IBM

@server

xSeries 345
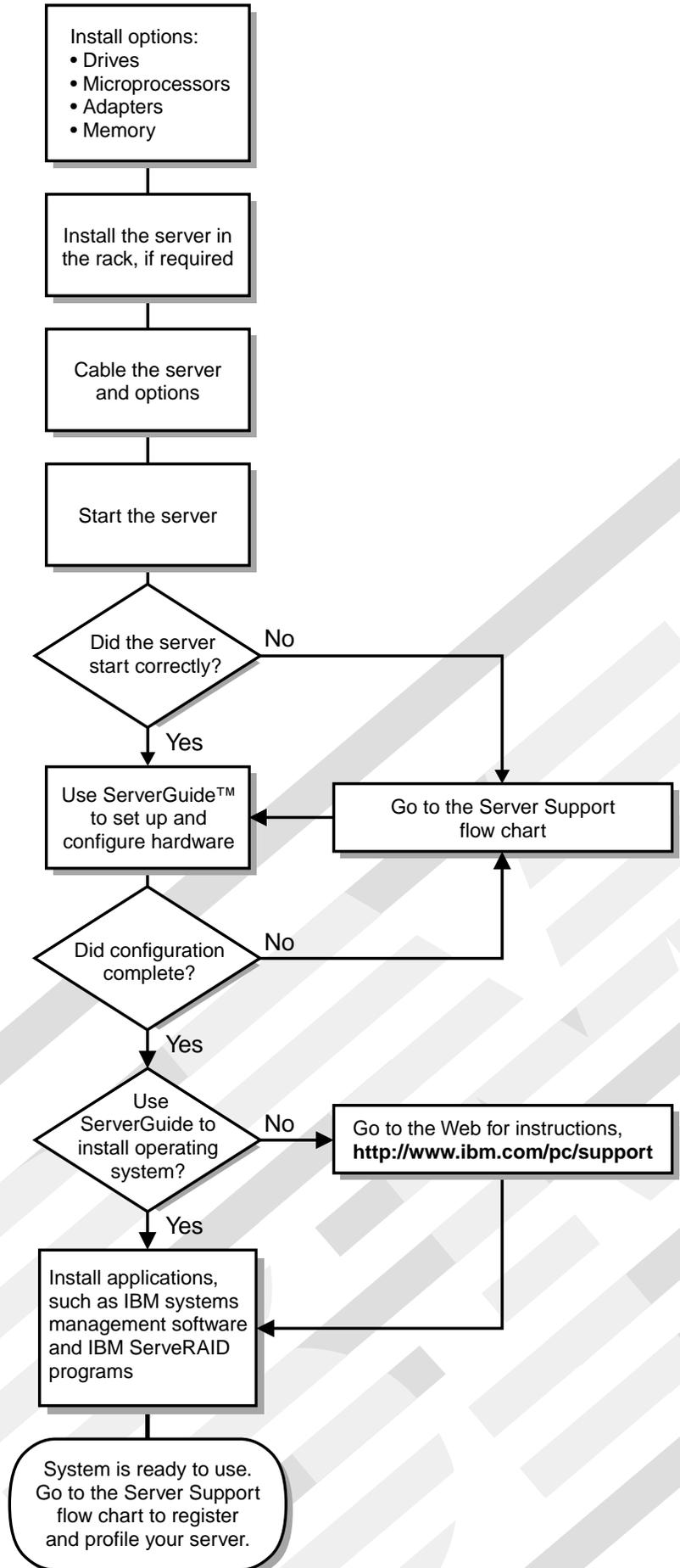## Type 8670

Installation Guide

Welcome. . .

Thank you for buying an IBM xSeries server. Your server is based on the X-Architecture™ technology, and it features superior performance, availability, and scalability.
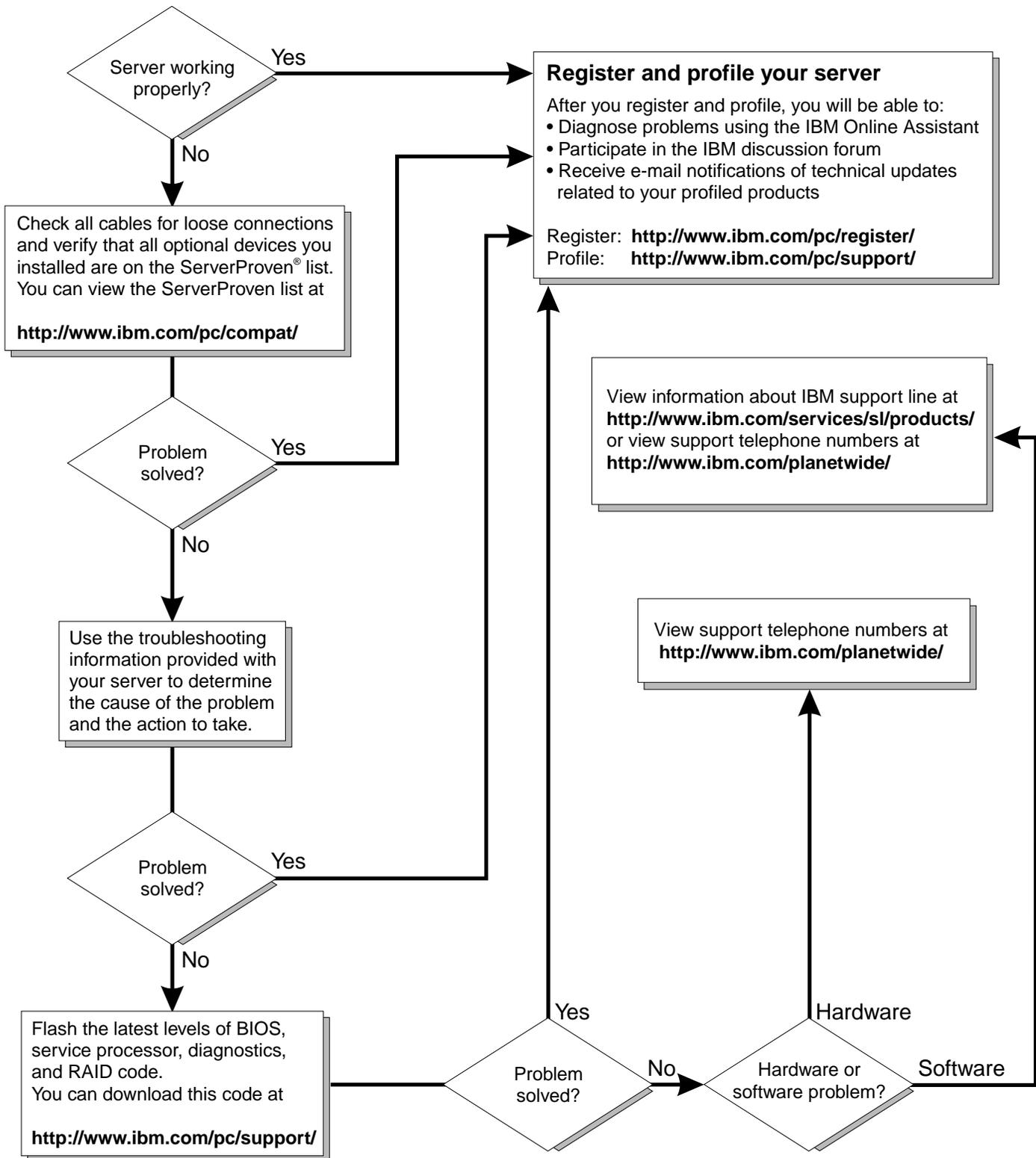
This server *Installation Guide* contains information for setting up and configuring your server.

For detailed information about your server, view the publications on the Documentation CD.

You can also find the most current information about your server on the IBM Web site at: http://www.ibm.com/pc/support

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Install options:
• Drives
• Microprocessors
• Adapters
• Memory

↓

Install the server in the rack, if required

↓

Cable the server and options

↓

Start the server

↓

Did the server start correctly? —No→ Go to the Server Support flow chart

↓ Yes

Use ServerGuide™ to set up and configure hardware ←

↓

Did configuration complete? —No→ (to Go to the Server Support flow chart)

↓ Yes

Use ServerGuide to install operating system? —No→ Go to the Web for instructions, **http://www.ibm.com/pc/support**

↓ Yes

Install applications, such as IBM systems management software and IBM ServeRAID programs

↓

System is ready to use. Go to the Server Support flow chart to register and profile your server.

Server Support

Server working properly? — Yes → **Register and profile your server**

No ↓

Check all cables for loose connections and verify that all optional devices you installed are on the ServerProven® list. You can view the ServerProven list at

http://www.ibm.com/pc/compat/

Problem solved? — Yes →

No ↓

Use the troubleshooting information provided with your server to determine the cause of the problem and the action to take.

Problem solved? — Yes →

No ↓

Flash the latest levels of BIOS, service processor, diagnostics, and RAID code.
You can download this code at

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

→ **Problem solved?** — No → **Hardware or software problem?**

Yes ↑ (to Register and profile your server)

Register and profile your server

After you register and profile, you will be able to:
• Diagnose problems using the IBM Online Assistant
• Participate in the IBM discussion forum
• Receive e-mail notifications of technical updates related to your profiled products

Register: **http://www.ibm.com/pc/register/**
Profile: **http://www.ibm.com/pc/support/**

View information about IBM support line at
http://www.ibm.com/services/sl/products/
or view support telephone numbers at
http://www.ibm.com/planetwide/

View support telephone numbers at
http://www.ibm.com/planetwide/

Hardware ↑ (from Hardware or software problem?)

Software →

IBM xSeries 345
Type 8670

Installation Guide

Note:

Before using this information and the product it supports, be sure to read the general information in Appendix A, "Warranty information" on page 37, and Appendix B, "Notices" on page 49.

Second Edition (July 2002)

Contents

Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

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

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

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

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

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

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

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

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

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

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

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

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

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1

Danger

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

To avoid a shock hazard:

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

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

Statement 2

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

Do not:

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

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

Statement 3

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

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

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

Danger

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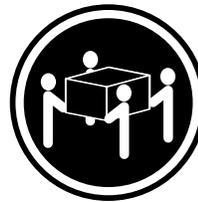

Statement 4

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

CAUTION:
Use safe practices when lifting.

Statement 5

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

2

1

Statement 8

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

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

Statement 12:

CAUTION:
The following label indicates a hot surface nearby.

