCI slot.) Disabling the PCI slot turns off the power light for that PCI slot.

   Attention: Make sure that the power light for the hot-plug PCI slot is off before you continue with the next step.

5. Remove the expansion-slot cover:
   a. Rotate the adapter retention latch counterclockwise.
   b. Lift the tab covering the top of the expansion-slot cover and then remove the expansion-slot cover from the server. Store it in a safe place for future use.
   c. Press on the rear adapter retention latch (near the hard disk drives) as indicated by the arrow on the latch and lift it to the open position.

      Attention: You must install expansion-slot covers on all empty slots. This maintains the electromagnetic emissions characteristics of the system and ensures proper cooling of system components.
6. Refer to the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route any cables before you install the adapter.
7. Remove the adapter from the static-protective package.

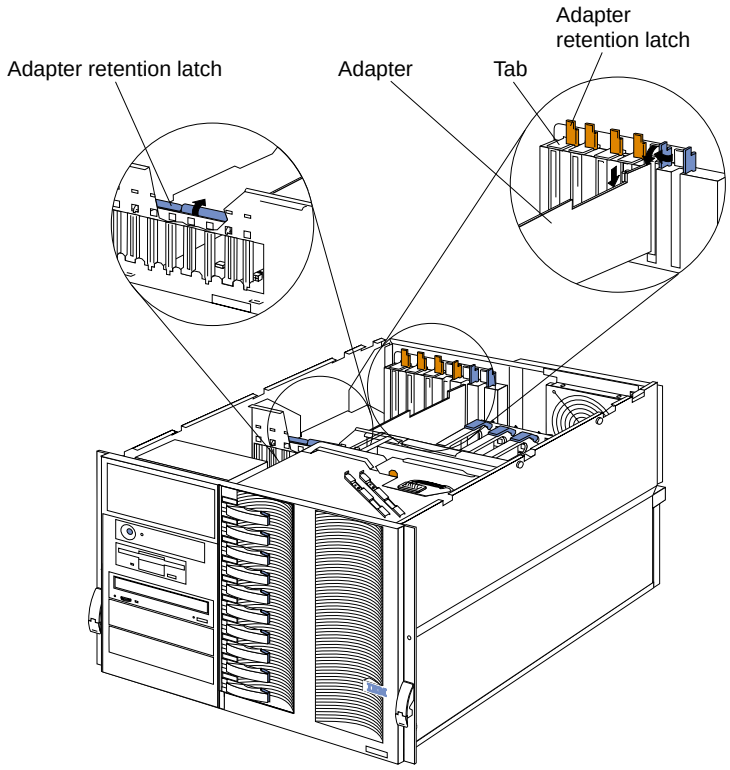
   Attention: Avoid touching the components and gold-edge connectors on the adapter. If you need to put down the adapter, place the adapter, component-side up, on a flat, static-protective surface.
8. Install the adapter:
   a. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the processor 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 expansion slot. Incomplete insertion might cause damage to the processor board or the adapter.
   c. Lower the tab over the top corner of the adapter. Rotate the adapter retention latch clockwise until it snaps into place.
   d. Lower the rear adapter retention latch (near the hard disk drives) over the top of the adapter and press on the indentation on the latch until the latch snaps into place.
9. Connect any needed cables to the adapter.
10. Enable the PCI slot from your operating system. (Refer to the documentation that comes with your operating system for information about enabling a hot-plug PCI slot.) Make sure that the power light for the hot-plug PCI slot comes on.
11. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 77.

Installing a non-hot-plug PCI adapter (slots 1 and 2)

The following illustration shows how to install a non-hot-plug PCI adapter.

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



To install a non-hot-plug PCI 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 37.

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. Turn off the server; then, disconnect the power cords.
3. Remove the top cover (see “Removing the server top cover and bezel” on page 40).
4. Determine which expansion slot you will use for the adapter.

   Note: PCI slots 1 and 2 support non-hot-plug PCI adapters only.
5. Remove the expansion-slot cover:
   a. Rotate the adapter retention latch counterclockwise.
   b. Lift the tab covering the top of the expansion-slot cover and then remove the expansion-slot cover from the server. Store it in a safe place for future use.
   c. Press on the rear adapter retention latch (near the hard disk drives) as indicated by the arrow on the latch and lift it to the open position.

      Attention: You must install expansion-slot covers on all empty slots. This maintains the electromagnetic emissions characteristics of the system and ensures proper cooling of system components.

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

   Attention: Avoid touching the components and gold-edge connectors on the adapter. If you need to put down the adapter, place the adapter, component-side up, on a flat, static-protective surface.
8. Install the adapter:
   a. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the processor 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 expansion slot. Incomplete insertion might cause damage to the processor board or the adapter.
   c. Lower the tab over the top corner of the adapter. Rotate the adapter retention latch clockwise until it snaps into place.
   d. Lower the rear adapter retention latch (near the hard disk drives) over the top of the adapter and press on the indentation on the latch until the latch snaps into place.
9. Connect any needed cables to the adapter and reconnect the power cords that you disconnected in step 2 on page 45.
10. If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 77.

Cabling example for the ServeRAID adapter

You can install an optional IBM ServeRAID™ adapter in your server to control the internal hot-swap hard-disk drives; that is, to enable you to configure the internal hot-swap hard disk drives into disk arrays. Refer to your ServeRAID adapter option documentation for additional information on:

- Installing a ServeRAID adapter in your server
- Connecting the SCSI cable to a ServeRAID adapter
- ServeRAID adapters and controllers

Select the PCI slot where you want to install the ServeRAID adapter. Before you install the ServeRAID adapter, verify that it is compatible with the PCI slot that you selected. Some ServeRAID adapters are not compatible with PCI slots 1 and 2. See “Adapter considerations” on page 42 for additional information on PCI slots.

The following procedure describes the cable routing that is necessary when you install a ServeRAID adapter. You can also cable a ServeRAID adapter to external hard disk drives.

Notes:

1. The illustrations in this document might differ slightly from your hardware.
2. Refer to the documentation that comes with your adapter for any cabling instructions.
3. Cable identifiers are printed on the cables that come with your server and options. Use these identifiers to connect the cables to the correct connectors. For example, the hard disk drive cables are labeled "HDD".

To cable the ServeRAID adapter:

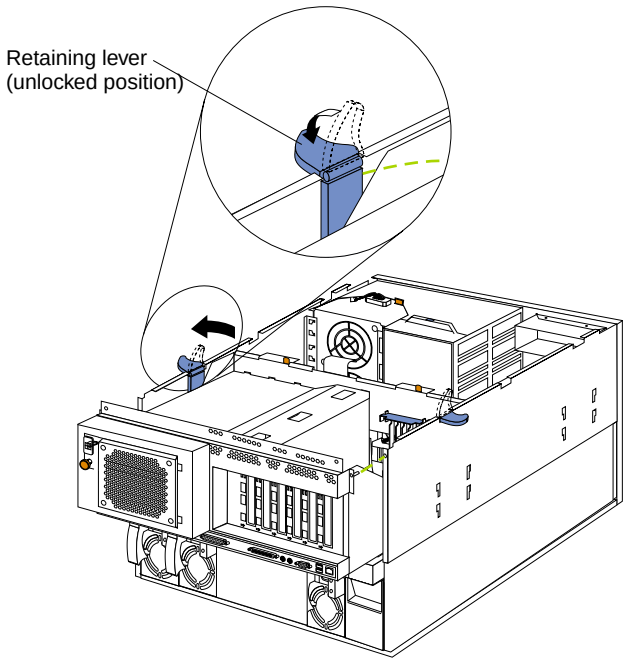
1. Determine the number of SCSI channels that you want to use on the ServeRAID adapter. If you are connecting to more than two SCSI channels, you might need to purchase additional SCSI cables. Consult your IBM marketing representative or reseller for additional information on the number and types of cables that your server configuration requires.

   As shipped, your server comes with two SCSI cables attached to the SCSI backplane (see “Using the LVD SCSI backplane” on page 53 for details):

   - One end of the first SCSI cable is attached to the SCSI channel A connector on the SCSI backplane, and the other end is attached to the power backplane.
   - One end of the second SCSI cable is attached to the SCSI channel B connector on the SCSI backplane. The other end of this cable is folded and restrained with a clamp.

   If you want to connect all of the hot-swap hard disk drives to one channel, you must install an optional SCSI repeater card as described in “Installing a SCSI repeater card” on page 54.
2. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
3. Turn off the server; then, disconnect the power cords.
4. Remove the top cover (see “Removing the server top cover and bezel” on page 40).
5. If you have not yet installed the ServeRAID adapter, install it now. Depending on your server configuration, see the beginning of this section for instructions on installing a hot-plug or non-hot-plug adapter; then, return here. Otherwise, continue with the next step.

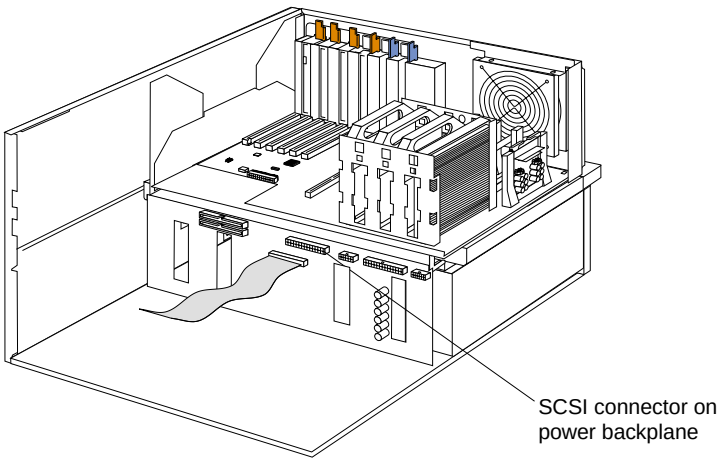
6. Disconnect the shuttle:
   a. Disengage the retaining levers by pressing inward.
   b. Move the retaining levers back to the unlocked position.



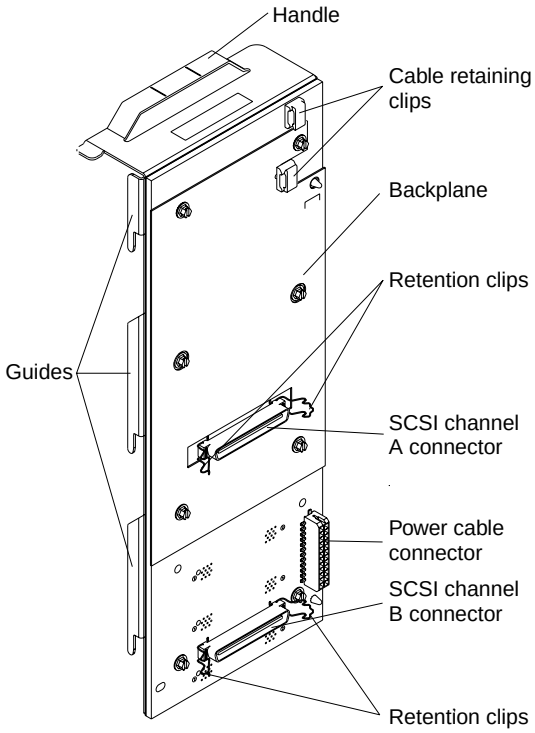
   c. Slide the shuttle toward the rear of the server until it stops.

      Note: It is not necessary to remove the shuttle from the server.

7. Disconnect the SCSI cable from the SCSI connector on the power backplane.



8. Route one end of the SCSI cable through the cable retaining clips on the SCSI backplane.

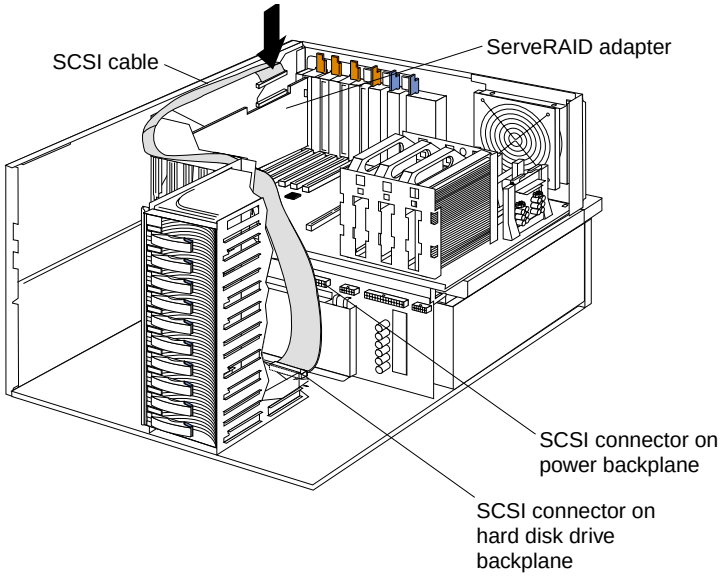


9. Attach one end of the SCSI cable to the selected internal SCSI channel connector on the ServeRAID adapter. Make sure that the other end of the SCSI cable is attached to the appropriate channel connector on the SCSI backplane.

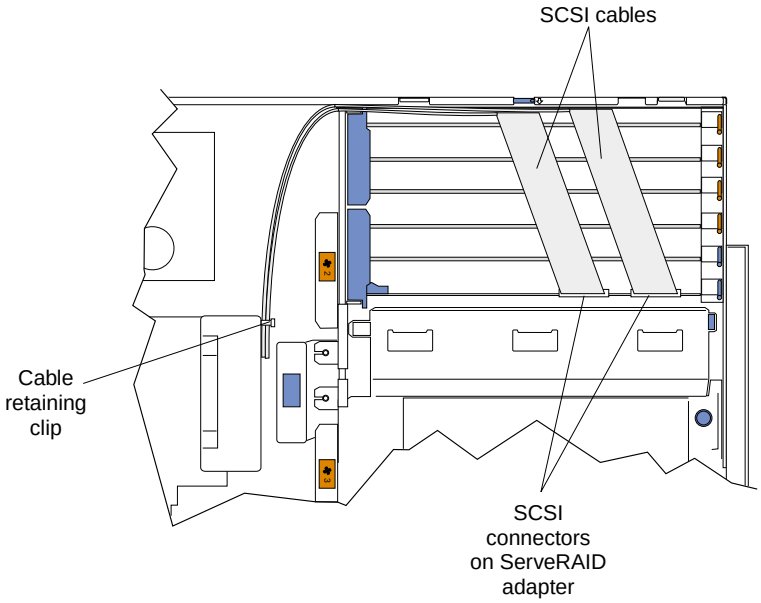
   Attention: When you route the SCSI cable, do the following:

   - Do not block the ventilated space in front of the fan assembly.
   - Do not place the SCSI cable fold on top of the fan assembly.
   - Do not route the SCSI cable over the memory board assembly.

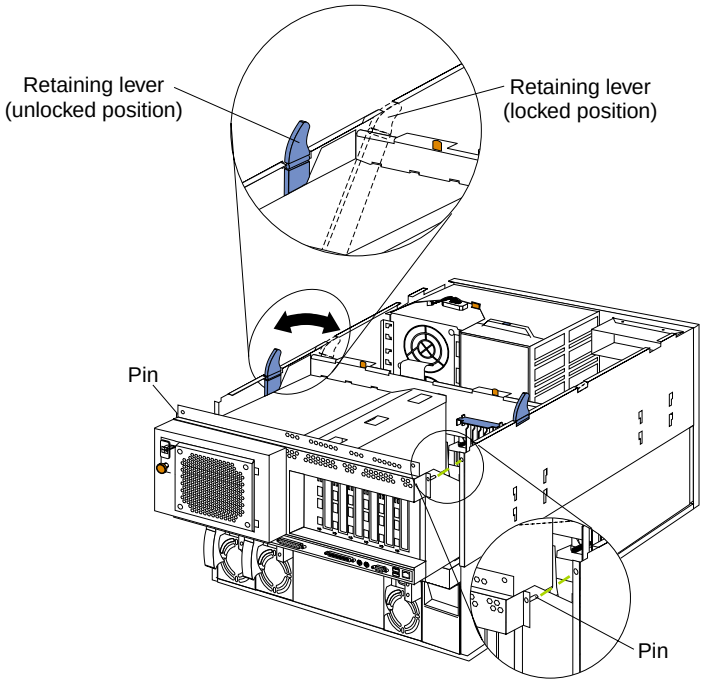
   The following illustration shows how to route one SCSI cable to the ServeRAID adapter.



10. If you are connecting to two SCSI channels, repeat step 8 on page 49 and step 9 on page 50 for the second channel on the SCSI backplane. The following illustration is a top-down view that shows how to route two SCSI cables to the ServeRAID adapter in PCI slot 1.



11. Connect the shuttle.



    a. Align the two shuttle pins with the holes on each side of the rear of the chassis, and disengage the retaining levers from the notches on the chassis.

    b. Move the retaining levers toward the front of the server and secure the retaining levers in the horizontal (locked) position.

12. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 77.

Using the LVD SCSI backplane

Your server contains hardware that enables you 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. The hot-swap drives are attached to a hot-swap hard disk drive *backplane*. The backplane is a printed circuit board behind the drive bays. For more information on drive bays and drive installation, see “Installing internal drives” on page 60.

As shipped, the LVD SCSI hot-swap hard disk drive backplane supports a split, dual-channel configuration. You can install a maximum of 10 slim-high, hot-swap hard disk drives. You can attach five drives to each half of the backplane. These drives must be low voltage differential (LVD) hard disk drives that operate at 160 MB per second or lower.

You can configure the channels on the SCSI backplane in one of two ways:

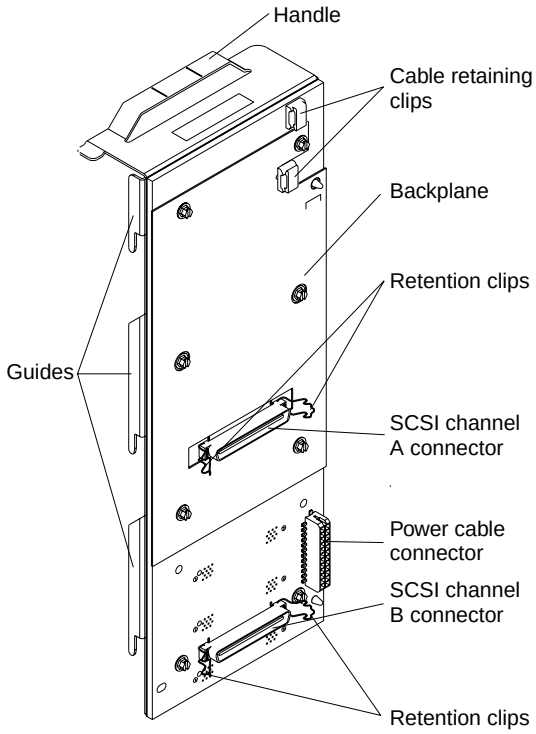
- You can configure each SCSI channel (bus) independently. This is the standard backplane configuration. In this configuration:
  - — The hard disk drives in the upper half of the backplane are attached to channel A through a SCSI cable that comes attached to the SCSI backplane.
  - — The hard disk drives in the lower half of the backplane are attached to channel B through a second optional SCSI cable. One end of this second SCSI cable comes attached to the SCSI channel B connector on the backplane. The other end of this cable is folded and restrained with a clamp.

  When you are installing hot-swap hard disk drives in the standard backplane configuration, attach the first five to channel A; then, attach the remainder to channel B. Refer to the illustration in this section for the SCSI channel connector locations.
- You can choose to configure the SCSI backplane as a single 10-drive SCSI channel. To do this, you must install an optional SCSI repeater card as described in “Installing a SCSI repeater card” on page 54.

Notes:

1. The LVD SCSI backplane is also known as the SCSI backplane or the hot-swap hard disk drive backplane.
2. Table 10 on page 85 lists the SCSI identifiers (IDs) for the LVD SCSI backplane and the hot-swap hard disk drives that are attached to SCSI channels A and B.
3. Carefully route all cables so that they do not become damaged.
4. Cable identifiers are printed on the cables that come with your server and options. Use these identifiers to attach the cables to the correct connectors. For example, the hard disk drive cables are labeled "HDD".
5. For information on cabling options and using the LVD SCSI backplane, refer to the documentation that comes with the option kit.
6. For additional information on cabling the ServeRAID adapter, see “Cabling example for the ServeRAID adapter” on page 47.
7. The illustrations in this document might differ slightly from your hardware.

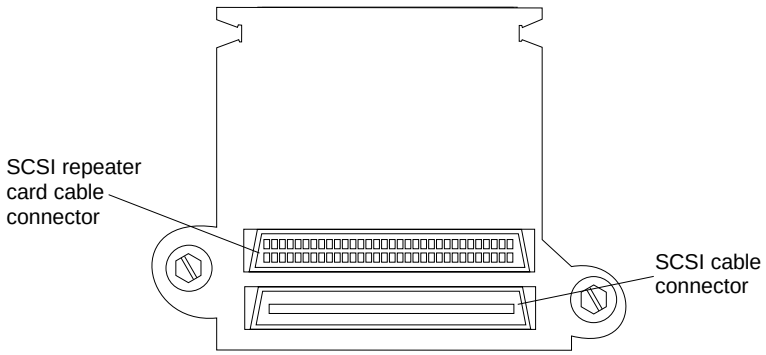
The following illustration shows the main SCSI backplane component locations.



Installing a SCSI repeater card

You must install an optional SCSI repeater card to connect all of your internal hot-swap hard disk drives to the same SCSI channel.

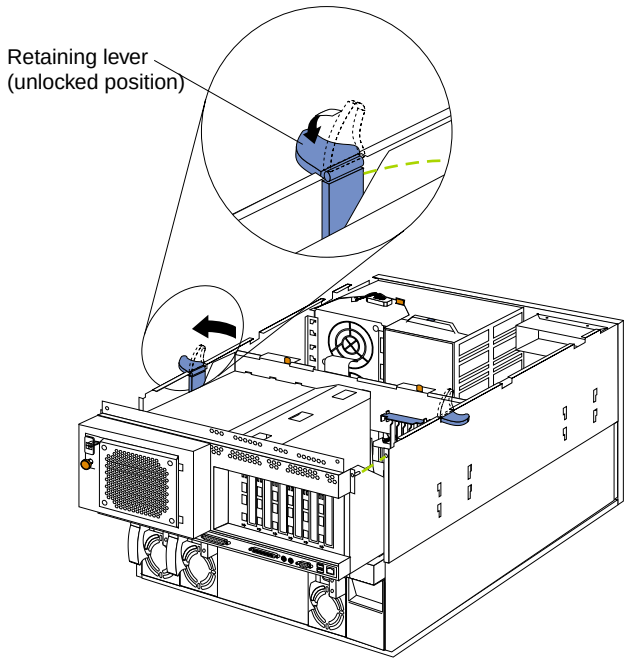
The following illustration shows the rear connectors on the optional SCSI repeater card, as viewed from the rear of the server.



To install a SCSI repeater card:

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 37.

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. Turn off the server and peripheral devices, and disconnect all power cords and external cables; then, remove the top cover (see “Removing the server top cover and bezel” on page 40).
3. If a ServeRAID adapter is installed in the server, disconnect the SCSI cable from the adapter (see “Cabling example for the ServeRAID adapter” on page 47).
4. Disconnect the shuttle:
   a. Disengage the retaining levers by pressing inward.
   b. Move the retaining levers back to the unlocked position.



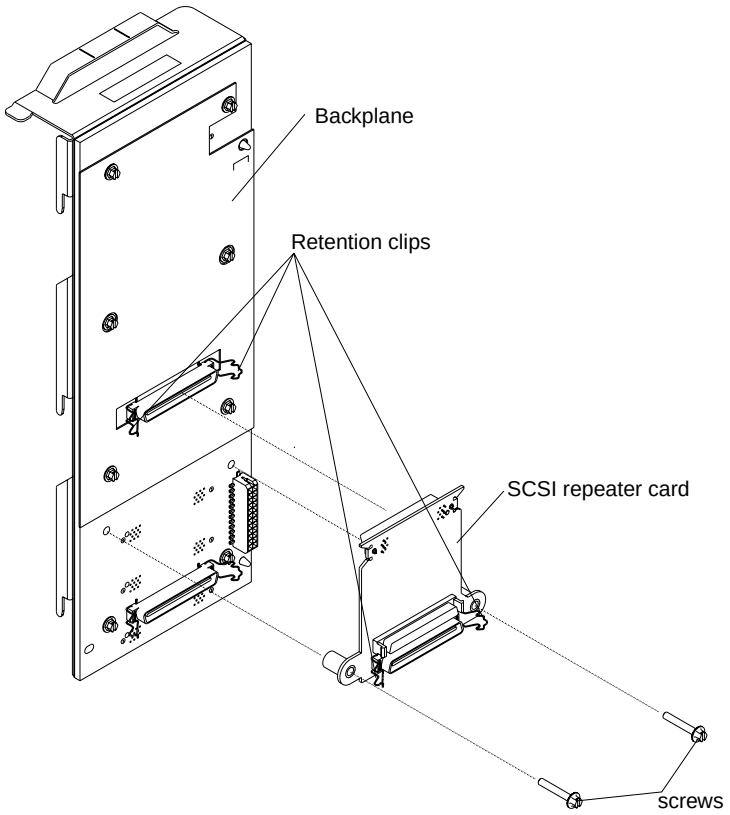
   c. Slide the shuttle toward the rear of the server until it stops.

      Note: It is not necessary to remove the shuttle from the server.
5. Remove fan assembly 1 from the server (see “Replacing a hot-swap fan” on page 76).
6. Disconnect the hot-swap hard disk drives from the corresponding SCSI backplane connectors; then, slide the drives forward.

   Note: It is not necessary to remove the drives from the server.

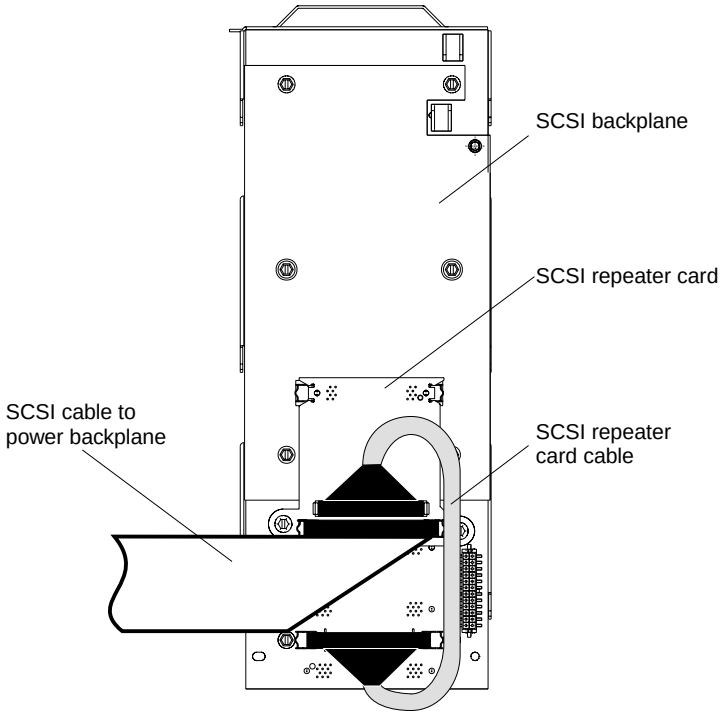
7. Remove the SCSI backplane from the server:
   a. Lift the SCSI backplane guides from the corresponding slots on the server; then, slide the SCSI backplane upward.
   b. Disconnect the power cable from the SCSI backplane.
   c. Disconnect the SCSI cables from the channel A and B connectors on the SCSI backplane.
   d. Lift the SCSI backplane from the server.
8. Touch the static-protective package that contains the repeater card option to any unpainted metal surface on the server; then, remove the repeater card option from the package.

   Note: If necessary, refer to the documentation that comes with the repeater card option kit to assemble the repeater card option.
9. Connect the repeater card option to the SCSI backplane:
   a. Align the corresponding connectors on the repeater card and the SCSI backplane. The corresponding screw holes on the repeater card and the SCSI backplane will automatically align.

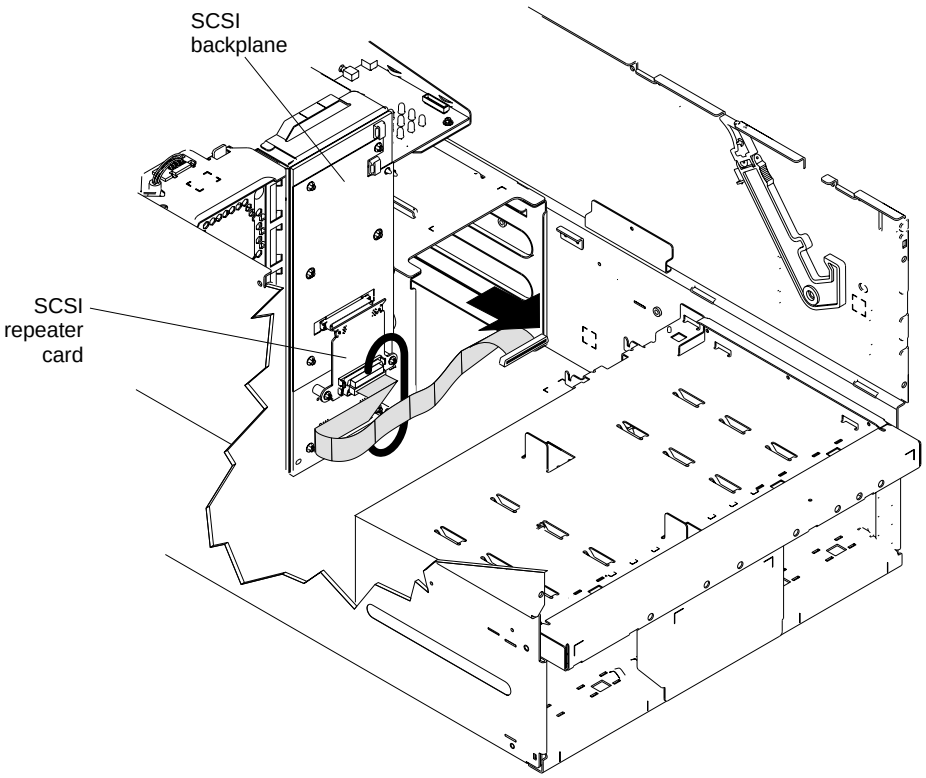


   b. Use a small, flat-blade screwdriver to connect the repeater card to the SCSI backplane with the two screws from the repeater card option kit.
   c. Secure the repeater card with the retention clips on the SCSI channel A connector on the SCSI backplane.

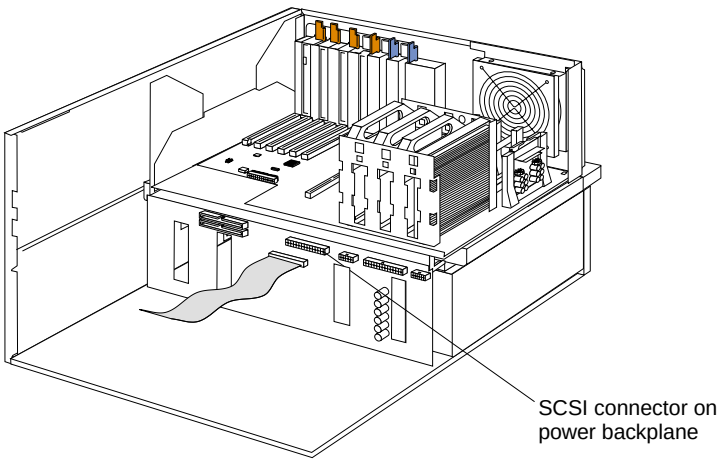
10. A short SCSI cable comes with the repeater card option kit.
    a. Connect one end of this cable to the repeater card.
    b. Connect the other end of the cable to the SCSI channel B connector on the SCSI backplane.
    c. Secure both cable ends with the retention clips on the SCSI connectors.



11. Reinstall the SCSI backplane in the server:
    a. Reconnect the power cable to the SCSI backplane.
    b. Align the SCSI backplane guides with the corresponding slots on the server.
    c. Slide the SCSI backplane into the server.
    d. Connect one end of the SCSI cable to the repeater card.



    e. Make sure that the other end of the SCSI cable is attached to the power backplane located on the rear of the shuttle.

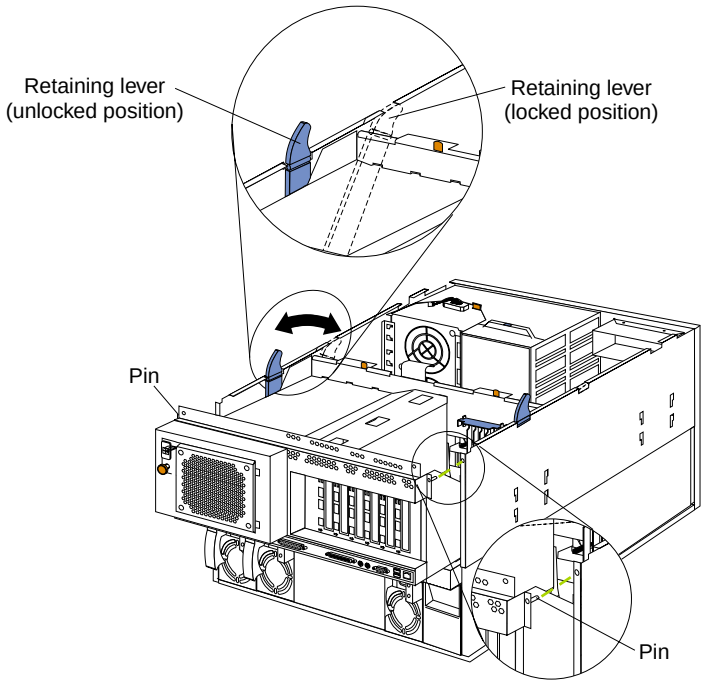


12. Slide the hot-swap hard disk drives back into place in the drive bays. If you need to install additional hot-swap drives, do so now (see “Installing a hot-swap hard disk drive” on page 62). You can connect a maximum of 10 hard disk drives to the SCSI backplane.

    Note: After you connect these hard disk drives to the SCSI backplane, the backplane sets the SCSI IDs for the backplane and the hard disk drives. See “Setting SCSI IDs” on page 85 for additional information.

13. Reinstall fan assembly 1 in the server.

14. Reconnect the shuttle.



    a. Align the two shuttle pins with the holes on each side of the rear of the chassis, and disengage the retaining levers from the notches on the chassis.

    b. Move the retaining levers toward the front of the server, and secure the retaining levers in the horizontal (locked) position.

15. If you disconnected the SCSI cable from the ServeRAID adapter in step 3 on page 55, reconnect the SCSI cable to the adapter.

16. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 77.

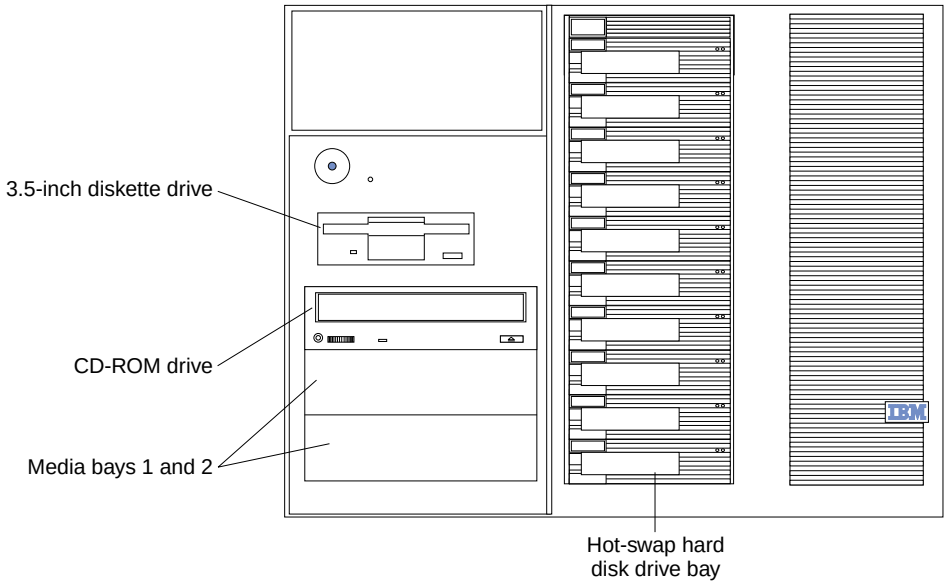
Installing internal drives

If you add different types of drives, your system can read multiple types of media and store more data. Several types of drives are available, such as:

- Diskette
- Hard disk
- CD-ROM
- Tape

Internal drives are installed in bays. Your server comes with one 3.5-inch, 1.44 MB diskette drive and one IDE CD-ROM drive.

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



Each hot-swap drive has two indicator lights on the front of the server. If the amber hard-disk status light for a drive is lit continuously, that individual drive is faulty and needs to be replaced. When the hard-disk status light indicates a drive fault, you can replace a hot-swap drive without turning off the server.