Statement 13

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

Statement 14

CAUTION:
Hazardous voltage, current, and energy levels might be present. Only a qualified service technician is authorized to remove the covers where the following label is attached.

Statement 15

CAUTION:
Make sure that the rack is secured properly to avoid tipping when the server unit is extended.

Statement 16

CAUTION:
Some accessory or option board outputs exceed Class 2 or limited power source limits and must be installed with appropriate interconnecting cabling in accordance with the national electric code.

Statement 17

CAUTION:
The following label indicates moving parts nearby.

Chapter 1. Introduction

Thank you for purchasing an IBM® @server xSeries™ 345 Type 8670 server. Your server is based on the IBM X-Architecture™ technologies[1].

This *Installation Guide* provides the information that is needed to:

- Set up and cable your server
- Start and configure your server
- Install options
- Install your operating system
- Perform basic troubleshooting of your server

Packaged with this *Installation Guide* are software CDs that help you configure hardware, install device drivers, and install the operating system.

Also included is an IBM *xSeries Documentation* CD that provides detailed information about this server.

See the *Rack Installation Instructions* that come with your server for complete rack installation and removal instructions.

Record your product information in this table.	
Product name	_____
Machine type	_____
Model number	_____
Serial number	_____

Your server serial number and model number are located on labels on the bottom of the server and on the lower corner of the bezel. You will need these numbers when you register your server with IBM. The information label containing the serial number, machine type, model number, and agency marks for your server is located on the bottom of the server.

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1. X-Architecture technology takes full advantage of existing IBM technologies to build powerful, scalable, and reliable Intel processor-based servers. For more information about IBM X-Architecture, go to http://www.ibm.com/pc/us/eserver/xseries/xarchitecture/enterprise/index.html.

Features and specifications

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

Table 1. Features and specifications

Microprocessor:
• Intel® Xeon™, 2.0 GHz or higher depending on server model
• 512 KB (minimum) Level-2 cache
• 100 MHz front-side bus (FSB), at four data transfers per cycle, yielding a 400 MHz system bus
• Support for up to two microprocessors with Intel Hyper-Threading technology
 	
Memory:
• Minimum: 512 MB, expandable to 4 GB
• Type: 100 MHz, PC2100 (CL2.5), downward compatible with PC1600 (CL2), registered, ECC, double data rate (DDR), SDRAM
• Sizes: 256 MB, 512 MB, or 1 GB, in pairs
• Connectors: Two-way interleaved, four dual inline memory module (DIMM) connectors
• Maximum: Two pairs of DIMMs
 	
Drives standard:
• Diskette: 1.44 MB
• CD-ROM: IDE
 	
Expansion bays:
• Six hot-swap, slim-high, 3.5-inch drive bays (hot-swap hard disk drives installed, some models)
• One 5.25-inch bay (CD-ROM drive installed)
• One 3.5-inch removable-media drive bay (diskette drive installed)
 	
Upgradeable microcode:
 	
BIOS, diagnostics, and IBM Advanced System Management upgrades (when available) can update EEPROMs on the system board
 	
Hot-swap fans:
• Minimum: Five
• Maximum: Eight - provide redundant cooling
 	
Hot-swap power supplies:
 	
350 watts (115-230 V ac)
• Minimum: One
• Maximum: Two - provide redundant power
	PCI expansion slots:
	• Two PCI-X non-hot-plug 133 MHz/64-bit
	• Two PCI-X non-hot-plug 100 MHz/64-bit (low profile)
	• One PCI non-hot-plug, 33 MHz/32-bit
	
	Integrated functions:
	• IBM integrated system management processor (ISMP)
	  – Service processor with Light Path Diagnostics™
	  – Interconnect port
	  – Dedicated I/O port
	  – Support for IBM Remote Supervisor Adapter
	• Two 10BASE-T/100BASE-TX/1000BASE-T Ethernet ports (Intel Ethernet controller on system board)
	• One serial port
	• One external and one internal Ultra320 SCSI port (dual-channel integrated controller with RAID capabilities)
	• Three Universal Serial Bus (USB) v1.1 ports
	• Keyboard port
	• Mouse port
	• ATI Rage XL video (controller on system board)
	  – Compatible with SVGA and VGA
	  – 8 MB video memory
	
	Acoustical noise emissions:
	• Declared sound power, idle: 6.5 bel
	• Declared sound power, operating: 6.5 bel
	• Bystander sound pressure, idle: 48 dBa
	• Bystander sound pressure, operating: 48 dBa
	
	Environment:
	• Air temperature:
	  Maximum altitude: 2133 m (7000 ft)
	  – Server on: 10° to 35°C (50° to 95°F)
	  – Server off: -40° to +60°C (-40° to 140°F)
	• Humidity:
	  – Server on: 8% to 80%
	  – Server off: 8% to 80%
		Security features:
		• Power-on password
		• Remote control security settings
		• Selectable drive startup
		• Keyboard password
		• System management security
		  – User login password
		  – Read-only or read/write access
		  – Dial-in call-back
		
		Predictive Failure Analysis® (PFA) alerts:
		• Power supplies
		• Fans
		• Memory
		• Hard disk drives
		• Microprocessors
		• Voltage regulator modules (VRMs)
		
		Size (2 U):
		• Height: 85.4 mm (3.36 in.)
		• Depth: 698 mm (27.48 in.)
		• Width: 443.6 mm (17.5 in.)
		• Weight: 21.09 kg (46.5 lb) to 28.12 kg (62 lb) depending upon configuration
		
		Heat output:
		
		Approximate heat output in British thermal units (Btu) per hour
		• Minimum configuration: 341 Btu/hour (100 watts)
		• Maximum configuration: 2200 Btu/hour (645.2 watts)
		
		Electrical input:
		• Sine-wave input (50-60 Hz) required
		• Input voltage range automatically selected
		• 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: 0.1 kVA
		  – Maximum: 0.62 kVA
		
		Power available for drives:
		• +5 V dc
		• +12 V dc

Notices and statements in this book

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

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

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

Major components of your server

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

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

The following illustration shows the major components in the server.

Note: The illustrations in this document might differ slightly from your hardware.
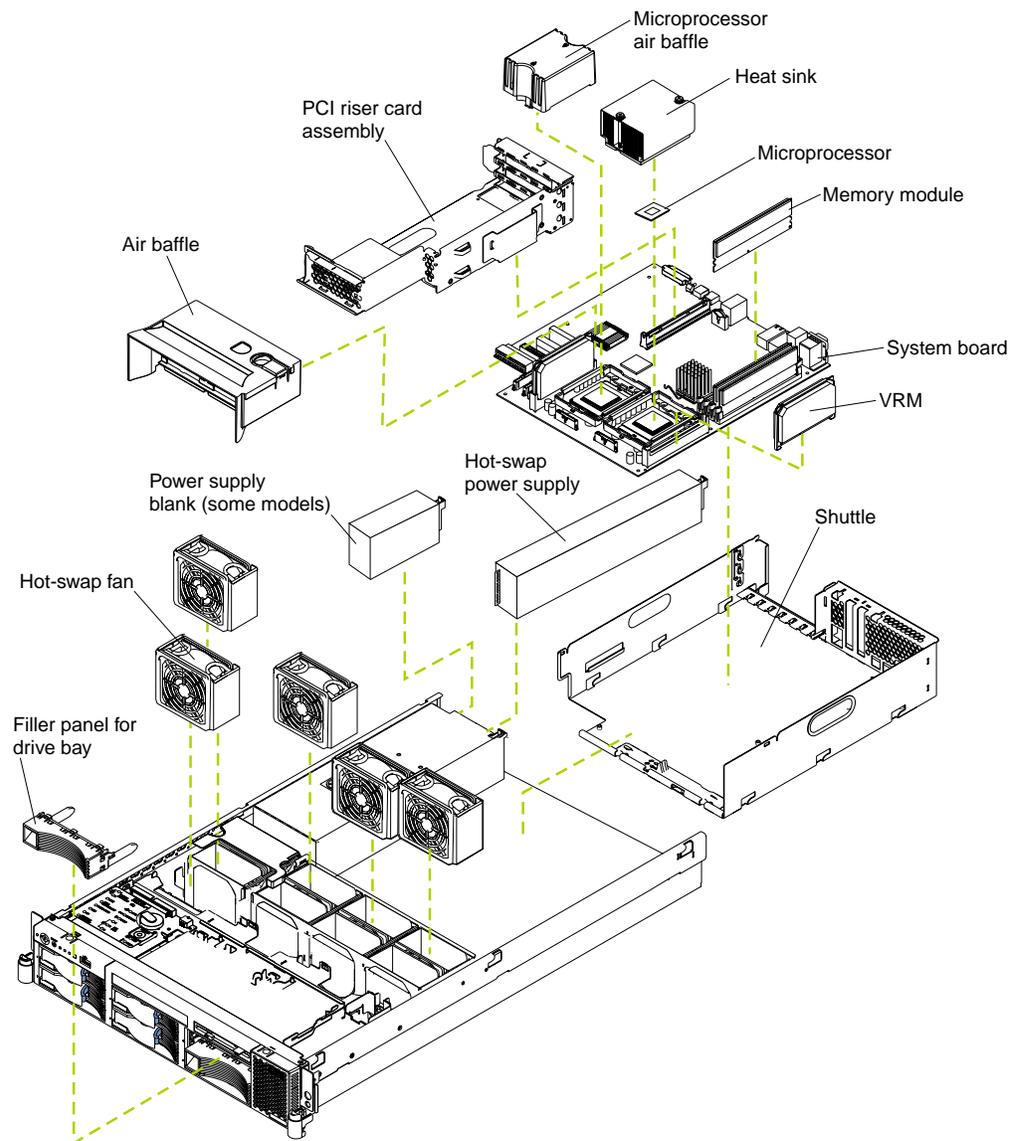
Chapter 2. Installing options

This chapter provides the basic information needed to install options in your server. This section is for all users, but it is written with the experienced user in mind. If you need more detailed installation information, see the *Option Installation Guide* on the IBM *xSeries Documentation* CD.

Installation guidelines

Be sure to review the information in this section before you begin.

System reliability considerations

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

- Become familiar with the information provided in "Safety" on page v and "Handling static-sensitive devices". These guidelines will help you work safely while working with your server options.
- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options that you intend to install.
- Back up all important data before you make changes to hard disk drives.
- For a list of supported options for your server, go to http://www.ibm.com/pc/compat/ on the World Wide Web.
- To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed in each bay.
- During normal operation, each power-supply bay must have either a power supply or power-supply blank installed for proper cooling.
- Do not leave open spaces above or below an installed server in your rack cabinet. To help prevent damage to server components, always install a blank filler panel to cover the open space and to help ensure proper air circulation. See the documentation that comes with your rack cabinet for more information.

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 packages until you are ready to install them.

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least 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 in its static-protective package. Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Installing adapters

This section describes how to install PCI or PCI-X adapters. Before you continue with the adapter-installation procedure, review the following:

- To ensure system reliability, an optional SCSI adapter cannot control internal hard disk drives.
- You can install only low-profile adapters in slots 1 and 2.
- You can install standard full-length adapters, with the adapter guides removed from the adapters, in slots 3 and 4.
- You can install only a half-length adapter in slot 5.
- The optional IBM Remote Supervisor Adapter can be installed only in PCI slot 5. Use the ribbon cable that comes with the adapter to connect the adapter to the system management connector on the PCI riser card.
- Your server supports 5.0 V and universal PCI adapters in the 32-bit PCI slot 5; your server supports only 3.3 V and universal PCI adapters in the 64-bit PCI/PCI-X slots 3 and 4.
- The PCI bus configuration is:
  - Non-hot-plug, 64-bit PCI-X slots 1 through 2 (PCI bus A, 100 MHz)
  - Non-hot-plug, 64-bit PCI-X slots 3 through 4 (PCI bus B, 133 MHz)
  - Non-hot-plug, 32-bit PCI slot 5 (PCI bus C, 33 MHz)
- The system scans PCI and PCI-X slots 1 through 5 to assign system resources; then, the system starts (boots) the system devices in the following order, if you have not changed the default boot precedence: integrated Ethernet controller, integrated SCSI controller, and then PCI and PCI-X slots 5, 3, 4, 1, and 2.

Note: If you are installing the optional ServeRAID-5i controller, please review the following:
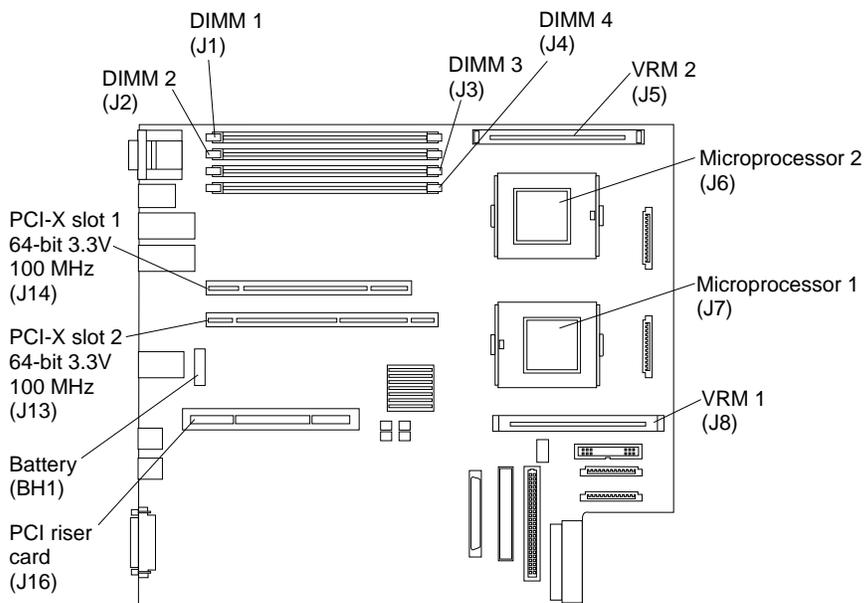
- No rerouting of the internal SCSI cable is required if you are installing the ServeRAID-5i controller. The ServeRAID-5i controller uses the SCSI connector on the system board for output.
- The ServeRAID-5i controller can be installed only in PCI slot 2.
- The low-profile 2-U bracket that comes with the controller is required to install the controller.

- If the ServeRAID-5i controller is installed, it takes control of the integrated SCSI controller with RAID capabilities and operates at 66 MHz.
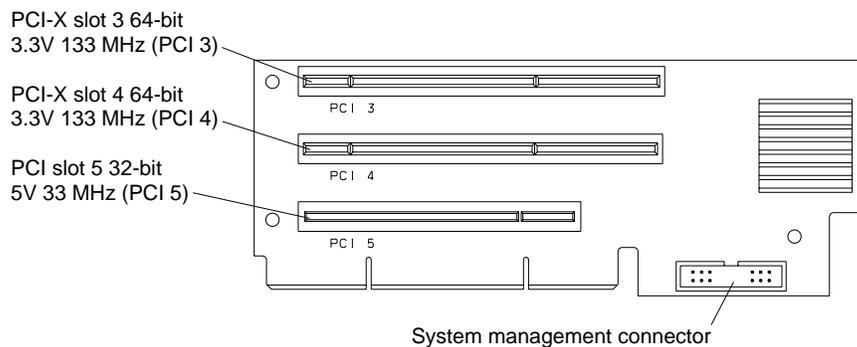
This section contains the procedure for installing an adapter. For more detailed instructions, see the *Option Installation Guide* on the *xSeries Documentation* CD.

The following illustrations show the location of the PCI and PCI-X adapter expansion slots on the system board and PCI riser card.

System board

DIMM 1 (J1)
DIMM 2 (J2)
DIMM 3 (J3)
DIMM 4 (J4)
VRM 2 (J5)
Microprocessor 2 (J6)
PCI-X slot 1 64-bit 3.3V 100 MHz (J14)
Microprocessor 1 (J7)
PCI-X slot 2 64-bit 3.3V 100 MHz (J13)
VRM 1 (J8)
Battery (BH1)
PCI riser card (J16)

PCI riser card

PCI-X slot 3 64-bit 3.3V 133 MHz (PCI 3)
PCI 3
PCI-X slot 4 64-bit 3.3V 133 MHz (PCI 4)
PCI 4
PCI slot 5 32-bit 5V 33 MHz (PCI 5)
PCI 5
System management connector

The following illustration shows how to install an adapter.
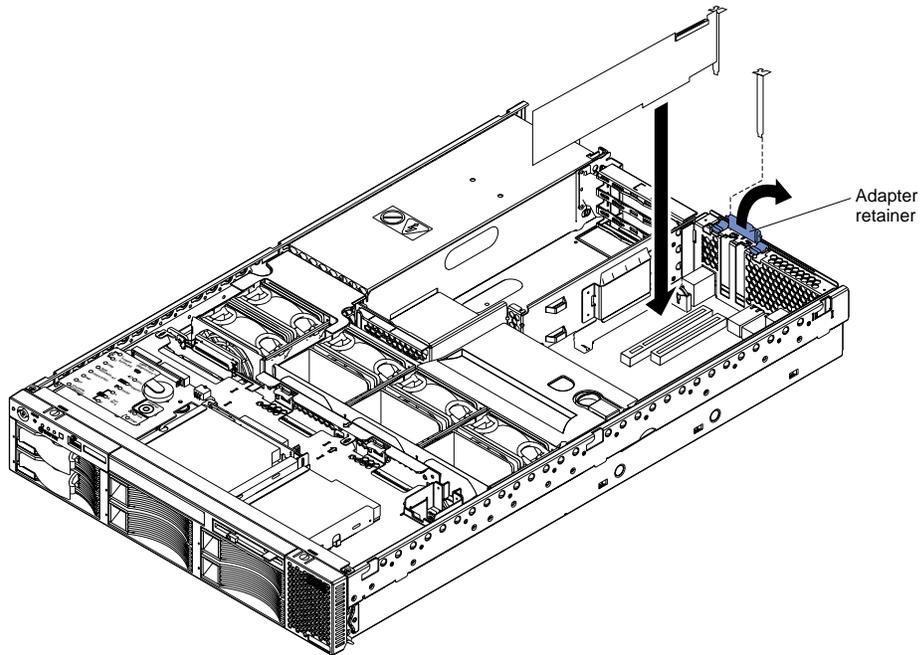
Adapter
retainer

Complete the following steps to install a PCI or PCI-X adapter:

1. Review the information in "Safety" on page v and "Installation guidelines" on page 5.
2. Remove the top cover.
3. Select the slot you will use for the adapter.
4. If you are installing an adapter in PCI slot 3, 4, or 5, remove the PCI riser-card assembly.

PCI riser-card assembly

Retention latch
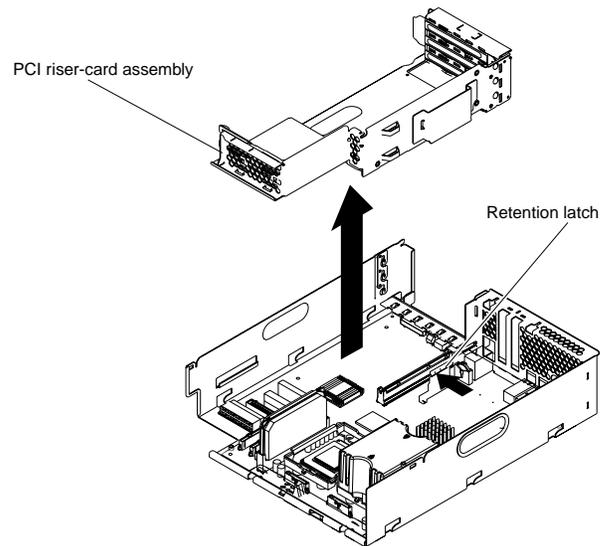
5. Slide the expansion-slot cover out of the server or PCI riser-card assembly.

6. Install the adapter. The following illustration shows how to install an adapter in the PCI riser-card assembly.
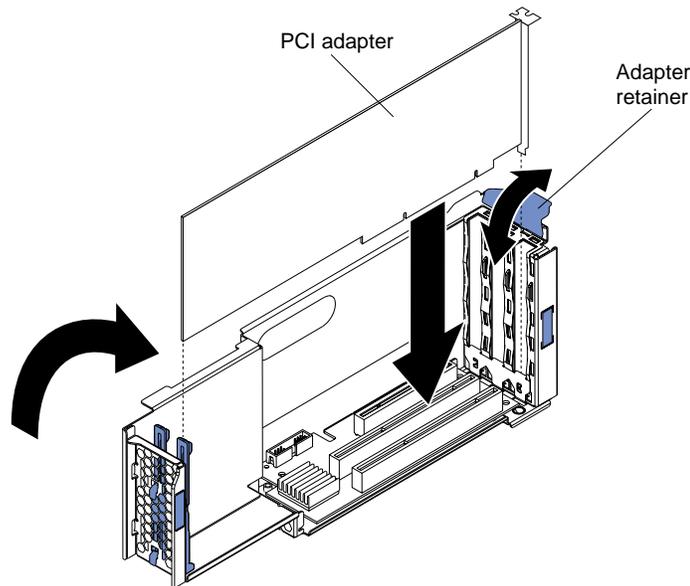
7. If you removed the PCI riser-card assembly to install the adapter, press the PCI riser-card assembly *firmly* into the connector so that the retention latch is engaged.