Each hot-swap drive that you plan to install must be 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.

Internal drive bays

Internal drives are installed in *bays*.

- Your server comes with one CD-ROM drive and one 3.5-inch, 1.44 MB diskette drive.
- The left front bays support 5.25-inch, half-high, removable-media drives. Any two adjacent 5.25-inch, half-high bays can be converted to a single full-high bay.

  Note: The server EMI integrity and cooling are both protected by having the left front bays covered or occupied. When you install a drive, save the filler panel from the bay, in case you later remove the drive and do not replace it with another.
- You cannot install hard disk drives in the left front bays. You can install hot-swap hard disk drives only in the hot-swap hard disk drive bays on the right front side of the server.
- If you are installing a device with a 50-pin connector in one of the left front bays, you will need a 68-to-50-pin converter (option number 32G3925).
- Your server supports 10 1-inch (26 mm) slim-high, 3.5-inch hot-swap hard disk drives in the hot-swap bays.
- The hot-swap bays connect to the LVD SCSI backplane. Your server comes with two SCSI channels on this backplane. For more information, see “Using the LVD SCSI backplane” on page 53.

Some drives have a special interface called *small computer system interface*, or SCSI. Using this interface, you can attach multiple drives to a single SCSI controller.

Notes:

1. Any information about SCSI drives also applies to other SCSI devices, such as scanners and printers.
2. If you plan to install both internal and external SCSI devices, you must follow the instructions in “Connecting external options” on page 79, in addition to the instructions in this section.

An additional 16-bit, two-drop SCSI cable comes with your server for connecting removable-media drives. This removable-media drive cable is located in the bottom of your server between the open bays and the power supply area. It is folded and restrained with a cable clamp.

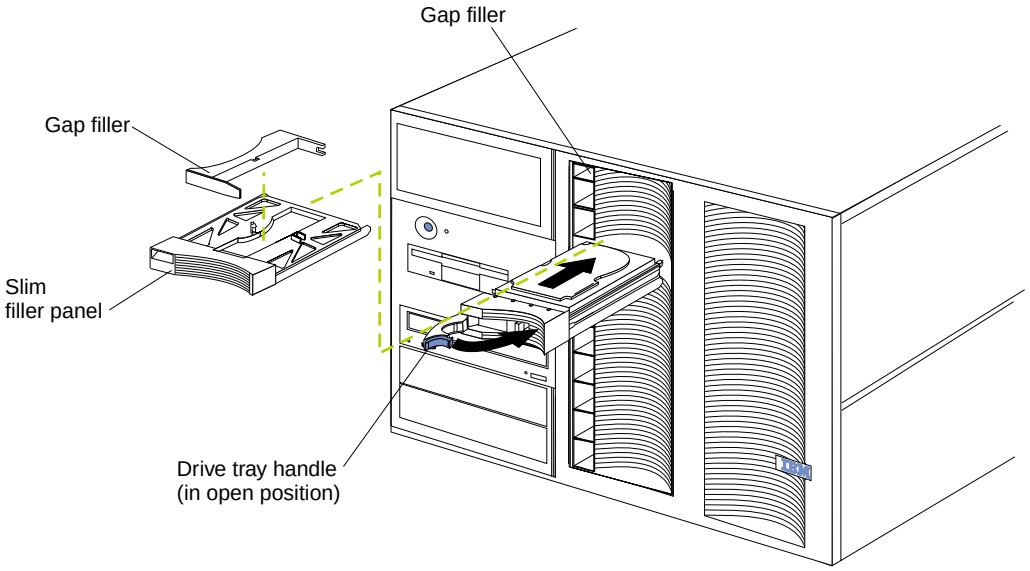
If you want to install SCSI devices in the removable-media bays:

1. Locate the internal SCSI connector on the power backplane.
2. Use the 16-bit, two-drop SCSI cable located in the bottom of the server media bay.
3. Connect the SCSI device(s) in the removable-media bay to the internal SCSI connector on the power backplane.

Installing a hot-swap hard disk drive

When you install hot-swap hard disk drives in the server, these drives must be LVD hard disk drives that operate at 160 MB per second or lower. Refer to the following illustration when installing a hot-swap drive. The server comes with a gap filler installed at the top of the hot-swap hard disk drive bays. You cannot install a drive in the gap. Some gap fillers also come attached to a slim filler panel. The gap filler is removable from the slim filler panel, when available.

Attention: If you are replacing a drive that is part of a RAID level 1 or RAID level 5 logical drive, ensure that you install the replacement drive in the correct bay. Failure to replace the drives in their correct bays can result in loss of data.



Note: You do not have to turn off the server to install hot-swap drives in these bays.

To install a drive in a hot-swap bay:

1. Review the information in"Before you begin" on page 36 through "Safety information statements" on page 38.
2. Remove the slim 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.

   Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed for each bay.
3. Install the hard disk drive in the hot-swap bay:
   a. If there is a small gap above or below the drive, separate the gap filler from the slim filler panel and insert it in the gap.

      Note: A drive placement guide is located on the inside edge of the bezel. The drive placement guide indicates the placement for slim-high drives. The guide also shows the SCSI ID assigned to the drive.

   b. Ensure that the tray handle is open (that is, perpendicular to the drive).
   c. Align the drive assembly with the guide rails in the bay.
   d. Gently push the drive assembly into the bay until the drive stops.
   e. Push the tray handle to the closed (locked) position.

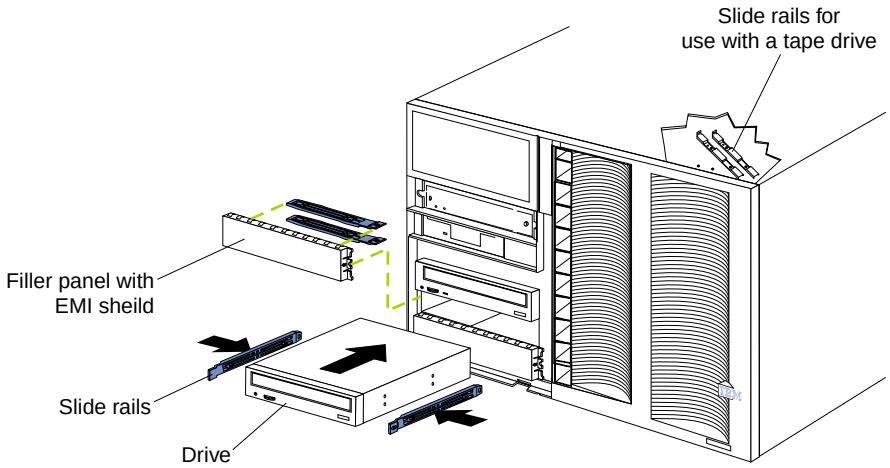
f. Check the hard disk drive status indicators to verify that the hard disk drive is operating properly.

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

Note: If your server has an optional ServeRAID adapter installed, you must configure your disk arrays after installing hard disk drives. Refer to the information that comes with your ServeRAID adapter for details.

Installing a 5.25-inch removable-media drive

Refer to the following illustrations when installing a 5.25-inch removable media drive.



Choose the bay in which you want to install the drive. Also, check the instructions that come with the drive to see if you need to set any switches or jumpers on the drive.

To install a removable-media drive in one of the left front bays:

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 37.

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. Turn off the server and all attached devices. Disconnect all external cables and remove the top cover (see “Removing the server top cover and bezel” on page 40).
3. Remove the media-bay bezel.
4. Remove the filler panel from the bay opening. Keep the filler panel nearby.

   Note: The server EMI integrity and cooling are both protected by having the left front bays covered or occupied. When you install a drive, save the filler panel from the bay, in case you later remove the drive and do not replace it with another.
5. Touch the static-protective package that contains the drive to any unpainted metal surface on the server; then, remove the drive from the package and place it on a static-protective surface.

6. Remove the snap-on slide rails from the filler panel and snap the rails on the drive. Store the filler panel for later use.

   Note: Slide rails for installing a tape drive are attached with screws. Use the screws to attach the rails to the side of the tape drive.

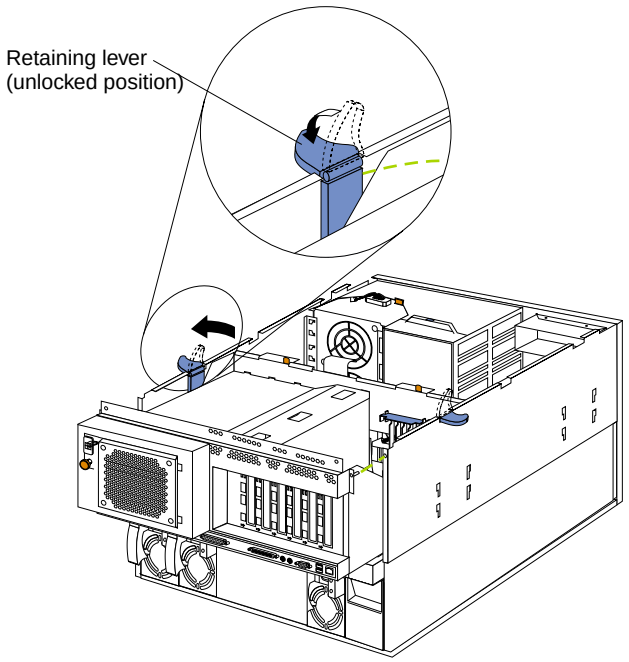
7. Align the slide rails on the drive with the guide rails in the bay; then, slide the drive into the bay until it snaps into place.

   Note: If you are installing a tape drive, use the screws that are shipped next to the tape drive rails to attach the tape drive to the front of the chassis.

8. Disconnect the shuttle:

   a. Disengage the retaining levers by pressing inward.

   b. Move the retaining levers back to the unlocked position.



   c. Slide the shuttle toward the rear of the server until it stops.

      Note: It is not necessary to remove the shuttle from the server.

9. If you are installing a SCSI device, continue with the next step. If you are installing an IDE device, go to step 11 on page 65.

10. Install the two-drop SCSI cable:

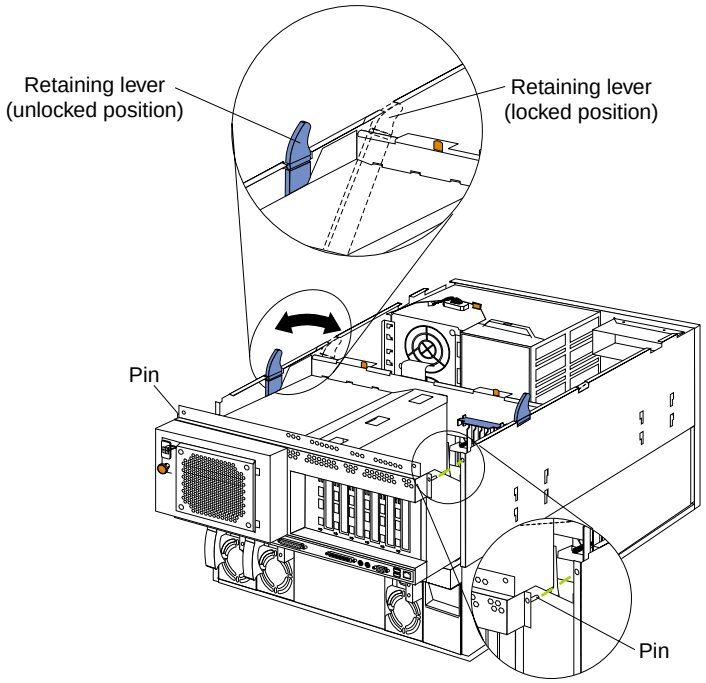
    a. Locate the two-drop SCSI cable. This removable-media drive cable is located in the bottom of your server between the open bays and the power supply area. It is folded and restrained with a cable clamp.

    b. Connect one of the connectors on the two-drop SCSI cable to the back of the drive.

    c. Connect the other end of the two-drop SCSI cable to the SCSI connector on the power backplane.

    d. Go to step 12 on page 65.

11. To install an IDE device, such as a CD-ROM or a DVD-ROM, use the two-drop IDE cable that comes with the option.
    a. Remove the cable that connects the CD-ROM to the IDE connector on the power backplane.
    b. Using the two-drop cable that came with your IDE option, connect the CD-ROM and IDE device that you are installing to the IDE connector on the power backplane.
    c. Set the jumper on the back of the new IDE option as secondary.
12. Connect a power cable to the back of the drive. Power cables for removable-media drives come installed in your server. The connectors are keyed and can be inserted only one way.
13. If you are installing another 5.25-inch drive, do so now. Otherwise, continue with the next step.
14. Connect the shuttle.



    a. Align the two shuttle pins with the holes on each side of the rear of the chassis, and disengage the retaining levers from the notches on the chassis.
    b. Move the retaining levers toward the front of the server, and secure the retaining levers in the horizontal (locked) position.
15. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 77.

Installing memory-module kits

Before you continue with the memory-installation procedure, review the following:

- Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
- All the DIMMs installed in each set must be the same size and speed, but all the sets do not have to contain DIMMs of the same size and speed.
- The memory board contains 16 DIMM connectors and supports 4-way memory interleaving.
- Install only 3.3 V, 168-pin, 8-byte, registered DIMMs. Only 100 MHz, 72-bit, registered, synchronous, error correcting code (ECC), SDRAM configuration DIMM memory is supported for the 128 MB, 256 MB, 512 MB and 1 GB (when available) DIMMs.

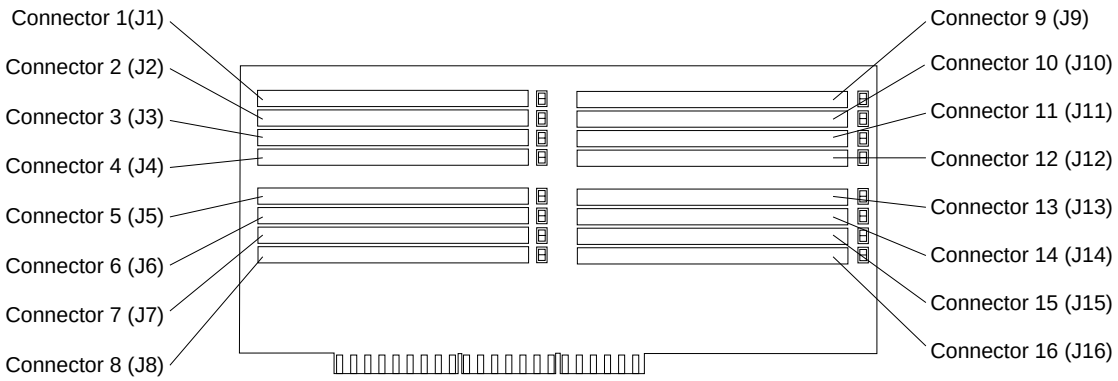
  Note: If you install 64 MB DIMMs, they will not support the Chipkill memory function.
- If you install 4 GB of memory, some of the memory is reserved for system resources. The amount reserved for system resources depends on the configuration of the server.
- If you install 16 GB of memory, the Configuration/Setup Utility will display the memory that is usable by the network operating system. This amount of memory might differ from the amount of memory that you have installed.
- 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 using the Configuration/Setup Utility program. Refer to “Using the Configuration/Setup Utility program” on page 13 for more information.
- Install the DIMMs in the order provided in Table 3 on page 67.

Set of 4 DIMMs	Install DIMMs in these connectors:
First set (shipped as standard)	J1, J5, J9, J13
2nd set	J2, J6, J10, J14
3rd set	J3, J 7, J11, J15
4th set	J4, J8, J12, J16

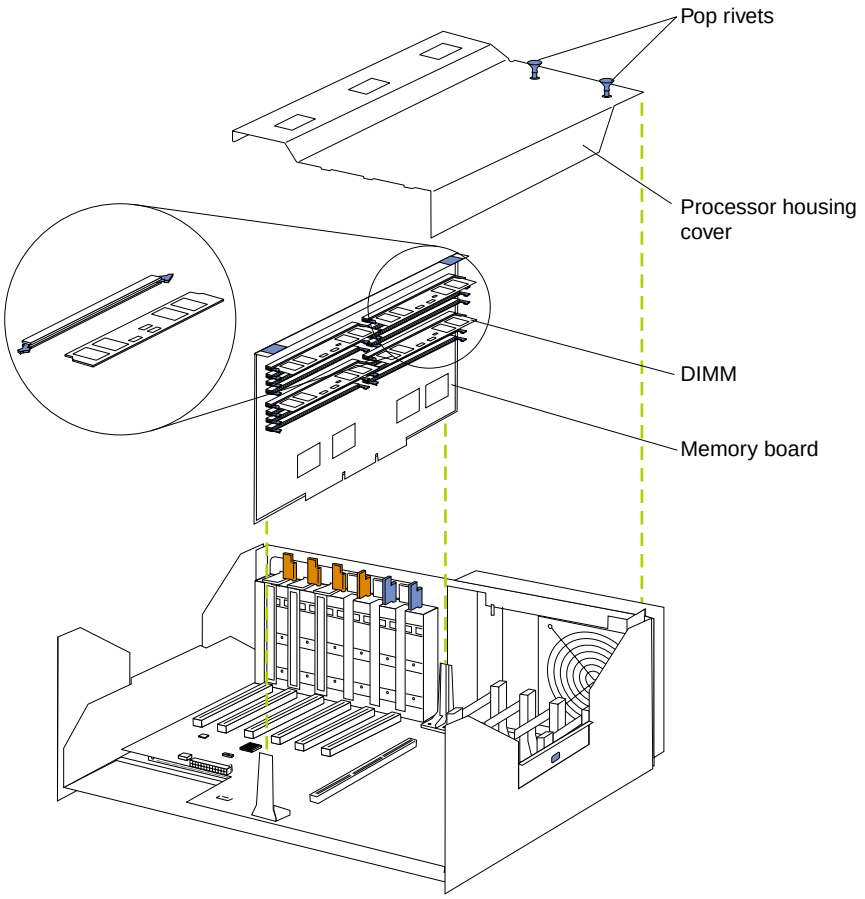
Table 3. DIMM installation order.

The following illustration shows the location of the DIMM connectors.

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



Refer to the following illustration when installing memory.



To install additional memory:

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 37.

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. Turn off the server and peripheral devices, and disconnect all power cords and external cables; then, remove the top cover (see “Removing the server top cover and bezel” on page 40).
3. Pull up the two pop rivets on the processor housing cover and remove the cover from the processor housing.
4. Remove the memory board assembly:
   a. Lift up on the memory board assembly and remove it from the server.
   b. Place the memory board assembly on a static-protective surface, such as the static-protective package in which the option came.
5. Locate the DIMM connectors on the memory board. Determine the DIMM connectors into which you will install the DIMMs. (See the notes at the beginning of this procedure.)
6. Touch the static-protective package that contains the DIMM option to any unpainted metal surface on the server. Then, remove the DIMM from the package.