   Note: Make sure that the PCI riser-card assembly is properly seated on the system-board connector and that the cables under the PCI riser-card assembly are not pinched.

8. Connect any needed cables to the adapter.

   Attention: When you route the cables, do not block the ventilated space around any of the fans. In addition, route any cables that are plugged into the PCI adapter under adjacent adapters so they are not pinched between the top edge of the adapter and the server side wall.

9. If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 17.

Installing memory modules

When you install memory, you must install a pair of matched double-data-rate (DDR) dual-inline-memory modules (DIMMs). Before you install memory, review the following:

- The system board contains four DIMM connectors and supports two-way memory interleaving.
- The DIMM options available for your server are 256 MB, 512 MB, and 1 GB.
- The amount of usable memory will be reduced, depending on the system configuration. The BIOS will display the total amount of installed memory and the amount of configured memory.
- Your server supports a minimum of two 256 MB DIMMs (for a total of 512 MB) installed in the DIMM 1 and DIMM 2 memory connectors (J1 and J2, respectively). When you install additional DIMMs, install them in pairs, with the next pair in DIMM connectors 3 and 4 (J3 and J4).
- Both DIMMs in a pair must be the same size, speed, type, and technology. You can mix compatible DIMMs from various manufacturers.

- The second pair of DIMMs do not have to be of the same size, speed, type, and technology as the first pair.
- Install only 100 MHz, 2.5 V, 184-pin, double-data-rate (DDR), PC2100, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2100 (and downward compatible with PC1600) SDRAM Registered DIMM specification, which is available from http://www.jedec.org/ on the World Wide Web. For a list of supported options for your server, go to http://www.ibm.com/us/compat/ on the World Wide Web.
- Your server supports Chipkill™ technology, if the DIMMs are all of the type 4x.
- Save new configuration information only if you replace a faulty DIMM that was marked as **Disabled** in the Configuration/Setup Utility program **Memory Settings** menu. In this case, re-enable the memory row in the Configuration/Setup Utility program or reload the default memory settings. See the *User's Guide* on the IBM *xSeries Documentation* CD for more information.

Install the DIMMs in the order shown in the following table:

Table 2. DIMM order of installation

Pair	DIMM connectors
First	1 and 2 (J1, J2)
Second	3 and 4 (J3, J4)

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

DIMM 3 (J3)
DIMM 4 (J4)
DIMM 1 (J1)
DIMM 2 (J2)
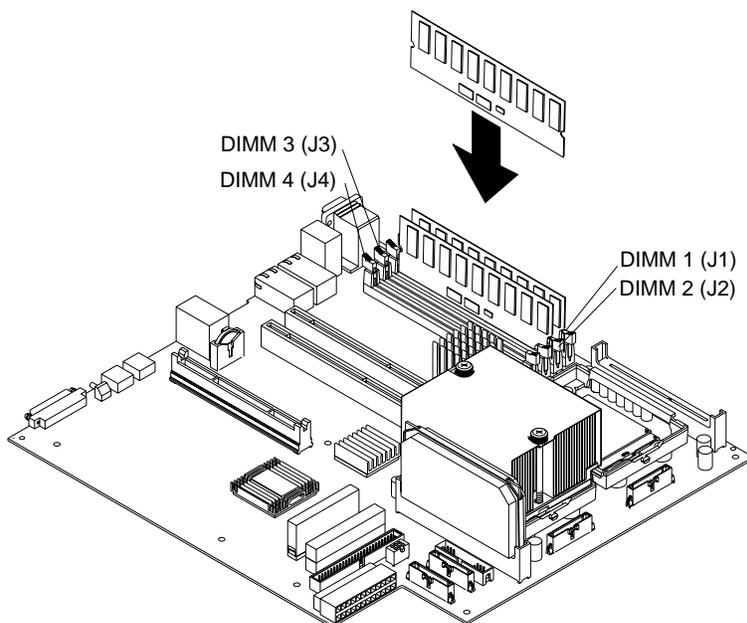
Before you begin, read the documentation that comes with your option.

Complete the following steps to install a DIMM:
1. Review the information in "Safety" on page v and "Installation guidelines" on page 5.
2. Remove the top cover.
3. Determine the connectors into which you will install the DIMMs.
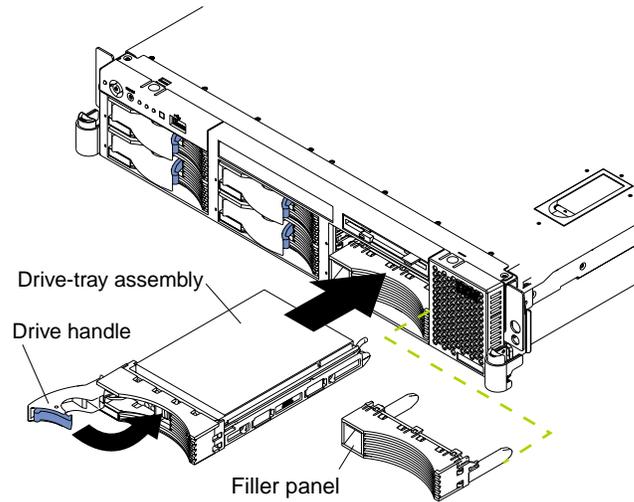4. Install the DIMMs in the connectors.

5. If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 17.

Installing a hot-swap drive

Your server supports six 1-inch (26 mm) slim 3.5-inch low-voltage differential (LVD) hard disk drives.

The following illustration shows how to install a hot-swap hard disk drive.

Complete the following steps to install a drive in a hot-swap bay.

Notes:

1. All hot-swap drives being used in the server should have the same throughput speed rating. Mixing hard drives with different speed ratings will cause all drives to operate at the lower throughput speed.
2. The SCSI ID assigned to each bay is printed on the bezel.

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 in each bay.

1. Review the information in "Safety" on page v and "Installation guidelines" on page 5.
2. Remove the filler panel.
3. Place the drive handle in the open position and slide the drive into the bay.
4. Close the drive handle.

Installing an additional microprocessor

Your server supports up to two microprocessors.

Attention:

- A startup (boot) microprocessor must always be installed in socket J7 on the system board.
- To ensure proper server operation when you install 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.

Notes:

1. To order additional microprocessor options, contact your IBM reseller or IBM marketing representative.
2. When you install the microprocessor in socket J6, you must also install the voltage regulator module (VRM) that comes with the microprocessor in VRM connector J5.
3. The microprocessor speeds are automatically set for this server; therefore, you do not need to set any microprocessor frequency-selection jumpers or switches.
4. If you need to replace a microprocessor, call for service.

The following illustration is a simplified layout of the microprocessor connector locations and other microprocessor-related components on the system board.
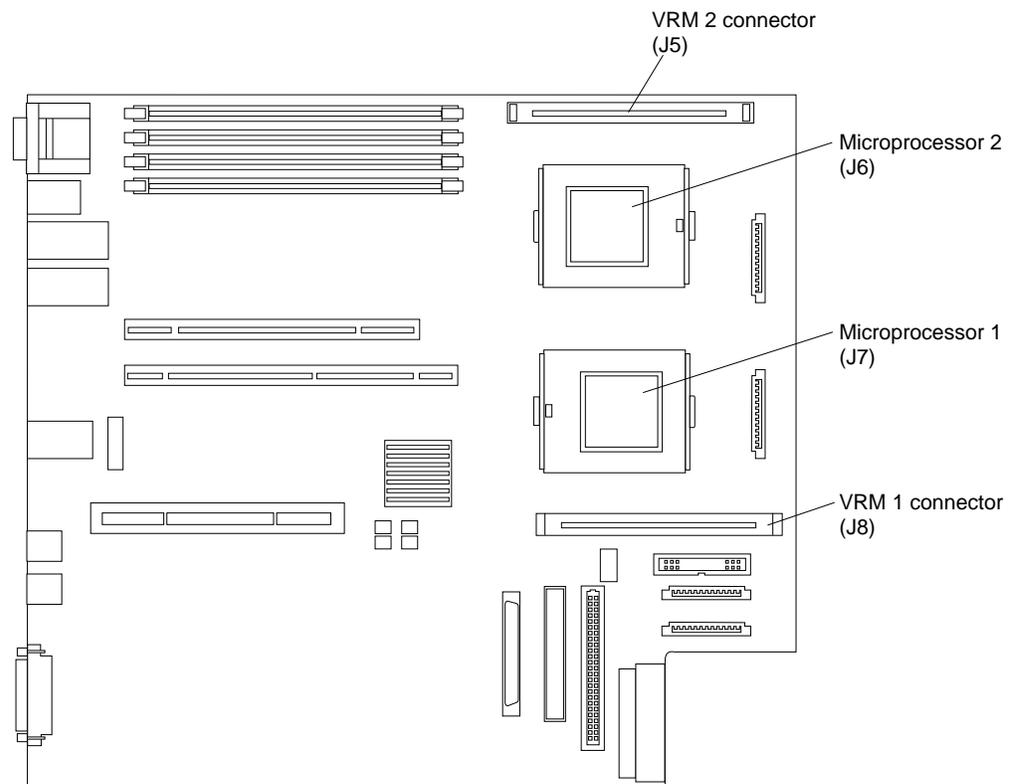
The following illustration shows how to install the second microprocessor on the system board.

Note: Do not remove the first microprocessor from the system board to install the second microprocessor.
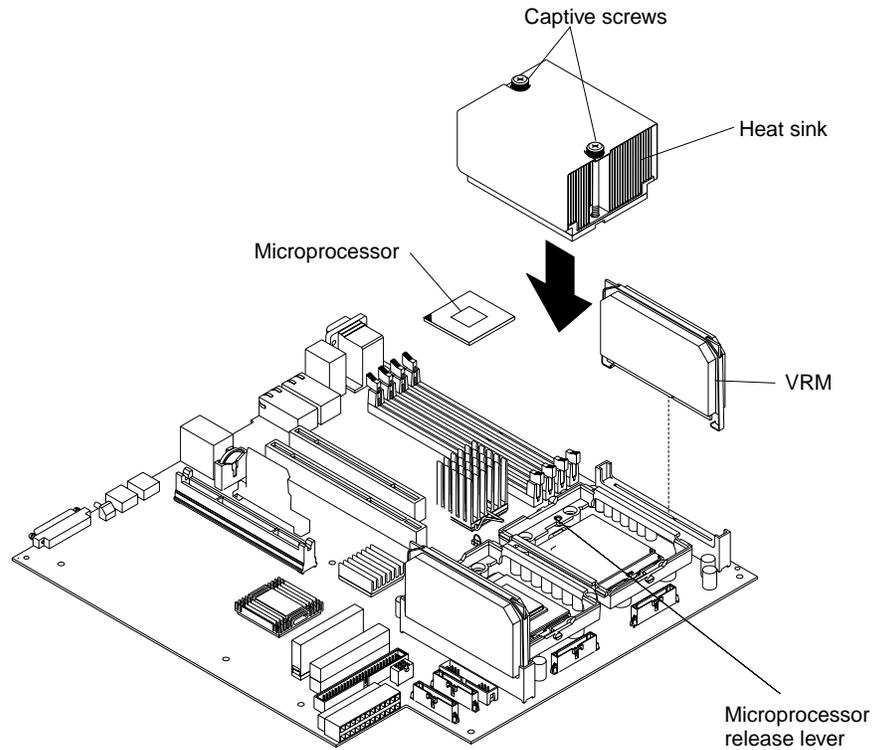
Complete the following steps to install an additional microprocessor:

1. Review the information in "Safety" on page v and "Installation guidelines" on page 5.
2. Remove the top cover.
3. Remove the air baffle.

4. Remove the air baffle from the empty microprocessor socket and store the air baffle for future use.
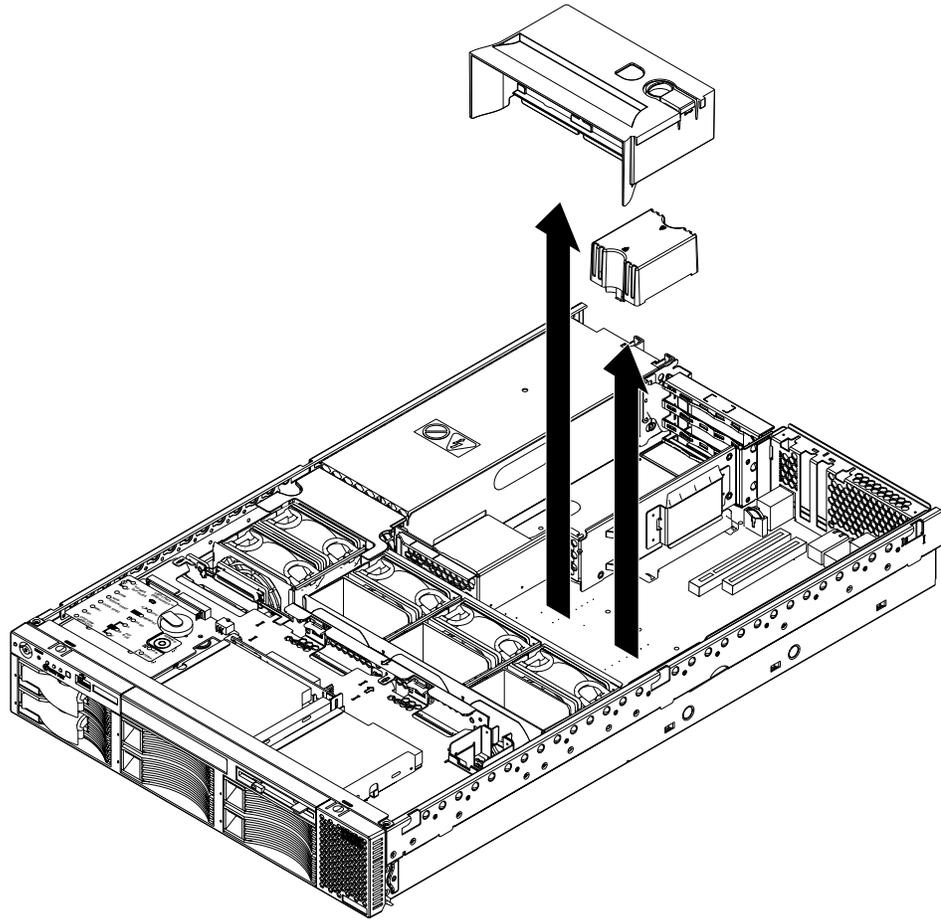
5. Install a VRM in the VRM connector (J5) and install the metal clip over the VRM.
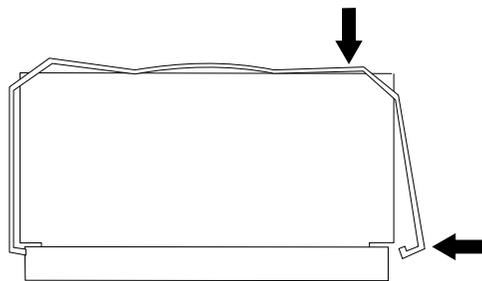
6. Locate the second microprocessor socket (connector J6) on the system board.

7. Install the microprocessor:

   Attention:

   - Do not use excessive force when pressing the microprocessor into the socket.
   - Make sure that the microprocessor is oriented and aligned correctly with pin number 1 in the socket before you try to close the lever. The following illustration shows the alignment marks for microprocessor 2 and microprocessor socket 2.

   a. Center the microprocessor over the microprocessor socket. Align the triangle on the corner of the microprocessor with the triangle on the corner of the socket and carefully press the microprocessor into the socket.
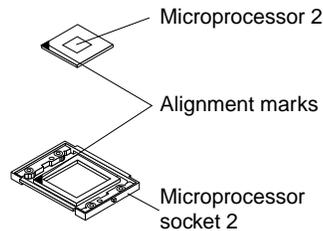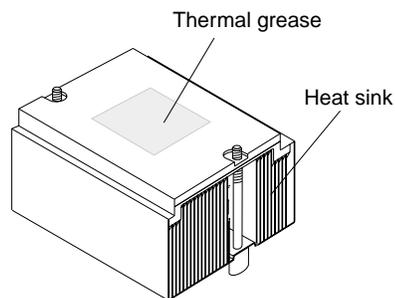
   Microprocessor 2

   Alignment marks

   Microprocessor
   socket 2

   b. Carefully close the microprocessor-release lever to secure the microprocessor in the socket.

8. Install a heat sink on the microprocessor:

   Attention:

   - Do not set the heat sink down after you remove the plastic cover.

   Thermal grease

   Heat sink

   - Do not touch the thermal grease on the bottom of the heat sink. Touching the thermal grease will contaminate it. If the thermal grease on the microprocessor or heat sink becomes contaminated, contact your service technician.

   a. Remove the plastic protective cover from the bottom of the heat sink.

   b. Align and place the heat sink on top of the microprocessor with the thermal grease side down. Press firmly on the heat sink.

      Attention: If you do not alternate the tightening of the two captive screws, you might damage the microprocessor. Ensure that the screws are completely tightened; otherwise, the server will not function properly.

   c. Secure the heat sink to the microprocessor by tightening the captive screws. Alternate between the two captive screws in the heat sink while tightening them.

9. Install the air baffle.

10. If you have other options to install or remove, do so now; otherwise, go to "Completing the installation" on page 17.

Installing a hot-swap power-supply option

Your server supports a maximum of two hot-swap power supplies.

Note: Hot-swap fans come with the power-supply option.

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.

The following illustration shows how to install a hot-swap power supply.
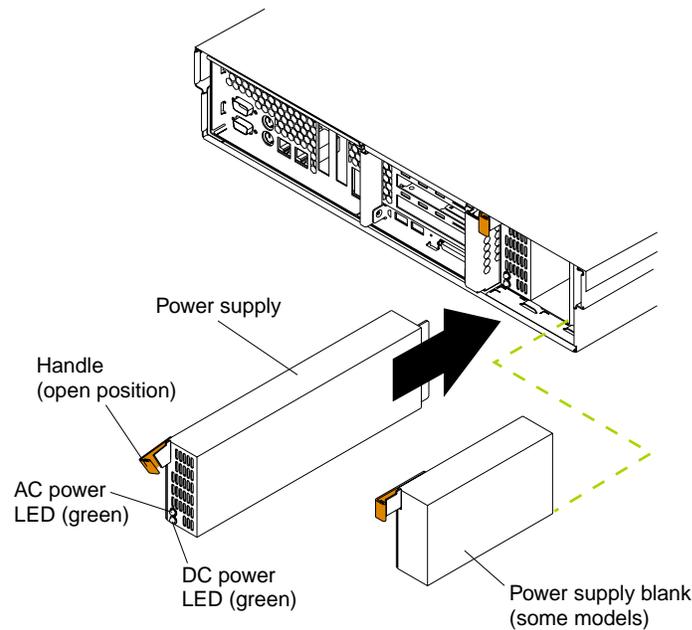
Complete the following steps to install a power supply:

1. Review the information in "Safety" on page v and "Installation guidelines" on page 5.

2. (Some models) Remove the power-supply blank from the empty power-supply bay by pinching the side clip and pulling the power-supply blank from the bay. Save the power-supply blank in case you remove the power supply at a later time.

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

3. Move the handle on the power supply into the open position and slide the power supply into the chassis.

4. Gently close the handle to seat the power supply into the bay.

5. Plug the power cord for the new power supply in the power-cord connector on the back of the server.

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

Note: When you turn on the server, verify that the dc power LED and ac power LED on the power supply are lit, indicating that the power supply is operating correctly.

Completing the installation

Complete the following steps to complete the installation:

1. Install the top cover.

2. Install the server in a rack. See the *Rack Installation Instructions* that come with your server for complete rack installation and removal instructions.