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

7. To install the DIMMs, repeat the following steps for each DIMM that you install.
   a. Turn the DIMM so that the pins align correctly with the DIMM connector.
   b. Insert the DIMM by pressing the DIMM straight into the connector. Be sure that the retaining clips snap into the closed position.
8. Install the memory board assembly:
   a. Hold the memory board assembly and align it over the memory board connector.
   b. Insert the memory board assembly into the connector.
9. Install the processor housing cover and push the two pop rivets down to secure the cover.
10. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 77.

Installing a microprocessor kit

Your server comes with one microprocessor installed on the processor 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 among the microprocessors.

Microprocessor speed (MHz)	Core/bus fraction	J13 Jumper	J14 Jumper	J15 Jumper	J16 Jumper
700	7.0	Pins 2 and 3	Pins 1 and 2	Pins 1 and 2	Pins 2 and 3
900	Automatic setting	Due to the automatic speed setting, no jumper settings are required.			

Table 4. Microprocessor core frequency selection.

Notes:

1. Thoroughly 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, service, and information" on page 145 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/us/compat/ on the World Wide Web.

   Attention: To avoid damage and ensure proper server operation when you install a new or an additional microprocessor, use microprocessors that have the same cache size and type, and the same clock speed. Microprocessor internal and external clock frequencies must be identical.
3. To order additional microprocessor options, contact your IBM reseller or IBM marketing representative.
4. If you replace the microprocessor in your server with a microprocessor that operates at a different speed, be sure to set the microprocessor core-frequency-selection jumpers correctly. See Table 4.
5. Your server comes standard with one microprocessor installed. The microprocessor is installed in microprocessor connector J2 and is the startup (boot) processor. A microprocessor installed in microprocessor connector J3 is processor 2; a microprocessor installed in microprocessor connector J4 is processor 3; a microprocessor installed in microprocessor connector J5 is processor 4. If more than one microprocessor is installed, the highest numbered microprocessor is the one from which the server will start. The lower numbered microprocessors are used as application processors.

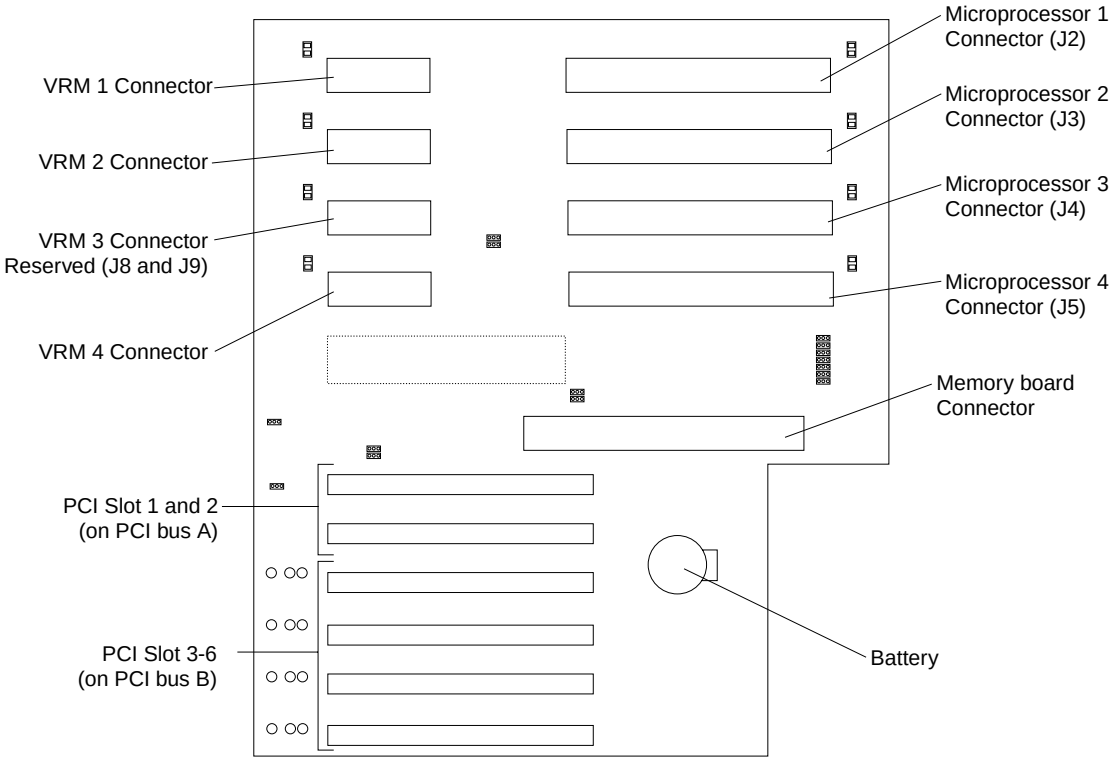
6. Table 5 and the label on the inside cover of the server show the order in which additional microprocessors and voltage regulator modules (VRMs) must be installed.

Note: "T" indicates an installed terminator card; "X" indicates an installed microprocessor or VRM. A terminator card must be installed in each microprocessor connector that does not contain a microprocessor.							
One microprocessor installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)
X	T	T	T	X			
Two microprocessors installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)
X	X	T	T	X	X		
Three microprocessors installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)
X	X	X	T	X	X	X	
Four microprocessors installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)
X	X	X	X	X	X	X	X

Table 5. Microprocessor and VRM installation order.

The following illustration shows the microprocessor and VRM connectors.

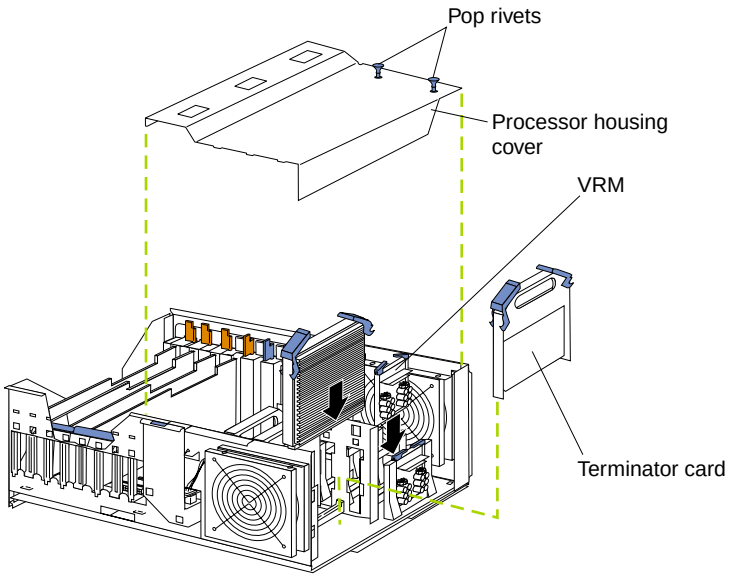
Note: The illustrations in this book might differ slightly from your hardware.



To install an additional microprocessor kit:

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 37.

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. Turn off the server and peripheral devices, and disconnect all power cords and external cables; then, remove the top cover (see “Removing the server top cover and bezel” on page 40).



3. Pull up the two pop rivets on the processor housing cover and remove the cover from the processor housing.
4. Determine the slots where you will install the microprocessor and VRM.
5. Remove the terminator card from the microprocessor connector.
6. Install the microprocessor:
   a. Touch the static-protective package that contains the new microprocessor to any *unpainted* metal surface on the server; then, remove the microprocessor from the package.
   b. Hold the microprocessor by the open latches, and center the microprocessor over the microprocessor connector.

      Attention: Make sure that the microprocessor is oriented and aligned correctly before you try to close the latches.

   c. Carefully close the latches to seat the microprocessor in the connector.
   d. Store the terminator card in a safe place in the static-protective package that your new microprocessor comes in; you will need to install it again if you ever remove the microprocessor.
7. Install the voltage regulator module (VRM).
   a. Center the VRM over the connector. Make sure that the VRM is oriented and aligned correctly.

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

   b. Carefully close the latches to seat the VRM in the connector.
8. Install the processor housing cover and push down on the two pop rivets.
9. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 77.

Installing a hot-swap power supply

Before you continue with the power supply-installation procedure, review the following.

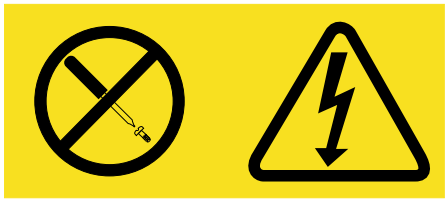
Notes:

1. During normal operation, each power supply bay must have either a power supply or filler panel installed for proper cooling.
2. Before you install a power supply in the right-most power supply bay, you must disconnect the cable-management arm. You can reconnect the cable-management arm after installing the power supply.

If you install or remove a power supply, observe the following precautions:

Statement 8

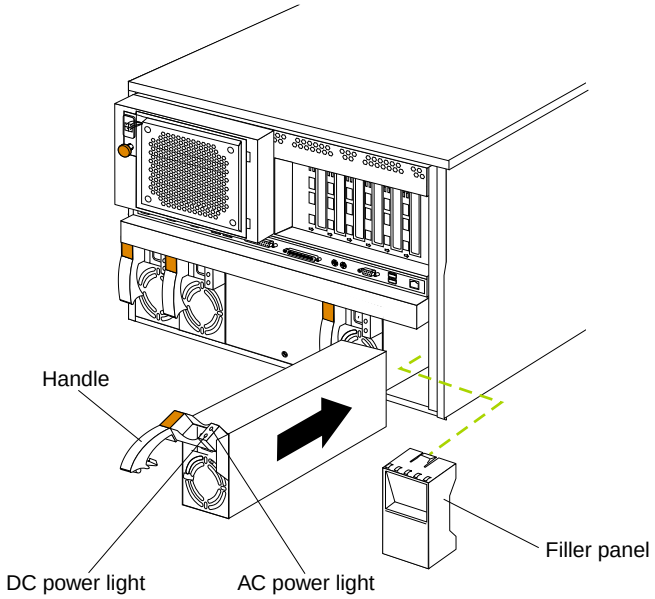
CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.



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

Refer to the following illustration to install a hot-swap power supply.

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



To install an additional power supply:

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. Remove the filler panel.
3. Place the handle on the power supply in the open position.
4. Slide the power supply into the chassis and close the handle.
5. Plug one end of the power cord into the power supply; then, plug the other end of the cord into a properly grounded electrical outlet.
6. Verify that the DC Power light and the AC Power light on the power supply are lit, indicating that the power supply is operating properly.

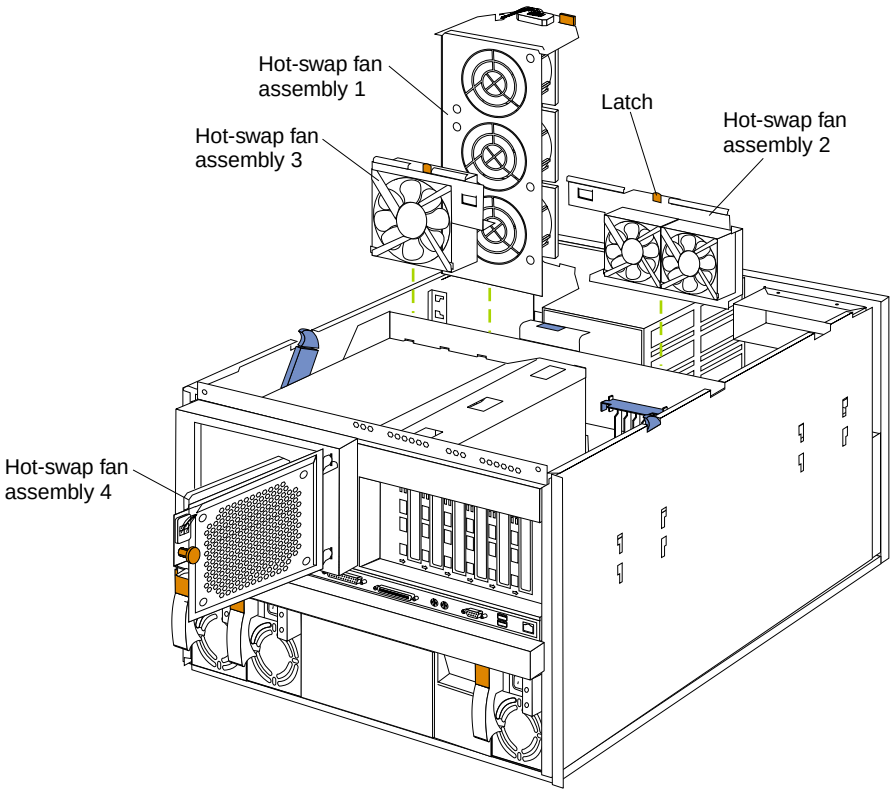
Statement 6

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.

Replacing a hot-swap fan

Refer to the following illustration to replace a hot-swap fan.

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



To replace a hot-swap fan assembly:

1. Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38.
2. If you are replacing fan assembly 1, 2, or 3:
   a. Remove the top cover (see “Removing the server top cover and bezel” on page 40).

      Attention: To ensure proper system cooling, keep the cover removed for no more than 30 minutes during this procedure.

   b. Press the fan release latch and lift the fan assembly out of the server.
   c. Slide the replacement fan assembly into the server. The latch will snap into place and secure the fan in the server.
   d. Replace the top cover (see “Completing the installation” on page 77).
3. If you are replacing fan assembly 4:
   a. Pull out on the orange pop rivet on the rear fan bracket; then, lift the fan assembly up and out of the hinge cutouts.
   b. Slide the replacement fan assembly into the server. (Make sure that the fan assembly fits correctly into the hinge cutouts on the rear of the shuttle.)
   c. When you have the fan assembly properly seated, push on the pop rivet until it clicks into place.

Completing the installation

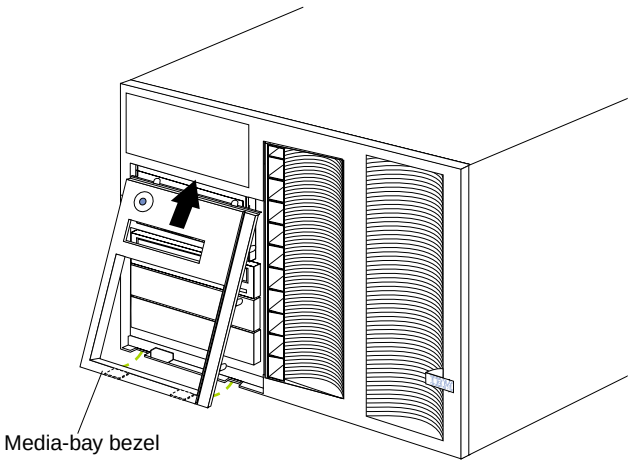
To complete your installation, you must reinstall the media-bay bezel, reinstall the top cover, reconnect all the cables that you disconnected, and for certain options, run the Configuration/Setup Utility program. Follow the instructions in this section.

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

Installing the media-bay bezel

Refer to the following illustration to install the media-bay bezel.

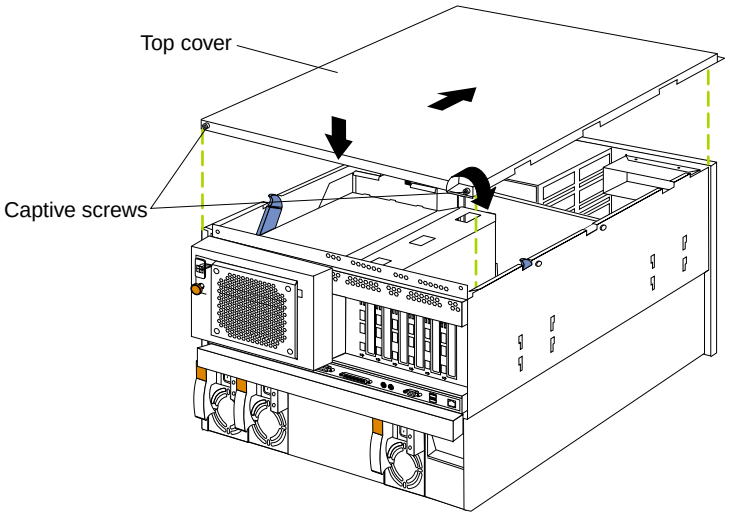
Note: The illustrations in this book might differ slightly from your hardware.



To install the media-bay bezel:

1. Insert the two tabs on the top of the media-bay bezel into the matching holes on the server chassis.
2. Push the bottom of the media-bay bezel toward the server until the two tabs at the bottom of the bezel snap into place.

Installing the top cover



To install the server top cover:

1. Before installing the cover, check that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
2. Lower the cover with the rear edge of the cover about 25 mm (1 inch) back from the rear edge of the server.
3. Slide the cover forward.
4. Tighten the two captive screws on the back edge of the cover.
5. If you disconnected any cables from the back of the server, reconnect the cables; then, plug the power cords into properly grounded electrical outlets.

   Note: If necessary, see "Cabling the server" on page 93 for connector locations.

Reconfiguring the server

When you start your server for the first time after you add or remove an internal option or an external SCSI device, you might see a message telling you that the configuration has changed. Run the Configuration/Setup Utility program to save the new configuration information. See "Chapter 3. Configuring your server," on page 13.

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

If you have installed a new microprocessor, you might want to upgrade your operating system to support symmetric multiprocessing (SMP). Refer to "Chapter 4. Using the ServerGuide CDs," on page 23.

If you have installed or removed a hard disk drive, refer to the information that comes with your ServeRAID adapter for details on configuring your disk arrays.

Connecting external options

Review the information in“Before you begin” on page 36 through “Safety information statements” on page 38. Also, read the documentation that comes with your options.

To attach an external device:

1. Turn off the server and all attached devices.
2. Follow the instructions that come with the option to prepare it for installation and to connect it to the server.

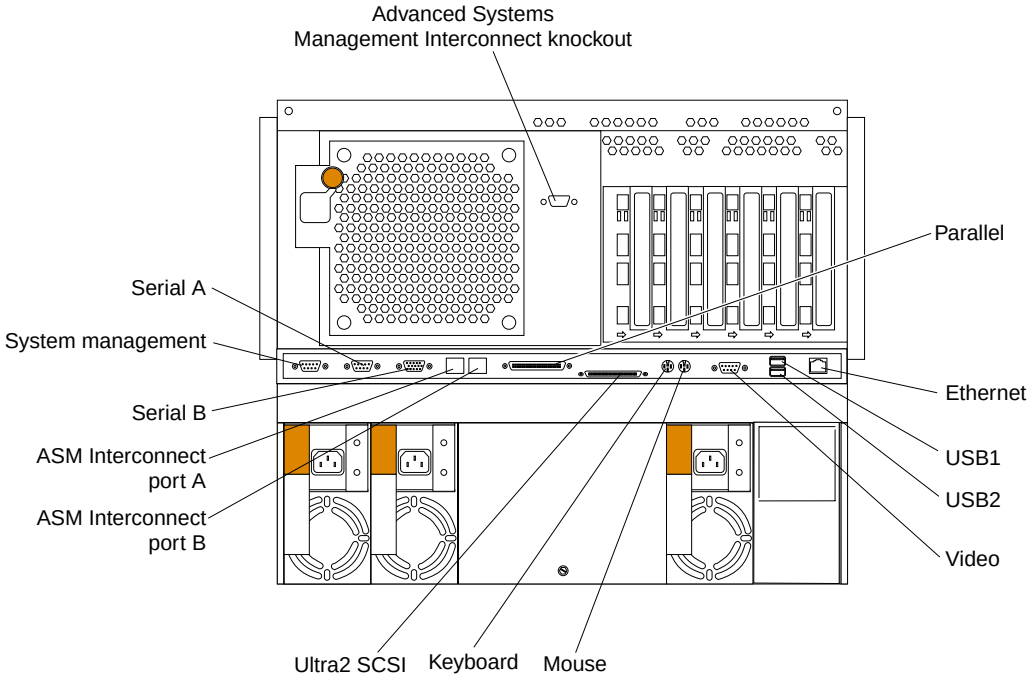
   Note: If you are attaching a SCSI device, see “Setting SCSI IDs” on page 85 for information about SCSI IDs and cables.

Input/Output ports

This section provides information about the input/output (I/O) ports on the rear of your server. These ports include the following:

- One parallel port
- One video port
- One keyboard port
- One auxiliary-device port (mouse)
- One dual-channel Ultra2 (LVD) SCSI port
- Two serial ports
- Two Universal Serial bus (USB) ports
- One Ethernet port
- Three communication ports dedicated to the Advanced System Management processor

Refer to the following illustration for the location of input and output connectors.



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 parallel-port assignments

You can use the built-in 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:

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

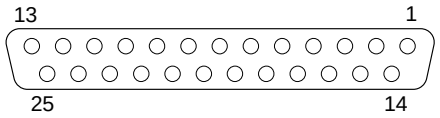
   Note: The Devices and I/O Ports choice appears only on the full configuration menu. If you set two levels of passwords, you must enter the administrator password to access the full configuration menu.
3. From the main menu, select **Devices and I/O Ports**; then, press Enter.
4. Select the parallel port; then, use the arrow keys to advance through the settings available.

   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 your 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

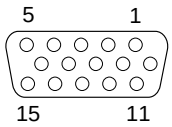
Table 6. Parallel-port connector pin-number assignments.

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 will automatically disable the integrated video controller.

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



Pin	Signal	Pin	Signal	Pin	Signal
1	Red	6	Ground	11	Monitor ID bit 0
2	Green or monochrome	7	Ground	12	DDC SDA
3	Blue	8	Ground	13	Horizontal synchronization (Hsync)
4	Monitor ID bit 2	9	+5 V dc	14	Vertical synchronization (Vsync)
5	Ground	10	Ground	15	DDC SDL

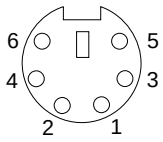
Table 7. Video-port connector pin-number assignments.

Keyboard port

One keyboard port connector is located on the rear of your server.

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

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



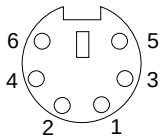
Pin	I/O	Signal
1	I/O	Data
2	N/A	Reserved
3	N/A	Ground
4	N/A	+5 V dc
5	I/O	Keyboard clock
6	N/A	Reserved

Table 8. Keyboard connector pin-number assignments.

Auxiliary-device (pointing device) port

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

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



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

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

Ultra2 (LVD) SCSI ports

Your server supports an optional IBM ServeRAID adapter. This adapter provides three independent SCSI channels. A 16-bit (wide) LVD SCSI cable connects the hard disk drive backplane to one channel of the ServeRAID adapter. Two 68-pin SCSI connectors for two additional channels are on the rear of the server. Refer to the information that comes with your ServeRAID adapter for additional details.

Your server has a dual-channel Ultra2 small computer system interface (SCSI) controller. This controller supports two independent SCSI channels: one external and one internal. Each channel supports up to 15 SCSI devices. You can use the external LVD SCSI channel connector on the rear of your server to connect different types of SCSI devices, such as drives or printers.

SCSI cabling requirements

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

For information about the maximum length of SCSI cable between the terminated ends of the cable, refer to the American National Standards Institute (ANSI) SCSI standards on the ANSI Web site at http://www.ansi.org on the World Wide Web. Adhering to these standards will help ensure that your server operates properly.

Setting SCSI IDs

Each SCSI device connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs. SCSI IDs 6 and 7 are reserved for the SCSI controller on either SCSI channel A or B. The following table lists the SCSI IDs for devices that are connected to one channel. In Table 10, the hot-swap hard disk drive bays are in the standard (vertical) configuration.

Standard (SCSI channel A)	Optional (SCSI channel B)
Drive bay 1: SCSI ID 0	Drive bay 1: SCSI ID 11
Drive bay 2: SCSI ID 1	Drive bay 2: SCSI ID 12
Drive bay 3: SCSI ID 2	Drive bay 3: SCSI ID 13
Drive bay 4: SCSI ID 3	Drive bay 4: SCSI ID 14
Drive bay 5: SCSI ID 4	Drive bay 5: SCSI ID 15
Backplane: SCSI ID 8	Backplane: SCSI ID 9

Table 10. SCSI IDs for hot-swap hard disk drives and backplanes (standard configuration).

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

SCSI connector pin-number assignments

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

Pin	Signal	Pin	Signal
1	+Data 12	35	-Data 12
2	+Data 13	36	-Data 13
3	+Data 14	37	-Data 14
4	+Data 15	38	-Data 15
5	+Data P1	39	-Data P1
6	+Data 0	40	-Data 0
7	+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.

Serial ports

Your server has two standard serial ports: serial port A and serial port B. The operating system can use and share both serial ports; however, the integrated Advanced System Management processor can use and share only serial port A.

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

Viewing or changing the serial-port assignments

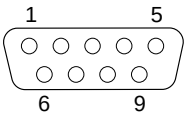
To view or change the serial-port assignments:

1. Restart the server and watch the monitor screen.
2. When the message `Press F1 for Configuration/Setup` appears, press F1.
3. From the main menu, select **Devices and I/O Ports**; then, press Enter.

   Note: The Devices and I/O Ports choice appears only on the full configuration menu. If you set two levels of passwords, you must enter the administrator password to access the full configuration menu.
4. Select the serial port; then, use the arrow keys to advance through the settings available.
5. Select **Save Settings**; then, select **Exit Setup** to exit from the Configuration/Setup Utility main menu.

Serial-port connectors

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



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

Table 12. Serial-port connectors pin-number assignments.

Universal Serial Bus ports

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

Notes:

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

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 five meters (16 ft.) per segment.

USB-port connectors

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

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

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

Table 13. USB-port connector pin-number assignments.

Ethernet port

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

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

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

Configuring the Ethernet controller

When you connect your server to the network, the Ethernet controller automatically detects the data-transfer rate (10 Mbps or 100 Mbps) on the network and then sets the controller to operate at the appropriate rate. That is, the Ethernet controller will adjust to the network data rate, whether the data rate is standard Ethernet (10BASE-T), Fast Ethernet (100BASE-TX), half duplex (HDX), or full duplex (FDX). The controller supports half-duplex (HDX) and full-duplex (FDX) modes at both speeds.

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

Failover for redundant Ethernet

The IBM Netfinity 10/100 Fault Tolerant Adapter is an optional redundant network interface card (NIC adapter) that you can install in your server. If you install this NIC adapter and connect it to the same logical LAN segment as the primary Ethernet controller, you can configure the server to support a *failover* function. You can configure either the integrated Ethernet controller or the NIC adapter as the primary Ethernet controller. In failover mode, if the primary Ethernet controller detects a link failure, all Ethernet traffic associated with it is switched to the redundant (secondary) controller. This switching occurs without any user intervention. When the primary link is restored to an operational state, the Ethernet traffic switches back to the primary Ethernet controller. The switch back to the primary Ethernet controller can be automatic or manually controlled, depending on the setup and operating system.

Note that only one controller in the redundant pair is active at any given time. For example, if the primary Ethernet controller is active, then the secondary Ethernet controller cannot be used for any other network operation.

Note: Your operating system determines the maximum number of IBM Netfinity 10/100 Fault Tolerant Adapters that you can install in your server. See the documentation that comes with the adapter for more information.

Considerations when combining failover and hot-plug functions: If your operating system supports hot-plug PCI adapters and the optional redundant NIC adapter is installed in a hot-plug PCI slot, you can replace the NIC adapter without powering off the server — even if it is the primary Ethernet controller. Disconnecting the Ethernet cable from the primary Ethernet controller will cause the Ethernet traffic to switch automatically to the secondary Ethernet controller. This can be very useful if a faulty adapter causes a network problem, or if you want to upgrade the primary adapter hardware.

Note: If you hot replace the primary adapter while the Ethernet traffic is being handled by the secondary Ethernet controller, the traffic does not automatically switch back to the primary adapter when the primary adapter comes back online. See "Configuring for failover".

Configuring for failover: The failover feature currently is supported by Windows NT Server, and IntraNetWare. The setup required for each operating system follows.

Windows NT Server:

IBM offers hot-plug support for Windows NT Server Version 4.0. Failover can work in conjunction with hot-plug support or independently. If you are not using hot-plug support, go to "Windows NT Server failover setup" on page 91.

Windows NT Server hot-plug setup:

IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package is available for download from the IBM Web site at:

`http://www.pc.ibm.com/support`

Enter the brand type of **Server**, click on **Downloadable files** and look for **Hot Plug**. The IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package uses the Intel Desktop Management Interface (DMI) to control hot-plug support for the Ethernet controllers. The Ethernet controller in your computer is DMI compliant. Download and install the following software in the order listed:

1. IBM Netfinity PCI Hotplug for Windows NT 4.0 Failover DMI Agent
2. IBM Netfinity PCI Hotplug for Windows NT 4.0 Solution
3. IBM Netfinity 10/100 Fault Tolerant Adapter device drivers

Note: The order of installation is important. You must install the IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package before you install the IBM Netfinity 10/100 Fault Tolerant Adapter driver. If you install the adapter device driver before the PCI Hot Plug Solution package, the adapter device driver will not recognize the hot-plug code. This happens because the adapter device driver only checks the NT registry for the Hot Plug package during installation. If the PCI Hot Plug Solution package is added after the adapter device driver is installed, the adapter must be removed and added again in order for it to detect the PCI Hot-Plug Solution code.

To install the IBM Netfinity PCI Hotplug for Windows NT 4.0 Failover DMI Agent:

1. Download the IBM Netfinity PCI Hotplug for Windows NT 4.0 Failover DMI Agent file from the Netfinity Support Web page and extract the files onto a diskette.
2. Insert the diskette into the diskette drive.
3. From the Start menu, select the **Run** option.
4. Type A:\SETUP.EXE in the Open box.
5. Click **Ok**. The setup wizard opens.
6. Follow the instructions that are given by the setup wizard until the program is installed.
7. Restart the server.

To install the IBM Netfinity PCI Hotplug for Windows NT 4.0 Solution package:

1. Download the IBM Netfinity PCI Hotplug for Windows NT 4.0 Solution file from the Netfinity Support Web page and extract the files onto a diskette.
2. Log on to Windows NT Server as a user in the Administrator group.

3. Insert the diskette into the diskette drive.
4. From the Start menu, select the **Run** option.
5. Type A:\SETUP.EXE in the Open box.
6. Click **OK**. The Setup wizard opens.
7. Follow the instructions given by the setup wizard until the program is installed.

Windows NT Server failover setup:

To install the IBM Netfinity 10/100 Fault Tolerant Adapter device drivers:

1. Add the redundant NIC adapter according to the instructions that are provided with the adapter.
2. Use the ServerGuide CDs to install the AMD PCNet Ethernet Family adapter device driver.
3. Do not select the Grouping box at this point; you must first restart the machine.
4. From the Windows NT Server desktop, select **Control Panel**, then select the **Network** icon, then select the **Adapters** tab.
5. Highlight one of the adapters that will be in the redundant pair and then click the **Properties...** button.
6. Check the Grouping box. This will show the possible combinations for redundant pairs.
7. Select the adapter pair you want and then select **OK**. Note that the integrated Ethernet controller is located at PCI C.

   Two options are available for recovering from a failover condition. The options are determined by the Enable for DMI / Hot Swap Support checkbox. If the IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package is installed, this checkbox will appear at the bottom of the Adapter Properties panel. If you do not have the IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package installed on your server, you will not see the Enable for DMI / Hot Swap Support checkbox.

   If the Enable for DMI / Hot Swap Support checkbox is not checked or is not present, traffic will automatically switch back to the primary adapter when the primary link status is restored. In this mode, the adapter cannot be hot-swapped. Users with the IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package installed should check the Enable for DMI / Hot Swap Support checkbox.

   If the Enable for DMI / Hot Swap Support checkbox is checked, traffic will remain on the secondary adapter until the user directs it to return to the primary adapter. This can be done after the hot-swap replacement of the primary adapter or by using the DMI interface.
8. Select **Close** to exit from the Network setup.

   When you restart the server, the failover function will be in effect.

If a failover occurs, a message is written to the NT Event Viewer log. In addition, if the Enable for DMI / Hot Swap Support checkbox is checked, a DMI alert will also be generated.

IntraNetWare:

The IBM PCI Hot Plug System Bus Driver Diskette for Novell Netware V4.41, V4.42, and V5.0 is available for download from the IBM Web site at:

`http://www.pc.ibm.com/support`

The failover function is now enabled. If a failover occurs:

- The operating system console generates a message.
- The custom counters for the device driver contain variables that define the state of the failover function and the location of the redundant pair. You can use the NetWare Monitor to view the custom counters.

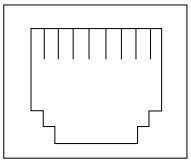
Note: If the primary adapter was hot-replaced while the Ethernet traffic was being handled by the secondary Ethernet controller, the traffic does not automatically switch back to the primary adapter when the primary adapter comes back online. In this case, issue the command:

```
LOAD d:\path\PCNTNW SCAN
```

where *d* and *path* are the drive and path where the driver is located. This command causes the device driver to locate the primary adapter and switch the Ethernet traffic to it.

Ethernet port connector

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



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

Table 14. Ethernet RJ-45 connector pin-number assignments.

Advanced System Management ports

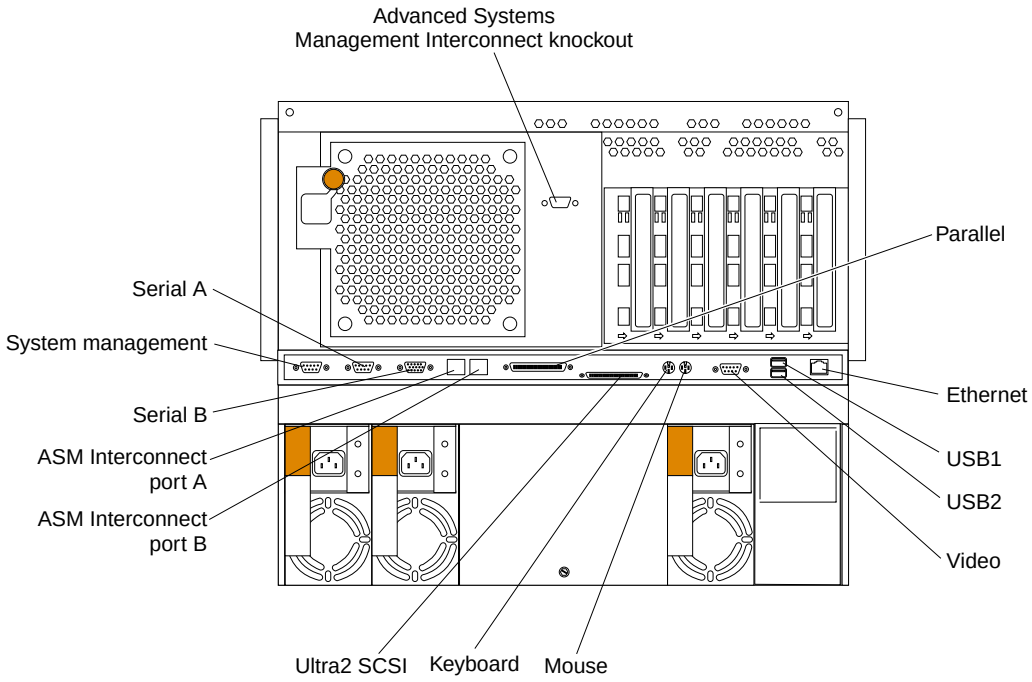
Your server has three communication ports dedicated to the Advanced System Management processor. One port uses a standard D-shell serial-port connector, connector C. The other two ports, which are used for the ASM Interconnect function, use a dual RJ-45 connector.

You can attach a dedicated modem to the D-shell system-management connector on the rear of your server to communicate with the integrated Advanced System Management processor.

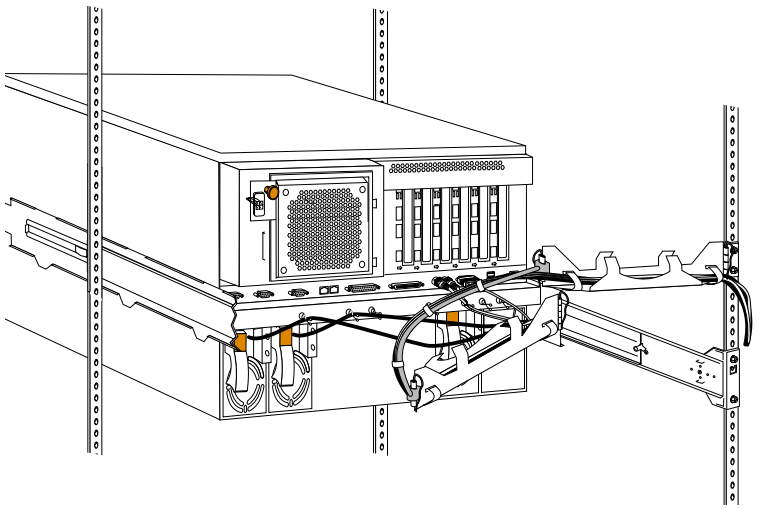
The ASM Interconnect function uses the RJ-45 system-management connectors. This function enables you to connect the Advanced System Management processors of several rack-mounted servers so that they can communicate with each other in half-duplex mode.