   Attention:
   - Install your server only in a rack cabinet with perforated doors.
   - Do not leave open spaces above or below an installed server in your rack cabinet. To help prevent damage to server components, always install a blank filler panel to cover the open space and to help ensure proper air circulation. See the documentation that comes with your rack cabinet for more information.
   - Install your server in a rack that meets the following requirements:
     – Minimum depth of 70 mm (2.76 in.) between the front mounting flange and the inside of the front door.
     – Minimum depth of 157 mm (6.18 in.) between the rear mounting flange and the inside of the rear door.
     – Minimum depth of 718 mm (28.27 in.) and maximum depth of 762 mm (30.00 in.) between the front and rear mounting flanges.

3. Plug in all cables and power cords.

The following illustrations show the locations of the input and output connectors on your server. Detailed cabling instructions are in the *Rack Installation Instructions* that come with your server.

Notes:

1. You must turn off the server before connecting cables to or disconnecting any cables from the server (see "Turning off the server" on page 22).

2. See the documentation that comes with your options for additional cabling instructions. It might be easier for you to route cables before you install certain options.

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.

Rear view

Mouse

Universal Serial Bus (USB)
1 and 2

Serial

Video

Keyboard

Ethernet 1

Ethernet 2

RS 485-A
(ISMP)

RS 485-B
(ISMP)

SCSI

Front view

USB 3
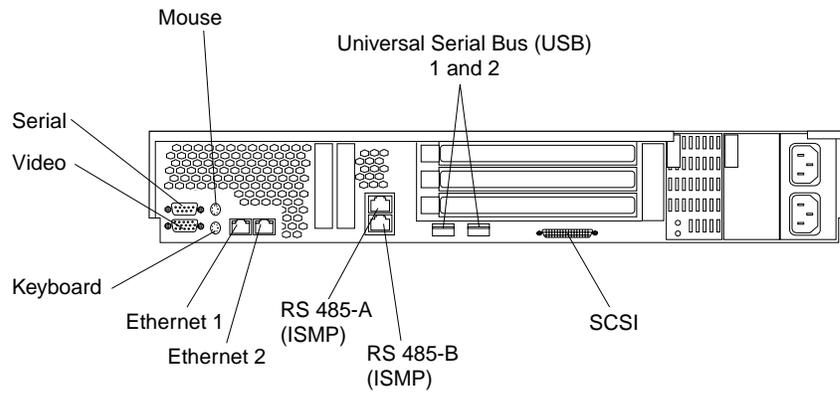
Chapter 3. Server power, controls, and indicators

This section identifies the controls and indicators on the front and rear of your server. It also describes the power features of your server.
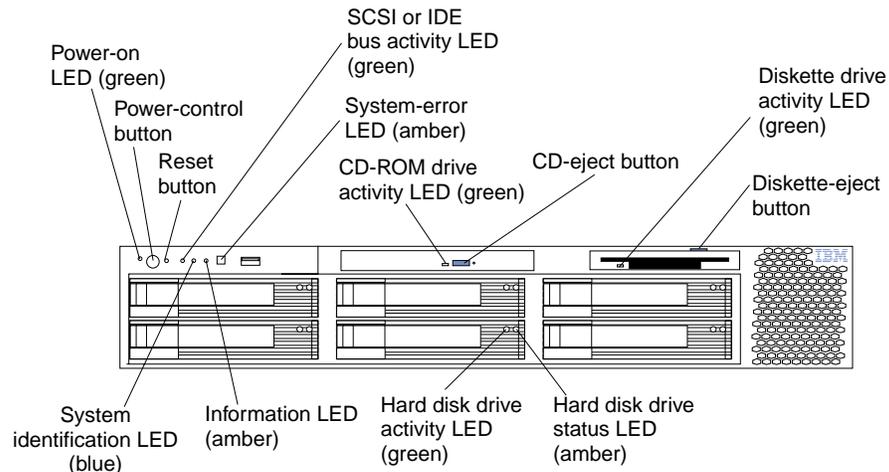
Front view

Power-on LED (green)
Power-control button
Reset button
SCSI or IDE bus activity LED (green)
System-error LED (amber)
CD-ROM drive activity LED (green)
CD-eject button
Diskette drive activity LED (green)
Diskette-eject button
System identification LED (blue)
Information LED (amber)
Hard disk drive activity LED (green)
Hard disk drive status LED (amber)

Power-on LED: This green LED is lit and stays on when you turn on your server and flashes when the server is in Standby mode.

Attention: If the power-on light-emitting diode (LED) is off, it does not mean that there is no electrical current present in the server. The LED 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.

Power-control button: Press this button to manually turn on the server and put the server in Standby mode (see "Turning on the server" on page 21).

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

SCSI or IDE bus activity LED: This green LED is lit when there is activity on the SCSI or IDE bus.

System error LED: This amber LED is lit when a system error occurs. An LED on the diagnostic LED panel will also be on to further isolate the error.

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

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

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

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

Hard disk drive status LED: Each hot-swap drive has a hard disk drive status LED. When this amber LED is lit continuously, the drive has failed. If a RAID adapter is installed in the server, when the LED flashes slowly (one flash per second), the drive is being rebuilt. When the LED flashes rapidly (three flashes per second), the controller is identifying the drive.

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

Information LED: This amber LED is lit when the information log contains information about certain conditions in your server that might affect performance. For more information, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

System-identification LED: This blue LED is lit in response to a programmed condition, or it can be turned on remotely by the system administrator to aid in server identification for maintenance. The system administrator can turn off the system identification LED after maintenance is complete.

Rear view
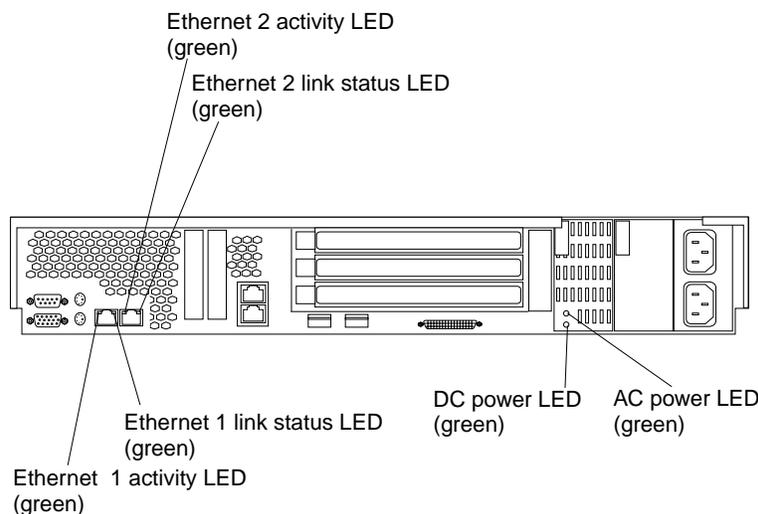
Ethernet 2 activity LED: This green LED is lit when the server is transmitting to or receiving signals from the Ethernet LAN that is connected to Ethernet port 2.

Ethernet 2 link status LED: This green LED is lit when there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for Ethernet port 2.

AC power LED: This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

DC power LED: This green LED provides status information about the power supply. During typical operation, both the ac and dc power LEDs are lit. For any other combination of LEDs, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD.

Ethernet 1 link status LED: This green LED is lit when there is an active link connection on the 10BASE-T, 100BASE-TX, or 1000BASE-TX interface for Ethernet port 1.

Ethernet 1 activity LED: This green LED is lit when the server is transmitting to or receiving signals from the Ethernet LAN that is connected to Ethernet port 1.

Server power features

This section contains information about how to properly turn your server on and off.

Turning on the server

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

- If the power cords are connected to a power source, you can press the power-control button on the front of the server.

    Note: 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.

- If the server is turned on and a power failure occurs, it restarts automatically when power is restored.
- You can turn on the server by using the optional Remote Supervisor Adapter.
- You can turn on the server by using the Integrated System Management Processor (ISMP)
- When you plug in your server for the first time, Wake on LAN™ can turn on the server.
- If your server was previously turned on, it must be properly placed in Standby mode for the Wake on LAN feature to turn on the server.

Complete the following steps to manually turn on the server:

1. Review the information in "Safety" on page v.
2. Turn on all external devices, such as the monitor.
3. Plug the server power cords into the power source.
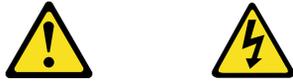4. Press the power-control button on the front of the server.

Note: While the server is powering up, the power-on LED on the front of the server is lit.

Turning off the server

Complete the following steps to manually turn off the server:

1. Review the information in "Safety" on page v.
2. See your operating system documentation for the proper procedure to shut down the operating system.

Statement 5

CAUTION:
The power-control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.
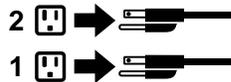
3. Press the power-control button on the front of the server. This will put the server in Standby mode.
4. Disconnect the server from the power source.

   Notes:

   a. After you turn off the server, wait at least 5 seconds before you turn on the server again.
   b. You might need to press and hold the power-control button for more than 4 seconds to cause an immediate shutdown of the server and to force the power off. You can use this feature if the operating system stops functioning.

Standby mode

Standby mode refers to the condition in which the server operating system is not running and all core logic is shut down except for the service processor.

Complete the following steps to put the server into Standby mode:

1. See the operating system documentation for the proper procedure to shut down the operating system.

   Note: Each operating system is different. Read all the documentation about shutting down the operating system before continuing.
2. Press the power-control button on the front of the server.

You can put the server into Standby mode remotely by using the service processor.

Chapter 4. Configuring your server

The *ServerGuide™ Setup and Installation* CD provides software setup tools and installation tools that are specifically designed for your IBM server. Use this CD during the initial installation of your server to configure basic hardware features and to simplify your operating system installation. (See "Using the ServerGuide Setup and Installation CD" for more information.)

In addition to the *ServerGuide Setup and Installation* CD, you can use the following configuration programs to customize your server hardware:

- **Configuration/Setup Utility**

  This program is part of the *basic input/output system* (*BIOS*) code that comes with your server. You can use this program to configure serial port assignments, change interrupt request (IRQ) settings, change the drive startup sequence, set the date and time, and set passwords. For information on using this utility, see "Using the Configuration/Setup Utility program" on page 24.

- **ServeRAID programs**

  The ServeRAID programs come with your server. If your server has a ServeRAID adapter installed or if you are using the RAID capabilities of the integrated SCSI controller, you can use the ServeRAID Manager program to define and configure your disk-array subsystem *before* you install your operating system. For information about using this utility, see "Using ServeRAID Manager" on page 24.

- **LSI Logic Configuration Utility**

  With the built-in LSI Logic Configuration Utility program, you can configure the integrated SCSI controller and the devices that attach to it. See "Using the LSI Logic Configuration Utility program" on page 25.