Cabling the server

Refer to the following illustration for the location of input and output connectors.



Refer to the following illustration for an example of proper cable routing.



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 help, service, and information” on page 145 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 97 for more information.

- **Diagnostic programs and error messages**

  The server diagnostic programs are stored in upgradable read-only memory (ROM) on the processor board. These programs are the primary method of testing the major components of your server. See “Diagnostic programs and error messages” on page 111 for more information.

- **Light Path Diagnostics**

  Your server has light-emitting diodes (LEDs) to help you identify problems with server components. These LEDs are part of the Light Path Diagnostics that are built into your server. By following the *path of lights*, you can quickly identify the type of system error that occurred. See “Identifying problems using status LEDs” on page 124 for more information.

- **Troubleshooting charts**

  These charts list problem symptoms, along with suggested steps to correct the problems. See the “Troubleshooting charts” on page 130 for more information.

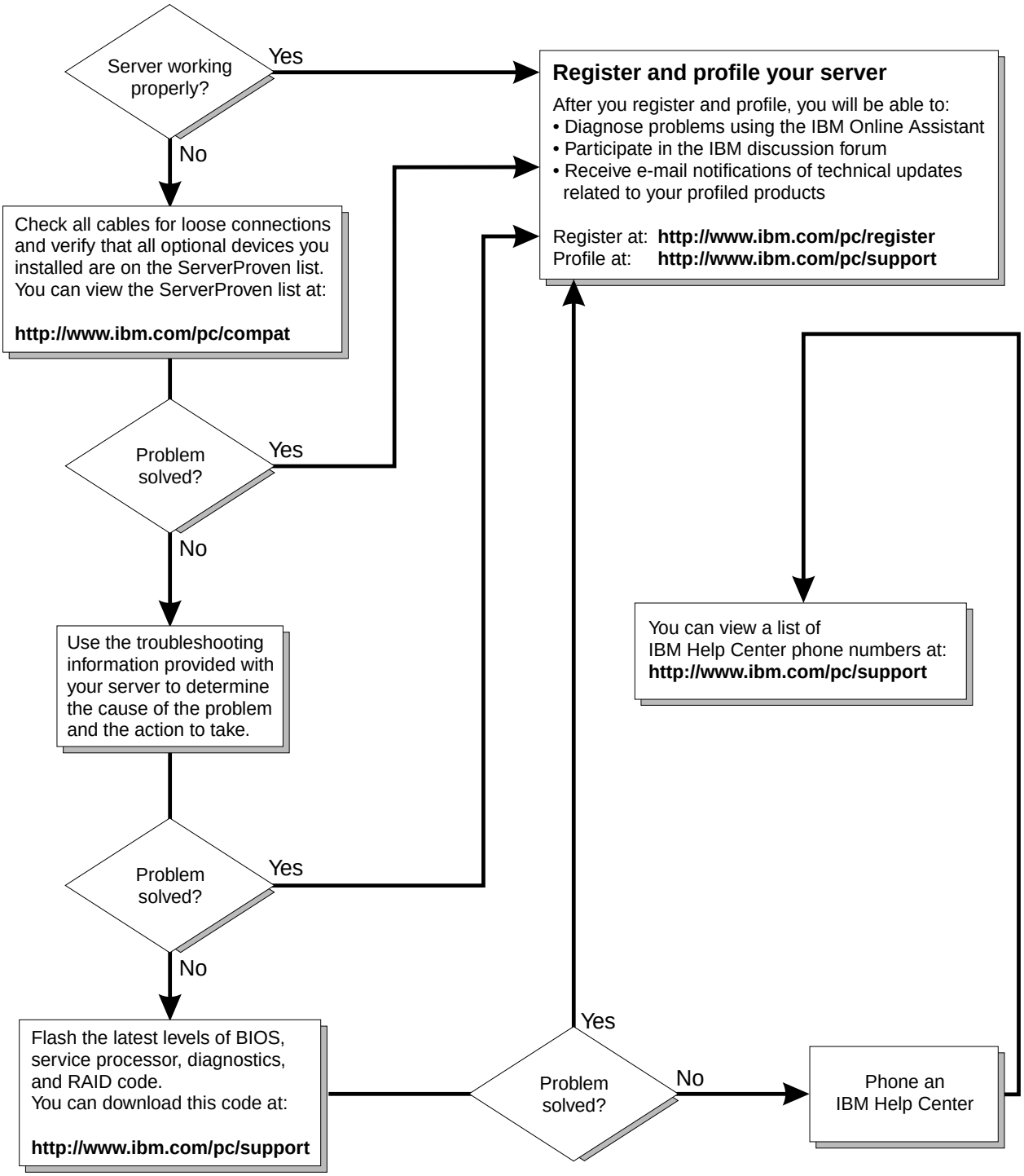
- **Customized support page**

  You can create a customized support page that is specific to your hardware, complete with Frequently Asked Questions, Parts Information, Technical Hints and Tips, and Downloadable files. In addition, you can choose to receive electronic mail (e-mail) notifications whenever new information becomes available about your registered products.

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

  — http://www.ibm.com/pc/register
  — http://www.ibm.com/pc/support

Server Support



POST

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

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

If POST detects a problem, more than one beep sounds and an error message appears on your screen. See “POST beep code descriptions” and “POST error messages” on page 100 for more information.

Notes:

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

POST beep code descriptions

Beep codes are sounded in a series of beeps. For example, a 1-2-4 beep code sounds like one beep, a pause, two consecutive beeps, another pause, and four more consecutive 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 (that is, after the System POST Complete (OK) light on the operator information panel is illuminated), call for service.

Continuous beep

Your startup (boot) microprocessor has failed, the processor board, I/O 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 processor has failed; replace the startup processor.

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 enter 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 100 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:

1. Nothing is resting on the keyboard and pressing a key.
2. No key is stuck.
3. 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 persists, 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

Beep code	Description	Action
1-1-1	Adapter, DIMM, or I/O board and processor board has failed	Call for service.
1-1-2	Microprocessor register test has failed.	
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.	
1-4-3	Interrupt vector loading test has failed.	
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.	
2-3-2	Screen memory test has failed.	
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.	
3-2-3	Math Coprocessor test has failed.	
3-2-4	Comparison of CMOS memory size against actual has failed.	
2-3-1 3-3-2	Screen initialization has failed. I2C bus has failed.	Turn off the server and then restart the server. If the problem persists, call for service.

Table 15. POST beep codes.

1-2-4	RAM refresh verification has failed.	Reseat the memory modules or install a memory module. If the problem persists, call for service.
1-3-1	First 64 Kb RAM test has failed.	
1-3-2	First 64 Kb RAM parity test has failed.	
3-3-1	A memory size mismatch has occurred.	
3-3-3	No memory has been detected in the system.	

Table 15. POST beep codes.

POST error messages

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

POST message	Description
062	The server failed to boot 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 persists, 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.

Table 16. POST error messages.

POST message	Description
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 persists, check to see if the system has isolated the problem to a microprocessor: • If the System Error light on the operator information panel is on, check to see if the CPU LED on the diagnostic LED panel is on. If it is on, check the Microprocessor Error LEDs next to the microprocessor sockets. — If a Microprocessor LED is on, run the diagnostic program for the microprocessor indicated by the LED. If the tests fail, replace the indicated microprocessor. — If the microprocessor tests do not fail, call for service. • If no error LED is on, the error logs in the Configuration/Setup Utility program might provide additional information about the microprocessor error. If the problem persists, 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.
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.

Table 16. POST error messages.

POST message	Description
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, shutdown the server, reseat the memory modules, and restart the server. 3. If the problem persists, check to see if the system has isolated the problem to a memory module: • If the System Error light on the operator information panel is on, check to see if the MEM LED on the diagnostic LED panel is on. If it is on, check the DIMM Error LEDs next to the memory sockets. If a DIMM Error LED is on, run the diagnostic program for the memory. — If the tests fail, replace the DIMM. If the problem persists after you replace the DIMM, call for service. — If the memory tests do not fail, call for service. • If no error LED is on, the error logs in the Configuration/Setup Utility program might provide additional information on the memory error. If the problem persists, 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**, then select **Product Data.** If the problem persists, call for service.
188	A vital product data (VPD) error occurred. **Action:** Call for service.

Table 16. POST error messages.

POST message	Description
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.
201	An error occurred during the memory controller test. This error can be caused by: • Incorrectly installed memory • A failing memory module • A processor-board problem • A memory-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 persists, check to see if the system has isolated the problem to a memory module: • If the System Error light on the operator information panel is on, check to see if the MEM LED on the diagnostic LED panel is on. If it is on, check the DIMM Error LEDs next to the memory sockets. If a DIMM Error LED is on, run the diagnostic program for the memory. • If the tests fail, replace the DIMM. If the problem persists after you replace the DIMM, call for service. • If the memory tests do not fail, call for service. 3. If no error LED is on, the error logs in the Configuration/Setup Utility program might provide additional information on the memory error. If the problem persists, 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 persists, check to see if the system has isolated the problem to a microprocessor: • If the System Error light on the operator information panel is on, check to see if the CPU LED on the diagnostic LED panel is on. If it is on, check the Microprocessor Error LEDs next to the microprocessor sockets. — If a Microprocessor LED is on, run the diagnostic program for the microprocessor indicated by the LED. (If the Secondary Microprocessor Error LED is on, run the "Alt CPU" diagnostic program.) If the tests fail, replace the microprocessor. — If the microprocessor tests do not fail, call for service. • If no error LED is on, the error logs in the Configuration/Setup Utility program might provide additional information on the microprocessor error. If the problem persists, call for service.
262	A memory parity configuration error occurred. **Action:** Call for service.

Table 16. POST error messages.

POST message	Description
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 persists, 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: 1. Nothing is resting on the keyboard and pressing a key. 2. No key is stuck. 3. 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 persists, make sure that the diskette drive cables are correctly and securely connected. 3. If the problem remains, replace the diskette drive. If the problem persists, 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 persists, call for service.
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 persists, call for service.

Table 16. POST error messages.

POST message	Description
11*xx*	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 five 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.
1301	Cable to Information LED panel not detected. **Action:** Make sure that the cable to the operator information panel is connected. If the problem persists, call for service.
1302	Cable to Power and Reset pushbuttons not detected. **Action:** Make sure that the cable to the Power and Reset pushbuttons is connected. If the problem persists, call for service.
1303	I2C cable to Power Backplane not detected. **Action:** Make sure that the cable to the power backplane is connected. If the problem persists, call for service.
1304	Cable to Diagnostic LED panel not detected. **Action:** Make sure that the cable to the diagnostic LED panel is connected. If the problem persists, call for service.
1600	The Advanced System Management processor is not functioning. **Action:** 1. Verify that the jumpers for the system-management processor are set correctly. 2. Disconnect the server from all electrical sources, wait for 30 seconds, reconnect the server to the electrical sources, and restart the server. If the problem persists, call for service.
1601	The BIOS needs to be updated. **Action:** 1. Disconnect the server from all electrical sources, wait for 30 seconds, reconnect the server to the electrical sources, and restart the server. 2. If the problem persists, update the BIOS. If the problem persists, call for service.

Table 16. POST error messages.

POST message	Description
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.
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 the Configuration/Setup menu. Go to step 3. **No** Follow the instructions on the screen to add the drive; then, save the changes and exit the Configuration/Setup menu. Restart the server. 3. Is an operating system installed? **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 persists, 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 persists, call for service.

Table 16. POST error messages.

POST message	Description
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. 2. If the problem persists, replace the microprocessor.
00019501	Processor 1 is not functioning. **Action:** Replace microprocessor 1. (The Microprocessor 1 Error LED will be on.) If the problem persists, call for service.
00019502	Processor 2 is not functioning. **Action:** Replace microprocessor 2. (The Microprocessor 2 Error LED will be on.) If the problem persists, call for service.
00019503	Processor 3 is not functioning. **Action:** Replace microprocessor 2. (The Microprocessor 3 Error LED will be on.) If the problem persists, call for service.
00019504	Processor 4 is not functioning. **Action:** Replace microprocessor 4. (The Microprocessor 4 Error LED will be on.) If the problem persists, call for service.
00019701	Processor 1 failed the built-in self test. **Action:** Replace microprocessor 1. (The Microprocessor 1 Error LED will be on.) If the problem persists, call for service.

Table 16. POST error messages.

POST message	Description
00019702	Processor 2 failed the built-in self test. **Action:** Replace microprocessor 2. (The Microprocessor 2 Error LED will be on.) If the problem persists, call for service.
00019703	Processor 3 failed the built-in self test. **Action:** Replace microprocessor 3. (The Microprocessor 3 Error LED will be on.) If the problem persists, call for service.
00019704	Processor 4 failed the built-in self test. **Action:** Replace microprocessor 4. (The Microprocessor 4 Error LED will be on.) If the problem persists, call for service.
00180100	A PCI adapter has requested memory resources that are 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 memory resource settings are not correct, change the settings. 2. 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.
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.

Table 16. POST error messages.

POST message	Description
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. (Where *xxxx* is the PCI vendor ID and *yyyy* is the PCI device ID.) **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.
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 persists, 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 persists, 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 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 to a level that supports the microprocessors installed in the server.
01298003	No update data is available for processor 3. **Action:** Update the system BIOS to a level that supports the microprocessors installed in the server.
01298004	No update data is available for processor 4. **Action:** Update the system BIOS 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 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 to a level that supports the microprocessors installed in the server.
01298103	The update data for processor 3 is incorrect. **Action:** Update the system BIOS to a level that supports the microprocessors installed in the server.

Table 16. POST error messages.

POST message	Description
01298104	The update data for processor 4 is incorrect. **Action:** Update the system BIOS 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.
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.

Table 16. POST error messages.

Event/error logs

The POST error log contains the three most recent error codes and messages that the system generated during POST. The System Event / Error Log contains all error messages issued during POST and all system status messages from the Advanced System Management Processor.

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

Small computer system interface messages

The following table lists actions to take if you receive a SCSI error message.

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.

SCSI Messages	Description
All	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 **Action:** 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.

Table 17. SCSI messages.

Diagnostic programs and error messages

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

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

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

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

The error code format is as follows:

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

where:

fff is the three-digit function code that indicates the function being tested when the error occurred. For example, function code 089 is for the microprocessor.

ttt is the three-digit failure code that indicates the exact test failure that was encountered. (These codes are for trained service personnel and are described in the *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 recorded.

cc is the check digit that is used to verify the validity of the information.

text message
is the diagnostic message that indicates the reason for the problem.

Text messages

The diagnostic text message format is as follows:

```
Function Name: Result (test specific string)
```

where:

Function Name
Is the name of the function being tested when the error occurred. This corresponds to the function code (fff) given in the previous list.

Result can be one of the following:

Passed This result occurs when the diagnostic test completes without any errors.

Failed This result occurs when the diagnostic test discovers an error.

User Aborted
This result occurs when you stop the diagnostic test before it is complete.

Not Applicable
This result occurs when you specify a diagnostic test for a device that is not present.

Aborted This result occurs when the test could not proceed 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 Help and return to where you left off, press Esc.

To start the diagnostic programs:

1. Turn on the server and watch the screen.

   Note: To run the diagnostic programs, you must start the server with the highest level password that is set. That is, if an administrator password is set, you must enter the administrator password, not the power-on password, to run the diagnostic programs.

2. When the message F2 for Diagnostics appears, press F2.
3. Type in 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 persists, 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. The regular mouse test cannot test a USB mouse.

   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 have completed, you can view the Test Log by selecting **Utility** from the top of the screen.

If the hardware checks out OK but the problem persists 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 on page 114.

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 or administrator password is set, the server prompts you for it. Type in 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.

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

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.
		Failed	System board	Call for service.
020	PCI interface	Failed	System board	Call for service.
			Tab on PCI Hot Swap slot #*n* is bad (where *n* is the number of the failing PCI slot) **Note:** For normal operation, the Power LED for the hot-plug PCI slot will be on and the Attention Led will be off.	Make sure that the tab and latch on hot-plug PCI slot *n* are closed correctly. If the problem persists, call for service.

Code	Function	Result	Text message	Action
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 persists, call for service.
			SCSI controller on system board failed register / counter / power test	Call for service.
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 persists, call for service.

Code	Function	Result	Text message	Action
035	ServeRAID	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*. If the problem persists, call for service.
			Adapter in slot *n*; internal error (where *n* is the slot number of the failing adapter)	
			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 persists, 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 persists, 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 persists, call for service.
075	Power supply	Failed	Voltage sensed by the system is out of range	Call for service.

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 installed, update the BIOS. 3. If the problem remains, replace the *xyz* microprocessor and run the test again. If the problem persists, 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) **Note:** The Microprocessor Error LED associated with the microprocessor will be lit.	1. Reseat the microprocessor. 2. If the problem remains, replace the microprocessor. If the problem persists, 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 persists, call for service.

Code	Function	Result	Text message	Action
089	Microprocessor	Failed	Test setup error: Application microprocessor not installed or BIOS setup problem	1. Verify that the Application microprocessor is installed and seated correctly. 2. Check the system error log for related error messages. 3. If your server does not have the latest level BIOS installed, update the BIOS. 4. If the problem remains, replace the application microprocessor and run the test again. If the problem persists, call for service.
			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 persists, call for service.
165	Service processor	Failed	Advanced System Management Processor on system board	Call for service.
175	System thermal	Failed	Fan # *n* (where *n* is the number of the failing fan) **Note:** The fan LED on the diagnostic LED panel will be lit.	Replace the indicated fan
			Temperature sensed on processor board is out of range	If one of the fan LEDs on the diagnostic LED panel is on, replace the indicated fan. If the problem persists, call for service.
180	Status display	Failed	Diagnostic panel	Call for service.
			Operator information panel	
			LED on hot-swap SCSI backplane	
			Processor board	
			System board	
			Memory card	

Code	Function	Result	Text message	Action
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 persists, call for service.
			Test setup error: Corrupt BIOS in ROM	If your server does not have the latest level BIOS installed, update the BIOS to the latest level. If the problem persists, call for service.
			Test setup error: Corrupt DMI BIOS, information in BIOS is not as expected	

Code	Function	Result	Text message	Action
202	System cache	Aborted	Test setup error: BIOS cannot access VPD information	If your server does not have the latest level BIOS installed, update the BIOS to the latest level and run the diagnostic program again. If the problem persists, 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 installed, update the BIOS to the latest level. 2. Run the diagnostic program again. 3. If the problem remains, replace the failing processor. If the problem persists, 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) **Note:** The indicated microprocessor LED will be on.	1. Reseat the identified microprocessor. 2. If the problem remains, replace the microprocessor. If the problem persists, 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 persists, call for service.
206	Diskette drive	Failed	Internal diskette drive bay	Call for service.
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. If the problem persists, call for service.