- **IBM Director**

  IBM Director is a work-group-hardware-management tool that you can use to centrally manage xSeries servers; IBM Netvista™, IntelliStation®, and ThinkPad® computers; and non-IBM Intel-microprocessor-based systems. IBM Director automates tasks such as inventory-taking, monitoring of environmental sensors (such as temperature, voltage and fans), alerting, and system-health information.

  For more information and instructions about IBM Director, see the IBM *Director User's Guide* on the IBM *Director* CD that comes with your server.

See the *User's Guide* on the IBM *xSeries Documentation* CD for detailed instructions for using the configuration programs and the *ServerGuide Setup and Installation* CD.

Using the ServerGuide Setup and Installation CD

The *ServerGuide Setup and Installation* CD provides state-of-the-art programs to detect the server model and hardware options that are installed, configures the server hardware, provides device drivers, and helps to install your operating system.

Note: If the *ServerGuide Setup and Installation* CD does not start, see "ServerGuide problems" on page 29.

Complete the following steps to start the *ServerGuide Setup and Installation* CD.

1. Insert the *ServerGuide Setup and Installation* CD, and restart the server.
2. Follow the instructions that appear on the screen to:

a. Select your language.

b. Select your keyboard layout and country.

c. View the overview to learn about ServerGuide features.

d. View the README file to review installation tips about your operating system and adapter.

e. Start the setup and hardware configuration programs.

f. Start the operating system installation. You will need your copy of the operating system CD.

   Note: For information about the supported operating system versions, see the *ServerGuide Setup and Installation* CD label.

Using the Configuration/Setup Utility program

The Configuration/Setup Utility program is a menu-driven utility program that is part of the BIOS code that comes with your server. You can use it to:

• Configure serial port assignments
• Change the drive startup sequence
• Enable USB keyboard and mouse support
• Resolve configuration conflicts
• Set the date and time
• Set passwords

Complete the following steps to start the Configuration/Setup Utility program:

1. Turn on the server (see "Turning on the server" on page 21) and watch the monitor screen.

2. When the message `Press F1 for Configuration/Setup` appears, press F1.

3. Follow the instructions that appear on the screen.

Using ServeRAID Manager

You can use the ServeRAID Manager program, provided on the IBM *ServeRAID Support* CD, to:

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

The ServeRAID Manager program operates in two ways:

• Startable CD mode
• As an installed software program

See the ServeRAID documentation on the IBM *ServeRAID Support* CD for additional information about RAID technology and instructions for using ServeRAID Manager.

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports only RAID level 1 operation.

2. If your server has a ServeRAID-5i controller installed, you can use ServeRAID Manager to configure the integrated SCSI controller with RAID capabilities for other supported RAID levels.

Using the LSI Logic Configuration Utility program

The LSI Logic Configuration program is a built-in, menu-driven configuration utility program. You can use it to:

- Perform a low-level format on a hard disk drive
- Set the SCSI device scan order
- Set the SCSI ID for a controller

Notes:

1. The integrated SCSI controller with RAID capabilities in your server supports RAID level 1 operation. Installing an optional ServeRAID-5i controller provides additional RAID levels. See "Using ServeRAID Manager" on page 24 for information on configuring your server for RAID operation.

2. If you install a different type of RAID controller in your server, use the configuration method supplied with the RAID controller to view or change SCSI settings for attached devices.

Complete the following steps to start the LSI Logic Configuration Utility program:

1. Turn on the server (see "Turning on the server" on page 21) and watch the monitor screen.

2. When the `Press CTRL C to start LSI Logic Configuration Utility` prompt appears, press Ctrl+C.

   Note: If an administrator password has been set, a prompt appears asking you to type the password to start the LSI Logic Configuration Utility program.

3. Use the arrow keys to select a controller (channel) from the list of adapters; then, press Enter.

4. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Chapter 5. Solving problems

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

If you cannot locate and correct the problem using the information in this section, see the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information.

Diagnostic tools overview

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

- **POST beep codes**

  The power-on self-test beep codes indicate the detection of a problem.

  – One beep indicates successful completion of POST.

  – More than one beep indicates that POST detected a problem. Error messages also appear during startup if POST detects a hardware-configuration problem.

  See "POST beep code descriptions" and the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information.

- **Troubleshooting charts**

  These charts list problem symptoms and steps to correct the problem. See the "Troubleshooting chart" on page 30 for more information.

- **Diagnostic programs and error messages**

  The system diagnostic programs are provided in ROM. These programs test the major components of your server. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information.

- **Light Path Diagnostics feature**

  Use the Light Path Diagnostics feature to identify system errors quickly. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information.

POST beep code descriptions

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

Note: See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information about the POST beep codes.

Table 3. POST beep code descriptions

Beep code	Descriptions of the POST beep codes
No beep	Call for service.
Continuous	If no video appears, the startup microprocessor failed. Verify that the startup microprocessor is installed correctly. If it is, call for service.

Table 3. POST beep code descriptions (continued)

Beep code	Descriptions of the POST beep codes
One short	POST completed successfully. One beep also occurs after POST if you enter an incorrect password.
Two short	Follow the instructions that appear on the screen.
Three short	POST detected a system memory error. Verify that the memory is installed correctly. If it is, replace the failing memory module.
Repeating short	The system board might contain a failing component. 1. Verify that the keyboard and pointing devices are connected properly. 2. Ensure that nothing is resting on the keyboard. 3. Disconnect the pointing device; then, restart the server. If the problem goes away, replace the pointing device. If the problem remains, call for service.
One long and one short	If the video controller on the system board is being used, call for service. If you installed an optional video adapter, replace the failing adapter.
One long and two short	A video I/O adapter ROM is not readable, or the video subsystem is defective. If you installed an optional video adapter, replace the failing adapter. If the problem remains, call for service.
One long and three short	The system-board video subsystem has not detected a monitor connection to the server. Ensure that the monitor is connected to the server. If the problem remains, replace the monitor.
Two long and two short	POST does not support the optional video adapter. Replace the optional video adapter with one that is supported by the server or use the integrated video controller.
All other beep codes	1. Verify that the system memory modules are installed correctly. 2. Turn off the server; then, restart the server. If the problem remains, call for service.

POST error messages

The following table provides an abbreviated list of the error messages that might appear during POST.

Note: See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more information about the POST error messages.

Table 4. Abbreviated list of POST error messages

POST message	Failing device or problem found	Suggested action
129	L1 cache of a microprocessor	Check the installation of your microprocessors.
162	Change in device configuration	Verify that your optional devices are turned on and installed correctly.
163	Time of day has not been set	Set the correct date and time.
164	Change in memory configuration	Verify that your memory is installed properly; then, restart the server and run the Configuration/Setup Utility program.
201	Change in memory configuration	Verify that your memory is fully seated and installed properly.
229	L2 cache of a microprocessor	Check the installation of your microprocessors.
289	Failing DIMM was disabled	Verify that your memory is correct for your server and that it is installed properly.
301 303	Keyboard and keyboard controller	Ensure that the keyboard cable is connected and nothing is resting on the keyboard keys.
11*xx*	Serial port error	Verify that the serial cable is connected correctly.

Table 4. Abbreviated list of POST error messages (continued)

POST message	Failing device or problem found	Suggested action
1162	Serial port configuration conflict	Start the Configuration/Setup Utility program and ensure that the IRQ and I/O port assignments needed by the serial port are available.
1601	BIOS code update needed	Download and install the latest level of system BIOS code.
1800	PCI adapter hardware interrupt	Start the Configuration/Setup Utility program and verify that the interrupt resource settings are correct.
2400 2462	Video controller and memory	Verify that the monitor is connected correctly.
00019*xxx*	Processor *x* is not functioning or failed the built-in test	Verify that processor *x* is installed correctly. If the problem remains, replace processor *x*.
00180*xxx*	A PCI adapter requested a resource that is not available	Start the Configuration/Setup Utility program and ensure that the resources needed by the PCI adapter are available.
012980*xx* 012981*xx*	Data for processor *x*	Download and install the latest level of system BIOS code.
01298200	Microprocessor speed mismatch	Install microprocessors with identical speeds.
I9990305	POST could not find an operating system.	Install your operating system.

ServerGuide problems

The following table lists problem symptoms and suggested solutions.

Table 5. ServerGuide Setup and Installation CD

Symptom	Suggested action
The *ServerGuide Setup and Installation* CD will not start.	• Ensure that the server is supported and has a startable (bootable) CD-ROM drive. • If the startup (boot) sequence settings have been altered, ensure that the CD-ROM drive is first in the startup sequence. • If more than one CD-ROM drive is installed, ensure that only one drive is set as the primary drive. Start the CD from the primary drive.
The SCSI RAID program cannot view all installed drives, or the NOS cannot be installed.	• Ensure that there are no duplicate SCSI IDs or IRQ assignments. • Ensure that the hard disk drive is connected properly.
The Operating System Installation program continuously loops.	Make more space available on the hard disk.
The ServerGuide program will not start your NOS CD.	Ensure that the NOS CD you have is supported by the ServerGuide program. See the *ServerGuide Setup and Installation* CD label for a list of supported NOS versions.
The NOS cannot be installed; the option is not available.	Ensure that the NOS is supported on your server. If the NOS is supported, either there is no logical drive defined (SCSI RAID systems) or the ServerGuide System Partition is not present. Run the ServerGuide program, and ensure that setup is complete.

Troubleshooting chart

Notes:

1. See the *Hardware Maintenance Manual and Troubleshooting Guide* on the IBM *xSeries Documentation* CD for more detailed troubleshooting charts.
2. If you cannot find the problem in the troubleshooting charts, run the diagnostic programs. If you have run the diagnostic test programs, or if running the tests does not reveal the problem, call for service.