Code	Function	Result	Text message	Action
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 persists, 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 persists, 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 persists, 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 persists, call for service.

Code	Function	Result	Text message	Action
302	Mouse	Failed	On system board pointing device test failed.	Replace the pointing device. If the problem persists, call for service.
305	Video monitor		Any message	Refer to the information that came with the monitor.
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 persists, call for service.
			On system board	Call for service.

Code	Function	Result	Text message	Action
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 persists, 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 persists, call for service.
		Failed	Modem reset failed	Replace the modem. If the problem persists, call for service.
			No dial tone 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 persists, call for service.

Recovering the BIOS code

If the BIOS code in your server gets corrupted, such as from a power failure during a flash update, you can recover the BIOS code using the recovery boot block and a BIOS flash diskette.

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

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

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

To recover the BIOS code, do the following:

1. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover.
2. Locate jumper J56 on the processor board. See "Component locations" on page 31.
3. Move J56 to pins 1 and 2 to enable BIOS recovery mode.
4. Insert the BIOS flash diskette into the diskette drive.
5. Restart the server.

   The Recovery Boot screen will appear. A progress report, `Loading data from diskette` *`xx`*%, is displayed. When programming is underway, a further progress report, `Programming block` *`n of 7 yy`*%, is displayed. When recovery is complete, `Recovery complete, remove the diskette and return boot block switch to the off position before rebooting` is displayed.
6. Remove the flash diskette from the diskette drive.
7. Turn off the server.
8. Move J56 to pins 2 and 3 to return to normal startup mode.
9. Restart the server. The system should start up normally.

Identifying problems using status LEDs

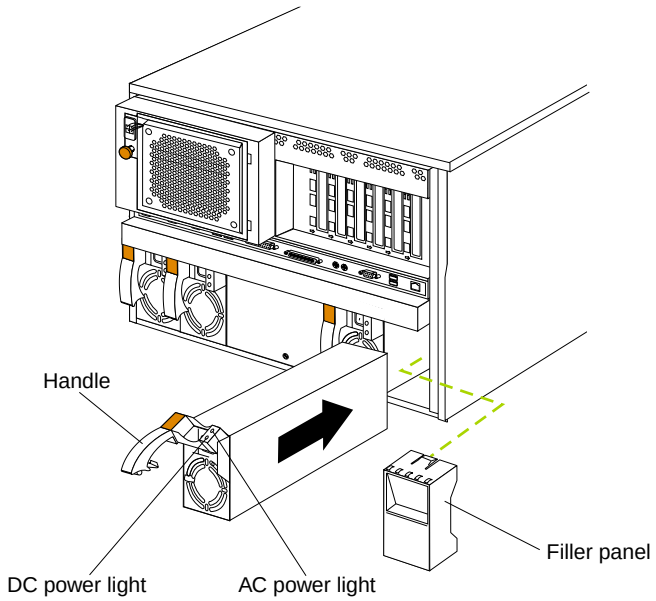
Your server has LEDs to help you identify problems with some server components. These LEDs are part of the Light Path Diagnostics built into the server. By following the *path* you can quickly identify the type of system error that occurred.

Status LEDs are located on the following components:

- Information panel
- Hard disk drive trays
- Power supply
- Diagnostic panel
- Processor board

Power supply LEDs

The AC and DC power LEDs on the power supply provide status information about the power supply. The following illustration shows the location of the AC and DC power LEDs.



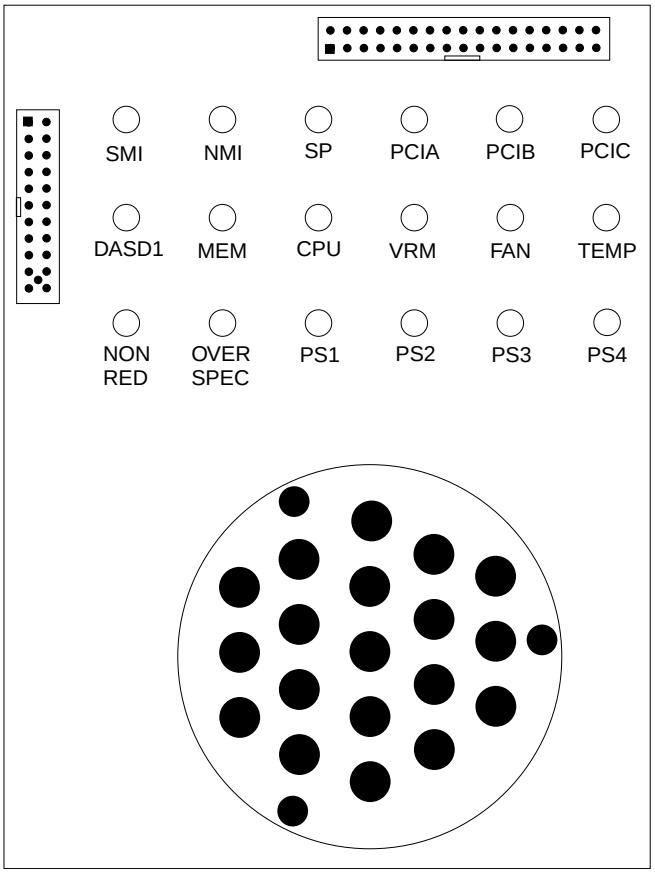
The following table describes the AC and DC power LEDs.

AC power LED	DC power LED	Description and action
On	On	The power supply is on and operating correctly.
On	Off	There is a DC power problem. Possible causes: 1. The server is not turned on (the power LED is blinking on the front of the server). **Action:** Press the power-control button to start the server. 2. The power supply has failed. **Action:** Replace the power supply. If the problem persists, have the system serviced.

AC power LED	DC power LED	Description and action
Off	Off	There is an AC power problem. Possible causes: 1. There is no AC power to the power supply. **Actions:** Verify that: • The electrical cord is properly connected to the server. • The electrical outlet functions properly. 2. The power supply has failed. **Action:** Replace the power supply. If the problem persists, have the system serviced.

Diagnostic panel LEDs

The following illustration shows the LEDs on the diagnostics panel inside the server. See “Light Path Diagnostics” on page 127 for information on identifying problems using these LEDs.



Light Path Diagnostics

You can use the Light Path Diagnostics 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, as long as the power supplies are operating properly. This feature helps you to isolate the problem if an error causes the server to shut down.

System error LED (on the information LED panel)	Diagnostics panel LED on	Cause	Action
On A system error was detected. Check to see which of the LEDs on the diagnostics panel inside the server are on.	None	The system error log is 75% or more full or a PFA alert was logged.	Check the system error log and correct any problems. Disconnecting the server from all power sources for at least 20 seconds will turn off the system error LED.
On	SMI	A systems management event occurred.	Restart the server. If the problem persists, have the system serviced.
On	NMI	A nonmaskable interrupt occurred. The PCIA or PCIB LED will probably also be on.	1. If the PCIA or PCIB LED is on, follow the instructions for those LEDs. 2. If the PCIA or PCIB LED is not on, restart the server. If the problem persists, have the system serviced.
On	SP	The service processor has failed.	Have the system serviced.
On	PCIA	An error occurred on PCI bus A. An adapter in PCI slot 1 or 2, or the processor board caused the error.	1. Check the error log for additional information. 2. If you cannot correct the problem from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus A (PCI slots 1 and 2) and restarting the server after each adapter is removed. If the problem persists, have the system serviced.

Table 18. Light Path Diagnostics.

System error LED (on the information LED panel)	Diagnostics panel LED on	Cause	Action
On	PCIB	An error occurred on PCI bus B. An adapter in PCI slot 3, 4, 5, or 6 or the processor board caused the error.	1. Check the error log for additional information. 2. If you cannot correct the problem from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus B (PCI slots 3 through 6) and restarting the server after each adapter is removed. If the problem persists, have the system serviced.
On	PCIC	An error occurred on PCI bus C. An error on the I/O board caused the problem.	Check the error log for additional information. If the error log indicates a problem with the integrated SCSI controller, the Ethernet controller, or video controller, have your system serviced. If the problem persists, have the system serviced.
On	DASD	A hot-swap hard disk drive has failed on SCSI channel B.	1. Check the error log for additional information. If the error log indicates a temperature problem and the fans are working correctly, have the system serviced. 2. If the amber hard disk status LED on one of the hot-swap hard disk drives is on, refer to “Server controls and indicators” on page 6 for more information.
On	MEM	A memory error occurred.	1. Check the DIMM error LEDs on the memory board. 2. Replace the DIMM indicated by the lit DIMM error LED.

Table 18. Light Path Diagnostics.

System error LED (on the information LED panel)	Diagnostics panel LED on	Cause	Action
On	CPU	One of the microprocessors has failed, or a microprocessor is installed in the wrong connector.	1. Check the microprocessor error LEDs on the memory 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 a microprocessor kit” on page 70 for information about the correct order for installing microprocessors and VRMs. 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 persists, replace the microprocessor. If the problem persists, have the system serviced.
On	VRM	One of the voltage regulator modules on the processor board has failed.	1. Check the VRM error LEDs on the processor board. 2. Turn off the server, reseat the VRM indicated by the lit VRM error LED, and restart the server. 3. If the problem persists, replace the VRM. If the problem persists, replace the VRM.
On	FAN	One of the fan assemblies has failed or is operating too slowly. **Note:** A failing fan can also cause the TEMP and DASD LEDs to be on.	The LED on the failing fan assembly will be lit. Replace the fan assembly.
On	TEMP	The system temperature has exceeded the maximum rating.	1. Check to see if a fan has failed. If it has, replace the fan. 2. Make sure that the room temperature is not too high. See “Features and specifications” on page 2. 3. Check for blocked air flow. If the problem persists, have the system serviced.

Table 18. Light Path Diagnostics.

System error LED (on the information LED panel)	Diagnostics panel LED on	Cause	Action
On	OVER SPEC	The server is drawing more power than the power supplies are rated for.	Either add a power supply or remove a device from the server.
On	PS1	The first power supply has failed.	Replace the first power supply.
On	PS2	The second power supply has failed.	Replace the second power supply.
On	PS3	The third power supply has failed.	Replace the third power supply.
On	PS4	The fourth power supply has failed.	Replace the fourth power supply.
Off	None	The Light Path Diagnostics have not detected a system error.	None

Table 18. Light Path Diagnostics.

Noncritical Light Path Diagnostics

Table 19 describes the Light Path Diagnostics for noncritical events.

Information LED (on the information LED panel)	Diagnostics panel LED on	Cause	Action
On A noncritical event has occurred.	NON RED	The server power subsystem is no longer redundant.	To restore redundancy, either add another power supply to increase the power available or remove a device from the server to reduce the power usage.
	None	Some noncritical event has occurred.	Read the event log to determine the cause.
Off	None	The Light Path Diagnostics have not detected a noncritical event.	None

Table 19. Noncritical Light Path Diagnostics.

Troubleshooting charts

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

If you cannot find the problem in the troubleshooting charts, go to “Starting the diagnostic programs” on page 113 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.

Device	Suggested action
CD-ROM drive CD-ROM drive is not recognized.	Verify that: 1. The primary IDE channel is enabled in the Configuration/Setup Utility program. 2. All cables and jumpers are installed correctly. 3. The correct device driver is installed for the CD-ROM drive.
Diskette drive Diskette drive in-use light stays on, or the system bypasses the diskette drive.	If there is a diskette in the drive, verify that: 1. The diskette drive is enabled in the Configuration/Setup Utility program. 2. The diskette is good and not damaged. (Try another diskette if you have one.) 3. The diskette contains the necessary files to start the server. 4. Your software program is OK. If the diskette drive in-use light stays on, or the system continues to bypass the diskette drive, call for service.
Expansion enclosure problems The SCSI expansion enclosure used to work, but does not work now.	Verify that: 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. 3. Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. For more information, see your SCSI and expansion enclosure documentation.
General problems Problems such as broken cover locks or indicator lights not working.	Call for service.
Intermittent problems A problem occurs only occasionally and is difficult to detect.	Verify that: 1. All cables and cords are connected securely to the rear of the server and attached options. 2. When the server is turned on, air is flowing from the rear of the server at the fan grill. If there is no air flow, the fan is not working. This causes the server to overheat and shut down. 3. Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. If the items above are correct, call for service.
Keyboard, mouse, or pointing-device problems All or some keys on the keyboard do not work.	1. Make sure that the keyboard cable is properly connected to the server. 2. Make sure that the server and the monitor are turned on. 3. Try using another keyboard. If the items above are correct, call for service.
The mouse or pointing device does not work.	1. Verify that the mouse or pointing-device cable is securely connected and the device drivers are installed correctly. 2. Try using another mouse or pointing device. If the problem remains, call for service.

Table 20. Troubleshooting charts.

Device	Suggested action
Memory problems The amount of memory displayed is less than the amount of memory installed.	Verify that: 1. The memory modules are seated properly. 2. You have installed the correct type of memory. 3. If you changed the memory, you updated the memory configuration with the Configuration / Setup Utility program. 4. All banks of memory on the DIMMs are enabled. The server might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. If the above items are correct, run the memory diagnostic program. The system might have detected a bad memory module and automatically reallocated memory to enable you to continue to operate. If the memory tests fail, call for service or replace the failing DIMM.
Microprocessor problems The server emits a continuous tone during POST.	The startup (boot) microprocessor is not working properly. Verify that the startup microprocessor is seated properly. If it is, replace the startup microprocessor. If the problem remains, call for service.
Monitor Testing the monitor.	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 you still cannot find the problem, call for service.
The screen is blank.	Verify that: 1. The server power cords are plugged into the server and a working electrical outlet. 2. The monitor cables are connected properly. 3. The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. If the items above are correct and the screen remains blank, call for service.
Only the cursor appears.	Call for service.
The monitor works when you turn on the server, but goes blank when you start some application programs.	Verify that: 1. The primary monitor cable is connected to the video port. 2. You installed the necessary device drivers for the applications. If the items above are correct and the screen remains blank, call for service.

Table 20. Troubleshooting charts.

Device	Suggested action
Wavy, unreadable, rolling, distorted screen, or screen jitter.	If the monitor self-tests show the monitor is OK, 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 that the distance between monitors and diskette drives is at least 76 mm (3 in.). 2. Non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, see your IBM reseller or IBM marketing representative. If the problem remains, call for service.
Wrong characters appear on the screen.	If the wrong language is displayed, update the BIOS with the correct language. If the problem remains, call for service.
Option problems An IBM option that was just installed does not work.	Verify that: 1. The option is designed for the server. Refer to the "Support for Servers" flowchart for information about obtaining ServerProven™ compatibility information from the World Wide Web. 2. You followed the installation instructions that came with the option. 3. The option is installed correctly. 4. You have not loosened any other installed options or cables. 5. You updated the configuration information in the Configuration / Setup Utility program. Whenever memory or an option is changed, you must update the configuration. If the problem remains, call for service.
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: 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. 3. Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. If the problem remains, call for service.
Parallel port The number of parallel ports displayed is less than the number of parallel ports installed.	Verify that: 1. Each port is assigned a unique address by the Configuration / Setup Utility program and none of the parallel ports are disabled. 2. The parallel-port adapter, if you installed one, is seated properly. If the problem remains, call for service.

Table 20. Troubleshooting charts.

Device	Suggested action
Power problems The server does not power on.	Verify that: 1. The power cables are properly connected to the server. 2. The electrical outlet functions properly. 3. The type of memory installed is correct. 4. If you just installed an option, remove it, and restart the server. If the server now powers on, you might have installed more options than the power supply supports. 5. The LEDs on the power supply are on. If the problem remains, call for service.
Printer problems The printer does not work.	Verify that: 1. The printer is turned on and is online. 2. The printer signal cable is connected to the correct serial or parallel port on the server. **Note:** Non-IBM printer cables might cause unpredictable problems. 3. You have assigned the printer port correctly in your operating system or application program. 4. You have assigned the printer port correctly using the Configuration/Setup Utility program. If the items above are correct and the printer still does not work, run the tests described in the documentation that comes with your printer. If the tests show that the printer is OK, call for service.
Serial port problems The number of serial ports identified by the operating system is less than the number of serial ports installed.	Verify that: 1. Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports are disabled. **Note:** The ASM Interconnect connector is the same as a serial port connector, but it is used only by the integrated Advanced System Management Processor, and is not available for use by the operating system. This port does not appear in the Configuration/Setup Utility program menus; it can be configured using the system-management program. 2. The serial-port adapter, if you installed one, is seated properly. If the problem still exists, call for service.
A serial device does not work.	Verify that: 1. The device is compatible with the server. 2. The serial port is enabled and is assigned a unique address. 3. Make sure that the device is not connected to the management port C. **Note:** The management C connector is the same as a serial port connector, but it is used only by the integrated Advanced System Management Processor and is not available for use by the operating system. This port does not appear in the Configuration/Setup Utility program menus; it can be configured using the system-management program. If the problem still exists, call for service.

Table 20. Troubleshooting charts.

Device	Suggested action
Service processor problems Service Processor Manager reports a general monitor failure	Disconnect the server from all electrical sources, wait for 30 seconds, reconnect the server to the electrical sources, and restart the server. If a problem remains, call for service.
Software problem Suspected software problem.	To determine if problems are caused by the software, verify that: 1. Your server has the minimum memory requirements needed to use the software. For memory requirements, refer to the information that comes with the software. **Note:** If you have just installed an adapter or memory, you might have a memory address conflict. 2. The software is designed to operate on your server. 3. Other software works on your server. 4. The software that you are using works on another system. 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) port problems A USB device does not work.	Verify that: 1. You are not trying to use a USB device during POST if you have a standard (non-USB) keyboard attached to the keyboard port. **Note:** If a standard (non-USB) keyboard is attached to the keyboard port, then the USB is disabled and no USB device will work during POST. 2. The correct USB device driver is installed. 3. Your operating system supports USB devices. If the problem still exists, call for service.

Table 20. Troubleshooting charts.

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 persists, 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 Ethernet controller lights on the operator information panel.