Table 6. Troubleshooting charts

Symptom	Suggested action
CD-ROM drive problems CD-ROM drive is not recognized.	Verify that: • The IDE channel to which the CD-ROM drive is attached (primary or secondary) is enabled in the Configuration/Setup Utility program. **Note:** On systems with a single IDE channel, only the primary channel can be used. • All cables and jumpers are installed correctly. • The correct device driver is installed for the CD-ROM drive.
Diskette drive problems Diskette drive activity LED stays on, or the system bypasses the diskette drive.	If there is a diskette in the drive, verify that: • The diskette drive is enabled in the Configuration/Setup Utility program. • The diskette is good and not damaged. (Try another diskette if you have one.) • The diskette contains the necessary files to start the server. • Your software program is working properly. If the diskette drive activity LED 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: • The cables for all external SCSI options are connected correctly. • The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • 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 expansion enclosure documentation.
General problems Problems such as broken cover locks or indicator LEDs not working.	Call for service.
Hard disk drive problems Not all drives are recognized by the hard disk drive diagnostic test (Fixed Disk test).	1. Remove the first drive not recognized and try the hard disk drive diagnostic test again. 2. If the remaining drives are recognized, replace the drive you removed with a new one.
System stops responding during hard disk drive diagnostic test.	1. Remove the hard disk drive being tested when the server stopped responding and try the diagnostic test again. 2. If the hard disk drive diagnostic test runs successfully, replace the drive you removed with a new one.

Table 6. Troubleshooting charts (continued)

Symptom	Suggested action
Intermittent problems A problem occurs only occasionally and is difficult to detect.	Verify that: • All cables and cords are connected securely to the rear of the server and attached options. • When the server is turned on, air is flowing from the rear of the server at the fan grill. If there is no airflow, the fan is not working. This causes the server to overheat and shut down. • Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. If you have verified these items and the problem remains, call for service.
Keyboard, mouse, or pointing-device problems. All or some keys on the keyboard do not work.	• Make sure that the keyboard cable is properly connected to the server. • Make sure that the server and the monitor are turned on. • Try using another keyboard. If the problem remains, call for service.
The mouse or pointing device does not work.	• Verify that the mouse or pointing-device cable is securely connected and the device drivers are installed correctly. • Try using another mouse or pointing device. If the problem remains, call for service.
Memory problems	Verify that: • The memory modules are seated properly. • You have installed the correct type of memory. • If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program. • 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.

The amount of system memory displayed is less than the amount of physical memory installed.	Look in the POST error log for error message 289:
	• If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM.
	• If the DIMM was disabled by the user or by POST:
	  1. Start the Configuration/Setup Utility program.
	  2. Enable the DIMM.
	  3. Save the configuration and restart the server.
	• If you continue to get this error, replace the DIMM.
	
	If the problem remains, call for service.

Microprocessor problems	The startup (boot) microprocessor is not working properly.
The server emits a continuous tone during POST.	Verify that the startup microprocessor is seated properly. If it is, call for service.
Monitor problems Testing the monitor.	Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, see the information that comes with the monitor for adjusting and testing instructions. If you still cannot find the problem, call for service.
The screen is blank.	Verify that: • The server power cord is plugged into the server and a working electrical outlet. • The monitor cables are connected properly. • The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. If you have verified these items and the screen remains blank, call for service.

Table 6. Troubleshooting charts (continued)

Symptom	Suggested action
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 you installed the necessary device drivers for the application. If the items above are correct and the screen remains blank, call for service.
The screen is wavy, unreadable, rolling, distorted, or has screen jitter.	If the monitor self-tests show the monitor is working properly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor. **Notes:** 1. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). 2. Non-IBM monitor cables might cause unpredictable problems. 3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, contact your IBM reseller or IBM marketing representative. If the problem remains, call for service.
Wrong characters appear on the screen.	If the wrong language is displayed, update the BIOS code with the correct language. If the problem remains, call for service.
Option problems An IBM option that was just installed does not work.	Verify that: • The option is designed for the server. See the "Server Support" flowchart for information about obtaining ServerProven™ compatibility information from the World Wide Web. • You followed the installation instructions that came with the option. • The option is installed correctly. • You have not loosened any other installed options or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. If the problem remains, call for service.
An IBM option that used to work does not work now.	Verify that all of the option hardware and cable connections are secure. If the option comes with its own test instructions, use those instructions to test the option. If the failing option is a SCSI option, verify that: • The cables for all external SCSI options are connected correctly. • The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • 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.

Table 6. Troubleshooting charts (continued)

Symptom	Suggested action
Power problems The server does not turn on.	Verify that: • The power cables are properly connected to the server. • The electrical outlet functions properly. • The type of memory installed is correct. • If you just installed an option, remove it, and restart the server. If the server now turns on, you might have installed more options than the power supply supports. If the problem remains, call for service.
The server does not turn off.	Verify whether you are using an ACPI or non-ACPI operating system. If you are using a non-ACPI operating system: 1. Press Ctrl+Alt+Delete. 2. Turn off the system by using the power-control button. If the problem remains or if you are using an ACPI-aware operating system, 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: • Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports are disabled. • The serial-port adapter, if you installed one, is seated properly. If the problem remains, call for service.
A serial device does not work. For more information about the serial port, see the *Option Installation Guide* on the IBM *xSeries Documentation* CD.	Verify that: • The device is compatible with the server. • The serial port is enabled and is assigned a unique address. If the problem remains, call for service.
Software problem Suspected software problem.	To determine if problems are caused by the software, verify that: • Your server has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. **Note:** If you have just installed an adapter or memory, you might have a memory address conflict. • The software is designed to operate on your server. • Other software works on your server. • The software that you are using works on another system. If you received any error messages when using the software program, see the information that comes with the software for a description of the messages and suggested solutions to the problem. If you have verified these items and the problem remains, contact your place of purchase.
Universal Serial Bus (USB) port problems A USB device does not work.	Verify that: • You are not trying to use a USB device during POST if you have a standard (non-USB) keyboard attached to the keyboard port. **Note:** If a standard (non-USB) keyboard is attached to the keyboard port, the USB is disabled and no USB device will work during POST. • The correct USB device driver is installed. • Your operating system supports USB devices. If the problem remains, call for service.

Chapter 6. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you. This 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 xSeries or IntelliStation system, and whom to call for service, if it is necessary.

Before you call

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

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

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

Using the documentation

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

Getting help and information from the World Wide Web

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

You can find service information for your IBM products, including supported options, at http://www.ibm.com/pc/support/. If you click **Profile** from the support page, you can create a customized support page. The support page has many sources of information and ways for you to solve problems, including:

- Diagnosing problems, using the IBM Online Assistant
- Downloading the latest device drivers and updates for your products
- Viewing Frequently Asked Questions (FAQ)
- Viewing hints and tips to help you solve problems
- Participating in IBM discussion forums
- Setting up e-mail notification of technical updates about your products

Software service and support

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

For more information about Support Line and other IBM services, go to http://www.ibm.com/services/, or go to http://www.ibm.com/planetwide/ for support telephone numbers.

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to http://www.ibm.com/planetwide/ for support telephone numbers.

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

Appendix A. Warranty information

This section contains information about your warranty period and the service and support that are provided by your warranty.

Warranty period

The warranty period varies by machine type and country or region.

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

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician.

A warranty period of 3 years on parts and 1 year on labor means that IBM will provide warranty service without charge for:
1. parts and labor during the first year of the warranty period
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor it provides in performance of the repair or replacement.

The IBM Machine Warranties Web site at http://www.ibm.com/servers/support/machine_warranties/ contains a worldwide overview of the IBM Statement of Limited Warranty for IBM Machines, a glossary of terms used in the Statement of Limited Warranty, Frequently Asked Questions (FAQ), and links to Product Support Web pages. The IBM Statement of Limited Warranty is available from this Web site in 29 languages in Portable Document Format (PDF).

Machine - IBM @server xSeries 345 Type 8670

Country or region	Warranty period	Service delivery method
Japan	Parts - 3 years, Labor - 1 year	On-site repair
All other countries or regions	Parts - 3 years, Labor - 3 years	On-site repair

Problem determination

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician. The service specialist will run diagnostic tests on the hardware and check the software.

Running diagnostics
The IBM service specialist will help you determine whether your equipment is functioning as specified. It might be necessary to isolate the failing xSeries, Netfinity, or IntelliStation system; IBM component; or both from any active production environment to run diagnostics and perform defect-isolation programs. You are responsible for making the system, IBM component, or both available for running diagnostics and defect-isolation programs.

Checking software

The IBM service specialist will help you ensure that the correct BIOS code, firmware, device drivers, and other supporting IBM software are installed and correctly configured. It might be necessary to manually gather information about the relevant software levels or run IBM-approved utility programs to gather this information. It might be necessary to isolate the failing system from any active production environment to gather this information. You are responsible, with assistance from the service specialist, for gathering this information. The IBM Statement of Limited Warranty does not include on-site assistance with this activity.

Warranty service and support

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

The following services are available during the warranty period:
- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.
- **Customer replaceable units (CRUs)** - Some parts of IBM servers are designated as customer replaceable units. IBM ships CRUs to you for replacement by you. CRUs include keyboards, monitors, memory, diskette drives, hard disk drives, and mice (this list is not inclusive of all CRUs).

The following items are not covered under warranty service:
- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of BIOS code, firmware, or device drivers that are designated as customer installable.

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

Please have the following information ready when you call:
- The machine type and model of your IBM hardware product (if available)
- Serial numbers of your IBM hardware products
- A description of the problem
- The exact wording of any error messages
- Hardware and software configuration information

International Warranty Service

If you travel with your xSeries or IntelliStation system or relocate it to a country where your system is sold and serviced by IBM or IBM resellers authorized to perform warranty service, International Warranty Service (IWS) is available during the warranty period. Eligible IBM systems are identified by their four-digit machine types.

You can obtain IWS through the service delivery method (such as depot, carry-in, or on-site) provided in the servicing country. Service methods and procedures vary by country, and some service or parts might not be available in all countries. Service centers in certain countries might not be able to service all models of a particular machine type. In addition, some countries might have fees and restrictions that apply at the time of service.

To determine whether your system is eligible for IWS, go to http://www.ibm.com/pc/support/ and click **Warranty lookup**.

Purchasing additional services

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

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

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.

Appendix B. Notices

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Important notes

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

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

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1000000 bytes, and GB stands for approximately 1000000000 bytes.

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

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

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

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

Electronic emission notices

Federal Communications Commission (FCC) statement

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

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

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

Industry Canada Class A emission compliance statement

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

Avis de conformité à la réglementation d'Industrie Canada

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

Australia and New Zealand Class A statement

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

United Kingdom telecommunications safety requirement

Notice to Customers

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

European Union EMC Directive conformance statement

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

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

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

Taiwan electrical emission statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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

Power cords

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

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

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

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

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

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

Table 7. Power cords

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

Table 7. Power cords (continued)

IBM power cord part number	Used in these countries and regions
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
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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IBM

Part Number: 48P9726

48P9714