  These lights indicate whether a problem exists with the connector, cable, or hub.

  — The Ethernet Link Status light illuminates when the Ethernet controller receives a LINK pulse from the hub. If the light is off, there might be a defective connector or cable, or a problem with the hub.

  — The Ethernet Transmit/Receive Activity light illuminates when the Ethernet controller sends or receives data over the Ethernet Network. If the Ethernet Transmit/Receive Activity light is off, make sure that the hub and network are operating and that the correct device drivers are loaded.

  — The Ethernet Speed 100 Mbps light illuminates when the Ethernet controller LAN speed is 100 Mbps.
- Make sure that you are using the correct device drivers, supplied with your server.
- Check for operating system-specific causes for the problem.
- Make sure that the device drivers on the client and server are using the same protocol.
- Test the Ethernet controller.

  How 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 definite symptoms.

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 interrupt (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.

Table 21. Ethernet troubleshooting chart.

Ethernet controller problem	Suggested Action
Ethernet Link Status light does not illuminate.	Check the following: • Make sure that the hub is turned on. • Check all connections at the Ethernet controller and the hub. • Check the cable. A crossover cable is required unless the hub has an *X* designation. • Use another port on the hub. • If the hub does not support auto-negotiation, manually configure the Ethernet controller to match the hub. • If you manually configured the duplex mode, make sure that you also manually configure the speed. • Run diagnostics on the LEDs. If the problem remains, call for service.
The Ethernet Transmit/Receive Activity light does not illuminate.	Check the following: **Note:** The Ethernet Transmit/Receive Activity LED illuminates only when data is sent to or by this Ethernet controller. • 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. • The function of this LED can be changed by device driver load parameters. If necessary, remove any LED parameter settings when you load the device drivers.
Data is incorrect or sporadic.	Check the following: • Make sure that you are using Category 5 cabling when operating the server 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 server.	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 interrupt (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.

Table 21. Ethernet troubleshooting chart.

Ethernet controller messages

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

- Novell™ NetWare™ or IntraNetWare Server ODI
- NDIS Adapter for level 4.0 (Windows NT)
- SCO™ UNIX LLI

Novell NetWare or IntraNetWare server ODI driver messages

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

PCNTNW-NW-026	**The MSM is unable to parse a required custom keyword.** **Explanation:** The user entered an incorrect parameter keyword. **Action:** Reload the driver using the correct keyword.
PCNTNW-NW-054	**The adapter did not respond to the initialization command.** **Explanation:** The adapter did not respond when the driver tried to initialize it. **Action:** Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, go to "Starting the diagnostic programs" on page 113 to run the diagnostic programs.
PCNTNW-NW-058	**The adapter did not respond to the initialization command.** **Explanation:** The interrupt request (IRQ) setting might not be valid or the EEPROM information might be incorrect. **Action:** Make sure that the IRQ settings are correct in the Configuration/Setup Utility program. for information on setting the interrupt requests. If the IRQ settings are correct, call for service.
PCNTNW-NW-066	**The cable might be disconnected from the adapter.** **Explanation:** The cable might be disconnected from the server Ethernet port. **Action:** Verify that a cable is connected to the Ethernet port.
PCNTNW-NW-071	**The matching virtual adapter could not be found.** **Explanation:** You tried to load another instance of the driver with a different I/O address. This new adapter could not be found. **Action:** Verify that you installed an IBM Netfinity 10/100 Fault Tolerant Adapter and make sure that the adapter is seated correctly. If the adapter is seated correctly, call for service.
PCNTNW-NW-072	**A resource tag is unavailable**. **Explanation:** The driver tried to allocate some resources that were not available. **Action:** Add more memory, or free some memory resources in the server. Then, restart the server.
PCNTNW-NW-073	**Unable to allocate memory** **Explanation:** The driver failed to allocate the memory needed for normal operation. **Action:** Add more memory, or free some memory resources in the server. Then, restart the server.

Table 22. Novell NetWare or IntraNetWare ODI driver messages for the Ethernet controller.

PCNTNW-NW-074	**The hardware interrupt cannot be set.** **Explanation:** An attempt was made to initialize a given hardware interrupt. The attempt was not successful. **Action:** Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, go to “Starting the diagnostic programs” on page 113 to run the diagnostic programs. If you have an Ethernet adapter installed, make sure that the adapter does not share an IRQ with any other device.
PCNTNW-NW-075	**The Multiple Link Interface Driver (MLID) cannot be registered with the Link Support Layer (LSL).** **Explanation:** An error occurred while the driver was trying to register with the LSL. **Action:** Check the version of the NetWare or IntraNetWare Operating System. Make sure that this driver is correct for the version of NetWare or IntraNetWare that you are using. Restart the server.
PCNTNW-NW-079	**The Multiple Link Interface Driver (MLID) did not initialize MSMTx Free Count.** **Explanation:** The MSMTx Free Count is not initialized correctly. **Action:** Restart the server. If the problem persists, call for service.
PCNTNW-NW-086	The driver parameter block is too small. **Explanation:** The driver parameter block is too small. **Action:** Restart the server. If the problem persists, call for service.
PCNTNW-NW-087	The media parameter block is too small. **Explanation:** The driver media parameter block is too small. **Action:** Restart the server. If the problem persists, call for service.
PCNTNW-NW-091	The hardware configuration conflicts. **Explanation:** You tried to load a new frame type for the existing controller. The hardware assumptions made in doing so are incorrect. This error can also occur if you try to specify a mode (such as, redundancy) that conflicts with another specified mode. **Action:** Make sure that your hardware configuration matches the software settings.
PCNTNW-NW-126	The group bit in the node address override was cleared. **Explanation:** The IEEE address has a group bit that indicates that an address belongs to a group of stations. This bit is used only as a destination address; it cannot be used as a source address. You tried to enter a source address with this bit set. The driver cleared the group bit of the source address. **Action:** None necessary, message is for information only.
PCNTNW-NW-127	The local bit in the node address override was set. **Explanation:** The local bit in the IEEE address format indicates that the addresses are being managed locally. If you use the node address override capabilities of this driver to enter a new address, the local bit must be set. You entered an address without the local bit set. The driver has set the local bit. **Action:** None necessary, message is for information only.
PCNTNW-NW-164	The device was not found. **Explanation:** The driver cannot find an Ethernet controller in the server. **Action:** Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, go to “Starting the diagnostic programs” on page 113 to run the diagnostic programs.

Table 22. Novell NetWare or IntraNetWare ODI driver messages for the Ethernet controller.

PCNTNW-NW-165	The device was not found at IOADDRESS. **Explanation:** The Ethernet controller cannot be found at the I/O address specified. **Action**: The Ethernet controller does not require a parameter for the I/O address. Remove the I/O address parameter.
PCNTNW-NW-167	PCI scan specified, device not found. **Explanation:** The driver cannot locate the Ethernet controller on the PCI bus. **Action**: Verify that the Ethernet controller is enabled. If the problem persists, go to "Starting the diagnostic programs" on page 113 to run the diagnostic programs.
PCNTNW-NW-180	The DMA parameter is not necessary for PCI device. **Explanation:** The Ethernet controller does not require a DMA setting. **Action**: None necessary, message is for information only.

Table 22. Novell NetWare or IntraNetWare ODI driver messages for the Ethernet controller.

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.

PermaNet™ Server:	No Secondary Adapter Found. Grouping Mode is disabled. **Explanation**: The failover option requires an adapter that is compatible with the device driver of the Ethernet controller. No such adapter was found. **Action:** Make sure that the correct adapter is installed.
PermaNet Server:	Problem Occurs on the Primary Adapter. Switching over to the Secondary Adapter. **Explanation**: The system detected a problem with the primary Ethernet connection and has transferred all network traffic to the secondary Ethernet controller. **Action:** Identify the cause of the failure on the primary Ethernet connection. Restoring the operational state of the primary connection will cause the network traffic to automatically transfer to the primary Ethernet controller.
PermaNet Server:	Switching back to Primary Adapter. **Explanation**: The primary Ethernet connection is now operating correctly. Network traffic will automatically transfer to the primary Ethernet controller. **Action:** None needed, message is for information only.

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

UNIX messages

This section provides descriptions of the Ethernet error messages for the SCO UNIX LLI driver, and suggested actions to resolve each problem.

pnt0-2	**PCI search specified, PCI device not found!** **Explanation:** The driver cannot locate the Ethernet controller on the PCI bus. **Action**: • Run the NETCONFIG program to search for another Ethernet controller • Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.
pnt0-6	Cannot allocate memory for the adapter during an interrupt. Please check your Streams parameters. **Explanation:** On a SunSoft Solaris system, this message indicates that the system is out of Streams memory blocks. **Action:** Use the CRASH utility to increase the number of Streams memory blocks. Modify the interrupt request (IRQ) settings in the Configuration/Setup Utility program, or run the NETCONFIG program to match the hardware settings.
pnt0-7	Cannot allocate memory for the adapter during reset. Please check your Streams parameters. **Explanation:** The system is out of Streams memory blocks. **Action:** Use the CRASH utility to increase the number of Streams memory blocks.
pnt0-11	**Device not found!** **Explanation:** The driver cannot find an Ethernet controller. **Action:** Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.
pnt0-12	Device failed checksum test! **Explanation:** The driver cannot find an Ethernet controller. **Action:** Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.
pnt0-13	add_intr_handler failed! Interrupts already enabled. **Explanation:** The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. **Action:** Modify your hardware settings.
pnt0-14	Cannot locate hardware. **Explanation:** The SunSoft Solaris driver cannot find any Ethernet controller. **Action:** Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.
pnt0-15	No more devices to open. **Explanation:** The SunSoft Solaris driver cannot find any more Ethernet controllers. **Action:** Verify that additional IBM Netfinity 10/100 Fault Tolerant Adapters are present or replace the Ethernet adapter that fails to respond. If the problem persists, run the diagnostic programs.
pnt0-17	Device fault...Reset initiated! **Explanation:** The SunSoft Solaris driver has been reset due to a device fault. **Action:** Verify that additional IBM Netfinity 10/100 Fault Tolerant Adapters are present or replace the Ethernet adapter that fails to respond. If the problem persists, run the diagnostic programs.

Table 24. UNIX LLI driver messages for the Ethernet controller.

pnt0-19	IRQ found for PCnet hardware does not match space.c (or pnt.conf)! **Explanation:** This is a warning message referring to the interrupt request (IRQ) that the SunSoft Solaris driver found in the system. **Action:** Ignore this message if you are sure that this is what you want to do. Otherwise, run the NETCONFIG program to match the hardware settings
pnt0-20	add_intr_handler failed! Unknown interrupt type. **Explanation:** The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. **Action:** • Modify your hardware settings. • Run the NETCONFIG program to search for another Ethernet controller.
pnt0-21	add_intr_handler failed! Out of range interrupt number. **Explanation:** The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. **Action:** • Modify your hardware settings. • Run the NETCONFIG program to search for another Ethernet controller.
pnt0-22	add_intr_handler failed! Out of range IPL. **Explanation:** The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. **Action:** Modify your hardware settings. Run the NETCONFIG program to search for another Ethernet controller.
pnt0-23	add_intr_handler failed! Vector already occupied. **Explanation:** The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. **Action:** Modify your hardware settings.
pnt0-24	add_intr_handler failed! Vector already shared at different IPL. **Explanation:** The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. **Action:** • Modify your hardware settings. • Run the NETCONFIG program to search for another Ethernet controller.
pnt0-26	The DMA number is not necessary for PCI device. **Explanation:** The IBM Netfinity 10/100 Fault Tolerant Adapter does not require a DMA setting. **Action:** Edit the SPACE.C file to delete the DMA parameter.
pnt0-29	The IRQ number is already in use. **Explanation:** The specified I/O address is already in use. **Action:** Run the NETCONFIG program to modify your hardware settings.
pnt0-31	I/O address is not necessary for the PCI device. **Explanation:** The I/O address specified is not required. **Action:** Remove the assigned I/O address specified for the Ethernet controller

Table 24. UNIX LLI driver messages for the Ethernet controller.

Replacing the battery

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

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

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a proper manner.

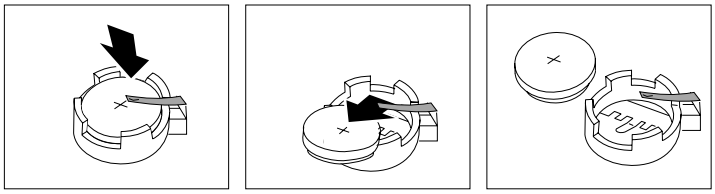
To order replacement batteries, call 1-800-772-2227 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

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

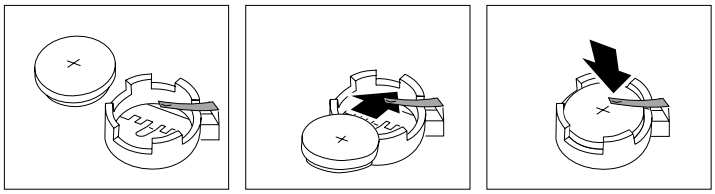
To replace the battery:

1. Read the information in “Before you begin” on page 36.
2. Follow any special handling and installation instructions supplied with the battery.
3. Turn off the server and all attached devices and disconnect all external cables and power cords (see “Safety information statements” on page 38); then, remove the top cover.
4. Locate the battery on the processor board (see “Processor board component locations” on page 32).

5. Remove adapters as necessary, so that you can access the battery. (See “Working with adapters” on page 41).
6. Lift and remove the plastic dividers by pressing the latches on the top ends of the dividers toward the dividers and lifting the dividers from the server.
7. Remove the battery:
   a. Use one finger to lift the battery clip over the battery.
   b. Use one finger to slightly slide the battery toward the rear of the server. The spring mechanism behind the battery will push it out toward you as you slide it forward.
   c. Use your thumb and index finger to pull the battery from under the battery clip.
   d. Ensure that the battery clip is touching the base of the battery socket by pressing gently on the clip.



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



9. Reinstall any adapters that you removed.
10. Insert the plastic dividers into the divider guides.
11. Reinstall the top cover.

    Note: You must wait approximately 20 seconds after you plug the power cord of your server into an electrical outlet before the power control button becomes active.

12. Start the Configuration/Setup Utility program and set configuration parameters as needed. See “Starting the Configuration/Setup Utility program” on page 13.

Getting help, service, and information

If you need help, service, 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 computer and preinstalled software, if any, is available in the documentation that comes with your computer. 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 Personal Computer 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, including supported options, at http://www.ibm.com/pc/support.

If you select 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.

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 computer, you will find a wide variety of sources available to help you.

Using the documentation and diagnostic programs

Many computer problems can be solved without outside assistance. If you experience a problem with your computer, the first place to start is the troubleshooting information of your computer 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 computers and servers come with a set of diagnostic programs that you can use to help you identify hardware problems. See the troubleshooting information of your computer 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 PC 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

  Note: 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.

Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your computer and IBM monitor
- Installing and setting up IBM options purchased from IBM or an IBM reseller
- Arranging for service (on-site or carry-in)
- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased an IBM xSeries server, you are eligible for IBM Server Start Up Support. This service provides assistance for setting up your network operating system. You can find more information about IBM Server Start Up support at http://www.ibm.com/pc/qtechinfo/SCOD-44HJ9W.html.

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.

If possible, be at your computer when you call. Please have the following information ready:

- 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 **HelpCenter Phone List**.

Country		Telephone number
Austria	Österreich	01-24 692 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	35 25 02 91
Finland	Suomi	09-22 931 840
France	France	01-69 32 40 40
Germany	Deutschland	069-6654 9040
Ireland	Ireland	01-815 9202
Italy	Italia	02-482 9202
Luxembourg	Luxembourg	298-977 5063
Netherlands	Nederland	020-504 0501
Norway	Norge	23 05 32 40
Portugal	Portugal	21-791 51 47
Spain	España	91-662 49 16
Sweden	Sverige	08-751 52 27
Switzerland	Schweiz/Suisse/Svizzera	0848-80 52 52
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.

Other services

IBM Update Connector™ is a remote communication tool that you can use with some IBM computers to communicate with the HelpCenter. Update Connector enables you to receive and download updates for some of the software that might come with your computer.

With some computer models, you can register for International Warranty Service. If you travel with your computer or need to move it to another country, you might be able to receive an International Warranty Service Certificate that is honored virtually worldwide, wherever IBM or IBM resellers sell and service IBM products.

For more information or to register for International Warranty Service:

- In the U.S. or Canada, call 1-800-497-7426.
- In Europe, call 44-1475-893638 (Greenock, U.K.).
- In Australia and New Zealand, call 61-2-9354-4171.
- In all other countries, contact your IBM reseller or IBM marketing representative.

IBM Integrated Technology Services offers a broad range of information technology support, implementation, and management services. For more information about these services, refer to the Integrated Technology Services Web site at http://www.ibm.com/services/its.

For technical assistance with the installation of, or questions related to, Service Packs for your preinstalled Microsoft Windows product, refer to the Microsoft Product Support Services Web site at http://support.microsoft.com/directory/, or you can contact the IBM HelpCenter. Some fees might apply.

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, see the online information.

Appendix A. Product warranties and notices

This chapter contains warranty and emission notices. It also contains trademarks and general-information notices.

Warranty Statement

Warranty Period

Machine - IBM @server xSeries 250 **Warranty Period*** - Three Years ** Contact your place of purchase for warranty service information. Some IBM Machines are eligible for On-site warranty service depending on the country where service is performed.*

IBM Statement of Limited Warranty

Z125-4753-06 8 / 2000

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.

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North Castle Drive

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U.S.A.

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This IBM hardware product and IBM software products that might be packaged with it have been designed, when used in accordance with their associated documentation, to process date data correctly within and between the 20th and 21st centuries, provided all other products (for example, software, hardware, and firmware) used with these products properly exchange accurate date data with them.

IBM cannot take responsibility for the date data processing capabilities of non-IBM products, even if those products are preinstalled or otherwise distributed by IBM. You should contact the vendors responsible for those products directly to determine the capabilities of their products and update them if needed. This IBM hardware product cannot prevent errors that might occur if software, upgrades, or peripheral devices you use or exchange data with do not process date data correctly.

The foregoing is a Year 2000 Readiness Disclosure.

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Alert on LAN	Predictive Failure Analysis
Chipkill	ServeRAID
e	ServerGuide
EtherJet	ServerProven
HelpCenter	Update Connector
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Light Path Diagnostics	xSeries

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Important notes

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

When referring to hard disk drive capacity, 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.

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 classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

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

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

Taiwan electrical emission statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Power cords

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

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

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

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

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

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

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

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

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Part Number: 21P9020

Printed in the United States of America.